ENCAP

BEYOND BATTERIES

USER MANUAL

ENCAP Micro Pro S Module 8KWH-48V

EPS-8k-48-1C-2PA-X-X-X_1V0_GEN1

VERSION 1| REVISION 0 | RELEASE DATE: 6th Feb 2025

SMART MANAGEMENT

- Feature-rich Online Monitoring via Encontrol Tool
- Automatic Firmware Updates
- Warning Alarms

EFFICIENT

- Highly Efficient: > 95% RTE (Round Trip Efficiency)
- 100% DOD (Depth of Discharge)
- 500,000 Cell Life Cycles

SAFE & RELIABLE

- Wide Operating Temperature Range
- Deployable in Various Environments including High Altitudes
- No Thermal Runaway Risk

ATTENTION

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Document HISTORY

Issue 01 (6th Feb 2025)

First release

TABLE OF CONTENTS

SAFETY INSTRUCTIONS

SAFETY GUIDELINES

1. PERSONAL SAFETY

- Always wear proper personal protective equipment (eyes protection, gloves, and safety shoes).

2. GENERAL GUIDELINE

- Do not subject the Module to strong impact.
- Do not crush or puncture the Module.
- Do not place the Module near a heat source, such as a fireplace.
- Do not disassemble the Module under any circumstances.
- Ensure precautions to prevent short-circuit under all circumstances.
- Do not touch the terminals with conductors while the Module is charging. Serious burns, shock, or material fusing may occur.
- Protect surrounding electrical components from incidental contact.
- Do not subject the Module to high pressure.
- Do not place any object on top of the Module.
- Do not drop the Module. Internal damage may occur that will not be visible.

- Do not stack Modules once they have been removed from the packaging. Instead the Modules should be placed on shelves.
- In case the Module is physically damaged for any reason, do not install and energize the Module under any circumstances and immediately contact your Reseller.

3. MODULE OPERATION

- Do not operate the Module above the specified voltage.
- Always make sure charger is set as recommended.
- When connecting to external devices ensure that galvanic isolation of the external device(s) does not exceed 1000V.
- Always make sure chargers are disconnected while working on Modules.
- Do not connect or disconnect terminals from the Module without first disconnecting the load.

4. MODULE OPERATING ENVIRONMENT

- Location: Indoor/Outdoor
- Operating Temperature Range: -30°C to 70°C (For continuous operations outside this range, please consult your Resellers or Enercap).
- Operating Humidity: Non-Condensing
- Do not charge the Module when the temperature is below -30°C.
- Do not charge the Module when temperature is above 70°C.

5. MODULE CLEANING

- Disconnect the power before cleaning.

- Use a soft cloth dampened in a solution of mild detergent and water.

6. STORAGE ENVIRONMENT

- Do not store the Module at temperature greater than 70°C.

7. DISPOSAL

- Do not dispose the Module in fire.
- Do not dispose this Module as unsorted municipal waste. Please use a separate collection facility or contact the supplier from whom this Module was purchased. Please make sure discarded electrical waste is properly recycled per applicable regulations to reduce environmental impact.

PRE-INSTALLATION

INSPECTION

Document (e.g., photo) any damage and report this to your Reseller and shipping agent immediately. Remove the Module from the shipping carton and retain the shipping materials until the unit has been inspected and is determined to be operational.

UNPACKING

The Modules and cable accessories are packed in a cardboard carton with foam padding for protection during shipping.

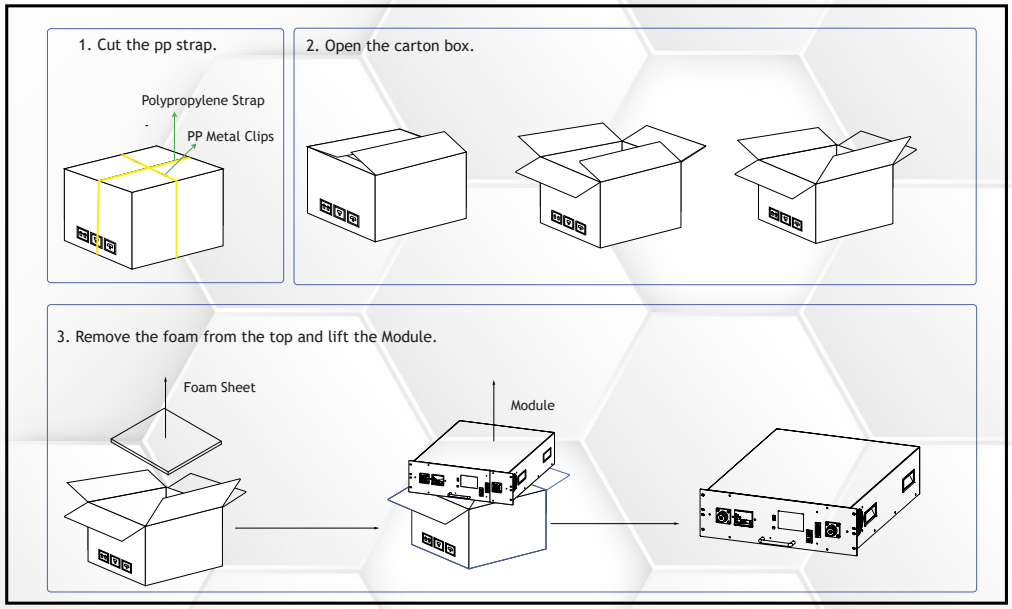


Figure 1: Steps to unpack the Module

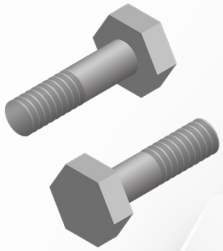
CONTENT CHECK

Check the contents of the package. The following are standard items shipped by us.

8kWh-48V

Connector 6 Pin

CANBUS Cable



Bolts M10x20mm

Washer M10

Spring Washer M10

Figure 2: Module package contents

HANDLING

The Modules are designed to provide years of trouble-free operation. Proper handling is required to avoid damage to the Module. In particular, the following precautions should be observed.

1. LIFTING THE MODULE

1. Pull up the handle on the top of the Module, grip the Module firmly and lift it.

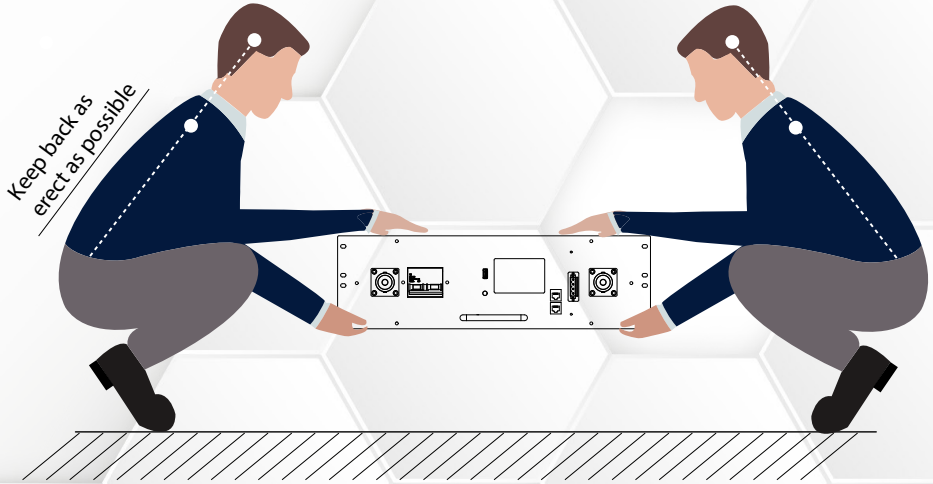


Figure 3: Holding the Module to lift up

2. Lift up straight, remembering not to turn your body while you are lifting.

Figure 4: Lifting up the Module

LOCATION REQUIREMENTS

1. AREA OF INSTALLATION

- Install the Module at an appropriate height for ease of viewing LCD and operating switches.

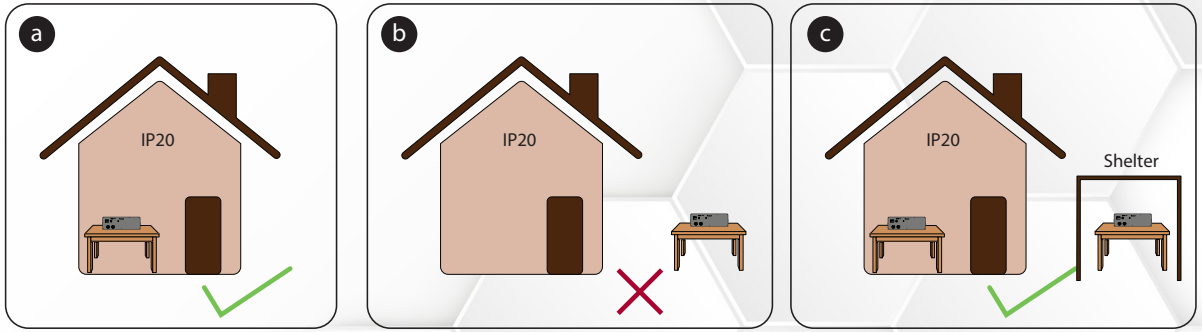


Figure 5: Installation restriction: a) Module can be stored inside b) Modules cannot be stored outside without shelter c) Modules can be installed indoors and outdoors with shelter

2. ENVIRONMENT REQUIREMENTS

- The ambient temperature and relative humidity must meet the following requirements.

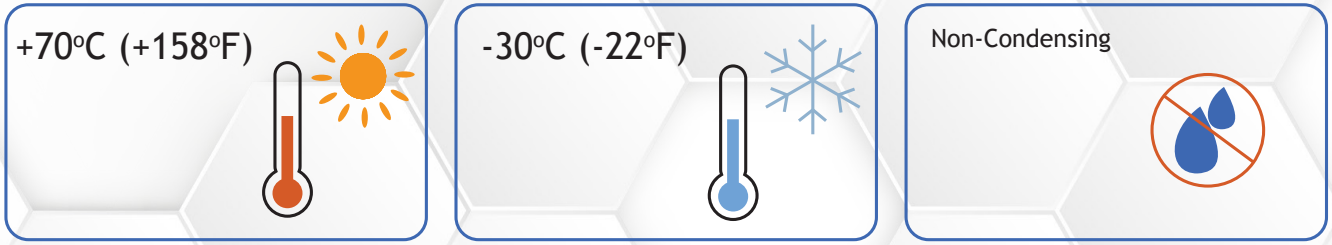


Figure 6: Operating temperatures and humidity of Module

3. ANGLE REQUIREMENT

- Never install the Module vertically, or with a forward tilt/backward tilt, or upside down.

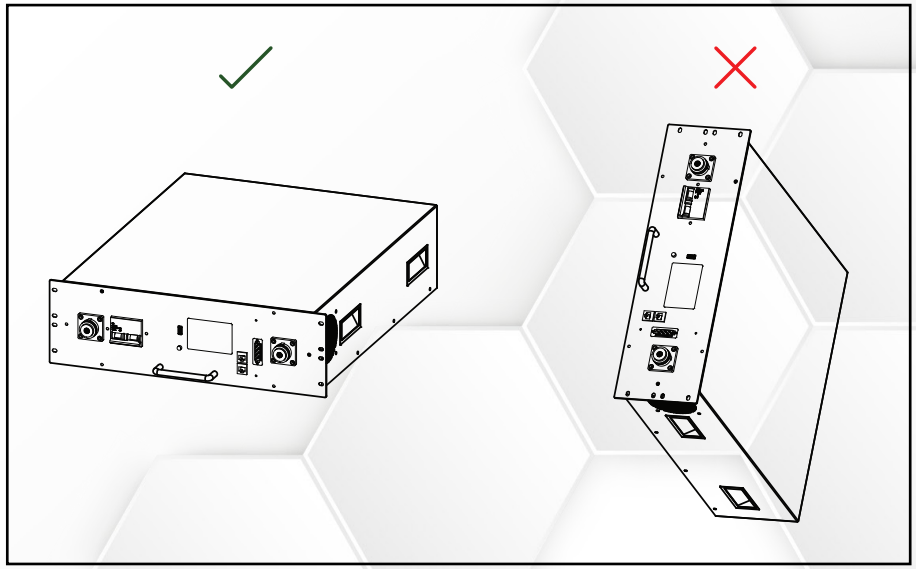


Figure 7: 1) Correct angle position 2) Wrong angle position

ELECTRICAL INSTALLATION

ELECTRICAL CONNECTIONS

1. CABLE SIZE

We recommend a cable size of 150mm^2 thickness and 1m length to hold current up to 300A. Please use a thicker cable for lengths longer than 1m.

2. CABLE CRIMPING

Crimp the cables for connecting the Modules in series or parallel.

- Wrap the wire crimping area with heat shrink tubing or insulation tape.
- When using a heat gun, protect the equipment from being scorched.

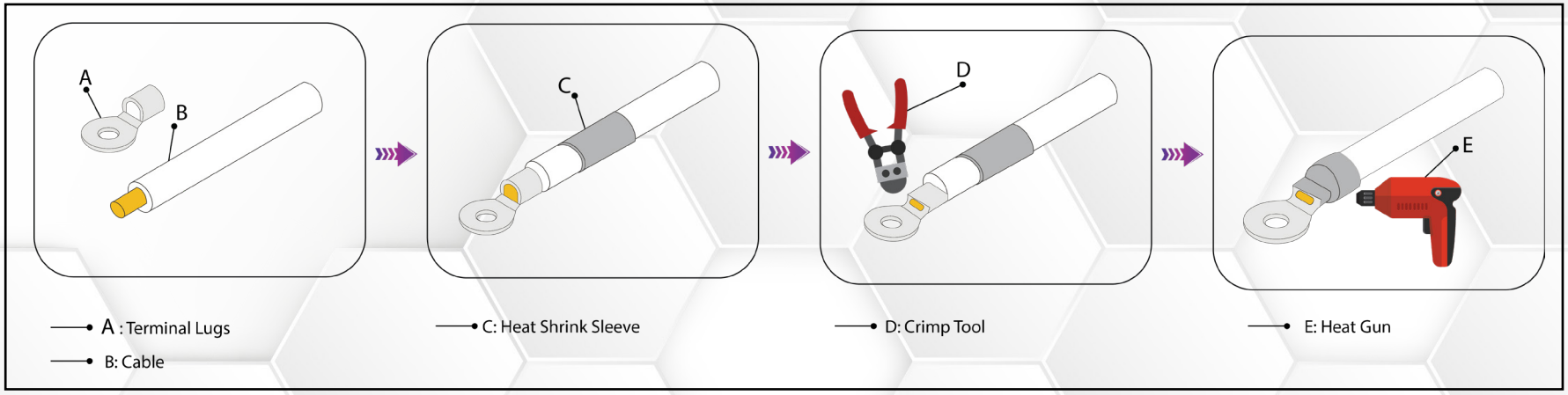


Figure 8: Steps to crimp the cables for the terminal

3. CONNECTING CABLE LUGS, WASHERS, AND BOLTS TO MODULE TERMINALS

Follow the sequence below to connect the cable lugs, washers, and bolts to the positive and negative terminals of the Module.

Figure 9: Connecting lugs, washers, and bolts to negative terminal of Module

Figure 10: Connecting lugs, washers, and bolts to positive terminal of Module

1. CONNECTING MODULE TO POWER SUPPLY/CHARGER

Connect positive and negative terminals of charger to the positive and negative terminals of the Module, respectively.

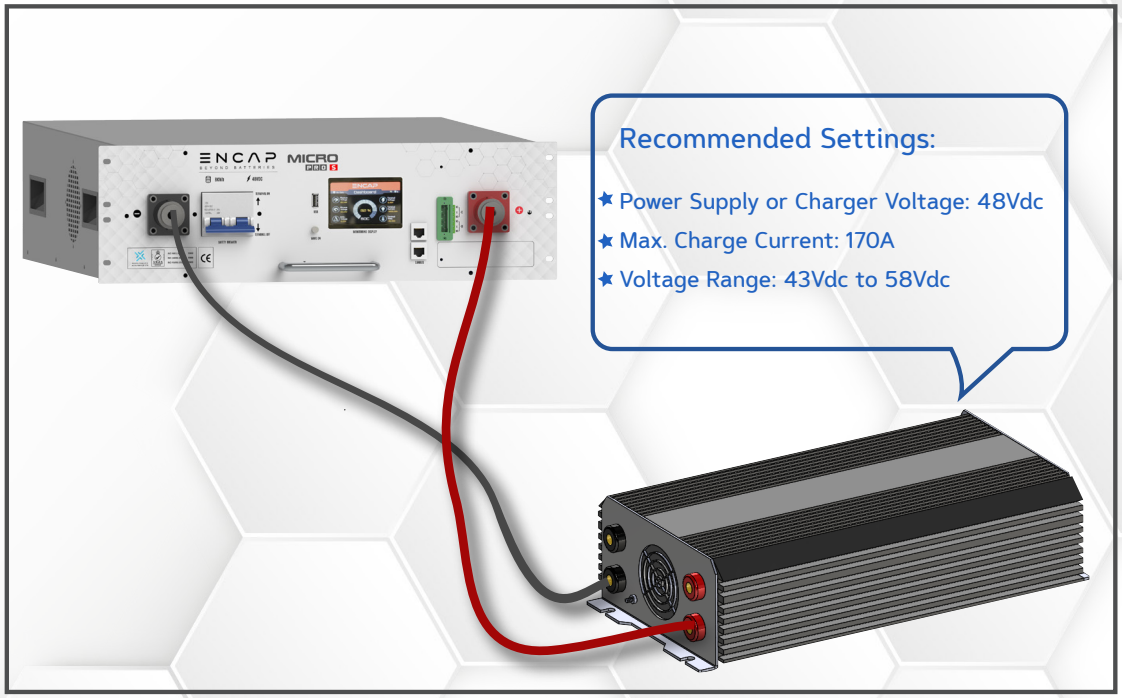


Figure 11: Charging Module with power supply

2. CONNECTING MODULE TO LOAD/DISCHARGER

Connect positive and negative terminals of discharger to the positive and negative terminals of the Module, respectively.

Figure 12: Discharging Module from discharger

PARTS DESCRIPTION

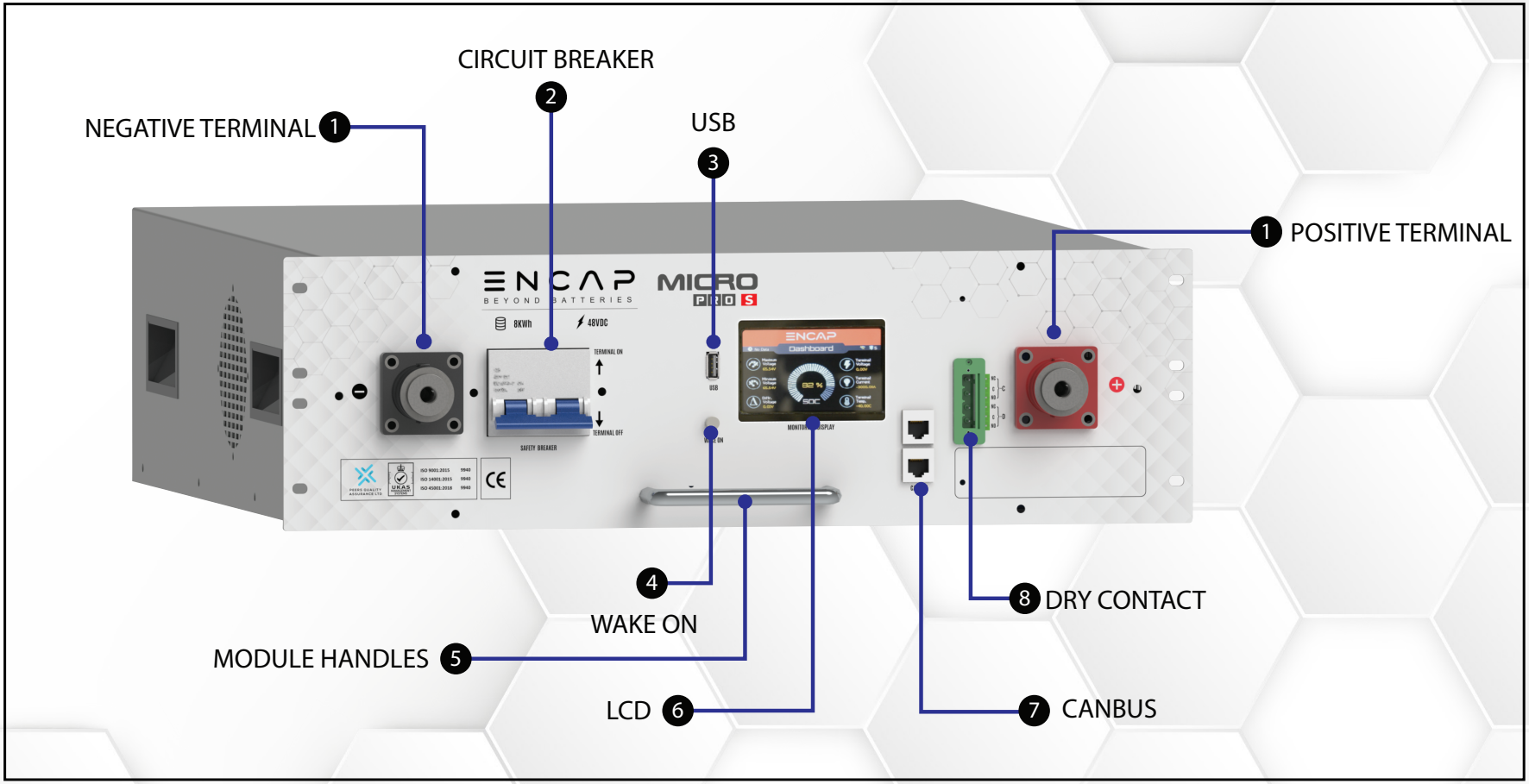


Figure 13: Module parts description

1. TERMINAL

ENCAP has 300A positive and negative terminals. The terminals are equipped with one fastening point supplied with M10x20mm bolts to accommodate interconnecting busbars and cable lugs.

2. CIRCUIT BREAKER

The Module has 125A 2P manual circuit breaker. This breaker serves as over current protection for the Module.

3. USB

USB port is used to update firmware version.

4. WAKE-ON BUTTON

The BMS of the Module goes in a dormant state to save power when not in use for an hour.

You can quickly wake-up the BMS.

Do the following to wake up the BMS;

- Press the Wake-ON button, the LCD will power On.

5. MODULE HANDLES

Two carrying handles are fitted to the front face and back of each Module to ensure easy and safe handling and lifting onto the pedestal. Four people are recommended for stacking the Modules.

6. LCD

The Monitoring LCD allows monitoring and configuring of the Module.

7. DRY CONTACT

The purpose of the Dry Contact output is to send the information about unexpected or unwanted events occurring in the Module to other apparatus so that external equipment can understand the current state of the Module and act accordingly. This card provides two output relays as mentioned below. All output contacts are programmable using the Monitoring LCD (explained later).

DRY CONTACT PIN CONFIGURATION:

Dry Contact C – Pin 1, 2 & 3

Dry Contact D – Pin 4, 5 & 6

8. CAN COMMUNICATION

This interface is used to connect the Module to CANBUS compatible inverters and system controllers. The RJ45 cable for CANBUS communication is included in the packaging.

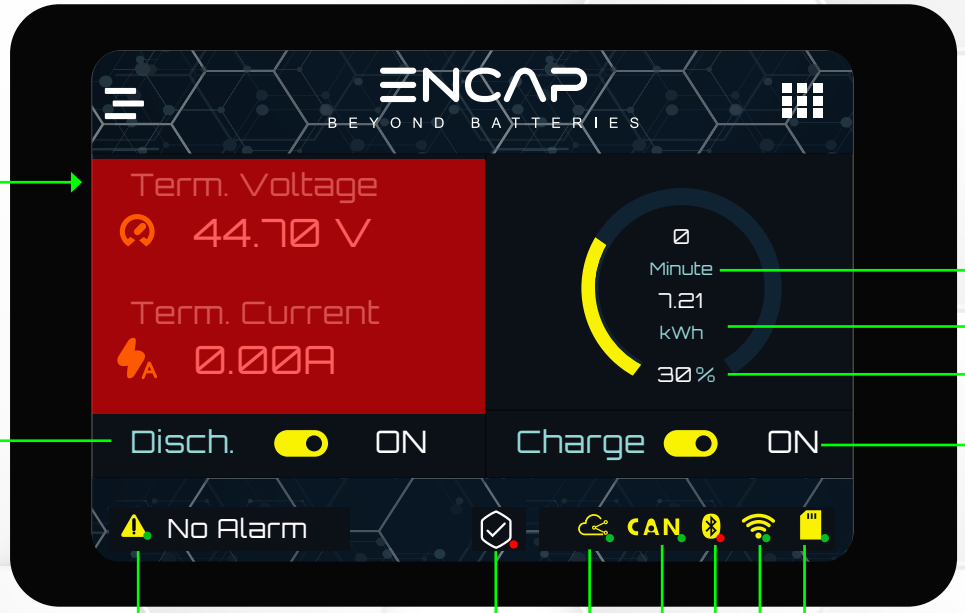
This Module uses CANopen 1.0 protocol. CANopen is a high-level communication protocol and device profile specification that is based on the CAN protocol. (Please visit https://encap.energy/downloads/ page to see Module configuration for this protocol).

MONITORING LCD (FIRMWARE VERSION 3.0.2)

The Monitoring LCD allows user to monitor and configure the Module.

1. DASHBOARD

The first page on LCD is dashboard by default.



Tap anywhere in the shaded area to view Module parameters

Discharge Status of Module

Minute shows the remaining time for full charge or full discharge. 0 minute means the Module is on standby

kWh shows the capacity of the Module

It shows the SOC of the Module

Charge Status of Module

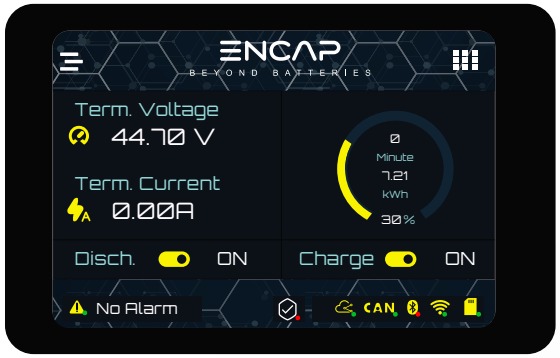
Alarm Notifications

Terminal ON/OFF for secure operation

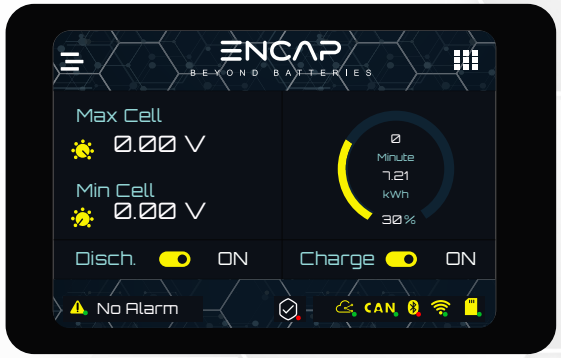
SD Card Status
WIFI Status
Bluetooth Status
CANBUS Status
Online Monitoring Status

- Active
- Non-Active

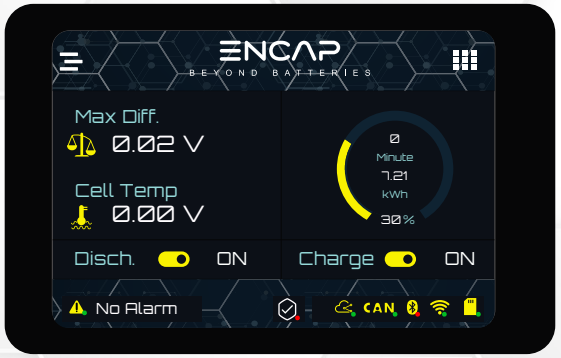
Tap the dashboard to view Module parameters: i.e. Terminal Voltage, Terminal Current, Maximum and Minimum Cell Voltages, Difference of Maximum and Minimum Cell Voltages, Cell Temperature, Charge Energy, Discharge Energy, System Time, System Date, System Alarms, System Mode.



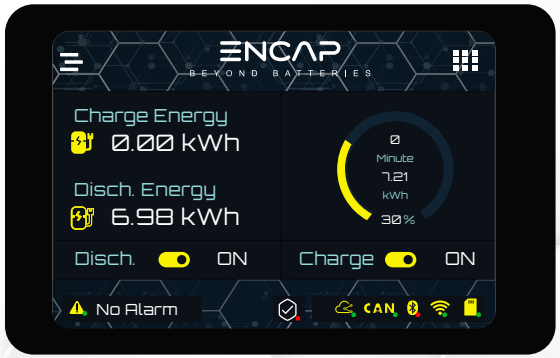
First Display



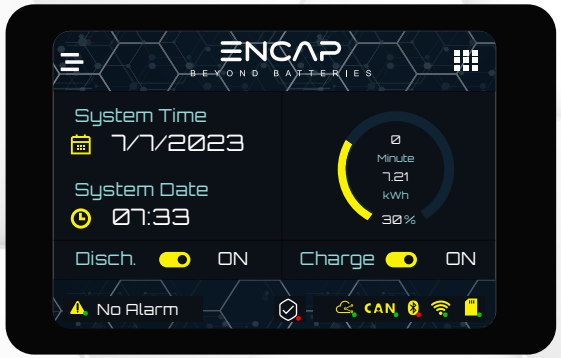
Second Display



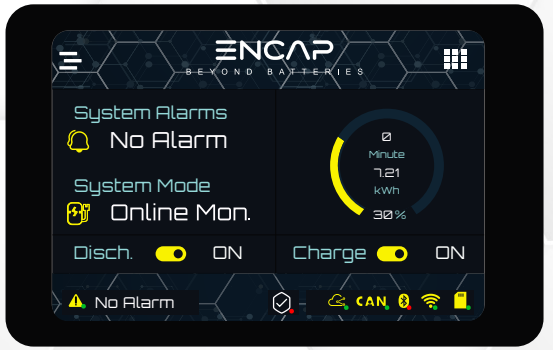
Third Display



Fourth Display

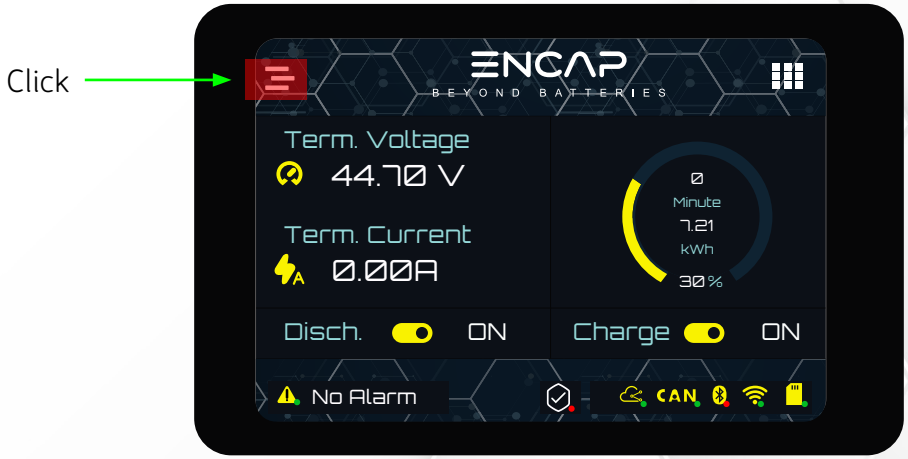


Fifth Display



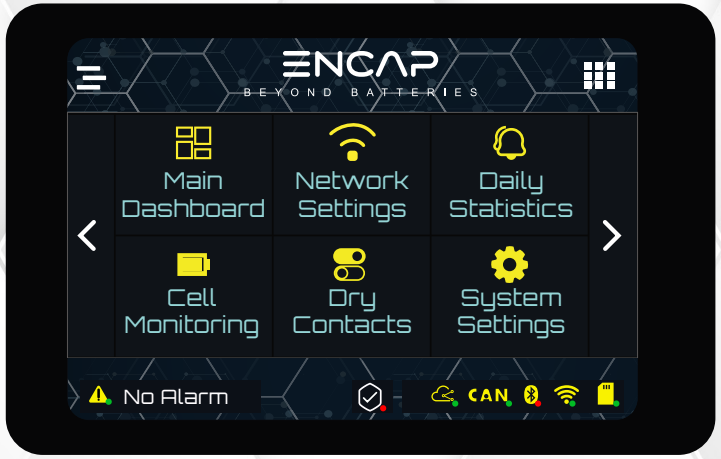
Sixth Display

Click on the menu bar ☰ to go to main menu.

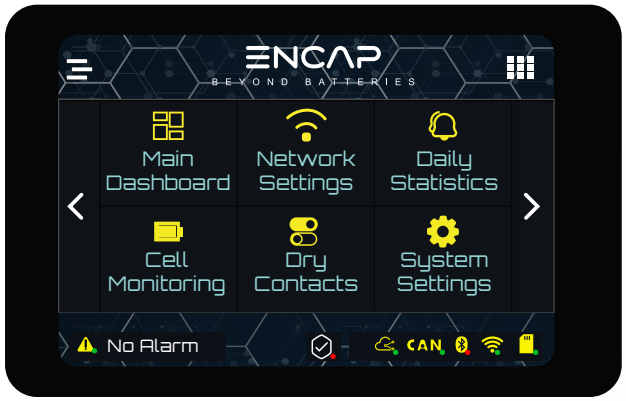


2. MAIN MENU:

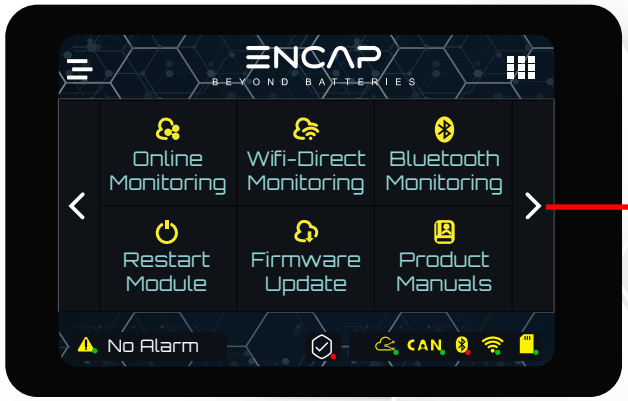
The main menu provides parameter viewing and functions setting. The main menu is categorized into three pages.



First page

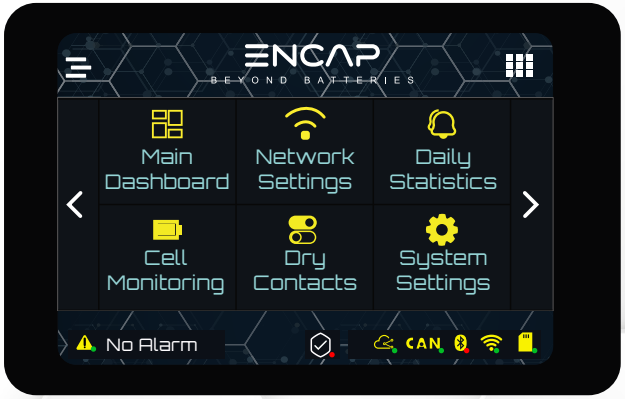


First page



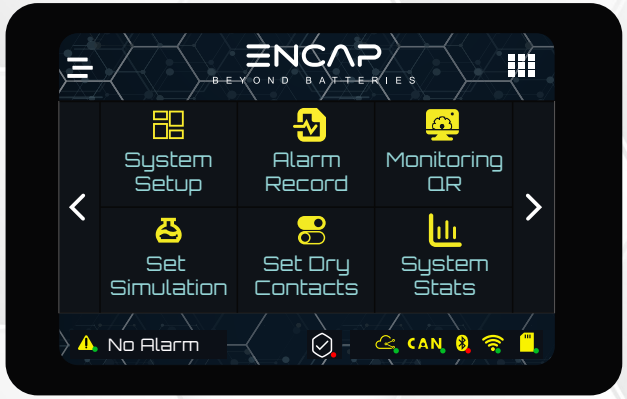
Second page

Click on right arrow to go to third page



First Page

Second Page



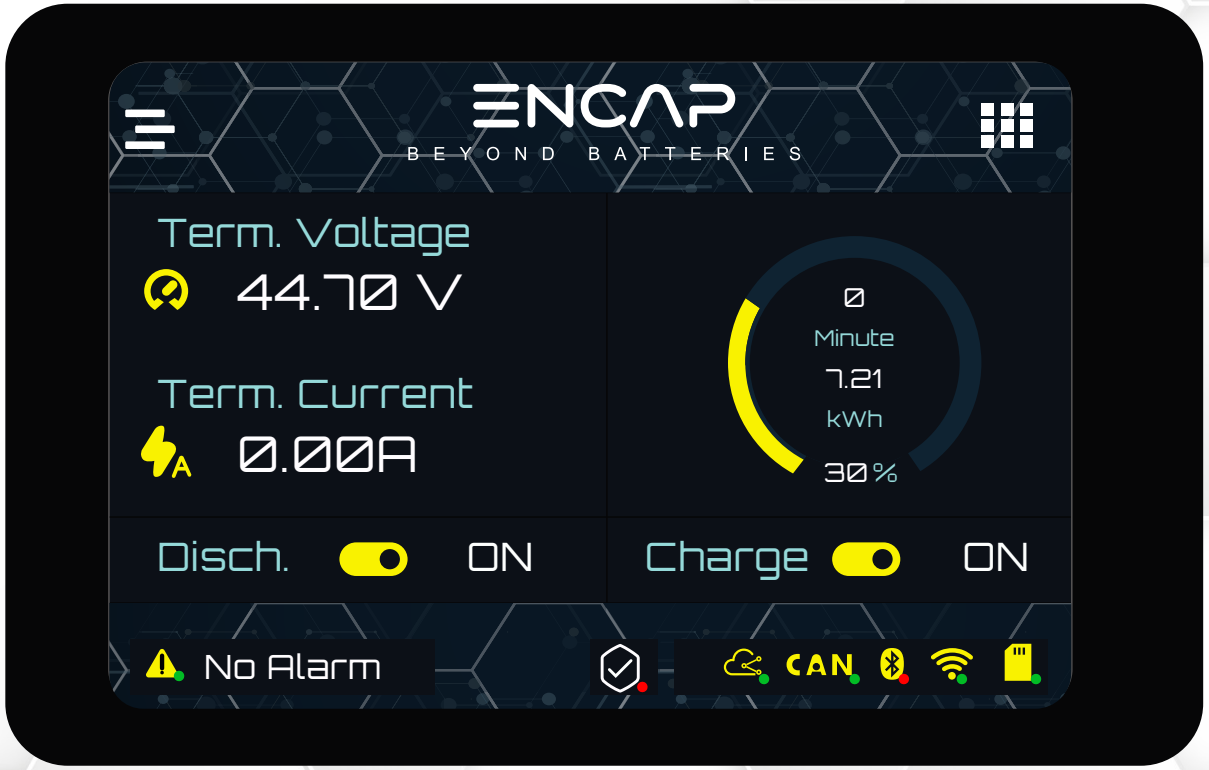
Third Page

FIRST MENU PAGE

First Menu page has Main Dashboard, Network Settings, Daily Statistics, Cell Monitoring, Dry Contacts and System Settings.

1. MAIN DASHBOARD

The first page on LCD is dashboard by default.

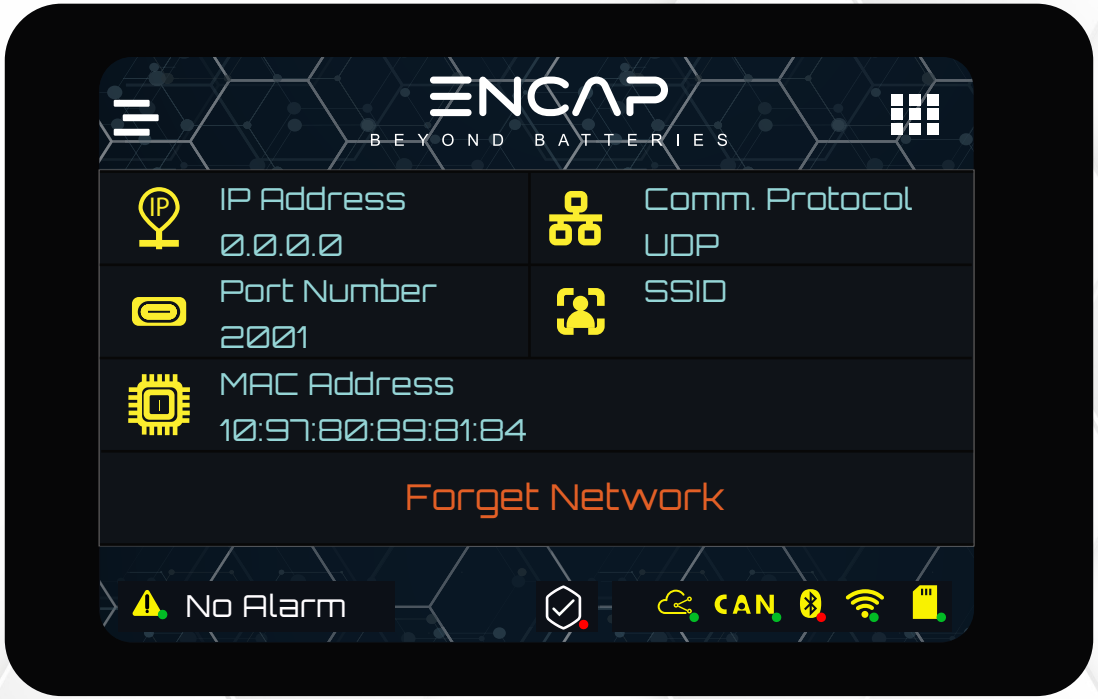


2. NETWORK SETTINGS

This page shows the IP Address, Port Number, Mac Address, Communication Protocol and SSID.

FORGET NETWORK:

Click on Forget Network to delete stored network info and Wi-Fi passwords.

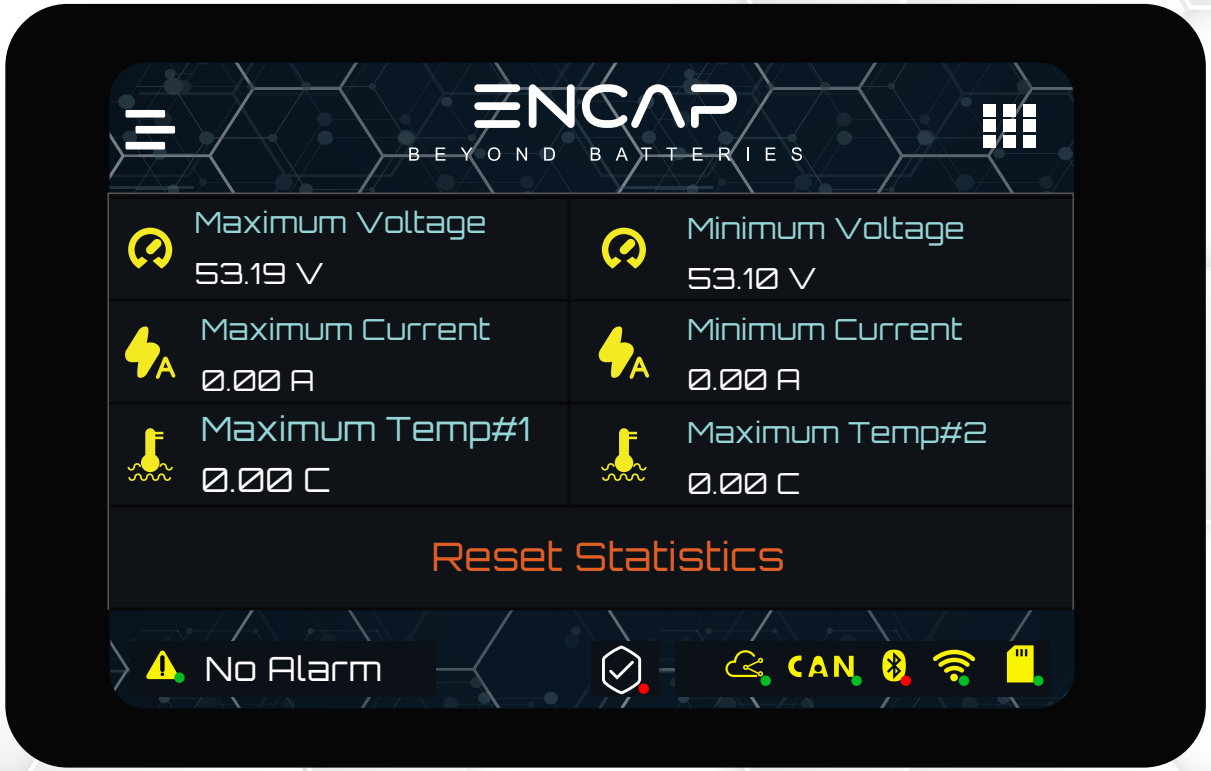


3. DAILY STATISTICS

Daily statistics shows the maximum and minimum voltages, maximum and minimum currents and maximum temperature of the Module.

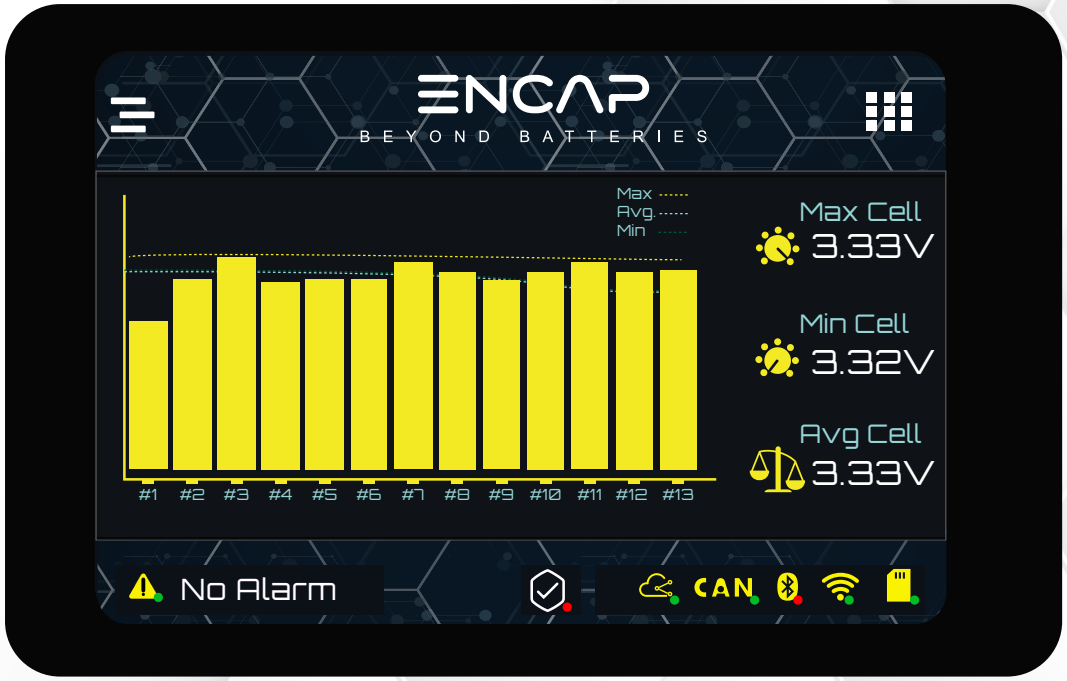
RESET STATISTICS:

Click on Reset Statistics to delete stored preset values.



4. CELL MONITORING

This page gives information on each cell's voltage in the Module. This page helps the user to know about the imbalance and under/over voltage of cells.

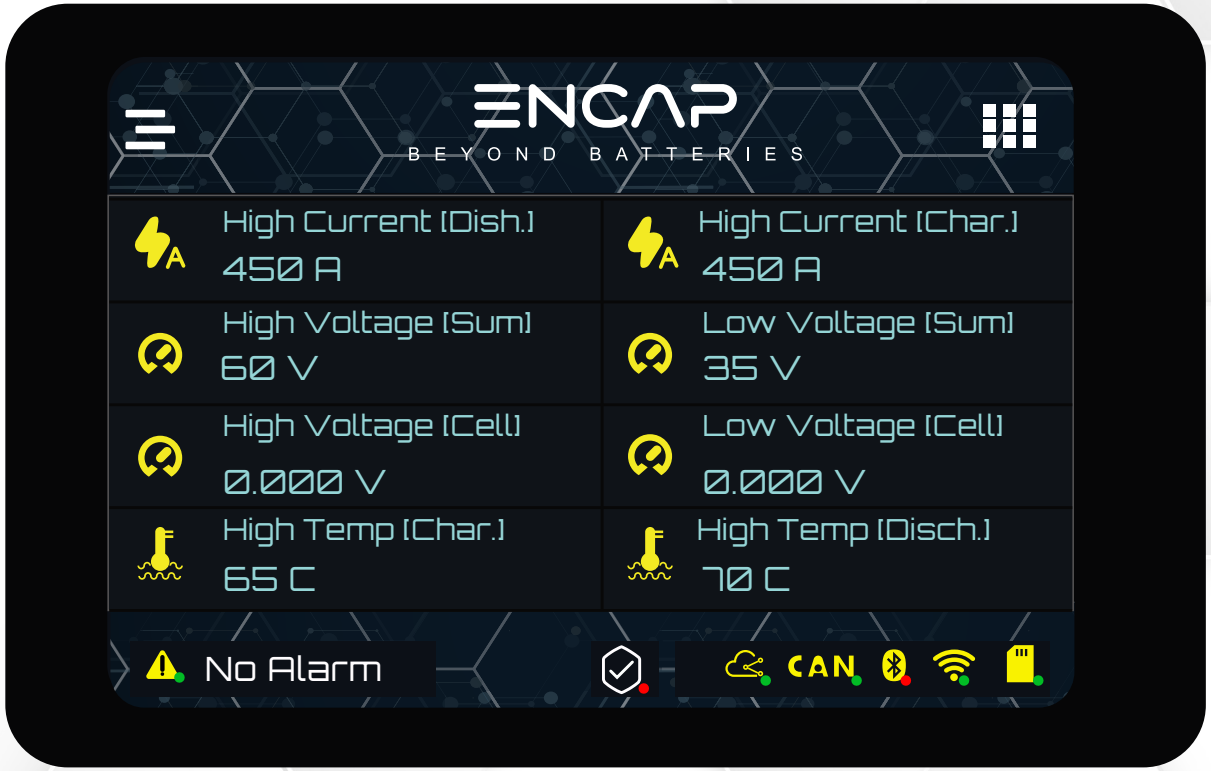


5. DRY CONTACTS

This is the Dry Contact read page. This page helps the user to view all the settings of the configured Dry Contacts.

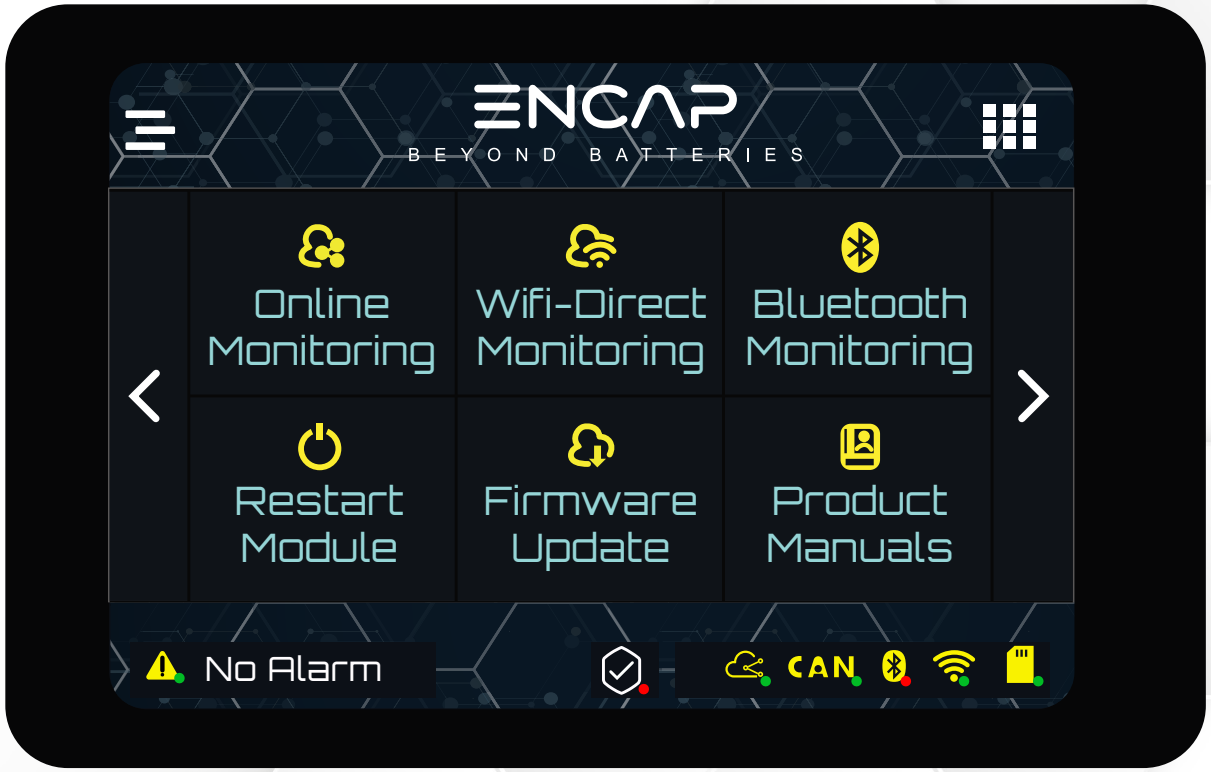
6. SYSTEM SETTINGS

System settings shows the preset limit of high current during charging and discharging, high and low voltage of Module, high and low voltage of cells and high temperature during charging and discharging.



SECOND MENU PAGE

Second menu page has Online Monitoring, Wifi-Direct Monitoring, Bluetooth Monitoring, Restart Module, Firmware Update and Product Manuals.



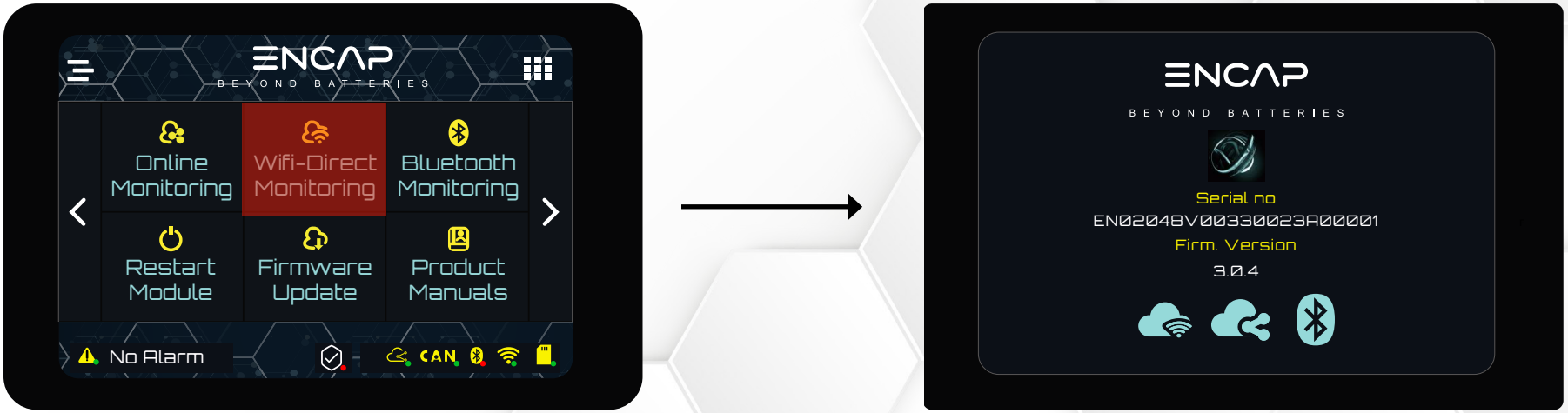
1. ONLINE MONITORING

Click on Online Monitoring, Module will restart. While restarting, the Online Monitoring will brighten up.

Online Monitoring will connect automatically if SSID and password are defined. For connecting for the first time, user need to define SSID and password. Kindly refer to Monitoring QR for defining SSID and password.

2. WIFI- DIRECT MONITORING

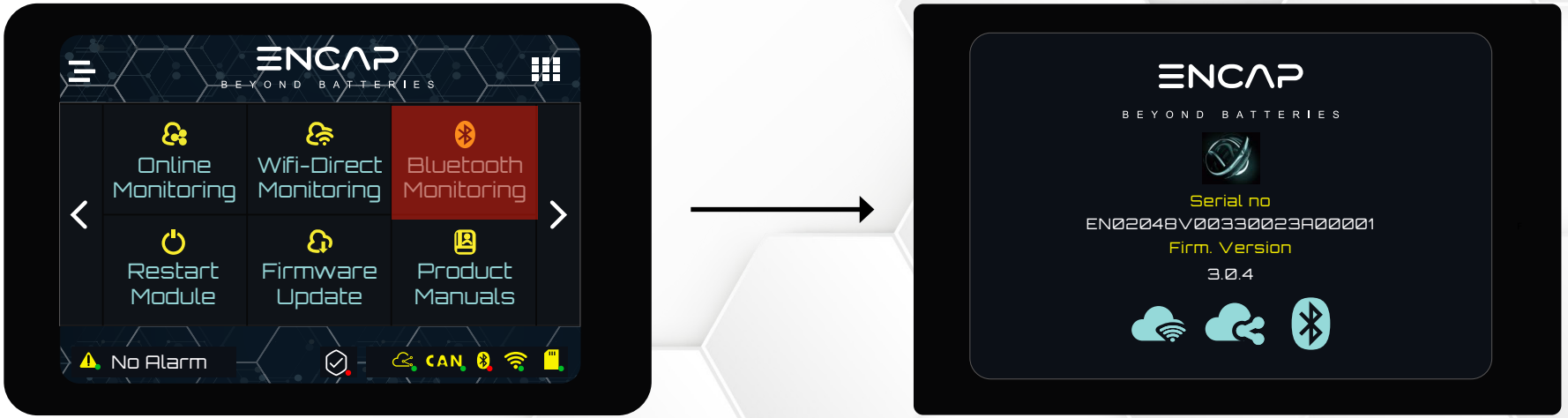
Click on Wi-Fi Direct Monitoring, Module will restart. While restarting, the Wi-Fi Direct icon will brighten up.



Wi-Fi Direct will connect automatically if SSID and password are defined. For connecting for the first time, user need to define SSID and password. Kindly refer to Monitoring QR for defining SSID and password.

3. BLUETOOTH MONITORING

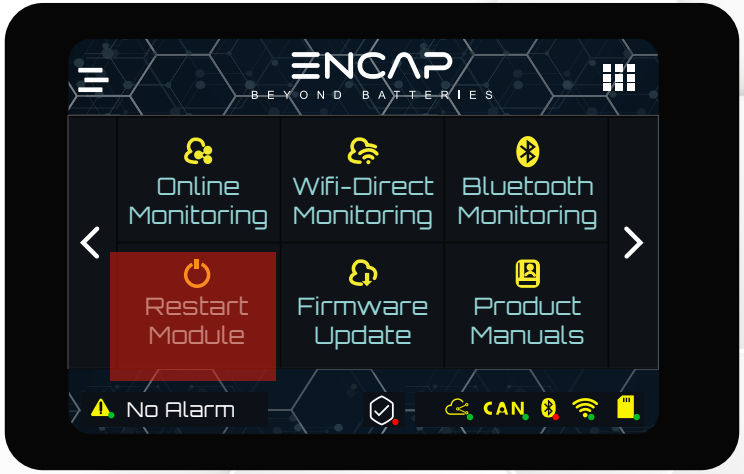
Click on Bluetooth Monitoring, Module will restart. While restarting, the Bluetooth icon will brighten up.



This function is only for use by **ENCAP** and not available to a user at this time.

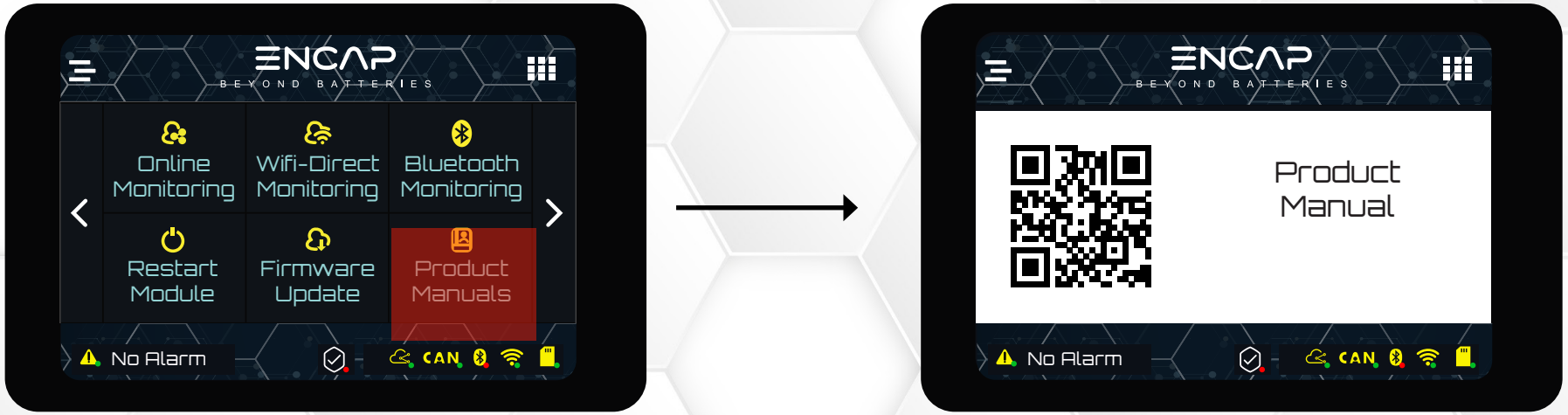
4. RESTART MODULE

If user want to restart Module, click on restart Module to restart the Module.



5. PRODUCT MANUAL

Click on product manual. Scan the QR code to download this product manual.



THIRD MENU PAGE

Third menu page has System Setup, Alarm Record, Monitoring QR, Set Dry Contacts and System Statistics.

1. SYSTEM SETUP

User can enable/disable BMS buzzer, enable/disable terminal safety and set and read CAN ID from system setup page.

BMS BUZZER:

If the BMS buzzer is enabled, whenever the touch functionality is triggered, it will buzz. Tap on the BMS buzzer to disable it.

TERMINAL SAFETY:

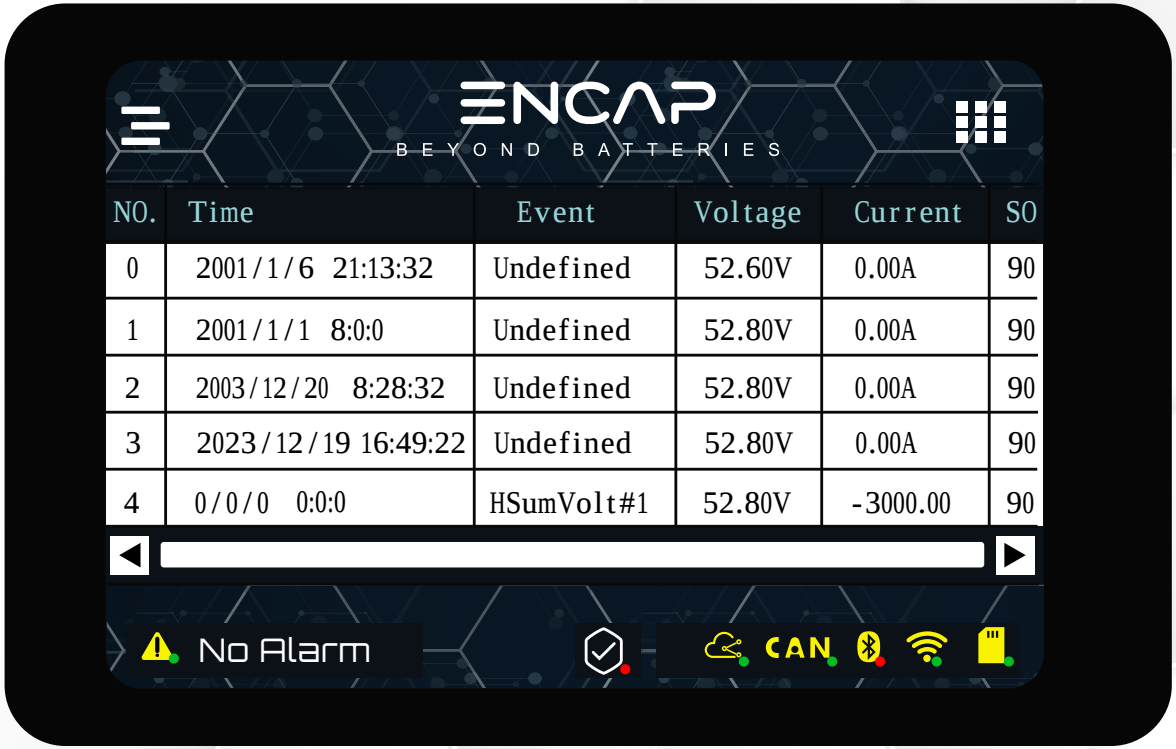
This feature is added to secure the operation of BMS. Click on Terminal Safety to enable the feature. When safe feature is enabled, Module will not charge or discharge.

If you want to charge and discharge the Module, disable the safe feature by clicking on Terminal Safety. .

SET CAN_ID and Read CAN 1D is for racked and containerized Modules only.

2. ALARM RECORDS

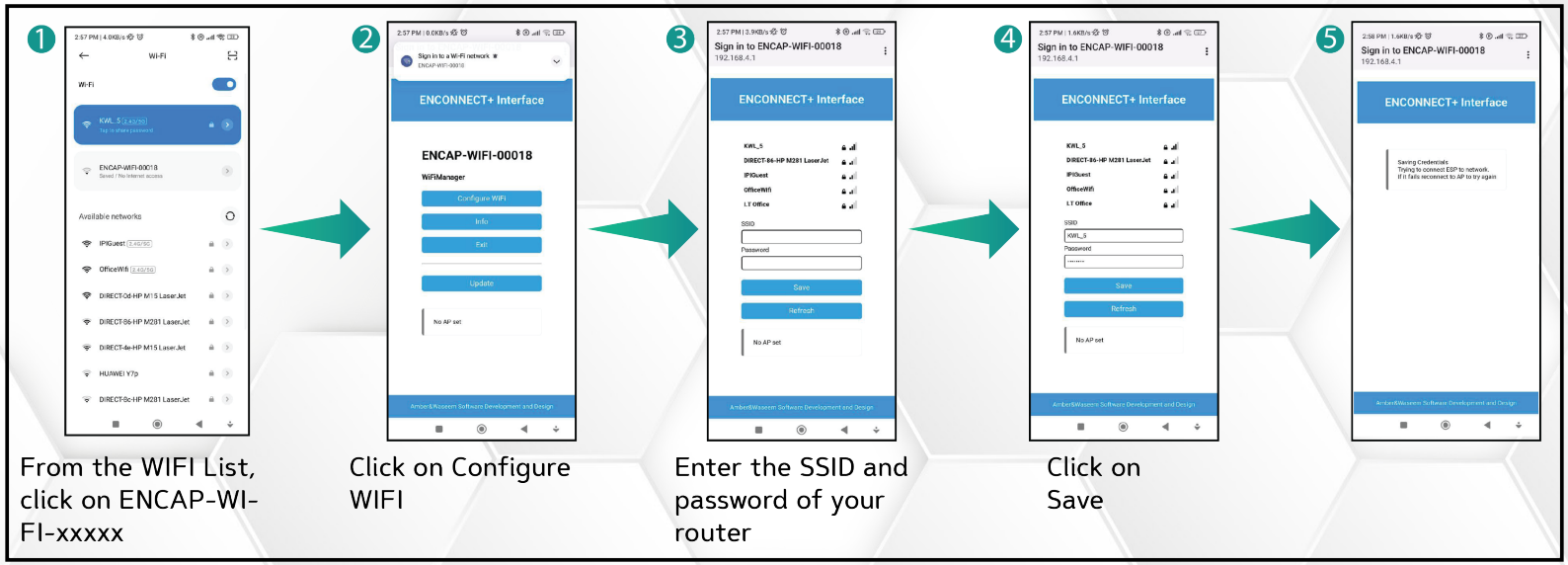
Encap Module has all the alarms settings with protection feature as default. This page shows all the logged alarms with time and date.



MONITORING QR

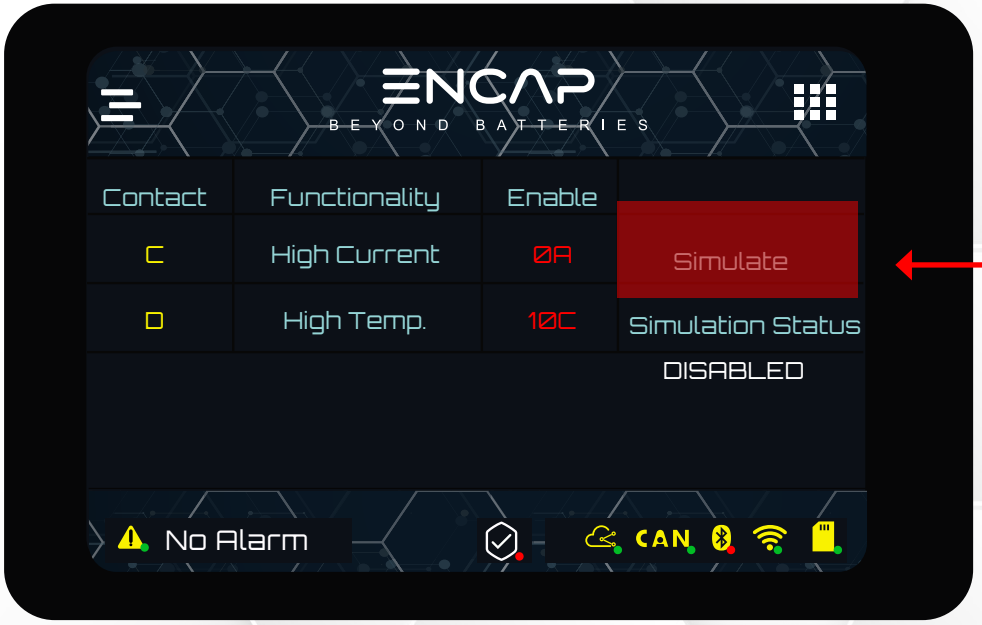
Click on monitoring QR to scan the QR code.

Follow the steps below to complete the process:



SET SIMULATIONS

Set Simulations is use to test Dry Contacts. To check if Dry Contacts are working, click on simulate to enable or disable Dry Contacts.



Click on Simulate to enable or disable the Dry Contacts

SET DRY CONTACTS

Dry Contact Write page allows the user to configure the Dry Contacts.

The user can specify Dry Contact, its type, and the condition they want. Module has two Dry Contacts:

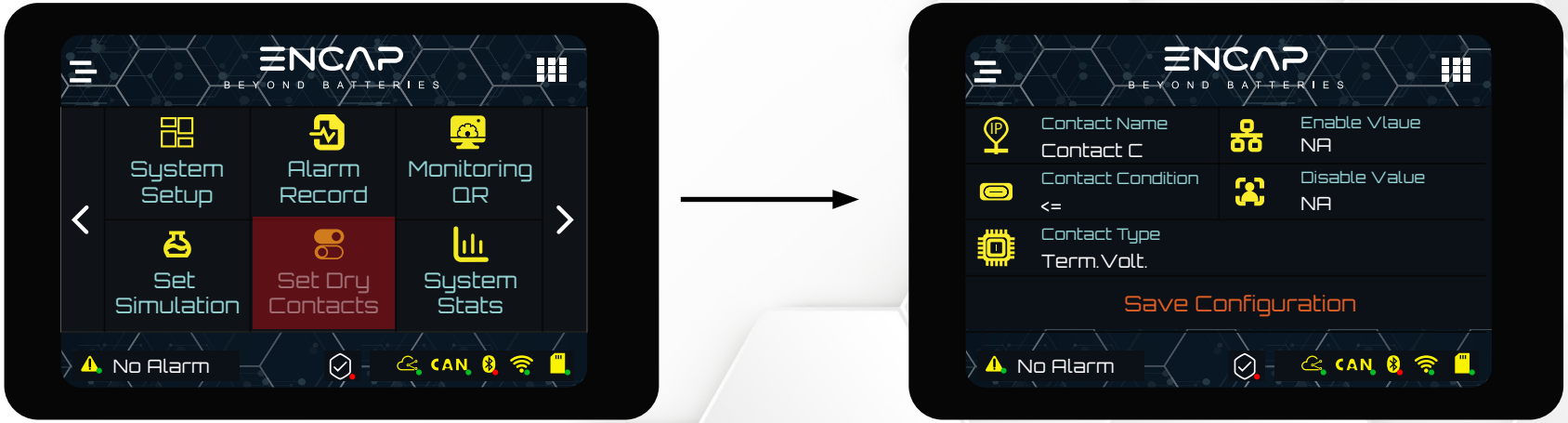
- Dry Contact C
- Dry Contact D

These Dry Contacts can be set for the following six parameters.

- Terminal Voltage
- Current
- Temperature
- SOC
- Disable
- Enable

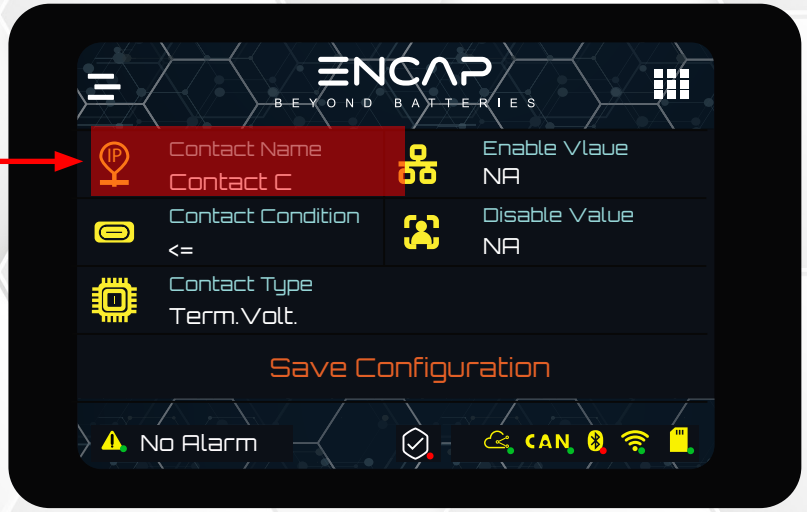
1. STEPS TO CONFIGURE DRY CONTACTS:

Click on Set Dry Contacts. Set Dry Contacts window will open.



DRY CONTACT PIN SELECTION

Tap on the Contact Name to navigate through the Dry Contact C and D.

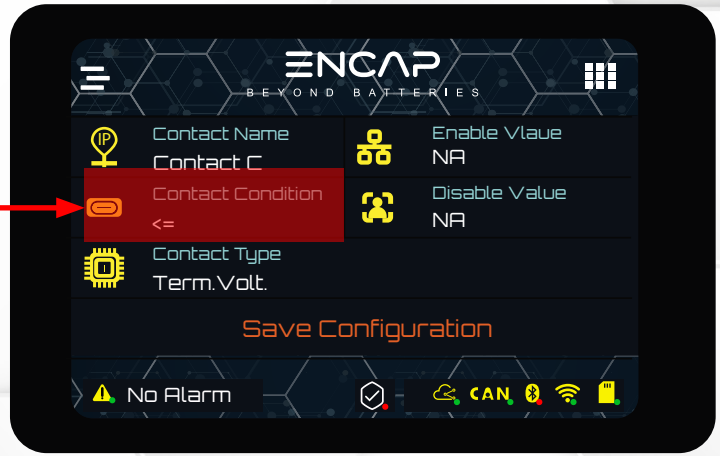


DRY CONTACT CONDITION

There are two set conditions:

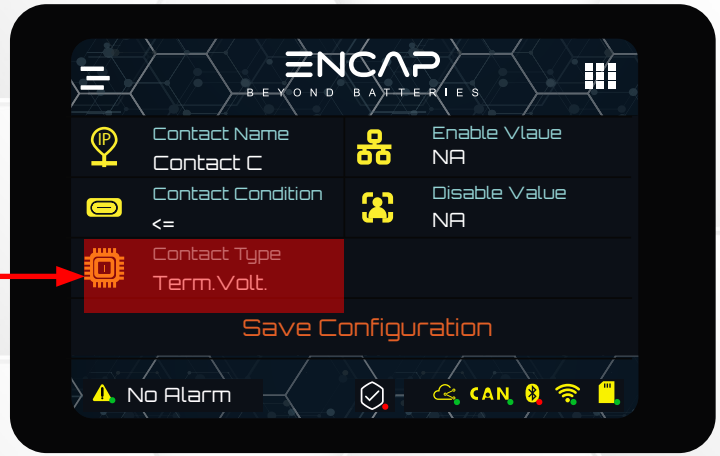
1. Less than or equal to
2. Greater than

Tap on the Contact Condition to navigate through the conditions



DRY CONTACT PARAMETER TYPE SELECTION

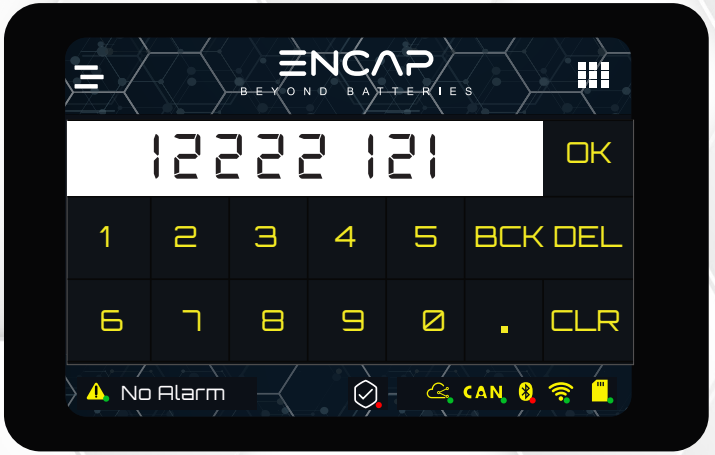
Select the Contact type by navigating through the list. Tap on the Contact Type for navigation.



DRY CONTACT FUNCTION SELECTION:

After the name, type and condition of the Dry Contact is set, choose the set value to enable and disable the function.

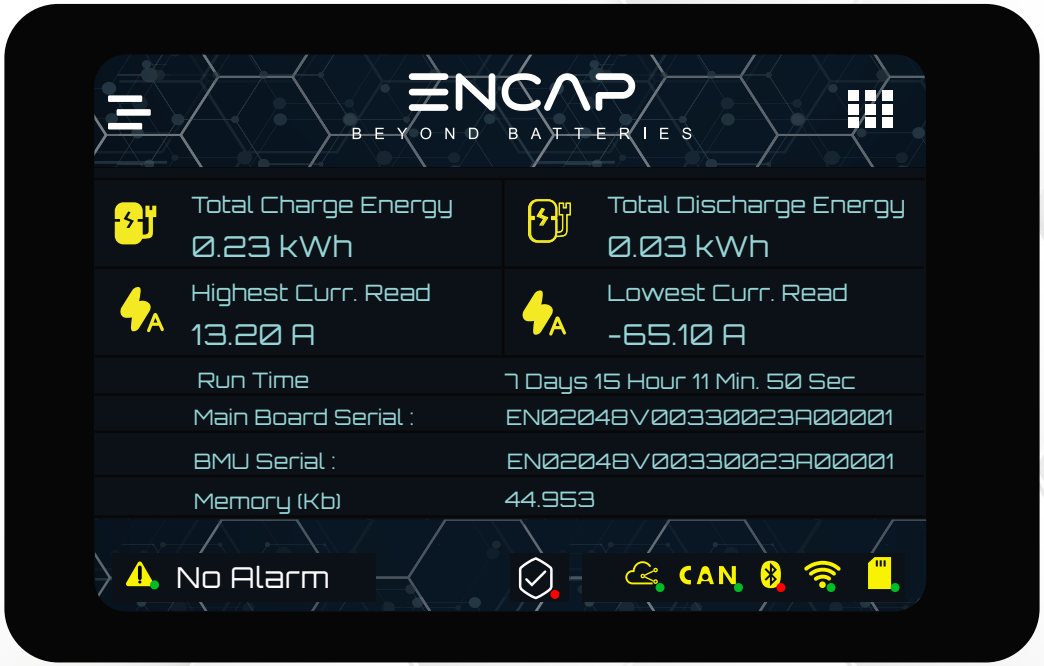
Clicking enable or disable will open the set value prompt window.



Write the value and click OK. When everything is set, click on Save Configurations.

SYSTEM STATS

System stats shows the statistics of the Module from the time of first start. It shows total charge and discharge energies, highest and lowest current read, system run time, main board and BMU serial.



PARALLEL CONNECTION OF MODULES

Any number of Modules can be connected in parallel. All Modules must have same voltage before connecting in parallel.

- Connect the positive (+) terminal and negative (-) terminal of all Modules as illustrated.
- Connect all the CANBUS ports with the cable provided.

Refer to the parallel connection of the Modules as shown below and make your connections accordingly.

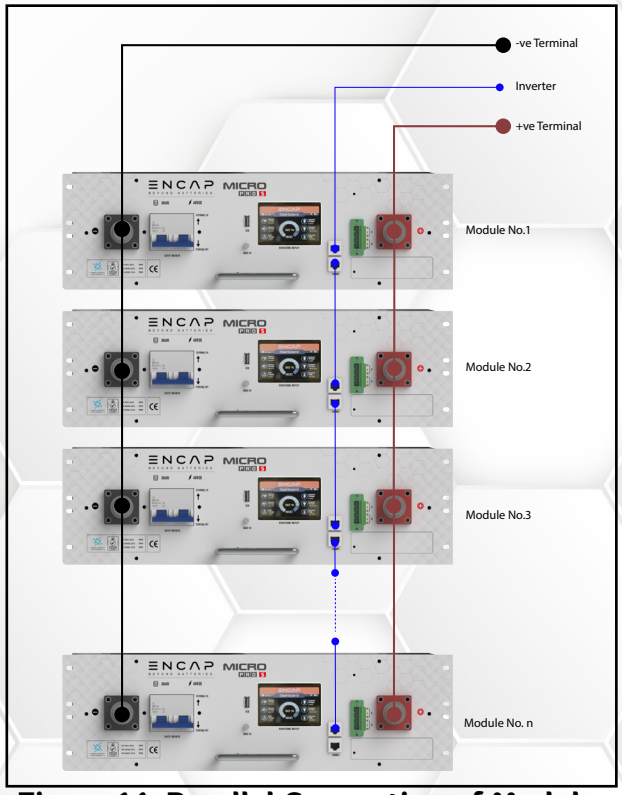


Figure 14: Parallel Connection of Modules

PROTECTION

INTRODUCTION

Module will trip under any excessive use conditions to prevent damage to itself and to the connected equipment. Specified limits for excessive current, high voltage and low voltage are provided in Module's Technical Data Sheet.

OVER-CURRENT

When the Module has an over-current fault, the terminals cut off, which means the Module will not take more current from the charging device.

MODULE FULLY CHARGED

When the Module voltage reaches the maximum voltage limit, the electronic switch will stop further charging and will go into standby mode. This means that each cell from the Module has reached to maximum rated voltage. The Module terminal will not activate unless you start discharging the Module.

MODULE FULLY DISCHARGED

When the Module voltage reaches the minimum voltage limit, the electronic switch will stop further discharging and will go into standby mode. The Module terminal will not activate unless you start charging the Module.

CELL OVER-TEMPERATURE

When the ambient cell temperature reaches above 70°C, the electronic switch will stop further charging or discharging the Module and will go into standby mode. The Module terminal will not activate unless the ambient cell temperature goes below 70°C .

TERMINAL OVER-TEMPERATURE

When the terminal temperature reaches above 70°C, the electronic switch will stop further charging or discharging and will go into standby mode. The Module terminal will not activate unless the terminal temperature goes below 70°C .

STATE OF CHARGE (SOC)

When the SOC reaches to 20% or 80% the electronic switch will stop further discharging or charging of the Module respectively.

CELL BALANCING

1. DESCRIPTION

If there is cell over voltage or cell under voltage, or if the delta voltage is greater than specified range, the Module will stop charging/discharging and the Equalizer will automatically turn-on to remove cell imbalance. After the Equalizer has balanced cell voltages [voltage difference is within ± 0.05V], the Module will automatically resume charging or discharging, as the case may, before the equalizer turned on.

KEY FEATURES

- Low power consumption.
- Accurate SOC estimation.
- Smart active cell balancing
- Long service life.

PHYSICAL FEATURES

1. ENCAP Module has embedded functionality in the event of:

- High Cell Voltage
- Low Cell Voltage
- High Terminal Voltage
- Low Terminal Voltage
- High Terminal Current
- High Ambient Temperature
- High Module Temperature
- Cells Imbalance
- Low SOC
- High SOC

2. Front panel of ENCAP Module has Wake on Button. When the Module is not in use for an hour, it goes to a dormant state to save power and the LCD will blank out. Pressing the Wake-on Button will turn on the LCD..

TECHNICAL FEATURES

3. OLED display has memory card that logs the following values.

- Terminal Voltage
- Terminal Current
- Module SOC
- Ambient Temperature
- Terminal Temperature
- Time Stamp
- Parameters Graphs
- Measurement Monitoring
- Alarm Monitoring