OPERATING INSTRUCTIONS
DGC-202X

Installation Guide

Rev.-01

INDEX

1.0. Introduction

This document details the in-built features, operating procedure requirements of the DGC202X Series modules. This document is subject to changes without prior notice.

DGC202X series is designed on a common platform and provided variants for different level of functionality and economics. This allows system designers greater flexibility in the choice of controller to use for a specific application.

The DGC202X series module has been designed to allow the operator to start and stop the generator manually or automatically and transfer the load to the generator automatically.

DGC202X automatically starts and stops the generator set depending upon the status of the mains (utility) supply. The user also has the facility to view the system operating parameters on LCD display. Additionally, a special mode, Test Mode, is incorporated to facilitate easy debugging during the building and testing a genset.

The DGC202X module monitors the engine, indicating the operational status. On detection of faulty conditions, it automatically shutting down the engine. The LCD display indicates the fault and warning.

The powerful microcontroller contained within the module allows for incorporation of a range of complex features:

- Icon and Description based LCD display
- **True RMS** Voltage, Current monitoring
- USB Communications
- Engine parameter monitoring.
- Fully configurable inputs for use as alarms or a range of different functions.
- CAN bus for Engine ECU interface.
- Isolated and Protected RS485 with Modbus.
- Canopy Fan Current Monitoring for Air Cooled Engines.

A robust plastic case designed for front panel mounting houses the module. Connections are via locking plug and sockets connectors.

All parameters can be changed from the module's front panel, USB or RS485 communication. Access to Program/Modify the parameter, through front keys, is protected through a password.

2.0 Model selection

Model	RS485	Fan Current
DGC2021	x	x
DGC2022	√	x
DGC2023	x	√
DGC2024	√	√

3.0. Specifications

3.1 Terminal Specification

Connection type	Two-part connector. •Male part fitted to module •Female part supplied in module packing case - Screw terminal, rising clamp, no internal spring.	Example showing cable entry and screw terminals of a 10 way connector. 

3.2Power Supply Requirements

Minimum supply voltage	8V continuous
Cranking dropouts	Able to survive 0V for 400mS providing the supply was at least 10V before the dropout and recovers to 5V afterwards.
Maximum supply voltage	28V continuous
Maximum operating current	
• Back Light On	58mA at 12V 60mA at 24V
• Back Light Off	48mA at 12V 52mA at 24V
• Digital Inputs Connected	60mA at 12V 62 mA at 24V
• All Sensors Connected	72mA at 12V 74 mA at 24V
Maximum standby current. LCD Back Light Off	47mA at 24V 51mA at 12V
Maximum Current when in Sleep Mode	35mA at 12V 32mA at 24V

3.3 Battery Voltage Display

Range	0V-40V DC (note Maximum continuous operating voltage of 28V DC)
Resolution	0.1V
Accuracy	1% of Reading +1Least Count (At 12V 0.2V)

3.4 Generator Voltage/Frequency Sensing

Measurement type	True RMS conversion
Harmonics	Up to 11
Input Impedance	300K Ph-N
Phase to Neutral	30V to 330V AC (Measurement Range)
Phase to Phase	50V to 570V AC (Measurement Range)
Common mode offset from Earth	100V AC (max)
Resolution	0.1V
Accuracy	±1% of Reading phase to neutral ±1% of Reading phase to phase
Minimum frequency	15.0Hz
Maximum frequency	75.0Hz
Frequency resolution	0.1Hz
Frequency accuracy	±0.05Hz

3.5 Generator Current Sensing

Measurement type	True RMS conversion
Harmonics	Up to 11th
Nominal CT secondary rating	5A
Maximum continuous current	10A
Absolute maximum overload	50A for 1 second
Burden	0.25VA (0.01E current shunts)
Resolution	0.5% of 5A
Accuracy	±1% of Nominal (excluding CT error)

3.6 CT Polarity:

DGC202X has inbuilt CT polarity correction system. Measurement of Power, Energies etc are independent of Polarity of connected CT, but it must be ensured that the CT are connected to right phase. Eg. R Phase CT must go to R Phase CT terminal on the controller.

3.7 Inputs

3.7.1 Digital Inputs

Number	6 fully configurable
Arrangement	Connection to Ground
Polarity	Programmable as Normally Open or Closed
Low Level Threshold	<0.7 V
Max Input Voltage	+40V
Min Input Voltage	-40V
Contact Wetting Current	1ma
Open Circuit Voltage	3V

3.7.2 Analog Input

3.7.2.1 Coolant Temperature and Fuel

Measurement Type	Resistance measurement by measuring voltage across sensor with a fixed current applied
Arrangement	Differential resistance measurement input
Measurement Current	13 mA independent of System Voltage
Full scale	600 Ohms
Resolution	Fuel 1% Temperature 1°
Accuracy	<1% of Full scale ± 4 Ω excluding transducer errors
Max Common Mode Voltage	0.5V
Display Range	Depends upon the sensor selected. (Sensor can be selected from pre-programmed sensors or user can program sensor data)

3.7.2.2 Pressure Sensor: Resistive type sensors or 4-20mA sensor interface

Measurement Type	Programmable • Resistance measurement by measuring voltage across sensor with a fixed current applied • 4-20 mA output sensors
Arrangement	Resistive: Differential resistance measurement input 4-20 mA: Burden of 100 Ω
Measurement Current	Resistive: 13 mA independent of System Voltage
Full scale	600 Ohms
Resolution	0.1 bar
Accuracy	Resistive :<1% of Full scale ± 4 Ω excluding transducer errors 4-20mA: 2% of full scale excluding transducer error
Max Common Mode Voltage	0.5V
Display Range	Depends upon the sensor selected. (Sensor can be selected from pre-programmed sensors or user can program sensor data for resistive sensor)

3.7.3 Charging Alternator Interface

Excitation	
• Magnetizing Current	220mA @12V (Typical) 110mA @24V (Typical)
Measurement	
• Range	• 0-40V
• Accuracy	• 1% of reading
• Resolution	• 0.1V

Whenever the generator is required to run, the terminal provides excitation current to the charge alternator field winding. When the charge alternator is correctly charging the battery, the voltage of the terminal is close to the battery supply voltage. In a failed charge situation, the voltage of this terminal is pulled down to a low voltage. It is this drop in voltage that triggers the charge failure alarm.

3.8 MPU Input

Freq Range	5Hz -7.5KHz
Load	10K Ω
Voltage Input Min	3V
Voltage Input Max	40V
Input Wave Form	Square
Input From	Magnetic Pickup Unit (MPU) Charging Alternator W point (Should not be very noisy)

3.9 Digital Out Puts

No of Digital Out Puts	6
Out Put drive	To drive Relays
Out Put current	400mA
Out Put polarity	Delivers System Voltage
Protection	Over Temperature, Short Circuit, Over current and Load Dump

3.10 Communication Ports

USB	**USB 2.0 Running on PC and can be used to:** • Program the Controller • Read Instantaneous Parameters • Read Fault History & Event Recordings • USB Cable Type A to Type B
CAN	• J1939 Implementation at 250K • Non-Isolated • Internal Termination of 120 Ω • Details on Request
RS485	• Fully Isolated and Protected against 200V between D+ & D- • Isolation voltage 4KV • Modbus Implemented • Protocol on Request • Internal Termination of 120 Ω

4.0. Salient Features, Measurement, Protection and Supervision

4.1 Salient Features

1. Fully field programmable either from front Keypad, through PC via USB or in field through Modbus communication
2. Built in sensor data as well as provision to program a sensor data
3. Bright LCD with Icon and English Text Based Descriptions. No need to remember Icons or consult the manual for understanding the displayed parameters, status, warning or fault announcement.
4. 4-20mA Pressure Sensor can be interfaced
5. Fuel Solenoid can be configured as Pull to Start or Pull to Stop
6. System Configurable for:
    a. Mains Single Phase Mains and Single-Phase Generator
    b. Mains Three Phase and Generator Single Phase
    c. Mains Three Phase and Generator Three Phase
7. SMPS Power Supply.
8. Heavily protected and isolated Rs485
9. Provision of measuring Fan Current and Protection against Fan failure for water cooled engines

4.2 Measurement

4.2.1 Generator

- 1 Phase / 3 Phase Voltage
- Frequency
- Water Temperature
- Fuel Level
- Run Hour
- 1 Phase / 3 Phase Current
- PF, KW, KVA, KWH
- Oil Pressure
- RPM
- Service Due Hour

4.2.2 Mains

- 1 Phase/ 3 Phase Voltage
- Frequency
- KW
- Phase Sequence Detection
- 1 Phase/ 3 Phase Current
- PF
- KVA
- Voltage Unbalance

4.2.3 Mains Monitoring/ Mains Unhealthy condition

- Mains Under/Over Voltage
- Mains Unbalance Voltage
- Mains Under Over Frequency
- Mains Phase Sequence

4.2.4 Supervision

- Generator Under/Over Voltage
- Generator Current Unbalance
- Generator Overload: Both Current and KW
- Charging Alternator/V-belt
- Service Due
- Fail to Stop
- Canopy Temp
- HET/HWT
- Low Fuel
- Generator Under/Over RPM
- RWL
- LLOP
- Emergency off
- Fail to Start
- Oil Level
- Fire
- Oil Temperature

5.0. Digital Input & Output:

5.1 Digital Outputs

No of Digital Out Puts	6
Programmable Output	1 Could be assigned to any one of these functions • None • Unit Healthy • Glow Plug/Choke. • Fuel Pump • Load Warning. This contact will get activated if the load cross a defined level. • MCCB Shunt Trip. When the Auto shut down in manual mode is selected this output can be used to trip the MCCB and let the engine shut down on no load after cooling down.

Fixed Outputs	• Crank • Fuel Solenoid (configurable as pull to start or pull to stop) • Mains Contactor • Generator Contactor • Hooter

5.2 Digital Inputs

There are six digital inputs and each one of them can be assigned to perform a task as indicated in the list below:

Assignable Functions	**Descriptions**
RWL	Radiator Water Level switch to trigger a fault in case of low coolant
Oil Level	Oil Level switch to shut down the engine on low oil level
Earth Fault	External switch input for earth fault protection
Canopy Temperature	External switch input for high Canopy temperature protection
Emergency	Emergency Stop signal
HET/HWT	High engine/coolant temperature switch. Though the unit has provision for a temperature sensor. This input could be used to provide additional protection.
Fuel	Low fuel level switch. Additional protection along with the fuel sensor
LLOP: Low Lube Oil Pressure	Low LLOP switch. Additional protection along with Pressure sensor
R. Start/Stop	If assigned this function to a digital input the input could be used to start/stop the genset in manual mode. **Connection to ground: Start the Engine** **Open: Stop the Engine** **Note:** Front Start/stop keys shall not work with this assignment.
R. Stop	Remote stop: If assigned this function to a digital input, the Digital input shall, in manual mode, stop the engine, when connected to ground. This could just be pulse of around 100ms
R. Start	Remote start: If assigned this function to a digital input, the Digital input shall, in manual mode, start the engine, when connected to ground. This could just be pulse of around 100ms
Auto/Manual	If assigned this function to a digital input, the input will select the mode of operation. **Connection to Ground: Auto Mode** **Open: Manual Mode** The front key can't be used to select Auto or Manual mode but the test mode can still be selected form front.

Note: There are some restriction on the assignment of the function to the Digital Inputs
a)R. Start/Stop can not be selected along with either of R.Stop or R.start
b)R.Start and R.Stop both must be assigned. Assigning only one is not allowed.

6.0. Modes of Operation

Mode	Description
Auto	The genset runs without any human interventions. The engine shall be switched on when the Mains becomes unhealthy as per the user defined settings. The mains can be monitored for voltage levels, frequency, phase sequence and voltage unbalance. The monitoring of frequency, phase sequence and voltage unbalance can be disabled. Once the Mains voltage is outside the limit, continuously for the programmed time, the engine is cranked and load transferred to the genset after warmup time. The engine keeps running till the Mains is restored and upon its restoration, the load is transferred to the Mains and engine is shut down after cooling. This cycle keeps repeating. On detection of unhealthy conditions(faults) the engine shall be shut down and an alarm (Hooter) is activated for the programmed time.
Manual	In this mode the starting and stopping of the genset is controlled manually. All other functions like load transfer and protections are performed automatically Starting the Engine: Depending upon the setting of the digital Input the engine could be started by either: • Front Start Key • R. Start Key • R. Start/Stop Key Stopping Engine: The engine can be shut down either automatically on restoration of Mains Voltage (Auto shut down) if the setting xxxxxxxxx is enabled in xxxxxx Parameter else it's shuts down by user depending upon the digital Input setting • Front Stop Key • R. Stop Key • R. Start/Stop Key
Test	This is special mode meant for testing during building the system or trouble shooting. This mode allows the operator to manually start and stop the engine also the mains contactor and generator contacts can be manually controlled from Front Keys

7.0. Analog Sensors in Details

Though three sensors one each for Temperature, Pressure and Fuel are installed but at times systems have typical requirements. DGC202X is deigned to cater for all these possible requirements and these can be programmed in System Configuration Settings:

Requirement	Description
Sensor/Sensors are not installed	In such case the display shall not display the measured sensor value and the protection shall not be activated on the sensor readings.
Sensor/Sensors Installed but not to protect the engine	If system requires to have the engine protected only through the digital Input but the sensor measured values have to be displayed.
Sensor/Sensors installed and used for Protection	Normal Operation
Fault in Sensors	The following faults in sensors are detected and announced: • Sensor Common Open. • Sensor Open If Sensor Common Open is detected, non sensors shall be effective If a Sensor Open on an individual sensor is detected, it renders that sensor ineffective

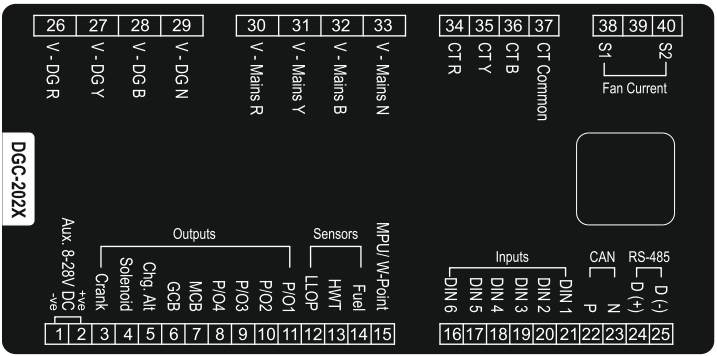
8.0. Records

Fault Records	Last 64 Faults with time stamping. This is a circular buffer with last 64 faults. Newer fault shall replace the oldest fault(64th). These can be viewed on the LCD display or downloaded either by USB or RS485. The faults logged are as per the list in 3.2.4(Supervision)
Event Records	Last 64 Events with time stamping. This is a circular buffer with last 64 Events. Newer Event shall replace the oldest event(64th). These can be viewed on the LCD display or downloaded either by USB or RS485. The events are: 1. Parameters Modified 2. RTC time changes 3. Password Changed

9.0. Installation

For dimension details, see the section entitled Dimension latter in this document.

9.1 Terminal Description



9.1.1 DC Supply, Outputs and Inputs

PIN No	DESCRIPTION	NOTES
1	DC Supply Input (Negative)	Negative DC Supply
2	DC Supply Input (Positive)	Positive DC Supply
3	Programmable Output 1	Battery Positive to drive a Relay
4	GCB	Battery Positive to drive a Relay for Generator
5	Charging Alternator	Magnetising current during starting of the engine is delivered to Charging Alternator. The charging Alternator voltage is measured here and used for
6	MCB	Battery Positive to drive a Relay for Mains Contactor
7	Solenoid	Battery Positive to drive a Relay for Solenoid
8	Crank	Battery Positive to drive a Relay for cranking the
9	Hooter	Battery Positive to drive a Relay to drive hooter during fault annunciation.
10	Programmable Output 2	Battery Positive to drive a Relay
11	Programmable Output 3	Battery Positive to drive a Relay
12	LLOP	Connect to Oil pressure sensor
13	HWT	Connect to High Water Temperature sensor
14	Fuel	Connect to Fuel sensor
15	MPU/W-Point	Input of MPU or W-Point from charging alternator

9.1.2 Configurable Digital Inputs

PIN No	DESCRIPTION	NOTES
16	Digital Input 1	Switch to negative
17	Digital Input 2	Switch to negative
18	Digital Input 3	Switch to negative
19	Digital Input 4	Switch to negative
20	Digital Input 5	Switch to negative
21	Digital Input 6	Switch to negative

9.1.3 Communications

PIN No	DESCRIPTION	NOTES
22	CAN P	For CAN communication
23	CAN N	For CAN communication
24	RS-485(D+)	For RS-485 communication
25	RS-485(D-)	For RS-485 communication

9.1.4 Generator/Mains Voltage Sensing

PIN No	DESCRIPTION	NOTES
26	Generator L1 Voltage monitoring	Connect to generator L1 (R) output (AC)
27	Generator L2 (Y) Voltage monitoring	Connect to generator L2 (Y) output (AC)
28	Generator L3 (B) Voltage monitoring	Connect to generator L3 (B) output (AC)
29	Generator Neutral (N) input	Connect to generator Neutral terminal (AC)
30	Mains L1 (R) voltage monitoring	Connect to Mains L1 (R) output (AC)
31	Mains L2 (Y) Voltage monitoring	Connect to Mains L2 (Y) output (AC)
32	Mains L3 (B voltage monitoring	Connect to Mains L3 (B) output (AC)
33	Mains Neutral (N) input	Connect to Mains Neutral terminal (AC)

9.1.5 Generator Current Transformers

PIN No	DESCRIPTION	NOTES
34	CT Secondary for Gen L1(R)	Connect to s1 secondary of L1 monitoring CT
35	CT Secondary for Gen L2(Y)	Connect to s1 secondary of L2 monitoring CT
36	CT Secondary for Gen L3(B)	Connect to s1 secondary of L3 monitoring CT
37	CT Common	

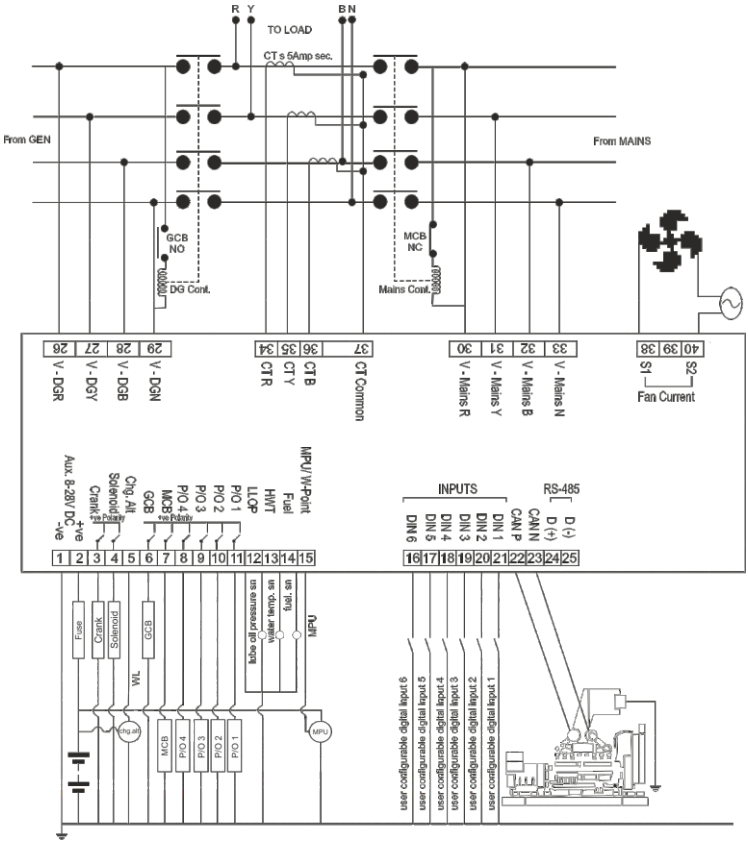
9.1.6 Generator Fan Current

PIN No	DESCRIPTION	NOTES
38	Fan Current(S1)	Connect to s1 of CT
40	Fan Current(S2)	Connect to s2 of CT

9.1.7 Generator Fan Current

	DESCRIPTION	NOTES
	Socket for connection to PC with software.	This is a standard USB type A to type B connector.

9.2 Typical Wiring Diagram



Note 1: These ground connections must be on the engine block, and must be to the sender bodies.

Note 2: All the digital inputs(DIN 1-DIN 6) are available in section 5.2.

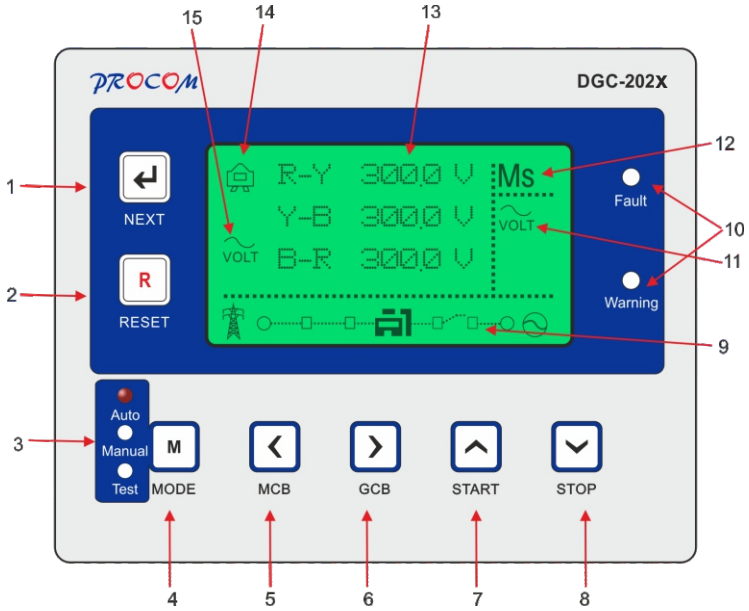
10.0 Display / Front Panel

10.1 Front Facia

128x64 pixels Graphical LCD Display for ease of readout. Parameters are displayed in English along with symbolic representation. Normally the display auto scrolls and displays a parameter for 10 seconds, but any time the Next key can be pressed to select the next parameter window.

Icons:

When displaying instrumentation, a small icon is displayed in the instrumentation area to indicate what value is currently being displayed.



S.No	Description
1	Next Key. The preceding section describes the functions associated with all keys
2.	Reset Key
3.	Radio LED annunciation for the selected mode: Auto/Manual/Test
4.	Mode Key
5.	MCB/Back Key
6.	GCB/Forward Key
7.	Increment/Start Key
8.	Decrement/Stop Key
9.	Status Area: This area shall display the position of the Mains and Generator contacts or will indicate operations status like Cranking, Eng Cooling etc.
10.	Fault and Warning Led. Fault Led blinks on a fault that resulted in engine shut down while the warning will blink on a warning not resulting in shut down
11 & 12	Ms = Mains status. The area below Ms shall indicate the status of mains. If the mains is healthy √ is displayed. Reasons of Mains being unhealthy such as Phase Sequence, voltage unbalance, under/over voltage or under/over frequency shall be indicated by respective Icon. In case of more than one unhealthy condition two Icon in the priority, as written above, shall be announced.
13.	Parameter Window. All measure Parameter shall be displayed here.
14.	Icon to distinguish between Mains or Generator Parameter. eg: Mains Icon with voltage display means its mains voltage and vice versa
15	Icon of the parameter being displayed

10.2 Backlight

Any event such as a front Key is pressed, Fault or Warning shall set the backlight to 100% brightness. After 120 sec of expiry of the event the brightness of the backlight shall be reduced to the programmed level. The level can be programmed from 10%-100%. During the cranking, backlight shall be switched off.

11.0 Icons

11.1 Fault Icons

ICON	DESCRIPTION	NOTES
	Start Failed	The engine has not fired after the programmed number of starts attempts
	Stop Failed	The controller has detected a condition that indicates that the engine is running when it has been instructed to stop.
	Engine High Temperature (HWT)	The controller detects that the engine coolant temperature has exceeded the high engine temperature setting level and the Safety On timer has expired.
	Low Lube Oil Pressure(LLOP)	The controller detects that the engine oil pressure has fallen below the low oil pressure programmed level and the Safety On timer has expired.
	Under RPM	The engine speed has fallen below the programmed RPM
	Over RPM	The engine speed has risen above the programmed RPM alarm setting
	V Belt/Chg Alt	The auxiliary charge alternator voltage is low
	Low Fuel	The level detected by the fuel level sensor is below the low fuel level setting.
	Generator Under Voltage	The generator output voltage has fallen below the programmed setting after the Safety On timer has expired.
	Generator Over Voltage	The generator output voltage has risen above the programmed setting and the Timer has expired.
	Emergency Stop	The emergency stop button has been depressed. This fail safe (normally closed to emergency stop) input and will immediately stop the set should the signal be removed.
	LLOP Sensor Open	Oil pressure sensor has been detected as being open circuit.
	HWT Sensor Open	HWT sensor has been detected as being open circuit.
	FUEL Sensor Open	Fuel sensor has been detected as being open circuit.
	RWL	RWL fault.
	Oil Level	Oil level fault.
	OilTemperature	Oil Temperature.
	Earth Fault	Earth fault.
	Canopy Temperature	Canopy Temperature fault.

OL	Over Load	The current or KW derived from the genset is above the programmed limit.
A	Voltage Unbalance	The unbalance in the voltage between the phases.
A	Current Unbalance	The unbalance in the current between the phases.

11.2 Warning Icons

ICON	DESCRIPTION	NOTES
	LLOP Sensor Open	Oil pressure sensor has been detected as being open circuit when sensor open is selected as warning.
	HWT Sensor Open	HWT sensor warning has been detected as being open circuit when sensor open is selected as warning.
	FUEL Sensor Open	Fuel sensor warning has been detected as being open circuit when sensor open is selected as warning.
OPEN	Sensor Common Open	Sensor Common Open warning has been detected when sensor common pin is open.
	Battery	The DC supply has fallen below or risen above the low/high volts setting level.
KVA	KVA Warning	When power of generator in KVA reaches to set value, then KVA warning occurs.

11.3 Operation Icons

	Mains	This icon indicates that the parameters shown on the screen are of
G	Generator	This icon indicates that the parameters shown on the screen are of Generator.
VOLT	Voltage	Voltage of Mains or Generator.
Hz	Frequency	Frequency of Mains or Generator.
RPM	RPM	RPM of Generator.
AMP	Current	This icon shows the current of Mains or Generator. When Mains contactor is connected, it shows Mains current. When Generator contactor is connected, it shows Generator current.
P	Active Power	This icon shows the active power of Mains or Generator. When Mains contactor is connected, it shows Mains active power. When Generator contactor is connected, it shows Generator active power.

	Apparent Power	This icon shows the apparent power of Mains or Generator. When Mains contactor is connected, it shows Mains apparent power. When generator contactor is connected, it shows Generator apparent power.
	Power Factor	This icon shows the power factor of Mains or Generator. When Mains contactor is connected, it shows Mains power factor. When Generator contactor is connected, it shows Generator power factor.
	Total Power	This icon shows the total power of Mains or Generator. When Mains contactor is connected, it shows Mains total power. When Generator contactor is connected, it shows Generator total power.
	Battery Voltage	battery voltage.
	Chg. Alt Voltage	Charging Alternator Voltage.
	Service due Hour	Remaining hours for servicing the generator.
	Run Hour	Run Hour of generator.
	Energy	KWhr of Genset
	LLOP Sensor	This icon shows the low lube oil pressure of generator.
	HWT Sensor	This icon shows the high-water temperature of generator.
	Fuel Sensor	This icon shows the fuel of generator.
	Oil Temperature Sensor	This icon shows the oil temperature of generator when CAN is enabled.
	RTC	This icon shows the current date and time.

12.0 Keys & LEDs Description

DGC202x has seven Keys provided on its front panel. The table below describes the operation of these.

Keys Symbol	Keys Function	Description
	Next	Normal operation mode: It is used to scroll forward the parameters being displayed on LCD. Programming Mode: Key displays the next parameter to be programmed.
	Increment /Start	Programming Mode: It is used to increment the value of the parameters being modified. Manual mode: it is used to issue the crank/ start command to DG. Crank is disabled while in Programming Mode.

	Decrement /Stop	Programming mode: It is used to decrement the value of the parameter being modified program. Manual mode: It is used to issue the stop command to DG. Stop is disabled while in Programming Mode.
	Reset	Normal Operation: 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 Mode: Go a level up.
	Programming /History Fault Mode Entry	If both the keys are pressed simultaneously, the unit will enter in first Level of the Programming Mode. Here Edit/View of the Parameters or View history, events and CAN status could be selected.
	MCB	Test Mode: Toggles then mains contactor, On/Off Programming Mode: Scrolls the parameter back
	GCB	Test Mode: Toggles then generator contactor, On/Off Programming Mode: Scrolls the parameter forward
	MODE	Toggle between Auto, Manual and Test Mode Please refer to Digital Input section for more clarity

LED Annunciations Description: DGC202X has 5 annunciations on its front panel. These either announce the faults or indicate status of the system.

Nomenclature	Symbol	Description
Auto	Auto	Led lights up when unit is in Auto mode
Manual	Manual	Led lights up when unit is in manual mode
Test	Test	Led lights up when unit is in Test mode
Fault	Fault	This LED blinks in case of a fault
Warning	Warning	This LED blinks in case of a warning

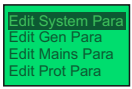
13.0. Lamp Test:

If the DGC202X is switched on while the reset switch is pressed, all the LEDs start blinking till the reset switch is kept pressed. This state shall persist till the switch is kept pressed and on release of the switch DGC202X shall start functioning normally.

14.0. Setting Procedure:

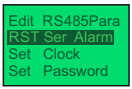
DGC202X has provision to program the operating parameters. It is user/site configurable. User can view all parameters, fault history, events, adjust clock, reset password and also edit the parameter.

Press **Next Switch** and **Reset Switch** simultaneously.
The LCD shall display "Main menu"
This menu has a various Edit/View mode which is scroll by and Keys
Edit is password protected. The default password is 123 which is set by and Key.



14.1 Edit System Para/Edit Gen Para/Edit Mains Para/Edit Prot Para/Edit RS485 Para

Press **Next Switch** and **Reset Switch** simultaneously.
LCD shall display Edit System Para programming mode.
Scroll Up and Down to select the desired function by and Key.
Press **Next Switch** to enter in any of the above Edit modes.
It will ask for a password if this is the first entry.
Press **Start switch** to set the password which is by default 123.
Press Next Switch , the LCD shall display all the first parameters of the selected.
Keys or Key can be used to modify the values of that Parameter.
Press for the next parameter or for the previous Parameter.
Press to update the setting or Press to quit and discard changes made.

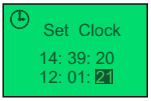


14.2 Reset Service Alarm

Scroll Up or Down to select the RST Ser Alarm.
Press Next Switch to enter in the RST Ser Alarm mode.
The LCD shall display:
Press
START to Reset
STOP to ESC
If you press START Switch, it will reset the Service due hour.
If you press STOP Switch, the service due hour will not reset.

14.3 Set Clock

Scroll Up and Down to select the Set Clock.
Press Next Switch to enter in the Set Clock mode.



LCD shall display:
HH: MM: SS
DD: MM: YY

or Keys can be used to select the Parameter to be edited. The selected Parameter shall be highlighted.

and Key can be used to edit the Parameter.

key shall update the RTC with the screen value.

14.4 Set Password

Scroll Up and Down to select the Set Password.

Press Next Key to enter in the Set Password mode.

Follow the instructions on the screen.

14.5 View Fault History/Event (Same procedure for all other views)

Scroll Up and Down to select the View History /Event.

Press Next Key to enter.

Press Key to see the next fault.

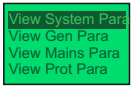
Press Key to see the previous fault.

Press R to leave and go back to the previous Screen

DGC 202X keeps a log of the last 64 faults/Events with the date and time stamp. These records are updated on a first in first out basis.

ake the unit back in normal mode and all the changes done shall be discarded.

14.6 View System Para/View Gen Para/View Mains Para/View Prot Para/View RS485 (Same procedure for all other views)



Scroll Up and Down to select the desired function by ⌃ and ⌄ Key.

Press **Next Switch** ↵ to enter in any of the above View modes.

Press › for the next parameter or ‹ for the previous Parameter.

Press R to quit and discard changes made.

14.7 View CAN DTCs/ History CAN DTCs (Same procedure for all other views)
Scroll Up and Down to select the View CAN DTCs / Hist CAN DTCs .

Press Next ↵ Key to enter.

Press › Key to see the next CAN DTCs.

Press ‹ Key to see the previous CAN DTCs.

Press R to leave and go back to the previous Screen.

DGC 202X keeps a log of the Live last 5 **CAN DTCs.**

DGC 202X keeps a log of the last 64 **CAN DTCs** with the date and time stamp. These records are updated on a first in first out basis.

15.0 Inbuilt Parameter

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

15.1 System Parameter

Parameter Name on LCD & Icon	Explanation of Parameter	Factory Setting	Setting Range
Supplier	Company logo and default parameter is set as per system suppliers.	PROCOM	PROCOM TMTL Escort Greaves Cotton Mahindra kirloskar Cooper
System Config A/MΦ	DGC202X provides complete flexibility in system designing. This parameter defines the system configuration in terms of the mains and generator connections (Phases 1P or 3P) Please note that the phases are defined w.r.t to the input to the panel	AMF-M: 3P/G:3P	AMF-M: 3P/G:1P AMF-M: 3P/G:3P AMF-M: 1P/G:1P
CAN J1939 CAN	CAN Bus enable/disable. DGC202X can be used engine with CAN bus or without this bus.	Disabled	Disabled* Enabled
CAN Source Addr.	The source address of the controller over CAN BUS for J1939 Communication.	1	0-253
CAN ECU Addr.	The source address of the controller over CAN BUS for J1939 communication.	1	0-255
Solenoid Type 	Pull to Start Cranking command occurs after the solenoid pre time set in generator parameter. Fuel solenoid is kept pull till the time engine is running. To stop engine it is released Pull to Stop Fuel solenoid is pulled to stop the engine for a pre-programmed duration.	Pull to stop	Pull to Stop Pull to Start
LLOP Sensor Type 	Select the installed sensor for LLOP. There are many built in sensors to choose from. For sensors whose data is not in-built User defined can be selected and the sensor data programmed. Below twenty parameters are for programming the User defined sensors. If a in-built sensor is selected the following twenty parameter shall not be displayed	TYPE A	User Defined CAN BUS Type A M&M MNEPL VE TMTL HUAFANG TATA GC(VDO) GC(MURPHY) 4-20 ma 4-20 + 250 ohm Disabled *

4-20 Max Range	Max. Range of 4-20 mA LLOP Sensor.	40	2-40
LLOP Sensor R1	R1 to R10 = Resistance Value V1 to V10 = Corresponding pressure value. These table are used when sensor type is selected as user defined.	10	0-999
LLOP Sensor V1		0.0	0.0-10.0
LLOP Sensor R2		29	0-999
LLOP Sensor V2		1.0	0.0-10.0
LLOP Sensor R3		38	0-999
LLOP Sensor V3		1.5	0.0-10.0
LLOP Sensor R4		48	0-999
LLOP Sensor V4		2.0	0.0-10.0
LLOP Sensor R5		57	0-999
LLOP Sensor V5		2.5	0.0-10.0
LLOP Sensor R6		67	0-999
LLOP Sensor V6		3.0	0.0-10.0
LLOP Sensor R7		86	0-999
LLOP Sensor V7		4.0	0.0-10.0
LLOP Sensor R8		105	0-999
LLOP Sensor V8		5.0	0.0-10.0
LLOP Sensor R9		124	0-999
LLOP Sensor V9		6.0	0.0-10.0
LLOP Sensor R10		143	0-999
LLOP Sensor V10		7.0	0.0-10.0

Fuel Sensor 	Select the installed sensor for Fuel There are many built in sensors to choose from. For sensors whose data is not in-built User defined can be selected and the sensor data programmed. Below twenty parameters are for programming the User defined sensors. If a in-built sensor is selected the following twenty parameter shall not be displayed	Type A	User Defined Type A Sam-0 Sam-1 Electronics Linear CCPL Disabled*
Fuel Sensor R1	R1 to R10 = Resistance Value V1 to V10 = Corresponding fuel level in %. These table are used when sensor type is selected as user defined.	10	0-999
Fuel Sensor V1		0	0-100
Fuel Sensor R2		29	0-999
Fuel Sensor V2		10	0-100
Fuel Sensor R3		48	0-999
Fuel Sensor V3		20	0-100
Fuel Sensor R4		67	0-999
Fuel Sensor V4		30	0-100
Fuel Sensor R5		86	0-999
Fuel Sensor V5		40	0-100
Fuel Sensor R6		105	0-999
Fuel Sensor V6		50	0-100
Fuel Sensor R7		124	0-999
Fuel Sensor V7		60	0-100
Fuel Sensor R8		143	0-999
Fuel Sensor V8		70	0-100
Fuel Sensor R9		181	0-999

Fuel Sensor V9		90	0-100
Fuel Sensor R10		200	0-999
Fuel Sensor V10		100	0-100
HWT Sensor 	Select the installed sensor for HET There are many built in sensors to choose from. For sensors whose data is not in-built User defined can be selected and the sensor data programmed. Below twenty parameters are for programming the User defined sensors. If a in-built sensor is selected the following twenty parameter shall not be displayed	Type A	User Defined CAN BUS Type A M&M MNEPL VE TMTL RANGE 1 TMTL RANGE 2 TMTL WATER HUAFANG TATA GC(VDO) GC(MURPHY) CCPL (MVD) Disabled *
HWT Sensor R1	R1 to R10 = Resistance Value V1 to V10 = Corresponding temperature in °C. These table are used when sensor type is selected as user defined.	540	0-9999
HWT Sensor V1		40	0-300
HWT Sensor R2		458	0-9999
HWT Sensor V2		45	0-300
HWT Sensor R3		222	0-9999
HWT Sensor V3		65	0-300
HWT Sensor R4		120	0-9999
HWT Sensor V4		85	0-300
HWT Sensor R5		93	0-9999
HWT Sensor V5		90	0-300
HWT Sensor R6		80	0-9999

HWT Sensor V6		95	0-300
HWT Sensor R7		70	0-9999
HWT Sensor V7		100	0-300
HWT Sensor R8		60	0-9999
HWT Sensor V8		105	0-300
HWT Sensor R9		53	0-9999
HWT Sensor V9		110	0-300
HWT Sensor R10		46	0-9999
HWT Sensor V10		115	0-300
Sensor Open 	User can select the action to be taken in case of sensor open, it can be configured as a fault, or as warning. Fault selection shall shut down the engine. Warning setting shall display a warning but will let the engine continue. No action will all together neglect the fault Please note that a faulty sensor shall not protect the engine till alternate provision such a sensor switch is connected on a Digital Input.	Warning	Fault Warning None
CT Ratio 	Current Transformer ratio.	1	1-1999
Gen. RPM 	Engine RPM Type.	1500	1500RPM 3000RPM
Output 1/P (01) 	This is a programmable output which can be configured for any one function from the list.	None	None Heater /Choke Fuel Pump Load Warning Unit Healthy MCCB Shunt Trip Fail To Start Fail To Stop Hooter Common Fault CPCB4+ Audio CAN Output 1 CAN Output 2

			CAN Output 3 CAN Output 4 EGR Warning NCD Warning NCD Fault LLOP Trip HWT Trip Fuel Trip Fuel Warning Emergency Trip
Output 2/P (01) 	This is a programmable output which can be configured for any one function from the list.	None	None Heater /Choke Fuel Pump Load Warning Unit Healthy MCCB Shunt Trip Fail To Start Fail To Stop Hooter Common Fault CPCB4+ Audio CAN Output 1 CAN Output 2 CAN Output 3 CAN Output 4 EGR Warning NCD Warning NCD Fault LLOP Trip HWT Trip Fuel Trip Fuel Warning Emergency Trip
Output 3/P (01) 	This is a programmable output which can be configured for any one function from the list.	None	None Heater /Choke Fuel Pump Load Warning Unit Healthy MCCB Shunt Trip Fail To Start Fail To Stop Hooter Common Fault CPCB4+ Audio CAN Output 1 CAN Output 2

			CAN Output 3 CAN Output 4 EGR Warning NCD Warning NCD Fault LLOP Trip HWT Trip Fuel Trip Fuel Warning Emergency Trip
Output 4/P (01)	This is a programmable output which can be configured for any one function from the list.	None	None Heater /Choke Fuel Pump Load Warning Unit Healthy MCCB Shunt Trip Fail To Start Fail To Stop Hooter Common Fault CPCB4+ Audio CAN Output 1 CAN Output 2 CAN Output 3 CAN Output 4 EGR Warning NCD Warning NCD Fault LLOP Trip HWT Trip Fuel Trip Fuel Warning Emergency Trip
Over Load KW KW↑	The Power (KW) above which the over load fault monitoring will start. The timer for it is over load delay. This fault is only enabled while the generator is running. On expiry of the timer the generator is stopped.	40	1-9999

Over Current 	The current above which the over current fault monitoring will start. The timer for it is over load delay. This fault is only enabled while the generator is running. On expiry of the timer the generator is stopped.	50	1-9999
Over Load Delay 	This is the timer for the over load condition either due to over KW or over current. On expiry of this timer the engine shall be stopped.	5	1-100 Sec
Digital Input 1 	This can be assigned to any of the function from this list.	None	None Auto/Man R Start R Stop R. Start/Stop LLOP Fault Fuel Fault HWT Fault Emergency Canopy Temp. Earth Fault Oil Level Fault RWL Fault Water Fault Ext RPM Fault ECU Fault Debar Auto start LLOP Warning HWT Warning RWL Warning Water Warning Ext RPM Warning ECU Warning EGR Fault EGR Warning Padmini EGR ECU
Digital Input 2 	This can be assigned to any of the function from this list.	None	None Auto/Man R Start R Stop R. Start/Stop LLOP Fault Fuel Fault HWT Fault Emergency Canopy Temp.

			Earth Fault Oil Level Fault RWL Fault Water Fault Ext RPM Fault ECU Fault Debar Auto start LLOP Warning HWT Warning RWL Warning Water Warning Ext RPM Warning ECU Warning EGR Fault EGR Warning Padmini EGR ECU
Digital Input 3 	This can be assigned to any of the function from this list.	None	None Auto/Man R Start R Stop R. Start/Stop LLOP Fault Fuel Fault HWT Fault Emergency Canopy Temp. Earth Fault Oil Level Fault RWL Fault Water Fault Ext RPM Fault ECU Fault Debar Auto start LLOP Warning HWT Warning RWL Warning Water Warning Ext RPM Warning ECU Warning EGR Fault EGR Warning Padmini EGR ECU

Digital Input 4 	This can be assigned to any of the function from this list.	None	None Auto/Man R Start R Stop R. Start/Stop LLOP Fault Fuel Fault HWT Fault Emergency Canopy Temp. Earth Fault Oil Level Fault RWL Fault Water Fault Ext RPM Fault ECU Fault Debar Auto start LLOP Warning HWT Warning RWL Warning Water Warning Ext RPM Warning ECU Warning EGR Fault EGR Warning Padmini EGR ECU
Digital Input 5 	This can be assigned to any of the function from this list.	None	None Auto/Man R Start R Stop R. Start/Stop LLOP Fault Fuel Fault HWT Fault Emergency Canopy Temp. Earth Fault Oil Level Fault RWL Fault Water Fault Ext RPM Fault ECU Fault Debar Auto start LLOP Warning

			HWT Warning RWL Warning Water Warning Ext RPM Warning ECU Warning EGR Fault EGR Warning Padmini EGR ECU
Digital Input 6 	This can be assigned to any of the function from this list.	None	None Auto/Man R Start R Stop R. Start/Stop LLOP Fault Fuel Fault HWT Fault Emergency Canopy Temp. Earth Fault Oil Level Fault RWL Fault Water Fault Ext RPM Fault ECU Fault Debar Auto start LLOP Warning HWT Warning RWL Warning Water Warning Ext RPM Warning ECU Warning EGR Fault EGR Warning Padmini EGR ECU

Digital Input 1 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
Digital Input 2 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
Digital Input 3 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
Digital Input 4 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
Digital Input 5 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
Digital Input 6 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close

MPU/Chg Alt 	Used to enable or disable MPU.	Disabled	Disabled* Enabled
Pulses in a Rev 	No. of pulses, from magnetic pickup or W-Point of charging alternator, in one revolution of the engine. This shall be used to calculate the RPM.	120.0	1.0-300.0
RPM Source 	Take RPM from generator or MPU/W-Point.	Gen Vol	MPU Gen Vol CAN Bus (If Can enabled)
Test Mode	Test mode from the front Keys can only be selected if this setting is enabled.	Disabled	Disabled* Enabled
MCB Polarity	This parameter define the polarity of MCB operation. When normally close polarity is selected, contactor will connect with normally close point of the relay. When normally open polarity is selected, contactor will connect with normally open point of the relay.	Normally Close	Normally Open Normally Close
Fan High Current 	Maximum permissible limit for fan current.	Disabled	0.0-3.5 Disabled*
Fan Low Current 	Minimum limit for fan current.	Disabled	0.0-3.5
Fan Current Delay 	This is the timer for fan current trip.	Disabled	1-100

15.2 Generator Parameter

Over Voltage 	Max. Permissible Generator voltage, above this the Generator voltage is treated unhealthy & the Generator is stopped on voltage fault.	270V	50-300V
Under Voltage 	Min. permissible Generator voltage, below this the Generator voltage is treated unhealthy & the Generator is stopped on voltage fault.	180V	50-300V
Gen Voltage Delay  VOLT	Duration for which generator Over/Under voltage condition can be tolerated before stopping the Generator.	10	1-100 Sec
Over RPM  RPM	Max. Permissible Generator RPM, above this the Generator RPM is treated unhealthy & the Generator is stopped on RPM fault.	1950	1000-3999Hz Disabled*
Under RPM  RPM	Min. permissible Generator RPM, below this the Generator RPM is treated unhealthy & the Generator is stopped on RPM fault.	1350	Disabled* 1001-4000Hz
Gen RPM Delay  RPM	Duration for which Generator Over/Under RPM condition can be tolerated before stopping the Generator. This setting is not available if (4)&(5) are disabled.	2	1-100 Sec.
Current Unbalance IN  A	The maximum permissible current unbalance in %. The unbalance starts only after the one phase is loaded to 25% or more of its capacity.	Disabled	6-100% Disabled*
Current Unbalance Delay  A	Duration for which the current unbalance can be tolerated before triggering the fault.	10	1-999Sec
Pickup Voltage	This parameter specifies the generator voltage at which it is presumed to have started and crank has to be terminated.	100	80-150V
Pick Up RPM 	This parameter specifies the minimum RPM at which crank shall be terminated.	900	600-3000

Pick Up RPM Source 	The source of RPM which shall be used to terminate the crank	Gen Vol	Gen Voltage MPU CAN Bus(if CAN Enabled)
Cnk Dsc LLOP Sw 	Auto disconnects the crank command on detection of Oil pressure from switch.	Disabled	Enabled Disabled*
Cnk Dsc LLOP Sn 	Auto disconnects the crank command on detection of Oil pressure from sensor.	Disabled	Enabled Disabled*
Cnk Dsc Alt Vol 	The minimum voltage from Charging alternator which shall be deemed fit enough to disconnect the crank.	5	Disabled* 3-40V
Service Due Hr 	Time, in hours, for next service due. This is warning/reminder.	250	10-999 Hrs
Pick Up KVA warning KVA 	If the programmable Digital output is programmed for “Load Warning” The digital output shall be activated on crossing the load KVA above the programmed level.	8	1-9999
Reset KVA warning KVA 	Once the load falls below this level the above activated contact shall be released.	8	1-9999
KVA Warning Delay KVA 	The supervision time for the above 2 parameters.	5	1-999 Sec
Choke Pre time 	If the programmable Digital output is programmed for “Heater /Choke” This parameter sets the time gap between this contact and crank. The crank will be activated after the programmed time has elapsed after this contact was activated.	Disabled	Disabled* 1-100 Sec
Choke Post time 	If the programmable Digital output is programmed for “Heater /Choke” Keep the choke for this time after the engine has started.	Disabled	Disabled* 1-100 Sec
Pump/ Sol Pre Time 	Activate the Pump/Sol Pre Time by this time before cranking when solenoid type is selected as “pull to start”.	2	1-100Sec

14.3 Mains Parameter

Over Voltage 	Max. Permissible Mains voltage, above this the mains voltage is treated unhealthy and Generator is started.	270V	50-300V
Under Voltage 	Min. Permissible Mains voltage, below this the mains voltage is treated unhealthy and Generator is started.	180V	50-300V
Mains Voltage Delay 	Duration for which Mains Over/Under voltage condition can be tolerated before starting the Generator.	10	1-999 Sec
Over Frequency 	Max. Permissible Mains frequency, above this frequency the Mains is treated unhealthy & Generator is started.	65.0	40.0-69.9Hz Disabled*
Mains U/F 	Min. permissible Mains frequency, below this frequency the Mains is treated unhealthy & Generator is started.	45.0	Disabled* 40.1-70.0Hz
Mains Freq Delay 	Duration for which Mains Over/Under frequency condition can be tolerated before starting the Generator.	5	1-999 Sec.
Voltage Unbalance 	Max. allowed voltage unbalance in volt.	Disabled	10-99Volt Disabled*
Voltage Unbalance Delay 	Duration for which unbalance can be allowed before starting the Generator. This parameter is not available if above is set to disabled.	10	1-999Sec

Phase Sequence Delay 	This setting determines if the engine shall be started and load switch to generator in case of reverse phase sequence of mains.	Disabled	Disabled* 1-10 Sec
Mains Restoration Time 	The time for which Mains should be continuously healthy before stopping the Generator and load transferred to Mains.	10	1-100 Sec
Warm Up Time 	Generator is allowed to run idle(warm up) for this duration before the load is connected.	0	0-100 Sec
Mains Over Load 	DGC202X can protect contactors from mains overload. If this setting is enabled then the mains contactor shall drop after the mains current crosses the set limit for a programmed duration.	2	2-9999 Disabled*
Mains Over Load Delay 	The monitoring duration for the above parameter before the fault is triggered.	5	1-100 Sec
Mains Fail 	Some application requires the generator to start on failure of one or more phases Other wants all the 3 phases to become unhealthy before starting the generator DGC can handle both situations.	Any Phase Fail	Any Phase Fail R phase Fail
GCB to MCB Delay 	User programmable delay when the load is transferred from Generator to Mains.	2	1-10 Sec
Recooling Time 	The time for which generator is allowed to run on no load(cool down) before switching off.	30	0-100 Sec
Manual: Auto Stop 	In manual mode, though the generator shall be started manually, its stopping could either be manual or automatic. If enabled the generator can be automatically shut down once the mains voltage becomeshealthy.	Enabled	Enabled Disabled*

15.4 Protection Parameter

Fuel Warn Level	Monitoring value of fuel level below which fuel level warning is generated.	15	Disabled* 11-80 %
Fuel Warn Delay	Monitoring time for above.	10	1-100 Sec
Fuel Trip Level	Monitoring value of fuel level below which fuel level trip is generated.	15	10-80 % Disabled*
Fuel Trip Delay	Monitoring time for above.	10	1-100 Sec
LLOP Trip Level	Monitoring value of lube oil pressure below which LLOP trip is generated.	1.0	0.4-8.5 Kg/cm2 Disabled*
LLOP Trip Delay	Monitoring time for above.	5	1-100 Sec
HWT Trip Level 	Monitoring value of water temperature above which HET trip is generated.	90	40-249 Disabled*
HWT Trip Delay 	Monitoring time for above.	5	1-100 Sec
Oil Temp Trip 	Monitoring value of Oil temperature above which Oil Temperature trip is enabled. This is only available if CAN Bus is enabled.	100	40-250 Disabled*
Oil Temp Trip Delay 	Monitoring time for above.	5	1-100 Sec
Digital Input 1 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
Digital Input 2 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
Digital Input 3 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec

Digital Input 4 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
Digital Input 5 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
Digital Input 6 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
ChgALt Vol 	The minimum voltage for the charging alternator for a healthy charging alternator/V-Belt.	Disabled	Disabled* 5-30
Chg Alt- V Belt Delay 	Duration for which the above voltage should fall below the set limit for the engine to be stopped on fault.	Disabled	Disabled* 1-30 Sec
Hooter ON Time 	Duration for which the hooter shall be ON, if not externally reset, while announcing a fault.	30	1-100 Sec
Crank ON Time 	Maximum crank time.	5.0	1.0-20.0 Sec
Crank GapTime 	The delay between two successive cranks.	5	1-200 Sec
Crank Attempts 	The maximum number of cranks that shall be attempted to start the Engine.	3	1-10
Solenoid ON time 	The time for which stop solenoid will be kept active while stopping the engine. Please note that in case of PULL to Start mode this time should be reduced (recommended 5 sec).	22	1-100 Sec
Priming Delay 	The duration at which the stop solenoid to go in the fuel shut-off mode and simultaneously shall start the cranking command when the start command is initiated.	Disabled	1.1-9.9 Sec Disabled*

Prime Off Hr 	The duration after which the priming function again works after the last engine stop.	24	0-99 Hr
Auto Scroll 	Setting ON will enable Auto Scroll of display. OFF: No scroll and next parameter can be viewed by pressing next switch.	Auto Scroll On	Auto Scroll On Auto Scroll Off
B.Light Dim % 	Backlight brightness while there is no event, such as Key pressed, fault or warning. In normal case the display brightness shall reduce to this level after 120 sec of no event.	50	0-100
LCD Contrast 	For increasing or decreasing the Display Contrast.	10	1-20
Battery UV Warning 	Min. permissible battery voltage, below this the voltage is treated unhealthy & warning is generated.	Disabled	Disabled* 9.1-35.0V
Battery OV Warning 	Max. permissible battery voltage, above this the voltage is treated unhealthy & warning is generated.	Disabled	9.0-34.9V Disabled*

15.5 Comm RS485 Parameter

Device Id 	Modbus device ID.	1	1-247
Baud Rate 	RS-485 Communication Baud rate.	9600	1200 2400 4800 9600 19200
Parity 	RS-485 Communication Parity Bits.	None	Even Odd None
Stop Bits 	RS-485 Communication Stop Bits.	1	1 2

16.0 Current Unbalance Calculation:

Steps to calculate Current Unbalance:
1. Determine the current average.
2. Calculate the maximum current deviation from average current.
3. Divide the maximum deviation by the average current and multiply by 100%

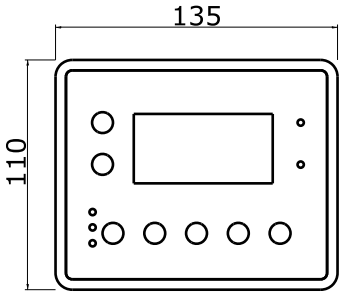
Unbalance=(Maximum deviation from average Current / Average Current)*100

Note: Current Unbalance starts only after at least one phase is loaded to 25% of its capacity.

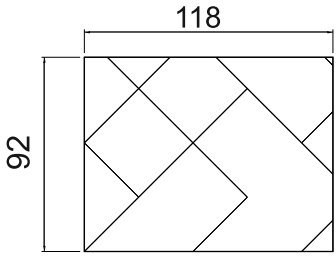
17.0 Technical Specifications:

AC voltage withstand:	450 VAC (Phase to neutral)
Measurement Accuracy	
• Voltages & Current:	1% of Reading
• Power & Energies:	2% of Reading
Surge 1.2/50Usec	2.5KV
Battery Voltage	8-28V DC
Interruption time	0.4 Sec
Environmental	
Ambient Temperature	
• Operation:	-20oC – 70oC
• Storage:	-30oC - 85oC
Vibration	5Hz - 8Hz at +/- 7.5mm
	8Hz – 500Hz 2g
Ip65	From front

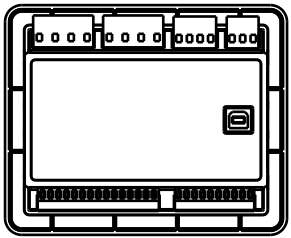
18.0. Dimensions



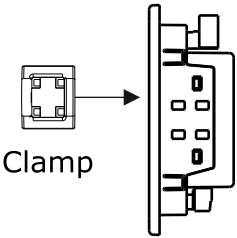
FRONT VIEW



CUT OUT



BACK VIEW



MRM PROCOM® 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
Website : www.mrmprocom.com