NUVATION BMS™

Operator Interface Manual

Single Stack

2018-10-08, Rev. 2.0, Babbage 18.08

Table of Contents

1. Introduction

Thank you for choosing Nuvation BMS™

Nuvation BMS™ manages rechargeable battery cells by limiting operation to within the cell's safe operating range, monitoring the state of the cells, estimating State-of-Charge and State-of-Health, reporting measured data, and interacting with the energy storage system controller.

Nuvation BMS™ Operator Interface is a platform-agnostic (i.e. Windows, Linux, Mac, mobile OS) plug-and-play user interface. It allows energy storage system operators to manage the operation of Nuvation BMS modules as well as internal and external communications.

With battery management system, operators achieve peace of mind that their cells are protected.

1.1. About this Guide

This *Operator Interface Manual: Single Stack* covers the graphical dashboard and control of your Nuvation BMS™ via the Operator Interface.

This guide covers single stack installations. If you are using a Nuvation BMS™ Grid Battery Controller please refer to the *Operator Interface Manual (Multi-Stack)*.

> This document applies to Nuvation BMS Babbage 18.08 software release (Operator Interface version 0.38.0). Content may be inaccurate or incomplete for other versions.

> We thrive on your feedback and what we build is driven by your input. Please submit support tickets to support@nuvationenergy.com.

2. Setting up your Nuvation BMS

2.1. Overview

Once you have completed wiring your Nuvation BMS™ to your energy storage system you need to configure your Nuvation BMS.

> For instructions on how to wire your Nuvation BMS to your energy storage system please refer to the *Nuvation BMS Installation Guide*

To get started with the configuration and setup your Nuvation BMS you need to:

1. Install the Operator Interface
2. Connect to the Operator Interface
3. Upgrade your Nuvation BMS
4. Generate a Configuration File
5. Import the Configuration File
6. Calibrate your Nuvation BMS

Let's get started…

2.2. Install the Operator Interface

2.2.1. Overview

The Operator Interface can be accessed from any computer/tablet with the latest Firefox or Chrome web browser. The Operator Interface is used to access the Nuvation BMS™ High-Voltage Stack Controller or Nuvation BMS™ Low-Voltage Battery Controller in a single stack installation.

2.2.2. Installing the Operator Interface

The Operator Interface is distributed through two mechanisms: a USB Memory Stick included in the initial hardware shipment and/or a 7-ZIP file package sent electronically by Nuvation Energy.

> *Browser Compatibility*
>
> The Operator Interface currently supports the most recent versions of Mozilla Firefox and Google Chrome. Other browsers such as Internet Explorer are not supported. Please install a supported browser before attempting to access the Operator Interface.

Using the USB Memory Stick Shipped with Your Hardware

1. Insert the USB Memory Stick into an available USB port on your computer.

2. Browse to the root folder of the USB Memory Stick using your preferred operating system interface. For example, this would be Windows Explorer on Windows, Finder on Mac OS X, or Files on Ubuntu Linux.

3. Copy the contents of the USB Memory Stick to a folder directory on the computer of your choosing.

Using a 7-ZIP Release Delivered Electronically by Nuvation Energy

1. Unzip the Nuvation BMS release you received electronically to a suitable location on your computer. 7-ZIP is a free tool that can be downloaded here: http://www.7-zip.org

2. The archive's password is `nuvation`.

3. Releases follow a naming convention similar to `nuvation-bms-18.08.0.zip`. The archive should be extracted to a folder with the same name to avoid overwriting other releases or files present in the same directory.

2.3. Connect to the Operator Interface

2.3.1. Overview

Ensure your computer is connected directly to the Nuvation BMS™ High-Voltage Stack Controller or Nuvation BMS™ Low-Voltage Battery Controller via an Ethernet cable. You will need to configure the network adapter on your computer to match the settings on your Nuvation BMS.

2.3.2. Connecting to the Operator Interface

By default, the Nuvation BMS is configured with a static IP address of `192.168.1.21`. To connect to a Nuvation BMS that is using the default IP address:

1. Go to `Control Panel > All Control Panel Items > Network Connections`
2. Right-click your network adapter that connects to your Nuvation BMS and select `Properties`
3. Click `Internet Protocol Version 4 (TCP/IPv4)` and click `Properties`
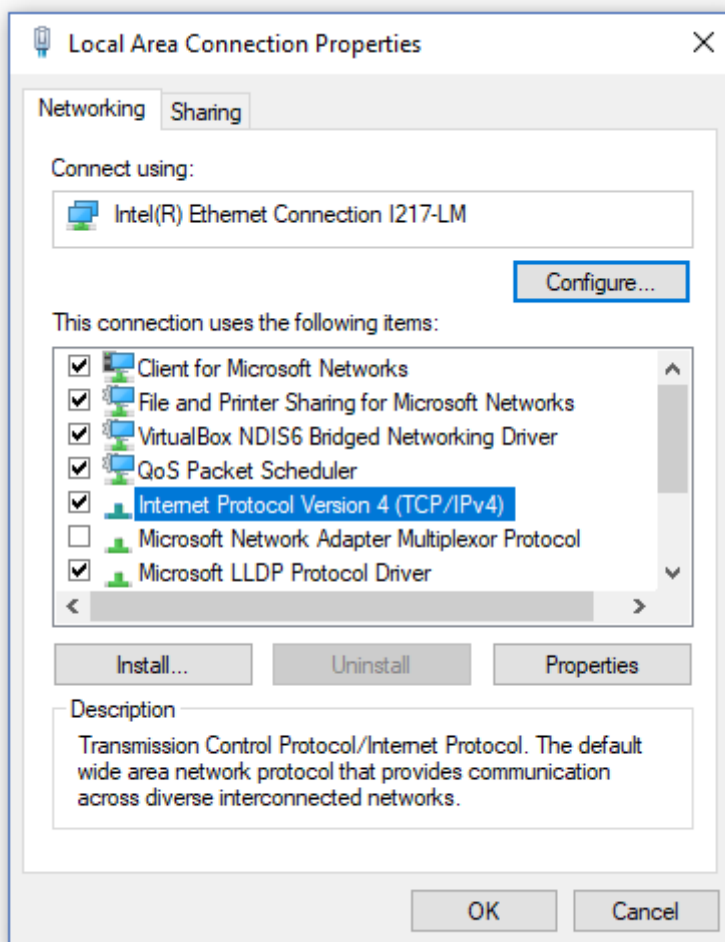
Figure 1. Network Adapter Properties on Windows

4. Update your network adapter TCP/IPv4 settings to the following:
   - Static IP Address: `192.168.1.x` (where `x` is not 21)
   - Subnet Mask: `255.255.255.0`

◦ Default gateway: `192.168.1.1`
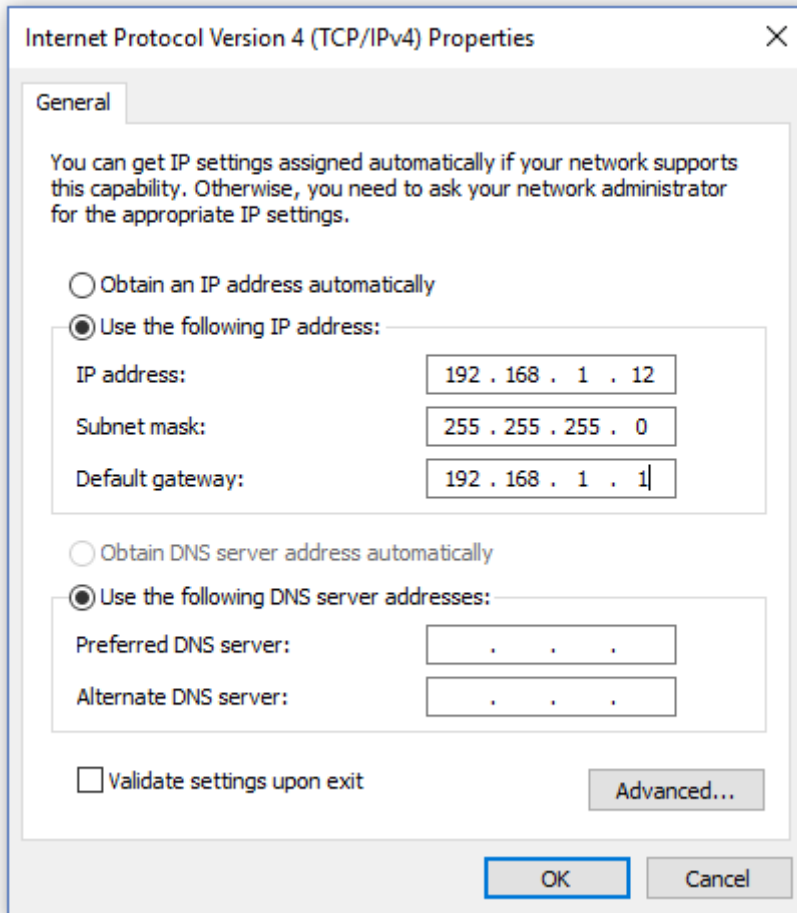
Figure 2. Network Adapter Settings on Windows

5. Ensure your computer is on the same network as your Nuvation BMS Stack Controller or Battery Controller.

   ◦ You can connect an Ethernet cable between the Nuvation BMS and the network adapter of your PC.

6. Open the `Nuvation-BMS-Operator-Interface.html` file in your web browser.

   ◦ This is usually done by double-clicking on the file. If your default browser is not a supported browser, you may need to specify the browser to use.

   ◦ For example, on Windows you may need to right click on the file, select `Open with`, and then choose Chrome or Firefox from the list.

2.4. Upgrade your Nuvation BMS

2.4.1. Overview

The Operator Interface is packaged with the appropriate version of Nuvation BMS firmware. The firmware for the Nuvation BMS can be upgraded using the Operator Interface.

To upgrade the firmware the Nuvation BMS must be in Service Lockout. Please see Understanding the Service Lockout for more details.

2.4.2. Enter Service Lockout

1. Unlock the Operator Interface by clicking the menu and Unlock

2. From the menu, select Service to bring up the Service page
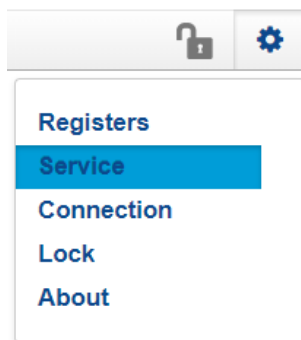
3. Click Lockout to enter Service Lockout

⚠️ Entering Service Lockout will open all contactors and GPOs

ℹ️ When in Service Lockout, you will not be able to access the Operator Interface dashboard.

2.4.3. Upgrading the Firmware

The Upgrade option will become available when the Nuvation BMS successfully enters Service Lockout. If a newer firmware version is available, proceed with the firmware upgrade.

⚠️ The firmware upgrade will erase the configuration file on your Nuvation BMS. If this is not a new install and you have a configuration file loaded on your Nuvation BMS, please remember to export and save it. You can import this file after the upgrade is complete.

1. Click the Upgrade button to begin the upgrade. A progress bar allows you to monitor the upgrade process.
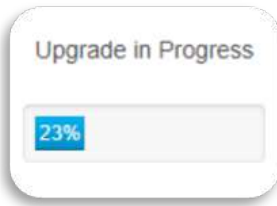
2. Wait until a dialog box appears with the upgrade result. It should indicate that the firmware upgrade is complete.
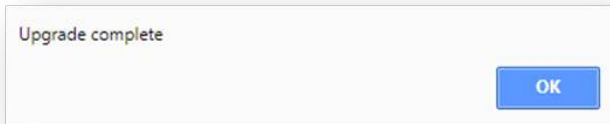
3. If the upgrade is successful, you will be returned to the dashboard. The Nuvation BMS will remain in Service Lockout.
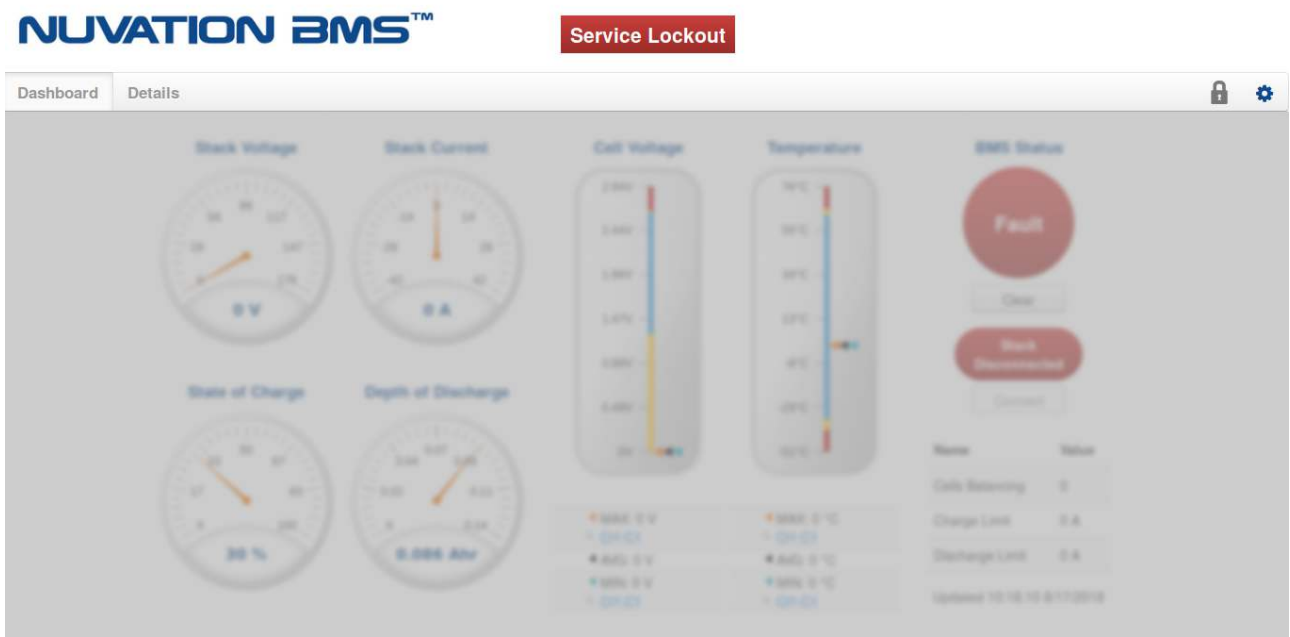
> ℹ️ You will need to import a valid configuration file before attempting to exit Service Lockout.

2.4.4. Troubleshooting

During the firmware upgrade, if a failure is reported, retry the upgrade.

While exiting the service lockout, if a failure is reported, please see Understanding the Service Lockout for troubleshooting details.

If the failures persist, please submit a support ticket with as much detail as possible to support@nuvationenergy.com.

2.5. Generate a Configuration File

2.5.1. Overview

Your Nuvation BMS needs a valid configuration file to operate. You can generate and download a configuration file via the nCloud and import it to your Nuvation BMS. The Operator Interface provides tools for importing and exporting configuration files to and from Nuvation BMS as a way to set or retrieve the state of all configuration registers.

2.5.2. Generating your Configuration file

For Nuvation High-Voltage BMS™ installations

For High-Voltage BMS installations please refer to the *Software Reference Manual* for details on how to create a configuration file for your setup.

For Nuvation Low-Voltage BMS™ installations

To generate a configuration file, visit the nCloud at: https://ncloud.nuvationenergy.com. The nCloud is Nuvation Energy's online portal to Remote Battery Management.

In the nCloud, configuration files can be generated and retrieved from the `Configurations` menu option by following these steps:

1. Click `Create New Configuration`
2. Follow the instructions in the `Quick Start Wizard`.
3. Download the `.config` configuration file
4. Store the configuration file on the computer running the Operator Interface.

Figure 3. Configuration screen in the nCloud

> If your Nuvation BMS is connected to a computer that doesn't have internet access, you can use a USB stick to transfer the configuration file between computers.

2.5.3. Edit the Configuration File (optional)

This is an optional step. If you would like to further adjust your Nuvation BMS settings, to meet the requirements of your particular system, you may choose to edit the configuration file.

To edit the Configuration file, open the file in any text editor. Please backup the modified configuration file for future use. The Nuvation BMS doesn't store the file internally; it only stores the register values. The export feature will export a configuration file with an alphabetical listing of all registers and their set values.

For instructions on how to modify the configuration file and understand the various registers please refer to the Software Reference Manual for your Nuvation BMS.

2.6. Import the Configuration File

2.6.1. Overview

Once you have exported your configuration file to the computer connected to the Nuvation BMS, you can proceed to import it to the Nuvation BMS.

To import a configuration file the Nuvation BMS must be in Service Lockout. Please see Service Lockout for more details.

2.6.2. Import the configuration file

1. Ensure you are in Service Lockout

2. Ensure `Persist Configuration to BMS` is checked

   > *Persist Configuration to BMS*
   >
   > Enabling this option tells the Nuvation BMS to persist the imported configuration file. If you are using known, good, configuration files you should check this box.
   >
   > Disabling this option tells the Nuvation BMS to not persist the newly imported configuration file. On reboot, the Nuvation BMS will revert to the previous configuration file. This is useful when tweaking and testing configuration files. It allows you to recover from incorrect configuration settings by rebooting the Nuvation BMS

3. Click `Import Configuration`

4. Select the configuration file to use and click `Open`

5. A dialog indicating progress will pop-up

   Configuration Import in Progress

   34%

6. Wait until a dialog box appears with the configuration import result. It should indicate that the import was successful.

   This page says:

   Configuration Imported and Saved Successfully

   OK
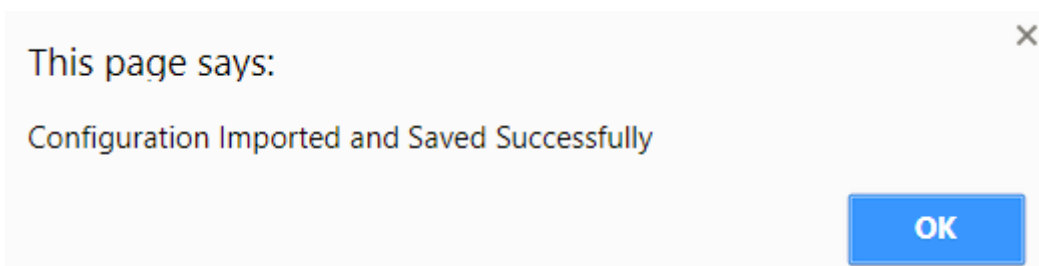
2.6.3. Exit Service Lockout

1. Unlock the Operator Interface by clicking the menu and `Unlock`
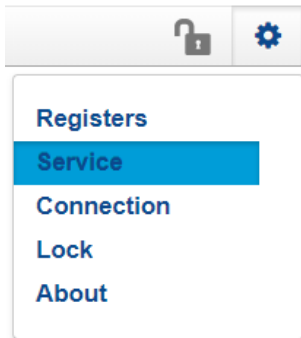
2. From the menu, select `Service` to bring up the Service page
3. Exit the Service Lockout by clicking `Exit Service Lockout`

⚠️   Exiting Service Lockout may close contactors

You will be able to access the dashboard controls once the Nuvation BMS has successfully exited service lockout.

2.6.4. Troubleshooting

During the configuration file import, if you receive a `Register Write failure error`, ensure you have valid entries in your configuration file. For details on the various registers and their intended use, please refer to the Software Reference Manual for your Nuvation BMS.

While exiting the service lockout, if a failure is reported, please see Understanding the Service Lockout for troubleshooting details.

💡   If the failures persist, please submit a support ticket with as much detail as possible to support@nuvationenergy.com.

2.7. Calibrate your Nuvation BMS

2.7.1. Overview

Before you start regular operation of your Nuvation BMS, it is recommended that you calibrate it for accurate usable capacity measurements.

This calibration should be done if changes are made to the energy storage installation or if a new configuration file has been imported.

2.7.2. Calibration

1. Refer to the section *Measurement Calibration* in the Software Reference Manual for steps to calibrate the stack current,voltage and temperature measurements
2. Fully charge up the batteries to 100% State-of-Charge (as defined in the configuration file)
3. Discharge the batteries to 0% State-of-Charge (as defined in the configuration file)
4. Optionally, charge the batteries back up to 100% State-of-Charge

You are now ready to start using your Nuvation BMS!

3. Using your Nuvation BMS

3.1. The Dashboard Tab

3.1.1. Overview

The default tab of the Operator Interface is the Dashboard. The Dashboard contains a high-level overview on the state of the battery stack. This is the only page required for daily monitoring of the battery stack.
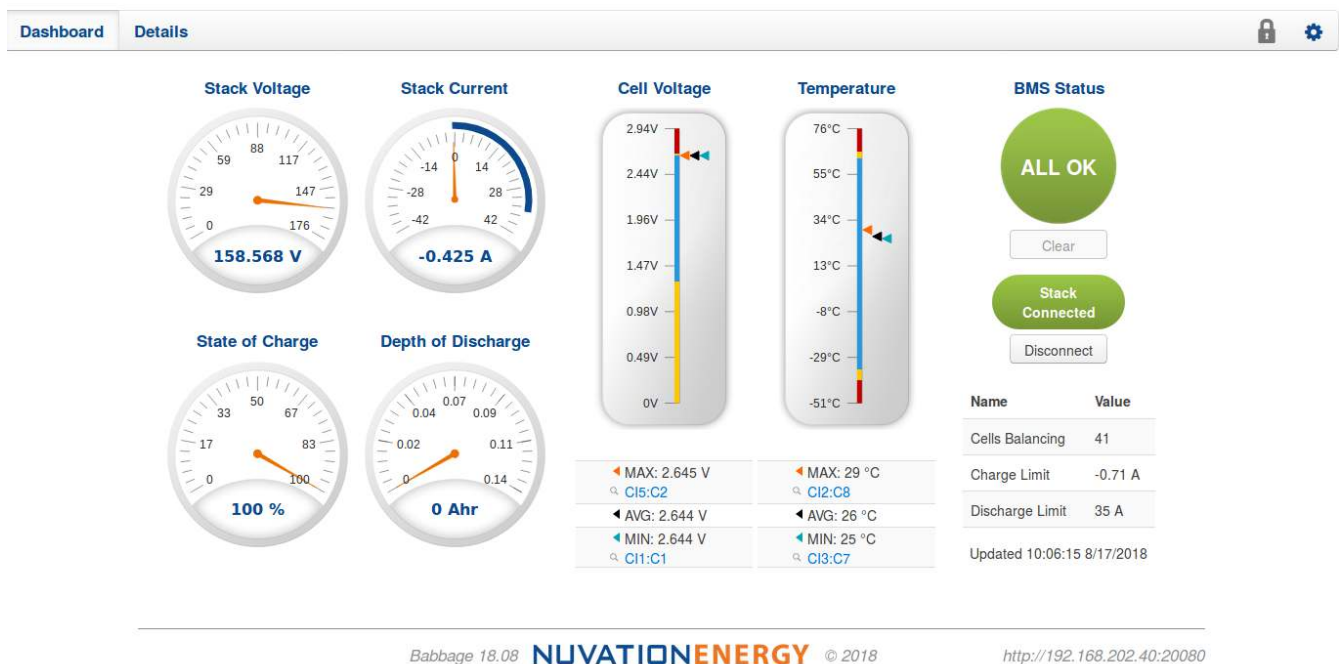
Figure 4. Nuvation BMS™ Operator Interface Dashboard screenshot

3.1.2. Warnings and Faults

Before going into the details of the gauges and information presented in the dashboard, it is important to understand what a fault and a warning Nuvation BMS status means.

Warning	A Nuvation BMS Warning indicates the state of the battery system has been detected outside of its normal operational range. The cause of the warning should be identified and a corrective action should be performed. For instance, if the warning is a thermistor temperature measurement has become too hot, the battery system should be cooled to bring the measurement back into the normal operational range.

Fault	A Nuvation BMS Fault indicates the state of the battery system has been detected outside of its safe operational range. The cause of the fault must be identified and a corrective action must be performed. For instance, if the fault is a cell voltage measurement has become too low, the cell maintenance manual must be reviewed to identify what remedial actions are required. A Nuvation BMS Fault is more severe than a Nuvation BMS Warning and the source of the fault must be discovered and resolved before attempting to clear the Nuvation BMS Fault to continue operating the battery system.
ALL OK	An ALL OK indicates that there are no faults or warning. This is the normal state for the Nuvation BMS.

3.1.3. Stack Voltage

The stack voltage radial meter shows the total battery stack voltage.

Refer to the Stack Voltage Thresholds section in the Software Reference Manual to tune this gauge

Stack Voltage

502
467   536
432   571
397   606

566.993 V

3.1.4. Stack Current

The stack current radial gauge shows the battery stack current as well as the maximum charge current limit and the maximum discharge current limit. The acceptable current range is visualized on the gauge by the blue arc. An absence of the blue arc indicates the battery stack cannot be charged or discharged in its present condition.

A negative current value indicates the battery stack is charging. A positive current value indicates the battery stack is discharging.

Refer to the Stack Current Thresholds section in the Software Reference Manual to tune this gauge

Stack Current

3.1.5. State of Charge

The State-of-Charge radial gauge shows the battery stack's State-of-Charge. The battery stack is empty when the State-of-Charge value is 0% and full when the State-of-Charge value is 100%.

State of Charge
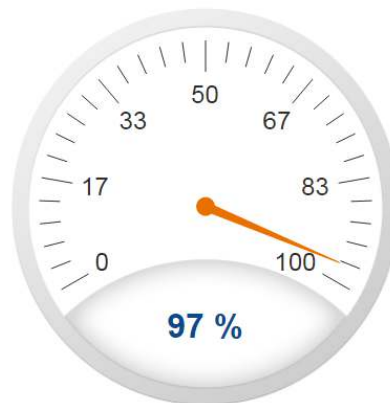
3.1.6. Depth of Discharge

The Depth-of-Discharge radial gauge shows how much energy has been taken out of the battery stack. In an ideal energy storage system, defined as a system with no power losses, the amount of energy shown in this gauge needs to be added back into the battery stack to fill it back up to 100% SOC.

Depth of Discharge

1.32 Ahr

3.1.7. Cell Voltage

The cell voltage bar gauge shows the maximum, minimum and average cell voltage measurements within the stack.

The high cell voltage and low cell voltage warning and fault threshold is visualized on the gauge with yellow and red segments. The blue segment depicts the acceptable cell voltage range.

If a triangle enters the yellow segment, a warning has occurred. If a triangle enters the red segment, a fault has occurred.

The maximum and minimum cell location in the stack and their voltage value are shown below the gauge, along with the average cell voltage value.

Cell Voltage
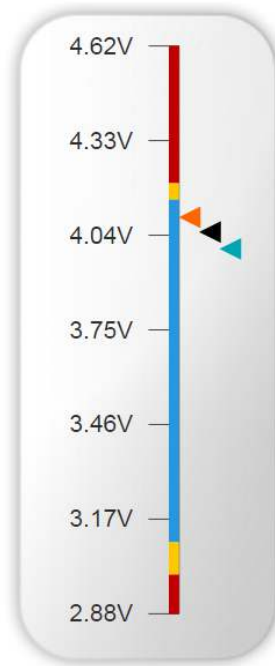
3.1.8. Temperature

The temperature bar gauge shows the maximum, minimum and average cell temperature measurements within the stack.

The high cell temperature and low cell temperature warning and fault threshold is visualized on the gauge with yellow and red segments. The blue segment depicts the acceptable cell temperature range.

If a triangle enters the yellow segment, a warning has occurred. If a triangle enters the red segment, a fault has occurred.

The maximum and minimum cell location in the stack and their temperature value are shown below the gauge, along with the average cell temperature value.

Temperature
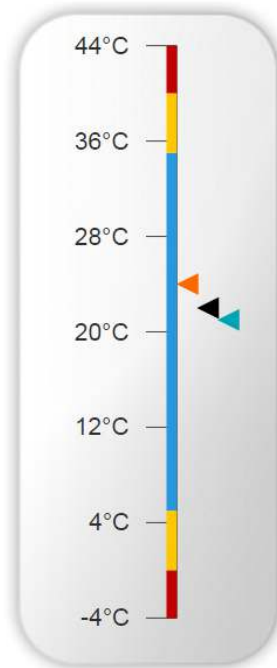

```
◀ MAX: 24 °C
🔍 Cl7:T3
◀ AVG: 22 °C
◀ MIN: 21 °C
🔍 Cl10:T4
```

3.1.9. Nuvation BMS Status

The Nuvation BMS status information contains information on the overall safety status of the battery stack, the battery stack connection state, number of cells balancing, maximum charge current limit, maximum discharge current, and the time and date of the last update of the Dashboard.

Safety Status

The Nuvation BMS safety state is shown in the big status circular indicator.

Figure 5. Three possible Nuvation BMS safety states

The normal state is `All OK` and the color of the indicator will be green. The warning state is `Warning`

and the color of the indicator will be orange. The fault state is `Fault` and the color of the indicator will be red.

Clicking on the indicator will jump to a comprehensive status list of all warnings and faults active in the battery stack.

Clicking on the `Clear` button below the state will cancel any warnings and faults that are not self-clearing.

Connection State

The battery stack connection state is shown in the oval indicator.

Figure 6. Three possible connection states

`Stack Disconnected` in a red oval indicates the battery stack is unavailable to be charged or discharged.

`Stack Pre-charging` in an orange oval indicates the battery stack has connected its pre-charge circuit and is attempting to equalize the battery stack voltage to the system DC bus voltage.

`Stack Connected` in a green oval indicates the battery stack is available to be charged or discharged.

Clicking the `Connect` button initiates the stack connection sequence of events. The Nuvation BMS must be in the `All OK` state for the `Connect` button to be available.

Clicking the `Disconnect` button will disconnect the battery stack from the system DC bus.

Information Table

The information table shows the number of cells that are having excess energy bled off to maintain a balanced battery stack.

Name	Value
Cells Balancing	70
Charge Limit	-32.266 A
Discharge Limit	132 A

The `Charge Limit` shows the maximum charge current limit value. The `Discharge Limit` shows the maximum discharge current limit value.

The `Charge Limit` and `Discharge Limit` values are visualized on the Stack Current radial gauge as the limits of the blue arc.

Last Update

The `Updated` time and date shows the last time the Operator Interface had successfully communicated with the Nuvation BMS and updated all items in the Dashboard with values from the Nuvation BMS. The time and date is based on the local computer/tablet; it does not come from the Nuvation BMS.

<div align="center">

Updated 21:42:07 4/6/2017

Error: Register read error

</div>

If a communication timeout has occurred, a notification appears beneath the `Updated` time and date. If a timeout has occurred, the information shown on the Dashboard is no longer recent.

3.2. The Details Tab

3.2.1. Overview

The Details tab contains a much more detailed view into the status of the Nuvation BMS. The data values shown in this tab can be easily copied into a spreadsheet as a means of capturing the current state of the Nuvation BMS for manual data recording purposes.

The Details tab has multiple sub-sections called *accordions* that can be expanded to reveal more information. You can have multiple accordions expanded at the same time.
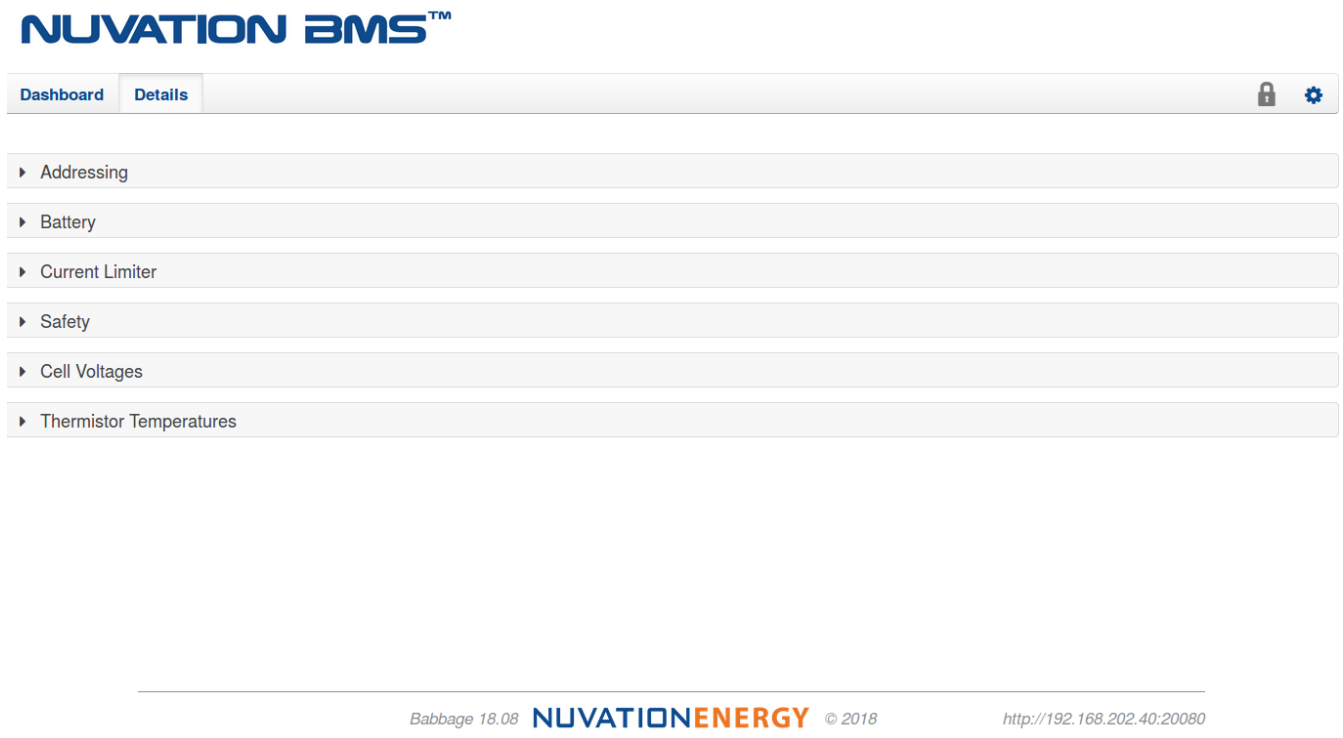
Figure 7. Nuvation BMS™ Operator Interface Details tab screenshot

3.2.2. Addressing

The Addressing accordion presents the addressing information for your Nuvation BMS. Refer to Appendix A for details on how to change your Nuvation BMS IP address.

Figure 8. Addressing accordion in Details Tab

3.2.3. Battery

The Battery accordion contains values on the overall battery stack. This information is identical to the values shown in the radial gauges and bar gauges on the Dashboard.

Battery	Last update: Wed Dec 20 2017 17:48:37 GMT-0500 (Eastern Standard Time)

Register Name	Value
Stack Voltage	93.55 V
State of Charge	18 %
Stack Current	0.634 A
Depth of Discharge	0.106 Ahr
Average Cell Voltage	1.56 V
Maximum Cell Voltage	1.598 V
Minimum Cell Voltage	1.546 V
Average Temperature	24 C
Maximum Temperature	27 C
Minimum Temperature	24 C

Stack Current

Depth of Discharge

Cell Voltage Statistics

Thermistor Temperature Statistics

Figure 9. Battery accordion in Details Tab

3.2.4. Current Limiter

The Current Limiter accordion contains the maximum charge current limit, maximum discharge current limit and the number of cells balancing in the battery stack. This information is identical to the values shown in the Information Table on the Dashboard. The unit of the current limit values is mA.

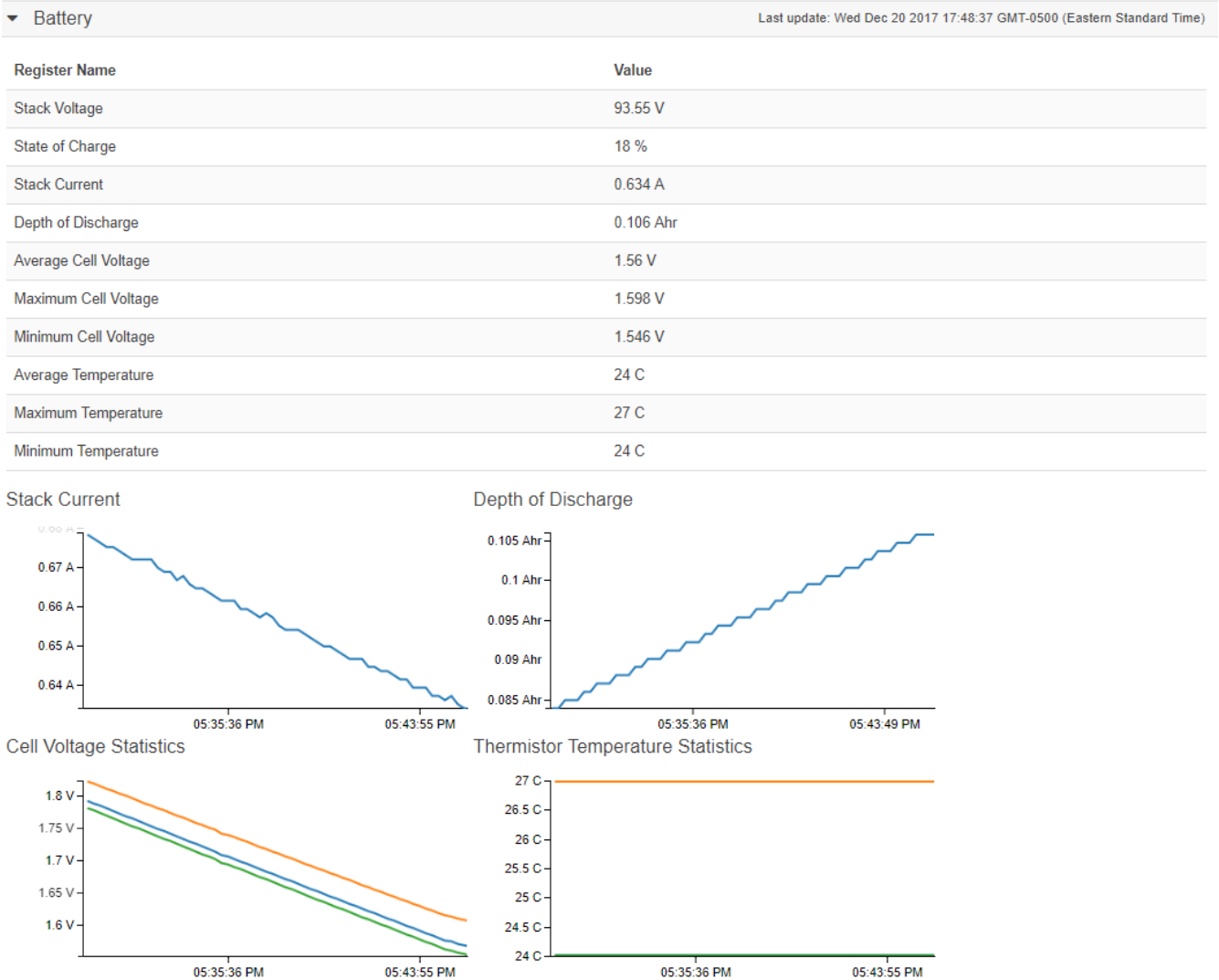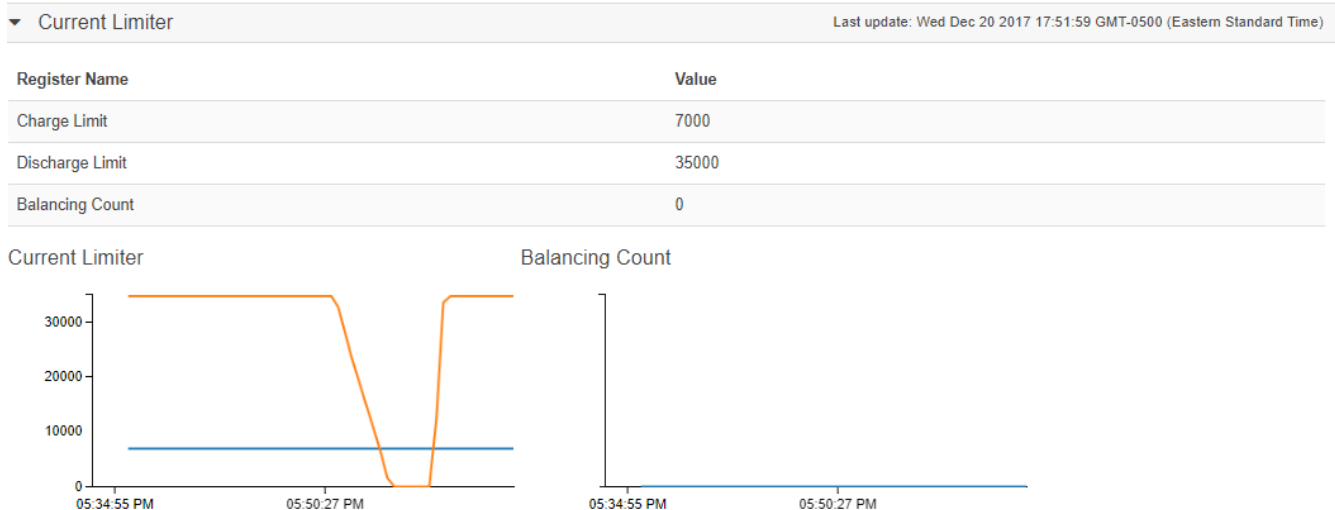| Current Limiter		Last update: Wed Dec 20 2017 17:51:59 GMT-0500 (Eastern Standard Time)
Register Name	**Value**	
Charge Limit	7000	
Discharge Limit	35000	
Balancing Count	0	

Figure 10. Current Limiter accordion in Details Tab

3.2.5. Safety

The Safety accordion contains a comprehensive list of all possible Nuvation BMS faults and warnings as well as the overall status of the battery stack. An active fault or warning is shown as `Tripped`. In normal operation, all warnings and faults should be clear and the battery stack is safe to charge, safe to discharge and overall safe.

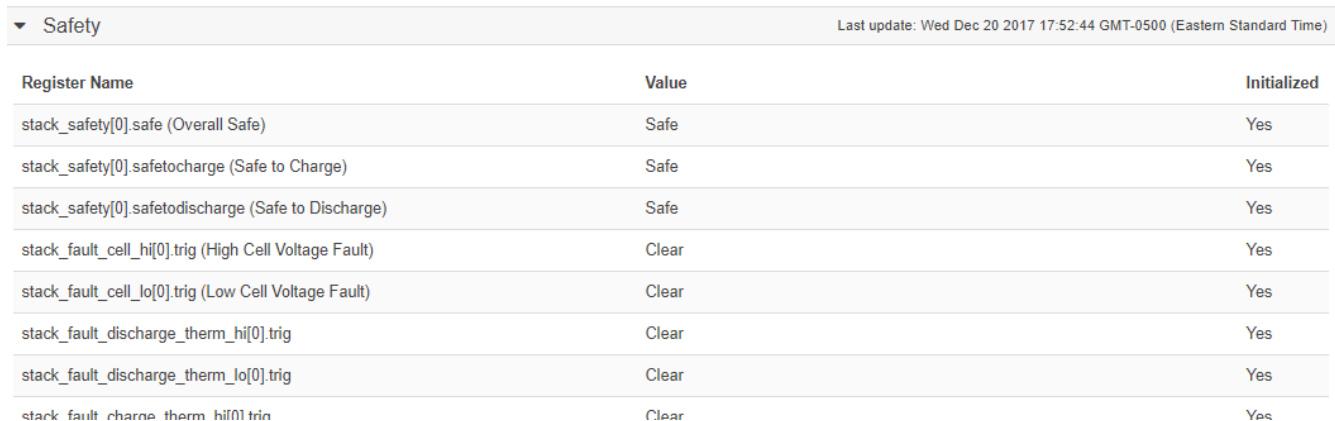| Safety		Last update: Wed Dec 20 2017 17:52:44 GMT-0500 (Eastern Standard Time)	
Register Name	**Value**		**Initialized**
stack_safety[0].safe (Overall Safe)	Safe		Yes
stack_safety[0].safetocharge (Safe to Charge)	Safe		Yes
stack_safety[0].safetodischarge (Safe to Discharge)	Safe		Yes
stack_fault_cell_hi[0].trig (High Cell Voltage Fault)	Clear		Yes
stack_fault_cell_lo[0].trig (Low Cell Voltage Fault)	Clear		Yes
stack_fault_discharge_therm_hi[0].trig	Clear		Yes
stack_fault_discharge_therm_lo[0].trig	Clear		Yes
stack_fault_charge_therm_hi[0].trig	Clear		Yes

Figure 11. Safety accordion in Details Tab

Clicking on the `Clear Faults and Warnings` button at the bottom of this accordion will clear any faults that are not self-clearing. It will not clear any warnings that are not self-clearing; the `Clear` button on the Dashboard must be used to clear warnings that are not self-clearing.

stack_warn_therm_lo[0].trig	Clear	Yes
stack_warn_current_hi[0].trig	Clear	Yes
stack_warn_current_lo[0].trig	Clear	Yes
stack_warn_voltage_hi[0].trig	Clear	Yes
stack_warn_voltage_lo[0].trig	Clear	Yes
sc_warn_ci_therm_hi[0].trig	Clear	Yes
sc_warn_ci_therm_lo[0].trig	Clear	Yes
stack_warn_combined_voltage_hi[0].trig	Clear	Yes
stack_warn_combined_voltage_lo[0].trig	Clear	Yes

Clear Faults and Warnings

Figure 12. Bottom of Safety accordion in Details Tab

3.2.6. Cell Voltages

The Cell Voltages accordion lists all installed cell voltage measurements. Cells that are not installed are displayed as a - (hyphen). Voltages in red indicate measurements which have triggered a Nuvation BMS fault. There is no differentiation between cells that are in the normal operating voltage range and cells that have triggered a Nuvation BMS warning.

	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Cell 7	Cell 8	Cell 9	Cell 10	Cell 11	Cell 12	Cell 13	Cell 14	Cell 15	Cell 16
CI 1	2.499 V	2.498 V	2.498 V	2.499 V	2.493 V	2.495 V	2.498 V	2.499 V	2.497 V	2.494 V	2.496 V	2.497 V	-	-	-	-
CI 2	2.497 V	2.496 V	2.498 V	2.498 V	2.496 V	2.496 V	2.498 V	2.497 V	2.494 V	2.494 V	2.497 V	2.494 V	-	-	-	-
CI 3	2.499 V	2.497 V	2.496 V	2.498 V	2.495 V	2.494 V	2.499 V	2.498 V	2.496 V	2.496 V	2.497 V	2.498 V	-	-	-	-
CI 4	2.494 V	2.497 V	2.495 V	2.495 V	2.493 V	2.49 V	2.493 V	2.495 V	2.494 V	2.493 V	2.498 V	2.496 V	-	-	-	-
CI 5	2.496 V	2.497 V	2.494 V	2.497 V	2.495 V	2.496 V	2.495 V	2.495 V	2.496 V	2.495 V	2.498 V	2.497 V	-	-	-	-

Cell Voltages — Last update: Wed Dec 20 2017 17:53:50 GMT-0500 (Eastern Standard Time). Filter: Off / Above / Below

Figure 13. Cell Voltages accordion in Details Tab

Filtering

You can filter the display to cells with voltages above or below a value you specify.

Filter: Off / Above / Below / 2.6 V

3.2.7. Thermistor Temperatures

The Thermistor Temperatures accordion lists all installed thermistor temperature measurements. Thermistors that are not installed are displayed as a dash. Temperatures in red indicate measurements which have triggered a Nuvation BMS fault. There is no differentiation between thermistors that are in the normal operating temperature range and thermistors that have triggered a Nuvation BMS warning.

Figure 14. Thermistor accordion in Details Tab

Filtering

You can filter the display to cells with temperatures above or below a value you specify.

3.3. The Menu Options

3.3.1. Overview

The menu to the right of the Operator Interface provides access to tools and advanced options. Some of these options may be locked to prevent accidental changes.

3.3.2. Registers

This screen allows you to change registers and customize your Nuvation BMS to your needs. Please refer to the Software Reference Manual for more details on what the registers do.

3.3.3. Service

This screen allows you to enter and exit Service Lockout in-order to perform an upgrade or configuration file import. For more details refer to Understanding the Service Lockout.

Importing a Configuration File

This menu option allows you to import a configuration file.

If you have a configuration file ready to import, refer to Import the Configuration File for instructions.

If you need to generate a configuration file, refer to Generate a Configuration File for instructions. For instructions on how to modify the configuration file or understand the various registers, please refer to the Software Reference Manual for your Nuvation BMS.

Exporting a Configuration File

The Nuvation BMS doesn't preserve the originally imported configuration file with comments and formatting. The export feature will export a configuration file with an alphabetical listing of all registers and their set values.

To export your configuration file:

1. From the menu, select `Service`
2. Click `Export Configuration`

Upgrade

Refer to Upgrade your Nuvation BMS above for instructions.

The firmware upgrade will erase the configuration file on your Nuvation BMS. Please remember to export and save your current configuration file to import after the upgrade is complete.

3.3.4. Connection

The connection screen allows you to change the IP address of the Nuvation BMS you are trying to access.

If you are connecting to a Nuvation BMS™ High-Voltage Stack Controller or Nuvation BMS™ Low-

Voltage Battery Controller that does not use the default IP address (192.168.1.21), you will need to change the connection settings in the Operator Interface to match the BMS

1. Re-open the Nuvation-BMS-Operator-Interface.html file in your web browser.
2. Wait for the connection message to time out

Connecting to IP: http://192.168.1.21... Please wait.

3. From the menu, select Connection to bring up the IP address configuration page.
4. Enter the IP address of Nuvation BMS you wish to connect to
5. Enter a Connection Timeout – 20 is the recommended seconds

BMS IP Address: 192.168.1.21

BMS Connection Timeout (seconds): 20

Save

6. Click the Save button. The page will refresh and try to connect to this new IP

3.3.5. Locking and Unlocking

When the Operator Interface is unlocked, the lock indicator will be replaced with an unlock indicator

Figure 15. Operator Interface Lock indicator

Figure 16. Operator Interface Unlock indicator

Lock the Operator Interface

To lock the Operator Interface bring up the settings menu and select Lock

> To prevent accidental changes to your Nuvation BMS, always lock the Operator Interface after making your changes.

It is possible to require a password to unlock the Operator Interface, please refer to the Software Reference Manual for details on how to enable this.

3.3.6. Unlock the Operator Interface

To Unlock the Operator Interface bring up the settings menu and select Unlock

3.3.7. About

This screen display version details for the underlying software for your Nuvation BMS. The name and number of the current software release is displayed at the top of the About screen.

In the screenshot below, the release name is Ampere. The version number following the release name has a format of yy.mm with yy representing the year and mm representing the month within that year that this Nuvation BMS package was released.

The version numbers below the release name are the version numbers of the individual software packages running on your Nuvation BMS

When contacting support, please include the details in your About screen.

Figure 17. Sample About screen

4. Understanding the Service Lockout

4.1. Overview

Service Lockout allows you to put your Nuvation BMS into a Lockout state while you perform maintenance on your energy storage installation such as loading new configurations, or upgrading the firmware.

If you are making physical wiring changes, you should enter Service Lockout before powering down the Nuvation BMS.

When in Service Lockout, the Nuvation BMS will flag all faults and notify other Operator Interfaces.

4.2. Entering Service Lockout

1. Unlock the Operator Interface by clicking the menu and Unlock

2. From the menu, select Service to bring up the Service page
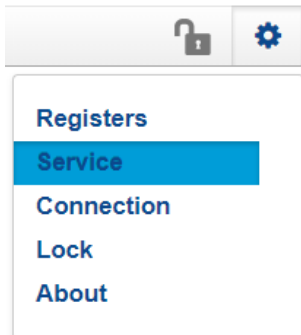
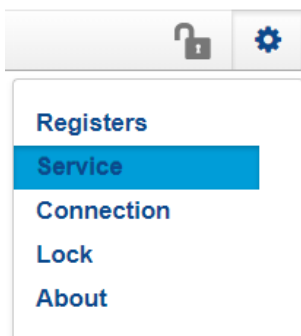3. Click Lockout to enter Service Lockout

⚠️   Entering Service Lockout will open all contactors and GPOs

ℹ️   When in Service Lockout, you will not be able to access the Operator Interface dashboard.

4.3. Exiting Service Lockout

1. Unlock the Operator Interface by clicking the menu and Unlock

2. From the menu, select `Service` to bring up the Service page

3. Exit the Service Lockout by clicking `Exit Service Lockout`

> ⚠️ Exiting Service Lockout may close contactors

You will be able to access the dashboard controls once the Nuvation BMS has successfully exited service lockout.

4.4. Stealing a Lock

The Operator Interface that puts the Nuvation BMS into Service Lockout, *owns* the lock. Only the Operator Interface that *owns* the lock, can take the Nuvation BMS out of Service Lockout.
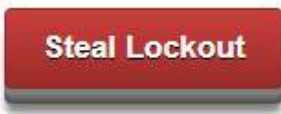
If for some reason another Operator Interface needs to *take ownership* of the lock, it can use the `Steal Lock` option and *take ownership* of the lock on the Nuvation BMS it is connected to.

> ⚠️ Steal Lockout will take control away from the operator that owns this lockout

4.5. Shutdown Timer for Battery Controller

To protect your batteries, a Nuvation BMS™ Low-Voltage Battery Controller will automatically shutdown after an hour of being in Service Lockout.

The Nuvation High-Voltage BMS™ doesn't use a shutdown timer when in service lockout.

4.6. Troubleshooting

If the Nuvation BMS fails to exit service lockout you will receive an error notification. The reason for the failure is that some form of input to the battery management system could not be initialized. This means that the battery management system was expecting some measurement (e.g. cell voltage, current) but it never was received by the software. Because of this lack of initialization, the battery management system should not be operated and the issue(s) needs to be resolved. There are two main causes for a lack of initialization:

- Misconfiguration: The current configuration does not match the battery management system deployment.
- Incomplete setup: There is an issue in the setup of the battery management system (i.e. cables are missing)

You can identify the uninitialized parts of the battery management system by referring to the `Details > Safety` accordion section. The fault registers that failed to initialize are shown on the right side of the display. Refer to the Software Reference Manual to the Troubleshooting section for details on how to address the uninitialized data registers.

If you just imported a configuration file, re-import a known-good configuration file. You can download a previously generated configuration file from the nCloud (https://ncloud.nuvationenergy.com).

If the failures persist, please submit a support ticket with as much detail as possible to support@nuvationenergy.com.

Appendix A: Changing your Nuvation BMS Network Configuration

BMS Network Configuration

Overview

The Nuvation BMS is flexible and allows changing its network configuration if you need the IP address of the Nuvation BMS to match your existing network settings.

> ⚠️ Improperly modifying the network settings can result in a Nuvation BMS that cannot communicate over Ethernet. To restore the Nuvation BMS to its default IP address (192.168.1.21), you must initiate a factory reset action - refer to the Installation Guide for your Nuvation BMS for instructions.
>
> Be sure to record the updated IP address, netmask, and gateway settings if you decide to make changes to these settings.

Modifying the Network Settings

1. Unlock the Operator Interface by clicking the menu and `Unlock`

2. From the menu, select `Registers` to bring up the register browser page

3. Under the `Manual Register Configuration` panel, expand the row for Component Name `sc_ethernet`. The `sc_ethernet` component contains network settings like IP address, gateway, etc.

> 💡 Use the find feature (`Ctrl + F`) in your browser to locate components in the page

sc_ethernet		Ethernet Parameters		0x31500		1	
Register Offset	Register Name	Description	Type	Units	Storage		
0x0	use_dhcp	Flag indicating if DHCP is used	Boolean	Flag	Configuration	Edit	
0x1	ip_address	IP address to be used in static configuration	IpAddress	IP	Configuration	Edit	
0x2	net_mask	Network mask to be used in static configuration	IpAddress	IP	Configuration	Edit	
0x3	gateway	Gateway address to be used in static configuration	IpAddress	IP	Configuration	Edit	
0x4	mac	MAC address of this board	UInt64	Value	Manufacturing	Edit	

4. Click the `Edit` button on the register you need to modify to meet your desired network configuration. This will bring up the `Edit Register` dialog box

5. Enter the desired value for the register. Then click `Write`

> ℹ️ The index field may be left blank for all operations.

6. Confirm that the value has been updated by clicking `Read`

7. Under the `Manual Register Configuration` panel, expand the row for component name `sc_locked_cfg_persist`.

8. Click the `Edit` button for the `save` register and write a value of `1`

9. Verify that the configuration has been saved correctly by reading the error register. The value will be `0` if no errors have occurred.

The network settings have been updated. Any changes will take effect when the Nuvation BMS is rebooted.