



## OPERATING INSTRUCTION: DGC-6D





# DGC-6D Automatic Engine Controller

## 1.1 Introduction

- The Microprocessor/Microcontroller based DGC-6D automatic generator start and supervisory device is designed keeping in view the ease of operation.
- Housed in 96 x 96 flush mounted enclosure, is an ideal replacement of logic based AMF.
- The functions of the discrete logic based AMF units are built in to one single compact device, resulting in simplified panel wiring and size reduction.

## 1.2 Salient features of the DGC-6D

### 1.2.1 Protection & Supervision:

- 3 phase Under & Over voltage protection for EB supply (True RMS measurement)
- Phase under & over voltage protection of Generator supply (True RMS measurement)
- User programmable Cranking attempt.
- Generator over speed supervision
- DC Battery Voltage supervision (Under & Over voltage)
- External fault detection (2 digital inputs)
- External engine running signal
- DG Fail to Start supervision and indication
- DG fail to Stop supervision and indication
- Unit remains fully operational even if battery voltage falls to zero volts for one sec.

### 1.2.2 Measurement & Display.

**DGC-6D, equipped with four seven segment display, displays:**

- EB voltages of RYB phase
- Generator voltage
- DC battery voltage
- Generator Frequency
- RPM
- Cumulative Run Hour Five Digit
- Set Values

### 1.2.3 LED Indication

- Status Indication of Mains Supply (R,Y,B)
- Status Indication of Generator Voltage (G)
- Status Indication of Battery Voltage (Vb)
- Generator Frequency (Hz)
- Load on Generator (GCB)
- Load on EB (MCB)
- Auto / Manual (Auto)
- Emergency Fault (Emer)
- DG Fail to Start (FST)
- DG Fail to Stop (FSP)
- High Water Temperature (HWT)
- Low Lube Oil Pressure (LLOP)

### 1.2.4 Timers

**Following timers are incorporated in the DGC-6D**

- DG Start Delay (Variable)
- Generator Voltage Supervision (Variable)
- Max. Cranking Time (Variable)
- Crank Gap Time (Variable)
- No of Crank Attempts (Variable)
- Mains Restoration Time (Variable)
- DG Recooling Time (Variable)
- High Water Temperature (Variable)
- Low Lube Oil Pressure (Variable)
- Generator Over Speed Delay Timer (Variable)
- Timer for Stop Solenoid (Variable)

## 1.3 Function

### **Auto/ Manual mode selection:**

Press A/M button for 4 sec. On pressing the button the unit selects Auto or manual mode. Auto LED glows when the unit is in auto mode & turns off in manual mode.

### **Auto Mode**

DGC-6D monitors the mains supply, if mains supply varies beyond set limit of Under and Over voltage for more than Mains supervision time, DGC-6D starts the genset.

To start the genset DGC-6D gives a cranking signal via potential free contact to crank motor. On detection of engine start, started either by external engine start input or by build up of generator voltage, the Crank command is withdrawn.

Max duration of crank command is user settable.

The maximum number of cranks is user programmable. Failure of starting of generator after maximum-programmed crank attempts, result into blinking of FST LED, indicating Fail to Start fault and the hooter is switched on.

While the genset is running, DGC-6D monitors the genset for external fault LLOP, HWT, Emergency and voltage healthiness.

On detection of any fault, Gen-set is stopped by the DGC-6D after set time delay & hooter is switched on.

On restoration of healthy EB supply for the set time duration the Gen-set is stopped after recooling it for the user set recooling time.

Load change over is automatically performed by DGC-6.

### **Manual Mode/Test**

In manual /Test mode the DG can start or stop by pressing Start and stop button respectively. The main contactor can be switched on and off by pressing MCB button and generator contactor can be switched on / off by pressing GCB button.

**1.4 Engine solenoid** Engine solenoid contact (Terminal 15 & 16) can be configured in two modes

- a. **Mode 0:** In this mode fuel solenoid contact changes from NO to close at the time of cranking and remains close till the Genset is running. For stopping the Generator this contact opens.

**b. Mode 1:** In this mode fuel solenoid contact remains open at the time of cranking and till the Genset is running . For stopping the Generator this contact closes for a user programmed time. For changing the solenoid mode first press Reset button, than simultaneously press GCB button . It's a good practice to switch off and than switch on the battery supply after changing the mode.

## 1.5 Display

a) It LCD display, to display voltages. Beside the numeric display there are 14 LEDs for annunciations

## 1.6 Programming mode

Programming mode can be entered any time by simultaneously pressing Reset & A/M keys. The following table details the various programmable parameters:


### 1.6.1 Setting table

Sl. No	Parameter	Explanation of parameter	Default setting	Setting Range
1	Mains Over Voltage	Max. permissible voltage, above this the voltage is treated unhealthy & Genset is started.	270V	80-300V
2	Mains Under Voltage	Min. permissible voltage, below this the voltage is treated unhealthy & Genset is started	180V	80-300V
3	Mains voltage supervision time	Time for which the mains voltage has to be unhealthy (Under or Over voltage as defined above in 1 & 2) before starting the Generator.	10Sec	0-999Sec
4	Generator Start Delay	After opening the Mains MCB, Generator starting is delayed by generator start delay time	Disable	0-999Sec

5	Generator Over Voltage	Max. permissible voltage, above this the voltage is treated unhealthy & the Generator is stopped by releasing fuel solenoid. Generator contactor is released and mains contactor is closed. Hooter shall be activated .	270V	80-300V
6	Generator Under Voltage	Min. permissible voltage, below this the voltage is treated unhealthy & the Generator is stopped by releasing fuel solenoid. Generator contactor is released and mains contactor is closed. Hooter shall be activated	180V	80-300V
7	Generator Supervision Time	The time for which the Generator voltage should, continuously be unhealthy to generate a fault condition.	10Sec	0-999 Sec.
8	Generator O/S	If the generator frequency goes beyond this limit, genset shuts down immediately	65 Hz	40-80 Hz; Disable
9	No. of Crank Attempt	The maximum number of Cranks that shall be issued to start the Generator	3	1-10
10	Crank Time	Maximum Crank time	10Sec	0-25Sec
11	Crank Delay	The delay between two successive Cranks	5	1-100Sec
12	Gen. pickup Voltage	This is the ignition voltage of the genset	100V	80-150V
13	Generator warm up time	After switching on the genset the load is put on the genset on elapse of generator warm up time	10 Sec	0-999 Sec.
14	Mains Restoration Time	The time for which mains should be continuously healthy before stopping the Generator.	30Sec	0-999Sec
15	Generator Recooling Time	The time for which Generator is allowed to run on no load before switching off	30 sec	0-999Sec

16	Stop solenoid time	The time for which stop solenoid will be kept active while stopping the engine	30Sec	0-100Sec
17	Low Fuel time delay	Time delay before this fault can be activated. Faults are described in details.	5 Sec	0-999Sec
18	LLOP Time delay	Time delay before this fault can be activated. Faults are described in details.	5 Sec	0-999Sec
19	HWT Time delay	Time delay before this fault can be activated. Faults are described in details.	5 Sec	0-999Sec
20	GCB to MCB time delay	Changeover time delay from generator to mains	2Sec	1 –5 Sec
21	Hooter Reset Time	Time for which the hooter is switched on after fault	30 Sec	0-999 Sec.

### 1.8 Switch Description:

S.No.	Switch Symbol	Switch Function	Description
1	 OR A/M	Next	<b>Normal operation mode:</b> In this mode, next is used to select the voltages on the display. The default voltage is mains R Phase voltage. Y Phase, B Phase. Generator voltage & Battery voltage can be selected by pressing next. The corresponding LED shall light up to indicate the parameter that is displayed. <b>Programming Mode:</b> Next key is used to select the next parameter to be programmed. When pressed for more than 4 sec. It toggles the mode from auto to manual and vice versa.
2	+ OR Start	Increment or start	This key is only active during programming mode and is used to increment the value of the parameter under programming. In manual mode this key may be used for ignition / crank command to DG



3	— OR Stop	Decrement	This key is only active during programming mode and is used to decrement the value of the parameter under programming. In manual mode this key may be used to stop the DG.
4	Reset	Reset	Reset key resets the Hooter and Fault signals. The first press shall reset the hooter and next shall reset the faults. A long press of 1 Sec shall reset both.
5	MCB	Mains contactor on/off	Mains contactor can be switched on or switched off by pressing this key.
6.	GCB	Generator contactor on/off	Generator contactor can be switched on or switched off by pressing this key.

## 1.9 Faults

There are two categories of faults

- Internal Faults
- External faults

### 1.9.1 Internal Faults

Internal faults are the faults, which do not need any external signals and are detected by the system itself. They are:

- **Generator Fails to Start.** Corresponding LED blinks and hooter is activated
- **Generator Voltage Unhealthy.** Corresponding LED blinks and hooter is activated
- **Generator Fails to Stop.** Corresponding LED blinks and hooter is activated
- **Over-Speed.** Corresponding LED blinks, hooter is activated & Genset stops.
- **Battery Under or Over voltage.** Corresponding LED blinks.

### 1.9.2 External Faults:

Those faults which cannot be sensed by the unit itself (these faults are not reflected by the generator voltage) and are to be provided externally. The external faults could be Low Lube Oil Pressure, High Water Temperature, emergency stop etc.

There is provision to connect three such faults externally.

■ **LLOP:** This fault can only be activated while the generator is running. If the genset is off because the Mains is available or some other fault have switched off the generator this fault shall be inactive.

■ **HWT & Low fuel:** This fault always remains active irrespective of Generator condition (ON or OFF). This fault is also provided with variable timer, and is generated after the expiry of programmed " HWT / Emergency Time delay". This fault can be used for emergency stop or it can be used for High Water Temperature

### 19.3 Fault Reset

■ **Internal Faults:** All internal faults can be reset by pressing reset Key.

■ **LLOP:** This fault can be reset by pressing reset Key.

■ **HWT /Low fuel:** This fault cannot be reset till the conditions creating this fault are not cleared. Until this fault is cleared the Generator shall not start.

**Contacts after the fault conditions:** Immediately after activation of any faults the Generator is stopped. The Generator Circuit Breaker contact is released, and after 125millsec delay the load is transferred to Mains Supply. The hooter is active for 30 second if not reset during this period.

**Type of Contacts:** All contacts are normally open (NO) type except the Mains Circuit breaker contact which is Normally Closed (NC) type.



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MRM *PROCOM*<sup>®</sup> Pvt. Ltd.  
Plot No. 20-21, Industrial Estate  
Sector-59 (II), HUDA, Faridabad-121004, Haryana  
Phone: 0129-4700400 (10 Lines), E-mail : [info@mrmprocom.com](mailto:info@mrmprocom.com)  
Website : [www.mrmprocom.com](http://www.mrmprocom.com)