PWRM10-01
PWRM20-01

IoT Energy Monitoring Modules

MA1069

Quick Start Guide



DATAFORTH®

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PWRM10-01 & PWRM20-01 Quick Start Guide
MA1069 Rev. A – May 2022
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"Our passion at Dataforth Corporation is designing, manufacturing, marketing, and selling the best possible signal conditioning, data acquisition, and data communication products. Our mission is to set new standards of product quality, performance, and customer service." Dataforth Corporation, with more than thirty years of experience, is the worldwide leader in Instrument Class® Industrial Electronics – rugged, high performance signal conditioning, data acquisition, and data communication products that play a vital role in maintaining the integrity of industrial automation, data acquisition, and quality assurance systems. Our products directly connect to most industrial sensors and protect valuable measurement and control signals and equipment from the dangerous and degrading effects of noise, transient power surges, internal ground loops, and other hazards present in industrial environments.

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Dataforth operates under an ISO9001:2015 quality management system.

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1.0 Features

The PWRM10-01 and PWRM20-01 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 PWRM10-01
- Wide Operating and Measurement Range of 85 - 525VAC for PWRM20-01
- 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 Power
- 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 Three Step Setup: Install → Connect → Acquire

Three simple steps are all that is required to start monitoring energy with the PWRM10-01 or PWRM20-01 modules:

STEP 1 Installing the Module

- Unpack the PWRM10-01 or PWRM20-01 module and mount it on a DIN rail
- Wire the phase voltages and phase currents to be monitored to the terminal blocks

  *The modules are powered by the phase voltages – separate power is not needed
- Use a standard Ethernet cable for direct or network connection to a computer, tablet, or smartphone

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.

STEP 2 Connecting Communications to the Module

- Download the PWRM Discovery Tool from the Dataforth website

  PWRM Software & User Manual Download Center
- Run the tool to identify all PWRMxx-xx modules connected direct or on a local network
- Double-click on a module to connect to it using a standard browser and the Web Interface

STEP 3 Acquiring Data from the Module

- Sensor Configuration in the Web Interface sets up the module to properly read devices used for measuring phase currents and phase voltages
- Data Display in the Web Interface displays real time data in tables
- Data Charts in the Web Interface graphically display real time data
- Logger in the Web Interface provides data logging

Sections 4.0, 5.0, and 6.0 respectively detail these steps.

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4.0 Installing the Module

Each PWRM10-01 and PWRM20-01 module is shipped in electro-static discharge (ESD) protective packaging. Use appropriate ESD protection measures while unpacking. If physical damage is noted, file a claim with the shipping carrier and contact the factory.

4.1 Mounting on a DIN Rail

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.

The PWRM10-01 and PWRM20-01 modules mount on 35mm DIN rails that are elevated or flush on panels. They require no tools or hardware for insertion into a system and only a simple flat blade screwdriver for removal.

To install a module:

1. Orient the module with the metal latch down and the Ethernet jack away from the DIN rail
2. Align the module DIN rail capture with the top edge of the rail
3. Slide the module down until the module engages the rail
4. Rotate the module and snap in place

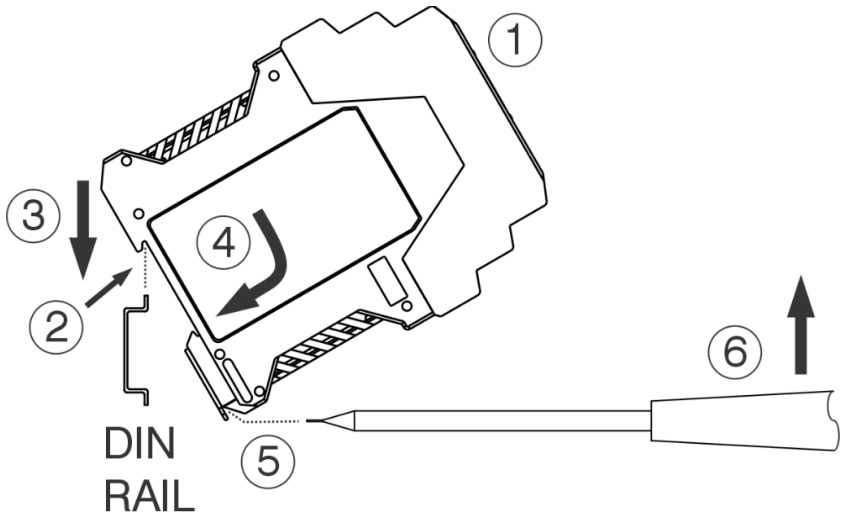


Figure 1: PWRM10-01 Installation and Removal from a DIN Rail

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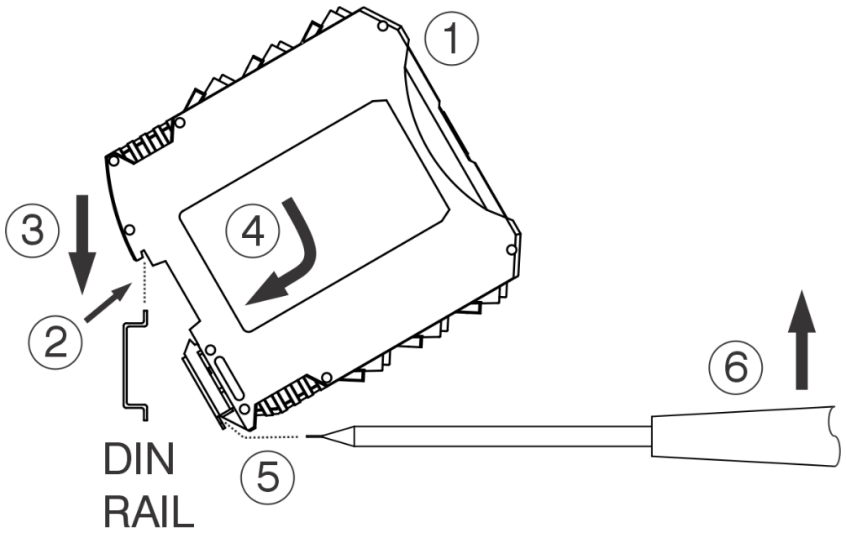


Figure 2: PWRM20-01 Installation and Removal from a DIN Rail

To remove a module:

5. Insert a flat blade screwdriver into the slot in the metal clip
6. Lift the screwdriver to pull back the clip and release the module from the rail

4.2 Wiring to Phase Voltages and Phase Currents

The PWRM10-01 and PWRM20-01 modules have pluggable terminal blocks to connect to phase voltages and phase currents. This allows modules to be easily added to or removed from a system. The modules are powered by the phase voltages and an external power supply is not required.

DANGER – HAZARDOUS VOLTAGES

These wiring instructions are for use by qualified personnel only.
Only licensed electricians or qualified personnel should install and maintain the modules and wiring.

REFER TO MA1068 PWRM10-01 & PWRM20-01 Hardware User Manual FOR DETAILS ON WIRING TO PHASE VOLTAGE AND FOR SENSORS AND WIRING TO PHASE CURRENTS.

PWRM10-01 and PWRM20-01 modules interface to phase currents with burden resistors, current transformers, or Rogowski Coils with 0.333VAC output at rated current. This low voltage interface is on the module top terminal blocks.

PWRM10-01 and PWRM20-01 modules interface to phase voltages using the bottom terminal blocks.

WARNING!

Mains voltages of 85VAC to 525VAC can be lethal!

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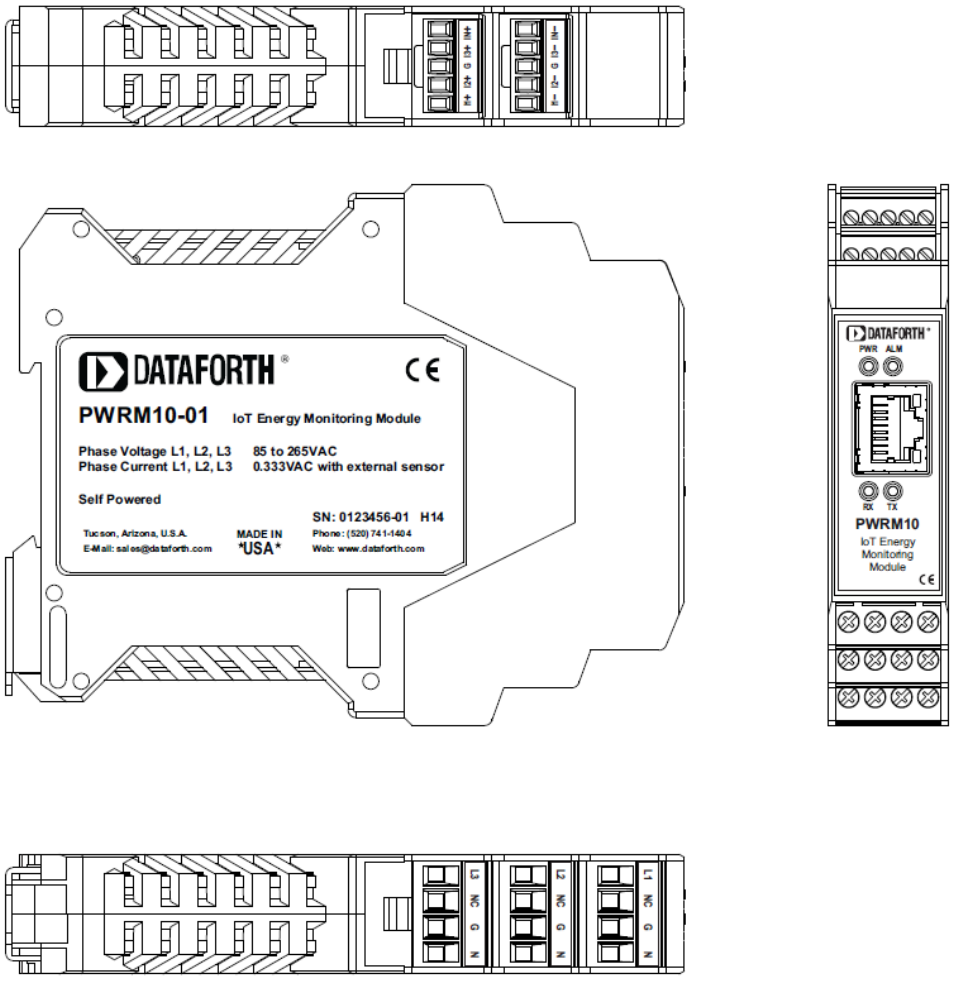


Figure 3: PWRM10-01 3D View

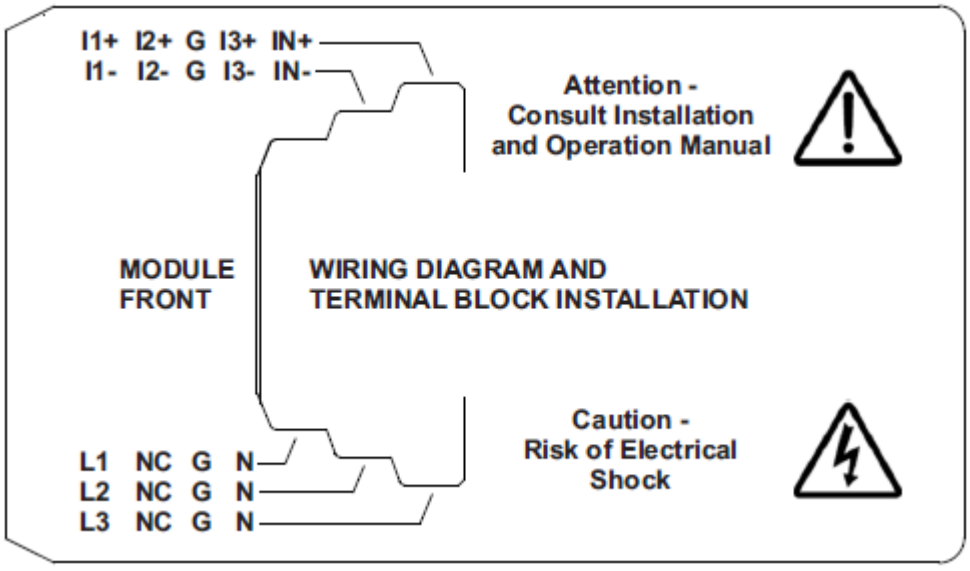


Figure 4: PWRM10-01 Wiring Diagram & Terminal Block Positions

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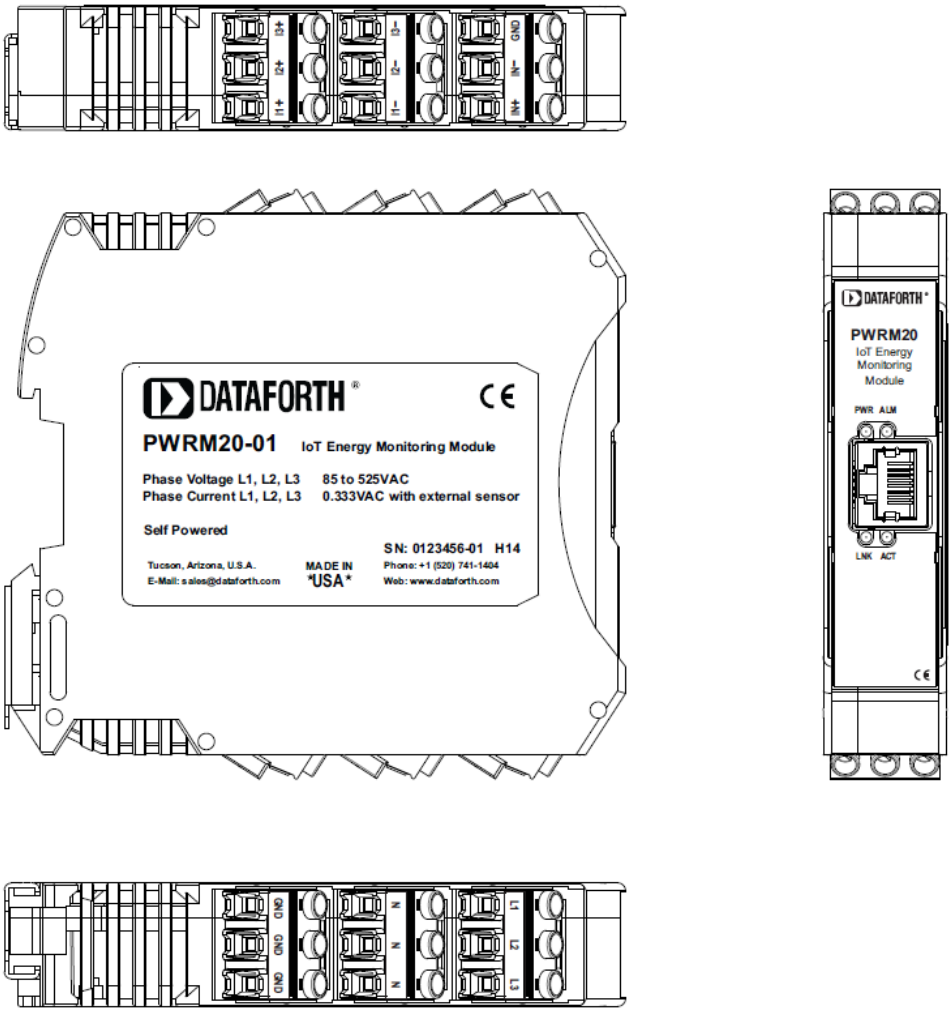


Figure 5: PWRM20-01 3D View

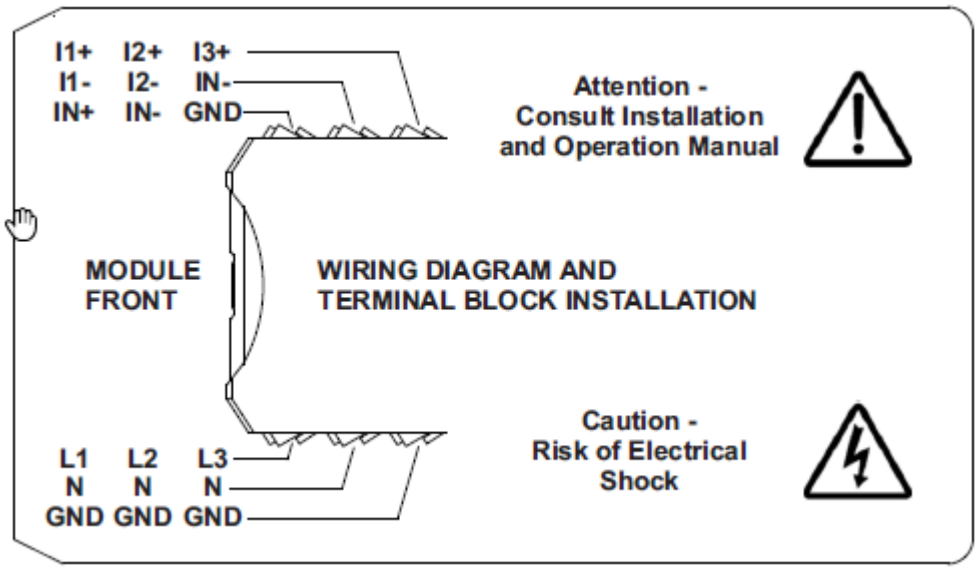


Figure 6: PWRM20-01 Wiring Diagram & Terminal Block Positions

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4.3 Ethernet Connection

The PWRM10-01 and PWRM20-01 modules use an Ethernet connection for communication and configuration.

Communication with the modules is accomplished over Ethernet using a no cost HTTP API. Use a standard Ethernet cable to connect the module to a local network or for direct connection to a computer. LEDs integrated in the Ethernet connector and surrounding the connector show communications and module status. Refer to MA1068 PWRM10-01 & PWRM20-01 Hardware User Manual for more details.

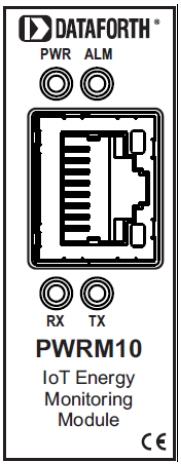


Figure 7: PWRM10-01 Front Panel

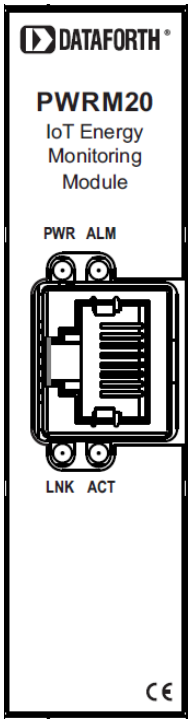


Figure 8: PWRM20-01 Front Panel

4.3.1 Connecting a Module to a Computer Over a Network

Hardwire connect the PWRM10-01 or PWRM20-01 module to a network using a router or switch. Connect a computer to the same network as the module using a hardwire connection through a router, switch, or wireless connection to a Wi-Fi router or switch.

4.3.2 Connecting a Module to a Computer Directly

Connect a computer directly to a module using a hardwire connection or Wi-Fi bridge.

4.3.3 Connecting a Module to a Tablet or Smartphone

Hardwire connect the PWRM10-01 or PWRM20-01 module to a network that has a Wi-Fi router or switch. Connect a tablet or smartphone to the same network as the module using the Wi-Fi router or switch.

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5.0 Connecting to the Module

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.

5.1 Downloading the PWRM Discovery Tool

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.

5.2 Running the Discovery Tool

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

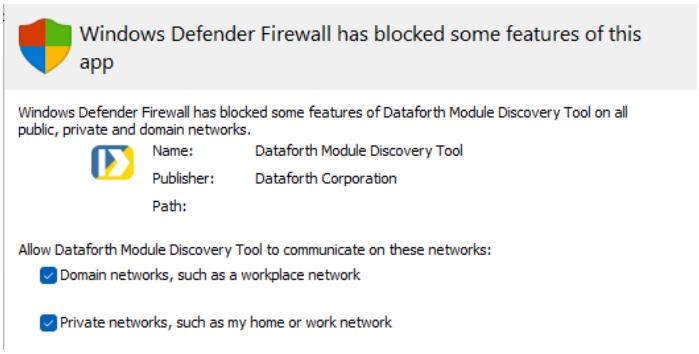
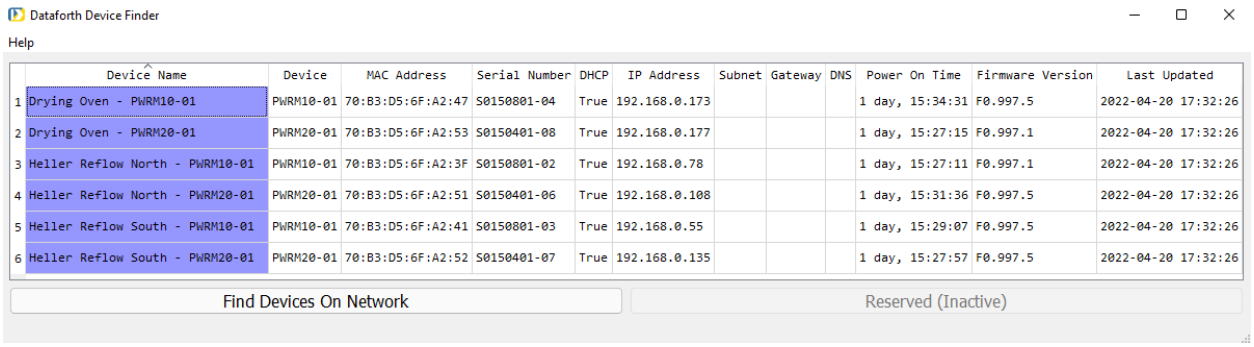


Figure 9: Windows Firewall Settings

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 10: PWRM Discovery Tool Module Listing

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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

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.

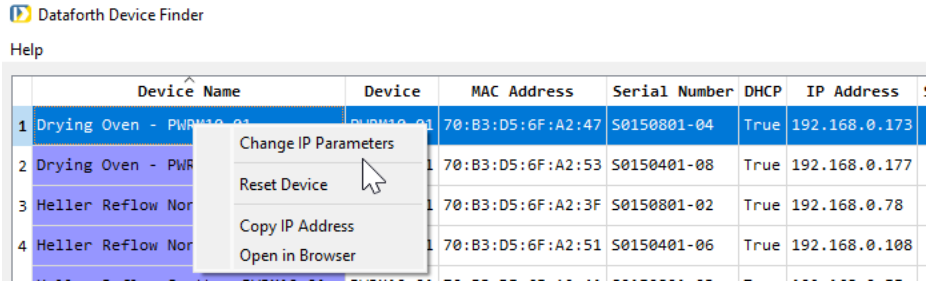


Figure 11: Change IP Parameters

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.

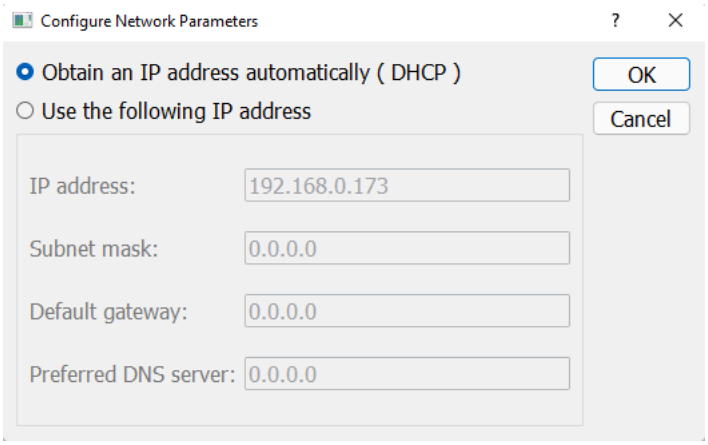


Figure 12: Configure IP Parameters

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.

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5.3 Selecting a Module and Connecting

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*.

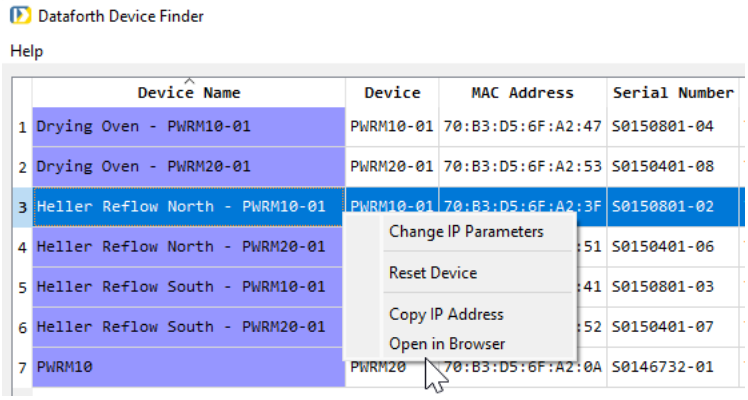


Figure 13: Open Web Interface in a Browser

The Overview page will display after the connection is established.

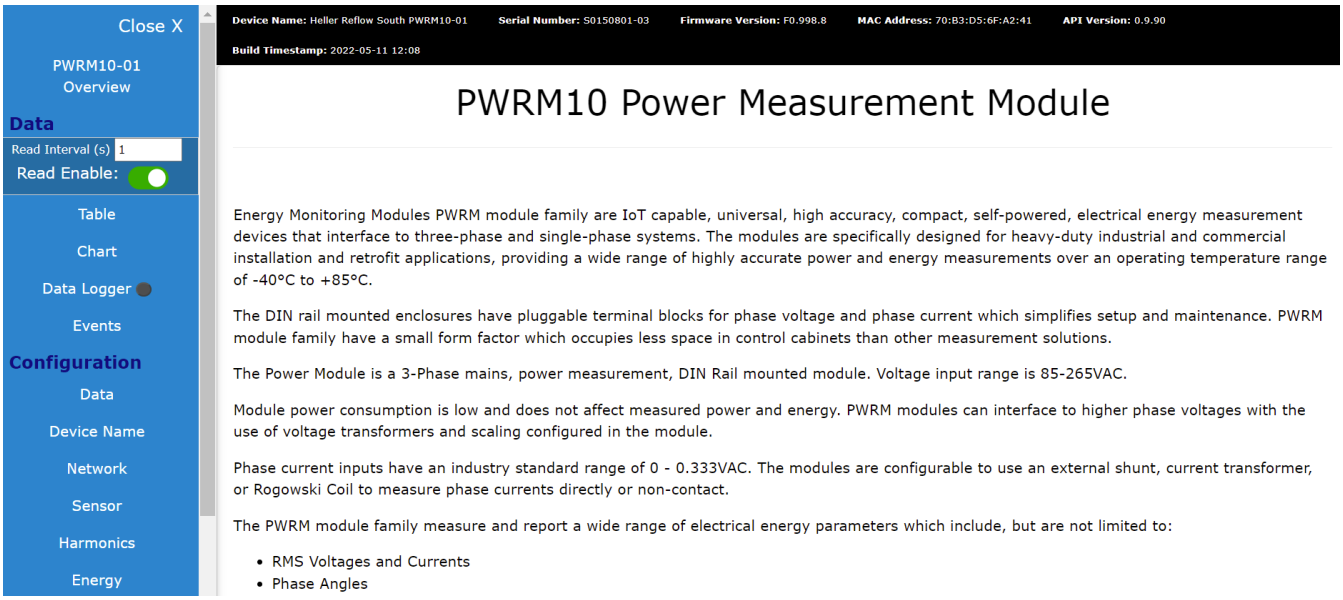


Figure 14: Web Interface in a Browser

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6.0 Acquiring Data from the Module

Selections on the left side of the panel give full access to module configuration and all features and functions.

6.1 Enter Sensing Device Parameters with Sensor Configuration

Data will not be accurate until phase voltage and phase current sensors are configured.

First go to the **Configuration | Sensor** page, select devices used to measure phase currents and phase voltages, and enter the device parameters.

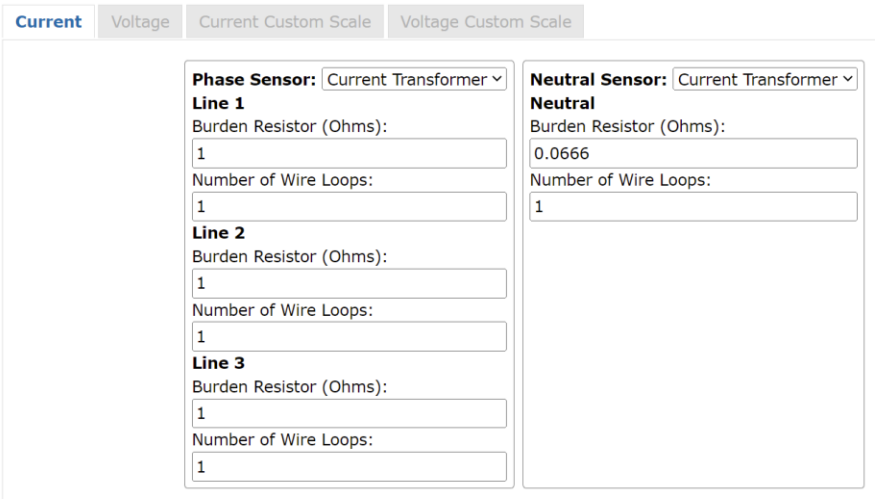


Figure 15: Configuration | Sensor Page

Custom scaling parameters are available if required by an installation.

6.2 Data Display in Tables

Data is continuously collected from the module at the default poll rate of 1 second and posted to the appropriate displays and charts.

The **Data | Table** page has a concise tabulation of the basic parameters measured.

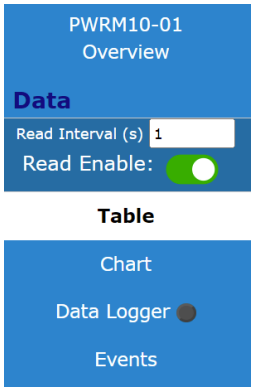
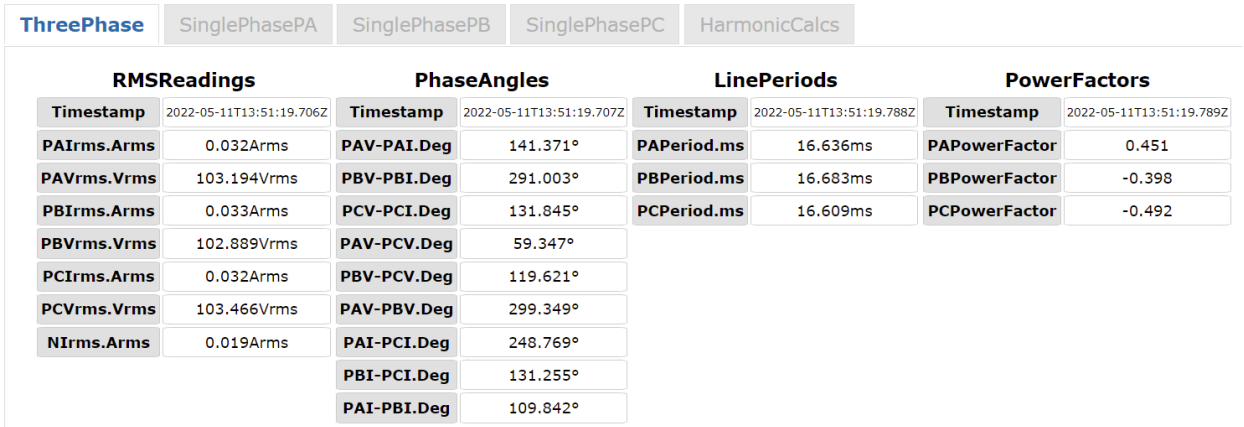


Figure 16: Data | Table Selection

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RMSReadings

Timestamp	2022-05-11T13:51:19.706Z
PAIrms.Arms	0.032Arms
PAVrms.Vrms	103.194Vrms
PBIrms.Arms	0.033Arms
PBVrms.Vrms	102.889Vrms
PCIrms.Arms	0.032Arms
PCVrms.Vrms	103.466Vrms
NIrms.Arms	0.019Arms

PhaseAngles

Timestamp	2022-05-11T13:51:19.707Z
PAV-PAI.Deg	141.371°
PBV-PBI.Deg	291.003°
PCV-PCI.Deg	131.845°
PAV-PCV.Deg	59.347°
PBV-PCV.Deg	119.621°
PAV-PBV.Deg	299.349°
PAI-PCI.Deg	248.769°
PBI-PCI.Deg	131.255°
PAI-PBI.Deg	109.842°

LinePeriods

Timestamp	2022-05-11T13:51:19.788Z
PAPeriod.ms	16.636ms
PBPeriod.ms	16.683ms
PCPeriod.ms	16.609ms

PowerFactors

Timestamp	2022-05-11T13:51:19.789Z
PAPowerFactor	0.451
PBPowerFactor	-0.398
PCPowerFactor	-0.492

Figure 17: Data | Table

6.3 Data Display in Charts

The **Data | Charts** page provides a graphical display of user selected readings from the module. Charts will autoscale.

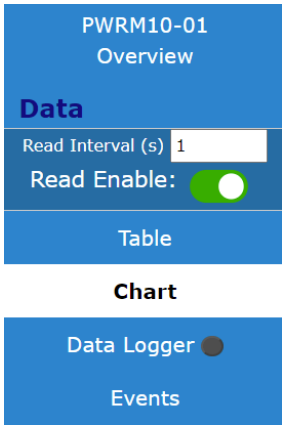


Figure 18: Data | Chart Selection

Select the charted data and number of data points to be displayed from the *Select Category* and *History Capacity* drop-down menus.

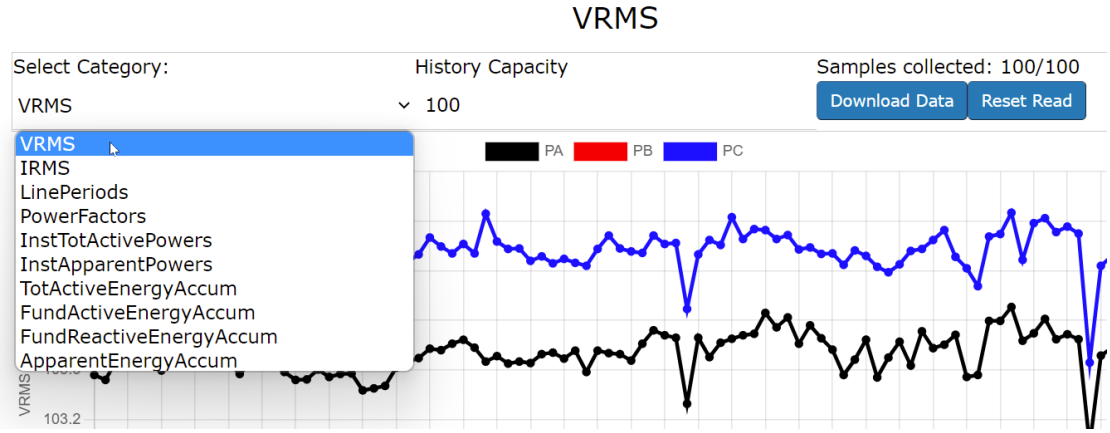


Figure 19: Charted Data Selection

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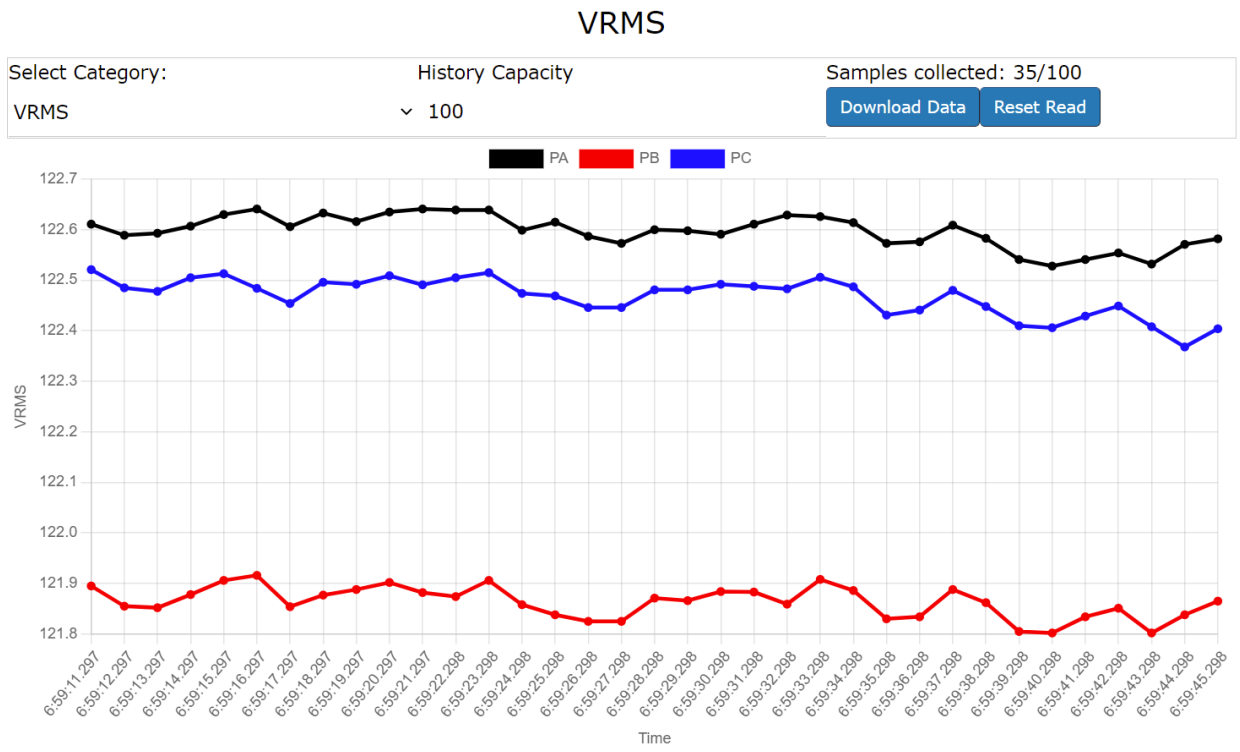


Figure 20: Data | Chart Display

6.4 Data Logging

The **Data | Data Logger** page is where logging is configured and operated.

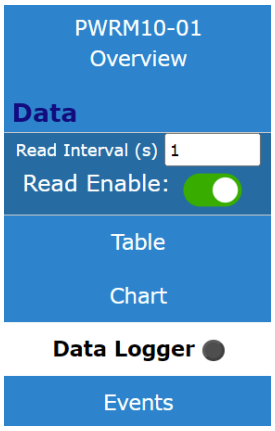


Figure 21: Data | Data Logger Selection

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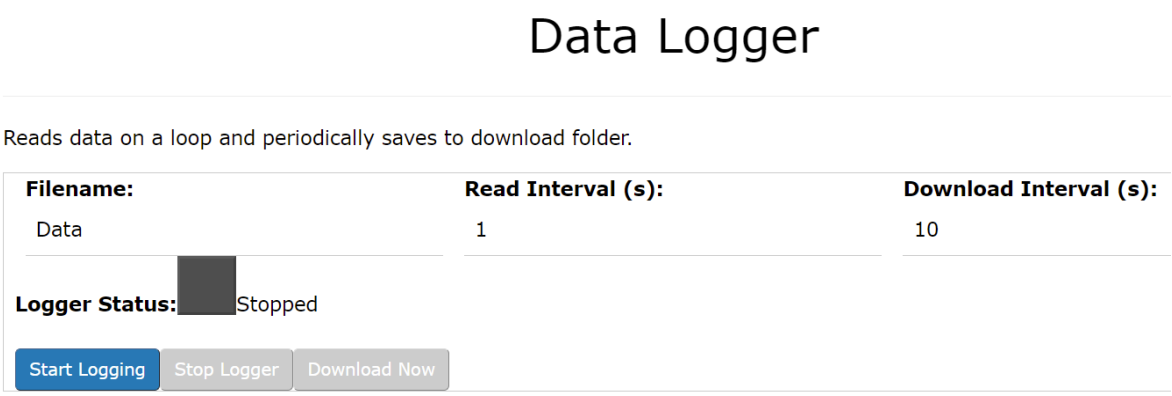


Figure 22: Data | Data Logger Page

Configure data logging by entering *Filename*, *Read Interval*, and *Download Interval*.

Initiate data logging by clicking the *Start Logging* button. Data will be collected per the specified parameters and stored locally in the module. When the download interval is reached the file will be saved in the \Downloads folder in .CSV format on the host computer, tablet, or smartphone running the application and a new data file will be opened. This process will repeat until the *Stop Logger* button is pressed.

Data files will be downloaded upon completion or immediately by pressing the *Download Now* button.

The data filename is made up of the name specified and the date and time that the data was collected.

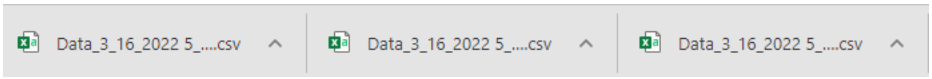


Figure 23: Logged Data File Format

The web browser may post a pop-up asking if downloading multiple files is to be allowed.

Logger status shows when data logging is active or stopped.



Figure 24: Data Logger Start and Stop Status

Status is also shown with green and grey in the left column so logging status is known when a different page is selected such as Data Display or Data Charts.

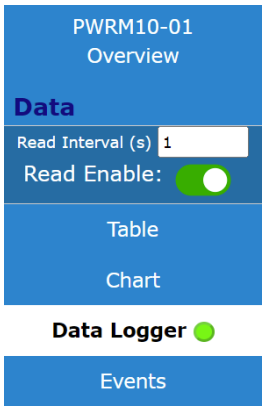


Figure 25: Data Logger Status Sidebar Indicator

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Dataforth provides timely, high-quality product support.

Contact Method	Contact Information
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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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MA1069 Rev. A – May 2022
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