



**OPERATING INSTRUCTIONS
DGC-101X**



DGC 101X
Rev: 1.0

INDEX

1.0. Introduction

2.0. Specifications

2.1 Terminal Specifications

2.2 Power Supply Requirements

2.3 Battery Voltage Display

2.4 Inputs

2.4.1 Digital Inputs

2.4.2 Analog Inputs

2.4.2.1 Coolant Temperature and Fuel

2.4.2.2 Pressure Sensor

2.4.3 Charging Alternator Interface

2.5 MPU Input

2.6 Digital Outputs

2.7 Communication Ports

3.0. Salient features, Measurement, Protection & Supervision

3.1 Salient Features

3.2 Measurement

3.3 Protection/Supervision

4.0. Digital Inputs and Outputs

4.1 Digital Outputs

4.2 Digital Inputs

5.0. Analog Sensors in Details

6.0. Records

7.0. Installation

7.1 Terminal Description

7.1.1 DC Supply, Outputs and Inputs

7.1.2 Configurable Digital Inputs

7.1.3 Communications

7.1.4 PC Configuration Interface Connector

8.0. Display/ Front Panel

8.1 Front Facia

8.2 Backlight

9.0. Icons

9.1 Fault Icons

9.2 Warning Icons

9.3 Fault related Warning Icons

9.4 Operation Icons

10.0. Keys and Leds Description

11.0. Lamp Test

12.0. Setting Procedure

12.1 Edit System Para / Edit Eng Para / Edit Prot Para / Edit Ann Para/ Edit RS485 Para

12.2 Reset Service Alarm

12.3 Set Clock

12.4 Set Password

12.5 View Fault History / Event

13.0. In Built Parameter

13.1 System Parameter

13.2 Engine Parameter

13.3 Protection Parameter

13.4 Edit Annunciation Parameter

13.5 Comm. RS485 parameter

14.0 Model selection

15.0 Technical Specifications

16.0. Dimensions

1.0. Introduction

This document details the in-built features, operating procedure requirements of the DGC101X Series modules. This document is subject to changes without prior notice.

DGC101X 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 DGC101X is an engine control / protection unit for engines used for non DG applications. This module has been designed to allow the operator to start and stop the engine manually. The user also has the facility to view the system operating parameters on LCD display.

The DGC101X 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. In critical operation, it is possible to disable or debar tripping of engine via an external digital input.

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

- Icon and Description based LCD display
- 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

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. SPECIFICATIONS

2.1 Terminal Specification

Connection type	Two-part connector. <ul style="list-style-type: none"> • Male part fitted to module • Female part supplied in module packing case - Screw terminal, rising clamp, no internal spring. 	 <p>Example showing cable entry and screw terminals of a 10 way connector.</p>
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2.2 Power 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	35V continuous
Maximum operating current	
<ul style="list-style-type: none"> • Back Light On 	58mA at 12V 60mA at 24V
<ul style="list-style-type: none"> • Back Light Off 	48mA at 12V 52mA at 24V
<ul style="list-style-type: none"> • Digital Inputs Connected 	60mA at 12V 62 mA at 24V
<ul style="list-style-type: none"> • All Sensors Connected 	72mA at 12V 74 mA at 24V
Maximum standby current. LCD Back Light Off	47mA at 24V 51 mA at 12V
Maximum Current when in Sleep Mode	35mA at 12V 32mA at 24V

2.3 Battery Voltage Display

Range	0V-40V DC (note Maximum continuous operating voltage of 35V DC)
Resolution	0.1V
Accuracy	1% of Reading +1Least Count (At 12V 0.2V)

2.4 INPUTS

2.4.1 Digital Inputs

Number	8 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

2.4.2 Analog Input

2.4.2.1 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 \pm 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)

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

Measurement Type	Programmable <ul style="list-style-type: none"> • 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 \pm 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)

2.4.3 Charging Alternator Interface

Excitation	
<ul style="list-style-type: none"> Magnetizing Current 	220mA @12V (Typical) 110mA @24V (Typical)
Measurement	
<ul style="list-style-type: none"> Range 	<ul style="list-style-type: none"> 0-40V
<ul style="list-style-type: none"> Accuracy 	<ul style="list-style-type: none"> 1% of reading
<ul style="list-style-type: none"> Resolution 	<ul style="list-style-type: none"> 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.

2.5 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)

2.6 Digital Out Puts

No of Digital Out Puts	8
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

2.7 Communication Ports

USB	USB 2.0 Running on PC and can be used to: <ul style="list-style-type: none"> Program the Controller Read Instantaneous Parameters Read Fault History & Event Recordings USB Cable Type A to Type B
CAN	<ul style="list-style-type: none"> J1939 Implementation at 250K Non-Isolated Internal Termination of 120 Ω Details on Request
RS485	<ul style="list-style-type: none"> Fully Isolated and Protected against 200V between D+ & D-

	<ul style="list-style-type: none"> ● Isolation voltage 4KV ● Modbus Implemented ● Protocol on Request ● Internal Termination of 120 Ω
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3.0. Salient Features, Measurement, Protection and Supervision

3.1 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. It can measure signal from MPU to calculate RPM.
6. Fuel Solenoid can be configured as Pull to Start or Pull to Stop
7. SMPS Power Supply.
8. Heavily protected and isolated RS485

3.2 Measurement

1. Battery Voltage
2. Charging Alternator Voltage
3. Engine run hour
4. RPM
5. Oil Pressure
6. Water Temperature
7. Oil Temperature
8. Fuel
9. Service due hour

3.3 Protection/Supervision

1. Under/Over RPM
2. RWL
3. LLOP
4. HWT
5. Low Fuel
6. Oil Temperature
7. Charging Alternator/V-Belt
8. Emergency Off
9. Oil Level
10. Fail to Start
11. Fail to Stop
12. Service due hour

4.0. Digital Inputs and Outputs:

4.1 Digital Outputs

No of Digital Out Puts	8
Programmable Output	5 <ul style="list-style-type: none"> • Annunciation 1 • Annunciation 2 • Annunciation 3 • Annunciation 4 • User Contact User Contact could be assigned to any one of these functions <ul style="list-style-type: none"> • None • Unit Healthy • Heater/Choke. • Fuel Pump
Fixed Outputs	<ul style="list-style-type: none"> • Crank • Fuel Solenoid (configurable as pull to start or pull to stop) • Hooter

4.2 Digital Inputs

There are eight 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
Oil Temperature	Oil Temperature switch to shut down the engine on high Oil Temp.
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
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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

5.0. Analog Sensors in Details

Though four sensors one each for Oil Temperature, Water Temperature, Pressure and Fuel are installed but at times systems have typical requirements. DGC101X 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: <ul style="list-style-type: none"> • 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

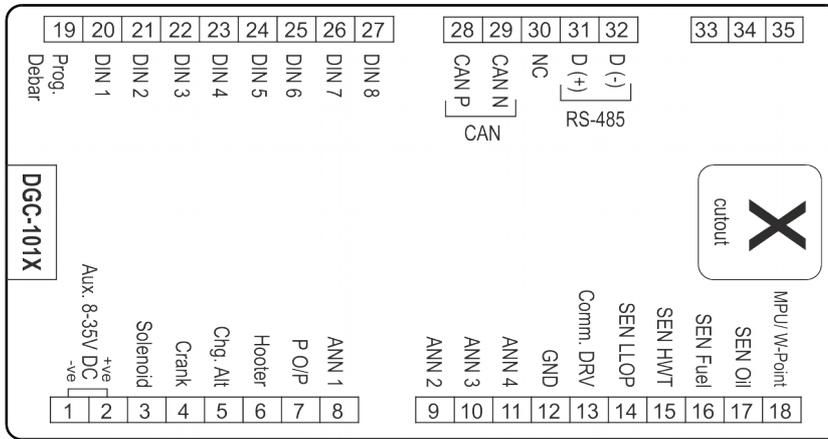
6.0. Records

Fault Records	Last 64 Faults with time stamping. This is a circular buffer with last 64 faults. Newer fault shall replace the oldest fault(64). These can be viewed on the LCD display or downloaded either by USB or RS485. The faults logged are as per the list in 3.3(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(64 th). These can be viewed on the LCD display or downloaded either by USB or RS485. The events are: <ol style="list-style-type: none"> 1. Parameters Modified 2. RTC time changes 3. Password Changed

7.0. Installation

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

7.1 Terminal Description



7.1.1 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	Solenoid	Battery Positive to drive a Relay for Solenoid operation
4	Crank	Battery Positive to drive a Relay for cranking the engine
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 disconnecting the crank as well as detecting V-Belt/Charging Alternator failure.
6	Hooter	Battery Positive to drive a Relay to drive hooter during fault annunciation.
7	Programmable Output	Battery Positive to drive a Relay
8	Annunciation 1	Battery Positive to drive a Relay
9	Annunciation 2	Battery Positive to drive a Relay
10	Annunciation 3	Battery Positive to drive a Relay
11	Annunciation 4	Battery Positive to drive a Relay
12	Ground	Ground pin
13	Comm. Driver	Return feed for sensor. Should be connected to the body where sensor is mounted (Engine Body)

14	SEN LLOP	Connect to Oil pressure sensor
15	SEN HWT	Connect to High Water Temperature sensor
16	SEN Fuel	Connect to Fuel sensor
17	SEN Oil	Connect to Oil Temperature Sensor
18	MPU/W-Point	Input of MPU or W-Point from charging alternator

7.1.2 Configurable Digital Inputs

PIN No	DESCRIPTION	NOTES
19	Prog. Debar	Switch to negative
20	Digital Input 1	Switch to negative
21	Digital Input 2	Switch to negative
22	Digital Input 3	Switch to negative
23	Digital Input 4	Switch to negative
24	Digital Input 5	Switch to negative
25	Digital Input 6	Switch to negative
26	Digital Input 7	Switch to negative
27	Digital Input 8	Switch to negative

7.1.3 Communications

PIN No	DESCRIPTION	NOTES
28	CAN P	For CAN communication
29	CAN N	For CAN communication
30	NC	Not Connected
31	RS-485(D+)	For RS-485 communication
32	RS-485(D-)	For RS-485 communication

7.1.4 PC Configuration Interface Connector

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

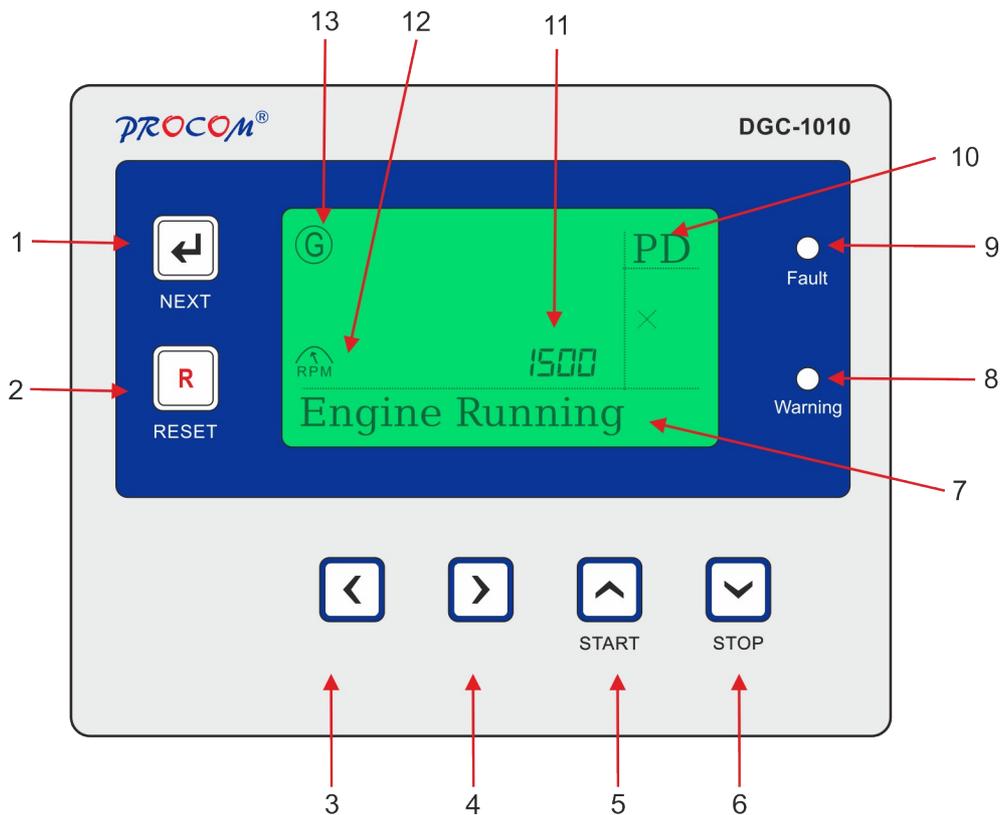
8.0. Display / Front Panel

8.1 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.	Back Key.
4.	Forward Key.
5.	Increment/Start Key.
6.	Decrement/Stop Key.
7.	The area below shall indicate the status of engine. If the engine is running, engine running is displayed.
8.	Warning LED. Warning led will blink in case of warning.
9.	Fault LED. Fault led blinks on a fault that resulted in engine shutdown.
10.	The input is activated on connection of dc negative at terminal no. 19. On activation, DGC 101X disable trip function on all the faults. When PD is enabled, √ symbol shows in the right corner of the display. When PD is disabled, x symbol shows in the right corner of the display.
11	Parameter Window. All measure Parameter shall be displayed here.
12.	Icon of the parameter being displayed here.
13.	This icon indicates that the parameter of engine is displayed on the screen.

8.2 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.

9.0 Icons

9.1 Fault Icons

ICON	DESCRIPTION	
	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 alarm

	OVER RPM	The engine speed has risen above the programmed RPM alarm
	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.
	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.
	OIL TEMP SENSOR OPEN	Oil Temp. sensor has been detected as being open circuit.
	RWL	RWL fault.
	OIL LEVEL	Oil level fault.
	OIL TEMPERATURE	Oil Temperature fault.

9.2 Warning Icons

ICONS	DESCRIPTION	
	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.
	Oil Temperature sensor warning has	
	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.

9.3 Fault Related Warning Icons

	LLOP	LLOP Warning shows in the display when Action LLOP is selected as warning.
	HWT	HWT Warning shows in the display when Action HWT is selected as warning.
	Oil Temperature	Oil Temperature Warning shows in the display when Action Oil Temperature is selected as warning.
	Over RPM	Over RPM Warning shows in the display when Action Over RPM is selected as warning.
	Under RPM	Under RPM Warning shows in the display when Action Under RPM is selected as warning.
	Charging Alternator	Charging Alternator Warning shows in the display when Action Chg Alt is selected as warning.
	DIN(1-8)	All the parameters of digital inputs warning shows in the display when Action Digital input(1-8) is selected as warning except low fuel and emergency.

9.4 Operation Icons

ICON	DESCRIPTION	
	RPM	RPM of Engine.
	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	KW hr 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.

	This icon shows the oil temperature of	
	Fuel Sensor	This icon shows the fuel of generator.
	Charging Alternator Voltage	This icon shows the voltage of alternator.
	RTC	This icon shows the current date and time.

10.0 Keys & LEDs Description

DGC101X has seven Keys provided on its front panel. The table below describes the operation of these.

Keys Symbol	Keys Function	Description
	Next	It is used to scroll forward the parameters being displayed on LCD.
	Increment /Start	It is used to increment the value of the parameters being modified and it is used to issue the crank/ start command to engine. Crank is disabled while in Programming Mode.
	Decrement /Stop	It is used to decrement the value of the parameter being modified program and It is used to issue the stop command to engine. Stop is disabled while in Programming Mode.
	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 first Level of the Programming Mode. Here Edit/View of the Parameters or View history, events and CAN status could be selected.
	Back	Scrolls the parameter back.
	Forward	Scrolls the parameter forward.

LED Annunciations Description: DGC101X has 2 annunciations on its front panel. These announce the faults and warning of the system.

Nomenclature	Symbol	Description
Fault	Fault	This LED blinks in case of a fault
Warning	Warning	This LED blinks in case of a warning

11.0. Lamp Test:

If the DGC101X 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 DGC101X shall start functioning normally.

12.0. Setting Procedure:

DGC101X 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 1 which is set by  and  Key.

12.1 Edit System Para/Edit Eng Para/Edit Prot Para/Edit Ann 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 the any of the above Edit mode.

It will ask for Password if this is the first entry.

Press **Start**  **switch** to set the password which is by default 1.

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 next parameter or  for previous Parameter.

Press  to update the setting or Press  to quit and discard changes made.

```

Edit RS485Para
RST Ser Alarm
Set Clock
Set Password
    
```

12.2 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.

12.3 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.

12.4 Set Password:

Scroll Up and Down to select the Set Password.

Press Next  Key to enter in the Set Password mode.

Follow the instruction on the Screen.

12.5 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  to leave and go back to previous Screen.

DGC 101X keeps a log of last 64 faults/Events with date and time stamp. These records are updated on first in first out basis.

13.0. In built 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.

13.1 System Parameter

Parameter Name on LCD & Icon	Explanation of Parameter	Factory Setting	Setting Range
CAN J1939 	CAN Bus enable/disable. DGC1010 can be used engine with CAN bus or without this bus.	Disabled	Disabled* Enabled
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 Type A M&M MNEPL VE TMTL HUAFANG TATA GC(VDO) GC(MURPHY) 4-20 ma 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.	10	0-999
LLOP		0.0	0.0-10.0

Sensor V1	These table are used when sensor type is selected as user defined.		
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	

<p>Fuel Sensor</p> 	<p>Select the installed sensor for Fuel</p> <p>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</p>	<p>Type A</p>	<p>User Defined Type A Sam-0 Sam-1 Electronics Linear Disabled*</p>
<p>Fuel Sensor R1</p>	<p>R1 to R10 = Resistance Value V1 to V10 = Corresponding fuel level in %.</p> <p>These table are used when sensor type is selected as user defined.</p>	<p>10</p>	<p>0-999</p>
<p>Fuel Sensor V1</p>		<p>0</p>	<p>0-100</p>
<p>Fuel Sensor R2</p>		<p>29</p>	<p>0-999</p>
<p>Fuel Sensor V2</p>		<p>10</p>	<p>0-100</p>
<p>Fuel Sensor R3</p>		<p>48</p>	<p>0-999</p>
<p>Fuel Sensor V3</p>		<p>20</p>	<p>0-100</p>
<p>Fuel Sensor R4</p>		<p>67</p>	<p>0-999</p>
<p>Fuel Sensor V4</p>		<p>30</p>	<p>0-100</p>
<p>Fuel Sensor R5</p>		<p>86</p>	<p>0-999</p>
<p>Fuel Sensor V5</p>		<p>40</p>	<p>0-100</p>
<p>Fuel Sensor R6</p>		<p>105</p>	<p>0-999</p>
<p>Fuel Sensor V6</p>		<p>50</p>	<p>0-100</p>
<p>Fuel Sensor R7</p>		<p>124</p>	<p>0-999</p>

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 Type A M&M MNEPL VE TMTL RANGE 1 TMTL RANGE 2 TMTL WATER HUAFANG TATA GC(VDO) GC(MURPHY) 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
Oil Temperature Sensor	Select the installed sensor for Oil Temperature 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	Type A	User Defined Type A M&M MNEPL VE TMTL RANGE 1 TMTL RANGE 2 TMTL WATER HUAFANG TATA GC(VDO)

	parameter shall not be displayed		GC(MURPHY) Disabled *
User OIL R1	R1 to R10 = Resistance Value V1 to V10 = Corresponding Oil temperature in °C. These table are used when sensor type is selected as user defined.	540	0-9999
User OIL V1		40	0-300
User OIL R2		458	0-9999
User OIL V2		45	0-300
User OIL R3		222	0-9999
User OIL V3		65	0-300
User OIL R4		120	0-9999
User OIL V4		85	0-300
User OIL R5		93	0-9999
User OIL V5		90	0-300
User OIL R6		80	0-9999
User OIL V6		95	0-300
User OIL R7		70	0-9999
User OIL V7		100	0-300
User OIL R8		60	0-9999
User OIL V8		105	0-300
User OIL R9		53	0-9999
User OIL V9		110	0-300

User OIL R10		46	0-9999
User OIL 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
User Contact 	This is a programmable output which can be configured for any one function from the list.	None	None Heater /Choke Fuel Pump Unit Healthy
Digital Input 1 	This can be assigned to any of the function from this list.	LLOP	RWL Oil Level Oil Temp Emergency HWT Fuel LLOP R. Start/Stop R Stop R Start None

<p>Din 1 Polarity</p>  <p>The polarity of digital input can be changed either normally open or normally close.</p>	<p>Normally Open</p>	<p>Normally Close Normally Open</p>	
<p>Digital Input 2</p> 	<p>This can be assigned to any of the function from this list.</p>	<p>Fuel</p>	<p>RWL Oil Level Oil Temp Emergency HWT Fuel LLOP R. Start/Stop R Stop R Start None</p>
<p>Din 2 Polarity</p>  <p>The polarity of digital input can be changed either normally open or normally close.</p>	<p>Normally Open</p>	<p>Normally Close Normally Open</p>	
<p>Digital Input 3</p> 	<p>This can be assigned to any of the function from this list.</p>	<p>HWT</p>	<p>RWL Oil Level Oil Temp Emergency HWT Fuel LLOP R. Start/Stop</p>

			R Stop R Start None
Din 3 Polarity  The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Close Normally Open	
Digital Input 4 	This can be assigned to any of the function from this list.	Oil Temp	RWL Oil Level Oil Temp Emergency HWT Fuel LLOP R. Start/Stop R Stop R Start None
Din 4 Polarity  The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Close Normally Open	
Digital Input 5 	This can be assigned to any of the function from this list.	Oil Level	RWL Oil Level Oil Temp Emergency HWT Fuel LLOP

			R. Start/Stop R Stop R Start None
Din 5  PolarityThe polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Close Normally Open	
Digital Input 6 	This can be assigned to any of the function from this list.	RWL	RWL Oil Level Oil Temp Emergency HWT Fuel LLOP R. Start/Stop R Stop R Start None
Din 6 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Close Normally Open
Digital Input 7 	This can be assigned to any of the function from this list.	None	RWL Oil Level Oil Temp Emergency HWT Fuel LLOP R. Start/Stop R Stop R Start None
Din 7 Polarity	The polarity of digital input can	Normally Open	Normally Close

	be changed either normally open or normally close.		Normally Open
Digital Input 8 	This can be assigned to any of the function from this list.	None	RWL Oil Level Oil Temp Emergency HWT Fuel LLOP R. Start/Stop R Stop R Start None
Din 8 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Close Normally Open
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

13.2 Engine Parameter

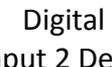
Over RPM 	Max. Permissible Generator RPM, above this the Generator RPM is treated unhealthy & the Generator is stopped on RPM fault.	1950	1000-3999Hz Disabled*
Action Over RPM 	Select the action when Over RPM fault occurs.	Engine Shut Down	Warning Engine Shut Down No Action
Under RPM 	Min. permissible Generator RPM, below this the Generator RPM is treated unhealthy & the Generator is stopped on RPM fault.	1350	Disabled* 301-4000Hz
Action Under RPM 	Select the action when Under RPM fault occurs.	Engine Shut Down	Warning Engine Shut Down No Action
Gen RPM Delay	Duration for which Generator Over /Under RPM condition can be	5	1-100 Sec.

	tolerated before stopping the Generator. This setting is not available if (4)&(5) are disabled.		
RPM Source 	RPM can be selected through MPU or CAN Bus.	MPU	MPU CAN Bus
Pick Up RPM 	This parameter specifies the minimum RPM at which crank shall be terminated.	900	200-3000
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

<p>Choke Pre time</p> 	<p>If the programmable Digital output is programmed for “Heater /Choke”</p> <p>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.</p>	Disabled	Disabled* 1-100 Sec
<p>Choke Post time</p> 	<p>If the programmable Digital output is programmed for “Heater /Choke”.</p> <p>Keep the choke for this time after the engine has started.</p>	Disabled	Disabled* 1-100 Sec
<p>Pump/ Sol Pre Time</p> 	<p>Activate the Pump/Sol Pre Time by this time before cranking when solenoid type is selected as “pull to start”.</p>	2	1-100Sec

13.3 Protection Parameter

<p>Fuel Warn Level</p> 	<p>Monitoring value of fuel level below which fuel level warning is generated.</p>	15	Disabled* 11-80 %
<p>Fuel Warn Delay</p> 	<p>Monitoring time for above.</p>	10	1-100 Sec
<p>Fuel Trip Level</p> 	<p>Monitoring value of fuel level below which fuel level trip is generated.</p>	15	10-80 % Disabled*
<p>Fuel Trip Delay</p> 	<p>Monitoring time for above.</p>	10	1-100 Sec
<p>LLOP Trip Level</p> 	<p>Monitoring value of lube oil pressure below which LLOP trip is generated.</p>	1.0	0.4-8.5 Kg/cm ² Disabled*
<p>LLOP Trip Delay</p> 	<p>Monitoring time for above.</p>	5	1-100 Sec

Action LLOP 	Select the action when LLOP fault occurs.	Engine Shut Down	Warning Engine Shut Down No Action
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
Action HWT 	Select the action when HWT fault occurs.	Engine Shut Down	Warning Engine Shut Down No Action
Oil Temp Trip 	Monitoring value of Oil temperature above which Oil Temperature trip is enabled.	100	40-250 Disabled*
Oil Temp Trip Delay 	Monitoring time for above.	5	1-100 Sec
Action Oil Temp 	Select the action when Oil Temperature fault occurs.	Engine Shut Down	Warning Engine Shut Down No Action
Digital Input 1 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
Action DIN 1 	Select the action when any parameter of digital input 1 is selected.	Engine Shut Down	Warning Engine Shut Down No Action
Digital Input 2 Delay 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
Action DIN 2 	Select the action when	Engine Shut Down	Warning Engine Shut Down No Action

any parameter of digital input 2 is selected.			
<p>Digital Input 3 Delay</p> 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
<p>Action DIN 3</p>  <p>Select the action when any parameter of digital input 3 is selected.</p>	Engine Shut Down	Warning Engine Shut Down No Action	
<p>Digital Input 4 Delay</p> 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
<p>Action DIN 4</p>  <p>Select the action when any parameter of digital input 4 is selected.</p>	Engine Shut Down	Warning Engine Shut Down No Action	
<p>Digital Input 5 Delay</p> 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
<p>Action DIN 5</p>  <p>Select the action when any parameter of digital input 5 is selected.</p>	Engine Shut Down	Warning Engine Shut Down No Action	
Digital	Monitoring time for programmable digital input.	5	1-100 Sec

<p>Input 6 Delay</p> 	Digital inputs are explained above.		
<p>Action DIN 6</p> 	Select the action when any parameter of digital input 6 is selected.	Engine Shut Down	Warning Engine Shut Down No Action
<p>Digital Input 7 Delay</p> 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
<p>Action DIN 7</p>  <p>Select the action when any parameter of digital input 7 is selected.</p>	Engine Shut Down	Warning Engine Shut Down No Action	
<p>Digital Input 8 Delay</p> 	Monitoring time for programmable digital input. Digital inputs are explained above.	5	1-100 Sec
<p>Action DIN 8</p>  <p>Select the action when any parameter of digital input 8 is selected.</p>	Engine Shut Down	Warning Engine Shut Down No Action	
<p>ChgAlt Vol</p> 	The minimum voltage for the charging alternator for a healthy charging alternator/V-Belt.	Disabled	Disabled* 5-30
<p>Chg Alt-V Belt Delay</p> 	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
<p>Action Chg Alt</p>  <p>Select the action when charging</p>	Engine Shut Down	Warning Engine Shut Down No Action	

alternator fault occurs.			
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 Gap Time 	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
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*

13.4 Edit Annunciation Parameter

Ann HWT 	If desired, the HWT fault can be announced at one of the ann. Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann
Ann LLOP 	If desired, the LLOP fault can be announced at one of the ann. Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann
Ann OIL Temp 	If desired, the oil temp fault can be announced at one of the ann. Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann
Ann Fuel Low 	If desired, the low fuel fault can be announced at one of the ann. Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann
Ann RPM 	If desired, the RPM fault can be announced at one of the ann. Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann
Ann RWL 	If desired, the RWL fault can be announced at one of the ann. Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann
Ann Oil Level 	If desired, the oil level fault can be announced at one of the ann. Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann
Ann Unit OK 	If desired, the healthiness of the controller can be announced at one of the annunciation Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4

			No Ann
Ann Eng Running 	If desired, the running of the engine can be announced at one of the annunciation Digital Output.	No Ann	On Ann 1 On Ann 2 On Ann 3 On Ann 4 No Ann

13.5 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

14.0 Model selection:

Model	RS485	CAN BUS
DGC1010	x	x
DGC1011	x	√
DGC1012	√	√
DGC1013	√	x

15.0 Technical Specifications:

Measurement Accuracy

Frequency ± 0.05 Hz

Surge 1.2/50Usec 2.5KV

Battery Voltage 9-35 V DC DC

Interruption time 0.4 Sec

Environmental

Ambient Temperature

- Operation: -20°C – 70°C
- Storage: -30°C - 85°C

Vibration

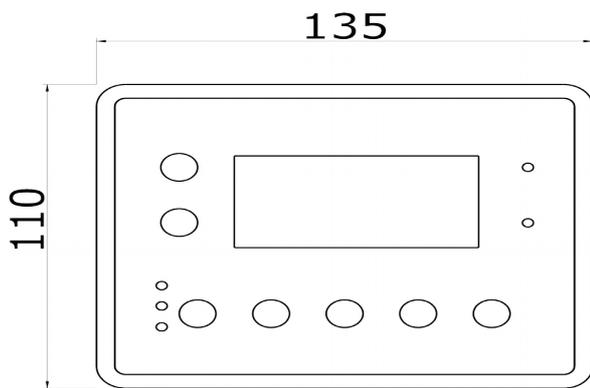
5Hz - 8Hz at +/- 7.5mm

IP65

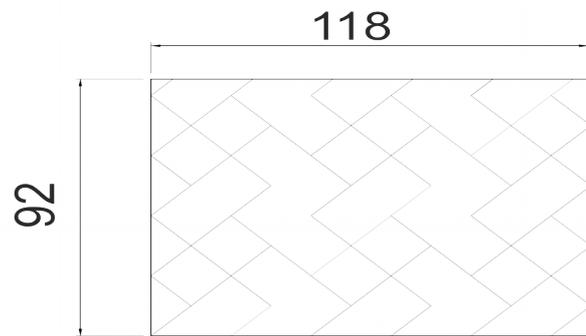
8Hz – 500Hz 2g

From front

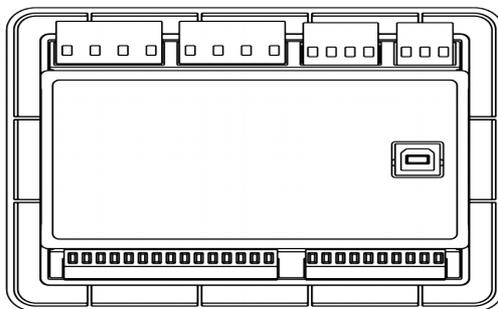
16.0. Dimensions



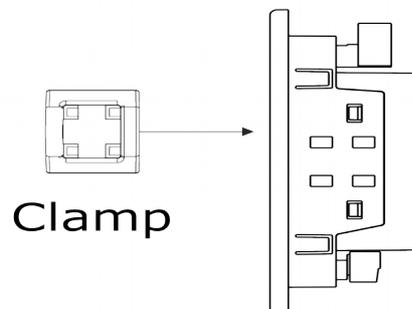
FRONT VIEW



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