

Getting Started with the Guardian Power Quality Recorder



The Guardian power analyzer from Power Monitors Inc. is designed for use in a 200A residential meter base with the existing revenue meter. In addition to RMS voltage and current as in the 2SX+ recorder, the Guardian comes standard with the ability to measure and monitor power factor, demand, phase angle, and harmonics to the 51st, and new features like E-mail & text alerts through the PQ Canvass web-interface, network time sync, Wi-Fi, Cell Modem, CBEMA / ITIC recording, enhanced waveform capture, and with cellular or Ethernet connectivity, the ability to send data to the PQ Canvass web servers, in an all-weather, self-contained, unit and uses surface mount technology

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Safety Information

Safety Notice

Please read this before installing the Guardian™. The Guardian recorder contains dangerous voltage levels during operation. Do not disassemble the recorder.

THERE ARE NO USER SERVICEABLE PARTS INSIDE.

Do not install or operate near open bodies of water.

The Guardian is intended for use with a standard 2S meter base, with the appropriate revenue meter plugged into the meter base.

Always wear protective gloves and safety glasses during installation and operation of the Guardian. If possible, disconnect power during installation.

If the green ground clip is damaged or detached, call PMI for a replacement.

Do not install the Guardian if the green ground clip cannot be attached to earth ground.

When removing an installed Guardian, always completely remove the revenue meter before attempting to remove the recorder from the meter socket.

The USB port is electrically isolated from the 120VAC line. However, to ensure user safety and prevent damage to the unit, plug only the supplied Guardian USB cable into this port. Plug the other end of the communications cable into a USB port.

Although the Guardian has been designed and built to be as safe as possible, great care should be exercised at all times during operation and installation.

Always follow the National Electric Code as well as any local safety procedures.

SIGNAL INPUTS WARNING

Use extreme caution when wiring signal input connections. Hazardous potentials may exist on signal input terminals, which are floating, with respect to instrument ground. These hazardous potentials may be exposed inside the instrument case and on the Connectors of your instrument. Any voltage potential at the signal source will exist on the instrument's respective signal input cable.

Introduction

Power Monitors Incorporated (PMI), an industry-leading product design and manufacturing firm based in Mt. Crawford, Virginia, specializes in applying advanced technologies to develop state-of-the-art power quality recording solutions for residential, commercial, retail, institutional, industrial, and substation applications. Since 1987, we have worked directly with electrical utilities and their customers to identify and address a wide array of power quality concerns. We pride ourselves in delivering leading-edge recorders and software that are as easy to use as they are affordable. Our 24/7 technical support is consistently rated "best in the business."

Dedicating ourselves to this high standard of quality, we have developed the Guardian™ meter socket recorder. The Guardian combines the powerful, technologically advanced analysis capabilities of our other recorders with the specific needs of single-phase meter base applications. We developed the Guardian meter socket recorder specifically to diagnose and record power quality issues at the revenue meter. The unit plugs into any standard 2S meter socket to measure and record voltage, current, power, harmonics, and more, detecting outages, sags, swells, and flicker.

We created the lightweight and rugged Guardian with your needs in mind. It is perfect for analyzing electrical power issues at the consumer level. After looking through this manual and using the Guardian meter socket recorder, please contact us if you have any questions about its operation or if you have any ideas for new features or additional products. Total customer satisfaction is our primary goal, and we appreciate any input to help us develop products to meet your future needs. We are always available to discuss how PMI can help you meet your power monitoring needs.

Guardian PQ recorder Overview

The Guardian PQ recorder has connectivity options that include cell modem, Wi-Fi, Blue Tooth, and direct connect using a USB cable. Refer to the section on connecting the Guardian.

Physically connecting the Guardian recorder to a meter base is the same as connecting other PMI socket recorder. Refer to the section on Installation.

The Guardian has more recording features than older socket recorders, and the initialization settings are similar to the Revolution recorder.

The Guardian recorder must first be initialized. This is done by either connecting the Guardian meter socket recorder to your computer using the USB communications cable that came with the recorder or wirelessly using a Cell or Bluetooth® connection and using the ProVision software. The ProVision software is used to download the data to a file and analyze the recorded data.

The latest ProVision software and USB driver software can be downloaded from the Power Monitors Website: <https://powermonitors.com/downloads>

Download the Provision manual from: <https://powermonitors.com/downloads>

Differences from other PMI recorders

The Guardian contains no batteries. It does have super capacitors to provide short ride-through capabilities during a power outage.

The Guardian will flash a red/orange LED when powering up.

It may take longer to connect to Provision than other recorders, due to a longer boot up cycle.

When in Idle mode, the LED will flash Green twice, either; 5 seconds on/1 second off or 2 seconds on/3 seconds off, then repeat the sequence.

When recording the LED will flash the Green LED on for 1 second/off for 5 seconds, then repeat the sequence.

There is a shorter initialization time and the LED - '2 minute' countdown on/off pattern lasts for 10 seconds.

Any repeating Red LED indicates a fault.

Installation

Please read the safety section carefully before installation. Always exercise extreme caution when installing the Guardian meter socket recorder. Interrupt the electrical service to the point of connection whenever possible. Always wear gloves and safety glasses, as well as any additional applicable protective equipment. Do not install the Guardian unless you are qualified by your utility to install and remove revenue meters.

Remove the revenue meter at the installation site using normal safety precautions. Make whatever notations your procedures require about the status and identification of the meter at the time of removal. Attach the green ground clip (found on the rear of the recorder) to earth ground, or the ground from the service drop. Install the Guardian meter socket recorder in the meter socket by sliding the blades of the recorder into the receptacles in the socket. The top of the unit is marked with a sticker inside the front face. If the ground clip is damaged, please call PMI for a replacement cable. The ground clip **MUST** be connected for proper recorder operation.

Use the locking ring supplied with the Guardian to secure the recorder to the meter base.

Reinstall the revenue meter using the front of the Guardian recorder as the meter socket. Attach the clamp or locking ring you would normally use to install a meter. The Guardian socket should accommodate the existing hardware. Secure your utility's standard meter seal and make any notations your procedures require about the status and identification of the meter at the time of installation.

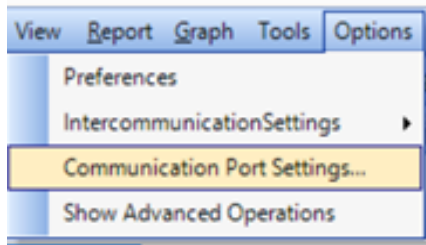
Connecting the Guardian Recorder to ProVision

Using the Cell modem

How to configure ProVision to access an IP address

In ProVision, Select the 'Options' tab

Next, select 'Communication port settings'

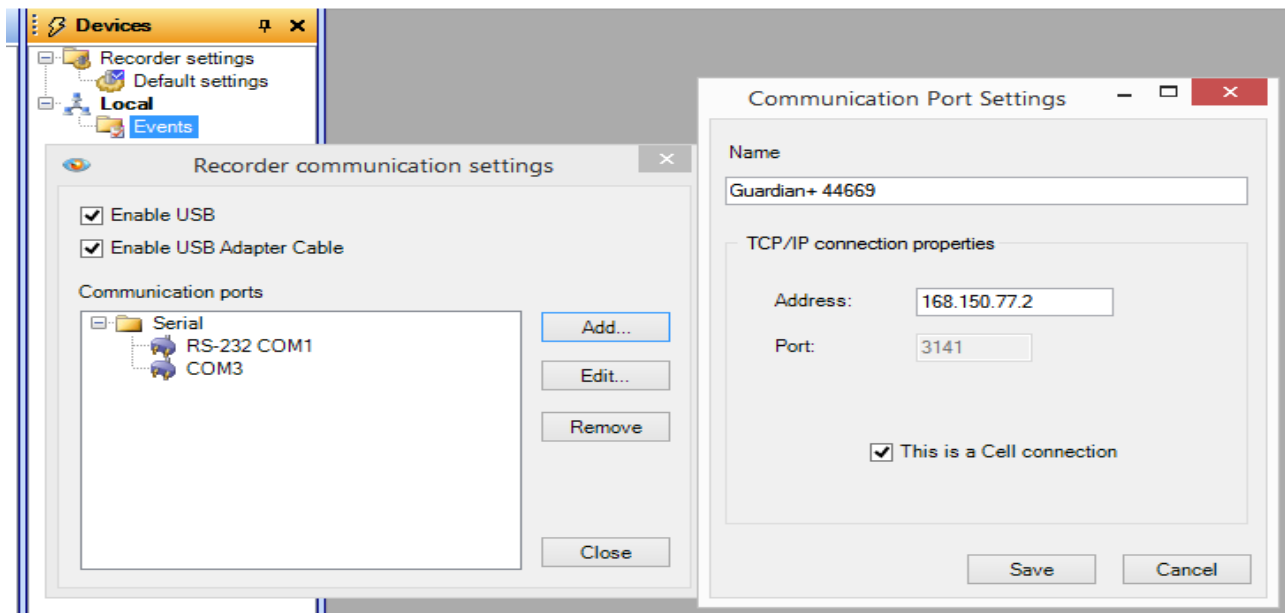


Click the 'Add' button, then TCP/IP

Change the Name to reflect the serial number or identifier of choice

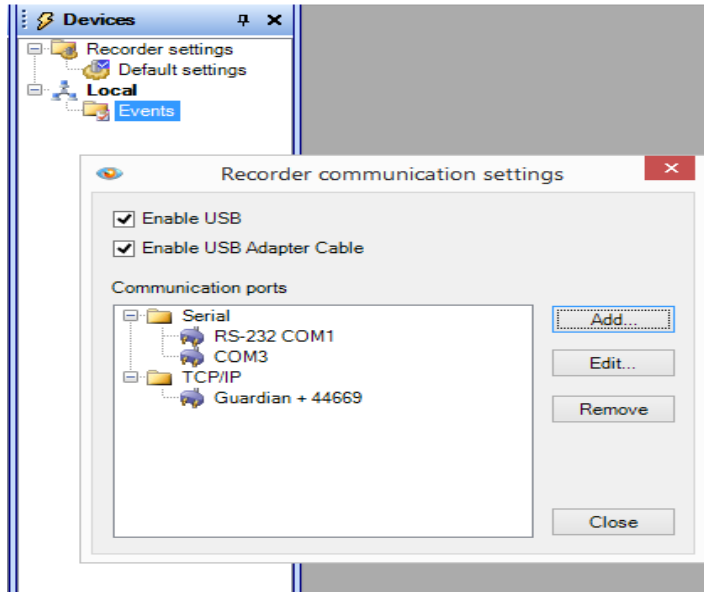
Change the Address to the assigned IP number

Check the 'This is a Cell Connection' box



Select Save

The entry will be listed under the TCP/IP heading



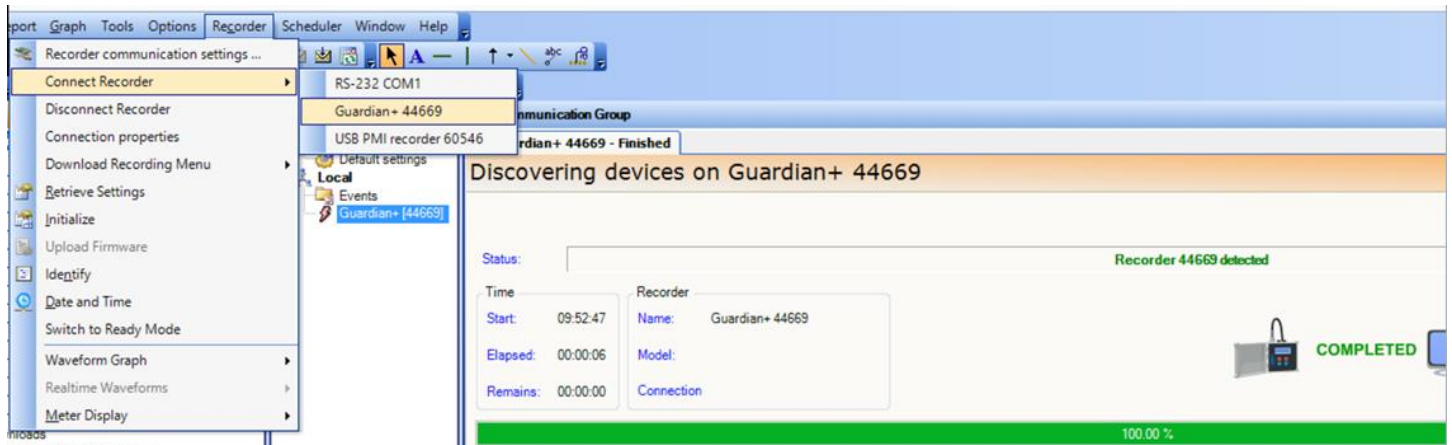
Select Close

How to connect a cell Guardian to ProVision using the IP address

Select the 'Recorder tab' and select 'Connect Recorder'

Select the new entry for the Guardian

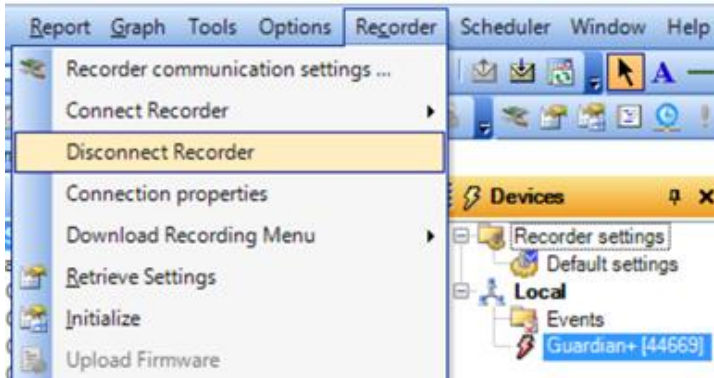
You should see Guardian (serial number) listed in the Devices column with a Yellow lightning bolt in front of it. (Not seeing the Devices column? Select the View tab and click on Devices).



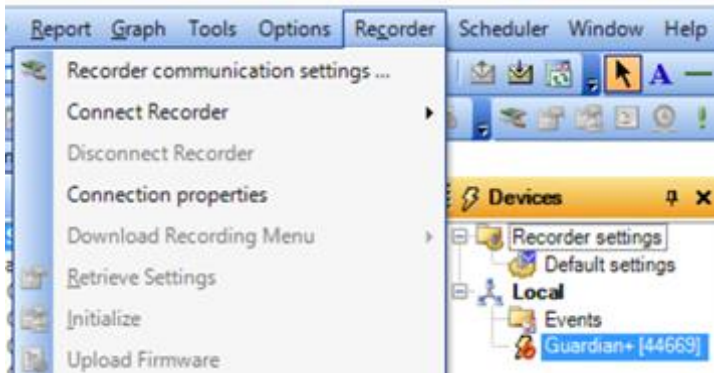
You can now initialize, download, or view live data on the Guardian recorder.

Disconnecting the Cell Guardian recorder from Provision

Select the Recorder tab and then select 'Disconnect Recorder'



After disconnecting, the lightning bolt will have a red mark in it



The Guardian name will remain under the Devices column.

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

To remove the listing, right-click on the name and select 'Delete'

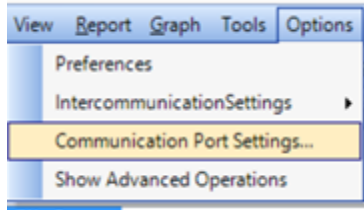
NOTE: A second Guardian name will show if connecting using the USB cable and also connecting by cell.

Connecting a Guardian Recorder to ProVision – Using Wi-Fi

How to configure ProVision to access the Wi-Fi IP address

In ProVision select the 'Options' tab

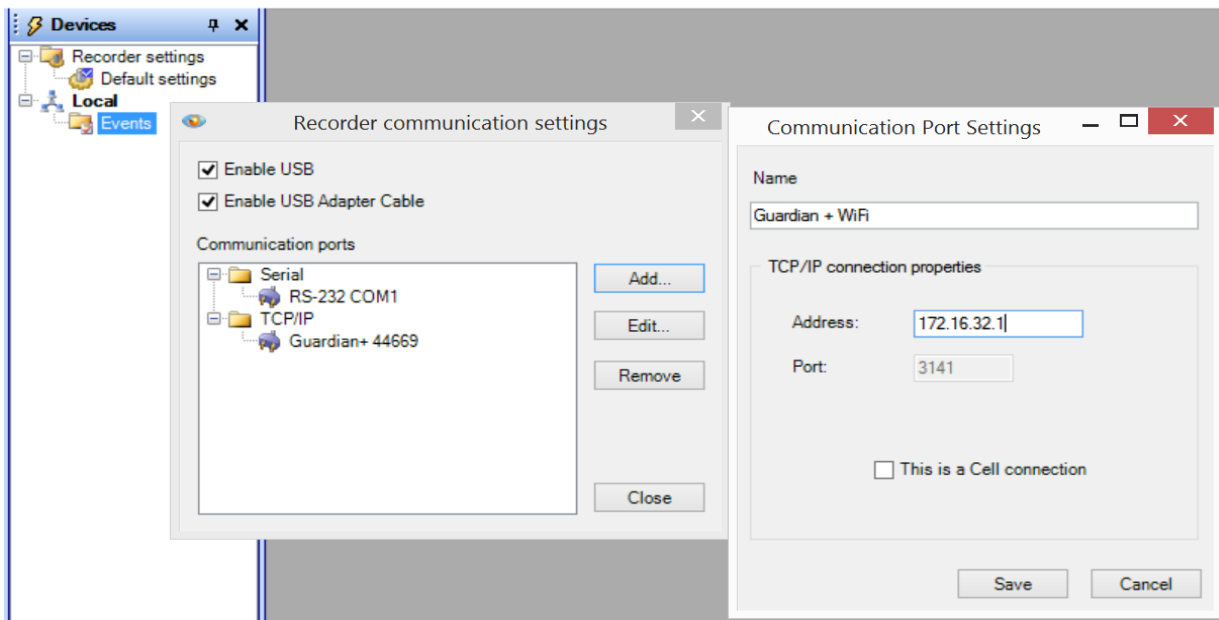
Select 'Communications port settings'



Click the 'Add' button, then TCP/IP

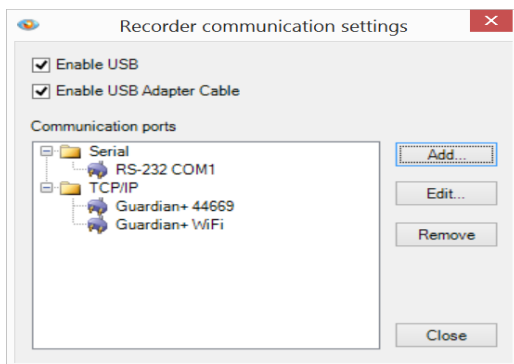
Change the Name to 'Guardian Wi-Fi'

Change the Address to 172.16.32.1



Select Save

The entry will be listed under the TCP/IP heading



Select Close

How to connect your PC to the Wi-Fi network

Before connecting ProVision to your Wi-Fi Guardian, you must connect your PC to the Guardian WiFi network.

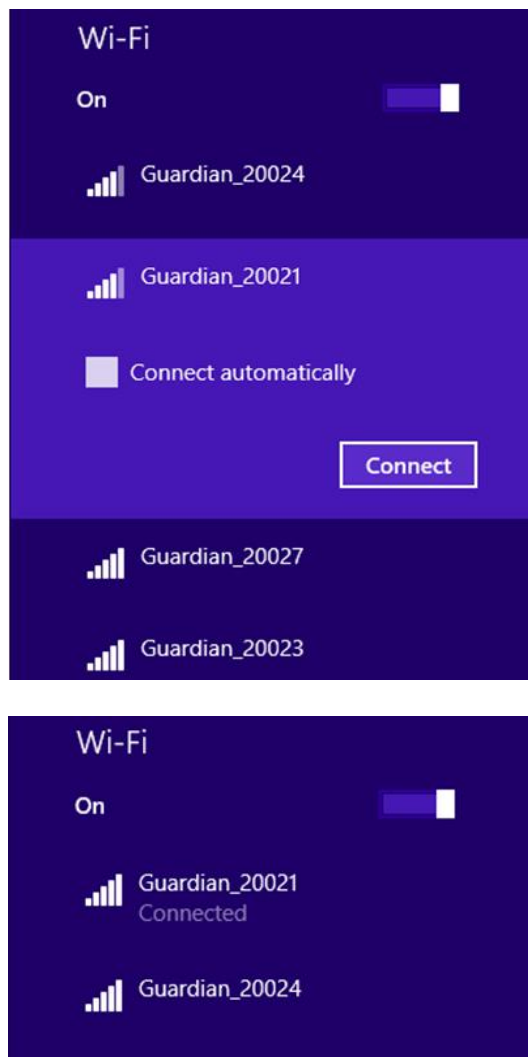
Contact your IT person if Wi-Fi is not enabled on your PC or Laptop

(Windows 10 example) Select the network icon  located on the desktop at the bottom-right

For Guardian recorders in Wi-Fi range, a list of Guardian 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*



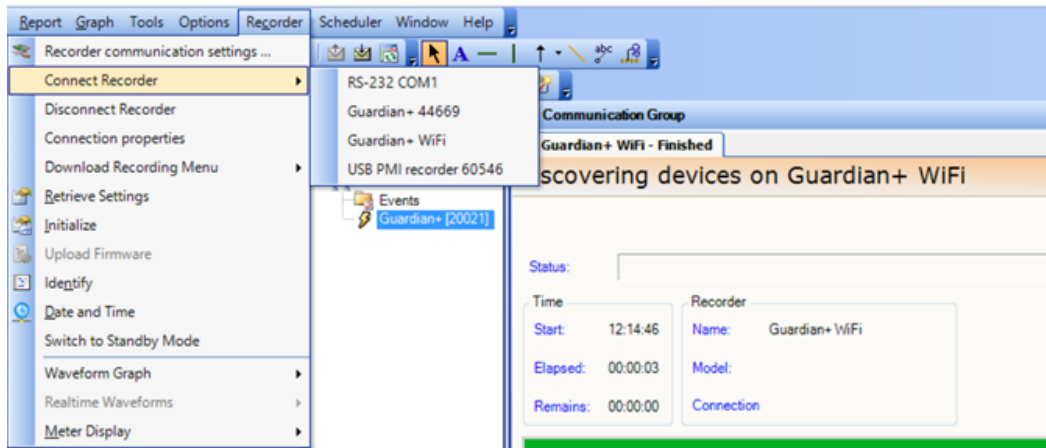
Once the connection is established, return to Provision and connect to the GuardianWi-Fi IP address.

How to connect ProVision to a Wi-Fi Guardian recorder

Select the 'Recorder tab' and select 'Connect Recorder'

Select the entry for the Guardian Wi-Fi

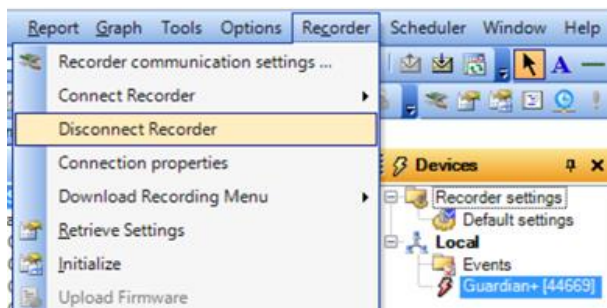
You should see Guardian (serial number) listed in the Devices column with a yellow lightning bolt in front of it.
(Not seeing the Devices column? Select the View tab and click on Devices)



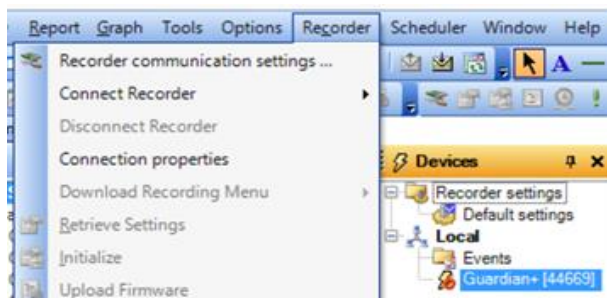
You can now initialize, download, or view live data on the Guardian recorder.

Disconnecting the Guardian recorder from Provision (Wi-Fi)

Select the Recorder tab and then select 'Disconnect Recorder'



After disconnecting



The Guardian name will remain under the Devices column.

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

If you have multiple Guardian 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



Connecting the Guardian recorder to ProVision – Using the USB cable

Get the latest USB driver for Windows 7,8, and 10 from the Power Monitors.com

Website: <https://powermonitors.com/downloads>

The Guardian will auto-connect to Provision.

You can initialize, download, or view live data on the Guardian recorder using ProVision

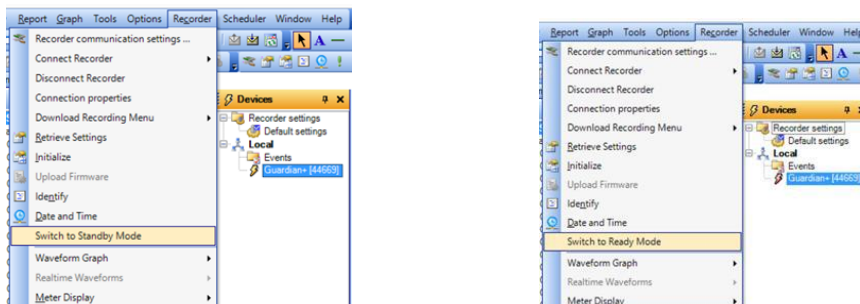
Disconnecting the Guardian recorder from Provision (USB)

Unplug the USB cable from the PC

The Guardian listing in the Devices column will disappear.

Notes:

- 1) In Provision, if you are also using PQ Canvass, the cell Guardian date-and-time will show in UTC time (Coordinated Universal Time, formerly GMT).
Subtract 5 hours for Eastern Standard time (4 hours during Daylight Saving Time).
- 2) If you are not using PQCanvass, the setting can be changed to use the local time.
- 3) The Guardian recorder will be in either the Standby Mode or Ready Mode. In Standby Mode the Guardian is not recording. In Ready Mode the Guardian is recording data. Selecting Provision commands may switch the modes automatically. To manually change the mode, select the Mode from the Recorder tab.



Refer to the ProVision manual for more information

Initialization

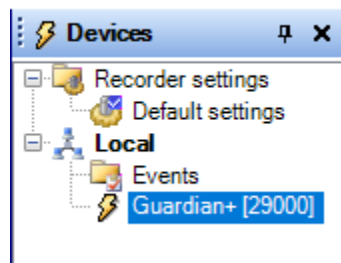
The Guardian PQ recorder must be initialized with ProVision prior to using. The Guardian can be powered from the USB cable connection with no AC power applied or mounted in a meter base, then connected to ProVision using Bluetooth®, cellular, or USB connections. (Do not connect a damaged USB cable)

Select the settings in the initialization screens to enable the Guardian to record the correct information for your trouble site. It is best to initialize whenever the Guardian is moved to another site, so you have separate data files for each location. If you do not initialize, the data will append to the previous data.

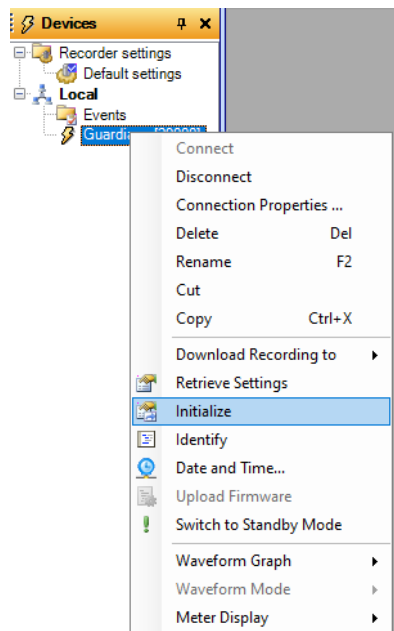
ProVision has the ability to 'join' several files into one for easier data analysis of long term recording

To initialize, use one of the connection methods described in the section titled – Connecting the Guardian Recorder to ProVision.

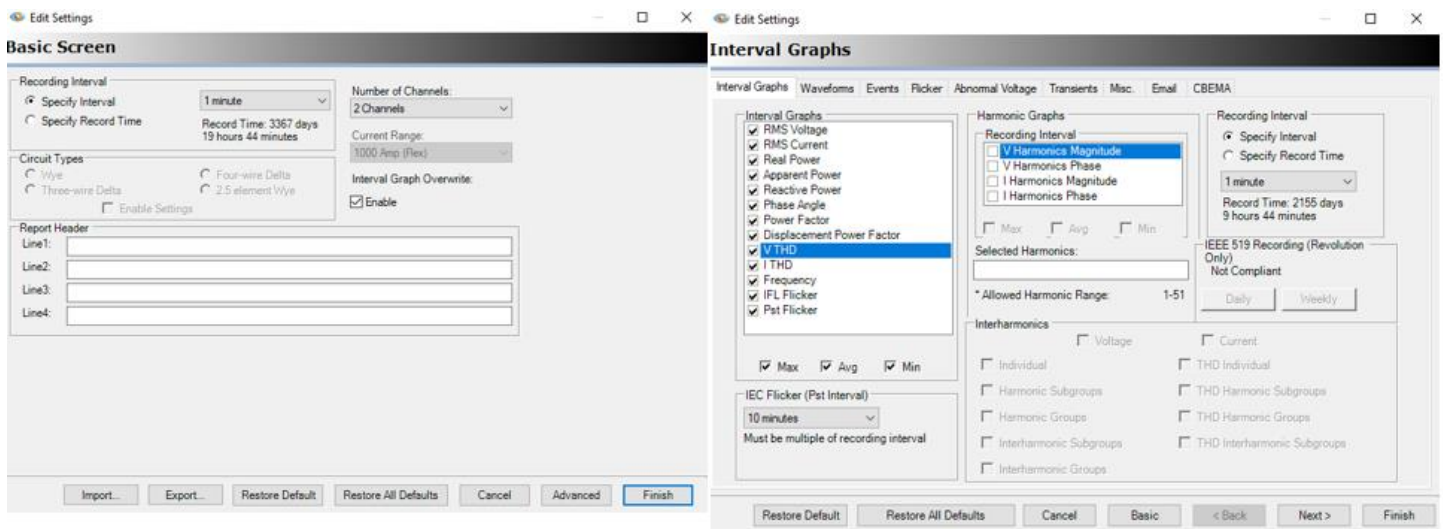
The Guardian will show in the Devices pane of ProVision when connected.



Right click on the Guardian entry, or select the Recorder tab at the top of ProVision and then select Initialize. You could also select 'Retrieve Settings' to pull the current settings from the Guardian to view or modify the settings

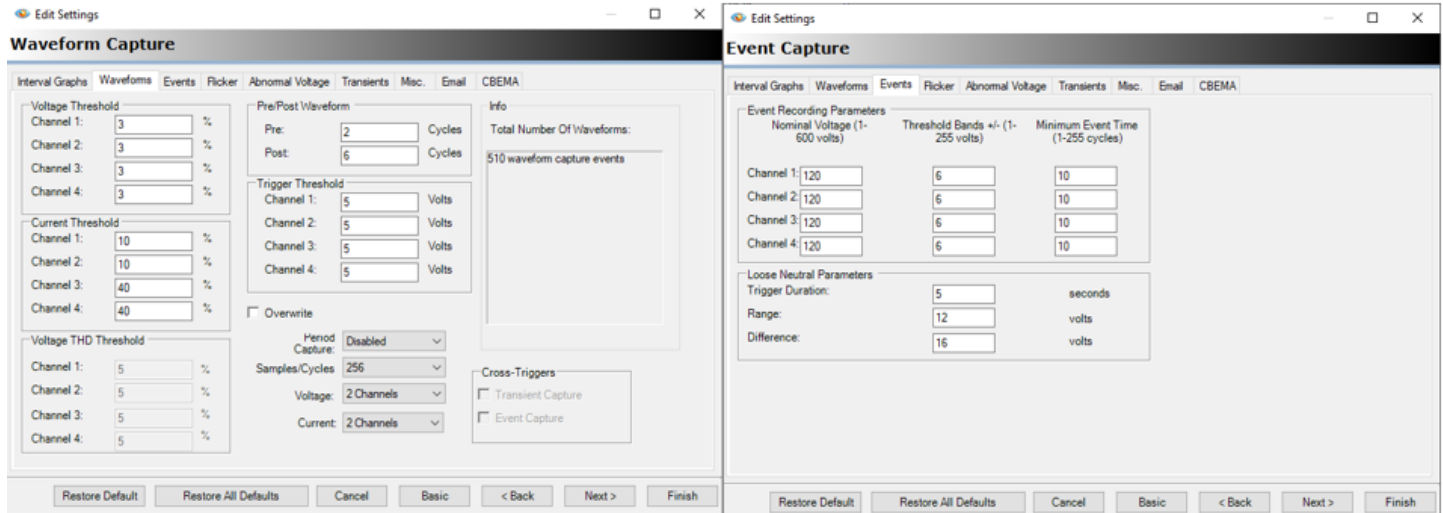


The Basic and Advanced Initialization pages contain the settings for the Interval 'Stripcharts', both graphs and reports. A 1-Minute Interval will show the lowest cycle, the highest cycle and the average of the samples (256 samples per cycle) for each minute of recording. A 1-Minute interval is a good setting for most recordings.



Selecting more or fewer recording options will change the Record Time (the time it takes to 'fill up' the Guardians memory and start to over write the earlier data)

The other tabs such as Waveforms or Events, have their own memory and do not change the Interval Record Time. Set only channels 1 and 2 for the Guardian.



When completed choose Finish at the bottom right of the screen, then select Yes to initialize.

After downloading a recording you will be asked to initialize the recorder, selecting Yes will use the same settings as the previous recording.

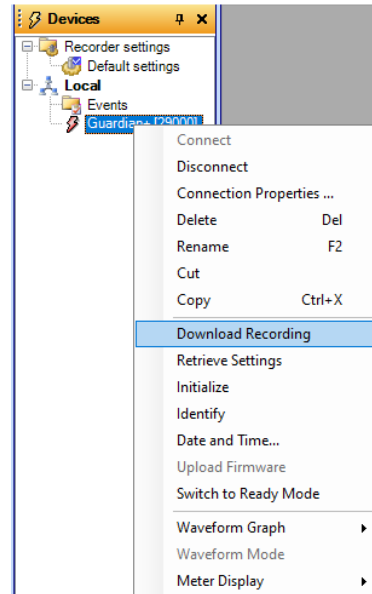
Recording Templates can be created to standardize the settings, this makes it easy to 'drop' the settings onto the recorder

Complete Initialization information can be found in the PoVision manual.

Downloading

Once you have complete the recording, the Guardian will need the data downloaded into ProVision for analysis.

To start the download procedure, connect the Guardian to ProVision using the USB cable, cellular or Bluetooth® connections. Right click on the Guardian listed in the Devices pane and select Download Recording or select Download Recording from the Recorder menu



When the recording has finished downloading, you will be asked to name the recording and then asked to initialize. Choosing Yes will initialize the Guardian with the same settings as the previous recording. You can choose no and initialize the recorder at a later time.

The data in memory will not be removed until the Guardian is powered on AC power

If connected over a cellular or Bluetooth® connection, be sure to perform a 'Disconnect' to start the new recording.

See the ProVision manual for details on viewing the different graphs and reports stored in your data file.

PQ Canvass

The PQ Canvass website is located: <https://pqcanvass.powermonitors.com>

Login and password is needed. *Contact PMI Tech Support for assistance.*

See the PQ Canvass Getting Started Guide for more information: <https://powermonitors.com/downloads>

Overview

PQ Canvass is a cloud-based system for power quality analysis, it contains most graphs and reports that are used by ProVision, including live waveform graphs and histograms.

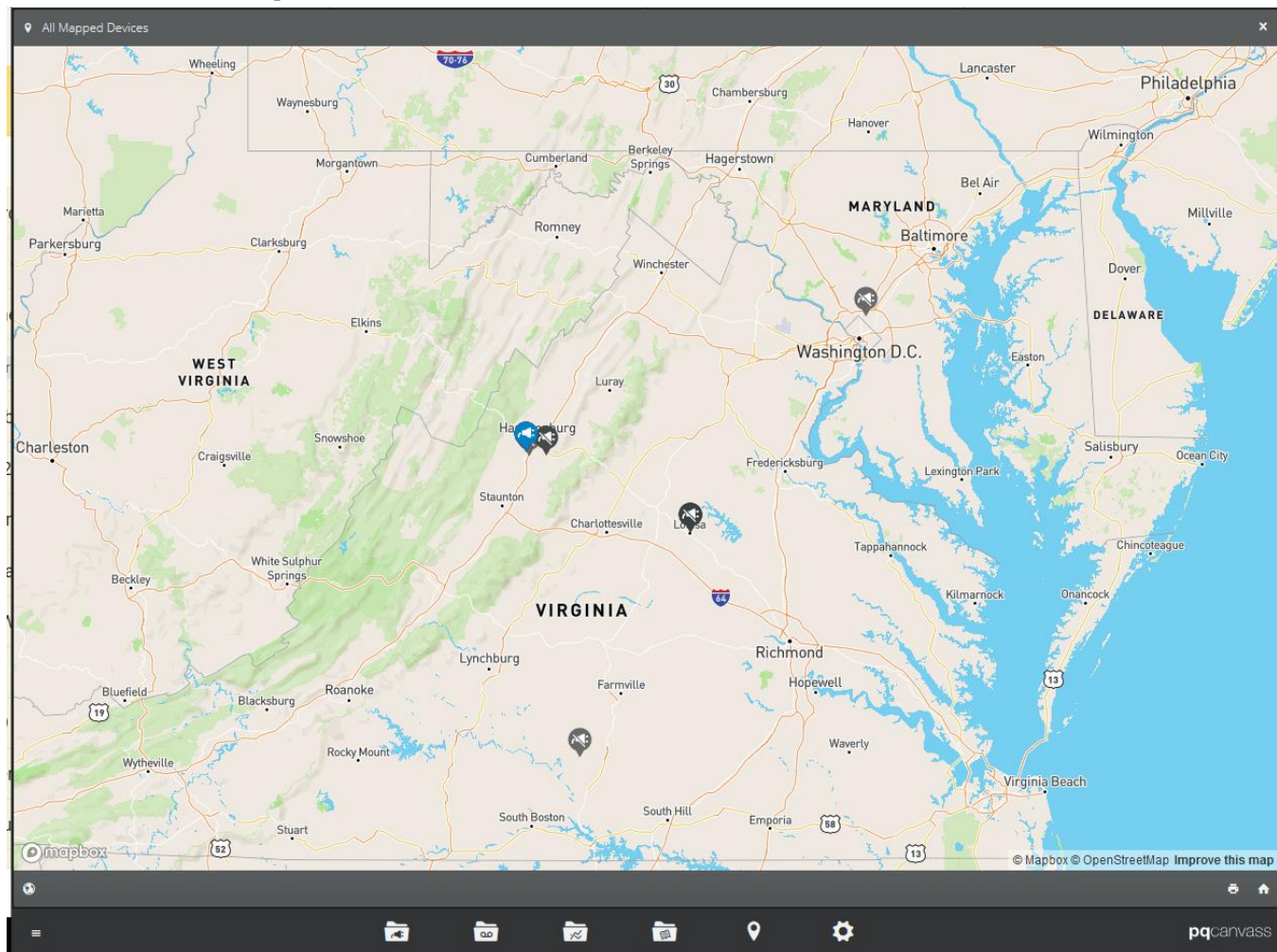
As a Guardian is recording data, that data is also being saved in PQ Canvass as a 'live' recording.

When a Guardian is downloaded and initialized using ProVision, the 'live' recording is stored in PQ Canvass.

In PQ Canvass you can view the 'live' recording or any of the stored recordings.

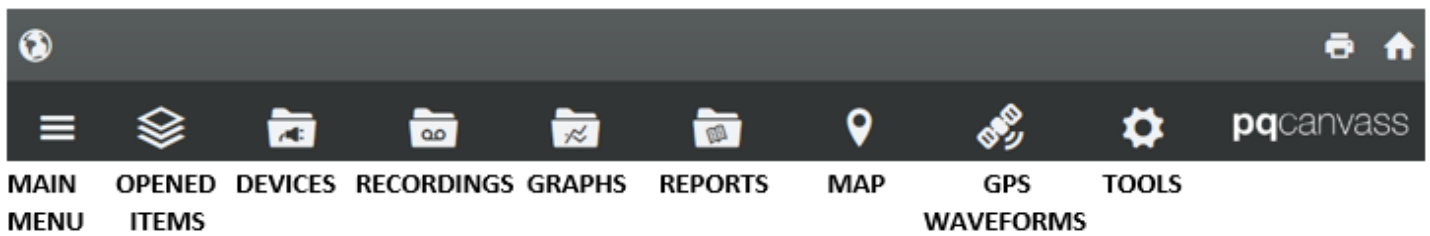
If you initialize a Guardian and never download it using ProVision, PQ Canvass will continue adding to the 'Live' recording while the data in the Guardian will be continually overwritten.


PQ Canvass Main Map View



Blue icons are 'live' active recorders, Black icons are non-active recorders and Amber icons are in an alert state. You can select an icon to view the Device Information for that recorder, and view 'live' waveform captures.

PQ Canvass Control Icons

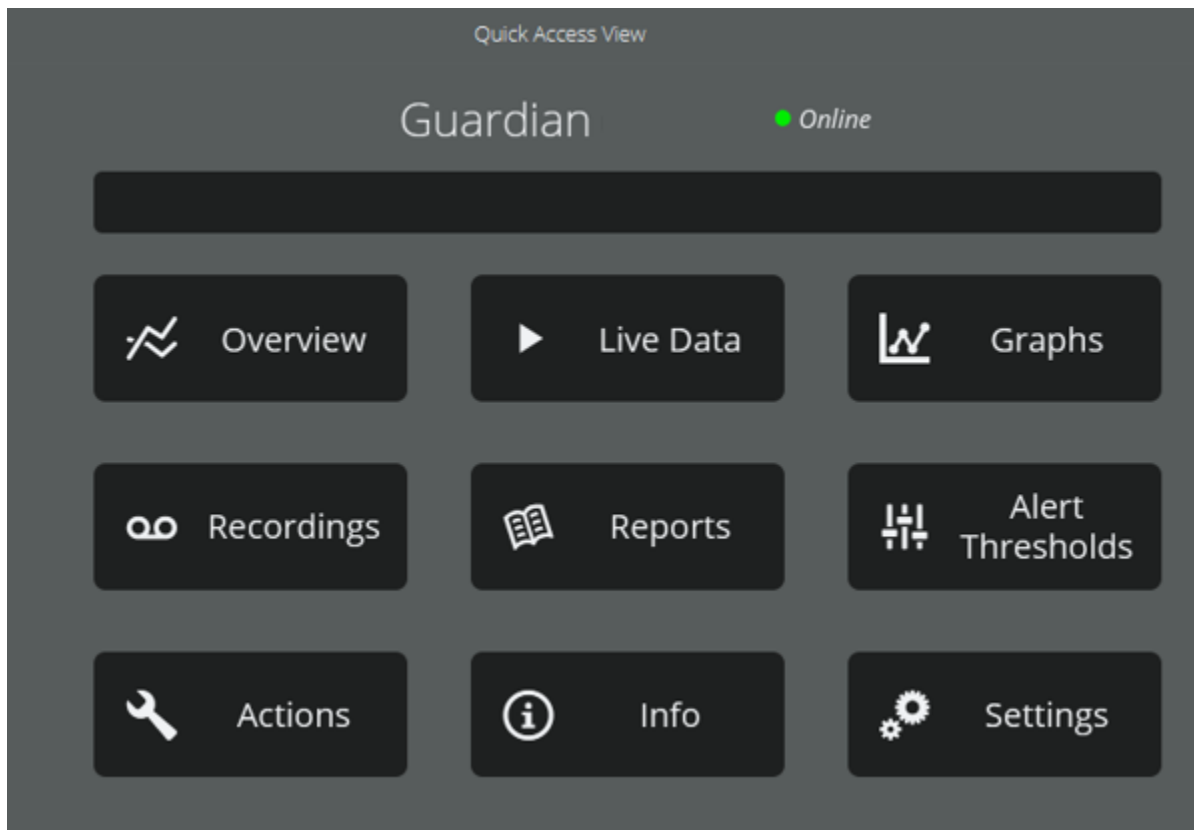


Devices icon  list all Recording devices associated with your company


Selecting a device from the list or from the map displays that device's Quick Access View menu

PQ Canvass Quick Access View

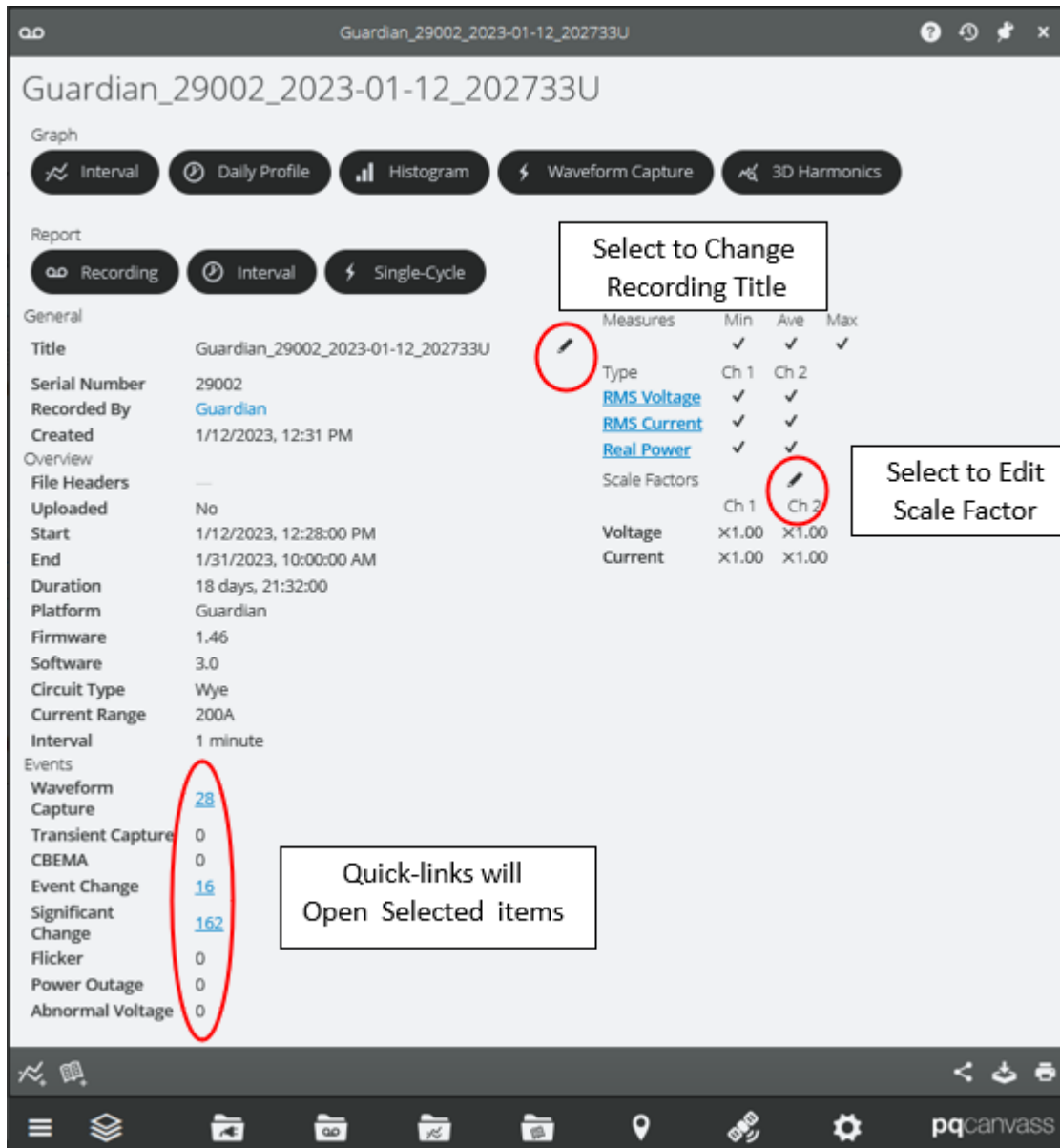
Select *Overview* or *Graphs* to see graphs displaying data in 1 second averages, *Live Data* to see live data in a waveform view or a meter view, or *Recording* for Power Quality (PQ) data file based on initialization and trigger settings. See the PQ Canvass User Guide for detail instructions.



Opening a Recording

To see a list of all Power Quality (PQ) recordings for every device, select the recordings icon  at the bottom of the page. Then select a data file.

The Header Report will be displayed showing information about the recording



The screenshot shows the Guardian recording header report for recording ID Guardian_29002_2023-01-12_202733U. The interface includes navigation tabs for Graph (Interval, Daily Profile, Histogram, Waveform Capture, 3D Harmonics) and Report (Recording, Interval, Single-Cycle). The General section lists recording details such as Title, Serial Number, Recorded By, Created, Overview, File Headers, and Events. The Events section shows counts for Waveform Capture (28), Transient Capture (0), CBEMA (0), Event Change (16), Significant Change (162), Flicker (0), Power Outage (0), and Abnormal Voltage (0). The Measures table lists metrics like RMS Voltage, RMS Current, and Real Power with Min, Ave, and Max values. The Scale Factors table shows Ch 1 and Ch 2 scale factors for Voltage and Current. Annotations include a red circle around the edit icon for the recording title, a red circle around the edit icon for the Ch 2 scale factor, and a red circle around the '28' value in the Waveform Capture event count. A text box indicates that quick-links will open selected items.

Measures	Min	Ave	Max
Type	Ch 1	Ch 2	
RMS Voltage	✓	✓	✓
RMS Current	✓	✓	✓
Real Power	✓	✓	✓

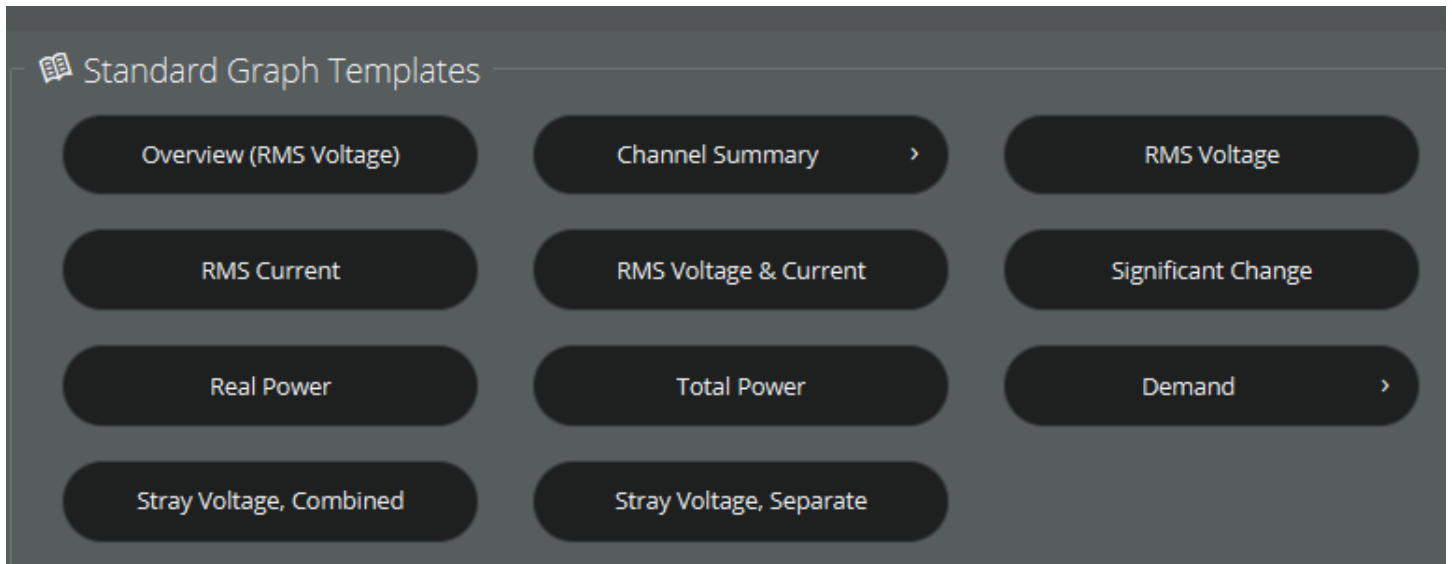
Scale Factors	Ch 1	Ch 2
Voltage	×1.00	×1.00
Current	×1.00	×1.00

Events	Count
Waveform Capture	28
Transient Capture	0
CBEMA	0
Event Change	16
Significant Change	162
Flicker	0
Power Outage	0
Abnormal Voltage	0

Working with Graphs

Select the Interval, Daily Profiles, Histogram or Waveform Captures to see the sub menus


















Select the desired Graph. Grayed out selections are not contained in the recorded graph




RMS Voltage and Current shows min, max, and averages

Waveform Capture overlays  can be applied to the graphs



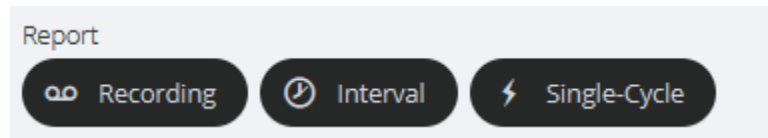
-  New Graph,  Set Timespan,  Customize Axis,  Toggle Show/Hide Annotations,  Select Tool,
-  Save Graph  Zoom Out,  Zoom In,  Toggle Graph Overlays,  Back/undo,  Home/Revert
-  Next/Redo,  Reload,  Annotate Graph,  Graph Template Editor,  Print Graph,  Per Unit Scaling

 Quick Editor lets you de-select graph traces, or re-select them as needed

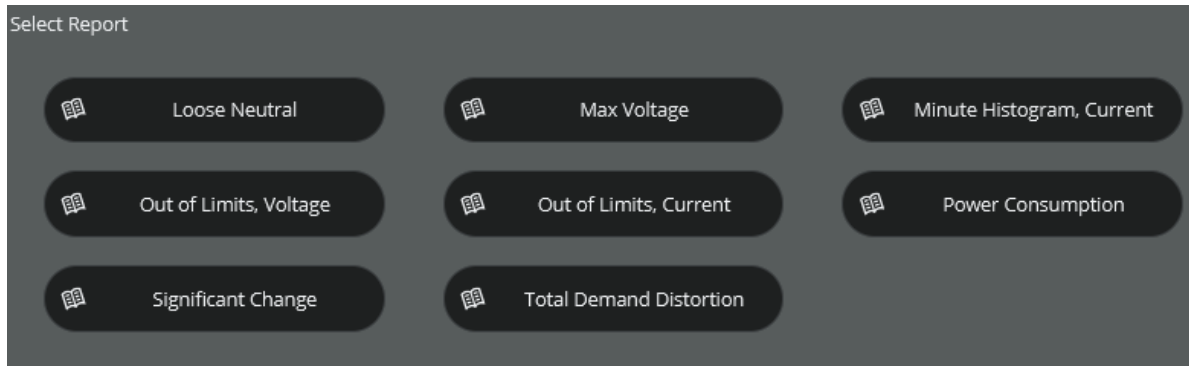
Traces				Measures	
	Min	Ave	Max		
Ch 1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ch 2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Opening a Report from a PQ Data File

Select a report from the header report list



Then select desired report



New Recording (Initialization options)

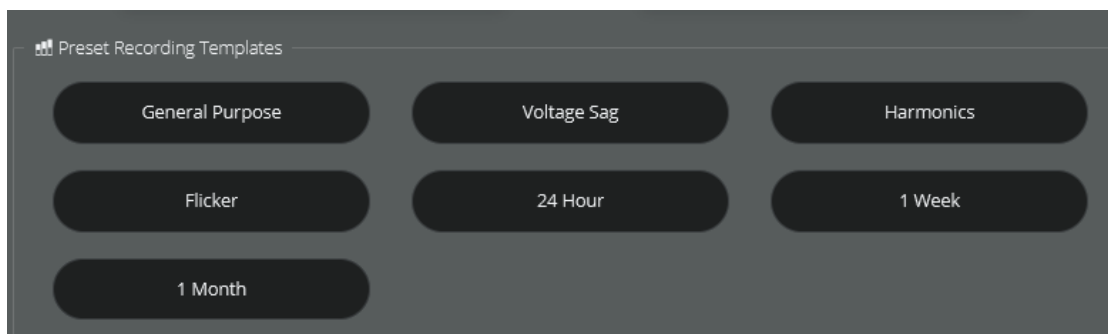
To start a new recording (which creates a PQ data file) the Guardian must be initialized at least once (the PQ data file will continue to update until the next initialization) and initialized whenever the Guardian is moved to another site. This creates separate PQ data files for each location.

To initialize a recorder, go to the Recorder's *Quick Access View* page and select *Recordings* then select *New Recording*. A list of templates is available with preset recording options.

General Purpose contains all the settings available; all other templates will be subsets of these settings or contain specific settings.

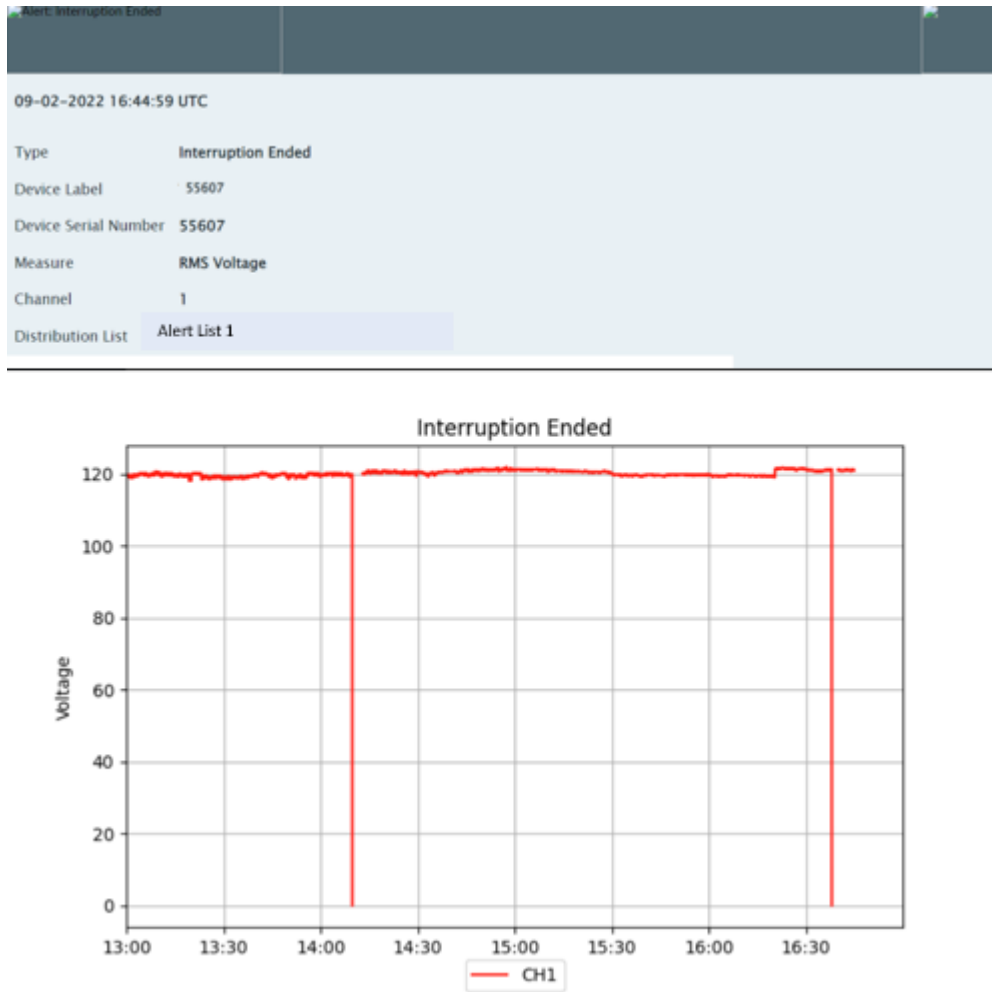
Set or remove check marks to adjust what is recorded. Select **[Start Recording]** when you have completed your selections

There are many settings and different models of recorders will have different selections available, see the PQ Canvass User manual for more information.



PQ Canvass - Setting Alert Notifications

PQ Canvass can be configured with your Guardian or other models to send email or SMS (text) alerts when the trigger thresholds of a monitored setting are reached. The Notification List must be configured, then each device will need its Trigger Thresholds set.



Refer to the PQ Canvass Getting Started Guide and the PQ Canvass User Manual for more details on setting alerts.

Technical Support

Help is always available if one needs additional assistance. The technical support team at PMI is widely considered to be the best in the industry. Use one of the following methods to obtain technical support.

Email Support

Send email to: techsupport@powermonitors.com

Web Support

Submit a support request via the web at <https://powermonitors.com/support>

Telephone Support

Contact us 24 hours a day, 7 days a week for live tech support by calling:

(800) 296-4120

Faxes should be sent to: **(540) 432-9430**

Postal Mail Support

All correspondence by post should be addressed to:

Power Monitors, Inc.

800 North Main Street

Mount Crawford, VA 22841

USA