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USER MANUAL

TURBOMAX
Australian Energy Research Laboratories, Pty.Ltd
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TURBOMAX MAXIMIZER
WALLMOUNT

Installation and Operation User Manual



Model

TMHV

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Important Safety Information

This Installation Manual contains important safety information and Installation instructions for the AERL TURBOMAX MAXIMIZER Wall Mount.

The following symbols are used throughout this user manual to indicate ideal Installation methods, potential dangerous conditions and important operational information.



Important
Indicates information that must be followed to ensure proper operation of the TURBOMAX unit



Caution
Indicates a critical procedure for the safe Installation of the TURBOMAX unit. Use extreme caution when performing this task.



Information
Indicates general points of interest that are relevant and informative in nature to the topic at hand.



Note
Indicates guidance for specific points within the manual that the user can find helpful and informative.

About this Manual



Important

- **This User Manual provides detailed installation and usage instructions for the TURBOMAX unit. It is recommended that all of the Instructions and Cautions in this User Manual be read before beginning installation.**
- **Only qualified electricians and technicians should install the TURBOMAX System. This manual is intended for all Installation technicians and the system owner.**
- **Do not disassemble or attempt to repair the TURBOMAX unit unless you are a qualified technician and have authority in writing from AERL to do so.**
- **AERL will not be held responsible in any way for the mishandling of this product or for installation of the product in a manner that does not follow the instructions in this manual.**

1 PRODUCT WARRANTY

1. AERL warrants that the Product will be free from manufacturing defects for a period of 24 months from the date of dispatch of the products by AERL to the customer.
2. The Products technical specifications are contained within the Product Datasheet. The Product will conform to the technical specifications contained in the Product Datasheet at the time of dispatch of the Products to the Customer. If the technical specifications as contained in the Product Datasheet are not met, AERL will repair, replace the Product, or refund the amount paid by the Customer in relation to the Product at the Customers option. AERL is under no obligation to provide assistance or advice to the Customer in relation to the technical specifications.
3. The Products must be installed in strict accordance with the Installation Recommendations listed in this Manual.
4. In no event will AERL be liable for:

a) any loss or damage which the Customer suffers arising from, or caused or contributed to by, the Customer's negligence or the negligence of the Customer's agents or servants; and

b) special, indirect or consequential loss or damage as a result of a breach by the Customer of these Standard Terms including, without limitation, loss of profits or revenue, personal injury, death, property damage and the costs of any substitute Products which the Customer obtains.

5. The Product is not covered for damage occurring due to water, including but not limited to condensation, moisture damage and other forms of precipitation.
6. The Product is not covered for damage occurring due to the Product being incorrectly installed or installed in a manner not in accordance with the Installation Recommendations listed in the Product Manual.
7. The Product is not covered for damage occurring due to failure on the part of the customer to operate the product in accordance with the technical specifications as listed in the Product Datasheet.
8. The Product is not covered for damage occurring due to lightning.
9. The Product is not covered for situations where it is used in a manner not specifically outlined in the Product Manual.
10. If any provision in this document is invalid or unenforceable this document will remain otherwise in full force apart from such provision, which will be deemed deleted

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b) Assumes no responsibility or liability for loss or damage whether direct, indirect, consequential or incidental, which might arise out of use of such information. The use of any such information will be entirely at the user's risk.
c) Reserves the right to change any AERL product, product specifications and data without notice to improve reliability, function or design or otherwise.

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1.1 PRODUCT SPECIFICATIONS

CHARACTERISTIC	TURBOMAX
Nominal Battery Voltage - Selectable	48 to 132V
Maximum Output Current	45A
Maximum Available Turbine Power	5200W @ 132Vout(nom) 5000W @ 120Vout(nom) 4500W @ 96Vout(nom) 2300W @ 48Vout(nom)
Maximum PV Voltage Open Circuit	290V
Battery Temperature Compensation	Yes
Operating Temperature Range	-20° to 50°+C
Remote Temperature Sensor	Included
Storage Temperature	-30° to 70° C
Self Consumption	75mA @ 40V
Communication Protocol Options	CAN and Modbus RTU
Communication Ports	RS485 & USB
Required cabinet air exchange rate (intake at 40°C)	40 m^3/hour
Operating temperature of heatsink at full rated power	35°C temperature rise
Cable entry conduit diameter	40mm
High power wire size	16mm^2 Max
Enclosure type	Indoor Type 1
Weight	3.7kg
Outer dimensions (L x W x H)	356 x 133 x 104 mm
Languages (other language updates to come)	English

2 OVERVIEW

The AERL TURBOMAX is a buck only, common positive Single Point Wind Turbine Charge Controller. It is the first release product of this kind for AERL with a full MPPT version soon to follow. The TURBOMAX blends the famously reliable AERL power stage with easy to use digital features such as system performance logging, fully configurable alarms and remote system monitoring and control.

Some of the device's main features include:

- Common positive wiring configuration.
- Highly advanced colour touch screen LCD display
- Modbus, CAN bus and standard USB interface for remote monitoring.
- High power density — 1kW/l & 1.5kW/kg

3 INSTALLATION



Important

The TURBOMAX is designed to be installed in a clean dry location away from direct sunlight. Best cooling is achieved when the TURBOMAX is mounted vertically against a wall with a clear open area at the top of the unit. At least 20cm should be kept clear above the TURBOMAX to allow free air flow.

3.1 MOUNTING

The TURBOMAX should be fixed to a vertical surface using M5 screws through the 8 mounting holes in the chassis, shown as red holes **(Fig:1)**

All dimensions in mm.

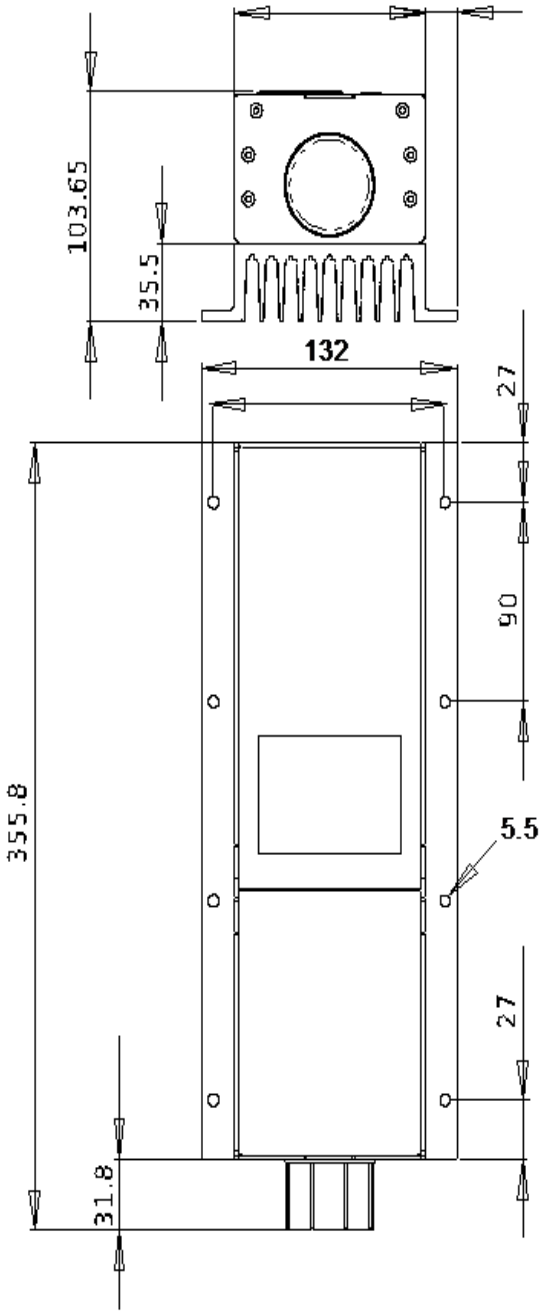


Figure 1: Mounting Holes

4 WIRING

All TURBOMAX wiring must enter the unit via a 40mm conduit fitting at the bottom of the unit. Remove the access cover at the bottom of the TURBOMAX to install the cabling. This is done by removing the two M3 countersunk hex screws on the bottom of the enclosure at the front as shown below in **Fig. 2**.

AERL TURBOMAX MAXIMIZER Units are not designed to be used in parallel with other 3rd Party Charge Controller Units.

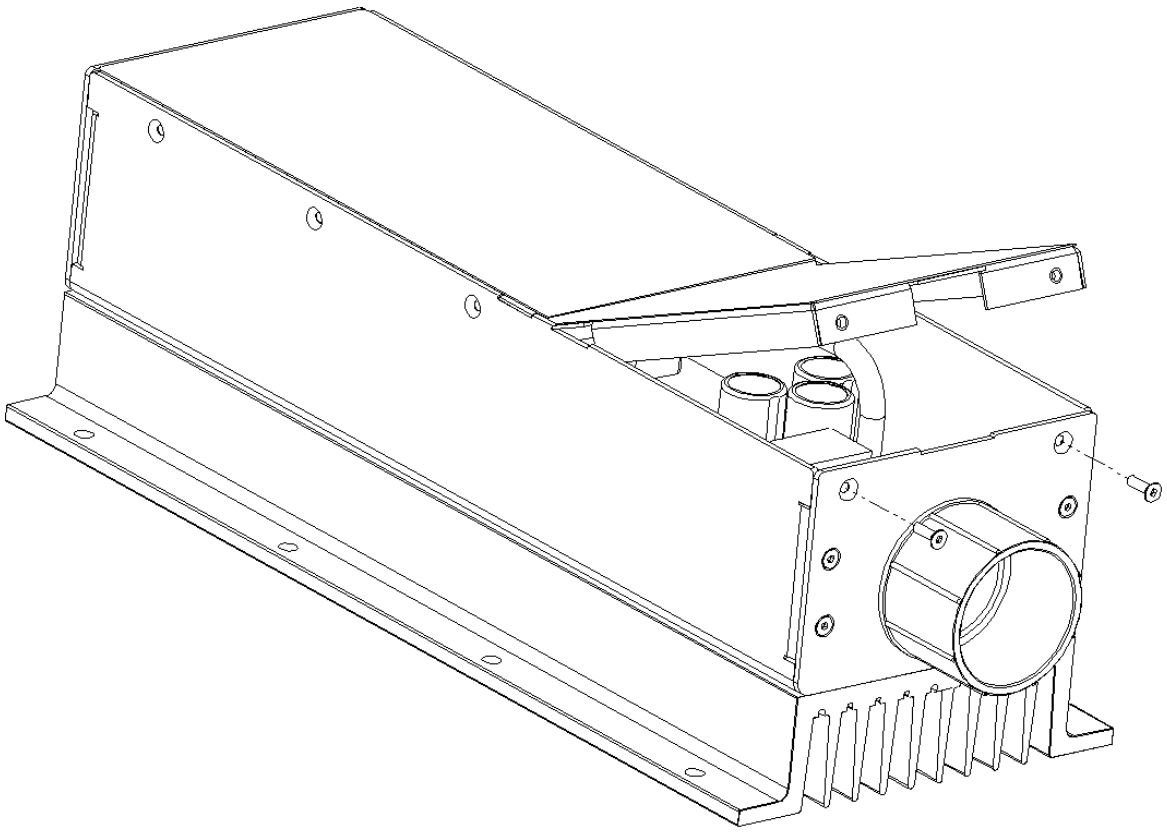


Figure 2: Removal of the Access Panel

With the access cover removed, three terminal blocks should be visible. The left most terminal block **(J1)** is for the alarm output, remote shutdown input, and temperature compensation. The terminal block **(J3)** on the right is for the Controller Area Network (CAN). The central terminal block **(J2)** is for power in and power out. Figure 3 shows the PIN-outs for these terminals.

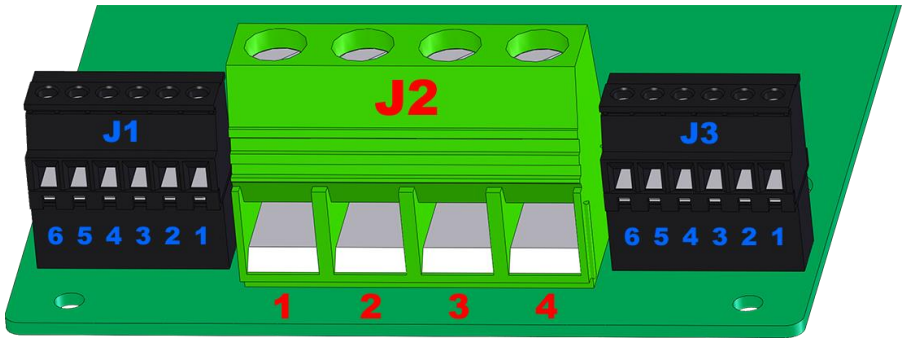


Figure 3 - Terminal Board PINout (Looking into Access Port)

Signal PIN Assignment

PIN	Assignment	Type	Functional Description	Isolated
J1-1	GND	Analogue input	Temperature compensation thermistor	NO
J1-2	TMPCMP			
J1-3	GND	Digital input	Pull these lines together to disable output of the Maximizer	NO
J1-4	ON/OFF			
J1-5	Dump Load No	Dump Load Control	Will close when unit is in bulk mode. Relay contact is rated at 12V 1Amp.	YES - 1000V
J1-6	Dump Load COM			
J2-1	PV IN-	PV PWR IN	Refer to Product datasheet for the current and voltage limitations	NO
J2-2	PV IN+			
J2-3	BATT OUT +	BATT PWR OUT	Refer to Product datasheet for the current and voltage limitations	NO
J2-4	BATT OUT -			
J3-1	CAN +12V	Output power	Power for the CAN bus	YES
J3-2	CAN GND			
J3-3	SHIELD			YES
J3-4	CAN H	Digital IO	CAN signals	
J3-5	CAN L			
J3-6	NC			

Table 1 - Signal PIN Assignment

5 CIRCUIT BREAKERS

AERL recommends the advice and recommendation of a qualified solar installation specialist for the safest and most effective protection method for both the generator as well as the charge controller.

AERL recommends that the TURBOMAX be utilized in a floating system (no earthing to the power terminals). For very exposed systems, it is recommended that a lightning conductor be provided nearby to prevent damage to equipment, batteries and the TURBOMAX.

5.1 CONNECTIONS

Use only appropriately rated wire to connect TURBOMAX input and battery bank output. Check the polarity in the diagram provided in this User Manual.

CAUTION

Reversing polarity of either the input or the output ***WILL DAMAGE*** the TURBOMAX unit.

6 PIN CODE SCREEN

The PIN Code screen **(Fig.16)** is a security feature of the TURBOMAX, which requests the user to input a 4 digit PIN Code before any set point data can be edited.
This ensures that only authorised personnel can edit critical set point data. Once the 4 digit PIN Code has been entered press the Enter Button and this will allow access to the relevant set point screen that needs to be edited. If a mistake is made while entering the PIN Codes press the Delete Button to re-enter the number again. Unauthorised users who access this screen should immediately press the Delete Button to exit back to the Set Points viewing screen. Information on what your Individual PIN CODE is, can be found on the provided quick start manual.

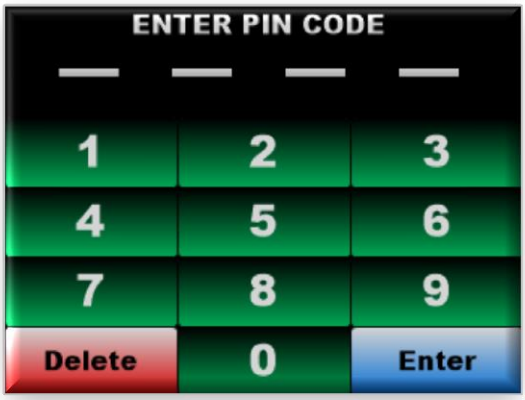


Figure 16- PIN Code Entry Screen

Information

Each TURBOMAX has its own individual PIN CODE assigned to it. Please refer to the installer quick start to determine your PIN CODE. Your TURBOMAX should be set up with required set point values by your system installer.

Important

Unauthorised modifications of the Set point Values can damage the system. Please do not modify set point values without being 100% sure you know what you are doing. Always speak to a qualified installations professional prior to making any changes.

8 CAN COMMUNICATIONS

8.1 CAN NETWORK TOPOLOGY

Multiple TURBOMAX units can exist on the same CAN bus and this can be connected to other networks using a CAN-Ethernet Bridge adaptor.

The CAN bus is structured as a linear network, with short stubs branching from 'T' connectors on the main bus backbone to each device. The CAN bus data lines must be terminated at each end of the main bus with 120 Ω resistors between the CAN-H and CAN-L signals.

A simple method of implementing the 'T' junction is shown in Figure 4. The in and out wire of each CAN line are twisted together and screwed into the appropriate terminal on the CAN connector, as shown below in Figure 5. This connector plugs into J3 as shown in Figure 3.

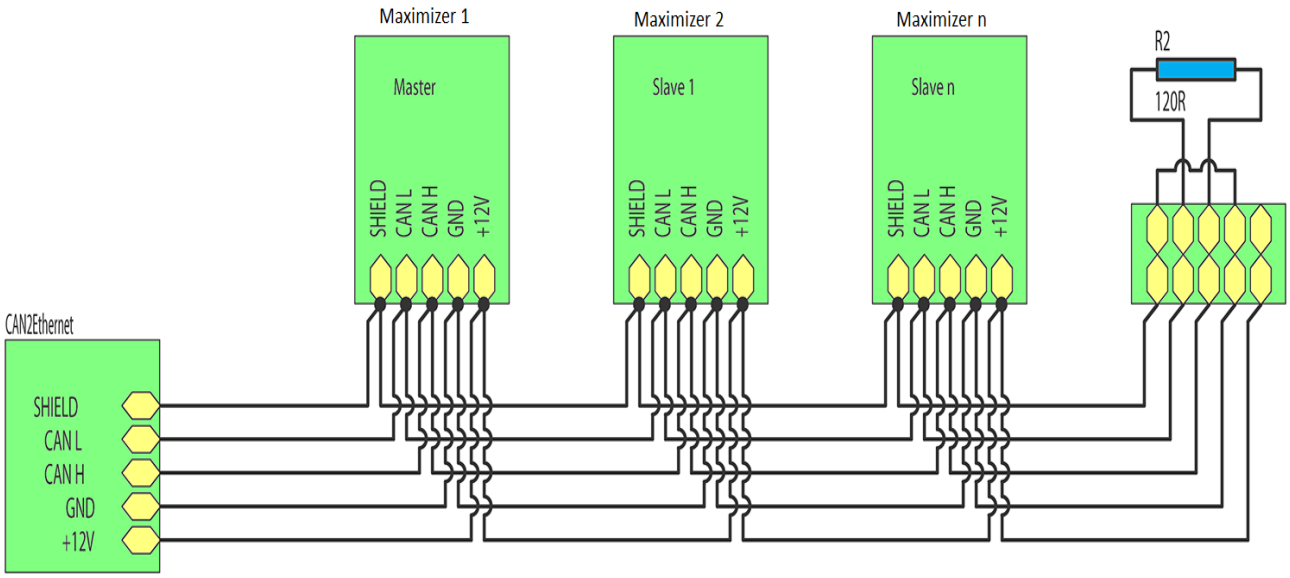


Figure 4 - CAN Network Wiring Diagram

Important

In order to use multiple TURBOMAX units in a Master / Slave configuration, it has to be ensured that they are connected to different individual Turbines, or one Turbine with completely isolated generators for each TURBOMAX.

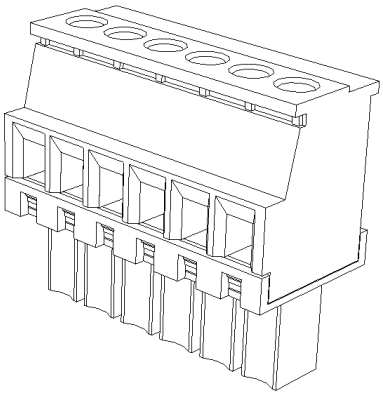


Figure 5 - CAN Connector (6-Way Screw Terminal)

8.2 CAN WIRING

The CAN data lines (CAN-H and CAN-L) must be implemented with twisted-pair wire for proper data integrity. The wire should have a characteristic impedance of 120 Ω.

Power should also be provided along the CAN cable, ideally with another twisted pair to minimise noise pickup. An overall shield can also be advantageous.

Important

The recommended choice of cable is 7mm DeviceNet CAN-Bus 'thin' cable, with 24 AWG (data) + 22 AWG (power) twisted pairs and a braided shield. Using this cable will result in a robust installation.

Standard CAT5 network cabling (which has an impedance of 100 Ω) can be used, but may become unreliable in longer networks or in the presence of electrical noise from DC/DC converters and other electrical devices in the system.

8.3 SHIELDING

Important

Correct shielding practice is important for error free communications. Incorrect shielding can cause more interference than unshielded cables would experience. Shields should be linked between each wire segment along the network but only grounded in one place. The following paragraphs explain how to achieve this.

The shield should be wired through the entire network independently of the ground and connected to ground at the end of the network and nowhere else in the network. This is shown at the right hand end of the example network in Figure 4.

8.4 CAN TERMINATION

A 120 Ω resistor needs to be wired between the CAN-H and CAN-L lines at either end of the linear network in order to terminate both ends of the network. At the far end of the network the resistor can be simply installed into the last terminal block.

If no CAN-Ethernet Bridge adapter is present on the network the same terminal block style termination can be made on the other end of the network. However, if a CAN-Ethernet Bridge adapter is present on the network, it can be used to terminate the network by wiring a termination resistor across CAN-H and CAN-L on the unused header.

8A MODBUS COMMUNICATIONS

8A.1 MODBUS NETWORK TOPOLOGY

Multiple TURBOMAX units can exist on the same Modbus and this can be connected to other networks using a Modbus-Ethernet Bridge adaptor.

The Modbus is structured as a linear network, with short stubs branching from 'T' connectors on the main bus backbone to each device. The Modbus data lines must be terminated at each end of the main bus with 120 Ω resistors between the Modbus-A and Modbus-B signals.

A simple method of implementing the 'T' junction is shown in Figure 4. The in and out wire of each Modbus line are twisted together and screwed into the appropriate terminal on the Modbus connector, as shown in Figure 9. The Modbus connector is then connected into the TURBOMAX as shown in Figure 10.

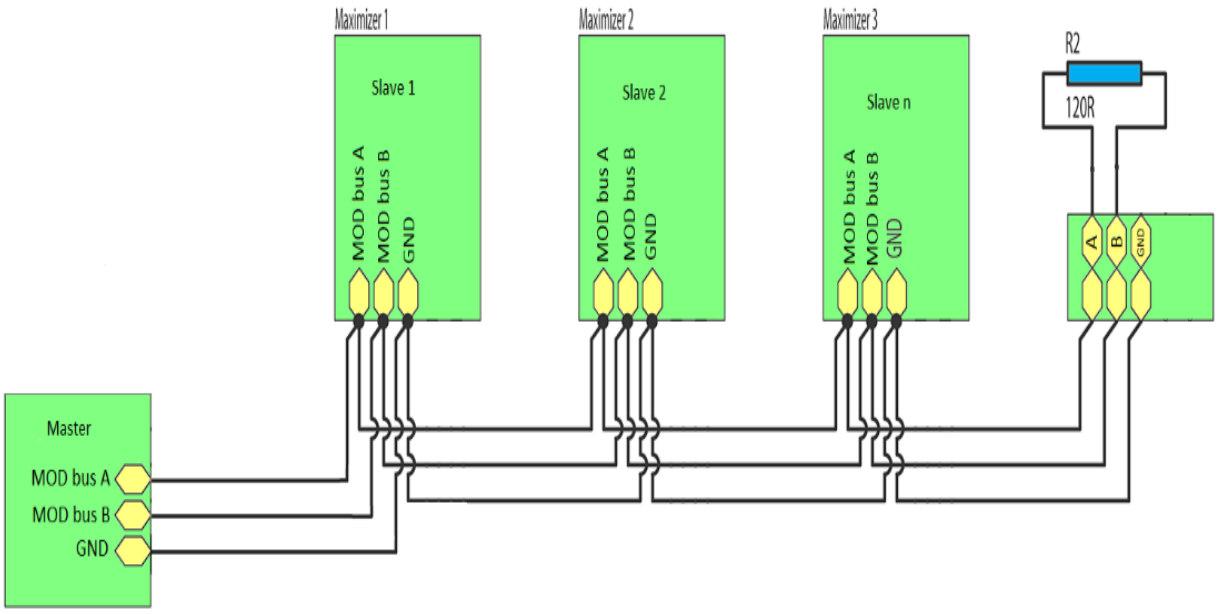


Figure 7 – Modbus Wiring Diagram

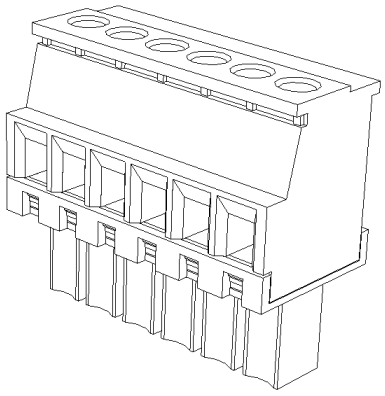


Figure 8 – Modbus Connector (6-Way Screw Terminal)

8A.2 MODBUS WIRING

The Modbus data lines (Modbus-A and Modbus-B) must be implemented with twisted-pair wire for proper data integrity. The wire should have a characteristic impedance of 120 Ω.

Power should also be provided along the Modbus cable, ideally with another twisted pair to minimise noise pickup. An overall shield can also be advantageous.

Important

The recommended choice of cable is 7mm DeviceNet Modbus 'thin' cable, with 24 AWG (data) + 22 AWG (power) twisted pairs and a braided shield. Using this cable will result in a robust installation.

Standard CAT5 network cabling (which has an impedance of 100 Ω) can be used, but may become unreliable in longer networks or in the presence of electrical noise from DC/DC converters and other electrical devices in the system.

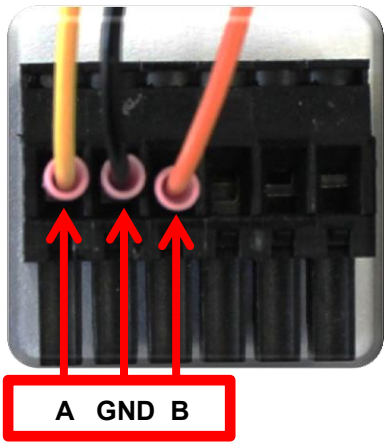


Figure 9 – Modbus Connector

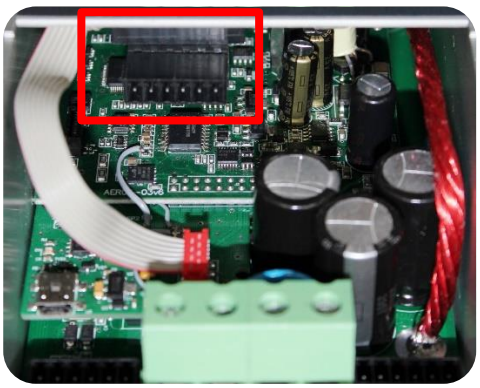


Figure 10 – Modbus Connector Socket

8A.3 SHIELDING

Important

Correct shielding practice is important for error free communications. Incorrect shielding can cause more interference than unshielded cables would experience. Shields should be linked between each wire segment along the network but only grounded in one place. The following paragraphs explain how to achieve this.

The shield should be wired through the entire network independently of the ground and connected to ground at the end of the network and nowhere else in the network. This is shown at the right hand end of the example network in Figure 7.

8A.4 MODBUS TERMINATION

A 120 Ω resistor needs to be wired between the Modbus-A and Modbus-B lines at either end of the linear network in order to terminate both ends of the network. At the far end of the network the resistor can be simply installed into the last terminal block.

If no Modbus-Ethernet Bridge adapter is present on the network the same terminal block style termination can be made on the other end of the network. However, if a Modbus-Ethernet Bridge adapter is present on the network, it can be used to terminate the network by wiring a termination resistor across Modbus-A and Modbus-B on the unused header.

9 OPERATING GUIDELINES

9.1 BATTERY CHARGING SETUP

The batteries are charged using an automatic equalise / anti-sulphation charging profile. This profile is designed for lead-acid batteries, which can be equalised automatically by allowing each battery to vent for a short time.

The charge profile can be edited for other battery chemistries by manipulating the following parameters

- Bulk voltage
- Float voltage
- Bulk reset voltage
- Bulk time

Battery chemistries other than lead acid should be used with extreme caution as it is not safe to overcharge individual cells. It is always recommended to employ a battery monitoring system as an unbalanced battery pack can result in damage to batteries due to overcharging.

An example charge profile for the TURBOMAX is shown below to illustrate the charge profile parameters above. The charge profile parameters can be edited using the touchscreen LCD, please refer to the manual to find out how to make these parameter changes.

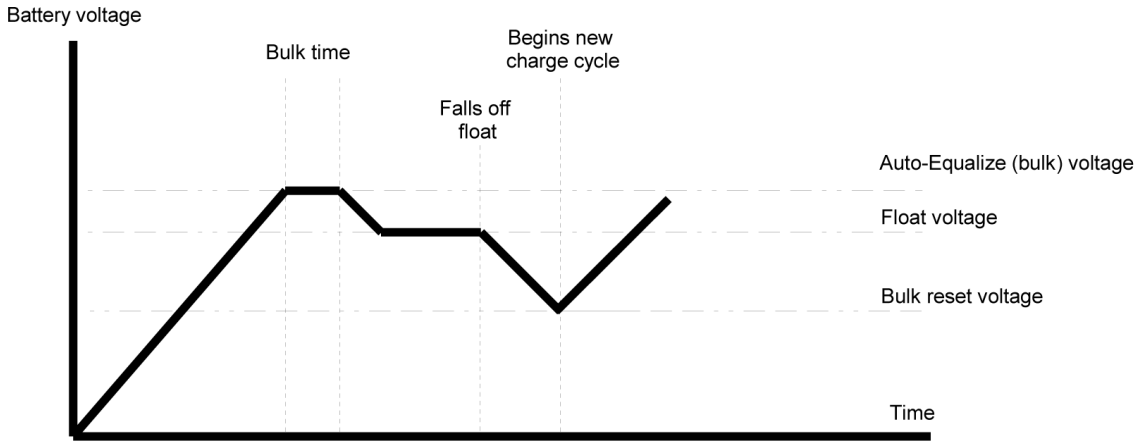


Figure 11 - Battery Charge Control Profile

9.2 TEMPERATURE COMPENSATION

Temperature compensation measures the temperature of the batteries and adjusts the float voltage set point to the ideal voltage for batteries at that temperature.

The thermistor is connected between J1-1 and J1-2 as shown in Figure 3. The TURBOMAX measures the voltage between TMPCMP+ and GND to determine the temperature of the batteries.

Using the temperature of the batteries, the TURBOMAX adjusts the float voltage by a user specified factor in millivolts per °C.

The temperature compensation factor can be adjusted via the LCD display of the TURBOMAX.

9.3 DUMP / DIVERSION LOAD DETAILS

The TURBOMAX has a clean contact relay output which can handle 12V at 1A.

This output as indicated in Table 1 is used to control the switching in and out of the wind turbine dump load. The following are a set of conditions under which the relay output contacts are either short circuit or open circuit:

- TURBOMAX output disabled – Relay Open Circuit (Dump Load Active).
- TURBOMAX in Bulk Mode – Relay Closed Circuit (Dump Load Inactive).
- TURBOMAX in Float Mode – Relay Open Circuit (Dump Load Active).
- TURBOMAX Input below MP Set point – Relay Open Circuit (Dump Load Active).
- TURBOMAX Output Triggers Bulk Reset – Relay Closed Circuit (Dump Load Inactive).
- TURBOMAX Input Voltage drops below Set MP Voltage – Relay Open Circuit (Dump Load Active).

9.4 MAXIMIZER STARTUP

The TURBOMAX electronics will begin to run when either the input or output is connected with a voltage above the start-up voltage listed in the datasheet. CAN communications can be used whenever the TURBOMAX is powered up.

10 ADJUSTING THE CHARGE PROFILE

10.1 REAL TIME

When the TURBOMAX Unit is first powered the on, the Real Time Screen **(Fig.12)** is the first screen to appear. The Real Time screen displays all the telemetry information relevant to the TURBOMAX unit and is the starting point from which all other TURBOMAX screens are accessible.

Important

The TURBOMAX unit typically requires a Battery or PV voltage above 40 volts to be able to power on.

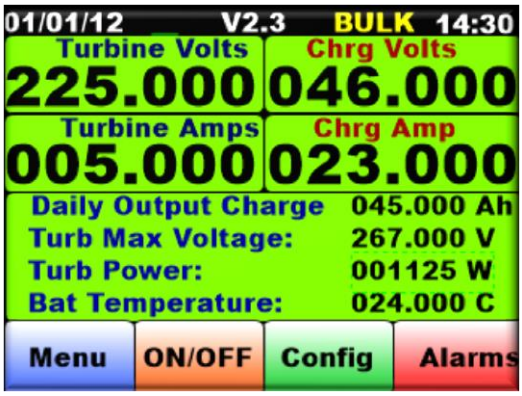


Figure 12 - Real Time Screen

10.2 MAIN MENU

To access the Main Menu Screen press the Menu Button that is at the bottom left of the Real Time Screen **(Fig.12).** This will go the Main Menu Screen **(Fig.13)** from which the Settings, Info and Alarms screen can be accessed.

To go back to the Real Time Screen (**Fig.12**) from the Main Menu Screen **(Fig.13)** press the Back Button at the top left of the Menu Screen. This will go back to the Real Time Screen.

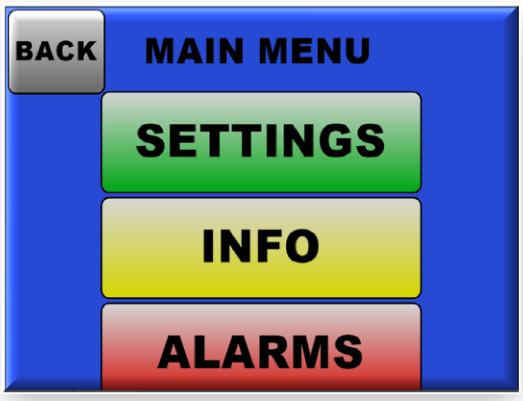


Figure 13 - Main Menu Screen

10.3 SETTINGS

From the Main Menu **(Fig.13)** press the Settings Button, this will go the Settings Menu screen **(Fig.14)** from where the various set points can be edited. The Settings Screen can also be accessed from the Real Time Screen **(Fig.12**) by pressing the Green Config Button at the bottom of the screen.

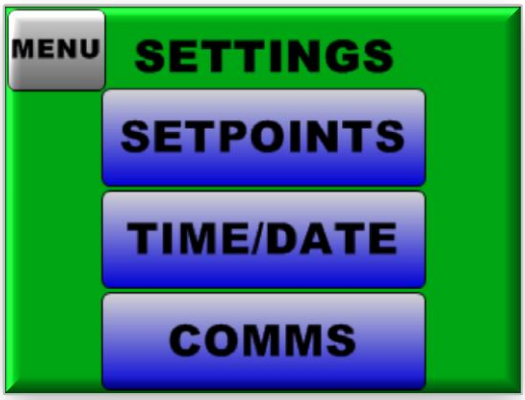


Figure 14-Settings Menu Screen

10.4 SET POINTS

The Set Points screen (**Fig.15**) allows the user to modify the factory settings of the TURBOMAX unit to customise the unit for a particular system configuration. To scroll through the various Set Points on Page 1 and 2, press the Up or Down buttons at the bottom of the screen. This will enable the user to scroll up or down through the various Set Points and also be able to move from Page 1 to Page 2 (**Fig.15 & 15A)** and vice versa.

To edit the selected Set Point press the Edit Button at the bottom left of the screen. This will go to a PIN Code Entry Screen **(see Fig.16)** where a 4 Digit PIN Code has to be entered.

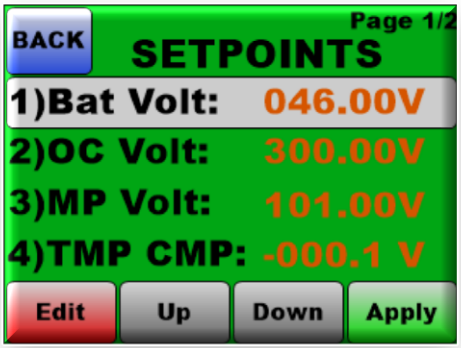


Figure 15 – Set Point Screen 1



Figure 15A – Set Point Screen 2

10.5 EDITTING BATTERY VOLTAGE SETPOINT

The following steps illustrate the correct procedure to modify the Battery Voltage Set Point to customise the unit.

Step 1

Once the unit has been powered up and the Real Time Screen **(Fig.17)** appears Press the Menu button to go the Main Menu Screen **(Fig.17)**. From the main Menu Screen **(Fig.17A**) press the Settings button to go to the Settings Screen. **(Fig.17B)**



Figure 17 – Real Time Screen

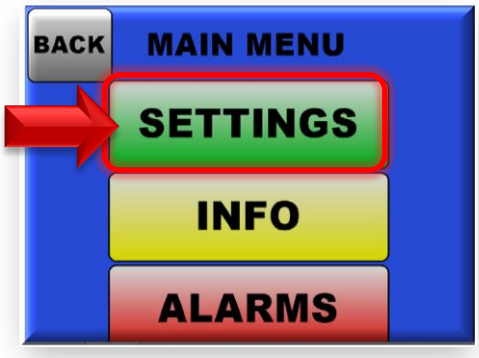


Figure 17A – Main Menu Screen

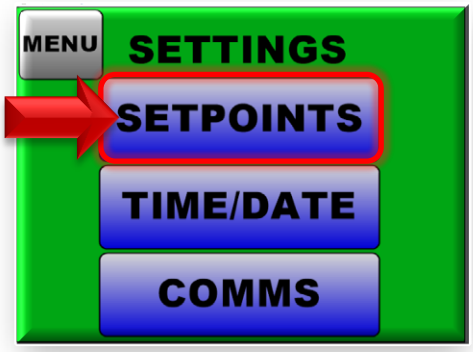


Figure 17B – Settings Screen

Step 2

On the Settings Screen (**Fig.17B**) press the "SETPOINTS" Button to go the Set Points Screen **(Fig.18).** On the Set Points Screen **(Fig.18**) select the Bat Volt Set Point. Then press the Edit Button which goes to the PIN Code screen **(Fig.19)** where a 4 Digit PIN Code has to be entered.

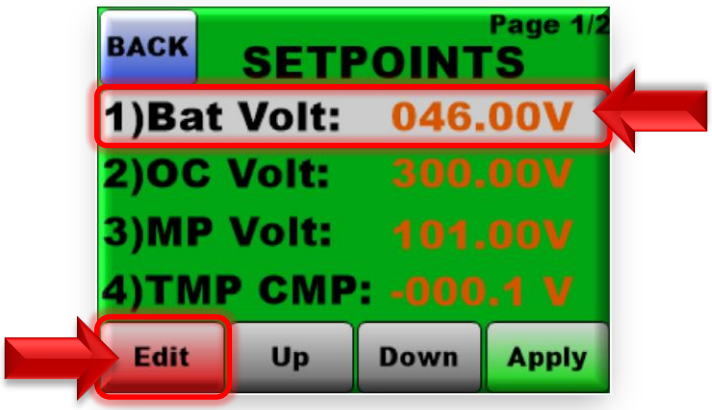


Figure 18 – Set Points Screen

Step 3

Once the 4 Digit PIN Code has been entered in the PIN Code Entry Screen **(Fig.19)** press the Enter Button which would then go to the Set Points Edit Screen **(Fig.20)** where the Set Points can be modified. To move between the various digits on the Set Points edit screen press the Next button and to increase or decrease the digits press the Up/Down buttons. Once the required digits have been entered press the "Accept" Button which would go back to the Set Points Screen.

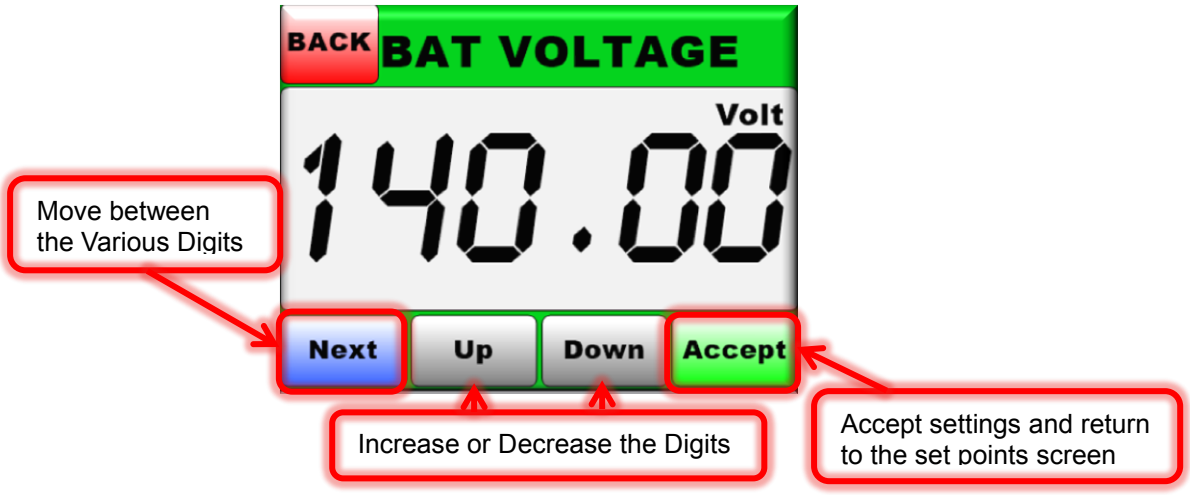


Figure 20 – Set Point Edit Screen

Step 4

On the Set Points Screen **(Fig.21)** press the "Apply" Button. If the set point data has been set correctly the configuration is uploaded and the progress is displayed on the notification screen **(Fig.22**). Once the Data has been successfully uploaded, the TURBOMAX will initiate an auto-reset and return back to the Real Time Screen.

NOTE: Listen for the Fan Noise while the TURBOMAX Unit Resets to indicate a successful reboot.



Figure 21 – Set Point Screen

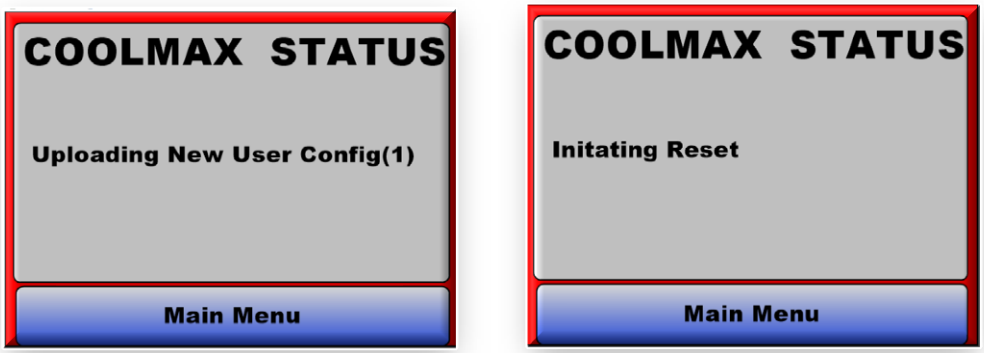


Figure 22 – Notification Screen

10.6 EDITING OPEN CIRCUIT VOLTAGE SET POINT

The following steps illustrate the correct procedure to modify the OC Voltage Set Point to customise the unit.

Step 1

Once the unit has been powered up and the Real Time Screen (**Fig.23**) appears Press the Menu button to go the Main Menu Screen **(Fig.23**). From the main Menu Screen **(Fig.23A**) press the Settings button to go to the Settings Screen. **(Fig.23B)**



Figure 23 – Real Time Screen

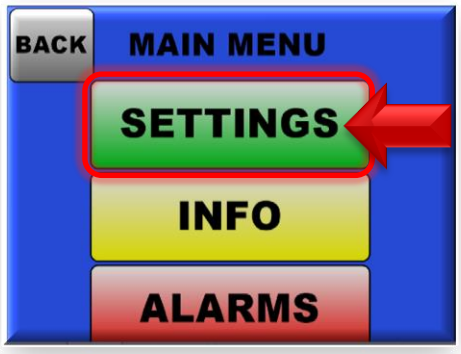


Figure 23A – Main Menu Screen

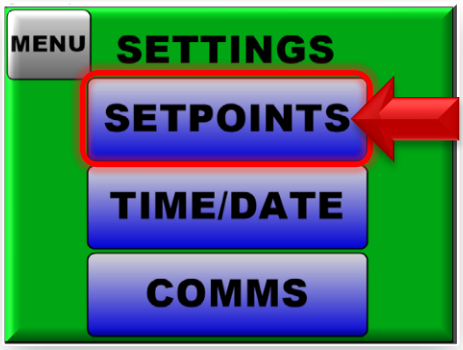


Figure 23B – Settings Screen

Step 2

On the Settings Screen (**Fig.23B**) press the "SETPOINTS" Button to go the Set Points Screen **(Fig.24).** On the Set Points Screen **(Fig.24**) select the OC Volt Set Point by pressing the Down Button. Then press the Edit Button which goes to the PIN Code screen.

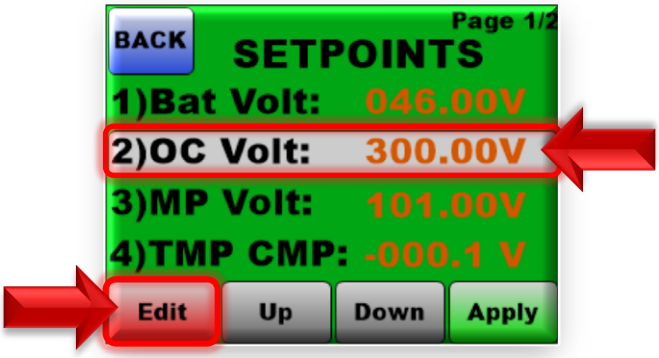


Figure 24 – Set Points Screen

Step 3

Once the 4 Digit PIN Code has been entered in the PIN Code Entry Screen **(Fig.25)** press the Enter Button which would then go to the Set Point Edit Screen **(Fig.26)** where the Set Points can be modified. To move between the various digits on the Set Point edit screen press the Next Button and to increase or decrease the digits press the Up/Down buttons. Once the required digits have been entered press the "Accept" Button which would go back to the Set Points Screen.

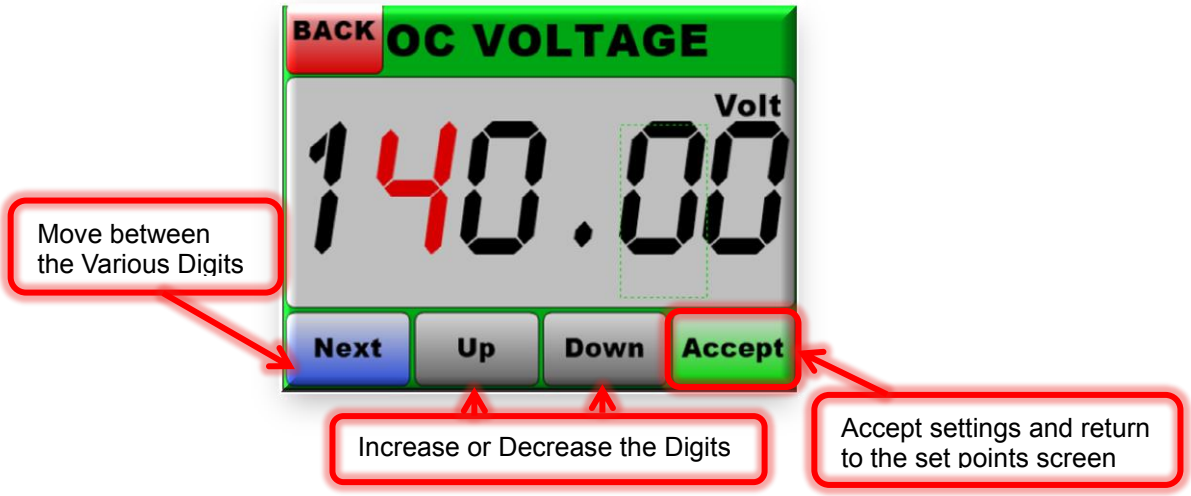


Figure 26 – Set Point Edit Screen

Step 4

On the Set Points Screen **(Fig.27)** press the "Apply" Button. If the set point data has been set correctly the configuration is uploaded and the progress is displayed on the notification screen **(Fig.28**). Once the Data has been successfully uploaded, the TURBOMAX will initiate an auto-reset and return back to the Real Time Screen.

NOTE: Listen for the Fan Noise while the TURBOMAX Unit Resets to indicate a successful reboot.

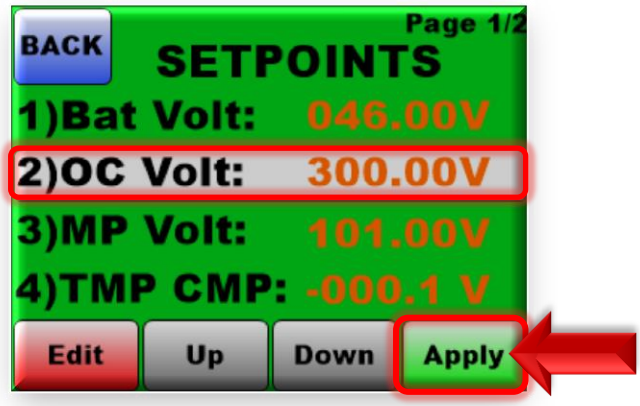


Figure 27 – Set Points Screen

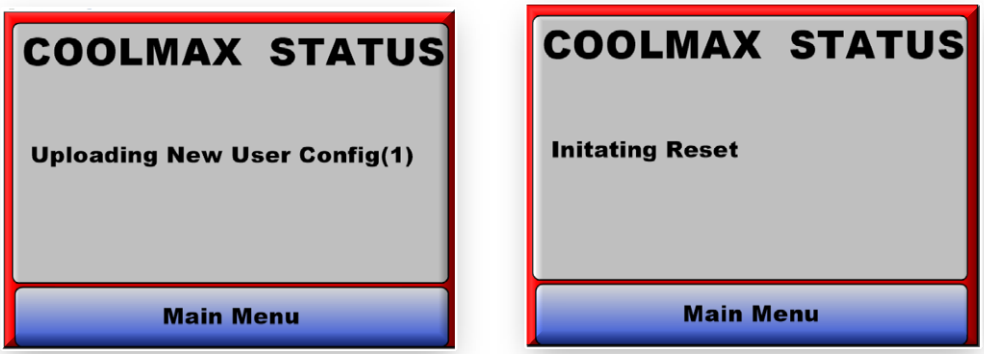


Figure 28 – Notification Screen

10.7 EDITING MAXIMUM POWER POINT VOLTAGE SET POINT

The following steps illustrate the correct procedure to modify the MP Voltage Set Point to customise the unit.

Step 1

Once the unit has been powered up and the Real Time Screen **(Fig.29**) appears Press the Menu Button to go the Main Menu Screen **(Fig.29A**). From the main Menu Screen **(Fig.29A)** press the Settings Button to go to the Settings Screen. **(Fig.29B)**



Figure 29 – Real Time Screen

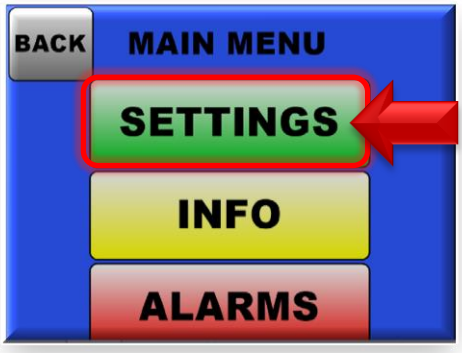


Figure 29A – Main Menu Screen

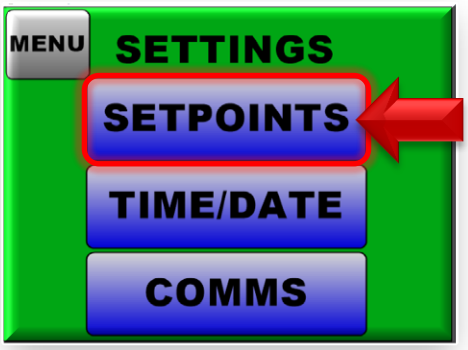


Figure 29B – Settings Screen

Step 2

On the Settings Screen **(Fig.29B**) press the SETPOINTS Button to go the Set Points Screen **(Fig.30).** On the Set Points Screen **(Fig.30** select the MP Volt Set Point by pressing the Down Button. Then press the Edit Button which goes to the PIN Code screen.



Figure 30 – Setpoints Screen

Step 3

Once the 4 Digit PIN Code has been entered in the PIN Code Entry Screen, press the Enter Button which would then go to the Set Points Edit Screen **(Fig.32)** where the Set Points can be modified. To move between the various digits on the Set Point edit screen press the Next Button and to increase or decrease the digits press the Up/Down buttons. Once the required digits have been entered press the Accept Button which would then go back to the Set Points Screen.

Important

Very important to note that the MP Voltage needs to be carefully selected depending on the turbine and overall system configuration. Charging is only possible when the input voltage of the TURBOMAX is equal to or larger than the MP voltage setting. Also the

Information

The TURBOMAX will not charge if the Input Voltage to the TURBOMAX is bellow the set MP Voltage. The current model is single point MPP Controller with a configurable MP voltage. MP Voltage must also be larger than the battery Bulk Voltage.

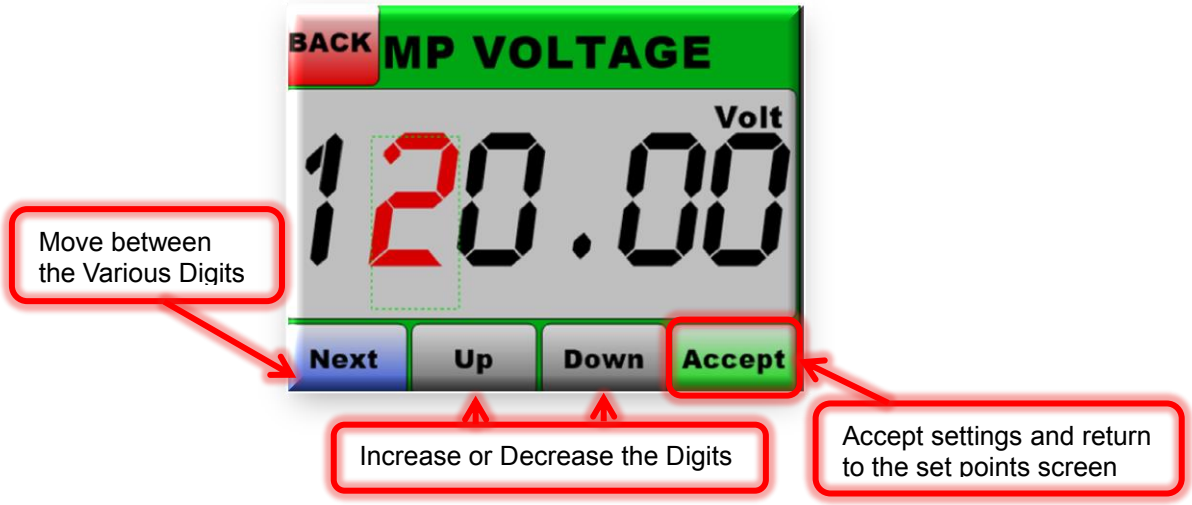


Figure 32 – Set Point Edit Screen

Step 4

On the Set Points Screen **(Fig.33)** press the Apply Button. If the set point data has been set correctly the configuration is uploaded and the progress is displayed on the notification screen **(Fig.34**). Once the Data has been successfully uploaded the TURBOMAX will initiate an auto-reset and return back to the Real Time Screen.

NOTE: Listen for the Fan Noise while the TURBOMAX Unit Resets to indicate a successful reboot.



Figure 33 –Set Points Screen

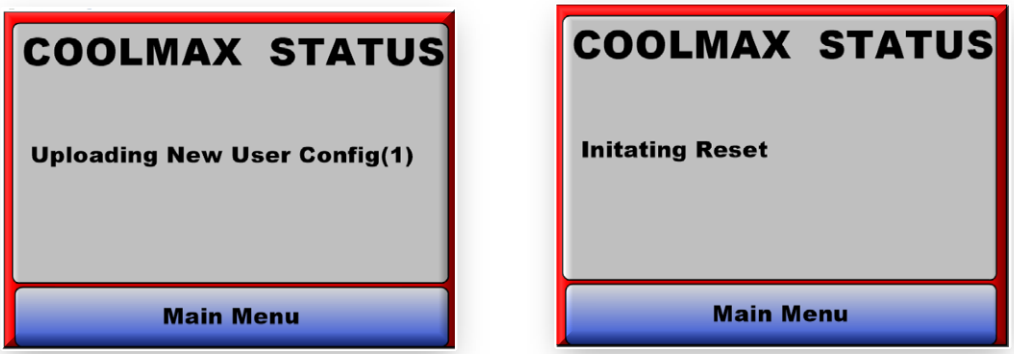


Figure 34 – Notification Screen

10.8 EDITING BATTERY TEMPERATURE COMPENSATION SET POINT

The following steps illustrate the correct procedure to modify the TEMP COMP Voltage Set Point to customise the unit.

Step 1

Once the unit has been powered up and the Real Time Screen **(Fig.35)** appears press the Menu Button to go the Main Menu Screen **(Fig.35A)**. From the main Menu Screen **(Fig.35A)** press the Settings Button to go to the Settings Screen. **(Fig.35B)**



Figure 35 – Real Time Screen

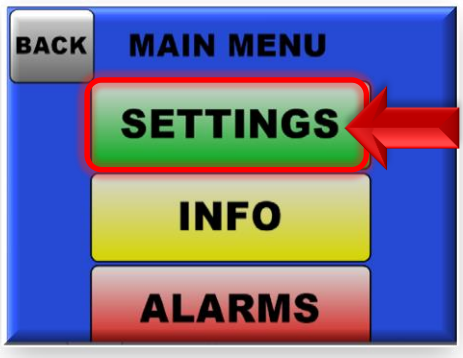


Figure 35A – Main Menu Screen

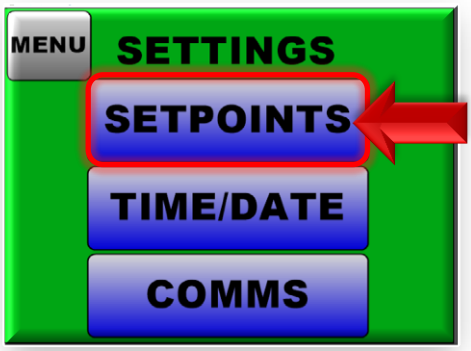


Figure 35B – Settings Screen

Step 2

On the Settings Screen **(Fig.35B)** press the "SETPOINTS" Button to go the Set Points Screen **(Fig.36).** On the Set Points Screen **(Fig.36**) select the Tmp Cmp Set Point by pressing the Down Button. Then press the Edit Button which goes to the PIN Code screen **(Fig.37)** where a 4 Digit PIN Code has to be entered.

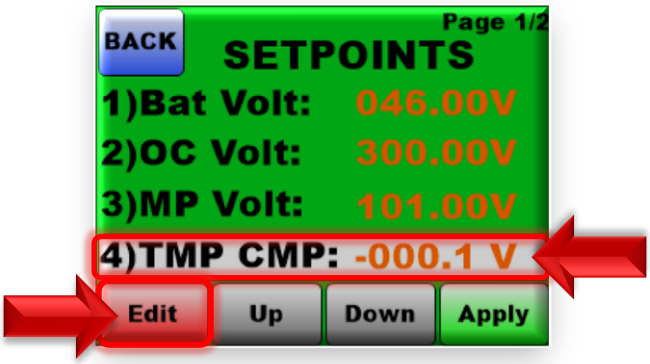


Figure 36 – Set Points Screen

Step 3

Once the 4 Digit PIN Code has been entered in the PIN Code Entry Screen, press the Enter Button which would then go to the Set Point Edit Screen **(Fig.38)** where the Set Points can be modified. To move between the various digits on the Set Points edit screen press the Next Button and to increase or decrease the digits press the Up/Down buttons. Once the required digits have been entered press the Accept Button which would go back to the Set Points Screen.

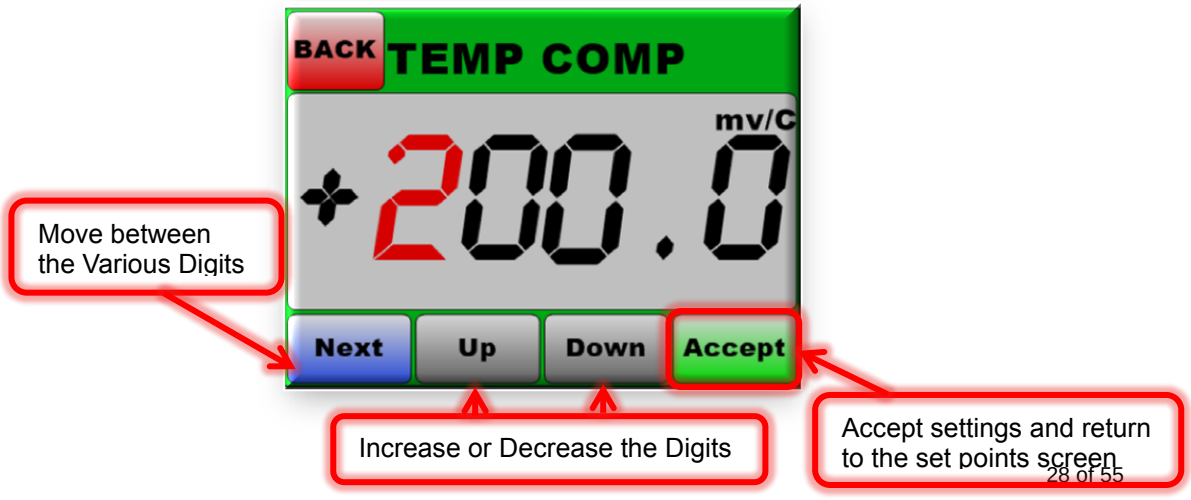


Figure 38 – Set Point Edit Screen

Step 4

On the Set Points Screen **(Fig.39)** press the Apply Button. If the set point data has been set correctly the configuration is uploaded and the progress is displayed on the notification screen **(Fig.40**). Once the Data has been successfully uploaded the TURBOMAX will initiate an auto-reset and return back to the Real Time Screen.

NOTE: Listen for the Fan Noise while the TURBOMAX Unit Resets to indicate a successful reboot.

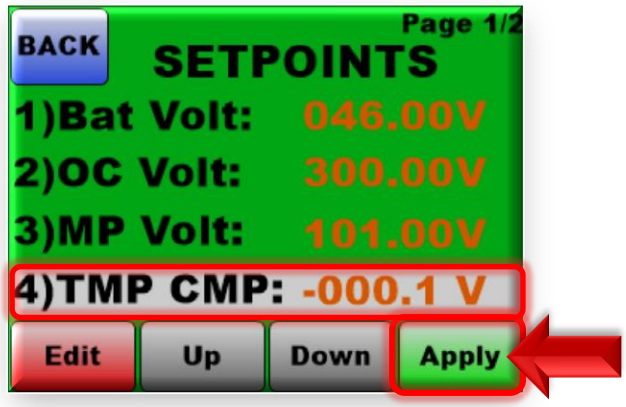


Figure 39- Set Point Screen

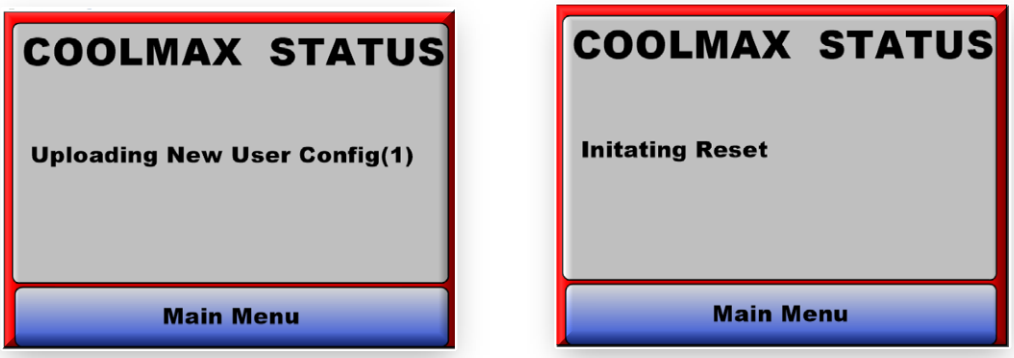


Figure 40 – Notification Screen

10.9 NOTIFICATION SCREEN

Once all Set Point data has been edited to the required values **(Fig.41)** press the Apply Button at the bottom of the Set Points Screen, to load these settings into the TURBOMAX configuration memory. The Notification Screen **(Fig.42 & 42A**) will be displayed to give the user information on update status of the configuration load or warning messages of the TURBOMAX System.

When data entered on set points are above or below the allowable system parameters, a warning message is displayed **(Fig.42)** and the loading of the Set Point data is aborted. The user must return to the Set Points Screen to change the Set Point that was the cause of the warning message to an allowable value.

If all set point data has been set correctly the user is shown the progress of the configuration upload on the notification screen **(Fig.42A)**, once the data is successfully uploaded the TURBOMAX will auto-reset and return the user to the Real Time Screen. **(Fig.12)**

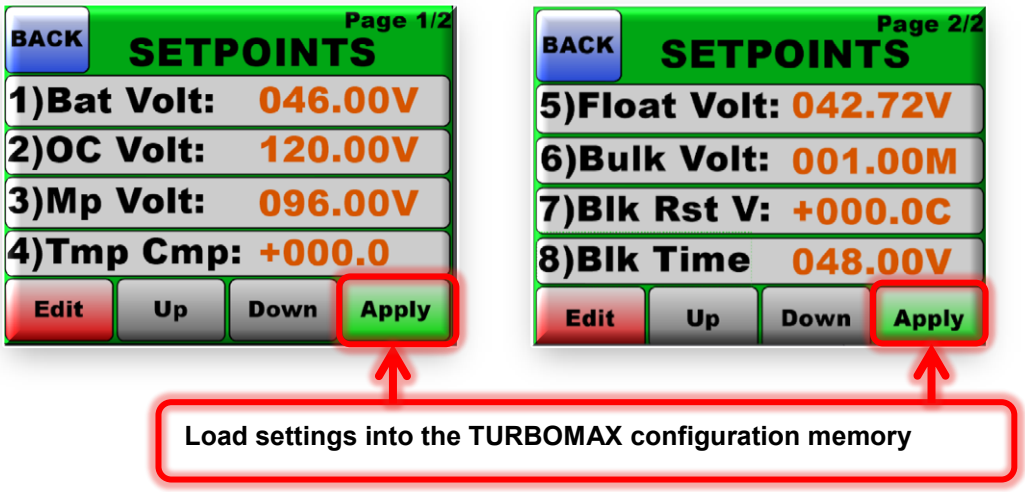


Figure 41 – Set Points Screen



Figure 42- Warning Message Screen

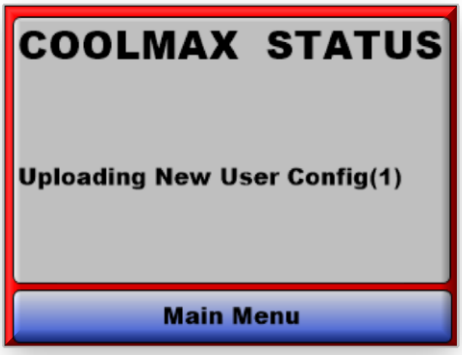


Figure 42A- Update Message Screen

NOTE: Listen for the Fan Noise while the TURBOMAX Unit Resets to indicate a successful reboot.

Important

It is advisable to check if the data has been updated correctly by going back to the Set Point Screen and ensuring the recently edited data is still correct.

10.10 TIME / DATE EDITING SCREEN

From the Main Menu **(Fig.13**) click on the Settings button. This will go to the Settings Screen **(Fig.14)**. On the Settings Screen **(Fig.14)** press the Time / Date button and this will go to the Time / Date Screen **(Fig.43)**. Press the Time Button to go to the Time Edit Screen **(Fig.43A).** Press the Date Button to go to the Date Edit Screen **(Fig.43B).**

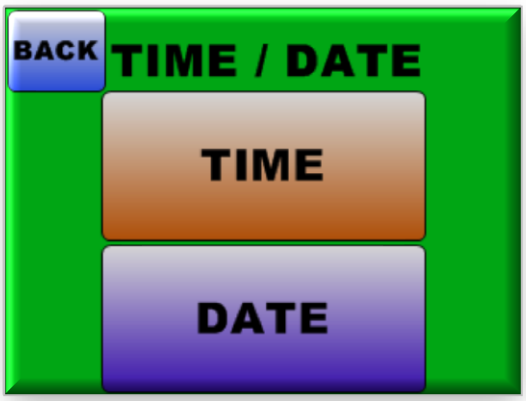


Figure 43 – Time / Date Edit Screen



Figure 43A – Time Edit Screen



Figure 43B- Date Edit Screen

10.11 EDITING THE TIME

The following steps illustrate the correct procedure to set the time for the TURBOMAX Unit.

Step 1

From the Real Time Screen **(Fig.44)** press the Menu Button to go to the Main Menu screen. **(Fig.44A). From** the Main Menu Screen **(Fig.44A)** press the Settings Button to go to the Settings Menu screen.



Figure 44 – Real Time Screen

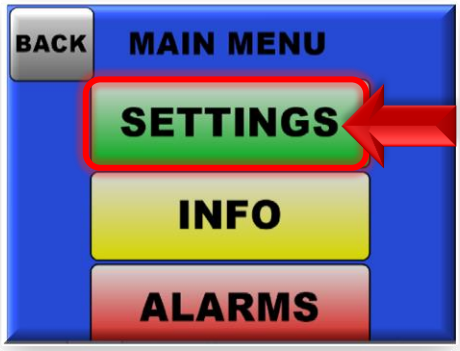


Figure 44A – Main Menu Screen

Step 2

From the Settings Menu screen **(Fig.45)** press the Time / Date button to go to the Time / Date screen **(Fig.45A)**. On the Time / Date screen **(Fig.45A)** press the Time Button to go to the Time Edit screen.

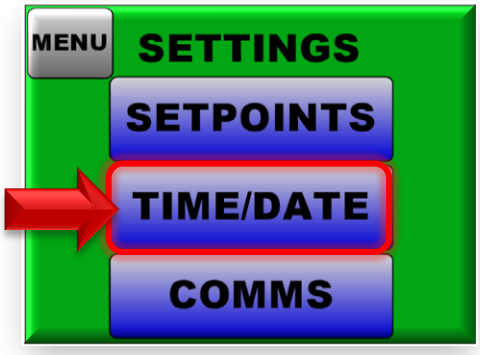


Figure 45 – Settings Menu Screen

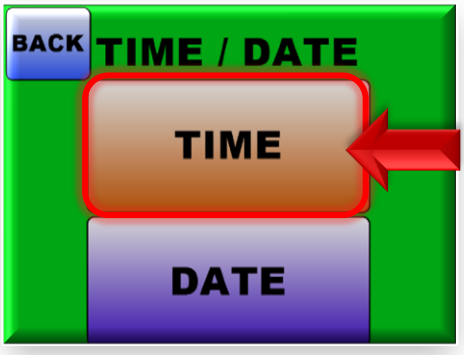


Figure 45A – Time / Date Screen

Step 3

On the Time Edit screen **(Fig.46)** press the Next button to move between the various digits and the Up / Down buttons to increase or decrease the Time. Once the Time has been set press the Accept button to accept the Time and this would return back to the Time / Date screen **(Fig.45A)**.

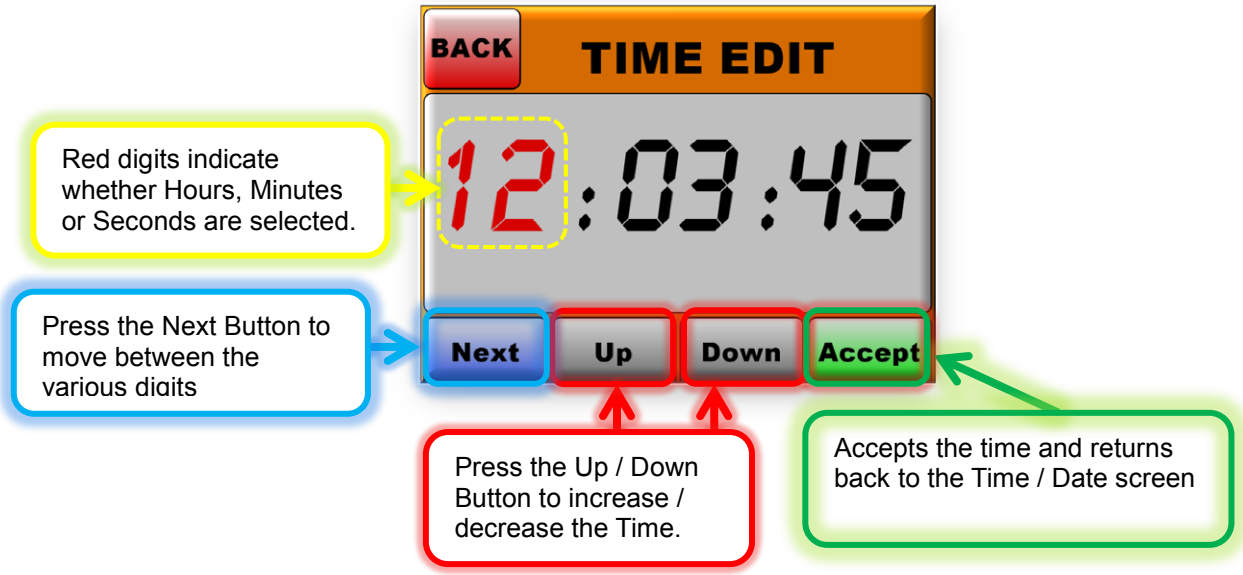


Figure 46 – Time Edit screen

Step 4

From the Time / Date Screen **(Fig.47)** press the Back Button to go back to the Settings Menu screen **(Fig.47A) (1)**. From the Settings Menu screen **(Fig.47A)** press the Menu Button to go back to the Main Menu screen **(Fig.47B) (2)**. From the Main Menu **(Fig.47B)** screen press the Back Button to go back to the Real Time screen **(Fig.47C**) **(3)**. On the Real Time screen **(Fig.47C)** ensure the time has been set correctly on the LCD Screen **(4)**.

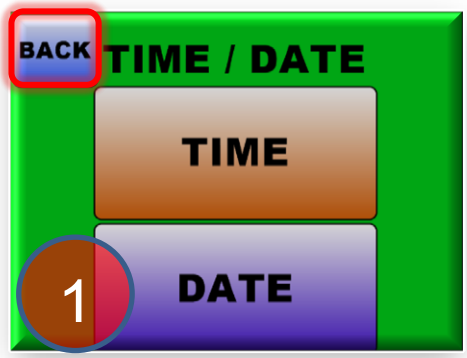


Figure 47 – Time /Date

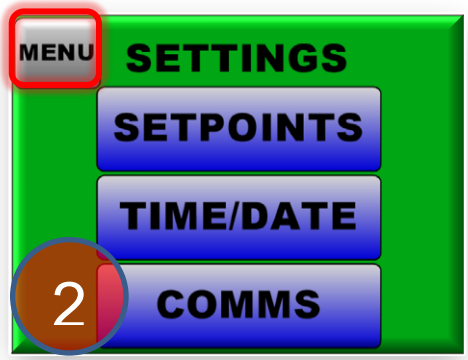


Figure 47A – Settings Menu Screen

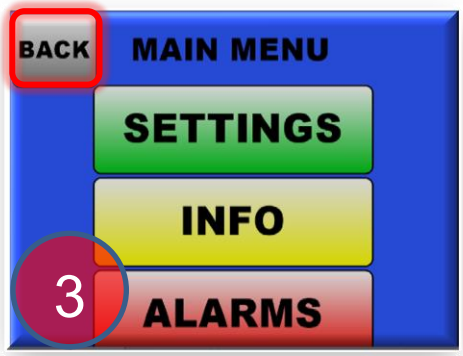


Figure 47B – Main Menu Screen

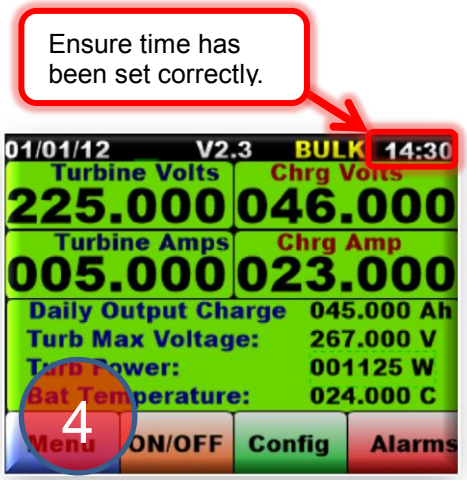


Figure 47C – Real Time Screen

10.12 EDITING THE DATE

The following steps illustrate the correct procedure to set the Date for the unit.

Step 1

From the Real Time Screen **(Fig.48)** press the Menu Button to go to the Main Menu screen. **(Fig.48A). From** the Main Menu screen **(Fig.48A)** press the Settings Button to go to the Settings Menu screen.



Figure 48 – Real Time Screen

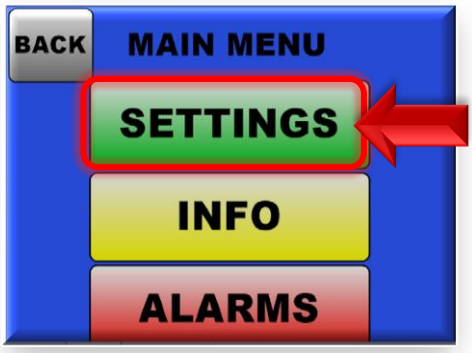


Figure 48A – Main Menu Screen

Step 2

From the Settings Menu screen **(Fig.49)** press the Time / Date button to go to the Time / Date screen **(Fig.49A)**. On the Time / Date screen **(Fig.49A)** press the Date Button to go to the Date Edit screen.

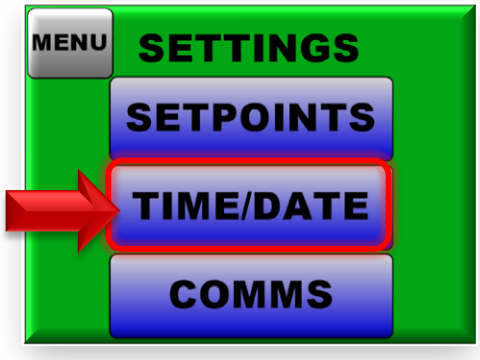


Figure 49 – Settings Menu Screen

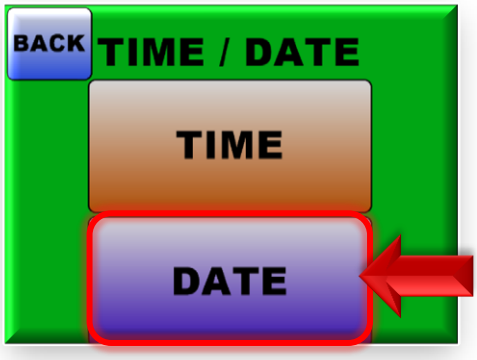


Figure 49A – Time / Date Screen

Step 3

On the Date Edit screen **(Fig.50)** press the Next button to move between the various digits and the Up / Down buttons to increase or decrease the Time. Once the Date has been set press the Accept button to accept the Date and this would return back to the Time / Date screen **(Fig.49A).**

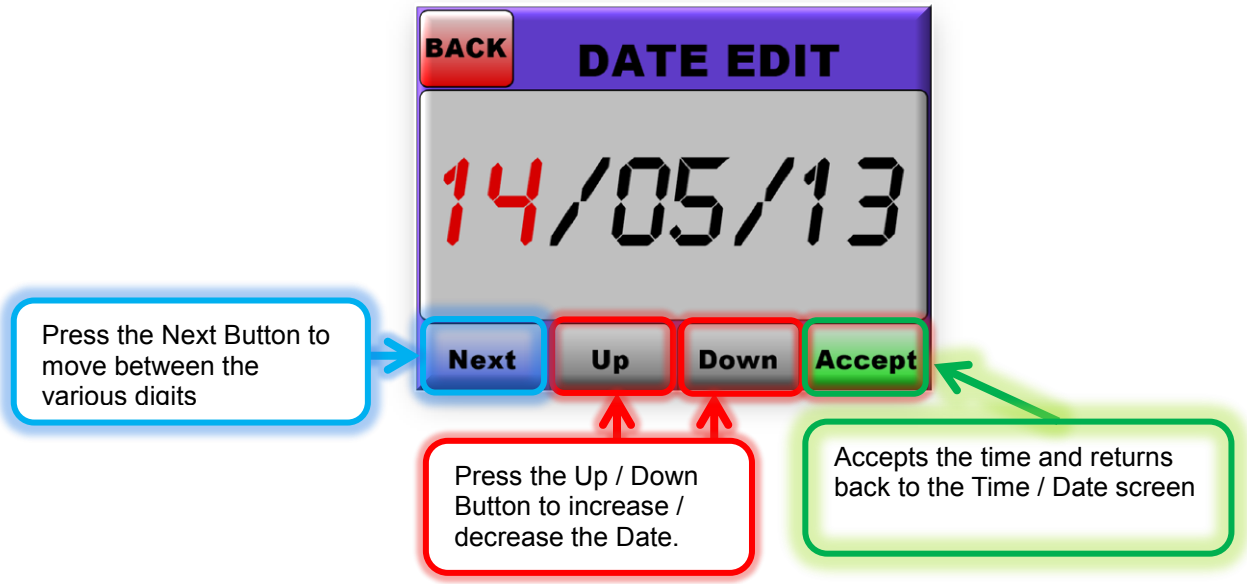


Figure 50 – Date Edit Screen

Step 4

From the Time / Date Screen **(Fig.51)** press the Back button to go back to the Settings Menu screen **(Fig.51A) (1)**. From the Settings Menu screen **(Fig.51A)** Press the Menu button to go back to the Main Menu screen **(Fig.51B) (2)**. From the Main Menu **(Fig.51B)** screen press the Back button to go back to the Real Time screen **(Fig.51C**) **(3)**. On the Real Time screen **(Fig.51C)** ensure the Date has been set correctly on the LCD Screen **(4)**.

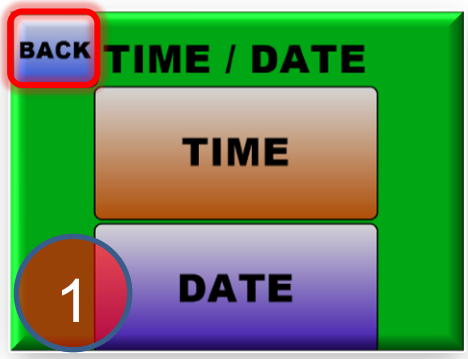


Figure 51 – Time / Date Screen

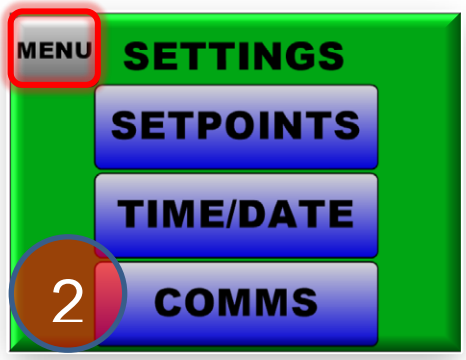


Figure 51A – Settings Menu Screen

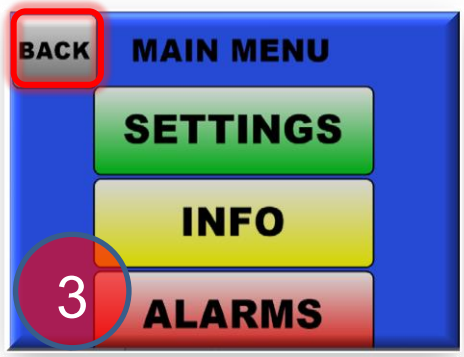


Figure 51B – Main menu

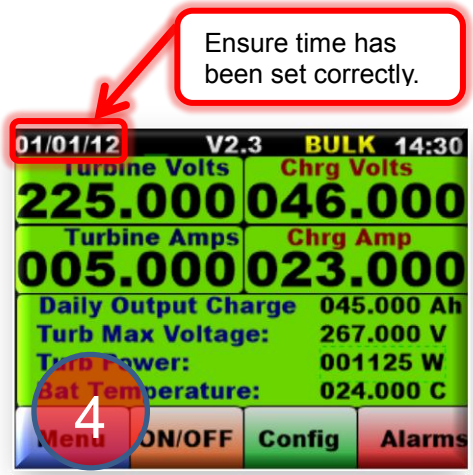


Figure 51C – Real Time Screen

10.13 COMMUNICATION INFORMATION

The Comms / Connections Info displays all relevant information with which the TURBOMAX Unit communicates with external devices on any network.

The Connections Info screen **(Fig.52**) can be accessed from the Setting's Menu **(Fig.14)** by pressing the Comms Button. This screen can also be accessed by pressing the Green Config Button from the Real Time Screen **(Fig.12**). The communication information screen will display CAN and MODBUS addresses of each unit. It also informs the user whether the unit is a Master or Slave.

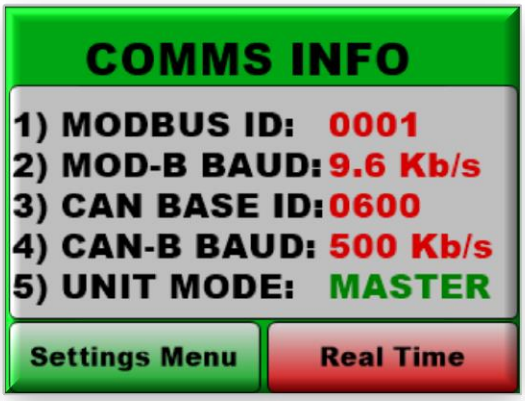


Figure 52- Can Bus Info Screen

10.14 UNIT INFORMATION SCREEN

From the Main Menu Screen (**Fig.12**) press the Info Button. This will go to the Unit Info Screen **(Fig.53**). The Unit Info Screen can also be accessed from the Real Time Screen (**Fig.12**) by pressing the Yellow Info Button.

Unit Info displays all relevant System Information relating to the TURBOMAX Unit. The information displayed on the Info Screen page consists of:

- **Serial Number**
- **Product Model Number**
- **Hardware Version**
- **Firmware Version**
- **Battery Nominal Voltage**
- **Status Code A (For Internal Use Only)**
- **Status Code B (For Internal Use Only)**

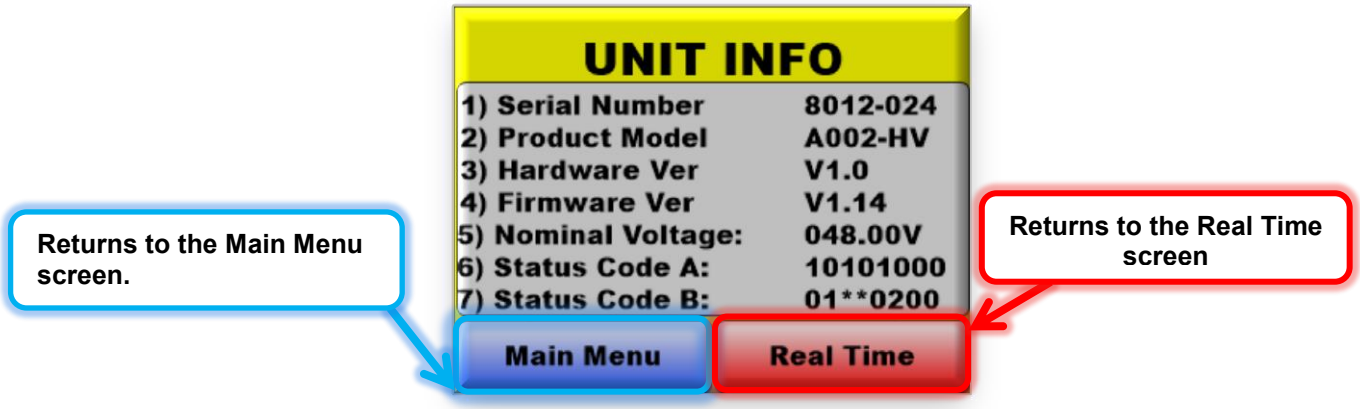


Figure 53- Unit Info Screen

To return back to the Main Menu from the Unit Info Screen press the Main Menu Button. And to go back to the Real Time Screen press the Real Time button on the Info Screen page.

10.15 ALARMS / RESET

To check the status of a system alarms press the Alarms button from the Real Time Screen **(Fig.12)** or from the Main Menu Screen **(Fig.13**). This will take you to the Alarms Screen **(Fig.54)** where all the status of any active alarms will be displayed.

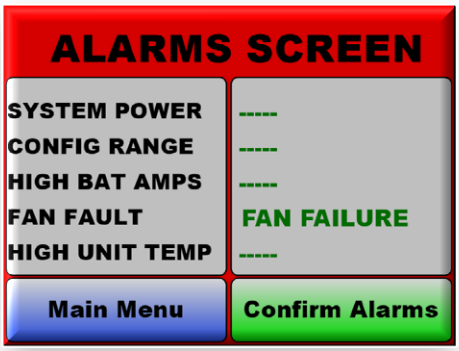


Figure 54- Alarms Screen

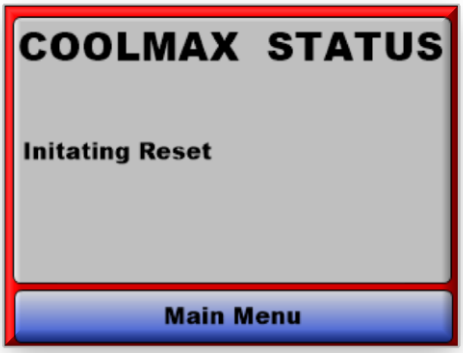


Figure 54A- Notification Screen

Press the Confirm Alarms Button to enable the TURBOMAX Unit to try and reset the system to clear the alarms. The Notification Screen **(Fig.54A**) will be shown as it displays the reset status of the TURBOMAX System. Pressing the Main Menu Button will not reset the alarms and return the user to the Main Menu. If the Alarm still exists after the TURBOMAX System reboots please contact AERL technical support on advice on how to fix or remove the cause of the alarm.

Important

Even if there are no alarms just pressing the confirm alarms button **(Fig.54)** will reset the TURBOMAX unit.

Information

When critical errors occur that causes the output to be shut down the Alarms button on the Real Time Screen **(Fig.55)** will start to flash. Press the Confirm Alarms button **(Fig.55A)** to reset the unit and try and rectify the alarms. If the Alarm still exists after the TURBOMAX System reboots please contact AERL technical support on advice on how to fix or remove the cause of the alarm.

NOTE: Listen for the Fan Noise while the TURBOMAX Unit Resets to indicate a successful reboot.

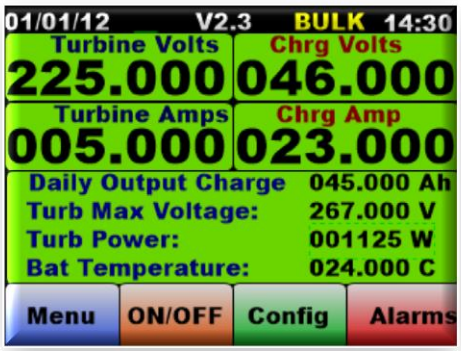


Figure 55 – Real Time Screen

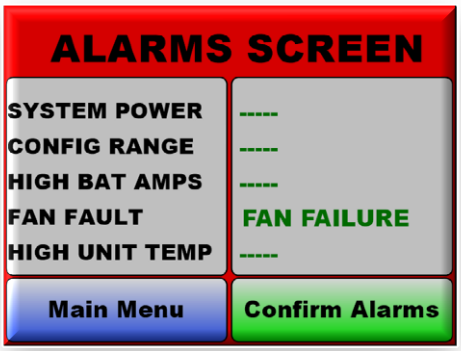


Figure 55A – Alarms Screen

11 LCD POWER SAVING FEATURE

The TURBOMAX unit is fitted with a power saving feature where the LCD Screen dims after 40 Seconds. This results in the TURBOMAX unit consuming just 10watts of power once the LCD Screen has been dimmed. To enable the backlight for the LCD Screen to turn back on, just touch the LCD Screen. The dim light function cannot be disabled completely. This power saving feature enables customers to differentiate between a unit that is not powered and a unit whose screen has been dimmed to save power.

12 OUTPUT CHARGE POWER SWITCH

The TURBOMAX MAXIMIZER unit is fitted with an ON/OFF button to enable or disable the charge output or when required to be turned off during regular maintenance. The ON/OFF button is located at the bottom of the Main Menu screen

Caution

To prevent the possibility of damaging the unit or the battery system it is advisable to turn off the output charge using the ON/OFF button during regular maintenance or when adjusting the charge profile.

12.1 BATTERY CHARGE POWER TURN ON

When the unit is first turned on, output battery charge power is disabled. To activate output battery charges press the ON/OFF button at the bottom of the Main Menu Screen **(Fig.56)**. This goes to the Output Control screen which shows the output is OFF **(Fig.56A)**. Press the Enable Output button on the Output Control screen **(Fig.56A)** to turn Battery Charge Power on and wait till the Output Control screen shows the Output is Now ON **(Fig.56B)**. Press the Back button to go back to the Main Menu screen.



Figure 56 – Main Menu Screen

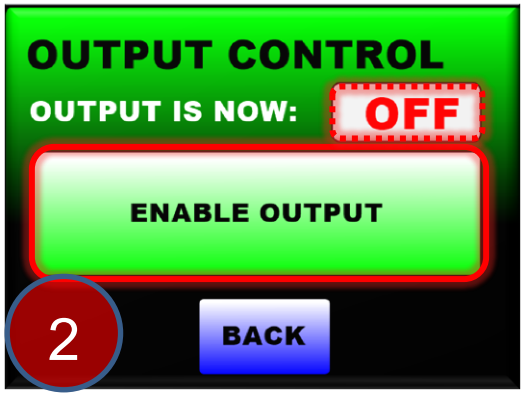


Figure 56A – Output Control Screen

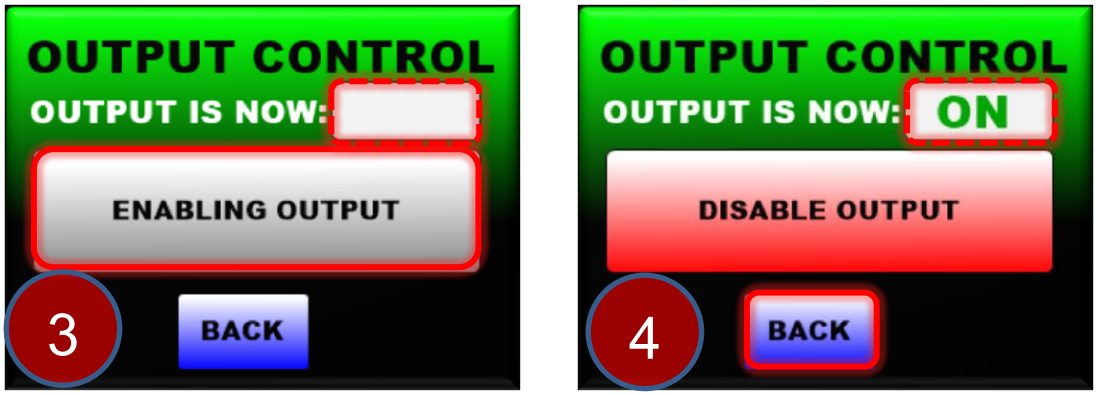


Figure 56B – Enabling Output

Important

Output will only be enabled once manually enabled by the user. It is highly recommended that the output is disabled before any maintenance work is done on the batteries.

12.2 BATTERY CHARGE POWER TURN OFF

To turn the Battery Charge Power off, press the ON/OFF button at the bottom of the Main Menu Screen **(Fig:57).** This goes to the Output Control Screen which shows the Output is Now ON **(Fig.57A).** Press the Disable Output button on the Output Control screen **(Fig.57A)** to turn the Battery Charge Power off and wait till the Output Control screen shows the Output is Now OFF **(Fig.57B)**. Press the Back button to go back to the Main Menu screen.

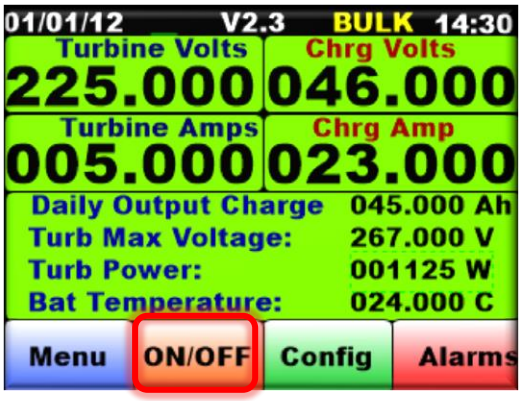


Figure 57 – Main Menu Screen



Figure 57A – Output Control Screen

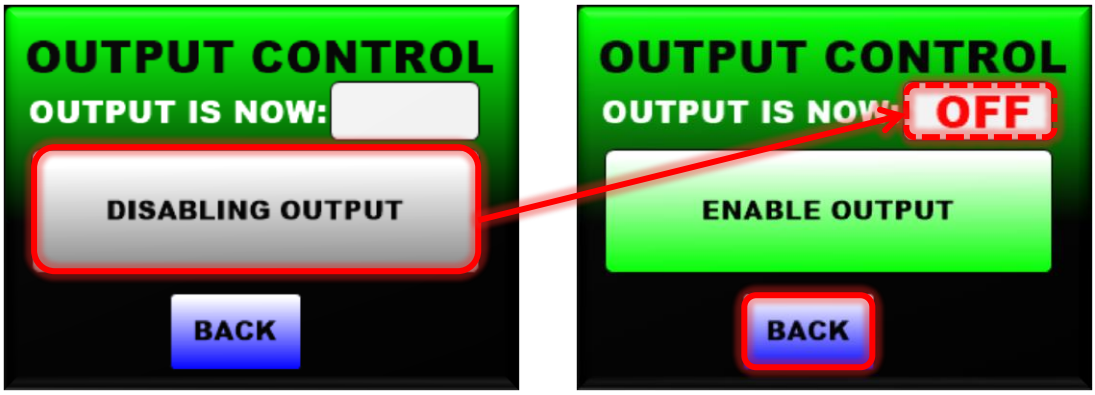


Figure 57B – Disabling Output

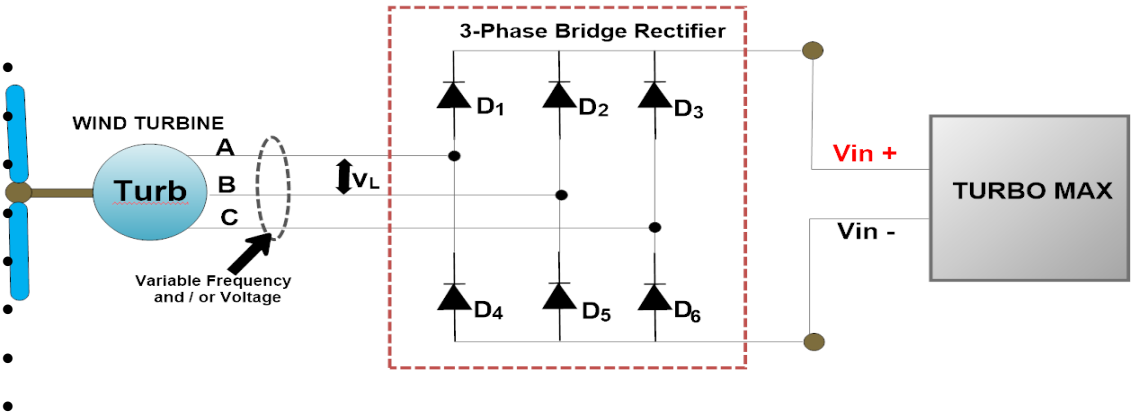
Information

Prior to adjusting any charge profile settings or prior to reconnecting output or input breakers that have tripped or if performing any maintenance on the battery system, it is essential to turn off the TURBOMAX Battery Charge Output.

13 RECTIFIER WIRING CONFIGURATION

13.1 WIRING CONFIGURATION WITH 3-PHASE BRIDGE RECTIFIER

The TURBOMAX is a DC voltage controller, meaning that the input and output of the controller are DC Voltages. Most Wind Turbines have a three phase AC Voltage output, hence requiring a three phase Bridge Rectifier. Below is a wiring diagram indicating the typical wiring configuration of a three phase bridge rectifier sitting between the Wind Turbine and the TURBOMAX controller.



14 TROUBLESHOOTING

14.1 LOW BATTERY ALARM TRIGGERS OFTEN

This could indicate that the Turbine system is underpowered, never allowing the batteries to reach a full 108% equalise value. The battery life will be severely compromised in this situation. Having a better understanding of the average wind speeds in the area will give a better indication of how to set the system up accordingly.

Solution: The MP Voltage might be set to high on the unit. Adjusting the MP Voltage point to a lower value can make the TURBOMAX more efficient over a larger wind speed range.

If the MP voltage has been adjusted, but the alarm is activated frequently check that the TURBOMAX SR is set up for the correct voltage of the battery pack. See adjusting the battery float voltage. Also check that the TURBOMAX is charging the battery by checking the Real Time Screen **(Fig.12)**. If the TURBOMAX is not functioning, please contact technical support.

14.2 BATTERY BANK USING EXCESSIVE WATER (ELECTROLYTE)

The battery bank is lightly loaded compared to the input power and rarely comes off float voltage.

See Section 10 to adjust the Charge Profile

15 APPENDIX A – CAN COMMUNICATIONS PROTOCOL

15.1 OVERVIEW

15.1.1 Hardware

The CAN hardware interface used is compatible with the CAN 2.0B standard. The supported bit rates (bits per second) are 1 Mbps, 500 kbps (default), 250 kbps, 125 kbps, 100 kbps and 50 kbps.

15.1.2 Software

The CAN protocol uses data frames for most communication. Remote frames are also enabled. All measurement data is transmitted using IEEE single-precision 32-bit format (IEEE 754) with most significant byte (MSB) sent first.

Bit Length	1	11	6	8 Bytes	16	2	7
	Start	Identifier	Control	Data Field	CRC	Ack	End

Figure 6 - CAN Data Frame

15.1.3 Identifier

The identifier field has been split into two sections for the TURBOMAX. Bits 10-5 contain the device identifier and bits 4-0 contains the message identifier associated with that device, as shown below.

10 – 5	4 – 0
DEVICE IDENTIFIER	MESSAGE IDENTIFIER

Figure 7 - CAN Device Identifier Address Format

15.1.4 Data Field

The data field in all frames is fixed at 8 bytes (64 bits) which allows space for two IEEE 754 32-bit floating point variables as shown in the Figure below. The data field is sent and expected to be received least significant byte first. This allows a direct overlay of a float [2] array and char [8] array on a little endian processor.

High float	Low float
s eeeeeeee mmmmmmmmmmmmmmmmmmmmmmm ^ ^ ^ ^ ^ 63 62 55 54 32	s eeeeeeee mmmmmmmmmmmmmmmmmmmmmmm ^ ^ ^ ^ ^ 31 30 23 22 0

Figure 8 - Format of a Data Field in a Data Frame

15.2 TURBOMAX BROADCAST MESSAGES

Data frames containing telemetry values are periodically broadcast onto the bus by the TURBOMAX.

15.2.1 Identification Information

ID: TURBOMAX Base Address + 0

Variable	Bits	Type	Description
Serial Number	63…32	Uint32	Device serial number, allocated at manufacture.
Product ID	31…0	Uint32	“A001” stored as a string.

15.2.2 Turbine Voltage/Current Measurement

ID: TURBOMAX Base Address + 1

Variable	Bits	Type	Description
Turbine Current	63…32	float	Turbine Current
Turbine Voltage	31…0	float	Turbine Voltage

15.2.3 Output Voltage/Current Measurement

ID: TURBOMAX Base Address + 2

Variable	Bits	Type	Description
Output Current	63…32	float	Output Current
Output Voltage	31…0	float	Output Voltage

15.2.4 Turbine Open Circuit Voltage/Output Charge Measurement

ID: TURBOMAX Base Address + 3

Variable	Bits	Type	Description
Output charge	63…32	float	Output charge
Turbine OC Voltage	31…0	float	Turbine OC Voltage

15.2.5 Turbine Power/Battery Temperature Measurement

ID: TURBOMAX Base Address + 4

Variable	Bits	Type	Description
Battery Temperature	63…32	float	Battery Temperature
Turbine Power	31…0	float	Turbine Power

15.2.6 Active Flags

ID: TURBOMAX Base Address + 5

Variable	Bits	Type	Description
Unused	63…13	-	-
Panel missing	12	Boolean	Input voltage indicates panel missing
Log file full	11	Boolean	Log file full
Maximizer fault	10	Boolean	Regulation or power stage fault
Bat temp sensor fault	9	Boolean	Battery temperature sensor fault
Not used	8	Boolean	-
Not used	7	Boolean	-
Hi bat temp	6	Boolean	High battery temp fault
Bat current	5	Boolean	High battery discharge current fault
Iout fault	4	Boolean	High output current fault
Vout high fault	3	Boolean	High output voltage fault
Not used	2	-	-
Vout low fault	1	Boolean	Low output voltage fault
Vout low warning	0	Boolean	Low output voltage warning

15.2.7 Time

ID: TURBOMAX Base Address + 7

Variable	Bits	Type	Description
Time	63…0	Uint64	System Unix time

15.3 TURBOMAX COMMAND MESSAGES

15.3.1 Reset Command

ID: Driver Controls Base Address + 23

Variable	Bits	Units	Description
Unused	63…32	Unit32	-
Reset command string ALL – full reset RCO – remote config reset	31…0	Uint32	Send 'ALL' or 'RCO' as a string (“00000ALL”) TURBOMAX replies with Y or N in byte 0

16 APPENDIX B – MODBUS COMMUNICATIONS PROTOCOL

16.1 OVERVIEW

16.1.1 Hardware

The Modbus hardware interface used is compatible with the Modbus RTU standard. The supported bit rates (bits per second) is 9600 bps.

Software

All measurement data is transmitted using IEEE single-precision 32-bit format (IEEE 754) with most significant byte (MSB) sent first.

16.1.2 Modbus Address

The Modbus address is a single byte field, valid address ranges from 1 to 128.

16.2 MODBUS MEMORY MAP (DISCRETE INPUTS)

Single−Bit (Read−Only)
Returns : 0 to 255 (***byte*** data type) 0x00 to 0xFF (i.e. 8 Bits)
Notes : When a request is sent to read a discrete input, a byte is returned containing the values of 8 consecutive inputs, with the addressed input as the LSB. If the returned input quantity is not a multiple of 8 bits, then the final data byte is padded with zeros.

Memory Offset	Input Address	Description	Input Range	Data Range	Read/Write	Comment
–	10000	–	–	–	–	–
0	10001	**ACTIVE EVENTS** System Power	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event

						Triggered
1	10002	**ACTIVE EVENTS** Low Out Voltage Warning	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
2	10003	**ACTIVE EVENTS** Low Out Voltage Fault	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
3	10004	**ACTIVE EVENTS** Low Out Voltage Gen−Set	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
4	10005	**ACTIVE EVENTS** High Out Voltage Fault	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
5	10006	**ACTIVE EVENTS** High Out Current Fault	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
6	10007	**ACTIVE EVENTS** High Discharge Current Fault	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
7	10008	**ACTIVE EVENTS** High Battery Temperature Fault	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
8	10009	**ACTIVE EVENTS** Input Breaker Open	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
9	10010	**ACTIVE EVENTS** Output Breaker Open	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
10	10011	**ACTIVE EVENTS** Temperature Sensor Fault	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
11	10012	**ACTIVE EVENTS** Negative PV Current Shutdown	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
Memory Offset	**Input Address**	**Description**	**Input Range**	**Data Range**	**Read/Write**	**Comment**
12	10013	**ACTIVE EVENTS** High PV Current Shutdown	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
13	10014	**ACTIVE EVENTS**	Bit	0 or 1	Read−Write	0 → Event

		High PV Voltage Shutdown				Cleared 1 → Event Triggered
14	10015	**ACTIVE EVENTS** High Output Current Shutdown	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
15	10016	**ACTIVE EVENTS** High Output Voltage Shutdown	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
16	10017	**ACTIVE EVENTS** Heat−Sink Temperature Too High	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
17	10018	**ACTIVE EVENTS** Fan Fault	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
18	10019	**ACTIVE EVENTS** Log File Full	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
19	10020	**ACTIVE EVENTS** Solar Panel Missing	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
20	10021	**ACTIVE EVENTS** Config Value Out−Of−Range	Bit	0 or 1	Read−Write	0 → Event Cleared 1 → Event Triggered
21	10022	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
22	10023	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
23	10024	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
24	10025	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
25	10026	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
26	10027	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
27	10028	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
Memory Offset	**Input Address**	**Description**	**Input Range**	**Data Range**	**Read/Write**	**Comment**
28	10029	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
29	10030	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
30	10031	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
31	10032	**ACTIVE EVENTS** (Not Used)	Bit	0 or 1	Read−Write	Reserved
32	10033	**STATUS –**	Bit	0 or 1	Read−Only	0 → CRC

		Configuration Factory Config CRC				Invalid 1 → CRC Valid
33	10034	**STATUS – Configuration** Factory Config Check	Bit	0 or 1	Read−Only	0 → Check Failed 1 → Check Passed
34	10035	**STATUS – Configuration** User Config CRC	Bit	0 or 1	Read−Only	0 → CRC Invalid 1 → CRC Valid
35	10036	**STATUS – Configuration** User Config Check	Bit	0 or 1	Read−Only	0 → Check Failed 1 → Check Passed
36	10037	**STATUS – Configuration** Event Config CRC	Bit	0 or 1	Read−Only	0 → CRC Invalid 1 → CRC Valid
37	10038	**STATUS – Configuration** Event Config Check	Bit	0 or 1	Read−Only	0 → Check Failed 1 → Check Passed
38	10039	**STATUS – Configuration** Telemetry Config CRC	Bit	0 or 1	Read−Only	0 → CRC Invalid 1 → CRC Valid
39	10040	**STATUS – Configuration** Telemetry Config Check	Bit	0 or 1	Read−Only	0 → Check Failed 1 → Check Passed
40	10041	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved
41	10042	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved
42	10043	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved
43	10044	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved
44	10045	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved
Memory Offset	**Input Address**	**Description**	**Input Range**	**Data Range**	**Read/Write**	**Comment**
45	10046	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved
46	10047	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved
47	10048	**STATUS – Statistics** (Not Used)	Bit	0 or 1	Read−Only	Reserved

48	10049	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
49	10050	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
50	10051	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
51	10052	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
52	10053	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
53	10054	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
54	10055	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
55	10056	**STATUS – Flags** (Not Used)	Bit	0 or 1	Read−Only	Reserved
56	10057	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
57	10058	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
58	10059	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
59	10060	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
60	10061	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
61	10062	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
62	10063	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
63	10064	**STATUS – Telemetry** (Not Used)	Bit	0 or 1	Read−Only	Reserved
64	10065	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved
65	10066	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved
66	10067	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved
67	10068	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved
Memory Offset	**Input Address**	**Description**	**Input Range**	**Data Range**	**Read/Write**	**Comment**
68	10069	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved
69	10070	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved

70	10071	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved
71	10072	**STATUS – Communications** (Not Used)	Bit	0 or 1	Read−Only	Reserved
72	10073	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
73	10074	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
74	10075	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
75	10076	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
76	10077	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
77	10078	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
78	10079	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
79	10080	**STATUS – Flash** (Not Used)	Bit	0 or 1	Read−Only	Reserved
80	10081	**STATUS – Control** Master / Slave	Bit	0 or 1	Read−Only	0 → Device is Master 1 → Device is Slave
81	10082	**STATUS – Control** Active Set−Point Mode	Bit	0 or 1	Read−Only	0 → Using Float Set−Point 1 → Using Bulk Set−Point
82	10083	**STATUS – Control** Control Mode	Bit	0 or 1	Read−Only	0 → MPPT 1 → Output Voltage 2 → Input Voltage 3 → Not Used
83	10084					
84	10085	**STATUS – Control** (Not Used)	Bit	0 or 1	Read−Only	Reserved
Memory Offset	**Input Address**	**Description**	**Input Range**	**Data Range**	**Read/Write**	**Comment**
85	10086	**STATUS – Control** (Not Used)	Bit	0 or 1	Read−Only	Reserved
86	10087	**STATUS – Control** (Not Used)	Bit	0 or 1	Read−Only	Reserved

87	10088	**STATUS – Control** (Not Used)	Bit	0 or 1	Read−Only	Reserved
88	10089	**STATUS – Safety** Shutdown State	Bit	0 or 1	Read−Only	0 → Shutdown 1 → Operating
89	10090	**STATUS – Safety** (Not Used)	Bit	0 or 1	Read−Only	Reserved
90	10091	**STATUS – Safety** (Not Used)	Bit	0 or 1	Read−Only	Reserved
92	10093	**STATUS – Safety** (Not Used)	Bit	0 or 1	Read−Only	Reserved
93	10094	**STATUS – Safety** (Not Used)	Bit	0 or 1	Read−Only	Reserved
94	10095	**STATUS – Safety** (Not Used)	Bit	0 or 1	Read−Only	Reserved
95	10096	**STATUS – Safety** (Not Used)	Bit	0 or 1	Read−Only	Reserved

MODBUS Memory Map (Input Registers)

16−Bit (Register)

Returns : 0 to 65535 (***unsigned short*** data type) 0x0000 to 0xFFFF (i.e. 2 x 8 Bits)

Notes : When a request is sent to read an input register, two bytes are returned for each register.
The result may be stored as an unsigned short data type.
Integers and Floating point values (32−bits) are stored over two registers.
Long values (64−bits) are stored over 4 registers.

Memory Offset	Register Address	Description	Register Range	Data Range	Read/Write	Comment
−	30000	−	−	−	−	−
0	30001	**LIVE TELEMETRY** Product ID (8 Characters)	16−Bits	0 to 65535	Read−Only	Product ID (Byte 1 − High) Product ID (Byte 2 − Low)
1	30002		16−Bits	0 to 65535	Read−Only	Product ID (Byte 3 − High) Product ID (Byte 4 − Low)
2	30003		16−Bits	0 to 65535	Read−Only	Product ID (Byte 5 − High) Product ID (Byte 6 − Low)
3	30004		16−Bits	0 to 65535	Read−Only	Product ID (Byte 7 − High)

						Product ID (Byte 8 − Low)
4	30005	**LIVE TELEMETRY** Serial Number (8 Characters)	16−Bits	0 to 65535	Read−Only	Serial # (Byte 1 − High) Serial # (Byte 2 − Low)
5	30006		16−Bits	0 to 65535	Read−Only	Serial # (Byte 3 − High) Serial # (Byte 4 − Low)
6	30007		16−Bits	0 to 65535	Read−Only	Serial # (Byte 5 − High) Serial # (Byte 6 − Low)
7	30008		16−Bits	0 to 65535	Read−Only	Serial # (Byte 7 − High) Serial # (Byte 8 − Low)
8	30009	**LIVE TELEMETRY** PV Voltage (Volts) (Float)	16−Bits	0 to 65535	Read−Only	PV Voltage (Byte 1 − High) PV Voltage (Byte 2 − Low)
9	30010		16−Bits	0 to 65535	Read−Only	PV Voltage (Byte 3 − High) PV Voltage (Byte 4 − Low)
10	30011	**LIVE TELEMETRY** PV Current (Amps) (Float)	16−Bits	0 to 65535	Read−Only	PV Current (Byte 1 − High) PV Current (Byte 2 − Low)
11	30012		16−Bits	0 to 65535	Read−Only	PV Current (Byte 3 − High) PV Current (Byte 4 − Low)
12	30013	**LIVE TELEMETRY** Output Voltage (Volts) (Float)	16−Bits	0 to 65535	Read−Only	Out Voltage (Byte 1 − High) Out Voltage (Byte 2 − Low)
13	30014		16−Bits	0 to 65535	Read−Only	Out Voltage (Byte 3 − High) Out Voltage (Byte 4 − Low)
14	30015	**LIVE TELEMETRY** Output Current (Amps) (Float)	16−Bits	0 to 65535	Read−Only	Out Current (Byte 1 − High) Out Current (Byte 2 − Low)
15	30016		16−Bits	0 to 65535	Read−Only	Out Current (Byte 3 − High) Out Current (Byte 4 − Low)
16	30017	**LIVE TELEMETRY** PV Open−Circuit Voltage (Volts) (Float)	16−Bits	0 to 65535	Read−Only	OC Voltage (Byte 1 − High) OC Voltage (Byte 2 − Low)
17	30018		16−Bits	0 to 65535	Read−Only	OC Voltage (Byte 3 − High) OC Voltage (Byte 4 − Low)
18	30019	**LIVE TELEMETRY** Daily Output Charge (Ah) (Float)	16−Bits	0 to 65535	Read−Only	Out Charge (Byte 1 − High) Out Charge (Byte 2 − Low)
19	30020		16−Bits	0 to 65535	Read−Only	Out Charge (Byte 3 − High) Out Charge (Byte 4 − Low)
20	30021	**LIVE TELEMETRY** Photovoltaic Power (W) (Float)	16−Bits	0 to 65535	Read−Only	PV Power (Byte 1 − High) PV Power (Byte 2 − Low)
21	30022		16−Bits	0 to 65535	Read−Only	PV Power (Byte 3 − High) PV Power (Byte 4 − Low)

Memory Offset	Register Address	Description	Register Range	Data Range	Read/Write	Comment
22	30023	**LIVE TELEMETRY** Case Temperature (°C) (Float)	16−Bits	0 to 65535	Read−Only	Out Current (Byte 1 − High) Out Current (Byte 2 − Low)
23	30024		16−Bits	0 to 65535	Read−Only	Out Current (Byte 3 − High) Out Current (Byte 4 − Low)
24	30025	**LIVE TELEMETRY**	16−Bits	0 to 65535	Read−Only	Active Events (Byte 1 −

		Active Events (Uint32)				High) Active Events (Byte 2 − Low)
25	30026		16−Bits	0 to 65535	Read−Only	Active Events (Byte 3 − High) Active Events (Byte 4 − Low)
26	30027	**LIVE TELEMETRY** Status Flags (UInt64)	16−Bits	0 to 65535	Read−Only	Status Flags (Byte 1 − High) Status Flags (Byte 2 − Low)
27	30028		16−Bits	0 to 65535	Read−Only	Status Flags (Byte 3 − High) Status Flags (Byte 4 − Low)
28	30029		16−Bits	0 to 65535	Read−Only	Status Flags (Byte 5 − High) Status Flags (Byte 6 − Low)
29	30030		16−Bits	0 to 65535	Read−Only	Status Flags (Byte 7 − High) Status Flags (Byte 8 − Low)
30	30031	**LIVE TELEMETRY** Unix Time (UInt64)	16−Bits	0 to 65535	Read−Only	Unix Time (Byte 1 − High) Unix Time (Byte 2 − Low)
31	30032		16−Bits	0 to 65535	Read−Only	Unix Time (Byte 3 − High) Unix Time (Byte 4 − Low)
32	30033		16−Bits	0 to 65535	Read−Only	Unix Time (Byte 5 − High) Unix Time (Byte 6 − Low)
33	30034		16−Bits	0 to 65535	Read−Only	Unix Time (Byte 7 − High) Unix Time (Byte 8 − Low)
40	30041	**SYSTEM INFO** Hardware Version (8 Characters)	16−Bits	0 to 65535	Read−Only	Hardware Ver. (Byte 1 − High) Hardware Ver. (Byte 2 − Low)
41	30042		16−Bits	0 to 65535	Read−Only	Hardware Ver. (Byte 3 − High) Hardware Ver. (Byte 4 − Low)
42	30043		16−Bits	0 to 65535	Read−Only	Hardware Ver. (Byte 5 − High) Hardware Ver. (Byte 6 − Low)
43	30044		16−Bits	0 to 65535	Read−Only	Hardware Ver. (Byte 7 − High) Hardware Ver. (Byte 8 − Low)

Memory Offset	Register Address	Description	Register Range	Data Range	Read/Write	Comment
44	30045	**SYSTEM INFO** Firmware Version (8 Characters)	16−Bits	0 to 65535	Read−Only	Firmware Ver. (Byte 1 − High) Firmware Ver. (Byte 2 − Low)
45	30046		16−Bits	0 to 65535	Read−Only	Firmware Ver. (Byte 3 − High) Firmware Ver. (Byte 4 − Low)
46	30047		16−Bits	0 to 65535	Read−Only	Firmware Ver. (Byte 5 −

						High) Firmware Ver. (Byte 6 − Low)
47	30048		16−Bits	0 to 65535	Read−Only	Firmware Ver. (Byte 7 − High) Firmware Ver. (Byte 8 − Low)
48	30049	**SYSTEM INFO** Model Type (4 Characters)	16−Bits	0 to 65535	Read−Only	Model Type (Byte 1 − High) Model Type (Byte 2 − Low)
49	30050		16−Bits	0 to 65535	Read−Only	Model Type (Byte 3 − High) Model Type (Byte 4 − Low)
50	30051	**SYSTEM INFO** Product ID (8 Characters)	16−Bits	0 to 65535	Read−Only	Product ID (Byte 1 − High) Product ID (Byte 2 − Low)
51	30052		16−Bits	0 to 65535	Read−Only	Product ID (Byte 3 − High) Product ID (Byte 4 − Low)
52	30053		16−Bits	0 to 65535	Read−Only	Product ID (Byte 5 − High) Product ID (Byte 6 − Low)
53	30054		16−Bits	0 to 65535	Read−Only	Product ID (Byte 7 − High) Product ID (Byte 8 − Low)
54	30055	**SYSTEM INFO** Serial Number (8 Characters)	16−Bits	0 to 65535	Read−Only	Serial # (Byte 1 − High) Serial # (Byte 2 − Low)
55	30056		16−Bits	0 to 65535	Read−Only	Serial # (Byte 3 − High) Serial # (Byte 4 − Low)
56	30057		16−Bits	0 to 65535	Read−Only	Serial # (Byte 5 − High) Serial # (Byte 6 − Low)
57	30058		16−Bits	0 to 65535	Read−Only	Serial # (Byte 7 − High) Serial # (Byte 8 − Low)
58	30059	**SYSTEM INFO** Reserved	16−Bits	0 to 65535	Read−Only	Reserved
59	30060	**SYSTEM INFO** Reserved	16−Bits	0 to 65535	Read−Only	Reserved
60	30061	**SYSTEM INFO** Reserved	16−Bits	0 to 65535	Read−Only	Reserved
61	30062	**SYSTEM INFO** Reserved	16−Bits	0 to 65535	Read−Only	Reserved
62	30063	**SYSTEM INFO** Reserved	16−Bits	0 to 65535	Read−Only	Reserved
63	30064	**SYSTEM INFO** Reserved	16−Bits	0 to 65535	Read−Only	Reserved