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LiFePO₄ – MPLHP-5125528 Battery System

Setup and Configuration Manual



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| 1.0 | 5/09/2021 | Initial release of V5.0 service tool |
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Included in this document are instructions for configuring the LiFePO4 MPLHP-5125528 Battery System.

Additionally, instructions for updating the BMS firmware are included, if required.

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Background:

- All LiFePO4 – MPLHP-5125528 Battery Systems have a BMS system for control and protection functions
- The BMS consists of the following components
 - o Control box – contains rack level control and protection components including rack level BMS (BCU)
 - o BCU – rack level BMS component installed in Control Box
 - o BMU – battery module level BMS component installed in each battery module
 - o BAU – system level BMS component installed on door of rack/string #1
 - o HMI – system level BMS user interface installed on door of rack/string #1

Required Materials:

- HMI password (contact MPINarada representative)
- BMSer software password (contact MPINarada representative)

| No. | Items | Usage / notes | Appearance |
|-----|--------------------------------------|--|---|
| 1 | Computer with BMSer software | Used to program battery ID |  |
| 2 | New BAU/BCU/HMI software (files) | Software for battery system (Contact MPI Narada prior to arriving on site to confirm software version) |  |
| 3 | USBCAN adapter | Plugs into computer and Control box SRV port (driver also needed on new computer) |  |
| 4 | Small ladder | To reach upper battery modules & to rest Charger on if leads are too short |  |
| 5 | 50-foot extension cord (one or more) | Needed when for computer (might be needed) |  |

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| 6 | "LiFePO4 NESP Battery System Installation Manual" | Describes safety, PPE, battery removal, & busbar torques referenced in this manual | |  | |

Summary of Configuration Steps:

To setup a system that has not been previously configured or tested, the following basic steps are required after the system has been full installed and assembled including all power and communication connections to the rack level control boxes and HMI/BAU.

- Depending on the configuration of the system the HMI may need to be updated (consult with MPINarada representative)
- Depending on the configuration of the system the BAU may need to be updated (consult with MPINarada representative)
- Depending on the configuration of the system the BCU's may need to be updated (consult with MPINarada representative)
- All control box BCU ID's must be set.
- All racks/strings must be enabled.

The procedures on the following pages describe the required steps for setting up the system.

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1. **Configuration** – The following are the required steps for configuring a system:

- 1.1 Assign BCU and BMU ID's – Each rack has a control box with circuit breaker and inputs for the battery string and outputs for connection to UPS/Inverter, the BCU BMS component is installed inside the control box.

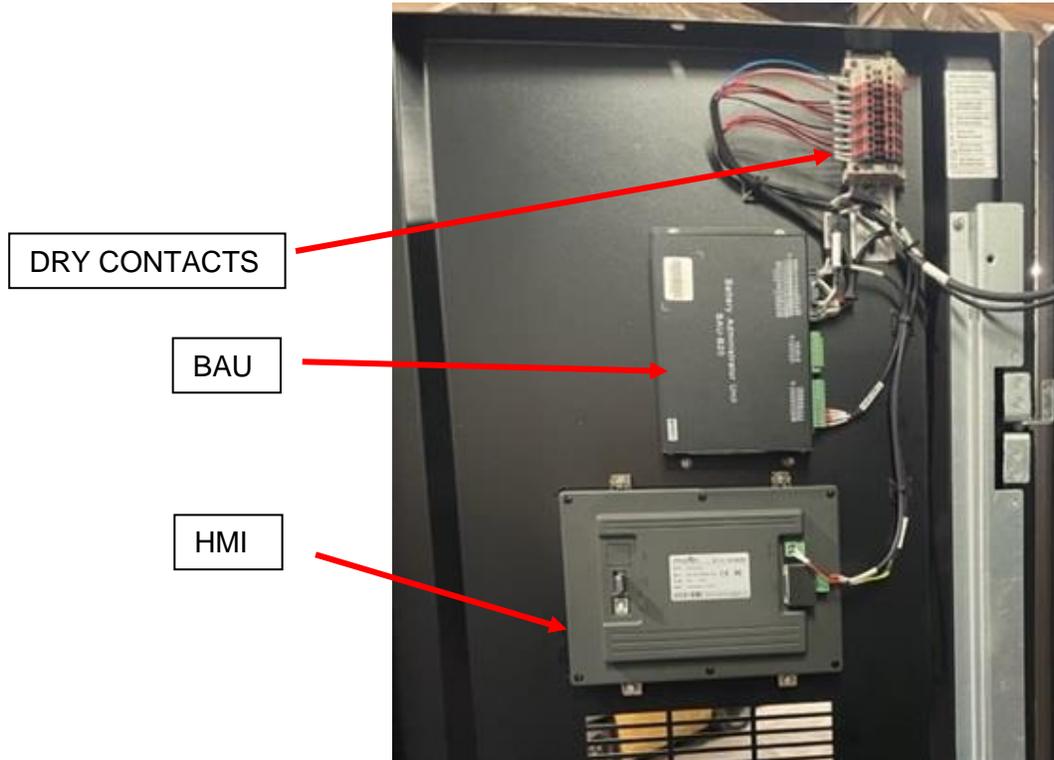


Control Box with internally installed BCU

- 1.2 For every battery bank that consists of multiple strings, each BCU in the bank needs to be assigned a unique BCU ID.
- 1.3 BCU ID's start at 1 (the string which includes the BAU and HMI is #1) and increments by 1 for each additional string.



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1.4 To assign a BCU ID the following steps should be followed:

1.4.1 Connect to the Control Box using “SRV” port and “USBCAN II” box connected to PC/laptop via USB port.

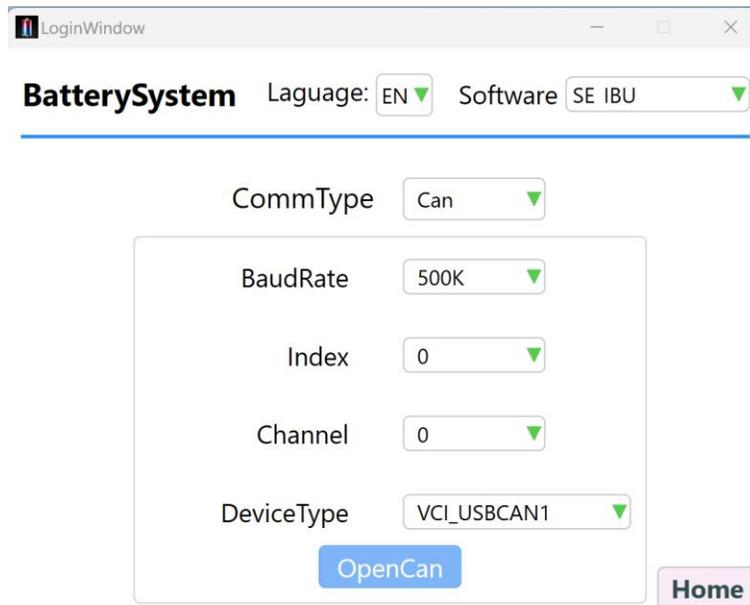


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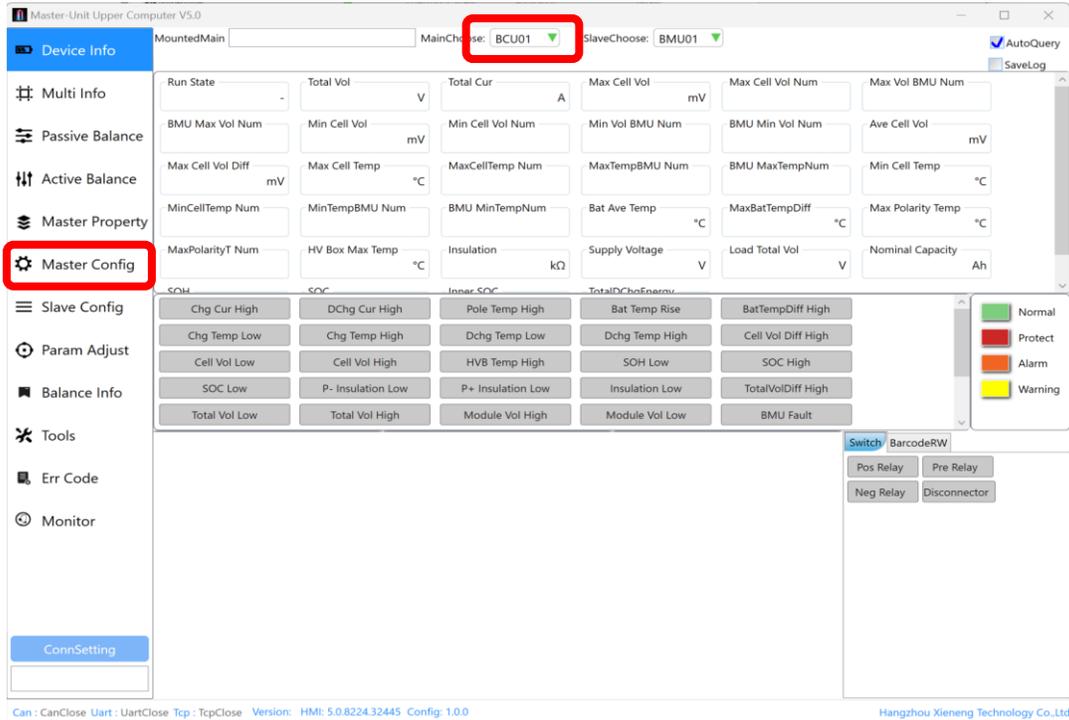
- 1.4.2 Ensure that the BMS is powered on (LED lights are lit)
- 1.4.3 The default BCU ID is “1”. If this is the first rack/string in the system (with HMI and BAU), the BCU ID does not likely need to be changed.
- 1.4.4 Open the BMSer “**BMS Terminal**” V5.0.0

| Name | Status | Date modified | Type | Size |
|------------------------|--------|--------------------|-----------------------|--------|
| ConfigFile | ✓ | 9/27/2023 11:30 PM | File folder | |
| kernelDlls | ✓ | 9/27/2023 9:58 PM | File folder | |
| Log | ✓ | 9/27/2023 9:58 PM | File folder | |
| Resource | ✓ | 9/27/2023 9:58 PM | File folder | |
| Bmsr.Core.dll | ✓ | 7/14/2022 7:30 AM | Application extension | 45 KB |
| Bmsr.LuaTest.dll | ✓ | 7/14/2022 7:30 AM | Application extension | 35 KB |
| BmsTerminal | ✓ | 7/14/2022 7:30 AM | Application | 598 KB |
| BmsTerminal.exe.config | ✓ | 5/13/2022 4:17 AM | CONFIG File | 2 KB |

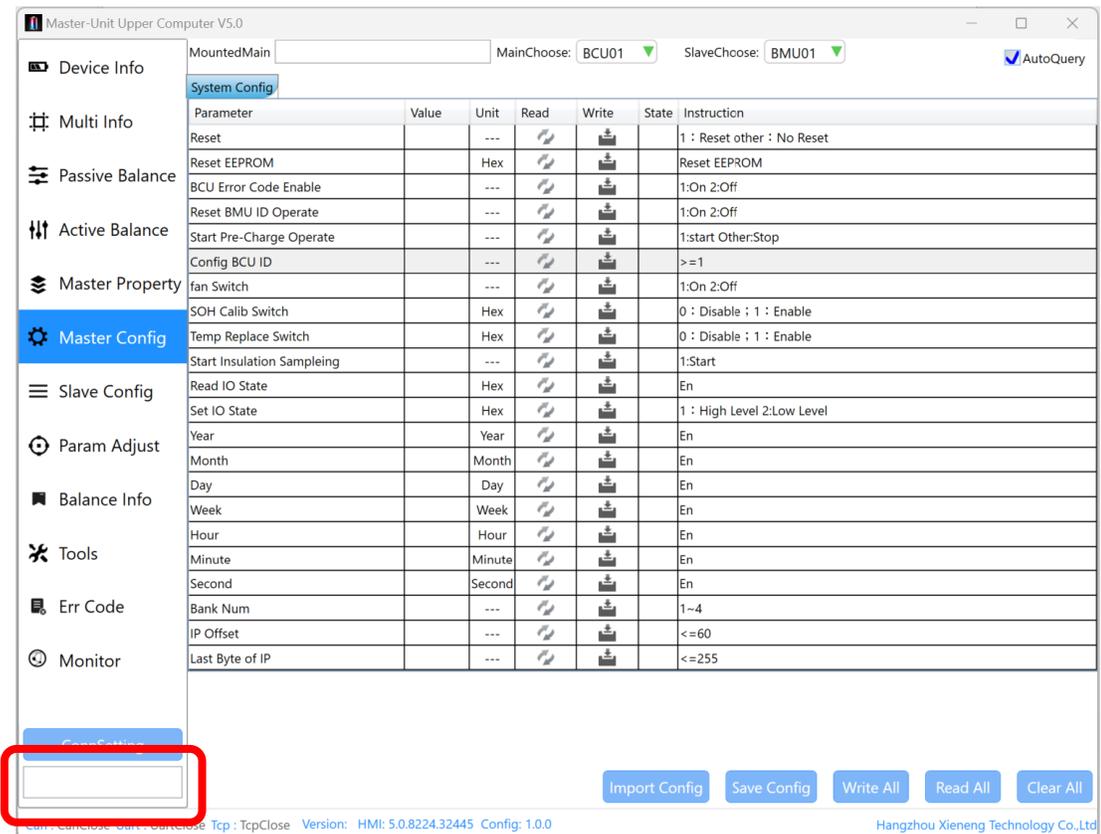
- 1.4.5 Press **OpenCan** button



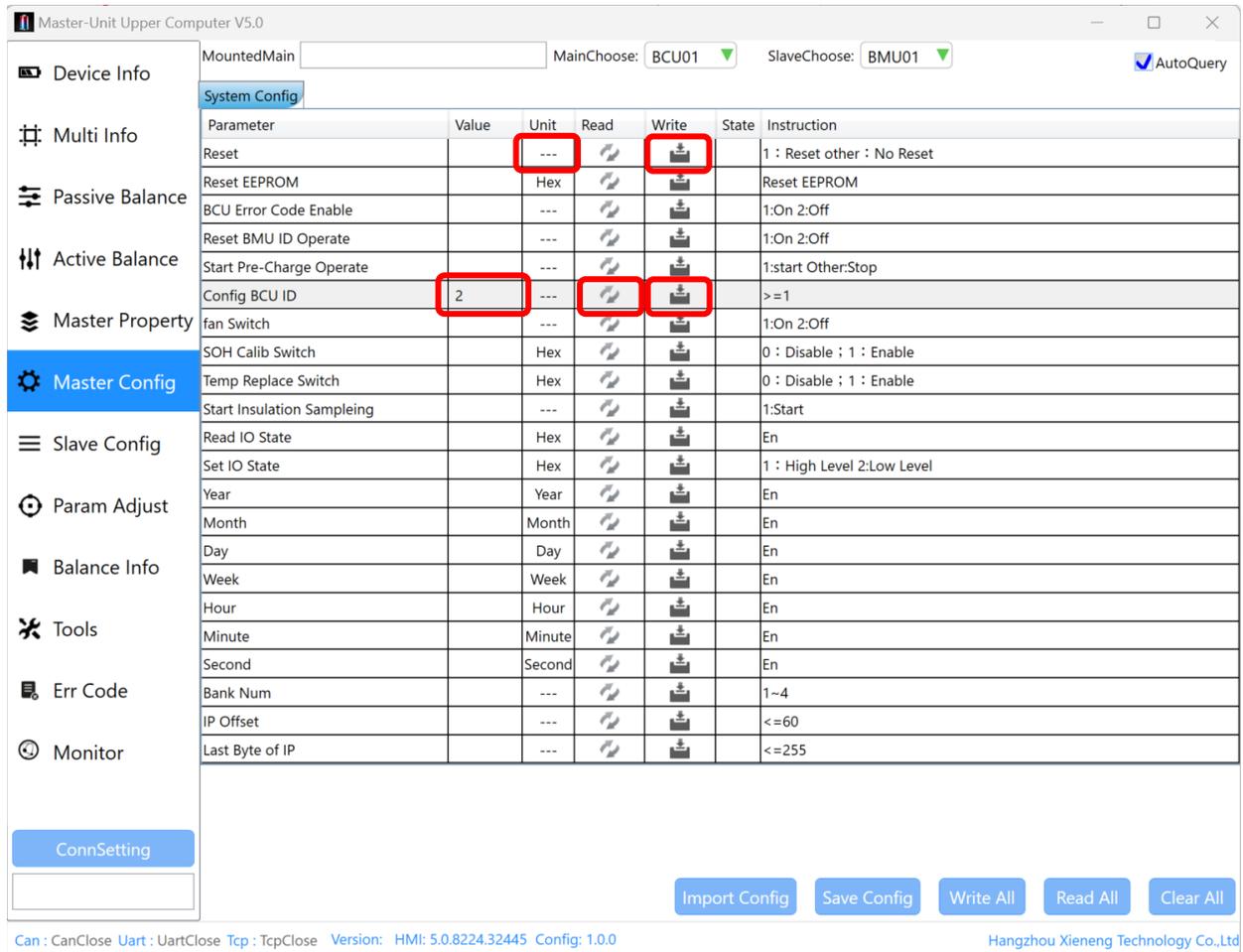
- 1.4.6 Select **BCU01** at top right pulldown in s/w (*Note: new BCU assignments start with BCU01*)
- 1.4.7 To change the BCU ID from the default of 1 press the ‘**Master Config**’ button



1.4.8 After pressing 'Master Config' button the software will show the below screen



- 1.4.8.1 To change the BCU ID
- 1.4.8.2 Enter “**write**” at lower left.
- 1.4.8.3 Enter a value (**2, 3, 4, 5, 6, 7, 8, etc.**) in the ‘**BCU ID**’ field
- 1.4.8.4 Press the ‘**Write**’ button.
- 1.4.8.5 Enter a value of ‘**1**’ in the ‘**Reset Value**’ field
- 1.4.8.6 Press the ‘**Write**’ button.
- 1.4.8.7 At this point communication with the BCU will be lost since the BCU ID is no longer set to 1



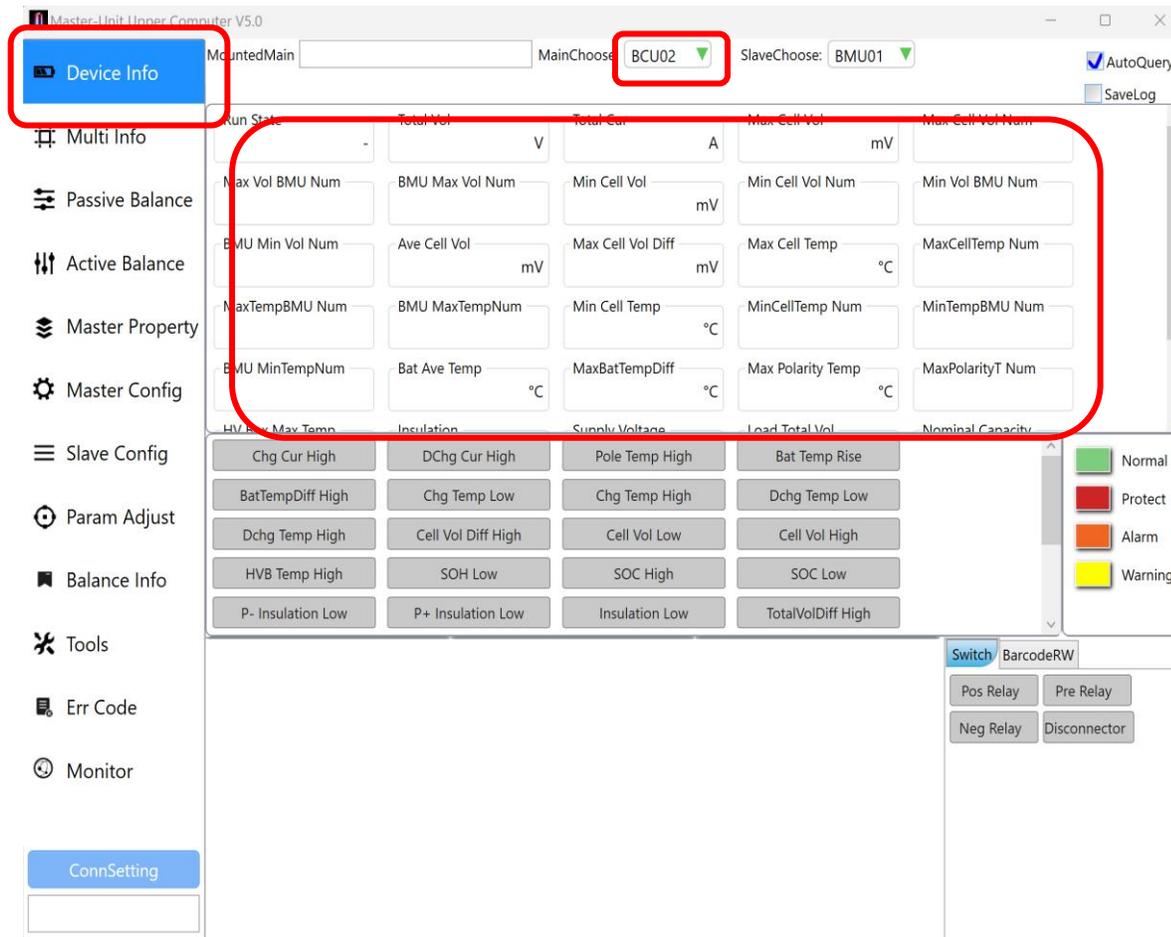
The screenshot shows the 'Master-Unit Upper Computer V5.0' software interface. The 'System Config' table is visible, with the following data:

| Parameter | Value | Unit | Read | Write | State | Instruction |
|---------------------------|-------|--------|------|-------|-------|----------------------------|
| Reset | | --- | | | | 1 : Reset other : No Reset |
| Reset EEPROM | | Hex | | | | Reset EEPROM |
| BCU Error Code Enable | | --- | | | | 1:On 2:Off |
| Reset BMU ID Operate | | --- | | | | 1:On 2:Off |
| Start Pre-Charge Operate | | --- | | | | 1:start Other:Stop |
| Config BCU ID | 2 | --- | | | | >=1 |
| fan Switch | | --- | | | | 1:On 2:Off |
| SOH Calib Switch | | Hex | | | | 0 : Disable ; 1 : Enable |
| Temp Replace Switch | | Hex | | | | 0 : Disable ; 1 : Enable |
| Start Insulation Sampling | | --- | | | | 1:Start |
| Read IO State | | Hex | | | | En |
| Set IO State | | Hex | | | | 1 : High Level 2:Low Level |
| Year | | Year | | | | En |
| Month | | Month | | | | En |
| Day | | Day | | | | En |
| Week | | Week | | | | En |
| Hour | | Hour | | | | En |
| Minute | | Minute | | | | En |
| Second | | Second | | | | En |
| Bank Num | | --- | | | | 1~4 |
| IP Offset | | --- | | | | <=60 |
| Last Byte of IP | | --- | | | | <=255 |

Red boxes in the screenshot highlight the 'Unit' column for 'Reset' and 'Config BCU ID', the 'Value' for 'Config BCU ID' (2), and the 'Write' icons for 'Reset' and 'Config BCU ID'.

At the bottom of the interface, there are buttons for 'Import Config', 'Save Config', 'Write All', 'Read All', and 'Clear All'. The status bar at the very bottom shows: 'Can : CanClose Uart : UartClose Tcp : TcpClose Version: HMI: 5.0.8224.32445 Config: 1.0.0 Hangzhou Xieneng Technology Co.,Ltd'.

- 1.4.9 To confirm new BCU ID setting select “**Device Info**” and select the new BCU0x from the pull down to connect.
- 1.4.10 The Data in the fields will populate automatically when the BCU ID is assigned correctly and BCU # selected matches the Control box the system is connected to.
- 1.4.11 Repeat steps in 1.4.8 above for each string/rack in the system.
- 1.4.12 It is not necessary to close the BMSer software on the PC/laptop in-between assigning BCU ID’s
- 1.4.13 It is necessary to move the SRV to the debug port of the BCU/Control Box that is being configured.



1.5 The 1st rack has BCU ID assigned. The rack is showing red as it is in Alarm mode because the busbars are not connected.



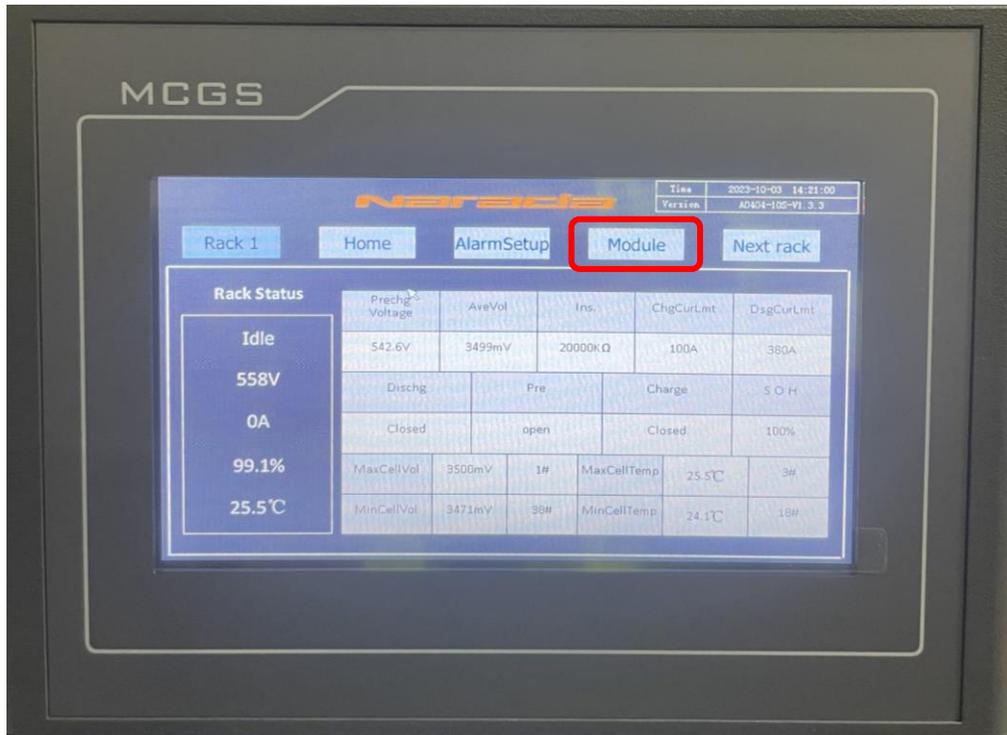
1.5.1 Return to the Home screen by pressing the 'Home' button

1.5.1.1 Press the 'R1' (or Rx for whatever rack is being setup) button



1.5.1.2 After pressing one of the 'Rx' buttons the rack detail page below will be shown

1.5.1.3 Press the 'Module' button to show individual module data. The screen should look like below for each battery module.



1.5.1.4 Press the 'Prev' or 'Next' button to advance to the next battery module.

1.5.1.5 There are 10 modules per rack (M1 thru M10). All module cell boxes should be green.



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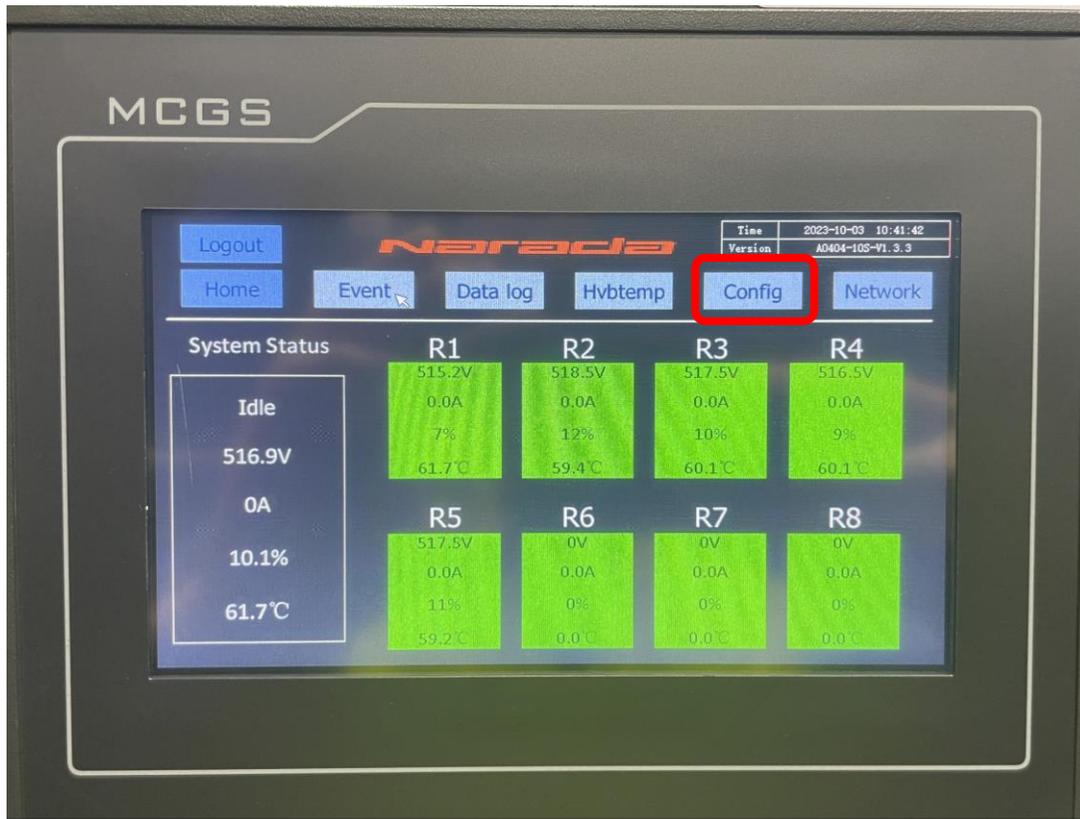
1.5.2 After all the racks in the system have their BCU ID's appropriately assigned, the Home screen would have all the Racks shown in Green.

1.5.2.1 After all the BCU IDs in the system have been successfully set, the power to all rack's BMS power should be cycled to reset the system.

1.5.2.2 After resetting the system, recheck all racks and modules for valid data and communication.

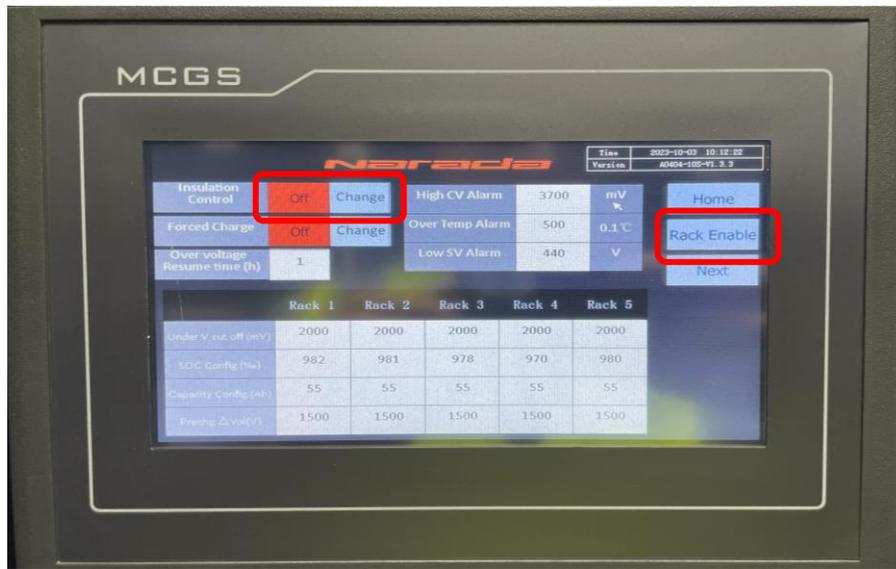
1.5.2.3 To prepare the system for operation the configured racks must be enabled.

1.5.3 From the Home screen on the HMI press the '**Config**' button



1.5.4 Change the Insulation Control to "**OFF**"

1.5.5 Press the '**Rack Enable**' button.



1.5.6 From the Rack Enable screen, press the 'Enable' button for each rack that has been configured for the system.

- 1.5.6.1 When Enabling racks, the contactors will close if there are no active alarms in the system.
- 1.5.6.2 When Control Box outputs are connected to a common point (DC bus, UPS, etc.), Enabling racks should be done one rack at a time, checking Control Box voltage output before connecting the next rack.
- 1.5.6.3 If the Control Box circuit breaker is closed, and the contactors close, the output terminals of the Control Box will be energized with 500+VDC. Be sure all appropriate precautions are taken before enabling racks.**



1.6 After the system has been fully configured and enabled, be sure to press 'logout' from the Home screen to avoid inadvertent setting changes by unqualified personnel.

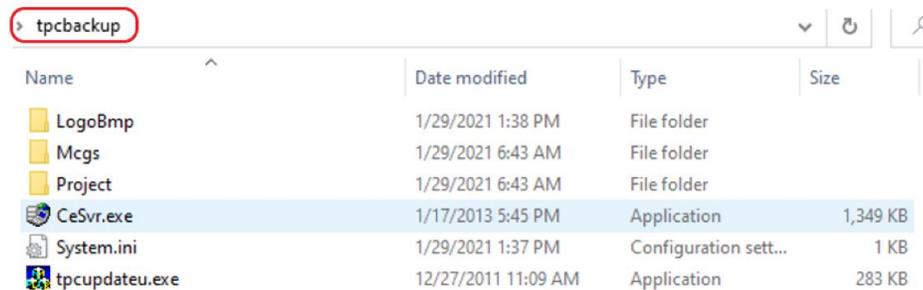
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2. **BMS firmware update** – Depending on system requirements and configuration, it may be required to update the BMS firmware in the HMI, BAU, and/or BCU.

2.1 Updating HMI firmware

2.1.1 If an HMI update is required, an MPINarada representative will provide the update files.

2.1.2 The update files are contained in a **'tpcbbackup'** folder.



2.1.2.1 Remove power to the HMI by shutting down the BMS power or removing the connector on the back of the HMI supplying power.

2.1.2.2 Remove the USB drive from the back of the HMI.

2.1.2.3 Connect the USB drive to a laptop or PC and load the **'tpcbbackup'** folder and its contents into the root directory of the USB drive.

2.1.2.3.1 Be sure that your laptop/PC does not encrypt the drive or files.

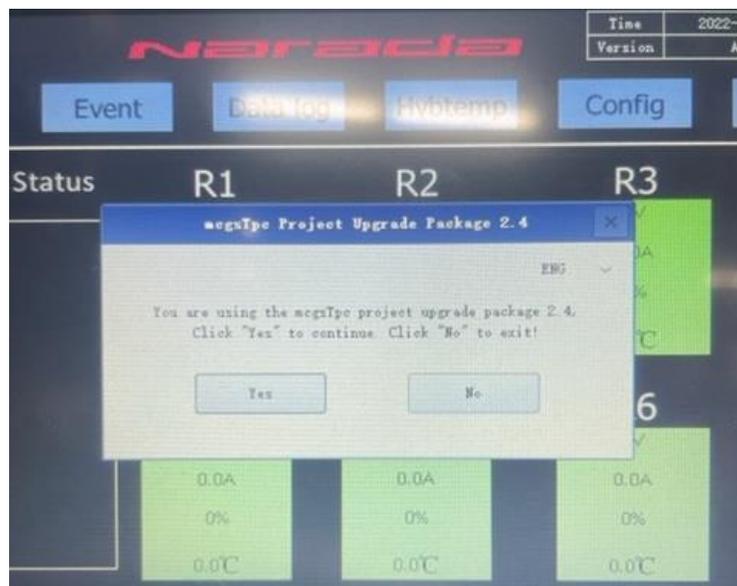
2.1.2.3.2 Be sure the folder and files are not zipped.

2.1.2.3.3 Be sure that the entire **'tpcbbackup'** folder and its contents are saved to the USB drive.

2.1.2.4 Re-install the USB drive into the back of the HMI.

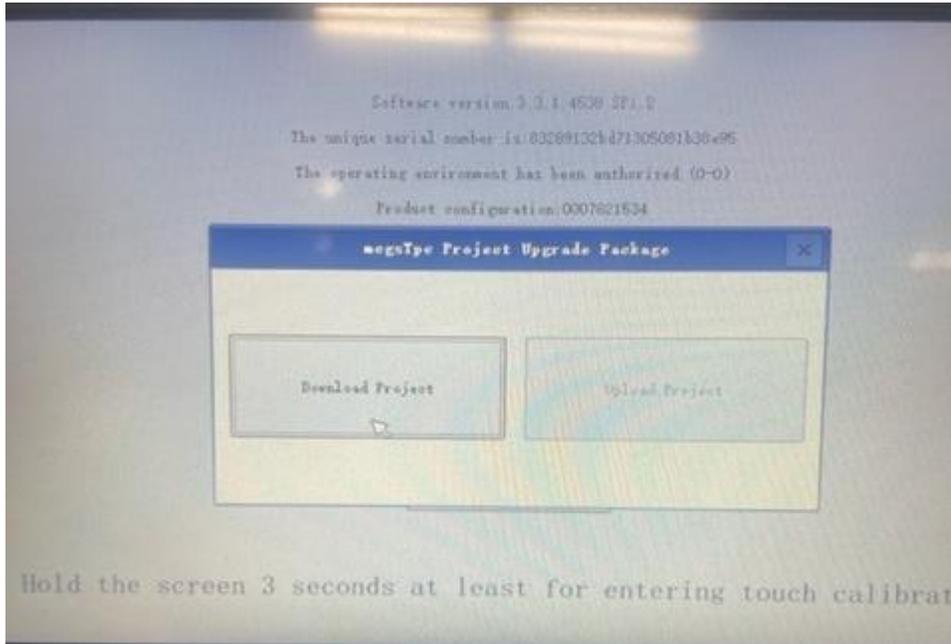
2.1.2.5 Re-apply power to the HMI.

2.1.2.6 The following screens will appear, all text is in Chinese, so the buttons to proceed with the upgrade must be pressed in the following order:

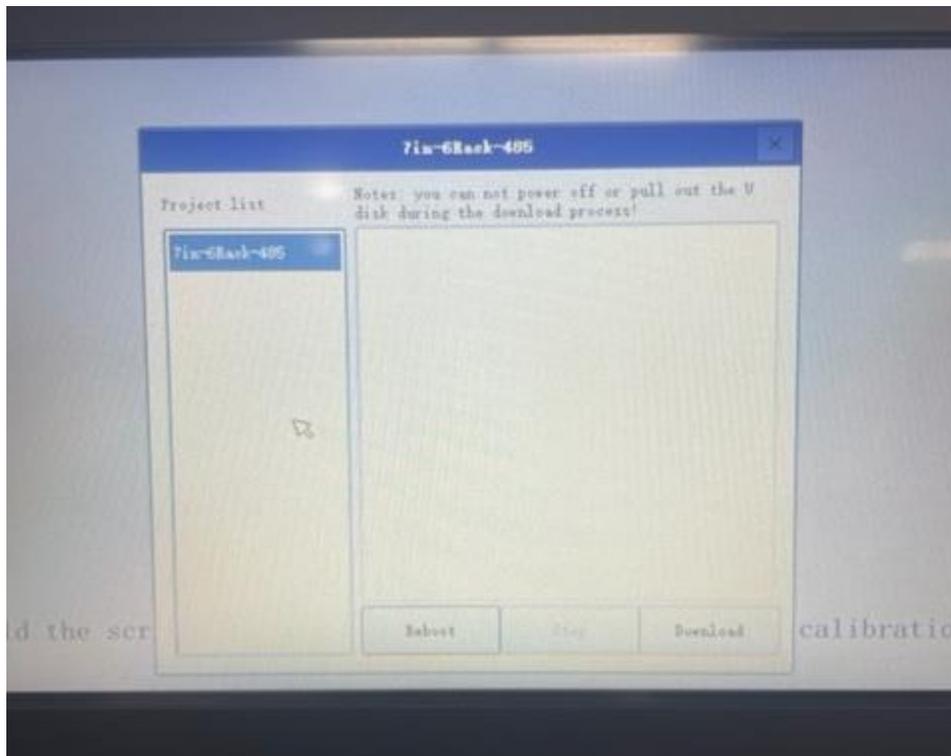


Press "Yes"

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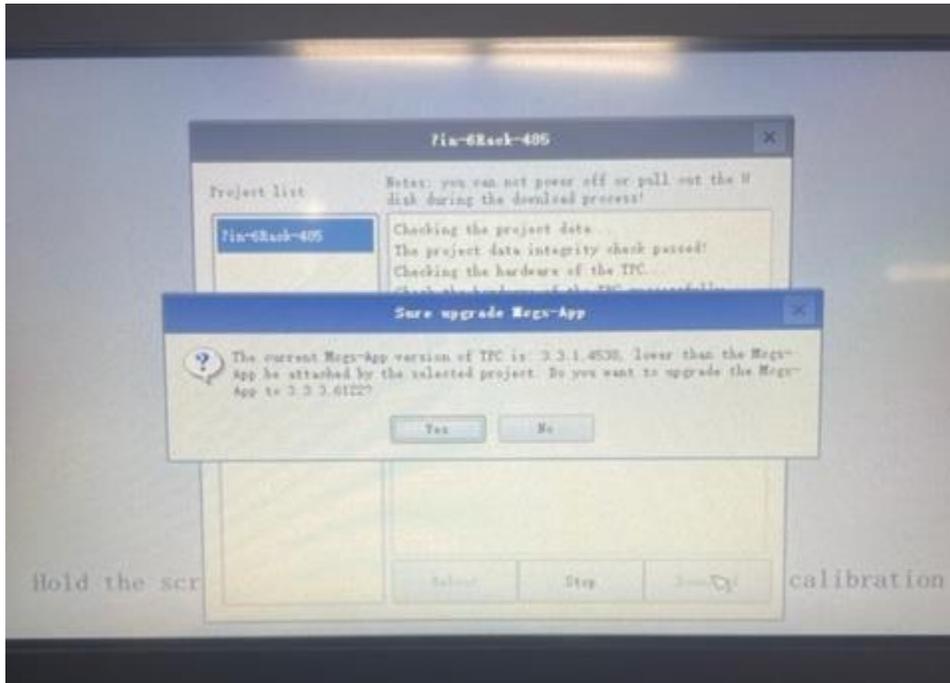


Press “Download Project”

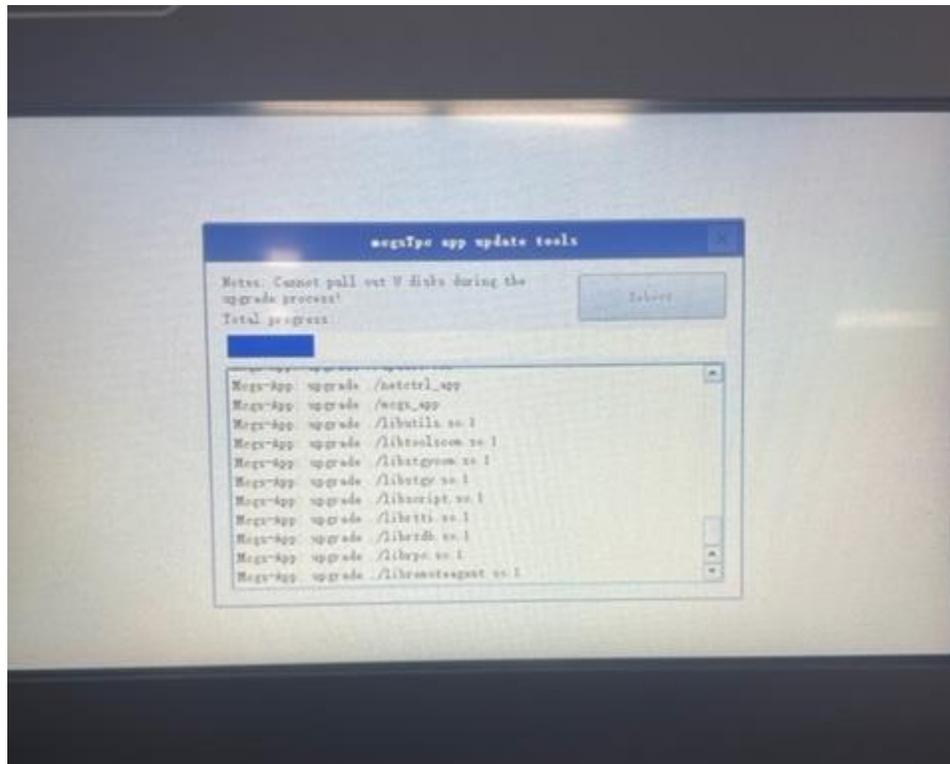


Press “Download”

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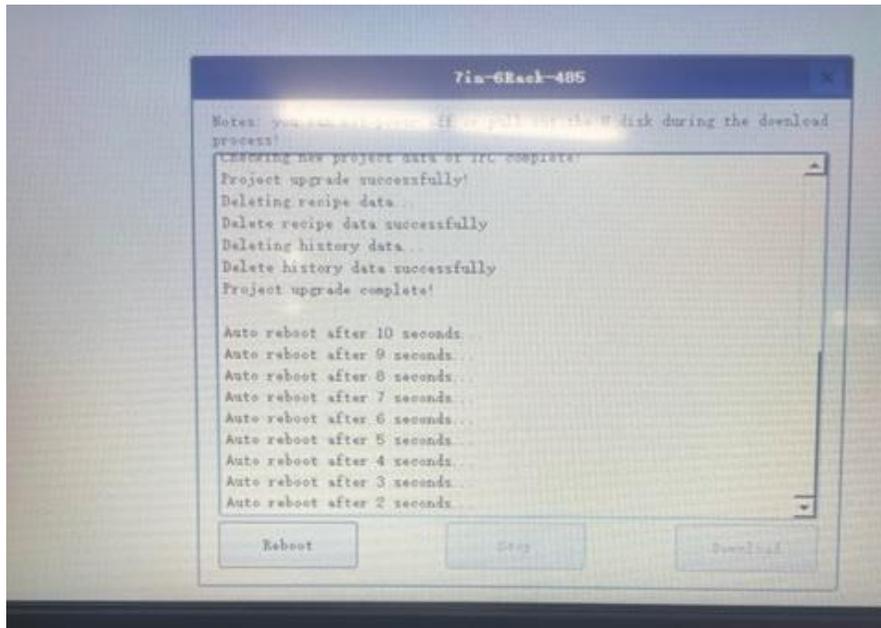


Press "Yes"

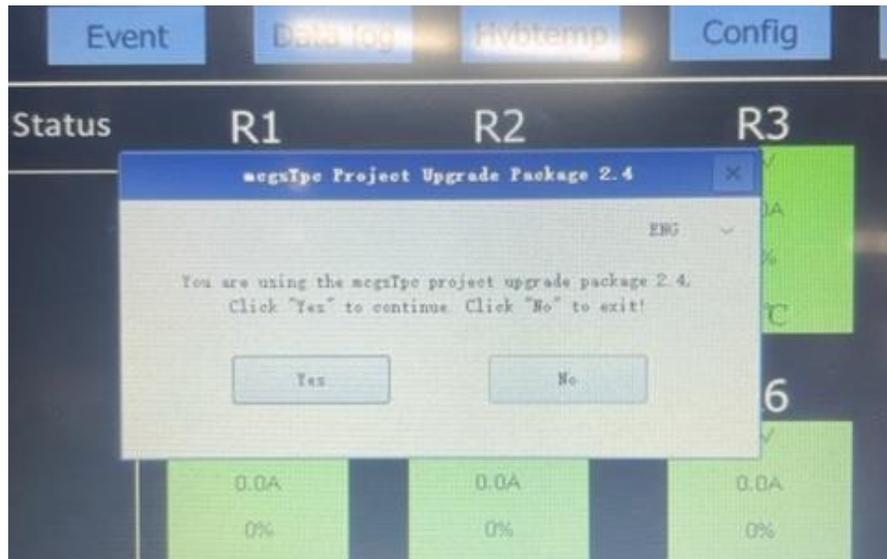


Screen showing status updates

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Press “Reboot” or wait for HMI to reboot on its own.

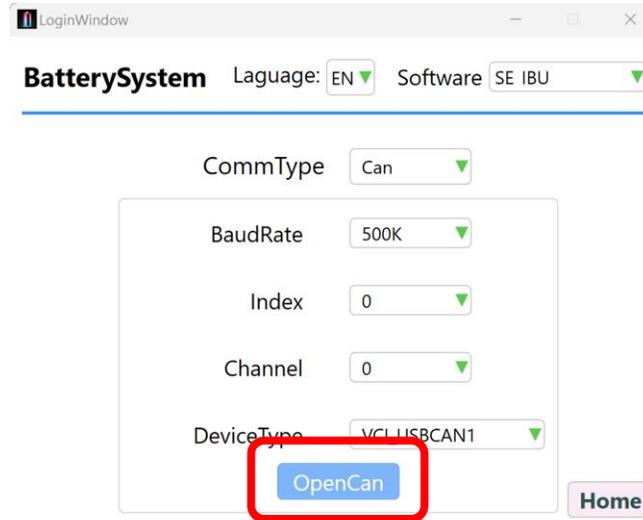


Press “No” after the system reboots. At this point the update is complete.

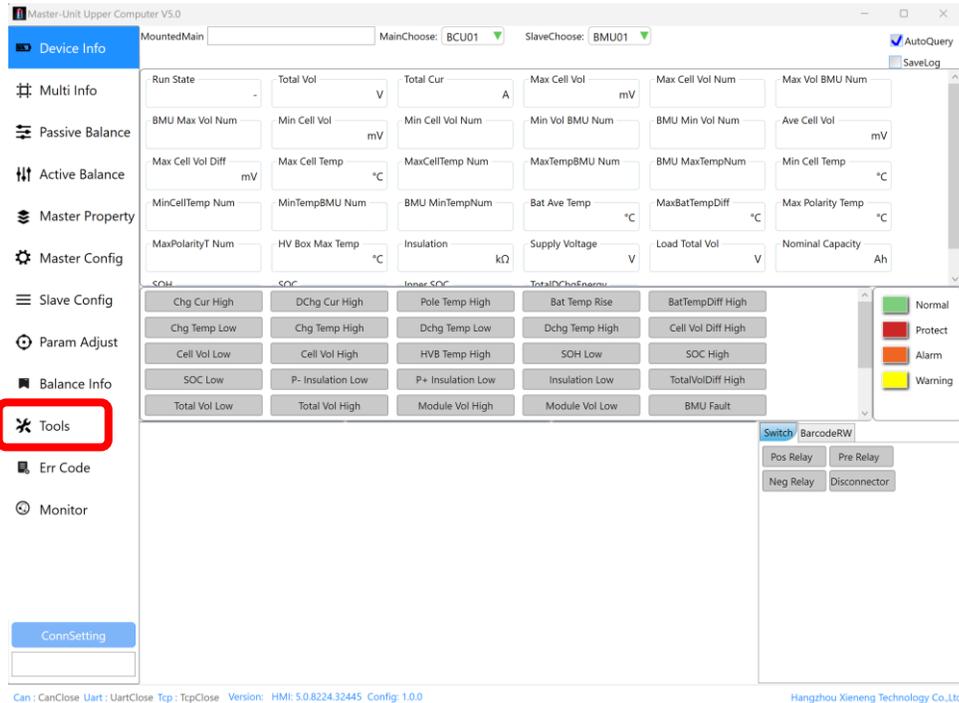
- i. **To avoid the below screen every time the HMI restarts, the ‘tpcbkup’ folder should be removed from the HMI USB drive or renamed**
 - a. It is preferable to rename the folder and leave on USB drive so the HMI can be reprogrammed later if needed.
 - i. The folder can be renamed anything, it is suggested to use the date in the new name for record keeping purposes.

2.2 Updating BAU firmware

- 2.2.1 There is one BAU per system
- 2.2.2 Connect to Control Box #1 (with HMI and BAU) using “SRV port and “USBCAN II” box connected to PC/laptop via USB port
- 2.2.3 Ensure that the BMS is powered on (LED lights are lit)
- 2.2.4 Open the BMSer Service Tool V5.0.0
- 2.2.5 Double click on **BmsTerminal**.
- 2.2.6 The software screen will be opened. Press **OpenCan**.



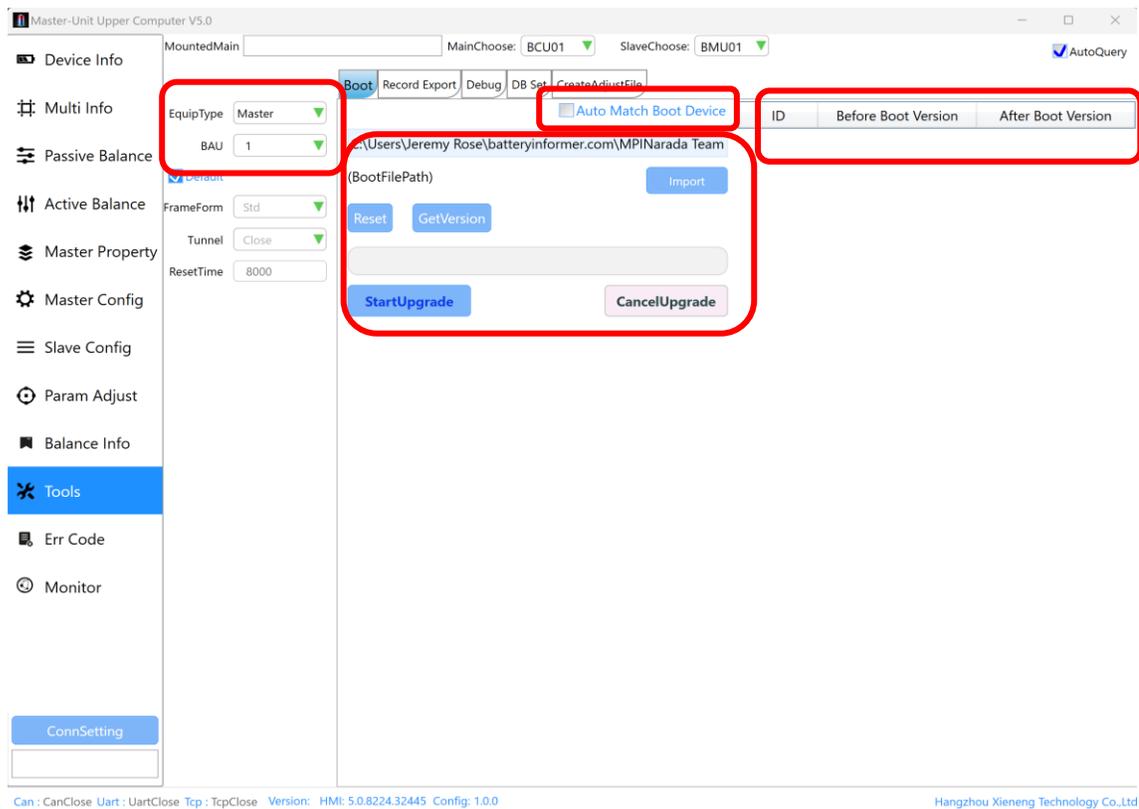
- 2.2.7 A new screen will Open. Press the **Tools** tab.



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2.2.8 In the following screen follow these steps:

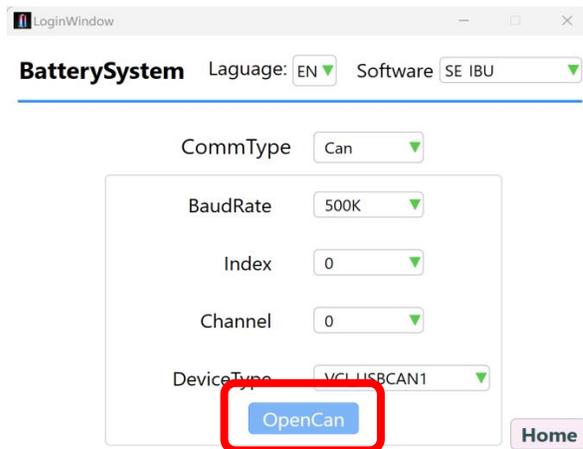
- 2.2.8.1 Uncheck **Auto Match Boot Device**.
- 2.2.8.2 Select '**Master**' in the EquipType dropdown menu.
- 2.2.8.3 Select '**1**' in the BAU dropdown menu.
- 2.2.8.4 Press '**ReadVersion**' button
 - 2.2.8.4.1 The current software version will be shown in the status windows on the right side.
- 2.2.8.5 Press the '**Import**' button to select location and **.bin file** for BAU update.
 - 2.2.8.5.1 Update file will be provided by MPINarada representative.
- 2.2.8.6 Press the '**StartUpgrade**' button.
 - 2.2.8.6.1 The update will begin with status displayed on screen.
 - 2.2.8.6.2 The software will indicate when the update is complete.
 - 2.2.8.6.3 A new version of the software will show up on the screen under "**After Boot Version.**"



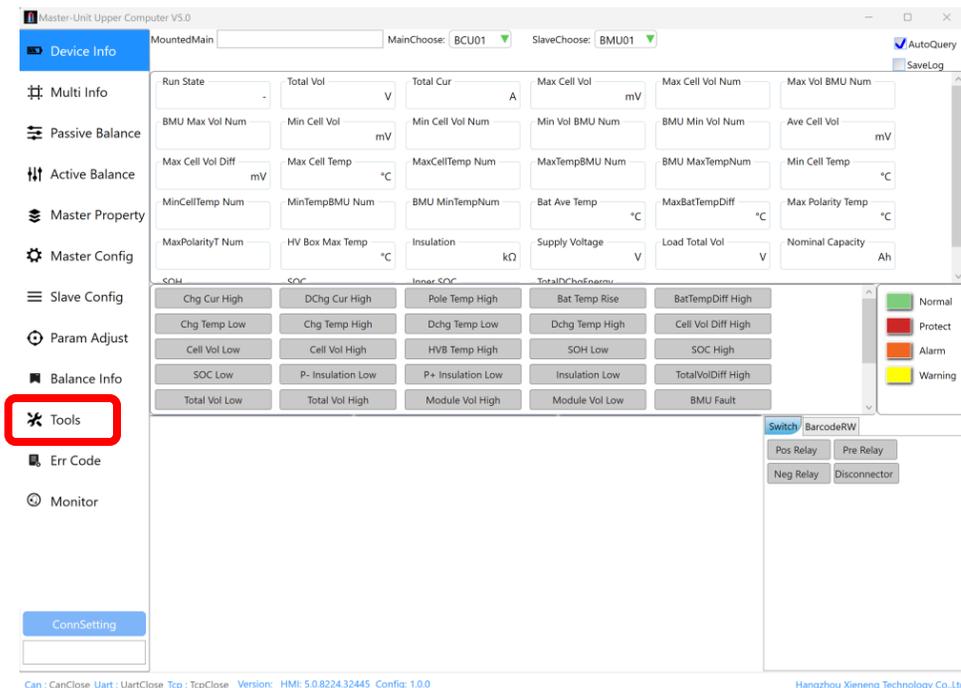
- 2.2.8.7 Press the '**Reset**' button to restart the BAU with the new firmware.
- 2.2.8.8 Press the '**ReadVersion**' button again to show new firmware version has been installed.
 - 2.2.8.8.1 Version numbers before and after the reprogramming should be different (the version numbers will NOT match the example version numbers below)

2.3 Updating BCU firmware

- 2.3.1 There is a BCU in each Control Box of the system.
- 2.3.2 Every string/rack will have a Control Box.
- 2.3.3 If a BCU firmware update is required, all BCU's in all Control Boxes must be updated individually (one by one)
- 2.3.4 Starting with Control Box #1 (with HMI and BAU), connect using "SRV" port and "USBCAN II" box connected to PC/laptop via USB port
- 2.3.5 Ensure that the BMS is powered on (LED lights are lit)
- 2.3.6 Open the BMSer Service tool V5.0.0
- 2.3.7 Double click on **BmsTerminal**.
- 2.3.8 The software screen will be opened. Press **OpenCan**.



- 2.3.9 The below software screen will be opened. Press the **Tools** tab



2.3.10 The below steps will need to be repeated to update the BCU/Control Box for each rack/string in the system.

2.3.11 In the following screen follow these steps:

2.3.11.1 Uncheck **Auto Match Boot Device**.

2.3.11.2 Select **'IBU'** in the EquipType dropdown menu.

2.3.11.3 BAU should be set to 1. Select corresponding number in the BCU drop down to the control box you are trying to update.

2.3.11.4 Press **'ReadVersion'** button

2.3.11.4.1 The current software version will be shown in the status windows on the right side.

2.3.11.5 Press the **'Import'** button to select location and **.bin file** for BAU update.

2.3.11.5.1 Update file will be provided by MPINarada representative.

2.3.11.6 Press the **'StartUpgrade'** button.

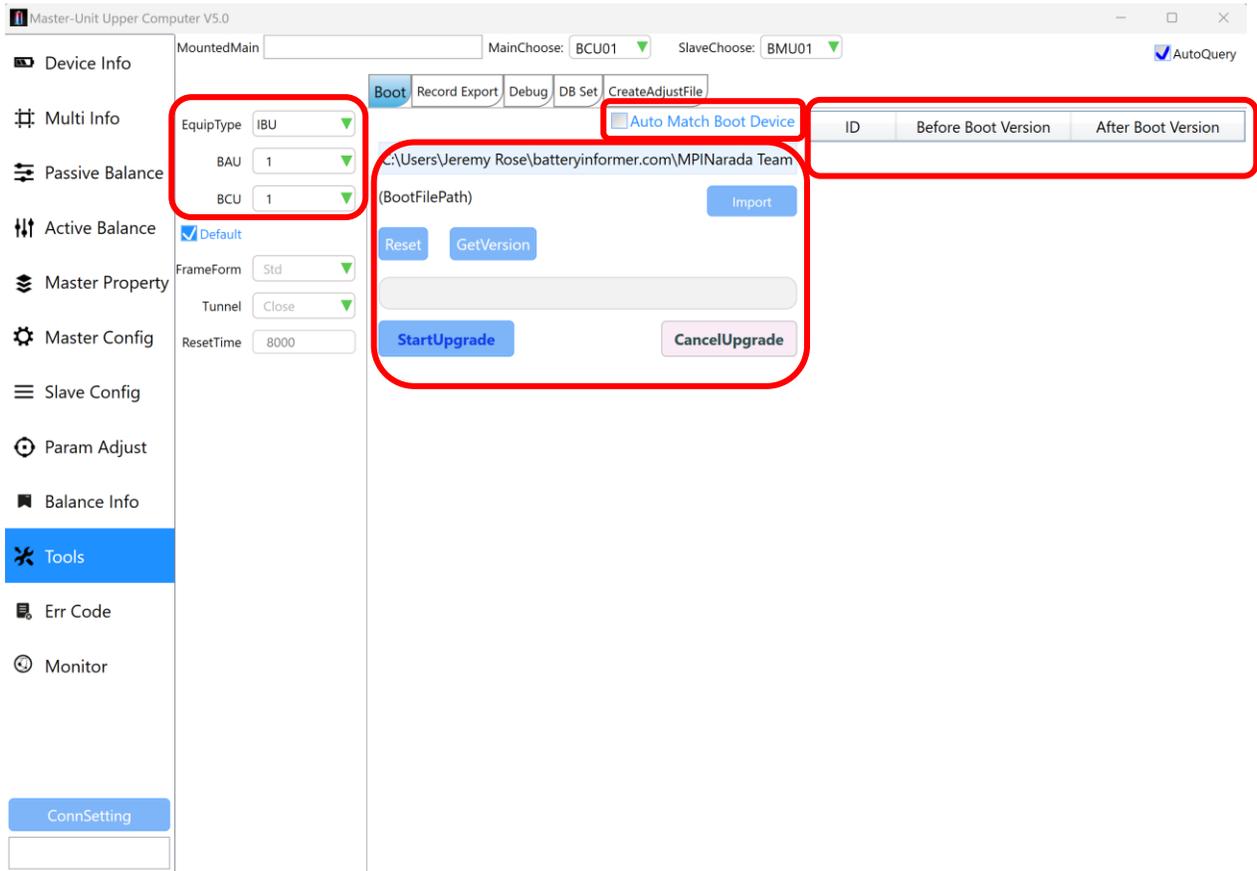
2.3.11.6.1 The update will begin with status displayed on screen.

2.3.11.6.2 The software will indicate when the update is complete.

2.3.11.6.3 A new version of the software will show up on the screen under **"After Boot Version"**

2.1.1.1 Press the **'Reset'** button to restart the BCU with the new firmware.

2.1.1.2 Cycle power on all control boxes after the update.



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