GCU-DG3
User's Guide

EGCON Co.,Ltd

A manual of Generator Control Unit

GCU®(GENERATOR CONTROL UNIT)

MODEL : DG3

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Cautions For Safety

1. Before use, please be well-informed of manual and drawing to use this product safely.
2. Please keep all cautions for safety to prevent potential accidents and dangers.
3. Cautions for safety are divided into 'warning' and 'caution' and each meaning is as follow.

⚠ warning	potential injury or death may arise in case that violates instructions
⚠ Caution	potential injury or product damage may arise in case that violates instructions

4. Meanings of picture signals indicated in the manual are as follow.

⚠	Please be careful of potential product damages.
⚡	Please be careful of potential electrocution.

5. Please keep the manual close to product.

⚠ Warnings

1. Please do not begin wiring work when power supply is input or driving a car to prevent electrocution and fire.
2. Please do not disassemble power supply even it is not input to prevent electrocution by charged current in product.
3. Please do not touch with wet hands to prevent electrocution.
4. Please do not touch when sheath of electric wire is damaged to prevent electrocution.
5. Please do earthing of electric wire to prevent electrocution.

⚠ Cautions

1. Please permit a regular power supply to product to prevent product damages and fire.
2. Please be careful of input of foreign substances in product to prevent short circuit and fire.
3. Please connect subordination fitted to capacity of input and output sockets to prevent product damages and fire.입.
4. Please do not connect wires arbitrarily to prevent product damages and fire.
5. Only technicians or educated operators are allowed to use this product to prevent human injuries or components damages connected to this product from irrational use.
6. For this product is made of electric components, please do testing that needs high voltage such as inner voltage test or insulation resistance test only after separation of product to prevent components damages.
7. Please use fuse and electric wire of regular capacity to prevent fire.
8. Please hold this product tightly because it is treated for high-vibrated engine generator.
9. Please install after checking untangled parts when moving.

1. Outline

GCU-DG3 is a Diesel Engine Generator Controller that contains digital instrumentation function and digital protective relay. Especially, this is easy and convenient to use that it is optimized for national environments.

2. Product Features

2.1. Watt-hour meter [kWh]
2.2. Function of Digital protective relay (OVR, OCR, UVR, OFR, UFR).
2.3. Input of RPM, OPG, WTG, DCV, ETM gauges and OTG
2.4. Interface functions of commercial electricity and non-electricity by automatic operating signals
2.5. Functions of remote control and observation through RS485 MODBUS-RTU-typed communication
2.6. Double protection of starter motor by detection of engine rotating speed and oil pressure switch
2.7. Input of condition printing function
2.8. Input of 18 Fault History functions
2.9. Input of overspeed and overvoltage testing switch
2.10. Preheating function of engine preheating plug for small engine
2.11. Input of alert sounds
2.12. pause Solenoid burn preventive designal
2.13. Function of administrator password
2.14. Function of change from interface capacity for starter and pauseper(15A), ACB input, and block to high capacity
2.15. Input of generator pauseper function when there perceives not MPU signal in normal operation

3. Capacity and function

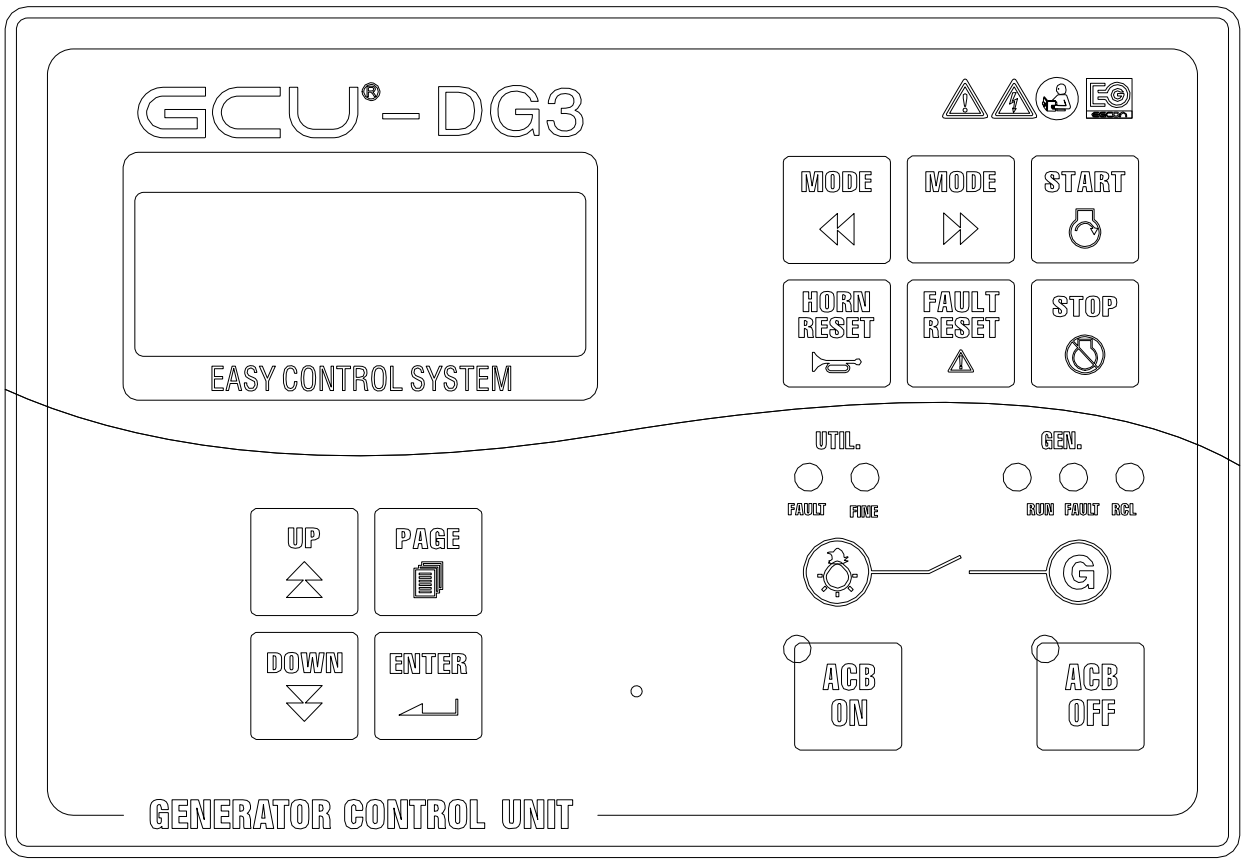
3.1. Control power supply: 8~35Vdc, Consumption voltage: below 5W on standby, 360W on maximum
3.2. Speed perception: MPU detection 0~7,000Hz, 3~20Vac
3.3. Detection of commercial power: Max. 500Vac, 3 Phase 4 Wire 380/220Vac or single Phase 220Vac
3.4. Automatic operation signal: commercial power or dry contact
3.5. Fault detection:10, Alert:4
3.6. Operating electricity instrumentation and scope accuracy: 3 Phase 4 Wire

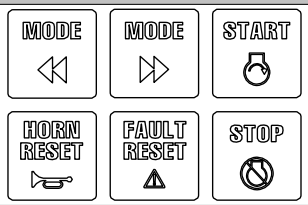
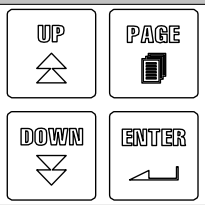
NO.	Instrumentation item	Range	Accuracy
1	L-L (Line to line Voltage)	30 ~ 500Vac	± 1%
2	L-N (Phase to phase Voltage)	10 ~ 300Vac	± 1%
3	A (Line current)	0 ~ 6.5A	± 1%
4	Hz (Frequency)	45 ~ 65Hz	± 1%
5	PF (Power factor)	-0.3 ~ +0.3	± 1%
6	kW (Active power)	0 ~ 99999kW	± 1%
7	kVAR (Reactive power)	0 ~ 99999kVAR	± 1%
8	kVA (Rated apparent power)	0 ~ 99999kVA	± 1%
9	kWh (Quantity of active power)	0 ~ 99999kWh	± 1%
10	kVARh (Quantity of Reactive power)	0 ~ 99999kVARh	± 1%

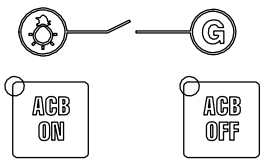
4. Circumstance

4.1. Operating Temperature: -10° ~ 40°C
4.2. Storage Temperature: -24° ~ 45°C
4.3. Relative Humidity: 0% ~ 90% Noncondensing
4.4. Vibration : amplitude-0.35mm,
frequency-0~30Hz
4.5. Maximum Operating Altitude: 3,000m
4.6. Maximum Storage Altitude: 4,500m
4.7. Installment inner area where no existence of influences of dust and salt

5. Functions of Control Switch



(1) Operation Control Switch		(2) Controling switch for setting change	
			
MODE	Switch for turning to the left in operation mode <OFF> - <MNU> - <ATO> - <R-M>	UP	Increasing change of setting, Changing in operation mode
MODE	Switch for turning to the right in operation mode <OFF> - <MNU> - <ATO> - <R-M>	DOWN	Decreasing change of setting, Changing in operation mode
START	Generator start switch in MNU(manual mode)	PAGE	Only in <OFF> Mode, transferring to setting page
STOP	Generator pause switch in MNU(manual mode)	ENTER	Save after setting change
HORN RESET	Buzzer pause switch when detecting fault, Lamp Test Function when OFF mode		
FAULT RESET	Fault Reset Button		

(3) ACB Control Switch		(4) Lamp	
			
ACB OFF	Blocking ACB in MNU(manual mode), ACB block indicating lamp	UTIL. FAULT FUSE	Fault: lighting when commercial electricity is abnormal, Normal: lighting when commercial electricity is normal
ACB ON	Blocking ACB in MNU(manual mode), ACB block indicating lamp, input is impossible when operation voltage is low.	GEN. RUN FAULT RCL	Operation: lighting when generation is in operation, Fault: lighting when there detecting all sorts of faults. Remote: lighting when selecting remote operation mode(GCU control is not in operation when selecting)

6. LCD Display

(0)

```
        GCU-DG3
GEN.     CONTROL     UNIT
        VER 0.91
    EGCON CO., LTD.
```

1. Version
2. Indicating short alert sound and screen for 5 seconds and transferring to start-up screen when inputting power supply.

(1)

```
<OFF>      MNU ATO R-M
R-S:000V   RPM:0000
  R:000A   OPG:0.0bar
 Hz:00.0   WTG:20.0'C
```

1. Start-up
2. Indication of R-S voltage, R-current, and frequency of generator
3. Indication of RPM, OPG, WTG measurements
4. Pressing <UP> transfers to screen (7) and pressing <DOWN> transfers to next screen.

(2)

```
<OFF>      MNU ATO R-M
R-S:000V   R:000.0A
S-T:000V   S:000.0A
T-R:000V   T:000.0A
```

1. Indication of line voltage and phase current
2. Pressing <DOWN> transfers to next screen

(3)

```
<OFF>      MNU ATO R-M
R-N:000V   R:000.0A
S-N:000V   S:000.0A
T-N:000V   T:000.0A
```

1. Indication of line voltage and phase current of generator

(4)

```
<OFF>      MNU ATO R-M
   kW:  000.0 kW
   pF:  1.00
  kWH:  000.0 kWH
```

1. Indication of active electricity, its quantity, and power factor of generator

(5)

```
<OFF>      MNU ATO R-M
 kVAR:  000.0 kVAR
  kVA:  000.0 kVA
   pF:  1.00
```

1. Indication of reactive electricity, apparent power, and power factor of generator

(6)

```
<OFF>      MNU ATO R-M
RPM:0000   OPG:0.0bar
ETM:023H0  OTG:    00'C
DCV:25.8V  WTG:    00'C
```

1. Indication of engine's rotating speed, operation time, battery voltage, oil pressure, coolant temperature, and oil temperature
2. Right H of ETM<operation time> indicates 6 minutes per unit

(7)

```
<OFF>      MNU ATO R-M
Normal   R-N: Power ON
Power    S-N: Power ON
         T-N: Power ON
```

1. Indication of normal state of phase voltage of commercial electricity

(8)

```
<OFF>      MNU ATO R-M
1:63QX   4:48X    7:51X
2:26WX   5:59X    8:51GX
3:12X    6:27GX
```

1. Indication of (OPTION) output
2. Pressing <UP> transfers to previous screen.
3. Pressing <DOWN> transfers to screen (1).

※ Indication of OPG and WTG differs according to option setting.

```
<OFF>      MNU ATO R-M
R-S:000V   RPM:0000
  R:000A   OPG:0.0bar
 Hz:00.0   WTG:20.0'C
```

In case that OPS MODE and WTS MODE are set to be SENSOR.

```
<OFF>      MNU ATO R-M
R-S:000V   RPM:0000
  R:000A   OPG:  ON
 Hz:00.0   WTG:  OFF
```

In case that OPS MODE and WTS MODE are set to be SWITCH.

7. Structures

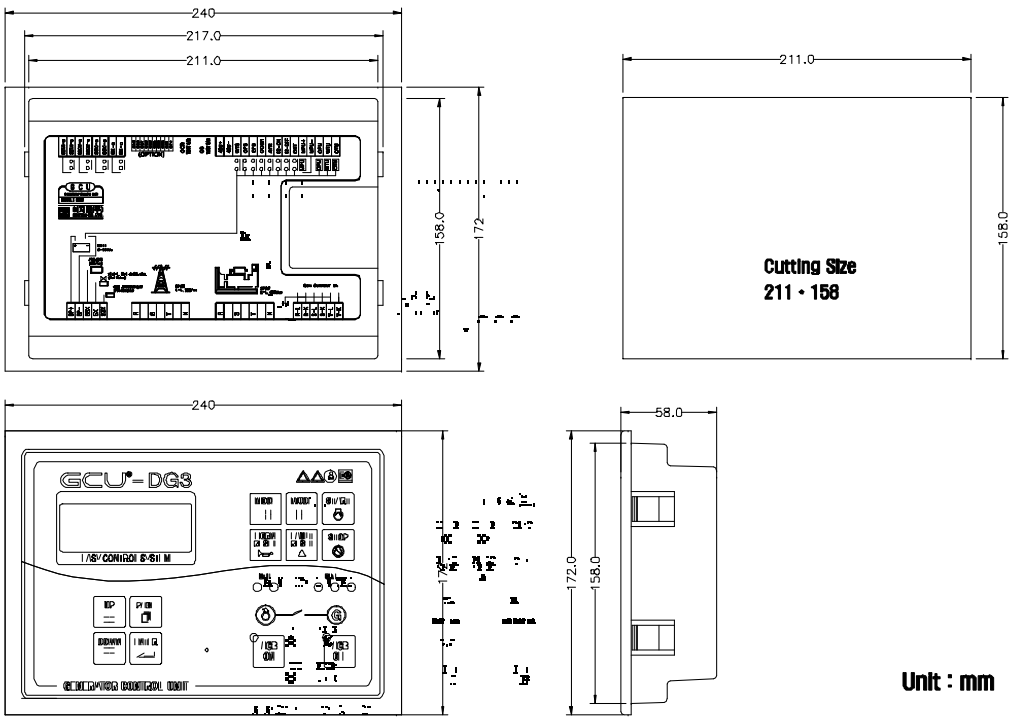
7.1. Dimension : W240 * H172 * D62 (mm).

7.2. Panel Cutting : W211 * H158.

7.3. Treatment Hall : W226 * H58

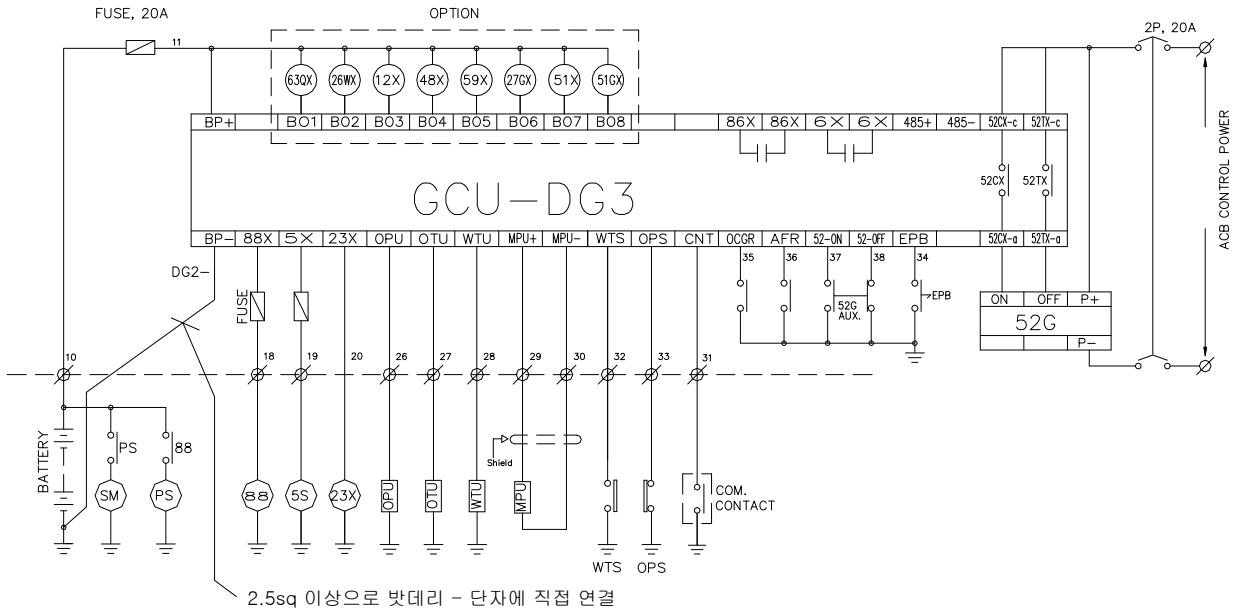
7.4. Weight : 약 1kg

7.5. Appearance drawing



8. Preparations before use

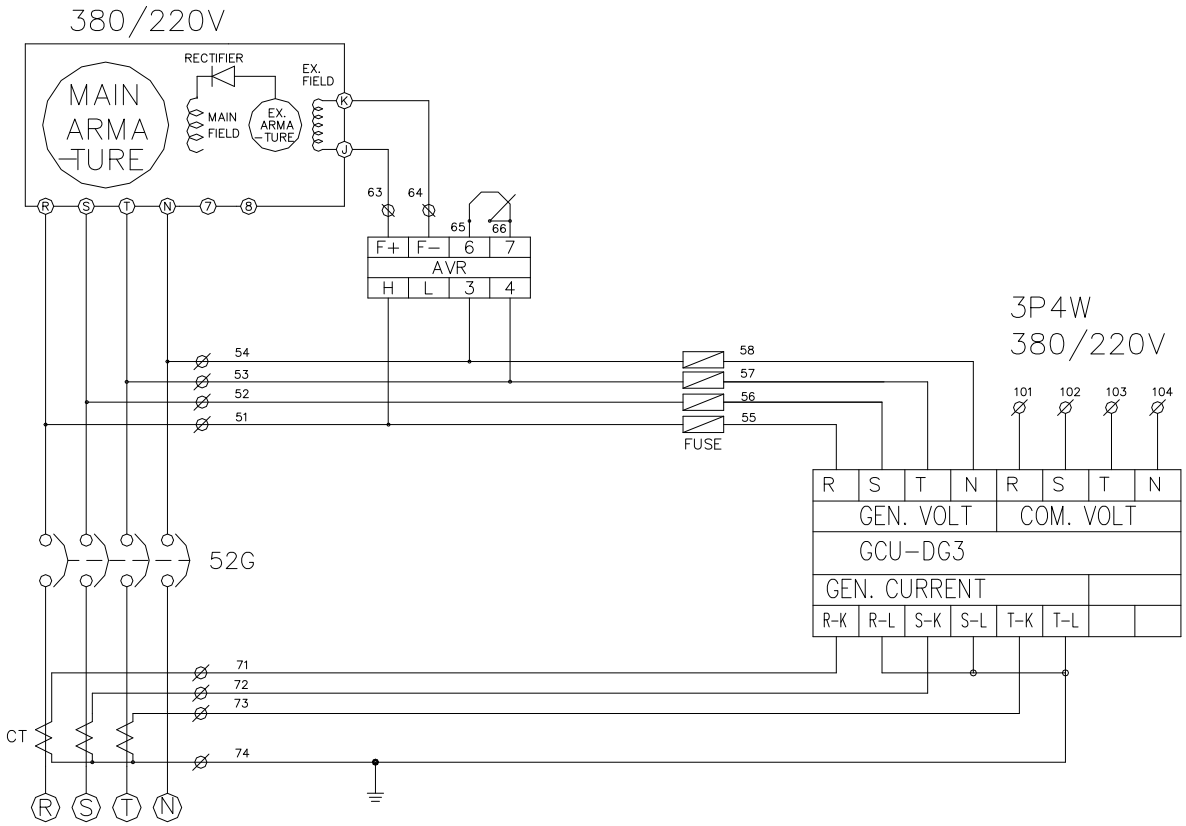
8.1. Connect input and output socket of GCU-DG3 with circuit diagram 1 and 2 to circuit.



[a circuit diagram 1]

Cautions

- Please connect voltage and current of generator power supply identically to prevent voltage indication error.
- Please do not connect CNT socket when inputting commercial electricity directly for detection of power outage signal.



[a circuit diagram 2]

8.2. Please set option setting of GCU-DG3 fitting to generator.


Warning

If setting option differently from generator, there will arise a problem and especially human accident may arise when detection of overspeed becomes unoperated on account of wrong setting of [5.PICK-UP SETTING]. Please be sure to inquire of engine generator manufacturing company the number of ring gear.

※Alarm machine make sound when input and output sockets of GCU are different from drawing and there will be indication of 'fault' on LCD when there are wrong parts.

▶ Option setting menu

[2. GEN-SET SETTING] --> [1. ENGINE TYPE] : Engine fuel control type - ETS/ETR
[2. OPS MODE] : VAL, CONT, NONUSE
[3. WTS MODE] : VAL, CONT, NONUSE
[4. CT RATIO] : CT setting
[8. COM POWER] : How to detect power outage signal
- USED : Direct input of commercial electricity
- Input of outer signal(CNT socket)

[4. SPEED SENSOR SET] --> [1.SENSOR] : Setting of generator speed sensor
- VOLT : Sensor of generator speed in generator voltage
- MPU : Sensor of generator speed in Magnet Pick Up sensor

[5. PICK-UP SETTING] --> [1. GEAR NUMBER] : Setting of the number of engine ring gear

9. Connection Socket and Capacity

Name of socket	Explanation	Formality
BP+, BP-	Input of control power supply	DC 8~35V , 15A
88x	Starter output	BP+ Voltage output, 15A on maximum
5x	pauseper output	BP+ Voltage output, 15A on maximum
23x	Preheating output	BP+ Voltage output, 15A on maximum
COM. Power R S T N	Input of commercial electricity	3P4W, 380/220Vac
GEN. Power R S T N	Input of generator power supply	3P4W, 380/220Vac
R-L, R-K	Input of L, K of R in generator CT	5Aac
S-L, S-K	Input of L, K of S in generator CT	5Aac
T-L, T-K	Input of L, K of T in generator CT	5Aac
52TX-c, 52TX-a	ACB TRIP interface	Dry contect , AC250V, 15A (2sec)
52CX-c, 52CX-a	ACB CLOSE interface	Dry contect , AC250V, 15A (2sec)
86X-c, 86X-a	Fault indication interface	Dry contect , AC250V, 10A
6X-c, 6X-a	Engine operating indication interface	Dry contect , AC250V, 10A
WTS	Input of over-temperature interface	NORMAL OPEN , DC- Connection
OPS	Input of oil pressure switch	NORMAL CLOSE, DC- Connection
EPB	Input of emergency pause switch	NORMAL OPEN , DC- Connection
OCGR	Input of overvoltage relay	NORMAL OPEN , DC- Connection
AFR	Input of potential fault	NORMAL OPEN , DC- Connection
52-ON, 52-OFF	Input of ACB blocking signal	DC- 연결(Connection)
CNT	Automatic operation interface	Operation when connecting AUTO Mode to DC
MPU+, MPU-	Input of magnet pick-up(MPU)	Shield cable must be earthing.
OPU	Input of oil pressure sensor	Use of VDO oil pressure sensor
WTU	Input of coolant temperature sensor	VDO and DongNam company, please refer to standard
OTU	Input of oil temperature sensor	VDO and DongNam company, please refer to standard
486+, 485-	Communication connecting socket	Shield cable must be earthing.

- CT L socket (R-L, S-L, T-L) is connected. For separate use, please use after opening case.

10. Signals and Marks

- GCU : GENERATOR CONTROL UNIT
- ETS : How to supply power supply to solenoid when pauseping
- ETR : How to supply power supply to solenoid when operating
- 86X : Fault indicating relay
- 6X : Operation indicating relay
- 23X : Preheating relay
- 52G : ACB
- SM : Operation motor
- PS : Pinion Solenoid
- 88 : Operation assistance magnet
- IDLE SPEED : The lowest speed of engine without assistance of engine operation motor
- MPU : MAGNETIC PICKUP
- RPM : Rotating speed system
- 5S : pause Solenoid
- 88X : Operation output relay
- EPB : Emergency pause button
- OPU : Oil pressure sensor
- OTU : Oil temperature sensor
- WTU : Water Temperature Sensor
- OPS : Oil pressure switch
- WTS : Water temperature switch

11. Manual Operation

11.1. Use of operation mode setting button, setting operation mode to <MNU>(manual mode)

11.2. Pressing operation button to operate engine

(1) Please check engine stopping method in case that only motor operates and engines does not operate.

(2) When engine is in operation, please press RPM and there will be an indication of oil pressure measurement in OPG(For use of OPS, indication will be OPG: OFF)

(3) When actual engine speed and RPM are different, please insert measurement correctly in <5. PICK-UP SETTING> of option setting after pausing engine.(The number of ring gear is different according to engine manufacturing company.)

(4) Starter motor circuit is blocked in over IDLE SPEED.

(5) When starting engine, starter output is blocked as oil pressure switch operates without input of IDLE SPEED after OST time.

(6) RUN lamp is lighted and 6X operates after operation of engine and input of IDLE SPEED signal.

(7) When oil pressure switch of OFT time is not open in IDLE SPEED, engine will pause after detection of low voltage.

(8) When signal for engine rotating speed and oil pressure switch are not open, starter output is blocked after 7 seconds of starter output.

(9) When oil pressure switch operates without IDLE SPEED signal, output of starter motor is

11.3. Engine pause

(1) Engine is paused when pressing pause button or setting MODE to OFF by pressing operation mode.

(2) In normal operation of engine, engine is paused when pressing EPB or engine protective circuit or generator protective circuit(OVR) operates.

12. Automatic operation

12.1. Setting operation mode to <ATO>

12.2. When commercial electricity is in outage, engine operates after SDT time.

12.3. When commercial electricity is in outage and it is returned, engine does not start and SDT time initializes.

12.4. When electricity is in outage, there comes output of battery "+" in 23X and it is blocked in over IDLE SPEED.

12.5. When starter output operates and it can not reach to IDLE SPEED, engine fault will be detected and it will pause after GCU pauses 3 times for 7 seconds.

12.6. When starter output operates and oil pressure switch is open, starter output will be blocked after OST time.

12.7. When engine is in normal operation, RUN LAMP will be in outage.

12.8. When there is normal detection of generator power supply, ACB will be input after waiting time.

12.9. When commercial electricity is returned in normal operation of engine, engine will pause after blocking ACB, preparing for re-outage in CDT time and cooling engine.

12.10. When commercial electricity is in outage in CDT operation, there will be input of ACB and initialization of CTD immediately.

13. Remote Operation

13.1. Please connect 485 link line.

13.2. Please select <R-M> in operation mode.

13.3. All operations are possible in computer except in GCU.

14. Protection Control Drive test of Engine Generator

14.1. Movement when fault and alarm operate(When protection equipment is operating, RESET after pressing buzzer pause.)

Detected items	Engine pause	86X, BUZZER
overspeed, low-voltage, over-temperature, operation failure	BASE : GEN STOP (Selectable)	○
Overvoltage, voltage unbalance, low and high frequency		○
EPB		○
low-voltage, over-current, current unbalance, OCGR, AFR	GEN RUN (Selectable)	○
Over-temperature alarm, low-voltage alarm, low and over-voltage battery		○

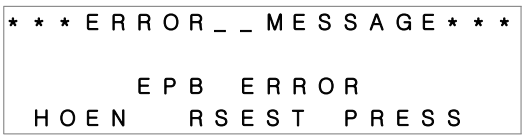
14.2. EPB (EMERGENCY PUSH BUTTOM) Emergency pause test

(1) Confirmation of engine operation, RUN LAMP lighting of GCU, and normal RPM.

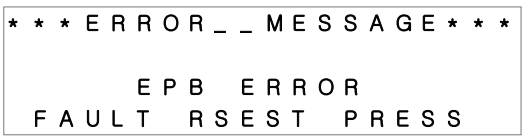
(2) Press EPB

(3) GEN FLT LAMP lights, alarm sounds, and engine pauses.

(4) Press buzzer pause, unfasten EPB, and press RESET.



- Screen when input of EPB
- Indication that pressing HORN RESET button



- Transferring to start-up screen after pressing FAULT RESET button.

14.3. Over speed test(OVER SPEED)

▶ Detective measurement of overspeed has to be changed and tested that overspeed test is dangerous when increasing the number of engine rotating.

▶ Default of OVER SPEED SETTING in [7. OVERSPEED] of SETTING MANU [6. GEN-PROTECTIVE SET] is 2150RPM and if changing the Default to 1800RPM, then GCU will be recognized as overspeed. Therefore it is necessary to return 1800RPM to the Default after test.

▶ Test operates through pressing overspeed test switch.(Pressing more than a second)

(1) Operate engine.
(2) Confirm RUN Lamp lighting and RPM of ECU.
(3) Recognizing overspeed, lighting GEN FLT Lamp after setting time, sounding alarm, and pausing engine.
(4) LCD Screen indicates OVER SPEED ERROR_MESSAGE.
(5) When pressing buzzer and resetting, it will return to normal state.

14.4. Low Oil Pressure Test

(1) When oil pressure switch operates after engine starting, output of starter motor becomes blocked and when oil pressure switch is closed, pause output of ETS TYPE becomes blocked.
(2) Setting to oil pressure switch.
1) Start engine.
2) Confirm RUN LAMP lighting and RPM of ECU.
3) Interface OPS socket.
4) Lighting GEN FLT Lamp after setting time, sounding alarm, and pausing engine.
5) LCD Screen indicates OPS ERROR_MESSAGE.
6) Reset after pressing buzzer pause button.
7) Setting to oil pressure sensor.
8) Start engine.
9) Confirm RUN LAMP lighting and RPM of GCU.
10) Interface or open OPU socket.
11) Lighting GEN FLT Lamp after setting time, sounding alarm, and pausing engine.
12) LCD Screen indicates OPS ERROR_MESSAGE.
13) Reset after pressing buzzer pause button.

14.5. HIGH WATER TEMPERATURE Test. (WTS)

(1) Setting to over-temperature switch
1) Start engine.
2) Confirm RUN LAMP lighting and RPM of GCU.
3) Interface WTS socket.
4) Lighting GEN FLT Lamp after setting time, sounding alarm, and pausing engine.
5) LCD Screen indicates WTS ERROR_MESSAGE.

6) Reset after pressing buzzer pause button.

(2) Setting to temperatrue sensor.

1) Start engine.

2) Confirm RUN LAMP lighting and RPM of GCU.

3) Interface or open WTU socket.

4) Lighting GEN FLT Lamp after setting time, sounding alarm, and pausing engine.

5) LCD Screen indicates WTS ERROR_MESSAGE.

6) Reset after pressing buzzer pause button.

14.6. START Fail Teat . (OVER CRANKING)

1) This changes mode automatically and let engine not operate.

2) This unlights commercial electricity or interface CNT socket.

3) Starter output after SDT time.

4) Lighting of OCL Lamp and buzzer alarm after 3 times of 7-second start and 7-second pause.

5) LCD Screen indicates OVER CRANK ERROR_MESSAGE.

6) Reset after pressing buzzer pause button.

7) Deleting all things that let engine not operate and returning to normal state.

14.7. Other tests for fault are similar as above.

15. Modification of Option Setting

15.1. Setting to option setting mode

(1)

```
<OFF>      MNU ATO R-M
R-S:000V   RPM:0000
  R:000A   OPG:  ON
 Hz:00.0   WTG:  OFF
```

1. Press <PAGE> in <OFF> mode.
2. Transferring to <SETTING>.
3. <PAGE> is possible only in <OFF> mode.

(2)

```
     SETTINGS
>. TIME SETTING
2. GEN-SET SETTING
3. GEN-PROTECTIVE SET
```

1. Cursor(>) indicates <TIME SETTING>.
2. Pressing <ENTER> to enter time setting.
3. Pressing <DOWN> to transfer to <2.GEN-SET SETTING>.

(3)

```
>. SPEED SENSOR SET
5. PICK-UP SETTING
6. PASSWORD SETTING
7. P-RELAY ERROR TYPE
```

1. A cursor indicates item 4.
2. Pressing <UP> transfers to above item.
3. Pressing <DOWN> transfers to below item.

(4)

```
>. SENSOR SELECT
9. PROTECT SETTING
10. ACB&ATS MODE SET
11. RS485 SET
```

1. A cursor indicates item 8.
2. Pressing <UP> transfers to above item.
3. Pressing <DOWN> transfers to below item.

(5)

```
>2. Relay Output Set
13. Fault History
```

1. This is the last page.
2. Items of options settings are all 12 and it is impossible to do option setting when generator is in operation.

15.2. After setting value of option, setting value of <GEN-SET SETTING> appears and method to set is all same.

(1)

```
<OFF>      MNU  ATO  R-M
R-S:000V    RPM:0000
   R:000A   OPG:NONUSE
 Hz:00.0    WTG:NONUSE
```

Pressing < PAGE > in < OFF > transfers to <SETTINGS> mode.

(2)

```
      SETTINGS
>.TIME  SETTING
2.GEN-SET  SETTING
3.GEN-PROTECTIVE  SET
```

1. Cursor(>) indicates <TIME SETTING>.
2. Pressing <DOWN> to transfer to <2.GEN-SET SETTING>.

(3)

```
      SETTINGS
1.TIME  SETTING
>.GEN-SET  SETTING
3.GEN-PROTECTIVE  SET
```

1. Pressing <ENTER> transfers to detailed item of <GEN-SET SETTING>.
2. The number of detailed items of <GEN-SET SETTING> is 8.

(4)

```
 2.GEN  SET  SETTING
>.ENGINE  TYPE:  ETR
2.OPS  MODE:  NONUSE
3.WTS  MODE:  NONUSE
```

1. Pressing <DOWN> transfers to <2.OPS MODE>.

(5)

```
 2.GEN  SET  SETTING
1.ENGINE  TYPE:  ETR
>.OPS  MODE:  NONUSE
3.WTS  MODE:  NONUSE
```

1. Pressing <ENTER> lets a cursor locate in front of setting value.

(6)

```
 2.GEN  SET  SETTING
1.ENGINE  TYPE:  ETR
2.OPS  MODE: NONUSE
3.WTS  MODE:  NONUSE
```

1. Black and square-shaped cursor locates in front of setting value.
2. Pressing <UP> or <DOWN> changes setting value..

(7)

```
 2.GEN  SET  SETTING
1.ENGINE  TYPE:  ETR
2.OPS  MODE: CONT
3.WTS  MODE:  NONUSE
```

1. This is a screen that value is changed to <CONT>.
2. Pressing <ENTER> saves the value.
3. A cursor locates at the front of item.

(8)

```
 2.GEN  SET  SETTING
1.ENGINE  TYPE:  ETR
>.OPS  MODE:  CONT
3.WTS  MODE:  NONUSE
```

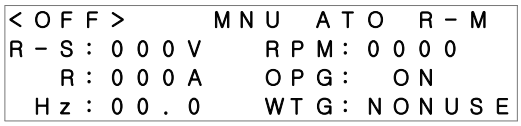
1. Pressing <UP> or <DOWN> here may transfer to another item.

(9)

```
      SETTINGS
1.TIME  SETTING
>.GEN-SET  SETTING
3.GEN-PROTECTIVE  SET
```

1. Pressing <PAGE> to transfer to above item.
2. This is the transferred screen to the above item.
3. Pressing <PAGE> exits option setting.

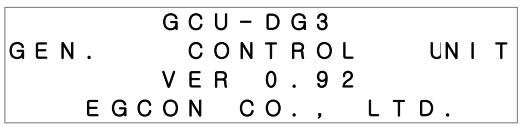
(10)



1. This is the returned screen of measurement screen after exiting option setting.

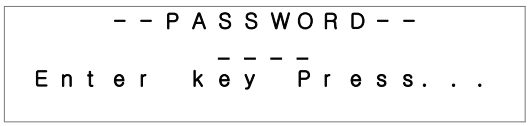
15.3. Password input when setting <PowerON_PW> to <USE>.

(1)



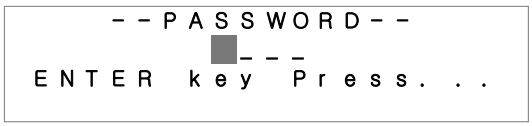
1. Inputting DC power supply makes a brief buzzer sound, indicates on left screen for 5 seconds, and transfers to next screen.

(2)



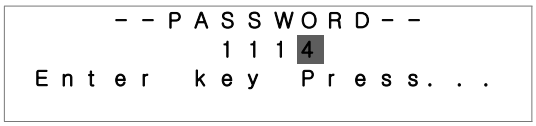
1. For <PowerON_PW> is set to <USE>, there will be a screen for password.
2. Pressing <ENTER> lets a cursor locate at the first box for insertion.

(3)



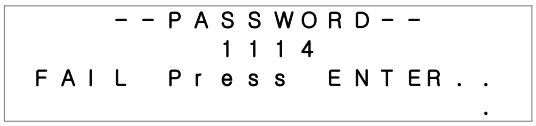
1. This is the screen that a cursor locates at the first box.
2. Pressing <UP> or <DOWN> to insert numbers.
3. Pressing <ENTER> transfers to next box.

(4)



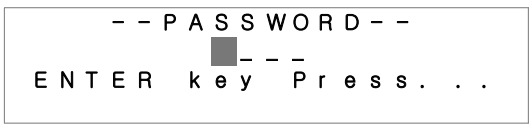
1. After filling all numbers, press <ENTER> to transfer to the start-up screen.

(5)



1. If password is wrong, there will be a message of <FAIL Press ENTER> as left, but screen does not transfers to the start-up.

(6)



1. Press <ENTER> to insert numbers again.
2. Inserted password become deleted and the cursor will locate at the first box.

15.4. How to insert password when setting <Setting_PW> to <USE> is same as above. However, if pressing <PAGE> when inserting wrong password transfers to start-up screen.

16. SETPOINT

16.1. TIME SETTING

NO.	Menu	Explanation	Range	Default
1	SDT	Waiting time for starting	0~60sec	3 sec
2	CDT	Waiting time for pausing	0~60min	5 sec
3	OST	Blocking time of starting output after pressing oil pressure switch	0~60sec	5 sec
4	OFT	Waiting time for detection of oil pressure	0~60sec	5 sec
5	UDT	Waiting time for detection of low-voltage	0~60sec	5 sec
6	STOP	Output time for ETS-typed pause	0~60sec	5 sec
7	MAX CRK_T	Starting output time	0~60sec	7 sec
8	ACB OPEN_T	Waiting time for ACB blocking in automatic mode	0~60sec	5 sec
9	ACB CLOSE_T	Waiting time for ACB input in automatic mode	0~60sec	5 sec
10	B_LED ON	Unlight time after lighting LCD backlight	0~60min	2 min
11	BZ STOP_T	Blocking time of alarm sound	0~60min	2 min

16.2. GEN-SET SETTING

NO.	Menu	Explanations and setting scopes	Default
1	ENGINE TYPE	ETR : A type that engine operates when power supplies to oil solenoid. ETS : A type that engine pauses when power supplies to oil solenoid.	ETR
2	OPS MODE (Detection of oil pressure)	SWITCH : Switch use with fault detecting type SENSER : Sensor use with fault detecting type NONUSE : Not using fault detecting type	NONUSE
3	WTS MODE (Detection of water temperature)	SWITCH : Switch use with fault detecting type SENSER : Sensor use with fault detecting type NONUSE : Not using fault detecting type	NONUSE
4	CT RATIO	CT ratio setting (5/5A~5000/5A)	50/5A
5	START RPM	RPM setting for starting output (400~800RPM)	600RPM
6	START OIL_P	Setting of oil pressure of starting output (3~6bar)	3.0bar
7	COM UVR	Voltage setting of commercial power outage checking	170V
8	COM POWER	USED : Checking commercial power outage with outage signal NONUSE : Using outage signal as input of CNT socket	USED

16.3. GEN-PROTECTIVE SET

NO.	Menu	Explanations	Setting Scope	Default Value
1	GEN UVR	Detective setting of low-voltage	70~ 220 Vac	180.0 Vac
2	OPE. UVR	Waiting time for low-voltage detection	0 ~ 59 sec	5 sec
3	GEN OVR	Setting of over-voltage detection	100~ 300 Vac	235.0 Vac
4	OPE. OVR	Waiting time for over-voltage detection	0 ~ 59 sec	1 sec
5	GEN OCR	Setting of over-current detection	2.0 ~ 8.0	5 A
6	OPE. OCR	Waiting time for over-current detection	0 ~ 59 sec	5 sec
7	OVER SPEED	Setting of overspeed	1000~2500 RPM	2150
8	OPE SPEED	Waiting time for overspeed detection	0 ~ 59 sec	0 sec
9	Wrn OIL_P	Setting of low-oil alarm	1.0 ~ 9.9 bar	3.0 bar
10	Err OIL_P	Setting of low-oil fault	1.0 ~ 9.9 bar	1.5 bar
11	OPE OIL_P	Waiting time for low-oil fault	0 ~ 59 sec	1 sec
12	Wrn WATER	Setting of over-temperature alarm	40 ~ 110 ℃	90 ℃
13	Err WATER	Setting of over-temperature detection	40 ~ 110 ℃	100 ℃
14	OPE WATER	Waiting time for over-temperature detection	0 ~ 59 sec	5 sec
15	HIGH BATT	Setting of battery overvoltage	20 ~ 40 Vdc	30 Vdc
16	LOW BATT	Setting of battery low-voltage	08 ~ 25 Vdc	08 Vdc
17	OPE BATT	Waiting time for battery overvoltage and low-voltage detections	0 ~ 59 sec	5 sec
18	CURR UNBAL	Setting of detective scope of current unbalance	10 ~ 99 %	30 %
19	OPE C_UNBAL	Waiting time for detection of current unbalance	0 ~ 59 sec	5 sec
20	VOLT UNBAL	Setting of detective scope of voltage unbalance	10 ~ 99 %	30 %
21	OPE V_UNBAL	Waiting time for detection of voltage unbalance	0 ~ 59 sec	5 sec
22	Gen Freq MAX	Setting of over-frequency detection	50 ~70 Hz	70 Hz
23	Gen Freq MIN	Setting of low-frequency detection	45 ~ 60 Hz	45 Hz
24	OPE Freq	Waiting time for over-frequency and low-frequency detection	0 ~ 59 sec	5 sec

16.4. SPEED SENSOR SET

NO.	Menu	Explanation	Default
1	SENSOR	VOLT : Speed sensor in generator voltage MPU : Speed sensor in Magnet PickUp	VOLT
2	DISPLAY	Indicative unit for rotating speed	(RPM) Presently not used

16.5. PICK-UP SETTING

NO.	Menu	Explanation	Setting Scope	Default
1	GEAR NUMBER	The number of MAGNET PICK-UP SENSOR per rotating of generator(The number of ring gear)	0~ 255 EA	121 EA

16.6. PASSWORD SETTING

NO.	Menu	Explanations and Setting Scope	Default
1	Setting_PW	USE : Using password in option setting NONUSED : Not Using password in option setting	NONUSED
2	PowerON_PW	USE : Using password at the first start-up (All operations are useless if not knowing password) NONUSED : All operations are possible without password	NONUSED
3	Password	_ _ _ _ : Changing password with pressing [DOWN]	1111
4	VALUE DEFAULT	Yes : Initializing all values of option setting NO : Not initializing all values of option setting	NO

16.7. P-RELAY ERROR TYPE

NO.	Menu	Contents	Explanations and Setting Scope
1	TYPE	Selection of using relay functions	INT. VAL - Using relay functions such as INT. VAL - UVR, OVR, OCR NONUSE - Not Using relay functions(only for detection of fault) Default : (INT. VAL)

16.8. SENSOR SELECT

NO.	Menu	Explanation	Setting Scope	Default
1	OP MODEL	Selection of oil pressure sensor	VDO	VDO
2	WT MODEL	Selection of water temperature sensor	VDO, DONGNAM	DONGNAM
3	OT MODEL	Selection of oil temperature sensor	VDO, DONGNAM	DONGNAM
4	OP CALIB	● Revision of oil pressure sensor value ● Value revision when using VDO sensor: unit is 0.3bar	-4.0 ~ 4.0bar	0.0bar
5	WT CALIB	● Revision of water temperature sensor value ● Value revision when using VDO sensor: unit is 3'C ● Value revision when using DONGNAM sensor: unit is 5'C	-40 ~ 40℃	0.0℃

16.9. PROTECT SETTING

NO.	Menu	Detection	Setting Value	Default
1	BASE	Overspeed, over oil, over temperature, start failure, overvoltage	GEN RUN, GEN STOP (주3 참고)	GEN STOP
2	UVR	Detection of low-voltage	GEN RUN, GEN STOP	GEN RUN
3	OCR	Detection of over-current	GEN RUN, GEN STOP	GEN RUN
4	OCGR	Detection of over-current	GEN RUN, GEN STOP	GEN RUN
5	AFR	Detection of preliminary fault input	GEN RUN, GEN STOP	GEN RUN
6	CURR UN	Detection of current unbalance	USED , NONUSE	USED

16.10. ACB & ATS MODE SET

NO.	Menu	Setting Scope	Default
1	ACB & ATS MODE SET	ACB , ATS , NONUSE , MCCB TRIP	ACB

16.11. RS485 SET

NO.	Menu	Setting Scope	Default
1	ADDRESS	Setting of communication address (1 ~ 16)	1
2	BAUD RATE	9600bps	9600bps
3	RS485 CK	No : RS485 TEST nonuse YES : RS485 TEST on - LCD indicate	NO

16.12. Relay Output Set

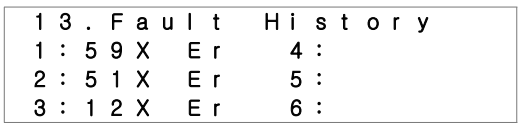
NO.	Menu	Setting Scope	Default
1.	RO1	Output setting of indication relay for actual state	63QX
2.	RO2	Output setting of indication relay for actual state	26WX
3.	RO3	Output setting of indication relay for actual state	12X
4.	RO4	Output setting of indication relay for actual state	48X
5.	RO5	Output setting of indication relay for actual state	59X
6.	RO6	Output setting of indication relay for actual state	27GX
7.	RO7	Output setting of indication relay for actual state	51X
8.	RO8	Output setting of indication relay for actual state	51GX

- Setting lists and explanations

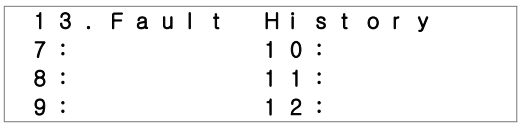
NO.	Indication	Explanation	Other
	63QX	Operation in fault of low oil	
	26WX	Operation in fault of over temperature	
	12X	Operation in fault of overspeed	
	48X	Operation in fault of automatic mode start	
	59X	Operation in fault of overvoltage	
	27GX	Operation in fault of low voltage	`
	51X	Operation in fault of over current	
	51GX	Operation in fault of over current	
	88X	Operation in starting output	
	5X	Operation in pausing output	
	5EX	Operation in fault of emergency pause	
	51CX	Operation in blocking input	
	51TX	Operation in blocking input	
	23X	Operation in preheating output	
	AFX	Operation in preliminary fault input	
	27C	Operation in normal commercial electricity	
	84G	Operation in normal generating power supply	
	86X	Operation in fault output of generator	
	14X	Operation in above IDLE SPEED of generator	
	13X	Operation in above SYNCHRO SPEED of generator	
	L-M	Operation when movement is manual mode.	
	L-A	Operation when movement is automatic mode.	
	R-M	Operation when remote control is manual mode.	
	R-A	Operation when remote control is automatic mode.	
	OFF	Operation when movement mode is OFF.	

16.13. Fault History

1



2



3

- Fault History

NO.	Indication	Explanation	Other
1	12X Er	Fault of generator's overspeed	
2	63Q_Er	Fault of generator's low oil	
3	63Q_Wa	Alarm of generator's low oil	
4	63Q_Op	Open of generator's oil sensor (In case that it can not detect oil sensor in the process of generator operation.)	
5	26W_Er	Fault of generator's over temperature	
6	26W_Wa	Alarm of generator's over temperature	`
7	26W_Op	Open of generator's temperature sensor (In case that it can not detect oil sensor in the process of generator operation.)	
8	48X Er	Operation failure in automatic mode	
9	59X Er	Fault of generator's overvoltage	
10	27X Er	Fault of generator's low voltage	
11	51X Er	Fault of generator's over current	
12	59X_Un	Fault of generator's voltage unbalance	
13	51X_Un	Fault of generator's current unbalance	
14	OCGR Er	Fault of over current	
15	AFR Er	Detection of preliminary fault	
16	EPB Er	Detection of emergency pause input	
17	Low Bat	Fault of battery's low voltage	
18	High Bat	Fault of battery's overvoltage	
19	UFR Er	Fault of generator's low frequency	
20	OFR Er	Fault of generator's over frequency	

17. Specification table of GCU-DG3 Compatibility Gauge Sensor

VDO OPU			Dong Nam - WTU		VDO - WTU	
psi	bar	Resisting value(Ω)	temperature (℃)	Resistance (Ω)	temperature(℃)	Resistance (Ω)
0	0	10.00	30	170.00	38	240.00
15	1	27.00	35	135.00	40	226.75
30	2	44.00	40	110.00	46	200.25
45	3	61.00	45	92.00	51	173.75
60	4	78.00	50	78.00	54	160.50
75	5	95.00	55	66.00	60	134.00
90	6	112.00	60	56.00	65	114.00
105	7	129.00	65	47.00	71	94.00
120	8	146.00	70	41.00	76	78.00
135	9	163.00	75	35.00	79	70.00
150	10	180.00	80	32.00	85	60.50
165	11	197.00	85	28.03	90	51.00
175	12	208.33	90	24.05	96	45.00
190	13	225.33	95	20.08	98	42.00
205	14	242.33	100	16.10	104	36.00
			105	12.10	110	30.00
			110	8.10	115	24.00
			115	4.10	118	21.00
			120	0.10	121	18.00

18. The Number of Major Engine Ring Gear

Manufacturing of engine	Engine Model	Ring Gear teeth	Manufacturing of engine	Engine Model	Ring Gear teeth
JOHN DEERE	3179D	142	CATERPILLAR	D399	183
	4039D	142		DG399	183
	6059T	129		G298	183
	6059TA	129		D379	183
PERKINS	2006TWG2	158		G379	183
	2006TG2A	158		G342	151
	2006TTAG	175		DB58	123
DOOSAN INFRACORE (Daewoo Heavy Industries)	C2240	108		0846	156
	DC24	108		D349	151
	DB33	122		D348	151
	DB58	122		D346	151
	DB33	129		D34	152
	P034TI	129		3306	156
	DB58	129		DE12T(I)	152
	D1146(T)	146		G333	156
	P86TI	146		D2840L,(E)	160
	2156	146		3406	113
	2366	146		3409	113
	DE12T	152		3412	136
	P126TI	152	CUMMINS	NT855G6	118
	D2848L,(E)	160		L10	118
	D2842L,(E)	160		6BT56G	159
	D2840L,(E)	160		4BT39G	159
	P158LE	160		KT19G	142
	P180LE	160		KT50	159
	P222LE	160	HYUNDAI	D6AZ	143
				D6BR	129

19. Failure Causes and Measures

Statue	Cause	Soultions
Power supply is not working(Nothing can be seen on LCD).	DC blocker opens.	Close DC blocker.
	DC fuse disconnects.	Change to new fuse of same capacity.
	Wrong connection of wiring	Correct wiring through referring circuit diagram.
	Battery discharges.	Use after charging battery more than 5 hours.
Start-up is not working(Starting motor is not rotating).	Battery discharges.	Use after charging battery more than 5 hours.
	Fault of starting assistance magnet	Use after changing start
	Fault of starting motor	Use after changing start motor.
	Wiring is not connected or wrongly connected.	Correct wiring through referring circuit diagram.
Start-up is not working(Starting motor is rotating).	Fault of preheating plug	Use after changing preheating plug.
	Wrong setting of engine type in option setting	Select ETR and ETS correctly after inquiring of engine manufacturing company.
Start-up is not working(Start-up works, but it is turned off soon)	Wrong PICK-UP Setting in option setting	Inserting the number ring gear correctly after inquiring of engine manufacturing company.
	Wiring of OPG is not connected or wrongly connected.	Correct wiring through referring circuit diagram.
OPG alarm sounds when turning on power supply.	Wiring of OPG is not connected or wrongly connected.	Correct wiring through referring circuit diagram.
	Wrong setting of OPS MODE in option setting	Set OPS MODE correctly.
	Not using proper sensor	For OPU, use product of VDO company.
The rotating number of generator is not correct.	Wrong PICK-UP Setting in option setting	Inserting the number ring gear correctly after inquiring of engine manufacturing company.
Generator is operating, but GEN. RUN LAMP is not working.	Wiring of PICK-UP is not connected or wrongly connected.	Correct wiring through referring circuit diagram.
	Wiring of GEN.VOLT is not connected or wrongly connected.	Correct wiring through referring circuit diagram.
Power value is not correct.	Wrong CT RATIO Setting in option setting	Insert the number of used CT correctly.
	Generator voltage input and CT input are different.	Correct wiring through referring circuit diagram.
Indication of power factor is not normal.	Second wiring of CT is wrongly connected.	Correct wiring with drawing after confirming polarity of CT.
Even though commercial power supply is in outage, automatic operation of generator is not working.	Wrong COM POWER Setting in option setting	Correct wiring through referring circuit diagram.
No input of ACB	The value of generator voltage is lower than the value of UVR setting.	Make generator voltage normal through adjusting AVR.