BOLT™
Power Quality Recorder
User's Manual

Power Monitors, Inc.

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Please contact us at the email powerquality@powermonitors.com

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Safety Specifications

This instrument is designed for measurements on
600V CAT III, Pollution Degree 2 installations. Installation Category III relates to the source of the low voltage distribution level installation.

Safety Standards
•UL 61010-1 second edition, 2004
•CAN/CSA-C22.2 No 61010-1, second edition, 2004
•EN/IEC 61010-1 second edition, 2001-02 With revisions through 6/2005.

This Safety Notice has been included to emphasize the danger of hazardous voltages on the input connection leads of your Bolt power quality recorder. **USE EXTREME CAUTION WHEN CONNECTING** your instrument. Hazardous potentials exist on voltage input leads and banana jacks. Please read the entire contents of the "Connecting the Bolt™" section before attempting to connect or service your instrument.

⚠ **Warning** ⚠

To avoid electric shock, use only the test leads and Current Transformers (CTs) supplied with the Bolt recorder.
•Inspect the voltage test leads and CT cables for damage to the insulation prior to use.
•Do not use exposed non-sheathed banana plug connectors or adapters, or retractable sheath type connectors.
•Remove all test leads that are not in use. The maximum permissible input voltage is 600V between inputs (channel-channel, or channel to common).
•Use only one connection to the COM connector on the Bolt housing.
•Do not connect the USB cable to the Bolt's communication port while the unit is powered from the voltage input jacks, as the USB cable is not rated for 600V CAT IV installation.

Safety Issues

Please read this safety information carefully before installing or using the Bolt. The interior of the recorder contains dangerous voltage levels during operation.

TO AVOID ELECTRIC SHOCK AND TO PRESERVE THE ENVIRONMENTAL INTEGRITY OF THE HOUSING, DO NOT ATTEMPT TO REMOVE THE LID OR OTHERWISE DISASSEMBLE THE UNIT.
THERE ARE NO USER SERVICEABLE PARTS INSIDE THE RECORDER.

This device is manufactured for use by trained and qualified personnel only. Do not install or operate while in contact with standing water or wet ground. Protective gloves, glove covers, safety glasses, and any other PPE required by your organization's applicable safety policies, should always be worn during installation, operation, and removal of the recorder. Where possible during installation, disconnect power from any lines to which the recorder will be attached.

PMI flexible CTs and True Low-Amperage Reading (TLAR) CTs available for use with the Bolt are manufactured with 600V rated integral cables, preventing accidental disconnection. Although the recorder has been designed and built to be as safe as possible, great care should always be exercised during operation and installation.

Safety Continued

⚠ **Warning** ⚠

To avoid electrical shock, use only the voltage test leads and current measuring accessories provided with the Bolt.

- TLAR current clamps and Flex CT accessories should only be connected to PMI products designated for use with these devices.
- Inspect the voltage test leads and CT signal cables for damage to the insulation before use.
- Do not use if there are visible cuts or punctures to the cable jacket, or inner wires are visible or exposed.
- Do not use chemicals to clean the voltage leads, CT accessories, recorder, electronic enclosures, or any part of the Bolt. Use only a clean, damp cloth to wipe the exterior of these devices.
- The Flex CTs electronics enclosure is sealed and potted for environmental integrity and safety. To ensure safe and reliable operation do not attempt to open the enclosure.

Environmental Considerations

To assure optimum performance and safety, observe the following precautions when selecting an installation environment for the Bolt and its accessories.

- Operating ambient temperature must be between -20°F to 135°F (-28.89°C to 57.22°C).
- Humidity must be less than or equal to 85%.
- Do not use in hazardous locations, as defined by the National Electric Code. The Bolt is not constructed with explosion proof fittings and is not approved for use near flammable gases or combustible dust.

Glossary Of Symbols

Below is a glossary of symbols that appear on the Bolt. Please read this section carefully to familiarize

	C-UL-US Indicates compliance with both Canadian and United States Underwriters Laboratories (UL) requirements.
	FCC Compliant Indicates that the device is FCC compliant, meaning it complies with the Federal Communications Commission's rules and regulations for radio frequency (RF) emissions and electromagnetic interference (EMI).
	Caution Indicates that caution should be exercised due to risk of danger. Refer the the safety specification page and installation procedure on pages for more information.
	Double Insulation Indicates that the equipment is protected throughout by double insulation or reinforced insulation.

Introduction

Bolt recorders are easy-to-use, line powered power quality recorders that produce accurate readings and professional reports. These recorders can help resolve customer voltage and power quality complaints, record flicker, conduct long-term voltage and current surveys, and detect sub-cycle voltage and current variations. The Bolt will not disrupt or alter the normal power source to which it is connected, as it uses a minimal amount of power from the monitored line connected to CH1 voltage input.

Each Bolt gathers and stores interval graph data, recording the average, minimum, and maximum readings for a user-selected interval with up to one-cycle resolution. Even events lasting less than one cycle are revealed in ProVision® or PQ Canvass reports if the recorder is configured to capture the information. The Bolt also calculates derivative power measurements such as power factor, phase angle, reactive power, harmonics, and triggered power quality events.

We offer a variety of ways to interact with your device's data. Options include:

- **PQ Canvass:** Power Monitors' cloud-based software, accessible through any standard web browser. Bolts configured with Wi-Fi can send data directly to PQ Canvass. Triggers, alerts, analysis, and reporting tools are all available within PQ Canvass.
- **PMI View (iOS):** Power Monitors' newest iOS application for power quality data analysis. View live waveforms, vector diagrams, harmonics, real-time meter readings, and easily downloadyour recordings to be uploaded and analyzed with PQ Canvass. iOS offers on-device recording analysis for users who need instant access in the field. and inspect recordings directly on your iPhone or iPad.
- **PMI View (Windows):** Power Monitors' newest application for Windows desktop. View live vector diagrams, real-time meter

readings, real-time flicker readings, and easily initialize and download recordings over USB, Wi-Fi, or Cell.

- **PQ Canvass:** Power Monitors' cloud-based software, accessible through any standard web browser. Bolts configured with Wi-Fi can send data directly to PQ Canvass. Triggers, alerts, analysis, and reporting tools are all available within PQ Canvass.

Installing the Bolt is simple, however the same attention to safety as working with any other high-voltage device should always be followed. Please read the Safety Information section of this manual prior to installation. Also see the section entittled Installation for additional infomation.
Once the unit has been installed and the recording is complete, the data can be downloaded with ProVision using the USB cable.

Our ProVision software allows you to create an array of graphs and reports, each of which provides useful, clearly presented data. If using PQ Canvass, data is sent from the Bolt automatically, and the recorded data can be viewed and analyzed at any time.

Real-time data from your device can be accessed and analyzed in multiple ways. You can view it via ProVision by using select laptops and desktop computers. Refer to the ProVision manual for more information.

Alternatively, use PQ Canvass to display data on a laptop or desktop using any modern web browser (Chrome, Firefox, Safari, Edge, etc) on any modern operating system (Windows), or on mobile devices and tablets. The PQ Canvass user manual provides further details.

For mobile analysis, PMI View offers another way to collect, analyze, and inspect field devices connected through direct wifi connections . PMI View

allows you to see live waveforms, vector diagrams, harmonics, and meter readings in real time. Recordings can also be downloaded, inspected, and exported to ProVision or PQ Canvass.

Getting Started

What you'll need

- **Bolt Recorder**
- **Compatible Cables**
  - 3-Channel Voltage Cable: Used for power connection and monitoring.
  - 3-Channel Boxless CTs: Used for power monitoring.
    Important: The Boxless CTs are the newest design offered by Power Monitors and are not reverse-compatible with Box CTs.
  - USB Cable: Used for power connection, data transfer, and initialization of the device.
- **PQ Canvass Account (Optional)**:
  - Web-enabled device: Can be a desktop, laptop, tablet, or phone with a modern web browser.
  - Find it at pqcanvass.powermonitors.com
- **PMI View**
  - View data, configure your recorder and perform basic analysis directly on your iOS device or WIndows PC.
- **Internet Connection (Optional):** Required for using PQ Canvass and installing PMI View.

Connecting the Bolt to ProVision

1. **Download Drivers**: Get the latest USB drivers for your Windows

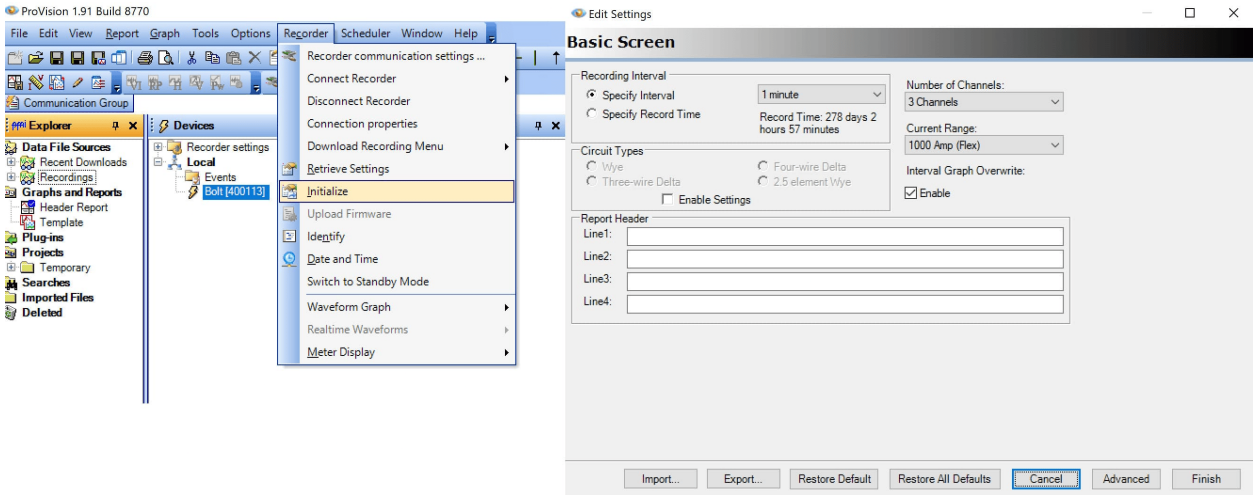
computer: https://powermonitors.com/downloads

2. **Connect the Cable**: Plug the USB Type A end of the provided cable into your computer and the other end (9-pin female) into the Bolt's USB / CT connection port.
    a. The Bolt's 3 LEDs, located around the CT connection point at the top of the Bolt, will light up white while flashing in a circle to indicate that it is powering up.
3. **Power and Auto-Connect**: The LEDs on the Bolt will light up orange, indicating it's powered and in communication mode. ProVision will automatically recognize the Bolt when opened.

If you're trying to connect over a local area network, see the section entitled Connecting Over A Local Area Network (Not recommended for most users)

Initialization

After connecting your Bolt to your PC or laptop, select the [Recorder] tab in ProVision followed by the [Initialize] command. The default settings shown in the Initialization menu pages will get you started. See the section titled What the Bolt records for more. You can also contact the Technical Support Team for additional assistance.



When finished, simply unplug the USB cable from your computer. The Bolt's entry will disappear from the Devices list in ProVision.

Starting A Recording

In order to begin your recording, youll need to connect the Bolt to an AC power source. The power provided from the USB cable and your computer **will not** begin a recording. The Bolt can be line powered with a voltage between 60VRMS and 600VRMS.

Important Notes About Start Up

- **Waiting for Power:** When first initialized, the Bolt waits for you to connect an AC power source to begin recording.
    - See the sub-section Recording Standby Mode for possible LED states
- **Two-Minute Countdown:** After AC power is connected, the Bolt starts a two-minute countdown to perform self-checks.
    - See the sub-section Recording Countdown Mode for possible LED states
- **Ready Mode:** Once the countdown is complete, the Bolt enters Ready Mode and begins recording data.
    - See the sub-section Recording Ready Mode for possible LED states

Downloading Data

Once you're done recording data with your Bolt, you'll need to download that data for viewing. Here's what you should know.

- **Download options**: Use ProVision software with a USB cable (in the field or back at your facility)

- **Stopping recording:** The Bolt stops recording when you halt the process through the software or follow safe disconnect procedure.
- **Data retention:** Recorded data is stored safely in the Bolt's memory even after it has been disconnected from power.

USB Download

1. **Safe Disconnect:** If you're using a USB cable for download, make sure to disconnect the Bolt from its monitored power source properly.
2. **Back at your facility:** Connect the Bolt to your computer using the USB cable. The LEDs will light up, indicating it's ready.
3. **Automatic Data Handling:** The Bolt will continue recording after the USB cable is removed and it is connected to AC power (if memory allows). To start a new recording, re-initialize the Bolt.

PQ Canvass Note: Data sent to PQ Canvass is stored in the cloud and is not limited by the Bolt's internal memory. A new recording session in PQ Canvass begins when the Bolt is re-initialized.

Analyzing Data

- Refer to the ProVision and PQ Canvass manuals for detailed instructions on analyzing your data. You can find these at powermonitors.com/download/pq-canvass/ and powermonitors.com/download/provision-manual/
- Explore our library of hundreds of power quality analysis whitepapers at library.powermonitors.com.
- Contact your PMI Sales Representative to learn about training options.

Connecting Over A Local Area Network

In the vast majority of cases, you'll find that connecting through the USB is the most straightforward way to connect your Bolt to ProVision. However, connecting over a network is also supported.

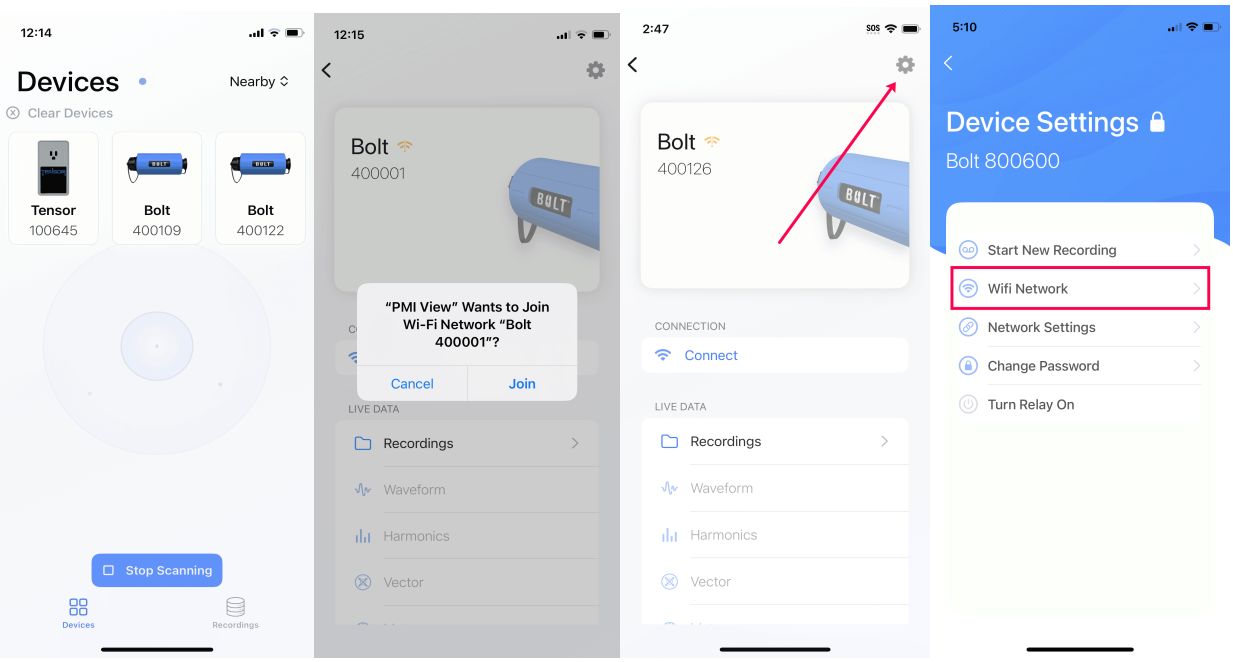
Important: You will need PMI View installed on your iOS device to complete this process.

Connecting Your Bolt to the Network

To begin, open PMI View. Select "Connect To Device".

Your phone may prompt you to enable Bluetooth®, you may also want to double check to ensure it's enabled. It will then search for nearby devices. This may take a few minutes depending on the distance from the device and any physical obstructions between you and the device.

Select the Bolt you wish to connect to. After connecting to the device from your phone via Bluetooth, select the Gear icon in the top right corner.



If this is your first time connecting to this device, you'll need to provide its initialization code. This can found on the card that came with your Bolt. If you don't have access to

this card, please contact Technical Support.

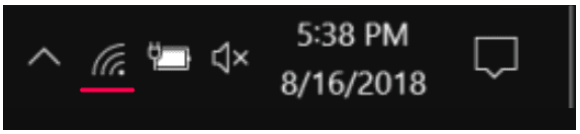
You will then be prompted to create a password for the device. This password will be used to configure your Bolt to join WiFi networks in the future, so take care to preserve this information once it has been set.

Once finished entering your init code and device password, select "Wifi Network".

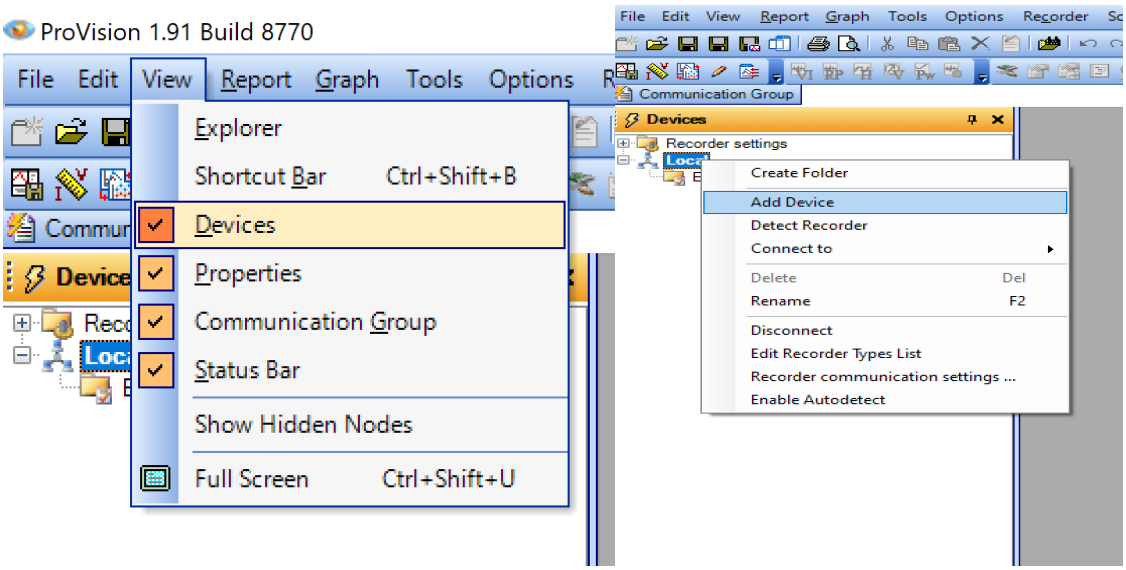
From there, choose your desired network.

Connecting Your Bolt to ProVision

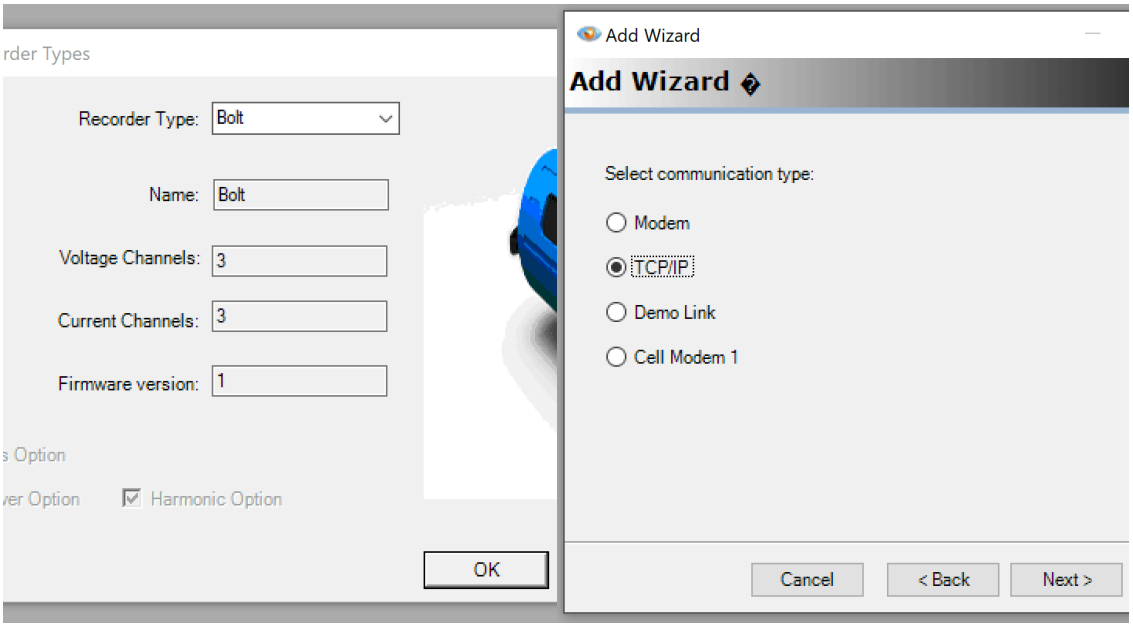
After connecting your Bolt to your network, make sure the device with ProVision is also connected to the same one. You can check by selecting the network icon located in your toolbar (typically in the bottom right corner of your screen). Find and select your desired network.



1. Open ProVision and open the Devices view. You can find this under the View menu by selecting "View" in the toolbar.
2. Right click the "Local" entry, and select "Add Device".
3. Set the Recorder Type to Bolt. The other fields can by left as they are. Click "OK".
4. Enter a name for the device, then click "Next".
5. Choose TCP/IP as the communication type.



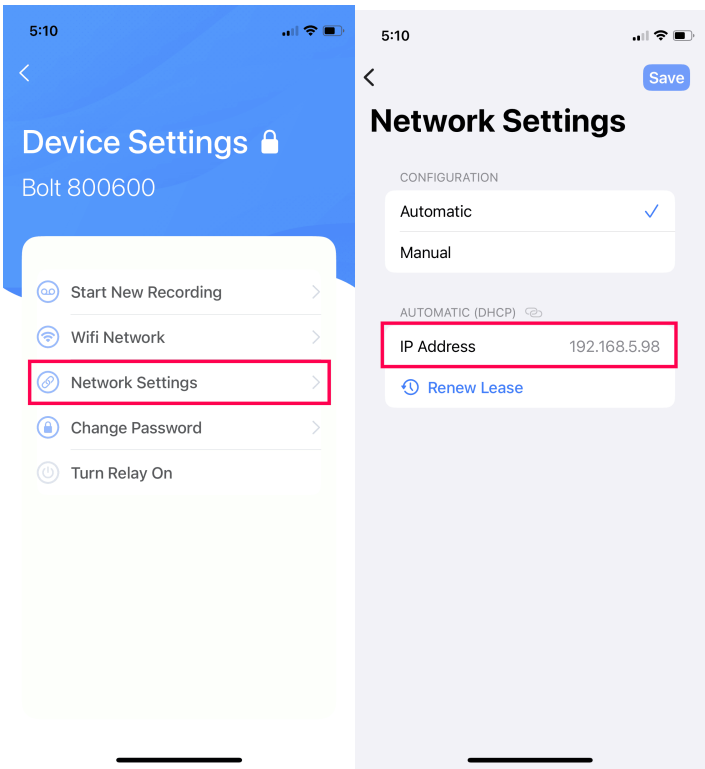
Steps 1 and 2 demonstrated above.



Steps 3 and 5 demonstrated above.

You'll need to enter the IP address of the Bolt next. PMI View can be used to determine this IP address.

1. Open PMI View and navigate back to the Device Settings page from earlier.
2. Select "Network Settings" to see your Bolt's IP address.
3. Go back to ProVision, and enter this IP Address in the "Address" field.
4. Enable "SSL Enabled Device", then click "Next".

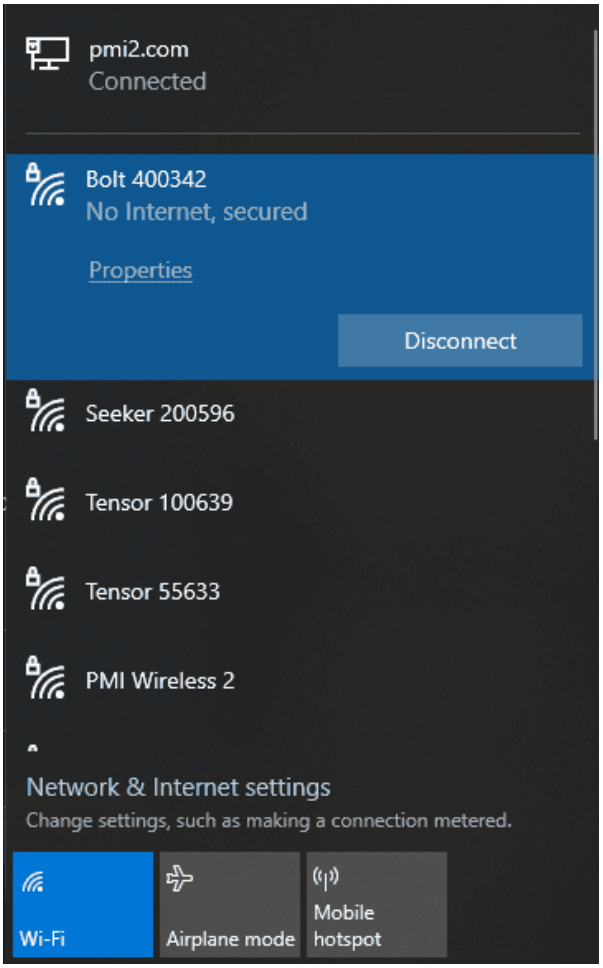


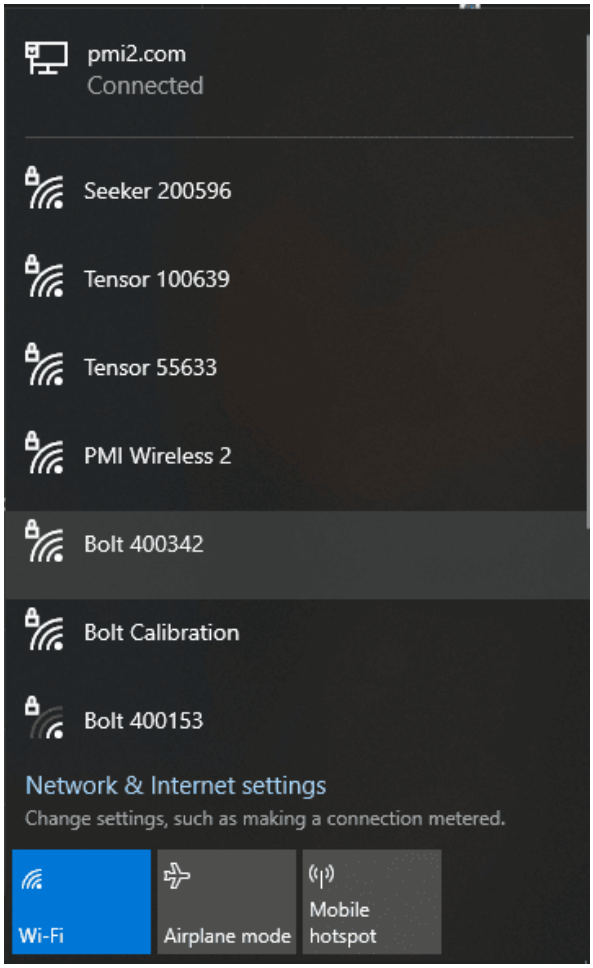
If no problems occurred, you'll be notified that the operation was completed successfully. You can now click "Finish".

Connecting your Bolt to ProVision - Using WiFi

Use PMI View to enable the Bolt WiFi network to be discoverable. For Bolt recorders in Wi-Fi range, a list of Bolt serial numbers will display. Select the target serial number and 'Connect'

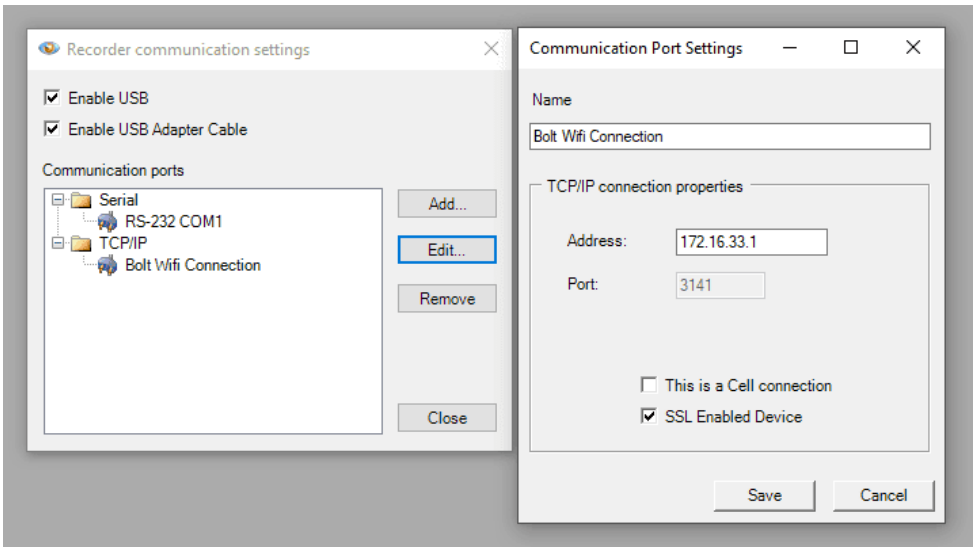
First time connections will be asked for a password – *Contact PMI Technical Support for the password.*

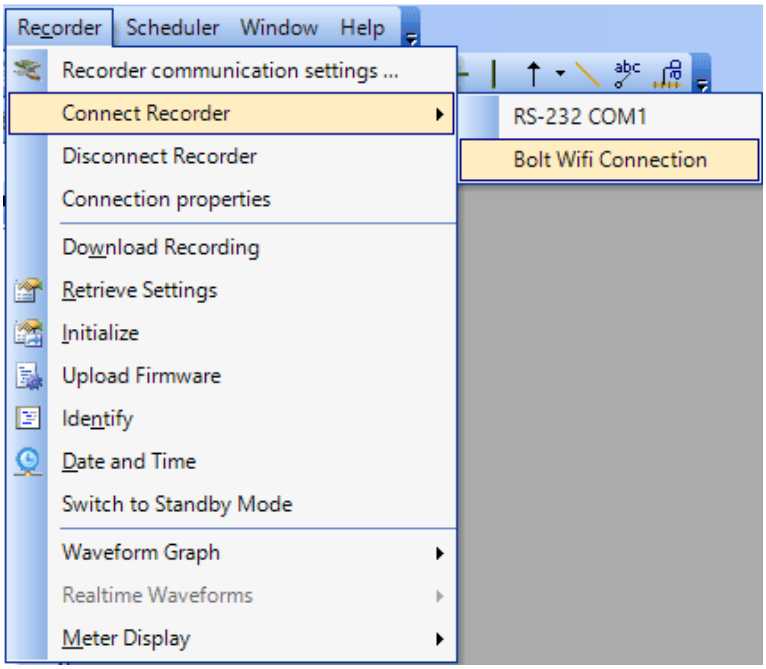




Once the connection is established, return to Provision and connect to the Bolt Wi-Fi IP address. 172.16.33.1

Select the 'Recorder tab' and select 'Connect Recorder' Select the entry for the Bolt Wi-Fi You should see Bolt (serial number) listed in the Devices column with a yellow lightning bolt in front of it. (Not seeing the Devices column? Select the View tab and click on Devices)

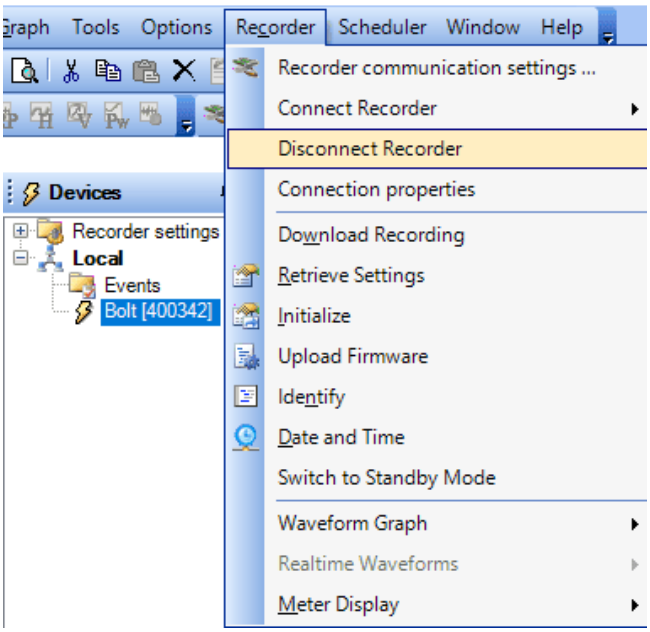




You can now initialize, download, or view live data on the Bolt recorder.

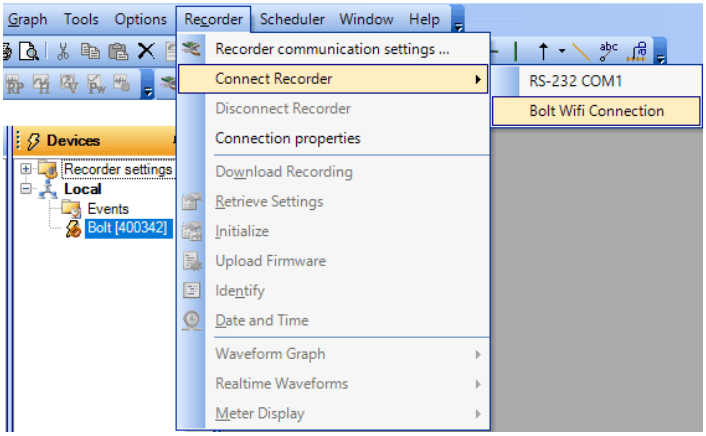
Disconnecting the Bolt recorder from Provision (Wi-Fi)

Select the Recorder tab and then select ‘Disconnect Recorder’



After disconnecting the Bolt name will remain under the Devices column,

To Quickly reconnect, right-click on the name and select 'Connect'



If you have multiple Bolt Wi-Fi recorders, it is best to remove the name every time you disconnect. Right-click on the name and select 'Delete.'

Go back to the PC network setting and also disconnect from the Wi-Fi network.

Starting A Recording

1. Select the "Recorder" tab and select "Connect Recorder"
2. Select the entry for the Bolt.
3. You should see **Bolt (serial number)** listed in the Devices column with a yellow lightning bolt in front of it. (Not seeing the Devices column? Select the View tab and click on Devices).

You can now initialize a new recording, download the current recording, or view live data on the Bolt recorder.

Connecting to the Bolt over Cell

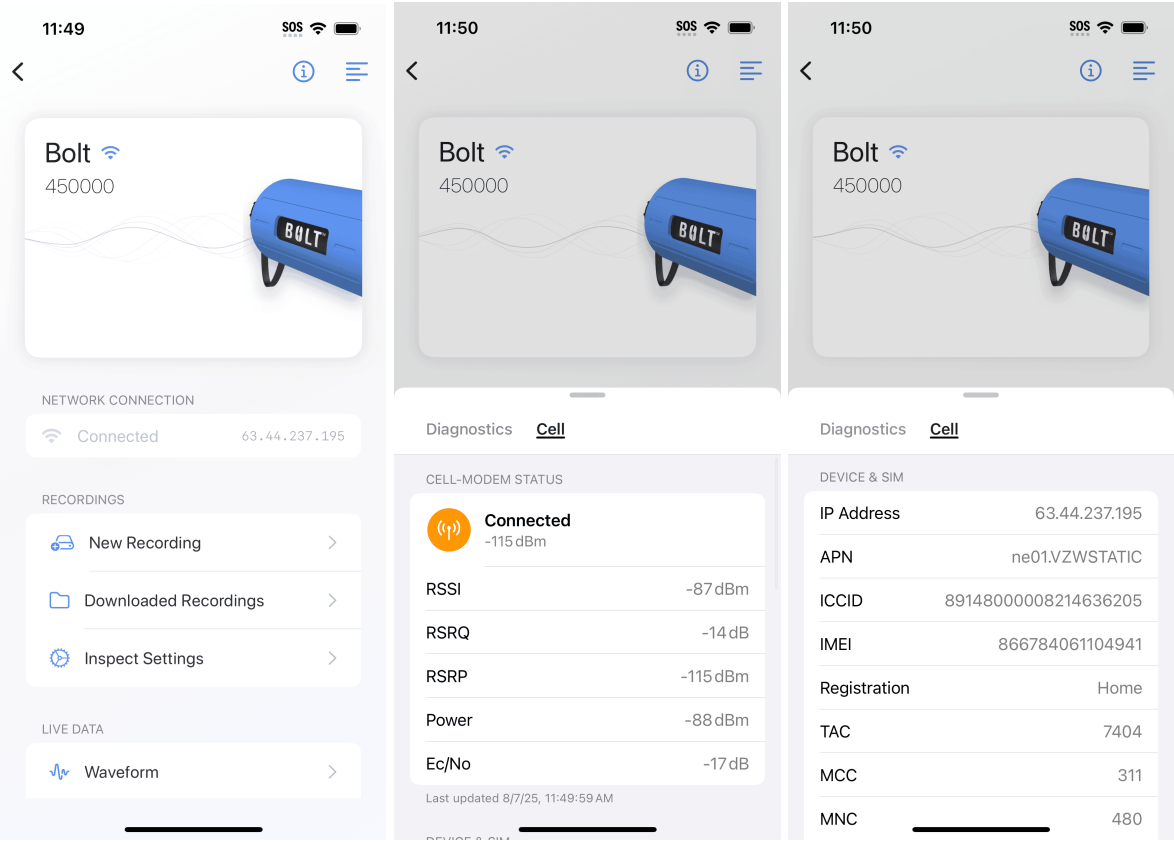
The Bolt is available with a cell modem. Bolts with a cell modem have a brass-colored antenna connection on the side of the housing near the current connector. The following are required to use cell connection:

- Connect an antenna to this connector in order to receive cell signal. An articulated antenna is included with the Bolt, and larger antennas are available if desired.
- An active cell plan is required for the Bolt to connect and transmit data over cell.
- The Bolt will only run the cell modem when connected to AC Voltage, not when powered over USB.
- The Bolt will blink the LEDs purple to indicate cell status. See the LED States section below for details. For the purposes of this section, one purple blink every 6 seconds indicates good status.

If the Bolt is already connected to cell and you know the IP, you can connect to it from PMI View or ProVision by entering the IP address. If you do not know the IP address, PMI View can also be used to see information about the cell modem. iOS PMI View can connect to the Bolt over WiFi, Windows PMI View can connect over WiFI or USB. If the Bolt sends data to PQ Canvass, a subset of cell information, including the IP, is available in PQ Canvass.

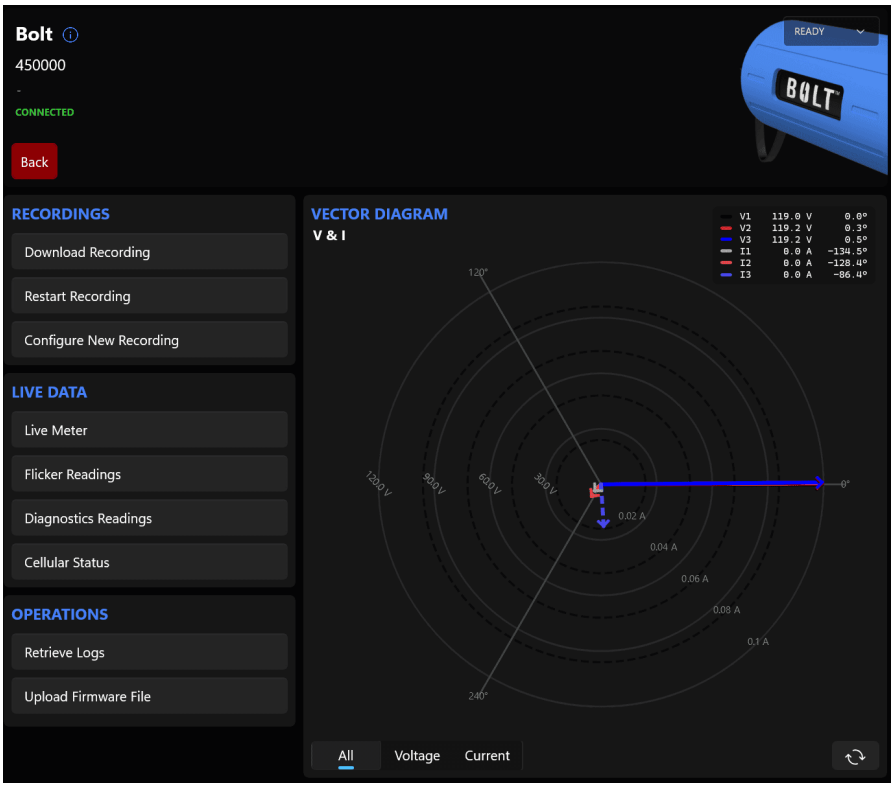
Cell information in PMI View iOS

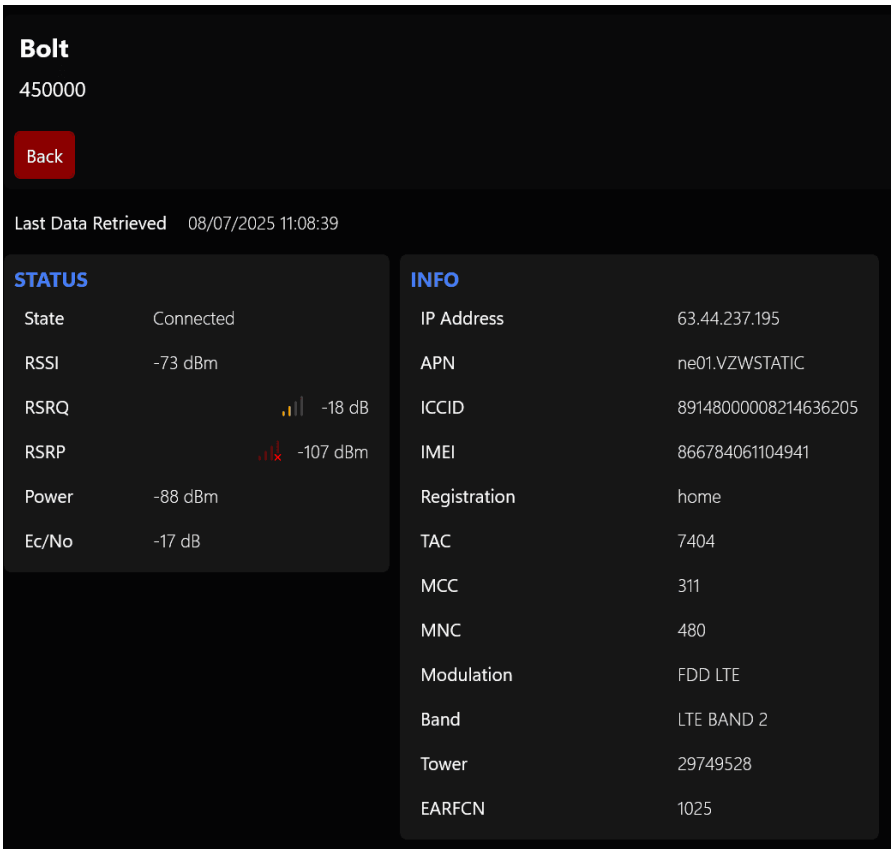
See section about connecting to the Bolt above. Once connected to the Bolt from the application, press the info icon (looks like the letter "i" in a circle) near the top of the screen. This will bring up information about the device itself. Select "Cell" from this tab to see information about the cell connection. Note that if the Bolt does not have cell enabled, "Cell" will not be selectable. Additionally, the cell information updates rapidly while trying to connect, but once the cell is connected, the signal strength information updates once per minute.



Cell information in PMI View Windows

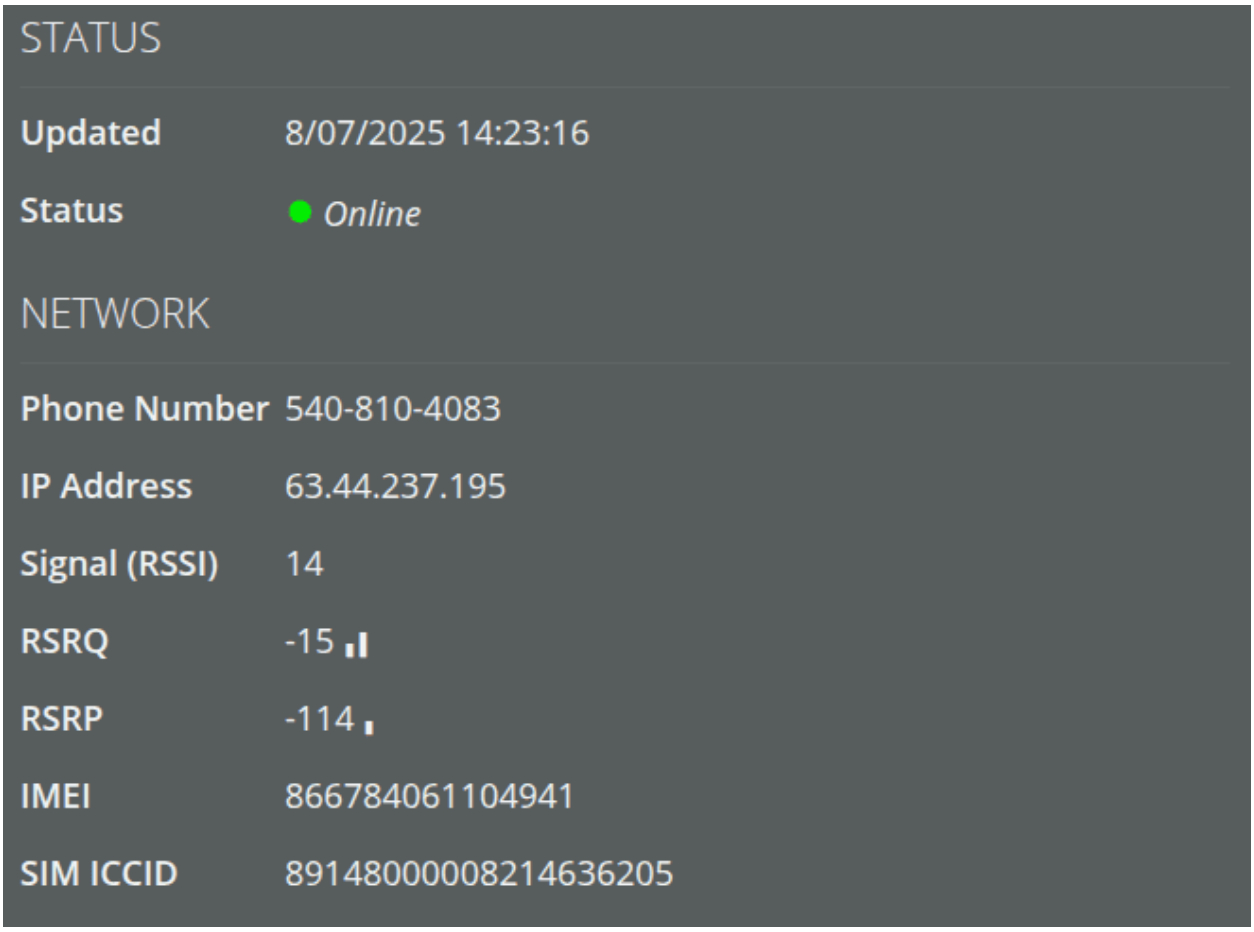
PMI View Windows can display all the same information as PMI View iOS, with the advantage that PMI View Windows supports connection over USB. After connecting to the Bolt, select "Cellular Status". Note that if the Bolt does not have cell enabled, it will not show the "Cellular Status" option. Additionally, the cell information updates rapidly while trying to connect, but once the cell is connected, the signal strength information updates one per minute.


Bolt
450000
CONNECTED
Back
READY
BOLT
RECORDINGS
Download Recording
Restart Recording
Configure New Recording
LIVE DATA
Live Meter
Flicker Readings
Diagnostics Readings
Cellular Status
OPERATIONS
Retrieve Logs
Upload Firmware File
VECTOR DIAGRAM
V & I
V1 119.0 V 0.0°
V2 119.2 V 0.3°
V3 119.2 V 0.5°
I1 0.0 A -134.5°
I2 0.0 A -128.4°
I3 0.0 A -86.4°
120°
240°
0°
1200 V
900 V
600 V
300 V
0.02 A
0.04 A
0.06 A
0.08 A
0.1 A
All
Voltage
Current


Bolt
450000
Back
Last Data Retrieved 08/07/2025 11:08:39
STATUS
State Connected
RSSI -73 dBm
RSRQ -18 dB
RSRP -107 dBm
Power -88 dBm
Ec/No -17 dB
INFO
IP Address 63.44.237.195
APN ne01.VZWSTATIC
ICCID 89148000008214636205
IMEI 866784061104941
Registration home
TAC 7404
MCC 311
MNC 480
Modulation FDD LTE
Band LTE BAND 2
Tower 29749528
EARFCN 1025

Cell Information in PQ Canvass

From the Device List in PQ Canvass, select the Bolt. On the device page, click the "Info" button and look at the "STATUS" and "NETWORK" sections. Note that this information is not live updating, it is the most recent status from before clicking on the device.



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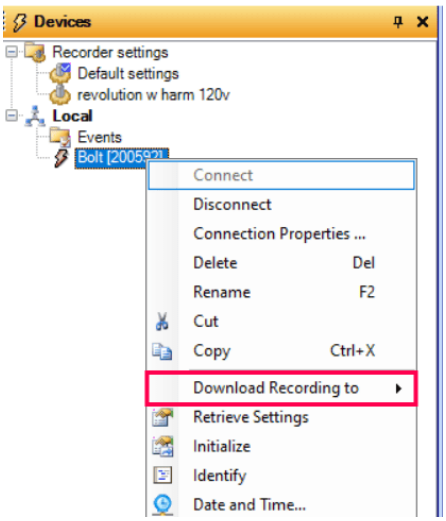
What the Bolt Records



Starting off, youll want to download any recording from your Bolt for viewing. You can do this be right clicking your Bolt in the Device view, and selecting "Downloading Recording to".

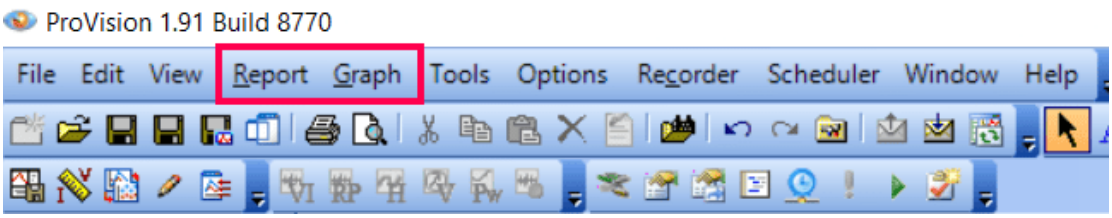
1. **Data Collection: Recording What You Need**
   - The Bolt is designed to continuously monitor voltage and current, creating different record types that enable you to hone in on the information you need most.
2. **Triggered Records: Event-Based**
   - This type of record is activated when specific conditions you set are met (like a voltage spike or sag).
   - Pros: Focuses your attention on disturbances and reduces the amount of data you need to analyze.
   - Cons: Setting the right thresholds is crucial. If they're too sensitive, you'll get unimportant events; too strict, and you might miss what matters.
3. **Non-Triggered Records: Continuous Monitoring**
   - This type of record constantly collects data, creating a graph-like timeline.
   - Pros: You won't miss anything since there are no thresholds to set. This is great for spotting trends in power usage, consistent voltage issues, etc.
   - Cons: You may get a lot of data to sift through, some of which might not be immediately relevant.

Record Types at a Glance

Type	What It Does	Best For
Triggered	Captures specific events based on your settings	Finding voltage issues, power disturbances
Non-triggered	Continuous data logging	Daily trends, power factor, consistent issues

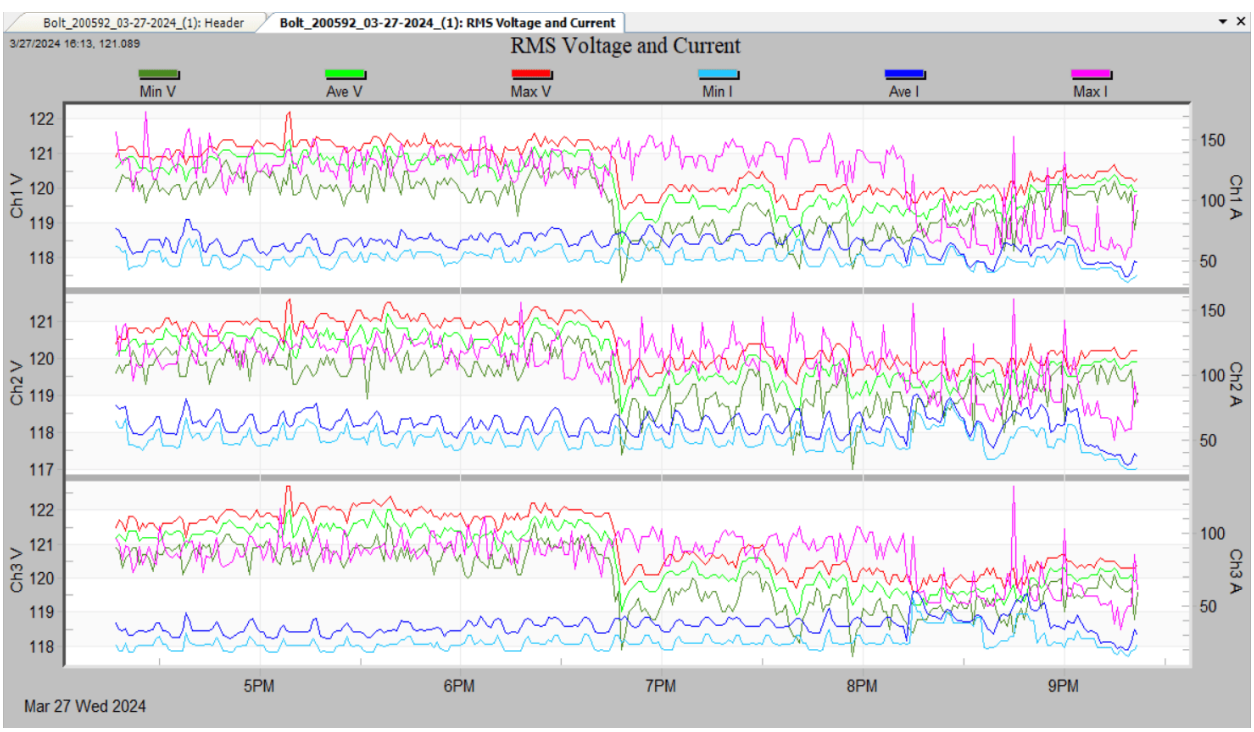
Understanding Recorded Data

The Bolt can record all available record types simultaneously. Each record type has its own dedicated memory space ensuring there is no danger of one errant record type filling the Bolts memory. This means your main decision isn't about which types to record, but rather which ones to analyze later. To make that choice wisely, you'll need to understand how each record type works and what it can be used for. Detailed explanations of each type follow.
Graphs and Reports can be found by selecting their respective tab in the toolbar.



Interval Graphs

Interval graphs offer a visual snapshot of short-term power quality events (e.g., voltage sags) and long-term trends. The key setting here is the interval, which can range from a single cycle for catching brief issues up to four hours for long-term unit installation.



The Basics

Within each interval, the Bolt tracks the maximum, minimum, and average values of the selected parameters. For instance, with a one-minute interval, you'll get the highest and lowest RMS voltage experienced within that minute, along with the average. This single-cycle resolution for maximum and minimum values is especially valuable for pinpointing worst-case scenarios and short-lived events.

Managing Memory

Interval graphs have a finite memory capacity. To ensure you're capturing the most relevant data, you have two options:

- **Wrap-around Mode:** Enabled via the "Interval Graph Overwrite" setting in ProVision, this mode ensures you always have the most recent data by **overwriting the oldest records.**
- **Fixed Recording:** Disabling wrap-around mode preserves the initial part of your recording session, though the Bolt will stop recording interval graphs once memory is full.

The Bolt lets you record interval graphs for a wide range of parameters, including voltage, current, various power types (real, reactive, apparent), power factor, and even harmonics magnitudes.

Typical Settings and Suggested Uses

Here's a breakdown of common settings and when you might use them:

- **Interval:** The one-minute interval strikes a balance between data resolution and longer recording times. For loads that cycle quickly, use a smaller interval (even down to one cycle). If your priority is extending the recording duration, opt for a larger interval.
- **Wrap-around Mode:** Ideal when you want the most recent data, such as when you leave the Bolt on-site until a power quality issue is reported. If you need to preserve a specific initial recording period, disable wrap-around.
- **Enabled Measures:** Selectively enabling different measures (voltage, current, etc) helps manage space. The more measures you record, the quicker the memory will fill.

Additional Tips

- Power outages will result in data gaps, which are filled with zeroes on the graphs.
- Consider disabling maximum/minimum traces if you are interested in only averages over a given time.

Daily Profiles

Daily profiles help you visualize daily trends in voltage, current, power factor, and more. They can serve as a 24-hour snapshot averaged over your entire recording period. While they may not reveal specific power quality events, they're great for understanding average conditions like voltage regulation and load patterns for each day of the week.

How Daily Profiles Work

- **Averaging:** Each day is divided into 96 intervals (15 minutes each). The Bolt calculates the average value (e.g., voltage) within each interval. This average is then combined with the averages from the same interval on previous days.
- **No Settings:** Daily profiles are always enabled. They keep collecting data as long as your recording runs (up to about a year), so memory isn't an issue.
- **Data Types:** The Bolt records daily profiles for voltage, current, different power types (real, reactive, apparent), power factor, phase angle, and even voltage/current THD (Total Harmonic Distortion).

Key Applications

- **Baselining:** Daily profiles help establish an average**.** Recording at a location with a good mix of loads gives you a reference point for distribution conditions.
- **Voltage Regulation:** Voltage daily profiles pinpoint consistent low/high voltage issues for potential correction.
- **Load Patterns:** Analyze current or apparent power profiles to see how your load profile evolves over a day.
- **Capacitor Bank Optimization:** Use power factor and reactive power to fine-tune capacitor bank switching for targeted correction.
- **Harmonic Trends:** Track when voltage/current harmonic distortion is most prevalent within a day.

Important Notes

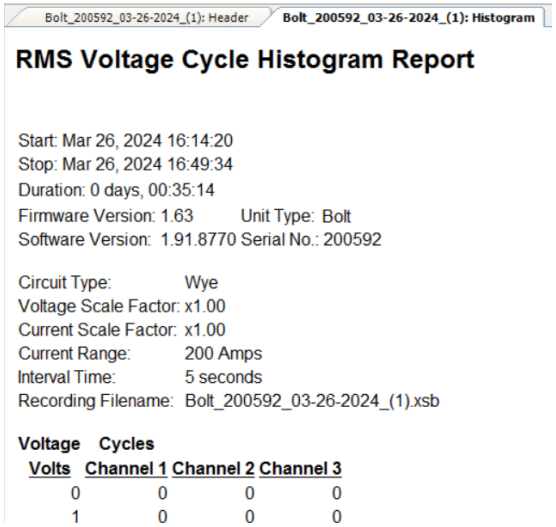
- More recording days improve the average calculation. Short recordings don't offer enough data to establish a baseline.
- While interval graphs can also reveal trends, daily profiles are better for spotting patterns within a standard 24-hour period.
- A recording session shorter than 15 minutes will have all zeroes for a daily profile.

Further Reading

- **Daily Profile Graphs in Provision:** Explores how to use daily profile graphs within the Provision software. [library.powermonitors.com/daily-profile-graphs-in-provision]
- **Using Standard Deviation to Get More from Daily Profiles:** Delves into how standard deviations can enhance daily profile analysis. (PQCanvass only) [library.powermonitors.com/using-standard-deviation-to-get-more-from-daily-profiles]
- **Analyzing Voltage Regulation:** Provides insights on voltage regulation analysis techniques. [library.powermonitors.com/analyzing-voltage-regulation]

Cycle Histograms

Cycle histograms offer granular insights into power system behavior, enabling the identification of voltage anomalies, statistical analysis, and distribution line profiling.


Bolt_200592_03-26-2024_(1): Header | Bolt_200592_03-26-2024_(1): Histogram

RMS Voltage Cycle Histogram Report

Start: Mar 26, 2024 16:14:20
Stop: Mar 26, 2024 16:49:34
Duration: 0 days, 00:35:14
Firmware Version: 1.63 Unit Type: Bolt
Software Version: 1.91.8770 Serial No.: 200592

Circuit Type: Wye
Voltage Scale Factor: x1.00
Current Scale Factor: x1.00
Current Range: 200 Amps
Interval Time: 5 seconds
Recording Filename: Bolt_200592_03-26-2024_(1).xsb

Voltage	Cycles		
Volts	Channel 1	Channel 2	Channel 3
0	0	0	0
1	0	0	0

How Cycle Histograms Work

- **Range Segmentation**: The histogram functions by dividing a selected measurement range (e.g., voltage) into numerous bins of equal width. These bins act as discrete categories for measurement allocation.
- **Cycle Categorization and Counting:** For every measured cycle, the corresponding

value is rounded to the nearest bin and its counter is incremented. This provides a frequency count for each specific value within the measurement range.

- **Temporal Context**: It's important to note that histograms do not inherently preserve time sequence information. The count within a bin represents an aggregate over the entire recording period. Use interval graphs or event reports for time-specific event correlation.

Key Applications

- **Identifying Voltage Extremes:** Easily determine the absolute highest and lowest voltage values experienced during the recording period, as well as the frequency of occurrences at those extremes and surrounding ranges.
- **Statistical Analysis:** Histogram data can be exported and manipulated within spreadsheet software for:
    - **Normalization:** Convert raw counts to probability distributions.
    - **Standard Deviation:** Calculate measures of spread or dispersion.
    - **Cumulative Probability:** Analyze likelihoods and set voltage tolerance thresholds.
- **Load and Distribution Profiling:** Histograms for current, power, and power factor provide a detailed view of distribution line characteristics and load behavior. Focus analysis on the central portion of the histogram to understand common operating conditions.

Important Notes

- The total count of cycles recorded (minus power outage periods) can be derived from the histogram data.
- Histograms are continuously updated throughout the recording session and are not subject to memory limitations.

Further Reading

- **Histograms In ProVision:** Explores how to use histograms within the Provision software. [library.powermonitors.com/histograms-in-provision]

Minute Histograms

Minute histograms offer a different perspective on power quality and load behavior by filtering out the 'noise' of single-cycle events seen in cycle histograms. This averaging process reveals the underlying trends that voltage and current profiles over time.

How They Work

- **One-Minute Averaging:** Unlike cycle histograms that track individual cycles, minute histograms calculate an average voltage or current value for every minute of your recording session. This average is then placed into the appropriate histogram bin, building a distribution of minute-by-minute values.

- **Interval Graph Connection:** Interestingly, if your interval graph is also set to a one-minute interval, the voltage/current averages displayed on the graph will directly correspond to the counts found in the minute histogram.

Key Applications

- **Voltage Regulation Analysis:** A key strength of minute histograms is visualizing voltage consistency. Ideally, the distribution on the histogram should be tightly clustered, indicating minimal variation. A wider spread signals more significant voltage fluctuations. The center of this spread can help pinpoint your target regulation voltage. Minute histograms can be more intuitive for this specific analysis compared to interval graphs.

- **Load Current Profiling:** The current minute histogram clearly illustrates load patterns. By examining the edges of the distribution, you can readily identify the maximum load current experienced. The center of the histogram pinpoints your average load current.

- **Understanding the 'Bigger Picture':** While interval graphs can also reveal trends, the minute histogram's focused view on minute-by-minute averages makes spotting these underlying patterns easier. This is particularly helpful when investigating longer-term voltage regulation issues or when profiling load behavior over extended periods.

Energy Usage

The Energy Usage report provides comprehensive insights into the cumulative power dynamics across your system, measuring energy in kilowatt-hours (kWh), reactive power in kilovar-hours (kVARh), and apparent power in kilovolt-ampere-hours (kVAh).

Bolt_200592_03-26-2024_(1): Histogram | **Bolt_200592_03-26-2024_(1): Energy Usage**

Energy Usage Report

Start: Mar 26, 2024 16:14:20
Stop: Mar 26, 2024 16:49:34
Duration: 0 days, 00:35:14
Firmware Version: 1.63 Unit Type: Bolt
Software Version: 1.91.8770 Serial No.: 200592

Circuit Type: Wye
Voltage Scale Factor: x1.00
Current Scale Factor: x1.00
Current Range: 200 Amps
Interval Time: 5 seconds
Recording Filename: Bolt_200592_03-26-2024_(1).xsb

Accumulated Real Power (kWh)

Channel 1	Channel 2	Channel 3
48.270	48.440	26.298

Accumulated Apparent Power (kVAh)

Channel 1	Channel 2	Channel 3
48.583	49.415	27.470

Accumulated Reactive Power (kVARh)

Channel 1	Channel 2	Channel 3
-2.474	-8.237	-4.130

How It Works

- **Continuous Calculation:** The Bolt calculates real, reactive, and apparent power values for every cycle and adds them to the running totals throughout your recording session.
- **Accounting for Harmonics:** These calculations consider the impact of voltage and current harmonics, ensuring accurate measurement even in the presence of waveform distortion.
- **Handling Negative Power:** Importantly, the report incorporates negative power values. This means that the accumulated totals will reflect both power absorption and generation by a load, as well as instances of leading and lagging power factor.

Key Applications

- **Energy Consumption Monitoring:** Use this report to track the energy used by a specific load. This can be helpful for billing verification or energy efficiency analysis.
- **Power Factor Studies:** The cumulative reactive power (kVARh) reading can aid in identifying trends and sizing potential power factor correction solutions.

Important Considerations

- **Discrepancies with Revenue Meters:** Your Energy Usage report readings may differ from those provided by a standard revenue meter. This could be due to the revenue meter's inability to capture negative power flows or its exclusion of harmonic effects.

Further Reading

- **Power Consumption vs. Energy Usage Reports:** Clarifies the distinctions between Power Consumption and Energy Usage reports as well as how to best utilize each report type. [library.powermonitors.com/power-consumption-vs.energy-usage-reports]
- **Power Flow - Consumption vs. Generation:** Describes the difference in power consumption vs. power generated in ProVision reports and graphs. [library.powermonitors.com/power-flow-consumption-vs-generation]

Significant Change

The Significant Change record type is designed to isolate and monitor rapid voltage fluctuations. It provides an improved view of power quality events by only reporting those exceeding a user-defined threshold.

Bolt_200592_03-26-2024_(1): Histogram | **Bolt_200592_03-26-2024_(1): Significant Change**

Significant Change Report

Start: Mar 26, 2024 16:14:20
Stop: Mar 26, 2024 16:49:34
Duration: 0 days, 00:35:14
Firmware Version: 1.63 Unit Type: Bolt
Software Version: 1.91.8770 Serial No.: 200592

Circuit Type: Wye
Voltage Scale Factor: x1.00
Current Scale Factor: x1.00
Current Range: 200 Amps
Interval Time: 5 seconds
Recording Filename: Bolt_200592_03-26-2024_(1).xsb

Threshold: 3.0 Volts

Channel Date Time Voltage

How It Works

- **Continuous Monitoring:**
  Each second, the Bolt compares the highest and lowest RMS voltages against a 'standard' voltage (initially set to your nominal voltage).
- **Trigger Threshold:** If the difference between the standard and a recorded extreme exceeds your predefined threshold, a significant change is logged. The voltage causing the trigger updates the 'standard' for subsequent comparisons.
- **Timestamped Records:** Each event is timestamped (to the second) and includes the triggering voltage and channel number for ease of analysis.

Key Features

- **Single-Cycle Response:** Ensures the capture of quick voltage fluctuations.
- **Selective Reporting:** By filtering out minor deviations, the report highlights only the most relevant events and prevents data overload.
- **Memory Management:** Each channel can log one significant change per second, optimizing memory usage.

Typical Settings and Applications

- **Threshold:** Defaults to 3V, adjustable between 1V and 8V to match your sensitivity.
- **Quick Assessment:** The Significant Change report reveals the frequency and severity of voltage disturbances. An empty report indicates a lack of fluctuations

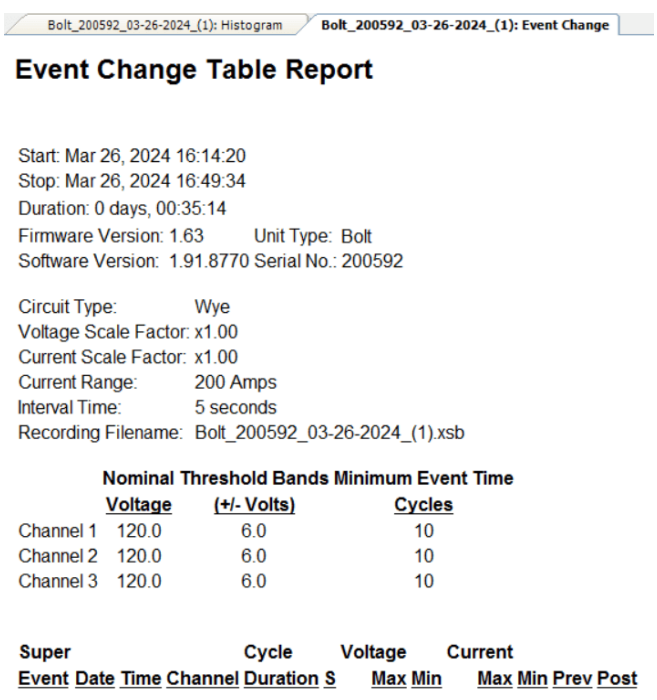
exceeding your threshold.

- **Correlation:** Timestamps allow you to pinpoint corresponding events on your interval graphs for broader context.
- **Waveform Analysis:** If waveform capture is enabled, significant changes can trigger detailed waveform recordings for deeper insights.

Choosing the Right Tool

- **Prioritize Detail:** If you need the highest possible resolution for disturbances, consider the Event Change report, but be aware of its complexity.
- **Balance:** The Significant Change record type offers a valuable compromise of single-cycle response and manageable data volume.

Event Change



Bolt_200592_03-26-2024_(1): Histogram | Bolt_200592_03-26-2024_(1): Event Change

Event Change Table Report

Start: Mar 26, 2024 16:14:20
Stop: Mar 26, 2024 16:49:34
Duration: 0 days, 00:35:14
Firmware Version: 1.63 Unit Type: Bolt
Software Version: 1.91.8770 Serial No.: 200592

Circuit Type: Wye
Voltage Scale Factor: x1.00
Current Scale Factor: x1.00
Current Range: 200 Amps
Interval Time: 5 seconds
Recording Filename: Bolt_200592_03-26-2024_(1).xsb

	Nominal Voltage	Threshold Bands (+/- Volts)	Minimum Event Time Cycles
Channel 1	120.0	6.0	10
Channel 2	120.0	6.0	10
Channel 3	120.0	6.0	10

Super Event	Date	Time	Channel	Cycle Duration	S	Voltage Max	Min	Current Max	Min	Prev	Post

The Event Change report provides a high-resolution lens for examining voltage fluctuations. Its cycle-level precision makes allows for diagnosing transient events with potential power quality implications.

How Event Change Works

- **Customizable Grid**: The nominal voltage and threshold settings create a grid of voltage trip points. Every time the monitored voltage crosses one of these trip points, an event is triggered. This grid can be finely tuned to align with your system's characteristics and specific monitoring goals.
- **Comprehensive Data Capture:** During an event, the Bolt tracks key parameters for all channels, including:
    - Precise timestamp indicating when the event began.
    - Peak and lowest voltages encountered during the event.

    - Current levels before, during, and after the event, aiding source identification.
    - Event duration, important for assessing the disturbance's impact.

When to Use Event Change

- **Targeted Investigations:** Since Event Change can generate substantial data, use it strategically. Interval graphs and the Significant Change report offer starting points for identifying events of interest. The Event Change report then provides the necessary details for those specific incidents.
- **Assessing Severity:** The duration, along with the maximum/minimum voltage deviations, quantify the seriousness of a voltage disturbance. This information aids in determining whether the disturbance falls within acceptable power quality tolerances.
- **Troubleshooting Root Causes:** By analyzing the patterns in pre-, during, and post-event current values, you can gain clues about whether the monitored load was the likely cause of a voltage sag or if the fault lies elsewhere on the network.

Key Considerations

- **Flexible Triggering:** The ability to customize nominal voltage and threshold settings ensures precise alignment with your system's unique conditions.
- **Super-Events for Clarity:** ProVision's streamlined grouping of related events eliminates unnecessary complexity and simplifies the analysis process.
- **Memory Management:** While Event Change is a powerful tool, it can be memory-intensive. Balance the need for detailed granularity with practical memory limitations in your recording strategy.

Think of the Event Change report as your power quality detective kit. When other reports flag an issue, it's time to deploy Event Change for a thorough investigation, helping you pinpoint the cause of disturbances and formulate mitigation solutions.

Recommended Settings for Event Change

Here's a quick guide to get the most out of your Event Change report:

- **Nominal Voltage:**
    - **Precision Matters**: Match this setting to the actual line voltage your equipment experiences (e.g., if it consistently runs at 117V, use that

value).
    - **Purpose:** This setting forms the baseline for detecting disturbances (sags and swells).
- **Threshold:**
    - The Balancing Act: Set this low enough to catch relevant voltage shifts, but high enough to avoid excessive data generation.
    - Starting Point: 5% of your nominal voltage is a good initial value. Adjust as needed based on observed power quality patterns.
- **Minimum Event Time:**
    - Avoid Redundancy: Ideally, set this slightly higher than the longest expected sag duration within your system. This helps prevent a single event from triggering multiple reports.

Additional Tips

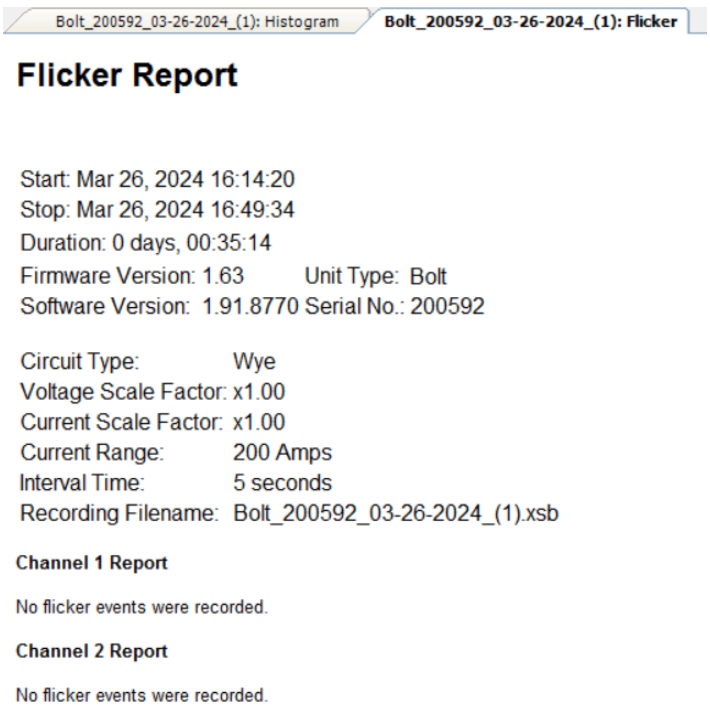
- **Disable Unused Channels:** If you're not monitoring a particular channel, set its threshold very high (e.g., 500V) to preserve memory.
- **Targeted Analysis:** Use Event Change in conjunction with other reports. Start with your interval graphs or Significant Change report to identify issues, then use Event Change for detailed analysis of those specific incidents.

Further Reading

- **Event Capture Function:** Explains how to implement, configure, and use Event Change Reports to capture power disturbances and optimize settings. [library.powermonitors.com/event-capture-function]
- **Analyzing Motor Startups with Event Capture:** Outlines how Event Capture can analyze motor startups, including settings, compatibility, and advantages over Waveform Capture in older recorders. [library.powermonitors.com/analyzing-motor-startups-with-event-capture]
- **Analyzing Motor Startups with Event Capture:** Explores how triggered event capture aids in identifying voltage sag sources. [library.powermonitors.com/analyzing-voltage-sags-with-event-change]

Flicker

The Flicker record type is designed to quantify voltage variations that can cause noticeable and potentially irritating light flicker. It utilizes the industry-standard IEEE 141 threshold of irritation curve by default.



Bolt_200592_03-26-2024_(1): Histogram | Bolt_200592_03-26-2024_(1): Flicker

Flicker Report

Start: Mar 26, 2024 16:14:20
Stop: Mar 26, 2024 16:49:34
Duration: 0 days, 00:35:14
Firmware Version: 1.63 Unit Type: Bolt
Software Version: 1.91.8770 Serial No.: 200592

Circuit Type: Wye
Voltage Scale Factor: x1.00
Current Scale Factor: x1.00
Current Range: 200 Amps
Interval Time: 5 seconds
Recording Filename: Bolt_200592_03-26-2024_(1).xsb

Channel 1 Report

No flicker events were recorded.

Channel 2 Report

No flicker events were recorded.

How it Works

- **Analyzing Voltage Fluctuations:** The Bolt continuously monitors one-cycle maximum, minimum, and average RMS voltage every second.
- **Threshold Comparison:** If the difference between these values exceeds predefined percentage thresholds within specified time periods, a flicker event counter is incremented.
- **Recording Flicker Events:** When the counter surpasses the allowable limit, a flicker record is generated, capturing the date, time, number of triggering voltage events, and the timespan of the flicker.

What's Recorded

- **Timestamp:** Precise date and time of the occurrence.
- **Event Count:** Total voltage fluctuations exceeding the tolerance thresholds.
- **Timespan:** Duration over which the flicker occurred.
- **Individual Channels:** Monitoring and reporting are done independently for each channel.

Typical Settings and Applications

- **Customer Complaints:** The Flicker report is ideal for validating or resolving customer concerns about flickering lights.
- **Mitigation Tracking:** Monitor progress in reducing flicker instances after corrective actions have been taken.
- **Subjective Perception:** Remember that perception of light flicker varies. Showing a customer a flicker report with no recorded events (within standard limits) can sometimes mitigate concerns.
- **Curve Selection:** The default IEEE threshold of irritation curve is the standard, but other curves (like the visibility curve) can be chosen in ProVision based on specific needs.

Important Considerations:

- **Memory:** Flicker recording stops if memory is full.
- **Lighting Type:** The standard curves are calibrated for 120V incandescent lighting.

Further Reading

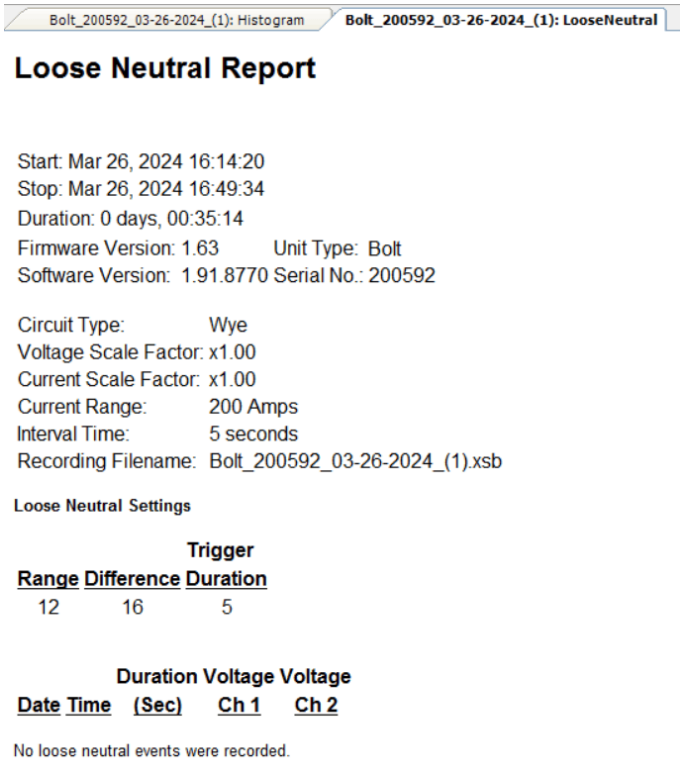
- **Strategies for Investigating Flicker:** Details how our recorders measure flicker severity, and techniques using Pst, IFL, voltage, and current data to pinpoint flicker causes. [library.powermonitors.com/strategies-for-investigating-flicker]
- **New Graph Templates for Flicker Analysis:** Introduces custom Provision graph templates to simplify flicker investigation aligned with the IEEE 1453 standard [library.powermonitors.com/new-graph-templates-for-flicker-analysis]
- **IEEE Std. 141 Flicker Curve vs. IEEE 1453 Flicker Meter:** Compares older IEEE 141 (GE Flicker Curve) and newer IEEE 1453 (Flicker Meter) standards. [library.powermonitors.com/ieee-std-141-flicker-curve-vs-ieee-1453-flicker-meter]

Loose Neutral

The Loose Neutral report is a tool for detecting imbalances specifically designed for single-phase services (e.g., where only channels 1 and 2 of your Bolt are connected line-to-neutral). A loose neutral connection can cause equipment damage, safety hazards, and frustrating power quality issues. This report helps pinpoint situations where these

conditions might exist.

How the Detection Logic Works



Bolt_200592_03-26-2024_(1): Histogram | Bolt_200592_03-26-2024_(1): LooseNeutral

Loose Neutral Report

Start: Mar 26, 2024 16:14:20
Stop: Mar 26, 2024 16:49:34
Duration: 0 days, 00:35:14
Firmware Version: 1.63 Unit Type: Bolt
Software Version: 1.91.8770 Serial No.: 200592

Circuit Type: Wye
Voltage Scale Factor: x1.00
Current Scale Factor: x1.00
Current Range: 200 Amps
Interval Time: 5 seconds
Recording Filename: Bolt_200592_03-26-2024_(1).xsb

Loose Neutral Settings

Range	Trigger Difference	Trigger Duration
12	16	5

Date	Time	Duration (Sec)	Voltage Ch 1	Voltage Ch 2

No loose neutral events were recorded.

The Bolt continuously monitors your system and looks for a very specific pattern of voltage changes.

- **Imbalance:** One monitored voltage rises significantly, while the other drops. This imbalance is measured against a 'difference' threshold you set.
- **Sum Consistency:** Despite this imbalance, the sum of the two voltages must remain within a specified 'range' of double the nominal voltage. This is important, as a loose neutral characteristically disrupts voltage distribution but not overall power delivery.
- **Duration:** The above conditions must persist without interruption for a user-defined number of seconds before a Loose Neutral event is logged.

Key Parameters and Their Role

- **Difference:** The minimum voltage separation required between the two legs to trigger an alert.
- **Range:** Defines an allowable tolerance around double the nominal voltage. This helps prevent false alarms from normal load variations.
- **Duration:** Specifies the minimum time the imbalance and sum consistency must be observed before the report is generated.

What's Recorded

- **Timestamp:** Provides the exact date and time when the loose neutral condition was first detected.
- **Voltages:** The voltage values on each monitored channel at the time of the event.

Typical Use and Important Considerations

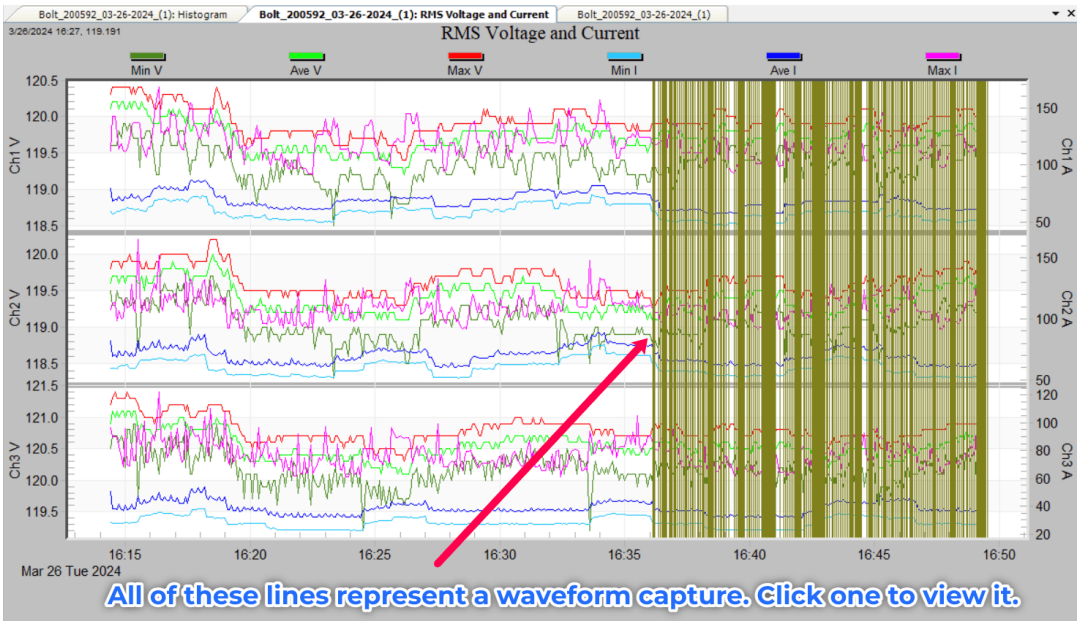
- **Warning Sign:** A triggered Loose Neutral report is a strong indication that you should investigate further. Contacting a qualified electrician is often the safest and most effective course of action.
- **Not Foolproof:** Certain scenarios can cause false positives (e.g., extremely heavy load on one leg). It's also possible for a loose neutral to exist without triggering the report if the loads are perfectly balanced.
- **Safety First:** Loose neutral situations can be dangerous. Exercise caution when investigating, and consider using other diagnostic tools like interval graphs to gather additional evidence.

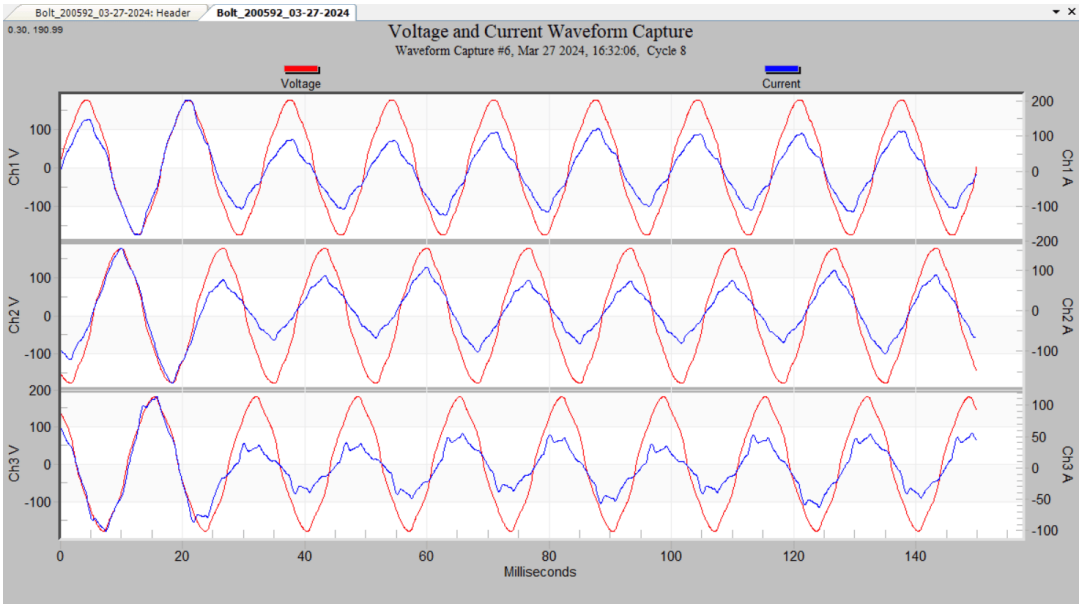
Further Reading

- **Detecting Loose Neutrals with a Receptacle PQ Monitor:** Outlines the dangers of loose neutrals and demonstrates how a 120V receptacle PQ monitor can be used to identify the signs of a loose/open neutral. [library.powermonitors.com/detecting-loose-neutrals-with-a-receptacle-pq-recorder]
- **Identifying Loose Neutrals:** Explains loose neutrals, their impact on equipment, causes, and detection methods using ProVision's Loose Neutral Report. [library.powermonitors.com/identifying-loose-neutrals]
- **Loose Neutrals and Grounding:** Explores the complexities of loose neutrals in scenarios with ground path conductance, emphasizing the safety hazards [library.powermonitors.com/loose-neutrals-and-grounding]

Waveform Capture

Waveform capture offers the highest level of detail. By recording the raw voltage and current waveforms, you can pinpoint the precise characteristics of voltage disturbances, providing clues to their potential causes. This tool helps greatly when other report types provide insufficient





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How it Works

- **Trigger Logic:** The Bolt continuously compares the RMS voltage of each cycle against the previous cycle. If the percent change exceeds your 'threshold,' a waveform capture is triggered.
- **Trigger Sources:** Any voltage channel (above 5V) can trigger. Current waveform capture also utilizes a separate, user-defined threshold.
- **Data Capture:** When triggered, waveforms from all voltage and current channels are recorded for the triggering cycle, plus the number of pre- and post-trigger cycles you specify.

What's Recorded

- **Timestamp:** Allows correlation with other data (to the nearest cycle).
- **Waveforms:** The actual voltage and current waveforms, visualized as both graphs and spreadsheets (for advanced analysis).
- **Duration:** Waveform capture records continue until the trigger condition is no longer met. Wrap-around mode can preserve recent events in case memory fills up during a lengthy disturbance.

Typical Settings and Analysis

- **Thresholds:** Default is 3% for voltage and 40% for current. Adjust these based on your system's sensitivity to disturbances. A lack of waveform captures could indicate too high of a threshold.
- **Finding Clues:** The shapes of the captured waveforms can reveal insights into the source of disturbances:
    - **Sag/Swell Characteristics:** Duration, peak voltage, and how they start/end provide valuable information.
    - **Harmonics and Distortion:** Non-sinusoidal waveforms indicate harmonics. Look for phase shifts to evaluate power factor.
- **Finding Correlations**: Use timestamps to match waveform captures with significant change/event change reports and interval graphs to build a comprehensive picture of events.

Considerations

- **Memory Intensive:** Waveform capture records are large. Manage storage accordingly or use wrap-around mode strategically.
- **Interpretation:** Analyzing waveforms requires some expertise and understanding of typical disturbance signatures.

Further Reading

- **Optimizing Waveform Capture Triggering:** Simplifies waveform capture for PQ analysis by reviewing triggers and suggesting settings for various scenarios. [library.powermonitors.com/optimizing-waveform-capture-triggering]
- **Advanced Waveform Capture with ProVision:** Guides users in extracting maximum insights from waveform capture data, utilizing ProVision's specialized analysis features. [library.powermonitors.com/advanced-waveform-capture-with-provision]

Accessories

Current

The Bolt uses our box-less *True Low Amperage Reading* (TLAR) current clamps, which come in sets of 2, 3. They record in either the 20 amp or 200 amp range.

For ranges of 100, 1000, or 5000 amps, the Bolt can use our box-less Flexible CTs that come in 2 or 3 loops and range in circumference from 12 to 48 inches.

These are powered by the device itself, and no outside power source is needed. Please note that the Bolt uses our ***box-less*** CT accessories, and therefore is ***not*** compatible with our boxed variants.

Boxless vs boxed CT cables

Voltage

The Bolt uses a 3 channel cable pigtail to monitor and record voltage, and power the device.

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Specifications

Power Requirements

Operational voltage range for the Bolt is 60-600VAC, on Channel 1 (**Black**) to Common (**White**), 43-67 Hertz.

Power Consumption

The Bolt uses 3W max, with 5 VA max at 600V.

Backup Power

The Bolt has a super capacitor that charges when powered though CT cables, it will **not** charge when powered by USB.
The Bolt can stay on via super capacitor ride through for recording.

LED States

Recording Countdown Mode

- **Green (single LED):** Voltage and current are good on that phase.
- **Purple (single LED)**: Check your current CT connections. It may be installed backward or connected to the wrong phase.
- **Orange (single LED):** Check that the current CT is connected, that the recorder has been initialized to the proper current range, and that a voltage source is present.
- **Orange (rapid blinking, any LED)**: Indicates a possible configuration issue. Refer to the troubleshooting section.

Recording Standby Mode

- LEDs hold solid: The Bolt is ready to start recording.
    - **Orange:** Bolt is connected via USB.
    - **Yellow:** Bolt has a WiFi connection (either through the Bolt's access point or a valid connection to PQ Canvass).
    - **Blue:** A Bluetooth device (typically an Atom) was connected within the last 30 minutes.
    - **Green**: Bolt is not currently connected to any device.

Recording Ready Mode

- LEDs off, blink every 6 seconds: The Bolt is actively recording.
    - **Orange:** Bolt is connected via USB.
    - **Yellow:** Bolt has a WiFi connection (either through the Bolt's access point or a valid connection to PQ Canvass).
    - **Blue:** A Bluetooth device (typically an Atom) was connected within the last 30 minutes.
    - **Green**: Bolt is not currently connected to any device.

Cell States

- If the Bolt is equipped with cell, the LEDs will blink purple every 6 seconds to indicate cell status. This occurs in both Recording Ready Mode and Recording Standby Mode. Examples:
    - 1 blue blink then 1 purple blink every 6 seconds would indicate Recording Ready Mode with a recent Bluetooth connection AND normal cell status.
    - A solid yellow LED interrupted by 2 purple blinks every 6 seconds would mean Recording Standby Mode with a recent network connection AND no cell signal.
- Cell status is not shown during Recording Countdown Mode to avoid confusion with the . Cell status is not shown during the "Other States" described below.

Cell Status Blink Patterns:

- **1 blink:** Cell status is normal. If AC power is not connected, the normal state of the cell modem is off. When AC power is connected/reconnected, the Bolt will turn the modem back on.
- **2 blinks:** Cell modem is working properly, but is not currently connected. Try moving the antenna to improve signal reception. This blink pattern would also appear on a Bolt without an active cell plan.
- **3 blinks:** Cell modem is reporting an error unrelated to connection. This does not interfere with Recording data collection.
- **Spinning (for 2 seconds):** The Bolt is starting the cell modem. This does not interfere with Recording data collection. The Bolt will show this pattern under 4 conditions:
    - Shortly after AC Voltage is connected/reconnected to the Bolt as the modem is powering on.

- If the cell modem is reporting an error, the Bolt will periodically restart the modem to try to restore operation.
- If the cell is not connected for a long period of time, the Bolt will periodically restart the modem.
- If the Bolt has been configured to refresh modem connection on a set interval. PMI does not recommend this for the Bolt, but a customer could still configure it with the Device Management Utility.

Other States

- **Startup (White, spinning):** The Bolt is powering on.
- **Recording Initialization (Orange, rapid blink):** The Bolt is uploading settings for recording.
- **Firmware Update (Purple, spinning):** The Bolt's firmware is being updated.
- **Shutdown (White, spinning):** The Bolt is shutting down.

Installation

The voltage connectors are color coded by channel:

Channel 1	Black
Channel 2	Red
Channel 3	Green
Common	White

To power the Bolt from the line, voltage must run between Channel 1 (**Black**) and Common (**White**).

You don't need to use all channels on the voltage leads. If you wish to observe a single-phase system, only Channel 1 (**Black**) and Common (**White**) are needed. Conversely, to measure a 3-phase system all 3 channels must be connected.

⚠ **Warning** ⚠

WHEN CONNECTING THE SIGNAL MEASURING LEADS, DO NOT TOUCH ANY OF THE CONNECTION POINTS.
LETHAL VOLTAGES MAY BE PRESENT WHICH CAN CAUSE SERIOUS INJURY OR DEATH.

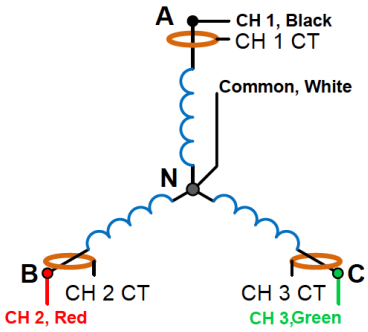
When connecting the Bolt, connect each lead in the following sequence:

1. CTs (Position them *first*, then connect them to the unit)
2. Common (**White**)
3. Channel 3 (**Green**)
4. Channel 2 (**Red**)
5. Channel 1 (**Black**)

It is important that you connect Channel 1 **last**. This will guarantee no false events or readings occur during the boot-up process. The next page illustrates hookup diagrams for several basic electric power circuit configurations and their connection to your Bolt recorder.

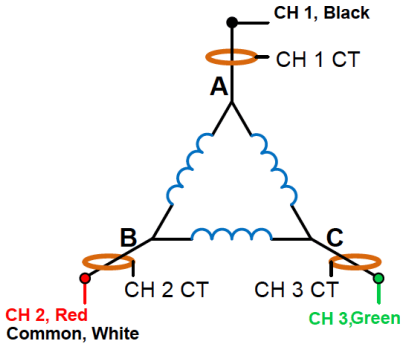
Bolt Hookup Diagram

Three Phase WYE



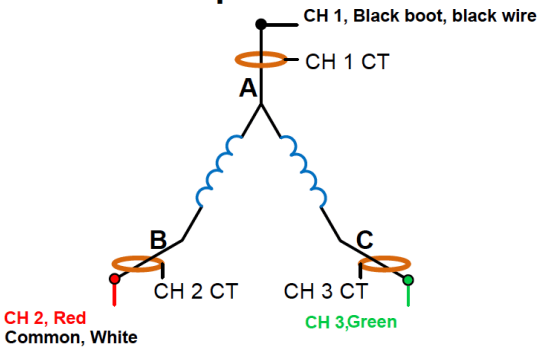
Set circuit type to "wye"

Three Phase Delta



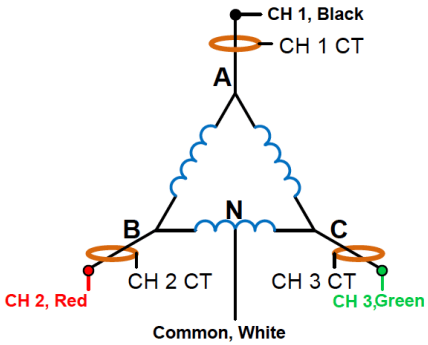
Set circuit type to "3 wire delta"

Open Delta



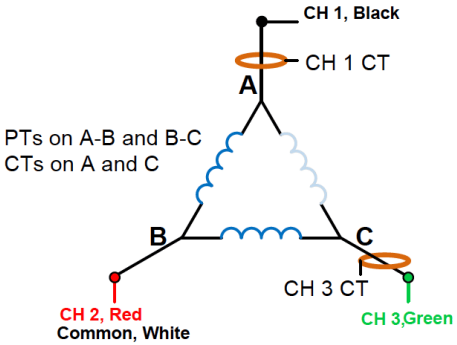
Set circuit type to "3 wire delta"

Four Wire Delta



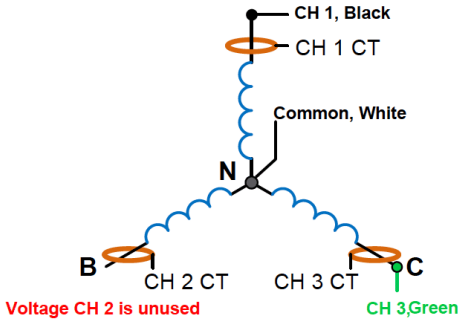
Set circuit type to "4 wire delta"

Two Element Delta



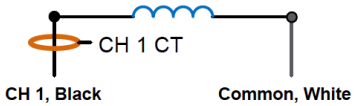
Set circuit type to "3 wire delta"

2½ Element WYE



Set circuit type to "2.5 el. wye"

2 Wire Single Phase



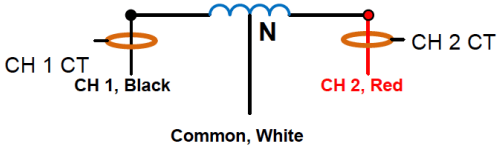
All Other Channels Optional

Set circuit type to "wye"

Notes:

- Directional arrows on CTs should point TOWARDS the load.
- Do not exceed 600 voltags RMS channel-to-channel or channel-to-common.
- Disable unused channels in software for more recording time.
- Phase to phase voltages are measured in 3-wire delata hookups.
- Line-to-neutral voltages are measured in wye hookups.
- All Channels are noted by their wire color.
  - If using alligator clips, the boot for ch. 3 is blue.
  - If using dolphin clips, all connection points are black with purple clip.

3 Wire Single Phase



All Other Channels Optional

Set circuit type to "wye"

Calibration

An extensive Calibration Report is available on the device and on our calcert.powermonitors.com. This report certifies the accuracy of your Bolt to factory specifications. Each Bolt is carefully calibrated before shipment, and is valid for one (1) year after the calibration date. To have your Bolt recalibrated, please contact our technical support department for a return authorization number and shipping instructions.

Appendix 1: Frequently Asked Questions (FAQs)

Firmware: How do I check the firmware version in the Bolt using ProVision?

1. To check the firmware version of your Bolt, first connect the Recorder to the PC or Laptop USB port and connect to ProVision.
2. View the recorder information by clicking the **[Recorder]** tab and then selecting **[Identify]**.
3. After the identification is complete, click on **[View]** and the "View Identification Information" window will appear, showing the firmware version of your Bolt.
4. Go to the website: https://powermonitors.com/firmware-chart/
5. Look at the latest firmware for the Bolt listed on the Firmware Chart and

/root/clk_ioctl -p 2

Firmware: How do I manually update Firmware using ProVision:

1. In Provision select **[Options]** and **[Show Advanced Operations]**
2. Then select **[Recorder]** and **[switch to standby mode]** (if shown)
3. Next select [Recorder] and [Upload firmware]

Initializing: How do I initialize my Bolt recorder using ProVision?

1. Connect to the device using ProVision.
2. Click on **[Recorder]** or right-click on your Bolt in the devices tree.
3. Select **[Initialize]**, which should open up the "Basic Screen" window.
4. Set the desired intervals, channels, circuit types, etc. If necessary, select **[Advanced]**. For more information on using this, see the ProVision documentation.
5. Click **[Finish]**.
6. Answer "Yes" to "Would you like to initialize the recorder?"
7. When the recorder has finished initializing, select **[Disconnect]** and unplug your Bolt. It is now ready to begin recording.

How do I check for or upgrade to the most current version of ProVision?

1. In ProVision, select the **[Help]** tab and then **[Check for Updates]**
2. The Wizard will inform you if ProVision or firmware files need updating

How do I export data files into Microsoft Excel or Word?

Note: There are limits to the number of lines Excel allows, as well as PC memory limitations.

1. Open the data file
2. Right-click the file and select **[Export to Word]** or **[Export to Excel]**

How do I save my favorite Bolt initialization settings for later use?

1. In ProVision, go to the “Recorder Settings” folder in the devices tree.
2. Right-click on the folder and click [Create Template Settings].
3. Select [Bolt] from the “Recorder Type” drop-down menu and click [OK].
4. Select the desired settings on the Basic and Advanced pages
5. Click [Finish] when done
6. Name the new settings template. (e.g. “Default Bolt Settings”)
7. Select [OK]
8. The new template should now be listed under the “Recorder Settings” Folder in the Device Tree column.
9. Drag and drop the template onto the connected recorder you wish to initialize (also listed in the Device Tree)
10. Answer “Yes” to “Would you like to initialize with these settings?”

How should I interpret the data recorded by my Bolt?

1. There are many Documents and videos listed on the Power Monitors website.
2. Videos are located on the Support Page: https://powermonitors.com/support
3. To View, Download and Search Technical Documents and Case Studies, go to the Library on the Power Monitors website: https://library.powermonitors.com

4. Or call the Technical Support Team at 1-800-296-412.

How do I change the scaling (upper or lower bounds) on a graph?

1. While looking at a graph, select **[Tools]** and then **[Axis Bounds]**.
2. In the “upper/Lower Bounds” window, select “Manual Scaling.”
3. You can now change the upper and lower bounds to values of your choice.

If you would like to set the bounds to all plots, simply click **[Set all scales to this scale]** after typing in your desired bounds.

4. Select “Apply"

My Bolt will not communicate. What should I do?

1. See Appendix 2 : Troubleshooting
2. Contact the Technical Support Team at 1-800-296-4120.

Will I need to buy a site license for ProVision to install it on multiple computers?

1. No. ProVision only works with PMI equipment, so we do not charge the customer in order to make it easier to use our equipment and software.

How can I get notified of updated versions of ProVision as they are released?

1. Your Sales Representative can register you to get email updates from PMI
2. Use the ProVision Upgrade Manager to check for new releases.
3. In ProVision, select the **[Help]** tab and then **[Check for Updates].**

Can I use the WinScan Utility with my Bolt?

1. No. Winscan does not have the full capabilities as ProVision and is no longer supported.

Appendix 2: Troubleshooting

There are several things that could cause communication/download problems with PMI equipment. Listed below are PC and software settings to check and procedures to try:

1. Check all cable connections to see if they are tight and free of any corrosion or any debris.
2. Check cable for physical defects, such as cuts or abrasions and missing connector pins
3. The LED should be solid Orange when connected to the USB Cable and powered by the PC or Laptop
4. Verify the PMI USB device driver is installed
5. If you are using a Bluetooth® card or adapter, make sure that you have the latest drivers installed from the manufacturer's website.
6. Check to ensure that the local port setting in ProVision is set for the Bluetooth® adapter outgoing-port setting on the PC.
7. Make sure that the baud rate setting in the adapter software is set to the correct rate.
8. After checking all the appropriate items listed above
9. Start fresh on the download process.
10. Disconnect the recorder and allow it to power down.
11. Close the ProVision program.
12. Try the operation again.
13. If you still have communications or download problems after trying all of the above, then there is possibly a hardware problem in the recorder.
14. Call Technical Support at 1-800-296-4120

If there appears to be a hardware problem, call PMI at 1800-296-4120 to arrange for a return authorization to send your unit to the repair department.

Technical Support

If you need any help, feel free to contact our industry-leading technical support team here at PMI.

E-mail Support
techsupport@powermonitors.com

Web Support
Submit a support request through our support portal.

Telephone Support
Contact us 24 hours a day, 7 days a week for live tech support:
Phone: 1-800-296-4120
Fax: (540) 432-9430

Warranty

Power Monitors Inc. (PMI) warrants each new product manufactured and sold to be free from defects in material, workmanship, and construction, and that when used in accordance with this manual will perform to applicable specifications for a period of two years after shipment.

If examination by PMI discloses that the product has been defective, then our obligation is limited to repair or replacement, at our option, of the defective unit or its components. PMI is not responsible for products that have been subject to misuse, alteration, accident, or for repairs not performed by PMI.

The foregoing warranty constitutes PMI's sole liability and is in lieu of any other warranty of merchantability or fitness. PMI shall not be responsible for any incidental or consequential damages arising from any breach of warranty.

Equipment Return

If any PMI product requires repair or is defective, call PMI at (800) 296-4120 before shipping the unit to PMI. If the problem cannot be resolved over the phone, PMI will issue a return authorization number. For prompt service, all shipments to PMI must include:

1. The billing and shipping address for return of equipment.
2. The name and telephone number of whom to contact for further information.
3. A description of the problem or the work required.
4. A list of enclosed items and serial numbers.
5. A return authorization number.
6. If possible, a copy of the original invoice.

Equipment returned to PMI must be shipped with freight charges prepaid. After repair, PMI will return equipment F.O.B. factory. If equipment is repaired under warranty obligation, freight charges (excluding airfreight or premium services) will be refunded or credited to the customer's account.

Return equipment to:

Power Monitors Inc.
800 North Main Street
Mount Crawford, VA 22841 USA
Attention: Repair Department

Regulatory Information

U.S. FCC Part 15 and Industry Canada RSS 210 Statements
This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

The FCC and Industry Canada (IC) ID numbers are applicable to the Bolt product are:

FCC ID: T7V-9026
IC: 2160-9026

FCC Warning
Changes or modifications to this product not expressly approved by Power Monitors Inc. could void the user's authority to operate this equipment.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.