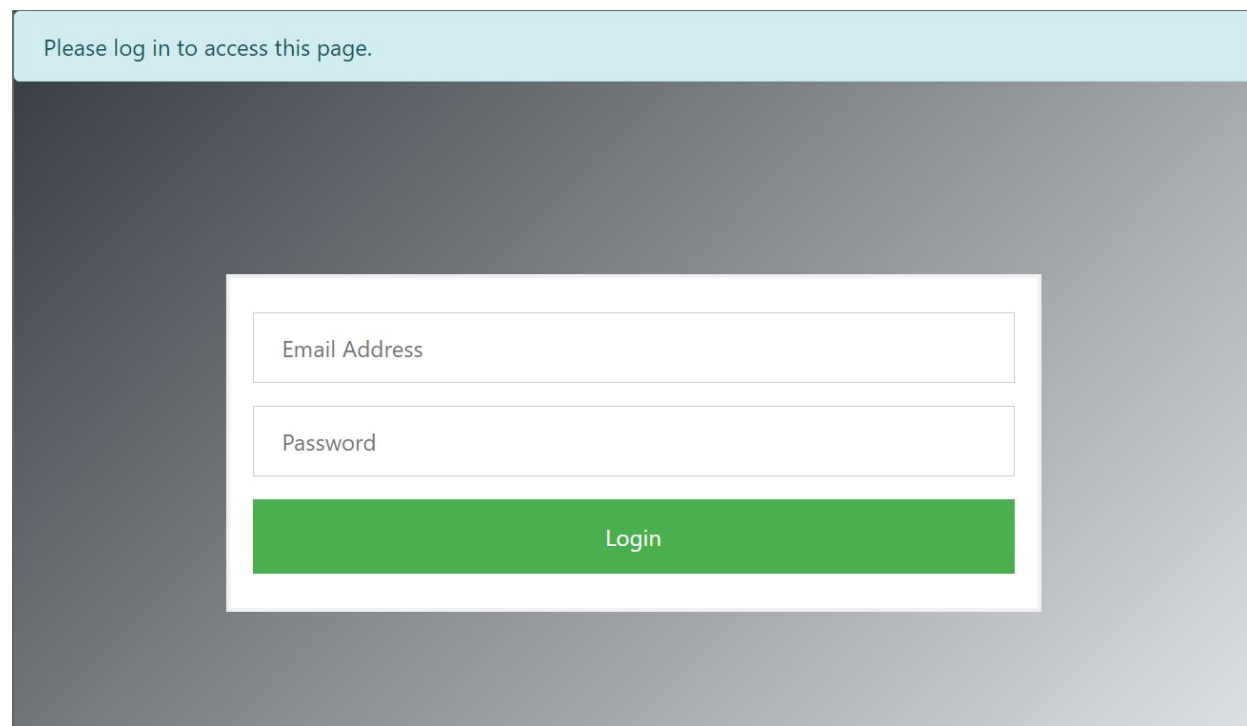# VIGILANT Web-Interface User Guide (v1.3.11)

Preface

This guide is written as an outline around each section of the VIGILANT web-interface. It is intended for any user that has access to the system. This guide does not cover installation or commissioning steps. Please contact Eagle Eye if seeking out that support literature.

1.0 System Login

The web-interface is hosted on the VIGILANT Monitor and can be accessed via any modern web browser. The device used to access the VIGILANT must be on the same network as the VIGILANT Monitor. In most applications, the VIGILANT is configured with a static IP address. This guide assumes the IP address and login credentials have been provided.

1. Enter the IP address of the VIGILANT in the web browser.

2. Enter the login credentials (note the login is the system email address, not username).

Note - *If not using the Fleet Management Software (FMS), it's recommended to bookmark the web-interface for easy access. This is especially helpful if you access multiple systems from the same browser. The FMS allows aggregation of VIGILANT systems into a single user interface.*
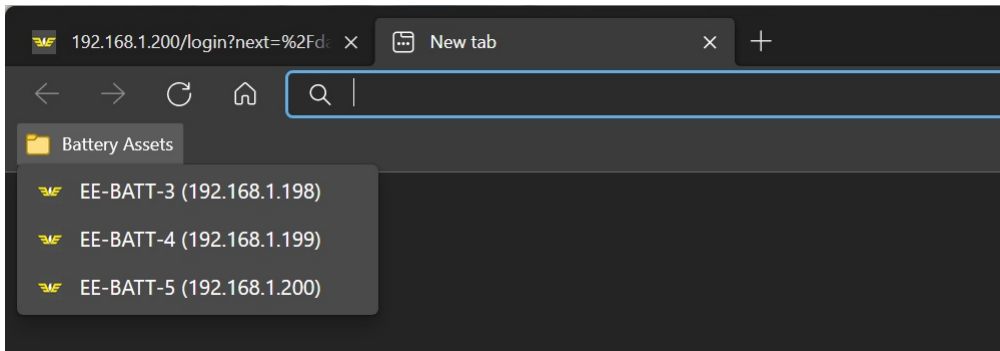
2.0 Navigating the Web-Interface

After logging in, the Home page will be displayed. Every page in the web-interface is organized into 3 main sections. Understanding these sections will make it easy to navigate the web-interface.

2.1 Header

The header is the gray bar across the page. It shows the battery asset name on the top right (e.g. EE-BATT-5) as well as links to each section of the software. Each section will be described briefly below, then in more detail throughout this guide:
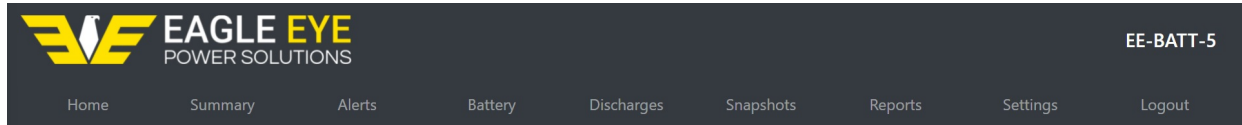
- **Home** - This is the default page when logging into the VIGILANT .
- **Summary** - Displays a summary of main data points for the VIGILANT .
- **Alerts** - Displays active alerts, with a link to historical alerts.
- **Battery** - Displays all battery data, with links to individual cell dashboards.
- **Discharges** - Displays a list of discharge events that have occurred on the system.
- **Snapshots** - Displays links to each of the available bar graphs for measured data.
- **Reports** - Displays links to available reports.
- **Settings** - Displays links to all of the available settings, as well as the current software version.
- **Logout** - Link to logout of the system.

2.2 Navigation Bar

The navigation bar is a trail of links that displays the currently viewed page's location within the hierarchy of the web-interface. Click any page before the current page to go back (shown in blue).

2.3 Page Content

Under the navigation bar is the page content. The content displayed will depend on the page being viewed. There are several UI elements throughout the web-interface that provide additional interaction when clicked.

2.3.1 Page Links

Throughout the web-interface a word, phrase, or number displayed in blue is a clickable link. The example below shows a collection of links from the Summary page.

Home / Summary	
Under discharge	No
Overall battery voltage	135.3V
Battery current	-55.78mA
Ambient temperature	64.18°F
Average post temperature	65.8°F
Ground Fault	No

Links open various sections of the software. Typically a link that is related to a measured value will open the historical chart for that value. Other links might open new pages, or tabs within a page. Important links will be explained throughout this guide.

2.3.2 Chart Controls

Line charts for historical data contain controls to zoom in our out of the chart. The slider controls are on the upper left and right of the charts.
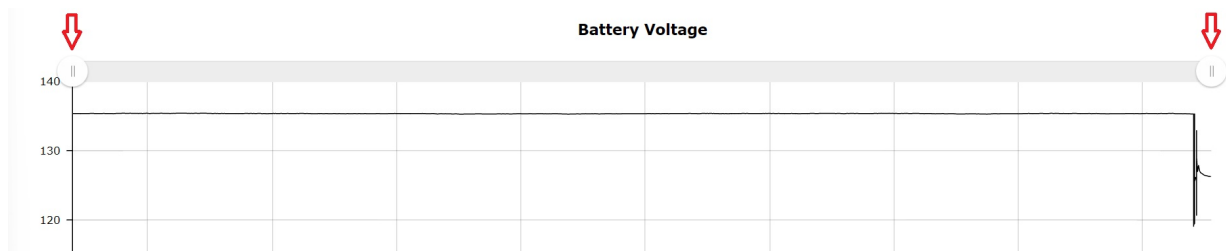
Move the sliders in or out to control the chart zoom level. Click the Show all button to reset the chart. Alternatively, click and hold to select a section of the chart to view in more detail. This is the best method to zoom in to specific areas.
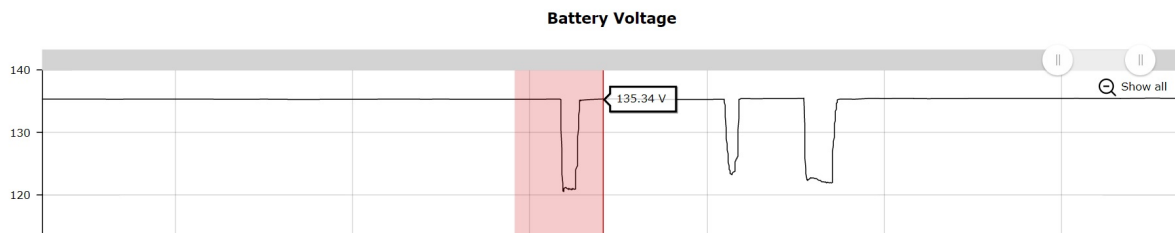
3.0 Home Page

The home page is the default page that is shown after logging in. This page displays the system dashboard which contains the following information:

- **Battery Voltage** - The float voltage of the battery system measured from the positive and negative charger cables. The voltage dial displays the measured value as well as the warning (yellow) and critical (red) alarm ranges. Adjusting the **Alarm Limits** in the **Settings** section will change the display of these alarm ranges.

- **Ambient Temperature** - Displays the ambient temperature as measured from the ambient sensor connected to the monitor.

- **Average Cell Resistance** - Displays the average resistance value of all cells over time. After initial startup of the system this chart will only have 1 data point. Hover over the graph to show the exact value and measured time.
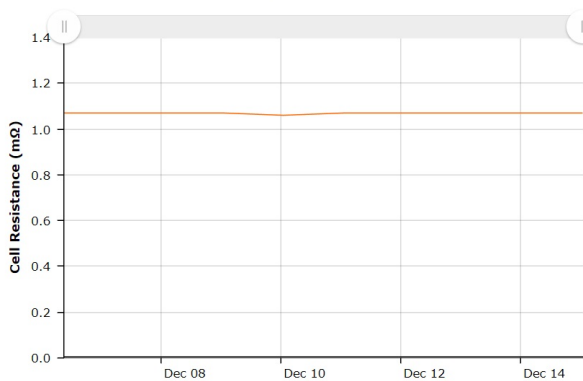
- **Operating Temperature vs Life** - Displays the measured ambient temperature against estimated life of the battery for that operating temperature. This chart is simply used for a reference against recommended operating temperatures for batteries and does not accurately predict battery life.
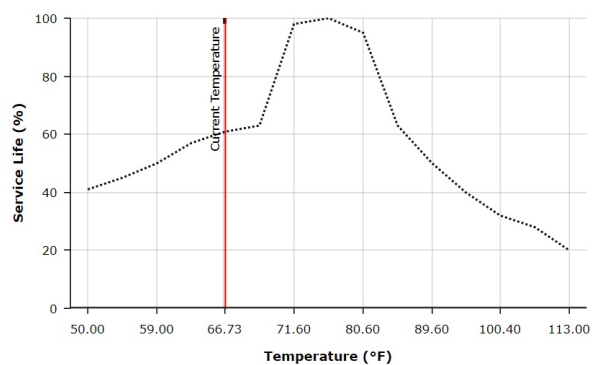
4.0 Summary Page

The summary page shows top level information from the VIGILANT . See below for full explanation of each value.

Note - *Clicking any of the hyperlink values on this page will open the historical data graph for that value.*

- **Under discharge** - Confirms if the system is recording a discharge or not (Yes or No). If Yes, the value will change to a link which if clicked will open the discharge recording. See the **Discharges Page** section for more information.

- **Overall battery voltage** - Measured battery float voltage.

- **Battery current** - Measured battery float current.

- **Ambient temperature** - Measured ambient temperature value.

- **Average post temperature** - The average value of all negative post temperatures.

- **Ground fault** - Ground fault status (Yes or No).

- **Monitor storage memory used** - Percentage of total monitor memory used.

- **Unexpected restarts** - Number of times the system has unexpectedly restarted. Includes manual reboots of the monitor.

| Home / Summary	
Under discharge	No
Overall battery voltage	126.26V
Battery current	-417.74mA
Ambient temperature	65.19°F
Average post temperature	66.73°F
Ground Fault	No
Monitor storage memory used	1.21 %
Unexpected restarts	No data

5.0 Alerts Page (view active alarms)

The alerts page shows all active alerts on the system. There is also a button to view all historical alerts that have occurred.

Note - *Many alerts are based on user-defined alarm limits. See the Alarms Page for more information on how to adjust alarm limits.*

- Clicking a value under the **Type**, **Metric**, **Threshold**, and **Current Value** column will bring up the historical chart for that entity's value. (e.g., clicking any of those values shown below will bring up the chart for cell 56's resistance history)
- Clicking the number under the **Entity** column will bring up the dashboard for that sensor. See the **Sensor Dashboard** page for more information.

Home / Alerts

Current alerts

[Click here to see all historical alerts.]

Type	Entity	Metric	Threshold	Current Value
Warning cell resistance (high)	56	Cell Resistance (mΩ)	1.60	5.65
Critical cell resistance (high)	56	Cell Resistance (mΩ)	1.87	5.65

- Clicking the historical alerts button will bring up the **Historical** page. This page organizes information as follows:
  - **Type** - This is the type of alert that occurred.
  - **Start / Stop Time** - Time the alert was first detected to when it stop being detected.
  - **Entity** - Sensor number that recorded the alert, the sensor number typically correlates to the cell/unit/jar/bloc on the battery.
  - **Metric** - The type of value that is in alert.
  - **Threshold** - The limit value that must be measured to set off the alert.
  - **Trigger Value** - The measured value that set off the alert.
  - **Stop Reason** - Why the alarm cleared.

Home / Alerts / Historical

Alert Log

Type	Start Time	Stop Time	Entity	Metric	Threshold	Trigger Value	Stop Reason
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	40	Cell Voltage (V)	2.13	2.11	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	44	Cell Voltage (V)	2.13	2.11	Returned to normal
Warning cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	48	Cell Voltage (V)	2.15	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	53	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	1	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	5	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	58	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	9	Cell Voltage (V)	2.13	2.11	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	13	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	17	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	21	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	24	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	28	Cell Voltage (V)	2.13	2.11	Returned to normal
Warning cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	32	Cell Voltage (V)	2.15	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	36	Cell Voltage (V)	2.13	2.11	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	41	Cell Voltage (V)	2.13	2.11	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	45	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	49	Cell Voltage (V)	2.13	2.12	Returned to normal
Critical cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	54	Cell Voltage (V)	2.13	2.11	Returned to normal
Warning cell voltage (low)	2021-12-15 10:30:00	2021-12-15 14:00:00	1	Cell Voltage (V)	2.15	2.12	Returned to normal

Previous | 1 to 21 of 256 | Next

6.0 Battery Page

The battery page displays all of the available measurement data from each sensor. A single sensor measures multiple parameters for the individual cell/bloc/unit/jar that it is connected to. The list below outlines the information displayed each in column on this page:

Note *- As mentioned earlier in this guide, clicking any hyperlink number will open the historical chart for that measured data.*

- **Cell -** Displays the sensor number (which corresponds to the connected cell/unit/bloc/jar). Clicking the number will open the **Sensor Dashboard** page for that sensor.
- **String -** Displays the string number. Multiple string numbers apply to parallel systems.
- **Cell Voltage (V) -** Displays the cell voltage value.
- **Temperature (C/F) -** Displays the sensor temperature value.
- **Temperature Type -** Displays where the temperature is measured. In most cases it will be the negative post.
- **Cell Resistance (mΩ) -** Displays the internal resistance value.
- **Interconnect Resistance (uΩ) -** Displays the interconnection value (the value measured on the positive side of the battery the sensor is connected to. E.g., the strap value for cell 4 is the interconnection resistance for the connection between cell 3-4).
- **Interconnect Type -** Displays the type of interconnection reading for that sensor.
- **Summary (buttons) -** Click the Summary button to view the **Sensor Dashboard** page.
- **Plus 1 sensor** - The extra sensor on the battery will be displayed in a separate table at the bottom of the page.

Sensor ID ▲	String	Temperature (°F)	Temperature Type	Interconnect Resistance (μΩ)	Interconnect Type	
61	1	69.13	Cable	189.31	Cable	Summary

7.0 Sensor Dashboard Page

The sensor dashboard page displays more specific information for the data measured from that sensor. It also provides various functionality for that sensor that will be explained in this section. The sensor dashboard page has 3 sections which can be accessed on the top of the page.

Home / Battery / 5

5

Data Overview   Cell Information   Control Panel

7.1 Data Overview

This section displays a snapshot of each parameter measured from the sensor. Click each chart to view the history.

- Cell voltage

- Post temperature

- Cell resistance

- ELM electrolyte level (*Note* - *this chart will either display a 1.0 for no alarm, or a 0.0 for alarm.*)

- ELM case temperature (*Note* - *this chart will either display a 1.0 for no alarm, or a 0.0 for alarm.*)

- Cell strap resistance

- Cell ripple

- Successful conversations (sensor communications)

Home / Battery / 6

6

Data Overview   Cell Information   Control Panel

Cell Voltage	Post Temperature	Cell Resistance	ELM Electrolyte Level
Cell Voltage (V)	Post Temperature (°F)	Cell Resistance (mΩ)	ELM Electrolyte Level
Aug 13 Aug 16	Aug 13 Aug 16	Aug 13 Aug 16	Aug 13 Aug 16

ELM Case Temperature Level	Cell Strap Resistance	Cell Ripple	Successful Conversations
ELM Case Temperature Level	Cell Strap Resistance (µΩ)	Cell Ripple (mV)	Successful Conversations (%)
Aug 13 Aug 16	Aug 13 Aug 16	Aug 13 Aug 16	Aug 13 Aug 16

7.2 Cell Information

This section displays information about the cell/unit/bloc/jar. This should typically be configured during commissioning. If the information needs to be edited, type `/settings/battery-info/` after the IP address to make edits.

23

Data Overview · **Cell Information** · Control Panel

Tags	**ELM** **Post temperature** **Strap interconnect**
String	1
Model	2-OPzS-200
Manufacturer	Leoch
Nominal voltage	2.0 V
Nominal capacity	200.0 AH
Sensor firmware	0.0.7
Sensor serial number	2051.3653

7.3 Control Panel

This section contains a number of functions that can be performed on the sensor. Each section will be explained in detail below.

23

Data Overview   Cell Information   **Control Panel**

Sensor controls

Blacklist sensor
Locate sensor
Stop locating sensor

Requests

Store results in next request?☐ Request resistances

ELM controls

Reset ELM
Calibrate ELM

Update sensor information

String 1 ▼ Change string

7.3.1 Sensor controls

- **Blacklist sensor (button) -** Removes the sensor strap connection from the float current calculation. This setting should only be used by certified installers.

- **Locate sensor (button) -** This will force the sensor to start blinking with a red LED. Useful for making sure the sensor is installed in the correct location.

- **Stop locating sensor (button) -** This will stop the sensor locating function.

Note - a successful blacklisting of a sensor will show a confirmation box. Remove a blacklist by clicking the same button which will be renamed.

> Sensor blacklisted.

7.3.2 Requests (manual resistance test)

This section allows the user to perform a manual resistance test. This is useful for troubleshooting resistance readings after making adjustments in the field. It will update the internal and interconnection resistance for that sensor.

Requests

Store results in next request?☐ Request resistances

- **Store results in next request? (checkbox)** - Clicking this checkbox will store the manual resistance test in the history. Do not check this box if troubleshooting erroneous or suspect resistances.
- **Request resistances (button)** - Clicking this button will perform a manual resistance test. During normal operation, the system will measure resistance once daily (around 01:00). Clicking this button and the checkbox above will save a new resistance value in the history.

Steps to perform a manual resistance test:

1. Determine if you want to save the data or not by checking the box.
2. Click the request resistances button. The page will refresh back to the sensor dashboard page.
3. Click the Control Panel section and a new table will be shown that explains the status of the test. It may take up to 30 seconds for the results to be shown.

Requests

Last request:

Submitted	2021-12-17 08:52:00
Completed	Pending
Type	Resistance (and save)
Request status	Awaiting result

4. A successful test will be shown as below, with the new resistance measurement result.

Requests

Last request:

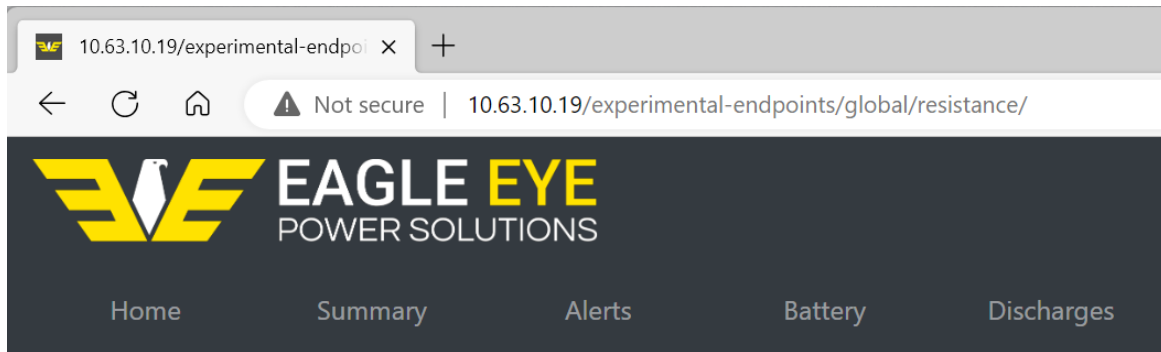| Submitted	2021-12-17 08:52:00
Completed	Pending
Type	Resistance (and save)
Request status	Awaiting result

5. If a resistance test was ran within the past 15 minutes a warning will appear saying to wait 15 minutes until trying again. Observe the time the test was attempted and wait at least 15 min before trying again.

7.3.3 Global Resistance Test

While not part of the Control Panel page this functionality extends from the manual resistance test outlined above. The global resistance test will update the resistance values for all sensors at once.

Warning: The global resistance test saves all updated values to the history. Only run this test if you are confident the updated values will not be erroneous.

To execute the global test, type `/experimental-endpoints/global/resistance/` after the IP address.

If allowed, the test will execute immediately, however the updated values do not appear in the Control Panel like they do with the manual test. Instead, the values will appear on the Battery page or in the report at the next 15 minute interval. If any of the conditions that prevent a resistance test have occurred the test will not execute and display a warning message.

7.3.4 ELM controls

- **Reset ELM (button) -** Resets the ELM sensor. This must be done after topping off the electrolyte level to clear an alarm. It has the same functionality as pressing the R/S button on the sensor.

- **Calibrate ELM (button)** - Calibrates the ELM sensor to the battery. Must be done only after the water level is well above the minimum line.

For steps on how to send global ELM commands, refer to the **ELM Management** section.

7.3.5 Update sensor information

- **String (dropdown menu) -** Selects the string number to change to.
- **Change string (button) -** Changes the string to the new number.

8.0 Discharges Page

The discharges page shows a list of historical discharge events captured by the VIGILANT . Discharges are captured based on the activation threshold set on the system, visit the **Discharge Setting** page under the **Settings** section of this guide for more information on how to configure the discharge thresholds.

- **Reference** - Name of the discharge, automatically assigned by the system. (as of 1.3.8, there is no way to change this name).
- **Started** - The date and time the discharge started.
- **Finished** - The date and time the discharge ended. This column will say Ongoing for any discharges that are still in progress.

Home / Discharges

Historical Discharges

Reference	Started	Finished
Discharge: 16 December 2021 12:39:29	2021-12-16 12:39:29	2021-12-16 12:45:28
Discharge: 16 December 2021 12:32:13	2021-12-16 12:32:13	2021-12-16 12:39:20
Discharge: 15 December 2021 10:21:42	2021-12-15 10:21:42	2021-12-15 10:23:49

8.1 Discharge Event Page

This page shows the discharge event in its entirety, including moments before this discharge as well as the recharge afterwards.

- **Event details** - The top of the page shows the start time, end time, and duration of the discharge.

Home / Discharges / Discharge: 16 December 2021 12:32:13

Discharge: 16 December 2021 12:32:13

Start	2021-12-16 12:32:13
End	2021-12-16 12:39:20
Duration	7 minutes and 7 seconds

- **Voltage & Current Chart** - The first chart displays the voltage and the current of the battery through the duration of the event. As with all charts in the web-interface, click and highlight sections of the chart to view them in finer detail.

Discharge: 16 December 2021 12:32:13 - Battery performance
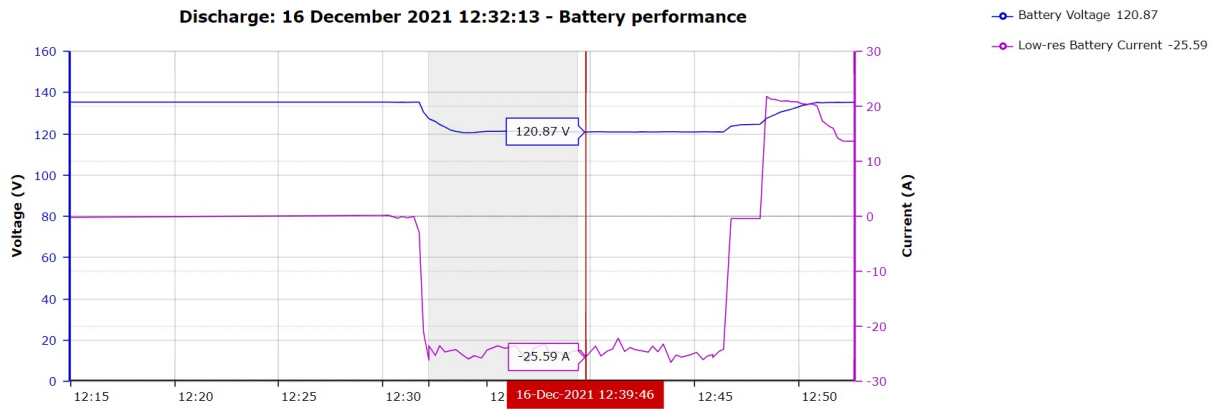
- **Cell Voltage Chart** - The second chart displays all of the cell voltages through the duration of the event. Click any cell on the right to hide it from the chart.

Discharge: 16 December 2021 12:32:13 - Cell voltages
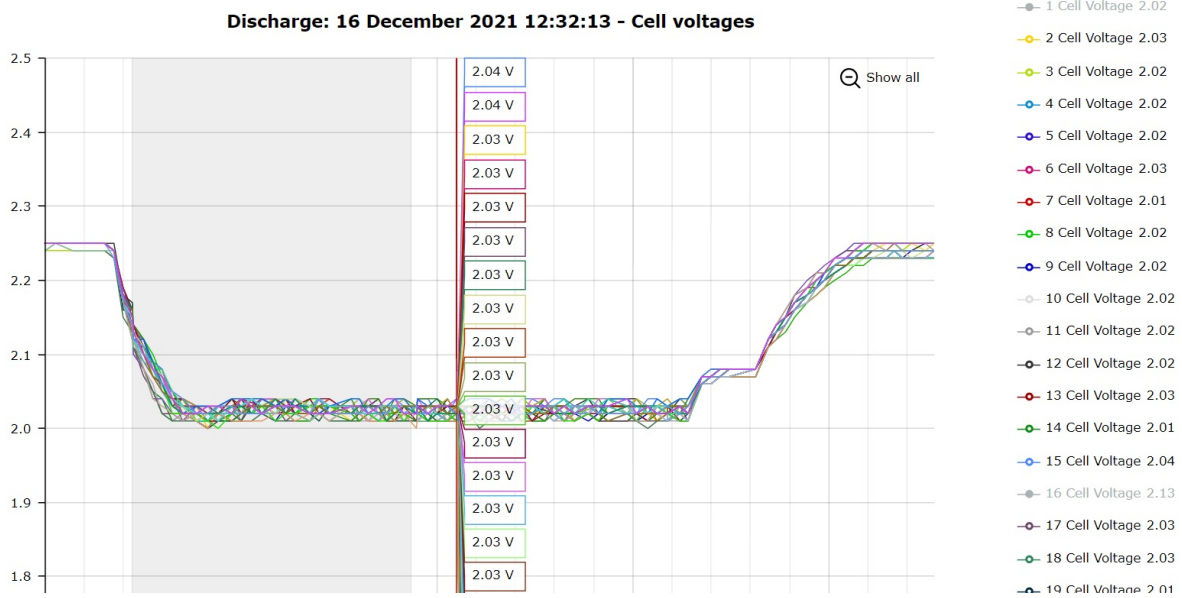
- **Temperature Chart** - The last chart shows the temperature of each negative post during the test. This chart has the same functionality as the cell voltage chart.

Discharge: 16 December 2021 12:32:13 - Temperatures
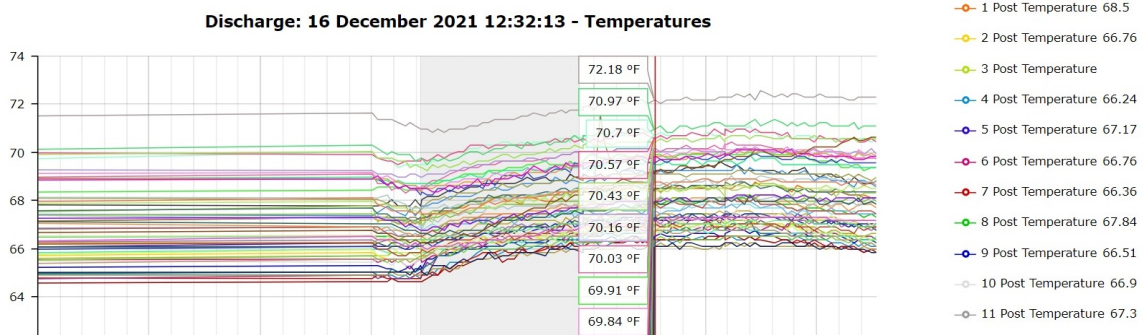
8.1.2 Discharge Report (in development)

As of software version 1.3.11, there is no functionality to export the discharge data. This functionality is currently in development and will be available as an update.

9.0 Snapshots Page

The snapshots page lists links to all of the available bar graphs on the system.

Snapshots

- Cell Voltage
- Post Temperature
- Cell Resistance
- Cell Ripple
- ELM Electrolyte Level
- ELM Case Temperature Level
- Successful Conversations
- Interconnect Resistances:
  - Cells
  - Intertier
  - Cable

- Cell voltage, post temperature, cell resistance, cell ripple, and interconnect resistances display measured values for each cell. Hover over a bar to view the cell number and most recently measured data. Click the bar to view history for that cell.
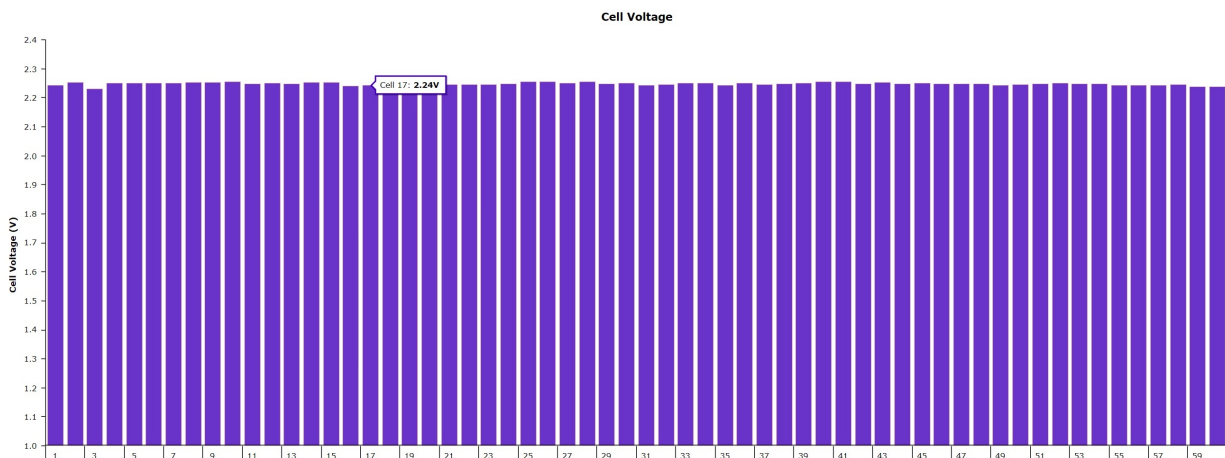
- Electrolyte level and ELM case temperature are displayed differently. These values are on/off alarms, so the chart displays a 1.0 when not in alarm, and a 0.0 when in alarm.

Eagle Eye Power Solutions, LLC | 1-414-877-3377 | www.eepowersolutions.com
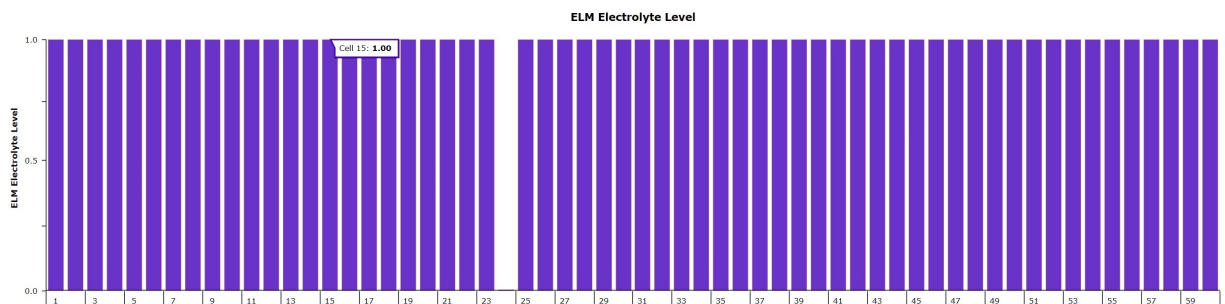
- Successful conversations refer the number of successful "conversations" each sensor has back to the monitor. Under normal operating conditions this should be at or near 100%. If a sensor loses power or the RJ12 connectors are disconnected, communications will drop to 0% creating an alarm.

10.0 Reports Page

The reports page contains links to the reports that can be viewed and exported from the system. As of software version 1.3.10, there are two reports available:

- **NERC Report** - Report tailored around NERC PRC-005-6: Table 1-4(f) and TPL-001-5 compliance.
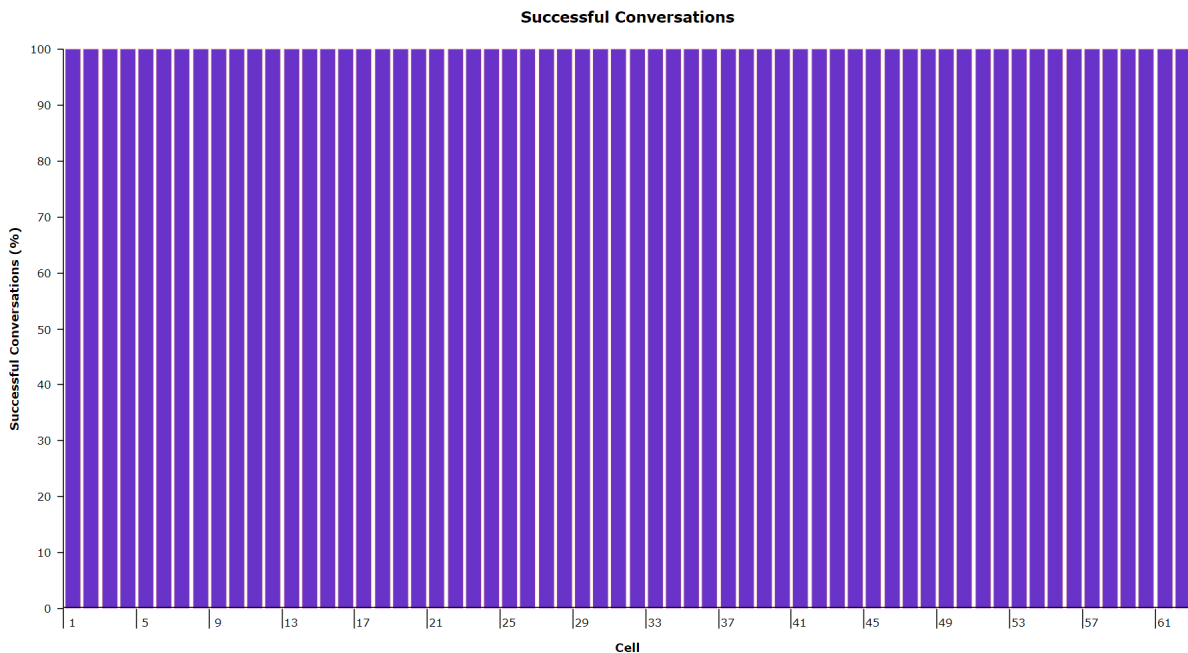- **Monitor Report** - General report that does not specify compliance for any specific entity.

Reports

NERC Report

Monitor Report

Note: See Appendix B for example reports.

10.1 Creating Reports

To create either report, follow the steps below:

1. Click the link for the report type.

2. When the report loads, view the web-page version of the report to make sure the data looks acceptable.

3. Click one of the 3 export options:

   - **Download docx** - Creates a docx report than can be opened in Microsoft Word

   - **Download csv** - Creates a csv report that can be opened in Microsoft Excel

   - **Download pdf** - Creates a PDF report

4. Save the report to the desired location. All report filenames include the battery name, date report was made, and the type of report.

10.2 Suggested Report Organization

As of software version 1.3.11, the VIGILANT system does not automatically generate or store reports on the system. When a report is manually generated, it uses them most recent data measured.

Note: A future update will add a drop down to select a date for the report, allowing reports to be created from historical data.

Below is a suggested work flow for creating and organizing reports:

1. Create internal processes for reports:

   - Determine frequency to create reports (e.g., once a month)

   - Determine where to save the reports (e.g., shared network drive)

   - Determine how to organize reports (e.g., folder for the battery system, organized by years)

2. Export the reports to the determined directory.

3. Reference reports as needed for audits or reference.

11.0 Settings Page

The settings page contains links most of the user-adjustable settings on the system. It also has options for rebooting the system and exporting data. A brief explanation of each section is outlined below, followed by a more detailed walkthrough.

Warning - *These settings are typically configured during the commissioning of the system by Eagle Eye trained technicians. Changing some of these settings can break some expected functionalities of the VIGILANT .*

- **Network** - Adjust IP settings.

- **Data Management** - Export data to a csv file.

- **User** - Change user account information.

- **Modbus** - Enable or disable Modbus.

- **Alarm** - Adjust alarm limits.

- **Actions** - Reset system, adjust time, perform software update, and calibrate.

- **Discharge** - Adjust discharge limits.

- **Diagnostics** - Export measurement data into a formatted Excel workbook.

- **ELM Management** - Perform various ELM related tasks.

Note - *The VIGILANT version number is shown on the lower left part of the page.*

Home / Settings

Settings

Network	Data Management	User
Modbus	Alarm	Actions
Discharge	Diagnostics	ELM Management
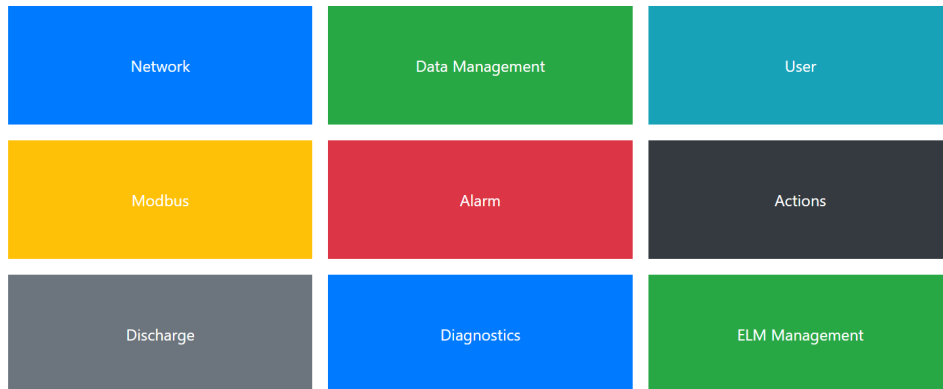
Vigilant version: 1.3.11

11.1 Network Settings

This section displays currently set network settings including the **IP address**, **MAC address**, **Interface type**, and **Mode** (static or DHCP). Under the current network information are 5 settings that can be adjusted:

- **Static IP** - Enter the desired static IP address here. If a static IP has not yet been set, this value will be 192.168.1.250 which is the default fallback IP address for the VIGILANT .
- **CIDR** - Enter the desired CIDR (classless inter-domain routing) number here. The default value is 24 (255.255.255.0).
- **Gateway (optional)** - Enter a gateway here if needed.
- **DNS server IP (optional)** - Enter a DNS server IP here if needed. In most applications, leave this field to the default value or leave it blank.
- **Use DHCP** - If not using a static IP, click this checkbox to enable DHCP.

Click the **Save** button to update any changed network settings.

Home / Settings / Network

Network

IP address:	192.168.1.200
MAC address:	cc:15:eb:88:fa:a9
Interface:	LAN
Mode:	Static
Static IP / CIDR:	192.168.1.200 / 24
Gateway IP (optional) :	192.168.1.1
DNS server IP (optional) :	192.168.1.1
Use DHCP:	☐

When you click save - the Vigilant will reboot.

Save

11.2 Data Management

As of version 1.3.8, this section has the functionality outlined below. This section is expected to gain additional functionality in future updates, such as the ability to export additional data and settings for backup purposes.

- **Sensor Data** - Export all sensor data history to a CSV file.
- **Ambient Data** - Export the string data to a CSV file.

Data Management

Sensor Data	Ambient Data

11.3 User Settings (change password, etc.)

This section allows adjustment of the following user settings:

- **Change Password** - Type in the current password, followed by the new password and click the button to save the change.
- **Battery unit terminology** - Usually set during commissioning, this allows the user to change the terminology of the individual batteries monitoring on the system. Options include cell, unit, bloc, and jar. Click the button to save the change.
- **Change timezone** - Usually set during commissioning, this option allows changing of the timezone. Click the button to save.

User
Change Password

Current Password:

New Password:

Change password

Battery unit terminology: cell ⌄

Change phrase

Change timezone: America/Chicago ⌄ Auto detect

Change timezone

11.4 Modbus Settings

This section is used to enable or disable Modbus. For more information about Modbus, contact Eagle Eye for the Modbus Data Mapping which lists all the available data points.

- **Enable?** - Click this checkbox to enable Modbus.
- **Unit Identifier** - Default value is set to 1. As of 1.3.8, this option does not have any functionality and will likely be removed in a future update.

Home / Settings / Modbus

Modbus Settings

Enable?	☑
Unit Identifier	1

Save

11.5 Alarm Settings (set alarm limits)

This section is used to adjust alarm limits on the system. As of software version 1.3.11, the alarm limits listed below can be adjusted. When the system is commissioned, alarm limits are automatically calculated based on nominal values. It's highly recommended to adjust alarm limits per the battery manufacturers recommendations.

Click the dropdown box to select the parameter to adjust alarm limits for:

- **Cell/Unit Voltage -** Alarm limits for individual cell/unit voltage measured by each sensor.
- **Post Temperature** - Alarm limits for negative post temperature measured on each sensor.
- **Battery Voltage** - Alarm limits for the total battery voltage measured by the monitor.
- **Cell/Unit Resistance** - Alarm limits for the individual internal battery resistance measured by each sensor.
- **Cable Resistance** - Alarm limits for the charger cable resistance.
- **Intertier Resistance** - Alarm limits for the longer inter-tier or inter-rack cables.
- **Strap Resistance** - Alarm limits for the fixed length bus bar or cable (strap) connections on the battery.

Alarms

Warning: any individually configured alarms will be overridden by these changes.

Cell Voltage ▾		
Cell Voltage	critical	2.37	V
Post Temperature	warning	2.32	V
Battery Voltage	warning	2.15	V
Cell Resistance	critical	2.13	V
Cable Resistance		
Intertier Resistance		
Strap Resistance		

All **critical** alarm limits will trigger relay 1 on the monitor and also illuminate the "Battery Alarm" LED on the monitor red.

All **warning** alarms will simply log a warning under the alerts page.

11.6 Actions Settings

This section outlines various actions that can be taken on the system.

- **Reboot** - Power cycle the VIGILANT .

- **Shutdown** - Shutdown the VIGILANT operating system and software.

- **Set Clock** - Adjust time and time settings.

- **Calibrate** - Calibrate the current measurement on the system.

System Actions

Reboot	Shutdown	Set Clock

Calibrate

11.6.1 Reboot

Click the **Yes - reboot** button to reboot the VIGILANT . Everything will come back up automatically after up to a few minutes. Rebooting is recommended if the system is being unresponsive or an update has recently been performed.

Reboot

Are you sure that you want to: reboot?

Yes - reboot

11.6.2 Shutdown

Click the **Yes - shutdown** button to shutdown the VIGILANT . This will only shutdown the operating system, not the hardware. This is recommended before removing power from the VIGILANT .

Shutdown

Are you sure that you want to: shutdown?

Yes - shutdown

11.6.3 Set Clock

This section allows manual adjustment of the date and time. If connected to a network, clicking the **Use NTP sync?** checkbox should set the date and time automatically. Uncheck this box to set the date and time manually. **Note:** the system does not currently have the ability for the user to set an IP address for NTP sync.

Take note of the **Next schedule sweep date and time** shown at the bottom. It's recommended to click the **Reset schedules** button after updating the date and time. This will align the automated measurement cycles with the new time.

Set system date & time

Current system time	2021-12-20 15:37:52
Use NTP sync?	☑
(If not), then set (local) time:	

Save

Next scheduled sweep (at page load)	2021-12-20 15:37:51

Reset schedules

11.6.4 Calibrate

This section is used to calibrate the current measured by the VIGILANT .

Note *- This step is typically completed during commissioning. Only try calibrating the system if trained by Eagle Eye.*

Home / Settings / Current Calibration

Battery current calibration

This page will calibrate your Vigilant sensor interconnect resistances to a known battery current. Each string needs to be calibrated in turn:

- Measure the DC string current between adjacent cells on the string
- Check that the DC string current is consistent
- Enter the DC string current into the relevant form below & press "Apply"
- The system will then calibrate
- Move onto the next string and repeat

(Calibration can be removed and/or adjusted afterwards)

String 1	0	A	Apply

12.0 ELM Management

The ELM settings page allows the user to send global commands to the ELM sensors. To access this page, enter `settings/elm/` after the IP address in the web browser.

Vigilant   ×   +

← → C ⌂   ⚠ Not secure | 10.63.10.18/settings/elm/
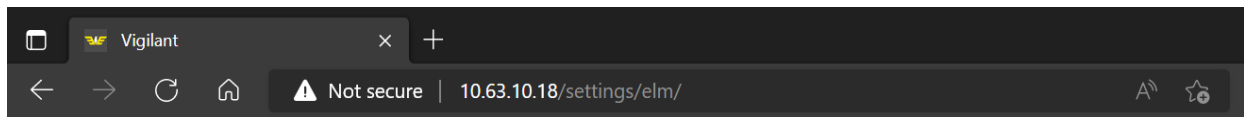
CAUTION: Some of the steps on this page should only be done by Eagle Eye certified installers. Some steps, if followed improperly, can affect the ELM functionality on the system. This section will only cover the steps which can be done by untrained users.

12.1 Calibrate Multiple ELM Sensors

This feature can be used to select multiple or all ELM sensors and calibrate them with a few clicks.

1. On the page, select the sensors to calibrate.
    1. If selecting only some sensors, hold the control button down and click each sensor to calibrate.
    2. If calibrating all sensors, click 1, then hold the shift button and click the last sensor, all should be selected.
2. From the dropdown menu, click Calibrate.

ELM management

You can select multiple sensors from the below selection box. Holding down shift will select a range of sensors, holding down control allows you to select multiple sensors.

Click here to see what other tasks are currently scheduled.

Add ▾
| Add |
| Calibrate |
| Remove |
| Replace |
| Spot check |
| 6 |
| 7 |
| 8 |
| 9 |
| 10 |
| 11 |
| 12 |
| 13 |
| 14 |
| 15 |
| 16 |
| 17 |
| 18 |
| 19 |
| 20 |

Submit

3. Click the Submit button, a green confirmation box should appear.

ELM tasks scheduled

---

4. To check the status of the calibration, click the "*Click here to see what other tasks are currently scheduled.*" link.

5. The Sensor tasks page will load which shows the status of the calibration. When the calibration is complete, each sensor will have a green box.

Home / Settings / ELM management / Sensor tasks

Sensor tasks

Clear/cancel all

Reference	elm_off	elm_on	connection_test	elm_calibrate	elm_spot_check	elm_read	Actions	Information
1	☐	☐	☐	☐	☐	☐	Clear/cancel	
2	☐	☐	☐	☐	☐	☐	Clear/cancel	
3	☐	☐	☐	☐	☐	☐	Clear/cancel	

6. When all boxes are green, click the **Clear/cancel** all button to finish the task. This will not undue the ELM and is required for the system.

12.2 Other ELM Tasks

The following other tasks should only be performed by Eagle Eye trained users.

- Add - Allows adding of ELM sensors to the system after commissioning.

- Remove - Allows complete removal of ELM sensors after commissioning.

- Replace - Allows replacement of an ELM sensor.

- Spotcheck - Tests that the ELM is capable of receiving commands.

Appendix A - Measurement Intervals

Under normal float operation:

- **Parameter check** - This handles the measurement of the following metrics. These checks are performed as regularly as possible when the system is not doing other tasks (such as determining the   electrolyte level). How regularly this occurs depends on how many sensors are being polled as well as what else is scheduled to happen. These are updated once every 15 minutes on the web UI.

  - Battery float voltage

  - Low resolution float current

  - Cell voltage

  - Cell negative post temperature

  - Ground fault

- **String voltage** - Not independently measured. Measured as the sum of all cell voltages. (Only when strings are in parallel)

- **Float current** - The float current in two ways:

  - Low-resolution float current: occurs in the regular parameter check.

  - High-resolution float current: is used and displayed as float current on the web UI. This is typically measured once a minute. 15-minute average displayed on the web UI.

- **Ambient temperature -** This is measured and updated in the web UI once every 15 minutes.

- **Cell/Connection resistances** - Both the cell resistance and connection resistance is measured once a day @ 1am admin time. This is displayed on the web UI as part of the 15 minute average update, even though there's no average. The reading will not change until 1am the next day.

- **Electrolyte alarm** - Electrolyte alarms operate independently from everything in the system

  - The ELM sensors are polled every 90 minutes. It is displayed at the next 15 minute web UI interval. This means that if an ELM alarm clears, it may take up to 105 minutes to clear in the webserver.

  - If there is a reported low electrolyte level, the sensor is reset.

  - If there are 4 consecutive ELM resets, we then raise an alarm.

Under discharge conditions:

- **Parameter check** - During discharge conditions - parameter checks take priority over other kinds of readings. The system enters SAM (slope acquisition mode), where it measures reasonably quickly   and average every 5 consecutive readings for a particular sensor for a particular metric and stores it. It is updated on the web UI every 30s or so. This mode lasts for 5 minutes - although this period can be extended under a number of circumstances. After this, the parameters begin to operate as per normal float operation.

- **String voltage** - Not independently measured. Measured as the sum of all cell voltages. (Only when strings are in parallel)

- **Float current** - as per float - except high-resolution float current this controls the exit criteria for the discharge

- **Ambient temperature -** As per float

- **Resistances** - Not measured

- **Electrolyte alarm** - Not measured

Appendix B - Example Report

Below is an example of the NERC Report generated from the system. Reports are generated with a filename that is in the format of: [battery name]-[date]-[report type]

Vigilant NERC Report

Metadata

Battery Name	GOLD STANDARD	Manufactured Date	2023-07-25
Model	2-OPzS-200	Install Date	2023-07-25
Manufacturer	Leoch	Report Date	2023-08-08 09:27:22
Nominal Voltage	2.0	Reporting System	Vigilant BMS
Nominal Capacity	200.0	System Version	1.3.11
Ambient Temperature (°F)	73.8	Report Version	1.5
Average Post Temperature (°F)	74.03		

Station DC Supply PRC-005-6 Compliance Summary

Battery Float Voltage / Station DC Supply	Pass	Cell Voltage	Pass
Battery Continuity	Pass	Cell Resistance	Pass
Post Temperature	Pass	Interconnection Resistance	Pass
Ground Fault	Pass	Electrolyte Level	Warning

Station DC Supply TPL-001-5 Compliance Summary

Battery Continuity	Pass	Station DC Supply	Pass

Summary Data

Battery Voltage (V)	Battery Current (A)	Ambient Temp (°F)	Ground Fault
135.31	-0.14	73.8	Pass

Cable & Intertier Data

ID	Interconnection Type	Resistance (μΩ)
1	Cable	89.39
16	Intertier	429.85
31	Intertier	384.12
46	Intertier	218.51
61	Cable	247.33

Battery & Strap Data

Cell ID	Cell Voltage (V)	Cell Resistance (mΩ)	Post Temperature (°F)	Strap Resistance (µΩ)
Min	2.23 (Cell 45)	0.75 (Cell 40)	71.08 (Cell 14)	3.37 (Cell 2)
Average	2.25	0.80	74.03	39.91
Max	2.26 (Cell 42)	0.88 (Cell 56)	78.23 (Cell 25)	94.55 (Cell 57)
1	2.25	0.77	75.96	Cable connection
2	2.25	0.81	74.14	3.37
3	2.25	0.83	73.42	40.66
4	2.25	0.77	74.53	39.91
5	2.25	0.80	75.66	41.22
6	2.25	0.77	72.28	38.33
7	2.25	0.81	75.51	40.23
8	2.25	0.81	75.58	40.04
9	2.25	0.78	71.29	42.56
10	2.25	0.79	75.49	40.45
11	2.25	0.79	75.71	41.60
12	2.25	0.78	71.50	37.74
13	2.25	0.78	72.37	37.52
14	2.25	0.78	71.08	39.81
15	2.25	0.78	75.67	42.21
16	2.25	0.77	72.29	Intertier connection
17	2.25	0.81	75.72	39.67
18	2.25	0.82	75.83	38.24
19	2.25	0.82	71.70	36.73

20	2.25	0.82	72.60	37.66
21	2.25	0.84	71.09	40.44
22	2.25	0.83	75.70	38.96
23	2.24	0.80	75.60	40.12
24	2.25	0.82	74.88	38.69
25	2.25	0.80	78.23	39.80
26	2.25	0.79	72.12	39.19
27	2.25	0.79	72.53	36.88
28	2.25	0.79	75.72	37.09
29	2.24	0.78	75.44	36.58
30	2.25	0.80	74.89	38.18
31	2.25	0.79	72.82	Intertier connection
32	2.25	0.81	73.69	38.30
33	2.26	0.84	73.23	37.98
34	2.25	0.81	74.97	37.86
35	2.25	0.81	72.23	39.96
36	2.25	0.81	72.01	40.85
37	2.25	0.81	72.22	43.56
38	2.25	0.79	72.58	40.17
39	2.25	0.79	75.25	42.34
40	2.25	0.75	75.75	40.38
41	2.25	0.82	77.88	35.96
42	2.26	0.84	77.22	37.12
43	2.25	0.81	75.36	37.92
44	2.24	0.80	75.73	40.62
45	2.23	0.84	71.49	40.10

46	2.25	0.78	75.44	Intertier connection
47	2.25	0.80	75.18	39.75
48	2.25	0.79	74.50	42.02
49	2.25	0.82	75.03	38.69
50	2.25	0.80	71.66	40.23
51	2.25	0.82	77.38	42.64
52	2.25	0.81	72.31	40.08
53	2.25	0.79	71.97	42.66
54	2.25	0.80	72.11	40.15
55	2.25	0.81	71.88	41.05
56	2.25	0.88	72.36	40.16
57	2.25	0.79	72.62	94.55
58	2.25	0.78	74.50	41.04
59	2.25	0.84	74.57	36.94
60	2.26	0.80	73.08	38.20