PWRM10-01
PWRM20-01

IoT Energy Monitoring Modules

MA1067

Web Interface & HTTP API User Manual



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PWRM10-01 & PWRM20-01 Web Interface & HTTP API User Manual
MA1067 Rev. A – May 2022
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Contacting Dataforth Corporation

Contact Method	Contact Information
E-Mail: Technical Support	support@dataforth.com
Website:	www.dataforth.com
Phone:	+1-520-741-1404 and toll free US +1-800-444-7644
Fax:	+1-520-741-0762
Mail:	Dataforth Corporation 3331 E. Hemisphere Loop Tucson, AZ 85706 USA

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1.0 Features

The PWRM10-01 and PWRM20-01 IoT Energy Monitoring Modules encompass more than 35 years of design excellence in the process control industry. These DIN rail mounted, industrially rugged, IoT modules provide a modern solution for a wide range of energy related applications.

Instrument Class Performance

- Wide Operating and Measurement Range of 85 - 265VAC for PWRM10
- Wide Operating and Measurement Range of 85 - 525VAC for PWRM20
- Connects to 3-Phase Systems, 3-Wire Wye, 4-Wire Wye, and Delta
- Connects to Single Phase Systems
- Self-Powered from any Phase – A, B, or C
- 0.1% Phase Voltage Accuracy
- 0.1% Phase Current Accuracy
- Industrial Operating Temperature Range -40°C to +85°C
- 100ppm/°C Temperature Coefficient
- CE Compliant

Industry Leading Functionality

- Internet of Things (IoT) Connectivity
- Simple Interface through a Web Browser, Smart Phone, or Tablet
- Data Charting
- Data Logging
- Events (Alarm) Configurable on Power Quality Parameters
- Event Trips Post Notifications
- Field Upgradeable for Improvements and Feature Addition
- Security Features
- Compact DIN Rail Housing

Interface Options

- Web UI Hosted on the Module
- HTTP API

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2.0 Description and Documentation

Energy Monitoring Modules PWRM10-01 and PWRM20-01 are IoT, universal, high accuracy, compact, self-powered, electrical energy measurement devices that interface to three-phase and single-phase systems. The modules are specifically designed for heavy-duty industrial and commercial installations and retrofit applications, providing a wide range of highly accurate power and energy measurements over an operating temperature range of -40°C to +85°C.

The DIN rail mounted enclosures have pluggable terminal blocks for connecting to phase voltages and phase currents which simplifies setup and maintenance. Both modules have a small form factor which occupies less space in control cabinets than other measurement solutions. The PWRM10-01 module interfaces to phase voltages of 85 – 265VAC, 50/60Hz and is self-powered from any of the three phases. For higher voltage systems, the PWRM20-01 module interfaces to phase voltages of 85 – 525VAC, 50/60Hz and is self-powered from any of the three phases. Both modules can interface to higher phase voltages with the use of voltage transformers and scaling configured in the module. Power consumption is low and does not affect measured power and energy.

Phase current inputs have an industry standard range of 0.333VAC full scale. The modules are configurable to use an external shunt, current transformer, or Rogowski Coil to measure phase currents directly or non-contact.

The PWRM10-01 and PWRM20-01 modules measure and report a wide range of electrical energy parameters which include, but are not limited to:

- RMS Voltages and Currents
- Phase Angles
- Line Periods
- Instantaneous Total Active Powers
- Instantaneous Total Apparent Power
- Fundamental Active Power
- Power Factors
- Total Active Energy
- Fundamental Active Energy
- Fundamental Reactive Energy
- Reactive Energy
- Harmonics
- Power Quality – Configurable Events Monitor and Post Notifications for:
  - Over-Voltage
  - Over-Current
  - Sag

Real-time data from the module is accessed via an Ethernet port using the HTTP API or a standard web browser on a host computer, smart phone, or tablet. Data logging is user configurable and once parameters and ranges are selected, the data is automatically downloaded and stored.

With the ease of use and many features of the PWRM10-01 and PWRM20-01 modules, measuring power quality, monitoring energy consumption, determining machine health, and other powerful data analyses become simple operations.

PWRM module literature and software is available for download from the PWRM Software & User Manual Download Center. This includes, but is not limited to:

MA1069 PWRM10-01 & PWRM20-01 Quick Start Guide
MA1068 PWRM10-01 & PWRM20-01 Hardware User Manual
MA1067 PWRM10-01 & PWRM20-01 HTTP API User Manual

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3.0 PWRM Web Interface – Connecting and Acquiring Data

The PWRM Web Interface provides an efficient and intuitive way to configure and operate the PWRM10-01 and PWRM20-01 modules. Connection to the modules can be established by simply typing the IP Address of the modules into a browser. If the IP Address of the modules is unknown, use the PWRM Discovery Tool as outlined in Section 3.1 PWRM Discovery Tool.

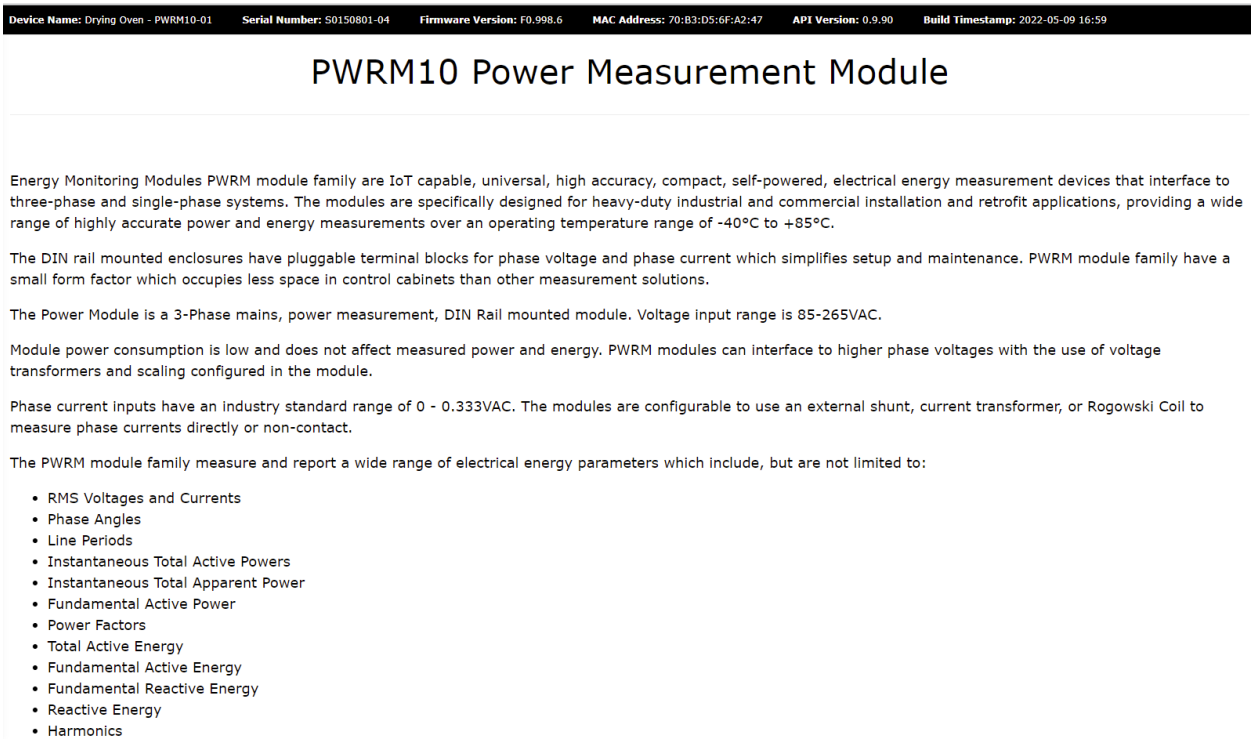


Figure 1: Web Interface Overview Page

3.1 PWRM Discovery Tool

Dataforth offers a no cost software tool which identifies all PWRM10-01 and PWRM20-01 modules connected to a computer, tablet, or smartphone either directly or through a local network. Use this tool find the IP Addresses or names of devices on the local network.

The tool is available for download from the PWRM Software & User Manual Download Center

Two versions are available - one for 64-bit systems and one for 32-bit systems.

PWRM Discovery Tool 32-bit

PWRM Discovery Tool 64-bit

NOTE: The PWRM Discovery Tool currently only runs on a Windows computer with operating system Win 7 or higher. Future versions will run on tablet and smartphone devices.

It may be necessary to modify corporate or local firewall settings for the tool to run.

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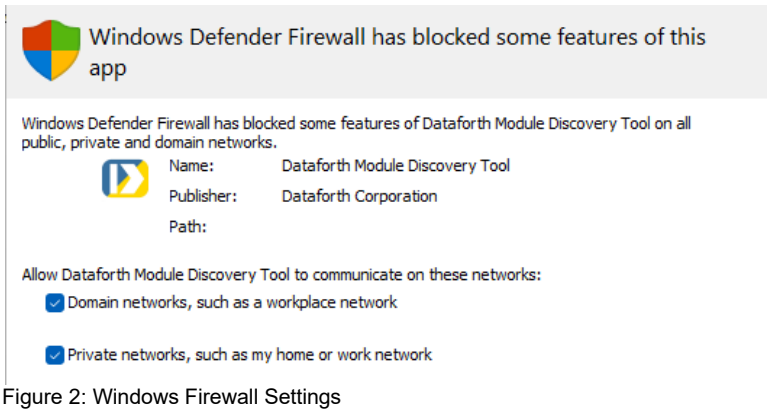
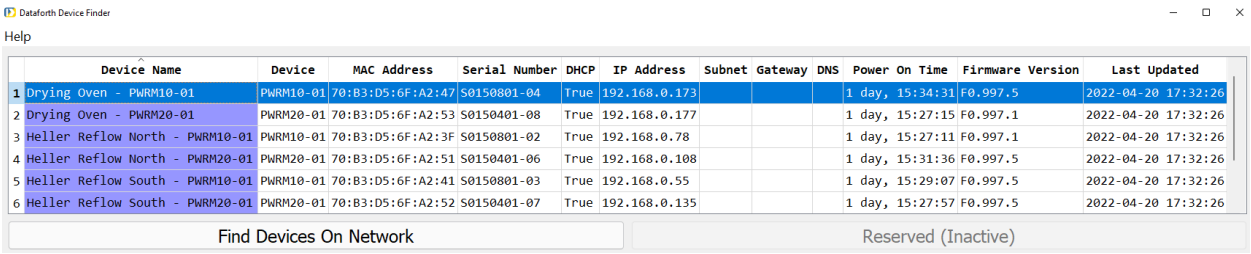


Figure 2: Windows Firewall Settings

Once the tool is running, press the *Find Devices On Network* button. A scan will execute, identify all connected modules, and continually update connection status.



	Device Name	Device	MAC Address	Serial Number	DHCP	IP Address	Subnet	Gateway	DNS	Power On Time	Firmware Version	Last Updated
1	Drying Oven - PWRM10-01	PWRM10-01	70:B3:D5:6F:A2:47	S0150801-04	True	192.168.0.173				1 day, 15:34:31	F0.997.5	2022-04-20 17:32:26
2	Drying Oven - PWRM20-01	PWRM20-01	70:B3:D5:6F:A2:53	S0150401-08	True	192.168.0.177				1 day, 15:27:15	F0.997.1	2022-04-20 17:32:26
3	Heller Reflow North - PWRM10-01	PWRM10-01	70:B3:D5:6F:A2:3F	S0150801-02	True	192.168.0.78				1 day, 15:27:11	F0.997.1	2022-04-20 17:32:26
4	Heller Reflow North - PWRM20-01	PWRM20-01	70:B3:D5:6F:A2:51	S0150401-06	True	192.168.0.108				1 day, 15:31:36	F0.997.5	2022-04-20 17:32:26
5	Heller Reflow South - PWRM10-01	PWRM10-01	70:B3:D5:6F:A2:41	S0150801-03	True	192.168.0.55				1 day, 15:29:07	F0.997.5	2022-04-20 17:32:26
6	Heller Reflow South - PWRM20-01	PWRM20-01	70:B3:D5:6F:A2:52	S0150401-07	True	192.168.0.135				1 day, 15:27:57	F0.997.5	2022-04-20 17:32:26

Figure 3: Discovery Tool Find Devices Results Example

The Discovery Tool will find multiple modules connected to a network with the same static IP address. For proper operation, assign each module a unique IP address or change the configuration to DHCP.

To change the settings, hover over a module Device Name in the list and right click to open the configure network menu.

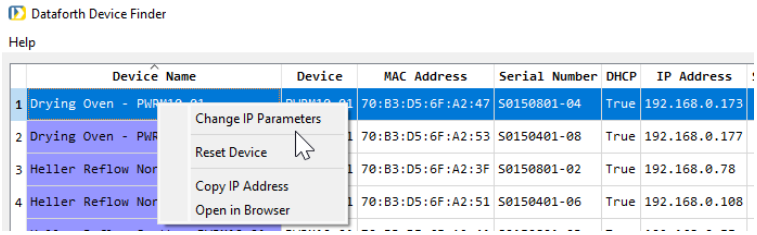


Figure 4: Change IP Parameters

Click *Change IP Parameters*, then enter the desired static IP address parameters or select *DHCP* to allow a network controller to automatically assign an IP address.

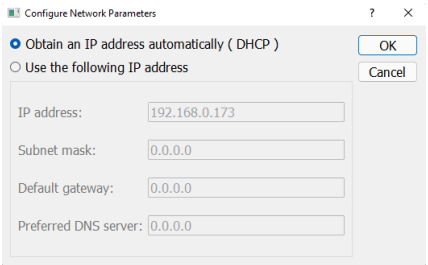


Figure 5: Configure IP Parameters

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To push network configuration changes to the module, press the *OK* button.

To apply the new network settings, power cycle the module or right click the module again and select *Reset Device*. The module will be removed from the list and reappear when a connection is established using the new parameters.

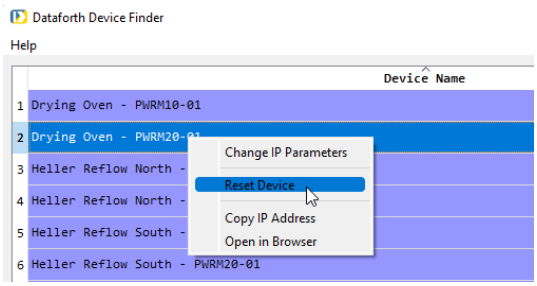


Figure 6: Reset Device

Network configuration can also be set in the PWRM10-01 and PWRM20-01 modules using the Web Interface or the API. See Section 4.3 Network Configuration for further details on specifying the communications connection to the module.

The Web Interface to a module can be opened from within the Discovery Tool. Double-click the Device Name, or hover over the Device Name, right click, then select *Open in Browser*.

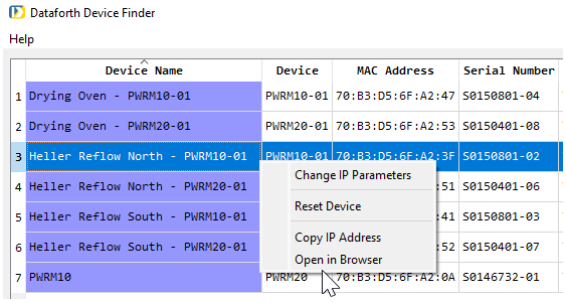


Figure 7: Open Web Interface in a Browser

The Overview page will display after the connection is established.

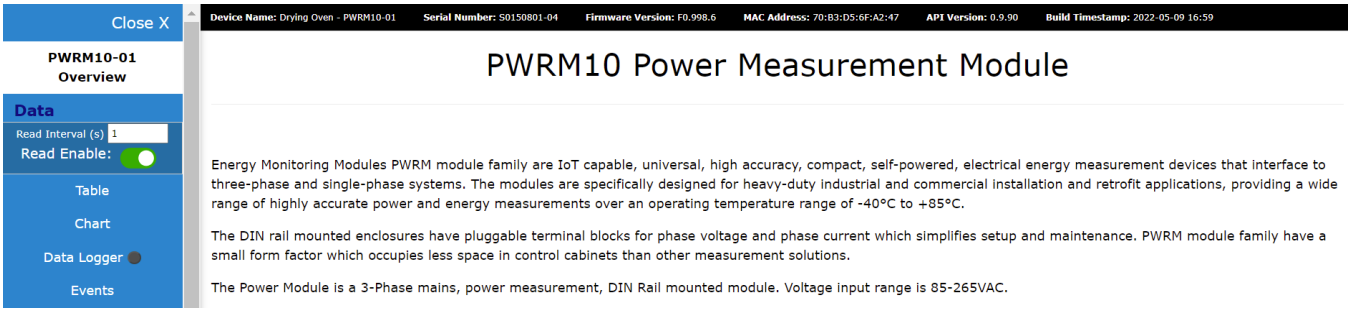


Figure 8: Web Interface in a Browser

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3.2 Reading Data from the Module – Instantaneous Data in Table Form

The **Data | Instantaneous** page continuously displays all data read from the API path /api/Data in table form. Use the Read Interval field in the Data section of the sidebar to specify the desired measurement poll rate.

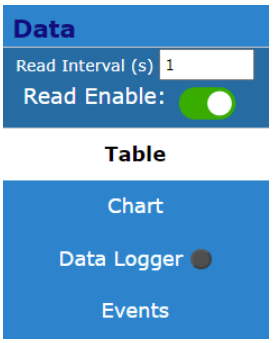


Figure 9: Read Interval

Data displayed includes:

RMS Voltages and Currents
Phase Angles
Line Periods
Power Factors
Active, Reactive, and Apparent Power
Active, Reactive, and Apparent Energy

Select **Data | Tabe** from the sidebar to display data in table format.

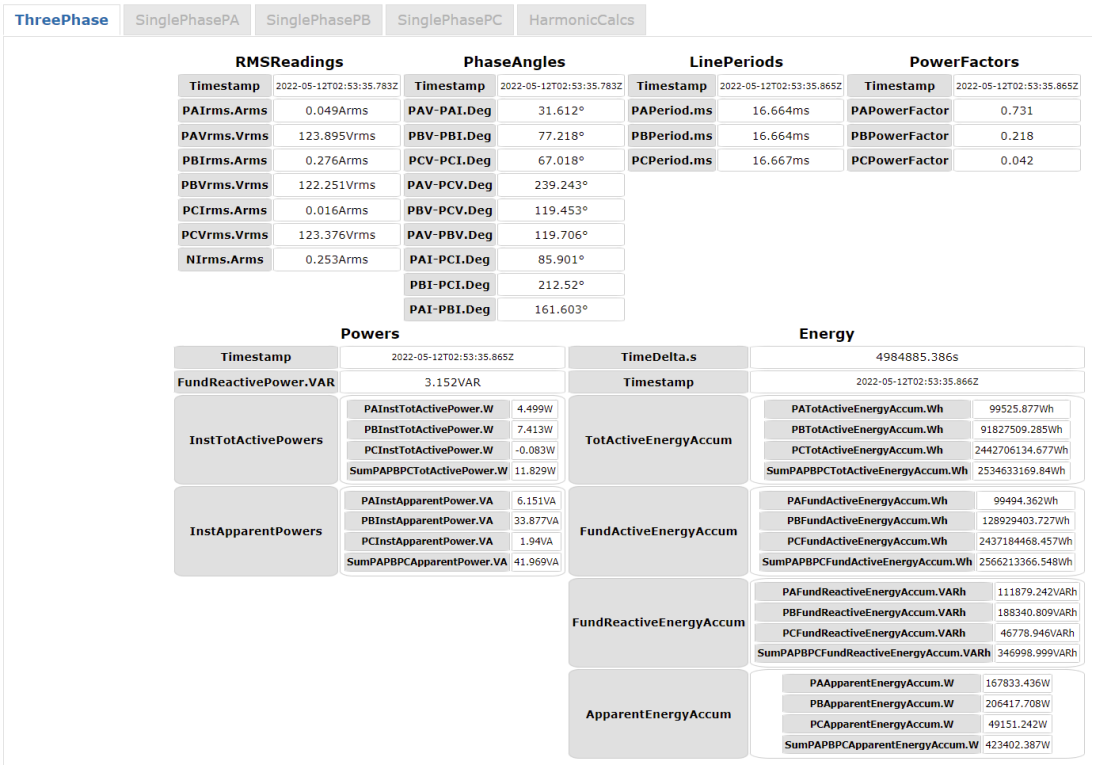


Figure 10: Data Display Example

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3.3 Reading Data from the Module – Chart Display

The **Data | Chart** page continuously reads and displays all data from the API path /api/Data in chart form. Use the Read Interval and History Capacity fields to specify the desired measurement poll rate and history capacity.

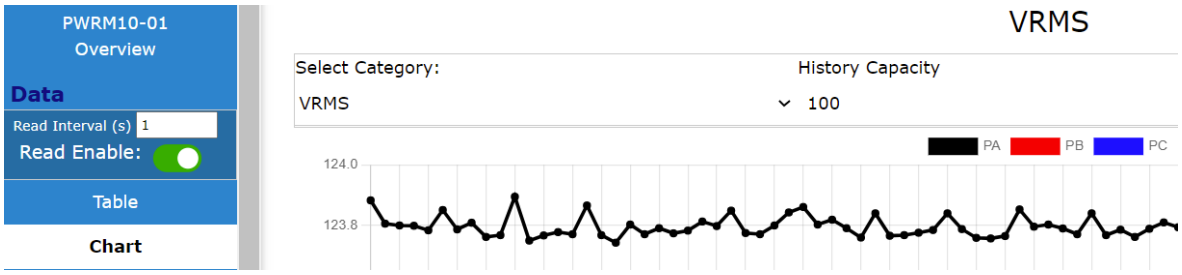


Figure 11: History Capacity

History Capacity specifies the amount of data displayed in charts. It also specifies how much data is stored in browser memory. The maximum capacity is 1,000,000 reads or scans. Each read or scan encompasses every parameter which the module can measure. Once the History Capacity limit is reached, the oldest read or scan will be deleted, and the newest read or scan will be added to the end of the chart or log. For charts, the newest sample is added to the end of the running display, and the charted data rolls to the left. Charting continues in the background when another Web Interface page is selected so the charts are always up to date when viewed.

Samples collected shows progress towards the History Capacity limit.

Press the *Download* button to manually download the collected data stored in browser memory to the host computer, tablet, or smartphone \Downloads directory. The filename for each download is unique with format 'data + current time'. Data is in json format and can be read with a common browser or other utility.



Figure 12: Downloaded JSON Data listed in Windows File Explorer

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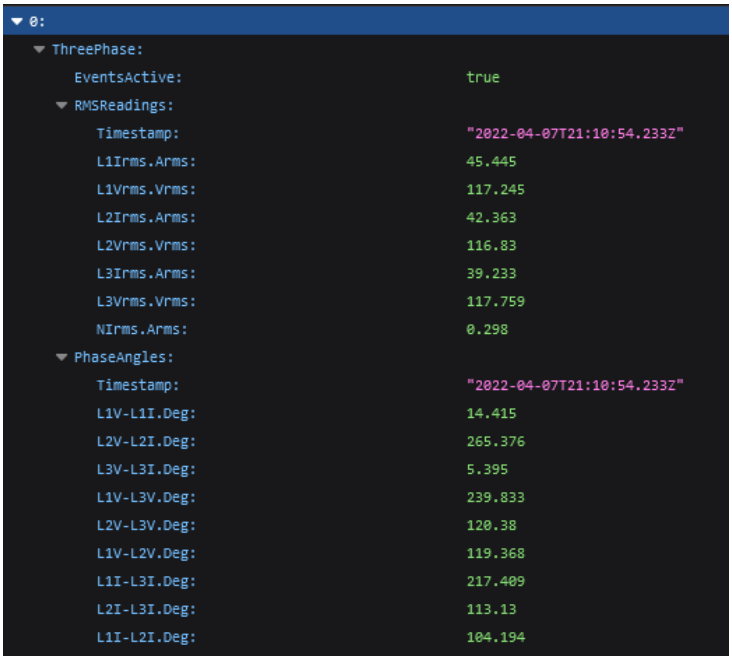


Figure 13: Viewing JSON Data using a Web Browser

Press the *Reset Read* button in the **Chart** page to clear readings collected. Charted data and readings stored to browser memory are deleted and data collection starts over at the specified Read Interval.

Select the charted data to be displayed from the drop-down menu on the **Chart** page.

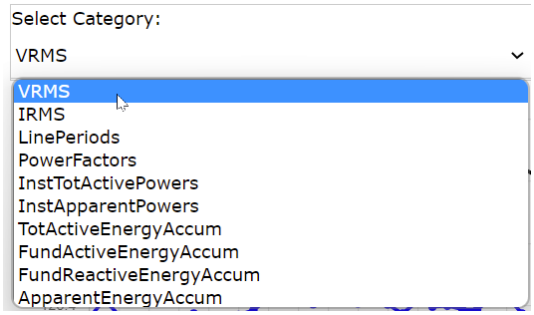


Figure 14: Charted Data Selection

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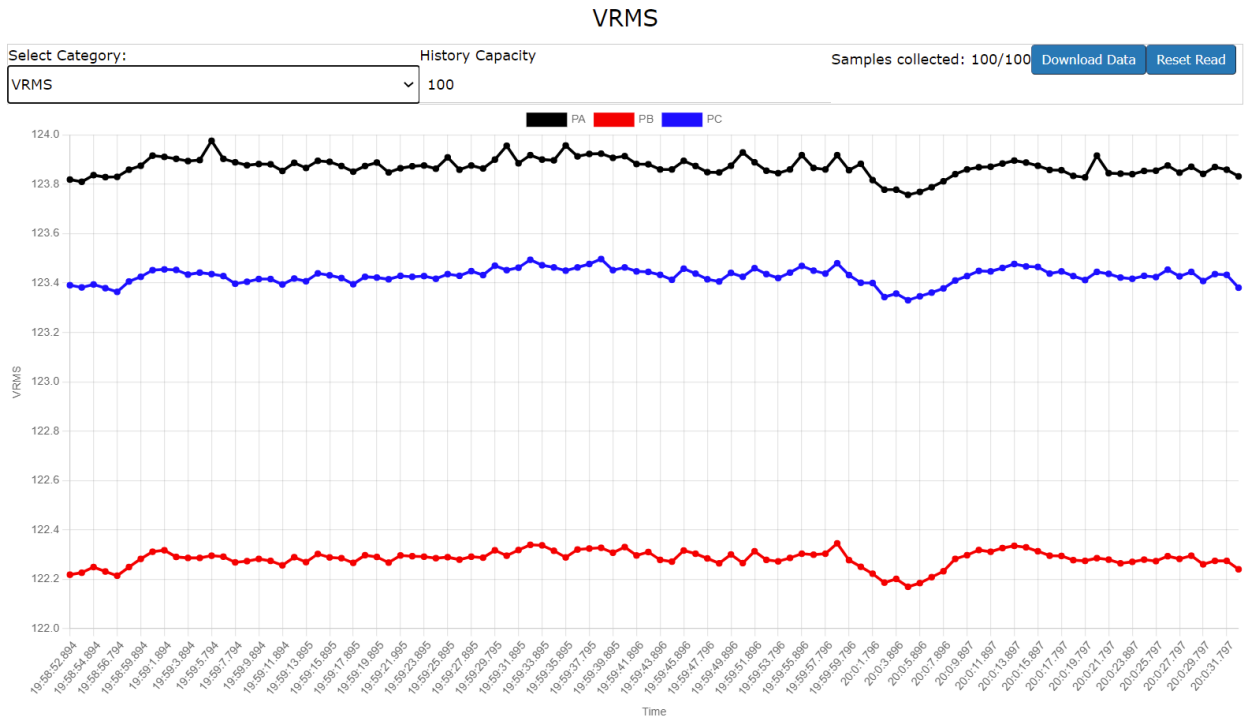


Figure 15: Charted Data Example

3.4 Data Logger

The Data Logger reads data from the PWRM10-01 or PWRM20-01 module at the specified Read Interval and periodically saves this data to the \Downloads folder of the host PC, tablet, or smartphone at the specified Download Interval. Use the **Data | Data Logger** page to set logging parameters.

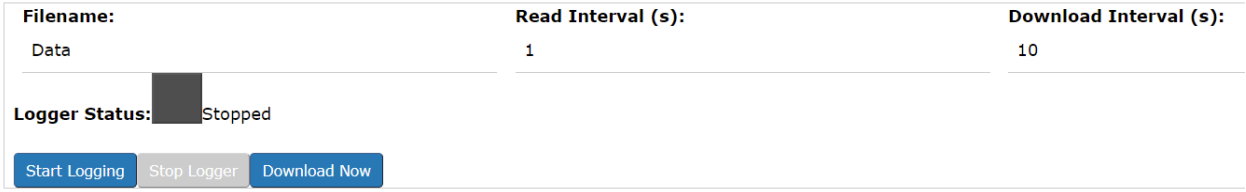


Figure 16: Data Logger

Enter the base filename into the Filename field. Data will be saved in the \Downloads directory in comma separated value format.

Enter the measurement read interval in seconds in the Read Interval field.

Enter the time in seconds at which the data file is to be downloaded to the host computer, tablet, or smartphone in the Download Interval field.

To operate the data logger, press the *Start Logging* button. Logger status will show as green on the Data Logging page and active data being collected will display on screen.

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Figure 17: Data Logger Control

ThreePhase_EventsActive	ThreePhase_RMSReadings_Timestamp	ThreePhase_RMSReadings_PAIrms.Arms	ThreePhase_RMSReadings_PAVrms.V
false	2022-05-12T03:02:37.202Z	0.05	123.866
false	2022-05-12T03:02:38.202Z	0.049	123.879
false	2022-05-12T03:02:39.202Z	0.049	123.902
false	2022-05-12T03:02:40.202Z	0.049	123.917

Figure 18: Data Logger Display

The specified data logging operation continues even when navigating away from the Data Logging page. The indicator on the sidebar next to Data Logging will show green when logging is enabled and grey when logging is stopped.

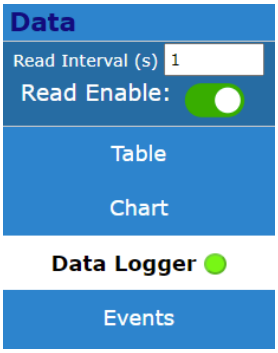


Figure 19: Data Logger Status

When the download interval is reached, the file is saved to \Downloads with a unique filename comprised of the specified filename plus the current date and time.



Figure 20: Data File Naming

The browser being used may ask permission to download files or to download multiple files. Follow the instructions on the browser pop up or go into the browser settings to allow these automated file downloads if this is acceptable with the application network policies.

Data collection and file download will continue until the *Stop Logger* button is pressed.

Use the *Download Now* button to manually download a data file before the Download Interval has been reached. If the *Stop Logger* button has been pressed before the Download Interval has been reached, press the *Download Now* button to retrieve remaining data points which have not been automatically downloaded on previous cycles.

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3.5 Events

One of the most powerful features of the PWRM10-01 and PWRM20-01 modules is their ability to measure power quality. Limits can be set for three parameters – Over Voltage, Over Current, and Sag. For details on setting up power quality measurements, see Section 4.8 Events Configuration.

The **Data | Events** page displays the status of all configured Events. When a measurement exceeds the set limit, a log is updated in module memory and displayed on this page. Entries show the limit exceeded, the phase on which the event occurred, and the timestamp of when the event started. A second entry will post when the measured data returns to a valid range and the event has ended.

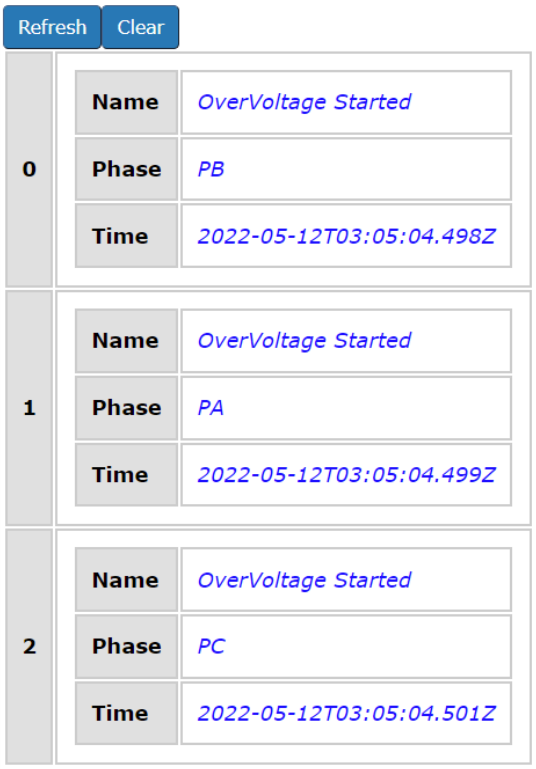


Figure 21: Events Log

The PWRM10-01 and PWRM20-01 modules will store up to 100 events. Once this limit is reached, the oldest event will be deleted and the newest added to the end of the log.

To update the event log displayed on screen, press the *Refresh* button.

To clear the event log, press the *Clear* button.

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4.0 PWRM Web Interface – Configuring PWRM10-01 and PWRM20-01

4.1 Data Configuration

The **Configuration | Data** page is used to specify module internal sampling, select the frequency of signals measured, and determine how data is presented on the Data Display and Data Charts pages.

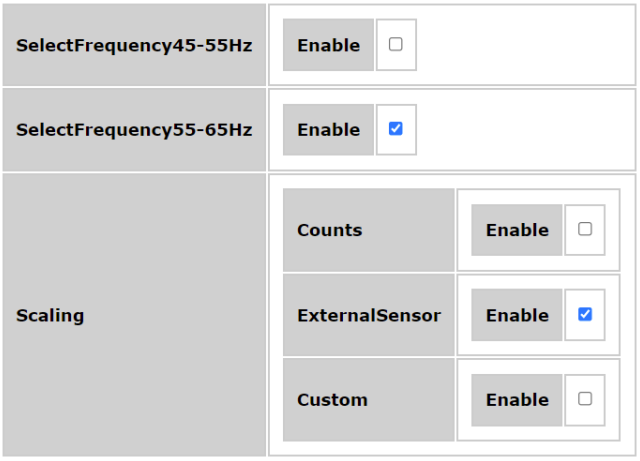


Figure 22: Data Configuration

For optimal accuracy of readings, select the line frequency of the phase voltages and currents as either 50Hz nominal or 60Hz nominal. 60Hz is the default setting. To change to 50Hz, uncheck the SelectFrequency55-65Hz *Enable* box and check the SelectFrequency45-55Hz *Enable* box.

To push phase frequency configuration changes to the module, press the *Send* button.

Data collected by the module can be presented in several different formats as specified by the user in the Scaling section of the Data Configuration page. The PWRM10-01 and PWRM20-01 modules use 24-bit data converters and 32-bit representation for some parameters. Data can be viewed in counts by selecting the Counts *Enable* box. When Counts is enabled, ExternalSensor and CustomScale parameters do not affect the displayed readings.

PWRM10-01 and PWRM20-01 modules interface to phase currents using Shunts, Current Transformers, or Rogowski Coils with 0 – 0.333VAC output. Both modules can interface to phase voltages over the standard input range limits with the use of Voltage Transformers. See Section 4.4 Sensor Configuration to enter external sensor parameters and push them to the module. Use the ExternalSensor *Enable* checkbox to apply external sensor scaling parameters to measured data.

Applications may require measured data to be scaled to ranges and units other than standard voltage and current. Examples are 0 to 100% of range or ratio scaling based on the way voltage transformers are connected. See Section 4.4 Sensor Configuration to enter custom scaling parameters and push them to the module. Use the CustomScale *Enable* checkbox to apply these scaling parameters to measured data. Measured data can be scaled by ExternalSensor scaling factors, CustomScale scaling factors or both.

Data configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Data** page will require login credentials. Clicking on **Configuration | Data** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Data** page. For more information, see Section 4.10 Security.

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4.2 Device Name Configuration

The **Configuration | Device Name** page gives the user the ability to assign a descriptive name to a PWRM10-01 or PWRM20-01 module.

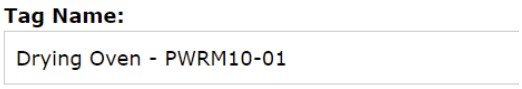


Figure 23: Device Name Configuration

To push device name configuration changes to the module, press the *Send* button.

Reload the page to see the tag name in the page header.

Device name configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Device Name** page will require login credentials. Clicking on **Configuration | Device Name** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Device Name** page. For more information, see Section 4.10 Security.

4.3 Network Configuration

The PWRM10-01 and PWRM20-01 modules have two options for Network Internet Protocol (IP) address configuration – DHCP and Static. The **Configuration | Network** page is used to set network parameters.

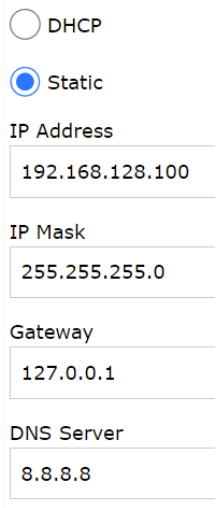


Figure 24: IP Configuration Page

DHCP is the default configuration. When using this setting, the module will have an IP address automatically assigned by the network it is connected to.

When *Static* is selected, the interface will show four additional text boxes: IP Address, IP Mask, Gateway, and DNS.

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Modules are factory configured as follows:

Static IP Address	192.168.128.100
Subnet Mask	255.255.255.0
Gateway	127.0.0.1
DNS Server	8.8.8.8

Select DHCP or Static by clicking the button next to the parameter. If Static is used, make any required changes to the default settings by entering the appropriate information into each field. To push network configuration changes to the module, press the *Submit* button. The IP Address changes will be executed immediately upon clicking the *Submit* button. This means that if the page is refreshed/reloaded and the address bar has not been updated to the new IP Address stored in the module, connection to the Web Interface will be lost.

Network configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Network** page will require login credentials. Clicking on **Configuration | Network** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Network** page. For more information, see Section 4.10 Security.

4.4 Sensor Configuration

PWRM10-01 and PWRM20-01 modules interface to phase currents using Shunts, Current Transformers, or Rogowski Coils with 0 – 0.333VAC output. Use the **Configuration | Sensor** page to select the type of sensor used and to enter the sensor parameters. Reference MA1068 PWRM10-01 & PWRM20-01 Hardware User Manual for descriptions of these parameters.

ATTENTION

Read, understand, and follow all instructions in this manual and MA1068 PWRM10 & PWRM20-01 Hardware User Manual including all warnings, cautions, and precautions before installing and using the product.

CAUTION – RISK OF ELECTRICAL SHOCK

When installing and operating the PWRM10-01 and PWRM20-01 modules, there is a potential shock hazard from dangerous high voltage. Ensure systems are de-energized before installing the product or removing the terminal blocks.

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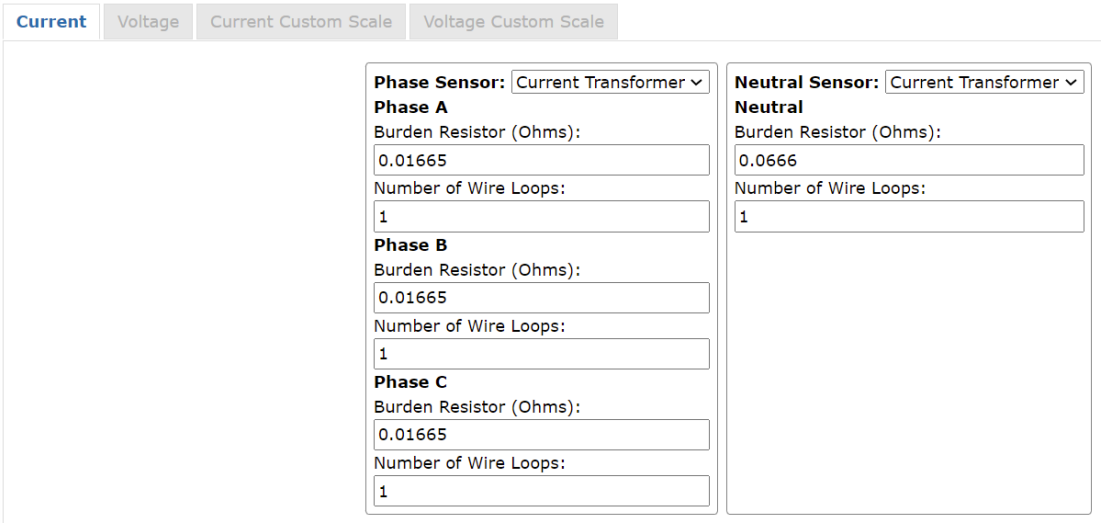


Figure 25: Sensor Configuration – Phase Current Sensor

To push sensor configuration changes to the module, press the *Send* button.

The PWRM10-01 module interfaces to phase voltages of 85 – 265VAC and the PWRM20-01 module interfaces to phase voltages of 85 – 525VAC. Both modules can interface to phase voltages over the standard input range limits with the use of voltage transformers. Use the Sensor Configuration page to specify the use of voltage transformers and to set the primary to secondary turns ratio.



Figure 26: Sensor Configuration – Phase Voltage Sensor

To push sensor configuration changes to the module, press the *Send* button.

Applications may require measured data to be scaled to ranges and units other than standard voltage and current. Examples are 0 to 100% of range or ratio scaling based on the way voltage transformers are connected. The Current Custom Scale and Voltage Custom Scale tabs of the Sensor Configuration page provide fields for user defined scaling and units. These scaling factors are applied to measured data in addition to standard scaling parameters from external current and voltage sensors.

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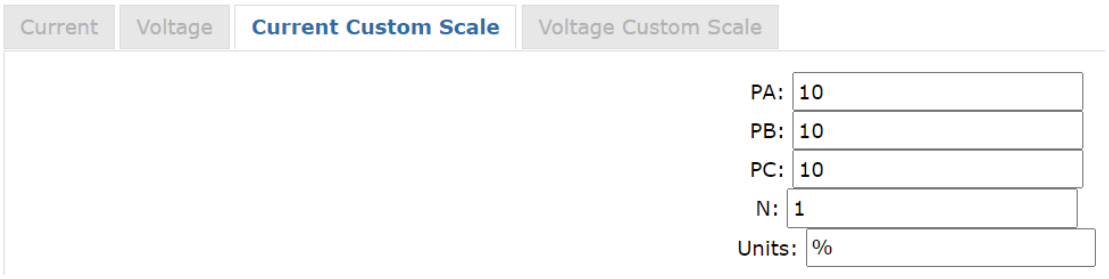


Figure 27: Custom Current Scale Configuration

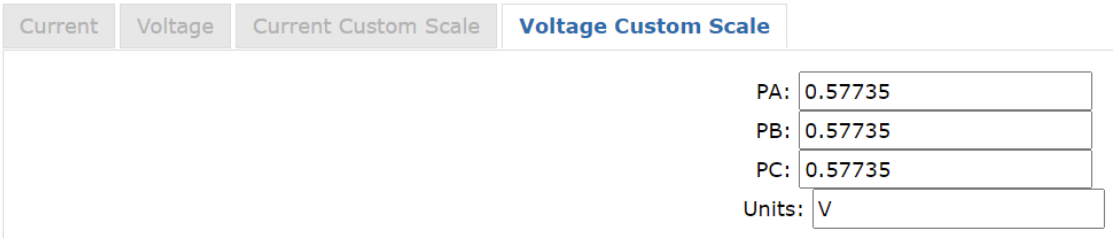


Figure 28: Custom Voltage Scale Configuration

To push sensor configuration changes to the module, press the *Send* button.

Custom Scaling parameters are only applied to measured data if CustomScale is selected in the Data Configuration page. See Section 4.1 Data Configuration for details.

Sensor configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Sensor** page will require login credentials. Clicking on **Configuration | Sensor** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Sensor** page. For more information, see Section 4.10 Security.

4.5 Harmonics Configuration

The **Configuration | Harmonics** page contains all parameters that relate to measurement of harmonics. The PWRM10-01 and PWRM20-01 modules can measure up to three harmonics at a time. The fundamental is always monitored. Use HXIndex, HYIndex, and HZIndex to specify which harmonics to read. The modules are capable of measuring up to the 51st harmonic on a selected phase, so the allowable range of values for HXIndex, HYIndex and HZIndex is 2 to 51.

HXIndex specifies harmonic 1 of 3 to be monitored by the harmonic computations. Choose a value between 2 and 51.

HYIndex specifies harmonic 2 of 3 to be monitored by the harmonic computations. Choose a value between 2 and 51.

HZIndex specifies harmonic 3 of 3 to be monitored by the harmonic computations. Choose a value between 2 and 51.

Measuring more than 3 harmonics requires a loop operation where 3 harmonics are monitored then HXIndex, HYIndex, HZIndex are changed to three new values and the read repeats. This sequence repeats until all are acquired. The Web Interface Tool automates this looping process, or it can be programmed using the API.

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For example, to measure odd harmonics up to the 15th harmonic,

Set HXIndex = 3, HYIndex = 5, HZIndex = 7, then read and save the measurements.
Set HXIndex = 9, HYIndex = 11, HZIndex = 13, then read and save the measurements.
Set HXIndex = 15, HYIndex = 1, HZIndex = 1, then read and save the measurements.

Repeat this sequence as long as harmonic measurements are to be made.

H#Index: 1 - 51
PhaseSelect: PA, PB, PC, or N
TimeBaseSelect: PA, PB, or PC
RateConfig: false: wait DelayPeriod before access to readings, true: access readings immediately
DelayPeriod: 500, 750, 1000, 1250
UpdateRate:"125us", "250us", "1ms", "16ms", "128ms", "512ms", "1.024s"

HXIndex	3
HYIndex	51
HZIndex	7
PhaseSelect	PA
TimeBaseSelect	PA
RateConfig	☐
DelayPeriod	750
UpdateRate	125us

Figure 29: Harmonics Configuration

PhaseSelect has values of PA, PB, PC, or N and specifies which phase voltage (PA, PB, PC) and current (PA, PB, PC, N) harmonics are to be measured on.
TimeBaseSelect has values of PA, PB, or PC and specifies which phase voltage is to be used as the time base for harmonics measurements.

RateConfig displays a value of 0 or 1 and is not user settable. The default value of 0 means that harmonics readings can be accessed after the specified DelayPeriod which occurs once upon power cycle or module reset.

DelayPeriod has a default value of 750ms and can be changed to 500ms, 1000ms, or 1250ms. Each time harmonics configuration is changed – as in the case of HXIndex, HYIndex, HZIndex during a loop read – DelayPeriod must elapse before readings are valid.

UpdateRate specifies the rate at which harmonic registers are read. The default value is 125µs and it can be selected to have 8 different values up to 1.024s. If harmonics specified by HXIndex, HYIndex, and HZIndex are not changed, UpdateRate is the time between subsequent reads.

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To push harmonics configuration changes to the module, press the *Send* button.

Harmonics configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Harmonics** page will require login credentials. Clicking on **Configuration | Harmonics** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Harmonics** page. For more information, see Section 4.10 Security.

4.6 Energy Configuration

Energy measurement is a continuous operation which starts at module power up or when a RestoreToDefault command is issued. Energy accumulation is stored in module non-volatile memory once each hour after measurement has started. This ensures that data is preserved across power cycles, shutdowns, or other unforeseen events. Accumulated energy totals can be reset to zero by the user with the selections on the **Configuration | Energy** page.

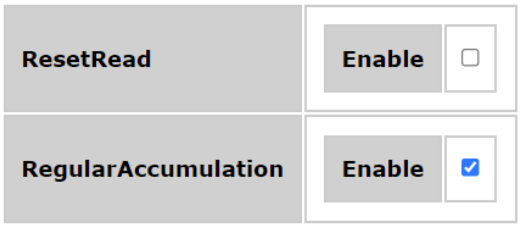


Figure 30: Energy Configuration

To immediately clear all energy accumulation readings, click the ResetRead *Enable* checkbox, then press the *Send* button.

To halt energy accumulation, uncheck the RegularAccumulation *Enable* checkbox, then press the *Send* button. Energy readings will remain at the last sampled value and accumulation will stop.

To clear energy accumulation readings and restart accumulation, click the RegularAccumulation *Enable* checkbox, then press the *Send* button. NOTE: This operation clears energy accumulation stored in module non-volatile memory.
Energy configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Energy** page will require login credentials. Clicking on C**onfiguration | Energy** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Energy** page. For more information, see Section 4.10 Security.

4.7 Time Configuration

The **Configuration | Time** page establishes how the PWRM10-01 and PWRM20-01 modules obtain a time reference and maintain accurate timestamps for all readings. Each set of measurements has a timestamp that is recorded when readings are taken. This timestamp is returned with the readings when they are requested from the module.

With the default setting of Auto and *Enable* selected, the PWRM10-01 or PWRM20-01 modules will automatically obtain the time reference using the network that the module is connected to and update its internal reference. An Internet connection is required for this option to work.

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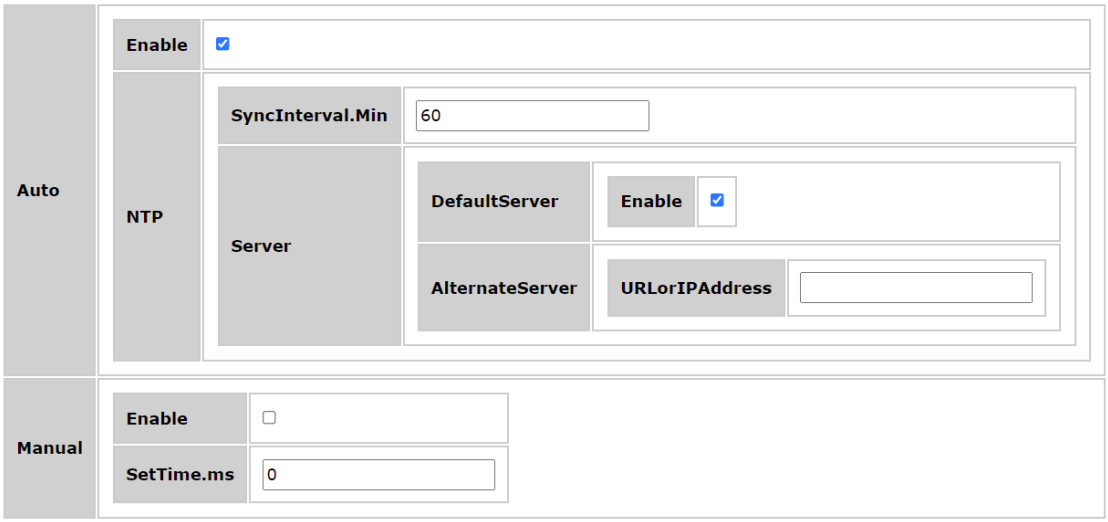


Figure 31: Time Configuration

If no internet connection is available, the module will use the time of power up as 0:00:00.000 and count elapsed time from there. The **Other | Diagnostics** page will show Last Sync = No successful sync to indicate status.

The PWRM10-01 and PWRM20-01 time is synchronized with the time reference at the interval specified in SyncInterval.Min. The default value is 60 minutes.

When the DefaultServer *Enable* checkbox is selected, the module attempts to get the time reference from a list of servers defined internally in the module. If this is unsuccessful, the module will use the time of power up as 0:00:00.000 and count elapsed time from there. The **Other | Diagnostics** page will show Last Sync = No successful sync to indicate status.

To use a Network Time Protocol server other than the default server, deselect the DefaultServer *Enable* box and use the AlternateServer URLorIPAddress field to enter a URL or IP address in string form that points to the NTP server that will be used.

The time reference can be set manually by selecting the Manual *Enable* checkbox and entering a value in the SetTime.ms field. The time value to be sent to the module is the number of milliseconds since the Unix Epoch, which is the number of seconds since January 1st, 1970. This number must be in UTC format, ISO-8601, xx:xx:xxZ.

To push time configuration changes to the module, press the *Send* button.

Time configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Time** page will require login credentials. Clicking on **Configuration | Time** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Time** page. For more information, see Section 4.10 Security.

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4.8 Events Configuration

One of the most powerful features of the PWRM10-01 and PWRM20-01 modules is their ability to measure power quality. The **Configuration | Events** page is where limits can be set for three parameters – OverVoltage, OverCurrent, and Sag.

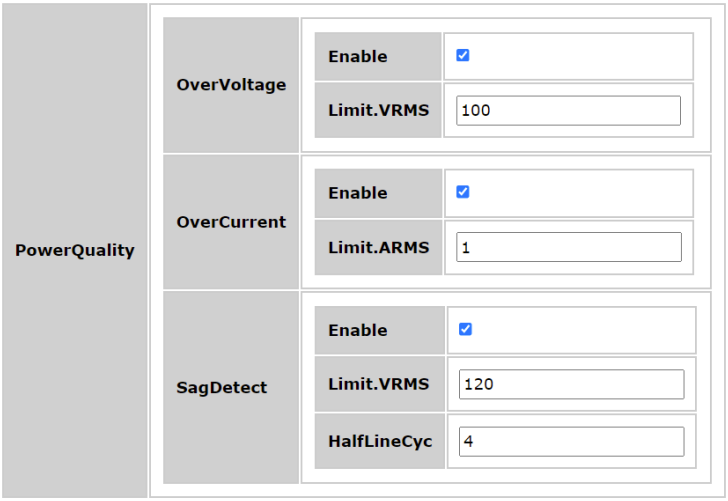


Figure 32: Events Configuration

OverVoltage
Overvoltage, or voltage swell, can occur when a heavy load turns off in a system. To monitor phase voltages and log an Event or Alarm when a threshold is exceeded, select the Enable checkbox and enter an RMS value for the phase voltage upper limit. A single over voltage limit is used for PA, PB, and PC, phase voltages.

OverCurrent
Overcurrent can occur when a heavy load turns on or a motor is starting in a system. To monitor phase currents and log an Event or Alarm when a threshold is exceeded, select the Enable checkbox and enter an RMS value for the phase current limit. A single over current limit is used for PA, PB, and PC, phase currents.

To push overvoltage or overcurrent configuration changes to the module, press the *Send* button.

Sag
Sag is a short duration reduction in phase voltage. It can be caused by high current demands when heavy loads switch on, when electric motors start, or when fault conditions occur. To monitor phase voltages for sag and log an Event or Alarm when a threshold is exceeded, select the Enable checkbox and enter an RMS value for the phase voltage lower limit. A single sag limit is used for A, B, and C, phase voltages.

To push sag configuration changes to the module, press the *Send* button.

If a specified measurement exceeds a set limit, a log is created under **Data | Events** with timestamps of when the Overvoltage, Overcurrent or Sag event started and ended and what phase it occurred on. See Section 3.5 Events for information on viewing events.

Events configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Events** page will require login credentials. Clicking on **Configuration | Events** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Events** page. For more information, see Section 4.10 Security.

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4.9 HTTP Configuration

The **Configuration | HTTP** page allows the user to change the port number and optimal communications setting.

Default settings are:

Port Number: 80
JSON Minify: deselected

If JSON Minify is selected, spaces and formatting which make the communications human readable will be eliminated from the data transfer. This does not change module operation but may result in an improvement in net data transfer speeds.

HTTP configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | HTTP** page will require login credentials. Clicking on **Configuration | HTTP** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | HTTP** page. For more information, see Section 4.10 Security.

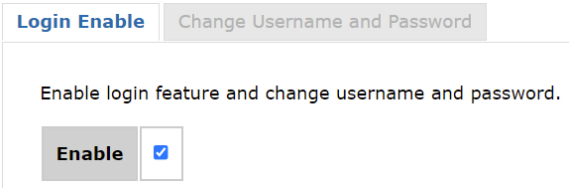
4.10 Security Configuration

The **Configuration | Security** page allows the user to set a username and password.

Default settings are:

Username: PWRM
Password: 7976

Username and password are case sensitive.



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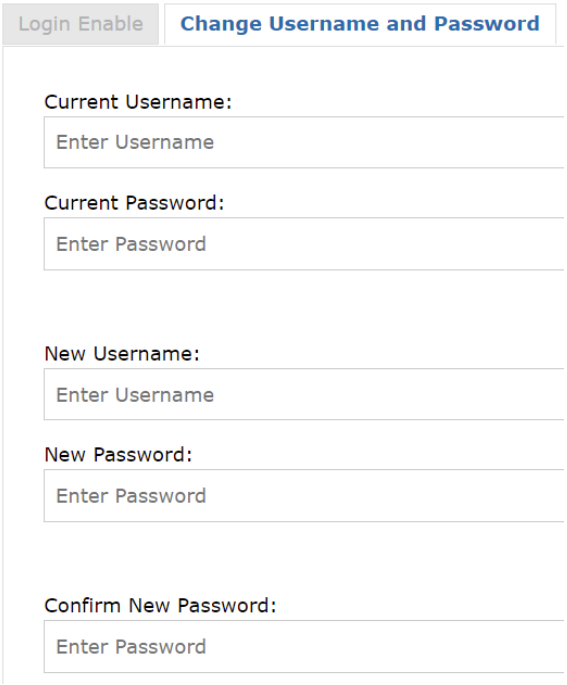


Figure 33: Security Configuration

Select the *Enable* box and press *Send* to require these credentials to be used to access certain parameters.

Web Interface pages that have restricted access when security is enabled are:

Configuration | Data
Configuration | Device Name
Configuration | Network
Configuration | Sensor
Configuration | Harmonics
Configuration | Energy
Configuration | Time
Configuration | Events
Configuration | HTTP
Configuration | Security

Dataforth personnel cannot access a programmed customer username and password. If security is enabled and the credentials have been lost, the only way to regain access to the module is to contact the factory and provide the MAC Address of the module. A 70 character, one-time unlock code will be issued that can be used to reset the security settings to default values. See Section 5.3 Control for details.

Security configuration is a security-locked feature, meaning that if security is enabled in the module, accessing the **Configuration | Security** page will require login credentials. Clicking on **Configuration | Security** in the sidebar menu when not logged in will result in the user being redirected to a login page. Once a user is logged in, they can freely access the **Configuration | Security** page.

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5.0 PWRM Web Interface – Tools

5.1 Diagnostics

The **Tools | Diagnostics** page displays information regarding the status of the module and HTTP requests. The data displayed represents the status of the module at the time the page was loaded. To update the data, click the *Refresh* button.

WatchdogFlag	false
UpTime.s	21107
ResetCause	Software
CheckFirmwareUpdate	Checked: false Available: false Version:
HTTP	Get: 404: 0, Success: 3966 Put: 404: 0, Success: 1 Post: 404: 0, Success: 0 OtherNotSupported: 0
NTP	LastSync: 2022-05-12T02:37:42.355Z
SelfTestError	false

Figure 34: Diagnostics Page

WatchdogFlag will show false for normal operation and true if the watchdog timer has expired. If the watchdog timer expires, the module will go through a reset process to restore normal operation. Saved parameters are preserved.

UpTime.s indicates the elapsed time in seconds since the module was last powered on.

ResetCause indicates the source of a module reset.

CheckFirmwareUpdate shows if a firmware update is available and what the latest version is.

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HTTP parameters Get, Put, and Post counters show the number of successful transactions. 404 is the standard HTTP status code meaning the server could not find the client requested webpage. Nonzero values indicate an invalid request or invalid API path or key.
The NTP section shows the last successful module time synchronization with a network source. See Section 4.7 Time Configuration for details.

SelfTestError shows false to indicate normal startup and verification upon power cycle or reset. If this shows true, reset the power to the module. If the true condition persists, contact the factory.

5.2 Firmware Update

PWRM10-01 and PWRM20-01 modules can be upgraded in-system and in the field. Access this feature using the **Other | Firmware Update** page.

To check if a newer version of firmware for the PWRM10-01 or PWRM20-01 module is available, use this link.
PWRM Firmware Check

Obtain module firmware from the Dataforth website.
PWRM Firmware Download Page



Figure 35: Firmware Update

Press the *Choose File* button and navigate to the location where the firmware file was downloaded. The file extension will be .dffw.

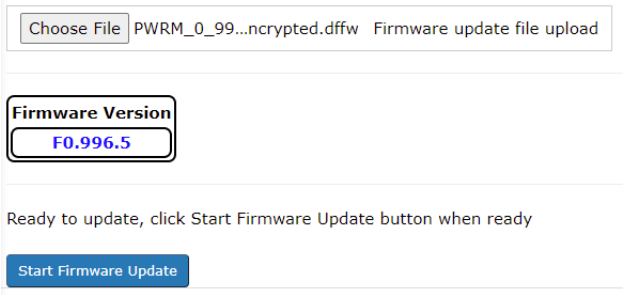


Figure 36: Firmware Update

Press the *Start Firmware Update* button to upload the firmware to the module.
If Security has been enabled, login credentials must be entered to proceed.

The module will be unresponsive during the process. Once the upload is complete, the module will restart, and the web page will automatically reconnect. If there is a problem with the upload, module firmware will revert to the previous version and the module will restart. Reload the browser page if the module interface is not visible.

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5.3 Control

The **Tools | Control** page gives several options for low level PWRM10-01 and PWRM20-01 module operations in case there are functional problems.

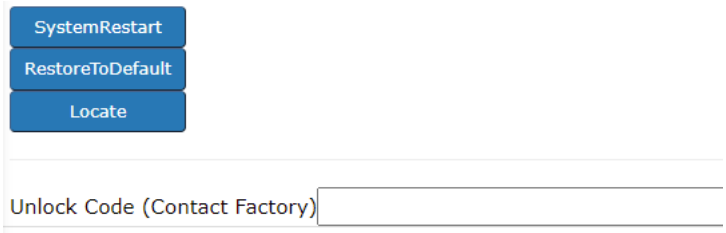


Figure 37: Control Commands

SystemRestart issues a command to the module to restart operation. This level of reset is the same as a power cycle.

RestoreToDefault takes the module back to the factory configuration. If security is enabled and the credentials have been lost, this is the only method that can be used to regain access to the module. Contact the factory and provide the MAC Address of the module to obtain a 70 character unlock code used in this process. The user will be prompted to enter the unlock code.

When a system is comprised of multiple PWRM10-01 and PWRM20-01 modules, it is useful to identify which module the host computer is communicating with. Press the *Locate* button to blink the power LED at a rate of 10Hz for 10 seconds.

5.4 Resources

Use the **Tools | Resources** page to access datasheets, documentation, manuals, and downloads on the Dataforth website.

www.dataforth.com

6.0 HTTP Application Programming Interface (API)

The PWRM10-01 and PWRM20-01 modules use an HTTP Application Programming Interface (API) as the public interface to the module. The format of the data transferred over the HTTP protocol is called Javascript Object Notation (JSON).

A JSON object is enclosed in curly brackets "{ }". These can be nested to contain additional JSON objects.

```
{
  "Key1": "Value1",
  "Key2": 2,
  "Key3": {
    "Key1": "AnotherValue",
    "Key2": 33
  }
}
```

Figure 38: JSON file/response/text

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A JSON response is made up of key-value pairs, where the information on the left side of the colon is the Key, with the corresponding Value on the right.

The example above is a JSON response which contains 3 children. These children are identified by a tag, or key. A key is always a String. Keys cannot contain spaces.

The keys in the example above are Key1, Key2, and Key3.

A JSON value can be of the following types:

- String: a set of characters enclosed in quotation marks, e.g. "This is a valid string"
- Number: integers, negative, floating point, a number is a number (1, -1, 1.454, etc).
- Boolean: true or false
- List: an array of values, defined by square brackets: [ ]
- Object: a set of key-value pairs, defined by curly brackets "{ }"

The structure above can be commented as follows:

```
{
  "Key1": "Value1", // String value
  "Key2": 2, // Number Value
  "Key3": {
    // Object Value
    "Key1": "AnotherValue", // String
    "Key2": 33 // Number
  }
}
```

Figure 39: JSON file/response/text with comments

Key3 has a nested object with its own set of key-value pairs.

6.1 API in PWRM10-01 and PWRM20-01

To access the API in a PWRM10-01 or PWRM20-01 module, /api needs to be added to the URL. For example, a module with an IP address of 192.168.0.58 has an API that can be accesses at the URL: http://192.168.0.58/api

/api returns the root of the API, which is a JSON response. The API can be thought of as a Tree, where api/ is the ROOT, sections are branches, and data is a leaf. Details on the API structure are found in Section 8.0 API Reference.

Another way to think about the API is a filesystem, where C:\ drive is the root, any folders are nested JSON objects, and files are values.

6.2 Traversing the HTTP API

Because the API returns the entire "MAP", only the root path is needed to traverse the API.

http://192.168.0.58/api gives the root, which returns a JSON object like the one above. More keys can be added to the URL to narrow down the response. Details on the API structure are found in Section 8.0 API Reference.

For example, http://192.168.0.58/api/DeviceInfo will now exclude the other sections from the response, and only return what the “DeviceInfo” object contains.

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```
{
  "DeviceDescription": "PWRM10",
  "SerialNumber": "S0128556-01",
  "DateCode": "D0915",
  "FirmwareRev": "F0.70",
  "MACAddress": "70:B3:D5:6F:A1:FC",
  "APIVersion": "0.1.1",
  "BuildTimeStamp": "2020-07-05 01:54:19.473294"
}
```


Figure 40: HTTP GET request to http://192.168.0.58/api/DeviceInfo

The request can be modified to access even more specific information. For example, to get the serial number:

HTTP GET request to http://192.168.0.58/api/DeviceInfo/SerialNumber returns: "S0128556-01"
SerialNumber is not a list or an object, so the value is a leaf, and cannot be narrowed down.

6.3 Traversing a List

A list is a collection of values, while these values do not have explicit keys, they can be accessed with an index number. The index of a list is zero based, meaning that the first value can be accessed with a 0.

The following JSON response represents a URL with a path: /ListExample


```
{
  "SomeList": [1, 2, 3]
}
```


Figure 41: JSON Response

HTTP GET Request to /ListExample/SomeList returns: [1, 2, 3]
HTTP GET Request to /ListExample/SomeList/0 returns: 1
HTTP GET Request to /ListExample/SomeList/1 returns: 2
HTTP GET Request to /ListExample/SomeList/2 returns: 3

Lists can have any valid JSON data type in them, meaning a list can have objects and other lists as well.


```
{
  "SomeList": [
    [1, 2, 3, 4, 5], // 0 element contains another list
    {
      // 1 element contains an object
      "SomeKey": "SomeValue",
      "AnotherKey": "AnotherValue"
    },
    2 // 2 element contains a Number
  ]
}
```


Figure 42: List Example

Examples of how to access different values:

- URL: /SomeList/0/1, Value: 2
- URL: /SomeList/1/SomeKey, Value: "SomeValue"

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7.0 API Source Code

The PWRM10-01 and PWRM20-01 API open source and can be downloaded from the Dataforth website.

PWRM Software & User Manual Download Center

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8.0 API Reference

Table 1: PWRM10-01 and PWRM20-01 API Reference

PWRMxxx-xx API Reference

Path	Key	Contents	Description
CONTROL			
Control/	/Control		
	/SystemRestart	Standard Reset	Halt execution of all processes. Reinitialize all parameters and restart firmware execution.
	/RestoreToDefault	Factory Reset	Restore all parameters and settings to factory default
	/Locate	Identify a module in a single unit or multi-unit installation.	Blink the PWR LED at a rate of 10Hz for 10 seconds
	/FirmwareUpdate	Firmware update	Initiate and execute firmware update
Path	**Key**	**Contents**	**Description**
INFORMATION			
DeviceInfo/	/api/DeviceInfo		
	/api/DeviceInfo/ModelName	Product Name	PWRMxxx-xx
	/api/DeviceInfo/Description	Product Short Description	
	/api/DeviceInfo/TagName	User Programmable Tag	PWRMxxx-xx
	/api/DeviceInfo/SerialNumber	Mirror of content in /private/SerialNumber	
	/api/DeviceInfo/DateCode	Mirror of content in /private/DateCode	
	/api/DeviceInfo/FirmwareRev	Firmware Revision	Foxy
	/api/DeviceInfo/MACAddress	Mirror of content in /private/MACAddress	
	/api/DeviceInfo/APIVersion	Current API Version	x.y.z Modify when changed. Processor to patch internal structure and EEPROM content.
	/api/DeviceInfo/BuildTimeStamp	Build Timestamp	YYYY-MM-DD HH:MM Updated automatically upon compilation.
Path	**Key**	**Contents**	**Description**
CONFIGURATION			
Config/IPConfig/	/api/Config		
	/api/Config/IPConfig/DHCP/Enable	DHCP	If True, all other parms in IPConfig are ignored
	/api/Config/IPConfig/IPAddress	Ethernet IP Address	192.168.128.100
	/api/Config/IPConfig/SubnetMask	Ethernet Subnet Mask	255.255.255.0
	/api/Config/IPConfig/Gateway	Ethernet IP Gateway Address	127.0.0.1
	/api/Config/IPConfig/DNSServer	DNS	Google DNS Server
Config/System	/api/Config/System/TagName	PWRMxxx-xx Tag Name	User programmable tag name. Contents are copied to /DeviceInfo/TagName
	/api/Config/Login/Enable	Blocks unauthorized writes to module	If enabled, PUT/POST request require a valid SessionKey obtained by writing the programmed Username and Password pair to /Login
Config/Time/	/api/Config/Time/Auto/Enable	Internal timekeeping auto set and sync enable/disable	True = Enable, use defined Network Time Protocol server to obtain and synchronize reference time for data timestamp. forces /Manual to Disable. False = disable NTP and internal time is referenced to 0:00.00 at power up or /Manual/SetTime.Millisec
	/api/Config/Time/Auto/NTP/Server/DefaultServer/Enable	Network Time Protocol default server enable/disable	Enable = True, use PWRMxx-xx internal list of servers. ignore /AlternateServer
	/api/Config/Time/Auto/NTP/Server/AlternateServer/URLorIPAddress	Network Time Protocol alternate server specified by URL	URL or IP address of alternate NTP server
	/api/Config/Time/Auto/NTP/SyncInterval.Min	Network Time Protocol synchronization interval	Time interval in minutes at which PWRMxx-xx internal time reference is synchronized with a network source. Time is UTC.
	/api/Config/Time/Manual/Enable	Internal timekeeping manual set enable/disable	True = Enable, manually set internal reference time. Can only be set to true if /Auto is disabled.
	/api/Config/Time/Manual/SetTime.ms	Reference time manually set by user	Time in milliseconds since Unix Epoch, January 1st, 1970. UTC time.
Config/DataConfig/	/api/Config/DataConfig/SelectFrequency45-55Hz/Enable	Select fundamental frequency range 45-55Hz	Enable = True, PWRMxxx-xx is connected to networks with fundamental frequency 45-55Hz. forces /SelectFrequency55-65Hz to opposite boolean value being written.
	/api/Config/DataConfig/SelectFrequency55-65Hz/Enable	Select fundamental frequency range 55-65Hz	Enable = True, PWRMxxx-xx is connected to networks with fundamental frequency 55-65Hz. forces /SelectFrequency45-55Hz to opposite boolean value being written.
	/api/Config/DataConfig/Scaling/Counts/Enable	Select format for data in /api/Data	Enable = True, data is presented in counts. 24-bit or 16-bit as indicated in register data type. When True, ExternalSensor and Custom are set to False.
	/api/Config/DataConfig/Scaling/ExternalSensor/Enable	Select format for data in /api/Data	Enable = True, data is scaled by parameters of external voltage and current sensors. When True, Counts is set to False, Custom may also be True. Refer to /api/Config/Sensor/Current/Type and /api/Config/Sensor/Voltage/Type.
	/api/Config/DataConfig/Scaling/Custom/Enable	Select format for data in /api/Data	Enable = True, data is scaled by user defined scaling factor. When True, Counts is set to False, ExternalSensor may also be True. Refer to /api/Config/Sensor/Current/CustomScale and /api/Config/Sensor/Voltage/CustomScale for parameters.

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Path	Key	Contents	Description
CONFIGURATION	/api/Config		
Config/Sensor/Current/	/api/Config/Sensor/Current/PhaseSensor	Sensor type used for measuring phase current.	Shunt, CurrentTrans, RogowskiCoil
	/api/Config/Sensor/Current/NeutralSensor	Sensor type used for measuring neutral current.	Shunt, CurrentTrans, RogowskiCoil
	/api/Config/Sensor/Current/Parameters/Shunt/PARes:Ohms	Current Shunt Resistance, PA	Resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Shunts are specified in terms of Rated Current and Voltage Drop. Calculate resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/Shunt/PBRes:Ohms	Current Shunt Resistance, PB	Resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Shunts are specified in terms of Rated Current and Voltage Drop. Calculate resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/Shunt/PCRes:Ohms	Current Shunt Resistance, PC	Resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Shunts are specified in terms of Rated Current and Voltage Drop. Calculate resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/Shunt/NRes:Ohms	Current Shunt Resistance, Neutral	Resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Shunts are specified in terms of Rated Current and Voltage Drop. Calculate resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/CurrentTrans/PA/BurdenRes:Ohms	Current Transformer Burden Resistor, PA	Burden Resistor resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. CTs are specified in terms of Rated Input Current and Output Voltage. Calculate burden resistor resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/CurrentTrans/PA/NumWireLoops	Current Transformer Number of Wire Loops, PA	Integer number of input current wire loops through CT. External sensor converts phase current to 0.333V full scale, 0.5V max overrange.
	/api/Config/Sensor/Current/Parameters/CurrentTrans/PB/BurdenRes:Ohms	Current Transformer Burden Resistor, PB	Burden Resistor resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. CTs are specified in terms of Rated Input Current and Output Voltage. Calculate burden resistor resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/CurrentTrans/PB/NumWireLoops	Current Transformer Number of Wire Loops, PB	Integer number of input current wire loops through CT. External sensor converts phase current to 0.333V full scale, 0.5V max overrange.
	/api/Config/Sensor/Current/Parameters/CurrentTrans/PC/BurdenRes:Ohms	Current Transformer Burden Resistor, PC	Burden Resistor resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. CTs are specified in terms of Rated Input Current and Output Voltage. Calculate burden resistor resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/CurrentTrans/PC/NumWireLoops	Current Transformer Number of Wire Loops, PC	Integer number of input current wire loops through CT. External sensor converts phase current to 0.333V full scale, 0.5V max overrange.
	/api/Config/Sensor/Current/Parameters/CurrentTrans/N/BurdenRes:Ohms	Current Transformer Burden Resistor, Neutral	Burden Resistor resistance in Ohms. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. CTs are specified in terms of Rated Input Current and Output Voltage. Calculate burden resistor resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/CurrentTrans/N/NumWireLoops	Current Transformer Number of Wire Loops, Neutral	Integer number of input current wire loops through CT. External sensor converts phase current to 0.333V full scale, 0.5V max overrange.
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PA/Out50Hz:mV	Rogowski Coil output per 1000A at 50Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PA/In50Hz:kA	Rogowski Coil reference input in kA at 50Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PB/Out50Hz:mV	Rogowski Coil output per 1000A at 50Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PB/In50Hz:kA	Rogowski Coil reference input in kA at 50Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PC/Out50Hz:mV	Rogowski Coil output per 1000A at 50Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PC/In50Hz:kA	Rogowski Coil reference input in kA at 50Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters

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Path	Key	Contents	Description
CONFIGURATION	/api/Config		
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/N/Out50Hz.mV	Rogowski Coil output per 1000A at 50Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/N/In50Hz.kA	Rogowski Coil reference input in kA at 50Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PA/Out60Hz.mV	Rogowski Coil output per 1000A at 60Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PA/In60Hz.kA	Rogowski Coil reference input in kA at 60Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PB/Out60Hz.mV	Rogowski Coil output per 1000A at 60Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PB/In60Hz.kA	Rogowski Coil reference input in kA at 60Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PC/Out60Hz.mV	Rogowski Coil output per 1000A at 60Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/PC/In60Hz.kA	Rogowski Coil reference input in kA at 60Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/N/Out60Hz.mV	Rogowski Coil output per 1000A at 60Hz	Coil output in millivolts. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/Parameters/RogowskiCoil/N/In60Hz.kA	Rogowski Coil reference input in kA at 60Hz	Coil reference input in kA for specifying output in mV. External sensor converts phase current to 0.333V full scale, 0.5V max overrange. Rogowski Coils are specified in terms of mV/kA at 50Hz and 60Hz. Calculate equivalent resistance using these two parameters
	/api/Config/Sensor/Current/CustomScale/PA	User defined phase current scaling coefficient	Convert phase current reported in Arms to a user defined scale, i.e. % span.
	/api/Config/Sensor/Current/CustomScale/PB	User defined phase current scaling coefficient	Convert phase current reported in Arms to a user defined scale, i.e. % span.
	/api/Config/Sensor/Current/CustomScale/PC	User defined phase current scaling coefficient	Convert phase current reported in Arms to a user defined scale, i.e. % span.
	/api/Config/Sensor/Current/CustomScale/N	User defined neutral current scaling coefficient	Convert phase current reported in Arms to a user defined unit, i.e. % span.
	/api/Config/Sensor/Current/CustomScale/Units	Data units after application of of user defined scaling coefficient	User defined unit, i.e. %.

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Path	Key	Contents	Description
CONFIGURATION	/api/Config		
Config/Sensor/Voltage/	/api/Config/Sensor/Voltage/Type/VoltageTrans/Enable	Sensor type used for measuring phase voltage, option 1 of n.	True = Voltage Transformer, False = other TBD. Only 1 allowed true at a time.
	/api/Config/Sensor/Voltage/Type/VoltageTrans/PrimaryTurns/PA	Voltage Transformer Primary Turns, PA	Integer number of VT primary turns. External sensor converts phase voltage to 265VAC full scale (5,326,737 counts), 500Vp max overrange.
	/api/Config/Sensor/Voltage/Type/VoltageTrans/SecondaryTurns/PA	Voltage Transformer Secondary Turns, PA	Integer number of VT secondary turns. External sensor converts phase voltage to 265VAC full scale (5,326,737 counts), 500Vp max overrange.
	/api/Config/Sensor/Voltage/Type/VoltageTrans/PrimaryTurns/PB	Voltage Transformer Primary Turns, PA	Integer number of VT primary turns. External sensor converts phase voltage to 265VAC full scale (5,326,737 counts), 500Vp max overrange.
	/api/Config/Sensor/Voltage/Type/VoltageTrans/SecondaryTurns/PB	Voltage Transformer Secondary Turns, PA	Integer number of VT secondary turns. External sensor converts phase voltage to 265VAC full scale (5,326,737 counts), 500Vp max overrange.
	/api/Config/Sensor/Voltage/Type/VoltageTrans/PrimaryTurns/PC	Voltage Transformer Primary Turns, PA	Integer number of VT primary turns. External sensor converts phase voltage to 265VAC full scale (5,326,737 counts), 500Vp max overrange.
	/api/Config/Sensor/Voltage/Type/VoltageTrans/SecondaryTurns/PC	Voltage Transformer Secondary Turns, PA	Integer number of VT secondary turns. External sensor converts phase voltage to 265VAC full scale (5,326,737 counts), 500Vp max overrange.
	/api/Config/Sensor/Voltage/CustomScale/PA	User defined phase voltage scaling coefficient	Convert phase voltage reported in Vrms to a user defined scale, i.e. % span.
	/api/Config/Sensor/Voltage/CustomScale/PB	User defined phase voltage scaling coefficient	Convert phase voltage reported in Vrms to a user defined scale, i.e. % span.
	/api/Config/Sensor/Voltage/CustomScale/PC	User defined phase voltage scaling coefficient	Convert phase voltage reported in Vrms to a user defined scale, i.e. % span.
	/api/Config/Sensor/Voltage/CustomScale/Units	Data units after application of of user defined scaling coefficient	User defined unit, i.e. %.
Config/Harmonics/	/api/Config/Harmonics/RateConfig	Harmonic calculations update rate and delay time	0 = HRCFG set to 0 (harmonic calculations can be accessed) after delay time HSTIME and harmonic calculations update at HRATE (but msp432 reads at fixed internal sampling rate of 100ms). 1 = HRCFG set to 1 after harmonic calculations update without waiting for calculations to settle.
	/api/Config/Harmonics/PhaseSelect	Select the phase or neutral analyzed by the harmonics calculation block.	Phase Voltage and current that the harmonics engine will calculate. PA, PB, PC, or N
	/api/Config/Harmonics/DelayPeriod	Delay period after which HREADY is set to 1 and harmonic calculations can be accessed.	500, 750, 1000, or 1250 in milliseconds
	/api/Config/Harmonics/UpdateRate	Update rate of the harmonic registers.	000 = 125us, 001 = 250us, 010 = 1ms, 011 = 16ms, 100 = 128ms, 101 = 512ms, 110 = 1.024s, 111 = harmonic calcs disabled
	/api/Config/Harmonics/TimeBaseSelect	Select the phase voltage used as time base for harmonic calculations.	Phase used as time base for harmonic calculations. PA, PB, or PC
	/api/Config/Harmonics/HXIndex	Selects an index, 1 of 3, of the harmonic monitored by the harmonic computations.	Fundamental is always monitored. Harmonic 1 of 3 monitored simultaneously. If HXIndex = 1 fundamental is monitored twice. 2.8kHz no attenuation passband.
	/api/Config/Harmonics/HYIndex	Selects an index, 2 of 3, of the harmonic monitored by the harmonic computations.	Fundamental is always monitored. Harmonic 2 of 3 monitored simultaneously. If HYIndex = 1 fundamental is monitored twice. 2.8kHz no attenuation passband.
	/api/Config/Harmonics/HZIndex	Selects an index, 3 of 3, of the harmonic monitored by the harmonic computations.	Fundamental is always monitored. Harmonic 3 of 3 monitored simultaneously. If HZIndex = 1 fundamental is monitored twice. 2.8kHz no attenuation passband.
Config/Events/PowerQuality/	/api/Config/Events/PowerQuality/OverVoltage/Enable	Overvoltage event monitor enable/disable	True = Detect when instantaneous absolute value of Phase A, Phase B, or Phase C voltage exceed a set threshold. False = no action.
	/api/Config/Events/PowerQuality/OverVoltage/Limit.Vpeak	Overvoltage event monitor threshold	Instantaneous absolute threshold value of Phase A, Phase B, or Phase C voltage over which event trips. When an event is detected, an event object is appended to the /api/Events/PowerQuality path which indicates type of event, phase(s), value, start/stop time.
	/api/Config/Events/PowerQuality/OverCurrent/Enable	Overcurrent event monitor enable/disable	True = Detect when instantaneous absolute value of Phase A, Phase B, or Phase C voltage exceed a set threshold. False = no action.
	/api/Config/Events/PowerQuality/OverCurrent/Limit.Apeak	Overcurrent event monitor threshold	Instantaneous absolute threshold value of Phase A, Phase B, or Phase C current over which event trips. When an event is detected, an event object is appended to the /api/Events/PowerQuality path which indicates type of event, phase(s), value, start/stop time.
	/api/Config/Events/PowerQuality/SagDetect/Enable	Sag Detect event monitor enable/disable	True = Detect when instantaneous absolute value of Phase A, Phase B, or Phase C voltage exceed a set threshold. False = no action.
	/api/Config/Events/PowerQuality/SagDetect/Limit.Vpeak	Sag Detect event monitor threshold	Threshold value of Phase A, Phase B, or Phase C voltage over which event trips. When an event is detected, an event object is appended to the /api/Events/PowerQuality path which indicates type of event, phase(s), value, start/stop time.
	/api/Config/Events/PowerQuality/SagDetect/HalfLineCyc	Sag Detect event half line cycle count	Number of half line cycles Phase A, Phase B, or Phase C voltage are above or below sag limit for event trip to occur.

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Path	Key	Contents	Description
CONFIGURATION	**/api/Config**		
Config/Energy/	/api/Config/Energy/ResetRead/Enable	Energy calculation reset	True = reset phase A, phase B, phase C watt-hour accumulation. False = energy calculations active and accumulating.
	/api/Config/Energy/RegularAccumulation/Enable	Energy calculation mode selection	True = use regular accumulation mode for energy calculation, always true with no other selection publicly available.
Config/Protocol/	/api/Config/Protocol/Discovery/Enable	Discovery protocol enable/disable	True = discovery protocol enabled
	/api/Config/Protocol/Discovery/SendPort	Discovery communication send port	PWRMxx-xx port for sending communications
	/api/Config/Protocol/Discovery/ReceivePort	Discovery communication receive port	PWRMxx-xx port for receiving communications
	/api/Config/Protocol/HTTP/Port	HTTP Port	Port number that HTTP server will serve
	/api/Config/Protocol/HTTP/JSONFormatMinified/Enable	JSON minification on responses	If true, JSON will be minified before sending over the network
Path	**Key**	**Contents**	**Description**
DATA	**/api/Data**		
Data/ThreePhase/	Data/ThreePhase/EventsActive/	Events flag	If True, then the Events list is not empty
Data/ThreePhase/RMSReadings/	/api/Data/ThreePhase/RMSReadings/Timestamp	Reading timestamp	Time at start of RMS readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/ThreePhase/RMSReadings/PAIrms.Arms	Phase A current measurement	Phase A current rms value in amps, modified by scale in /DataConfig
	/api/Data/ThreePhase/RMSReadings/PAVrms.Vrms	Phase A voltage measurement	Phase A voltage rms value in volts, modified by scale in /DataConfig
	/api/Data/ThreePhase/RMSReadings/PBIrms.Arms	Phase B current measurement	Phase B current rms value in amps, modified by scale in /DataConfig
	/api/Data/ThreePhase/RMSReadings/PBVrms.Vrms	Phase B voltage measurement	Phase B voltage rms value in volts, modified by scale in /DataConfig
	/api/Data/ThreePhase/RMSReadings/PCIrms.Arms	Phase C current measurement	Phase C current rms value in amps, modified by scale in /DataConfig
	/api/Data/ThreePhase/RMSReadings/PCVrms.Vrms	Phase C voltage measurement	Phase C voltage rms value in volts, modified by scale in /DataConfig
	/api/Data/ThreePhase/RMSReadings/NIrms.Arms	Neutral current measurement	Neutral current rms value in amps, modified by scale in /DataConfig
Data/ThreePhase/PhaseAngles/	/api/Data/ThreePhase/PhaseAngles/Timestamp	Timestamp at start of reading	Time at start of Phase Angles readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/ThreePhase/PhaseAngles/PAV-PAI.Deg	Phase A voltage to current phase angle	Phase Angle between Phase A voltage and Phase A current in degrees.
	/api/Data/ThreePhase/PhaseAngles/PBV-PBI.Deg	Phase B voltage to current phase angle	Phase Angle between Phase B voltage and Phase B current in degrees
	/api/Data/ThreePhase/PhaseAngles/PCV-PCI.Deg	Phase C voltage to current phase angle	Phase Angle between Phase C voltage and Phase C current in degrees
	/api/Data/ThreePhase/PhaseAngles/PAV-PCV.Deg	Phase A voltage to Phase C voltage phase angle	Phase Angle between Phase A voltage and Phase C voltage in degrees
	/api/Data/ThreePhase/PhaseAngles/PBV-PCV.Deg	Phase B voltage to Phase C voltage phase angle	Phase Angle between Phase B voltage and Phase C voltage in degrees
	/api/Data/ThreePhase/PhaseAngles/PAV-PBV.Deg	Phase A voltage to Phase B voltage phase angle	Phase Angle between Phase A voltage and Phase B voltage in degrees
	/api/Data/ThreePhase/PhaseAngles/PAI-PCI.Deg	Phase A current to Phase C current phase angle	Phase Angle between Phase A current and Phase C current in degrees
	/api/Data/ThreePhase/PhaseAngles/PBI-PCI.Deg	Phase B current to Phase C current phase angle	Phase Angle between Phase B current and Phase C current in degrees
	/api/Data/ThreePhase/PhaseAngles/PAI-PBI.Deg	Phase A current to Phase B current phase angle	Phase Angle between Phase A current and Phase B current in degrees

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Path	Key	Contents	Description
DATA	/api/Data		
Data/ThreePhase/LinePeriods/	/api/Data/ThreePhase/LinePeriods/Timestamp	Timestamp at start of reading	Time at start of Line Periods readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/ThreePhase/LinePeriods/PAPeriod.ms	Phase A line period	Phase A line period in milliseconds
	/api/Data/ThreePhase/LinePeriods/PBPeriod.ms	Phase B line period	Phase B line period in milliseconds
	/api/Data/ThreePhase/LinePeriods/PCPeriod.ms	Phase C line period	Phase C line period in milliseconds
Data/ThreePhase/PowerFactors/	Data/ThreePhase/PowerFactors/Timestamp	Timestamp at start of reading	Time at start of Power Factors readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/ThreePhase/PowerFactors/PAPowerFactor	Phase A power factor	Phase A power factor
	/api/Data/ThreePhase/PowerFactors/PBPowerFactor	Phase B power factor	Phase B power factor
	/api/Data/ThreePhase/PowerFactors/PCPowerFactor	Phase C power factor	Phase C power factor
Data/ThreePhase/Powers	/api/Data/ThreePhase/Powers/Timestamp		Time at start of Powers readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/ThreePhase/Powers/FundReactivePower.VAR	Reactive power	Reactive power of the fundamental component in VARs
	/api/Data/ThreePhase/Powers/InstTotActivePowers/PAInstTotActivePower.W	Phase A instantaneous total active power	Phase A instantaneous total active power in watts
	/api/Data/ThreePhase/Powers/InstTotActivePowers/PBInstTotActivePower.W	Phase B instantaneous total active power	Phase B instantaneous total active power in watts
	/api/Data/ThreePhase/Powers/InstTotActivePowers/PCInstTotActivePower.W	Phase C instantaneous total active power	Phase C instantaneous total active power in watts
	/api/Data/ThreePhase/Powers/InstTotActivePowers/SumPAPBPCTotActivePower.W	Summation of instantaneous total active powers	Phase A + Phase B + Phase C instantaneous total active power in watts
	/api/Data/ThreePhase/Powers/InstApparentPowers/PAInstApparentPower.VA	Phase A instantaneous apparent power	Phase A instantaneous apparent power in VA
	/api/Data/ThreePhase/Powers/InstApparentPowers/PBInstApparentPower.VA	Phase B instantaneous apparent power	Phase B instantaneous apparent power in VA
	/api/Data/ThreePhase/Powers/InstApparentPowers/PCInstApparentPower.VA	Phase C instantaneous apparent power	Phase C instantaneous apparent power in VA
	/api/Data/ThreePhase/Powers/InstApparentPowers/SumPAPBPCApparentPower.VA	Summation of instantaneous apparent powers	Phase A + Phase B + Phase C instantaneous apparent power in VA
Data/ThreePhase/Energy/	/api/Data/ThreePhase/Energy/TimeDeltas	Time period used for energy calculations	Time in seconds over which energy calculations are made. Reset in /Config/Energy
	/api/Data/ThreePhase/Energy/Timestamp	Timestamp at start of reading	Time at start of Energy readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
Data/ThreePhase/Energy/TotActiveEnergyAccum/	/api/Data/ThreePhase/Energy/TotActiveEnergyAccum/PATotActiveEnergyAccum.Wh	Phase A total active energy	Phase A total active energy accumulation in watt-hours
	/api/Data/ThreePhase/Energy/TotActiveEnergyAccum/PBTotActiveEnergyAccum.Wh	Phase B total active energy	Phase B total active energy accumulation in watt-hours
	/api/Data/ThreePhase/Energy/TotActiveEnergyAccum/PCTotActiveEnergyAccum.Wh	Phase C total active energy	Phase C total active energy accumulation in watt-hours
	/api/Data/ThreePhase/Energy/TotActiveEnergyAccum/SumPAPBPCTotActiveEnergyAccum.Wh	Summation of total active energy	Phase A + Phase B + Phase C energy accumulation in watt-hours
Data/ThreePhase/Energy/FundActiveEnergyAccum/	/api/Data/ThreePhase/Energy/FundActiveEnergyAccum/PAFundActiveEnergyAccum.Wh	Phase A fundamental active energy	Phase A fundamental active energy accumulation in watt-hours
	/api/Data/ThreePhase/Energy/FundActiveEnergyAccum/PBFundActiveEnergyAccum.Wh	Phase B fundamental active energy	Phase B fundamental active energy accumulation in watt-hours
	/api/Data/ThreePhase/Energy/FundActiveEnergyAccum/PCFundActiveEnergyAccum.Wh	Phase C fundamental active energy	Phase C fundamental active energy accumulation in watt-hours
	/api/Data/ThreePhase/Energy/FundActiveEnergyAccum/SumPAPBPCFundActiveEnergyAccum.Wh	Summation of fundamental active energy	Phase A + Phase B + Phase C fundamental active energy accumulation in watt-hours

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Path	Key	Contents	Description
DATA	/api/Data		
Data/ThreePhase/Energy/FundReactiveEnergyAccum/	/api/Data/ThreePhase/Energy/FundReactiveEnergyAccum/PAFundReactiveEnergyAccum.VARh	Phase A fundamental reactive energy	Phase A fundamental reactive energy accumulation in VAR-hours
	/api/Data/ThreePhase/Energy/FundReactiveEnergyAccum/PBFundReactiveEnergyAccum.VARh	Phase B fundamental reactive energy	Phase B fundamental reactive energy accumulation in VAR-hours
	/api/Data/ThreePhase/Energy/FundReactiveEnergyAccum/PCFundReactiveEnergyAccum.VARh	Phase C fundamental reactive energy	Phase C fundamental reactive energy accumulation in VAR-hours
	/api/Data/ThreePhase/Energy/FundReactiveEnergyAccum/SumPAPBPCFundReactiveEnergyAccum.VARh	Summation of fundamental reactive energy	Phase A + Phase B + Phase C fundamental reactive energy accumulation in VAR-hours
Data/ThreePhase/Energy/ApparentEnergyAccum/	/api/Data/ThreePhase/Energy/ApparentEnergyAccum/PAApparentEnergyAccum.W	Phase A apparent energy	Phase A apparent energy accumulation in VA-hours
	/api/Data/ThreePhase/Energy/ApparentEnergyAccum/PBApparentEnergyAccum.W	Phase B apparent energy	Phase B apparent energy accumulation in VA-hours
	/api/Data/ThreePhase/Energy/ApparentEnergyAccum/PCApparentEnergyAccum.W	Phase C apparent energy	Phase C apparent energy accumulation in VA-hours
	/api/Data/ThreePhase/Energy/ApparentEnergyAccum/SumPAPBPCApparentEnergyAccum.W	Summation of apparent energy	Phase A + Phase B + Phase C apparent energy accumulation in VA-hours
Data/HarmonicCalcs/	Data/HarmonicCalcs/EventsActive/	Events flag	If True, then the Events list is not empty
	/api/Data/HarmonicCalcs/Timestamp	Timestamp at start of reading	Time at start of Harmonics readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time base been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/HarmonicCalcs/HPhase	Phase for which all harmonic readings correspond	PA, PB, PC, or, N
	/api/Data/HarmonicCalcs/FundamentalFundPhaseVoltage.Vrms	Fundamental voltage of the selected phase	Phase voltage fundamental component RMS value in volts. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/FundamentalFundPhaseCurrent.Arms	Fundamental current of the selected phase	Phase current fundamental component RMS value in amps. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/FundamentalFundActivePower.W	Fundamental active power of the selected phase	Fundamental component active power in watts. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/FundamentalFundReactivePower.VAR	Fundamental reactive power of the selected phase	Fundamental component reactive power in VARs. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/FundamentalFundApparentPower.VA	Fundamental apparent power of the selected phase	Fundamental component apparent power in VA. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/FundamentalFundPowerFactor	Fundamental power factor of the selected phase	Fundamental component power factor. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/Distortion/PhaseVoltageTHD.Perc	Phase voltage THD of the selected phase	Phase voltage total harmonic distortion in percent. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/Distortion/PhaseCurrentTHD.Perc	Phase current THD of the selected phase	Phase current total harmonic distortion in percent. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/HX	Harmonic X index being read	Phase selected in Config/Harmonics/.
	/api/Data/HarmonicCalcs/HXIndex/HXPhaseVoltage.Vrms	Harmonic X voltage of the selected phase	Phase voltage harmonic X RMS value in volts. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/HXPhaseCurrent.Arms	Harmonic X current of the selected phase	Phase current harmonic X RMS value in amps. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/HXActivePower.W	Harmonic X active power of the selected phase	Harmonic X active power in watts. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/HXReactivePower.VAR	Harmonic X reactive power of the selected phase	Harmonic X reactive power in VARs. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/HXApparentPower.VA	Harmonic X apparent power of the selected phase	Harmonic X apparent power in VA. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/HXPowerFactor	Harmonic X power factor of the selected phase	Harmonic X power factor. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/Distortion/HXPhaseVoltageHD.Perc	Phase voltage harmonic X distortion of the selected phase	Phase voltage harmonic X harmonic distortion relative to the fundamental in percent. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HXIndex/Distortion/HXPhaseCurrentHD.Perc	Phase current harmonic X distortion of the selected phase	Phase current harmonic X harmonic distortion relative to the fundamental in percent. Harmonic 1 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.

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Path	Key	Contents	Description
DATA	/api/Data		
	/api/Data/HarmonicCalcs/HYIndex/HY	Harmonic Y index being read	Phase selected in Config/Harmonics/
	/api/Data/HarmonicCalcs/HYIndex/HYPhaseVoltage.Vrms	Harmonic Y voltage of the selected phase	Phase voltage harmonic Y RMS value in volts. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HYIndex/HYPhaseCurrent.Arms	Harmonic Y current of the selected phase	Phase current harmonic Y RMS value in amps. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HYIndex/HYActivePower.W	Harmonic Y active power of the selected phase	Harmonic Y active power in watts. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HYIndex/HYReactivePower.VAR	Harmonic Y reactive power of the selected phase	Harmonic Y reactive power in VARs. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HYIndex/HYApparentPower.VA	Harmonic Y apparent power of the selected phase	Harmonic Y apparent power in VA. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HYIndex/HYPowerFactor	Harmonic Y power factor of the selected phase	Harmonic Y power factor. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HYIndex/Distortion/HYPhaseVoltageHD.Perc	Phase voltage harmonic Y distortion of the selected phase	Phase voltage harmonic Y harmonic distortion relative to the fundamental in percent. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HYIndex/Distortion/HYPhaseCurrentHD.Perc	Phase current harmonic Y distortion of the selected phase	Phase current harmonic Y harmonic distortion relative to the fundamental in percent. Harmonic 2 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/HZ	Harmonic Z index being read	Phase selected in Config/Harmonics/
	/api/Data/HarmonicCalcs/HZIndex/HZPhaseVoltage.Vrms	Harmonic Z voltage of the selected phase	Phase voltage harmonic Z RMS value in volts. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/HZPhaseCurrent.Arms	Harmonic Z current of the selected phase	Phase current harmonic Z RMS value in amps. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/HZActivePower.W	Harmonic Z active power of the selected phase	Harmonic Z active power in watts. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/HZReactivePower.VAR	Harmonic Z reactive power of the selected phase	Harmonic Z reactive power in VARs. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/HZApparentPower.VA	Harmonic Z apparent power of the selected phase	Harmonic Z apparent power in VA. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/HZPowerFactor	Harmonic Z power factor of the selected phase	Harmonic Z power factor. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/Distortion/HZPhaseVoltageHD.Perc	Phase voltage harmonic Z distortion of the selected phase	Phase voltage harmonic Z harmonic distortion relative to the fundamental in percent. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
	/api/Data/HarmonicCalcs/HZIndex/Distortion/HZPhaseCurrentHD.Perc	Phase current harmonic Z distortion of the selected phase	Phase current harmonic Z harmonic distortion relative to the fundamental in percent. Harmonic 3 of 3 monitored simultaneously. Phase selected in Config/Harmonics/PhaseSelect.
Data/SinglePhasePA/	Data/SinglePhasePA/EventsActive/	Events flag	If True, then the Events list is not empty
Data/SinglePhasePA/RMSReadings/	/api/Data/SinglePhasePA/RMSReadings/Timestamp	Reading timestamp	Time at start of RMS readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time base been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePA/RMSReadings/PAIrms.Arms	Phase A current measurement	Phase A current rms value in amps, modified by scale in /DataConfig
	/api/Data/SinglePhasePA/RMSReadings/PAVrms.Vrms	Phase A voltage measurement	Phase A voltage rms value in volts, modified by scale in /DataConfig
Data/SinglePhasePA/PhaseAngles/	/api/Data/SinglePhasePA/PhaseAngles/Timestamp	Timestamp at start of reading	Time at start of Phase Angles readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time base been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePA/PhaseAngles/PAV-PAI.Deg	Phase A voltage to current phase angle	Phase Angle between Phase A voltage and Phase A current in degrees.
Data/SinglePhasePA/LinePeriods/	/api/Data/SinglePhasePA/LinePeriods/Timestamp	Timestamp at start of reading	Time at start of LinePeriods readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time base been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePA/LinePeriods/PAPeriod.ms	Phase A line period	Phase A line period in milliseconds

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Path	Key	Contents	Description
DATA	/api/Data		
Data/SinglePhasePA/Powers/	/api/Data/SinglePhasePA/Powers/Timestamp	Timestamp at start of reading	Time at start of Powers readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePA/Powers/PAInstTotActivePower.W	Phase A instantaneous total active power	Phase A instantaneous total active power in watts
	/api/Data/SinglePhasePA/Powers/PAInstApparentPower.VA	Phase A instantaneous apparent power	Phase A instantaneous apparent power in VA
	/api/Data/SinglePhasePA/Powers/FundReactivePower.VAR	Reactive power	Reactive power of the fundamental component in VARs
Data/SinglePhasePA/PowerFactors/	/api/Data/SinglePhasePA/PowerFactors/Timestamp	Timestamp at start of reading	Time at start of Power Factors readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePA/PowerFactors/PAPowerFactor	Phase A power factor	Phase A power factor
Data/SinglePhasePA/Energy/	/api/Data/SinglePhasePA/Energy/TimeDelta.s	Time period used for energy calculations	Time in seconds over which energy calculations are made. Reset in /Config/Energy
	/api/Data/SinglePhasePA/Energy/Timestamp	Timestamp at start of reading	Time at start of Energy readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePA/Energy/PATotActiveEnergyAccum.Wh	Phase A total active energy	Phase A total active energy accumulation in watt-hours
	/api/Data/SinglePhasePA/Energy/PAFundActiveEnergyAccum.Wh	Phase A fundamental active energy	Phase A fundamental active energy accumulation in watt-hours
	/api/Data/SinglePhasePA/Energy/PAFundReactiveEnergyAccum.VARh	Phase A fundamental reactive energy	Phase A fundamental reactive energy accumulation in VAR-hours
	/api/Data/SinglePhasePA/Energy/PAApparentEnergyAccum.W	Phase A apparent energy	Phase A apparent energy accumulation in VA-hours
Data/SinglePhasePB/	Data/ThreePhase/SinglePhasePB/	Events flag	If True, then the Events list is not empty
Data/SinglePhasePB/RMSReadings/	/api/Data/SinglePhasePB/RMSReadings/Timestamp	Reading timestamp	Time at start of RMS readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePB/RMSReadings/PBIrms.Arms	Phase B current measurement	Phase B current rms value in amps, modified by scale in /DataConfig
	/api/Data/SinglePhasePB/RMSReadings/PBVrms.Vrms	Phase B voltage measurement	Phase B voltage rms value in volts, modified by scale in /DataConfig
Data/SinglePhasePB/PhaseAngles/	/api/Data/SinglePhasePB/PhaseAngles/Timestamp	Timestamp at start of reading	Time at start of Phase Angles readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePB/PhaseAngles/PBV-PBI.Deg	Phase B voltage to current phase angle	Phase Angle between Phase B voltage and Phase B current in degrees
Data/SinglePhasePB/LinePeriods/	/api/Data/SinglePhasePB/LinePeriods/Timestamp	Timestamp at start of reading	Time at start of Line Periods readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePB/LinePeriods/PBPeriod.ms	Phase B line period	Phase B line period in milliseconds
Data/SinglePhasePB/Powers/	/api/Data/SinglePhasePB/Powers/Timestamp	Timestamp at start of reading	Time at start of Powers readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePB/Powers/PBInstTotActivePower.W	Phase B instantaneous total active power	Phase B instantaneous total active power in watts
	/api/Data/SinglePhasePB/Powers/PBInstApparentPower.VA	Phase B instantaneous apparent power	Phase B instantaneous apparent power in VA
	/api/Data/SinglePhasePB/Powers/FundReactivePower.VAR	Reactive power	Reactive power of the fundamental component in VARs
Data/SinglePhasePB/PowerFactors/	/api/Data/SinglePhasePB/PowerFactors/Timestamp	Timestamp at start of reading	Time at start of RMS readings. ISO8601 format (2021-08-26T08:15:59.5922) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePB/PowerFactors/PBPowerFactor	Phase B power factor	Phase B power factor

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Path	Key	Contents	Description
DATA	/api/Data		
Data/SinglePhasePB/Energy/	/api/Data/SinglePhasePB/Energy/TimeDeltas	Time period used for energy calculations	Time in seconds over which energy calculations are made. Reset in /Config/Energy
	/api/Data/SinglePhasePB/Energy/Timestamp	Timestamp at start of reading	Time at start of Energy readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePB/Energy/PBTotActiveEnergyAccum.Wh	Phase B total active energy	Phase B total active energy accumulation in watt-hours
	/api/Data/SinglePhasePB/Energy/PBFundActiveEnergyAccum.Wh	Phase B fundamental active energy	Phase B fundamental active energy accumulation in watt-hours
	/api/Data/SinglePhasePB/Energy/PBFundReactiveEnergyAccum.VARh	Phase B fundamental reactive energy	Phase B fundamental reactive energy accumulation in VAR-hours
	/api/Data/SinglePhasePB/Energy/PBApparentEnergyAccum.W	Phase B apparent energy	Phase B apparent energy accumulation in VA-hours
Data/SinglePhasePC/	Data/ThreePhase/SinglePhasePC/	Events flag	If True, then the Events list is not empty
Data/SinglePhasePC/RMSReadings/	/api/Data/SinglePhasePC/RMSReadings/Timestamp	Reading timestamp	Time at start of RMS readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePC/RMSReadings/PCIrms.Arms	Phase C current rms value	Phase C current rms value in amps, modified by scale in /DataConfig
	/api/Data/SinglePhasePC/RMSReadings/PCVrms.Vrms	Phase C voltage measurement	Phase C voltage rms value in volts, modified by scale in /DataConfig
Data/SinglePhasePC/PhaseAngles/	/api/Data/SinglePhasePC/PhaseAngles/Timestamp	Timestamp at start of reading	Time at start of Phase Angles readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePC/PhaseAngles/PCV-PCILDeg	Phase C voltage to current phase angle	Phase Angle between Phase C voltage and Phase C current in degrees
Data/SinglePhasePC/LinePeriods/	/api/Data/SinglePhasePC/LinePeriods/Timestamp	Timestamp at start of reading	Time at start of Line Periods readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePC/LinePeriods/PCPeriod.ms	Phase C line period	Phase C line period in milliseconds
Data/SinglePhasePC/Powers/	/api/Data/SinglePhasePC/Powers/Timestamp	Timestamp at start of reading	Time at start of Powers readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePC/Powers/PCInstTotActivePower.W	Phase C instantaneous total active power	Phase C instantaneous total active power in watts
	/api/Data/SinglePhasePC/Powers/PCInstApparentPower.VA	Phase C instantaneous apparent power	Phase C instantaneous apparent power in VA
	/api/Data/SinglePhasePC/Powers/FundReactivePower.VAR	Reactive power	Reactive power of the fundamental component in VARs
Data/SinglePhasePC/PowerFactors/	/api/Data/SinglePhasePC/PowerFactors/Timestamp	Timestamp at start of reading	Time at start of RMS readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePC/PowerFactors/PCPowerFactor	Phase C power factor	Phase C power factor
Data/SinglePhasePC/Energy/	/api/Data/SinglePhasePC/Energy/TimeDeltas	Time period used for energy calculations	Time in seconds over which energy calculations are made. Reset in /Config/Energy
	/api/Data/SinglePhasePC/Energy/Timestamp	Timestamp at start of reading	Time at start of Energy readings. ISO8601 format (2021-08-26T08:15:59.592Z) if NTP is enabled and a successful sync was made or if reference time hase been set manually. If NTP is disabled, timestamp is time elapsed in seconds since module power on (SSSS.mmm).
	/api/Data/SinglePhasePC/Energy/PCTotActiveEnergyAccum.Wh	Phase C total active energy	Phase C total active energy accumulation in watt-hours
	/api/Data/SinglePhasePC/Energy/PCFundActiveEnergyAccum.Wh	Phase C fundamental active energy	Phase C fundamental active energy accumulation in watt-hours
	/api/Data/SinglePhasePC/Energy/PCFundReactiveEnergyAccum.VARh	Phase C fundamental reactive energy	Phase C fundamental reactive energy accumulation in VAR-hours
	/api/Data/SinglePhasePC/Energy/PCApparentEnergyAccum.W	Phase C apparent energy	Phase C apparent energy accumulation in VA-hours

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Path	Key	Contents	Description
EVENTS	**/api/Events**		
Events/PowerQuality/	/api/Events/PowerQuality/	Power Quality event list	Objects are appended to this path when events occur as prescribed in /Config/Events/PowerQuality/. An object describing an event contains details such as the event name, phase(s) on which the event occurred, event start time, event stop time.
	/api/Events/PowerQuality/	Clear events	DELETE /api/Events/PowerQuality clears all

Path	Key	Contents	Description
DIAGNOSTICS	**/api/Diagnostics**		
Diagnostics/	/api/Diagnostics/WatchdogFlag	Watchdog flag status	True = WDT has expired and module has been reset
	/api/Diagnostics/UpTime.s	Module run time	Time in seconds that the module has been running since power on
	/api/Diagnostics/ResetCause	Array of string indicators	Array can contain strings Watchdog, Software, Brown-out, Power on, External showing reset cause during the current operational session.
	/api/Diagnostics/InternalTemp.C	PWRMxx-xx internal temperature	Internal temperature of the PWRMxx-xx in Celsius as measured by the microcontroller internal sensor
Diagnostics/SelfTest/	/api/Diagnostics/SelfTestError	Inidicates if there is a Self Test that failed	If True, then check /SelfTest to check what error was detected
Diagnostics/HTTP/	/api/Diagnostics/HTTP/GET/Success	HTTP communications statistics	Number of successful GET requests
	/api/Diagnostics/HTTP/GET/404	HTTP communications statistics	Number of GET requests made to a non-existent path
	/api/Diagnostics/HTTP/PUT/Success	HTTP communications statistics	Number of successful PUT requests
	/api/Diagnostics/HTTP/PUT/404	HTTP communications statistics	Number of PUT requests made to a non-existent path
	/api/Diagnostics/HTTP/POST/Success	HTTP communications statistics	Number of successful POST requests
	/api/Diagnostics/HTTP/POST/404	HTTP communications statistics	Number of POST requests made to a non-existent path
	/api/Diagnostics/HTTP/OtherNotSupported	HTTP communications statistics	Number requests made other than GET, PUT, POST
Diagnostics/NTP/	/api/Diagnostics/NTP/LastSync	Network Time Protocol Sync	If NTP is specified in /api/Config/Time, this register lists the UTC time of the last successful sync or No successful sync.

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Standard Terms and Conditions of Sale Applying to Products Sold by Dataforth Corporation

Full details on Terms and Conditions of Sale, including Warranty, are found on the Dataforth website at Dataforth Terms and Conditions of Sale

Application Support

Dataforth provides timely, high-quality product support.

Contact Method	Contact Information
E-Mail: Technical Support	support@dataforth.com
Website:	www.dataforth.com
Phone:	+1-520-741-1404 and toll free US +1-800-444-7644
Fax:	+1-520-741-0762
Mail:	Dataforth Corporation 3331 E. Hemisphere Loop Tucson, AZ 85706 USA

Returns/Repair Policy

All warranty and repair requests should be directed to the Dataforth Customer Service Department.

Return Material Authorization (RMA) instructions are found on the Dataforth website and can be accessed using this link: RMA Instructions and Form.

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PWRM10-01 & PWRM20-01 Web Interface & HTTP API User Manual
MA1067 Rev. A – May 2022
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Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000