

OPERATING INSTRUCTIONS ECON-ABT-REL



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• 1.0 Introduction

ECON is a universal controller for DG Set which can be configured as both automatic or manual controller.

• AMF Controller

- Three Phase Mains Three Phase DG
- Three Phase Mains Single Phase DG
- Single Phase Mains Single Phase DG

• Operating modes of AMF Controller

◦ **Manual Mode**

◦ **Auto Mode**

[This mode can be selected by pulling low the pin 63 (A/M)]

◦ **Test Mode**

This mode can be selected by pressing the mode switch while unit in auto mode (**Note : In 5G Auto or Manual Mode can be toggled by pressing mode switch from the front panel.**)

- Display: 128*64 pixel graphical backlit LCD for ease of readout and symbolic representation.
- Cyclic Timer based Engine Operation. Maximum engine on time as well as rest time are programmable
- Provision to Monitor BTS voltages based Generator start.
- Menu driven MM1 for easy in field configuration without PC or any customized equipment.
- Load Management . Load Dependent start/stop of 2nd DG in case of two DG application.
- Periodic Automatic Start of engine if not used for a predefined time to charge the battery as well as maintenance.
- ECON reminds user for timely service by indicating service due alarm.
- True RMS measurement of all measured parameters with 1% accuracy of measured value.
- Plug in connectors for error free replacement.
- Programmable DG on delay, DG continuous on time, DG Rest Time, warm-up time along with 33 other times.
- Automatic real time based DG Start and Stop(Manual Control Configuration.).
- Dimensions 167 x 129 x 41.8 mm.

• 2.0 Salient Features, Protection and Supervision

• Mains Measurements

- 1 Phase/ 3 Phase Voltage
- 1 Phase/ 3 Phase Current
- Frequency
- PF, KW, KVA, KVAR, KWH, KVAh,
- Run Hour .

• Generator Measurements

- 1 Phase / 3 Phase Voltage
- 1 Phase / 3 Phase Current
- Frequency
- PF, KW, KVA, KVAR, KWH, KVAh .
- Battery Voltage
- Water Temperature
- Oil Pressure
- Fuel Level (Both in percentage and Litre)
- RPM
- Run Hour
- Service Due Hour

• Protection / Supervision Mains

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

• Protection / Supervision DG

- Under/Over Voltage
- Under/Over Speed
- Current Unbalance
- Overload
- RWL
- LLOP
- Charging Alternator/V-belt
- Emergency off
- Service Due
- Fail To Start(only when configured as AMF controllers).
- Fail To Stop(only when configured as AMF controllers)
- Oil Level
- Oil Temp.
- Canopy Temp
- Fire
- HET
- LFL

• Digital Input : 13 digital [5 fixed, 8 programmable]

• Analog Input: Three Analog input (sensor measurement)

• Output: 21 digital

◦ **AMF Operation:** 9 outputs (five fixed and three programmable) and one for charging Alternator

◦ **Annunciation:** 12 Outputs

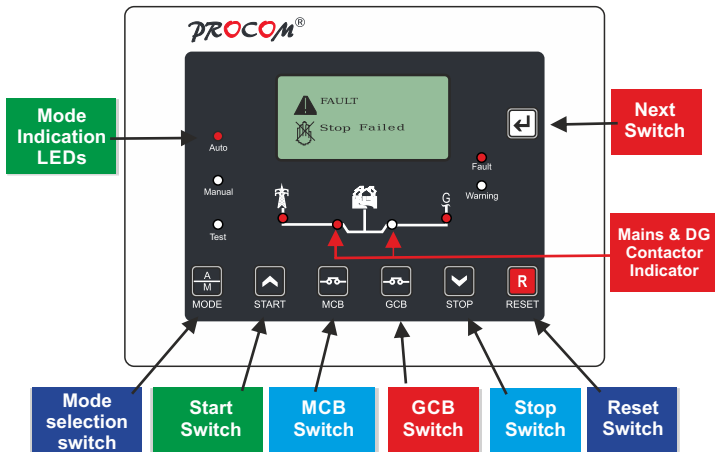
• **Modes:** Configurable Auto, Manual and Test mode of operation.

• **Fault Data Recording:** Last 64 fault with date and time stamping

• **Event Recording:** Last 64 event with date and time stamping

- **Start Stop Recording:** Last 100 records with date and time stamping
- **Password Protection:** Three digit password protection for system settings.
- Real Time Clock (RTC)
- **Communication:** RS232, USB, Fully Isolated RS485
- Provision for switching ON or OFF the measurement for individual sensors.
- Option of warning when open sensor is detected
- Programmable crank cut off method based on either voltage built up, or oil pressure build up & voltage built up









• 3.0 Display / Front Panel



- 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.





• 4.0 Switches Description

ECON has 7 switches provided on its front panel. The table below describes the operation of these.

Switch Symbol	Switch Function	Description
	Next	Normal operation mode: In this mode, it is used to change the parameters being displayed on LCD & used to toggle the auto scroll on and off when pressing this switch for 1-2 sec. Programming Mode: Next key is used to select the next parameter to be programmed.
	Increment /Start	This key has dual function Programming Mode: It is used to increment the value of the parameters under programming. Manual mode: it is used to issue the crank/ start command to DG
	Decrement /Stop	This key has dual function Programming mode: It is used to decrement the value of the parameter under programming. Manual mode: It is used to issue the stop command to DG
	Reset	Reset key resets the Hooter and Fault signals. The first press shall reset the hooter and next shall reset the faults. A long press of 1 Sec shall reset both.
	Programming /History Fault Mode Entry	If both the keys are pressed simultaneously the unit will enter in Programming Mode History Fault/Service Hours
	MCB	In Manual Mode this toggles the mains contactor, On/Off
	GCB	In Manual Mode this toggles the generator contactor, On/Off
	MODE	Toggle between Auto & Manual Mode

- **5.0 LED Annunciations Description:** ECON has nine annunciations on its front panel. These either announce the faults or indicate status of the system.

Nomenclature	Symbol	Description
Auto		Led lights up when ECON is in Auto mode
Manual Mode		Led lights up when ECON is in manual mode

Test Mode		Led lights up when ECON is in Test Mode
Mains Voltage		This symbol lights up continuously if Main is healthy else starts blinking.
MCB		LED turns on in case the mains breaker is switched on or else turned off In manual mode ,this LED is switched on by feedback from mains contact on pin 29
GCB		LED turns on in case the DG breaker is switched on or else turned off In manual mode ,this LED is switched on by feedback from DG contact on pin 28
DG Voltage		This indication glows continuously when the generator is running.
Warning		This LED blinks in case of a warning.
Fault		This LED blinks in case of a fault

• 6.0 Lamp Test:

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

• 7.0 Digital Input:

ECON has 13 digital input as below

• Fixed Inputs

- Emergency
- Remote (DI-9 in 5G)
- DG Contact
- Mains Contact
- A/M (Not use in 5G)

• Programmable 4(DIN 1 - DIN 4) inputs each can be programmed as one of the following inputs.

- RWL Switch
- LLOP Switch
- Fuel Switch
- Oil Temperature Switch
- HET Switch
- Oil Level Switch
- Canopy Temperature Switch
- Mains MCCB
- DG MCCB

• Programmable 4(DIN 5 - DIN 8) inputs each can be programmed as one of the following inputs.

- Canopy door open
- Oil Level
- Ext-2
- Oil Temp.
- Canopy Temp.
- Mains Charger
- V-belt
- Ext-1
- Fire
- Half Fuel Warning
- Mains MCCB
- DG MCCB

8.0 Analog Input: ECON has three Analog input:

- Low Lube Oil Pressure Sensor
- High Water Temperature Sensor
- Low Fuel Level Sensor

9.0 Digital Output: ECON has 21 digital outputs :

• Programmable output

Three digital outputs can independently be configured for the any functions from the list below.

- Unit Healthy
- Fuel Pump
- Pull Solenoid
- Load Warning
- Heater/Choke
- None

• Fixed output: The remaining 6 digital outputs are fixed:

- Charging Alt(Battery Voltage)
- Solenoid
- Mains Contactor
- Crank
- Hooter
- Generator Contactor

• Annunciation Outputs:

◦ 12 contacts can be assigned to announce system status/faults out of 32 possible conditions. Each annunciation can be assigned to one or more contacts. This is described latter in edit annunciation section

• 10.0 Operating Mode: Auto, or Test Mode can be toggled by pressing MODE switch from the front panel.

Do not enter in manual mode while test mode is oprating. Firstly enter in auto mode then manual mode

• 10.1 Auto Mode

ECON monitors the Mains supply, if Mains supply varies beyond set limit of under/over voltage or under/over frequency or voltage unbalance or phase sequence for more than their individual programmed supervision time, ECON releases the MCB contactor (to protect the contactor from failure because of low input voltage) and attempts to starts the generator after the following conditions are meet:

1. If the BTS voltage settings are enabled, the engine shall wait for Unhealthy Condition of BTS-Voltage.

This feature can be disable by pulling down the remote pin (PIN NO-57)

2. If gen start delay is enabled then the unit will wait to expire the gen start delay before switching on the engine

3. In case the mains voltage returns to normal before cranking the engine shall not be cranked.

In case the heater time is set Heater contact along with Fuel Pump contact is switched on else only the Fuel Pump contact is switched on.

After 1 second the ECON gives cranks the engine by activating the inbuilt, potential free, crank contact.

Crank command is withdrawn if the engine start is detected, either by LLOP pressure or by build-up of generator voltage, as per the setting done by the user. Max duration of crank command is user settable.

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

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

While the generator is running ECON monitors it for external fault and internal faults (Measured Values faults: LLOP, HET, Fuel, Over Load, voltage and frequency).

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

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

Cyclic Operation: ECON can be programmed to automatically shut down the engine, for a predefined duration, after a predefined duration of operation, even if the mains is unhealthy. In case the mains continue to be unhealthy this cyclic operation will continue till the mains is restored.

• 10.2 Manual Mode

Engine has to be started manually by manually pressing "Start" switch . The "Start" switch shall not operate if GCB contact is closed, to provide protection to generator. Once the generator is started the load can be switched to generator by feedback from DG contact on pin 28 or to mains by feedback from mains contact on pin 29. At any given time, either of GCB or MCB can be operational. Attempt to switch on GCB while MCB is on will be ignored and vice versa. Both MCB and GCB key have dual function of either switching ON or OFF the respective contactor. A press shall toggle the state. Continuously pressing these keys shall keep toggling the status. To stop the generator, switch off the GCB contactor and press "STOP" switch.

Any attempt to stop the generator, while the GCB contact is engaged, shall be ignored.

• 10.3 Test Mode:

Test mode is a very special mode for testing the panel and the engine. The unit can be put on test mode from the mode switch. In this mode the engine is switched on irrespective of the mains voltage but the load is not transferred to the generator. The load can be manually transferred to either generator or mains if desired. In case of mains failure the load is automatically transferred to Generator.





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

Auto, Manual and Test is Radio buttons and only one can be active at a time.


Do not enter in manual mode while test mode is operating. Firstly enter in auto mode then manual mode

• 11.0 Setting Procedure: How to Enter in Parameter Mode




Press Next & Reset switches simultaneously. The LCD shall display, “**System Parameter**”

To enter System Parameter setting mode, press  **Next Switch**, the LCD shall display, “**Enter Password**” and default password is 123 then press  **Next Switch**. For any change in value, press  **Start switch** and  **Stop switch**. For next parameter, press Next Switch.




To go to next menu press Start Switch the LCD shall display “**Generator Parameter**”

To enter Generator Parameter press  **Next Switch**, the LCD shall display, “**Enter Password**” and default password is 123 then press **Next Switch**. For any change in value, press  **Start switch** and  **Stop switch**. For next parameter, press Next Switch.

To go to next menu press Start Switch the LCD shall display “**AMF Parameter**”

To enter AMF Parameter press,  **Next Switch**, the LCD shall display, “**Enter Password**” and default password is 123 then press **Next Switch**. For any change in value, press  **Start switch** and  **Stop switch**. For next parameter, press Next Switch.

To go to next menu press Start Switch the LCD shall display “**Protection Parameter**”

To enter Protection Parameter press,  **Next Switch**, the LCD shall display, “**Enter Password**” and default password is 123 then press **Next Switch**. For any change in value, press  **Start switch** and  **Stop switch**. For next parameter, press Next Switch.

To go to next menu press Start Switch the LCD shall display “**Comm RS485 Parameter**”

To enter Comm RS-485 Parameter, press **Next Switch**, the LCD shall display, “**Enter Password**” and default password is 123 then press **Next Switch**. For any change in value, press **Start switch** and **Stop switch**. For next parameter, press Next Switch.

To go to next menu press Start Switch the LCD shall display “**BTS Parameter**”

To enter BTS Parameter, press **Next Switch**, the LCD shall display, “**Enter Password**” and default password is 123 then press **Next Switch**. For any change in value, press **Start switch** and **Stop switch**. For next parameter, press Next Switch.

To go to next menu press Start Switch the LCD shall display “**Display History**” To View Display History mode press Next Switch.

To go to next menu press Start Switch the LCD shall display “**Display Event**” To View Display Event mode press Next Switch.

To go to next menu press Start Switch the LCD shall display “**Display Start/Stop**” To View Display Start/Stop mode press Next Switch.

To go to next menu press Start Switch the LCD shall display “**Reset Service Alarm**”

To enter Reset Service Alarm mode press Next Switch. The LCD shall display
“**Press START to Reset**
Press STOP to ESC”

The unit shall ask for confirmation to reset the service hours pressing desired Switch.



To go to next menu press Start Key the LCD shall display “**Adjust Clock**” To enter Adjust Clock setting mode press Next Key. For setting up of the time, press Start switch and Stop switch.








Press Next Key the LCD shall display DD/MM/YYYY. For setting up of the date, press Start switch and Stop switch








- **12.0 Parameter Mode:**








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 cancelled.








• 12.1 System Parameter (# NA - NO Access)






Parameter Name on LCD & Icon	Explanation of Parameter	Factory Setting	Setting Range
# NA Enter Password	Systems setting are password protected. Password is a three digit number	123	0-999
# NA Suppliers	Company logo and default parameter is set as per system suppliers.	TMTL	PROCOM TMTL Greaves Cotton
# NA System Config A/M ϕ	ECON provides complete flexibility in system designing; it is possible to select auto and manual operation for any combination of mains and DG phases.	AMF-M:3P/G:1P	AMF-M:3P/G:1P AMF-M:3P/G:3P AMF-M:1P/G:1P
# NA Solenoid Type 	<p>Pull To Start In this mode fuel solenoid contact changes from Open to Close at the time of cranking and remains close till the genset is running. For stopping the generator this contact opens.</p> <p>Pull To Stop In this mode fuel solenoid contact remains open at the time of cranking and till the genset is running. For stopping the generator this contact closes for a user programmed time.</p>	Pull to Stop	Pull to Stop Pull to Start
LLOP Sensor 	Select the installed sensor for LLOP The installed sensor should be TMTL if system suppliers as TMTL	TMTL	Type A Type B M&M MNEPL VE TMTL HUAFANG TATA GC(VDO) GC(MURPHY) Disabled *

<p># NA Fuel Sensor</p> 	<p>Select the installed sensor for Fuel The installed sensor should be Electronics or Linear if system suppliers as TMTL</p>	<p>Electronics</p>	<p>Type A Sam-0 Sam-1 Electronics Linear 0-5V(0-100%) Disabled*</p>
<p># NA Fuel Tank Capacity</p> 	<p>The capacity of the fuel tank in litres.</p>	<p>250</p>	<p>Disabled 0-999Lt</p>
<p>HET Sensor</p> 	<p>Select the installed sensor for HET The installed sensor should be either TMTL AIR 1C or TMTL AIR 3C or TMTL WATER if system suppliers as TMTL</p>	<p>TMTL RANGE 2</p>	<p>Type A Type B M&M MNEPL VE TMTL RANGE 1 TMTL RANGE 2 TMTL WATER HUAFANG TATA GC(VDO) GC(MURPHY) Disabled *</p>
<p>Sensor Open</p> 	<p>User can select the action to be taken in case of sensor open, it can be configured as a fault, or as warning</p>	<p>Disabled</p>	<p>Disabled * Warning</p>
<p># NA CT Ratio</p> 	<p>Current Transformer ratio</p>	<p>15(10KVA) 20(20KVA)</p>	<p>1-9999</p>
<p># NA Gen. RPM</p> 	<p>Engine RPM Type</p>	<p>1500RPM</p>	<p>1500RPM 3000RPM</p>
<p>Contact ON Pin 32</p> 	<p>These are three programmable output which can be configured for any one function from the list</p>	<p>Heater /Choke</p>	<p>None Unit Healthy Load Warning Fuel Pump Heater /Choke Pull Solenoid</p>







<p>Contact ON Pin 31</p> 	<p>These are three programmable output which can be configured for any one function from the list</p>	<p>None</p>	<p>None Unit Healthy Load Warning Fuel Pump Heater /Choke Pull Solenoid</p>
<p>Contact ON Pin 30</p> 	<p>These are three programmable output which can be configured for any one function from the list</p>	<p>None</p>	<p>None Unit Healthy Load Warning Fuel Pump Heater /Choke Pull Solenoid</p>
<p># NA Over Load KW</p> 	<p>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</p>	<p>9.2(10KVA) 16.1(20KVA)</p>	<p>1-9999</p>
<p># NA Over Current</p> 	<p>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</p>	<p>50.1(10KVA) 88(20KVA)</p>	<p>1-9999</p>
<p># NA Over Load Delay</p> 	<p>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</p>	<p>10 Sec</p>	<p>1-999 Sec</p>
<p>Digital Input 1</p> 	<p>This can be configured for one out the listed below Parameters. RWL Oil Level Oil Temperature Canopy Temperature Mains MCCB DG MCCB</p>	<p>RWL</p>	<p>RWL Oil Level Oil Temperature Canopy Temperature Mains MCCB DG MCCB</p>
<p>Digital Input 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 Open Normally Close</p>










Digital Input 2 	This can be configured for one out the listed below Parameters. LLOP Oil Level Oil Temperature Canopy Temperature Mains MCCB DG MCCB	LLOP	LLOP Oil Level Oil Temp. Canopy Temp. Mains MCCB DG MCCB
Digital Input 2 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
# NA Digital Input 3 	This can be configured for one out the listed below Parameters. Low Fuel Oil Level, Oil Temperature Canopy Temperature Mains MCCB DG MCCB	Low Fuel	Low Fuel Oil Level Oil Temp. Canopy Temp. Mains MCCB DG MCCB
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 	This can be configured for one out the listed below Parameters. HET Oil Level Oil Temperature Canopy Temperature Mains MCCB DG MCCB	HET	HET Oil Level Oil Temp. Canopy Temp. Mains MCCB DG MCCB
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 	This can be configured for one out the listed below Parameters. Canopy door open Oil Level Oil Temperature Canopy Temperature V-belt, Ext-1, Ext-2 Mains Charger Mains MCCB DG MCCB	C Door Open	C door open Oil Level Oil Temp. Canopy Temp. V-belt Ext-1, Ext-2 Mains Charger Mains MCCB DG MCCB




Digital Input 5 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Close	Normally Open Normally Close
# NA Digital Input 6 	This can be configured for one out the listed below Parameters. Fire Oil Level Oil Temperature Canopy Temperature V-belt Ext-1, Ext-2 ,Mains Charger Mains MCCB DG MCCB	Mains Charger	Fire Oil Level Oil Temp. Canopy Temp. V-belt Ext-1, Ext-2 Mains Charger Mains MCCB DG MCCB
Digital Input 6 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
# NA Digital Input 7 	This can be configured for one out the listed below Parameters. Half Fuel Warning Oil Level Oil Temperature Canopy Temperature V-belt Ext-1, Ext-2 , Mains Charger Mains MCCB DG MCCB	Half Fuel Warning	Half Fuel Oil Level Oil Temp. Canopy Temp. V-belt Ext-1, Ext-2 Mains Charger Mains MCCB DG MCCB
Digital Input 7 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
Digital Input 8 	This can be configured for one out the listed below Parameters. Oil Level Oil Temperature Canopy Temperature V-belt, Ext-1, Ext-2 , Mains Charger Mains MCCB DG MCCB	Canopy Temp.	Oil Level Oil Temp. Canopy Temp. V-belt Ext-1, Ext-2 Mains Charger Mains MCCB DG MCCB
Digital Input 8 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close

Digital Input 9 	This can be configured for one out the listed below Parameters. Remote Start Oil Level Oil Temperature Canopy Temperature V-belt, Ext-1, Ext-2 , Mains Charger Mains MCCB DG MCCB	DG MCCB	Remote Start Oil Level Oil Temp. Canopy Temp. V-belt Ext-1, Ext-2 Mains Charger Mains MCCB DG MCCB
Digital Input 9 Polarity 	The polarity of digital input can be changed either normally open or normally close.	Normally Open	Normally Open Normally Close
# NA Fan High Current 	Maximum limit for fan current	1.1(10KVA) 2.5(20KVA)	Disabled. 0-3.5
# NA Fan Low Current 	Minimum limit for fan current. This parameter is disabled if the above parameter is disabled.	0.2	0-3.5
# NA Fan Current Delay 	This is the timer for fan current trip.	5	1-60
# NA Mode Change Hr 	Timing to Change the Mode from Manual to Auto	2 Hr	1-99
# NA Mode Change Warn 	Delay timing of mode change warning	120 Sec	30-600








• **12.2 Generator Parameter**









Generator O/V 	Max. Permissible Generator voltage, above this the Generator voltage is treated unhealthy & the Generator is stopped on voltage fault.	285V	150-300V
# NA Generator U/V 	Min. permissible Generator voltage, below this the Generator voltage is treated unhealthy & the Generator is stopped on voltage fault.	185V	100-200V
Gen Voltage Delay  VOLT	Duration for which generator Over/Under voltage condition can be tolerated before stopping the Generator.	10 Sec	1-300 Sec
Generator O/F 	Max. Permissible Generator frequency, above this the Generator frequency is treated unhealthy & the Generator is stopped on frequency fault.	55Hz	25-70Hz Disable*
# NA Generator U/F 	Min. permissible Generator frequency, below this the Generator frequency is treated unhealthy & the Generator is stopped frequency fault.	45Hz	Disable* 25-70Hz
Gen Freq Delay 	Duration for which Generator Over/Under frequency condition can be tolerated before stopping the Generator. This setting is not available if (4)&(5) are disabled	5 Sec	1-300 Sec.





#NA Current Unbalance IN 	The maximum permissible current unbalance in %. The unbalance starts only after the system is loaded to 25% of its capacity	Disable	5-100% Disable
#NA Current Unbalance Delay 	Duration for which the current unbalance can be tolerated before triggering the fault	10 Sec	1-999Sec
Pickup Voltage 	This parameter specifies the generator voltage at which it is presumed to have started and crank has to be terminated	30V	30-150V
Pickup RPM 	This parameter specifies the generator RPM at which it is presumed to have started and crank has to be terminated	300 RPM	300-1200 RPM
Service Due Hr 	Time, in hours, for next service due warning.	500Hrs	250-999 Hrs
Crank Cut Method 	Auto disconnects the crank command on detection of either voltage buildup/ voltage or oil pressure build up	Volt, freq , LLOP or switch	<ul style="list-style-type: none"> • Volt or freq • Volt, freq, or LLOP switch • Volt, freq, or LLOP sensor • Volt, freq, or LLOP (switch+ sensor)
Pick Up KVA warning KVA 	If the current level crosses this limit the contact is energized after the programmed supervision time	Disable	1-999.9
Reset KVA warning KVA 	If the current level falls below this limit the contact is de-energized after the programmed supervision time.	Disable	1-999.9
KVA Warning Delay KVA 	The supervision time for the above 2 parameters.	Disable	1-999 Sec






Choke Pre time 	Keep the choke for this time before the engine has started.	Disable	Disable* 1-999 Sec
Choke Post time 	Keep the choke for this time after the engine has started.	Disable	Disable* 1-999 Sec
Pump Pre Time 	Activate the Pump by this time before cranking	Disable	1-999 Sec

12.3 AMF Parameter









Mains O/V 	Max. Permissible Mains voltage, above this the Mains voltage is treated unhealthy & Generator is started	280V	250-288V
Mains O/V Return 	Voltage required for resetting the mains over voltage	275 V	250-288V
Mains U/V 	Min. permissible voltage, below this the voltage is treated unhealthy & Generator is started	100 V (10KVA) 145V (20KVA)	99-228V
Mains U/V Return 	Voltage required for resetting the mains Under voltage	125 V (10KVA) 165V (20KVA)	99-228V
Mains Voltage Delay  VOLT	Duration for which Mains Over/Under voltage condition can be tolerated before starting the Generator.	5	1-100 Sec
Mains O/F 	Max. Permissible Mains frequency, above this frequency the Mains is treated unhealthy & Generator is started.	55Hz	51-60Hz Disable*
Mains U/F 	Min. permissible Mains frequency, below this frequency the Mains is treated unhealthy & Generator is started.	45Hz	Disable* 40-60Hz

Mains Freq Delay Hz^{\ominus} 	Duration for which Mains Over/Under frequency condition can be tolerated before starting the Generator.	5 Sec	5-300 Sec.
Voltage Unbalance 	Max. allowed voltage unbalance in volt	Disable	10-100 Volt Disable*
Voltage Unbalance Time 	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.	Disable	Disable 1-999 Sec
Mains Restoration Time 	The time for which Mains should be continuously healthy before stopping the Generator and load transferred to Mains.	90 Sec	10-600 Sec
Warm Up Time 	The load is transferred to generator after expiry of this time	10 Sec	0-300 Sec
# NA Gen Start Delay 	The starting of generator is delayed by this time after the mains unhealthy timers have expired and the mains contact has been released. This is required in certain applications where immediate generator starting is not required but the mains contactors are to be protected. This timer is automatically reset, if during this duration the mains become healthy for "Mains Restoration Delay"	Disable	Disable* 0-999 Mins
Gen. On Time 	Max. duration for which the generator is allowed to work continuously	270	Disable* 1-999 Mins










<p>Gen Rest Time</p> 	<p>If the generator has run continuously as per above parameter, the generator is given rest irrespective of the mains condition. In case of mains unhealthy during this time the mains contact is deactivated but the generator is not started.</p> <p>This is unavailable if above is Disabled This timer is automatically reset, if during this duration the mains become healthy for "Mains Restoration Delay"</p>	10	1-10 mins
<p>Mains Over Load</p> 	<p>ECON can protect contactors from mains over load. If this setting is enabled than the mains contactor shall drop after the mains current crosses the set limit for a programmed duration</p>	Disable	Disable* 1-999.9Amps
<p>Mains O/L Delay</p> 	<p>The monitoring duration for the above parameter before the fault is triggered.</p>	5 Sec	1-999 Sec
<p>Contactor Protection</p> 	<p>In case of the unit placed under manual mode of tripped due to a fault condition and the mains voltage falls below the safe limit of the contactor, the contactor burns after chattering. This can be avoided by enabling this protection. If enabled the mains contactor shall drop if the mains voltage becomes unhealthy and the contactor will again engage after the mains voltage turns healthy</p>	Enabled	Disable / Enable

<p>Mains Fail</p> 	<p>Some application require the generator to start on failure of one or more phases Other wants all the 3 phases to become unhealthy before starting the generator ECON can handle both situations</p>	<p>R Phase Fail</p>	<p>R Phase Fail</p>
<p>GCB to MCB Delay</p> 	<p>User programmable delay when the load is transferred from Generator to Mains.</p>	<p>5 Sec</p>	<p>1-99 Sec</p>
<p>Recoil Time</p> 	<p>The time for which generator is allowed to run on no load before switching off</p>	<p>60 Sec</p>	<p>1-99Sec</p>
<p>Service Delay hour</p> 	<p>In AMF mode,if this parameter is enabled, the engine will automatically start after this periodic time lapse from the last start. This is meant for periodic function</p>	<p>Disabled</p>	<p>2-999 Hrs</p>
<p>Service Run min.</p> 	<p>The genset will work for this duration in service run mode. It will stop automatically after expiry of this time. During this time if the mains become unhealthy the generator contactor shall be engaged and the engine shall be stopped after the mains is healthy</p>	<p>1</p>	<p>1-999 Min Disabled</p>





• 12.4 Protection Parameter

<p># NA Fuel Warn Level</p> 	<p>Monitoring value of fuel level below which fuel level warning is generated.</p>	<p>50 %</p>	<p>Disable* 10-80 %</p>
<p># NA Fuel Warn Delay</p> 	<p>Monitoring time of fuel level after which fuel level warning is generated.</p>	<p>10 Sec</p>	<p>1-99Sec</p>
<p># NA Fuel Trip Level</p> 	<p>Monitoring value of fuel level below which fuel level trip is generated.</p>	<p>15 %</p>	<p>10-80 %</p>
<p># NA Fuel Trip Delay</p> 	<p>Monitoring time of fuel level after which fuel level trip is generated.</p>	<p>10 Sec</p>	<p>1-99 Sec</p>
<p>LLOP Trip Level</p> 	<p>Monitoring value of lube oil pressure below which LLOP trip is generated.</p>	<p>0.7 Kg/cm²</p>	<p>0.3-8.5 Kg/cm²</p>
<p>LLOP Trip Delay</p> 	<p>Monitoring time of lube oil pressure after which LLOP trip is generated.</p>	<p>10 Sec</p>	<p>1-49 Sec</p>
<p>HET Trip Level</p> 	<p>Monitoring value of water temperature above which HET trip is generated.</p>	<p>Disable*</p>	<p>40-250 Disabled*</p>
<p>HET Trip Delay</p> 	<p>Monitoring time of water temperature after which HET trip is generated.</p>	<p>5 Sec</p>	<p>10-60 Sec</p>



Digital Input 1 Delay 	Delay for programmable digital input. Digital input are explained above.	10 sec	1-99 Sec
Digital Input 2 Delay 	Delay for programmable digital input. Digital input are explained above.	10 sec	1-99 Sec
# NA Digital Input 3 Delay 	Delay for programmable digital input. Digital input are explained above.	10 sec	1-99 Sec
Digital Input 4 Delay 	Delay for programmable digital input. Digital input are explained above.	10 sec	1-99 Sec
Digital Input 5 Delay 	Delay for programmable digital input. Digital input are explained above.	10 sec	1-999 Sec
# NA Digital Input 6 Delay 	Delay for programmable digital input. Digital input are explained above.	180 sec	1-299 Sec
# NA Digital Input 7 Delay # 	Delay for programmable digital input. Digital input are explained above.	10 sec	1-99 Sec
Digital Input 8 Delay 	Delay for programmable digital input. Digital input are explained above.	10 sec	1-99 Sec

<p>Chg Alt-V Belt Delay</p> 	<p>Duration for which the V-Belt signal should be continuously deactive to be recognized as a fault and action initiated. This fault is only enabled while the generator is running.</p>	180	Disable* 1-299 Sec
<p>Hooter ON Time</p> 	<p>Duration for which the hooter shall be ON, if not externally reset, while announcing a fault.</p>	30Sec	1-299 Sec
<p>Crank ON Time</p> 	<p>Maximum crank time</p>	2.0 Sec	0.5-5.0 Sec
<p>Crank Gap Time</p> 	<p>The delay between two successive cranks</p>	10 Sec	1-150 Sec
<p>Crank Attempts</p> 	<p>The maximum number of cranks that shall be issued to start the Engine</p>	3	3-5
<p>Solenoid ON time</p> 	<p>The time for which stop solenoid will be kept active while stopping the engine</p>	35 Sec	1-99Sec
<p>Disp Auto Scroll</p> 	<p>Setting ON will enable Auto Scroll of display. OFF: No scroll and next parameter can be viewed by pressing next switch</p>	ON	ON/OFF
<p>Battery UV Warning</p> 	<p>Min. permissible battery voltage, below this the voltage is treated unhealthy & warning is generated.</p>	10 V	Disabled* 8-12V
<p>Battery OV Warning</p> 	<p>Max. permissible battery voltage, above this the voltage is treated unhealthy & warning is generated.</p>	14.5 V	12.0-30.0 V Disabled*
<p>Remote On</p>	<p>BTS voltage feature can be disable by enabled the remote on</p>	Disable	Disable Enable

• **12.5 Comm RS485 Parameter**

 Device Id	Modbus device ID	26	1-247
 Baud Rate	RS 485 Communication Baudrate	19200	1200 2400 4800 9600 19200
 Parity	RS 485 Communication Parity Bits	None	Even Odd None
 Stop Bit	RS 485 Communication Stop Bits	1	1 2










• **12.6 BTS Parameter**









 BTS1 Under Voltage	BTS 1 Voltage (if enabled) will delay the start of engine till BTS2 (if enabled) are healthy	48.0V	40.0-55.0 V Disabled*
 BTS Volt Delay	The monitoring time for BTS 1 and or BTS2 voltage before its declared unhealthy.	20 secs	1-99 secs









* All Digital Output are Normally Open.







• Crank Cut Off Frequency 22H₂ or 660RPM.

• 12.7 Edit Annunciation

# NA Ann. Mains OK 	Selected contact is activated if Mains Supply healthy.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Mains NOK 	Selected contact is activated if Mains Supply unhealthy.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Generator On 	Selected contact is activated if Generator is on.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Generator Off 	Selected contact is activated if Generator is off.	Disabled	Disabled Contact on pin 1-12
# NA. Ann. Fuel Trip 	Selected contact is activated if fuel fault registered	Disabled	Disabled Contact on pin 1-12
# NA Ann. LLOP Trip 	Selected contact is activated if LLOP fault registered	Contact on pin 1	Disabled Contact on pin 1-12
# NA Ann. HET Trip 	Selected contact is activated if HET fault registered.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Generator Voltage 	Selected contact is activated if Generator voltage is healthy.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Emergency 	Selected contact is activated if emergency fault is registered.	Disabled	Disabled Contact on pin 1-12

# NA Ann. Generator Overload 	Selected contact is activated if generator is overloaded.	Contact on pin 3	Disabled Contact on pin 1-12
# NA Ann. Generator Frequency 	Selected contact is activated if generator over frequency/under frequency fault registered	Contact on pin 5	Disabled Contact on pin 1-12
# NA Ann. RWL Fault 	Selected contact is activated if RWL fault registered.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Charging alternator/V-belt 	Selected contact is activated if Charging alternator/V-belt fault registered.	Contact on pin 6	Disabled Contact on pin 1-12
# NA Ann. Fail to Start 	Selected contact is activated if Fail to Start fault registered.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Fail to stop 	Selected contact is activated if Fail to stop fault registered.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Current Unbalance 	Selected contact is activated if Current Unbalance fault registered.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Fuel Open 	Selected contact is activated if fuel sensor is open.	Disabled	Disabled Contact on pin 1-12

# NA Ann. LLOP Open 	Selected contact is activated if LLOP sensor is open.	Disabled	Disabled Contact on pin 1-12
# NA Ann. HET Open 	Selected contact is activated if HET sensor is open.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Canopy Temperature 	Selected contact is activated if Canopy Temperature is high.	Contact on pin 7	Disabled Contact on pin 1-1
# NA Ann. Fire 	Selected contact is activated if fire fault registered.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Oil Temperature 	Selected contact is activated if Oil Temperature is high	Disabled	Disabled Contact on pin 1-12
# NA Ann. Oil level 	Selected contact is activated if Oil level is low.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Mains Overload 	Selected contact is activated if mains is overloaded	Disabled	Disabled Contact on pin 1-12
# NA Ann. Service Due 	Selected contact is activated if Service is due.	Disabled	Disabled Contact on pin 1-12

# NA Ann. Battery Voltage NOK 	Selected contact is activated if battery voltage is unhealthy	Disabled	Disabled Contact on pin 1-12
# NA Ann. BTS1 NOK 	Selected contact is activated if BTS1 voltage is unhealthy.	Disabled	Disabled Contact on pin 1-12
# NA Ann. BTS2 NOK 	Selected contact is activated if BTS2 voltage is unhealthy.	Disabled	Disabled Contact on pin 1-12
# NA Ann. Any Fault 	Selected contact is activated if generator stopped on any fault	Contact on pin 4	Disabled Contact on pin 1-12
# NA Ann. Half Fuel Warning 	Selected contact is activated if low fuel warning is generated	Disabled	Disabled Contact on pin 1-12
# NA Ann. C Door Open 	Selected contact is activated if Canopy Door is opened	Contact on pin 8	Disabled Contact on pin 1-12
# NA Ann. DG Not In ManualL	Selected contact is activated if DG is not in manual mode	Contact on pin 9	Disabled Contact on pin 1-12
# NA Ann. Unit Ok	Selected contact is activated if Unit is Healthy	Contact on pin 10	Disabled Contact on pin 1-12

• 12.8 Reset Service Alarm

	Press START to Reset Press STOP to esc		
--	---	--	--

• 12.9 Adjust Clock

	RTC Time and Date can be easily entered by pressing the increment & decrement switch	00.00	00.00 DD/MM/YYYY
--	--	-------	---------------------

These parameter can't be change thought front keypad & all can be modified by pc.

• 13.0 Load Management

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

- **14.0 Event Recording:**

ECON keeps a log of last 64 events. Setting change and warning are considered as event. Events are stamped along with date and time

- **15.0 Faults**

ECON keeps a log of last 64 Faults. These Faults are stamped along with date and time **There are two categories of faults**

- Internal Faults
- External faults

- **15.1 Internal Faults**

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

- Generator Fails to Start.
- Generator Under Speed.
- Generator Fails to Stop.
- Generator Voltage Unhealthy
- Generator over Speed.
- Over Load

- **15.2 External Faults**

Those faults which cannot be sensed by the unit itself (these faults are not reflected by the generator voltage) and are to be provided externally. They are:

- LLOP
- RWL
- Emergency
- Canopy Temp.
- HET
- Fuel
- V-Belt
- Fire
- Oil Level
- Oil Temp.

- **15.3 Fault Reset**

Internal Faults & LLOP fault:

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

External Fault except LLOP & V-Belt faults:

These faults cannot be reset till the engine is running and/or fault conditions persist. Once the faults are rectified, the fault can be reset by pressing Reset switch (R). In case the engine fails to stop "STOP KEY" can be pressed for manual attempt to stop engine

- **16.0 Remote Upgradation**

This feature allows higher version firmware to be uploaded through RS-485 to allow remote firmware upgradation.

Note : Contact PROCOM for more information.

- **17.0 Communication**

- Rs232
- USB
- Modbus on Isolated Rs485

Mod-Bus communication Guide.

- Protocol : MODBUS RTU (Rs485)
- Data bits : 8
- Baud rate : Default : 19200 (Setting: 1200/2400/4800/9600/19200)
- Parity : Default : None (Setting: Even/Odd/None)
- Device ID : Default : 26 (Setting: 1-247)
- Stop bit : Default : 1 (Setting: 1 or 2)
- Function Code : 04H (Read)
- Data type : 16 Bit Integer

Testing process:

This control make by Modbus protocols which is tested by Modbus Test View Software (which is free availableonline).

Starting add - 16385 (0x4001 Hex) and no of register/Length – 36 (0x24 Hex)

Mod-Bus Address Table:

Parameter Name	Type	Value	Note	Address (Hex)
Device ID		0x1A		
Function Code		0x04		
No of reg		0x46		
Digital Alarm 1	Int 2 Byte	02 00		0x4001
Digital Alarm 2	Int 2 Byte	00 04		0x4002
Solid State O/P	Int 2 Byte	00 00		0x4003
Mains Phase 1 Volt	Int 2 Byte	00 00		0x4004
Mains Phase 2 Volt	Int 2 Byte	00 00		0x4005
Mains Phase 3 Volt	Int 2 Byte	00 00		0x4006
DG Phase 1 Volt	Int 2 Byte	00 00		0x4007
DG Phase 2 Volt	Int 2 Byte	00 00		0x4008
DG Phase 3 Volt	Int 2 Byte	00 00		0x4009
Load Current Phase 1	Int 2 Byte	00 00		0x400A
Load Current Phase 2	Int 2 Byte	00 00		0x400B
Load Current Phase 3	Int 2 Byte	00 00		0x400C
Mains KWH (long)	Int 2 Byte	00 B0	bit0 to bit15	0x400D
	Int 2 Byte	00 00	bit16 to bit31	0x400E
DG KWH (long)	Int 2 Byte	00 88	bit0 to bit15	0x400F
	Int 2 Byte	00 00	bit16 to bit31	0x4010


DG Run Hour	Int 2 Byte	00 05	Hour	0x4011
	Int 2 Byte	00 00	bit(0:7)Min, bit(8:15) Sec.	0x4012
Mains Run Hour	Int 2 Byte	00 06	Hour	0x4013
	Int 2 Byte	00 38	bit(0:7)Min, bit(8:15) Sec.	0x4014
DG Battery Voltage	Int 2 Byte	00 8A	Value x10	0x4015
BTS Battery Voltage	Int 2 Byte	00 00	Value x10	0x4016
Fuel in Liter	Int 2 Byte	00 FA		0x4017
Mains KW R	Int 2 Byte	00 00	Value x10	0x4018
Mains KW Y	Int 2 Byte	00 00	Value x10	0x4019
Mains KW B	Int 2 Byte	00 00	Value x10	0x401A
DG KW R	Int 2 Byte	00 00	Value x10	0x401B
DG KW Y	Int 2 Byte	00 00	Value x10	0x401C
DG KW B	Int 2 Byte	00 00	Value x10	0x401D
BTS Run Hour	Int 2 Byte	00 00	Hour	0x401E
	Int 2 Byte	00 01	bit(0:7)Min, bit(8:15) Sec.	0x401F
DG Tamper Run Hour	Int 2 Byte	00 01	Hour	0x4020
	Int 2 Byte	00 03	bit(0:7)Min, bit(8:15) Sec.	0x4021
DG KWH (long)	Int 2 Byte	00 1A	Hour	0x4022
	Int 2 Byte	00 00	bit(0:7)Min, bit(8:15) Sec.	0x4023
MCCB STATUS	Int 2 Byte		bit0-mains mccb status, bit1- DG mccb status (0 for off,1 for ON)	0x4024
CRC		28 9D		

Alarm and Solid State O/P Bit-wise details:

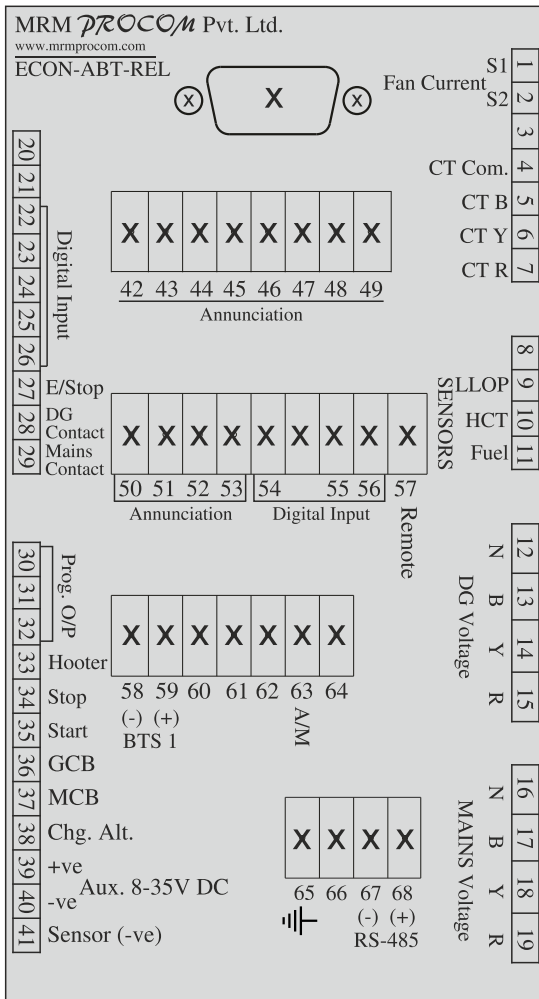
	Digital Alarm 1	Digital Alarm 2	Solid State O/P
Bit0	Door Open	Mains Cont. In	Output8
Bit1	Smoke Fire	Overload	Output7
Bit2	LLOP	Mains Fail	Output6
Bit3	HCT	NA	Output5
Bit4	DG Contactor On	DG Fail To Start	Output4
Bit5	V-belt Fail	NA	Output3
Bit6	Half Fuel	Over Speed	Output2
Bit7	Low Fuel	Under Speed	Output1
Bit8	Emergency	DG On	NA
Bit9	Auto/Manual Mode	NA	NA
Bit10	NA	Remote Start	DG Contactor Relay
Bit11	Ext1	Canopy THigh	Mains Contactor Relay
Bit12	Ext2	Alternator Fault	RESERVE
Bit13	Low Water Level	RESERVE	RESERVE
Bit14	NA	Mains Charger Fail	RESERVE
Bit15	NA	RESERVE	RESERVE

• 18.0 Terminal Numbers

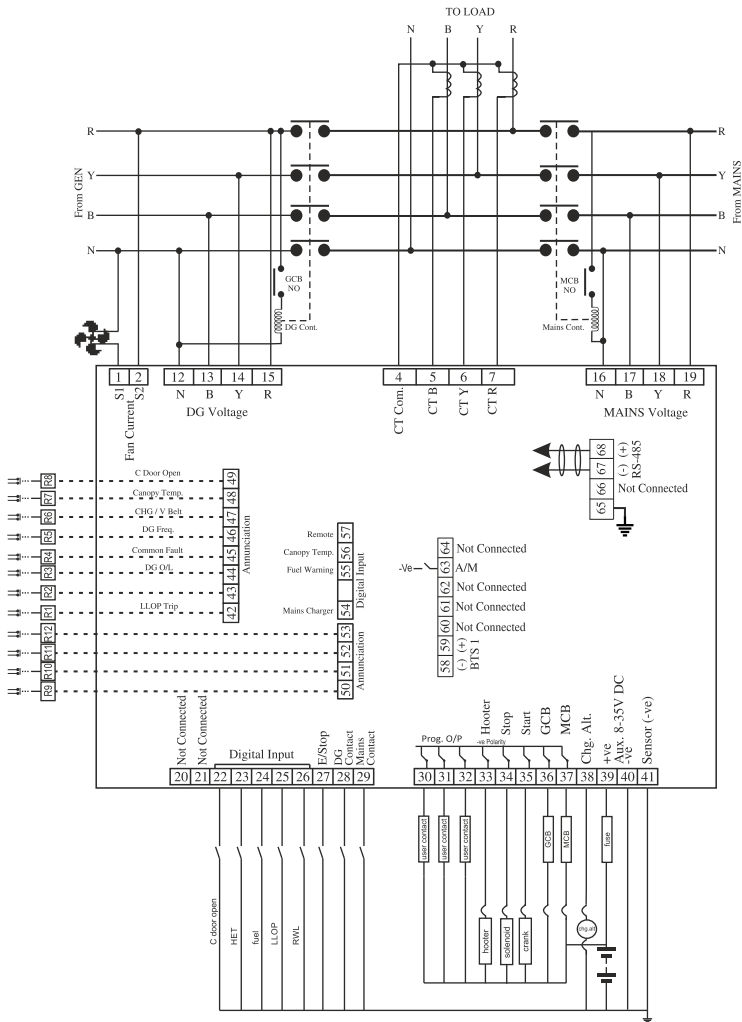
Terminal No.	Description
1	Fan Current S1
2	Fan Current S2
3	Blank
4	CT Common
5	CT B
6	CT Y
7	CT R
8	Blank
9	Sensor LLOP
10	Sensor HET
11	Sensor Fuel
12	V-DG-N
13	V-DG-B
14	V-DG-Y
15	V-DG-R
16	V-Mains-N
17	V-Mains-B
18	V-Mains-Y
19	V-Mains-R
20	Blank
21	Blank
22	D Input 5
23	D Input 4
24	D Input 3
25	D Input 2
26	D Input 1
27	Emergency
28	DG Contactor
29	Mains Contactor
30	Programmable Output 3
31	Programmable Output 2
32	Programmable Output 1
33	Hooter

34	Solenoid
35	Crank
36	GCB
37	MCB
38	Chg. Alt. Contact
39	Battery(+ve)(8-35 V DC)
40	Battery(-ve)
41	Sensor(-ve)
42	Annunciation 1
43	Annunciation 2
44	Annunciation 3
45	Annunciation 4
46	Annunciation 5
47	Annunciation 6
48	Annunciation 7
49	Annunciation 8
50	Annunciation 9
51	Annunciation 10
52	Annunciation 11
53	Annunciation 12
54	D Input 6
55	D Input 7
56	D Input 8
57	Remote
58	BTS 1(-)
59	BTS 1(+)
60	Blank
61	Blank
62	Blank
63	A / M, or Digital Input 9
64	Blank
65	
66	Blank
67	D(-):RS485
68	D(+): RS485

Connect the wires as per the labelling done in back sticker:



Typical Wiring Diagram



• 19.0 Technical Specifications

Reverse Voltage Protection Load Dump protection

AC Voltage

Measurement 300 VAC (Phase to Neutral)

Continuously 350 VAC (Phase to Neutral)

Swell For 200msec 600 VAC (Phase to Neutral)

Measurement Accuracy

Voltages & Current 1% of Reading

Power & Energies 2% of Reading

Battery Voltage 9-35 V DC

DC Interruption time 0.4 Sec

RS-485

Surge Protection 9KV

ESD Protection 30KV

Input voltage tolerance on D+ & D- 70V

Isolation b/w RS 485 ground & battery ground

Continuously 3750V

Transient 20KV/usec

Surge IEC-61000 4-5

9KV RS-485 D+ & D-

9KV RS-485 D+ & GND

9KV BTS Terminal

9KV Input Voltage & Neutral

Cold Test(operational) IEC 60068-2-1

Temp. $-20^{\circ}\text{C} \pm 3^{\circ}\text{C}$, Duration 2hrs

Cold Test(storage) IEC 60068-2-1

Temp. $-30^{\circ}\text{C} \pm 3^{\circ}\text{C}$, Duration 16hrs

Dry Heat Test IEC 60068-2-2

Temp. $70^{\circ}\text{C} \pm 3^{\circ}\text{C}$, Duration 16hrs

DUT Condition : ON

Damp heat cycle Test IEC 60068-2-30

Temp. $55^{\circ}\text{C} \pm 2^{\circ}\text{C}$, Duration 48hrs

RH = $95\% \pm 3\%$

Damp heat Static Test IEC 60068-2-78

Temp. $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$, Duration 48hrs

RH = $93\% \pm 3\%$

Vibration Test IEC 60068-2-6

5Hz to 8Hz at $\pm 7.5\text{mm}$

8Hz to 500Hz at 2 g

10 sweeps in each axis: x, y, z

Shock Test IEC 60068-2-27

Plus shape : half sine pulse

Peak acceleration : 5gn

Duration of pulses : 11ms

No. of shocks : 3 each direction

IP 65 IEC 60529:2001

IP 6X

Dust Protection, Duration 8hrs
Extraction rate 40 to 60 vol. per Hr.
Talcum powder 2kg/ cubic Mtr.
Sieve size : 75um (wire dia 50 um)
Water splashed test using :- nozzle
will ID: 6.3mm. Water delivery rate :
12.lt/min \pm 5% distance from
enclosure: 2.5 to 3 meter duration 1
minute/m² (minimum 3 minute)

IP X5

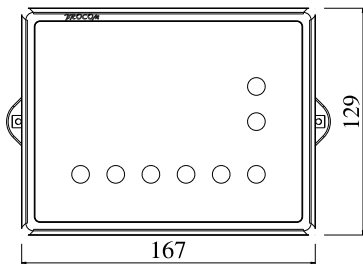
Cut out Dimensions
Depth
Digital Input Level

155mm X 117mm
41.8 mm
Battery Voltage (Negative)

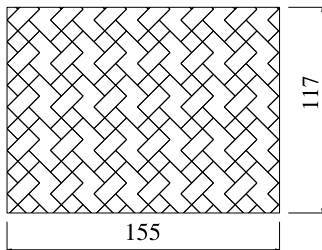
• **20.0 Model Selection**

No.	Model	Remote Upgradation
1	ECON-ABT-REL	<input type="checkbox"/>
2	ECON-ABT-REL-R	<input checked="" type="checkbox"/>

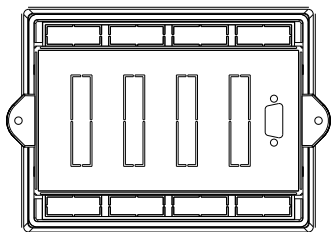
• 21.0 Dimensions



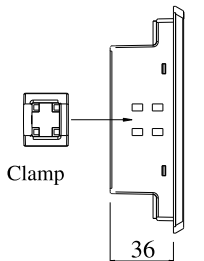
Front View



Cut Out



Rear View



Side View