EAGLE EYE POWER SOLUTIONS

Vigilant Battery Monitoring System for NERC Compliance

Product Overview

The Vigilant Battery Monitoring System is Eagle Eye's complete solution for meeting NERC PRC-005-6 Compliance. Within this standard, battery maintenance falls under *Table 1-4(f): "Exclusions for Protection System Station DC Supply Monitoring Devices and Systems"*. This table outlines the monitoring and alarming requirements needed to alleviate periodic on-site maintenance activities. The Vigilant is designed to meet and exceed all of these requirements. Additionally, proprietary machine-learning algorithms are used to measure cell condition and provide battery end-of-life predictions.

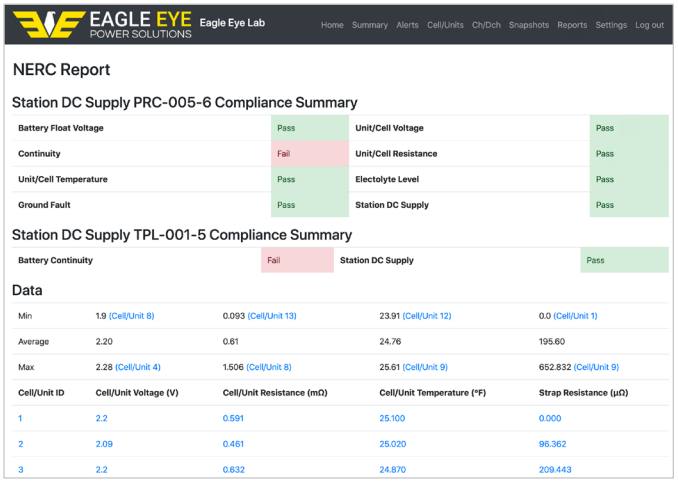
Parameters to Meet Compliance

The Vigilant system monitors and alarms for the following battery parameters as required in PRC-005-6:

- **String Voltage:** High and low monitoring and alarming of string voltage measured at the battery terminals.
- **Electrolyte Level:** Alarming and identification of low electrolyte level for every cell with infrared sensors.
- **Ground Fault:** Monitoring and alarming for unintentional DC ground fault by measuring earth potential relative to battery voltage.
- **String Continuity:** Monitors precise float current (in mA) by measuring the potential difference across the cell interconnections.
- **Float Voltage:** Monitoring and alarming of float voltage at the battery terminals.
- **Intercell & Terminal Connection Resistance:** Monitoring and alarming of battery terminal resistance and *each* intercell connection resistance as independent values.
- **Internal Ohmic Value & Float Current:** Monitoring and alarming of each cell's internal resistance against an established baseline per cell.
- **Negatvie Post Temperature** *(not required)***:** Monitoring and alarming of each cell's negative post temperature.

Key Features

- **One-Click Reporting:** Remove guesswork in reporting by easily creating NERC-compliant reports
- **TPL-001-5 Compliance:** Reports include compliance for this standard
- **Machine-Learning:** Proprietary algorithms provide cell condition and complete risk factor with projected end of life
- **Versatile Alarming:** Software alarming features as well as up to 6 dry contact outputs
- **Ease of Installation:** Universal components allow for simple installation to most battery types and can be installed while battery is in service
- **Charge/Discharge Events:** Automatically record all battery events with detailed playback options



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Home Summary Alerts Cell/Units Ch/Dch Snapshots Reports Settings Log out

NERC Report

Station DC Supply PRC-005-6 Compliance Summary

Battery Float Voltage	Pass	Unit/Cell Voltage	Pass
Continuity	Fail	Unit/Cell Resistance	Pass
Unit/Cell Temperature	Pass	Electolyte Level	Pass
Ground Fault	Pass	Station DC Supply	Pass

Station DC Supply TPL-001-5 Compliance Summary

Battery Continuity	Fail	Station DC Supply	Pass

Data

Min	1.9 (Cell/Unit 8)	0.093 (Cell/Unit 13)	23.91 (Cell/Unit 12)	0.0 (Cell/Unit 1)
Average	2.20	0.61	24.76	195.60
Max	2.28 (Cell/Unit 4)	1.506 (Cell/Unit 8)	25.61 (Cell/Unit 9)	652.832 (Cell/Unit 9)
Cell/Unit ID	Cell/Unit Voltage (V)	Cell/Unit Resistance (mΩ)	Cell/Unit Temperature (°F)	Strap Resistance (μΩ)
1	2.2	0.591	25.100	0.000
2	2.09	0.461	25.020	96.362
3	2.2	0.632	24.870	209.443

One-Click NERC Report

Vigilant System

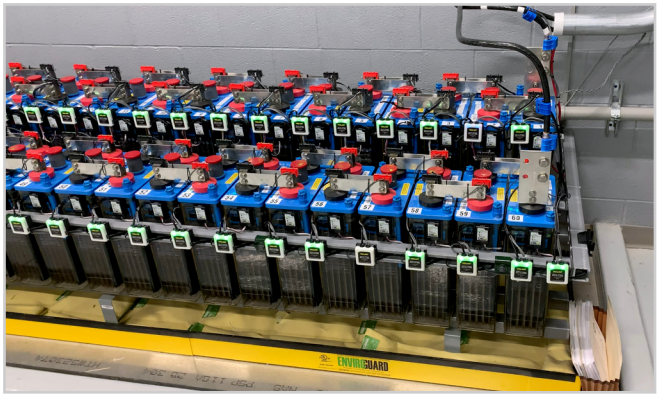
Each Vigilant has the following main components:

- 1 **Monitor** for up to 240 cells, divisible across 8 strings (e.g. 6 strings of 40 12V units)
- 1 **Sensor** per cell/unit, plus one additional sensor per string to monitor terminal resistance
- 1 **Wiring Harness** per sensor, connected to clamps
- 2 **Clamps** per battery, to monitor voltage, internal resistance, connection resistance, float current, & negative post temperature

Monitor

Sensor

Clamp & Harness



Technical Specifications

Sensor Performance	
Voltage Measurement Range	0.05 – 18.5VDC
Voltage Resolution	± 1mV
Post Temperature Resolution	± 1°C
Cell Resistance Resolution	± 7µΩ
Strap Resistance Resolution	At 100µΩ strap r: ± 2µΩ
Float Current Resolution	At 100µΩ strap r: ± 1mA

Communication	
Onboard Storage	SSD
Memory Capacity	20 years of battery data average for 60C, expandable for larger systems
Local Data Download	Via USB port
External Protocols	Modbus TCP, DNP3 (in development)
Alarm Relays	(2) Input/Output standard (4) Additional w/add-on
Network Interface	RJ45 Ethernet

Electrical Data	
Monitor Electrical Supply (from DC supply)	36 – 72VDC 90 – 300VDC 280 – 580VDC
Other Power Options	24VDC mains input (for other voltages w/adapter)
Sensor Electrical Supply	From Monitor (via comms)
Sensor Supply Current	Operating: 6mA With ELM: 10mA
Isolation I/P to O/P	1,000VDC
Test current @ 2.5V	20A

General	
Dimensions (L x W x H)	Sensor: 50 x 50 x 25 mm (2 x 2 x 1 in.) Monitor: 242 x 200 x 65 mm (9.5 x 8 x 2.6 in)
Operating Temp. Range	-4 – 70 °C (25 – 158°F)
Certification	CE (pending)