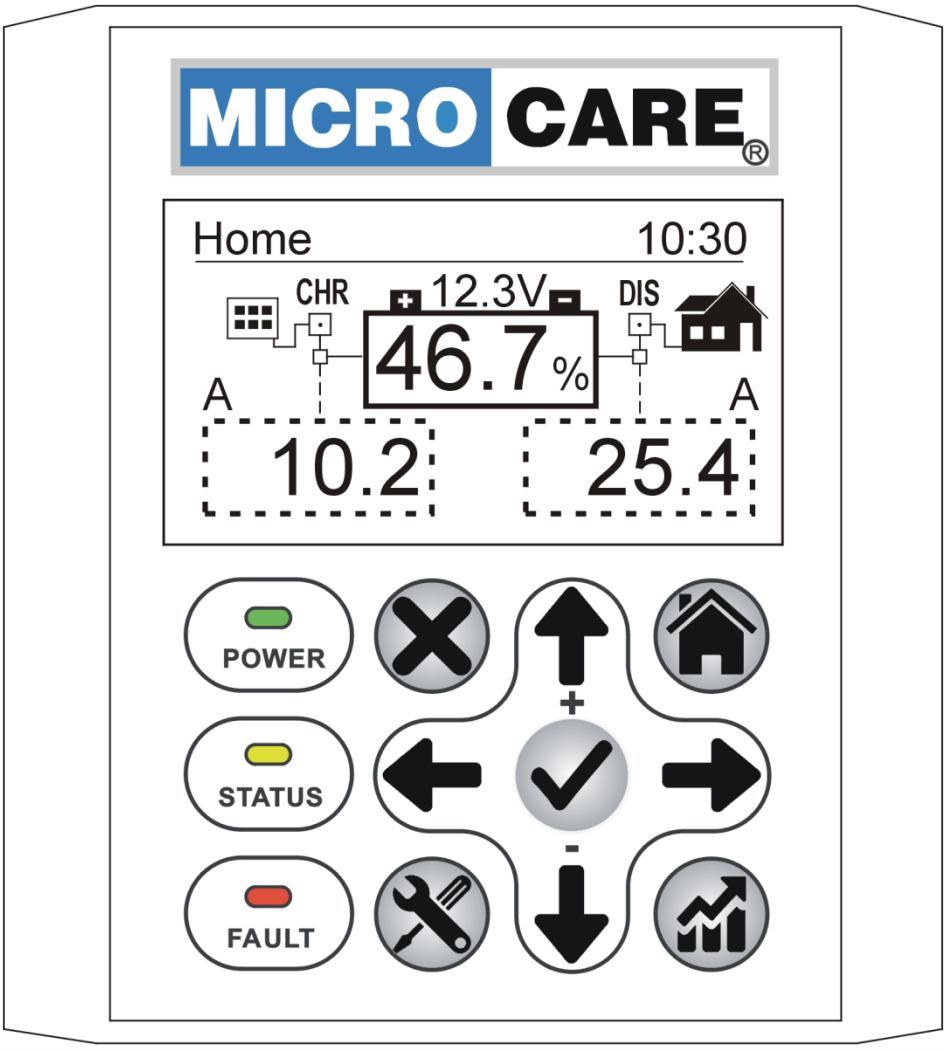
BATTERY MONITOR
User Manual



Manual Version: BM-2016-1-B

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INTRODUCTION

1.1 Product Description

The Microcare Battery Monitor is an All-In-One site management system which will monitor and control Microcare MPPT's and Inverters. The battery monitor will monitor up to 4 channels of sensors that will relay all aspects of your power generation and load requirements. This information is then used to accurately determine the condition of the battery and the remaining amp hours in the battery. All information is logged, and can be reviewed via the graphical display as logged entries or graphed screens.

1.2 Key Features

- Graphical user interface.
- Battery fuel gauge, fault finder, balance check.
- Load controller with prioritized load shedding.
- Load analyser with 2 years of Logged Data.
- Up to 4 sensors/channels can be used to monitor and control different loads or power generation sources.
- Can communicate with Microcare Inverters and MPPT's while operating as a remote display for these devices.
- Can be connected to the internet using the Microcare Web-Logger and viewed from our secure online server.
- Calculates battery capacity, according to Peukert's law.
- Battery bank voltage adjustable for 12, 24, 36, 48V.
- Current sense resolution 10MiliAmps – 400 Amps.
- 3 year warranty.

1.3 Versioning

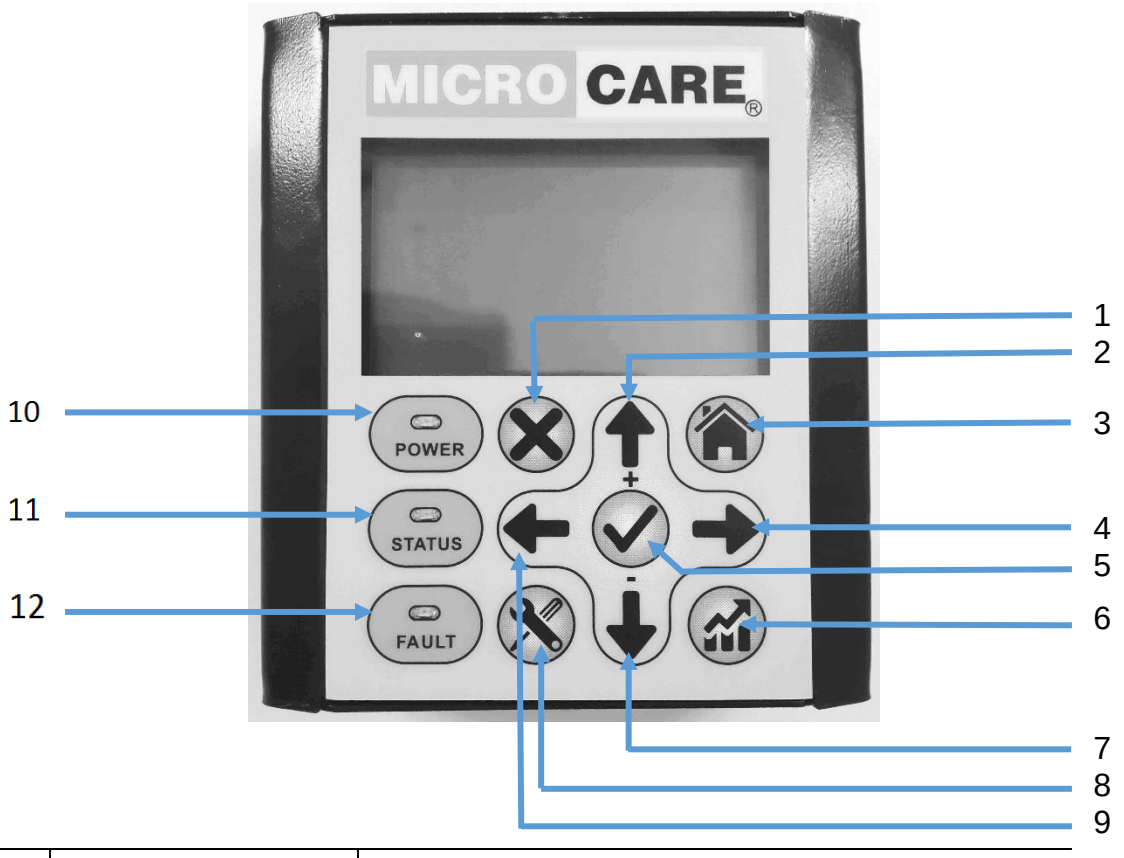
Please take note that this Manual is specifically for the following Battery Monitors. If your Battery Monitor has a newer software version than indicated below, please contact Microcare for an updated manual.

- Any Microcare Battery Monitor with Software of **V1R20** or older, EG. V1R19, V1R18.

Please refer to: Setup-Monitor-Information on Page 43 to identify the software version of your Battery Monitor.

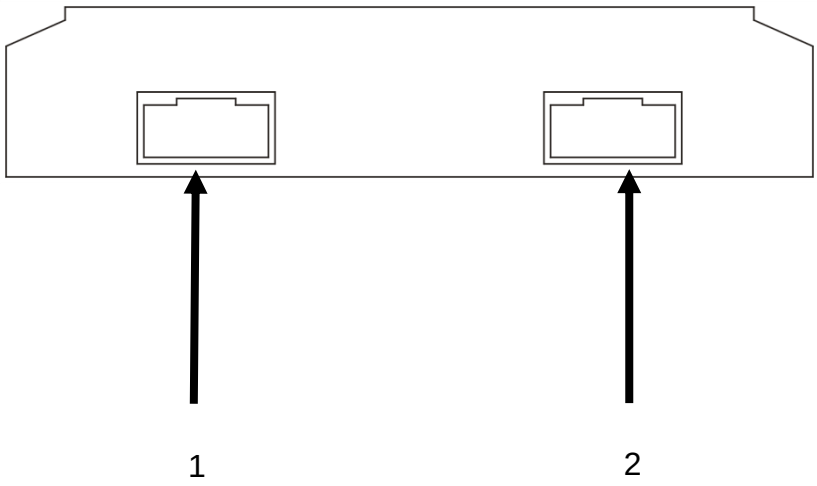
PRODUCT OVERVIEW

1.4 Battery Monitor Front Panel



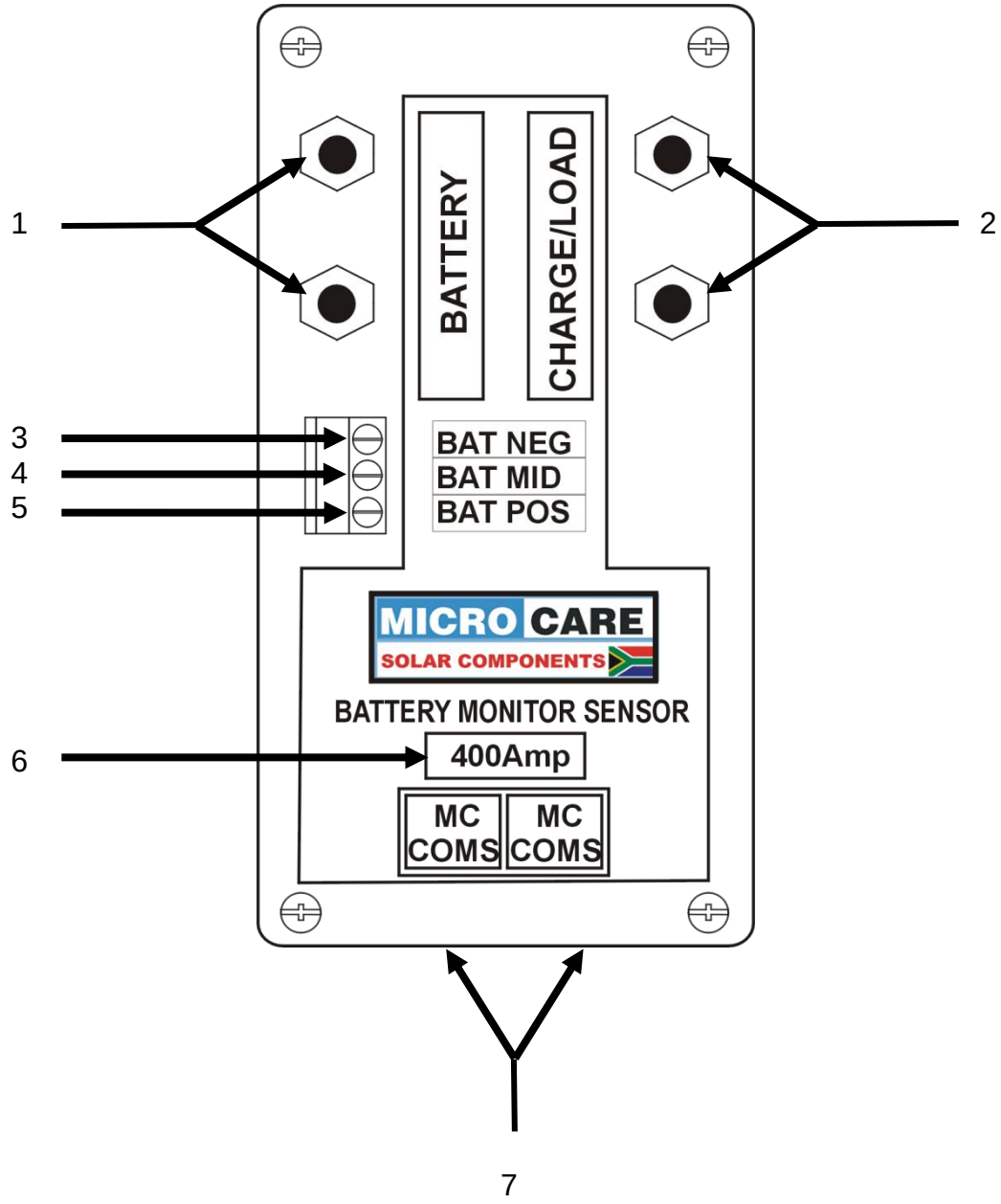
	Name		Function
1	Back	✖	Back / Cancel
2	Up Arrow	⬆	Change page, change date, select value or change value
3	Home Page	🏠	Home page
4	Right Arrow	➡	Select, change value or change screen
5	Select	✔	Select or change graph
6	Log	📈	Enter log or change graph
7	Down Arrow	⬇	Change page, change date, select value or change value
8	Settings	🛠	Enter settings
9	Left Arrow	⬅	Back, change value or change screen
10	Green LED (Power)		Flashing, indicates correct operation
11	Yellow LED (Status)		Indicates a change of battery monitor status, such as, relay's turning On or Off, UPS auto controlled or MPPT auto controlled.
12	Red LED (Fault)		Indicates warning or errors that need attention.

1.5 Battery Monitor Base



	Name	Function
1	MC – Coms Remote	Connects Microcare remote device (Inverter, MPPT or Web Logger)
2	MC – Coms Sense	Connects sensors and external relays

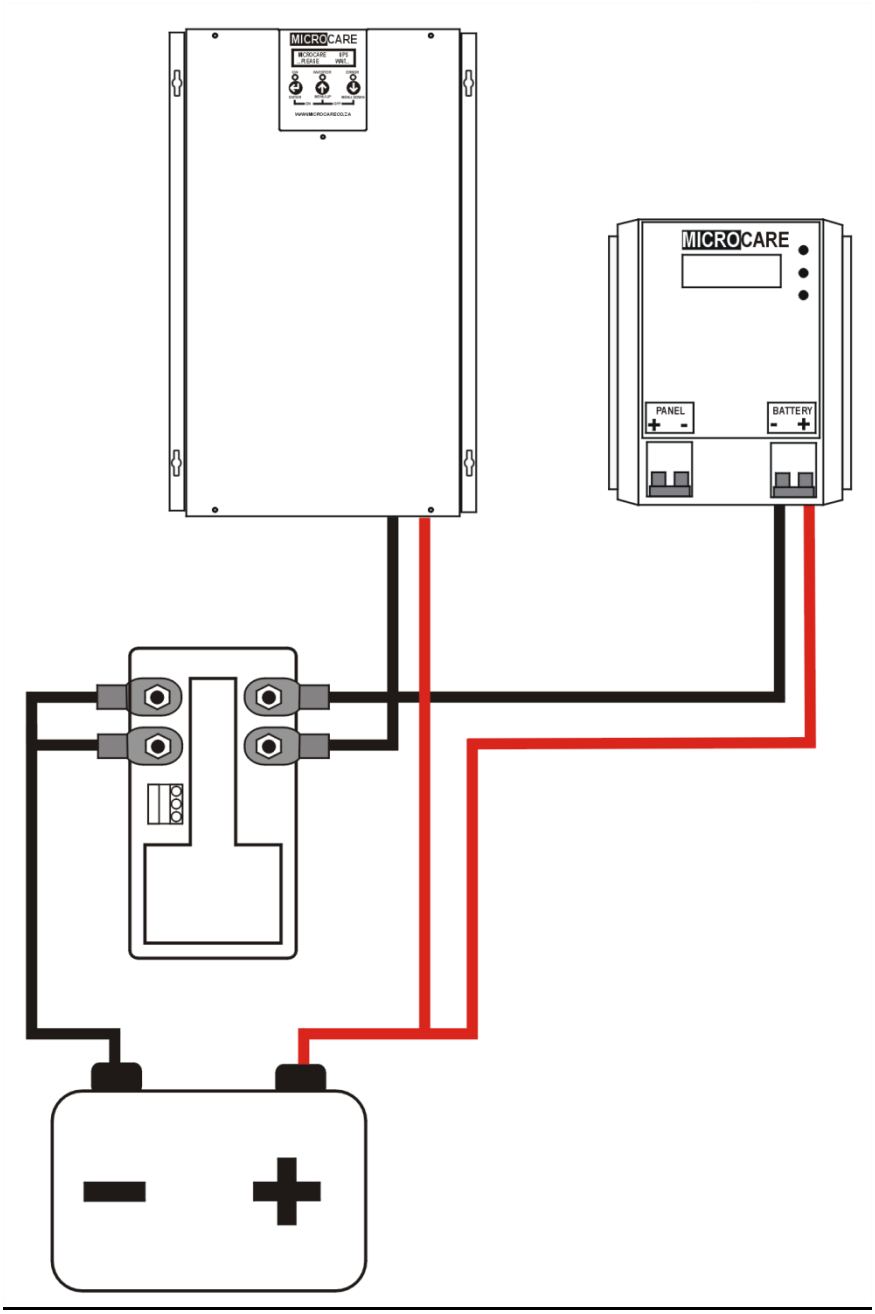
1.6 Battery Monitor Sensor



	Name	
1	Battery Connector	Should be connected to the battery bank negative terminal
2	Charge/Load Connector	Should be connected to the negative terminal of charge or load
3	Battery Negative Sense	Recommended wire size larger than 0.5mm.
4	Battery Midpoint Sense	
5	Battery Postitive Sense	
6	Sensor Size	Sensor Rating in Amps
7	MC Coms	

WIRING

1.7 Single Sensor Configuration



1.7.1 Single Sensor Configuration

In this configuration, there is a single sensor installed between the battery bank and any charge source (MPPT) or discharge load (Inverter). The sensor is installed with its battery indicated side connected to the negative terminal of the battery bank and its charge/load indicated side connected to all of the charges and loads negative terminals in the system.

Take Note: When using a battery to monitor always connect any charge or load through a sensor and not directly to the battery bank, as that information will be excluded from the battery monitors logging and calculation algorithm.

Advantages

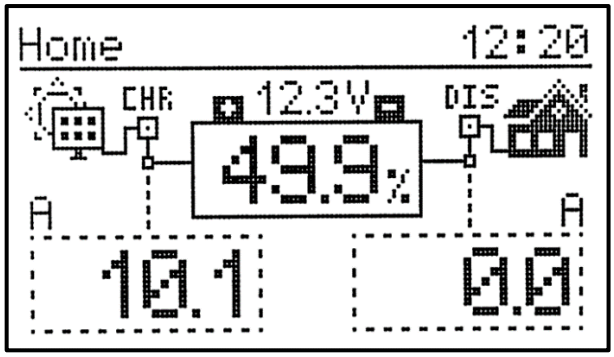
- Lowest possible cost.

Disadvantages

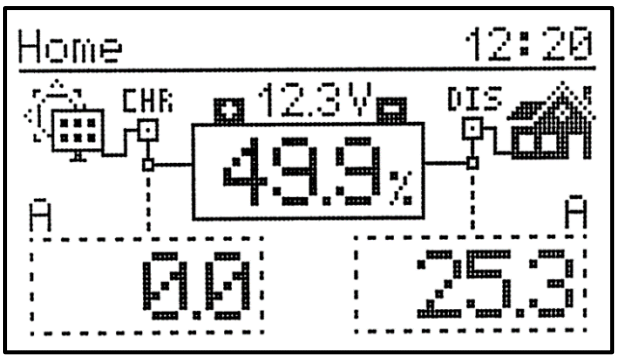
- Very limited in the amount of information that can be displayed.
- Does not allow user as much of an understanding of their system, compared to a more advanced configuration.
- Limited graphing information available.

In this configuration you will only be able to see the nett-total of charge or discharge of the battery.

When Charging

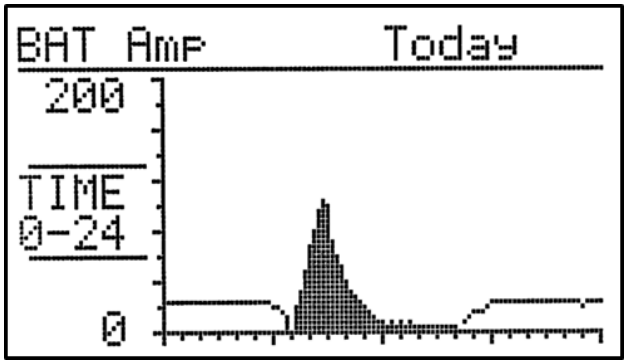


When Discharging

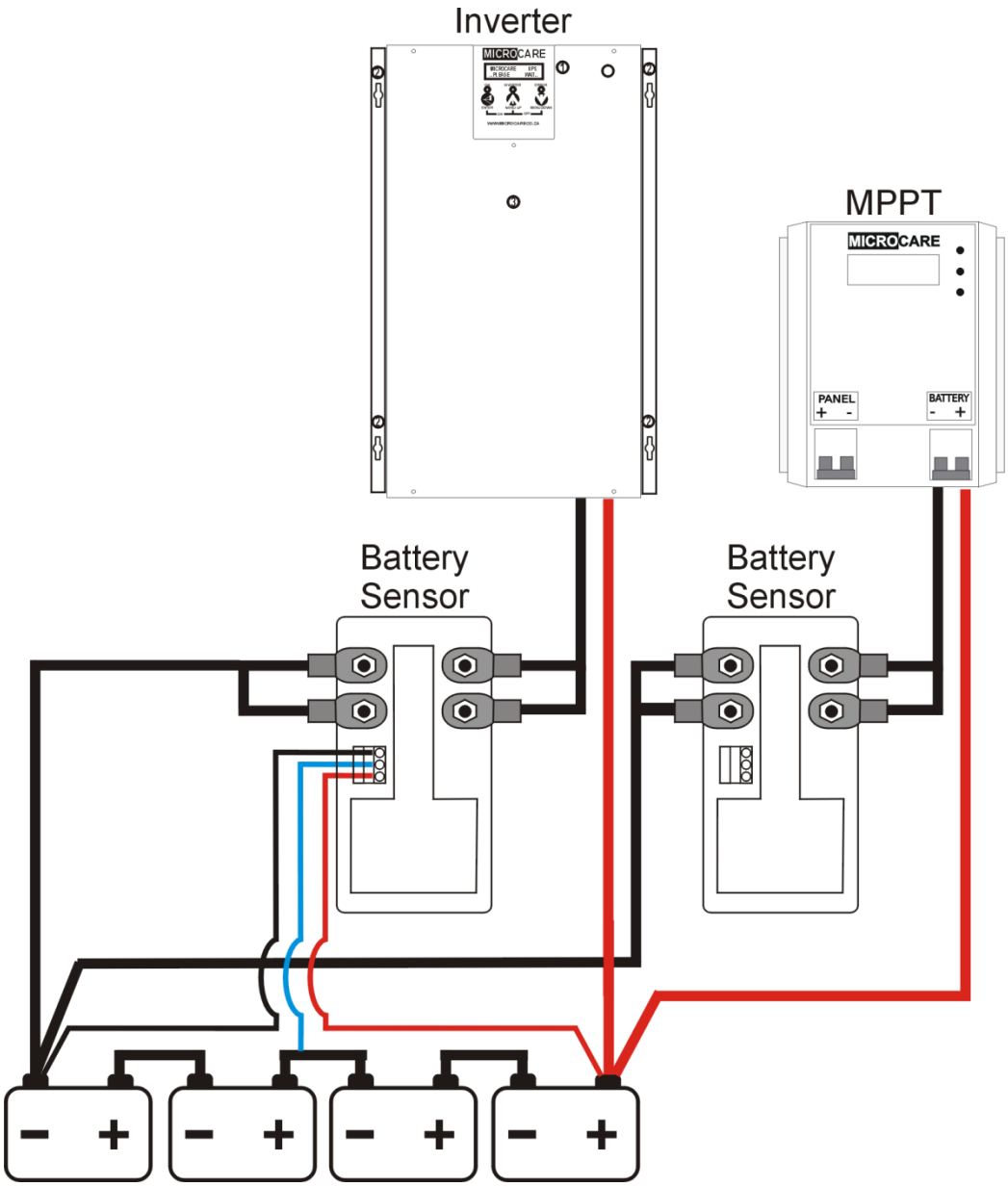


1.7.2 Graphs

In single sensor configuration you will either be able to see the power coming into the battery, or the power going out of the battery, not both at the same time.



1.8 Two Sensor Configuration



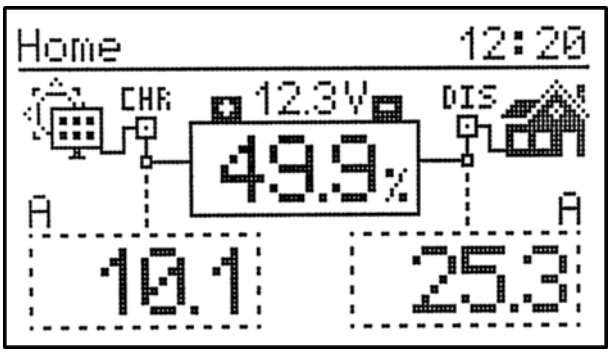
1.8.1 Two Sensor Configuration Explanation

In this configuration, there are two sensors installed. The first being installed between the battery bank and all charge source (MPPT), and the second being installed between the battery bank and all discharge loads (Inverter). The sensors are installed with the battery indicated side connected to the negative terminals of the battery bank and its charge/load indicated side connected to either the charge or load negative terminals respectively.

Advantages

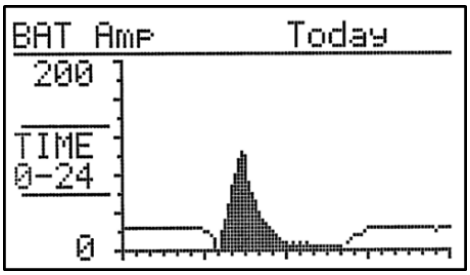
- More information that can be displayed, than on a single sensor configuration.
- Allows for better understanding of the system and its parameters, compared to a single sensor configuration.
- More graphing available compared to a single sensor configuration.

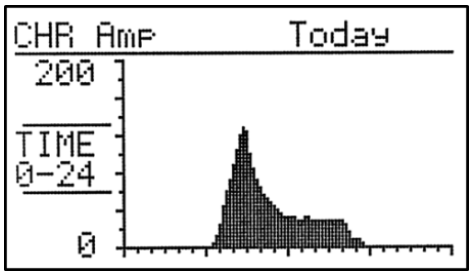
In this configuration you will be able to see charge and discharge of the battery simultaneously.

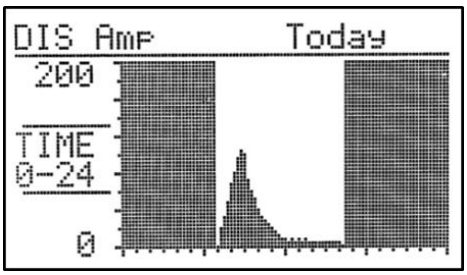


1.8.2 Graphs

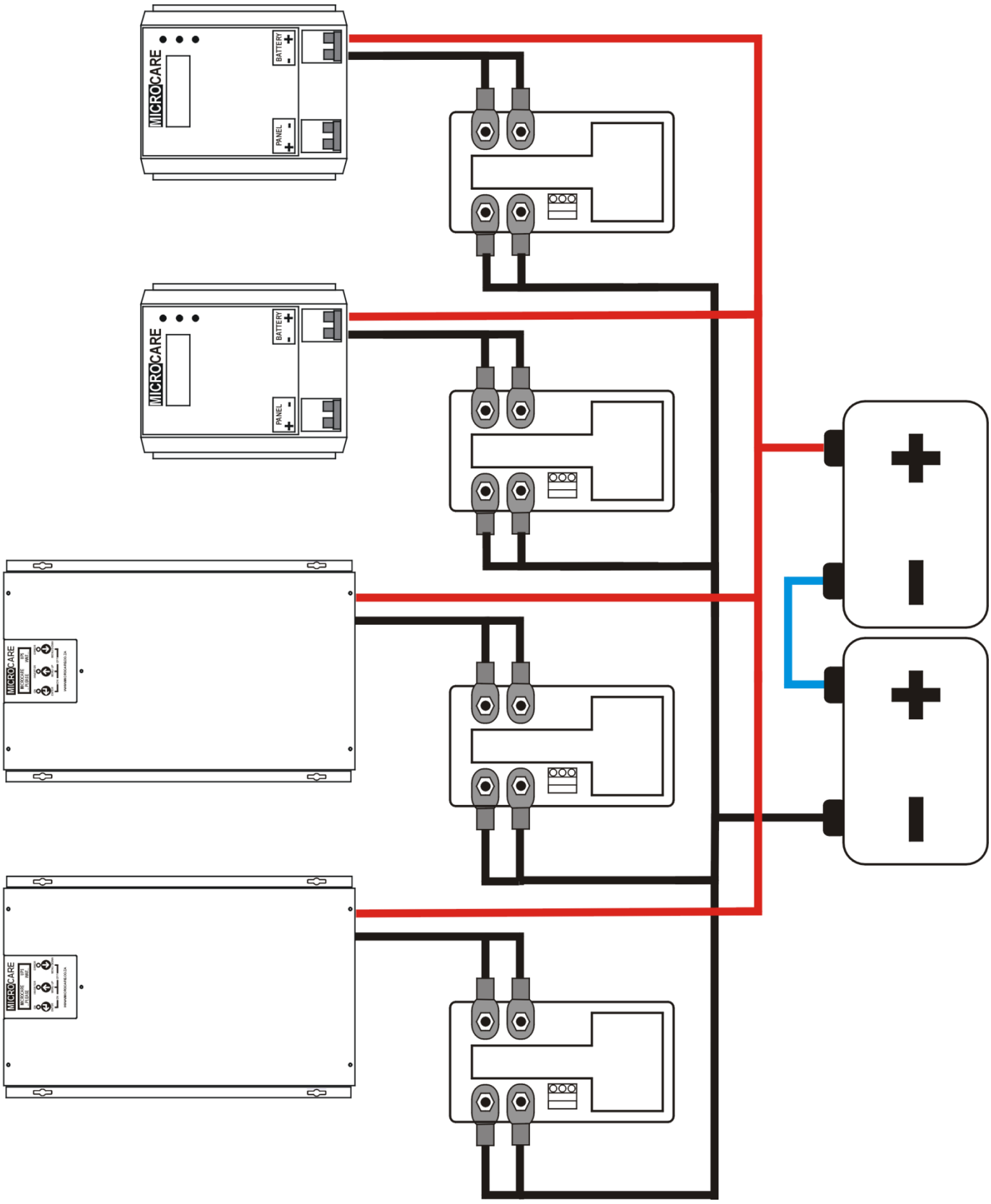
In this configuration now you will be able to see the power coming into the battery and the power going out of the battery separately.







1.9 Multiple Sensor Configuration



1.9.1 Multiple Sensor Configuration Explanation

In this configuration, there are multiple sensors installed. Sensors can be installed between:

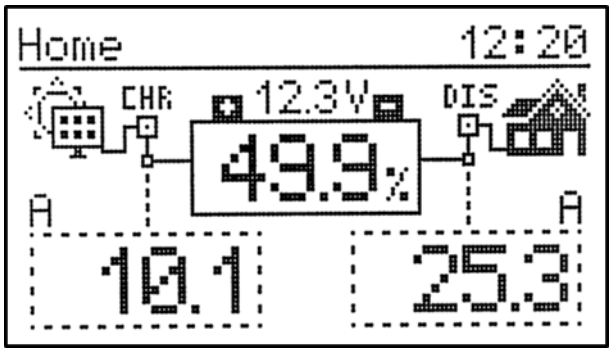
- The battery bank and all charge source (MPPT),
- The battery bank and all discharge loads (Inverter).

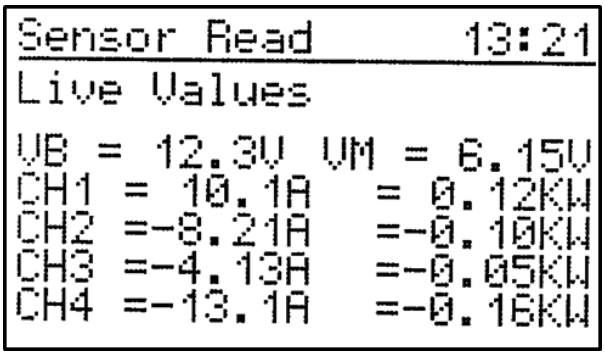
The sensors are installed with the battery indicated side connected to the negative terminals of the battery bank and its charge/load indicated side connected to either the charge or load negative terminals respectively.

Advantages

- Larger of information that can be displayed, than on a single or two sensor configuration.
- Allows user for better understanding of the system and its parameters, compared to a single or a two sensor configuration.
- More graphing available, compared to a single or a two sensor configuration.

In this configuration you will be able to see, charge and discharge of the battery simultaneously.

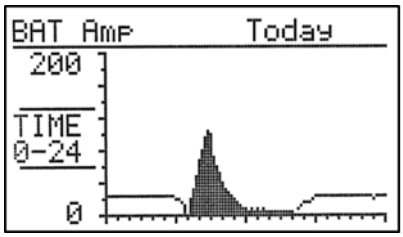


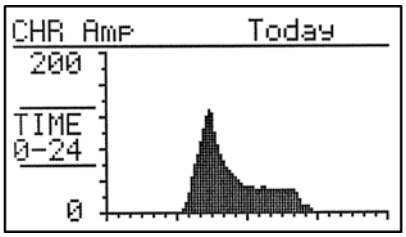


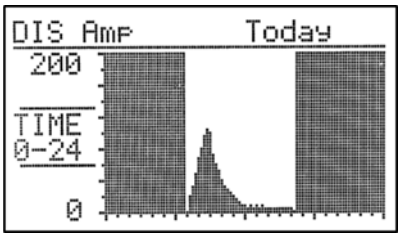
1.9.2 Graph

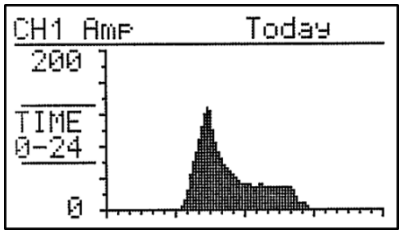
In this configuration you will be able to see the power coming into the battery and the power going out of the battery separately, as well as all currents on all individual channels.

For Example: Charge from different MPPT's or loads to multiple inverters.

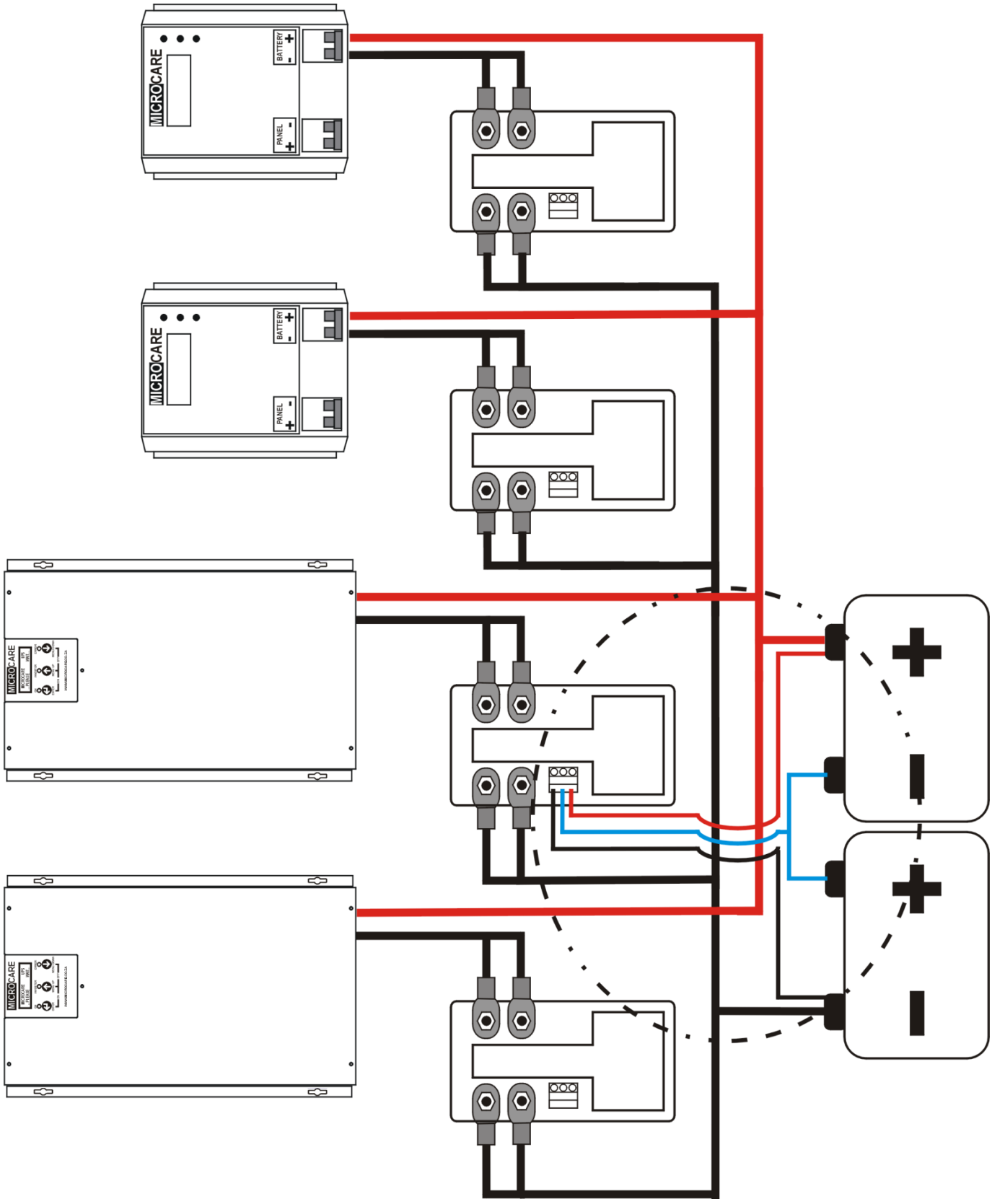








1.10 Battery Monitor, Power and Midpoint Wiring

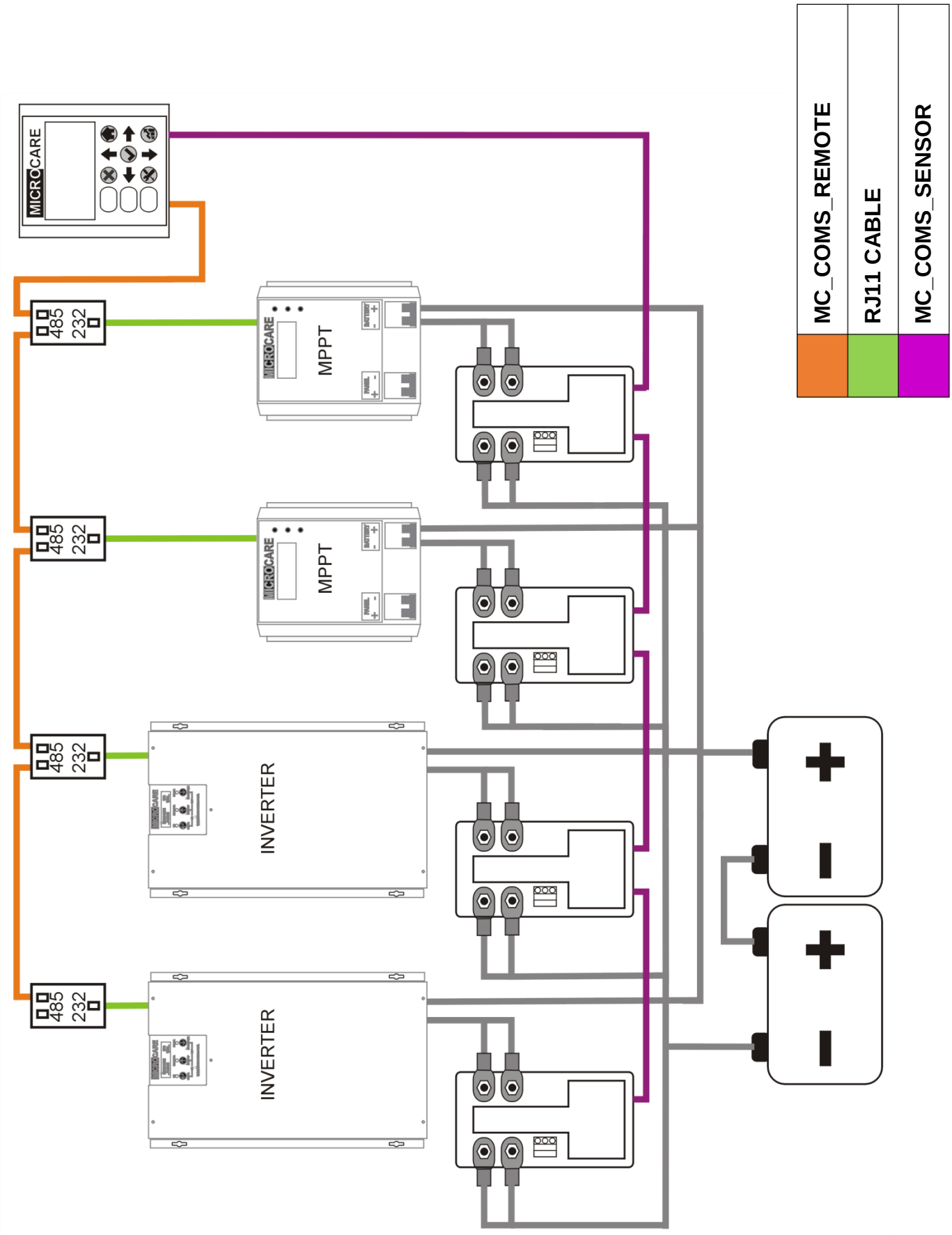


1.10.1 Battery Monitor, Power and Midpoint Wiring Explanation

The battery positive, battery negative and battery midpoint must be wired from the battery bank to any one of the battery monitors sensors (Take Note: Only one). Preferably the sensor that would facilitate the shortest possible cable lengths.

No other cables should be wired from the battery monitor sensor as this can affect the sensor accuracy. Other connections such as the Microcare Web-Logger should obtain their power connections directly from the battery.

1.11 Communication Wiring



1.11.1 Communication Wiring for MC_COM_SENSOR Explanation

The MC_COMS SENSOR connection as indicated by the purple wire on the “Communication Wiring” diagram is a daisy-chained communication connection facilitated by the RJ45 straight-cable. Communications pass through all sensors and relays without any particular direction require, for this reason, the orientation of the devices does not matter as long as all devices are connected to each other with the communication ending into the MC_COMS_SENSOR port located on the right side of the battery monitor.

1.11.2 Communication Wiring for MC_COMS_REMOTE Explanation

The MC_COMS_REMOTE connection as indicated by the orange wire on the communication wiring diagram, is a daisy-chained connection facilitated by the RJ45 straight-cable. Communication passes through all Microcare Inverters, Microcare MPPT’s and the Microcare Web-logger without any particular direction required, for this reason, the orientation of the devices does not matter as long as all devices are connected to each other with the communication ending into the MC_COMS_REMOTE port located on the left side of the battery monitor.

(For all Microcare products that have the RJ11 connection, the 232 to 485 converter is required in order to communicate with the battery monitor)

1.11.3 Communication Wiring for 232 to 485 converter Explanation

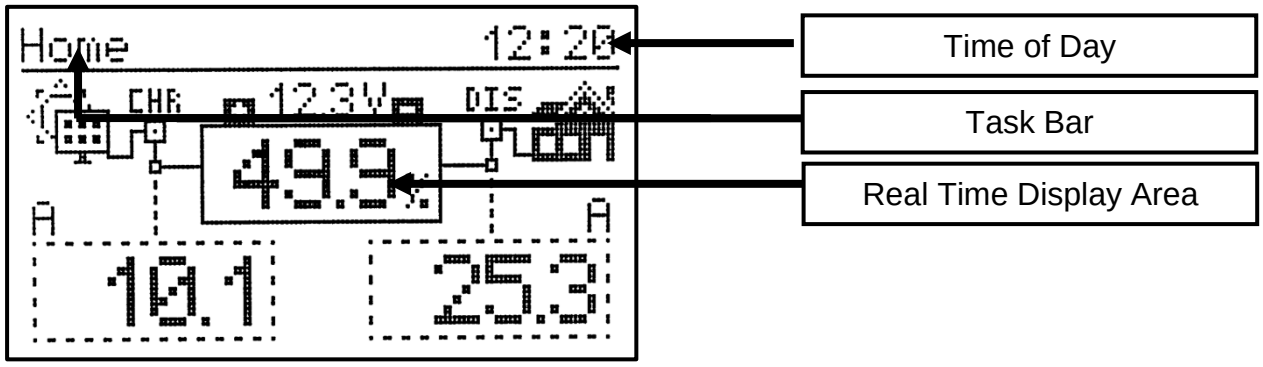
All legacy Microcare MPPT’s and Microcare Inverters use 232 communication through the RJ11 cable. The 232 to 485 converter is required for these devices to communicate with the battery monitor.

REAL TIME DATA SCREEN

1.12 Real Time Data Screen overview

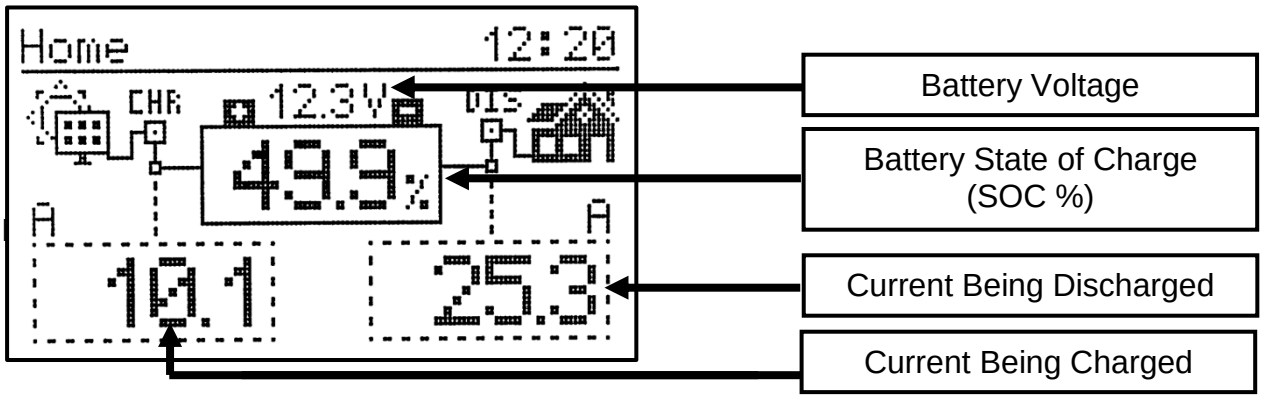
Press 🏠 to navigate back to the “Home” screen. The real time data screens are used for displaying information from the battery bank, Microcare Inverter and Microcare MPPT in real time. Information on these screens can be used to determine if the system is currently operating correctly.

Press ⬅ or ➡ to choose between “Home”, “Battery info”, “Sensor Read”, “MPPT” and “UPS” real time data screens.

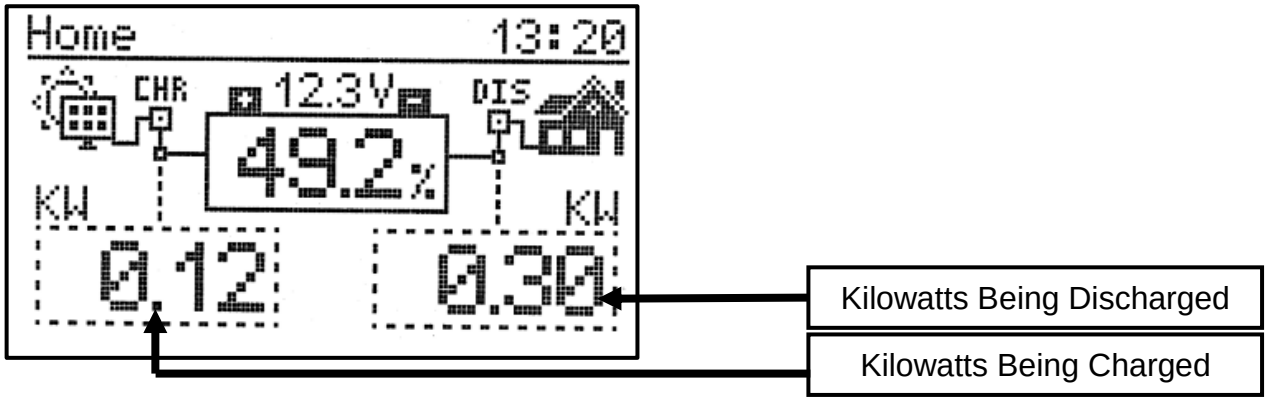


1.13 Home Screen

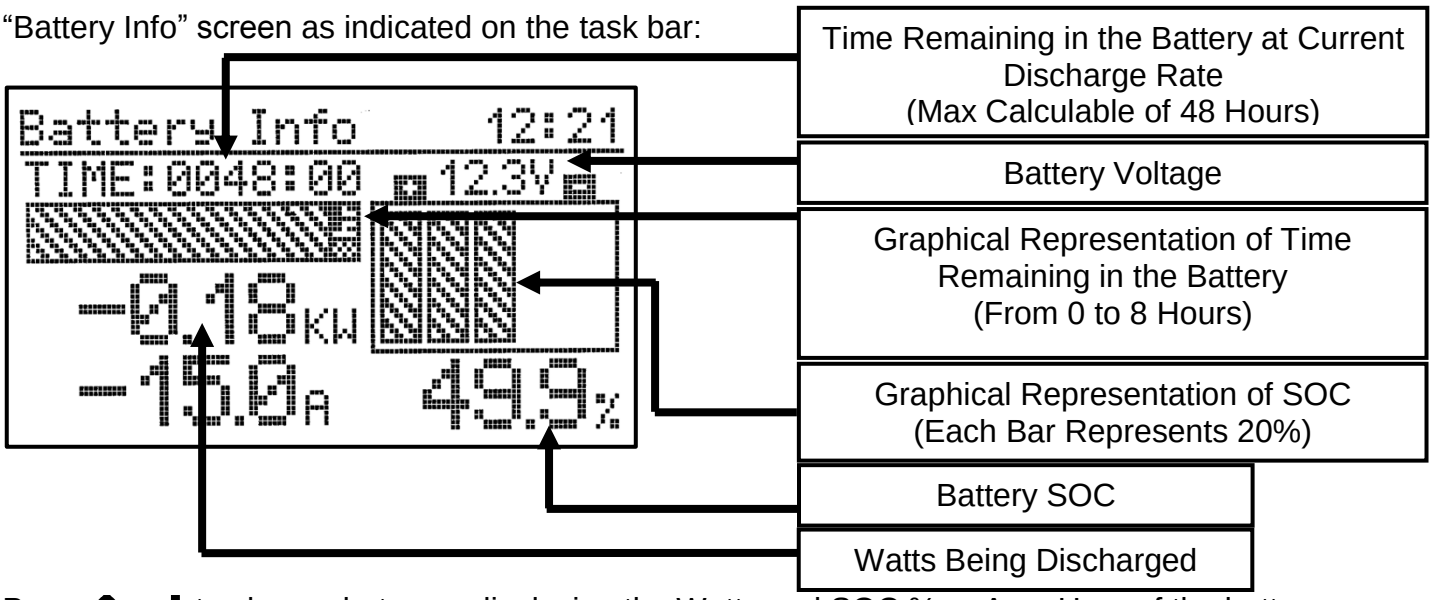
“Home” Screen, as indicated on the Task Bar:



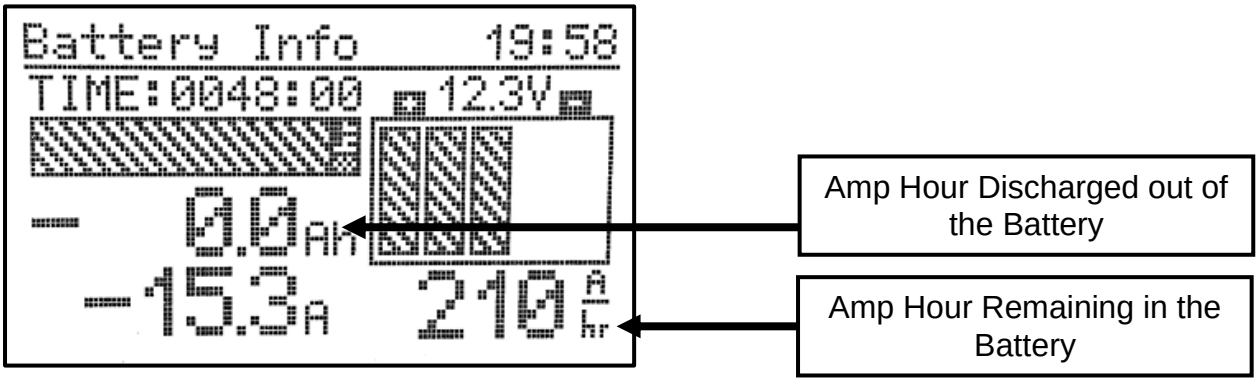
Press ⬆ or ⬇ to choose between displaying Kilowatts or Amp.



"Battery Info" screen as indicated on the task bar:

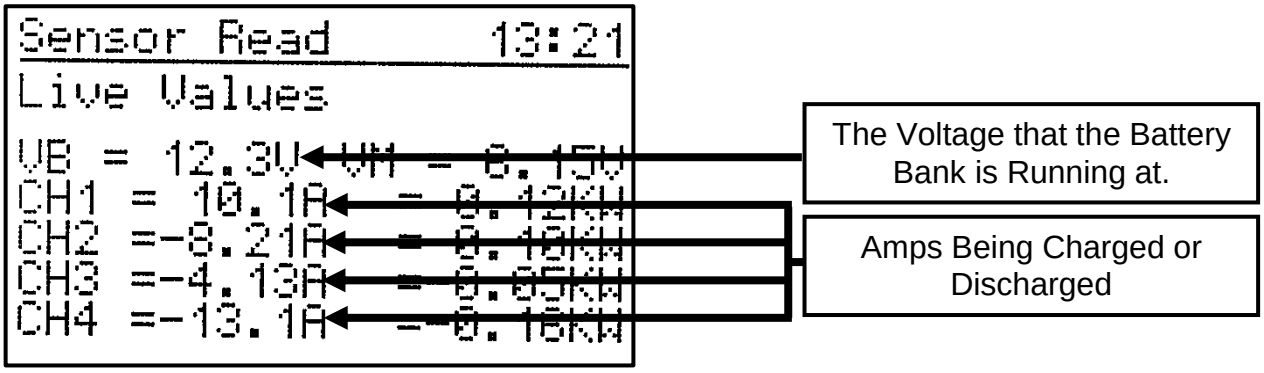


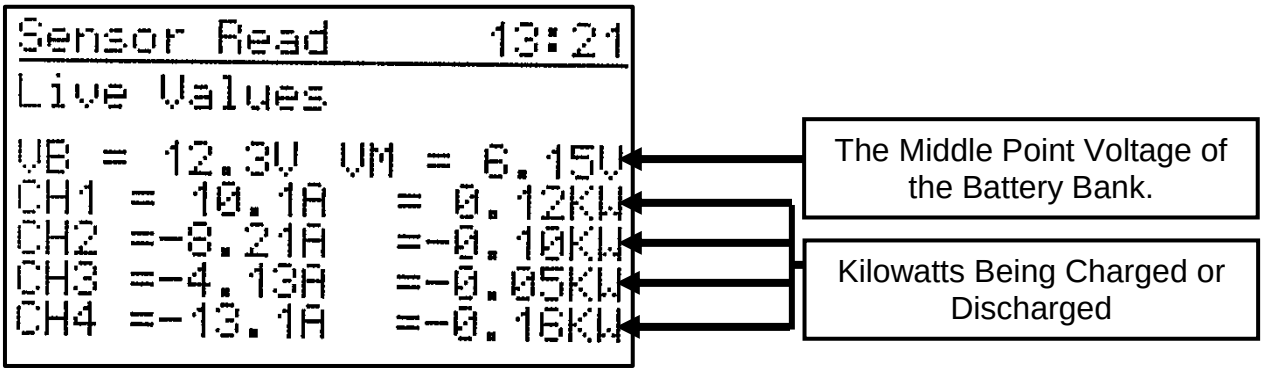
Press ⬆ or ⬇ to choose between displaying the Watts and SOC % or Amp Hour of the battery.



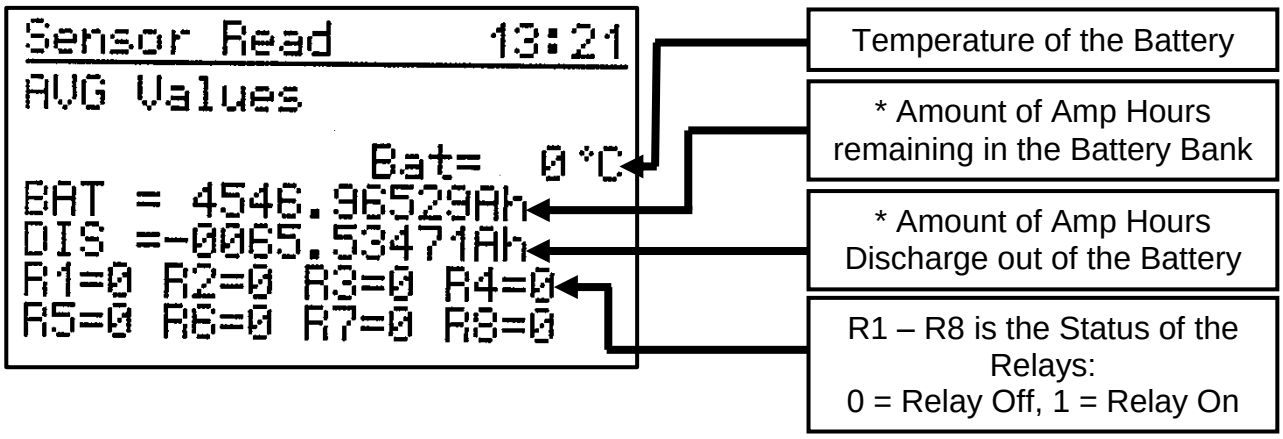
1.14 Sensor Read Screen

"Sensor Read" screen as indicated on the task bar, displaying sensor values:





Press ⬆ or ⬇ to choose between displaying “Live Values” or “AVG Values”.



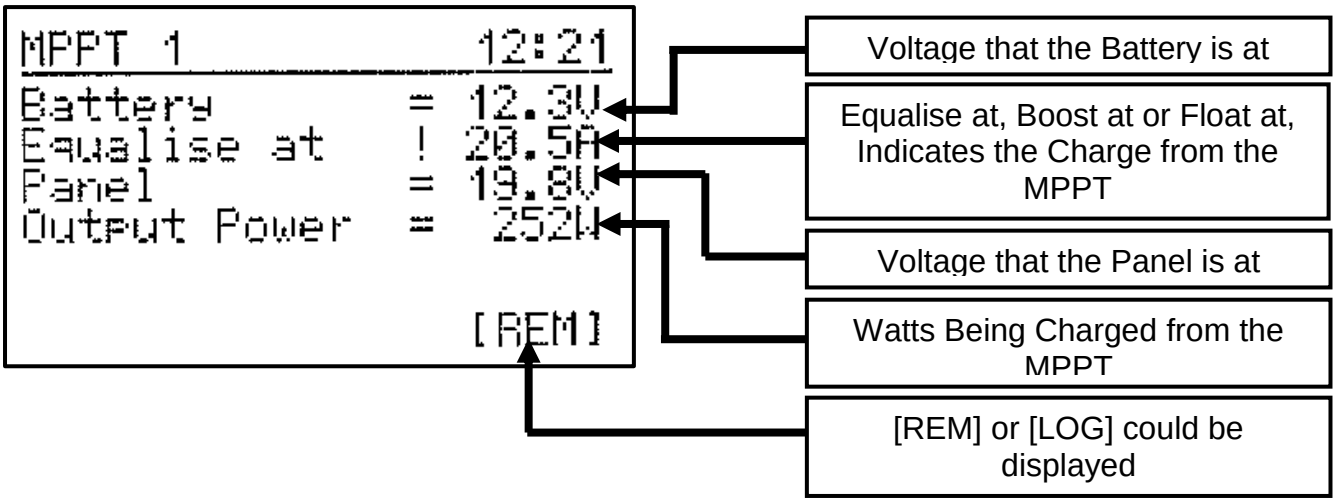
***** - These values are not directly representation of the battery capacity, but rather a calculation estimated based on the Peukert’s Exponent calculation.

Refer to Peukert’s Exponent Calculation 8.1 on page 64

1.15 MPPT Screen

This is the “MPPT” screen (for MPPT 1- 5) as indicated on the task bar, which is displayed when the MPPT is connected through communication.

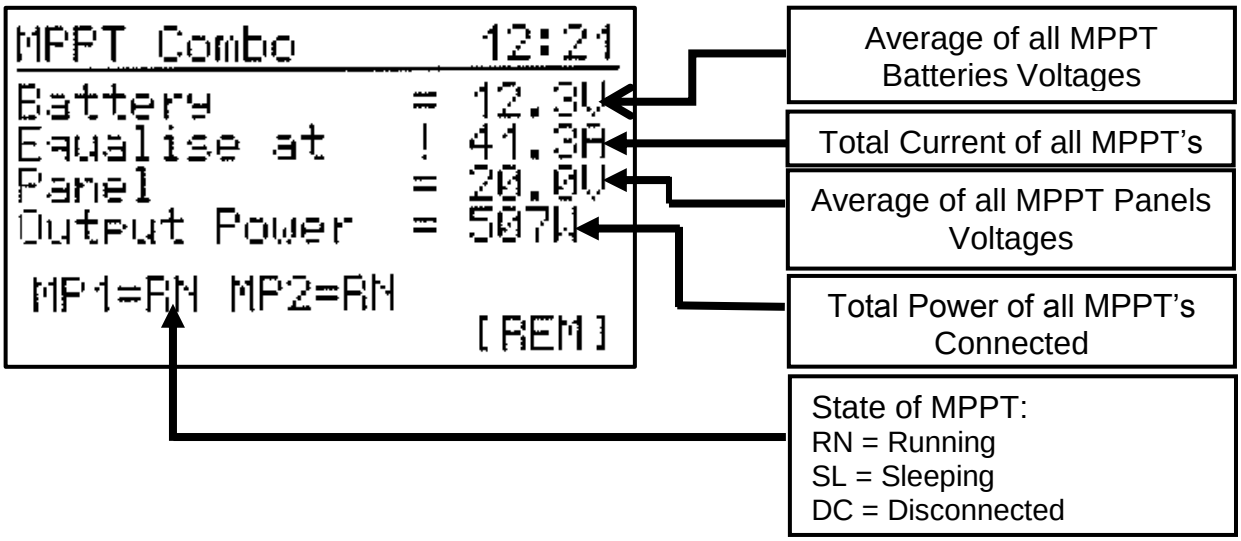
Press ⬆ or ⬇ to choose between MPPT 1-5 and the MPPT combo screen.



REM – Remote battery monitor is retrieving information from MPPT.

LOG – Internet logger is retrieving the data from the MPPT and the battery monitor is intercepting that data.

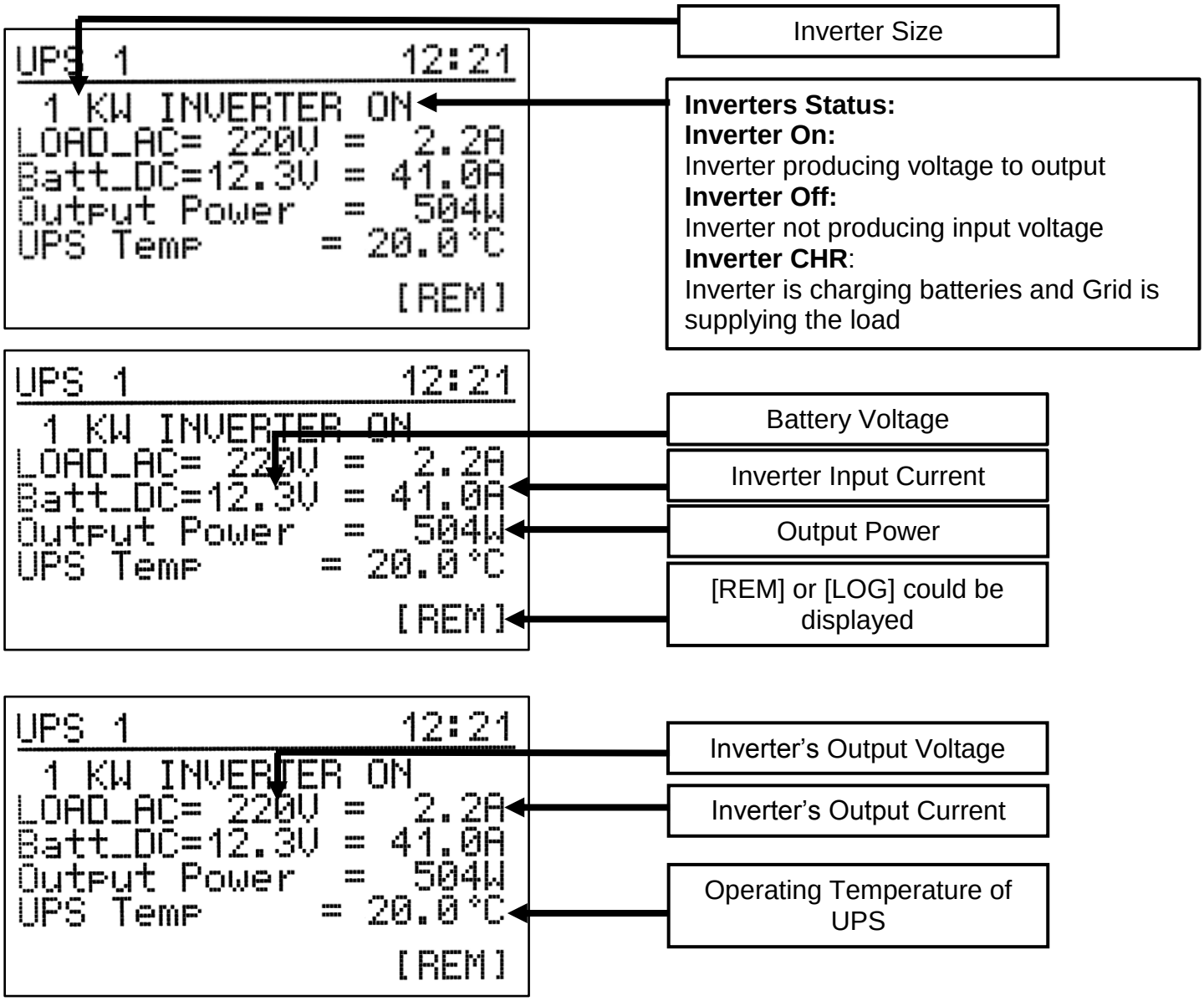
This is the “MPPT Combo” screen, displaying the combination of all the data of the MPPT’s. Take Note: This screen will only be shown when more than one MPPT is set up.



1.16 UPS Screen

This is the “UPS” screen (for UPS 1- 5) as indicated on the task bar, which is displayed when the UPS is connected through communication.

Press ⬆ or ⬇ to choose between UPS 1-5.

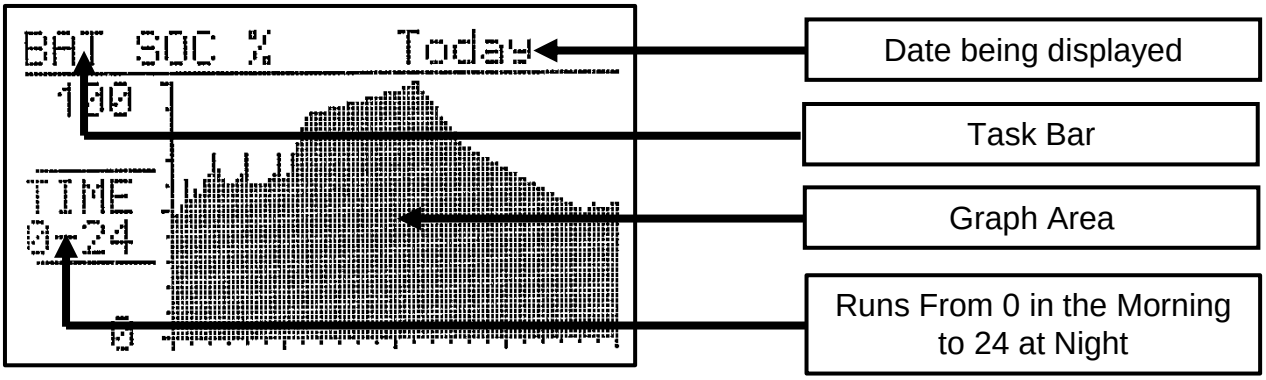


GRAPH SCREENS

1.17 Graph Screen overview

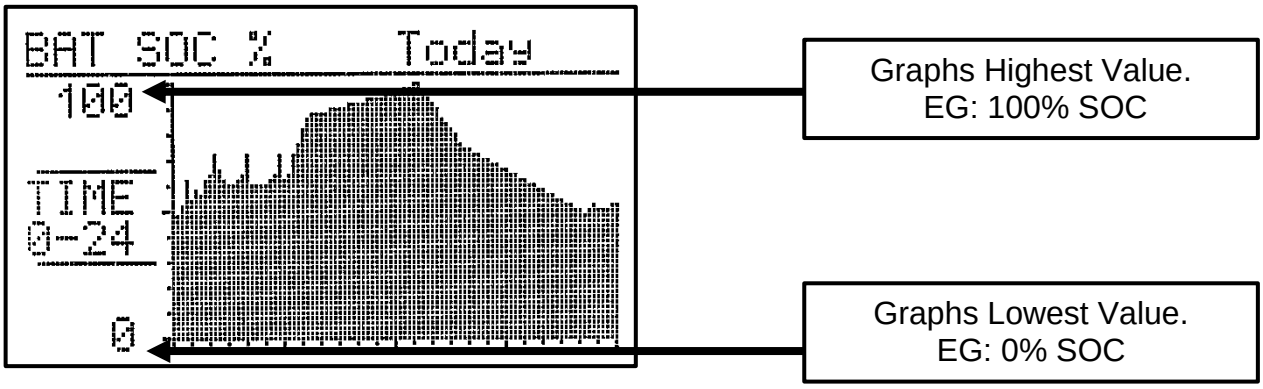
From the “Home” screen, press 📈 to navigate to the graph screens. The graph screens are used to graphically show the state of the system for the past 30 days. This information is shown as 24 hour graphs with 12 mid-day being in the middle of the screen.

Press ✔ or 📈 to choose between “BAT SOC”, “BAT Volt”, “BAT Amp”, “CHR Amp”. “DIS Amp”, “CH Amp” and “BAT Temp” Graph Screens.



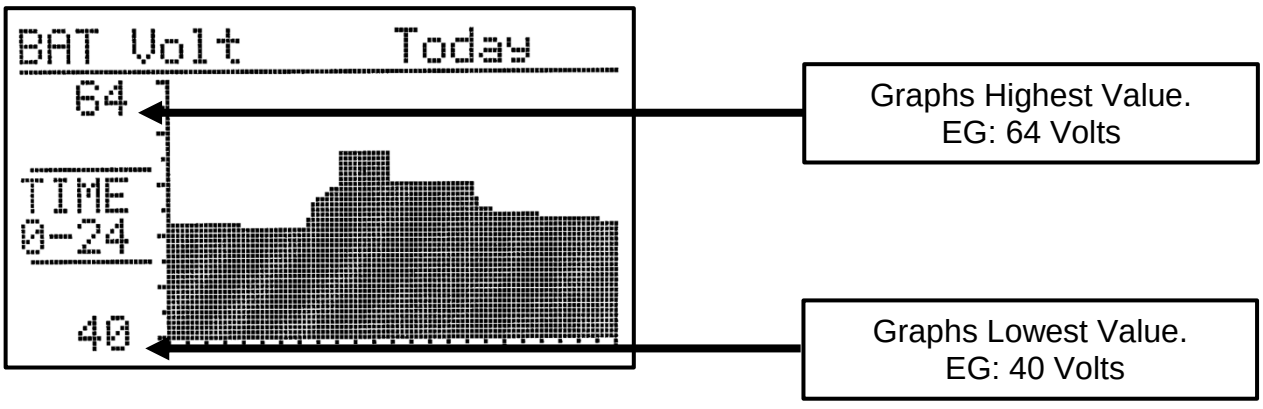
1.18 Battery State of Charge Graph

This is the “BAT SOC” (Battery State of Charge) graph, as indicated on the task bar:



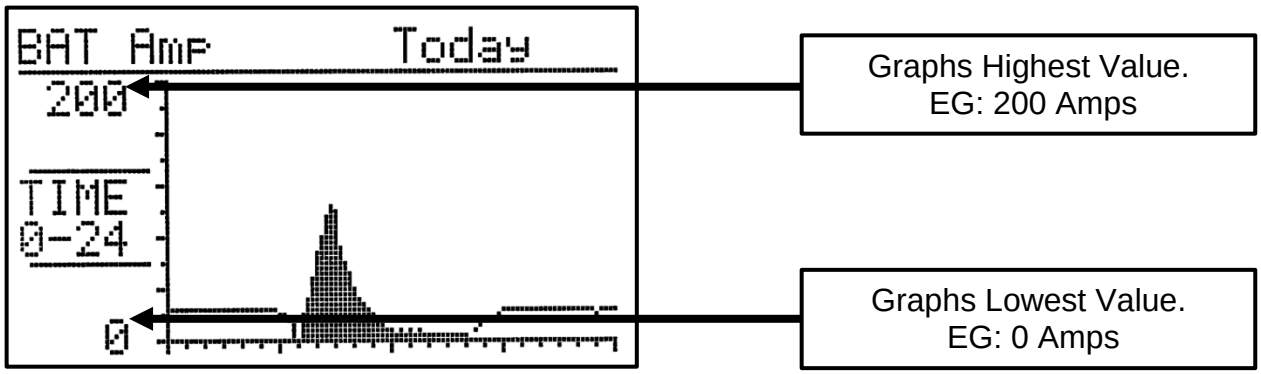
1.19 Battery Voltage Graph

This is the “BAT Volt” (Battery Voltage) graph, as indicated on the task bar:



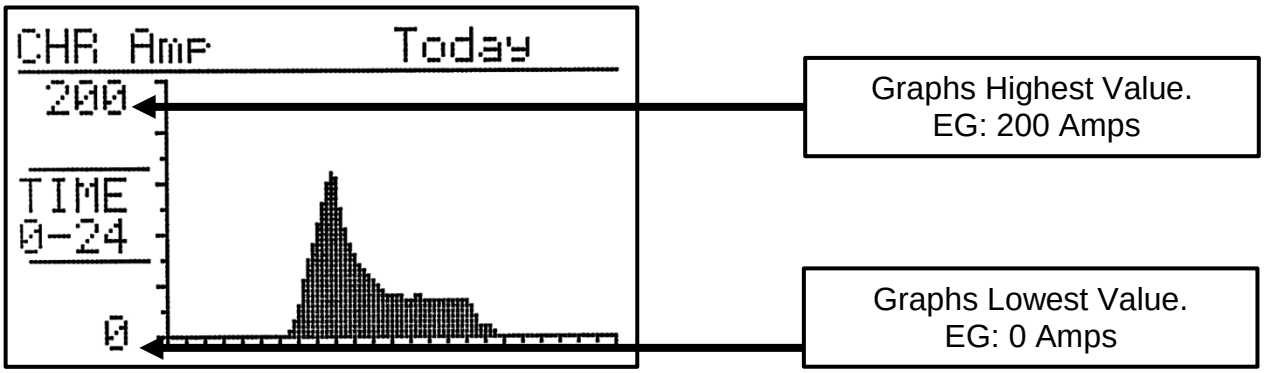
1.20 Battery Amp Graph

This is the “BAT Amp” (Battery Amp) graph, as represented on the task bar:



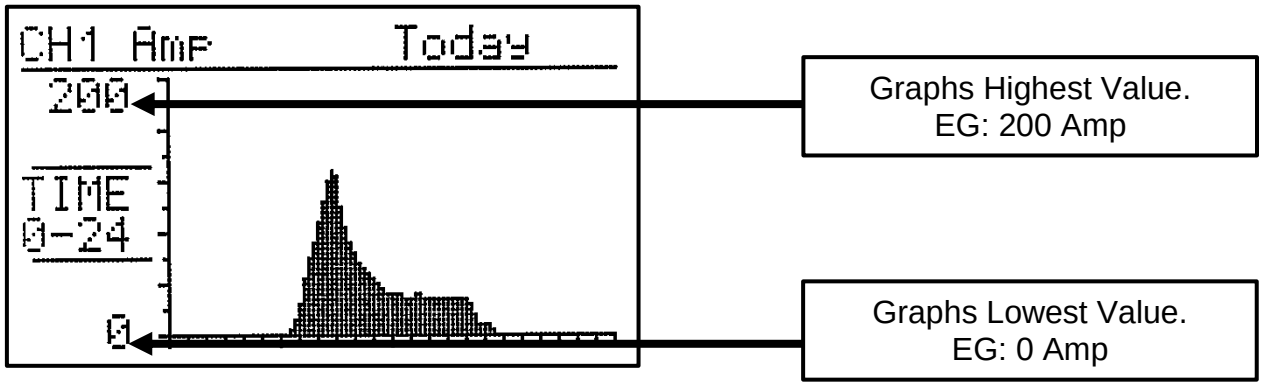
1.21 Charge Amp Graph

This is the “CHR Amp” (Charge Amp) graph, as indicated on the task bar:



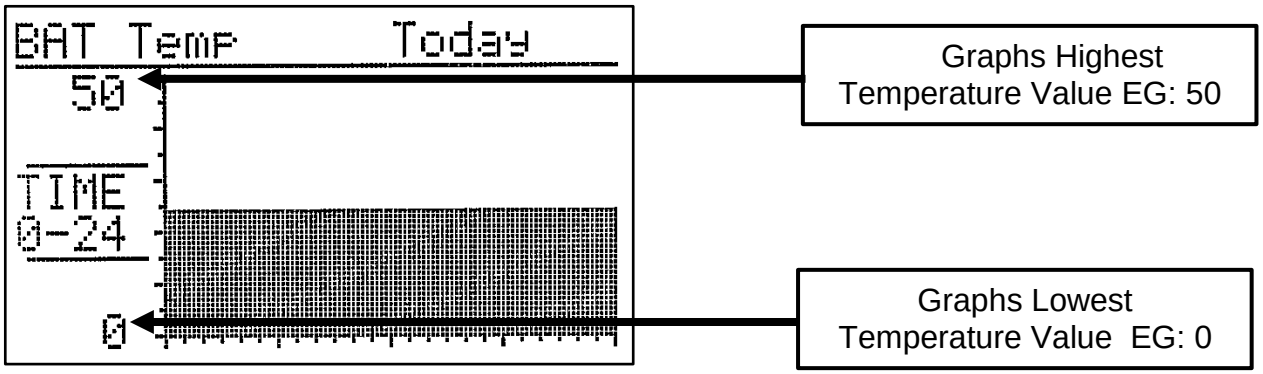
1.22 Channel Amp Graph

This is the “CH1 Amp” (Channel 1 Amps), as indicated on the task bar:



1.23 Battery Temperature Graph

This is the “BAT Temp” (Battery Temperature) graph, as indicated on the task bar:



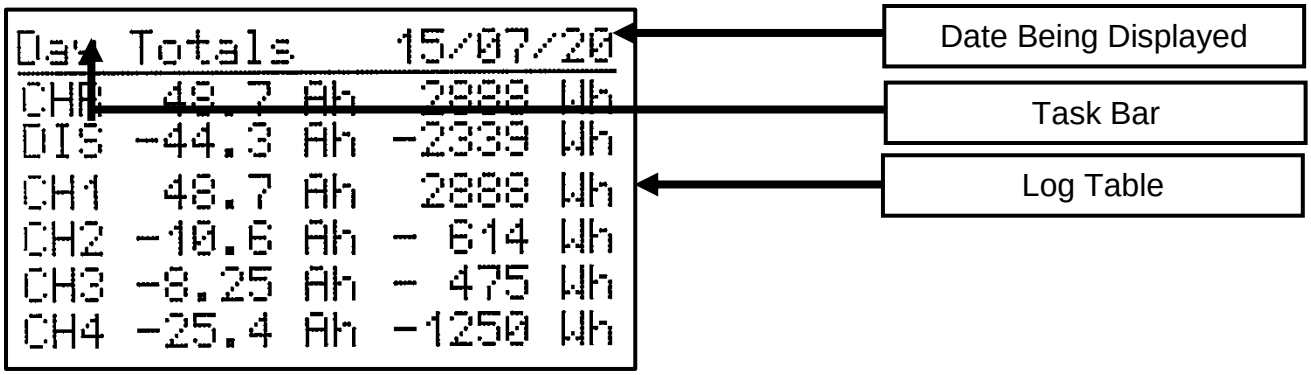
LOG SCREENS

1.24 Log Screen overview

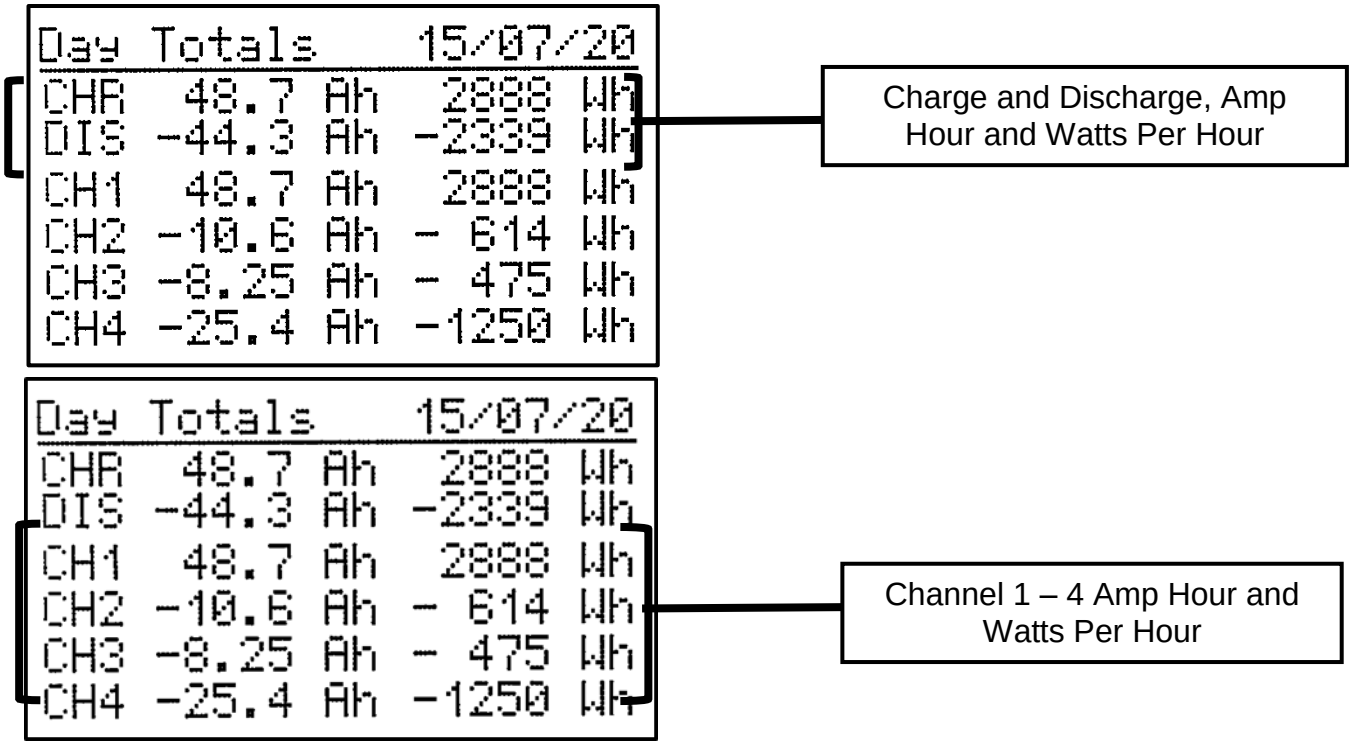
From the “Home” screen press to navigate to the graph screens, then press ← or → to view the log screens. The log screens are used to display calculated values about the system for the past 2 years. This information is shown as a day by day, hour table of values.

Press ↑ or ↓ to select the desired day to be displayed. ↑ going forward in days and ↓ going back in days. By pressing ✓ the user can also change the month or year being displayed. This is indicated with the day month of year being highlighted in the task bar.

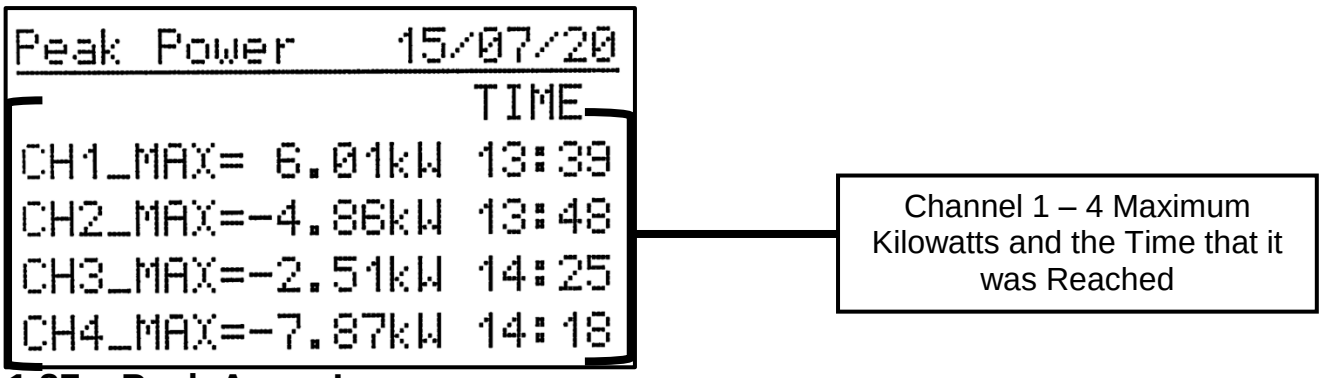
Press ↑ or ↓ to choose between “Day Totals”, “Peak Power”, “Peak Amps” and “General Info” log screens.



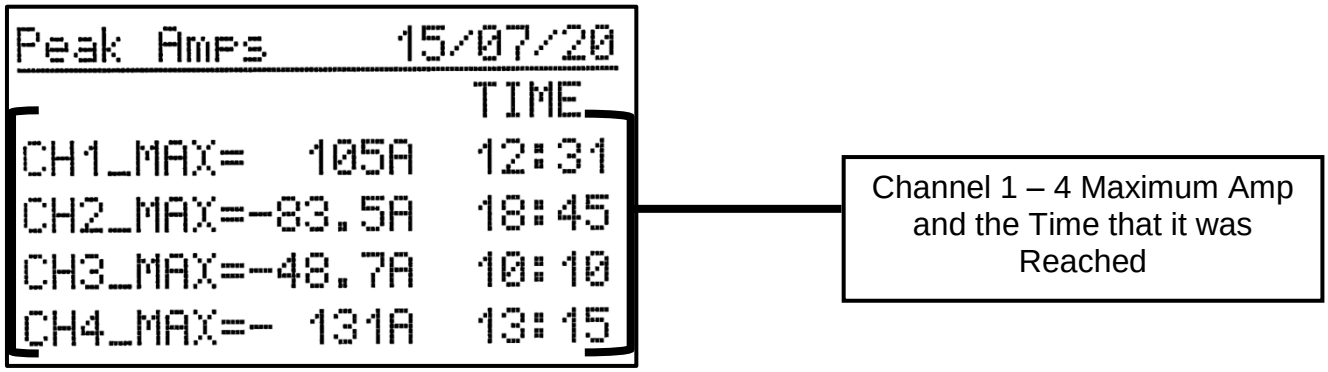
1.25 Day Total Log



1.26 Peak Power Log

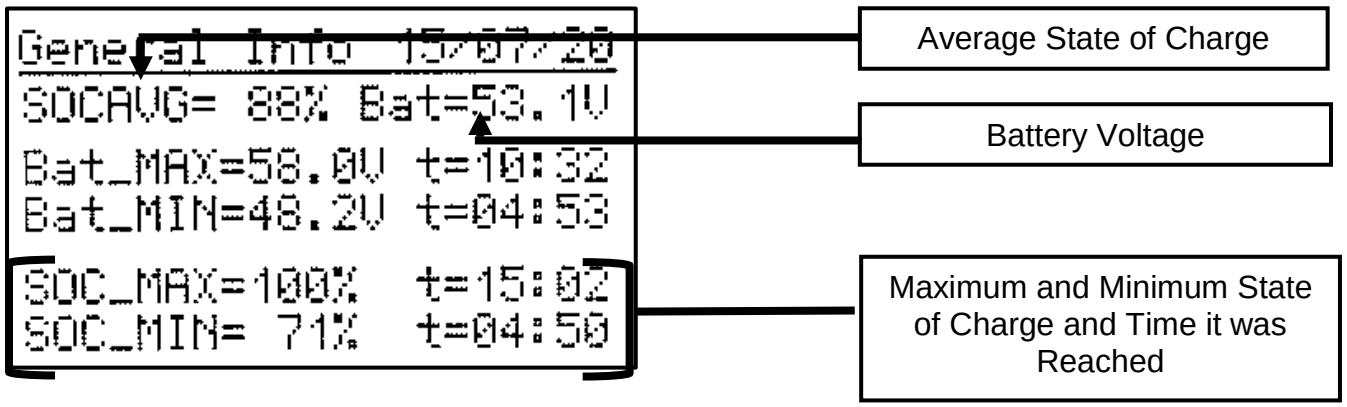


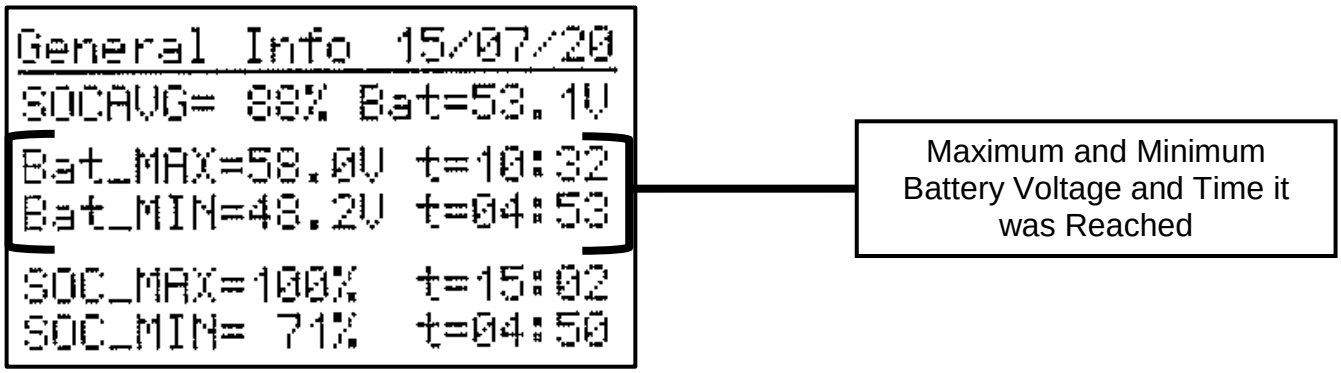
1.27 Peak Amps Log



1.28 General Info Log

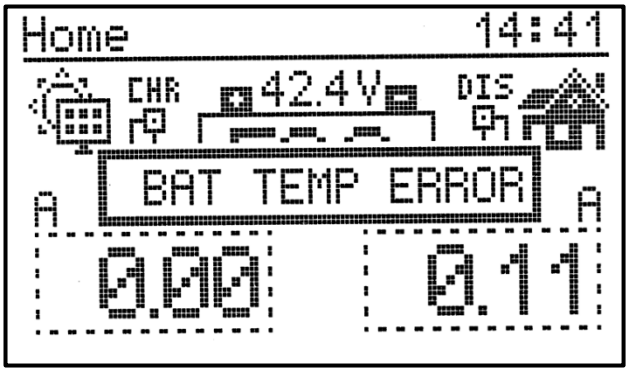
This is the “General Info” screen, as indicated on the task bar:





ERRORS

1.29 Battery Temperature Error



This error appears when the battery temperature exceeds the set value of temperature in degree Celsius. The default set value is 100 degree Celsius.

Refer to setting 5.12 on page 46

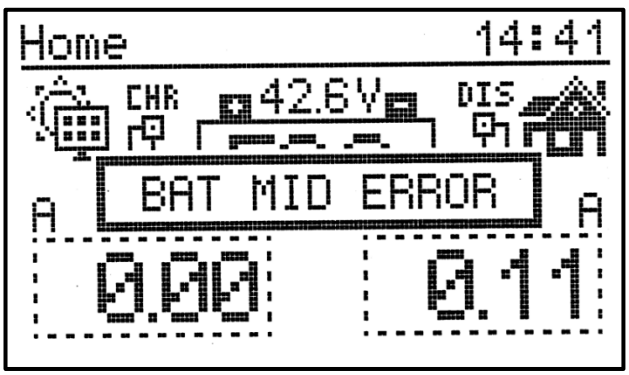
Possible causes of error:

- Insufficient ventilation of battery bank housing or battery bank room.
- Bad battery bank connection joints.
- Insufficient battery bank cable sizing.
- Possible overcharging of battery bank.
- Possible over discharge or too high a load on battery bank.
- Battery monitor not correctly set up.

Possible solutions to the error:

- Check ventilation of battery bank housing or room, as well as check ambient temperature of battery bank housing or room, to verify that it is at an acceptable level as specified by battery manufacturer.
- Check fastening of connection joints, as well as use volt drop measurement to verify a good connection on connection joints.
- Check that the battery bank cable sizing meets the requirements of both the charge and the load source capacity, as well as verify that volt drop across connected cables are within acceptable parameters.
- Check charge source to verify correct operation in voltage level and current being supplied.
- Check battery bank loads to verify correct operation.
- Verify settings of battery monitor. **Refer to setting 5.12 on page 46**

1.30 Battery Mid Error



This error appears when the battery midpoint voltage is out by more than the set value. The default set value is 200 millivolts.

For example: If a battery bank is 48 Volts, the midpoint error will trigger at a midpoint voltage above 24.2Volts or below 23.8 Volts.

Refer to setting 5.12 on page 46

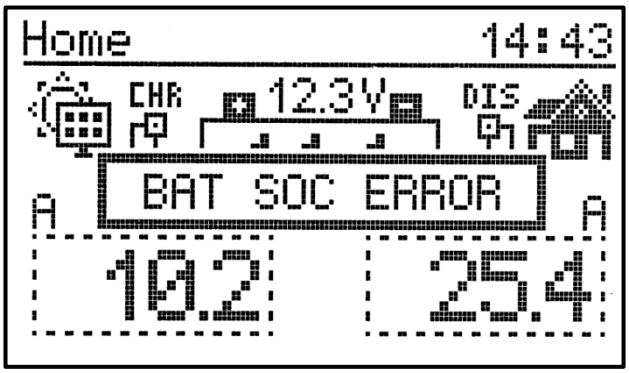
Possible causes of error:

- Normal battery bank drifting, due to numerous charge and discharge cycles.
- Possible bad cell in battery bank.
- Unbalance loads connected to battery bank. For Example: 12V loads connected to part of a 48V battery system.
- Possible sign of batteries requiring maintenance.
- Battery monitor not correctly set up.

Possible solutions to the error:

- Set charge source to equalise mode (if available), to force batteries into balance.
- If equalised charge does not correct battery bank imbalance, consider charging battery bank in a parallel configuration for improved battery bank balancing.
- Check for bad cell by measuring voltage across individual cells while applying a moderate load to battery bank. Bad cells will have a considerately lower voltage than the average cell. For Example: If average cell voltage is 12V, one cell at 10V will indicate a bad cell.
- Remove unbalanced loads from battery bank and avoid use of such loads in the future to extended battery lifetime. Use step down power supplies when 12V supplies are required.
- Check battery water as well as SG levels and perform general maintenance to battery bank.
- Replaced damaged battery cells where necessary.
- Verify settings of battery monitor. **Refer to setting 5.12 on page 46**

1.31 Battery SOC Error



This error appears when the battery percentage is below the set value. The default set value is 20%.

Refer to setting 5.12 on page 46

Possible causes of error:

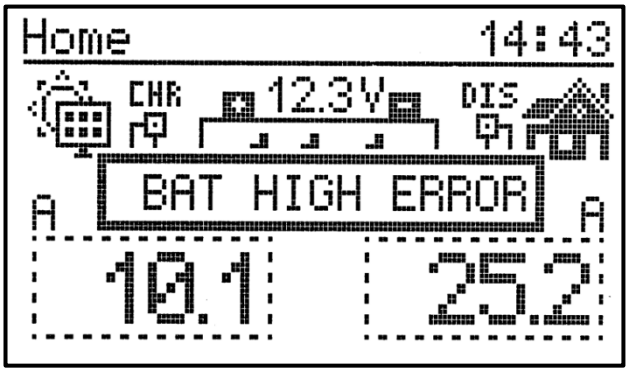
- Charge source is insufficient to maintain loads supplied from battery bank.
- Possible malfunction in charge source.
- Possible malfunction in loads.
- Battery monitor not correctly set up.

Possible solutions to the error:

- Consider increasing capacity of charge source.
- Consider reducing loads connected to battery bank.

- Verify correct operation in charge source.
- Verify correct operation in loads.
- Verify settings of battery monitor. **Refer to setting 5.12 on page 46**

1.32 Battery High Error



This error appears when the battery voltage is above the set value. The default set value is as follows:

Battery Bank System	Default Value
12 Volts	15 Volts
24 Volts	30 Volts
36 Volts	45 Volts
48 Volts	60 Volts

Refer to setting 5.12 on page 46

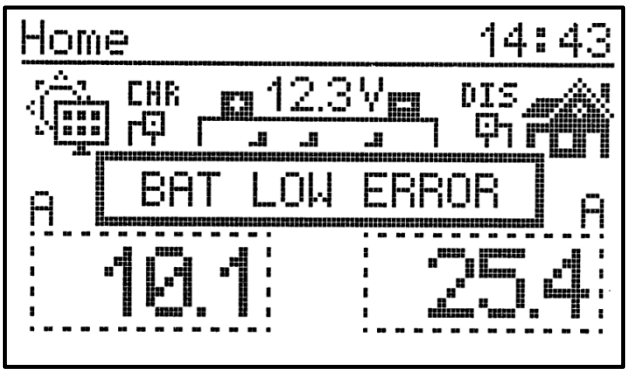
Possible causes of error:

- Malfunction in charge source.
- Bad battery bank connection joints.
- Insufficient battery bank cable sizing.
- Battery monitor not correctly set up.

Possible solutions to the error:

- Verify correct operation of charge source.
- Check fastening of connection joints, as well as use volt drop measurement to verify a good connection on connection joints.
- Check that battery bank cable sizing meets the requirements of both the charge and the load source capacity as well as verify that volt drop across connected cables are within acceptable parameters.
- Verify settings of battery monitor. **Refer to setting 5.12 on page 46**

1.33 Battery Low Error



This error appears when the battery voltage is below the set value. The default set value is as follows:

Battery Bank System	Default Value
12 Volts	10 Volts
24 Volts	20 Volts
36 Volts	30 Volts
48 Volts	40 Volts

Refer to setting 5.12 on page 46

Possible causes of error:

- Malfunction in charge source.
- Malfunction in discharge source.
- Bad battery bank connection joints.
- Insufficient battery bank cable sizing.
- Battery monitor not correctly set up.

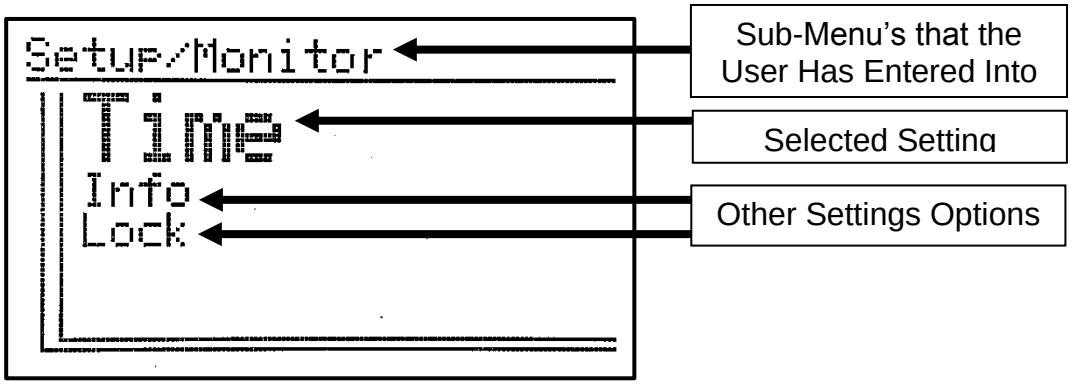
Possible solutions to the error:

- Verify correct operation of charge source.
- Verify correct operation of load.
- Check fastening of connection joints, as well as use volt drop measurement to verify a good connection on connection joints.
- Check that battery bank cable sizing meets the requirements of both the charge and the load source capacity, as well as verify that volt drop across connected cables are within acceptable parameters.
- Verify settings of battery monitor. **Refer to setting 5.12 on page 46**

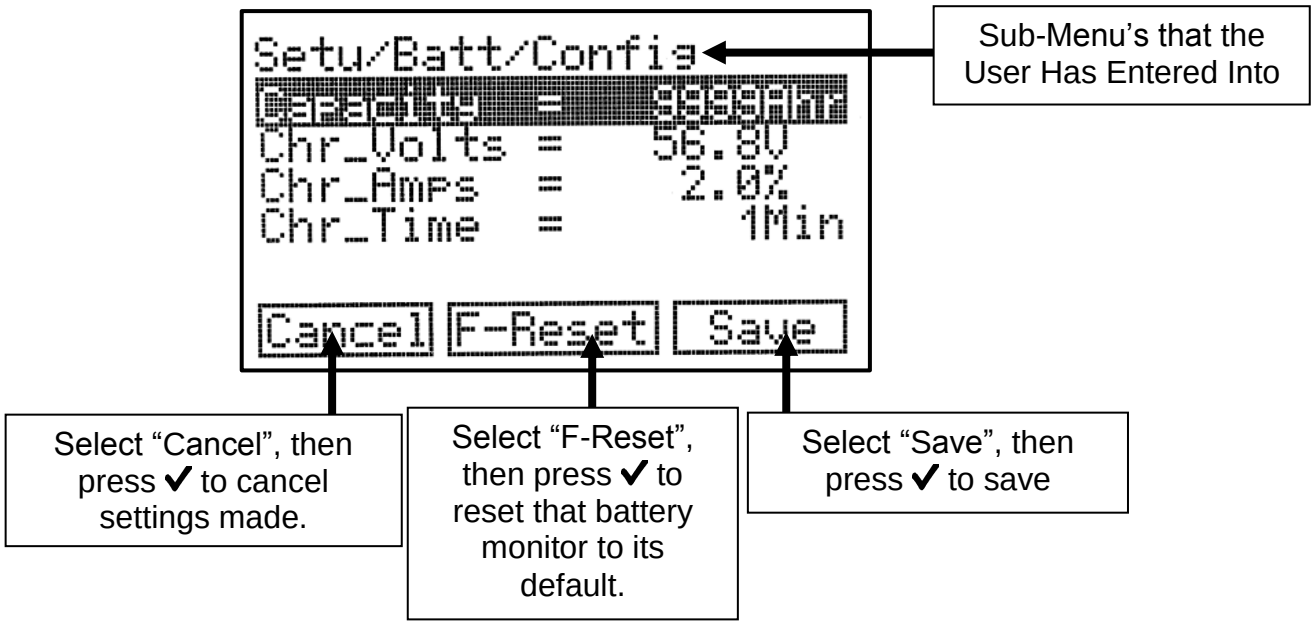
SETTINGS

1.34 Settings overview

From the “Home” screen, press 🛠 to navigate to “Settings”. Press the 🡅 or 🡇 to highlight the desired settings option, then press the ✔ to enter into that sub-setting.



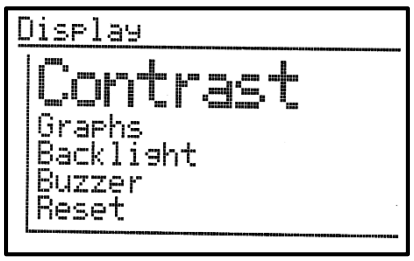
Press the 🡅 or 🡇 to highlight the field you wish to change, then press ✔. Press the 🡅 or 🡇 to change to your desired value, then press the ✔ to keep the changed settings. After changes have been completed, press the 🡇 to navigate to “save”, then press the ✔ to save selected changes.

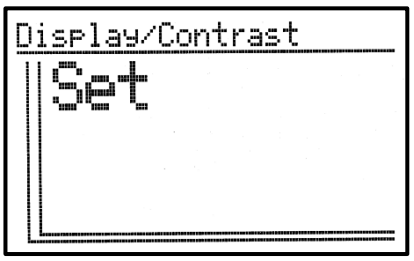


1.35 Display – Contrast – Set

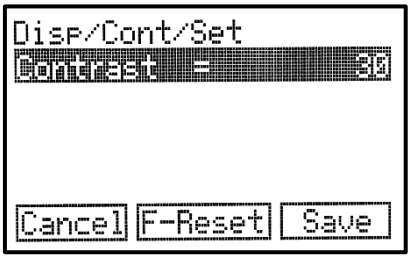
How to enter the "Display – Contrast – Set" menu:

To allow the user to set how light or dark the text on the screen should be displayed.





1. Press ✕ from the "Home" screen to enter the "Settings" screen.
2. In "Settings", press ⬆ or ⬇ to highlight "Display" and press ✔.
3. In "Display" sub-menu, press ⬆ or ⬇ to highlight "Contrast" and press ✔.
4. In "Contrast" sub-menu, press ⬆ or ⬇ to highlight "Set" and press ✔.



1.36 How to change the contrast:

5. In "Disp/Cont/Set" press ⬆ or ⬇ to highlight "Contrast" and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to select the value that you would like the battery monitors contrast set to.

   Range: 20 = Lightest, 30 = Default, 40 = Darkest
7. Press ✔ on your desired selection.

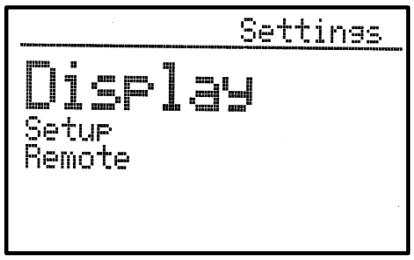
When desired changes have been made:

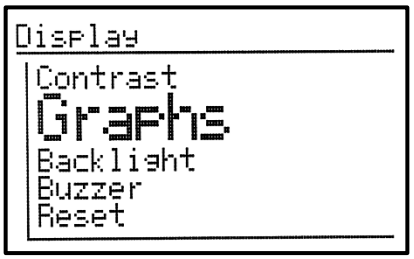
8. Save: Select "Save", then press ✔ to save changes made.
   F-Reset: Select "F-Reset", then press ✔ to reset that battery monitor to its default.
   Cancel: Select "Cancel", then press ✔ to cancel settings made.

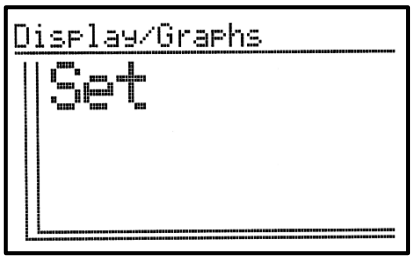
DISPLAY – GRAPH – SET

How to enter the “Display – Graph – Set” menu:

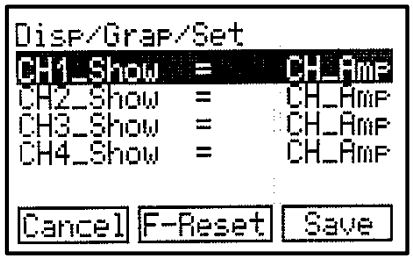
To allow the user to change what information is grafted on the channel 1 – 4 sensor display.







1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press 🡅 or 🡇 to highlight “Display” and press ✔.
3. In “Display” sub-menu, press 🡅 or 🡇 to highlight “Graphs” and press ✔.
4. In “Graphs” sub-menu, press 🡅 or 🡇 to highlight “Set” and press ✔.



1.36.1 How to setup what you would like the graph to display:

5. In “Disp/Grap/Set” press 🡅 or 🡇 to highlight the channel which you would like to setup, you can choose between: “CH1_Show”, “CH2_Show”, “CH3_Show” or “CH4_Show” and press ✔, then the selected graph channel on the right will be highlighted.
6. Press 🡅 or 🡇 buttons to select what you would like to be displayed.

   Range: CH_Amp (Channel’s Ampere), UPS1_KW to UPS4_KW (UPS’s 1 – 4’s Rating in Kilowatts) or MPPT1_KW to MPPT5_KW (MPPT’s 1 – 5 Rating in Kilowatts), CH_AMP = Default

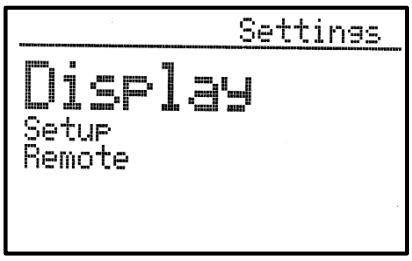
7. Press ✔ on your desired selection.

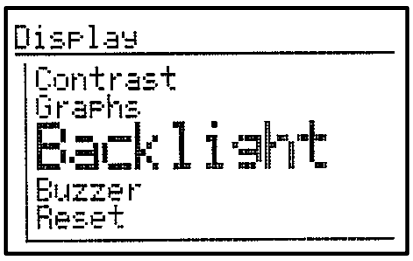
When desired changes have been made:

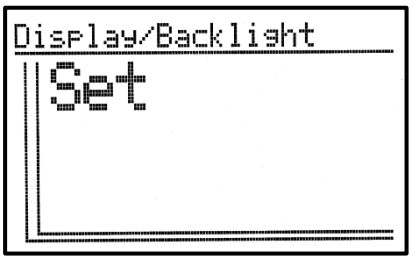
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

1.37 Display - Backlight – Set

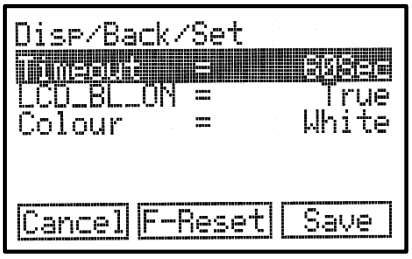
How to enter the “Display – Backlight – Set” menu:







1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇to highlight “Display” and press ✔.
3. In “Display” sub-menu, press ⬆ or ⬇ s to highlight “Backlight” and press ✔.
4. In “Backlight” sub-menu, press ⬆ or ⬇ to highlight “Set” and press ✔.



1.37.1 How to set the backlights timeout:

To allow the user to adjust how long the backlight should stay on after a button was pushed, in seconds. If set to “0Sec” the backlight will stay on permanently.

5. In “Disp/Back/Set”, press ⬆ or ⬇ to highlight “Timeout” and press ✔, then the value in seconds on the right will be highlighted.
6. Press ⬆ or ⬇ to change the value of the backlight’s timeout in seconds.

   Range: 1 Second = Minimum, 60 Seconds = Default, 1000 Seconds = Maximum
7. Press ✔ on your desired selection.

1.37.2 How to enable or disable the backlight:

To allow the user to disable or enable the backlight of the battery monitor.

5. In “Disp/Back/Set”, press ⬆ or ⬇ to highlight “LCD_BL_ON” and press ✔, then the option on the right will be highlighted.
6. Press ⬆ or ⬇ to choose between “True”, to enable the backlight or “False”, to disable the backlight.

   Range: True = Default
7. Press ✔ on your desired selection.

1.37.3 How to set the colour of the backlight:

To allow the user to select the colour of their battery monitor's backlight.

5. In "Disp/Back/Set", press ⬆ or ⬇ to highlight "Colour" and press ✔ then the option on the right will be highlighted.
6. Press ⬆ or ⬇ to select your backlights colour.

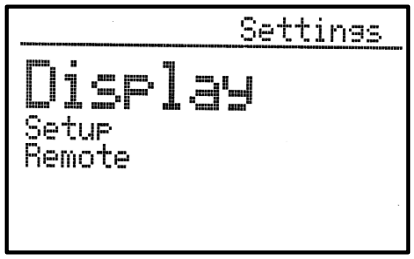
   Range Yellow, Green, White, Aqua, Blue, Red or Purple, White = Default
7. Press ✔ on your desired selection.

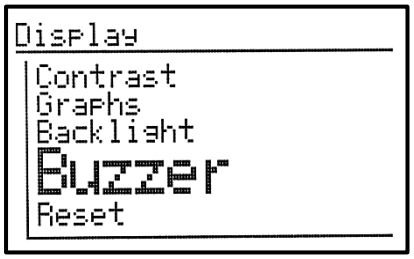
When desired changes have been made:

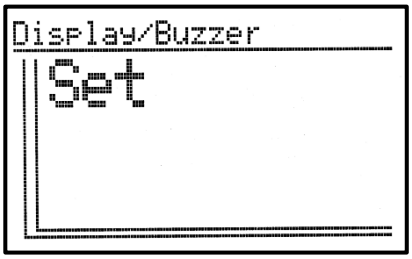
8. Save: Select "Save", then press ✔ to save changes made.
   F-Reset: Select "F-Reset", then press ✔ to reset that battery monitor to its default.
   Cancel: Select "Cancel", then press ✔ to cancel settings made.

1.38 Display – Buzzer – Set

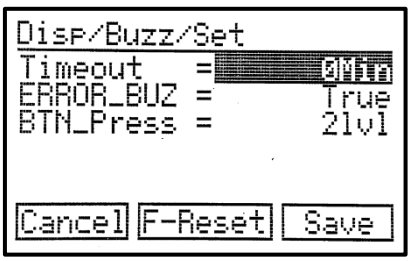
How to enter the "Display – Buzzer – Set" menu:







1. Press 🛠 from the "Home" screen to enter the "Settings" screen.
2. In "Settings", press ⬆ or ⬇ to highlight "Display" and press ✔.
3. In "Display" sub-menu, press ⬆ or ⬇ to highlight "Buzzer" and press ✔.
4. In "Buzzer" sub-menu, press ⬆ or ⬇ to highlight "Set" and press ✔.



How to set the timeout of the error buzzer:

To allow the user to adjust how long the buzzer will sound after an error has occurred, in minutes. When set to “0Min”, the buzzer will sound until the error is manually cleared.

5. In “Disp/Buzz/Set”, press ⬆ or ⬇ to highlight “Timeout” and press ✔, then the value in minutes on the right will be highlighted.
6. Press ⬆ or ⬇ to select the timeout value in minutes.

   Range: 1 Minute = Minimum, 0 Minute = Default, 30 Minutes = Maximum
7. Press ✔ on your desired selection

How to enable or disable the error buzzer:

To allow the user to enable or disable the error buzzer.

5. In “Disp/Buzz/Set”, press ⬆ or ⬇ to highlight “ERROR_BUZ” and press ✔, then the option on the right will be highlighted.
6. Press ⬆ or ⬇ to choose between “True”, to enable the error buzzer or “False”, to disable the error buzzer.

   Range**:** True = Default
7. Press ✔ on your desired selection

How to set the volume level of the buzzer:

To allow the user to adjust the volume of the buttons buzzer. (If set “0lvl”, the buttons will be muted.)

5. In “Disp/Buzz/Set”, press ⬆ or ⬇ to highlight “BTN_Press” and press ✔, then the value in level on the right will be highlighted.
6. Press ⬆ or ⬇ to change the values level.

   Range: 1lvl = Softest, 2lvl = Default, 4lvl = Loudest).
7. Press ✔ on your desired selection.

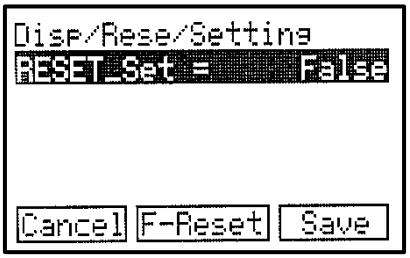
When desired changes have been made:

8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

1.39 Display – Reset – Setting

How to enter the “Display – Reset – Set” menu:

1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Display” and press ✔.
3. In “Display” sub-menu, press ⬆ or ⬇ to highlight “Reset” and press ✔.
4. In “Reset” sub-menu, press ⬆ or ⬇ to highlight “Setting” and press ✔.



How to reset the battery monitor:

To allow the user to reset the battery monitor to its factory default setting.

5. In “Disp/Rese/Setting”, press ⬆ or ⬇ to highlight “RESET_Set” and press ✔, then the option on the right will be highlighted.
6. Press ⬆ or ⬇ to choose between “True”, resetting the battery monitor to its factory default setting or “False”, resetting the battery monitor to its factory default setting.
   Range: “False” = Default
7. Press ✔on your desired selection.

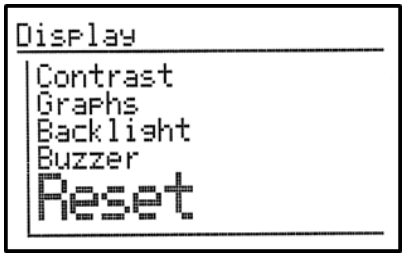
When desired changes have been made:

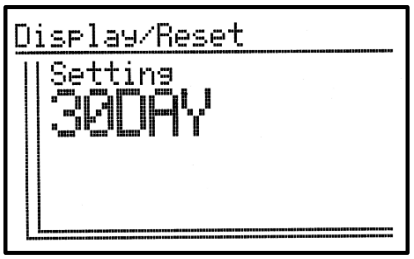
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

1.40 Display – Reset – 30DAY

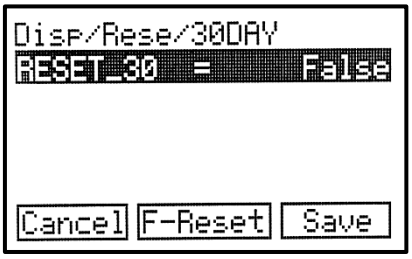
How to enter the “Display – Reset – 30DAY” menu:

To allow the user to reset the 30 day graph.





1. Press the 🛠 button from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Display” and press ✔.
3. In “Display”, press ⬆ or ⬇ to highlight “Reset” and press ✔.
4. In “Reset” sub-menu, press ⬆ or ⬇ to highlight “30DAY” and press ✔.



How to reset the battery monitor by 30 days:

5. In “Disp/Rese/30DAY” press ⬆ or ⬇ to highlight “RESET_30” and press ✔, then the option on the right will be highlighted.
6. Press ⬆ or ⬇ to choose between “True”, resetting the 30 day graph or “False”, not resetting the 30 day graph.
   Range: False = Default
7. Press ✔on your desired selection.

When desired changes have been made:

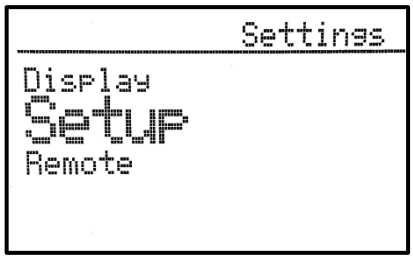
8. Save: Select “Save”, then press ✔to save changes made.
   F-Reset: Select “F-Reset”, then press ✔to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔to cancel settings made.

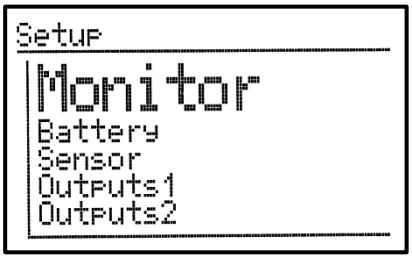
1.41 Setup – Monitor – Time

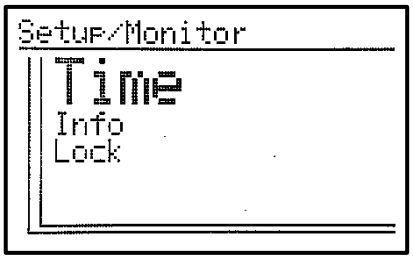
Take Note: The battery monitor will allow the user to set an incorrect date.

For Example: The 31st of February, but this will cause a date overflow, it will jump to the 1st of February. Therefore, please take note, only enter valid dates.

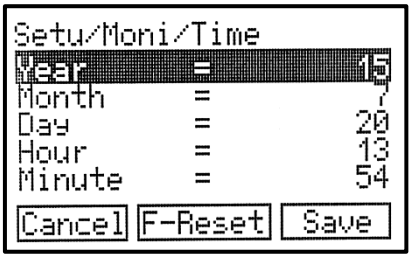
How to enter the "Setup – Monitor – Time" menu:







1. Press 🛠 from the "Home" screen to enter the "Settings" screen.
2. In "Settings", press ⬆ or ⬇ to highlight "Setup" and press ✔.
3. In "Setup" sub-menu, press ⬆ or ⬇ to highlight "Monitor" and press ✔.
4. In "Monitor" sub-menu, press ⬆ or ⬇ to highlight "Time" and press ✔.



How to set the Year:

5. In "Setu/Moni/Time", press ⬆ or ⬇ to highlight "Year" and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to enter the value of the current year.
   Range: 0 = Minimum, 15 = Default, 99 = Maximum
7. Press ✔ on your desired selection.

How to set the month:

5. In "Setu/Moni/Time", press ⬆ or ⬇ to highlight "Month" and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to enter the value of the current month.
   Range: 1 = Minimum, 1 = Default, 12 = Maximum
7. Press ✔ on your desired selection.

How to set the day:

5. In “Setu/Moni/Time”, press 🡅 or 🡇 to highlight “Day” and press ✔, then the value on the right will be highlighted.
6. Press 🡅 or 🡇 to enter the value of the current day.
   Range: 1 = Minimum, 1 = Default, 31 = Maximum
7. Press ✔ on your desired selection.

How to set the hour:

5. In “Setu/Moni/Time”, press 🡅 or 🡇 to highlight “Hour” and press ✔, then the value on the right will be highlighted.
6. Press 🡅 or 🡇 to enter the value of the current hour.
   Range: 0 = Minimum, 12 = Default, 23 = Maximum
7. Press ✔ on your desired selection.

How to set the Minute:

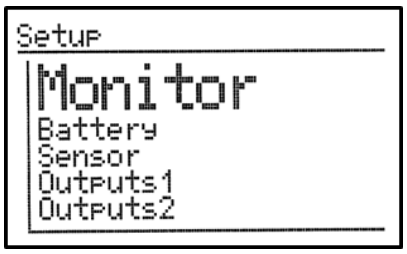
5. In “Setu/Moni/Time”, press 🡅 or 🡇 to highlight “Minute” and press ✔, then the value on the right will be highlighted.
6. Press 🡅 or 🡇 to enter the value of the current minute.
   Range: 0 = Minimum, 0 = Default, 59 = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

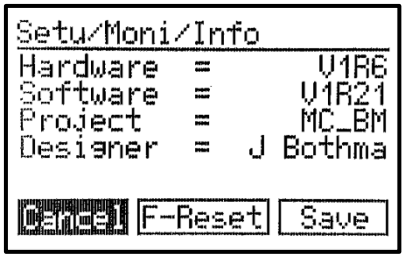
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

SETUP – MONITOR – INFORMATION

How to enter the “Setup – Monitor – Information” menu:



1. Press ✕ from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ↑ or ↓ to highlight “Setup” and press ✓.
3. In “Setup” sub-menu, press ↑ or ↓ to highlight “Monitor” and press ✓.
4. In “Monitor” sub-menu, press ↑ or ↓ to highlight “Info” and press ✓.



How to view the hardware version and revision of the battery monitor:

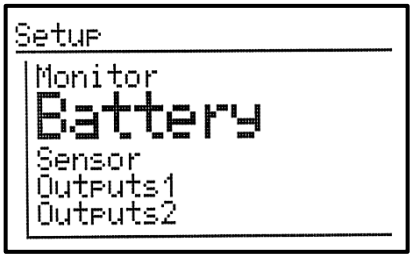
5. In “Setu/Moni/Info”, “HW_No” is the hardware version number.
6. When you have finished viewing this information, press the ✕ button

How to view the software version and revision of the battery monitor:

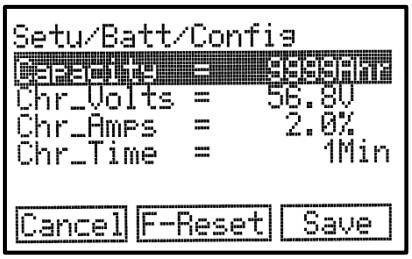
5. In “Setu/Moni/Info”, “SW_No” is the software version number.
6. When you have finished viewing this information, press the ✕ button.

1.42 Setup – Battery - Configuration

1.42.1 How to enter the “Setup – Battery – Configuration” menu:



1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight “Battery” and press ✔.
4. In “Battery” sub-menu, press ⬆ or ⬇ to highlight “Config” and press ✔.



1.42.2 How to set the size of the battery bank:

To allow the user to set the battery bank size connected to the battery monitor, in amp hour.

Figure 1: 4 x 100Ahr batteries in series. The bank size equals 100Ahr.

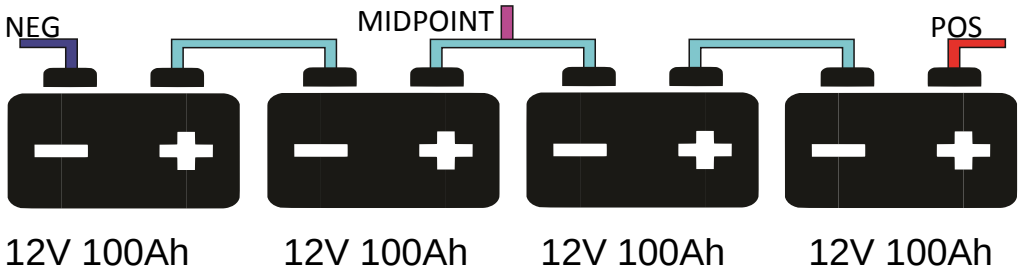


Figure 2: 4 x 100Ahr batteries, 2 in series with 2 parallel. The bank size equals 200Ahr.

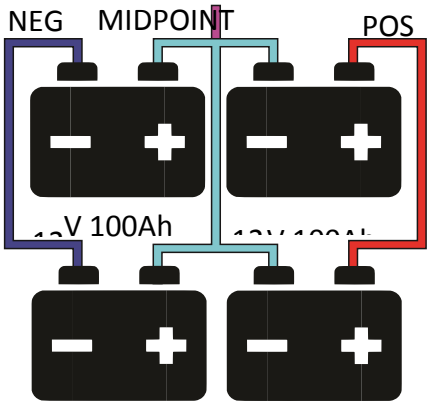
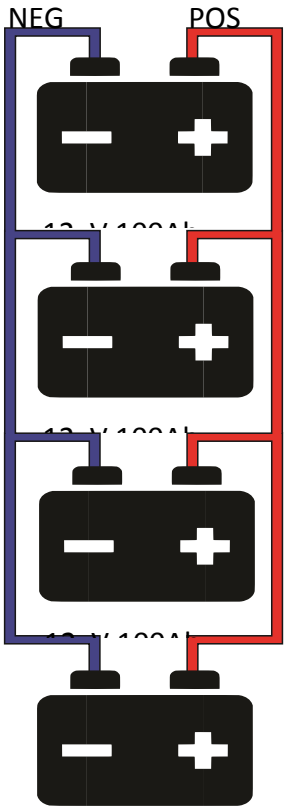


Figure 3: 4 x 100Ahr batteries in parallel. The bank size equals 400Ahr.



Synchronization rule

The battery monitor uses the set value of charge voltage, charge Amp and charge time to synchronize with a full battery.

For Example: To see when the battery is 100%

All 3 rules must pass to assume a full battery.

5. In “Setu/Batt/Config”, press ⬆ or ⬇ to highlight “Capacity” and press ✔, then the value in Amp hour on the right will be highlighted.
6. Press ⬆ or ⬇ to change the value in Amp hour.
   Range: 0Ahr = Minimum, 0225Ahr = Default, 9999Ahr = Maximum
7. Press ✔on your desired selection.

How to set the charge voltage of the battery bank:

Rule 1

To allow the user to set the voltage that the battery monitor will see the battery as full, when the battery is above this voltage this rule will pass.

See table for recommendations:

Battery Bank Voltage	Settings
12	13.2
24	26.4
36	39.6
48	52.8

5. In “Setu/Batt/Config”, press ⬆ or ⬇ to highlight “Chr_Volts” and press ✔, then the value in volts on the right will be highlighted.
6. Press ⬆ or ⬇ to change the value in volts.
   Range: 0.1V = Minimum, 52.8V = Default, 64.0V = Maximum
7. Press ✔ on your desired selection.

How to set the charge amps of the battery bank:

Rule 2

To allow the user to set the charge amps that the battery monitor will see the battery as full. When the battery is charging less than this amount, this rule will pass.

5. In “Setu/Batt/Config”, press ⬆ or ⬇ to highlight “Chr_Amps” and press ✔, then the value percentage on the right will be highlighted.
6. Press ⬆ or ⬇ to change the value in percentage.
   Range: 0.1% = Minimum, 2.0% = Default, 5.0% = Maximum
7. Press ✔ on your desired selection.

Take Note: It is important to take into account the size of the charger connected to the system compared to the battery bank size.

For Example: A small charger may only be able to charge at 1% or 2% at the battery bank size in certain conditions. In case of small chargers a setting of 0.5% or less is recommended.

How to set the charge time of the battery bank:

Rule 3

To allow the user to set the amount of time for the synchronisation to kick in.

For Example: If set to 5 minutes rules 1 and 2 have to pass for 5 minutes before the battery monitor will synchronise 100%.

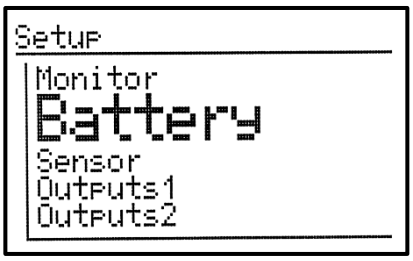
5. In “Setu/Batt/Config”, press ⬆ or ⬇ to highlight “Chr_Time” and press ✔, then the value in minutes on the right will be highlighted.
6. Press ⬆ or ⬇ to choose the value of in minutes.
   Range: 1 Minute = Minimum, 5 Minutes = Default, 60 Minutes = Maximum
7. Press ✔ on your desired selection.

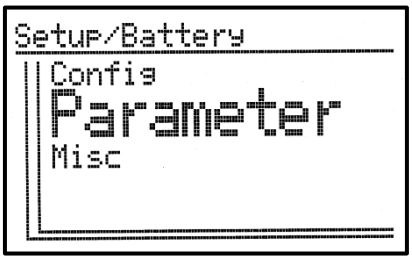
When desired changes have been made:

8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

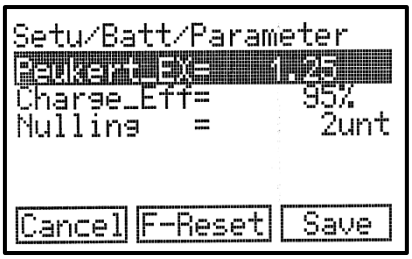
1.42.3 Setup – Battery – Parameter

How to enter “Setup – Battery – Parameter”





1. Press ✕ from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight “Battery” and press ✔.
4. In “Battery” sub-menu, press ⬆ or ⬇ to highlight “Parameter” and press ✔.



How to set the Peukert’s Exponent:

To allow the user to set Peukert’s Exponent number.

Peukert’s Exponent calculation is used by the battery monitor to more accurately calculate the percentage of the battery and the time remaining in the battery, in cases where the battery bank will be discharged faster than 20 hours

Peukert’s Exponent can be obtained from the battery manufacturer documentation or by using the 20 hour rating and any other hour rating below 20 hours.

For Example: 5 or 10

This is used to de-rate a battery when loads are applied that will discharge the battery faster than 20 hours.

For Example: When a 100Ahr battery is discharged at 2Amps it should give a theoretical run time of 50 hours. When a 100Ahr battery is discharged at 50Amps it should give a

theoretical runtime of 2 hours, but when a Peukert's Exponent number of 1, 2 is taken into account the runtime is reduced to 45 minutes.

Refer to 7.1 on page 64

5. In "Setu/Batt/Parameter", press ⬆ or ⬇ to highlight "Peukert_EX" and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to choose the value.
   Range: 1.00 = Minimum, 1.25 = Default, 1.50 = Maximum
7. Press ✔on your desired selection.

How to set the charge efficiency:

To allow the user to set the charge efficiency of the battery bank. As batteries get older, they become less effective, this setting allows the user to adjust how efficiently the batteries take charge.

For Example: Newer batteries might be 98% efficient. Older batteries might be 90% efficient.

5. In "Setu/Batt/Parameter", press ⬆ or ⬇ to highlight "Charge_Eff" and press ✔, then the value in percentage on the right will be highlighted.
6. Press ⬆ or ⬇ to choose the value in percentage.
   Range: 50% = Minimum, 95% = Default, 100% = Maximum
7. Press ✔ on your desired selection.

How to set the nulling:

To allow the user to offset some inaccuracy in the battery monitor sensor.

Take Note: When nulling is set to 2 units, sensor reading of 200milliamps or smaller will be ignored.

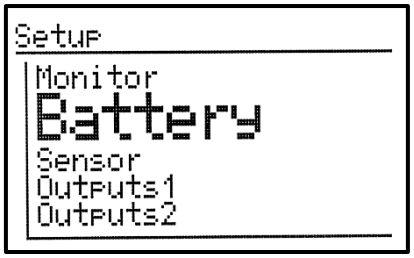
5. In "Setu/Batt/Parameter", press ⬆ or ⬇ to highlight "Nulling" and press ✔, then the value in units on the right will be highlighted.
6. Press ⬆ or ⬇ to choose the value in units. (The units range from 0 – 5.)
   Range: 0unt = Minimum, 2unt = Default, 5unt = Maximum
7. Press ✔ on your desired selection.

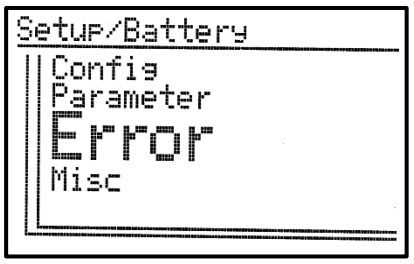
When desired changes have been made:

8. Save: Select "Save", then press ✔ to save changes made.
   F-Reset: Select "F-Reset", then press ✔ to reset that battery monitor to its default.
   Cancel: Select "Cancel", then press ✔ to cancel settings made.

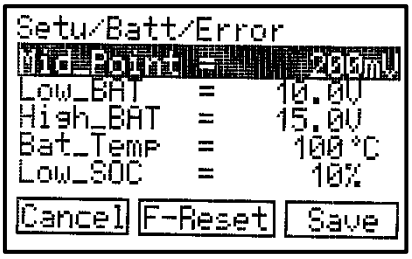
1.42.4 Setup – Battery – Error

How to enter “Setup – Battery - Error”





1. Press ✕ from the “Home” screen to enter the “Settings” Screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight “Battery” and press ✔.
4. In “Battery” sub-menu, press ⬆ or ⬇ to highlight “Error” and press ✔.



How to set the battery bank’s mid-point error level:

To allow the user to set the value at which the mid-point error will occur.

5. In “Setu/Batt/Error”, press ⬆ or ⬇ to highlight “Mid_Point” and press ✔, then the value in millivolt on the right will be highlighted.
6. Press ⬆ or ⬇ to choose the value in millivolts.
   Range: 00mV = Minimum, 200mV = Default, 500mV = Maximum
7. Press ✔ on your desired selection.

How to set the battery bank’s low voltage error level:

To allow the user to set the value at which the low voltage error will occur.

5. In “Setu/Batt/Error”, press ⬆ or ⬇ to highlight “Low_BAT” and press ✔, then the value in volts on the right will be highlighted.
6. Press ⬆ or ⬇ to choose the value in volts.
   Range: 0Ahr = Minimum, 40.0V, 0.0V = Default, 64.0V = Maximum
7. Press ✔ on your desired selection.

How to set the battery bank's high voltage error level:

To allow the user to set the value at which the high voltage error will occur.

5. In "Setu/Batt/Error", press 🡅 or 🡇 to highlight "High_BAT" and press ✔, then the value in volts on the right will be highlighted.
6. Press🡅 or 🡇 to choose the value in volts.

   Range: 0.0V = Minimum, 60.0V = Default, 80.0V = Maximum
7. Press ✔ on your desired selection.

How to set the battery bank's high temperature error level:

To allow the user to set the value at which the high temperature error will occur.

5. In "Setu/Batt/Error", press 🡅 or 🡇 to highlight "Bat_Temp" and press ✔, then the value in degree Celsius on the right will be highlighted.
6. Press 🡅 or 🡇 to choose the value in degree Celsius.
   Range: 0'C = Minimum, 100'C = Default, 120'C = Maximum
7. Press ✔ on your desired selection.

How to set the battery bank's low SOC error level:

To allow the user to set the value at which the low state of charge (SOC) error will occur.

5. In "Setu/Batt/Error", press 🡅 or 🡇 to highlight "Low_SOC" and press ✔, then the value in percentage on the right will be highlighted.
6. Press 🡅 or 🡇 to choose the value in percentage.
   Range: 0% = Minimum, 10% = Default, 80% = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

8. Save: Select "Save", then press ✔ to save changes made.
   F-Reset: Select "F-Reset", then press ✔ to reset that battery monitor to its default.
   Cancel: Select "Cancel", then press ✔ to cancel settings made.

1.43 Setup – Battery – Miscellaneous

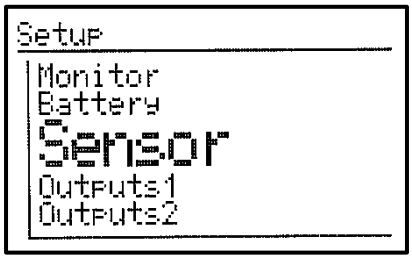
This feature is for factory use only.

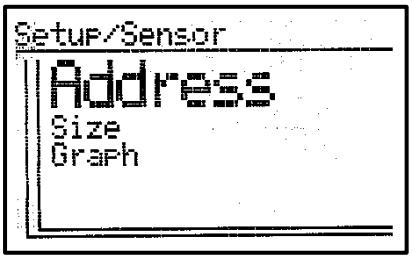
1.44 Setup – Sensor – Address

How to enter “Setup – Sensor – Address” menu:

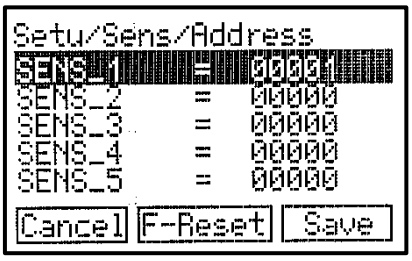
To allow the user to set the address of the sensor modules connected to the battery monitor.

Take Note: The address is provided on the battery monitor sensor.





1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight “Sensor” and press ✔.
4. In “Sensor” sub-menu, press ⬆ or ⬇ to highlight “Address” and press ✔.



How to change the address of sensor 1 to 5:

5. In “Setu/Sens/Address”, press ⬆ or ⬇ to choose between highlighting “SENS_1” to “SENS_5” and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to choose your value.
   Range: 00000 = Minimum, 00000 = Default, 65000 = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

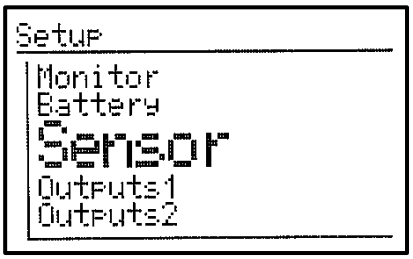
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

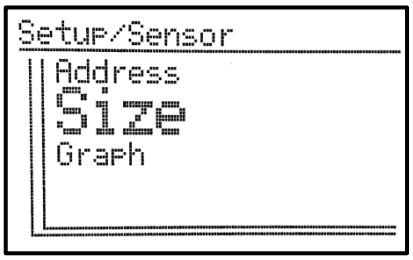
1.45 Setup – Sensor - Size

How to enter the “Setup – Sensor – Size” menu:

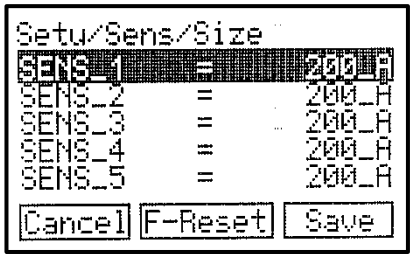
To allow the user to set the size of the sensor modules connected to the battery monitor.

Take Note: The size is indicated on the battery monitor sensor.





1. Press ✕ from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or to highlight “Sensor” and press ✔.
4. In “Sensor” sub-menu, press ⬆ or ⬇ to highlight “Size” and press ✔.



How to set the size of sensor 1 – 5:

5. In “Setu/Sens/Size”, press ⬆ or ⬇ to choose between highlighting “SENS_1” to “SENS_5” and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to choose your value in Amps.
   Range: 50_A = Minimum, 200_A = Default, 400_A = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

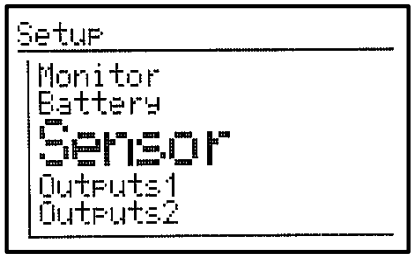
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

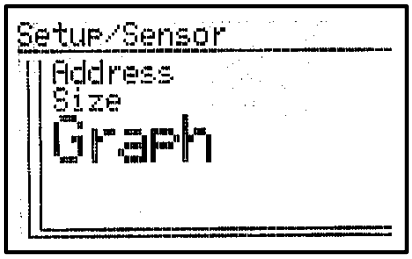
1.46 Setup – Sensor – Graph

How to enter the “Setup – Sensor – Graph” menu:

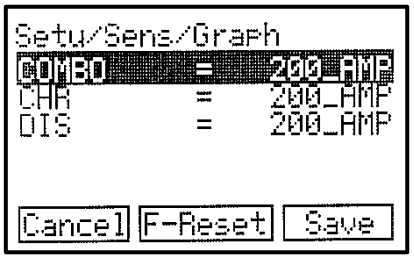
To allow the user to control the maximum value in Amps that the battery monitor will display for each of the following graphs:

For Example: If two loads are connected each with a 200Amp battery monitor sensor, it is recommended to set a discharged graph to 400Amp.





1. Press ✕ from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight “Sensor” and press ✔.
4. In “Sensor” sub-menu, press ⬆ or ⬇ to highlight “Graph” and press ✔.



How to set the maximum amps for the combo graph:

5. In “Setu/Sens/Graph”, press ⬆ or ⬇ to highlight “COMBO” and press ✔, then the value in Amps on the right will be highlighted.
6. Press ⬆ or ⬇ to choose your value in Amps.
   Range: 50_AMP = Minimum, 200_AMP = Default, 800_AMP = Maximum
7. Press ✔ on your desired selection.

How to set the maximum amps for the charge graph:

5. In “Setu/Sens/Graph”, press ⬆ or ⬇ to highlight “CHR” and press ✔, then the value in Amps on the right will be highlighted.
6. Press ⬆ or ⬇ to choose your value in Amps.
   Range: 50_AMP = Minimum, 200_AMP = Default, 800_AMP = Maximum
7. Press ✔ on your desired selection.

How to set the maximum amps for the discharge graph:

5. In “Setu/Sens/Graph”, press ⬆ or ⬇ to highlight “DIS” and press ✔, then the value in Amps on the right will be highlighted.
6. Press ⬆ or ⬇ to choose your value in Amps.
   Range: 50_AMP = Minimum, 200_AMP = Default, 800_AMP = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

1.47 Setup – Output – Mode

How to enter the “Setup – Output1/Output 2 – Mode” menu:

To allow the user to set the mode in which the relay modules should function.

“FRC_ON” (Force On) – The relay will be on permanently.

“FRC_OFF” (Force Off) – The relay will be off permanently.

“SOC” (State of Charge) – The relay will be controlled by the state of charge (SOC) of the battery.

For Example: When the battery only has 20% remaining, it may turn off.

“VOLT” (Voltage) - The relay will be controlled by the voltage of the battery.

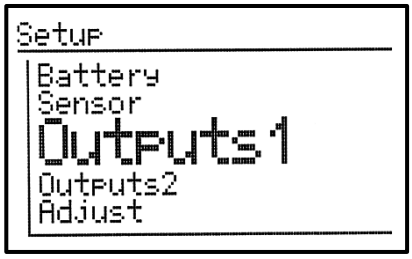
For Example: When the battery reaches 11 Volts, the relay will turn off.

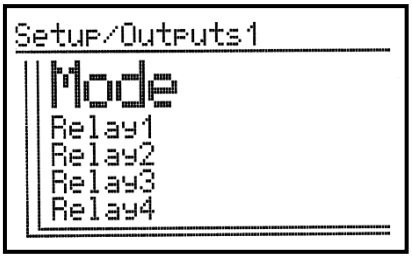
“TOD” (Time of Day” – The relay will be controlled by the time of the day.

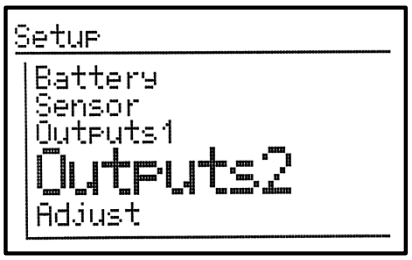
For Example: The relay will turn on at 5 o’clock and turn of at 7 o’clock.

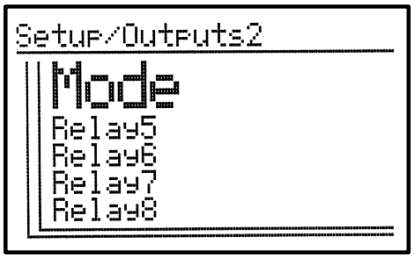
“TTG” (Time to Go) – The relay will be controlled by the time to go in the battery.

For Example: The relay will turn off if there is less than 8 hours of run time in the battery.

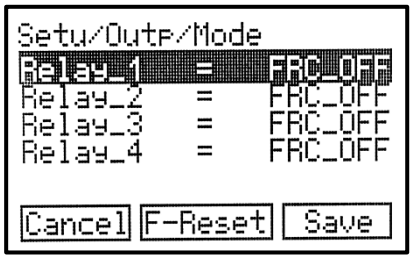


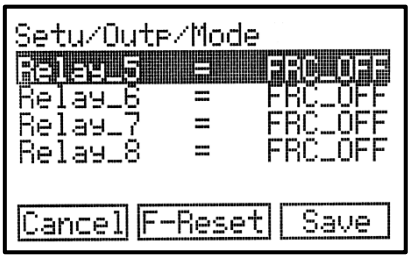






1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight the output menu you want, and press ✔.
   (Output 1 menu for relay 1 – 4 and Output 2 menu for relay 5 - 8)
4. In the “Output” sub-menu, press ⬆ or ⬇ to highlight “Mode” and press ✔.





How to choose the mode of relay 1 - 8:

5. In “Setu/Outp/Mode”, press ⬆ or ⬇ to highlight the relay you wish to change the mode of, and press ✔, then the option on the right will be highlighted.
6. Press⬆ or ⬇ to choose the relay setting.
   Range: “SOC”, “FRC_ON”, “FRC_OFF”, “TOD”, “TTG” or “VOLT”, “FRC_OFF = Default
7. Press ✔ on your desired selection.

When desired changes have been made:

8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

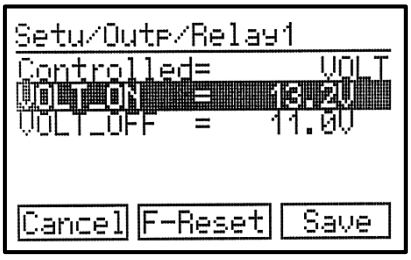
1.48 Setup – Output - Relay (If “VOLT” is selected)

How to enter the “*Setup – Output - Relay” menu:*

To allow the user to set the operation of the relay, according to the voltage of the battery.

A good recommendation for a non-essential load on a 12V battery would be “Volt_ON” = 13,8V and “Volt_OFF” = 11V. In this example, starting with a full battery the load will run until the battery falls below 11V, then the load will be turned off. The load will only turn back on when the battery recovers to above 13,8V.

1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight the output menu you want, and press ✔.
4. In the “Outputs” sub-menu, press ⬆ or ⬇ to highlight the “Relay” you want, and press ✔.



How to set the voltage at which the relay will turn on:

5. In “Setu/Outp/Relay”, press 🡅 or 🡇 to highlight “VOLT_ON” and press ✔, then the value in volts on the right will be highlighted.
6. Press 🡅 or 🡇 to choose the value in volts.
   Range: 48.0V = Minimum, 52.8V = Default, 58.0V = Maximum
7. Press ✔ on your desired selection.

How to set the voltage at which the relay will turn off:

5. In “Setu/Outp/Relay”, press 🡅 or 🡇 to highlight “VOLT_OFF” and press ✔, then the value in volts on the right will be highlighted.
6. Press 🡅 or 🡇 to choose your value in volts.
   Range: 40V = Minimum, 44.0V = Default, 50V = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

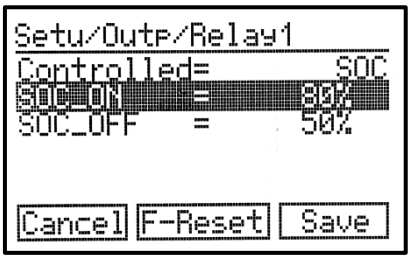
1.49 Setup – Output – Relay (If "SOC" (State of Charge) is selected)

How to enter the "*Setup – Output - Relay" menu:*

To allow the user to set the operation of the relay, according to the state of charge (SOC) of the battery.

A good recommendation for a non-essential load would be "SOC_ON" = 90% and "SOC_OFF" = 40%. In this example, starting with a full battery the load will run until the battery falls below a 40% SOC, then the load will be turned off. The load will only turn back on when the battery recovers to above a 90% SOC.

1. Press 🛠 from the "Home" screen to enter the "Settings" screen.
2. In "Settings", press 🡅 or 🡇 to highlight "Setup" and press ✔.
3. In "Setup" sub-menu, press 🡅 or 🡇 to highlight the output menu you want, and press ✔.
4. In the "Output" sub-menu, press 🡅 or 🡇 to highlight the relay you want, and press ✔.



How to set the SOC at which the relay will turn on:

5. In "Setu/Outp/Relay", press 🡅 or 🡇 to highlight "SOC_ON" and press ✔, then the value in percentage on the right will be highlighted.
6. Press 🡅 or 🡇 to choose the value in percentage.
   Range: 50% = Minimum, 80% = Default, 100% = Maximum
7. Press ✔ on your desired selection.

How to set the SOC at which the relay will turn off:

5. In "Setu/Outp/Relay" press 🡅 or 🡇 to highlight "SOC_OFF" and press ✔, then the value in percentage on the right will be highlighted.
6. Press 🡅 or 🡇 to choose the value in percentage.
   Range: 0% = Minimum, 50% = Default, 80% = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

8. Save: Select "Save", then press ✔ to save changes made.
   F-Reset: Select "F-Reset", then press ✔ to reset that battery monitor to its default.
   Cancel: Select "Cancel", then press ✔ to cancel settings made.

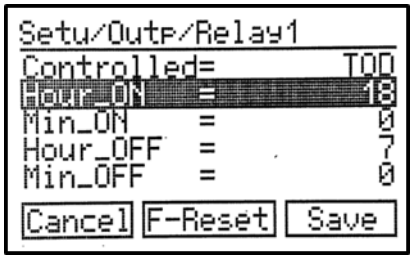
1.50 Setup – Output – Relay (If “TOD” (Time of Day) is selected)

How to enter “Setup – Output – Relay”:

To allow the user to set the operation of the relay according to the time of day.

A good recommendation for a timed load would be “Hour_ON” = 18, “Min_ON” = 30, “Hour_OFF” = 7, “Min_OFF” = 20. In this example the load will turn on at 18:30 (6:30pm) at night and only turn back off at 7:20 (7:20am) in the morning.

1. Press ✕ from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight the output menu you want, and press ✔.
4. In the “Outputs” sub-menu, press ⬆ or ⬇ to highlight the relay you want, and press ✔.



How to set the hour to turn on:

5. In “Setu/Outp/Relay”, press ⬆ or ⬇ to highlight “Hour_ON” and press ✔, then the value in hours on the right will be highlighted.
6. Press ⬆ or ⬇ to enter the value in hours.
   Range: 0 = Minimum, 18 = Default, 23 = Maximum
7. Press ✔ on your desired selection.

How to set the minute to turn on:

5. In “Setu/Outp/Relay”, press ⬆ or ⬇ to highlight “Min_ON” and press ✔, then the value in minutes on the right will be highlighted.
6. Press ⬆ or ⬇ buttons to enter the value in minutes.
   Range: 0 = Minimum, 0 = Default, 59 = Maximum
7. Press ✔ on your desired selection.

How to set the hour to turn off:

5. In “Setu/Outp/Relay”, press ⬆ or ⬇ to highlight “Hour_OFF” and press ✔, then the value in hours on the right will be highlighted.
6. Press ⬆ or ⬇ to enter the value in hours.
   Range: 0 = Minimum, 7 = Default, 23 = Maximum
7. Press ✔ on your desired selection.

How to set the minute to off:

5. In “Setu/Outp/Relay”, press ⬆ or ⬇ to highlight “Min_OFF” and press ✔, then the value in minutes on the right will be highlighted.
6. Press ⬆ or ⬇ to enter the value in minutes.
   Range: 0 = Minimum, 0 = Default, 59 = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

9. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

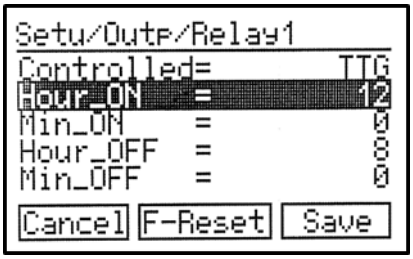
1.51 Setup – Output – Relay (If “TTG” (Time to Go) is selected)

How to enter “Setup – Output – Relay”:

To allow the user to set the operation of the relay according to the usable time remaining in the battery.

A good recommendation for a non-essential load would be “Hour_ON” = 24, “Min_ON” = 15, “Hour_OFF” = 8, “Min_OFF” = 0. In this example, starting with a full battery the load will run until there is less than 8 hours of operation remaining in the battery, the load will then be turned off. The load will only turn back on when the battery recovers to having more than 24hours and 15minutes of operation remaining in it.

1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Setup” and press ✔.
3. In “Setup” sub-menu, press ⬆ or ⬇ to highlight the output menu you want, and press ✔.
4. In the “Output” sub-menu, press ⬆ or ⬇ to highlight the relay you want, and press ✔.



How to set the hour on:

5. In “Setu/Outp/Relay”, press 🡅 or 🡇 to highlight “Hour_ON” and press ✔, then the value in hours on the right will be highlighted.
6. Press 🡅 or 🡇 to enter the value in hours.
   Range: 0 = Minimum, 12 = Default, 23 = Maximum
7. Press ✔ on your desired selection.

How to set the minute on:

5. In “Setu/Outp/Relay”, press 🡅 or 🡇 to highlight “Min_ON” and press ✔, then the value in minutes on the right will be highlighted.
6. Press 🡅 or 🡇 to enter the value in minutes.
   Range: 0 = Minimum, 0 = Default, 59 = Maximum
7. Press ✔ on your desired selection.

How to set the hour off:

5. In “Setu/Outp/Relay”, press 🡅 or 🡇 to highlight “Hour_OFF” and press ✔, then the value in hours on the right will be highlighted.
6. Press 🡅 or 🡇 to enter the value in hours.
   Range: 0 = Minimum, 8 = Default, 23 = Maximum
7. Press ✔ on your desired selection.

How to set the minute off:

5. In “Setu/Outp/Relay”, press 🡅 or 🡇 to highlight “Min_OFF” and press ✔, then the value in minutes on the right will be highlighted.
6. Press 🡅 or 🡇 to enter the value in minutes.
   Range: 0 = Minimum, 0 = Default, 59 = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

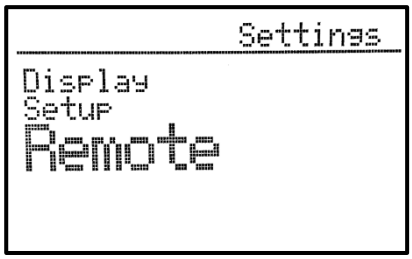
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

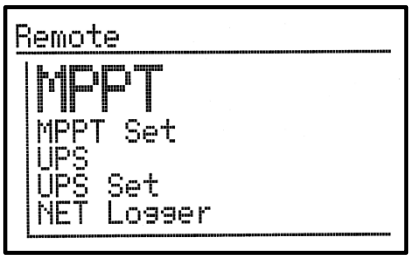
1.52 Setup – Adjust

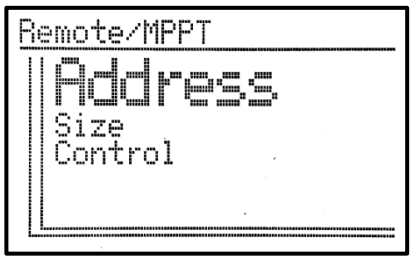
This feature is for factory use only.

1.53 Remote – MPPT - Address

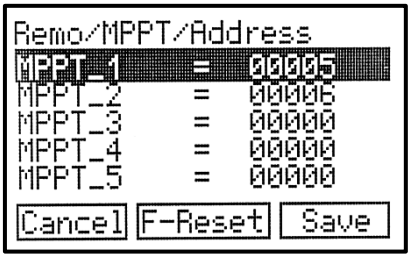
How to enter the “Remote – MPPT – Address” menu:







1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Remote” and press ✔.
3. In “Remote” sub-menu, press ⬆ or ⬇ to highlight “MPPT” and press ✔.
4. In “MPPT” sub-menu, press ⬆ or ⬇ to highlight “Address” and press ✔.



How to add the MPPT’S address:

To allow the user to set the network address of the Microcare MPPT’s connected in their system. On Microcare MPPTs of software v5.25 and older, the address is the serial number of the Microcare MPPT. On the newer Microcare MPPT, the address that it can be set on is “5” by default. Consult the Microcare MPPT manual for further details.

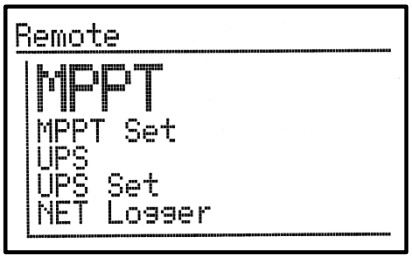
5. In “Remo/MPPT/Address”, press ⬆ or ⬇ to choose between highlighting “MPPT_1” to “MPPT_5” and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to add the value of your MPPT’s address
   Range: 00005 = Minimum, 00005 = Default, 65000 = Maximum
7. Press ✔ on your desired selection.

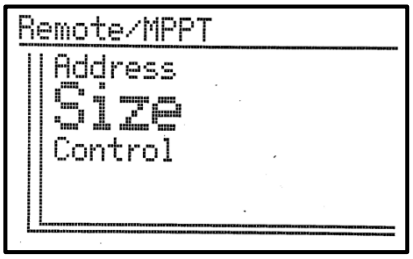
When desired changes have been made:

8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

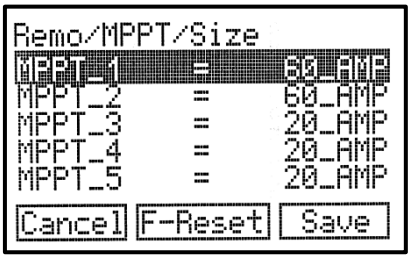
1.54 Remote – MPPT – Size

How to enter the “Remote – MPPT – Size” menu:





1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Remote” and press ✔.
3. In “Remote” sub-menu, press ⬆ or ⬇ to highlight “MPPT” and press ✔.
4. In “MPPT” sub-menu, press ⬆ or ⬇ to highlight “Size” and press ✔.



How to add the MPPT’s size:

To allow the user to set the size rating of the Microcare MPPT. The rating can be found on the Microcare MPPT. Consult the Microcare MPPT manual for further details.

5. In “Remo/MPPT/Size”, press ⬆ or ⬇ to choose between highlighting “MPPT_1” to “MPPT_5” and press ✔, now the value in Amps on the right will be highlighted.
6. Press ⬆ or ⬇ to add the value in Amps.
   Range: 20_AMP = Minimum, 20_AMP = Default, 100_AMP = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

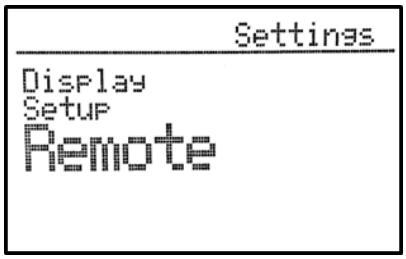
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

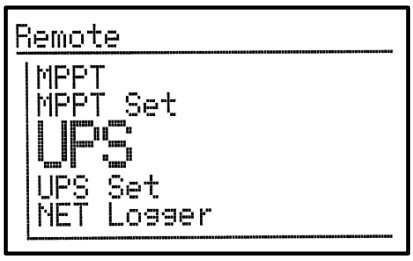
1.55 Remote – MPPT Set

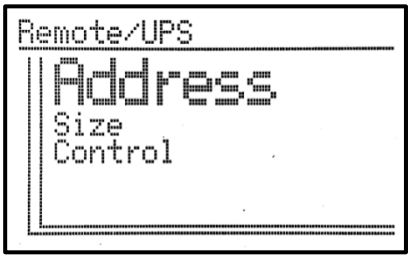
This feature is for factory use only.

1.56 Remote – UPS/Inverter – Address

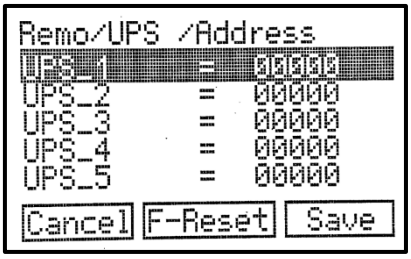
How to enter the “Remote – UPS – Address” menu:







1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Remote” and press ✔.
3. In “Remote” sub-menu, press ⬆ or ⬇ to highlight “UPS” and press ✔.
4. In “UPS” sub-menu, press ⬆ or ⬇ to highlight “Address” and press ✔.



How to add the UPS’s/Inverter address:

To allow the user to set the network address of the Microcare UPS’s/Inverters connected in their system. On the Microcare UPS, 00015 as the network address. Consult the Microcare UPS/Inverter manual for further details.

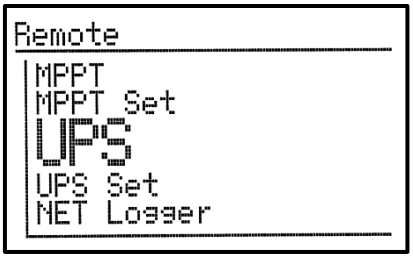
6. In “Remo/UPS/Address”, press ⬆ or ⬇ to choose between highlighting “UPS_1” to “UPS_5” and press ✔, then the value on the right will be highlighted.
5. Press ⬆ or ⬇ to add the value.
   Range: 00000 = Minimum, 00000 = Default, 65000 = Maximum
6. Press ✔ on your desired selection.

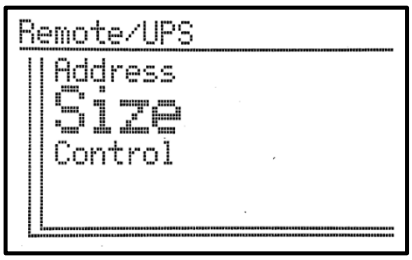
When desired changes have been made:

8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

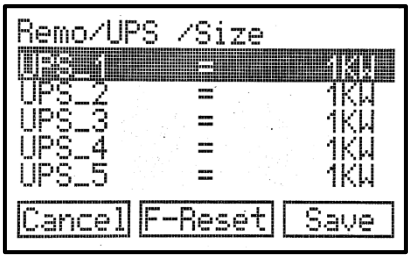
1.57 Remote – UPS/Inverter – Size

How to enter the “Remote – UPS – Size” menu:





1. Press 🛠 from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press 🡅 or 🡇 to highlight “Remote” and press ✔.
3. In “Remote” sub-menu, press 🡅 or 🡇 to highlight “UPS” and press ✔.
4. In “UPS” sub-menu, press 🡅 or 🡇 to highlight “Size” and press ✔.



How to add the UPS’s/Inverer size:

To allow the user to set the size rating of the Microcare UPS/Inverter. The rating can be found on the Microcare UPS/Inverter.. Consult the Microcare UPS/Inveter manual for further details.

5. In “Remo/UPS/Size”, press 🡅 or 🡇 to choose between highlighting “UPS_1” to “UPS_5” and press ✔, then the value in kilowatts on the right will be highlighted.
6. Press 🡅 or 🡇 to add the value in kilowatts.
   Range: 1KW = Minimum, 1KW = Default, 15KW = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

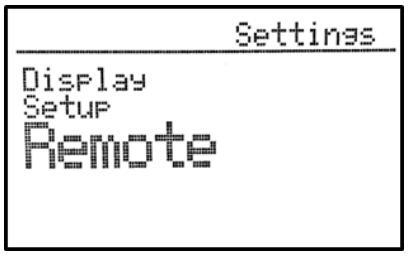
8. Save: Select “Save”, then press ✔ to save changes made.
   F-Reset: Select “F-Reset”, then press ✔ to reset that battery monitor to its default.
   Cancel: Select “Cancel”, then press ✔ to cancel settings made.

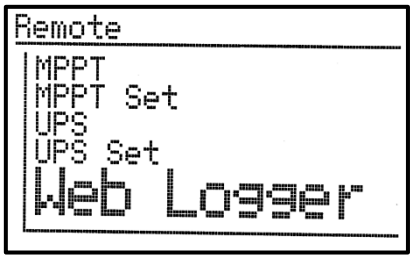
1.58 Remote – UPS Set

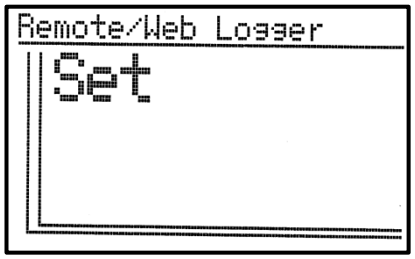
This feature is for factory use only.

1.59 Remote – Web Logger – Set

How to enter the “Remote – Web Logger – Set” menu:



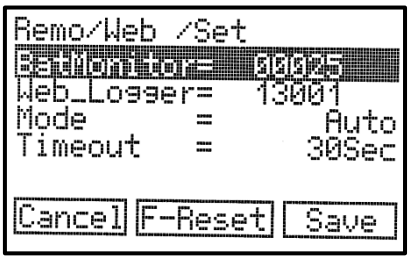




1. Press ✕ from the “Home” screen to enter the “Settings” screen.
2. In “Settings”, press ⬆ or ⬇ to highlight “Remote” and press ✔.
3. In “Remote” sub-menu, press ⬆ or ⬇ to highlight “Web Logger” and press ✔.
4. In “Web Logger” sub-menu, press ⬆ or ⬇ to highlight “Set” and press ✔.

How to add the address of the battery monitor:

To allow the user to set the network address of the battery monitor.



5. In “Remo/Web/Set”, press ⬆ or ⬇ to highlight “BatMonitor” and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to add the value.

   Range: 00000 = Minimum, 00025 = Default, 65000 = Maximum
7. Press ✔on your desired selection.

How to add the address of the web logger:

To allow the user to set the network address of the web logger (internet based power monitor).

5. In “Remo/Web/Set”, press ⬆ or ⬇ to highlight “Web_logger” and press ✔, then the value on the right will be highlighted.
6. Press ⬆ or ⬇ to add the value.
   Range: 00000 = Minimum, 13001= Default, 65000 = Maximum
7. Press ✔ on your desired selection.

How to add the mode of the battery monitor:

To allow the user to select the logging mode of the operation:

"Web_logger" – The web logger will be the communication to the battery monitor and all other devices on the network.

"Remote" – No web logger is used, the battery monitor will communicate to all devices on the network.

"Auto" – The battery monitor will start of in "Int_Log" mode, if the web logger is not communicating during the network timeout period, it will then automatically change into "Remote" mode.

5. In "Remo/Web/Set", press 🡅 or 🡇 to highlight "Mode" and press ✔, then "Remote" on the right will be highlighted.
6. Press 🡅 or 🡇 to select the mode of the battery monitor.
   Range: "Auto", "Remote" or "Int_Log", "Auto" = Default
7. Press ✔ on your desired selection.

How to set the timeout of the chosen mode:

To allow the user to set the timeout to be used in auto mode.

5. In "Remo/Web/Set", press 🡅 or 🡇 to highlight "Timeout" and press ✔, now the value on the right will be highlighted.
6. Press 🡅 or 🡇 to add the value in seconds.
   Range: 0 Seconds = Minimum, 30 Seconds = Default, 1000 Seconds = Maximum
7. Press ✔ on your desired selection.

When desired changes have been made:

8. Save: Select "Save", then press ✔ to save changes made.
   F-Reset: Select "F-Reset", then press ✔ to reset that battery monitor to its default.
   Cancel: Select "Cancel", then press ✔ to cancel settings made.

Additional Information

1.60 Peukert's Exponent Calculation

A key features of a BMS is to accurately measure the state of charge (SOC) of the battery bank, as well as predicting the estimated time remaining in the battery bank when a constant load is applied. The Peukert's Exponent calculation takes into account the size of the battery bank and the relative size of the load applied to the battery bank for more accurate calculations, including the effect of other factors on the battery.

Battery manufactures rate their batteries in terms of a 20 hour rate of discharge, for example a 20 Amp hour battery is rated to provide 1 Amp to the load for 20 hours on a full charge. When discharging the same battery at 20 Amps not considering the Peukert's exponent, the battery should be able to provide to the load for 1 hour, but when the Peukert's exponent with a number of 1.19 (a good modern lead acid average) is considered we find that the battery will only be able to provide power to the load for less than 34 minutes before being completely discharged.

Two battery ratings are required when calculating the Peukert's number for entering into the battery monitor.

1. The 20 hour rating provided by the battery manufacturer.
2. Another discharge rating provided by the battery manufacturer that is below 20 hours.
   For Example: 5 or 10 Hour.

X – Being the 20 hour rating of your battery in Ahr.

T - Being the amount of time for the second discard rating in hours.

Y– Being the T Hour rating of your battery in Ahr.

Using the Formula:

$$Peukert's number = \frac{\log(\frac{T}{20})}{\log\left(\frac{\mathrm{X}}{20}\right) - \log(\frac{\mathrm{Y}}{\mathrm{T}})}$$

For example if you have a battery with the follow ratings

- 20Hr = 500Ahr
- 5Hr = 455Ahr

The calculation would work as follow:

X = 500Ahr T = 5Hr Y = 455Ahr

$$1.072996 = \frac{\log(\frac{5Hr}{20})}{\log\left(\frac{500\mathrm{Ahr}}{20}\right) - \log(\frac{455\mathrm{Ahr}}{5\mathrm{Hr}})}$$

= 1.07 (this number will then be entered into the battery monitor)

DESTRIER ELECTRONICS LIMITED CARRY- IN WARRANTY

Destrier Electronics warrants this range of Battery Monitors against defects in workmanship and materials, fair wear and tear accepted, for a period of 3 (three) years from the date of delivery/collection for all equipment and is based on a carry-in basis. Where the installation of the product makes it impractical to carry-in to our workshops, Destrier Electronics reserves the right to charge for travel time and kilometres travelled to and from the site where the product is installed.

During this warranty period, Destrier Electronics will, at its own discretion, repair or replace the defective product free of charge. This warranty will be considered void if the unit has suffered any physical damage or alteration, either internally or externally, and does not cover damages arising from improper use such as, but not exclusive to:

- Reverse of battery polarity.
- Inadequate or incorrect connection of the product and/or of its accessories.
- Mechanical shock or deformation.
- Contact with liquid or oxidation by condensation.
- Use in an inappropriate environment (dust, corrosive vapour, humidity, high temperature, biological infestation.)
- Breakage or damage due to lightning, surges, spikes or other electrical events.
- Connection terminals and screws destroyed or other damage such as overheating due to insufficient tightening of terminals.
- When considering any electronic breakage except due to lightning, reverse polarity, over-voltage, etc. the state of the internal control circuitry determines the warranty.

This warranty will not apply where the product has been misused, neglected, improperly installed, or repaired by anyone else than Destrier Electronics or one of its authorised Qualified Service Partners. In order to qualify for the warranty, the product must not be disassembled or modified. Repair or replacement is our sole remedy. Destrier Electronics shall not be liable for damages, whether direct, incidental, special, or consequential, even caused by negligence or fault. Destrier Electronics owns all parts removed from repaired products. Destrier Electronics uses new or re-conditioned parts made by various manufacturers in performing warranty repairs and building replacement products. If Destrier Electronics repairs or replaces a part of a product, its warranty term is not extended. Removal of serial nos. may void the warranty.

All remedies and the measure for damages are limited to the above. Destrier Electronics shall in no event be liable for consequential, incidental, contingent or special damages, even if having been advised of the probability of such damages. Any and all other warranties expressed or implied arising by law, course of dealing, course of performance, usage of trade or otherwise, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited in duration to a period of 3 (three) years from the date of purchase.

Life Support Policy:
As a general policy, Destrier Electronics does not recommend the use of any of its products in life support applications where failure or malfunction of the Destrier Electronics product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness.

Destrier Electronics does not recommend the use of any of its products in direct patient care. Destrier Electronics will not knowingly sell its products for use in such applications unless it receives in writing assurances satisfactory to Destrier Electronics that the risks of injury or damage have been minimised, the customer assumes all such risks, and the Liability of Destrier Electronics is adequately protected under the circumstances.

Caution:
Our products are sensitive. While all care is taken by us to dispatch goods with adequate packaging, Destrier Electronics is not responsible for any damages caused to products after they have left our premises.

REGISTRATION OF MY MICROCARE PRODUCT

Please register your product online at www.microcare/register-my-product

Also fill in the form below as a hardcopy reference for technical support.

Product Serial Number: _____

Product Description: _____

Date Purchased _____

From whom the product was purchased.

Company Name _____

Contact Person _____

Contact Number _____

E-mail Address _____

Installation Company Information:

Company Name _____

Contact Person _____

Contact Number _____

E-mail Address _____

Details of Product Owner

Name & Surname _____

Address _____

City & Province _____

Contact Number _____

E-mail Address _____

Date Installed _____

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