



PROCOM

OPERATING INSTRUCTIONS DGC-11



Installation Guide

Rev.-01

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1.0 Introduction

- 16 Bit RISC, state of art, microcontroller based System.
- True RMS measurement of all measured parameters with 1% accuracy of measured value (Not full scale) Backlit LCD Display for easy reading and parameter settings. No need to consult the manual while programming the unit.
- All the inputs, such as Mains, Generator and Battery voltages are fully isolated, providing the freedom to design a totally isolated system. This avoids and prevents malfunctioning/ burning of the unit.
- Fully operational up to 4V. Can withstand a voltage dip up to 0V for 1sec.
- 23 window annunciation
- All system parameters are user programmable
- Suitable for all types of engines including the one requiring choke.
- Easy selection of modes by a simple press of a switch
- All outputs are through potential free contacts for system stability and reliability
- All contacts are protected by TVS to strengthen the EMI/EMC capabilities of the unit.
- Housed in 92X192mm Din Standard housing.

2.0 Protection, Supervision Salient features

- Mains 3 phase monitoring for under/over voltage, under/over frequency, Overload Phase Sequence and Phase voltages unbalance.
- Generators 3 phase monitoring and protection for under/over voltage, under/over frequency, over load, under/over frequency and over speeding.
- DC Battery Voltage supervision (Under & Over voltage)
- 7 digital input for system protection
- DG Fail to Start supervision
- Fuel, HWT and LLOP measurements and value display.
- DG fail to Stop supervision

3.0 Measurement & Display

16 segment 2 line LCD displays the following parameters. Some of the parameters are model dependent and are available in only those models.

- | | |
|-----------------------------|------------------------|
| ● Mains 3 Phase voltage | ● Mains Frequency |
| ● Generator 3 Phase Voltage | ● Load 3 Phase current |
| ● Generator Frequency | ● Battery Voltage |
| ● Generator Run Hour | ● RPM |
| ● Fuel Level, HWT and LLOP | ● KWh of generator |
| ● KW and PF of generator | ● Service Hour Due |
| ● Fault History | ● Programmed settings |

Normally the display auto scrolls and displays a set of parameter for 10 seconds, but any time the

Next key (↑) can be pressed to select the next parameter window.

4.0 Annunciations

DGC-11 is equipped with the following annunciations for system status and faults

- Load on generator (GON)
- Mains : Healthy/Unhealthy
- DG Fail to Start (fault)
- Emergency (Shut down Command)
- HWT(Fault)
- DG frequency(Fault)
- DG Over Speed (Fault)
- Over Current (Fault)
- Crank (Annunciation)
- Service Due(Warning)
- Manual (Annunciation)
- Off (Annunciation)
- Load on Mains (MON)
- Generator On
- DG Fail to Stop (fault)
- LLOP (Fault)
- Fuel (Fault)
- DG Voltage (Fault)
- Charging Alternator/V-Belt (Fault)
- Battery (Warning)
- RWL (Fault)
- Auto (Annunciation)
- Test (Annunciation)

5.0 Contacts

The following potential contacts are provided. Annunciation contacts are available in models requested with Annunciation features.

- Mains Contactor: MCB (NC)
- Crank (NO)
- Hooter (NO)
- Generator Contactor: GCB (N0)
- Fuel (NO)
- Choke/Load Management (NO).

6.0 Timers

DGC-11 is equipped with the following timers:

- Mains voltage supervision timer (variable)
- Mains frequency supervision timer(variable)
- Mains voltage unbalance supervision timer (variable)
- Mains phase Sequence timer(Variable)
- Generator start delay(Variable)
- Generator voltage supervision timer (variable)
- Generator Frequency Unhealthy supervision timer (variable)
- Generator over speed supervision timer (Variable)
- Choke pre start timer (Variable)
- Choke post start timer (Variable)
- Max. crank duration timer (variable)
- Crank gap timer (variable)
- No. of crank attempts (variable)
- DG re-cooling timer (variable)
- Stop Solenoid on time (variable)
- Fuel level supervision time (variable)
- LLOP supervision time (variable)
- HWT supervision time (variable)
- Auxiliary Supply Under/Over voltage supervision & warning timer (Fixed)
- Charging Alternators / V-Belt supervision timer(variable)
- Over Current supervision Timer(variable)
- Delay between GCB to MCB switching (Variable)
- Generator max. On Time(variable)
- Generator Rest Time(Variable)
- Hooter Reset Time(variable)
- DG warm up timer(variable)
- Mains restoration timer (variable)

7.0 Switches Description

DGC-11 has 12 switched are provided on its front panel. The table below describes the operation of these.

Switch Symbol	Switch Function	Description
↑	Next	Normal operation mode: In this mode, it is used to change the parameters being displayed on LCD. Programming Mode: Next key is used to select the next parameter to be programmed.
+	Increment	This key is only active during Programming Mode and is used to increment the value of the parameters under programming.
-	Decrement	This key is only active during programming mode and is used to decrement the value of the parameter under programming.
R	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.
+ & -	Programming /History Fault Mode Entry	If both the keys are pressed simultaneously the unit will enter in Programming Mode/History Fault/Service Hours
START		To start Generator in Manual Mode.
STOP		To stop Generator in Manual Mode.
MCB		In Manual Mode this toggles the mains contactor, On/Off
GCB		In Manual Mode this toggles the generator contactor, On/Off
Auto		To select Auto Mode.
Man.		To select Manual Mode.
Test		To select Test Mode.
Off		To select Off Mode.

Auto, Man., Test & Off are Radio buttons and only one can be active at a time.

8.0 Setting Procedure

DGC-11 has provision to program the operating parameters, resetting the service hours and viewing the last 20 fault history.

Press + & - switches simultaneously. The LCD shall display, "Enter Para Mode"

To enter parameter setting mode press ↑.

To go to next menu press +. The LCD shall display "Display History".

This menu can be entered by pressing ↑.

Or pressing + again shall bring up "Reset Service Hours" on LCD.

To reset service hours press ↑. The unit shall ask for confirmation. Pressing +, shall reset the

service hours. Pressing - shall terminate the menu.

9.0 Annunciations Description

DGC-11 has 23 annunciations on its front panel. These either announce the faults or indicated the status of the system.

S.No.	Nomenclature	Description
1	Fail Start	This LED blinks when the engine Fails to Start.
2	Fail stop	This LED blinks when the engine Fails to Stop.
3	Emergency	This LED blinks when the engine is Stopped in emergency.
4	LLOP	This LED blinks when the engine is stopped on LLOP fault.
5	HWT	This LED blinks when the engine is stopped on HWT fault.
6	Fuel	This LED blinks when the engine is stopped on Low Fuel fault.
7	Service Due	This LED blinks when to remind that engine service is Due
8	DG Freq	This LED blinks when the engine is stopped on frequency fault.
9	DG Vol	This LED blinks when the engine is stopped on voltage fault.
10	Over Speed	This LED blinks when the engine is stopped on over speed fault.
11	Chg Alt / V-Belt	The LED is continuously on when the charging alternator supply is available to the unit. This LED blinks when the engine is stopped on Chargin Alternator/V-Belt fault.
12	Battery	This LED blinks when the Auxiliary supply is outside the limits. Warning only.
13	Over load	This LED blinks when the engine is stopped on over current fault.
14	RWL	This LED blinks on Low water Radiator level..
15	Ph Seq	This LED lights up when the Phase Sequence is wrong(Negative).
16	Mains	Steady while Main is healthy else starts blinking.
17	MCB	Steady when MCB is engaged.
18	GCB	Steady when GCB is engaged.
19	Generator	Steady while generator is running.
20	Auto	This LED is On if the unit is in Auto Mode. This LED Blinks in Semi Auto Mode
21	Man.	This LED is On if the unit is in Manual Mode.
22	Test	This LED is On if the unit is in Test Mode.
23	Off	This LED is On if the unit is in OFF Mode.

10.0 Lamp Test

Switching on the power of the unit with RESET switch pressed shall force the entire annunciation LEDs to blink and display shall show the DGC-11 Model type along with the version number of the software. This state shall persist till the switch is kept pressed and on release of the switch DGC-11 shall start functioning normally.

11.0 Operating Mode

DGC-11 is equipped with 5 operation modes, namely Auto, Manual, Test, Off and Remote Mode. The first four modes can be selected by pressing the corresponding switch, from the front panel. The remote mode is selected by a digital signal at its terminal.

11.1 Auto Mode

DGC-11 monitors the Mains supply, if Mains supply varies beyond set limit of under/over voltage or under/over frequency or voltage unbalance for more than their individual programmed supervision time, DGC-11 releases the MCB contactor (to protect the contactor from failure because of low input voltage) and attempts to start the generator.

DGC-11 gives cranks the engine by activating the inbuilt, potential free, crank contact. Crank command is withdrawn if the engine start is detected, either by external engine start input or by build up of generator voltage. Max duration of crank command is user settable.

In case of non start of the engine DGC-11 re-cranks it till it starts or user programmed crank attempts are exhausted. If generator fails to start after the maximum programmed crank attempts, Fail to Start LED starts blinking, indicating start failure and the hooter is switched on.

After successful start of the generator, it is allowed to warm up for a user programmed time before the load is transferred to generator.

While the generator is running DGC-11 monitors it for external fault (Digital Inputs: Emergency, V-Belt, RWL) and internal faults(Measured Values faults: :LLOP, HWT, Fuel, Over Load, voltage and frequency).

On persistence of any fault for more than the programmed supervision delay, for that fault, generator is stopped, corresponding fault is announced & hooter is switched on.

On restoration of healthy mains supply, continuously, for the programmed duration the load is transferred to the mains and generator is stopped after expiry of re-cooling time. In case mains again become unhealthy during the re-cooling period the load is switched to generator.

11.2 Manual Mode

DGC-11, in this mode is under the manual control of the operator for starting and stopping of the generator. Engine has to be started manually by manually pressing "Start" switch. The "Start" switch shall not operate if GCB contact is closed, to provide protection to generator. Once the generator is started the load can be switched to generator by pressing "GCB" switch or to mains by pressing MCB switch. At any given time, either of GCB or MCB can be operational. Attempt to switch on GCB while MCB is on will be ignored and vice versa. Both MCB and GCB key have dual function of either switching ON or OFF the respective contactor. A press shall toggle the state.

Continuously pressing these keys shall keep toggling the status. To stop the generator, switch off the GCB contactor and press “STOP” key. **Any attempt to stop the generator, while the GCB contact is engaged, shall be ignored.** While the generator is running DGC-11 protects the generator by monitoring all internal and external faults.

11.3 Off Mode

This mode is selected to completely shut down the system. By default the load is transferred to Mains, but Mains contactor can also be switched off/On manually.

11.4 Test Mode

This mode helps the engineer to test the health of the engine. The engine can be started, as in Auto Mode, even when the Mains voltage is healthy. The load is not transferred to the generator. In case of Mains failure, while in this mode, the load is automatically transferred to the generator. Please note that the generator will not automatically switch off in this mode. To switch off the generator select either Auto, Manual or Off mode. “GCB” & “MCB” keys are active in this mode. DGC-11 protects the generator by monitoring all internal and external faults.

11.5 Semi Auto Mode

This mode can be selected by pulling the pin 37 low and selecting auto mode from the front panel. The Auto LED will blink indicating that the unit is in Semi-Auto Mode. In this mode the unit does not automatically starts the engine after the mains has failed and mains supervision timer has expired but waits for an external start signal pin 31. Once the start signal is given the unit now functions like auto mode with 3 crank attempts.

Please note: Operating Mode cannot be changed if the unit has stopped on a fault condition or the engine is cranking

12.0 Programming mode

The following tables gives the detailed descriptions. Please note that 20sec of inactivity will take the unit back in normal mode and all the changes done shall be cancelled.

12.1 Parameter Mode

Parameter name on first row of LCD	Explanation of parameter	Factory setting	Setting Range
Common to all Models			
Mains O/V	Max. Permissible voltage, above this the voltage is treated unhealthy & Generator is started.	270V	80-300V
Mains U/V	Min. permissible voltage, below this the voltage is treated unhealthy & Generator is started	180V	80-270V
Mains Sup Delay	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	1-999Sec

Mains O/F	Max. Permissible Mains frequency, above this frequency the Mains is treated unhealthy & Generator is started.	55Hz	40-65Hz
Mains U/F	Min. permissible Mains frequency, below this frequency the Mains is treated unhealthy & Generator is started.	45Hz	40-65Hz
Mains Freq Delay	Time for which the Mains frequency has to be unhealthy (under or over voltage as defined above in 4 & 5) before starting the Generator.	10Sec	1-999 Sec.
Mains Vol Unbal	Max. Permissible voltage difference between two phases of mains. Above this the voltage is treated to be unbalanced and Generator is started.	Disable*	10-100 Disable*
Mains Ph Seq	Enabled / Disabled	Off	On / Off
Phase Seq Delay	Duration for which the unhealthy phase sequence is acceptable. After this time the mains is treated as unhealthy and the engine is started	10Sec	1-999Sec
Unbalance Delay	Duration for which unbalance can be allowed before starting the Generator. This parameter is not available if (7) is set to disabled.	10Sec	1-999Sec
Gen Start Delay	The starting of generator is delayed by this time after the mains unhealthy timers have expired and the mains contact has been released. This is required in certain applications where immediate generator starting is not required but the mains contactor are to be protected. This timer is automatically reset, if during this duration the mains become healthy for "Mains Restoration Delay" (28)	Disable*	1-999
Gen Start Unit	The generator start delay(11) can be programmed in seconds or minutes. This parameter is not available if (11) is disabled.	Sec	Sec-Min

Generator O/V	Max. Permissible Generator voltage, above this the Generator voltage is treated unhealthy & the Generator is stopped on voltage fault.	270V	80-270V
Generator U/V	Min. permissible Generator voltage, below this the Generator voltage is treated unhealthy & the Generator is stopped on voltage fault.	180V	80-270V
Gen Sup Delay	Duration for which generator Over/Under voltage condition can be tolerated before stopping the Generator.	30Sec	1-999 Sec
Generator O/F	Max. Permissible Generator frequency , above this the Generator frequency is treated unhealthy & the Generator is stopped on frequency fault.	55Hz	40-65Hz Disable*
Generator U/F	Min. permissible Generator frequency, below this the Generator frequency is treated unhealthy & the Generator is stopped frequency fault.	45Hz	40-65Hz Disable*
Gen Freq Delay	Duration for which Generator Over/ Under frequency condition can be tolerated before stopping the Generator. This setting is not available if (16)&(17) are disabled	10Sec	1-999 Sec.
Generator O/S	The maximum Generator frequency beyond which over speed is detected	65Hz	40-80Hz Disable*
Gen O/S Delay	Time for which over speeding is allowed. This parameter is not available if (19) is disabled.	2 Sec	1-999Sec
Choke/Load Manag	This selects Choke, load Management or none function for the contact	None	1.0None 2.0 Choke 3.0 Load Management
Choke Pre Time	If the choke function is selected this defines the time this contact will energize before the crank.	Disable*	1-100Sec
Choke Post Time	The duration for which the choke contact will remain energized after the engine has started.	Disable*	1-100Sec
LM Active Curr	If the current level crosses this limit the contact is energized after the programmed supervision time.	5Amps	0-999Amps

LM Reset Curr	If the current level falls below this limit the contact is de-energized after the programmed supervision time.	2Amps	0-999Amps
LM Delay	The supervision time for the above 2 parameters.	5 Sec	1-999Sec
No Of Crank	The maximum number of cranks that shall be issued to start the Engine	3	0-10
Crank Time	Maximum crank time	5Sec	0-25 sec
Crank Delay	The delay between two successive cranks	5Sec	0-100Sec
Gen Pick Vol	This parameter specifies the generator voltage at which the is presumed to have started and crank has to be terminated	100V	80-150V
Warm Up Time	Generator warm up time. The load is transferred to generator after expiry of this time	1Sec	1-999 Sec
Mains Rest Delay	Mains restoration Delay: The time for which Mains should be continuously healthy before stopping the Generator.	30Sec	1-999Sec
Gen Recool Time	The time for which generator is allowed to run on no load before switching off	30Sec	1-999Sec
Stop Sol On Time	The time for which stop solenoid will be kept active while stopping the engine	30Sec	1-999Sec
Gen Over Current	The current above which the over current fault monitoring has to start. The timer for it is as described in 32. This fault is only enabled while the generator is running. On expiry of the timer the generator is stopped	6Amps for /5 40Amps for Procom Make Cts	1-999 Amps
Gen O/C Delay	Duration for which the external or internal over current (for models which have internal current measurement) be recognized as a fault and action initiated. This fault is only enabled while the generator is running	2 Sec	1-999 Sec

Mains O/Current	The current above which the over current fault monitoring has to start. The timer for it is as described in 34.. This fault is only enabled when the MCB is closed.On expiry of the timer the MCB is opened and reset key has to be pressed for reclosing the MCB	6Amps * for /5 40Amps for Procom Make Cts	1-999Amps
Mains O/C Delay	Duration for which the external or internal over current (for models which have internal current measurement) be recognized as a fault and action initiated.	2Sec	1-999Sec
CT Ratio	Current Transformer ratio Available only in /5 CTs model. Not available in models with Procom Make CTs	1	1-199
V-Belt/Alt Delay	Duration for which the V-Belt signal should be continuously active to be recognized as a fault and action initiated. This fault is only enabled while the generator is running.	2Sec	1-999
GCB to MCB Delay	User programmable delay when the load is transferred from Generator to Mains.	2 Sec	1-5 Sec
Hooter Reset Tim	Duration for which the hooter shall be ON, if not externally reset, while announcing a fault.	30Sec	1-999Sec
DC O/V	Max. permissible Auxiliary supply voltage. If Auxiliary voltage is higher than this for 10sec the Battery LED starts blinking (only warning).	30V	10-40V Disable*
DC U/V	Min. permissible Auxiliary supply voltage. If Auxiliary voltage is lower than this for 10sec the Battery LED starts blinking (only warning).	10V	10-40V Disable*
Gen Max On Time	Max. duration for which the generator is allowed to work continuously	Disable*	1-999Min
Gen Rest Time	If the generator has run continuously as per (41), the generator is given rest irrespective of the mains condition. In case of mains unhealthy during this time the mains contact is deactivated	Disable*	1-999Min

	the mains contact is deactivated but the generator is not started. This is unavailable if (41) is Disabled This timer is automatically reset, if during this duration the mains become healthy for "Mains Restoration Delay" (28)		
Service Time Hr	Time, in hours, after which the service is due.	250Hrs	1-999 Hrs
Engine RPM	Engine RPM Type	1500RPM	1500RPM 3000RPM
Disp Auto Scroll	Setting ON will enable Auto Scroll of display. OFF: No scroll and next parameter can be viewed by pressing next	ON/OFF	ON
Rad. Water Delay	Time for which Radiator water level has to be active before issuing shut down command	5 Sec	1-999 Sec
Sensor Status	Can Select The installed sensors	All Sensors	1) All Sensors installed 2) LLOP & HWT installed 3) LLOP and Fuel installed 4) Fuel and HWT installed 5) Only fuel 6) Only HWT 7) Only LLOP 8) No sensor
Fuel Level in %	Level of fuel at which the Engine shall shut down	20%	10-100%
LowLube Pressure	Level of LLOP at which the Engine shall shut down	2.0 Kg /Cm2	0.5-8.5 Kg /Cm2
High Water Temp	Temperature of water at which the Engine shall shut down	90	0-150 Degree centigrade
Sensor Type	A for Low rating Engines B for high rating Engines	A	Note: This can be customized
Fuel << delay	Monitoring time of Fuel Fault	5 Sec	1-999 Sec
LLOP delay	Monitoring time of LLOP Fault	5 Sec	1-999 Sec
HWT delay	Monitoring time of HWT Fault	5 Sec	1-999 Sec

Start No.PH Fail	Start The engine when 1.0 Any phase of mains fails 2.0 All the phases fails	Any phase fails	1.0 Any Phase Fail 2.0 All Phases fail
System Config	The Mains/Generator Phases selection	Mains 3ph Generator 3 Ph	All 4 combinations

*** This parameter can be disabled while programming**

12.2 Programming Solenoid Mode

For changing the solenoid mode first press (R) (reset) button, than simultaneously press +ve and –ve button while the reset button is pressed. The first row of LCD shall display “

FuelSolType”. There are two possible modes.

Mode 0 In this mode fuel solenoid contact changes from Open to Close at the time of cranking and remains close till the genset is running. For stopping the generator this contact opens.

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.

Don't change the mode while generator is running. It's a good practice to switch OFF and then switch ON the battery supply after changing this mode.

13.0 Faults

There are two categories of faults

- Internal Faults
- External faults

13.1 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.
- Generator Frequency Unhealthy.
- Generator Fails to Stop.
- Battery Under or Over voltage (Warning only).
- Generator Voltage Unhealthy
- Generator Over Speed.
- Over Current

13.2 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. They are:

- LLOP
- Canopy Temperature
- Emergency
- HWT
- Fuel
- V-Belt

13.3 Fault Reset

- Internal Faults & LLOP fault: All internal faults and LLOP fault can be reset by pressing (R) switch after the generator is stopped.

14.0 Communication

Half Duplex, RS232 or RS485 communication running in slave mode: The communication can be used for the following:

- Programming the parameters
- Reading instantaneous parameters
- Reading system conditions
- Reading fault status.

15.0 Load Management/Choke/Heater

DGC-11 has programmable contact for either the Heater/Choke function or Load management function.

In the choke mode the contact can be switched on for a programmed duration before the crank and will switch off after the programmed time has expired after the engine has started. This can be used to activate a choke or a heater.

In load management mode the contact will switch on when the current on the generator has crossed a programmed limit and will reset when the current has fallen below the reset programmed limit. This function can be used to cut-off unnecessary loads or start a second generator when the load goes above a limit.

16.0 Model Selection

The DGC-11 can be ordered as

16.1 DGC-11

16.1.1 INCT for /5CT

16.1.2 6500T for Procom Make CTs

16.2 DGC-11 with communication(RS232/RS485)

17.0

Terminal No.	Description
1	Mains R Phase Voltage
2	Mains Y Phase Voltage
3	Mains B Phase Voltage
4	Mains Neutral
5	Generator R Phase Voltage
6	Generator Y Phase Voltage
7	Generator B Phase Voltage
8	Generator Neutral
9-10	R Phase Current
11-12	Y Phase Current
13-14	B Phase Current
15	Sensor Fuel
16	Sensor Temperature
17	Sensor LLOP
18	Remote Stop(Semi Auto Mode Only)
19	NC
20	Auxiliary supply +ve

21	Auxiliary supply -ve
22-23	Mains Circuit Breaker
24-25	Generator Circuit Breaker
26	Crank
27	Fuel Sol
28	Hooter
29	Choke
30	Common for hooter, fuel, Choke & Crank
31	Remote Start (Semi Auto Mode Only)
32	LLOP Switch
33	HWT Switch
34	Fuel Switch
35	Emergency
36	RWL Switch
37	Auto/Semi Auto Mode
38	V-Belt/Charging Alternator

18.0 Specifications

AC voltage withstand	330 VAC (Phase to neutral)
Measurement Accuracy	
Voltages & Current	1% of Measurement
Power & Energies	2%
Surge 1.2/50Usec	2.5KV
Battery Voltage	Suitable for 12V/24 VDC System
Min. voltage to power on	9V
Min Running Voltage after Power on	4V
Max. Battery Voltage	35V
DC Interruption time	1 Sec.
Contact(MCB)	NC, 230V / 6A
Contact(GCB)	NO, 230V / 6A
Contact(Hooter)	NO, 230V / 6A
Contact(Fuel)	NO, 230V / 6A
Contact(Crank)	NO, 230V / 6A
Contact Choke	NO, 230V / 6A
Cut out Dimensions	186mm X 90mm
Depth	120mm
Digital Input Level	Battery Voltage (Negative) except charging Alternator which is positive.

It is our endeavour to constantly upgrade our products, hence specifications are subject to change without any notice.

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