

# ENCAP

B E Y O N D B A T T E R I E S

USER MANUAL

10KWH-48V

EN-10k-48-1C-X-X-X-X-1V0-GEN1

VERSION 3 | REVISION 0 | RELEASE DATE: 2nd Jan 2024



## SMART MANAGEMENT

- Feature-rich Online Monitoring via App or OLED Display
- 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 (2023-13-7)**

First release

### **Issue 02 (2023-14-8)**

The header and footer banner are changed.

Addition of safe button, Page 23-24

Addition of firmware update, Page 30

### **Issue 03 (2024-2-1)**

Added Manual for firmware version 3.0.4, Pages 39 to 65

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# 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.

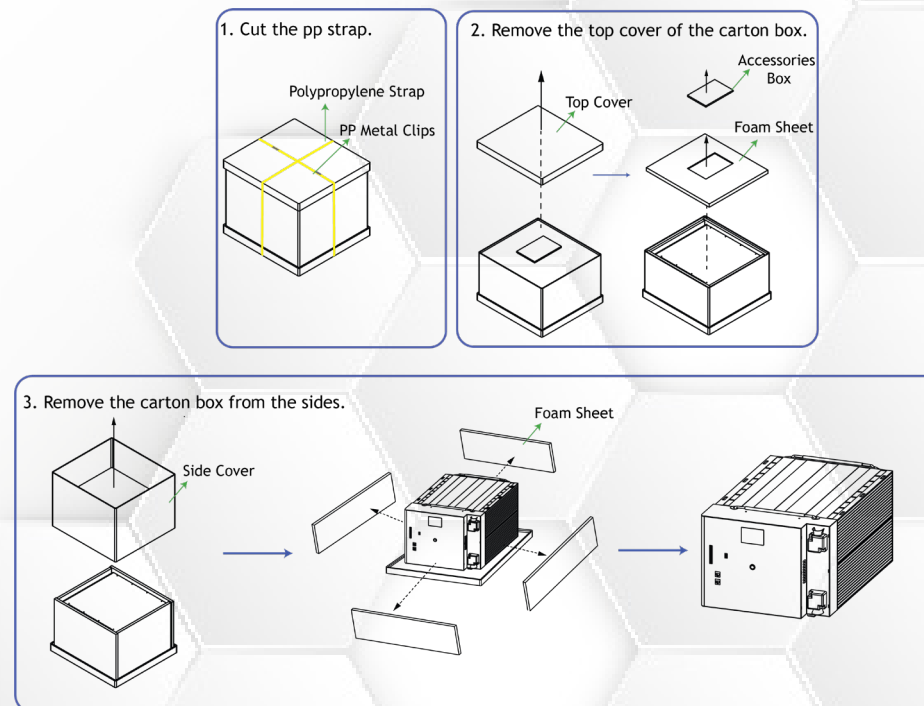
# PRE-INSTALLATION

## 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.



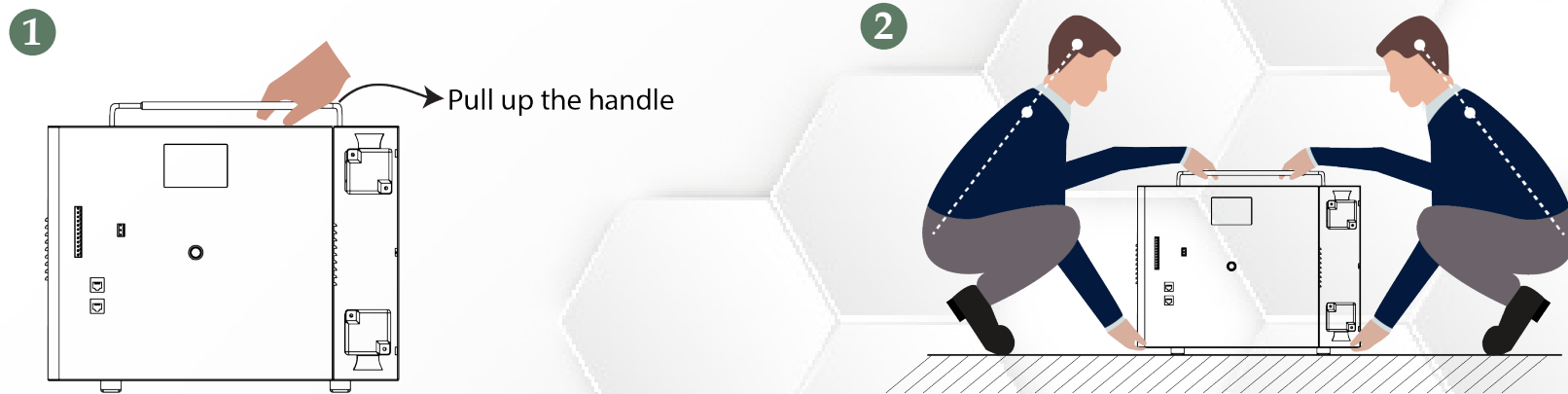
**Figure 2: Module package contents**

## 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.

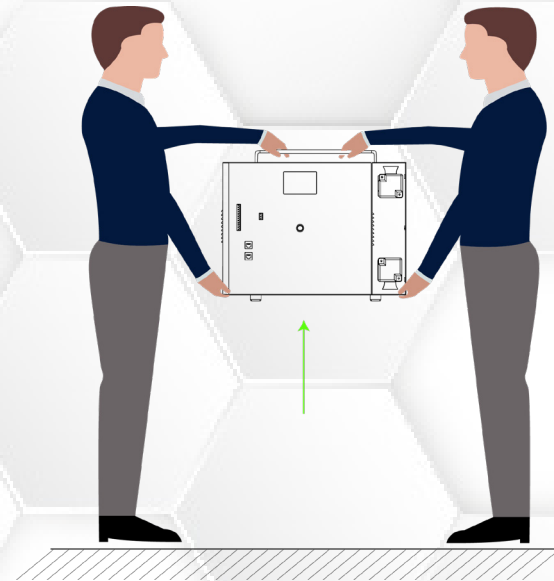
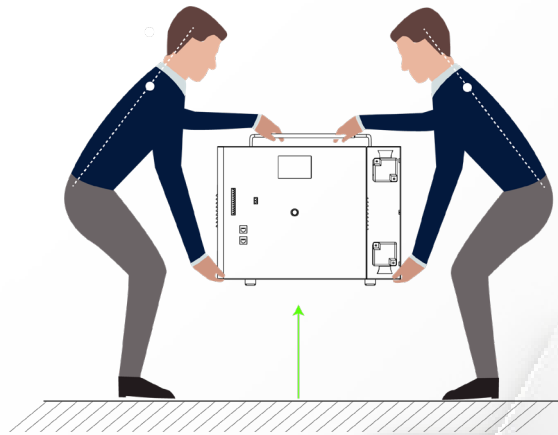
**1. LIFTING THE MODULE**

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**

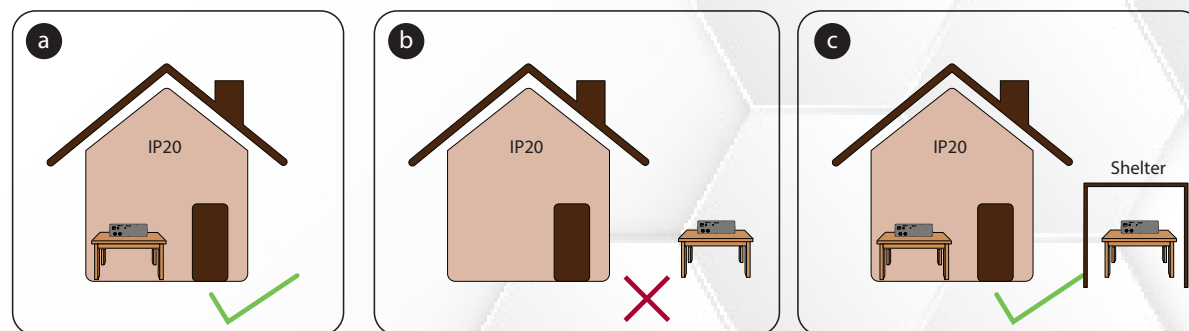


No less than four persons should lift the Module.

## LOCATION REQUIREMENTS

### 1. AREA OF INSTALLATION

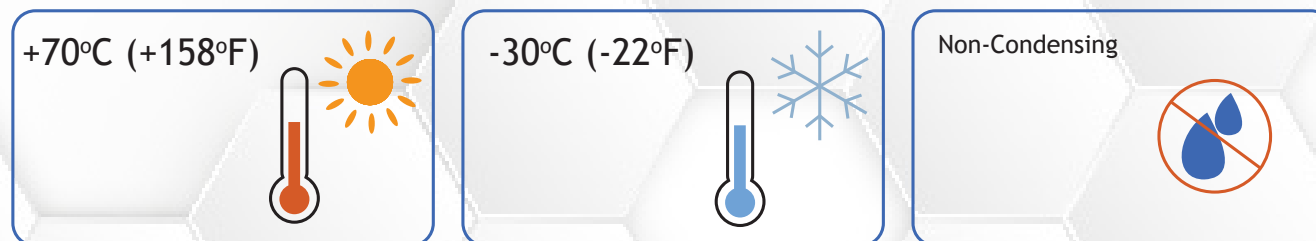
- Install the Module at an appropriate height for ease of viewing LCD and operating switches.



**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

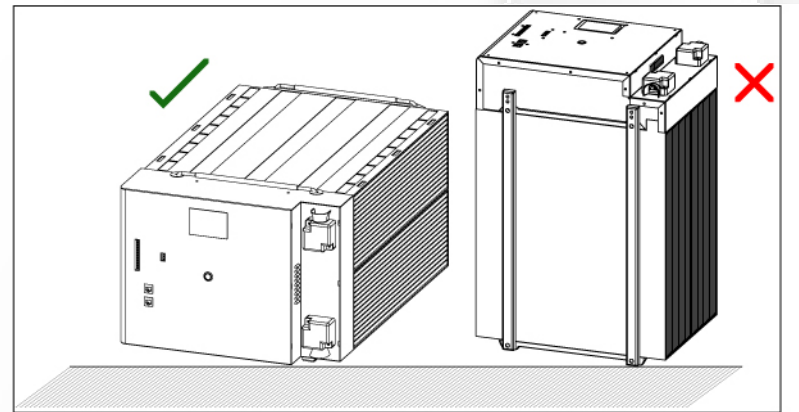
- The ambient temperature and relative humidity must meet the following requirements.



**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

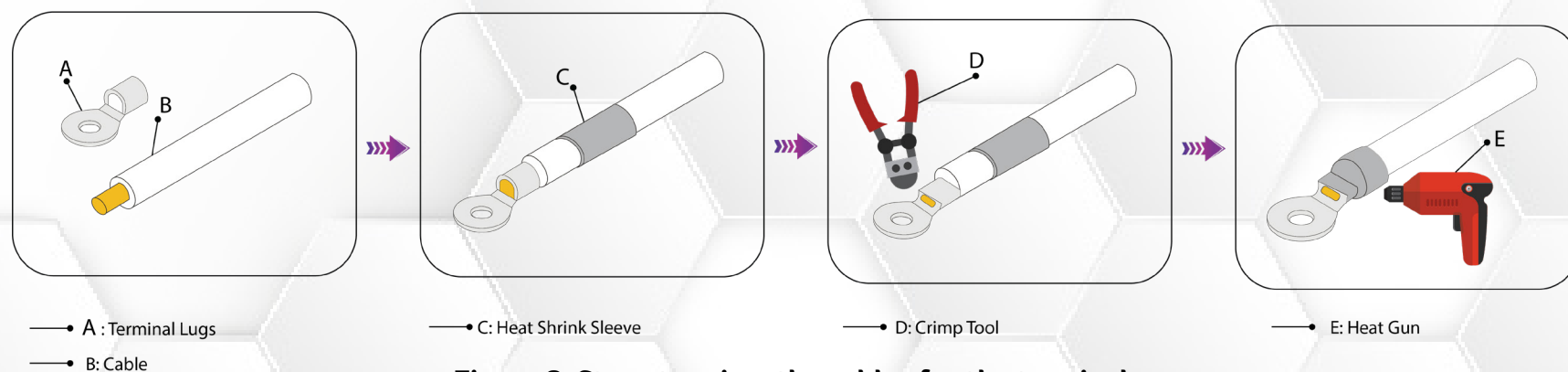
### 1. CABLE SIZE

We recommend a cable size of 150mm<sup>2</sup> 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**

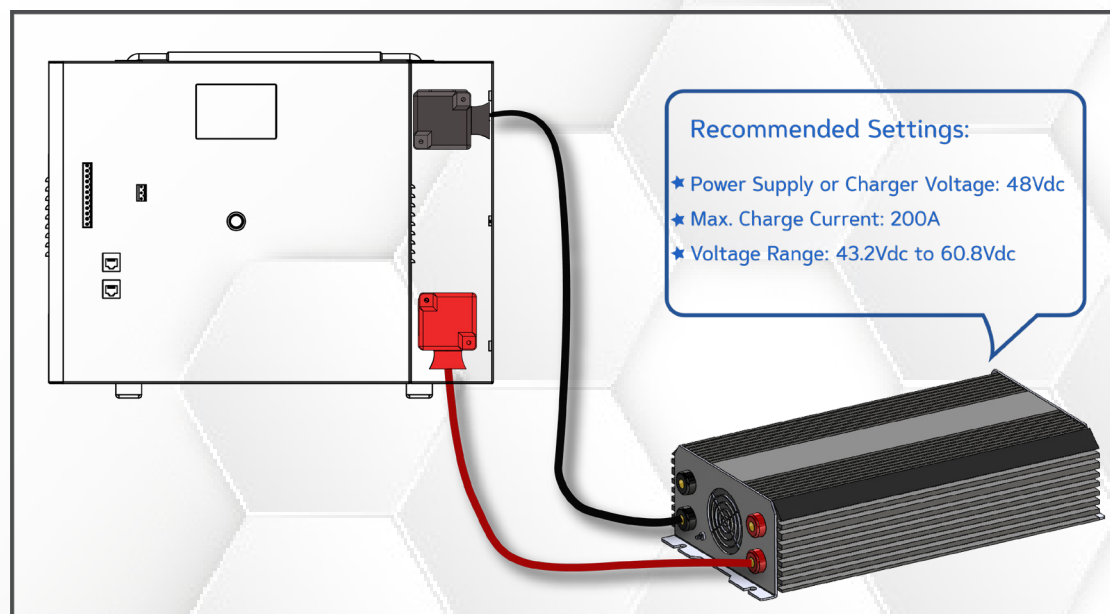


**Figure 10: Connecting lugs, washers, and bolts to positive terminal of Module**

## ELECTRICAL SETUP

**1. CONNECTING MODULE TO POWER SUPPLY/CHARGER**

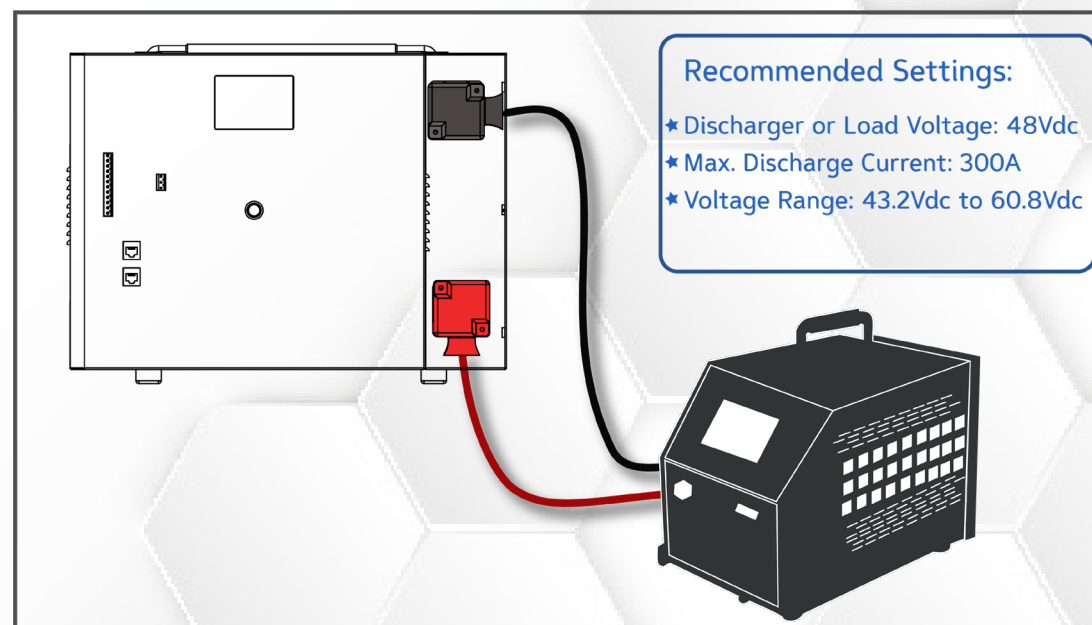
Connect positive and negative terminals of charger to the positive and negative terminals of the Module, respectively.



**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.

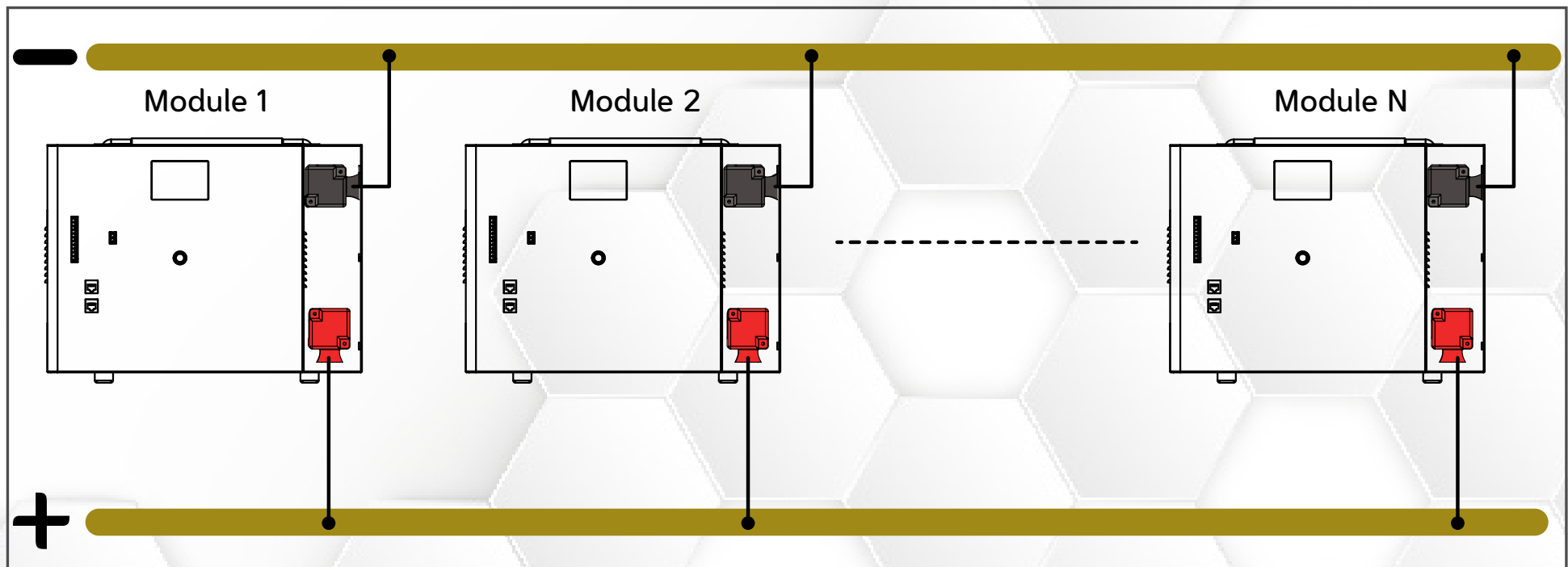


**Figure 12: Discharging Module from discharger**

### 3. PARALLEL CONNECTION SETUP:

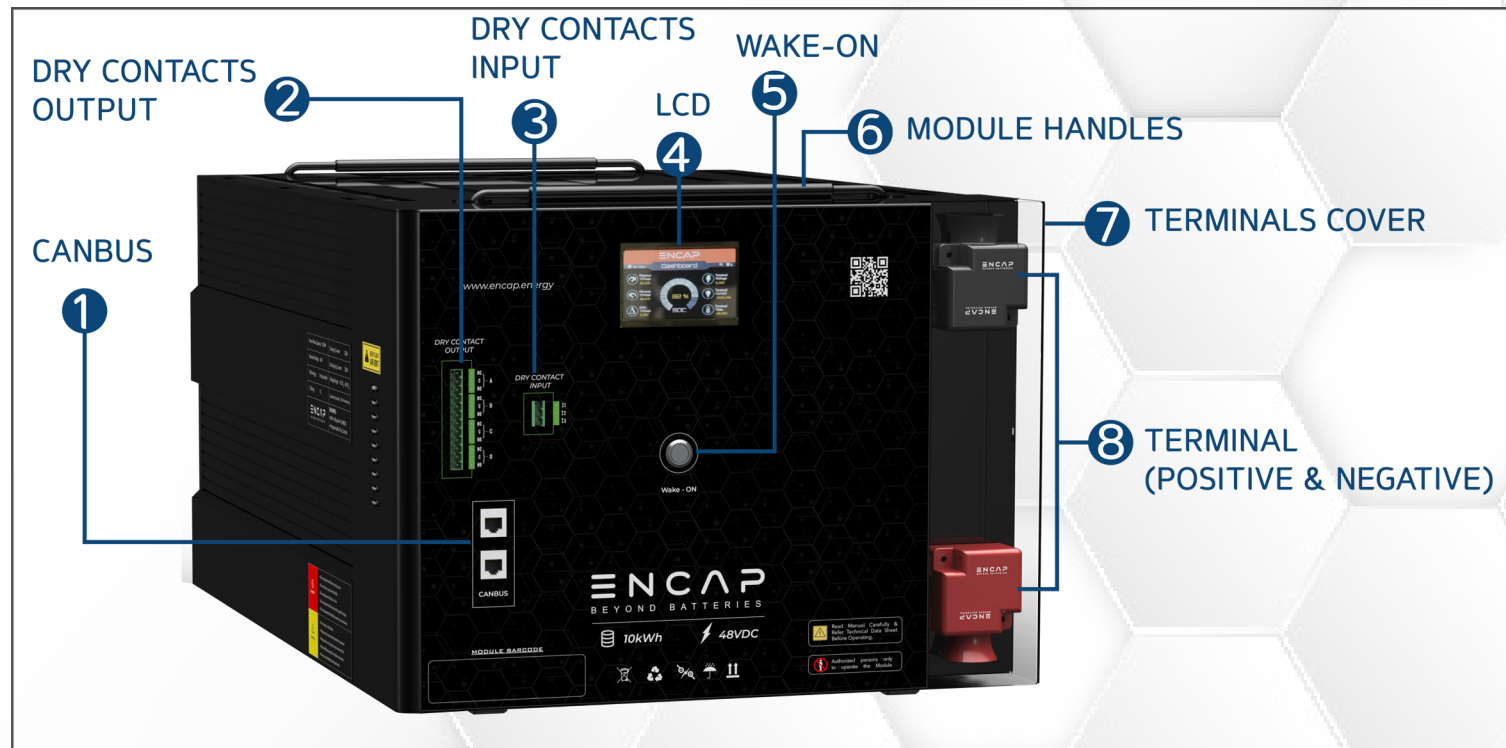
Any number of Modules can be connected in parallel. All Modules must be at 100% SOC before connecting in parallel.

- Connect the positive (+) terminal of all Modules to the positive busbar.
- Connect the negative (-) terminal of all Modules to the negative busbar.
- Refer to the parallel combination of the Modules as shown below and make your connections accordingly.



**Figure 13: Modules connected in parallel**

## PARTS DESCRIPTION



**Figure 14: Module parts description**

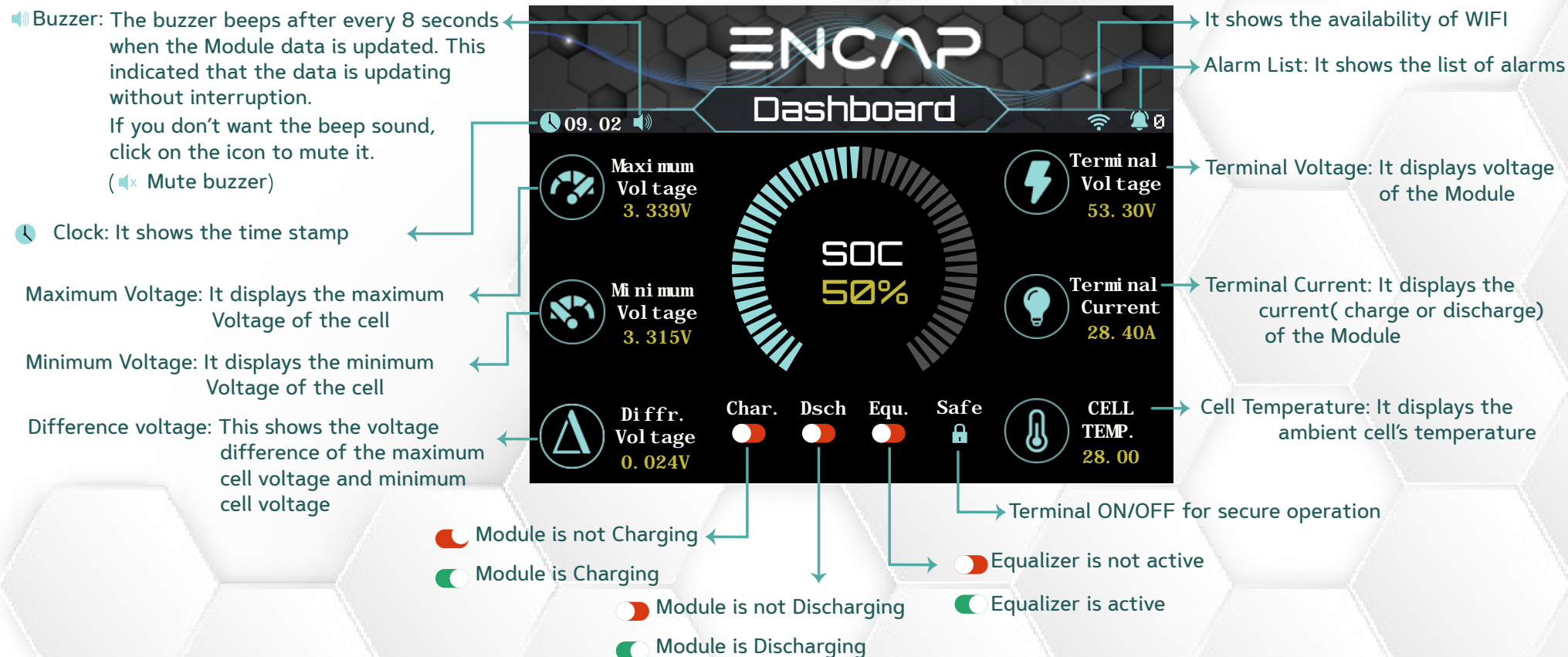
## MONITORING LCD (FIRMWARE VERSION 3.0.0)

The Monitoring LCD allows user to monitor and configure Modules.

The first page on LCD is dashboard by default.

### 1 DASHBOARD

Click on the dashboard to go to main menu.



## SAFE:

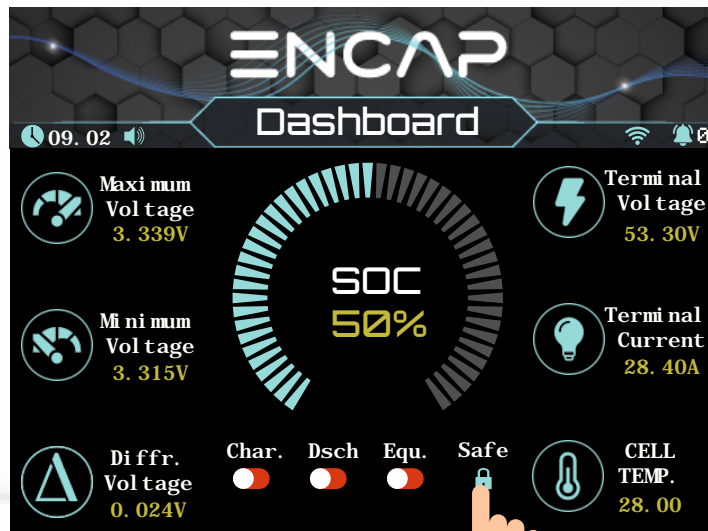
This feature is added to secure the operation of BMS.

Always activate safe terminals before connecting the terminals of the Module to charger or discharger. When safe feature is on, Module will not charge or discharge.

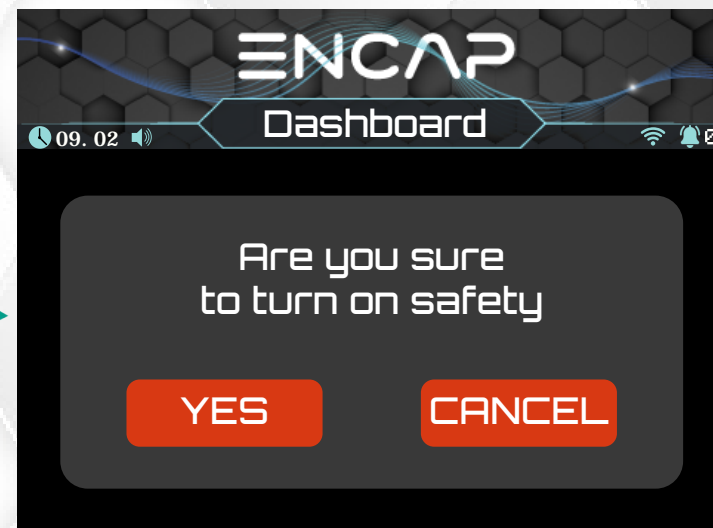
If you want to charge and discharge the Module, deactivate the safe feature.

## ACTIVATE SAFE:

Click on safe button, a pop up window will appear. Click on yes to activate the feature.



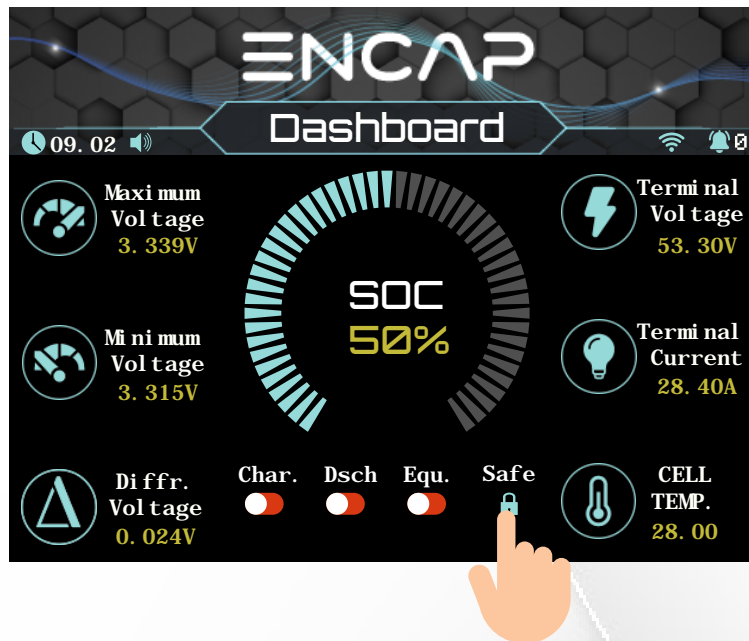
Click on safe



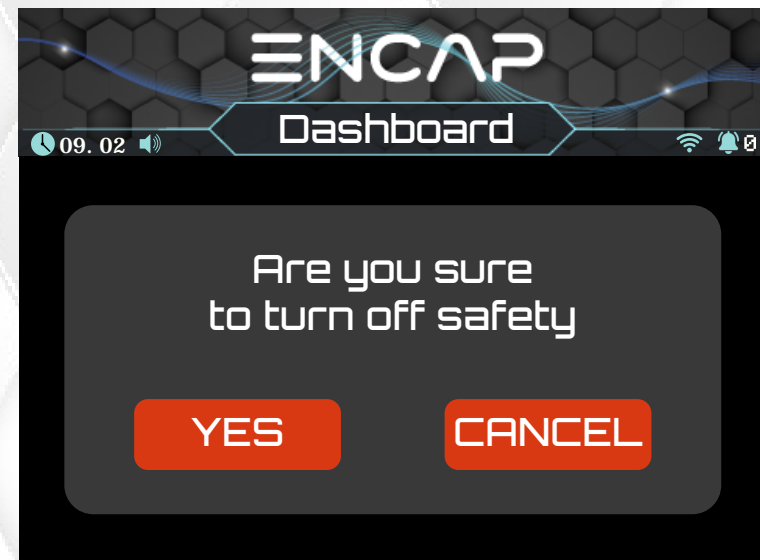
Pop-up window

## DEACTIVATE SAFE:

Click on safe button, a pop up window will appear. Click on yes to deactivate the feature.



Click on safe

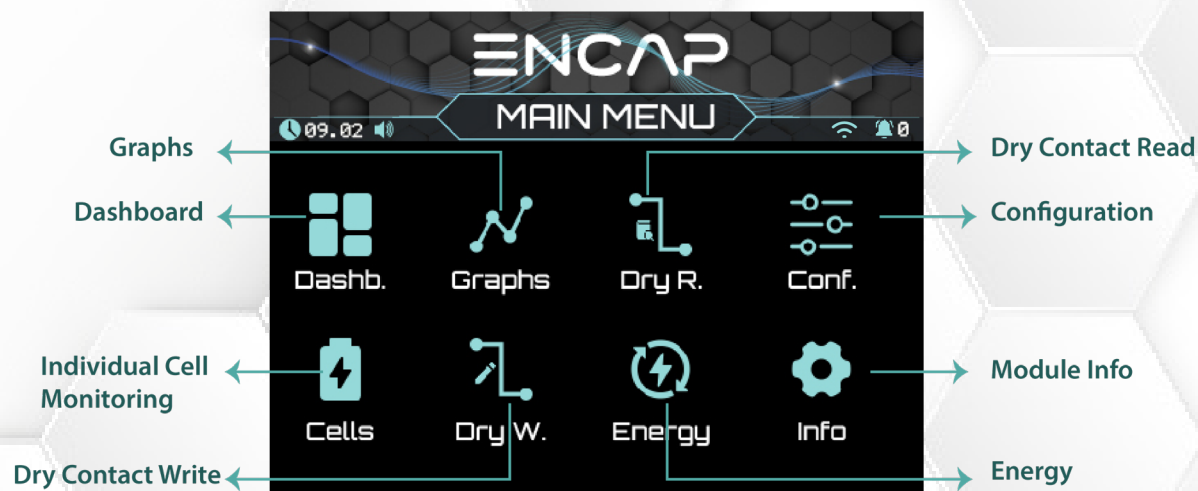
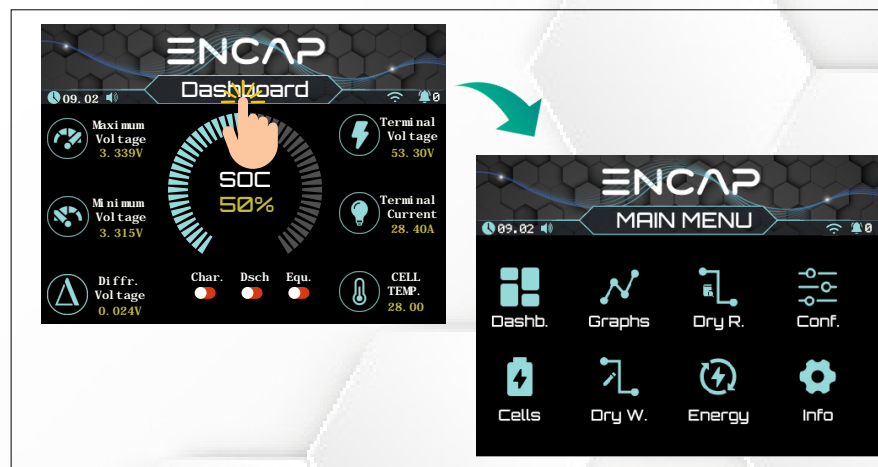


Pop-up window

Note: If you want to charge/ discharge the Module, deactivate the safe button.

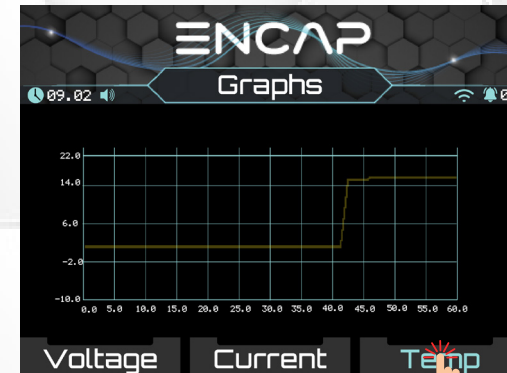
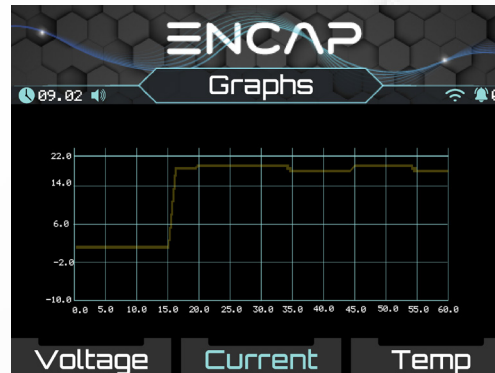
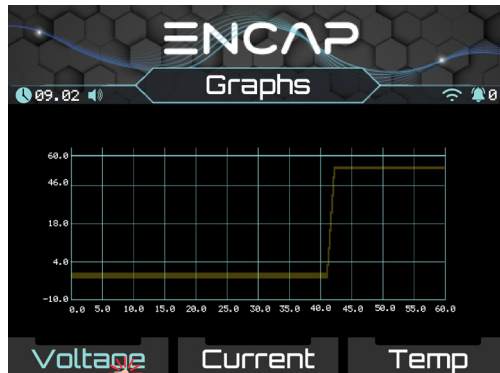
## 2 MAIN MENU:

The main menu provides parameter viewing and setting functions, as shown below;



## 3 GRAPHS:

The graph page shows voltage, current and temperature graphs. The graph logs data after every eight seconds.



## 4 DRY R:

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

ENCAP Dry Contacts					
Contact Name	Contact Type	Operation	Enable	Disable	Status
Dry Contact A	Term.Volt.	>	85.00	22.00	OFF
Dry Contact B	Term.Volt.	<=	0	0	OFF
Dry Contact C	Term.Volt.	>	0.00	0.00	ON
Dry Contact D	Term.Volt.	>	0.00	0.00	ON
Digital Inputs					
Input#1		Input#2	Input#3		

## 5 CONFIGURATION:

ENCAP has three modes of monitoring:

1. WIFI-Direct
2. Online Monitoring
3. Bluetooth

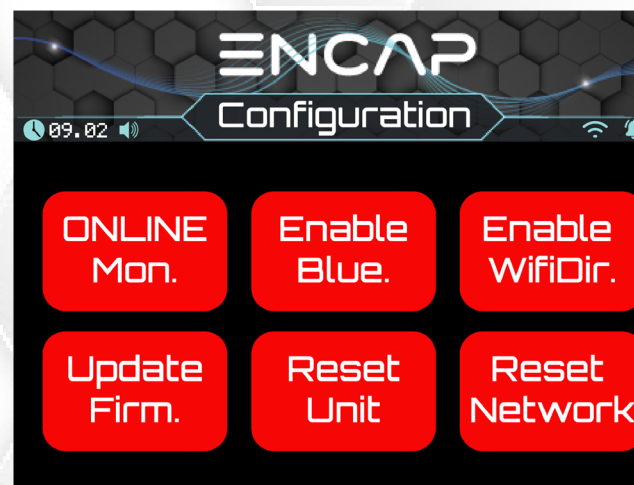
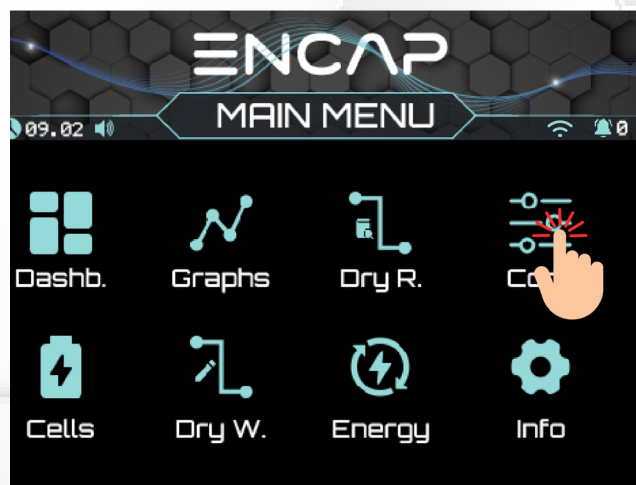
### 5.1 WIFI-DIRECT

WIFI-Direct allows user to do the following tasks:

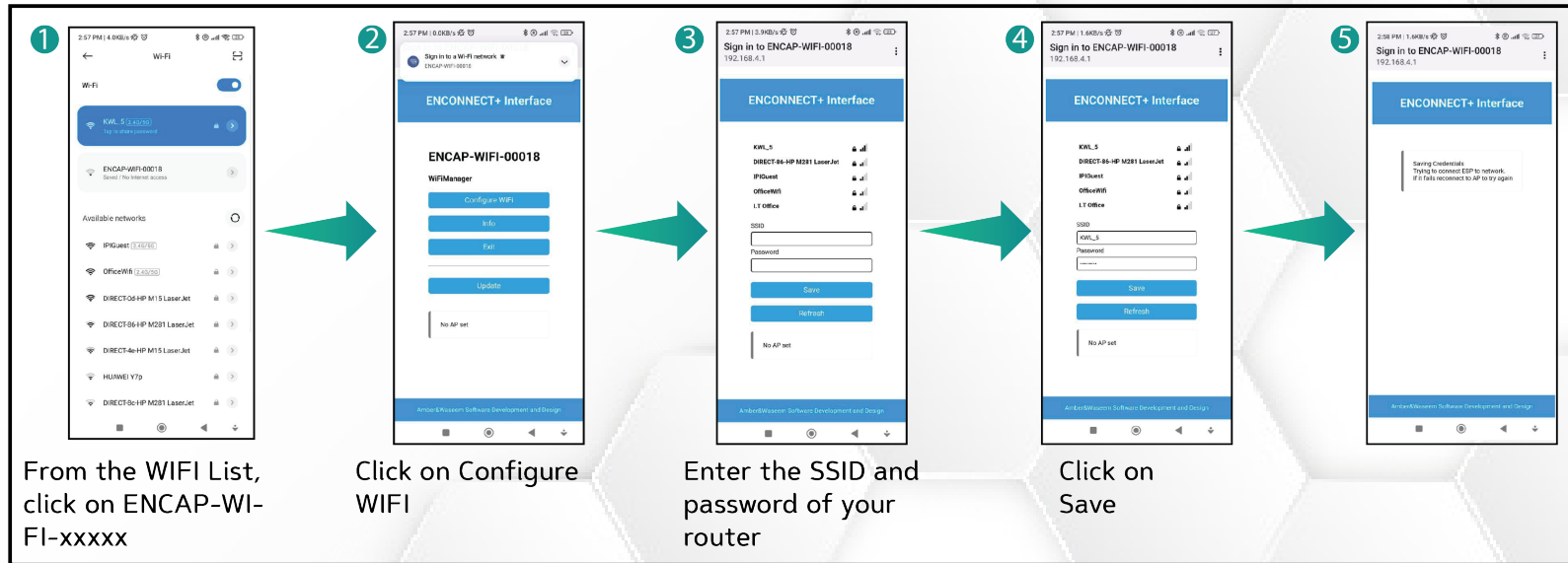
1. Monitor Module from an Internet browser
2. Download SD Card loggings

#### Connect WIFI-DIRECT:

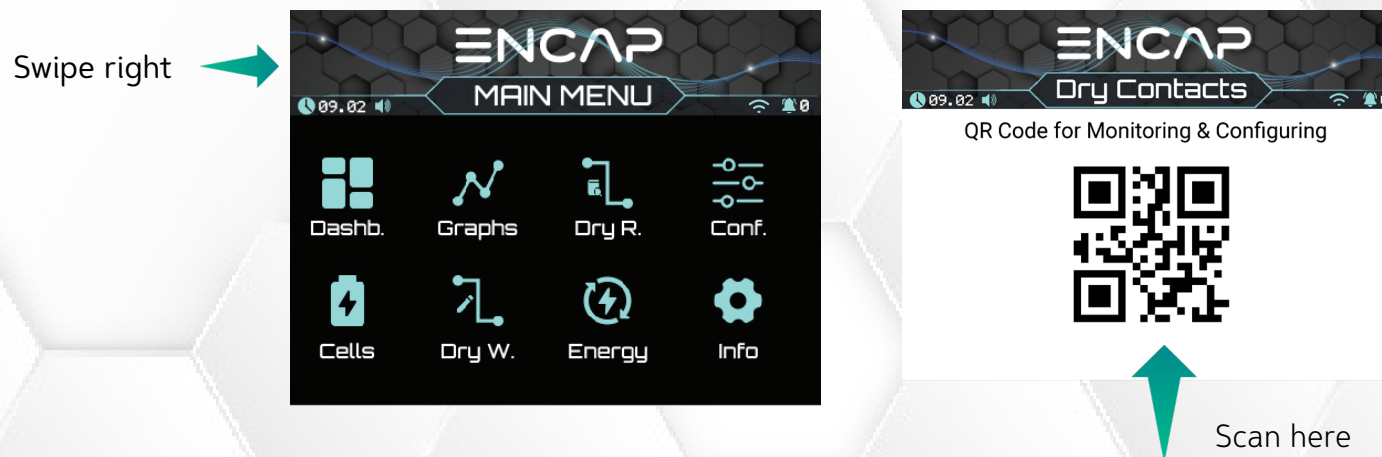
1. Go to Main Menu, click on Configurations. The configuration page will open.



2. Click on Enable WifiDir.
3. On your phone or PC, go to WIFI list.



4. On the main menu page, swipe right.



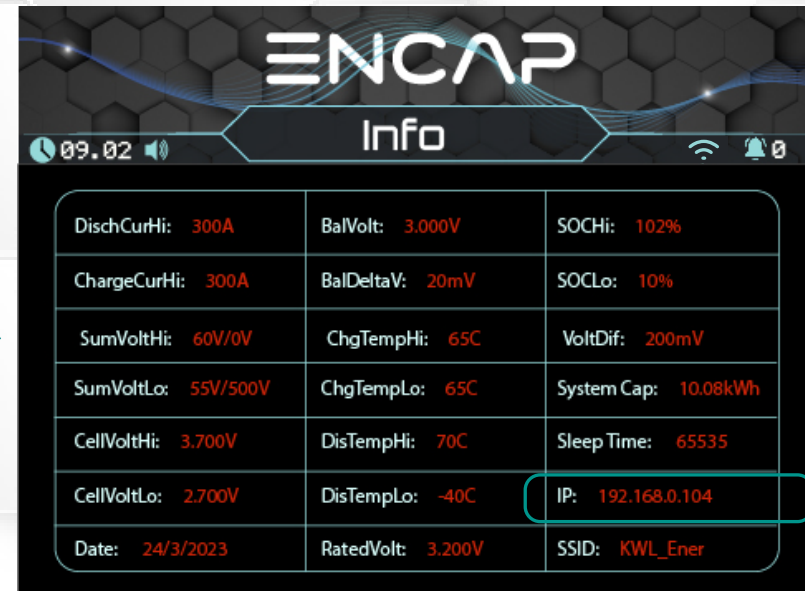
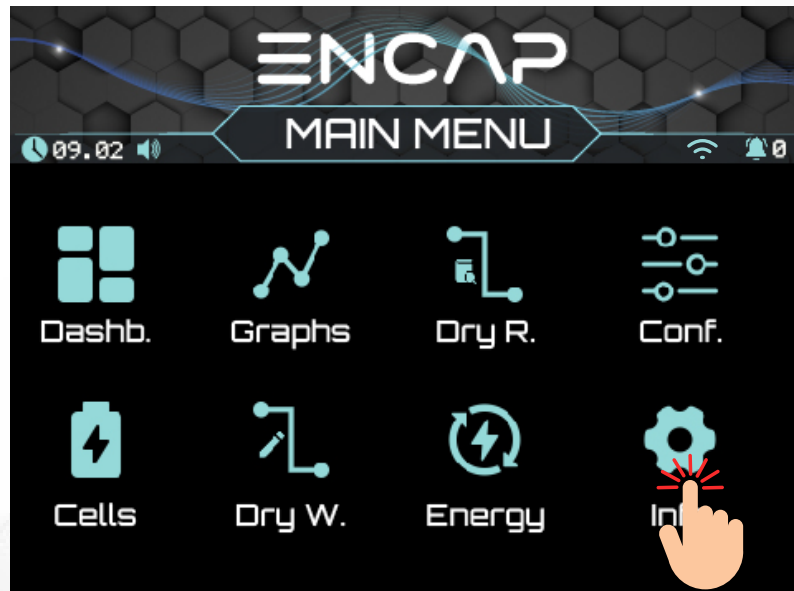
## 5.2 ONLINE MONITORING

Online monitoring allows user to do the following tasks:

1. User can monitor the Module from anywhere in the world (IOT devices).
2. Module can be updated for a new firmware version.

### Connect Online Monitoring:

1. Go to Menu Page, then to info. Copy the IP address.



2. Write the IP address in the browser.

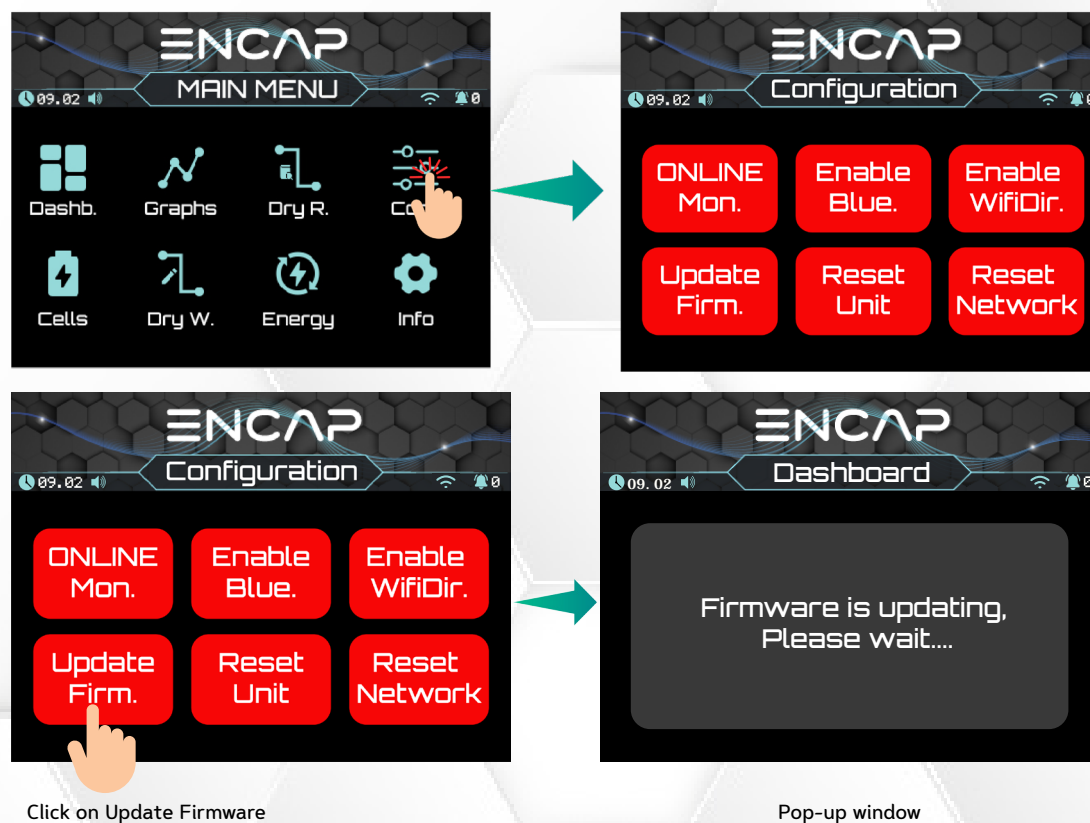
## 5.3 BLUETOOTH MONITORING

This feature is accessible by factory engineers only. The Bluetooth mode is enabled by default. It is used to reconfigure custom parameter and alarms.

## 5.4 UPDATE FIRMWARE

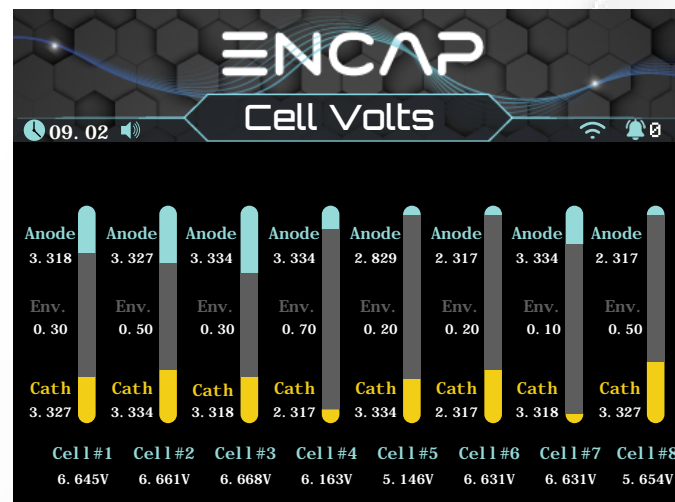
Make sure the Module is in Online monitoring mode when updating the firmware.

1. Go to Main Menu, click on Configurations. The configuration page will open.



## 6. CELLS

This page gives information of the voltage of each cell in the Module. This page helps the user to learn about the unbalancing and under/over voltage of cells.



## 7. DRY W.

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 four Dry Contacts:

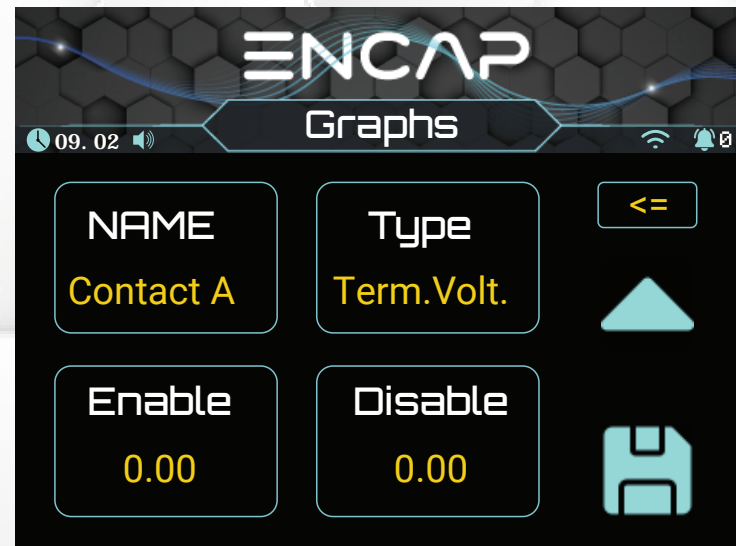
- Dry Contact A
- Dry Contact B
- Dry Contact C
- Dry Contact D

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

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

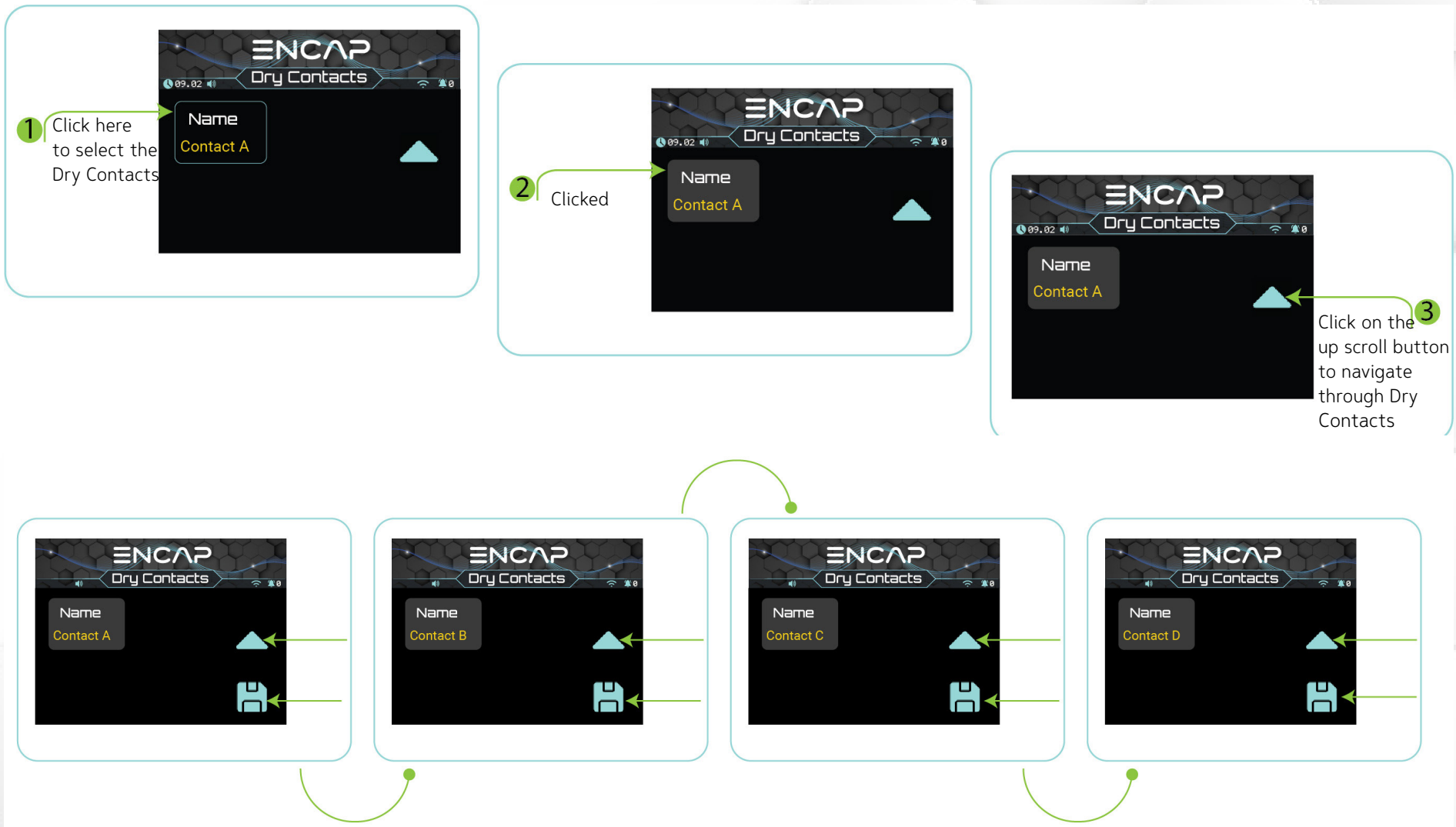
## 1. STEPS TO CONFIGURE DRY CONTACTS:

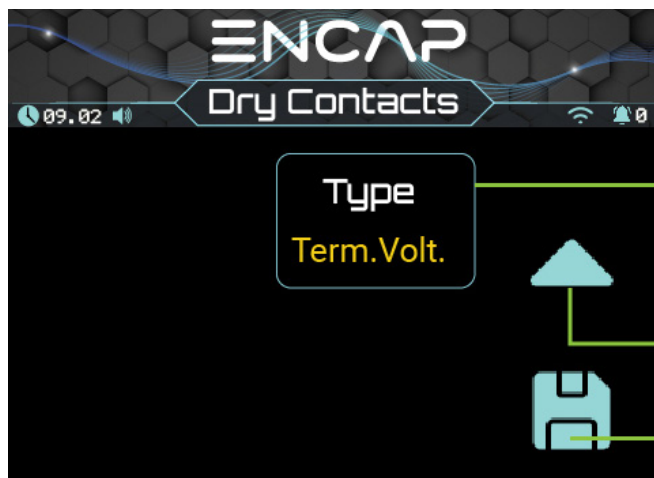
1. Go to **Main Menu**.
2. Tap the **Dry W.**
3. The Dry Contacts page will appears.



## DRY CONTACT PIN SELECTION

Lets understand the parameters one by one;



**DRY CONTACT PARAMETER TYPE SELECTION**

Term.Volt.  
abs(Current)  
Temperature  
SOC  
ENABLE  
DISABLE

Select the parameter for configuration from the list

Click on the up scroll button to navigate through parameters

Save the function parameter

**DRY CONTACT CONDITION**

There are two set conditions:

1. Less than or equal to
2. Greater than



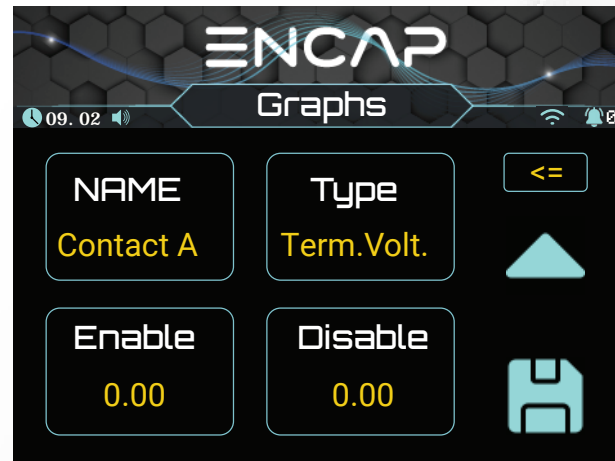
Select the condition from the list

Click on the up scroll button to navigate through conditions

Save the condition

## DRY CONTACT FUNCTION SELECTION:

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



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

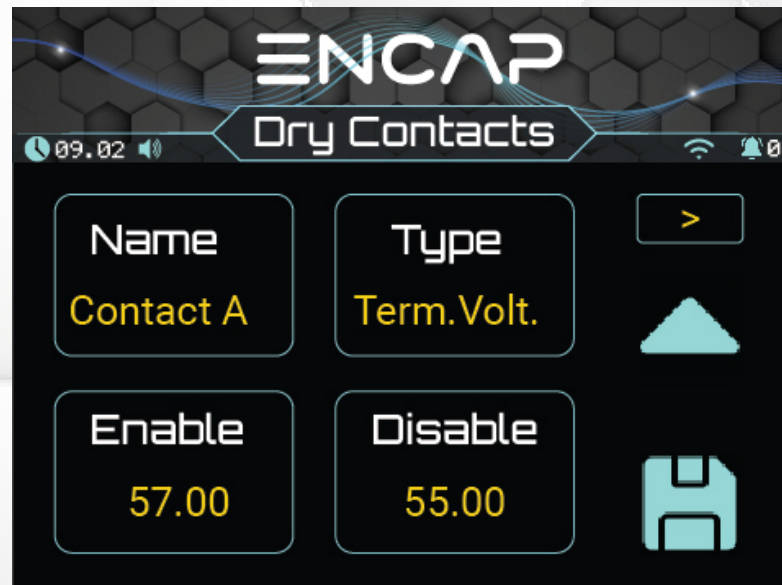


Write the value and click OK.

**EXAMPLE:**

Let's consider an example. The Dry Contact A is set to a triggered alarm. It should be enabled when the terminal voltage reaches above 57V and disabled when it goes below 55V.

1. Select Dry Contact A and click on the save button to set the parameter.
2. Then in the type, select the terminal voltage and click on the save button.
3. Select the condition greater than and click on save button.
4. Click on Enable and write 57V in the prompt window.
5. Click on Disable and write 55V in the prompt window.
6. Click on the save button.

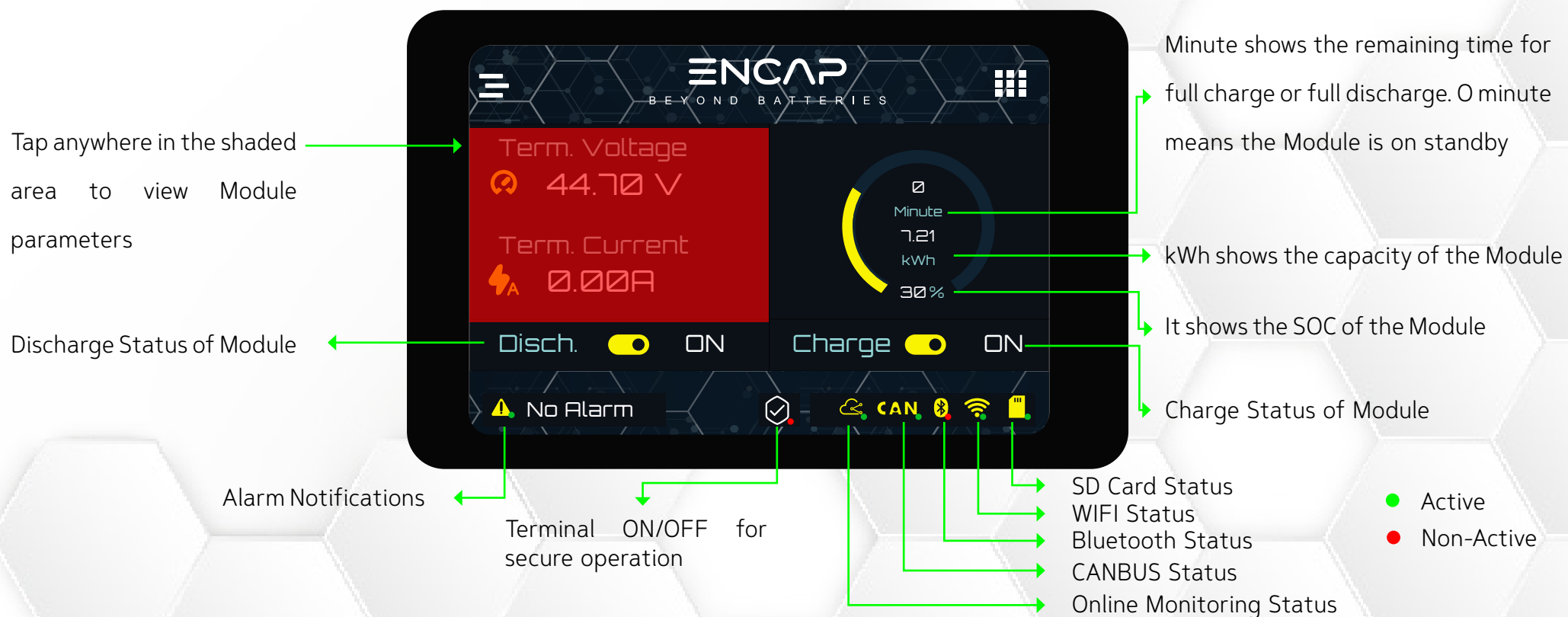


## MONITORING LCD (FIRMWARE VERSION 3.0.4)

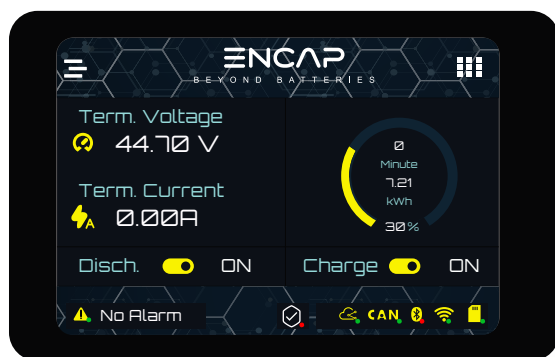
The Monitoring LCD allows user to monitor and configure the Module.

### 1. DASHBOARD

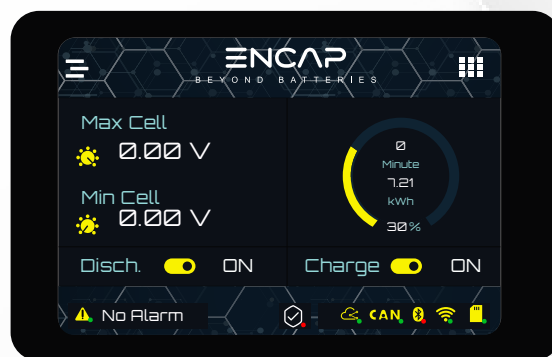
The first page on LCD is dashboard by default.



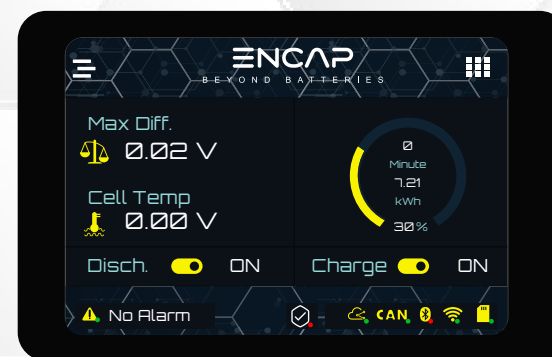
Tap the dashboard to view Module parameters: i.e. Terminal Voltage, Terminal Current, Maximum and Minimum Cell Voltages, Difference of Maximum and Minimum Cell Voltages, Cell Temperature, Charge Energy, Discharge Energy, System Time, System Date, System Alarms, System Mode.



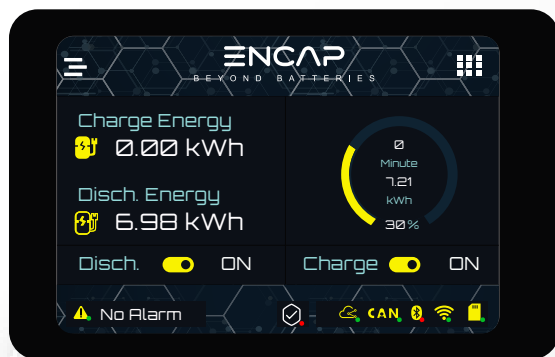
First Display



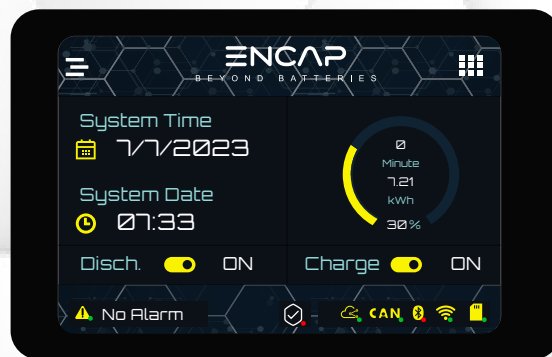
Second Display



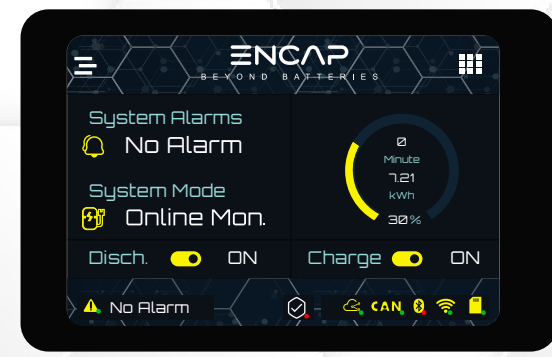
Third Display



Fourth Display

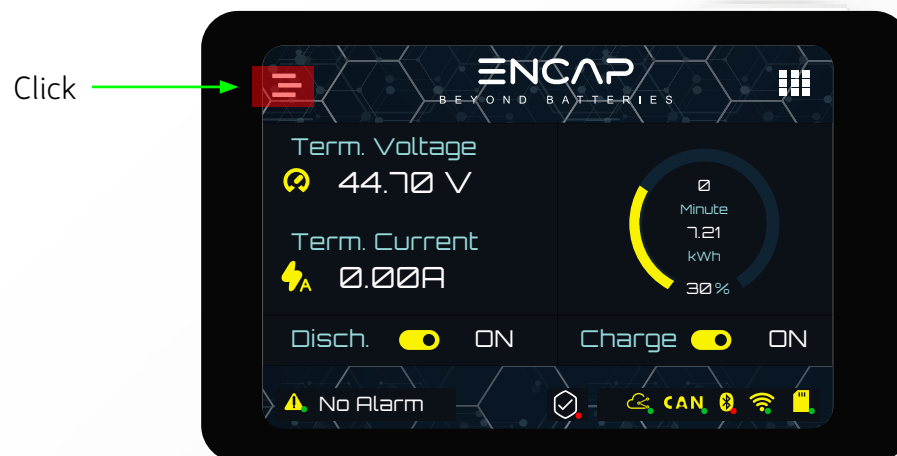


Fifth Display



Sixth Display

Click on the menu bar  to go to main menu.

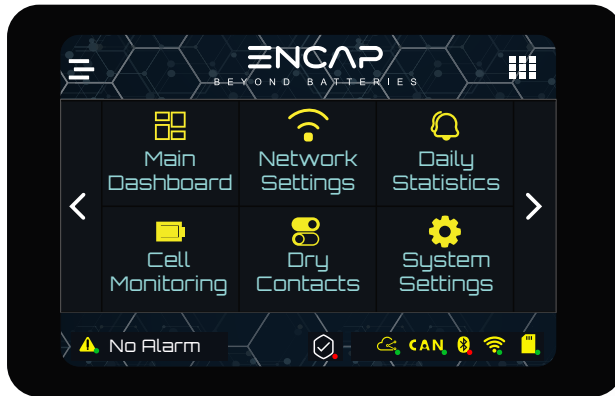


## 2. MAIN MENU:

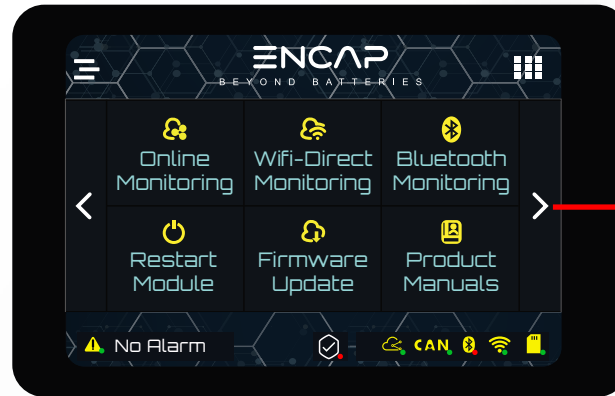
The main menu provides parameter viewing and functions setting. The main menu is categorized into three pages.



First page

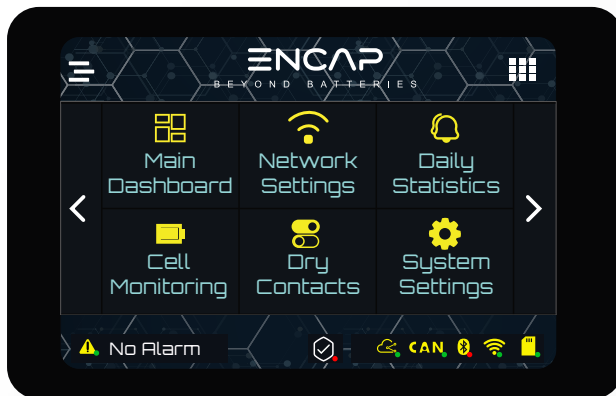


First page

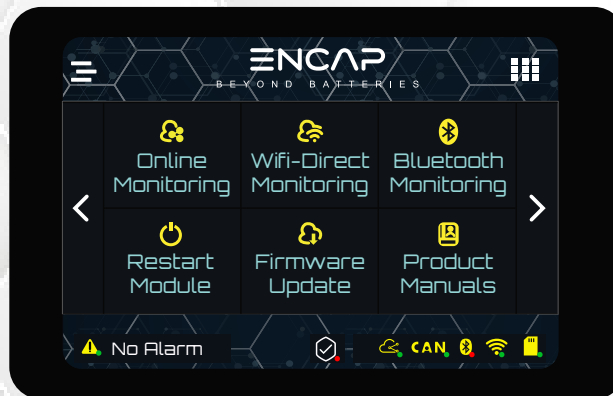


Second page

Click on right arrow to go to third page



First Page



Second Page



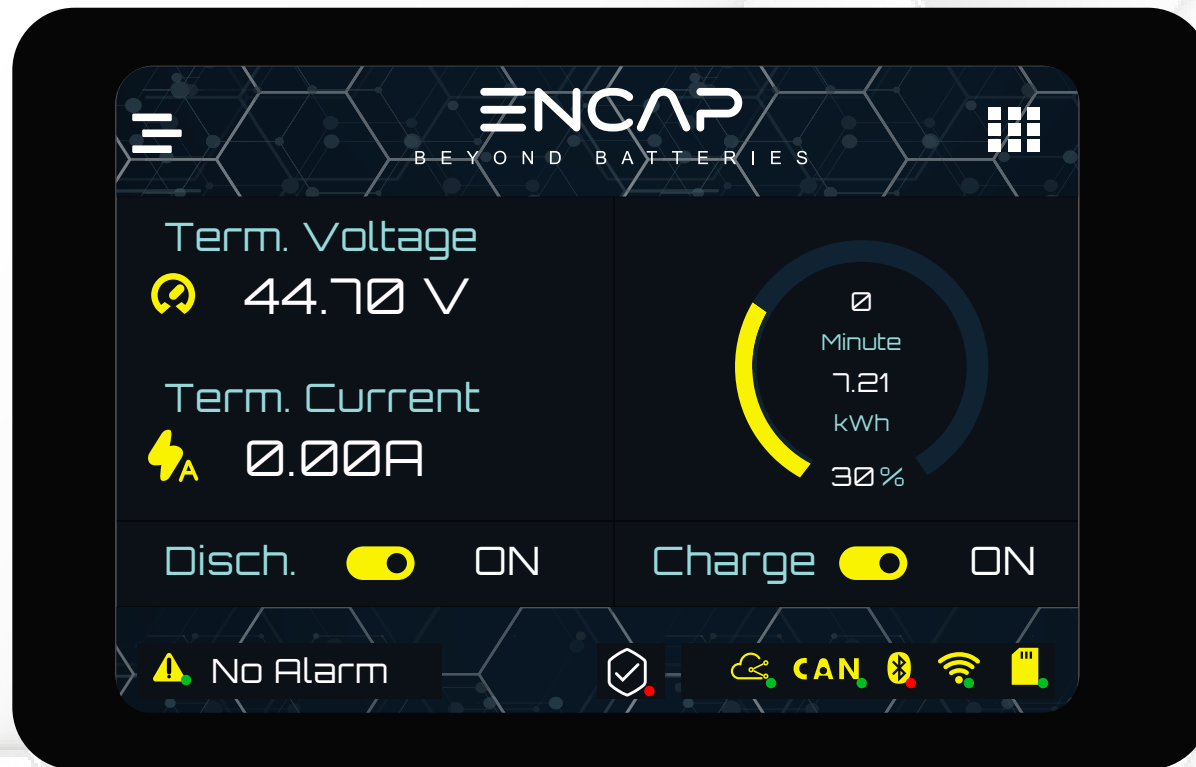
Third Page

## 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.

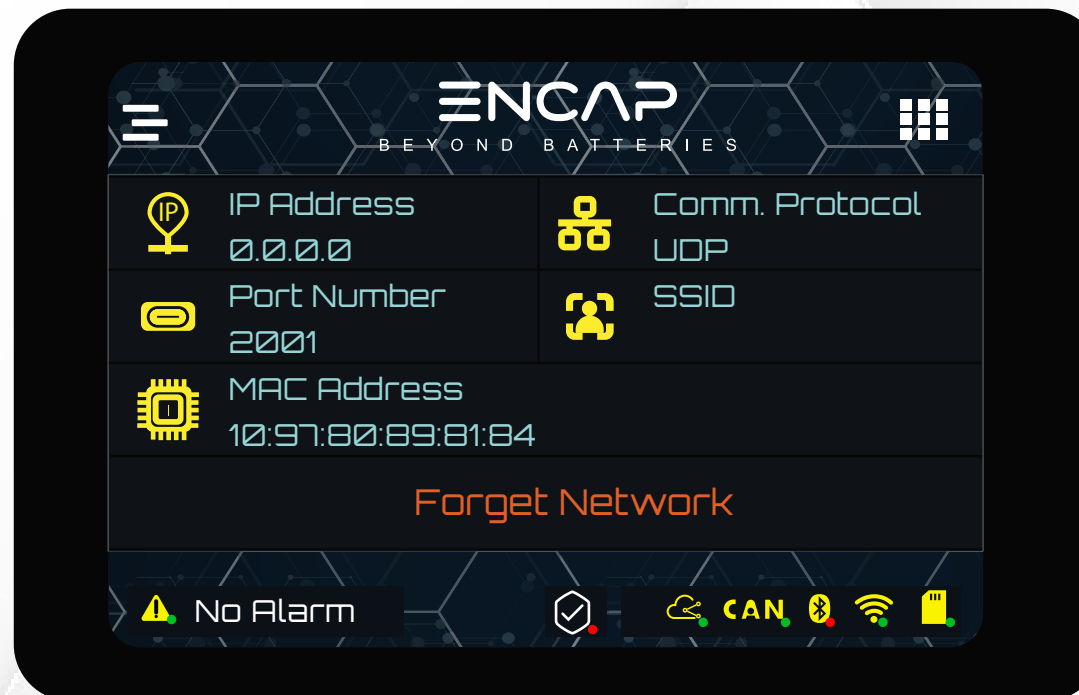


## 2. NETWORK SETTINGS

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.

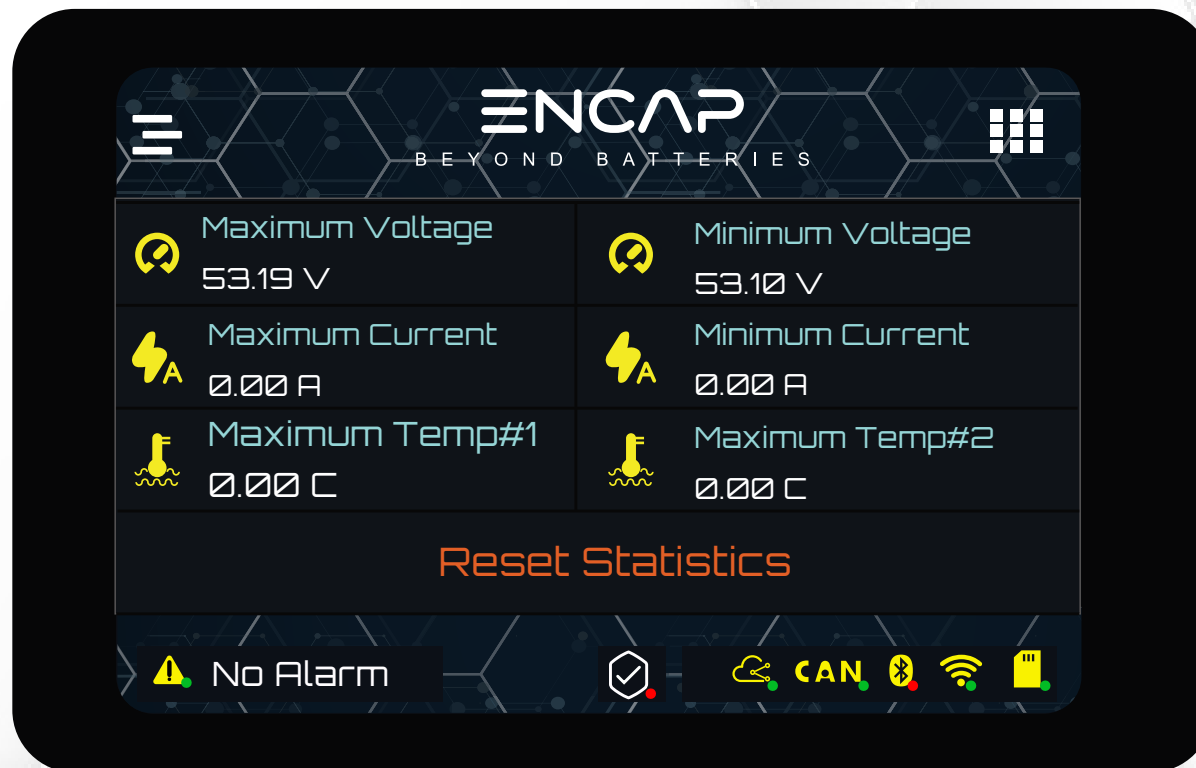


### 3. DAILY STATISTICS

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

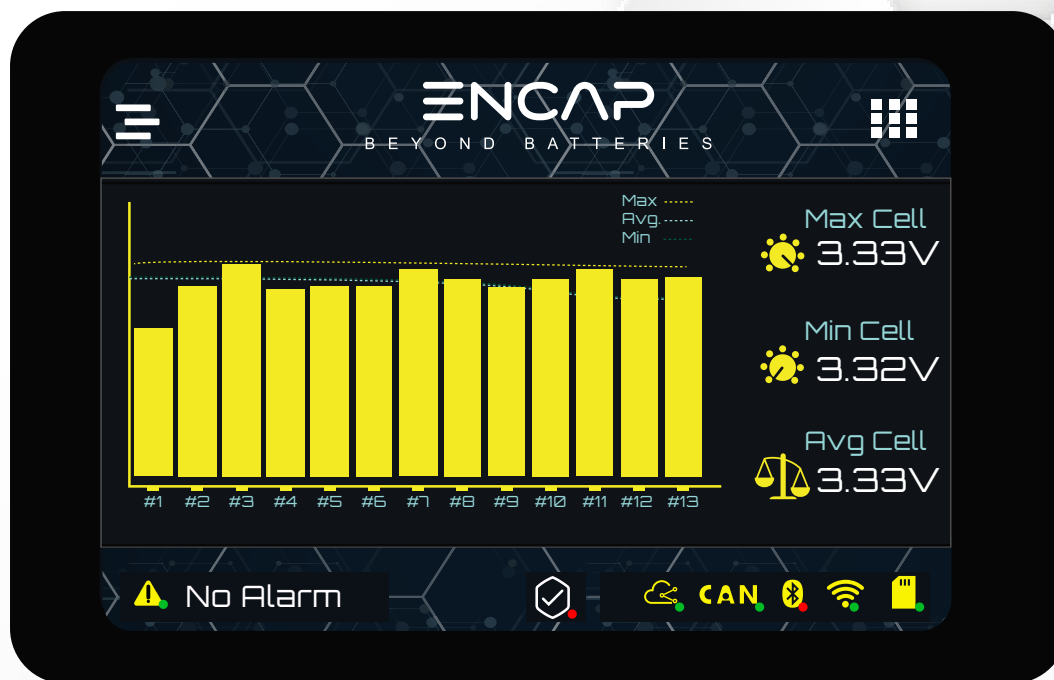
#### # RESET STATISTICS:

Click on Reset Statistics to delete stored preset values.



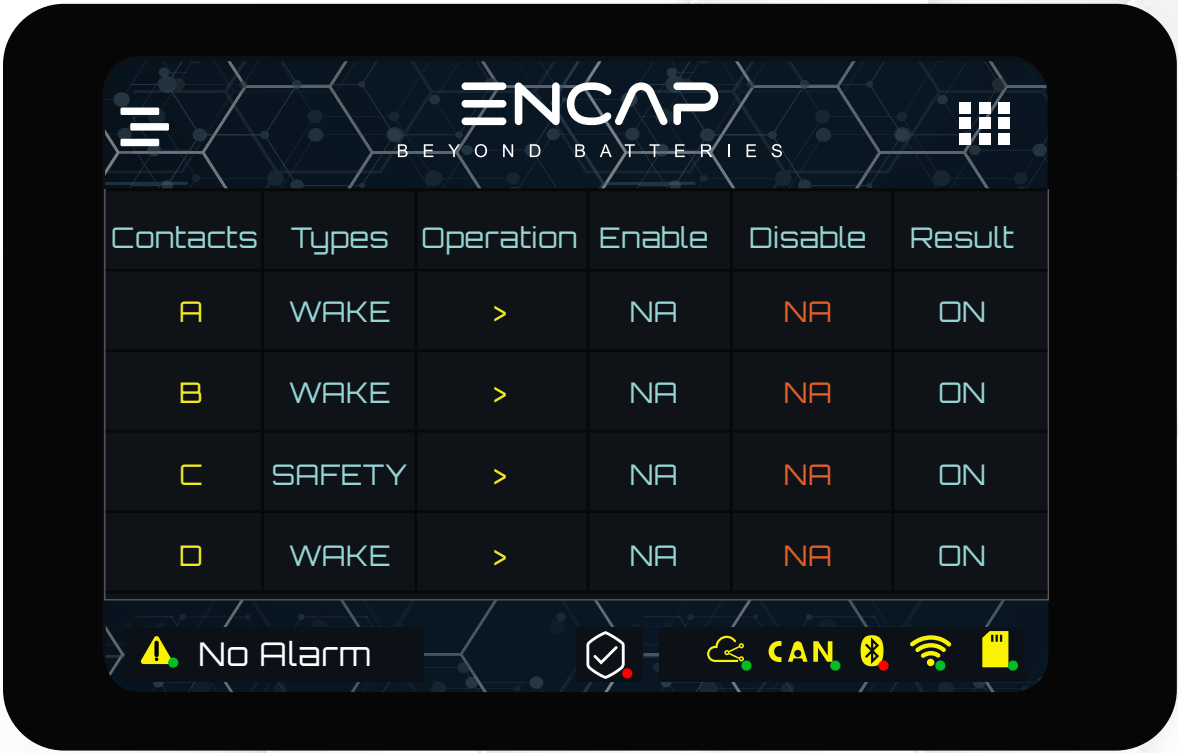
#### 4. CELL MONITORING

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.



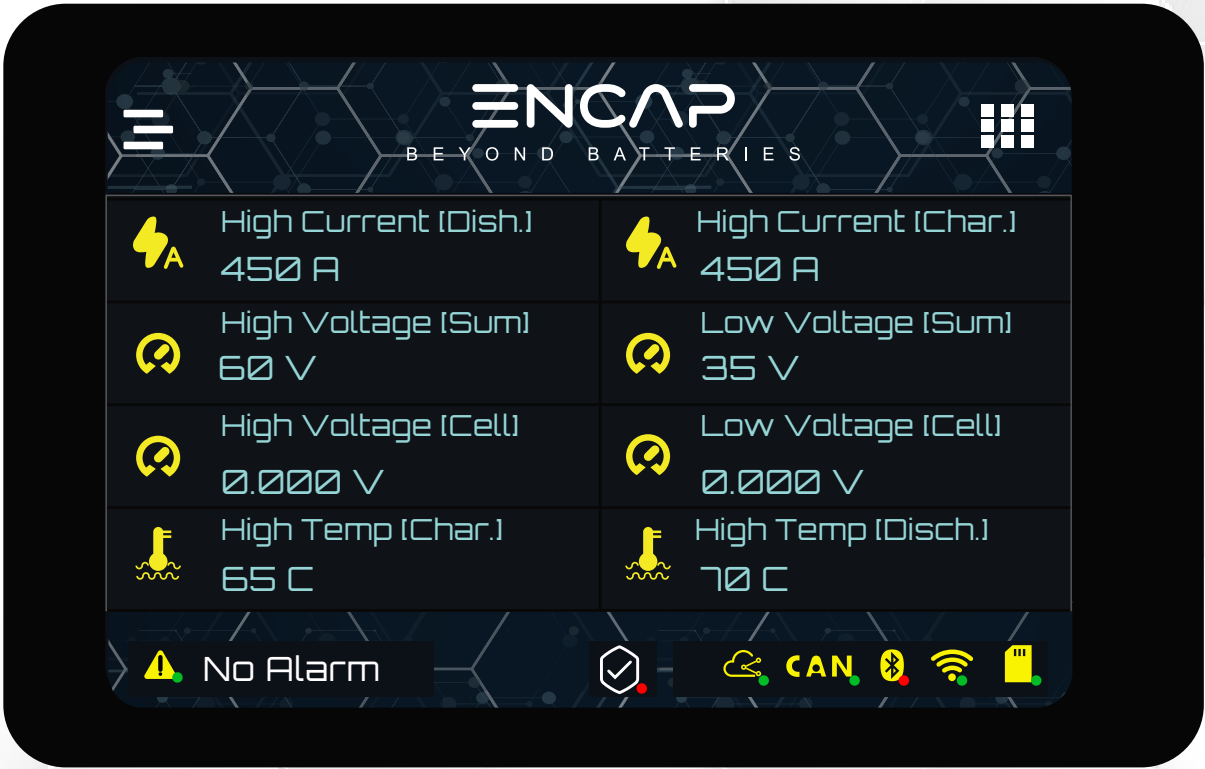
5. DRY CONTACTS

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



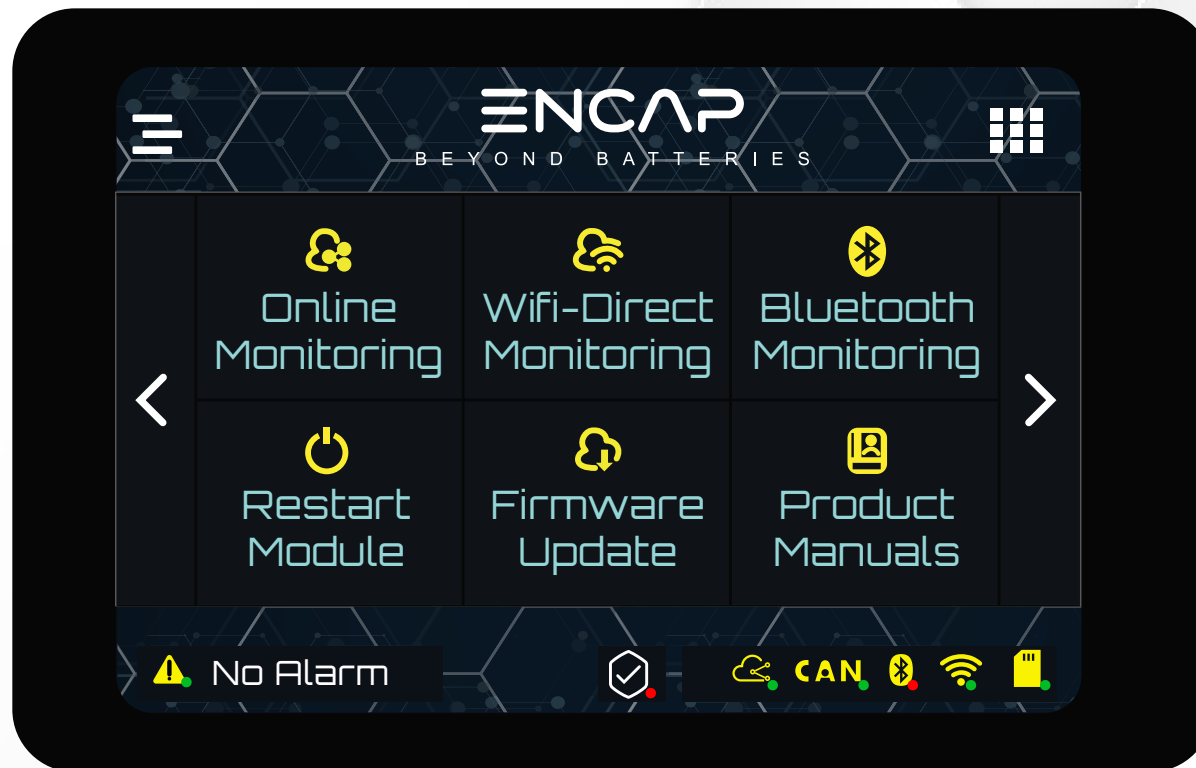
6. SYSTEM SETTINGS

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.



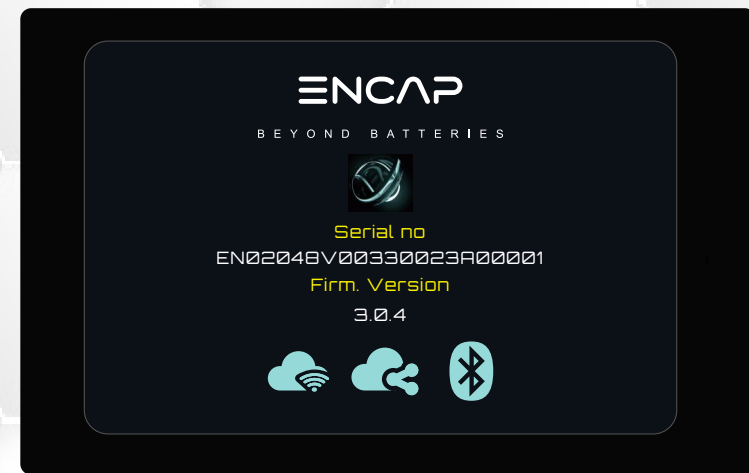
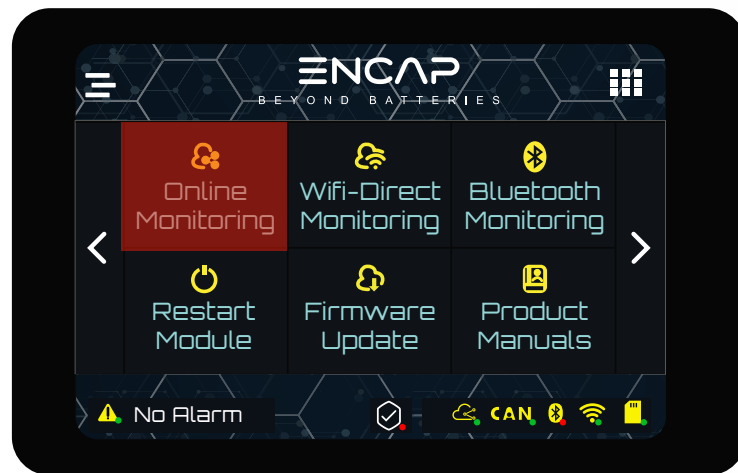
## SECOND MENU PAGE

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



## 1. ONLINE MONITORING

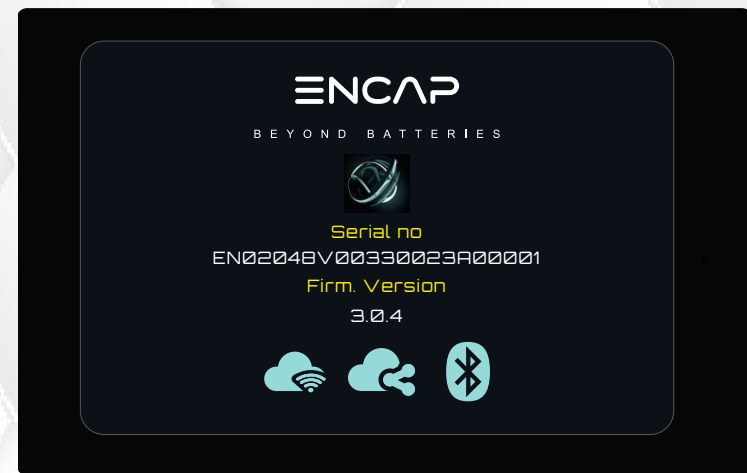
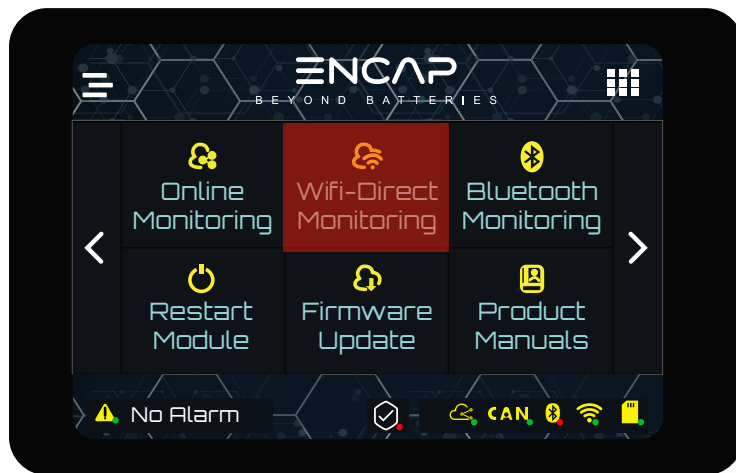
Click on Online Monitoring, Module will restart. While restarting, the Online Monitoring will brighten up.



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

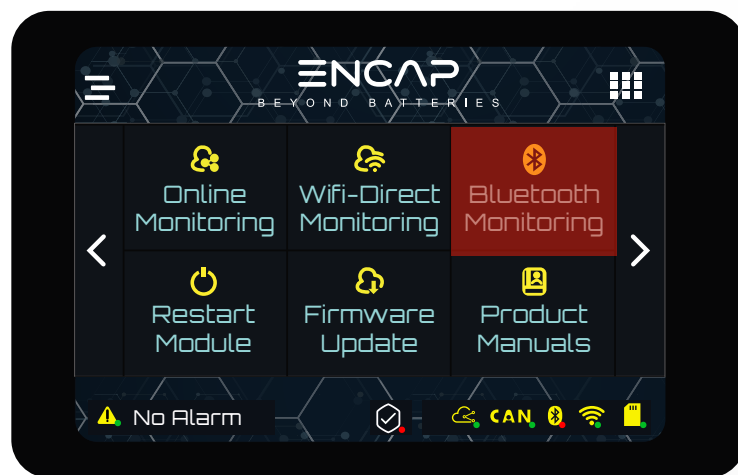
Click on Wi-Fi Direct Monitoring, Module will restart. While restarting, the Wi-Fi Direct icon will brighten up.



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

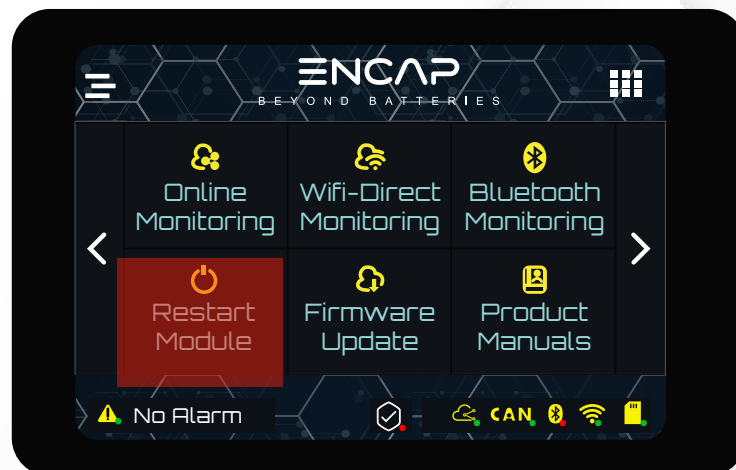
Click on Bluetooth Monitoring, Module will restart. While restarting, the Bluetooth icon will brighten up.



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.



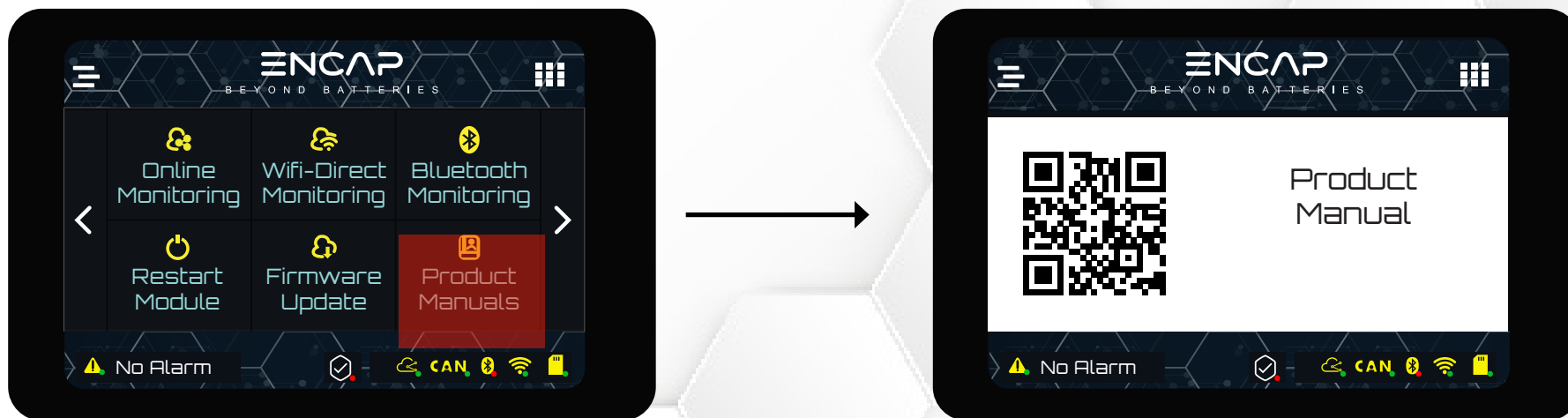
#### 5. FIRMWARE UPDATE

Make sure the Module is in Online Monitoring mode when updating the firmware. Click on Firmware Update.



## 6. 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.

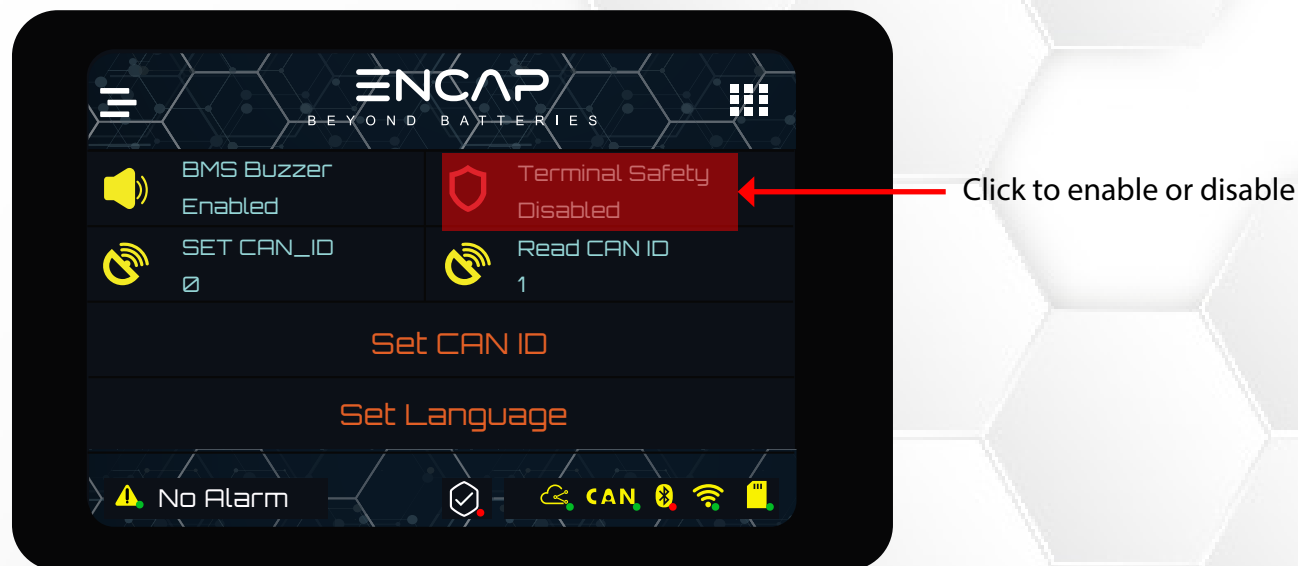
Tap here to enable or disable



### # 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.

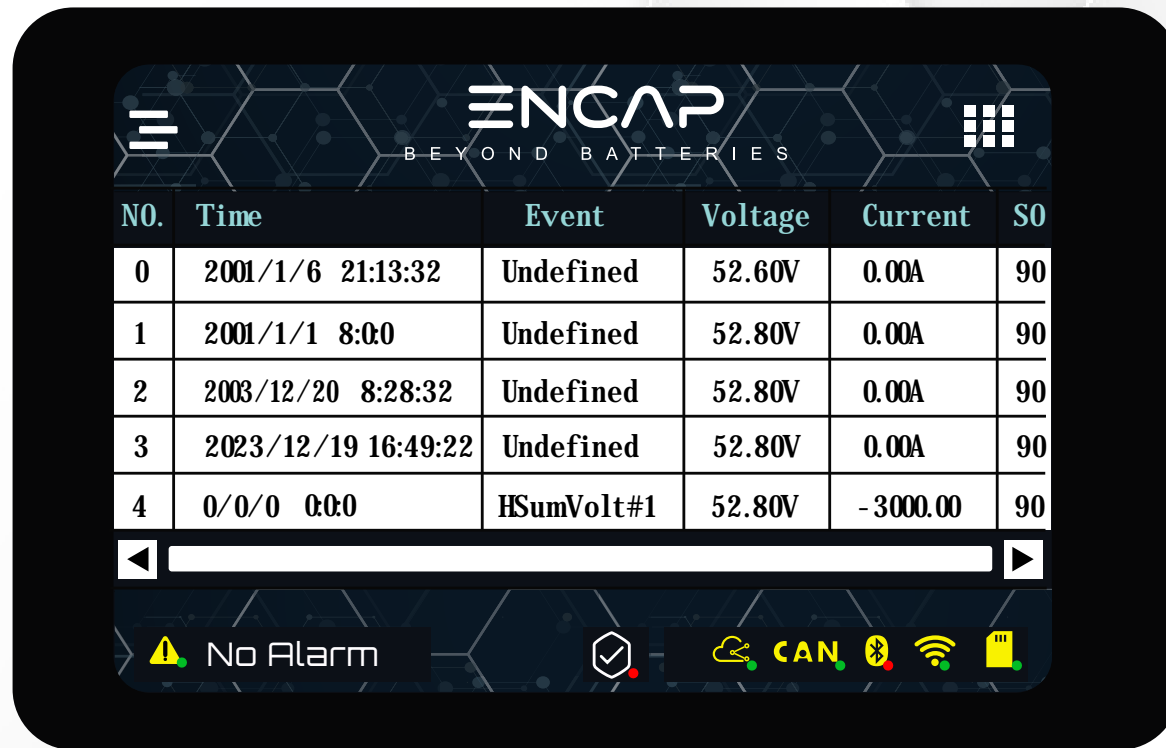
If you want to charge and discharge the Module, disable the safe feature by clicking on Terminal Safety. .



SET CAN\_ID and Read CAN ID 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.



NO.	Time	Event	Voltage	Current	SO
0	2001/1/6 21:13:32	Undefined	52.60V	0.00A	90
1	2001/1/1 8:00	Undefined	52.80V	0.00A	90
2	2003/12/20 8:28:32	Undefined	52.80V	0.00A	90
3	2023/12/19 16:49:22	Undefined	52.80V	0.00A	90
4	0/0/0 0:00	HSumVolt#1	52.80V	-3000.00	90

◀ [Progress Bar] ▶

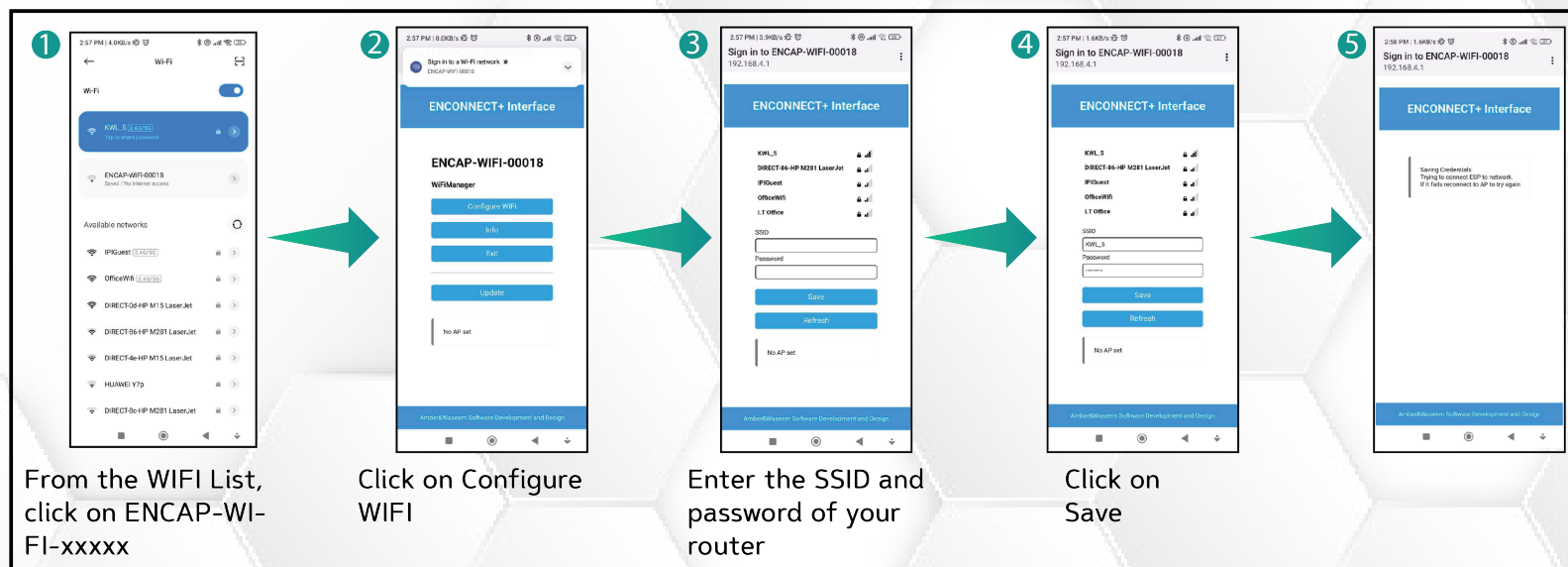
⚠ No Alarm ✓ CAN Bluetooth Wi-Fi 🔋

## MONITORING QR

Click on monitoring QR to scan the QR code.

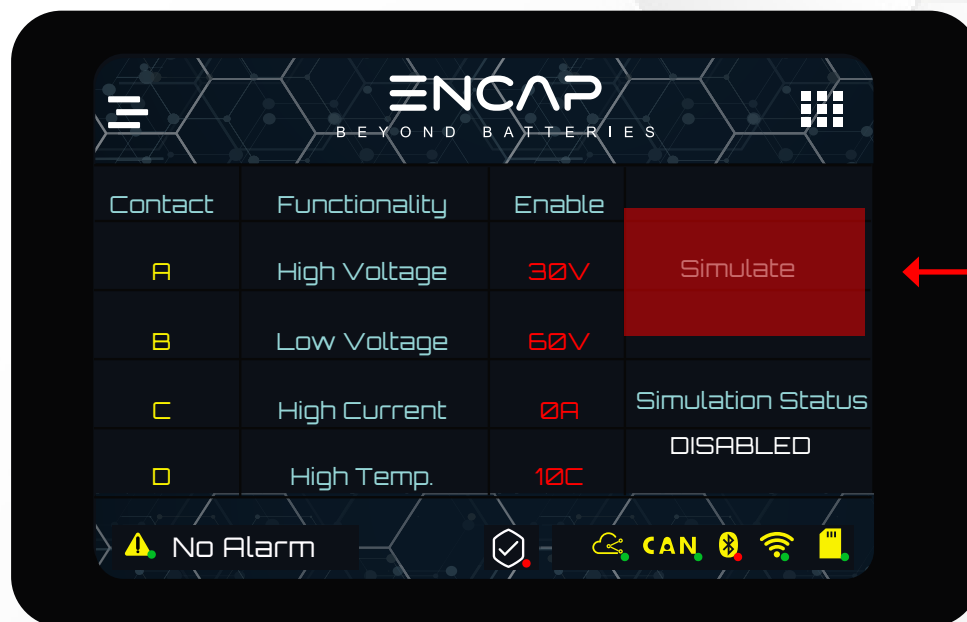


Follow the steps below to complete the process:



## 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 four Dry Contacts:

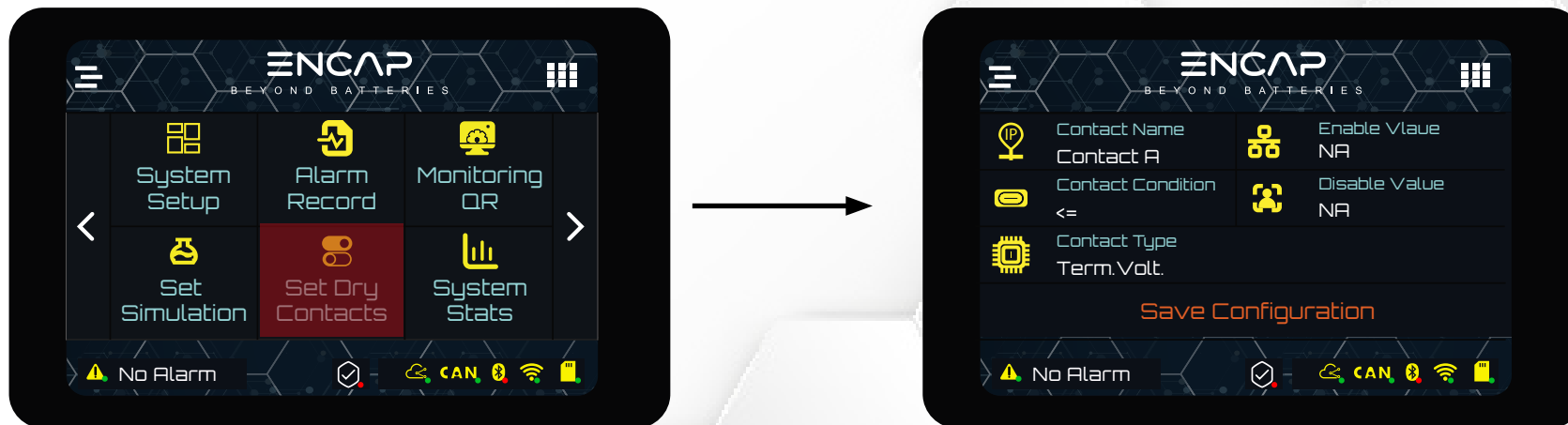
- Dry Contact A
- Dry Contact B
- Dry Contact C
- Dry Contact D

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

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

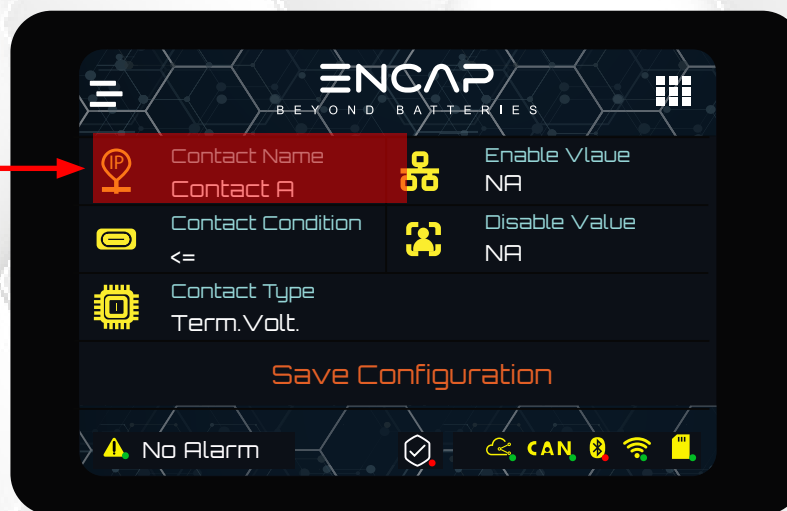
## 1. STEPS TO CONFIGURE DRY CONTACTS:

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 A, B, C and D.



## DRY CONTACT CONDITION

There are two set conditions:

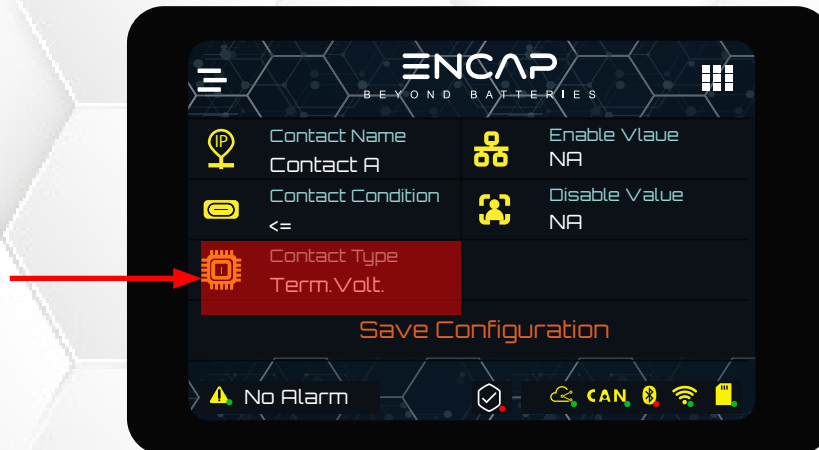
1. Less than or equal to
2. Greater than

Tap on the Contact Condition to navigate through the conditions



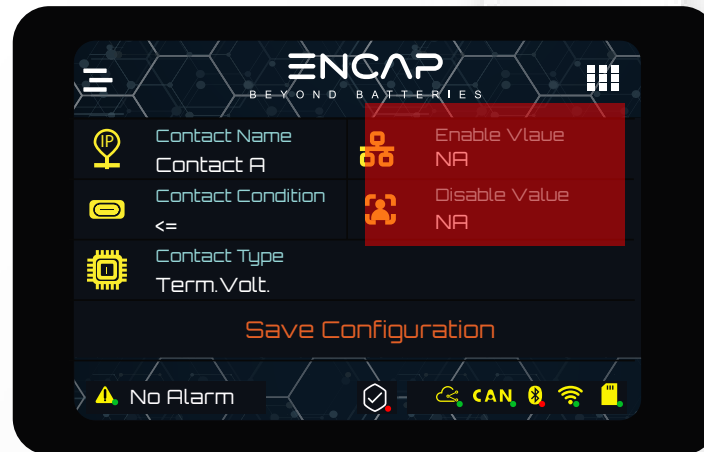
## DRY CONTACT PARAMETER TYPE SELECTION

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

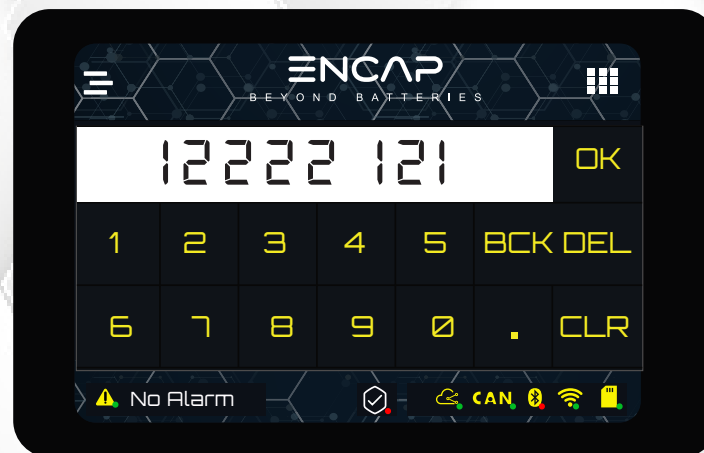


**DRY CONTACT FUNCTION SELECTION:**

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.

