



Vigilant Third-Party Installation Guide

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1.0 Preface

This guide is intended for third-party installation of the Vigilant Battery Monitoring System. It will cover aspects of the installation which can be completed by third-parties without assistance or supervision from Eagle Eye Power Solutions (EEPS) and/or Eagle Eye Services (EES). Start-up and commissioning of the Vigilant will still need to be completed by EES.

Along with this guide, installers need to complete the Installation Steps Checklist. This document is provided to ensure all the correct steps are followed and completed. **The Installation Steps Checklist must be completed and submitted in order for the EES commissioning to be scheduled.**

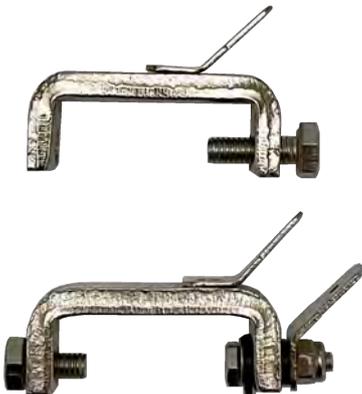
How to read: This guide is a combination of suggestions as well as specific steps for how to install the Vigilant. Sections outlined in bullet points provide information or suggestions on how to complete a task. Sections outlined in an ordered list provide specific steps that should be followed exactly.

1.1 Review BOM

- A printed BOM (bill of material) is included with each system in the same box as the monitor.
- Below is a summary of the items typically included in the Vigilant BOM. Refer to the included BOM for individual part #s.

- Some part numbers include sub parts which are needed for installation, take note of these parts.

Part	Description	Quantity	Photo
Vigilant Monitor	Main controller that processes and stores measurement data. Includes Cable Clamps, Ambient Sensor, and +1 Vigilant Sensor	1 per battery system	 <p>A black rectangular battery monitor with a digital display on the right side showing green LEDs. The front panel features the 'VIGILANT Expert' and 'EAGLE EYE POWER SOLUTIONS' logos. There are two circular vents on the left side and a small label at the bottom.</p>
Cable Clamps	Clamp set to connect to battery charger positive and negative cables	1 pair per battery system	 <p>A set of black cables with red and black wires. One end has a red and black clamp. The other end has a white connector. A blue fuse holder and a fuse labeled 'SAFE 3A 250V F1 25A' are also shown.</p>
Ambient Sensor	Sensor to measure ambient temperature	1 per battery system	 <p>A black cable with a white connector at one end and a metal probe at the other end, used for measuring ambient temperature.</p>

Part	Description	Quantity	Photo
Vigilant Sensor	Measures individual battery voltage, resistance, and temperature. Includes mounting cradle, comms. cable, and black dot cradle stickers	1 per cell/unit*	 <p>A white rectangular sensor unit with a black mounting cradle. The top has two orange and white terminals. A label on the front reads 'VIGILANT Advanced Intelligent Battery Sensor V/T/R/RV/SR/FC v0.06' and features the 'EAGLE EYE POWER SOLUTIONS' logo.</p>
Tab Harness	Wire harness that connects Vigilant Sensors to the clamps on the battery terminals. Includes positive and negative harness	1 pair per cell/unit	 <p>A coiled black wire harness with a green Ethernet-style connector on one end and red and blue wire terminals on the other.</p>
Terminal Tab Harness	Special wire harness that measures battery terminal resistance (note, looks very similar to the regular tab harness)	1 per battery system	 <p>A coiled black wire harness with a green Ethernet-style connector on one end and red and blue wire terminals on the other, similar to the Tab Harness but with a different internal configuration.</p>
C-Clamps	Clamp that connects the tab harness to the battery post (not included if using tab washers)	1 pair per cell/unit	 <p>Two metal C-clamps with threaded ends and a central pin, used for securing the wire harness to battery terminals.</p>

Part	Description	Quantity	Photo
Tab Washers	Tab washer that connects the tab harness to the battery post (not included if using C-Clamps)	3 per cell/unit	
ELM Sensor	Electrolyte Level Sensor, includes mounting cradle and comms. cable	1 per cell	
RJ12 Cable	Extra length of RJ12 cable for longer runs between sensors and the monitor	Various lengths depending on site survey	Not pictured

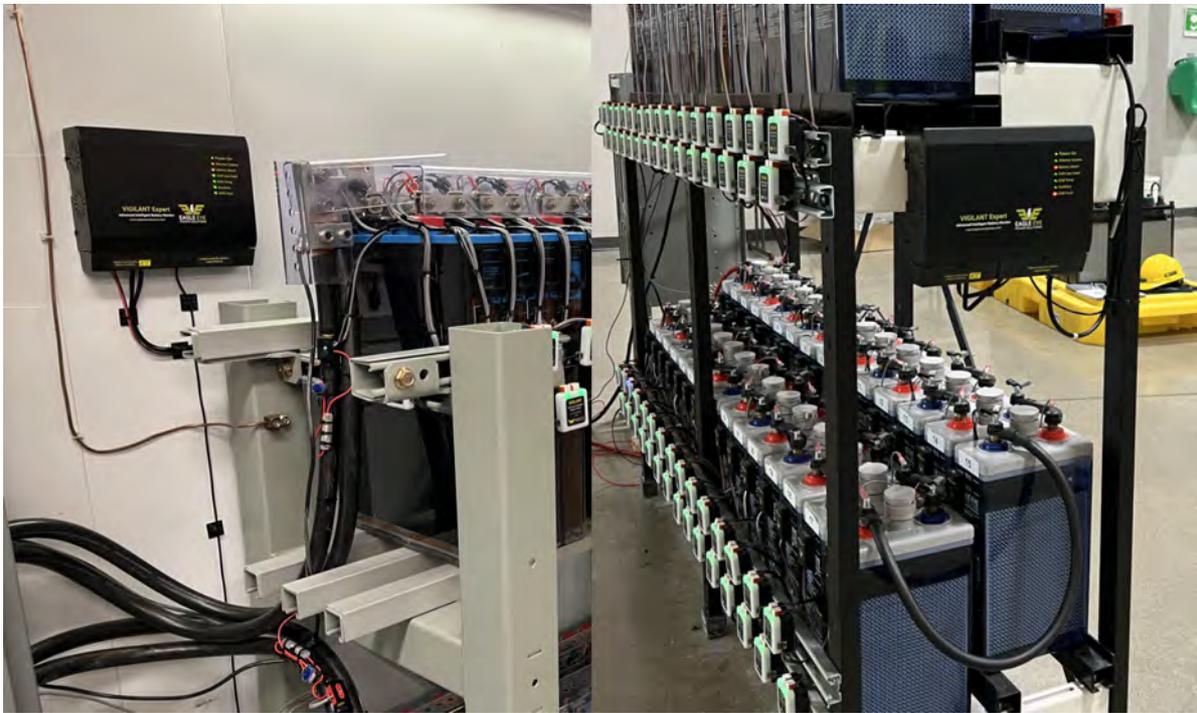
**Each system includes a +1 sensor with the monitor.*

1.2 Identify Placement of Components

This section will outline best practices for placement of the components on the battery. It's important to plan out the placement of each component before installing them on the battery. Section 1.4 will provide more instructions on how to install each component.

1.2.1 Vigilant Monitor

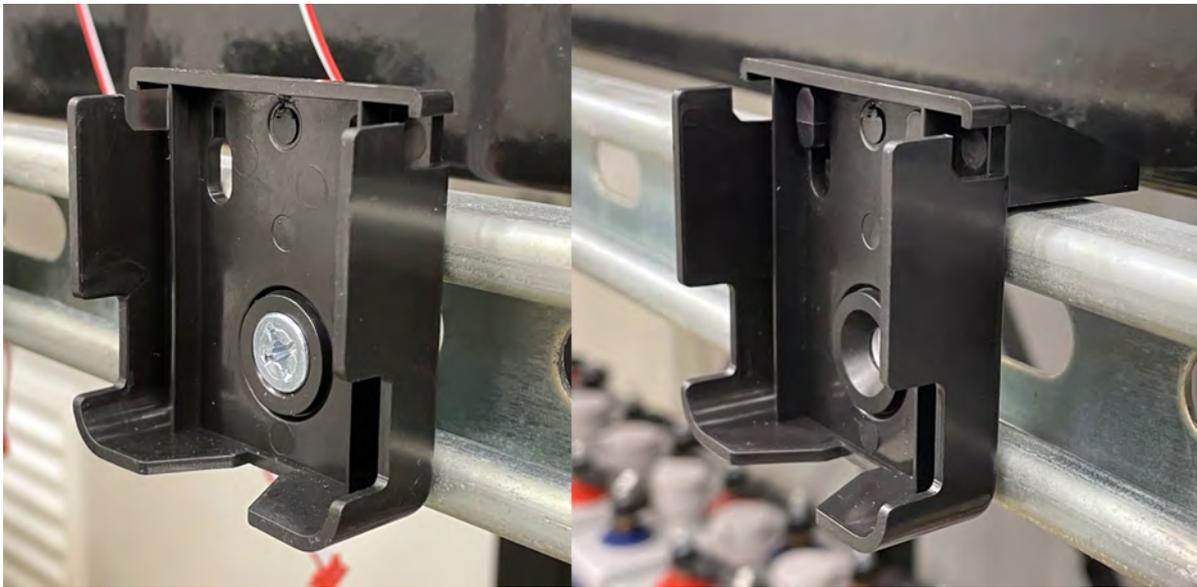
- Monitor dimensions:
-
- Each monitor includes a DIN rail for mounting, ensure the surface for mounting the monitor can accommodate the DIN rail securely
- The monitor should generally be placed as close to the battery mains as possible, either on the wall or directly on the battery rack. Below are 2 examples of each mounting option:



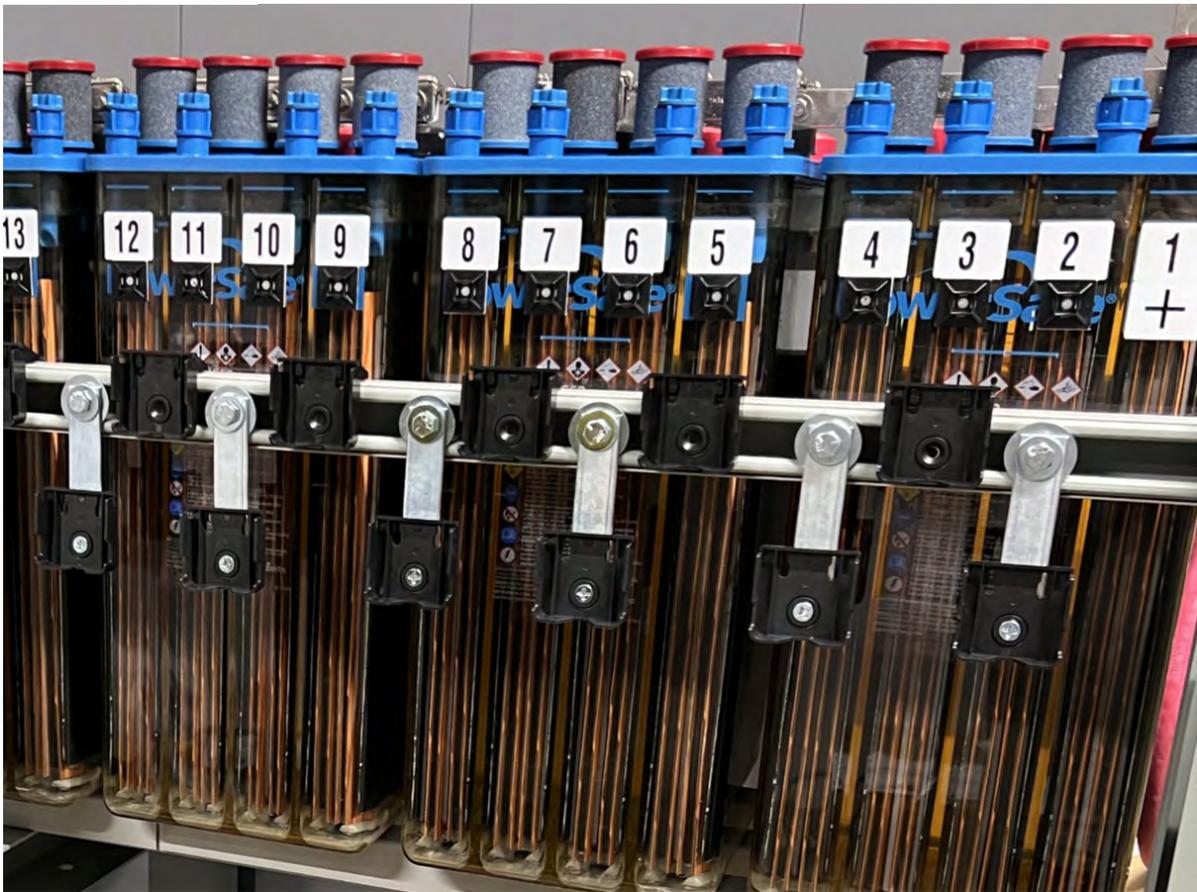
- The monitor should not be mounted more than 25 ft. (7.6m) from the battery.
- RJ12 communications cable will need to be cut to length and ran from the monitor to the first and last Vigilant sensor on the battery.

1.2.2 Vigilant Sensors

- Sensor dimensions:
 - Each sensor with the cradle is 2" wide, 2" tall, and 1.5" deep.
 - There needs to be at least 2" on each side of the sensor to fit the communications cable. If 2 sensors are mounted side-by-side, there should be at least 3" between them.
- Each sensor includes a mounting cradle. Understanding the mounting options should be considered when determining sensor placement:
 - **Hardware mount:** Sensor cradles have a hole in the middle for a bolt or screw. This is the preferred mounting method (*see left image below*).
 - **Adhesive mount:** Sensor cradles can be mounted using the adhesive backing. This should only be considered when hardware mounting is not possible (*see right image below*).



- In considering sensor placement, understand the cable length limitations:
 - **Tab Harnesses:** Each harness is 3.3ft long, do not place sensors more than this distance from the battery terminals (less than 2.5ft is ideal).
 - **RJ12 Cable:** Each sensor includes a 12" long RJ12 cable for sensor to sensor communications. Keep this in mind when spacing out sensors.
 - **ELM Cable:** The cable from the Vigilant sensor the ELM is 12" long. The ELM sensor is mounted on the front of the jar.
- Placement for Flooded/VLA battery systems:
 - It's recommended to mount the sensor inline with each cell, so that the sensor is in front of the cell.
 - On smaller battery systems, it may be difficult to fit sensors right next to each other. In this case consider a bracket which will stagger the sensors but still allow them to be in-line with each cell.



- Placement for front facing sealed/VRLA systems:
 - Sensors are typically mounted on the side or top of the battery bank. Keep in mind cable length limitations for each sensor. For example, if mounting sensors on the top of the battery bank, ensure the 3.3ft harness for that sensor can reach cells at the bottom of the battery bank.



1.2.3 ELM Sensors

- The placement of ELM Sensors requires more attention to detail than the other components. **For the sensors to measure electrolyte level accurately, they must be mounted exactly as this guide outlines.** These steps will be detailed in section 1.4.
- ELM sensors include a cradle which is mounted to the front of the battery jar. When planning placement of the ELM sensors, ensure there is adequate space above and below the minimum line on the jar for the cradle to mount.
- Below are common issues that can get in the way of ELM sensor placement:
 - Battery labels: Sensors must be placed in a spot with no stickers or obstructions behind the sensor.
 - Battery number stickers: For smaller jars, sometimes the battery number stickers are in the way of the only clear area on the jar. They must be moved.
 - Battery racking: Especially in seismic zones, the battery racking can get in the way of the sensors. It will need to be moved or the sensors might need to be mounted on the back of the cells. Contact Eagle Eye if this is an issue.
- ELM sensors connect to the Vigilant sensors with the provided 12" ribbon cable. Ensure the Vigilant sensors are close enough to where the ELM sensors will be mounted to account for this.

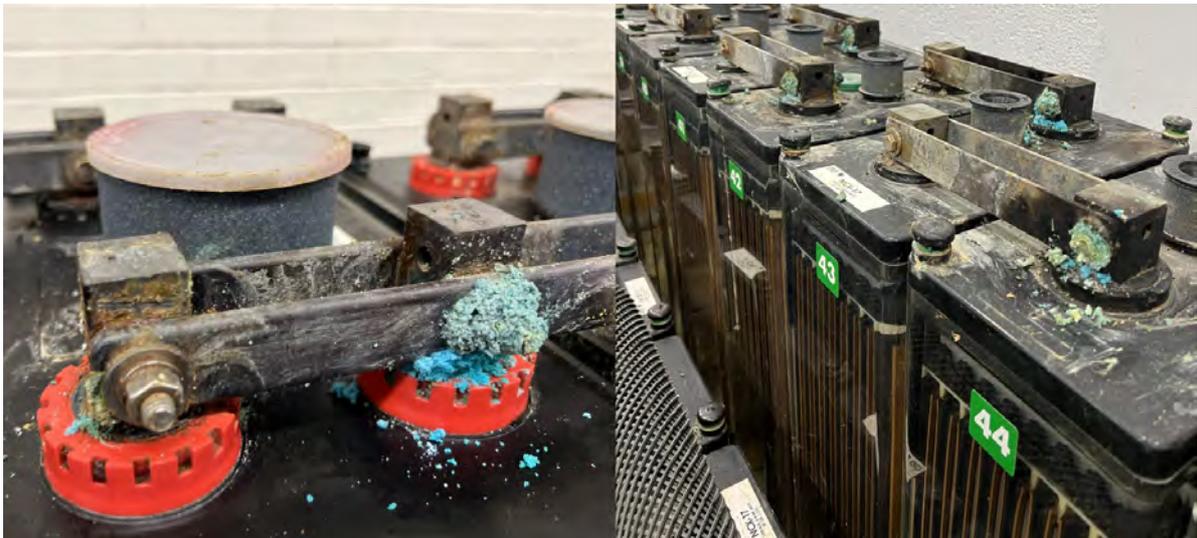


1.3 Battery Preparation

Prior to installing the Vigilant components, proper preparation of the battery must be completed.

1.3.1 Clean Battery Posts

- Battery posts must be clean for the Vigilant to work as intended.
- Clean off any corrosion on the batteries and posts. Excessive corrosion can damage the Vigilant components over time.
- Clean off excessive grease from the battery posts. Grease prevents the system from taking accurate measurement readings.



1.3.2 Clean Front of Jar

- This step only applies if installing the ELM sensors on flooded batteries.
- For strong adhesion of the ELM sensor cradles to the battery jar, any residues must be cleaned off.
- There are 2 preferred solutions to clean the front of the battery jars:
 - Isopropyl alcohol - Works for most battery types and does not harm the jar.
 - CRC PF Precision Cleaner (P/N: 03190 (US)) - A more thorough cleaner which can remove some of the anti-adhesive properties of some battery jar labels (EnerSys specifically).
- For either cleaning solution, clean each jar first, then go through again with a dry rag and buffer the jars.
- Be careful not to bump any sharp components

1.4 Install Components

This section will outline detailed steps for installing each component on the system.

1.4.1 Vigilant Monitor

Parts Needed

Part	Use	Where to Find
Vigilant Monitor	Main controller for data measurement and storage	Packaged in monitor box
DIN Rail	For mounting Monitor	Attached to back of monitor
Ambient Sensor	Measures ambient temperature	Packaged in monitor box

Installation Steps

1. Remove the 2 front covers from the monitor by loosening the screws. Back the screws out as far as you can without completely unscrewing them, then pull the covers out.



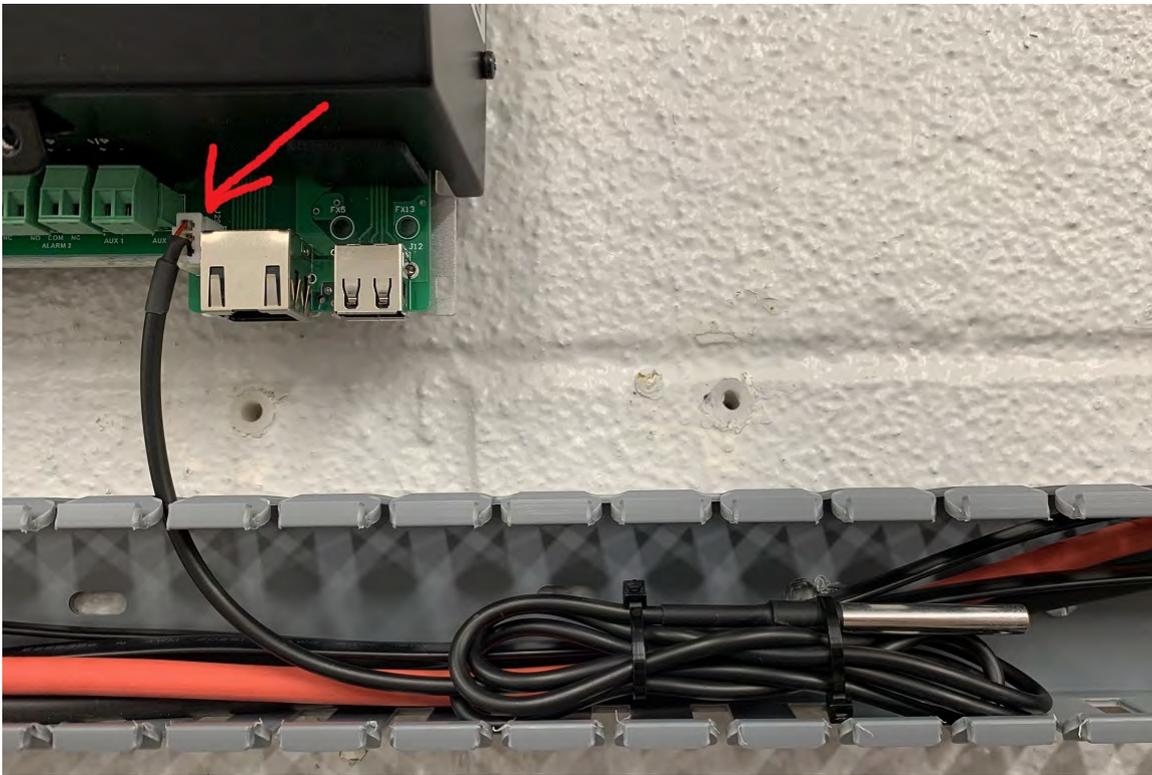
2. Remove the DIN rail by sliding the center clip on the back of the monitor down. This can only be done with the covers removed.
3. Mount the DIN rail to determined location (hardware not included).
4. Slide the monitor over the DIN rail, aligning the tabs on the back with the top of the DIN rail.



5. Push the DIN rail clip up to secure the monitor then hold the monitor with both hands and shake it gently to confirm it's mounted securely.



6. Plug the ambient temperature sensor into the port shown below.



7. Secure the sensor near the monitor using cable ties.
8. Put the 2 front covers back on the monitor, with the screws in all the way.

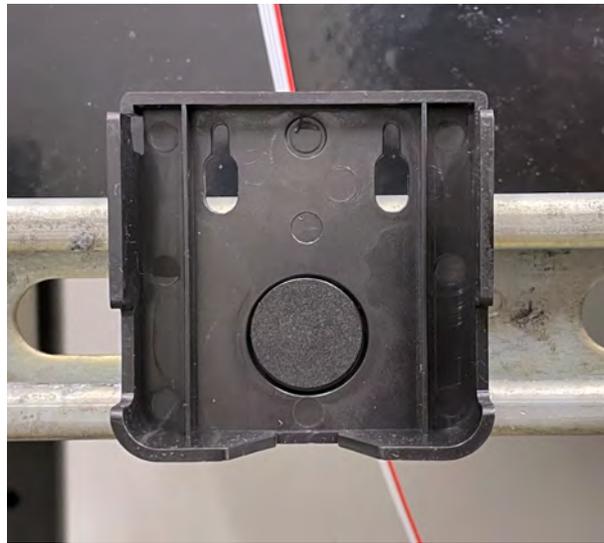
1.4.2 Vigilant Sensors

Parts Needed

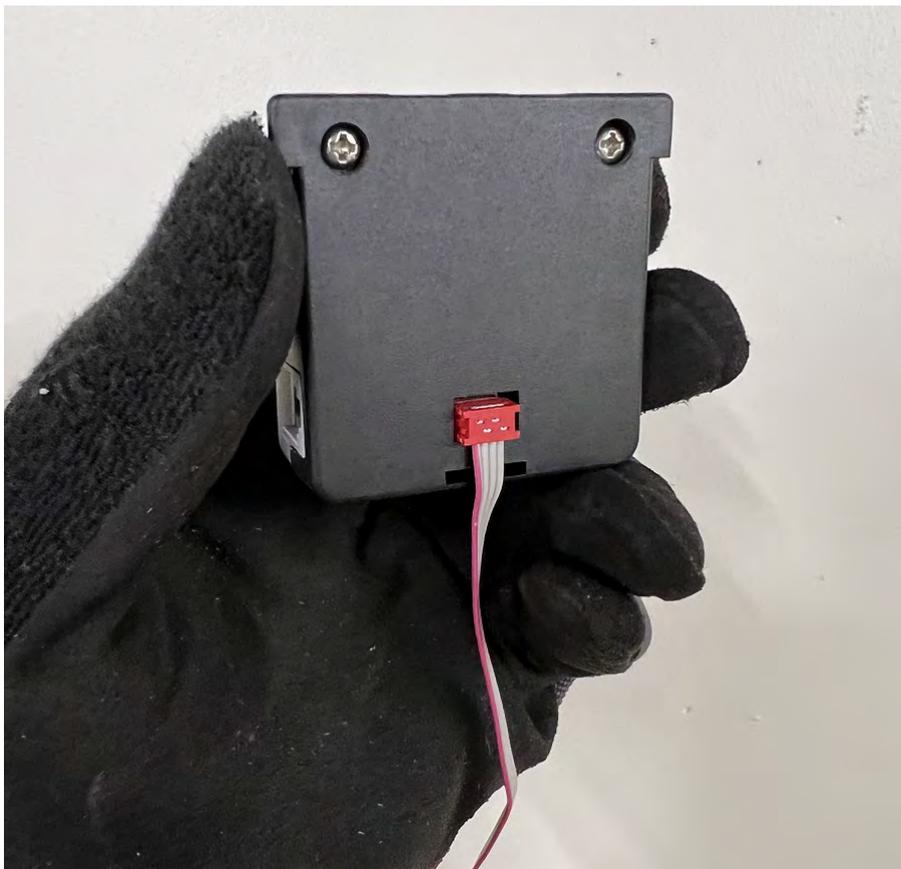
Part	Use	Where to Find
Vigilant Sensor	Measures each battery cell	In sensor box (12 per box)
Sensor Cradle	For mounting each sensor	Wrapped with each individual sensor
ICD Connectors	For tab harness connection to sensor	Plugged into each sensor
RJ12 Comms. Cable	For sensor to sensor communications	Bundled in each sensor box (12 per box)
ELM Ribbon Cable	Connection to ELM sensors (if used)	Bundled in each ELM sensor box (12 per box)
Black Dot Stickers	For covering cradle mounting hardware	Inside the leaflet included with each sensor box

Installation Steps

1. Mount the cradles as determined from Step 1.2.2:
 - **Hardware mount:** Screw each cradle into the battery rack, wall or surface they are mounting on. After secured, place a black dot sticker over the hardware on each cradle.



- **Adhesive mount:** Attach the top cradle piece to the main cradle. Remove both adhesive backings and stick the cradle to the cleaned surface.
2. If using ELM Sensors, attach the ribbon cable to the back of each Vigilant sensor, this will be needed for the ELM installation steps.



3. Slide the Vigilant sensor into the cradle, it's held in place with gravity, there is no locking mechanism.
4. Connect the RJ12 comms cable to each sensor; plug the cable in so that it's on the side of the sensor facing the most negative post of the string. **Do not** plug the other side of the cable into the next sensor, leave them hanging.

- Some battery systems require longer comms cable runs between rack tiers or steps, that step will be addressed in the coming steps.
5. When completed, all sensors should be in the cradles with the included comms cables attached, and ELM cables attached if applicable.



1.4.3 ELM Sensors

Parts Needed

Part	Use	Where to Find
ELM Sensor	Measures electrolyte level	In ELM Sensor box (30 per box)
ELM Cradle	For mounting ELM sensor to jar	Wrapped with each ELM sensor
ELM Ribbon Cable	Connects ELM sensor to Vigilant sensor	Bundled in ELM Sensor box (30 per box)*

*Should already be installed per Step 1.4.2.

Installation Steps

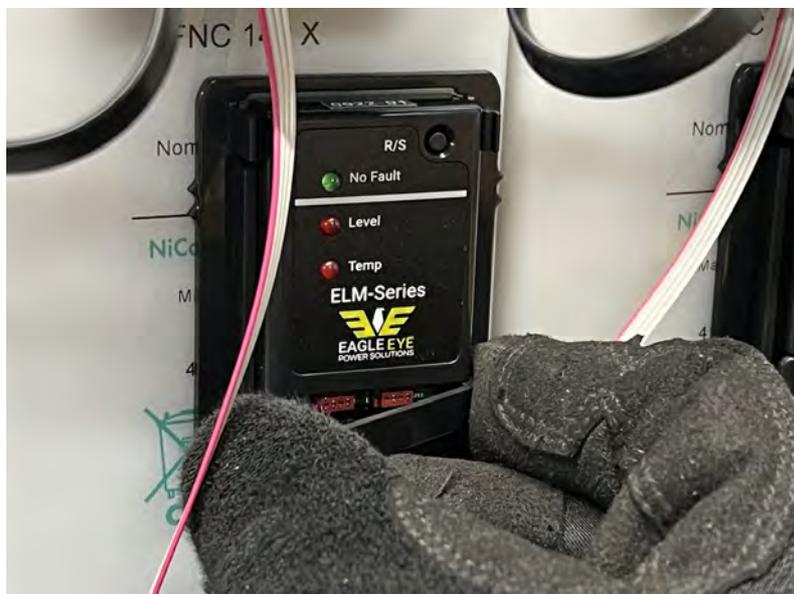
1. General placement of the sensors should have been determined during step 1.2.3. If in the way, battery labels and/or racking should have been moved or adjusted to accommodate the sensors.
2. The cradle has 2 pointed arrows on each side - line up the point of the bottom arrow to the top of the minimum line.



4. Check again that there is nothing printed on the battery jar between the arrow sets, including parts of the battery label.
5. Make sure the minimum line is not in-between the arrows on the cradle.



6. Once the mounting position is determined, remove the adhesive and firmly press the cradle onto the battery jar.
7. Repeat the steps above for all sensor cradles.
8. After the cradles are mounted, slide the sensor into the cradle and click it into place.
9. On the front of the ELM, remove the cover by squeezing both sides.



6. Plug in the ELM ribbon cable to either port (it does not matter which).
7. Put the cover back on the sensor.
8. Go through all sensors again and firmly press the cradles on to the battery jar to ensure maximum adhesion.
9. When complete, all ELM sensors should be securely mounted with the covers in place and ribbon cables connected to the Vigilant sensors.

1.5 Make Longer Cable Runs

Earlier in this guide it was mentioned that some cable runs would need to be longer. This applies to between battery racks and/or tiers.

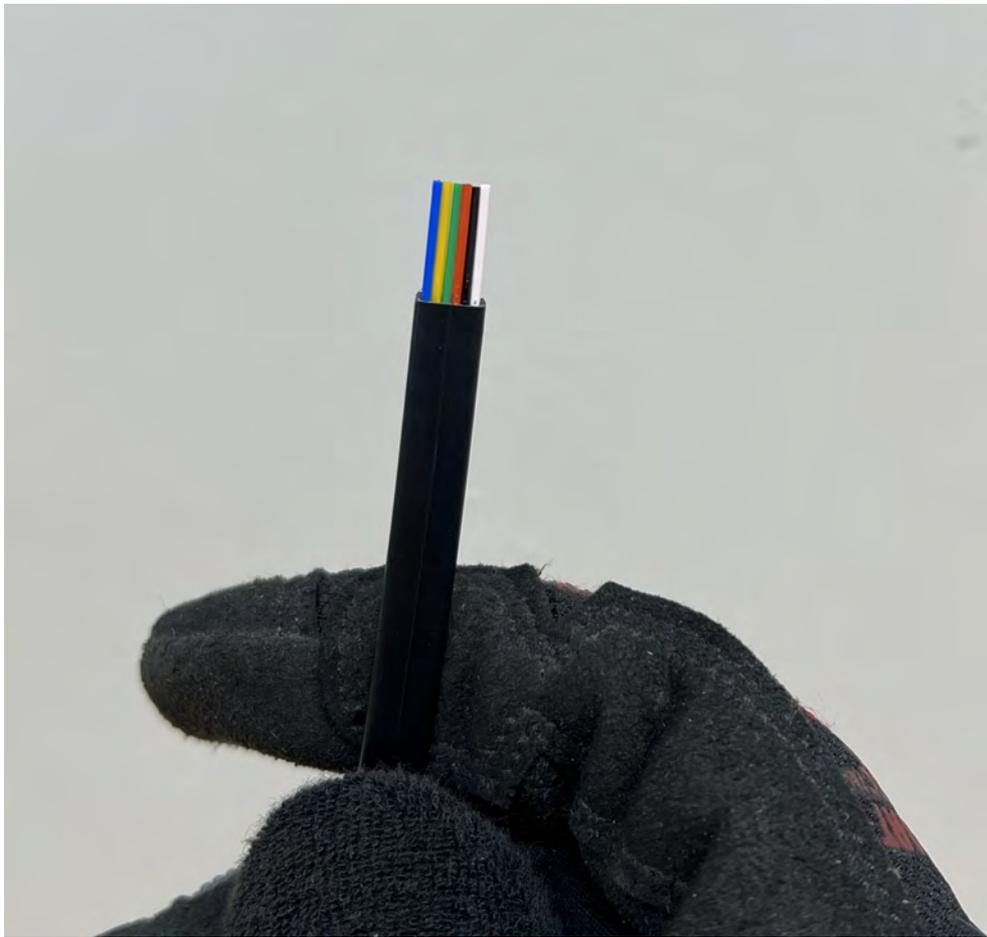
1.5.1 Monitor to Sensors

Parts Needed

Part	Use	Where to Find
RJ12 Cable	Communication between monitor and Vigilant sensors	In a bag in the main box
RJ12 Connectors	Crimp to the RJ12 cables	In the bag with the RJ12 cables

Installation Steps

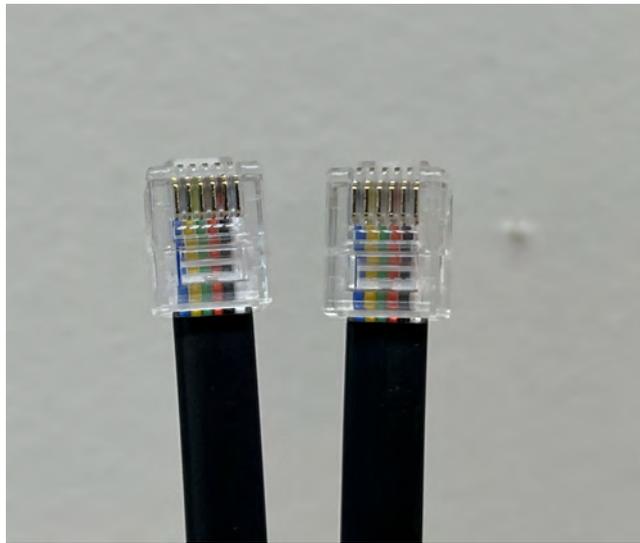
1. Route the first cable from the monitor to the first sensor and cut to length. Cables should be secured to the battery rack using cable ties.
2. Route the second cable from the monitor to the last sensor and cut to length.
3. With the cables cut to length, crimp the RJ12 connectors to both ends.
 - With the crimp tool in hand, strip back cable to expose the 6 colored wires.



- Insert the RJ12 connector into the crimp tool, then insert the cable.



- Take note of the orientation of the colored wires. The next crimp must be done in the exact same orientation. **Failure to crimp the cable correctly can result in damaged sensors and/or the monitor.**
- After crimping, hold both connectors side by side, the wires should be in the same orientation on each connector (e.g., both blue wires on the left like below).



4. Connect the first cable to the leftmost RJ12 port on the monitor, then route the cable to the sensor and connect it.
5. Connect the second cable to the next RJ12 port on the monitor, then route the cable to the last sensor, but leave it disconnected.
6. When completed, both cables should be connected to the monitor and routed to the sensors, secured with cable ties. Only the first sensor should be connected, with the last sensor disconnected.

1.5.2 Tier to Tier Sensors

Parts Needed

Part	Use	Where to Find
RJ12 Cable	Communication between monitor and Vigilant sensors	In a poly bag in the main box
RJ12 Connectors	Crimp to the RJ12 cables	In the bag with the RJ12 cables

Installation Steps

1. Route the cable from the first sensor to the next sensor to determine the length.
2. Follow the steps above to crimp the cables the same way.
3. Plug the made cable into the first sensor, then route the cable to the next sensor securing it with cable ties.
4. Leave the cable unplugged at the next sensor.

When all the longer cable runs are made, the system should be left with only the RJ12 cable from the monitor to the first sensor connected. All other RJ12 cables should only be connected on one end.

1.6 Measurement Parameters Check

The purpose of this step is to confirm conditions on the battery prior to Eagle Eye commissioning the system. Refer to the Installation Checklist form and measure and record the following parameters:

1. Overall Battery Voltage: Measure at the battery terminals using a calibrated voltmeter.
2. Battery Current: Measure on the positive charger cable using a calibrated amp meter.
3. Positive voltage to ground: Measure at the main positive battery terminal to ground using the voltmeter.
4. Negative voltage to ground: Measure at the main negative battery terminal to ground using the voltmeter.
5. Water level: Check if all cells are watered above the minimum line or not. Cells will need to be watered prior to Eagle Eye commissioning the system (for ELM calibration).

1.7 Finalize Installation

Below are the final steps to finish the 3rd party installation and prepare for Eagle Eye to commission the system.

1. Schedule commissioning and start-up with EES group:
 - Annette Stewart: annettes@eepowersolutions.com
2. Store all remaining Vigilant hardware in a clean, dry place:
 - All cable harnesses
 - All connection hardware (c-clamps or tab washers)
3. Confirm end-user login credentials:
 - Username (an email address)
 - Password (8 characters minimum)
4. Confirm end-user login credentials:
 - Static IP Address of the Vigilant
 - Network Subnet IP Address
 - Network Gateway (if required)
5. Submit the EEPS installation checklist with pictures to verify installation is complete.