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Asset Management

FactoryTalk® EnergyMetrix

USER GUIDE

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Allen-Bradley • Rockwell Software

Rockwell Automation

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Welcome to FactoryTalk EnergyMetrix

FactoryTalk EnergyMetrix is a modular, scalable, web-enabled, client/server energy information and management application. It connects energy-related data sources to a Microsoft SQL database and presents energy information in ways that enable you to monitor and manage your energy use to maximize the value of your enterprise. FactoryTalk EnergyMetrix is built using Microsoft .NET TM technology, ensuring the highest level of quality, reliability and compatibility now and in the future.

FactoryTalk EnergyMetrix components

FactoryTalk EnergyMetrix consists of modular components that make it easy to scale an energy monitoring and management system to meet your exact needs:

1. **"Manager" (page 26)**

   Core application for logging, charting and reporting enterprise energy information.
2. **"RealTime (RT)" (page 471)**

   Rich-client application for configuring and viewing data in Allen-Bradley power monitors.
3. **"ChartsPlus" (page 443)**

   Extended custom charting capabilities including X-Y trending with regression, targeting and CUSUM analysis.

4. **"ReportsPlus" (page 333)**

   Extended reporting capabilities including custom Multi-Purpose Reports.

5. **"OPC third-party connectivity" (page 34)**

   Enables 3rd party device communications via OPC.

Communications

Manager and RT connect to Allen-Bradley devices using RSLinx Lite, which is included on the installation DVD. With the optional FactoryTalk EnergyMetrix OPC package and customer-provided OPC drivers, FactoryTalk EnergyMetrix can consolidate energy-related information from a wide variety of third-party meters and other data sources.

Intended audience

This online Help resource is intended for developers and administrators of the FactoryTalk EnergyMetrix software and its project configuration. We assume that you are familiar with:

- Microsoft Windows-based personal computers
- Client-server systems
- Ethernet networking
- Microsoft® Windows® operating systems
- OLE for Process Control® (OPC) communication
- Microsoft SQL Server
- Microsoft Internet Information Services
- Allen-Bradley power monitors
- Allen-Bradley programmable logic controllers (PLC™)
- RSLinx Classic communications software

Features and benefits

FactoryTalk EnergyMetrix is sophisticated web-enabled energy management software that puts critical energy information at your desktop. The FactoryTalk EnergyMetrix Software Suite combines data communication, client-server applications, and Microsoft's advanced .NET web technology to provide you with a complete energy management solution. FactoryTalk EnergyMetrix captures, analyzes, stores, and shares energy data across your entire enterprise. Using a simple web browser, your energy information can now be available on your company's LAN or WAN, presenting you with the knowledge necessary to optimize your energy consumption. The net result- improved productivity and lower energy costs. FactoryTalk EnergyMetrix is scalable so you may add additional components while maintaining your original investment.

Why FactoryTalk EnergyMetrix?

FactoryTalk EnergyMetrix helps managers and engineers solve the ever growing energy related challenges

With FactoryTalk EnergyMetrix, you can:

- Correlate energy costs to production costs.
- Provide accurate cost accounting based on consumption.
- Generate energy reports and charts for a process, a department, a facility or an enterprise.
- Optimize energy procurement and negotiate better rates.
- Make decisions on electrical capacity.
- Avoid unscheduled shutdowns.
- Procure and analyze energy information with minimum capital investment.

- Provide energy data into FactoryTalk VantagePoint for integrating with other enterprise data sources.

FactoryTalk EnergyMetrix helps you connect to metering points right from your computer

In particular, you can connect to:

- Allen-Bradley power monitors and other devices through RSLinx Lite: RS232, RS-485, Ethernet, DeviceNet, RIO pass-thru (RSLinx Lite is included in the installation DVD).
- FactoryTalk Live Data server over Ethernet.
- Third party meters and controllers through OPC; more than ten meters requires the FactoryTalk EnergyMetrix OPC option.
- RSLinx Classic (OEM, Pro or Gateway) OPC supports native Logix tag addressing.

FactoryTalk EnergyMetrix provides easy and flexible configuration

You can configure:

- Electricity, gas, water, and steam meters or any energy or production related inputs.
- Manual meters for manual data entry.
- User-defined data sources such as PLC-5, SLC 500 or OPC servers.
- A system architecture with the ability to:
  - Name devices.
  - Name groups and domains.
  - Manage access by users through security.

    - Create sub-groups.
    - Share meters among multiple groups for cost allocation.
- Meter configuration values remotely.
- Multi-level password protection and privileges.

FactoryTalk EnergyMetrix is a powerful load profiling, cost allocation and billing analysis tool

With FactoryTalk EnergyMetrix, you can:

- Log usage, cost and power quality data.
- View any parameter in real time.
- Create historical trend reports and charts.
- View historical trending of individual meters and groups and save tabular data for further processing and analysis.
- Establish consumption baseline.
- Create custom rate plans using the rate plan menu and line item scripting with user defined time of use periods.
- Assign rate plans to meters or groups of meters.
- Import and export rate schedules in XML format.
- Create and print daily or monthly cost and billing reports by:
    - Meters.
    - Business groups.
    - Departments.
    - Sites.
- Create energy budgets and forecasts.

- Compare and contrast alternative utility rates; do “what-if” for other rate structures.
- Print and store all reports and charts.

FactoryTalk EnergyMetrix is a sophisticated power quality analysis tool

It offers the following features:

- Overlay waveforms to correlate phase to phase relationships.
- Plot Transients, Surges and Sags on ITI (CBEMA Curves).
- Display Harmonics. THD, K-factor, Crest Factor and Vector Diagrams.
- Generate Power Quality charts and reports.

FactoryTalk EnergyMetrix generates alarms

The alarms can be triggered by:

- System anomalies.
- Power quality events.
- Conditions predefined by the users.
- Workstation alarms.
- E-mail alarms.

Manager

Manager is the core data logging and reporting engine. Use Manager to organize your enterprise's energy architecture, connect to up to ten Allen-Bradley or 3rd party power monitors and programmable controllers, log energy data and view energy information. Manager can report your energy usage by department or cost center, display load and demand profiles, and correlate energy costs per unit of manufacturing output. It includes a flexible energy rate schedule that enables you to replicate utility bills or generate internal energy billing.

Microsoft Internet Explorer is used to access and configure Manager. FactoryTalk EnergyMetrix Manager is a required component.

RealTime (RT)

Use FactoryTalk EnergyMetrix RealTime (RT) to configure Allen-Bradley power monitors and display their real-time data and power quality information. RT is a ClickOnce application installed with FactoryTalk EnergyMetrix that requires a separate activation. Once activated, RT device configuration and device viewer links become operational from device setup pages and the RT device viewer links becomes operational meter pages.

Use Microsoft Internet Explorer to interact with RT.

RT complements Manager's data logging, cost allocation, profiling and reporting functions by allowing you to configure power monitors and to view, print, and save data from power monitors. With RT, you can:

- Download and upload power monitor configurations and save the configurations to the database.
- View and print all of the real-time parameters in power monitor.
- Manually capture oscillographs and view, print and save automatically captured oscillographs.
- View, save, and print all of the data logs in the power monitor.

ChartsPlus

ChartsPlus is an optional package that offers extensive custom charting capabilities. ChartsPlus is a Microsoft ClickOnce application that downloads and runs on the client computer. Its look and feel is that of a traditional Windows application rather than a web application. ChartsPlus is included in FactoryTalk EnergyMetrix software and requires a separate activation.

ChartsPlus provides you with the ability to create customized graphical views of your energy data. Some of the possibilities include:

- **Enhanced trend**

  Plots up to 8 variables with a lot of flexibility. Different time ranges may be selected for each variable and you may select various summary methods for each variable (eg. you can plot the average Monday for one variable vs. a specific Monday for the same variable or another variable). Also, the chart control itself has many built-in functions such as zoom, scroll, print, export, user customization, etc.

- **X-Y trend**

  Plots one dependent variable against up to 3 independent variables, plots a linear least squares regression line along with targeting and CUSUM analysis.

- **Enhanced calendar trend**

  Same as standard Calendar Trend but can overlay different months and multiple variables.

- **Load factor chart**

  Plots a trend of load factor over a one-month period as well as daily min, max and average demand.

- **Overlay chart**

Graphically displays a tag value with user-definable overlays.

Tip: ChartsPlus is best viewed with a Windows appearance scheme with standard sized fonts. Windows appearance schemes with large or extra large fonts may distort the appearance of ChartsPlus.

ReportsPlus

ReportsPlus provides you a package of enhanced reports in addition to the **standard reports** included in Manager.

Consumption Report

The report provides consumption values (kWh, kVARh, etc.) for selected meter(s) or group(s) for a specified date/time range. The consumption report aggregates data from each selected meter based on consumption value types, that is, value types with the Consumption flag selected. The report comprises one line item per meter with totals by group. The group and meter names are listed in the left hand column and a column is added for each consumption value type that exists in the selected meter(s). If more than three consumption value types exist the line items may be truncated.

Note: If any meter in the group is missing data, the report will contain no data.

Demand Analysis Report

The report provides kW demand values for selected meter(s) or group(s) for a specified date/time range. Reports "worst case scenario" peak demand that would have occurred if each meter or group's peak demand had occurred in the same demand interval. The demand analysis report selects from each selected group or meter value types with the Demand flag selected. The report is organized in groups by value type, e.g., "kVA", "kW".

Billing Report

The report provides billing information for selected group(s) or meter(s) for a specified date/time range. The report outputs a list of line items and a total charge amount. Each line item consists of a description, quantity, rate and charge. Billing reports select value types and calculate the report line items based on "Configuring billing rate schedules" (page 271) that you configure. The billing report displays currency symbols and numeric formatting based on the Windows regional setting that is selected in the rate schedule.

Cost Allocation Report

The report lists each meter's contribution to the total energy cost, based on a rate schedule that you configure. The reports are generated in the Microsoft Excel output format.

Power Quality Report

The report combines a graph and a grid display of power quality (sag and swell) events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 and M8 models with their sag and swell setpoints configured.
- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models and will report IEEE 1159 sag and swell events.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

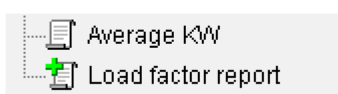
Each sag and swell record lists the time, duration and maximum deviation of the sag or swell. The report displays the events logged during the selected report interval on a ITI/CBEMA chart and in a grid (tabular) listing.

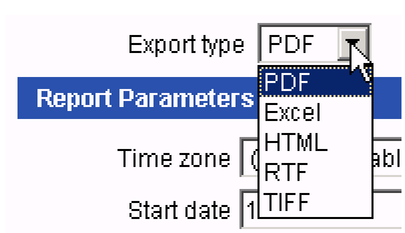
System Configuration Report

The report documents the configuration of the FactoryTalk EnergyMetrix project.

ReportsPlus reports are set up and viewed in the same way as standard Manager reports and may be configured to automatically run on a schedule and optionally send the report output to one or more email addresses.

ReportsPlus reports can be identified by their **distinctive icon** in the report list. You may choose the **report output type** among PDF (the default), Microsoft Excel, HTML, Rich Text Format (RTF), or Tagged Image File Format (TIFF).





The ReportsPlus functionality includes also the following reports:

Multi-purpose report

The Multi-Purpose Report ("MPR") supports a free-form type of report output that is driven by script code stored in a Multi-Purpose Report Script. For details, see "Multi-purpose reports" (page 347).

Efficiency report

The purpose of this report is to give you information on the "energy efficiency" of part or all of your process, plant or enterprise. You will be able to define an efficiency equation and then execute the equation over a period of time and a group of meters. Examples of how this report may be used are:

- Calculating efficiency of a boiler system based on BTU of gas consumed versus steam produced.
- Calculating production efficiency of a batch manufacturing line by calculating tons of product versus energy consumed.

The efficiency report will calculate not only average efficiency over the selected time range, but also snapshots of the efficiency during the range at user-specified intervals. Report output will be graphical and tabular, with a graph of efficiency versus time. The efficiency report is based on a simple Rate Schedule script.

Load factor report

The Load Factor report lists minimum, average and peak real power demand, load factor and time of peak demand. You may select Meters to include in the report, as well as the report date range and calculation intervals. The report output contains a tabular report and a graphical chart.

Power factor report

The Power Factor report lists real energy net, reactive energy net, and power factor (which is calculated from the real energy and reactive energy values) for selected meters for a selected date range divided into specified calculation intervals (hours, days, or months). Report output is tabular with a chart of power factor on the first page.

For this report to function, the selected meters or groups must be logging Real Energy Net and Reactive Energy Net.

Electrical summary report

The Electrical Summary report lists various electrical summary values for selected meters for the selected date and time period. These summaries are:

- Total Energy kWh, kVARh and kVAh.
- Average Demand for kW, kVAR and kVA.
- Load Factor for kW and kVA.
- Min and Max values for kW, kVAR, kVA and Power Factor and the date/time they occurred along with the coincident values for the other parameters.

The selected meters must be logging the relevant data in order for it to show up on the report (for example, if Real Power Demand is not logged then there will be no kW figures on the report). Power Factor is calculated from any two of the other three parameters (kW, kVAR, kVA).

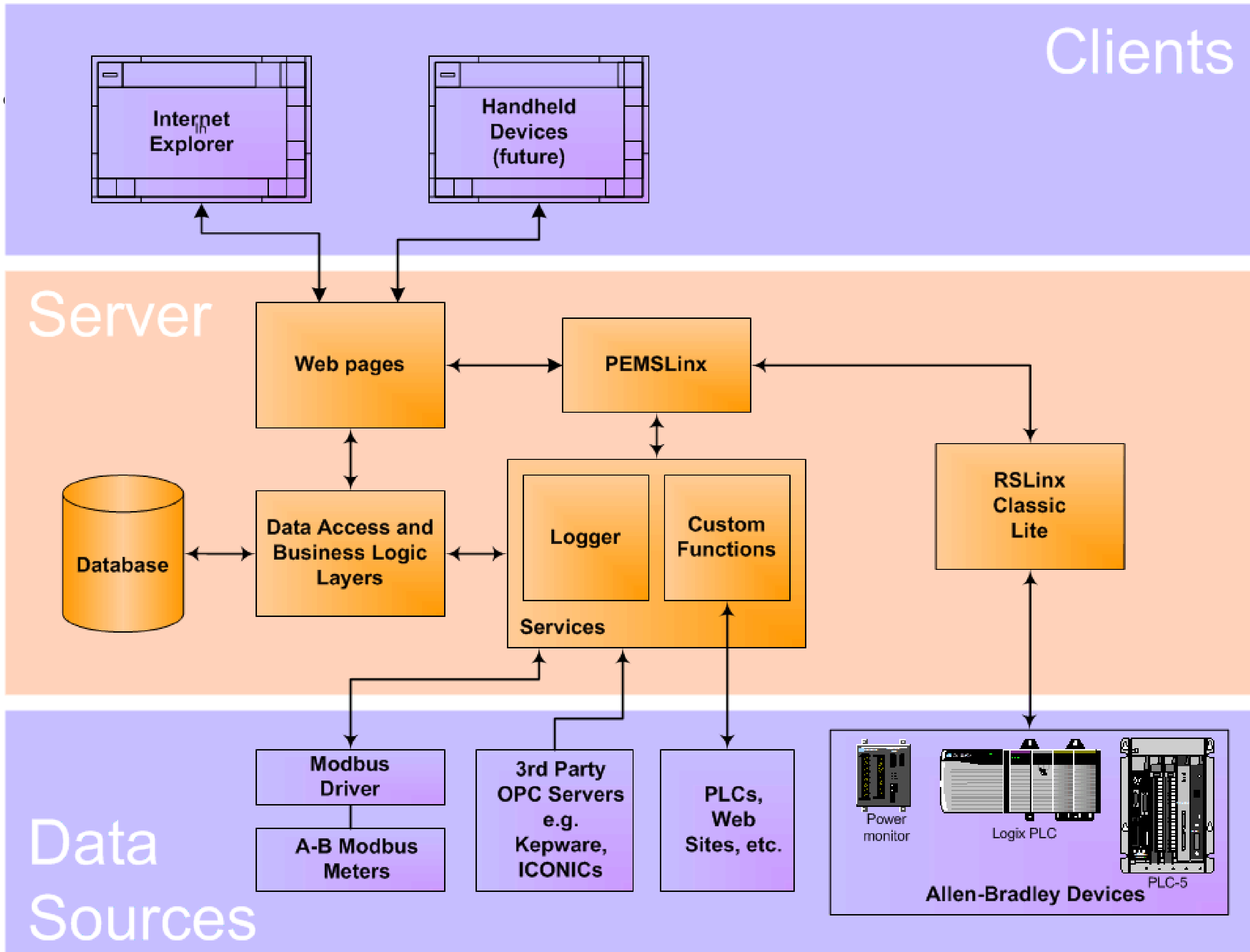
OPC third-party connectivity

FactoryTalk EnergyMetrix OPC enables Manager to collect data from third-party energy data sources through an OPC server that you provide. FactoryTalk EnergyMetrix OPC enables OPC client support for all licensed meters.

Tip: The FactoryTalk EnergyMetrix OPC option is not required to collect data from the RSLinx Classic OPC server, however, RSLinx Classic must be activated at a level that supports OPC (OEM or higher).

Important: The FactoryTalk EnergyMetrix OPC option alone does not enable operation of FactoryTalk EnergyMetrix software. A Manager license must be installed.

For more information about 3rd party OPC drivers, see the Rockwell Automation, Inc. Preferred Server Program website.



Licensing

FactoryTalk EnergyMetrix is a scalable, modular software application. Its components and capabilities are determined by the licenses purchased and installed by the user. Licenses are installed by means of FactoryTalk Activation.

Tip: The **About** page lists installed activations and the available and used meters of each type.

The table below shows the component type and, if applicable, the number of meters supported. There is no limit on the number of users. It is the customer's responsibility to observe the requirements of software licenses.

The Manager license is required for use of the software, and includes 10 meters which may be any combination of RSLinx and 3rd-party OPC meters. Additional meter licenses may be purchased in 10-, 50, 100- and 500- meter sets. The FactoryTalk EnergyMetrix OPC 3rd-party OPC option enables 3rd-party OPC connectivity to all licensed meters.

If you are upgrading from an existing installation of FactoryTalk EnergyMetrix, your existing licenses are supported, including existing meter counts.

Note: FactoryTalk EnergyMetrix only supports FactoryTalk Activation. If you plan to upgrade from an installation of FactoryTalk EnergyMetrix that uses EVRSI Master Disk activation, please contact Rockwell Automation, Inc. customer service to convert to FactoryTalk Activation.

Component type	Maximum meter count
FTEM Manager, includes 10 RSLinx or OPC meters	10
FTEM10 10-meter option, RSLinx	10
FTEM50 50-meter option, RSLinx	50
FTEM100 100-meter option, RSLinx	100
FTEM500 500-meter option, RSLinx	500
FTEMOPC 3rd-party OPC client for all licensed meters	N/A
FTEMRT RealTime option	N/A

Component type	Maximum meter count
FTEMRPT ReportsPlus option	N/A
FTEMCHT ChartsPlus option	N/A
Microsoft SQL Server bundle - 1 client license option	N/A
Microsoft SQL Server bundle - processor license option	N/A

Contact your Rockwell Automation, Inc. representative for information on the meter and option packages listed above.

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Quick start

This section outlines some basic tasks you will need to perform to use FactoryTalk EnergyMetrix software.

This section is set up as an example and will guide you through the steps needed to begin using the software, set up communications to a PowerMonitor 3000, begin logging data, and view a demand profile. The steps are simplified and presume that you have installed the required server and client software, that you will be using the default roles and users and that you are using an Allen-Bradley Bulletin 1404 PowerMonitor 3000 on Ethernet.

The Quick Start section does not include setting up a rate schedule or running reports.

Refer to other topics in the help for more information on each of these steps.

Installing FactoryTalk EnergyMetrix

For detailed information on the installation procedure, please refer to the *FactoryTalk EnergyMetrix Release Notes*, available on the installation DVD.

Logging on to FactoryTalk EnergyMetrix

To log on to FactoryTalk EnergyMetrix:

1. Launch Internet Explorer.
2. In the address box, type the URL of the FactoryTalk EnergyMetrix server: `http://localhost/FactoryTalk EnergyMetrix`.

- Support of PowerMonitor 500 EtherNet/IP data logging

  Tip: instead of "localhost" you may type the network name or IP address of the server.

3. Log in to FactoryTalk EnergyMetrix using the **default credentials**.

Default login credentials

Username	Password
admin	admin
user	user
guest	guest

Tip: Password are case-sensitive.

Exploring the FactoryTalk EnergyMetrix web page

To open the FactoryTalk EnergyMetrix web page:

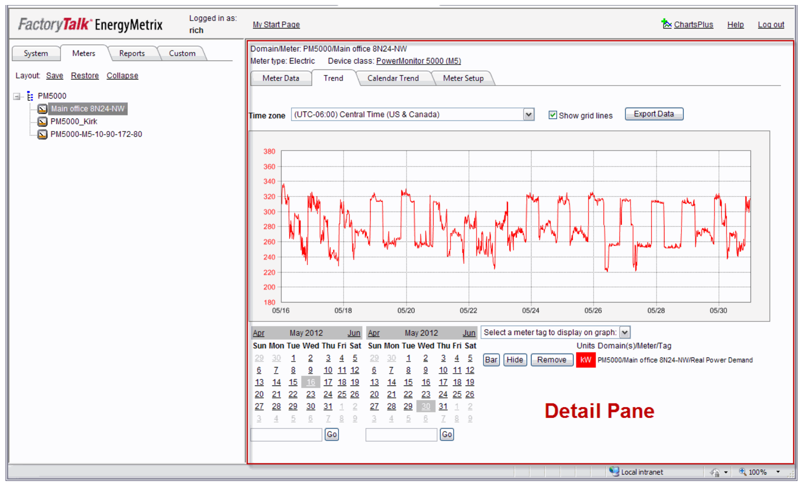
1. In the Internet browser, type http://<FT EnergyMetrix server machine name or IP address>/FTEnergyMetrix.
2. Log on.

   The client desktop appears.

   It consists of the "Navigation tree" (page 41) to the left, and the "Detail pane" (page 41) to the right.

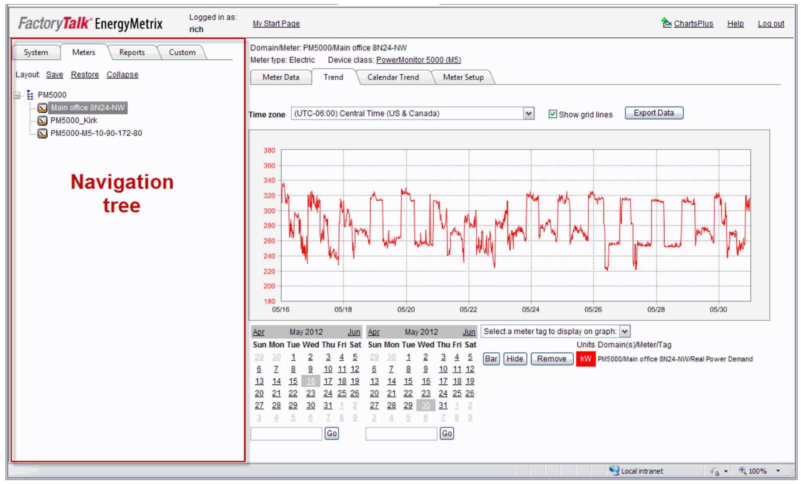
Detail pane

The detail pane is your main interface to FactoryTalk EnergyMetrix. Its content varies depending on what is selected in the enterprise navigation tree.



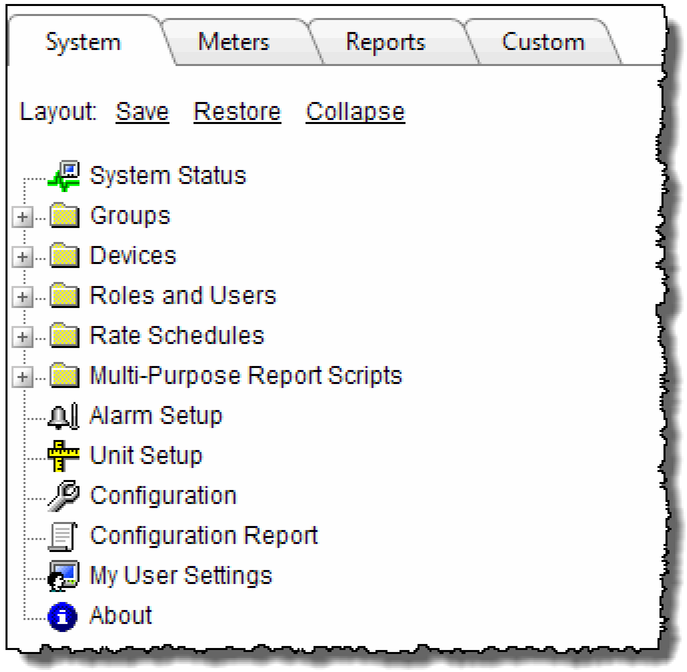
Navigation tree

The Navigation tree lets you select among the various components of the system, including reports, meters, customer pages, system folders such as rate schedules, groups, devices, roles and users. Items are represented by characteristic icons and are grouped into folders. To select an item, open the folder that contains it by clicking the + sign next to the folder. To select an item, click the item's icon.



System tab

The **System** tab in the navigation tree contains a number of folders and links that provide access to setup items such as Devices, Groups, security settings (Roles and Users), Rate Schedules, and Multi-Purpose Report Scripts, as well as links to the System Status, My User Settings, Unit Setup, Configuration, System Configuration Report and About pages.



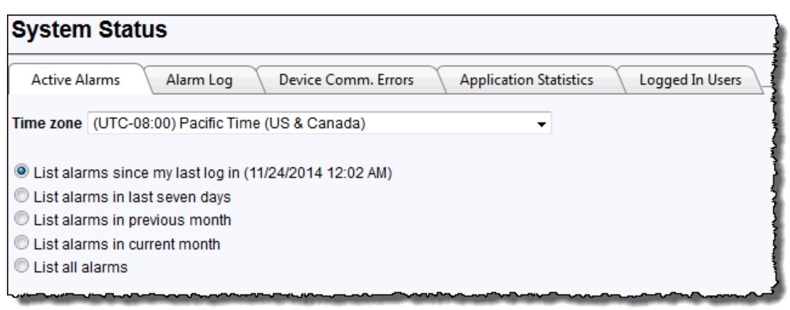
System Status page

To open the system status:

1. In the **System** tab, click System Status.

   The **System Status** page appears.

   On this page you can view alarms, device communications status and other system-level information.



The page contains the following tabs:

Active Alarms

This tab provides a view of active and logged alarms. You may select the time range of alarms to view by selecting an option. For details, see "Viewing alarms and alarm configurations" (page 255).

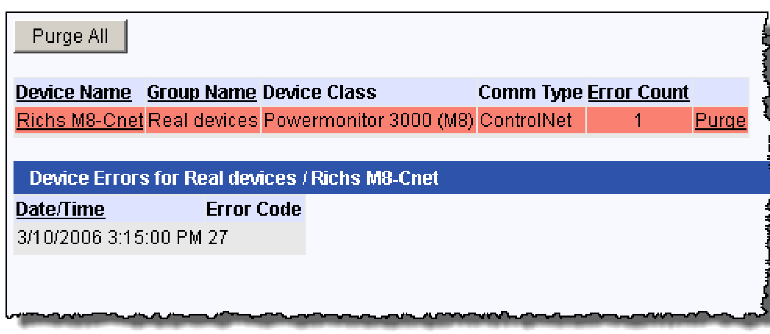
Device Comm. Errors

This tab lists device communications errors since your last logon. You may also select other error ranges.

You can filter the errors with the following options:

- Errors since your last logon.
- Errors in last seven days.
- Errors in the previous month.
- Errors in the current month.
- All errors.

To view errors associated with a specific device, click the **Device Name** link, and then drill down to a detailed list of communications errors associated with the Device.



You can clear errors for a particular device, or clear all errors for all the devices.

To clear all the errors for all the devices, click **Purge All**.

Application Statistics

This tab provides the information on the current number on the current number of system users, when the system was last restarted, etc.

Logged In Users

This tab shows a list of users that are currently logged in to the system.

Group

A **group** is a named collection of devices and meters that represents a subdivision of your enterprise such as a department, division or process. Groups contain meters, which may be shared between groups.

Domain

A **domain** is a group that is assigned roles and users. Rate schedules and reports may also be assigned to domains. Users assigned to a domain may only access objects assigned to that specific domain. This feature permits an administrator to allow certain users access to only parts of the system he or she chooses.

Groups and domains may be nested to any depth.

Important: You must set up at least one group or domain before you can set up devices and meters.

Devices

Devices are physical entities that FactoryTalk EnergyMetrix communicates with over a network.

Click the links listed below for information on specific device types.

Configuring a device in FactoryTalk EnergyMetrix establishes communications and creates database definitions for the device, and enables device configuration and data monitoring using the optional FactoryTalk EnergyMetrix RT package.

Important: If you want to set up devices and meters, configure at least one domain first. If you want to set up device-based meters, configure devices first.

Ethernet, ControlNet, serial and DeviceNet devices may be directly connected provided that the FactoryTalk EnergyMetrix server is also on the network through an appropriate network interface and you have configured the appropriate RSLinx Classic direct device drivers. Devices routed through a ControlLogix gateway or RSLinx Classic gateway are also considered directly connected devices.

Devices may also be set up in a parent/child, or pass-thru configuration. **Remote I/O** devices must be set up as children of a parent device such as a programmable controller. DeviceNet devices may also be used as child devices.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

Roles and users

The access to the application and its functions is controlled by means of **roles** and **users**.

Role

A **role** is a named collection of "Default privileges" (page 114) assigned to various users to manage security. Roles may be global or domain- specific.

User

A **user** is a named set of security credentials (user name and password) that permit an individual to access the privileges defined in the role assigned to the user. A user may be assigned to multiple roles.

Roles and users may be assigned global scope where they are permitted access to all domains, groups, devices, meters, reports and custom pages.

Alternately, roles and users may be assigned domain-specific scope in which they permit access to an individual domain and its subgroups, devices, meters and reports, as well as other global objects such as reports, custom pages and rate schedules.

The default roles are:

Role	Login	Password
Admin	admin	admin
User	user	user
Guest	guest	guest

Tip: It is highly recommended that you change the default password on the **Admin** default user in order to prevent inadvertent changes to the database.

To configure roles and users, use the **Roles and Users** folder in the tree explorer.

Windows Active Directory security

To utilize the Windows Active Directory / Lightweight Directory Access Protocol LDAP functionality, create a user name in the format DomainName\UserName used to log in to Windows.

The password fields and password button are displayed for Active Directory users, however, the password entered into the user setup will only be used if the user cannot be authenticated with the Active Directory server. When the user is authenticated against the Active Directory server, the Windows password is stored in the database to keep the passwords synchronized.

Rate schedules

Rate schedules define the content and format of billing reports.

You may use billing reports for:

- **Shadow billing**

  Replicating the monthly bill from your energy provider.

- **Cost allocation**

  Reporting the real cost of energy for each process or cost center in your enterprise.

- **Tenant billing**

  Generating energy bills for use of your manufacturing or commercial facilities by others.

- **What-if analysis**

Comparing costs of energy from different energy providers for the same usage.

Rate schedules may have global scope or be assigned to a domain. Global rate schedules may be used in all domains. Domain rate schedules apply to only a single domain.

The rate schedule model is designed to be very flexible so you may accommodate a wide variety of utility tariffs.

Rate schedule elements

A rate schedules comprises a set of rules and formulas that transform energy usage data into cost allocation or billing data. You may configure rate schedules to replicate your utility tariff for shadow billing or comparative billing analysis, or develop and implement your own billing rates for internal energy cost recovery from production operations or facility tenants. Rate schedules include the following elements:

- **General Information**

  Identity of the rate schedule owner, the rate schedules scope (global or local to a domain) and effective dates.

- **Runtime parameters**

  Allow you to manually define and enter report parameters that are not automatically logged into the database.

- **Seasons**

  Support utility tariffs that charge different amounts for energy, demand, etc. depending on the season of the year.

- **Day types**

  Days may be classified as working, non-working, holiday, and as a day of the week (Sunday through Saturday). Each day type may be used in line item calculations.

- **Times of Use**

  A menu to configure time-of-use billing periods down to the minute.

- **Line items**

  Flexible Visual Basic .NET scripting combined with specialized functions easily support a variety of utility tariff charges, such as facility, meter or service charges, energy and demand time-of-use charges, "ratchet"demand penalties, transitional competitive charges, sales and use taxes and many others.

- **Global variables**

  Allow line items to interact by sharing data.

Tip: The installation DVD contains a **ExportedRateSchedules** folder, in which you will find a rate schedule file called **Simple time-of-use template v 1.1**. You can use it as a starting point for rate schedule development.

Rate schedule options

Use this button:	To:
Export	Export a rate schedule to an XML file.
Import	Import a rate schedule. • To import and overwrite an existing rate schedule, navigate to the existing rate schedule's setup page and click **Import**. • To import a rate schedule without overwriting an existing rate schedule, navigate to the group rate schedule screen and click **Import**.

Use this button:	To:
	If the file is not in the correct format, the import will fail.
Print	Generates a PDF file containing a full listing of the rate schedule general information, seasons, non-working days, holidays, time-of-use periods, global variables, and line items.

Multi-purpose reports

The Multi-Purpose Report (MPR) is a free-form report driven by script code stored in a Multi-Purpose Report Script. The MPR is part of the "ReportsPlus" (page 333) functionality.

Multi-purpose report script

A MPR script defines what a MPR contains and what it looks like. A MPR script is conceptually similar to a rate schedule. Like a rate schedule, a MPR script is combined with selected meters or groups to form a specific report instance. This allows a script to be reused for different meters and groups.

MPR scripts are listed in a new sub-tree under the System tab and may be Global or assigned to a domain.

MPR scripts contain Visual Basic for .NET scripting that utilizes the MPR object model to select and format the content of the report.

User qualifications

MPR users are assumed to be familiar with FactoryTalk EnergyMetrix, in particular with its reporting and rate schedule functionality, and the Visual Basic for .NET scripting language.

Multi-purpose report elements

You may select one or more of the following elements, or objects, when configuring an MPR. Each provides a different way to view your energy, cost and production data:

Item	Description
Grid	Displays data in tabular format. The MPR script contains code that creates a Grid, specifies the number, width and heading text of columns, and populates the rows of the grid with data.
Bar Chart	Displays a bar graph of data. The MPR script contains code that creates a bar chart, defines the x and y axes and selects the data to be displayed in one or more data series.
Trend Chart	Displays a line graph of data. The MPR script contains code that creates a trend chart, defines the x and y axes and selects the data to be displayed in one or more data series. **Tip:** Bar chart series can be mixed with trend chart series in the same chart. Charts may have multiple Y axes.
Pie Chart	Displays a series of data as wedges of different sizes in a pie-shaped graphic. The MPR script contains code that creates a Pie Chart and populates it with data.
Rich Text Box	Provides a way to place text on a MPR. The MPR script contains code that creates the Rich Text Box and controls its location, size, content and formatting.
Page Header and Footer	Contains identifying elements such as the report title, the report headings from the Group setup, the report time range and time zone, and a user-selectable graphic element. The page footer contains the report page number and the date and time the report was printed.MPR script code controls the header graphic element selection and the visibility or the header and footer.
Intervals	Provide an easy way for MPR script code to process data in intervals specified by the user when they run a Multi-Purpose Report. Interval types are Day, Week, Month. Enable Intervals by selecting the Use Intervals check box on the MPR script setup screen.
Excel	Moves the report output and formatting from the MPR script into Excel. Since the report output is now Excel all of the functionality of Excel is now available to the report.

Sample MPR scripts

- "Consumption by group pie chart" (page 378)
- "Cost by group pie chart" (page 378)
- "Consumption by group trend chart" (page 377)
- "Consumption and cost per meter grid" (page 375)
- "Fiscal calendar listing" (page 379)
- "An RTF sample" (page 382)
- "An Excel spreadsheet sample" (page 384)

To learn how to set up a multi-purpose report, see "Configuring multi-purpose reports (MRP)" (page 349).

Using the System Configuration page

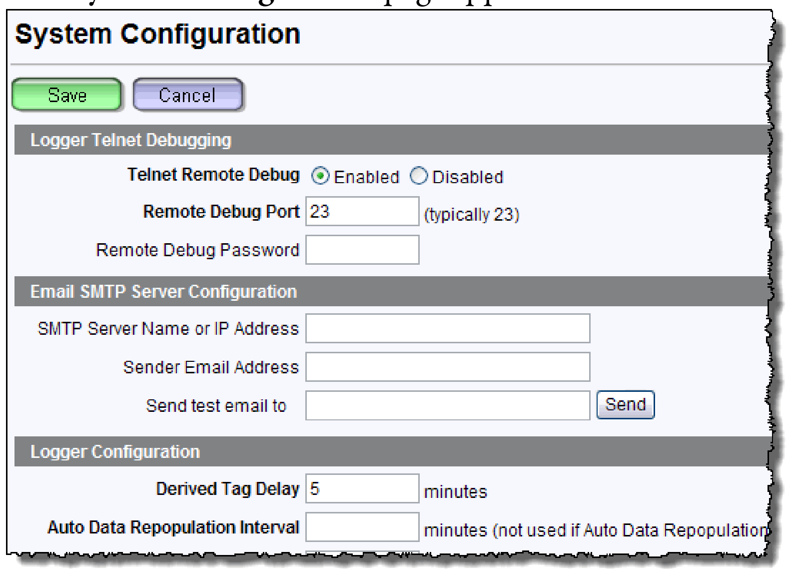
Use the **System Configuration** page to set a variety of program options.

Note: You must have the Edit System Configurations privileges to edit the system configuration.

To edit the system configuration:

1. In the **System** tab, click Configuration.

2. The **System Configuration** page appears.



3. Click **Edit**.

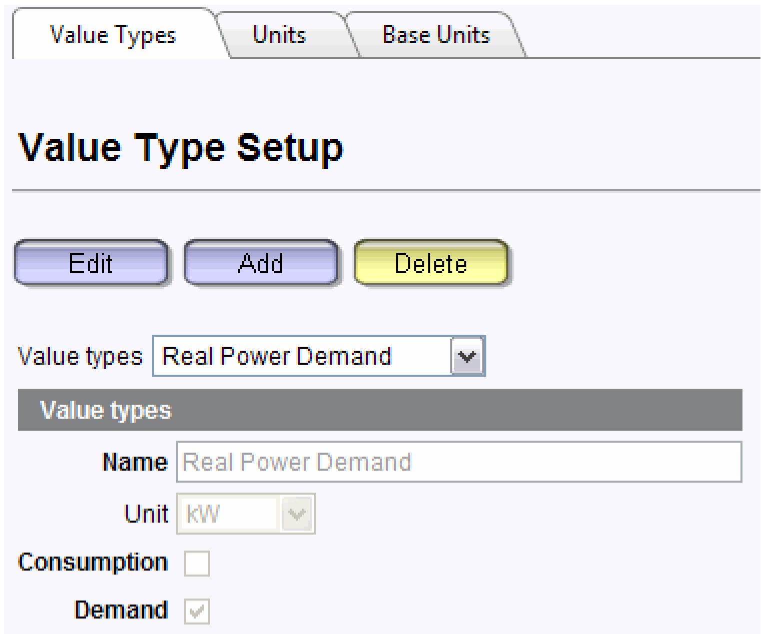
   On the **System Configuration** page, you can define the following settings:

Item	Description
Logger Telnet Debugging	• Telnet debugger, enabled or disabled (default) • Remote debug port, any unused port ID, default 23 • Remote debug password, default "". For details, see "Connecting to the FactoryTalk EnergyMetrix server using Telnet" (page 710).
Email SMTP Server Configuration	• FactoryTalk EnergyMetrix sends email alarms and reports via a SMTP server configured using this page. • SMTP (Simple Mail Transport Protocol) server name or IP address. • Sender email address (does not need to be an actual email address). • Test email button - sends a test message to the email address entered in the address field when you click **Send**.
Logger Configuration	• Derived tag delay - specifies how long after meter data is polled that derived tags are calculated. Default is 5 minutes.

Item	Description
	• Maximum active DTL operations - specifies the maximum concurrent messages with RSLinx Classic and hence devices. Range is 1 to 35. Default is 20. It is unlikely that you will need to adjust this setting.
Miscellaneous Settings	• SQL command timeout delay - default 120 seconds. • Roll-up interval - specifies how often tags are refreshed from roll-up servers, default 60 minutes. • OPC update rate - specifies how often the connection to OPC servers is refreshed. • New meter data page - Enabled by default, selects the paged meter data display page. • New consumption calculation - provides more accurate consumption reporting in the case of data logging anomalies such as unexpected zero values, resets, etc. Enabled by default. For details, see "Meter tag common elements" (page 216). • Fiscal Calendar Functionality - permits the creation and use of fiscal periods for reporting. Disabled by default. For details, see "Fiscal calendars" (page 117). • On-demand tree loading - If on-demand tree loading is enabled, nodes are loaded only when a user expands them. If disabled, the entire tree refreshes at a time. • ClickOnce for ChartsPlus and RT - Enabled by default, sets up RT and ChartsPlus as ClickOnce applications.

Unit Setup page

The **Unit Setup** page provides menus that allow you to add, delete and edit Value Types, Base Units and Units.



The FactoryTalk EnergyMetrix collection of base units includes many that are commonly uses in energy management applications. The default collection of units is based on the base units and includes a scaling factor which relates it to the base unit. For example, VA (volt-amperes) is a Base unit, and kVA (kilo-volt-amperes) is a Unit, with a scaling factor of 0.001.

Value types are used by the reporting and billing functions to aggregate values of a specific type in one or more meters or groups. The **default collection of value types** in FactoryTalk EnergyMetrix represents the most commonly used electrical energy management parameters. Value types may be set up as Consumption or Demand. Consumption value types are treated as accumulated values of energy or process output, for example, real energy net. Demand value types are treated as 'rate' values such as real power demand.

Default value types

Default Value Types include the following electrical energy and demand parameters:

Value Type	Units	Consumption	Demand
Real Energy Net	kWh	X	
Real Energy Exported	kWh	X	
Real Energy Imported	kWh	X	
Reactive Energy Net	kVARh	X	
Reactive Energy Exported	kVARh	X	
Reactive Energy Imported	kVARh	X	
Real Power Demand	kW		X
Reactive Power Demand	kVAR		X
Apparent Power Demand	kVA		X

You may add new Value Types. Navigate to the Unit Setup screen in the Navigation Tree.

To add, edit or delete a Base Unit, Unit, or Value Type navigate to the **System** tab, **Unit Setup** page. Select the appropriate tab and enter the values you desire in the menu fields.

Tip: There are special **naming conventions** for value types.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name

'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

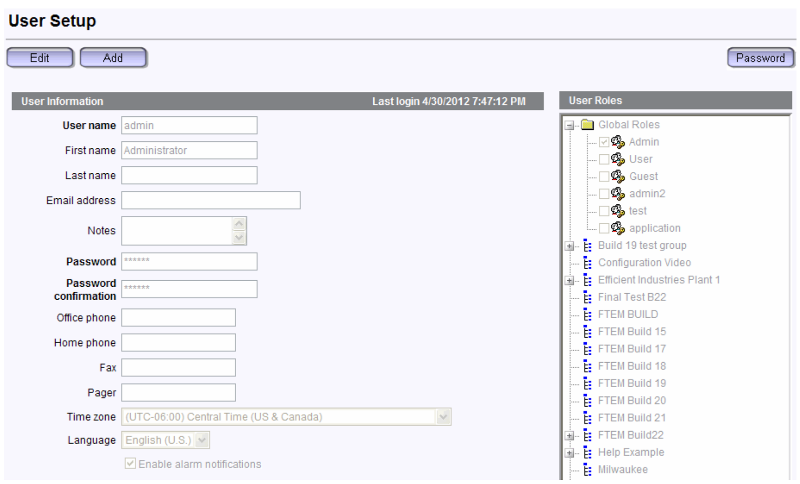
The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

Caution: Exercise care not to delete a base unit, unit or value type that is associated with tags that exist in the database or unpredictable results may occur.

Current user settings

This page shows the **user settings** of the currently logged-in user. A user may change their personal password here. It also allows a user to change other user settings, provided that the role associated with the currently logged-in user has the privilege to edit users.



Tip: If you wish to receive alarm notifications by email, select the **Enable alarm notifications** check box.

Using the Meter tab

The **Meter** tab in the navigation tree contains folders that organize the **meters** into groups and domains.

Meter

A **meter** is a logical source of data and is the unit used for licensing FactoryTalk EnergyMetrix Manager software.

There are the following types of meters:

Device meter

A data source associated with a physical piece of hardware such as a power monitor or a programmable controller, or a software application such as an OPC server. Tags associated with device meters are generally polled automatically.

Manual meter

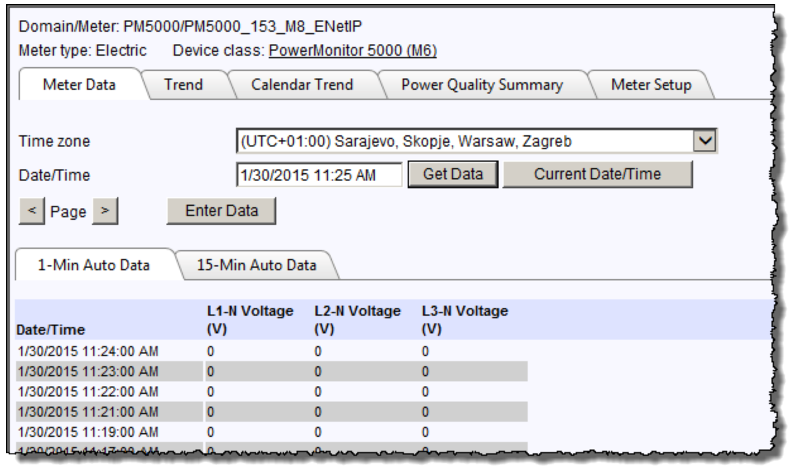
A logical or virtual device that functions as collections of data tags. Manual meters are data sources that permit data to be entered manually.

Selecting the **Meters** tab does not change the detail pane content. Select a Group or Domain to view aggregated information from the Meters the group contains.

To open a meter page:

- On the **Meters** tab, open the desired group or domain, and then click a meter.

  A meter page appears with the **Meter Data** displayed as the active tab.



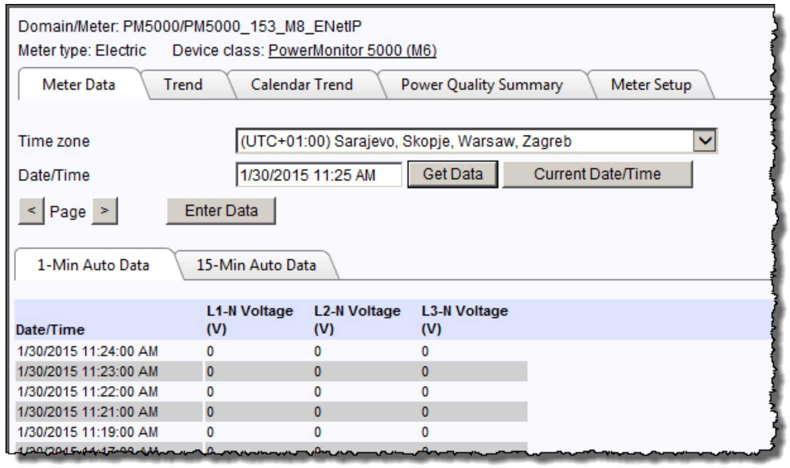
The meter page contains the following tabs:

- "Meter Data tab" (page 61)
- "Trend tab" (page 62)
- "Calendar Trend tab" (page 64)
- "Power Quality Summary tab" (page 65)
- "Power Quality Events tab" (page 72)
- "Meter Setup tab" (page 74)

Tip: If you select a tab, and then select another meter, the meter data will be displayed starting with the tab previously selected as the active one.

Meter Data tab

On the **Meter Data** tab you can view the logged meter data. The tab is arranged by log rate. The user time zone is selected by default. Controls allow you to select the desired date, scroll up and down through the data, and page backward and forward through the meter data.



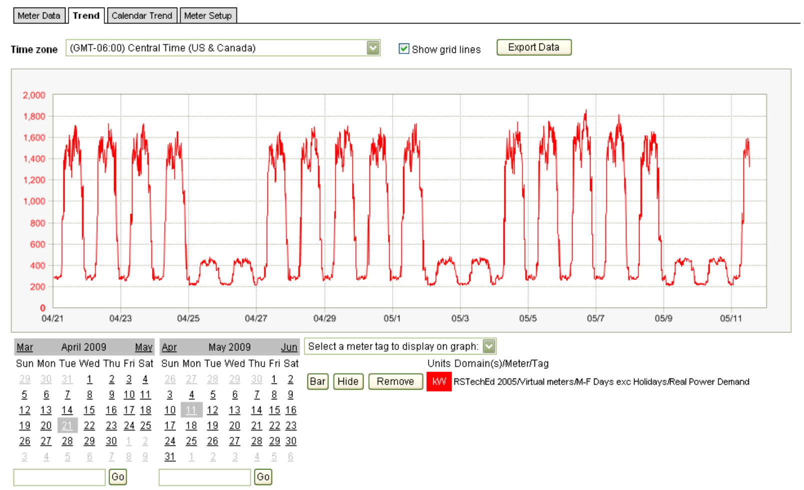
When you select a Group under the **Meters** tab, an aggregated view of the data of the meters in the group is shown. Data is aggregated based on value type. If data is missing from one or more meters for a particular time, no aggregated value appears in the Group display.

Click **Get Data** to refresh the current page of meter data.

Click **Current Date/Time** to select the current time and refreshes the **Meter Data** tab.

Trend tab

The **Trend** tab lets you select and view tags as their values vary by time.



You may select up to five tags from one or more **meters**. Each pen may be individually selected to be displayed as a line chart or bar chart. The user time zone is selected by default. You may select a different time zone for the trend and the start and end dates from the calendars. Or, enter start and end dates into the date fields and click **Go**. One day is the minimum trend period. If you select an end date earlier than the start date, the system will adjust the start date, and vice versa.

Meter

A **meter** is a logical source of data and is the unit used for licensing FactoryTalk EnergyMetrix Manager software.

There are the following types of meters:

Device meter

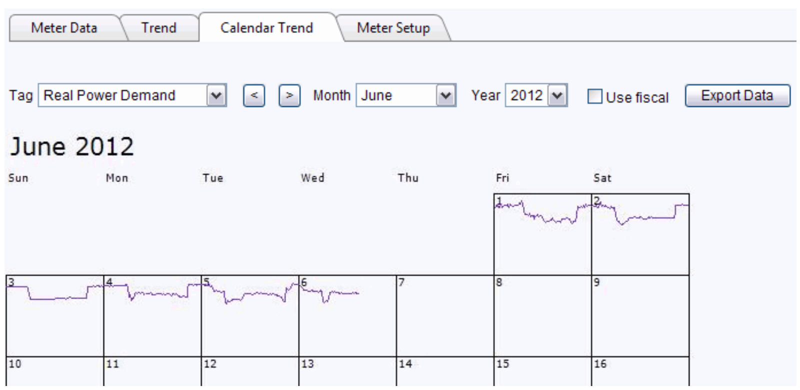
A data source associated with a physical piece of hardware such as a power monitor or a programmable controller, or a software application such as an OPC server. Tags associated with device meters are generally polled automatically.

Manual meter

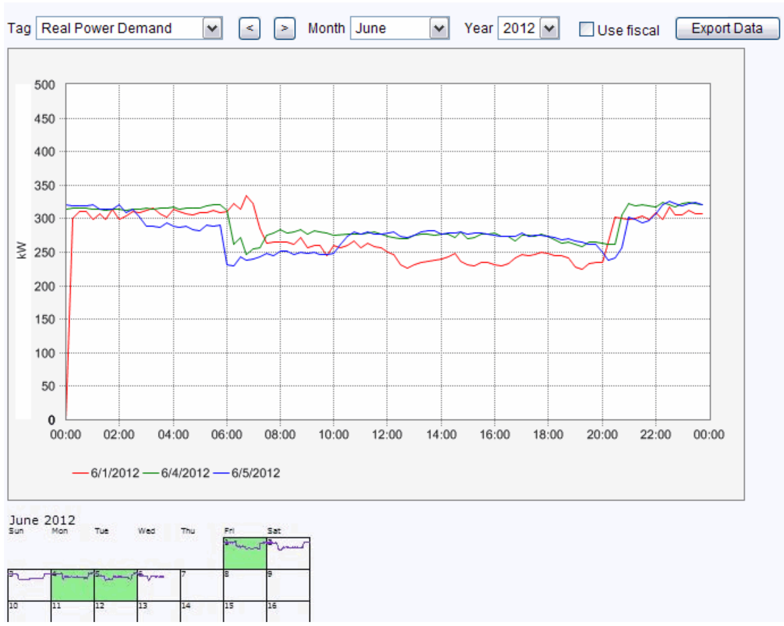
A logical or virtual device that functions as collections of data tags. Manual meters are data sources that permit data to be entered manually.

Calendar Trend tab

The **Calendar Trend** tab shows how the value of a meter tag or value type you select varies over a full month. You may select the meter tag to display from the list. The calendar trend is available for individual meters and for groups using aggregated data.



To zoom in to a day, click the day in the calendar. You may overlay days by selecting additional days from the small calendar in the **zoomed view**.



Power Quality Summary tab

On the **Power Quality Summary** tab you can view power quality events collected from the following sources:

- A meter.
- A meter group.
- A meter group and all its subgroups.

You can perform the following actions on power quality events:

- "Viewing power quality events" (page 65).
- "Deleting power quality events" (page 68).
- "Deleting categories of power quality events " (page 70).

Viewing power quality events

To view a power quality event:

1. On the **Meters** tab in the navigation pane, select a meter group or a meter.

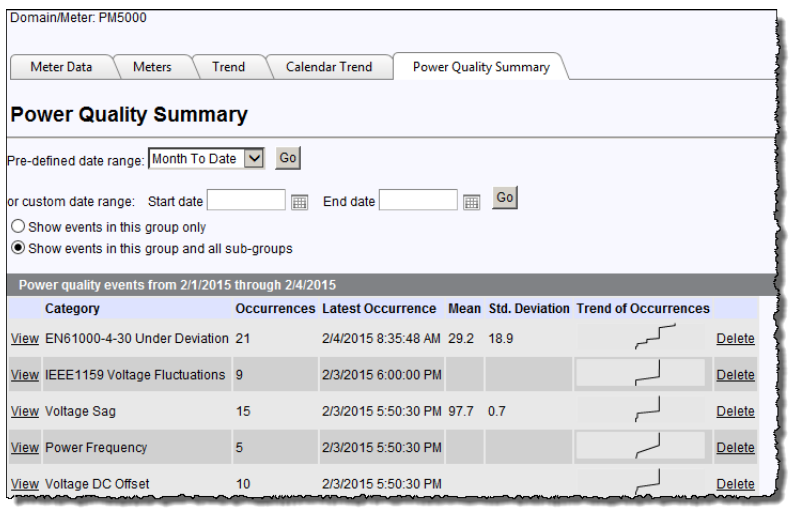
   The meter group or meter configuration page appears.

2. Click the **Power Quality Summary** tab.
3. Do either of the following:
   - In the **Pre-defined date range** list, select the date range for which you want to view the events.

     The default selection is **Month to Date**.

   - In the **Start date** and **End date** boxes, type the start and end date of the date range for which you want to view the events.
4. Click **Go**.

   The **Power quality events** table is populated with the events grouped by categories.



5. (Optional.) For a meter group, choose either of the following:
   - The **Show events in this group only** option.

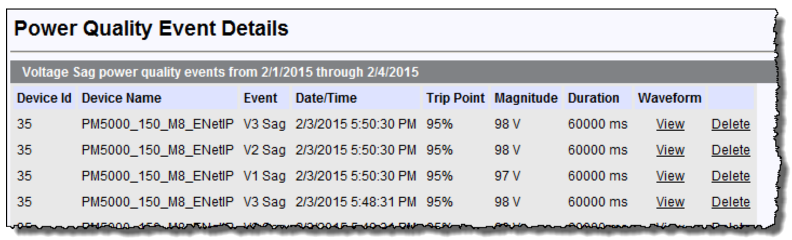
     With this option selected, the **Power quality events** table lists the events for the selected time range and the selected meter group.

     This is the default setting.

- The **Show events in this group and all sub-groups** option.

  With this option selected, the **Power quality events** table lists the events for the selected time range, the selected meter group and all the subgroups that belong to this group.

6. In the table, click **View** next to the category for which you want to view the events.
7. The **Power Quality Event Details** page appears in a separate browser window.



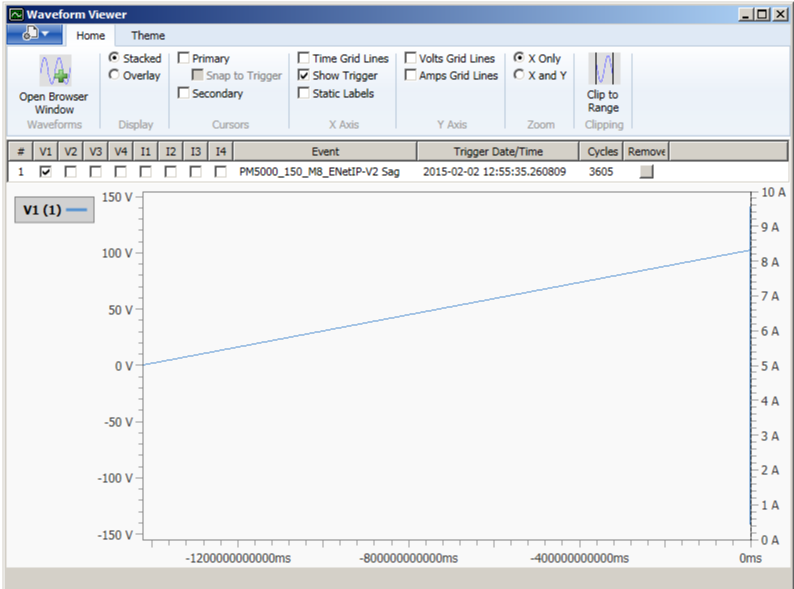
Power Quality Event Details

Voltage Sag power quality events from 2/1/2015 through 2/4/2015

Device Id	Device Name	Event	Date/Time	Trip Point	Magnitude	Duration	Waveform	
35	PM5000_150_M8_ENetIP	V3 Sag	2/3/2015 5:50:30 PM	95%	98 V	60000 ms	View	Delete
35	PM5000_150_M8_ENetIP	V2 Sag	2/3/2015 5:50:30 PM	95%	98 V	60000 ms	View	Delete
35	PM5000_150_M8_ENetIP	V1 Sag	2/3/2015 5:50:30 PM	95%	97 V	60000 ms	View	Delete
35	PM5000_150_M8_ENetIP	V3 Sag	2/3/2015 5:48:31 PM	95%	98 V	60000 ms	View	Delete

8. Under **Waveform**, click **View** next to the event that you want to view in detail.

   The waveform chart of the event appears in the Waveform Viewer window.



For details, see "Using the Waveform Viewer" (page 680).

Deleting power quality events

To delete a power quality event:

1. On the **Meters** tab in the navigation pane, select a meter group or a meter.

   The meter group or meter configuration page appears.

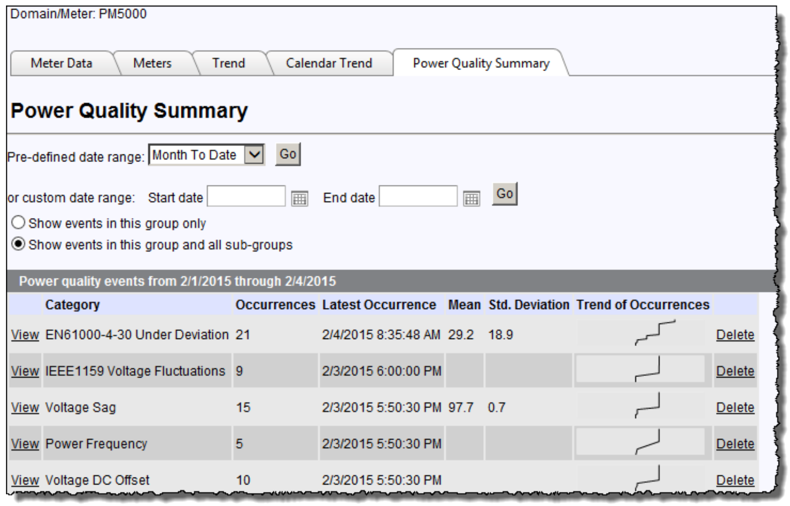
2. Click the **Power Quality Summary** tab.
3. Do either of the following:
   - In the **Pre-defined date range** list, select the date range for which you want to view the events.

     The default selection is **Month to Date**.

   - In the **Start date** and **End date** boxes, type the start and end date of the date range for which you want to view the events.

4. Click **Go**.

   The **Power quality events** table is populated with the events grouped by categories.

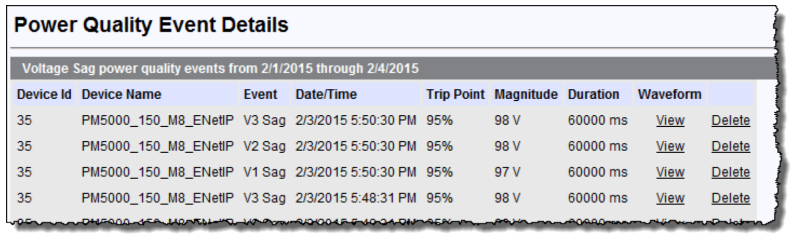
5. (Optional.) For a meter group, choose either of the following:
   - The **Show events in this group only** option.

     With this option selected, the **Power quality events** table lists the events for the selected time range and the selected meter group.

     This is the default setting.
   - The **Show events in this group and all sub-groups** option.

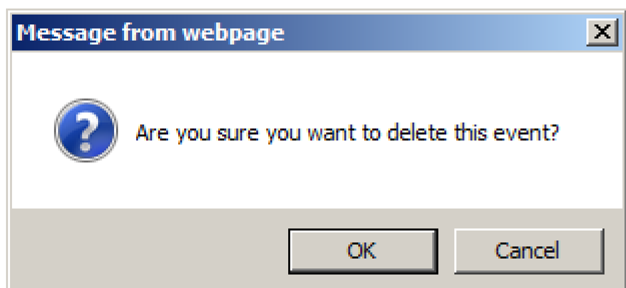
     With this option selected, the **Power quality events** table lists the events for the selected time range, the selected meter group and all the subgroups that belong to this group.
6. In the table, click **View** next to the category for which you want to view the events.

The **Power Quality Event Details** page appears in a separate browser window.



7. Click **Delete** next to the power quality event that you want to delete.

   The following message appears:



8. Click **OK**.

   The event is deleted.

Deleting categories of power quality events

To delete a category of power quality events:

1. On the **Meters** tab in the navigation pane, select a meter group or a meter.

   The meter group or meter configuration page appears.

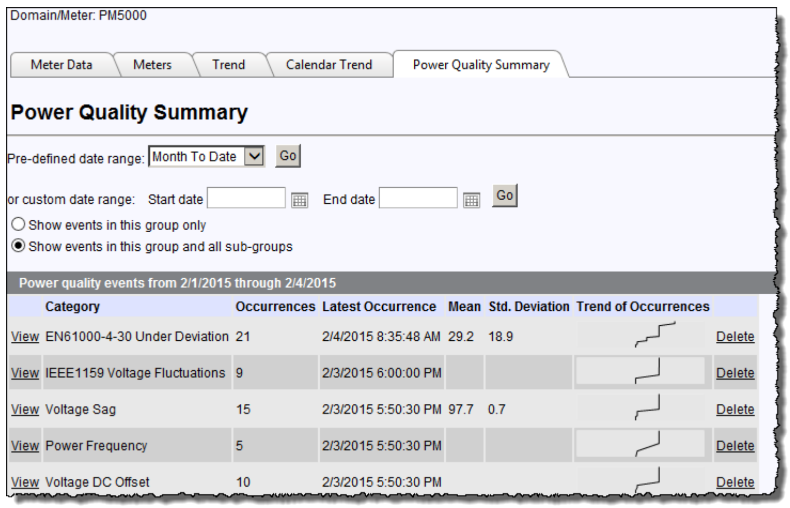
2. Click the **Power Quality Summary** tab.
3. Do either of the following:
   - In the **Pre-defined date range** list, select the date range for which you want to view the events.

The default selection is **Month to Date**.

- In the **Start date** and **End date** boxes, type the start and end date of the date range for which you want to view the events.

4. Click **Go**.

   The **Power quality events** table is populated with the events grouped by categories.



5. (Optional.) For a meter group, choose either of the following:
   - The **Show events in this group only** option.

     With this option selected, the **Power quality events** table lists the events for the selected time range and the selected meter group.

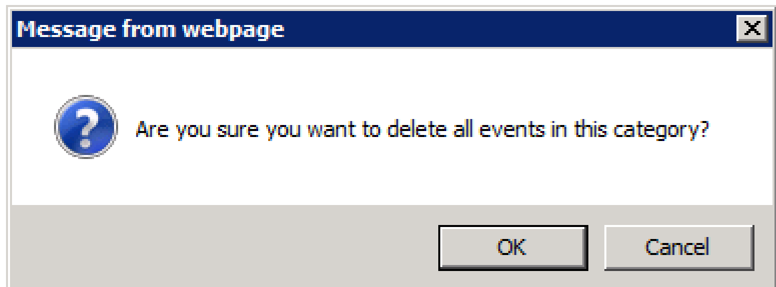
     This is the default setting.

   - The **Show events in this group and all sub-groups** option.

     With this option selected, the **Power quality events** table lists the events for the selected time range, the selected meter group and all the subgroups that belong to this group.

6. In the table, click **Delete** to the right of the event category that you want to delete.

   The following message appears:

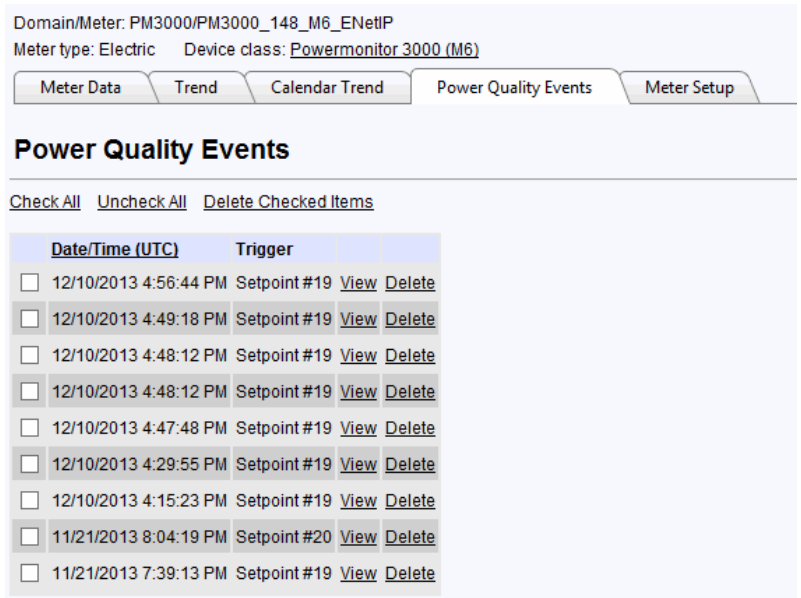
   

7. Click **OK**.

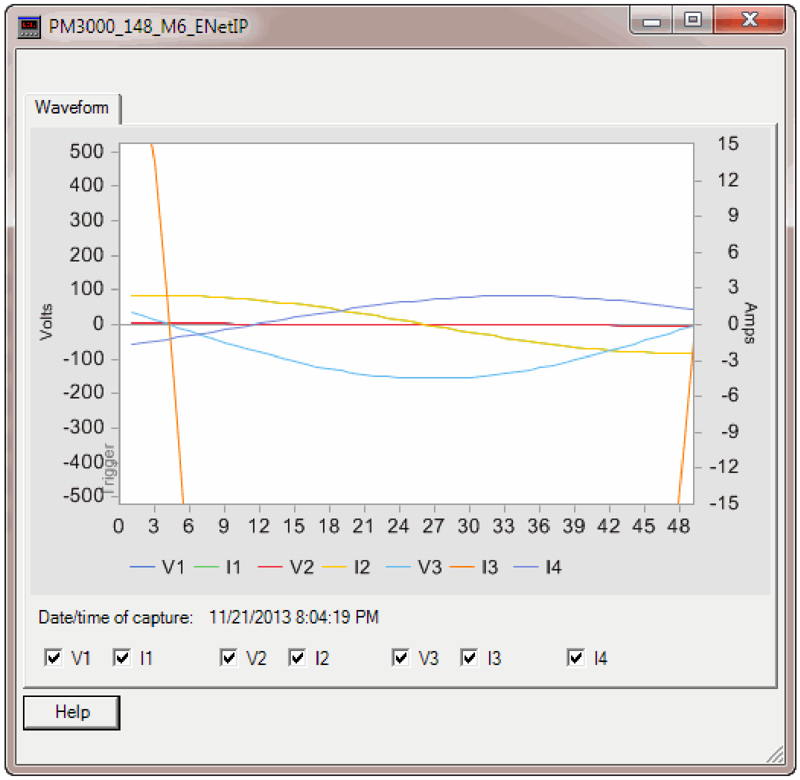
   The event category is deleted along with all the events that belong to it.

Power Quality Events tab

The **Power Quality Event tab** lets you view all power quality events collected from the meter. The tab lists all collected events, and when you select an individual event, it can be viewed as a waveform by clicking **View** to the right of the event reference.



The event will then be displayed in a separate dialog box, and here one or more channels can be selected, and the waveforms for these channels will be displayed in the **dialog box**.



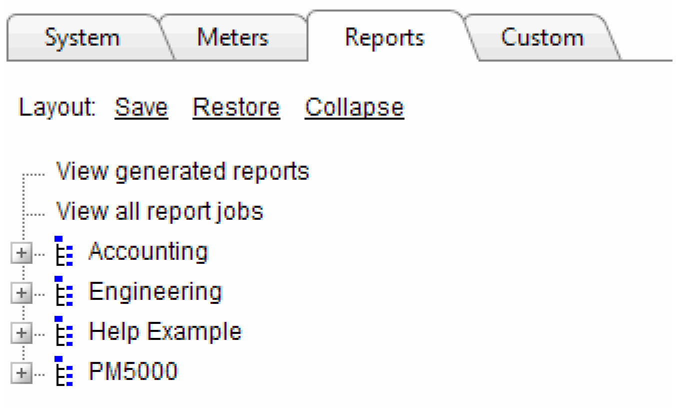
Tip: To activate the toolbar for zooming and otherwise change the chart, you right-click in the white space below or above the chart and a menu will appear that will allow you to show the toolbar.

Meter Setup tab

The meter setup page provides tools to allow you to create, modify, copy and delete Meters, add and modify meter tags, and set up alarms.

Reports tab

The **Reports tab** in the navigation tree provides access to both **standard reports** and ReportsPlus reports in FactoryTalk EnergyMetrix. You may select existing reports for viewing or editing, add a new report or delete an existing report. You may also view auto-run report job setup and automatically generated reports.



Consumption Report

The report provides consumption values (kWh, kVARh, etc.) for selected meter(s) or group(s) for a specified date/time range. The consumption report aggregates data from each selected meter based on consumption value types, that is, value types with the Consumption flag selected. The report comprises one line item per meter with totals by group. The group and meter names are listed in the left hand column and a column is added for each consumption value type that exists in the selected meter(s). If more than three consumption value types exist the line items may be truncated.

Note: If any meter in the group is missing data, the report will contain no data.

Demand Analysis Report

The report provides kW demand values for selected meter(s) or group(s) for a specified date/time range. Reports "worst case scenario" peak demand that would have occurred if each meter or group's peak demand had occurred in the same demand interval. The demand analysis report selects from each selected group or meter value types with the Demand flag selected. The report is organized in groups by value type, e.g., "kVA", "kW".

Billing Report

The report provides billing information for selected group(s) or meter(s) for a specified date/time range. The report outputs a list of line items and a total charge amount. Each line item consists of a description, quantity, rate and charge. Billing reports select value types and calculate the report line items based on "Configuring billing rate schedules" (page 271) that you configure. The billing report displays currency symbols and numeric formatting based on the Windows regional setting that is selected in the rate schedule.

Cost Allocation Report

The report lists each meter's contribution to the total energy cost, based on a rate schedule that you configure. The reports are generated in the Microsoft Excel output format.

Power Quality Report

The report combines a graph and a grid display of power quality (sag and swell) events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 and M8 models with their sag and swell setpoints configured.
- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models and will report IEEE 1159 sag and swell events.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

Each sag and swell record lists the time, duration and maximum deviation of the sag or swell. The report displays the events logged during the selected report interval on a ITI/CBEMA chart and in a grid (tabular) listing.

System Configuration Report

The report documents the configuration of the FactoryTalk EnergyMetrix project.

Standard reports

Standard reporting converts the energy and production data logged in the database into information you can use to manage your business, improve efficiency and reduce costs. Standard reports may be run on demand, automatically on a configurable schedule or may be run event-driven in response to an alarm condition.

Consumption Report

The report provides consumption values (kWh, kVARh, etc.) for selected meter(s) or group(s) for a specified date/time range. The consumption report aggregates data from each selected meter based on consumption value types, that is, value types with the Consumption flag selected. The report comprises one line item per meter with totals by group. The group and meter names are listed in the left hand column and a column is added for each consumption value type that exists in the selected meter(s). If more than three consumption value types exist the line items may be truncated.

Note: If any meter in the group is missing data, the report will contain no data.

Demand Analysis Report

The report provides kW demand values for selected meter(s) or group(s) for a specified date/time range. Reports "worst case scenario" peak demand that would have occurred if each meter or group's peak demand had occurred in the same demand interval. The demand analysis report selects from each selected group or meter value types with the Demand flag selected. The report is organized in groups by value type, e.g., "kVA", "kW".

Billing Report

The report provides billing information for selected group(s) or meter(s) for a specified date/time range. The report outputs a list of line items and a total charge amount. Each line item consists of a description, quantity, rate and charge. Billing reports select value types and calculate the report line items based on "Configuring billing rate schedules" (page 271) that you configure. The billing report displays currency symbols and numeric formatting based on the Windows regional setting that is selected in the rate schedule.

Cost Allocation Report

The report lists each meter's contribution to the total energy cost, based on a rate schedule that you configure. The reports are generated in the Microsoft Excel output format.

Power Quality Report

The report combines a graph and a grid display of power quality (sag and swell) events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 and M8 models with their sag and swell setpoints configured.
- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models and will report IEEE 1159 sag and swell events.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

Each sag and swell record lists the time, duration and maximum deviation of the sag or swell. The report displays the events logged during the selected report interval on a ITI/CBEMA chart and in a grid (tabular) listing.

Power Quality Events Report

The report provides a summary of power quality events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 and M8 models with their sag and swell setpoints configured.
- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. In the report, you can use the standard Excel grouping, filtering, and sorting options.

The report consists of the following sheets:

- **Summary**

  It displays the **Summary of Events** table in form of an Excel pivot table. By default, the table lists events grouped by power quality event type, and then by meter. For each meter it provides the following information:

  - The number of occurrences of the power quality event type (the **Count of Meter** column).
  - The average duration of the power quality event (the **Avg Duration** column).
  - The standard deviation of the power quality event (the **Std Dev** column).
  - The date and time of the latest occurrence of the power quality event (the **Latest** column).
- **Data**

  It lists each power quality event record.

Duration values are provided in milliseconds.

Power Quality IEEE 1159 Summary Report

The report provides a summary of power quality IEEE 1159 events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. In the report, you can use the standard Excel grouping, filtering, and sorting options.

The report consists of the following sheets:

- **Summary**

  It displays the **Summary of IEEE 1159 Events** table in form of an Excel pivot table. By default, the table lists events grouped by power quality event type, and then by meter. For each meter it provides the following information:

  - The number of occurrences of the power quality event type (the **Count of Meter** column).
  - The average duration of the power quality event (the **Avg Dur (sec)** column).
  - The standard deviation of the power quality event (the **Std Dev (sec)** column).
  - The date and time of the latest occurrence of the power quality event (the **Latest** column).
- **Data**

  It lists each power quality event record.

Duration values are provided in milliseconds.

Power Quality EN 50160 Weekly Compliance Report

The report provides information on compliance of selected power monitors with the **EN 50160 standard** on a weekly basis.

EN 50160-2010 is a European standard that defines, describes and specifies characteristics of voltage supplied in public power supply networks. It specifies limits on various attributes of the supply voltage, such as magnitude, frequency, and waveform quality, during normal operation. Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 measures and stores data that track conformance to the requirements defined in the standard, for low-voltage (1000V or less) and medium-voltage (1...36 kV) systems.

You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. It consists of the following sheets:

- **EN50160 Weekly Compliance**

  It displays power monitors grouped in the report by week. The start of each week is determined by the starting date of the report. If a meter does not have a full seven days of logged data for a week, a message providing the number of missing days is displayed next to the meter.

If a power monitor is configured as a synchronous connection, the **Non-Sync. Power Frequency Range 1** and **Non-Sync. Power Frequency Range 2** columns display **N/A** .

For information on EN 50160 compliance limits refer to Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 User Manual Appendix G.

- **Meters**

  It lists the meters referenced in the report along with the full domain/group path to which each meter is assigned.

Power Quality EN 50160 Yearly Compliance Report

The report provides information on compliance of selected power monitors with the **EN 50160 standard** on a yearly basis.

EN 50160-2010 is a European standard that defines, describes and specifies characteristics of voltage supplied in public power supply networks. It specifies limits on various attributes of the supply voltage, such as magnitude, frequency, and waveform quality, during normal operation. Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 measures and stores data that track conformance to the requirements defined in the standard, for low-voltage (1000V or less) and medium-voltage (1...36 kV) systems.

You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. It consists of the following sheets:

- **EN50160 Yearly Compliance**

  It displays power monitors grouped in the report by year. The start of each month/year is determined by the starting date of the report.

  If a power monitor is configured as a non-synchronous connection, the **Synchronous Power Frequency Range 1** and **Synchronous Power Frequency Range 2** columns display **N/A** .

- **Meters**

  It lists the meters referenced in the report along with the full domain/group path to which each meter is assigned.

The report may be run for only one year at a time.

Pareto Chart Report

The report provides consumption values of a selection of meters or groups. The Pareto chart displays each meter or group's consumption as a bar chart, with the bars arranged in order of decreasing consumption. A line chart indicating the cumulative consumption of the groups or meters, starting at zero and ending with 100%, is overlaid against the bar chart. The Pareto chart report help identify the areas in your facility that use the most energy.

ReportsPlus Report

ReportsPlus reports are available as part of the ReportsPlus option.

For details, see "ReportsPlus" (page 333).

Automatically Run Reports

The reports listed above may be set up to run automatically, either on a schedule or in response to an alarm. For details, see "Running reports automatically" (page 268).

System Configuration Report

The report documents the configuration of the FactoryTalk EnergyMetrix project.

For details, see "Using the system configuration report" (page 696).

ReportsPlus reports

ReportsPlus provides you a package of additional reports that are set up and viewed in the same way as standard reports. Like standard reports, ReportsPlus reports may be configured to automatically run on a schedule and optionally send the report output to one or more email addresses. ReportsPlus reports can be identified by a distinctive icon in the report list.

Multi-purpose report

The Multi-Purpose Report (MPR) is a free-form report driven by script code stored in a Multi-Purpose Report Script. The MPR is part of the "ReportsPlus" (page 333) functionality.

Efficiency report

The efficiency report provides information on the "energy efficiency" of part or all of a process, using an efficiency formula defined in a rate schedule.

The report calculates average efficiency over the selected date/-time range and also calculates a snapshot of the efficiency at user-selected intervals. Report output is tabular plus a chart showing efficiency versus time. The chart plots efficiency for each calculation interval, a rolling average of the efficiency for each calculation interval and the overall average efficiency.

Load factor report

The load factor report lists minimum, average and peak real power demand, load factor and time of peak demand. You may select Meters to include in the report, as well as the report date range and calculation intervals. The report output contains a tabular report and a graphical chart.

Power factor report

The power factor report lists real energy net, reactive energy net, and power factor (which is calculated from the real energy and reactive energy values) for selected meters for a selected date range divided into specified calculation intervals (hours, days, or months). Report output is tabular with a chart of power factor on the first page. Power factor values are signed: a negative sign indicates lagging power factor and a positive sign indicates a leading power factor. The chart is arranged with unity power factor as the horizontal axis with leading power factor displayed above the axis and lagging power factor below the axis.

Electrical summary report

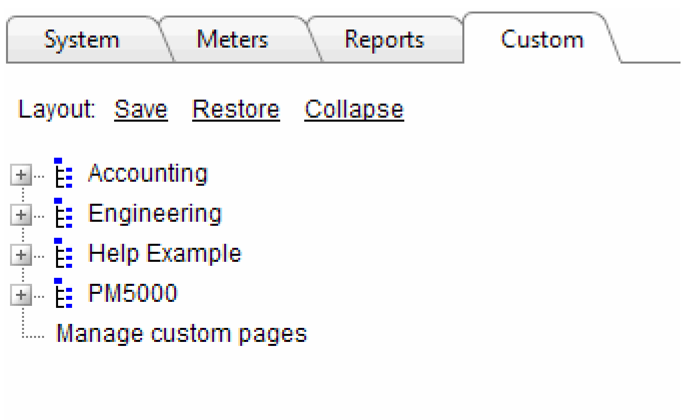
The electrical summary report lists various electrical summary values for selected meters for the selected date and time period.

These summaries are:

- Total Energy kWh, kVARh and kVAh
- Average Demand for kW, kVAR and kVA
- Load Factor for kW and kVA
- Min and Max values for kW, kVAR, kVA and Power Factor and the date/time they occurred along with the coincident values for the other parameters.

Custom tab

The **Custom** tab contains links to web pages or graphics that you select using the **Manage custom pages** link.



Custom pages may be configured in one of two ways:

- Upload a file which is then stored in the database.
- A URL that opens a web page.

Configuring domains

To configure a domain:

1. Select up the **System** tab.
2. Select the **Groups** folder in the tree.
3. Click **Add**.
4. Type the appropriate information into the data fields:
   a. Parent **group** - in this Quick Start we can presume that this is the first Domain added so there are no parent groups to select.

   Group

   A **group** is a named collection of devices and meters that represents a subdivision of your enterprise such as a department, division or process. Groups contain meters, which may be shared between groups.

   b. Click the **This group is a domain** check box - makes this group is to be a domain to which Roles, Meters and Reports may be assigned.

   Domain

   A **domain** is a group that is assigned roles and users. Rate schedules and reports may also be assigned to domains. Users assigned to a domain may only access objects assigned to that specific domain. This feature permits an administrator to allow certain users access to only parts of the system he or she chooses.

   Tip: A top level group must always be configured as a Domain. Groups lower than the top level may be Groups or Domains.

c. **Name** - type in a name for this Domain.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as

'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

d. **Notes** - type any additional information you desire.

Note fields

Notes fields (other than Rate Schedule notes fields) may be up to 255 characters in length, with no limitation on character selection. Notes fields in Rate Schedules may be any length.

e. **Default log rate** - type the interval in minutes that you want to log data from your meters. This is the default rate for the Domain, and may be adjusted for individual meters.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

Tip: Enter a log rate of 1 minute for this Quick Start exercise.

f. **Reports title** - type in the first and second line of the report title that will be used for all meters in this Domain.

Reports title

The Reports title appears as the first two lines of Consumption and Billing reports for all meters assigned to the Group or Domain. You may enter or edit the Reports Title by editing the Group or Domain setup screen.

5. Click **Add**.

   Your new Domain now appears in the **Groups** folder in the **System** tree.

Configuring devices

Note: If you are adding a device for the first time, make sure to upload the configuration from your power monitor first. For details, see "Uploading configuration from power monitors" (page 670).

To configure a device:

1. Make sure that you have configured an RSLinx Classic Ethernet driver (the default driver is AB_ETH-1) and typed the IP address of your power monitor in its station mapping.

Open RSWho, drill down to each device and select it with the mouse.

Tip: If FactoryTalk EnergyMetrix is installed on a Windows 2008 Server, see "Tips for RSLinx Classic running on a 64-bit server" (page 715).

2. Select the **System** tab. Open the **Devices** folder. Select a group for the new device.
3. Click **Add a device**.

Device

A device is a physical hardware entity that FactoryTalk EnergyMetrix communicates with over a network.

Devices may be directly connected to the network. Ethernet, ControlNet, serial and DeviceNet devices may be directly connected provided that the server is also connected to the appropriate network and you have configured the appropriate RSLinx Classic direct device drivers. Devices routed through the ControlLogix gateway or RSLinx Classic gateway are also considered directly connected devices.

Devices may also be set up in a parent/child, or pass-thru configuration. **Remote I/O** devices must be set up as children of a parent device such as a programmable controller. DeviceNet devices may also be used as "Child" devices.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

It is important to understand the difference between a Meter and a Device. A Device is a physical piece of hardware such as a power monitor or programmable controller, or a software application such as an OPC server. A Meter is a logical, or virtual, device that functions as a collection of data Tags.

4. Type information into the **Device Information** fields:
   a. Click the **This device is enabled** check box.
   b. Select a **Domain** from the list.
   c. Select a **Device class** from the list that matches your PowerMonitor 3000.
   d. Type a name for the device.
   e. Select **Time zone** from the list.

Select time zone for a device

The time zone you select for a device will determine the Co-ordinated Universal Time (UTC) logged in the database.

For example, data scanned at 9:00 AM for a device in the Eastern time zone will have a UTC timestamp of 1400 hrs.

In addition, the time zone you specify for a device during set up is used when synchronizing the device clocks with the server clock.

Important: The time zone selected for a device during setup must match the time zone in which the device is physically located.

f. Select a **Time sync.** interval for synchronizing the PowerMonitor 3000 with the server clock.

g. Type the device password.The default password is 0 (zero).

5. Type information into the **Device Communications** fields:
   - Type the communications path to the device: "`AB_ETH-1\aaa.bbb.ccc.ddd`" where `aaa.bbb.ccc.ddd` is the power monitor IP address.
6. Click **Save**.
7. Click **Test Connection** to verify communications with the power monitor.

Test connection

The **Test Connection** function performs a read of a device-class dependent data object in the target device.

Configuring meters

To configure a meter:

1. Select the **Meters** tab above the navigation tree. Select a group for the meter location.
2. Select the **Meters** tab in the detail pane. Click the **Add a new meter** link.
3. Select a **Parent Group**. The default is the group you selected in step 1.
4. Select a meter type from the list. For the PowerMonitor 3000, select **Electric**.
5. Select the Device you configured in the previous topic from the list.
6. Type a Name for the new meter and any notes you wish to record.

7. Select a **time zone** for the meter.

   Select time zone for a meter

   The time zone you select for a meter during set up will determine the Co-ordinated Universal Time (UTC) time logged in the database.

   For example, data scanned at 9:00 AM for a meter in the Eastern time will have a UTC timestamp of 1400 hrs.

   Important: The time zone selected for a meter during meter setup must match the time zone in which the meter is physically located.

   Meter data, trends and calendar trends are viewed in the logged-in user time zone.

8. Click **Save**.
9. Click the **Add a new meter tag** link.
10. Select Real Energy Net from the **Select device tag to load data** list.

    The remaining fields fill in automatically.

11. Click **Save**.
12. Click **Add** to add another tag.
13. Select **Real Power Demand** from the list.
14. Click **Save**.
15. Click the **Return to Meter Pages** link.

    You return to the **Meter Setup** page.

16. Click the **Read Device Tags** link to perform a test read of the power monitor data.

Viewing meter data

Before you try to view meter data, allow FactoryTalk EnergyMetrix to log data for a few minutes. In the last step you should have set a 1 minute log rate.

To view meter data:

1. Click the **Meter Data** tab. This displays the most recent reads of the meter.
2. Click the **Trend** tab. Select a meter tag to trend and a start and end date for the trend. Once there has been some data logged, you will see a graph of the selected tag over time.
3. Click the **Calendar Trend** tab to view a trend of logged data in a calendar format. Click a day or days to zoom in.

   If you are looking at meters with Power Quality event data, you will see either of the following tabs:

   - The **Power Quality Event** tab, where you can view a list of all Power Quality events (PowerMonitor 3000) and visualize the waveform for each of those events individually.
   - The **Power Quality Summary** tab, where you can view a list of all Power Quality events categorized by event type (PowerMonitor 5000), and be able to open a details dialog box with all the individual events for the chosen category, and visualize the waveform for each of those events individually.

Using FactoryTalk EnergyMetrix

Activating FactoryTalk EnergyMetrix

To activate FactoryTalk EnergyMetrix:

1. Install the FactoryTalk Activation Manager available from the **Optional Steps** page of the installation wizard.
2. Click **Start > All Programs > Rockwell Software > FactoryTalk Activation > FactoryTalk Activation Manager**

   The FactoryTalk Activation Manager appears.
3. Click **Get Activations**.
4. Follow the on-screen instructions to complete the process.

   Refer to the FactoryTalk Activation Manager Help topics for additional information.

FactoryTalk EnergyMetrix Manager and options

FactoryTalk EnergyMetrix is one software product. The Manager and Options are enabled by installing activations. One activation enables Manager, another enables the RealTime (RT) option, one enables the ChartsPlus option, etc.

Important: It is the customer's responsibility to observe the requirements of all software licenses.

FactoryTalk EnergyMetrix may be optionally purchased bundled with Microsoft SQL Server 2008 R2 Standard Edition Runtime Database licenses. SQL Server bundles are offered with a processor license (unlimited clients) or a single-client server license (1 client).

Any number of users may access the FactoryTalk EnergyMetrix server through its web interface.

Important: FactoryTalk EnergyMetrix software requires at minimum the activation for Manager for operation. Without a Manager activation, the software will not permit users to log in.

Upgrading meter limits or adding options

The basic Manager software includes a license for 10 **meters**. You may increase the meter limit on your server at any time by purchasing and installing additional meter licenses in 10, 50, 100 and 500-meter increments.

Meter

A **meter** is a logical source of data and is the unit used for licensing FactoryTalk EnergyMetrix Manager software.

There are the following types of meters:

Device meter

A data source associated with a physical piece of hardware such as a power monitor or a programmable controller, or a software application such as an OPC server. Tags associated with device meters are generally polled automatically.

Manual meter

A logical or virtual device that functions as collections of data tags. Manual meters are data sources that permit data to be entered manually.

You may also add options such as RT, FTEMOPC, ChartsPlus and ReportsPlus in the same manner. Check with your local Rockwell Automation, Inc. representative for option pricing and availability.

Activation types supported

FactoryTalk EnergyMetrix uses FactoryTalk Activation: If you are a new user, you will need to activate your software using FactoryTalk Activation because FactoryTalk EnergyMetrix no longer ships with physical “master disks” for activating the base software and options.

If you are upgrading from FactoryTalk EnergyMetrix software activated with EvRSI activation, please contact your local Rockwell Automation, Inc. sales office or Technical Support for information to migrate your activations to FactoryTalk Activations.

For Rockwell Automation, Inc. Technical Support in the U.S., call 1 (440) 646-3434. Outside the U.S., see http://www.rockwellautomation.com/locations/.

When you log in to the FactoryTalk EnergyMetrix web page, the software checks for the activation file. If the system fails to detect the activation file, an error is displayed and logged to FactoryTalk Diagnostics. For more information, refer to the online help included with the FactoryTalk Activation Manager.

Grace period

FactoryTalk EnergyMetrix software does not provide a grace period. The software will not permit users to log in if a valid activation is not available.

About FactoryTalk Activation

FactoryTalk Activationprovides a secure, software-based system for activating Rockwell Automation, Inc. products and managing software activation files. Activation files are generated and distributed via the Internet. If an Internet connection is not available, activation file information can be delivered via email, fax, or phone.

Refer to the Help topics in the FactoryTalk Activation Manager software for further information.

What is a "Host ID?"

A Host ID is an internal code that uniquely identifies a hardware device. FactoryTalk Activation uses the Host ID to “lock” each software activation file to a specific hardware device.

To prevent activations from failing unexpectedly at runtime, do not lock activations to virtual network adapters, such as those used for virtual private networks (VPN) or virtual machines. Instead, lock activations to the Host IDs of fixed devices such as hardware network adapters or hard disk serial numbers. If you need help determining which network adapters are virtual adapters, contact your Information Technology department.

Finding more information on FactoryTalk Activation

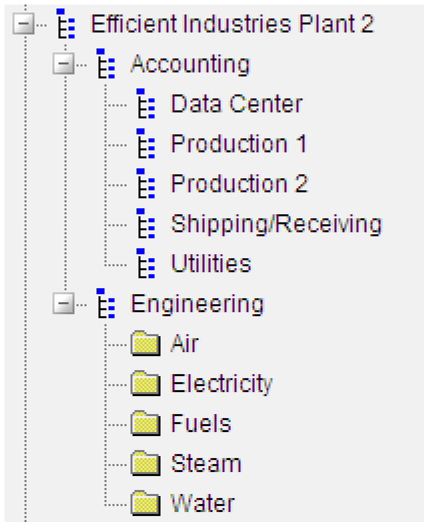
For help at any point, click the **Help** link on FactoryTalk Activation Manager software, or click the **Help** link on the Rockwell Automation, Inc. Activation website: https://activate.rockwellautomation.com/.

For Rockwell Automation, Inc. Technical Support, see http://www.rockwellautomation.com/rockwellautomation/distributor-locator/sales-locator.page

Configuring your FactoryTalk EnergyMetrix project

We suggest that you set up a system configuration that helps you visualize and understand the energy use patterns of your plant or enterprise.

A project is organized in a familiar tree-structured fashion. The user constructs a tree made up of domains and groups in a hierarchy. A typical and popular way to organize a project tree is shown below.



At the “root” of the tree is a top-level domain that represents a plant named “Efficient Industries Plant 1”. Under the top-level domain are two sub-domains, “Accounting” and “Engineering”. These are set up to address two groups of system users, those interested in energy usage by department or process (“Accounting”), and those interested in usage by utility type (“Engineering”).

Before we move on, let’s define some terms.

- A **group**, shown as a folder in the tree, is simply a collection of Devices and Meters (we’ll define these a little later).
- A **domain** is a special group with security assigned. Domains also may contain Devices, Meters, and other objects, such as Reports, Rate Schedules and Multi-purpose Report Scripts.

The main reason you would create a Domain rather than a Group is to control user access to the meters and other objects in the group.

There is a lot of flexibility in setting up the project structure. For instance, a corporate user with multiple locations may create a top-level domain for corporate, and sub-domains for each plant. The security configuration might permit plant users access only to the plant domains, while corporate users would have access to the corporate domain and all sub-domains.

You may assign a number of meters to a Group or domain, which represents a department, division or process. Meters may be assigned to multiple groups and domains, letting you create different views of meter data. Groups and domains may be nested.

You will encounter the project tree in several places in the web interface:

- In the **System** tab, the entire tree is found in the **Groups** folder. This is where you build the tree by adding groups and domains. This is the only place the tree may be edited.
- Also in the **System** tab, a copy of the complete tree (domains and groups) is found in the **Devices** folder. This is where you create and maintain Devices.
- A copy of the tree that includes only Domains is found in the **Roles and Users**, **Rate Schedules**, and **Multi-purpose Report Script** folders in the **System** tab.
- The **Meters** tab is arranged with a complete copy of the tree.
- The **Reports** and **Custom** tabs are organized with copies of the tree with only Domains.

Tips:

- The tree is refreshed whenever you click **Save** in an object that resides in the tree, raising a database change event. For instance, it is refreshed when a Device, Meter, Group, Rate Schedule or Report is saved. The tree does not refresh when a Meter Tag is saved.
- Before you try to set up Devices and Meters, you must create at least one Domain. Although roles, users, reports, rate schedules and multi-purpose report scripts may be global in scope, devices and meters must be assigned to groups.

Configuring groups or domains

Group

A **group** is a named collection of devices and meters that represents a subdivision of your enterprise such as a department, division or process. Groups contain meters, which may be shared between groups.

Domain

A **domain** is a group that is assigned roles and users. Rate schedules and reports may also be assigned to domains. Users assigned to a domain may only access objects assigned to that specific domain. This feature permits an administrator to allow certain users access to only parts of the system he or she chooses.

Groups and domains may be nested to any depth.

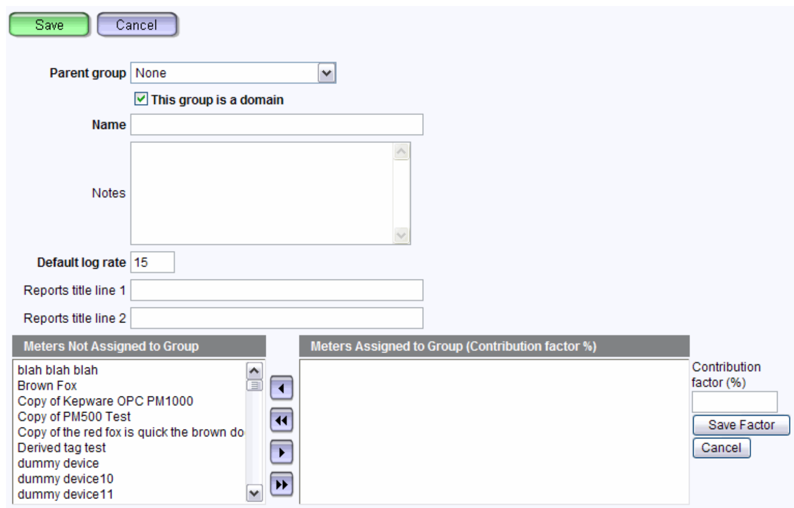
Important: You must set up at least one group or domain before you can set up devices and meters.

To configure a group or a domain:

1. Select the **System** tab in the navigation tree.
2. Click the **Groups** folder in the tree.

3. Click **Add**.

The **Add Group** page appears.



4. Type the appropriate information into the data fields:
   - **Parent group** - if this is a subgroup, type in the name of its parent group
   - Check the **This group is a domain check box**, if this group is to be a domain that Roles, Meters and Reports can be assigned to.

Domain

A **domain** is a group that is assigned roles and users. Rate schedules and reports may also be assigned to domains. Users assigned to a domain may only access objects assigned to that specific domain. This feature permits an administrator to allow certain users access to only parts of the system he or she chooses.

- **Name** - type in a name for this group.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

- **Notes** - type any additional information you desire in the Notes field.

Note fields

Notes fields (other than Rate Schedule notes fields) may be up to 255 characters in length, with no limitation on character selection. Notes fields in Rate Schedules may be any length.

- **Default log rate** - type the interval in minutes that you want to log data from your meters. The default rate for the group may be adjusted for individual meters
- **Reports title** - type in the first and second line of the report title that will be used for all meters in this group.

Reports title

The Reports title appears as the first two lines of Consumption and Billing reports for all meters assigned to the Group or Domain. You may enter or edit the Reports Title by editing the Group or Domain setup screen.

5. Click **Add**. Your new group now appears in the **Groups** folder in the **System** tree.

Deleting groups or domains

Important: Deleting a group also deletes all **devices** and **meters** assigned to the group, and purges all data associated with those meters in the database.

Device

A device is a physical hardware entity that FactoryTalk EnergyMetrix communicates with over a network.

Devices may be directly connected to the network. Ethernet, ControlNet, serial and DeviceNet devices may be directly connected provided that the server is also connected to the appropriate network and you have configured the appropriate RSLinx Classic direct device drivers. Devices routed through the ControlLogix gateway or RSLinx Classic gateway are also considered directly connected devices.

Devices may also be set up in a parent/child, or pass-thru configuration. **Remote I/O** devices must be set up as children of a parent device such as a programmable controller. DeviceNet devices may also be used as "Child" devices.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

It is important to understand the difference between a Meter and a Device. A Device is a physical piece of hardware such as a power monitor or programmable controller, or a software application such as an OPC server. A Meter is a logical, or virtual, device that functions as a collection of data Tags.

Meter

A **meter** is a logical source of data and is the unit used for licensing FactoryTalk EnergyMetrix Manager software.

There are the following types of meters:

Device meter

A data source associated with a physical piece of hardware such as a power monitor or a programmable controller, or a software application such as an OPC server. Tags associated with device meters are generally polled automatically.

Manual meter

A logical or virtual device that functions as collections of data tags. Manual meters are data sources that permit data to be entered manually.

When a large quantity of data is purged, it is possible that a timeout error will occur in Microsoft SQL server, requiring a server restart.

To delete a group or a domain:

1. Select the Group you wish to delete in the **System** tab,

Groups folder.

2. Click **Delete** on the **Device Setup** page.

   Tip: If the selected Group is a parent Group to other Groups Delete will not appear.

3. Click **OK** when prompted.

Roles and users

The access to the application and its functions is controlled by means of **roles** and **users**.

Role

A **role** is a named collection of "Default privileges" (page 114) assigned to various users to manage security. Roles may be global or domain- specific.

User

A **user** is a named set of security credentials (user name and password) that permit an individual to access the privileges defined in the role assigned to the user. A user may be assigned to multiple roles.

Roles and users may be assigned global scope where they are permitted access to all domains, groups, devices, meters, reports and custom pages.

Alternately, roles and users may be assigned domain-specific scope in which they permit access to an individual domain and its subgroups, devices, meters and reports, as well as other global objects such as reports, custom pages and rate schedules.

The default roles are:

Role	Login	Password
Admin	admin	admin
User	user	user
Guest	guest	guest

Tip: It is highly recommended that you change the default password on the **Admin** default user in order to prevent inadvertent changes to the database.

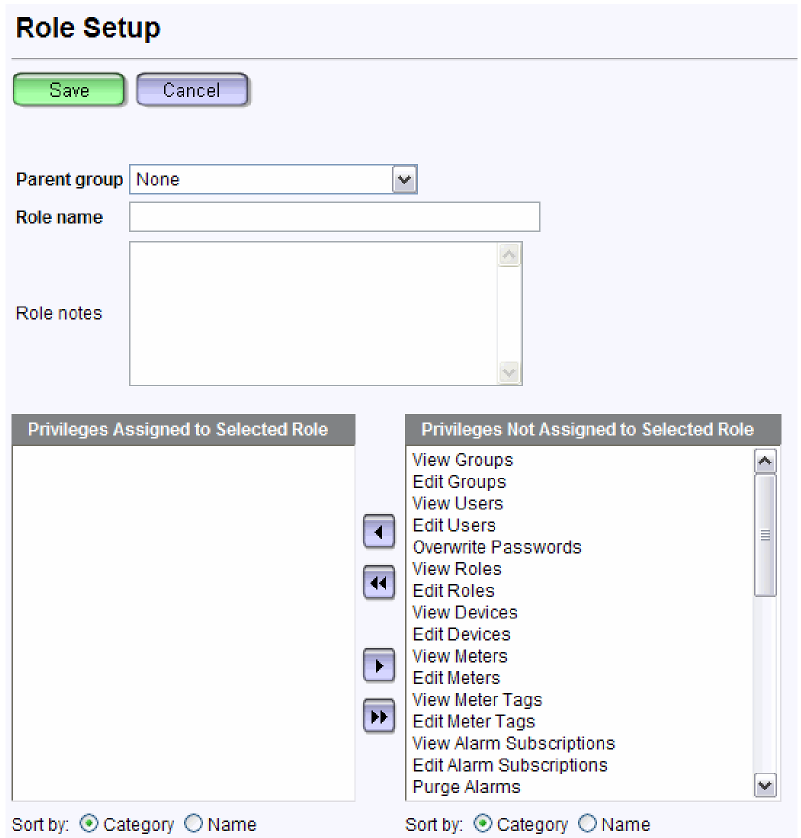
To configure roles and users, use the **Roles and Users** folder in the tree explorer.

Creating roles and assigning privileges

To create a role:

1. Navigate to the **Roles and Users** folder under the **System** tab in the navigation tree.
2. Under **Role Setup**, click **Add**.

   The **Role Setup** page appears.



3. Select a parent group from the list.

   If the Role is to be assigned Global scope, select **None**. Otherwise, select the desired Group (only groups that are Domains appear in the list).

   Roles that are assigned to domains may only be assigned to Users assigned to the same group or domain.

4. Type a name for the role along with any notes you wish to add.

5. To assign privileges, under **Privileges Not Assigned to Selected Role**, select a privilege from the list, and then click  to assign it to the role.

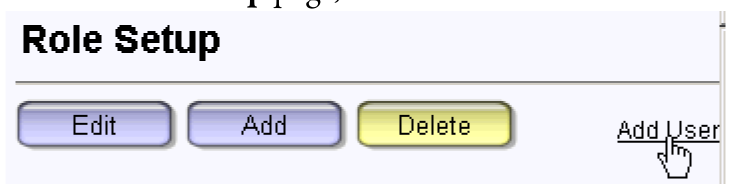
To assign all the privileges to the role, click . This should only be done with caution since this gives any users assigned this role administrative privileges.

To remove privileges from a role, use the right arrows.

Creating users and assigning roles

To create a new user:

1. On the **Role Setup** page, click the **Add User** link.



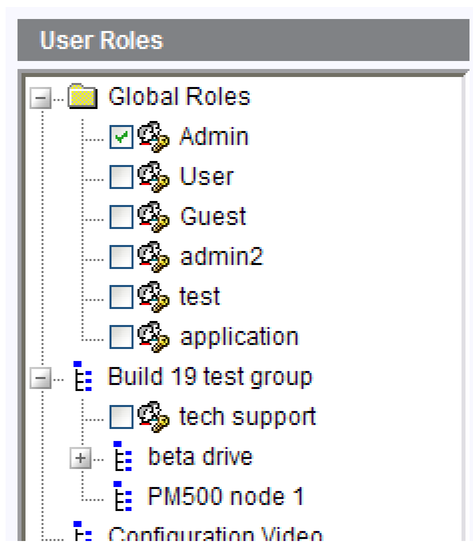
The **User Setup** page appears.

2. Fill in the information fields:
    - Type the User name to be used to log in. If using Windows Active Directory security, the user name must be of the form DomainName\UserName used to log in to Windows.
    - Type additional information such as first and last names, email address, telephone, fax and pager numbers.
    - Type a password. Note that the password is case sensitive. If using Windows Active Directory security, the entered password will only be used if the user cannot be authenticated with the Active Directory server. When the user IS authenticated against an Active Directory

server, the password is updated in the database to keep the passwords synchronized.

- If desired, select a different default time zone from the list.
- Provide a language preference (future functionality).
- Clear the **Enable alarm notifications** check box to disable alarm notifications by email if desired.

3. Select **User Roles** by checking the applicable check boxes. More than one Role may be assigned to a User.



Default privileges

Privilege Name	Description	Included in default Role definition		
		Admin	User	Guest
View Groups	View the structure of the project	x	x	x
Edit Groups	Add, delete and modify Groups and Domains	x		

Privilege Name	Description	Included in default Role definition		
		Admin	User	Guest
View Users	View the list of and properties of defined Users	x	x	
Edit Users	Add, delete and modify Users and their properties	x		
Overwrite Passwords	Change password of other users (any users may change their own password)	x		
View Roles	View the list and properties of defined Roles	x	x	
Edit Roles	Add, delete and modify Roles and their properties	x		
View Devices	View Devices and their properties	x	x	x
Edit Devices	Add, delete and modify Devices and their properties	x		
View Meters	View Meters and their properties	x	x	x
Edit Meters	Add, delete and modify Meters and their properties	x		
View Meter Tags	View Meter Tags and their properties	x	x	x
Edit Meter Tags	Add, delete and modify Meter Tags and their properties	x		
View Alarm Sub-scriptions	View alarm subscriptions	x		
Edit Alarm Subscriptions	Add, delete and modify alarms subscriptions	x		
Purge Alarms	Purge alarms	x		
Edit Units	Add, delete and modify Units, Base Units and Value Types	x		
View Meter Data	View Meter Data in Summary, Trend and Calendar Trend mode	x	x	x

Privilege Name	**Description**	**Included in default Role definition**		
		Admin	**User**	**Guest**
Edit Meter Data	Edit logged meter data in the database	x		
View Manual meter Data	View manual Meter Data in Summary, Trend and Calendar Trend mode	x	x	x
Edit Manual Meter Data	Input and modify manual meter data	x		
Purge Device Errors		x		
View Rate Schedules		x	x	
Edit Rate Schedules	Add, delete and modify Rate Schedules and their properties including editing line item scripts	x		
View Reports	View Reports including editing start and end dates	x	x	x
Edit Reports	Add, delete and modify Reports and their properties	x		
View Custom Pages		x	x	
Edit Custom Pages	Add, delete and modify Custom Pages	x		
View Report Jobs	View the setup information for auto-run Report Jobs	x	x	
Edit Report Jobs	Create and edit auto-run Report Jobs	x		
Purge Logged Data	Purge meter data from the database	x		
View Multi-Purpose Report Scripts	View Multi-Purpose Report Scripts	x	x	
Edit Multi-Purpose Report Scripts	Add, delete and modify Multi-Purpose Report Scripts	x		

Privilege Name	Description	Included in default Role definition		
		Admin	User	Guest
Edit System Configurations		x		
View Alarms		x	x	x
Edit Alarms		x		
View logged-in users		x		
View Fiscal Calendar	View Fiscal Calendars and select fiscal periods for trends, reports, etc.	x	x	x
Edit Fiscal Calendar	Add, delete and modify fiscal calendars	x		

Important: Privileges apply only within the Parent Domain of the Role. Privileges assigned to Global Roles apply within the entire project.

Fiscal calendars

Fiscal calendars allow users to configure and utilize custom reporting periods based on a fiscal calendar rather than a natural calendar. A fiscal year is defined by specifying the start month and day and what type of calendar it will be. Fiscal calendars include a Natural type, which uses the same months as a natural calendar but a different start month, and three types based on repeating patterns of weeks within fiscal quarters. The three week patterns are 4-4-5, 4-5-4, and 5-4-4. To keep a week pattern based fiscal calendar synchronized with the natural calendar, a leap month of 5 weeks is required every few years. The fiscal calendar configuration allows you to assign a specific leap month to a leap year when needed.

Fiscal calendar objects and controls

- **Enable / disable fiscal calendar functionality**

  The Configuration page in the **System** tab includes enable/disable options. Fiscal calendars are disabled by default. When first enabled, fiscal calendar related objects will be available the next time a user logs in.

- **Configuration**

  The **Fiscal Calendar** link in the **System** tab provides controls for configuring, viewing and editing fiscal calendars. For details, see "Configuring fiscal calendars" (page 119).

- **Fiscal trend and calendar trend views**

  With fiscal calendar functionality enabled, Trend and Calendar trend will display trends on a fiscal calendar basis. Fiscal Calendars are not supported in ChartsPlus charts.

- **Report period selection**

  If fiscal calendar functionality is enabled, fiscal periods will appear in the predefined report periods list along with natural calendar periods.

- **Natural Calendar**
  - Yesterday
  - Today
  - Last Week
  - Previous Month
  - Month to Date

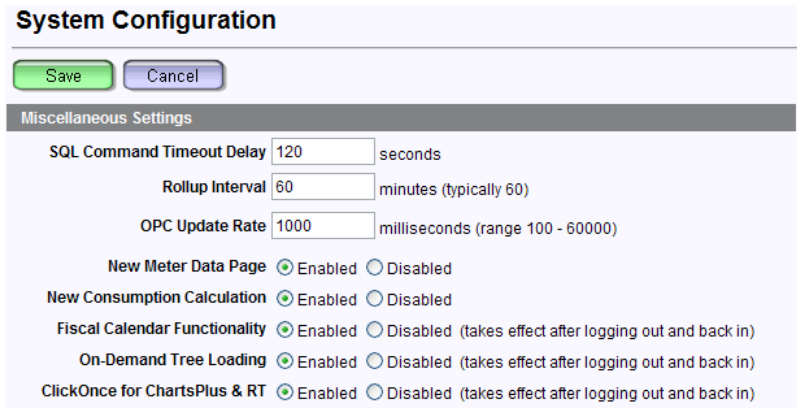
    - Previous Year
    - Year to Date
- **Fiscal calendar**
    - Fiscal Month to Date
    - Previous Fiscal Month
    - Second Previous Fiscal Month
    - Fiscal Quarter to Date
    - Previous Fiscal Quarter
    - Second Previous Fiscal Quarter
    - Fiscal Year to Date
    - Previous Fiscal Year (e.g. FY2008)
    - Second Previous Fiscal Year (e.g. FY2007)
- **Multi-purpose Report Object Model**
    - Several objects and collections have been added to the MPR object model to support fiscal period reporting in custom reports. For details, see "MPR object model" (page 386).

Configuring fiscal calendars

Enabling fiscal calendar functionality

You can enable and disable the fiscal calendar functionality on the **System Configuration** page with the **Enabled** and **Disabled** options.

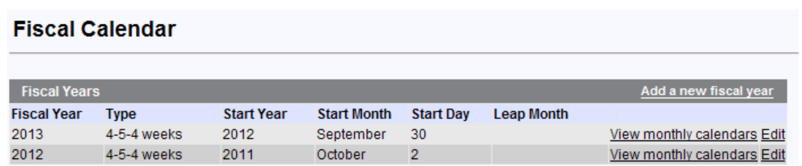
The Fiscal Calendar functionality is disabled by default. Fiscal calendar related objects become visible in the web interface the next time you logs on.



To create a new fiscal calendar:

1. On the **System** tab, click **Fiscal Calendar** in the tree.

   The **Fiscal Calendar** page appears.



2. Click the **Add a new fiscal year** link.

   The **Add a Fiscal Calendar Year** page appears.

3. Provide the following information:
   - **Fiscal year**

     This is the year number. Typically fiscal years begin prior to a calendar year. For example, FY 2009 began October 1, 2008 for many businesses.

   - **Fiscal year type**

     Select the fiscal calendar type that reflects that in use in your business accounting calendar.

     - **Natural:** This fiscal calendar has months that start on the first day of the natural month and end on the last day of the natural month. The primary difference between a natural fiscal calendar and a natural calendar is the start month.

  - **4-4-5 weeks:** This fiscal calendar provides fiscal quarters that consist of three months of length of 4 weeks, 4 weeks, and 5 weeks.
  - **4-5-4 weeks:** This fiscal calendar provides fiscal quarters that contain three months of length 4 weeks, 5 weeks, and 4 weeks.
  - **5-4-4 weeks:** This fiscal calendar provides fiscal quarters that contain three months of length 5 weeks, 4 weeks, and 4 weeks.

- **Start year**

  The year with which the fiscal year begins.

- **Start month**

  The month with which the fiscal year begins.

- **Start day**

  The day with which the fiscal year begins.

- **Leap month**

  A particular month may be added to a selected fiscal year to align the fiscal calendar with the natural calendar. This may be the same or a different month each time it occurs.

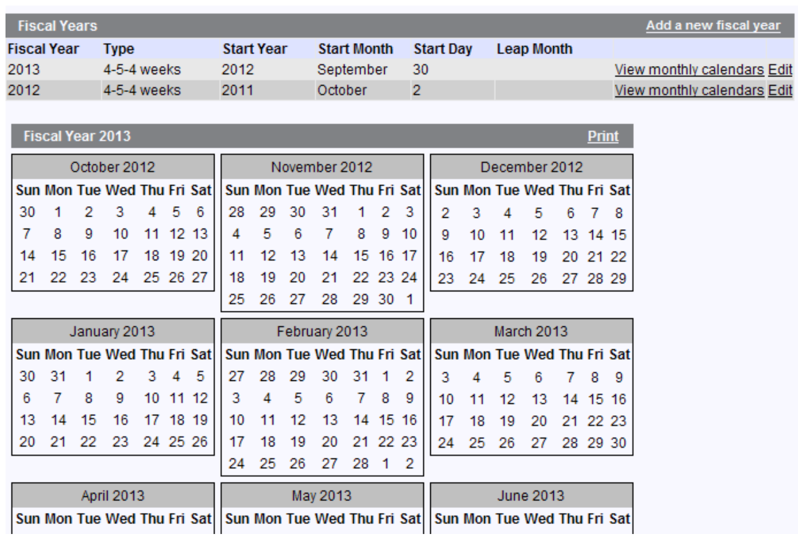
Note: It is the user's responsibility to verify the accuracy of the configured fiscal calendars. FactoryTalk EnergyMetrix does not check for consistency or relations between adjacent fiscal calendar years.

To edit a fiscal calendar:

- Click the **Edit** link next to the calendar that you want to modify.

To view a fiscal calendar:

- Click the **View monthly calendars** link next to the calendar that you want to view.



Fiscal Years — Add a new fiscal year

Fiscal Year	Type	Start Year	Start Month	Start Day	Leap Month	
2013	4-5-4 weeks	2012	September	30		View monthly calendars Edit
2012	4-5-4 weeks	2011	October	2		View monthly calendars Edit

Fiscal Year 2013 — Print

October 2012

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27

November 2012

Sun	Mon	Tue	Wed	Thu	Fri	Sat
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	1

December 2012

Sun	Mon	Tue	Wed	Thu	Fri	Sat
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

January 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26

February 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	1	2

March 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

April 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat

May 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat

June 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat

Using the System Configuration page

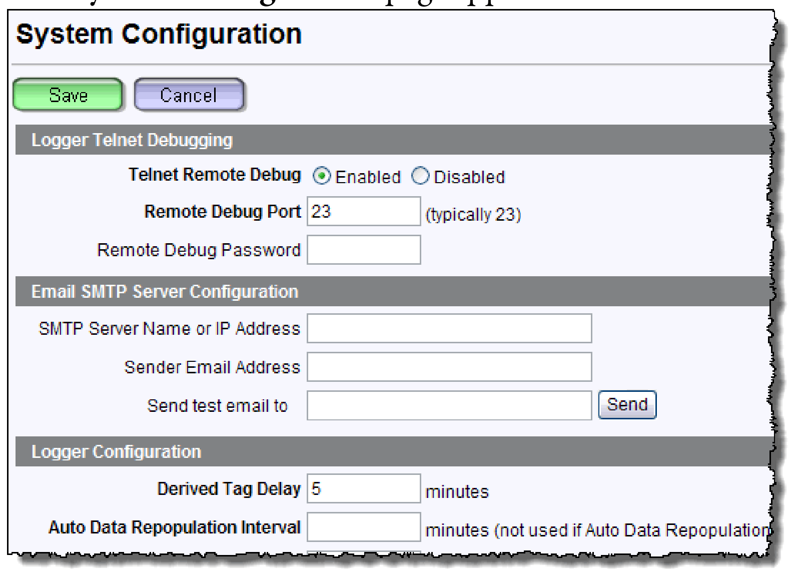
Use the **System Configuration** page to set a variety of program options.

Note: You must have the Edit System Configurations privileges to edit the system configuration.

To edit the system configuration:

1. In the **System** tab, click Configuration.

2. The **System Configuration** page appears.



3. Click **Edit**.

   On the **System Configuration** page, you can define the following settings:

Item	Description
Logger Telnet Debugging	• Telnet debugger, enabled or disabled (default) • Remote debug port, any unused port ID, default 23 • Remote debug password, default "". For details, see "Connecting to the FactoryTalk EnergyMetrix server using Telnet" (page 710).
Email SMTP Server Configuration	• FactoryTalk EnergyMetrix sends email alarms and reports via a SMTP server configured using this page. • SMTP (Simple Mail Transport Protocol) server name or IP address. • Sender email address (does not need to be an actual email address). • Test email button - sends a test message to the email address entered in the address field when you click **Send**.
Logger Configuration	• Derived tag delay - specifies how long after meter data is polled that derived tags are calculated. Default is 5 minutes.

Item	Description
	• Maximum active DTL operations - specifies the maximum concurrent messages with RSLinx Classic and hence devices. Range is 1 to 35. Default is 20. It is unlikely that you will need to adjust this setting.
Miscellaneous Settings	• SQL command timeout delay - default 120 seconds. • Roll-up interval - specifies how often tags are refreshed from roll-up servers, default 60 minutes. • OPC update rate - specifies how often the connection to OPC servers is refreshed. • New meter data page - Enabled by default, selects the paged meter data display page. • New consumption calculation - provides more accurate consumption reporting in the case of data logging anomalies such as unexpected zero values, resets, etc. Enabled by default. For details, see "Meter tag common elements" (page 216). • Fiscal Calendar Functionality - permits the creation and use of fiscal periods for reporting. Disabled by default. For details, see "Fiscal calendars" (page 117). • On-demand tree loading - If on-demand tree loading is enabled, nodes are loaded only when a user expands them. If disabled, the entire tree refreshes at a time. • ClickOnce for ChartsPlus and RT - Enabled by default, sets up RT and ChartsPlus as ClickOnce applications.

Configuring your start page

My Start Page allows you to set up a tabbed initial FactoryTalk EnergyMetrix view with tabs and links that let you navigate to your favorite graphs, reports, meters and custom pages.

A default start page appears until you configure your start page. To begin, click the **Configure My Start Page** link.

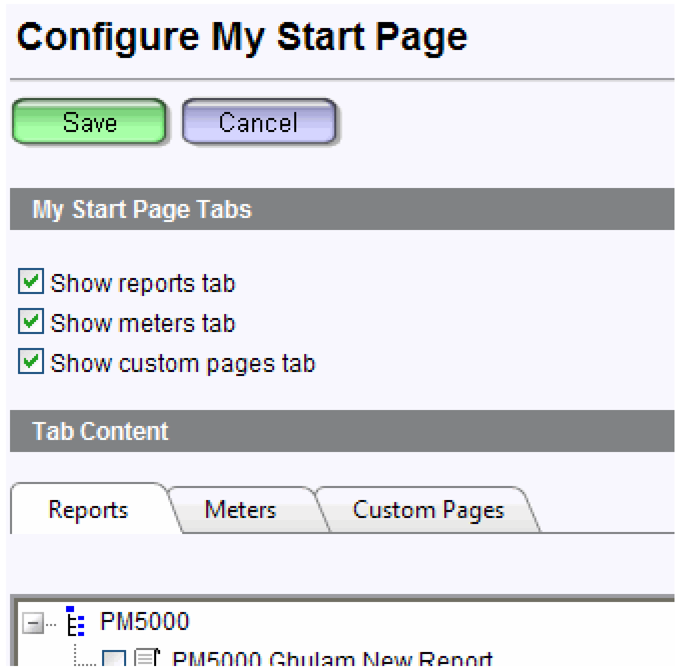
Once you configure it, your start page will be displayed each time you log on to FactoryTalk EnergyMetrix.

Each user with a unique logon may configure their own start page.

To configure your start page:

1. Click the **Configure My Start Page** link.

   The **Configure My Start Page** page appears.



2. Configure the following page components:

My Start Page Tabs

Select the tabs that you want to view on your start page.

If a tab is not selected, the tab appears on your start page anyway, with the following message:

```
You selected not to see this tab when you configured your page.
```

Tab Content

Select the content of the tabs that will appear on your start page.

Other links

- **Collapse All:** Collapses all the nodes to parent nodes.
- **Expand All:** Expands all the nodes of the tree.

- **Check All:** Selects all the check boxes in the tree.
- **Clear All:**Clears all the check boxes in the tree.

  Tip: You may select any content for the reports, meters and similarly custom pages for which you have privileges.

3. Click **Save**.

Tip: My Start Page is associated with a particular user. If you want to remove My Start page, you must delete and re-create the User.

Reports tab

The **Reports** tab contains the following information:

Report Date Range

Select the default date range for the reports listed in My Selected Reports.

You may choose from the list of predefined time periods or you can specify your own custom dates and times.

My Selected Reports

Lists the reports you selected when you configured My Start Page. The link on the section bar toggles the list between My Selected Reports and All Reports to which you have privileges.

For Global reports the domain column is blank.

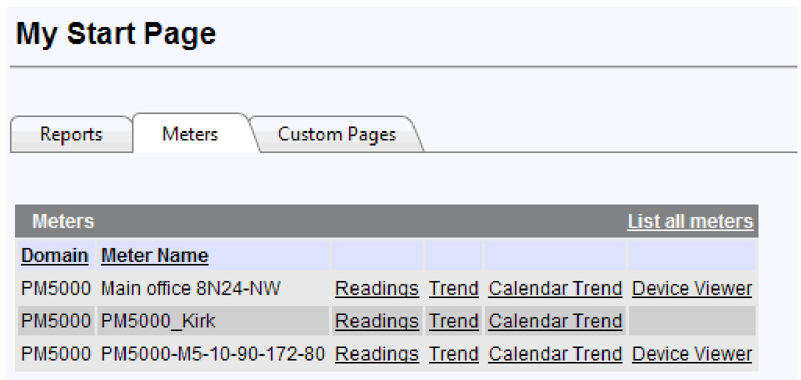
If the number of reports listed is more than 100, they are listed in multiple pages.

You may sort based on domains or report names. Click the Domain or Report Name header to sort on the respective sort key. Click again to reverse the sort order. The sort order is indicated by an arrowhead.

When you select a report from the list, it appears in a new browser window. In this window, you may adjust the default date and time interval and tie zone, and enter manual parameters if required.

Meters tab

The **Meters tab** on your start page contains a list of meters displayed with various options.



There are the following options available:

Click this link:	To:
List my selected meters	List the meters that you have selected for your start page.
List all meters	List all the meters that you have privileges to access.
Domain name headers	Sort the list by domain names. Click again to reverse the sorting order.
Meter name headers	Sort the list by meter names. Click again to reverse the sorting order.
Readings	View the meter status page and a list of the last ten values logged in a new browser window.
Trend	Open the meter trend page in a new browser window.

Click this link:	**To:**
Calendar Trend	Open the calendar trend page in a new browser window.
Device Viewer	Open the corresponding viewer. The link is available if the meter is associated with an Allen-Bradley PowerMonitor device and you have **View devices** privileges. The client computer must be set up correctly for Rich Client applications.

Custom Pages tab

The **Custom Pages** tab on your start page lists the pages that you have selected for this tab.

The custom pages are listed with their associated Domain or Group names, or blank for Global custom pages. Click the custom page name to launch the custom page in a new browser window.

There are the following options available on the **Custom Page** tab:

Click this link:	**To:**
List my custom pages	List the custom pages that you have selected for your start page.
List all custom pages	List all the custom pages that you have privileges to access.
Domain name headers	Sort the list by domain names. Click again to reverse the sorting order.
Page name headers	Sort the list by page names. Click again to reverse the sorting order.

Using the web.config file

The **web.config** file located in the FactoryTalk EnergyMetrix**program folder** contains a reference to the SQL server name, encrypted log-in information and database name as well as other software component license data. Program options stored in the **web.-config** file are also accessed using the **Configuration** page. For details, see "Using the System Configuration page" (page 122).

Program folder

The default program folder is:

- For 32-bit servers:

```
C:\Program Files\Rockwell Software\FactoryTalk
EnergyMetrix
```

- For 64-bit servers:

```
C:\Program Files (x86)\Rockwell Soft-
ware\FactoryTalk EnergyMetrix
```

It is very unlikely that you will need to edit the **web.config** file. If editing is required, you may edit the file using Notepad or other text or xml editor.

Note: If the file is locked (the **Save As** dialog box appears), stop the FactoryTalk EnergyMetrix logger service using the Services control panel. Then save the edited **web.-config** file and re-start the logger service. If the file is still locked, stop the World Wide Web Publishing Service. Save the file and then start the stopped services.

Devices

Devices are physical entities that FactoryTalk EnergyMetrix communicates with over a network.

Click the links listed below for information on specific device types.

Configuring a device in FactoryTalk EnergyMetrix establishes communications and creates database definitions for the device, and enables device configuration and data monitoring using the optional FactoryTalk EnergyMetrix RT package.

Important: If you want to set up devices and meters, configure at least one domain first. If you want to set up device-based meters, configure devices first.

Ethernet, ControlNet, serial and DeviceNet devices may be directly connected provided that the FactoryTalk EnergyMetrix server is also on the network through an appropriate network interface and you have configured the appropriate RSLinx Classic direct device drivers. Devices routed through a ControlLogix gateway or RSLinx Classic gateway are also considered directly connected devices.

Devices may also be set up in a parent/child, or pass-thru configuration. **Remote I/O** devices must be set up as children of a parent device such as a programmable controller. DeviceNet devices may also be used as child devices.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

Using device classes

FactoryTalk EnergyMetrix uses device classes to determine how to interact with a particular device. The device class includes the device family, communications type and whether the device has a clock that can be synchronized.

The following device classes are supported in FactoryTalk EnergyMetrix:

PowerMonitor 5000 (model) on (comm. type)

Connects to an Allen-Bradley Bulletin 1426 PowerMonitor 5000. The following are supported:

Models

- M5 - basic power and energy metering
- M6 - basic power quality metering

Communications types

- ControlNet
- DeviceNet
- EtherNet/IP

PowerMonitor 1000 (model) on (comm. type)

Connects to an Allen-Bradley Bulletin 1408 PowerMonitor 1000. The following are supported:

Models

- TR1 - voltage/current transducer
- TR2 - power transducer
- EM1 - real energy submetering monitor
- EM2 - energy and demand monitor
- EM3 - full function power and energy monitor

Communications types

- EtherNet/IP
- Serial - Allen-Bradley DF1 half or full duplex

PowerMonitor 500 on EtherNet/IP

Connects to an Allen-Bradley Bulletin 1420 PowerMonitor 500 model on EtherNet/IP (for data logging only).

PowerMonitor 500 on Modbus

Connects to an Allen-Bradley Bulletin 1420 PowerMonitor 500 panel-mounted meter using the Modbus RTU master driver integral to FactoryTalk EnergyMetrix. The PowerMonitor 500 units may connect to the FactoryTalk EnergyMetrix server using serial multidrop (RS-485) or Ethernet communications (using a serial to Ethernet gateway).

Caution: If the PowerMonitor 500 is configured for data logging via EtherNet/IP, and the configuration is uploaded or downloaded then EtherNet/IP communication may be disrupted for a minute or so, while the configuration activity is executing.

Wireless PowerMonitor W250

Connects to an Allen-Bradley Bulletin 1415 Wireless PowerMonitor W250. FactoryTalk EnergyMetrix uses an integral Modbus RTU master driver to communicate with this class of device. The device must be installed in a properly configured wireless mesh communications network with routers as necessary and using a wireless PC Receiver connected with the FactoryTalk EnergyMetrix server using serial or Ethernet communications.

PowerMonitor 3000 (model) on (comm. type)

Connects to an Allen-Bradley Bulletin 1404 PowerMonitor 3000. The following are supported:

Models

- M4 and M5 - basic power and energy metering

- M6 - basic power quality metering
- M8 - advanced power quality metering

Communications types

- ControlNet
- DeviceNet
- Ethernet - the older Ethernet protocol, also known as CSP or PCCC, used with the Series A Ethernet PowerMonitor 3000.
- EtherNet/IP - also known as CIP, used with the Series A Ethernet PowerMonitor 3000. Uses DeviceNet addressing.
- Remote I/O - Must have a parent device such as a PLC-5, SLC 500 or ControlLogix controller.
- Serial - Allen-Bradley DF1 half duplex master/slave

Caution: Serial communications will not provide adequate performance in most cases. Please contact Rockwell Automation, Inc. technical support for more information.

OPC Server on Ethernet

Connects to the RSLinx Classic OPC server or a 3rd party OPC server such as Kepware. OPC devices and meters allow FactoryTalk EnergyMetrix to communicate with a wide variety of Rockwell Automation, Inc. and third-party devices using OPC. Connection to third party OPC servers such as Kepware require installation of the FTEMOPC 3rd party communications option. The OPC Browser may be used for setting up Devices, Meters and Meter tags.

An important use for OPC meters is to log data from Allen-Bradley Logix family controller native tags using the RSLinx Classic

OPC server. To support OPC, RSLinx Classic must be activated at the OEM level or higher, e.g., Professional, Gateway, etc.

FactoryTalk Live Data server on Ethernet

Connects to the FactoryTalk Live Data server (RSLinx Enterprise). The OPC Browser may be used for setting up Devices, Meters and Meter tags.

FactoryTalk EnergyMetrix Server on Ethernet

Connects to a remote FactoryTalk EnergyMetrix server to obtain logged data as **roll-up server**. A roll-up server device is used to establish a connection to a remote FactoryTalk EnergyMetrix server.

Roll-up server

Roll-up is the term used for replication of tag data between servers. Roll-up devices, meters and meter tags are configured very similarly to how to set up devices and device-based meters and meter tags. Roll-up data, that is data from a remote server replicated in the roll-up server, may be utilized by the standard functions including data viewing, charting and reporting, just as if the data were logged locally.

A setting on the **Configuration** page or the **web.config** file determines how often the roll-up replication occurs. The default is 60 minutes.

When roll-up meters and meter tags are configured, their data will be transferred from the remote server at a rate defined in the **web.config** file. The default rate is once every 60 minutes. For details, see "Using the web.config file" (page 128).

Allen-Bradley Overload Relay and Motor Protection System products

Connects to the following products

- 825-P Modular Protection System on DeviceNet or EtherNet/IP
- E1 Plus Overload Relay on DeviceNet or EtherNet/IP
- E3, E3 Plus, E3 Plus EC5 Overload Relays on DeviceNet or EtherNet/IP
- E300 Overload Relay on DeviceNet or EtherNet/IP

Allen-Bradley Soft Starter and Smart Motor Controllers

Connects to the following products

- SMC Flex Low Voltage Soft Starter on DeviceNet or EtherNet/IP
- SMC-50 Solid State Soft Starter on DeviceNet or EtherNet/IP

Allen-Bradley Compact and Architecture Drives

Connects to the following products

- PowerFlex 40 AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 40P AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 400 AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 525 AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 70 AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 70EC AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 700 AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 700H AC Drive on DeviceNet or EtherNet/IP

- PowerFlex 700VC AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 700S AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 753 AC Drive on DeviceNet or EtherNet/IP
- PowerFlex 755 AC Drive on DeviceNet or EtherNet/IP

SLC 500 controller on (comm. type)

Connects to an **Allen-Bradley SLC 500 programmable controller**.

Allen-Bradley SLC 500 programmable controller

An SLC 500 programmable controller may be used as a User Defined Data Source or as a Parent device for a **Remote I/O** or DeviceNet power monitor.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

You may configure an SLC 500 controller as a ControlNet, Ethernet or Serial device. When used as a User Defined Data Source, an SLC 500 controller may be used to produce several Meters worth of data.

The following communications are supported:

- Ethernet - CSP/PCCC addressing

- Serial - DF1 full-duplex
- DH+ - Data Highway Plus

ControlLogix on (comm. type)

Connects to an Allen-Bradley ControlLogix (or Logix family) controller, such as CompactLogix. With this device class, FactoryTalk EnergyMetrix may log only PLC/SLC mapped tags. You may log Logix family native tags using RSLinx Classic OPC.

- ControlNet
- Ethernet - EtherNet/IP
- Serial - DF1 full duplex
- DH+ - Data Highway Plus

PLC-5 on (comm. type)

Connects to an **Allen-Bradley PLC-5 programmable controller**.

Allen-Bradley PLC-5 programmable controller

A PLC-5 programmable controller may be used as a User Defined Data Source or as a Parent device for a **Remote I/O** or DeviceNet power monitor.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

You may configure a PLC-5 controller as a ControlNet, Ethernet or Serial device. When used as a User Defined Data Source, a PLC-5 controller may be used to produce several Meters worth of data.

The following communications are supported:

- ControlNet
- Ethernet - CSP/PCCC addressing
- Serial - DF1 full duplex
- DH+ - Data Highway Plus

MicroLogix on Ethernet

Connects to an Allen-Bradley MicroLogix controller 1000, 1100, 1200, 1400, 1500.

PowerMonitor II (model) on (comm. type)

Connects to an Allen-Bradley Bulletin 1403 PowerMonitor II. Model LM specifies the limited metering model.

The following communications are supported:

- DeviceNet (the RT option is not supported for DeviceNet)
- Ethernet - CSP/PCCC addressing
- **Remote I/O** - Must have a parent device such as a PLC-5, SLC 500 or ControlLogix controller.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

- Serial - Allen-Bradley DF1 half duplex master/slave

Caution: Serial communications will not provide adequate performance in most cases. Please contact Rockwell Automation, Inc. technical support for more information.

PowerMonitor on Remote I/O

Connects to an Allen-Bradley Bulletin 1400 PowerMonitor. The only support communications is Remote I/O. Must have a parent device such as an Allen-Bradley PLC-5, SLC 500 or ControlLogix controller.

Ethernet Energy Module (model) on Ethernet

Connects to an Allen-Bradley 1803-EEM controller designed for totalizing pulse and analog **legacy meters**. The 1803-EEM is a legacy product which is no longer offered for sale by Rockwell Automation, Inc.. It comprises a programmable controller with preengineered logic.

Legacy WAGES meters

WAGES is an acronym that describes a typical assortment of energy-related meters -- Water, Air, Gas, Electric and Steam.

Legacy WAGES meters are typically equipped with a pulse (or "KYZ") output. In this scheme, the meter is equipped with a dry Form C relay contact that changes state at intervals related to the quantity measured by the meter.

Other legacy meters may be equipped with analog outputs that transmit a DC signal proportionate to the measured quantity. Standard analog signal ranges are -10 to 10 V, 4-20 mA, 0.1 mA, and others.

FactoryTalk EnergyMetrix can log data from legacy meters provided that an external device converts the output pulses or analog signals to data in a form it can read. One such device is the Allen-Bradley 1803-EEM. Or the user may utilize an existing programmable controller to make the conversion.

The logic in the interface device must calculate the accumulated value of the measured quantity as well as its rate of change. For electric meters, it must usually perform a demand calculation also.

The following models are supported in FactoryTalk EnergyMetrix:

- SLC 500
- MicroLogix
- ControlLogix

Configuring devices

Follow these general steps to set up a device. If you have already performed a step then skip to the next. Your login Role must be assigned Edit Devices privilege to add or edit Devices. Without this privilege, many of the elements will not be visible.

To configure a device:

1. Configure the data source as applicable:
   a. Set up a RSLinx Classic driver to communicate with the device.
   b. Configure the ControlNet or DeviceNet network using RSNetworx.
   c. Set up a parent device for **Remote I/O** devices.

   Remote I/O communications

   Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

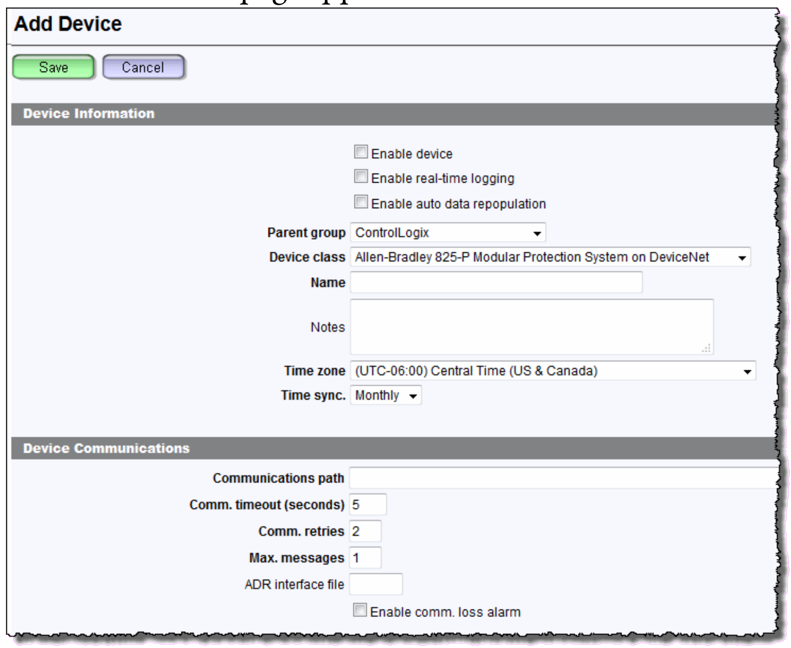
   To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

   d. Install and configure an OPC driver.

   Tip: If FactoryTalk EnergyMetrix is installed on a Windows 2008 Server, see "Tips for RSLinx Classic running on a 64-bit server" (page 715).
2. In the navigation tree, select the **System** tab and open the **Devices** folder.
3. Select the Group or Domain for the new device.

4. Click the **Add a device** link.

   The **Add Device** page appears.



5. Fill in the **Device Information** fields. The device setup page may change when you select a Device Class. For details, see "Device setup page elements" (page 142).
6. Fill in the **Device Communications** fields. For details, see "Configuring device communications" (page 149).
7. Click **Save**.

Device setup page elements

Use the **Device Setup** page to provide information FactoryTalk EnergyMetrix requires to establish communications with a Device. The device setup page for a specific Device contains the following elements, as well as Device Information Setup and Device Communications Setup parameters that vary depending on the Device Class and the type of network used to communicate with it.

Important: You must set up at least one Domain before setting up any Devices.

Device editing control buttons

These buttons appear when viewing the device setup:

Edit

Opens the device setup page in edit mode.

Add

Opens a new device setup page in edit mode.

Copy

Opens a new device setup page with a copy of the existing device setup information. For details, see "Copying and deleting devices" (page 156).

Delete

Deletes the device and all meters attached to it. Requires confirmation.

These buttons appear when adding a new device or editing an existing device setup:

- **Save**

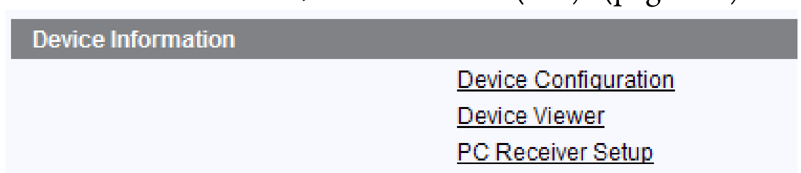
  Records edits to the database and exits edit mode. Triggers a database change event.

  - **Cancel**

Discards changes made to the device setup and exits edit mode. Does not delete a new device created using the **Add** button.

RealTime (RT) option links

If the device class supports RT functionality, links to the optional RT device configuration and device viewer windows appear in view mode. For details, see "RealTime (RT)" (page 471).



If the RT option is not installed, a page appears which indicates that the activation for RT is not present.

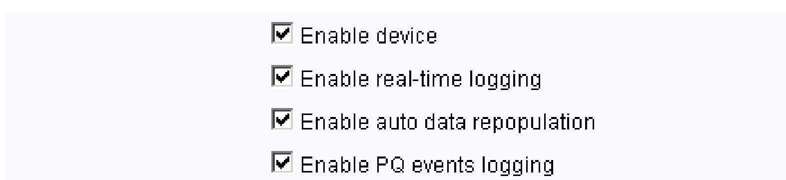
Wireless PowerMonitor W250 PC Receiver Setup link

A Wireless PowerMonitor W250 device also has a link to its PC Receiver setup page.

Using device configuration options

Options

You can use the following options in the edit mode:



Enable device

Turns on and off communications between FactoryTalk EnergyMetrix and the device. A device must be enabled for any of the other enables to be effective.

Enable real-time logging

Turns on and off logging of meter tags in meters attached to the device. Does not appear on setup page for roll-up servers.

Enable auto data repopulation

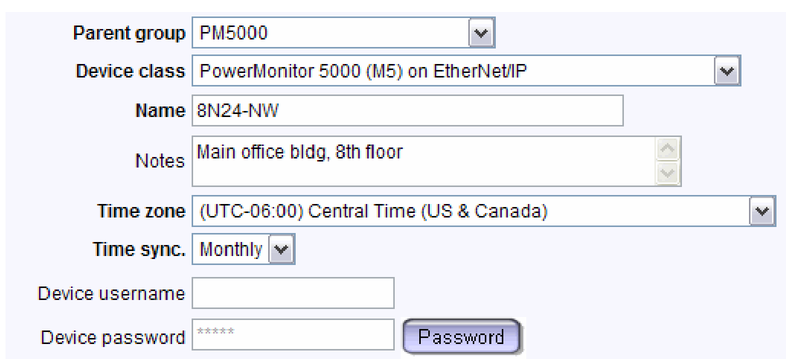
Turns on and off ADR. Supported in only certain devices such as Allen-Bradley PowerMonitors and MicroLogix EEMs. Does not appear on the device setup page for OPC devices. For details, see "Automatic data repopulation (ADR)" (page 233).

Enable PQ events logging

Turns on and off power quality event logging. Applies only to Allen-Bradley PowerMonitor 3000 model M6 and M8 devices.

Device identification

These parameters establish some general and some device-class specific details.



Parent group

Applies to all devices. Specifies the group or domain the device to which the device is assigned. A device may only be assigned to one group or domain.

Device class

Applies to all devices. A device class is a set of properties that informs FactoryTalk EnergyMetrix how to interact with the device. For details, see "Using device classes" (page 130).

Name

Every device must have a **Name**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

The name should uniquely identify the device, since:

1. The device name without group affiliation will be picked from a list during meter setup.
2. The overall device status page identifies devices by name without group affiliation

You may use any alphanumeric characters in a device name.

Notes

A field is provided for entering notes or comments for all devices.

Time zone

Applies to all devices except for roll-up servers. **Learn more**.

Select time zone for a device

The time zone you select for a device will determine the Coordinated Universal Time (UTC) logged in the database.

For example, data scanned at 9:00 AM for a device in the Eastern time zone will have a UTC timestamp of 1400 hrs.

In addition, the time zone you specify for a device during set up is used when synchronizing the device clocks with the server clock.

Important: The time zone selected for a device during setup must match the time zone in which the device is physically located.

Time sync.

Applies only to devices with internal clocks that may be synchronized to the FactoryTalk EnergyMetrix server. Establishes how often the server synchronizes the device clock. If the device time is synchronized by another method, set to "Never" to avoid time-related issues. Examples of devices that FactoryTalk EnergyMetrix may time-sync are Allen-Bradley PowerMonitors and programmable controllers.

Device password

Applies only to Allen-Bradley PowerMonitors. Default of zero matches the default power monitor password. The password entered here must match the power monitor password to enable time sync and device configuration download using the RT option. The username field only applies to the PowerMonitor 5000.

If security is enabled in a PowerMonitor 5000, enter both an application-level account username and password. This will allow FactoryTalk EnergyMetrix to configure or read log files from the power monitor. Security accounts must be configured in the power monitor.

Configuring device communications

This area of the device setup page defines how FactoryTalk EnergyMetrix communicates with the device. Its content depends on the device class and type of network connecting FactoryTalk EnergyMetrix to the device. FactoryTalk EnergyMetrix features very flexible device communications.

Communications path

Paths to Rockwell Automation, Inc. devices using the FactoryTalk EnergyMetrix integral Modbus driver

FactoryTalk EnergyMetrix communicates with Allen-Bradley Wireless PowerMonitor W250 and PowerMonitor 500 products using an integral Modbus RTU master driver.

Tip: Even though the PowerMonitor 500 support EtherNet/IP, it is only supported for data logging. Configuration of the PowerMonitor 500 through FactoryTalk EnergyMetrix is only supported for Modbus TCP.

Communications path syntax

The communications path is written in the following syntax:

```
<COM port ID>\x
```

or

```
<IP address>\x
```

where "COM port ID" is the physical COM port in the FactoryTalk EnergyMetrix server; "IP address" is the IP address of a serial to Ethernet protocol converter (e.g. Digi-One IA); and x is the Modbus node number of the device.

Paths to Rockwell Automation, Inc. devices using RSLinx Classic

FactoryTalk EnergyMetrix communicates with Allen-Bradley devices such as power monitors and programmable controllers using RSLinx Classic communications drivers. You must configure drivers in RSLinx Classic on the FactoryTalk EnergyMetrix server prior to configuring devices that communicate with the server using the drivers, and enter the device addresses into the driver address lists.

Tip: If FactoryTalk EnergyMetrix is installed on a Windows 2008 Server, see "Tips for RSLinx Classic running on a 64-bit server" (page 715) for details.

Communications path syntax

The communications path is written in the following syntax:

```
[ComputerName!]RSLinxDriver-
Name\PathSegment1\PathSegment2\ ... \PathSegmentN
```

ComputerName is optional but if used must be the FactoryTalk EnergyMetrix server name. RSLinxDriverName corresponds to the name in RSLinx Classic for the driver used to communicate with the device. Examples of default RSLinx Classic driver names are:

- AB_ETH-1, Ethernet TCP/IP driver.
- AB_DF1-1, Serial full-duplex DF1 driver.
- AB_MASTR-1, Serial half-duplex DF1 master driver.
- AB_TCP-1, RSLinx Classic Gateway remote driver.

- 1747-SDNPT-1, DeviceNet pass-thru driver for a 1747-SDN card.
- AB_PCC-1, ControlNet driver for the 1784-PCC card.

`PathSegment1` through `PathSegmentN` indicate node numbers, channels, addresses, slot numbers, etc. that make up the "hops" that a message takes. Communications paths may vary from very simple to quite complex.

Examples of communications paths

- AB_ETH-1\128.1.100.201, a direct connection to an Ethernet device on the same network as the FactoryTalk EnergyMetrix server.
- AB_ETH-1\128.1.100.134\Backplane\4, the path for a ControlLogix controller with a 1756-DHRIO module in slot 4. The controller will be used as a parent device to a power monitor on Remote I/O configured in the 1756-DHRIO module.
- AB_ETH-1\128.1.100.82\Backplane\2\A\10\Port2\6, path from the FactoryTalk EnergyMetrix server, via Ethernet to a ControlLogix Gateway with IP address 128.1.100.82, via ControlNet to a 1788-CN2DN bridge module, via DeviceNet to a PowerMonitor 3000 with node address (MAC ID) 6.
- AB_ETH-1\128.1.100.82\Backplane\2\A\5, path from the FactoryTalk EnergyMetrix server, via Ethernet to the same ControlLogix gateway as in the previous example, via ControlNet to a PowerMonitor 3000 with node address (MAC ID) 5.

Communications path rules

All communications paths begin at the FactoryTalk EnergyMetrix server. Select the end point of communications paths according to these rules:

- For PLC-5 and SLC 500 controllers used as **Remote I/O** parent devices, the communications path extends to the network address of the PLC-5 or SLC 500 processor (see first example above)

  #### Remote I/O communications

  Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

  To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

- For ControlLogix controllers used as Remote I/O parent devices, the communications path extends to the slot number of the 1756-DHRIO module (see second example above). The DHRIO module must be configured and owned by a ControlLogix processor and the RIO devices must be properly configured in the processor's I/O tree under that DHRIO module.
- For direct connect devices, the communications path extends through all communications hops to the device's communications port (see third example above). DeviceNet power monitors are always configured as direct

connect whether using an RSLinx direct or pass-thru driver.

- For 1803-EEM Ethernet Energy Module, the following applies:
  - If the 1803-EEM is based on a SLC 500 controller, the path extends to the network (IP) address of the SLC 5/05.
  - If the 1803-EEM is based on a ControlLogix controller, the path extends through the ControlLogix processor module. For example: AB_ETH-1\128.1.100.134\Backplane\0, where 0 is the processor slot.

Use RSLinx Classic to determine communications path

To use RSLinx Classic to help determine the correct path:

1. Access the FactoryTalk EnergyMetrix server and open RSLinx Classic

   Tip: If FactoryTalk EnergyMetrix is installed on a Windows 2008 Server, see "Tips for RSLinx Classic running on a 64-bit server" (page 715) for details.
2. From the RSLinx Classic main menu, select **Communications > Configure Shortcuts**.
3. Using RSWho, drill down to the network or parent device as applicable. Note the path shown at the top of the window
4. Copy the entire path and paste it into the Communications path field in the device configuration window in FactoryTalk EnergyMetrix. You may optionally omit the computer name at the beginning of the path (up to and including the exclamation point delimiter)
5. If the path ends on a network, add a '\' delimiter and the device address at the end of the shortcut path.

FactoryTalk Live Data communications path

Enter the FactoryTalk Live Data server name on the device setup page. **Learn more.**

FactoryTalk Live Data server details

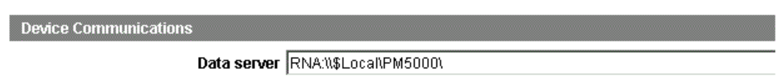
Use this format for communicating with Live Data servers:

```
RNA:\\$Local|$Network\<AppName>{\<ServerName>]
```

Where FactoryTalk Directory can be either local scope or network scope.

Device setup

The Server Name is entered into the Device setup.



Note: To successfully establish connection with RSLinx Enterprise, set the FactoryTalk EnergyMetrix Logger service to run under an administrative account.

Refer to your RSLinx Enterprise server documentation for assistance in setting up the Live Data server, establishing communications with the third-party devices, configuring topics and the proper server name, topic, group and item configuration to be entered into the device, meter and tag setup pages.

OPC communications path

Enter the OPC server name on the device setup page. For details, see "OPC server details" (page 177).

RSLinx Classic must be activated at the OEM or higher level to support OPC.

Tips:

- The update rate of OPC devices may be configured in System Configuration page. For details, see "Using the System Configuration page" (page 122).
- OPC devices utilize the Max Messages setting in the device setup. There is no field for this on the device setup web page so it must be changed manually in the database. If the field in the database is null then it defaults to 10.

Roll-up server communications path

The communication path is simply the remote server's IP address or network name.

Other communications settings

The settings listed below apply only to certain device classes.

Comm. timeout (seconds), Comm. retries, Max. messages

These parameters may be adjusted to improve communications on less than optimal networks.

Remote I/O Rack, Remote I/O Group, Remote I/O Scanner Slot

These parameters are used to configure pass-thru communications with child devices on a Remote I/O network with a PLC-5 or SLC 500 parent device. The child devices must be properly configured in the Remote I/O configuration of the parent device and the parent device must be in "run" mode for communications to occur.

Tip: FactoryTalk EnergyMetrix uses Remote I/O pass-thru communications to connect to power monitors. If the parent controller is communicating with the power monitor via block transfer, care must be taken to schedule the programmed block transfers to permit sufficient Remote I/O buffers and bandwidth to support the pass-thru communications. If communications errors occur with Remote I/O devices, check to ensure that scheduled block transfers are not programmed to occur continuously.

Note: If a PowerMonitor on Remote I/O Device is created with a rack/group address that does not exist, the RT device viewer may display bogus data.

ADR Interface File

Applies to programmable controllers programmed to support automatic data repopulation. Enter the address of the ADR interface file. The default is F100. If you have changed the address of the ADR interface file in the ADR Wizard, enter the correct address. For details, see "Configuring ADR for programmable controllers" (page 239).

Enable comm. loss alarm check box

Select this check box to have FactoryTalk EnergyMetrix treat communications loss to a device as an alarm condition. For details, see "Configuring alarming" (page 250).

Test Communications button

Visible only in view mode. Click this button to check the connection between FactoryTalk EnergyMetrix and the device.

Tip: When a new device is created, it may be necessary to click the button more than once to receive a "Connection successful" response. In some cases it may be necessary to access the FactoryTalk EnergyMetrix server, open RSLinx Classic, open RSWho and "drill down" to the non-responding device. This is necessary for ControlLogix controllers when FactoryTalk EnergyMetrix is logging PLC/SLC mapped tags.

Copying and deleting devices

You can copy or delete a device on the **Device Setup** page.

Copying devices

Copying **devices** can increase productivity during initial setup of FactoryTalk EnergyMetrix or when adding power monitors to an existing system.

Device

A device is a physical hardware entity that FactoryTalk EnergyMetrix communicates with over a network.

Devices may be directly connected to the network. Ethernet, ControlNet, serial and DeviceNet devices may be directly connected provided that the server is also connected to the appropriate network and you have configured the appropriate RSLinx Classic direct device drivers. Devices routed through the ControlLogix gateway or RSLinx Classic gateway are also considered directly connected devices.

Devices may also be set up in a parent/child, or pass-thru configuration. **Remote I/O** devices must be set up as children of a parent device such as a programmable controller. DeviceNet devices may also be used as "Child" devices.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

It is important to understand the difference between a Meter and a Device. A Device is a physical piece of hardware such as a power monitor or programmable controller, or a software application such as an OPC server. A Meter is a logical, or virtual, device that functions as a collection of data Tags.

To copy a device:

1. On the **System** tab, expand the **Devices** folder.
2. Click the device that you want to copy.
3. The **Device Setup** page appears.
4. Click **Copy** on the **Device Setup** page.

   A new device is created of the same type, with the name "Copy of <selected device name>". The new name is truncated if longer than 50 characters.
5. Rename the new device.
6. Change the device details.
7. Click **Save**.

Deleting devices

Important: Deleting a device also deletes all **meters** associated with the device and purges all data associated with those meters in the FactoryTalk EnergyMetrix database. When a large quantity of data is purged, it is possible that a timeout error will occur in Microsoft SQL server, requiring a server restart.

Meter

A **meter** is a logical source of data and is the unit used for licensing FactoryTalk EnergyMetrix Manager software.

There are the following types of meters:

Device meter

A data source associated with a physical piece of hardware such as a power monitor or a programmable controller, or a software application such as an OPC server. Tags associated with device meters are generally polled automatically.

Manual meter

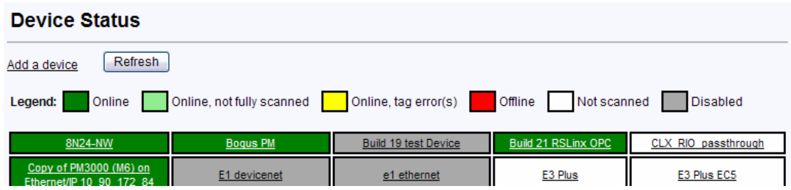
A logical or virtual device that functions as collections of data tags. Manual meters are data sources that permit data to be entered manually.

To delete a device:

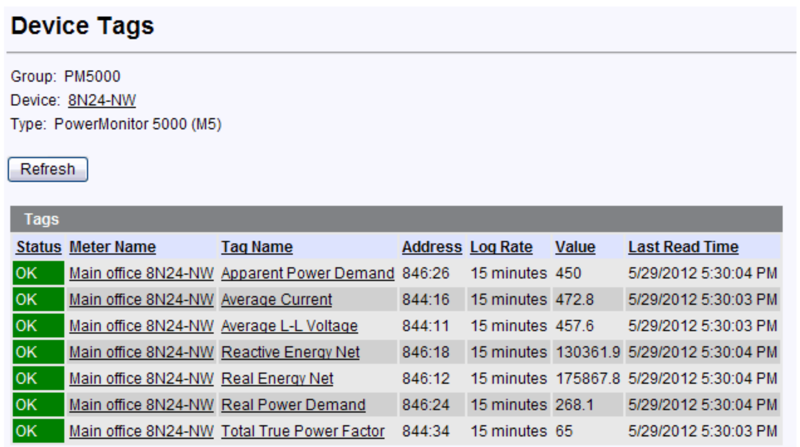
1. On the **System** tab, expand the **Devices** folder.
2. Click the device that you want to delete.
3. The **Device Setup** page appears.
4. Click **Delete**.

Viewing the device status

The **Device Status** display provides a color-coded summary of the communication status of all devices in a group or domain at a glance.



Click any device link to open a new browser window with detailed information on the device and its associated meters and meter tags.



Device Tags

Group: PM5000
Device: 8N24-NW
Type: PowerMonitor 5000 (M5)

Refresh

Tags

Status	Meter Name	Tag Name	Address	Log Rate	Value	Last Read Time
OK	Main office 8N24-NW	Apparent Power Demand	846:26	15 minutes	450	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Average Current	844:16	15 minutes	472.8	5/29/2012 5:30:03 PM
OK	Main office 8N24-NW	Average L-L Voltage	844:11	15 minutes	457.6	5/29/2012 5:30:03 PM
OK	Main office 8N24-NW	Reactive Energy Net	846:18	15 minutes	130361.9	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Real Energy Net	846:12	15 minutes	175867.8	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Real Power Demand	846:24	15 minutes	268.1	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Total True Power Factor	844:34	15 minutes	65	5/29/2012 5:30:03 PM

Meters

A meter is a logical source of data to FactoryTalk EnergyMetrix and is the unit used for licensing FactoryTalk EnergyMetrix Manager software. There are two types of meters.

- **Device Meters** are data sources that are associated with Devices. Tags associated with Device Meters are generally polled automatically.
- **Manual Meters** are data sources that permit data to be entered manually. A Manual Meter may also be used as a 'virtual' meter with derived tags.

Meters are assigned to Groups and Domains and may be apportioned among more than one Group or Domain.

Important: You must set up at least one Group or Domain before you can set up Devices and Meters. You must set up Devices before you set up device-based Meters

Meter Types

Meters may be assigned **meter types**.

Meter types

Default meter types you may select include:

- Manual
- Water
- Air
- Gas
- Electric
- Steam
- Environmental

You may add meter types only by adding rows to the dbo.MeterTypes table in the FactoryTalk EnergyMetrix EMMA database. Meter types are a useful index for filtering meters in MPR scripts. Manual meters may be assigned any Meter Type so long as its meter tags are set up as manual meter tags.

Meter tags

Meters may be considered collections of Meter tags. A tag is the basic unit of data collection in FactoryTalk EnergyMetrix. A tag may be a Device tag, a Manual tag, a Derived tag or an Alarm tag.

- Device tags are associated with data values polled from a Device. You may set up Device tags to be polled in real time or to be polled from the device's trend (or snapshot) log using automatic data repopulation (ADR).

- Manual tags are placeholders in the database that allow a user to manually input values that are used in reports but are not available as device tags.
- Derived tags are the result of calculations performed on combinations of other meter tags.

Most meter tags are associated with a Value type. The value type is used by the billing and reporting functions to aggregate data of a certain type from one or more meters or groups. FactoryTalk EnergyMetrix includes a number of **default value types**. You may easily add custom Value types from the **Unit Setup** page on the **System** tab.

Default value types

Default Value Types include the following electrical energy and demand parameters:

Value Type	Units	Consumption	Demand
Real Energy Net	kWh	X	
Real Energy Exported	kWh	X	
Real Energy Imported	kWh	X	
Reactive Energy Net	kVARh	X	
Reactive Energy Exported	kVARh	X	
Reactive Energy Imported	kVARh	X	

Value Type	Units	Consumption	Demand
Real Power Demand	kW		X
Reactive Power Demand	kVAR		X
Apparent Power Demand	kVA		X

You may add new Value Types. Navigate to the Unit Setup screen in the Navigation Tree.

Alarms

FactoryTalk EnergyMetrix alarming provides notification to users, or generation of reports based on a number of conditions. For details, see "Configuring alarming" (page 250).

Opening meters

To navigate to a meter, select the **Meters** tab in the navigation tree. Then drill down through the group or domain to the desired Meter.

The detail pane display for a meter provides a number associated displays:

- The **Meter Data** tab provides a tabular view of the meter Tags and the logged values of each Tag
- The **Trend** tab provides a graphical time trend or profile of user selected Tags over a user selected time scale
- The **Calendar Trend** tab allows you to chart user selected Tags in a calendar format
- The **Meter Setup** tab lets you perform the following actions:

- View, add, edit, copy, and delete meters.
- View and add meter tags.
- View device tags.
- View and alarms.

Configuring meters

For details on setting up meters, see "Configuring device-based meters" (page 165).

Notes on meters

It is important to understand the difference between a Meter and a Device. A Device is a physical piece of hardware such as a power monitor or programmable controller, or a software application such as an **OPC server**.

OPC device

An OPC device is a customer-furnished OPC driver that establishes OPC topics for communicating with third party electric power meters, programmable controllers and other devices using third-party communications protocols such as Modbus, DNP-3, etc. The Manager activation supports a connection to the RSLinx Classic OPC driver without installing the FactoryTalk EnergyMetrix OPC option. RSLinx Classic must be activated at an OEM level or higher (Professional, Gateway, etc.)

Important: In order to communicate with third party devices such as power monitors from other vendors, the optional FactoryTalk EnergyMetrix OPC connectivity software package must be installed as well as one or more customer-furnished OPC drivers.

- A Meter is a logical, or virtual, device that functions as a collection of data Tags. Three examples illustrating the importance of this distinction are:

- A power monitor is a single Device. Each of its status inputs may be used as a Meter by connecting a pulse type meter and counting pulses.
- A Programmable Controllers is a single Device which may include a number of Meters, each configured as a **user-defined data source**.

User-defined data source

A User-defined data source (UDDS) is a logical meter that exists with a Device such as a programmable controller. A UDDS may be configured to provide practically any energy or process-related data point for logging, graphing and reporting.

Some of these meters may also be devices, as where a PLC controller concentrates data from multiple power monitors for data logging yet each power monitor is also accessible from FactoryTalk EnergyMetrix RT for viewing all data, logs, oscillographs, etc.

Configuring device-based meters

To configure a device-based meter:

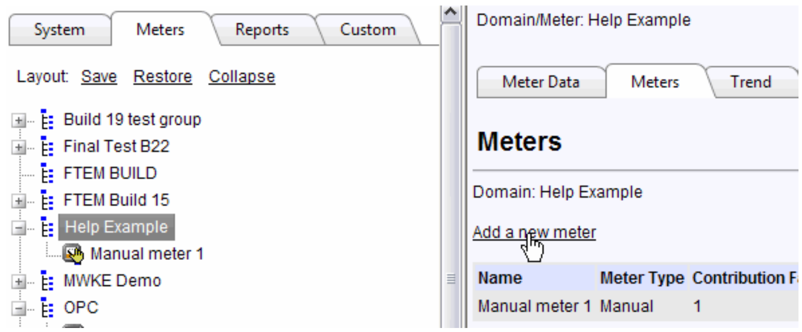
1. Click the **Meters** tab, and then select a group or domain for the meter location. If you need to, create a new **group**.

   #### Group

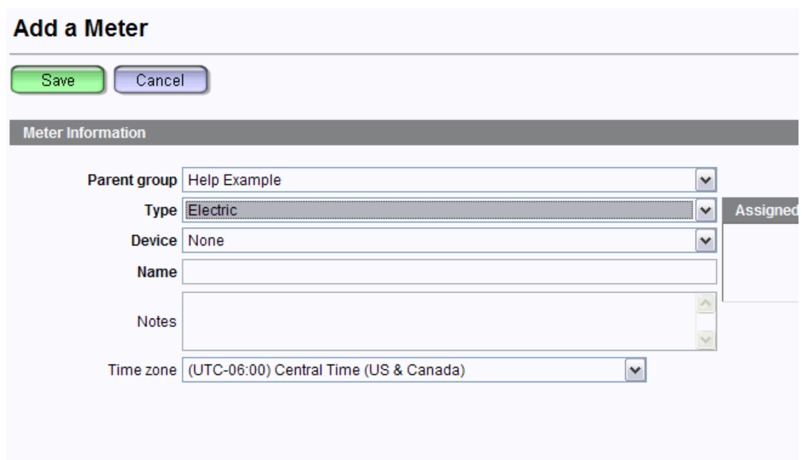
   A **group** is a named collection of devices and meters that represents a subdivision of your enterprise such as a department, division or process. Groups contain meters, which may be shared between groups.

   A page for the selected group or domain appears.

2. Click the **Meters** tab, and then click the **Add a new meter** link.



The **Add a Meter** dialog box appears.



3. Select a Parent Group. The default is the group selected when you began to configure the meter.
4. Select a meter **Type** from the list.

Meter types

Default meter types you may select include:

- Manual
- Water

- Air
- Gas
- Electric
- Steam
- Environmental

6. Select a Device from the list. If you need to, configure a new Device.
7. Enter a **name** for the new meter and any notes you wish to record.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons

- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

9. Select a **time zone** for the meter.

Select time zone for a meter

The time zone you select for a meter during set up will determine the Co-ordinated Universal Time (UTC) time logged in the database.

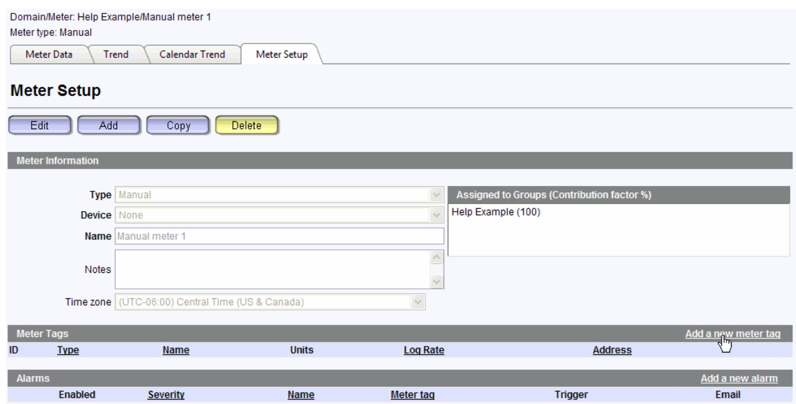
For example, data scanned at 9:00 AM for a meter in the Eastern time will have a UTC timestamp of 1400 hrs.

Important: The time zone selected for a meter during meter setup must match the time zone in which the meter is physically located.

Meter data, trends and calendar trends are viewed in the logged-in user time zone.

A new meter is automatically configured to contribute 100% of its value to its parent group. To adjust the contribution factor, navigate to the **System** tab, **Groups** folder. Select the parent group of the new meter and edit the **Group Setup** page.

11. Click **Save**.
12. To add meter tags, click the **Add a new meter tag** link.



13. Add meter tags and alarms as desired.

When finished adding meter tags, you may click **Read Device Tags** to view the value of the device tags.

Configuring manual meters

Manual meters allow the integration of data from non-automatic data sources such as legacy electric revenue meters, water meters, oil flow gauges and the like into the database and reports. In a manual meter, a user reads data from the legacy meter and enters the meter reading into FactoryTalk EnergyMetrix.

You may also use a manual meter to enter data needed in reports that is not available through an automatic data source. For example, your gas bill may include a "Heating factor" that varies from month to month. Setting up a manual meter allows you to enter each months parameter for use in that months report and for historical records.

You may also set up manual meters and manual meter tags as targets for data transferred from other data sources such as production or ERP databases.

Tip: Users who plan to convert from manual meters to power monitors in the future may set up manual meters with device tags. When the power monitor is eventually installed, the meter can be changed to a Device type. FactoryTalk EnergyMetrix will include records from both the manual meter and the power monitor in the same meter database.

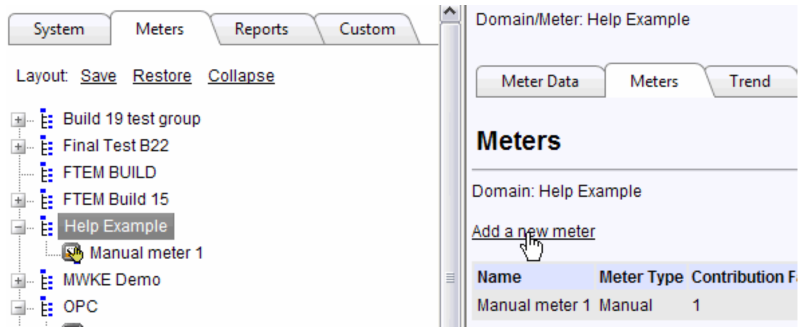
To configure a manual meter:

1. Click the **Meters** tab, and then select a group or domain for the meter location. If you need to, create a new **group**.

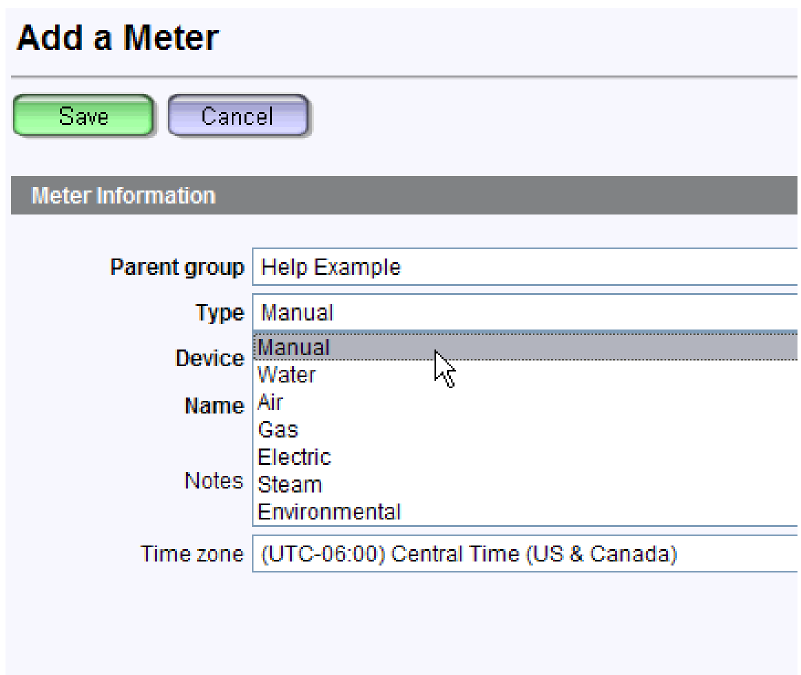
   Group

   A **group** is a named collection of devices and meters that represents a subdivision of your enterprise such as a department, division or process. Groups contain meters, which may be shared between groups.

   A page for the selected group or domain appears.
2. Click the **Meters** tab, and then click the **Add a new meter** link.



The **Add a Meter** dialog box appears.



3. Select a meter type from the **Type** list. Manual meters may be assigned any meter type.
4. Select **None** as the **Device**.
5. Enter **Name**, any **Notes**, and select **Time zone** for the meter.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name

'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

Note fields

Notes fields (other than Rate Schedule notes fields) may be up to 255 characters in length, with no limitation on character selection. Notes fields in Rate Schedules may be any length.

Select time zone for a meter

The time zone you select for a meter during set up will determine the Co-ordinated Universal Time (UTC) time logged in the database.

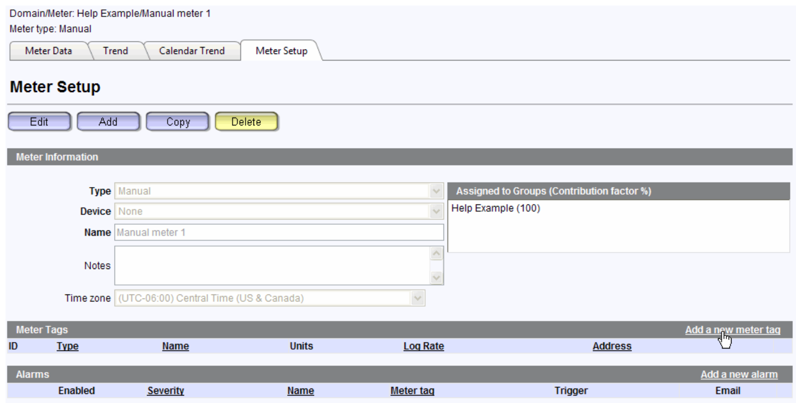
For example, data scanned at 9:00 AM for a meter in the Eastern time will have a UTC timestamp of 1400 hrs.

Important: The time zone selected for a meter during meter setup must match the time zone in which the meter is physically located.

Meter data, trends and calendar trends are viewed in the logged-in user time zone.

9. Click **Save**.

10. To add meter tags, click the **Add a new meter tag** link.



For details on setting up a meter tag, see "Configuring meter tags" (page 187).

Configuring OPC meters

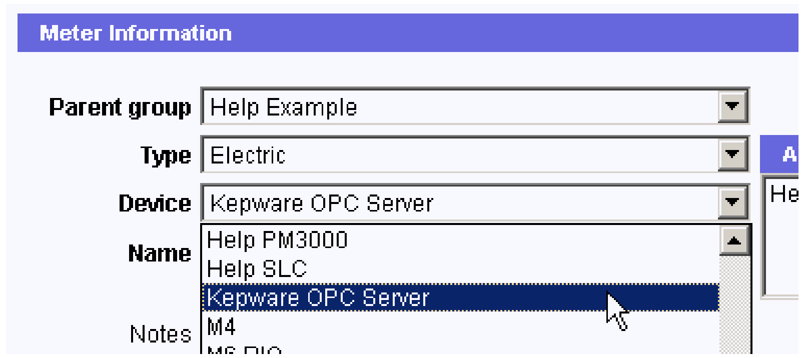
OPC meters allow FactoryTalk EnergyMetrix to communicate with a wide variety of Rockwell Automation, Inc. and third-party devices using OPC. Starting with FactoryTalk EnergyMetrix version 1.5, connection with the RSLinx Classic OPC server is supported in Manager. Connection to third party OPC servers such as Kepware requires installation of the FactoryTalk EnergyMetrix OPC 3rd party communications option.

An important use for OPC meters is to log data from Allen-Bradley Logix family controller native tags.

Tip: You must first configure an OPC Device before you may configure meters associated with the OPC server. You may also need to configure the OPC Server with channels, tags, topics, and/or items depending on the specific server.

To set up an OPC meter:

1. Select the name of the OPC Device from the **Device list**.



2. Enter a **Name** for the Meter and select a **Time zone**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods

- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

Select time zone for a meter

The time zone you select for a meter during set up will determine the Co-ordinated Universal Time (UTC) time logged in the database.

For example, data scanned at 9:00 AM for a meter in the Eastern time will have a UTC timestamp of 1400 hrs.

Important: The time zone selected for a meter during meter setup must match the time zone in which the meter is physically located.

Meter data, trends and calendar trends are viewed in the logged-in user time zone.

5. Enter the Access path. For details, see "OPC server details" (page 177).
6. Click **Save**.

   To add meter tags, click the **Add a new meter tag** link.

For details on setting up a meter tag, see "Configuring meter tags" (page 187).

OPC server details

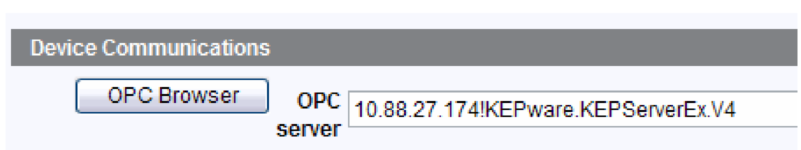
Syntax

Use this format for communicating with OPC servers:

```
[ComputerNodeName!]OPCServerName.AccessPath.Item
```

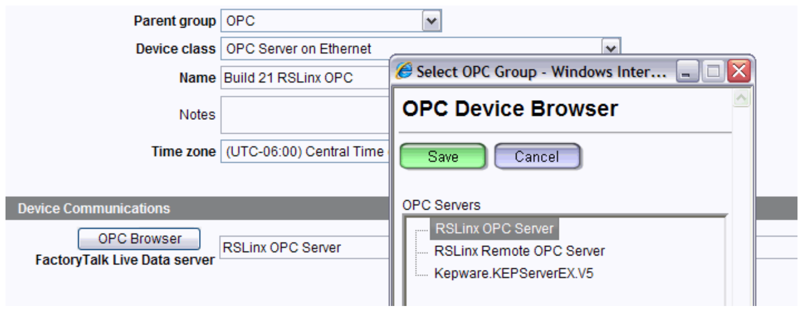
Device setup

The Server Name is entered into the Device setup. Specify a remote OPC server by inserting the node name of the computer where the OPC server is running ahead of the OPC server name. The node name and server name must be separated with an exclamation character. Acceptable node names are UNC names (Server), or DNS names or IP addresses (server.com, www.vendor.-com, or 192.168.1.101). For example:



If the OPC server is running on the local server machine, you may browse to the OPC Server. Click **OPC Browser** to open the **OPC Device Browser** dialog box. This dialog box displays the available

OPC servers. Click the OPC server name and then click Save to add it to the device setup.



Meter and meter tag setup

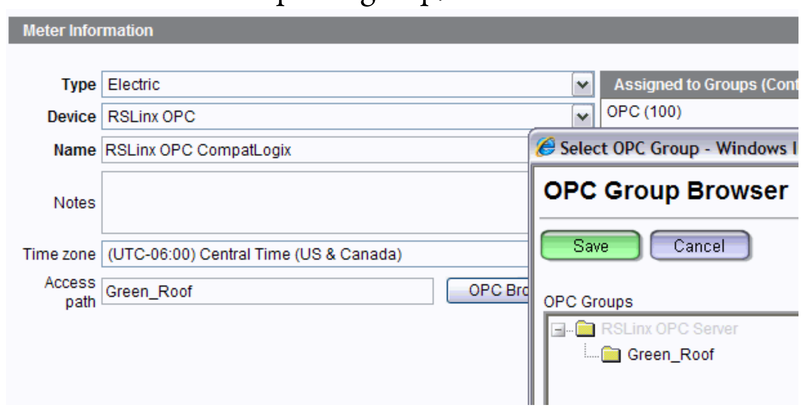
The Meter setup contains the Access Path and the Meter Tag setup contains the Item address.

To configure a meter and a meter tag:

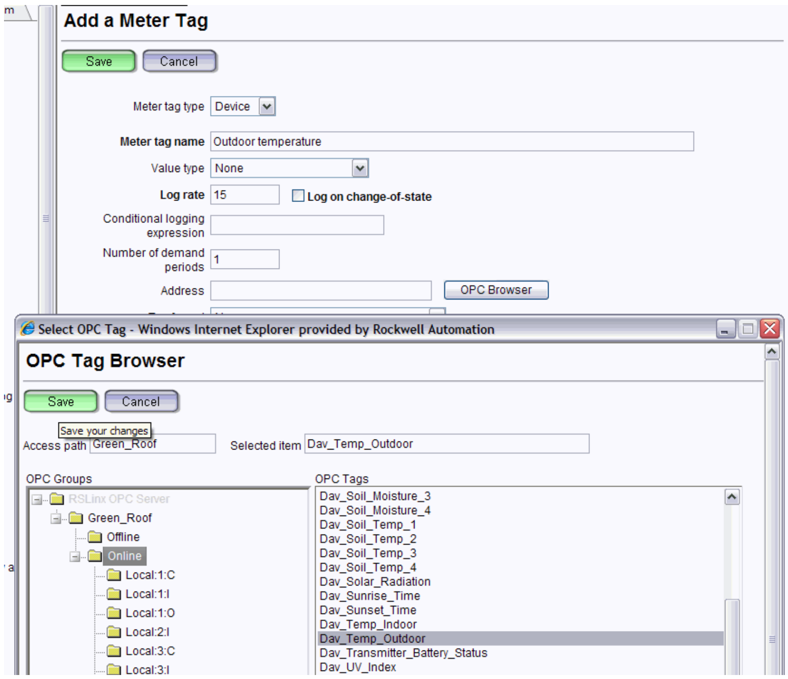
1. Click **OPC Browser**.

   The **OPC Group Browser** dialog box appears.

2. Select the desired topic or group, and then click **Save**.



You may browse for OPC meter tags in the same way.



Refer to your OPC server documentation for assistance in setting up the OPC server, establishing communications with the third-party devices, configuring topics and the proper server name, topic, group and item configuration to be entered into the device, meter and tag setup pages.

Configuring roll-up server meters

Roll-up server functionality in FactoryTalk EnergyMetrix supports transfer of meter data from a local FactoryTalk EnergyMetrix (or FactoryTalk EnergyMetrix) server database to another. Typically a **roll-up server** is used in a corporate setting to consolidate and summarize local plant energy information.

Roll-up server

Roll-up is the term used for replication of tag data between servers. Roll-up devices, meters and meter tags are configured very similarly to how to set up devices and device-based meters and meter tags. Roll-up data, that is data from a remote server replicated in the roll-up server, may be utilized by the standard functions including data viewing, charting and reporting, just as if the data were logged locally.

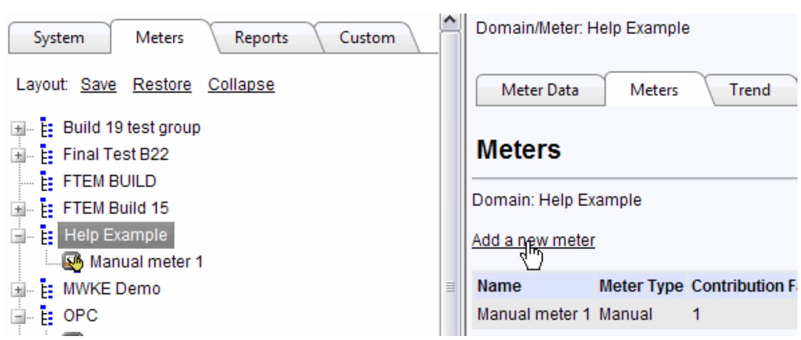
A setting in the Configuration page or the **web.config** file determines how often the roll-up replication occurs. The default is 60 minutes.

Important: If you plan to use roll-up server meters, please install Internet Explorer WebControls 1.0 on the server.

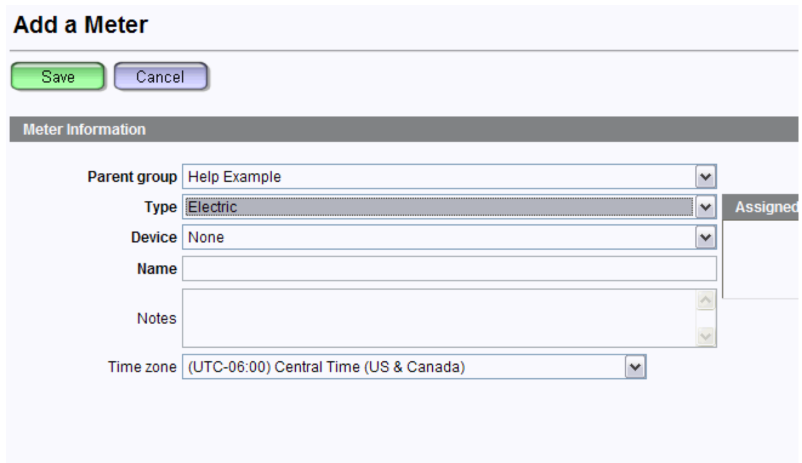
Tip: If custom value types have been added to a local FactoryTalk EnergyMetrix server, identical value types must exist in the roll-up server to prevent meter tags and their data in the roll-up server from being assigned incorrect value types. Identical value types have the same Value Type ID, description, units, demand and consumption flag settings.

To create a roll-up server meter:

1. Select the **Meters** tab in the navigation tree.
2. Select a group or domain for the meter location.
3. Select the **Meters** tab in the detail pane.
4. Click the **Add a new meter** link.



The **Add a Meter** dialog box appears.



5. Select a Parent Group.

   The default is the group selected when you began to configure the meter

6. Select a **meter type** from the list.

   ### Meter types

   Default meter types you may select include:

   - Manual
   - Water
   - Air
   - Gas
   - Electric
   - Steam
   - Environmental

8. Select a Device from the list.
9. Enter a **name** for the new meter and any notes you wish to record.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name

'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

11. Select a **time zone** for the meter.

Select time zone for a meter

The time zone you select for a meter during set up will determine the Co-ordinated Universal Time (UTC) time logged in the database.

For example, data scanned at 9:00 AM for a meter in the Eastern time will have a UTC timestamp of 1400 hrs.

Important: The time zone selected for a meter during meter setup must match the time zone in which the meter is physically located.

Meter data, trends and calendar trends are viewed in the logged-in user time zone.

A new meter is automatically configured to contribute 100% of its value to its parent group. To adjust the contribution factor, select the parent group and edit the **Group Setup** page.

13. Click **Save**.

Tip: To add meter tags, click the **Add a new meter tag** link. For details, see "Configuring roll-up meter tags" (page 212).

Sharing meters between groups and domains

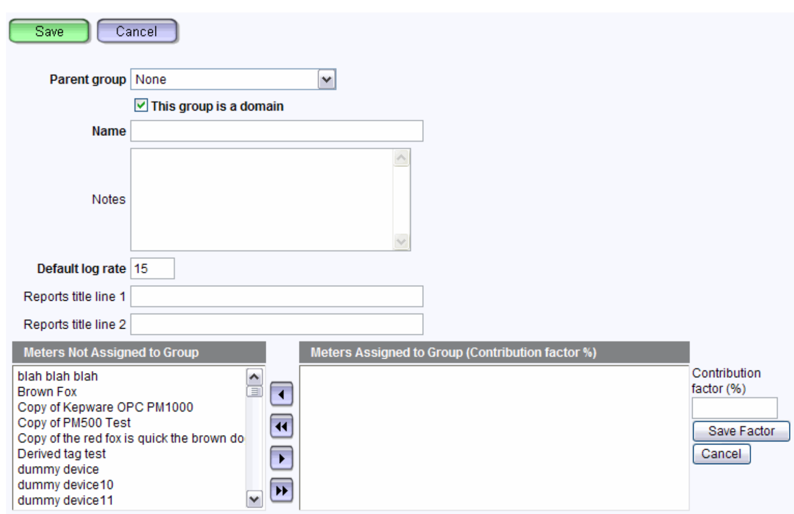
You may assign a meter to multiple groups, move a meter from one group to another, or apportion a meter among different groups or domains.

To share a meter between groups and domains:

1. On the **System** tab, expand the **Groups** folder, and then click a group or a domain that will share the meter.

   The **Group Setup** page appears.
2. Click **Edit** .
3. Select the meter to share.

   If the meter is not assigned to the group or domain, select it in the **Meters Not Assigned to Group** window and click the right arrow to assign it.

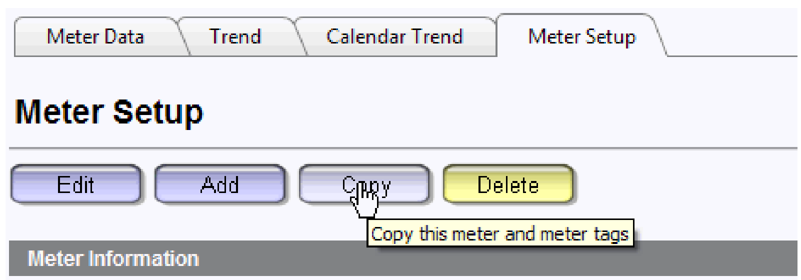


4. With the meter selected, enter a Contribution Factor between 0 and 100%. The default meter contribution factor is 100%. Click **Save** adjacent to the contribution factor field.
5. Click **Save**.

Important: FactoryTalk EnergyMetrix does not check that the contribution factors for a meter total 100%.

Copying or deleting meters

You can copy or delete a device on the **Meter Setup** page.



Copying meters

Copying **meter**s can increase productivity during initial setup of FactoryTalk EnergyMetrix or when adding power monitors to an existing system.

Meter

A **meter** is a logical source of data and is the unit used for licensing FactoryTalk EnergyMetrix Manager software.

There are the following types of meters:

Device meter

A data source associated with a physical piece of hardware such as a power monitor or a programmable controller, or a software application such as an OPC server. Tags associated with device meters are generally polled automatically.

Manual meter

A logical or virtual device that functions as collections of data tags. Manual meters are data sources that permit data to be entered manually.

Tip: To save time, create a master meter for each Device Class, create all the desired Meter Tags, verify logging and data correctness. Once the master meter has been verified, then make copies of it.

To copy a meter:

1. Select the meter you wish to copy in the **Meters** tab.
2. Select the **Meter Setup** tab on the meter page.
3. Click **Copy**.

   A new meter is created, with the name "Copy of <selected device name>". The new name is truncated if longer than 50 characters.

   Important: A new copy of a Device Meter is associated with the same device (if any) as the copied Meter, and includes replicas of all meter tags. The new meter tag addressing is based on the Device Class of the device associated with the meter that was copied. If the Device associated with the new copy is different than that associated with the original meter, the tag addressing is likely to be incorrect. For example, meter tag addressing for a PowerMonitor 3000 on Ethernet (Series A) is different than the addressing for a PowerMonitor 3000 on EtherNet/IP (Series B). Some device meter tags will require re-addressing in any event, such as 1803-EEM or PLC based meter tags.
4. Rename the new meter as desired.
5. Change the associated Device.

You may also change any other Meter Setup parameters, including Time Zone, etc.

6. Click **Save**.

Tip: The new Meter copy will be assigned to the same Group(s) as the meter that was copied. To change the group assignment, use the meter assignment function in the **System** tab > **Group Setup** page.

Deleting meters

Important: Deleting a Meter also deletes all Meter Tags and purges all data associated with the meter in the FactoryTalk EnergyMetrix database. When a large quantity of data is purged, it is possible that a timeout error will occur in Microsoft SQL server, requiring a server restart.

Tip: Do not delete a Meter to remove it from a group, as the meter will be deleted from all groups to which it is assigned. To unassign a meter from a group, use the meter assignment function in the **System** tab > **Group Setup** page.

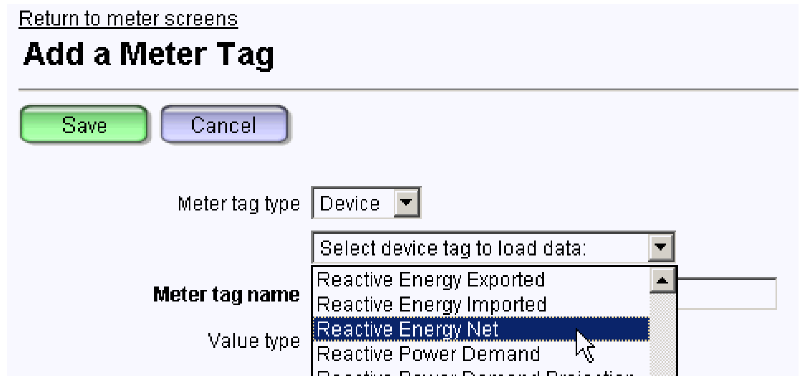
To delete a meter:

1. Select the meter you wish to delete in the **Meters** tab.
2. Select the **Meter Setup** tab on the meter page.
3. Click **Delete**
4. Click **OK**.

Configuring meter tags

To configure a meter tag:

- On the **Meter Setup** tab, click the **Add a new meter tag** link.

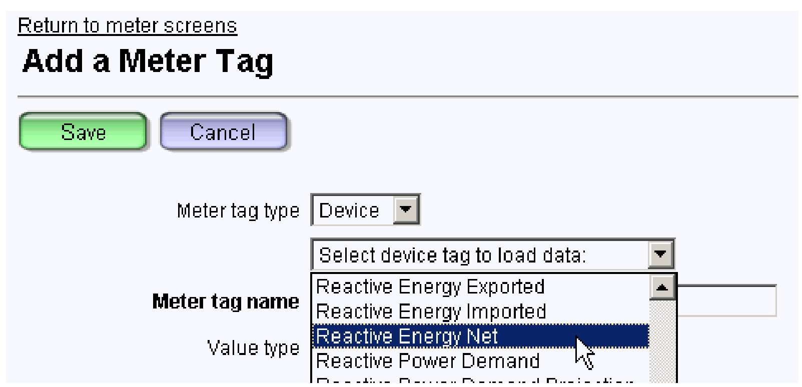


The next step depends on what kind of meter tag you wish to configure, and if it is a Device tag, what type of device it is. Select a link from the **Related Topics** section below for help with setting up a meter tag for each type of device.

Configuring Allen-Bradley power monitor tags

To configure an Allen-Bradley power monitor tag:

1. On the **Add a Meter Tag** page, leave the Meter tag type as Device.



2. Select a **tag** from the **Select device tag to load data** list.

Allen-Bradley power monitor loggable tags

You may select any power monitor parameter found in a real-time data table for logging. Certain parameters, such as data logs, harmonics, and setpoints are found in indexed data tables and are not available for logging. The list below of PowerMonitor 3000 parameters gives an example of meter tag names that are available.

Alarm Word	L3 True Power Factor
Amp Hours	L3-L1 Voltage
Apparent Energy Net	L3-N Voltage
Apparent Power Demand	Last Cycle Frequency
Apparent Power Demand Projection	Negative Sequence Current
Average Current	Negative Sequence Voltage
Average Frequency	Neutral Current
Average L-L Voltage	Percent Current Unbalance
Average L-N Voltage	Percent Voltage Unbalance
Current Demand	Phase Rotation
Current Demand Projection	Positive Sequence Current
Demand Period Elapsed Time	Positive Sequence Voltage
Frequency Source	Reactive Energy Exported
L1 Apparent Power	Reactive Energy Imported
L1 Current	Reactive Energy Net
L1 Displacement Power Factor	Reactive Power Demand
L1 Distortion Power Factor	Reactive Power Demand Projection
L1 Reactive Power	Real Energy Exported
L1 Real Power	Real Energy Imported
L1 True Power Factor	Real Energy Net
L1-L2 Voltage	Real Power Demand
L1-N Voltage	Real Power Demand Projection
L2 Apparent Power	Relay 1 Status
L2 Current	Relay 2 Status
L2 Displacement Power Factor	Status Input 1 Counter
L2 Distortion Power Factor	Status Input 2 Counter
L2 Reactive Power	Status Inputs
L2 Real Power	Total Apparent Power

L2 True Power Factor L2-L3 Voltage L2-N Voltage L3 Apparent Power L3 Current L3 Displacement Power Factor L3 Distortion Power Factor L3 Reactive Power L3 Real Power	Total Displacement Power Factor Total Distortion Power Factor Total Reactive Power Total Real Power Total True Power Factor

The remaining fields are automatically filled in.

Important: Do not change any of the remaining fields from the values that FactoryTalk EnergyMetrix fills in automatically. Changing the address, data format, scaling, value type and other parameters may prevent logging of the tag or may cause the tag to be logged with erroneous data.

3. Set the **Log rate** to the polling interval you desire.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

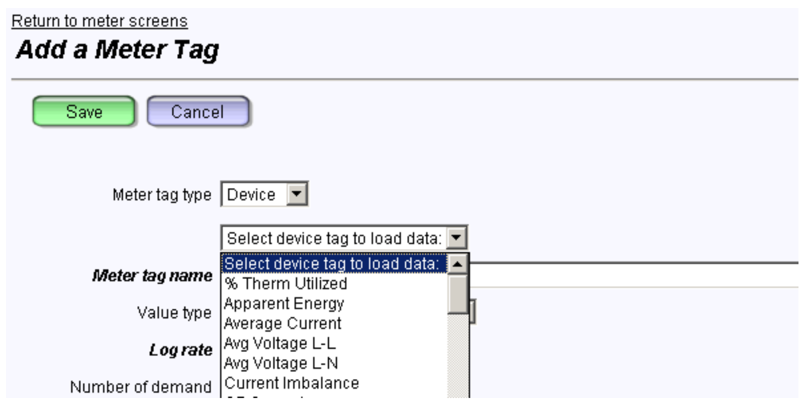
Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

4. Click **Save**.

Configuring Allen-Bradley motor protection device tags

To configure an Allen-Bradley overload relay and motor protection system tag:

1. On the **Add a Meter** page, leave the Meter tag type as Device.



2. Select a **tag** from the **Select device tag to load data** list.

Allen-Bradley power monitor loggable tags

You may select any power monitor parameter found in a real-time data table for logging. Certain parameters, such as data logs, harmonics, and setpoints are found in indexed data tables and are not available for logging. The list below of PowerMonitor 3000 parameters gives an example of meter tag names that are available.

Alarm Word	L3 True Power Factor

Amp Hours	L3-L1 Voltage
Apparent Energy Net	L3-N Voltage
Apparent Power Demand	Last Cycle Frequency
Apparent Power Demand Projection	Negative Sequence Current
Average Current	Negative Sequence Voltage
Average Frequency	Neutral Current
Average L-L Voltage	Percent Current Unbalance
Average L-N Voltage	Percent Voltage Unbalance
Current Demand	Phase Rotation
Current Demand Projection	Positive Sequence Current
Demand Period Elapsed Time	Positive Sequence Voltage
Frequency Source	Reactive Energy Exported
L1 Apparent Power	Reactive Energy Imported
L1 Current	Reactive Energy Net
L1 Displacement Power Factor	Reactive Power Demand
L1 Distortion Power Factor	Reactive Power Demand Projection
L1 Reactive Power	Real Energy Exported
L1 Real Power	Real Energy Imported
L1 True Power Factor	Real Energy Net
L1-L2 Voltage	Real Power Demand
L1-N Voltage	Real Power Demand Projection
L2 Apparent Power	Relay 1 Status
L2 Current	Relay 2 Status
L2 Displacement Power Factor	Status Input 1 Counter
L2 Distortion Power Factor	Status Input 2 Counter
L2 Reactive Power	Status Inputs
L2 Real Power	Total Apparent Power
L2 True Power Factor	Total Displacement Power Factor
L2-L3 Voltage	Total Distortion Power Factor
L2-N Voltage	Total Reactive Power
L3 Apparent Power	Total Real Power
L3 Current	Total True Power Factor
L3 Displacement Power Factor	

L3 Distortion Power Factor L3 Reactive Power L3 Real Power	

The remaining fields are automatically filled in.

Important: Do not change any of the remaining fields from the values that FactoryTalk EnergyMetrix fills in automatically. Changing the address, data format, scaling, value type and other parameters may prevent logging of the tag or may cause the tag to be logged with erroneous data.

4. Set the **log rate** to the polling interval you desire.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

6. Click **Save**.

Configuring 1803-EEM Ethernet Energy Module tags

An EEM is a controller provided by Rockwell Automation, Inc. with specific application logic that totalizes pulse and analog inputs for logging by FactoryTalk EnergyMetrix. The EEM as such is no longer offered by Rockwell Automation, Inc..

Tip: The IA Energy Management Accelerator Toolkit available at no charge from Rockwell Automation, Inc. provides information and logic samples.

Meter tags in the EEM are structured in floating point files beginning with F101. Each file number (F101, F102, etc.) represents a separate pulse or analog meter.

There are the following file elements to assign:

- Fx:10 - Total consumption. Nominally rolls over to zero at 9,999,999. See below.
- Fx:11 - Flow rate.
- Fx:12 - Peak flow rate (since last peak reset).
- Fx:13 - Demand flow rate.
- Fx:14 - Peak demand flow rate (since last peak reset).

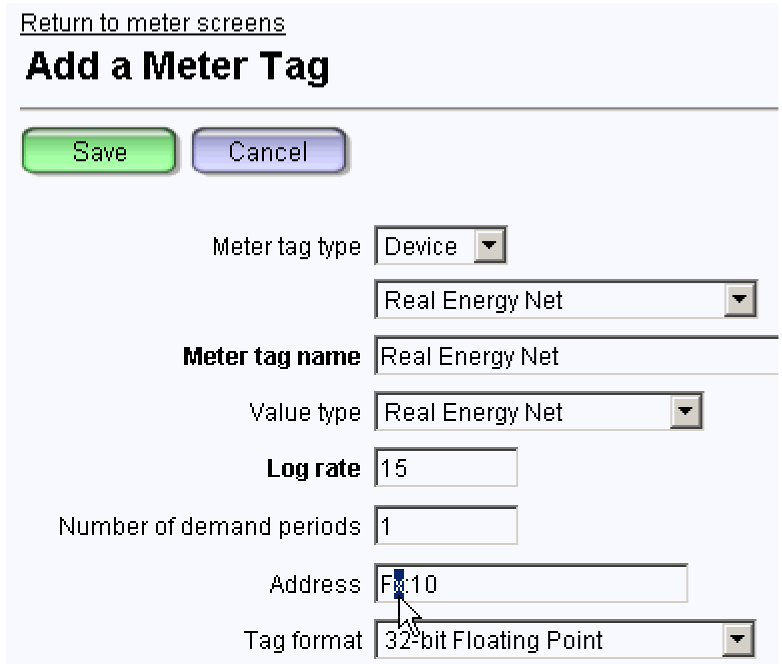
  Please refer to the 1803-EEM User Manual for further information.

Tip: The nominal rollover value of 10,000,000 may need to be changed if the meter pulse constant entered into the EEM is scaled from the actual pulse constant. The meter pulse weight set in the EEM must be coordinated with the meter tag scale factor and rollover value in FactoryTalk EnergyMetrix. Generally if the pulse weight in the EEM is scaled by a factor, the meter tag scale must be scaled by the same factor and the rollover value divided by the same factor.

To configure an EEM tag:

1. On the **Add a Meter Tag** page, select the desired tag from

the **Select device tag to load data** list.



The remaining fields are automatically filled in.

2. In the **Address** field, substitute the file number for the "x" in the address.

   Important: Do not change any of the remaining fields from the values that FactoryTalk EnergyMetrix fills in automatically. Changing the data format, scaling, value type and other parameters may prevent logging of the tag or may cause the tag to be logged with erroneous data.

3. Set the **Log rate** to the polling interval you desire.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

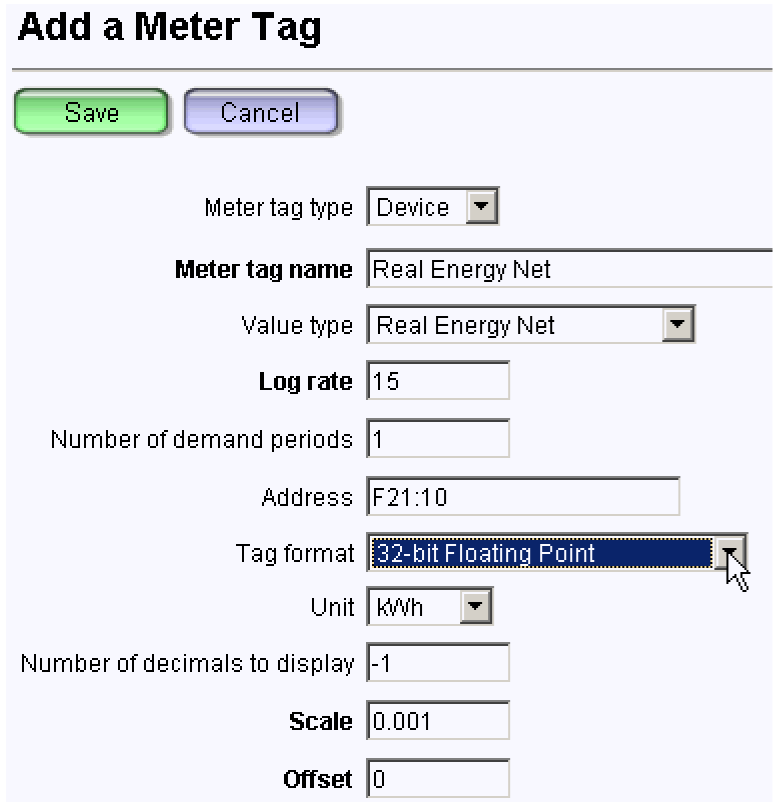
Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

5. Click **Save**.

Configuring PLC-5, SLC 500 or MicroLogix meter tags

To configure a PLC-5, SLC 500 or MicroLogix tag:

1. On the **Add a Meter Tag** page, leave the Meter tag type set to Device.



2. Enter a **meter tag name**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.

- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

4. If the tag corresponds to a Value Type, select a **value types** from the list.

Default value types

Default Value Types include the following electrical energy and demand parameters:

Value Type	Units	Consumption	Demand
Real Energy Net	kWh	X	
Real Energy Exported	kWh	X	
Real Energy Imported	kWh	X	
Reactive Energy Net	kVARh	X	
Reactive Energy Exported	kVARh	X	
Reactive Energy Imported	kVARh	X	
Real Power Demand	kW		X
Reactive Power Demand	kVAR		X
Apparent Power Demand	kVA		X

You may add new Value Types. Navigate to the Unit Setup screen in the Navigation Tree.

6. Enter a **log rate**.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

8. Type in the Address in PLC-5/SLC 500/MicroLogix address format, e.g. F21:10. Supported data type types are floating point (F) and integer (N). MicroLogix also supports long integer (L) type.
9. Select the appropriate Tag format from the list.
10. Select the Units, Number of decimals to display, Scale, Offset, and Rollover Value for the tag as appropriate
11. Click **Save**.

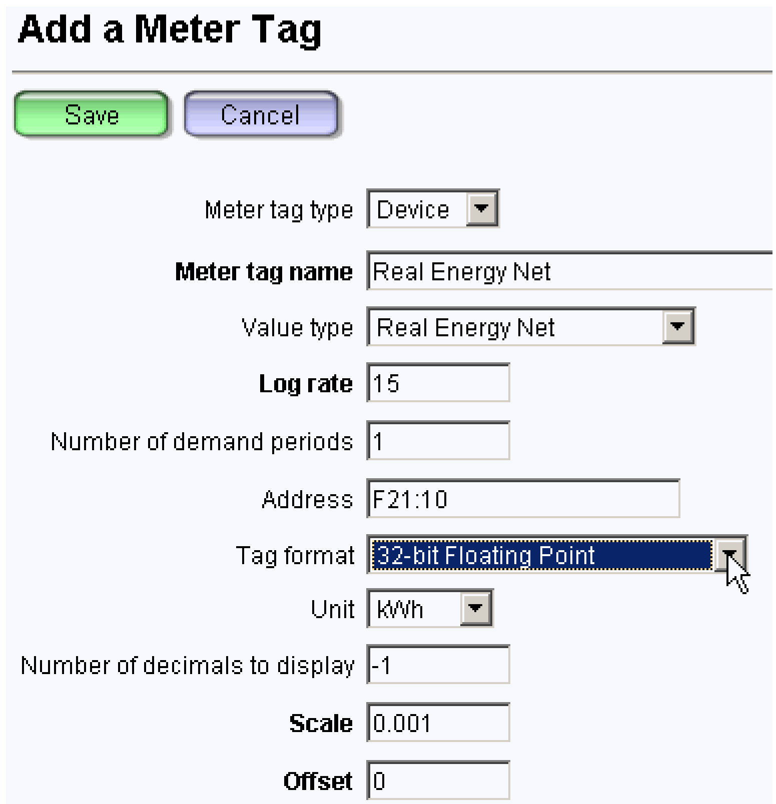
Configuring ControlLogix meter tags

For meters attached to ControlLogix device types, FactoryTalk EnergyMetrix communicates with PLC-5 or SLC 500 mapped tags in the ControlLogix controller. The user must perform the tag mapping and configure meters using the mapped addresses.

To communicate with ControlLogix native tags, use an OPC meter and the RSLinx Classic OPC server. For details, see "Configuring OPC tags" (page 205).

To configure a ControlLogix tag:

1. On the **Add a Meter Tag** page, leave the **Meter tag type** set to **Device**.



2. Type **Meter tag name**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

4. Select a **Value Type** from the list, if the tag corresponds to a Value Type.

Default value types

Default Value Types include the following electrical energy and demand parameters:

Value Type	Units	Consumption	Demand
Real Energy Net	kWh	X	
Real Energy Exported	kWh	X	
Real Energy Imported	kWh	X	
Reactive Energy Net	kVARh	X	
Reactive Energy Exported	kVARh	X	
Reactive Energy Imported	kVARh	X	
Real Power Demand	kW		X
Reactive Power Demand	kVAR		X
Apparent Power Demand	kVA		X

You may add new Value Types. Navigate to the Unit Setup screen in the Navigation Tree.

6. Type a **Log rate**.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

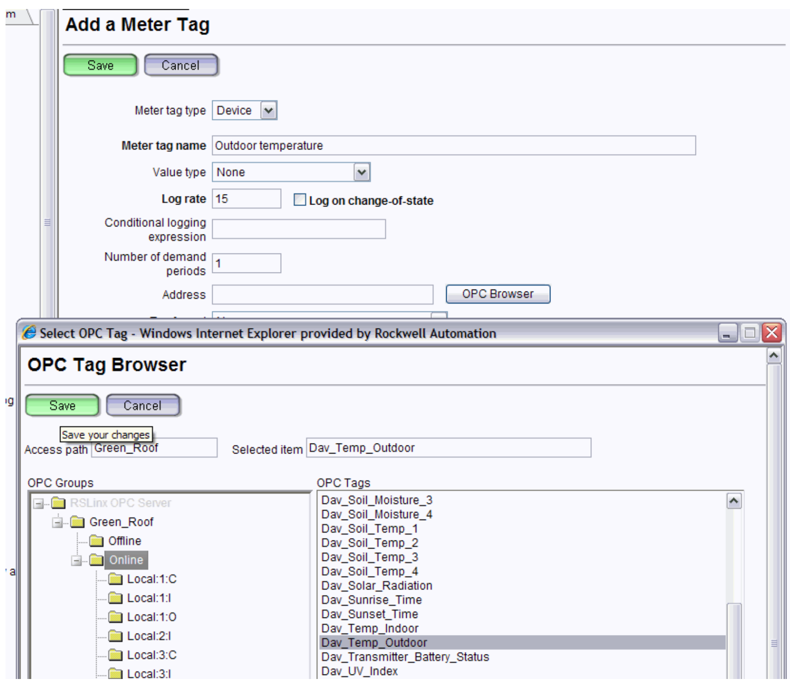
8. In the **Address** box, type a mapped address in the PLC-5/SLC 500 address format, e.g. `F21:10`.
9. In the **Tag format** list, select the appropriate tag format.
10. Define the following properties for the tag:
    - **Unit**.
    - **Number of decimals to display**.
    - **Scale**.
    - **Offset**.
    - **Rollover value**.
11. Click **Save**.

Configuring OPC tags

Important: Ten meter licenses are included in Manager. These meters may be any combination of RSLinx and OPC meters. Beyond the first ten meters, in order to communicate with third-party devices such as power monitors from other vendors, the optional FactoryTalk EnergyMetrix OPC connectivity software package must be installed. For details, see "OPC third-party connectivity" (page 34).

To configure an OPC meter tag:

1. On the **Add a Meter Tag** page, leave the Meter tag type set to Device.



2. Enter a **Name** for the meter tag. If the tag corresponds to a standard **value type**, select it from the list.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

Default value types

Default Value Types include the following electrical energy and demand parameters:

Value Type	Units	Consumption	Demand
Real Energy Net	kWh	X	
Real Energy Exported	kWh	X	
Real Energy Imported	kWh	X	
Reactive Energy Net	kVARh	X	
Reactive Energy Exported	kVARh	X	
Reactive Energy Imported	kVARh	X	
Real Power Demand	kW		X
Reactive Power Demand	kVAR		X
Apparent Power Demand	kVA		X

You may add new Value Types. Navigate to the Unit Setup screen in the Navigation Tree.

5. Enter a **Log Rate**.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

7. Enter the Item name in the Address field. For details, see "OPC server details" (page 177).
8. Select the tag format and units, as applicable.
9. Click **Save**.

Tip: FactoryTalk EnergyMetrix includes an OPC Test Client that can be used for verifying and troubleshooting logging from OPC servers. The OPC Test Client may be found on the server in the **bin** folder under the FactoryTalk EnergyMetrix **program folder**.

Program folder

The default program folder is:

- For 32-bit servers:

```
C:\Program Files\Rockwell Software\FactoryTalk
EnergyMetrix
```

- For 64-bit servers:

```
C:\Program Files (x86)\Rockwell Soft-
ware\FactoryTalk EnergyMetrix
```

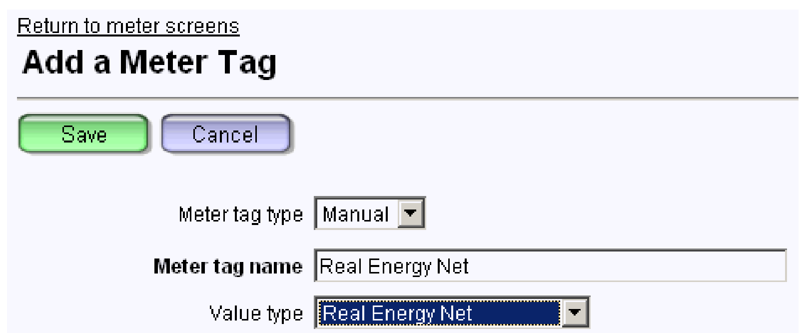
Configuring manual tags

Note: You can configure up to 25 meter tags for manual meters. The manual meters with more than 25 tags will generate an error.

To configure a manual tag for a manual meter:

1. On the **Meter Setup** tab, click the **Add a new meter tag** link.

   The **Add a Meter tag** page appears.



2. Select **Manual** from the **Meter tag type** list. This is required for the **Enter Data** button to appear in the **Meter Data** page, allowing you to enter manual meter data.
3. Give the tag a **Name**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

5. If desired, select a **Value Type** from the list.

Default value types

Default Value Types include the following electrical energy and demand parameters:

Value Type	Units	Consumption	Demand
Real Energy Net	kWh	X	
Real Energy Exported	kWh	X	
Real Energy Imported	kWh	X	
Reactive Energy Net	kVARh	X	
Reactive Energy Exported	kVARh	X	
Reactive Energy Imported	kVARh	X	
Real Power Demand	kW		X
Reactive Power Demand	kVAR		X
Apparent Power Demand	kVA		X

You may add new Value Types. Navigate to the Unit Setup screen in the Navigation Tree.

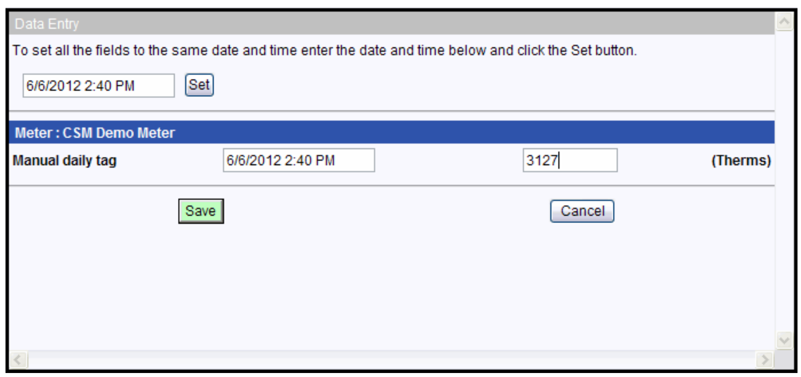
7. For a manual tag, leave the rest of the fields on the page as they are.
8. Click **Save**.

Providing data manually

You may set up manual meters and manual meter tags that allow you to enter data manually. Once a manual meter and its tags have been set up , you may enter data into the manual meter tags. You may enter data for a single meter or for a group of meters at one time.

To provide data manually:

1. Navigate to the **Meters** tab.
2. To enter data into a Group, select the **Group**. To enter data into a single Meter, select a meter.
3. On the **Meter Data** tab, click **Enter Data**.



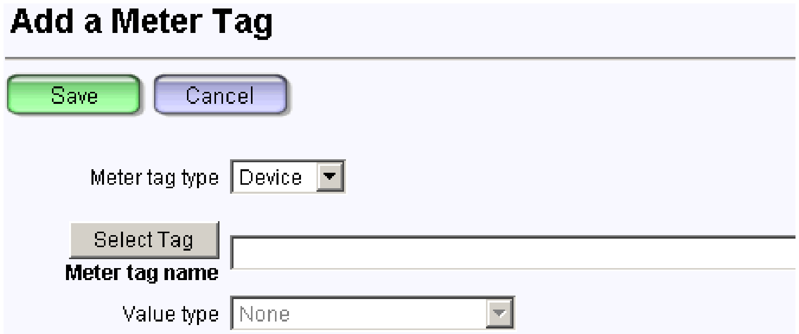
4. Enter a date and time in the date / time field and click **Set**.
5. Enter the desired data for each manual tag. Data will be scaled by the scale and offset parameters configured in the meter tag setup
6. Click **Save**.

Configuring roll-up meter tags

Important: If you plan to use roll-up server meters, install Internet Explorer WebControls 1.0 on the server.

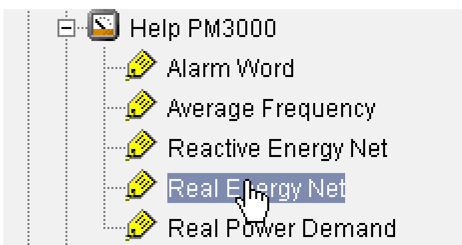
To configure a roll-up meter tag:

1. On the **Add a Meter** page, leave the Meter tag type as Device.



2. Click **Select Tag**.

A **new dialog box** appears containing the navigation tree, meters and meter tags in the remote server. The objects accessible to you are determined by the user name and password used in setting up the roll-up server device.

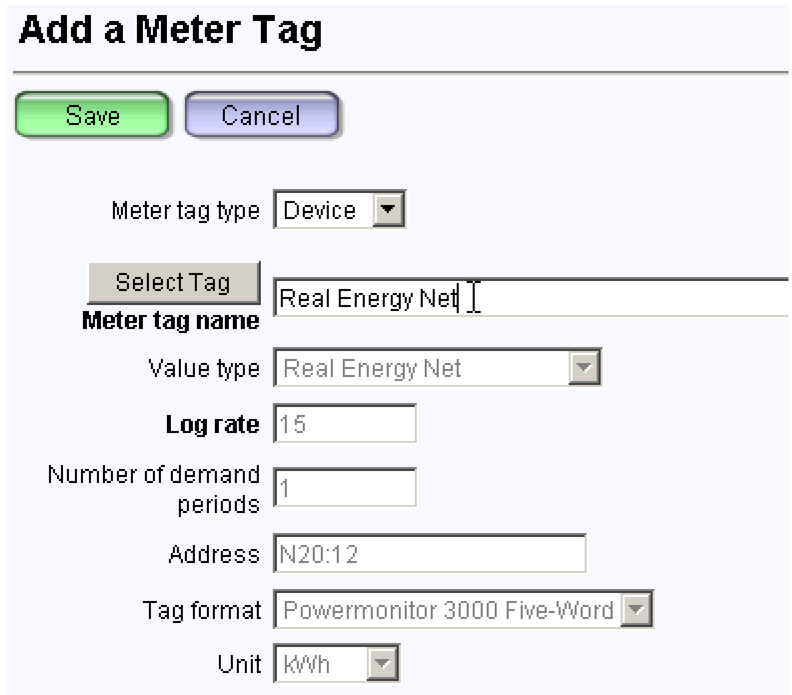


3. Drill down to and select a Meter Tag from the remote server.

The new dialog box remains open.

4. Return to the **meter tag setup screen**.

You may keep the name that is automatically entered or enter a different **name** for the meter tag.



Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

The remaining fields are automatically filled in.

The log rate value reflects the log rate of the tag on the remote server. The roll-up meter tags are refreshed at a rate determined by a setting in the **web.config** file. The default roll-up interval is 60 minutes.

Important: Do not change any of the remaining fields from the values that FactoryTalk EnergyMetrix fills in automatically. Changing the address, data format, scaling, value type and other parameters may prevent logging of the tag or may cause the tag to be logged with erroneous data.

6. Click **Save**.

Once the meter tag has been saved, you may manually refresh tags from the remote server by entering a start date in the field provided and clicking **Get roll-up tag values**.

Tip: If custom value types have been added to a local FactoryTalk EnergyMetrix server, identical value types must exist in the roll-up server to prevent roll-up data with an incorrect value type. Identical value types have the same Value Type ID, description, units, demand and consumption flag settings.

Meter tag common elements

Whether a meter tag represents a power monitor parameter, a PLC data table address, an FactoryTalk EnergyMetrix server roll-up parameter, a manual data entry point, or an OPC item, meter tags share several common elements. Not all tag types use every element.

Meter tag type

Select from None, Device, Manual, Derived or Alarm. When you select a tag type, the meter tag setup page will change to suit the tag type.

Meter tag name

The name may not contain the following characters: . (period), # (pound), or ' (single quote).

Value type

This field is automatically populated for power monitor, EEM and roll-up tags. For other tags, select a value type if desired from the list.

Value types are used by the reporting and billing functions to aggregate values of a specific type in one or more meters or groups. The **default value types** in FactoryTalk EnergyMetrix represents the most commonly used electrical energy management parameters. Value types may be set up as Consumption or Demand. Consumption value types are treated as accumulated values of energy or process output, for example, real energy net. Demand value types are treated as 'rate' values such as real power demand.

Default value types

Default Value Types include the following electrical energy and demand parameters:

Value Type	Units	Consumption	Demand
Real Energy Net	kWh	X	
Real Energy Exported	kWh	X	
Real Energy Imported	kWh	X	
Reactive Energy Net	kVARh	X	
Reactive Energy Exported	kVARh	X	
Reactive Energy Imported	kVARh	X	

Value Type	Units	Consumption	Demand
Real Power Demand	kW		X
Reactive Power Demand	kVAR		X
Apparent Power Demand	kVA		X

You may add new Value Types. Navigate to the Unit Setup screen in the Navigation Tree.

The **Unit setup** page lets you add or edit value types. For details, see "Unit Setup page" (page 55).

Log rate

The time expressed in minutes between subsequent data logging activity for the meter tag.

Caution: The time that FactoryTalk EnergyMetrix takes to log data during each polling interval is dependent on the number of devices, meters and tags set up in FactoryTalk EnergyMetrix; the performance of the local area network; and the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM. Setting a Logging Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

Number of demand periods

This parameter is used with power monitor and EEM tags and must be the equivalent to the number of demand periods averaged together configured in the source device.

Address and tag format

These fields are automatically populated for power monitor device tags and partially populated for 1803-EEM device tags. For other tag types, you must enter the appropriate address and data type. For derived tags, you may select a data type or leave it blank.

Unit

Applies a unit such as kWh, kVARs, etc. to the meter tag. Automatically populated if a Value Type is selected. Otherwise you may select a unit from the list.

Number of decimals to display

Applies to the meter data page.

Scale and offset

Permits linear adjustment of the raw value ("x") before it is stored (as "y") in the database. Scale is the "m" and offset is the "b" in the following equation: y = mx + b. Scale and offset are applied to manually entered data as well as date that is automatically logged from devices.

Log delta reading

Applies only to consumption-type values. Leave this box Cleared for consumption values expressed as accumulated counters (like an odometer). Check this box for consumption values expressed as consumption per log interval (such as a demand log imported from a utility meter record).

Tip: Delta-value logging is more susceptible to data errors due to network or server downtime. Whenever practical, use odometer-style tags for consumption values.

Rollover value

This field is automatically populated for power monitor device tags. It may need to be adjusted for EEM or other types of devices. In any case, this value must be set to the value at which the source device rolls over, taking into account any scale and offset calculations made.

Trend log parameter

This field applies to Allen-Bradley power monitor device tags and is usually automatically populated. It stores the ID number of the log parameter used for automatic data repopulation (if enabled).

This field is also used with controller ADR. The Index value of the respective controller data table or tag address is used to specify the queue record used for automatic data repopulation.

Max consumption per hour

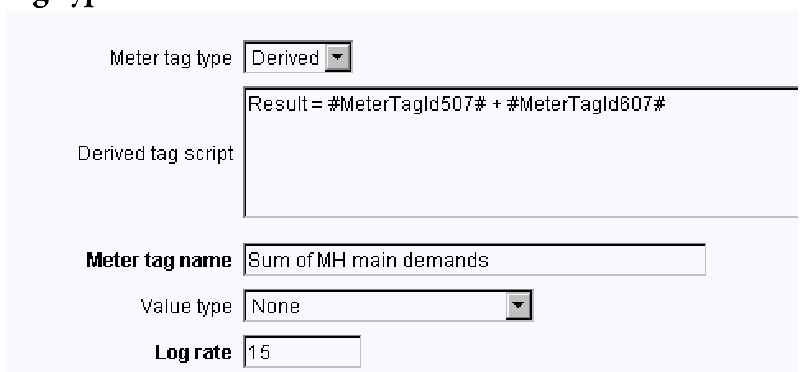
Used with consumption values to enable the enhanced consumption reporting algorithm. The enhanced algorithm provides more accurate consumption reporting in the case of data logging anomalies such as unexpected zero values, resets, etc. This value should be set to the maximum expected change in the consumption counter in an hour's time. If the calculated consumption exceeds the value stored here, the algorithm will perform a linear interpolation from known good data points. Without a value entered in this field, data anomalies may result in consumption calculations off by multiples of the rollover value. This parameter has no effect if the Log delta reading box is selected.

Configuring derived tags

A derived tag is used to log values that are calculated from other meter tags. A derived tag script defines the tags and mathematical operations that return the desired value.

To configure a derived tag:

1. In **Add a Meter Tag window**, select **Derived** as the **Meter tag type**.



2. Enter a Derived tag script in the entry field. Note the following:
   - The output variable of the script must be Result
   - Meter tags may be specified using **fully qualified tag names** or using the shortcut method.

Referencing tag names in scripts

Applies to:

- Derived tags
- TotalRTPCharge function

Fully-qualified tag name

Tags may be referenced in scripts by listing the fully-qualified tag name which specifies the path to the tag from the root level domain down to the tag name. Domains, groups and tag names within the fully-qualified tag name are separated with periods.

Because domains, groups, and tag names can have characters in them that are not valid in Visual Basic for .NET script code, the fully-qualified tag name must be enclosed with a pair of '#' characters.

Example: to reference the "Real Power Demand" tag in the Acme domain's Main meter, you would use the following fully-qualified tag name:

```
#Acme.Main.Real Power Demand#
```

Shortcut tag name

Tags may also be referenced by a "shortcut" method using the meter tag ID. This would be the shortcut method using the meter tag id:

```
#MeterTagId507#
```

Tip: When scripts reference tags using the fully-qualified tag name then any change to a domain name, group name, or the tag name of that tag will require the script to be updated.

Only Device and Manual meter tags may be referenced in derived tag scripts. Only Price Meter tags may be referenced in real time pricing scripts.

- Scripts may include any derived tag functions or functions in the .NET system.math namespace. For details, see "Using functions in derived tags" (page 227).

- Derived tags should not reference other derived tags, with two exceptions:
  a. Derived tag functions may reference any tag (including itself) logged previous to the current time
  b. Derived tags are calculated in meter tag ID order, so derived tag functions may reference other derived tags with lower-numbered meter tag IDs.

     Tip: If a derived tag script does not set the Result variable then no value will be inserted into the database.

3. Set the **Log rate** to the polling interval you desire. The derived tag script will run at the polling interval specified. Derived tag scripts run five minutes after the normal polling time, so that all referenced meter tags have been updated. Derived tags that reference roll-up meter tags must have a log rate no less than the roll-up interval.

Log rate

The **log rate** is the interval between times that devices are polled for tag data to store in the database. You may configure different logging rates for each meter tag. The smallest l Log rate determines the frequency that a device associated with a meter is polled.

The most common log rate is the same as the energy supplier's demand interval. While you are initially setting up the system, you may wish to temporarily set a shorter logging interval such as 1 minute so that you may see logging results sooner.

Caution: The time required to log data during each polling interval is dependent on the number of devices, meters and tags set up; the characteristics of the server hardware, e.g. number of processors, clock rate and amount of RAM; and the quality and reliability of network communications. Setting a Log Rate faster that the system can complete each polling interval may result in lost data and poor system performance.

Tip: Set the Log rate to 10,080 minutes (1 week) to process the derived tag at midnight on Sunday

4. Click **Save**.

   After the derived tag setup is saved, you may populate values from a point in the past until the present. See below.

Derived tag considerations

Derived tags allow calculation and logging of results from combining other logged data. However, derived tags have certain limitations which should be considered by the user prior to using them

- Derived tags should not perform simple addition or subtraction of consumption values. Doing so fails to take into account rollover and will result in errors in reporting, trending and aggregation. One method to combine consumption values in the use of the tagTotal() function with the tag set up to log delta values.
- Delta-value logging is more susceptible to data errors. Odometer-style data logging provides more reliable report data in the event of server or network downtime.
- Derived tags do not support automatic data repopulation, however, they may be repopulated manually by use of the CalcDerivedTags utility.
- Derived tags should not be used to aggregate meters into energy or cost accounting groups. It is recommended to

assign source meters to accounting groups using their contribution factor as needed.

- Use care when aggregating apparent energy or power values. These are phasor values, and their magnitude and angle must be taken into account in calculations.

Manually repopulating derived tags

You may manually populate derived tags in two ways:

On the **Meter Tag Setup** page, enter the start date in the text box in the bottom of the page and click **Generate derived tag values** button. The system will first delete all values between specified start date and the current time, and then generate the values from start date to current time according to meter tag derived formula and log rate settings.

Use the **CalcDerivedTags.exe** utility found in the **bin** folder in the FactoryTalk EnergyMetrix **program folder**. The usage is:

Program folder

The default program folder is:

- For 32-bit servers:

```
C:\Program Files\Rockwell Software\FactoryTalk
EnergyMetrix
```

- For 64-bit servers:

```
C:\Program Files (x86)\Rockwell Soft-
ware\FactoryTalk EnergyMetrix
```

```
CalcDerivedTags [-sd <start date>] [-ed <end date>] [-t
<metertagID>] [-d]

-sd <start date>

-ed <end date> if not specified, generates values until
current date
```

```
-t <meter tag id> if not specified, generates all derived
tags in the system

-d delete old data in the selected interval before gen-
erating new values; if not specified, existing data is
not overwritten
```

Examples

Simple derived tag

In this example, the 'Acme' domain includes a main meter and a meter on one of its two feeders. The meter on the second feeder is a 'virtual' meter populated with derived tags. The derived tag script using shortcut method tag names for the Real Power Demand tag is:

```
Result = #MeterTagID456# - #MeterTagId789#
```

The script may also use fully qualified tag names. This usage will not permit the use of other derived tags in the formula.

Derived tag using functions

This example calculates a value for Real Power Demand based on a 15 minute fixed demand period. The referenced meter tag (MeterTagId = 138) is logging Real Energy Net at a 15 minute log rate.

```
Result = TagTotal(138, 0, 0, 0, 15) * 4
```

Consumption derived tag (odometer-style)

This example logs an odometer-style consumption value in derived tag ID 123 by adding the 15-minute usage of meter tags 456 and 789 to the previous logged value of the derived tag.

```
Result = GetTagData(123, DateTime.utcNow.AddMinutes(-15))
_
+ TagTotal(456, 0, 0, 0, 15) _
```

```
+ TagTotal(789, 0, 0, 0, 15)
```

Testing source data

In this example, the source data is tested to avoid writing an incorrect result into the database. When the If condition is false, no Result is written.(

```
If (Not GetTagData(456) Is Nothing) And (Not GetTagData
(789) Is Nothing) Then

     Result = GetTagData(123, DateTime.utcNow.AddMinutes
(-15)) _

+ TagTotal(456, 0, 0, 0, 15) _

+ TagTotal(789, 0, 0, 0, 15)

End If
```

Using functions in derived tags

You may use functions similar to those used in Rate Schedules in Derived Tag scripts. Derived Tag functions are listed below. MeterTagId is the ID number of the selected meter tag and may be found on the **Meter Setup** page. Except as otherwise noted, all function arguments are Integer values and all functions return a Double value. Derived tags are calculated in meter tag ID order, so derived tag functions may reference other derived tags with lower-numbered meter tag IDs.

Functions

TagTotal function

Returns the accumulated usage of the selected MeterTagId over the specified DateRange or time. The TagTotal function is generally used with consumption values such as real energy.

Usage:

```
Result = TagTotal(MeterTagId, DateRange.enumValue)

Result = TagTotal(MeterTagId, months, days, hours,
minutes)
```

TagAverage function

Returns the mathematical average of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagAverage(MeterTagId, DateRange.enumValue)
Result = TagAverage(MeterTagId, months, days, hours,
minutes)
```

TagPeak function

Returns the largest instance of the selected MeterTagId over the specified DateRange or time.
.

Usage:

```
Result = TagPeak(MeterTagId, DateRange.enumValue)
Result = TagPeak(MeterTagId, months, days, hours,
minutes)
```

TagNPeaks function

Returns a Double array of N elements containing the N largest instances of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagNPeaks(MeterTagId, N, DateRange.enumValue)
Result = TagNPeaks(MeterTagId, N, months, days, hours,
minutes)
```

TagPeakTimestamp function

Returns a DateTime structure containing the UTC time stamp of the largest instance of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagPeakTimestamp(MeterTagId,
DateRange.enumValue)

Result = TagPeakTimestamp(MeterTagId, months, days,
hours, minutes)
```

TagNPeakTimestamps function

Returns a DateTime array of N elements containing the UTC time stamps of the N largest instances of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagNPeakTimestamps(MeterTagId,
DateRange.enumValue)

Result = TagNPeakTimestamps(MeterTagId, months, days,
hours, minutes)
```

TagRatchet function

Returns the largest instance of the selected MeterTagId over the specified DateRange or time and IntervalInMonths ending with the optional EndDate argument. The EndDate argument is a String type. If the EndDate is not specified, the IntervalInMonths ends on the current date and overlaps the specified DateRange or time.

Usage:

```
Result = TagRatchet(MeterTagId, [EndDate,] Inter-
valInMonths, DateRange.enumValue)

Result = Tagratchet(MeterTagId, [EndDate,] Inter-
valInMonths, months, days, hours, minutes)
```

TagLowest function

Returns the smallest instance of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagLowest(MeterTagId, DateRange.enumValue)

Result = TagLowest(MeterTagId, months, days, hours,
minutes)
```

TagNLowest function

Returns a Double array of N elements containing the N smallest instances of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagNLowest(MeterTagId, N, DateRange.enumValue)

Result = TagNLowest(MeterTagId, N, months, days, hours,
minutes)
```

TagLowestTimestamp function

Returns a DateTime structure containing the UTC time stamp of the smallest instance of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagLowestTimestamp(MeterTagId,
DateRange.enumValue)

Result = TagLowestTimestamp(MeterTagId, months, days,
hours, minutes)
```

TagNLowestTimestamps function

Returns a DateTime array of N elements containing the UTC time stamps of the N smallest instances of the selected MeterTagId over the specified DateRange or time.

Usage:

```
Result = TagNLowestTimestamps(MeterTagId,
DateRange.enumValue)

Result = TagNLowestTimestamps(MeterTagId, months, days,
hours, minutes)
```

TagSum function

Returns the arithmetic sum of the selected MeterTagId over the specified DateRange or time. The TagSum function is usually used with non-consumption values such as hourly production.

Usage:

```
Result = TagSum(MeterTagId, DateRange.enumValue)

Result = TagSum(MeterTagId, months, days, hours, minutes)
```

GetTagData function

Returns the value of the most recent logged value of the selected MeterTagId, looking back from the current time (or the optional utcTimeStamp argument if specified) for a duration of one logging interval. The result is an Object variable which contains the tag value or Nothing if no tag value can be found. If data is found, the expression "Not GetTagData(argument) Is Nothing" evaluates as True.

Usage:

```
Result = GetTagData(MeterTagId[, utcTimeStamp])
```

Enumeration values

DateRange

The DateRange argument specifies how far back in time that logged data is evaluated in the function. The DateRange is referenced to the current timestamp of the Derived Tag (recall that Derived Tags are executed 5 minutes after the nominal log rate time). For instance, DateRange.DayToDate used in a Derived Tag script that executes at 12:05 pm on a particular day specifies a time period beginning at noon the day before.

Usage:

```
MinuteToDate
HourToDate
DayToDate
WeekToDate
MonthToDate
```

Using variables in derived tags

Variables

Two predefined variables are available in Derived tags for use in Derived tag scripting.

```
TagGenerationTimestamp
TagGenerationTimestampUTC
```

These variables are of DateTime type and hold the time stamp that a derived tag script executes for. TagGenerationTimestamp is the time stamp for the meter's time zone and the TagGenerationTimestampUTC is the time stamp in the UTC time zone.

Example

These variables will allow derived tag scripts the ability to control when they insert a record into the database. For example, you can create a "once-per-month" derived tag that only inserts a record into the database on the first of each month by creating a derived tag with a daily log rate and then testing the time stamp in the derived tag script as follows:

```
If TagGenerationTimestamp.Day == 1 Then
Result = <perform your calculation here>
End If
```

Tip: If a derived tag script does not set the Result variable then no value will be inserted into the database.

Automatic data repopulation (ADR)

Automatic data repopulation (ADR), a standard Manager function, gathers selected data from device data logs to repopulate database gaps caused by network or server outages. ADR will not repopulate gaps in the database that are caused by loss of power to or failure of the metering devices.

ADR periodically reads data logs from the device and, inserts records in the database where no corresponding data exists. It will not overwrite existing database records.

Important: ADR is designed to help assure the integrity of data for billing, cost allocation, demand analysis and consumption reporting, such as real energy, reactive energy and demand real power. Data not contained in the device snapshot, energy or trend logs is not available for data repopulation.

Devices that support ADR

Allen-Bradley Bulletin 1426 PowerMonitor 5000

The power monitor energy and data logs provide the source for ADR. The energy log collects a fixed collection of energy and demand parameters at a user-settable logging rate. The data log content and logging rate are user-configurable.

Allen-Bradley Bulletin 1408 PowerMonitor 1000

The PowerMonitor 1000 energy log contains a predefined collection of energy, status input and demand parameters (depending on the model) logged at a user-configurable interval.

Allen-Bradley Bulletin 1404 PowerMonitor 3000

All communications networks are supported. The **trend log** is user-configurable and holds a variable number of records depending on the user configuration. The PowerMonitor 3000 trend log should be configured to align with parameters and logging rate of parameters being logged as meter tags.

PowerMonitor 3000 trend log

The Bulletin 1404 trend log can contain over 45,000 individual parameters organized in time-stamped records which include up to 16 user-selectable parameters. The default logged parameters are:

- Real energy net
- Reactive energy net
- Real power demand

Note: PowerMonitor 3000 trend log energy data is expressed with 7 digit precision while real-time energy data is expressed with 15 digit precision. For accurate reporting results when using ADR, configure the PowerMonitor 3000 energy counters to roll-over at 7 or 8 digits depending on your accuracy requirements. This option is available with master module firmware version 1.12 or higher. The rollover value in consumption meter tags must be adjusted to match the actual energy rollover value.

Allen-Bradley Bulletin 1403 PowerMonitor II

Remote I/O, Ethernet and serial communications are supported. The PowerMonitor II must be at firmware version 3.00 or later and set up to use either the **16 parameter** or **3 and 7 parameter** snapshot log.

Remote I/O communications

Communications with power monitors on Remote I/O uses pass-through communications through a PLC or SLC. Pass-through communication does not require programming in the controller.

To set up communications with Remote I/O devices, set up the appropriate driver in RSLinx Classic to the parent device.

PowerMonitor II 16 parameter snapshot log

The Bulletin 1403 snapshot log contains up to 265 time-stamped records which include the following parameters:

- Line to line (or neutral)voltages
- Line and neutral currents
- Voltage unbalance
- Current unbalance
- Total real power
- Total reactive power
- Real power demand
- Reactive power demand
- Total power factor
- Real energy net

- Reactive energy net

PowerMonitor II 3 and 7 parameter snapshot log

The Bulletin 1403 snapshot log contains up to 100 time-stamped records which include the following parameters along with an additional 745 records which include the first three parameters only:

- Real energy net
- Reactive energy net
- Real power demand
- Average line voltage
- Average current
- Current unbalance
- Total real power
- Reactive power demand
- Total power factor

Important: The first three parameters are user configurable; the default selections are shown.

Note: Snapshot log energy data is expressed with 7 digit precision while real-time energy data is expressed with 15 digit precision. ADR used with the PowerMonitor II may result in inaccuracies in energy consumption and billing reports, especially if the repopulated data occurs at the beginning or end of the reporting period.

Allen-Bradley Bulletin 1400 PowerMonitor

The power monitor snapshot log holds up to **50 records**. Remote I/O communications are supported.

Power monitor snapshot log

The Bulletin 1400 snapshot log contains up to 50 time-stamped records which include the following parameters:

- Total real power
- Total reactive power
- Real power demand
- Average apparent power demand
- Total power factor
- Frequency
- Real energy imported
- Reactive energy net
- Real energy exported

Allen-Bradley MicroLogix EEM (1803-EEM)

The MicroLogix EEM trend log contains an accumulated energy counter and a demand value for each configured meter.

Allen-Bradley programmable controllers

ControlLogix, CompactLogix, MicroLogix, SLC 500 and PLC-5 controllers support ADR when programmed with specific logic. The ADR Wizard for RSLogix is used to develop the specific logic that supports ADR. For details, see "Configuring ADR for programmable controllers" (page 239).

Configuring ADR for power monitors

To configure ADR for power monitors:

1. Set up the power monitor or EEM snapshot, energy, data or trend log (depending on the power monitor model) to log the

desired parameters at a rate equal to the log rate of the meter tags.

2. During device setup, enable ADR by selecting the check box.
3. During meter tag setup, the correct **snapshot or trend log** parameter value is automatically selected based on the value type you select for the meter type. If this does not occur automatically, please refer to the power monitor user manual for the value of the log parameter number, and enter the number in the meter tag setup page.

Snapshot or Trend Log

It is the **Snapshot log** in these power monitors:

- Allen-Bradley Bulletin 1400 PowerMonitor and Allen-Bradley Bulletin 1403 PowerMonitor II.

  It is the **Trend log** in Allen-Bradley Bulletin 1404 PowerMonitor 3000.

- **Allen-Bradley Bulletin 1400 PowerMonitor**

  Records average voltage and current values, plus total values for kW and kVAR, at defined time intervals. Displays the 100 most recent snapshots.

- **Allen-Bradley Bulletin 1403 PowerMonitor II**

  Contains voltage, current, and power values recorded at defined time intervals or triggered by setpoints, and stored with date and time stamps. The snapshot log holds 50 records, and each record includes 46 parameters.

- **Allen-Bradley Bulletin 1404 PowerMonitor 3000**

  Contains up to 16 user-selectable parameters (8 for DeviceNet power monitors) recorded at defined time intervals or triggered by setpoints. The trend log may hold over 45,000 individual records.

- **Allen-Bradley Bulletin 1408 PowerMonitor 1000**

  The Energy Log contains a fixed collection of energy and demand values

- **Allen-Bradley Bulletin 1426 PowerMonitor 5000**

  The Energy Log contains a fixed set of energy and demand values. The Data Log contains a user-selected set of metering results.

Tip: ADR for legacy power monitors is may conflict with other applications which read the trend or snapshot logs at the same time. Examples of these applications include RSPower32 and the RT device viewer, **Logs** tab. To reduce the likelihood of conflicts, temporarily disable ADR when reading the power monitor trend or snapshot log using one of these applications.

Configuring ADR for programmable controllers

To configure automatic data repopulation (ADR) from programmable controllers:

1. Run the ADR Wizard to generate the RSLogix library import file.
2. Import the library file into the RSLogix ladder program for the controller.
3. Enable ADR on the controller Device in the Device Setup page.
4. Configure meter tags, specifying the ADR buffer index for each tag using the Trend log parameter value.

MicroLogix ADR considerations

Real-time clock functionality is required to utilize ADR in a MicroLogix controller. The following firmware is required for clock functionality:

- MicroLogix 1100, Series A, FRN 1 or higher
- MicroLogix 1200 Series C, FRN 4 or higher
- MicroLogix 1400 Series A
- MicroLogix 1500 Series C, FRN 6 or higher
- MicroLogix 1000 does not offer a real-time clock.

The real-time clock option must be installed in MicroLogix 1200 and 1500 controllers for clock functionality. FactoryTalk EnergyMetrix uses file N14 with a length of 12 words for reading and writing clock status. Two rungs of ladder logic are required for reading and writing the clock:

```
NEQ N14:0 0 BST CPW #N14:0 #RTC:0.YR 1 NXB CPW #N14:1
#RTC:0.MON 1 NXB CPW #N14:2 #RTC:0.DAY 1 NXB CPW #N14:3
#RTC:0.HR 1 NXB CPW #N14:4 #RTC:0.MIN 1 NXB CPW #N14:5
#RTC:0.SEC 1 NXB CLR N14:0 BND

BST CPW #RTC:0.YR #N14:6 1 NXB CPW #RTC:0.MON #N14:7 1
NXB CPW #RTC:0.DAY #N14:8 1 NXB CPW #RTC:0.HR #N14:9 1
NXB CPW #RTC:0.MIN #N14:10 1 NXB CPW #RTC:0.SEC #N14:11 1
BND
```

Note: MicroLogix 1803-EEM devices support automatic data repopulation by design. Do not modify the logic in a 1803-EEM.

FactoryTalk EnergyMetrix ADR Wizard for RSLogix

The ADR Wizard is a Windows program named **ADRWizardForRSLogix.exe**, located in the **ADR Wizard for RSLogix** folder in the FactoryTalk EnergyMetrix **program folder**. The wizard requires Microsoft .NET Framework 3.5 SP1 to be installed on the computer the wizard will run on. The Framework is installed by default on Windows XP and 2003 Server operating systems. Users with access to the FactoryTalk EnergyMetrix server can run it on the server. The program file can be copied to and run on any computer with the .NET Framework 3.5 SP1 installed.

Program folder

The default program folder is:

- For 32-bit servers:

```
C:\Program Files\Rockwell Software\FactoryTalk
EnergyMetrix
```

- For 64-bit servers:

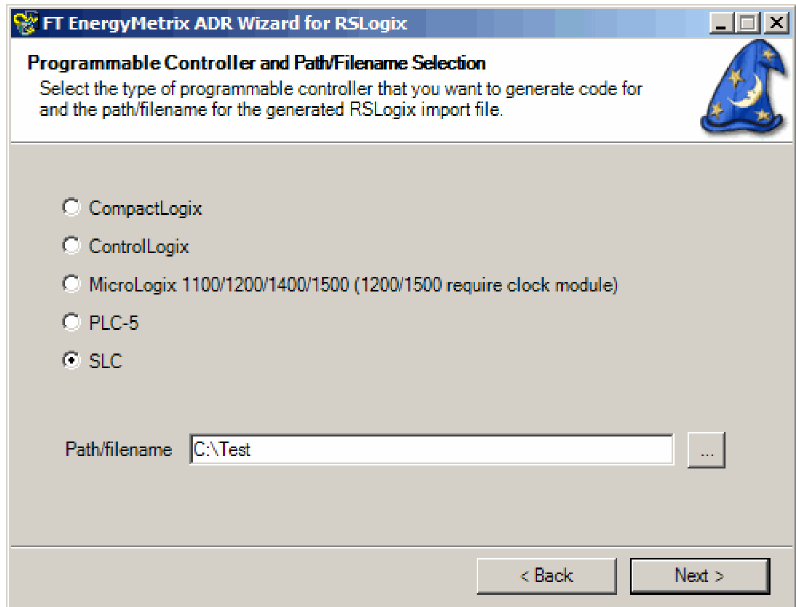
```
C:\Program Files (x86)\Rockwell Soft-
ware\FactoryTalk EnergyMetrix
```

Important: ADR for Logix controllers (ControlLogix and CompactLogix) uses PLC/SLC mapped tags.

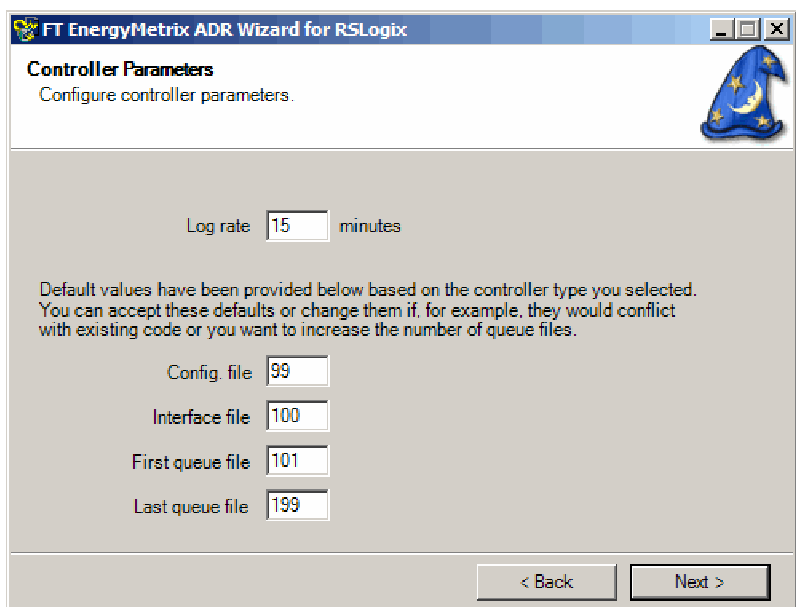
Importing library files to the ladder program

To import a library file into your ladder program:

1. Launch the wizard and click **Next**.
2. Select the processor type and enter the file name and path for the library file.



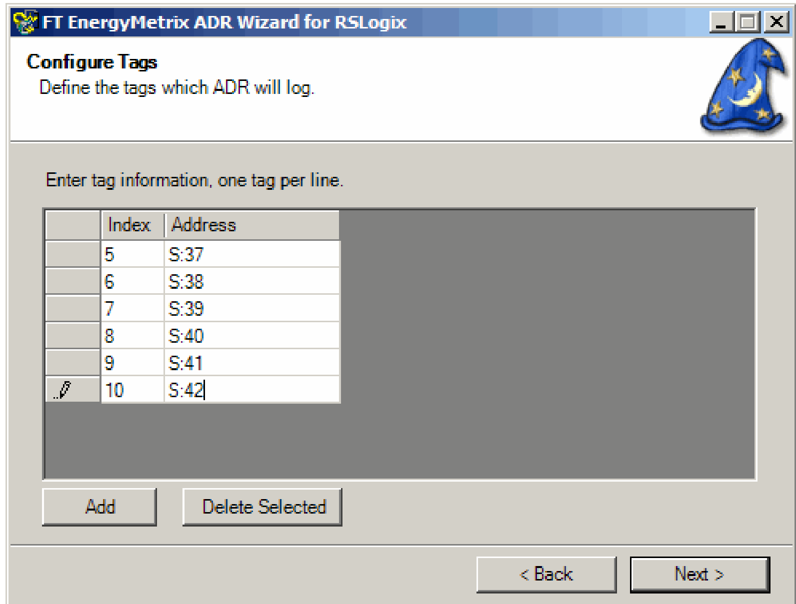
3. Click **Next.**
4. Configure the controller parameters.



- The default values of the fields should only be changed if required for the particular application.
- The log rate determines the sampling period in minutes and should correspond to the log rate of the meter tag in FactoryTalk EnergyMetrix.
- Select file numbers that will not conflict with any existing files assigned in your controller. In this example, config file N99, interfact file F100 and queue files F101 to f199 will be created by the wizard. The queue length (99 files) and the log rate determine the time ADR data will be available. In this example, the ADR time is 99 * .25 hour = 24.75 hours.
- Available file numbers are determined by the controller type and memory size. MicroLogix and SLC controllers have a maximum file index of 255. PLC-5 controllers have a maximum file index of 999. CompactLogix and ControlLogix controllers have no limit on the number of files.

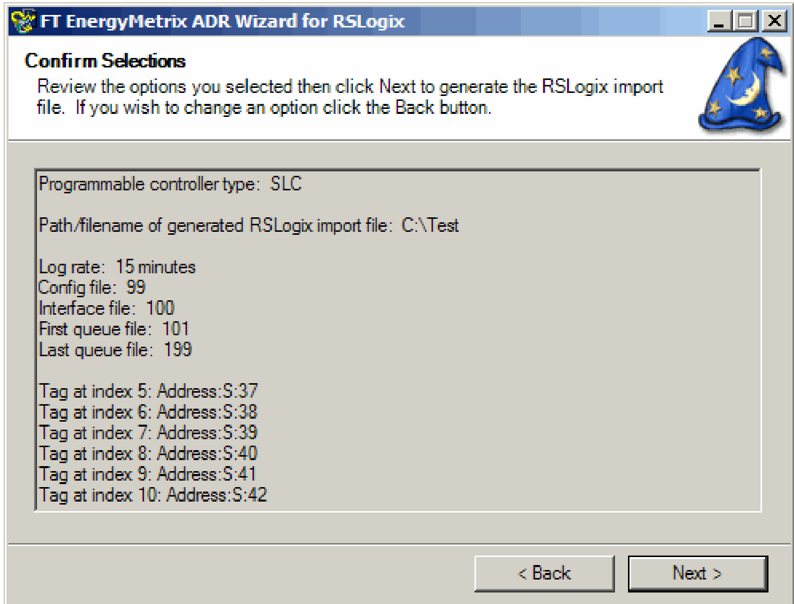
5. Click **Next**.

6. Enter the tags for ADR to buffer, one tag per line.



- The **Index** is the value to enter into the meter tag setup Trend log parameter field. It starts at 5 and auto-increments for each tag entered.
- The **Address** is the address in the controller where the real-time data is stored.

7. Click **Next** to review the selections, and then click **Finish**.



- For controller types CompactLogix and ControlLogix, the output file will have the file name you specified with a .L5K extension and a controller type of 1756-L63. L5K files are complete ladder files rather than library files.
- For controller type of MicroLogix or SLC 500, the ADR wizard creates a set of output files: <filename>.SLC, .SY5 and .SY6 for import into a controller you create in RSLogix 500 software.
- For controller type of PLC-5, the ADR wizard creates the output file <filename>.PC5 for import into a controller you create in RSLogix 5 software.

Import the Wizard output file into the controller logic program

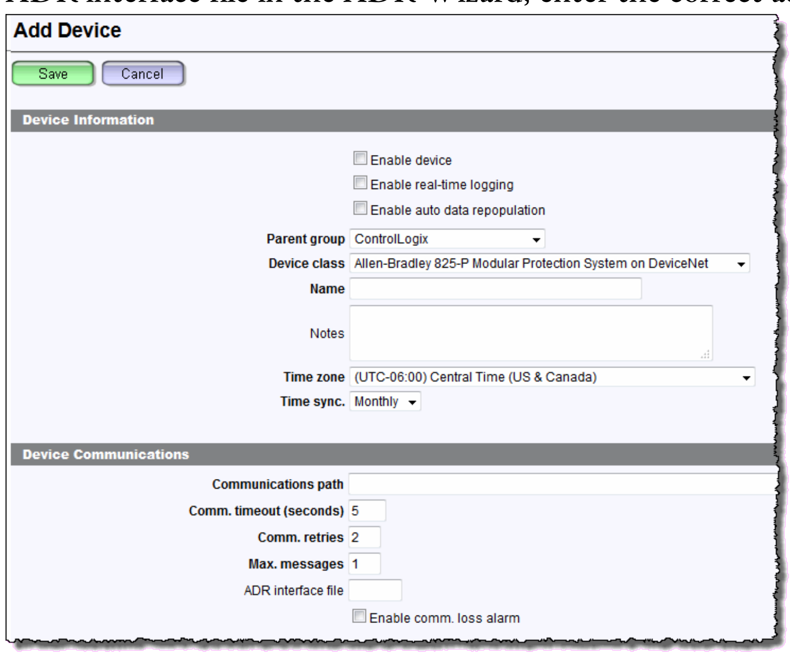
The final step is to open the applicable RSLogix software and import the library file created by the ADR Wizard into the controller logic program. Refer to the RSLogix documentation and online Help for additional information. You may need to change the controller type and correct data table values, I/O configuration, etc., in response to errors and warnings. Minor errors and warnings frequently occur as part of the library import process and cannot be avoided.

Tip: If adding ADR to an existing CompactLogix and ControlLogix controller, the ADR Wizard output file will need to be opened in a separate instance of RSLogix 5000 and the logic and tags copied and pasted into the existing program.

The ADR Wizard does not attempt to determine if its output file will fit into the controller memory. This check is made within the RSLogix software when the import is made.

Enable ADR in the Device Setup page

During device setup in FactoryTalk EnergyMetrix, enable ADR by selecting the check box. Enter the address of the ADR interface file. The default is 100. If you have changed the address of the ADR interface file in the ADR Wizard, enter the correct address.



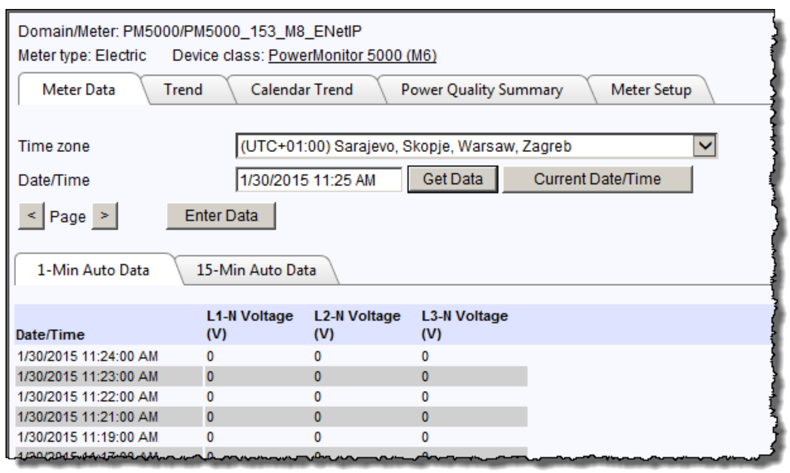
Specify the Index value in the meter tag setup

When setting up meter tags, enter the address of the real-time data into the meter tag Address field, and add the Index value of the corresponding controller address into the Trend log parameter field and then Save the meter tag setup.

Visualize energy usage

Viewing meter data

On the **Meter Data** tab you can view the logged meter data. The tab is arranged by log rate. The user time zone is selected by default. Controls allow you to select the desired date, scroll up and down through the data, and page backward and forward through the meter data.



When you select a Group under the **Meters** tab, an aggregated view of the data of the meters in the group is shown. Data is aggregated based on value type. If data is missing from one or more meters for a particular time, no aggregated value appears in the Group display.

Click **Get Data** to refresh the current page of meter data.

Click **Current Date/Time** to select the current time and refreshes the **Meter Data** tab.

Using standard charts

The following charting tools will help you understand your energy usage:

Trend chart

The trend chart displays a trend of one or more logged parameters from one or more meters over a time period that you select. You may select up to five parameters on the same chart.

Calendar trend chart

The calendar trend chart displays a trend line of one logged parameter in a calendar format. This chart is typically used to display real or reactive power demand over time to pinpoint peaks that vary by day, week or month. You may 'zoom in' on a day's chart by clicking on the day in the calendar view. Selecting multiple days overlays one trend line on top of another, allowing you to compare, for instance, all the Mondays in a month.

Viewing trend charts

To view a trend chart:

1. On the **Meters** tab, select a Group or Meter.

   The group or meter page appears.
2. Click the **Trend** tab.

   A blank chart appears.

   If desired, select a time zone for the chart. The default is the logged-in user time zone.
3. Select a meter tag to display from the list.

4. Select a start and end date for the trend using the calendars.

   Alternatively, you may type the **start and end dates** into the data entry boxes, and then click **Go**.

   If fiscal calendar functionality is enabled, the calendars will display fiscal months.

   #### Date fields

   Enter dates date fields according to the short date format set in Windows Regional Settings in the server. For U.S. English regional settings the default short date format is mm/d-d/yyyy.

6. To add another meter tag, select another tag from the list.
7. To add a tag from another meter, navigate to and select the other meter in the meters tab of the navigation tree and select a tag from its list. You may view up to 5 tags in a standard Trend chart.

   If you hover the mouse cursor over the trend chart for a moment, a menu bar appears. From this menu bar, you may Save, Print, or Email the chart image.

8. Click **Hide** to temporarily not display a meter tag on the trend chart. The tag will still be selected, just not displayed. To show the tag again, click **Show**.
9. Click **Bar** to display a bar chart for the selected tag. The button toggles between **Bar** and **Line** to allow you to select the desired chart type for each tag.
10. To permanently remove a tag from the trend chart, click **Remove**.

11. To save the trend chart's data series as a .CSV file, click **Export Data**.

Your trend selections will persist until you log out.

Viewing calendar trends

To view a calendar trend of a meter or group data:

1. On the **Meters** tab, navigate to and select a meter or group.

   The mater or group page appears.
2. Click the **Calendar trend** tab.
3. Select the meter tag or value type you wish to trend from the list.

   The Calendar trend is most commonly used to display demand-type values.
4. Select a month and year from the respective lists.

   If fiscal calendar functionality is enabled, a fiscal month is displayed.
5. Click the forward and backward buttons to display the next and previous months respectively.
6. Use scroll bars as needed to view the entire calendar display.
7. To zoom-in, click a day in the calendar.

   You may select up to five days by clicking on each one at a time.

   To save the trend chart's data series as a .CSV file, click **Export Data**.

Configuring alarming

Alarming operates based on events or conditions. When alarms occur, they are entered into an alarm log in the database. Alarms may be viewed from the web interface, in the **System** tab, **System**

Status folder. A number of user-configurable actions are available to respond to an alarm, including:

- Send an e-mail.
- Run a report.

Configuring alarms on values

Alarming on value lets a user set up actions, such as sending an email or running a report, based on the value of a meter tag. The user may define one or more alarms per meter tag. Alarms may be set for any tag type, including analog or digital (boolean), device, derived or manual.

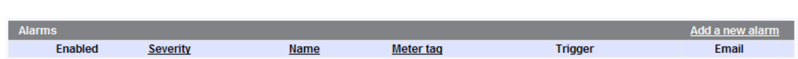
When setting up an alarm, the user configures an alarm range. For analog tags, the range is specified by a high and low value and whether the alarm activates inside or outside of the range. Digital tag alarms are either equal or not equal. Alarms may also be triggered by any change in a meter tag value. When an alarm activates, it is displayed in the Active Alarms page and in the Alarm log. When the alarm clears, it is removed from the Active Alarms page but remains in the Alarm Log page until purged by the user.

Actions may be configured by the user when the alarm activates, deactivates or both.

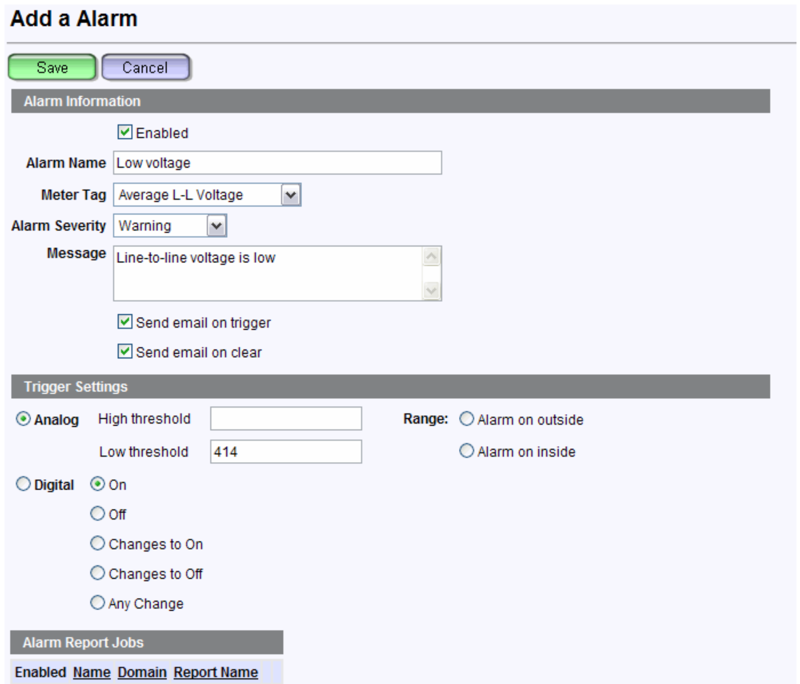
How to set up alarms on value

New alarms are set up from the Meter Setup page. Existing alarm setups may be viewed and edited from the **Alarm Setup** folder on the **System** tab. The user must possess the applicable privileges to view and edit alarm setups.

To set up a new alarm, navigate to the selected Meter Setup page and click **Add a new alarm** at the bottom of the page.



The Alarm Setup page appears.



Setup parameters

Alarm information

- **Enabled** check box - select to enable alarm, clear it to disable alarm.
- **Alarm Name** - alphanumeric name for the alarm, displayed in the Active Alarms and Alarm Summary pages.
- **Meter Tag** - select the meter tag to evaluate for alarm condition
- **Alarm Severity** - select from the list, displayed in the Active Alarms and Alarm Summary pages.
- **Message** - Message to be displayed in the Active Alarms and Alarm Summary pages and also in alarm-triggered email messages.

- **Send email on** check boxes - select one or both to send an email when desired.

  Tip: For emails to be sent on alarm, a smtp server must be configured for the server, alarm notifications enabled and alarm subscriptions set up for the applicable users.

Trigger settings

- **Analog / Digital** - determines which set of trigger settings apply to the alarm. Analog selection is disabled if the meter tag is a power monitor alarm flag
- **High threshold / Low threshold** - set the upper and lower bounds of the alarm range. Either the high threshold, the low threshold or both may be selected depending on the nature of the alarm. If only the high threshold is specified, the alarm triggers if the meter tag value exceeds the threshold. If only the low threshold is specified, the alarm triggers if the value is less than the threshold. The range selections are disabled unless both thresholds are specified.
- **Range: Alarm on inside** - triggers the alarm when the value of the meter tag exceeds the low threshold AND is less than the high threshold.
- **Range: Alarm on outside** - triggers the alarm when the value of the meter tag exceeds the high threshold OR is less than the low threshold.

  Tip: No alarm is activated if the meter tag value is EQUAL to either threshold.

- Digital tag trigger settings - triggers the alarm when the selected condition occurs.

Configuring communications alarms

A communications alarm is triggered when a device fails to respond to four consecutive polls. To enable a communications alarm, select the **Enable comm. loss alarm** check box on the **Device Setup** page.

An email will be sent to alarm subscribers when communications loss with a device is detected and another sent when communications with the device is restored. The device must be successfully communicating after the logger service starts before the loss email can be triggered. This will prevent nuisance emails when the logger service starts. These communication alarms will not be shown on the Alarm Status or the Alarm Log web pages.

Configuring email alarm subscriptions

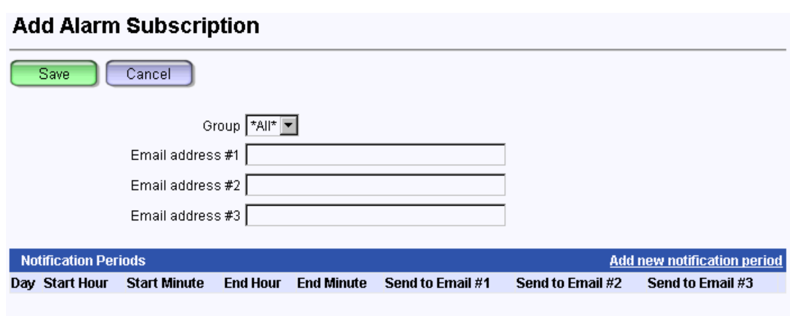
Each user may configure one or more alarm subscriptions. Each alarm subscription may be assigned to an individual domain or to 'none' which is a global subscription to all domains. A subscription consists of up to three email addresses along with a schedule that determines when each email address is active.

To configure an alarm subscription:

1. On the **System** tab, click **My User Settings**.

   The **User Setup** page appears.
2. Select the **Enable alarm notifications** check box.
3. Click the **Add a new alarm subscription** link.

   The **Add Alarm Subscription** page appears.



4. Select the group or domain you wish to subscribe to (or 'none' for all domains), and enter up to three email addresses.
5. Click the **Add new notification period** link to set up schedules when each email address is active.
6. Select a day or day range from the **Day** list.
7. Type start and end times for each notification period.

   To set up a notification period of "all day," leave all times with a value of zero.

   Tip: If you want to send emails on alarm, an SMTP server must be configured for the server, alarm notifications enabled and alarm subscriptions set up for the applicable users.
8. Click **Save**.

Configuring reports triggered by alarms

You may configure reports to run when an alarm is triggered. To set up alarm-triggered reports, first set up the alarm, then set up a report job triggered by the alarm. For details, see "Running reports automatically" (page 268).

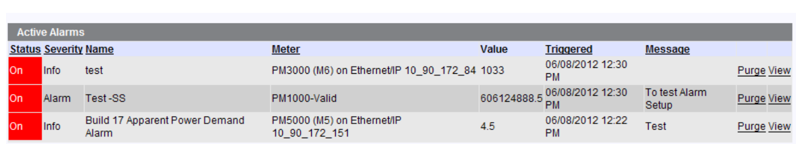
Viewing alarms and alarm configurations

To view active alarms and the alarm log:

- On the **System** tab, click **System Status**.

  The **System Status** page appears.

  The **Active Alarms** tab displays any alarms that are currently active.



The **Alarm Log** tab lists the alarm history. Each alarm may be individually viewed or purged by clicking the appropriate link.

Purge All

Alarm Log

Status	Severity	Name	Meter	Value	Triggered	Cleared	Message		
Off	Critical Alarm	Build 17 Average Current Alarm	PM5000 (M5) on Ethernet/IP 10_90_172_151	5.6	06/08/2012 07:24 PM	06/08/2012 07:24 PM	test	Purge	View
Off	Warning	Build 17 Average L-LVoltage Alarm	PM5000 (M5) on Ethernet/IP 10_90_172_151	482.8	06/08/2012 07:24 PM	06/08/2012 07:24 PM	Warning	Purge	View
Off	Alarm	Build 17 Apparent Energy Net Alarm	PM5000 (M5) on Ethernet/IP 10_90_172_151	2304.9	06/08/2012 07:24 PM	06/08/2012 07:24 PM	Test alarm	Purge	View
Off	Critical Alarm	Build 17 Average Current Alarm	PM5000 (M5) on Ethernet/IP 10_90_172_151	5.6	06/08/2012 07:22 PM	06/08/2012 07:22 PM	test	Purge	View

Click **Purge All** to clears all alarms form the database.

To view alarm configurations for all alarms:

- On the **System** tab, click **Alarm Setup**.

  The **Alarm Setups** page appears.

Alarm Setups

Alarm Setups

Enabled	Severity	Name	Meter Tag Name	Meter	Trigger	Email	
✓	Alarm	Test -SS	Apparent Energy Net	PM1000-Valid	On	✓	View
✓	Info	PM - New Meter	QA - PM Meter	PM - New Meter	On	✓	View
✓	Info	PM5K - Alarm	Reactive Energy Net	PM5K Meter - 150	On	✓	View
✓	Info	test	Average Current	PM3000 (M6) on Ethernet/IP 10_90_172_84	On	✓	View
	Alarm	Build 17 Apparent Energy Net Alarm	Apparent Energy Net	PM5000 (M5) on Ethernet/IP 10_90_172_151	AnyChange	✓	View

The page provides a summary list of all the alarms configured in the system. The list may be sorted by severity, name, meter tag name or meter name by clicking the underlined links. The <u>**View**</u> link directs you to the alarm setup page where you may view, edit or delete the alarm.

Configuring and using standard reports

Standard reporting converts the energy and production data logged in the database into information you can use to manage your business, improve efficiency and reduce costs. Standard reports may be run on demand, automatically on a configurable schedule or may be run event-driven in response to an alarm condition.

Consumption Report

The report provides consumption values (kWh, kVARh, etc.) for selected meter(s) or group(s) for a specified date/time range. The consumption report aggregates data from each selected meter based on consumption value types, that is, value types with the Consumption flag selected. The report comprises one line item per meter with totals by group. The group and meter names are listed in the left hand column and a column is added for each consumption value type that exists in the selected meter(s). If more than three consumption value types exist the line items may be truncated.

Note: If any meter in the group is missing data, the report will contain no data.

Demand Analysis Report

The report provides kW demand values for selected meter(s) or group(s) for a specified date/time range. Reports "worst case scenario" peak demand that would have occurred if each meter or group's peak demand had occurred in the same demand interval. The demand analysis report selects from each selected group or meter value types with the Demand flag selected. The report is organized in groups by value type, e.g., "kVA", "kW".

Billing Report

The report provides billing information for selected group(s) or meter(s) for a specified date/time range. The report outputs a list of line items and a total charge amount. Each line item consists of a description, quantity, rate and charge. Billing reports select value types and calculate the report line items based on "Configuring billing rate schedules" (page 271) that you configure. The billing report displays currency symbols and numeric formatting based on the Windows regional setting that is selected in the rate schedule.

Cost Allocation Report

The report lists each meter's contribution to the total energy cost, based on a rate schedule that you configure. The reports are generated in the Microsoft Excel output format.

Power Quality Report

The report combines a graph and a grid display of power quality (sag and swell) events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 and M8 models with their sag and swell setpoints configured.
- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models and will report IEEE 1159 sag and swell events.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

Each sag and swell record lists the time, duration and maximum deviation of the sag or swell. The report displays the events logged during the selected report interval on a ITI/CBEMA chart and in a grid (tabular) listing.

Power Quality Events Report

The report provides a summary of power quality events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 and M8 models with their sag and swell setpoints configured.
- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. In the report, you can use the standard Excel grouping, filtering, and sorting options.

The report consists of the following sheets:

- **Summary**

  It displays the **Summary of Events** table in form of an Excel pivot table. By default, the table lists events grouped by power quality event type, and then by meter. For each meter it provides the following information:

  - The number of occurrences of the power quality event type (the **Count of Meter** column).
  - The average duration of the power quality event (the **Avg Duration** column).
  - The standard deviation of the power quality event (the **Std Dev** column).

- The date and time of the latest occurrence of the power quality event (the **Latest** column).

- **Data**

  It lists each power quality event record.

Duration values are provided in milliseconds.

Power Quality IEEE 1159 Summary Report

The report provides a summary of power quality IEEE 1159 events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. In the report, you can use the standard Excel grouping, filtering, and sorting options.

The report consists of the following sheets:

- **Summary**

  It displays the **Summary of IEEE 1159 Events** table in form of an Excel pivot table. By default, the table lists events grouped by power quality event type, and then by meter. For each meter it provides the following inform-ation:

   - The number of occurrences of the power quality event type (the **Count of Meter** column).
   - The average duration of the power quality event (the **Avg Dur (sec)** column).
   - The standard deviation of the power quality event (the **Std Dev (sec)** column).
   - The date and time of the latest occurrence of the power quality event (the **Latest** column).
- **Data**

  It lists each power quality event record.

Duration values are provided in milliseconds.

Power Quality EN 50160 Weekly Compliance Report

The report provides information on compliance of selected power monitors with the **EN 50160 standard** on a weekly basis.

EN 50160-2010 is a European standard that defines, describes and specifies characteristics of voltage supplied in public power supply networks. It specifies limits on various attributes of the supply voltage, such as magnitude, frequency, and waveform quality, during normal operation. Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 measures and stores data that track conformance to the requirements defined in the standard, for low-voltage (1000V or less) and medium-voltage (1…36 kV) systems.

You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. It consists of the following sheets:

- **EN50160 Weekly Compliance**

  It displays power monitors grouped in the report by week. The start of each week is determined by the starting date of the report. If a meter does not have a full seven days of logged data for a week, a message providing the number of missing days is displayed next to the meter.

  If a power monitor is configured as a synchronous connection, the **Non-Sync. Power Frequency Range 1** and **Non-Sync. Power Frequency Range 2** columns display **N/A** .

  For information on EN 50160 compliance limits refer to Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 User Manual Appendix G.

- **Meters**

  It lists the meters referenced in the report along with the full domain/group path to which each meter is assigned.

Power Quality EN 50160 Yearly Compliance Report

The report provides information on compliance of selected power monitors with the **EN 50160 standard** on a yearly basis.

EN 50160-2010 is a European standard that defines, describes and specifies characteristics of voltage supplied in public power supply networks. It specifies limits on various attributes of the supply voltage, such as magnitude, frequency, and waveform quality, during normal operation. Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 measures and stores data that track conformance to the requirements defined in the standard, for low-voltage (1000V or less) and medium-voltage (1...36 kV) systems.

You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

The report is generated in the Microsoft Excel XLSX format. It consists of the following sheets:

- **EN50160 Yearly Compliance**

  It displays power monitors grouped in the report by year. The start of each month/year is determined by the starting date of the report.

  If a power monitor is configured as a non-synchronous connection, the **Synchronous Power Frequency Range 1** and **Synchronous Power Frequency Range 2** columns display **N/A** .

- **Meters**

  It lists the meters referenced in the report along with the full domain/group path to which each meter is assigned.

The report may be run for only one year at a time.

Pareto Chart Report

The report provides consumption values of a selection of meters or groups. The Pareto chart displays each meter or group's consumption as a bar chart, with the bars arranged in order of decreasing consumption. A line chart indicating the cumulative consumption of the groups or meters, starting at zero and ending with 100%, is overlaid against the bar chart. The Pareto chart report help identify the areas in your facility that use the most energy.

ReportsPlus Report

ReportsPlus reports are available as part of the ReportsPlus option.

For details, see "ReportsPlus" (page 333).

Automatically Run Reports

The reports listed above may be set up to run automatically, either on a schedule or in response to an alarm. For details, see "Running reports automatically" (page 268).

System Configuration Report

The report documents the configuration of the FactoryTalk EnergyMetrix project.

For details, see "Using the system configuration report" (page 696).

Configuring reports

To configure a report:

1. On the **Reports** tab, click **Global Reports** folder, a domain or an existing report.
2. Click **Add**.

   The **Add a new report** page appears.

3. Type a name for the report.
4. Select a Report template from the list. Do not change the selected Report file.
5. Select a Report parent group.

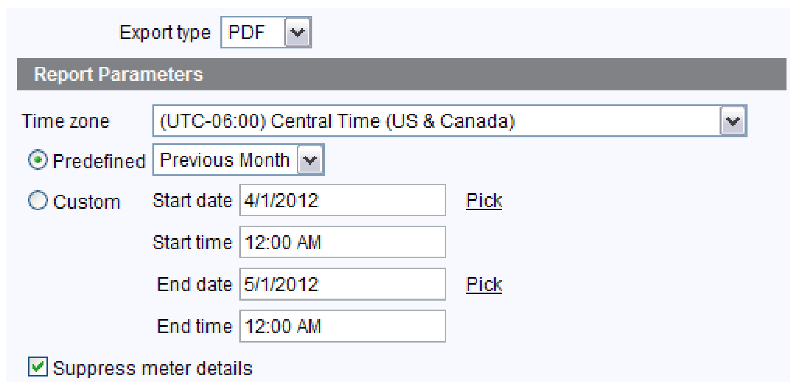
   If you select a domain, only users with access to that domain will be permitted to view the report.
6. From the meter tree in the right pane of the page, select meters to include in the report:
   - To select one or more meters, select the check box next to the meter.
   - To select one or more groups, click the **Groups** link, and then select the check box next to the group.
   - To select all items in the tree, click the **Select All** link.
   - To clear the selection of all the items in the tree, click the **Clear All** link.

Optional ReportsPlus reports permit you to select among several output options.

7. Click **Save**.

To view, print, and save the report output:

1. Edit a report.
2. Under **Report Information**, select a report export type. The default setting is PDF.



3. Under **Report Parameters**, select a report time zone from the list.

   Most reports default to the server local time zone. Reports based on a rate schedule default to the rate schedule's time zone.
4. Select a predefined or custom report time. The default report time is the previous calendar month.

   If fiscal calendar functionality is enabled, predefined fiscal periods will appear in the list.
5. Select the **Suppress meter details** option to list only group totals in a consumption report. This is useful for clearly

reporting consumption when percentages of meters are allocated to groups.

6. For Pareto Chart reports, select a consumption value type from the list.
7. Click **View**.

   A new Internet Explorer window appears while the report is being generated and then closes automatically. The report appears in another window.

   Tip: If the new window does not appear, check that a browser pop-up blocker is not active.

8. To print or save the report use the menu items available in the report output window.

To edit a report:

1. Select a report.

   The **Reports** page appears.

2. Click **Edit**.
3. Modify the report configuration.
4. Click **Save**.

To copy a report:

1. Select a report.

   The **Reports** page appears.

2. Click **Copy**.

   The copy of the report will be created under a name "Copy of <existing report name>".

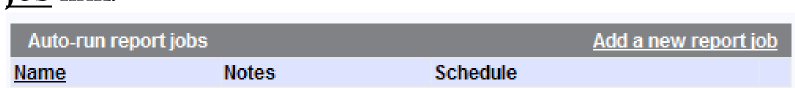
Running reports automatically

The **Auto-run Report Jobs** function allows you to schedule a report to run automatically. Report jobs are set up for individual reports. The report job setup is accessed from the report setup page. Reports that have been run automatically are saved in the database and may be automatically sent to one or more email addresses.

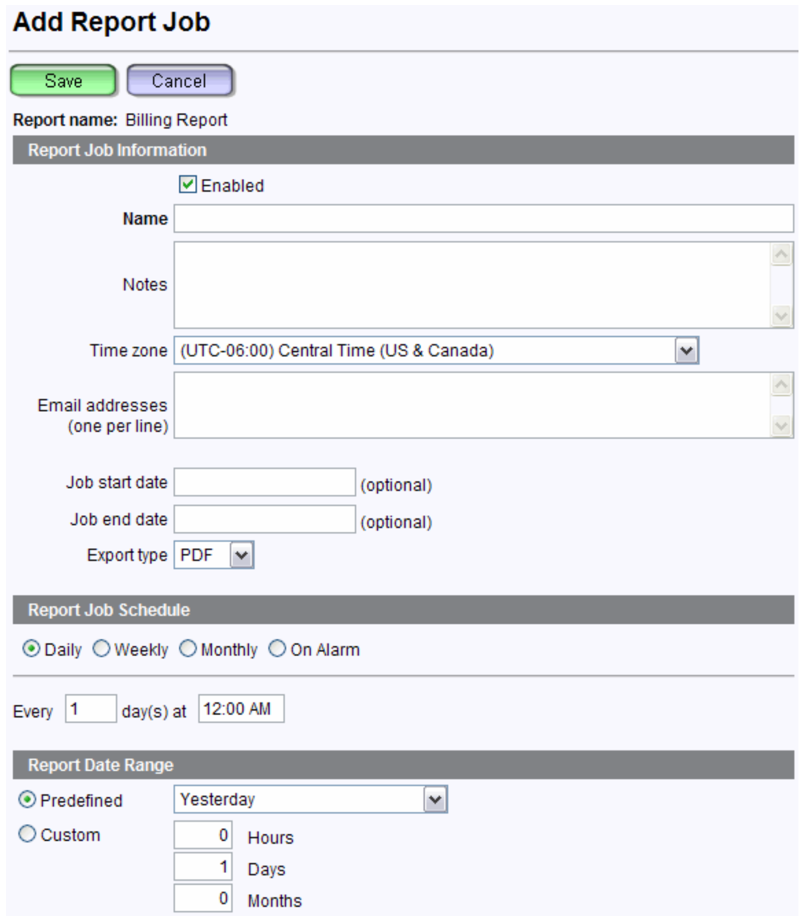
Note: Scheduling many auto-run reports to run at the same time may cause excessive server resource demand and cause reports to time out.

To configure a report job:

1. Open a report.
2. Under **Auto-run report jobs**, click the **Add a new report job** link.



The **Add Report Job** page appears.



3. Fill in the data fields to define the report job options.

Enabled

Check to enable the report job.

Name

Type a name for the report job.

Notes

Type any additional information you wish in the Notes field.

Time zone

Type the time zone in which the report job is to run.

Email addresses (optional)

Type one email address per line if you want to automatically run and email reports on a schedule. In order for this option to function, you must configure the email SMTP server path in the system configuration page. For details, see "Using the System Configuration page" (page 122).

Job start and end dates (optional)

Type the dates between which you want the report job to run.

Report job schedule

Select Daily, Weekly,Monthly or On Alarm by clicking an option. Enter the remaining details in the fields that appear. The data entry fields vary depending on the schedule selection. For on-alarm reports, select an alarm from the list. Alarms must be configured before on-alarm report jobs. For details, see "Configuring alarms on values" (page 251).

Report date range

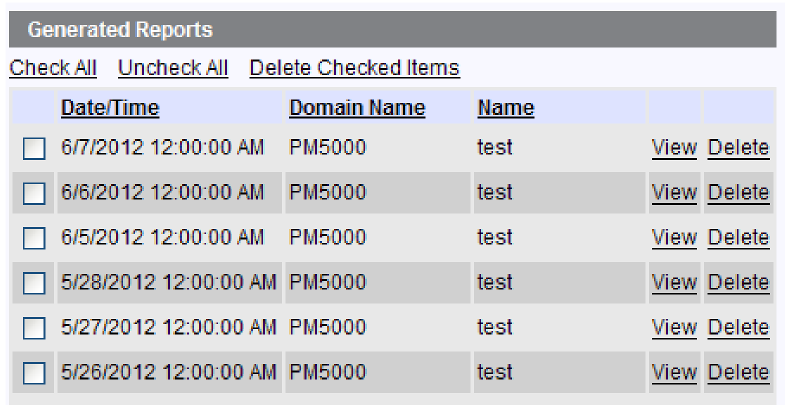
Select either a predefined or custom date range. If fiscal calendar functionality is enabled, predefined fiscal periods will appear in the list.

4. Click **Save**.

To view automatically generated reports:

1. On the **Reports** tab, click **View generated reports**.

The **Generated Reports** page appears.

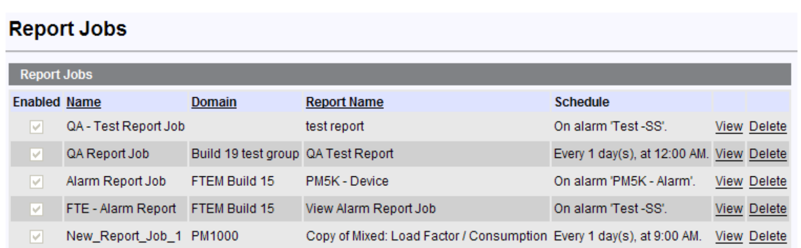


- Click the **View** link next to the report that you want to view. The report appears in a new window.
- Click a list header (**Data/Time**, **Name**, **Domain Name**) to sort the list by the selected header. The sorting order is indicated by an arrow.
- Click the header again to reverse the sorting order.

To view all report jobs:

1. On the **Reports** tab, click **View all report jobs**.

   The **Report Jobs** page appears.



2. Click the **View** link next to the report job that you want to view.

Configuring billing rate schedules

Rate schedules define the content and format of billing reports.

You may use billing reports for:

- **Shadow billing**

  Replicating the monthly bill from your energy provider.

- **Cost allocation**

  Reporting the real cost of energy for each process or cost center in your enterprise.

- **Tenant billing**

  Generating energy bills for use of your manufacturing or commercial facilities by others.

- **What-if analysis**

  Comparing costs of energy from different energy providers for the same usage.

Rate schedules may have global scope or be assigned to a domain. Global rate schedules may be used in all domains. Domain rate schedules apply to only a single domain.

The rate schedule model is designed to be very flexible so you may accommodate a wide variety of utility tariffs.

Rate schedule elements

A rate schedules comprises a set of rules and formulas that transform energy usage data into cost allocation or billing data. You may configure rate schedules to replicate your utility tariff for shadow billing or comparative billing analysis, or develop and implement your own billing rates for internal energy cost recovery from production operations or facility tenants. Rate schedules include the following elements:

- **General Information**

  Identity of the rate schedule owner, the rate schedules scope (global or local to a domain) and effective dates.

- **Runtime parameters**

  Allow you to manually define and enter report parameters that are not automatically logged into the database.

- **Seasons**

  Support utility tariffs that charge different amounts for energy, demand, etc. depending on the season of the year.

- **Day types**

  Days may be classified as working, non-working, holiday, and as a day of the week (Sunday through Saturday). Each day type may be used in line item calculations.

- **Times of Use**

  A menu to configure time-of-use billing periods down to the minute.

- **Line items**

  Flexible Visual Basic .NET scripting combined with specialized functions easily support a variety of utility tariff charges, such as facility, meter or service charges, energy and demand time-of-use charges, "ratchet"demand penalties, transitional competitive charges, sales and use taxes and many others.

- **Global variables**

  Allow line items to interact by sharing data.

Tip: The installation DVD contains a **ExportedRateSchedules** folder, in which you will find a rate schedule file called **Simple time-of-use template v 1.1**. You can use it as a starting point for rate schedule development.

Rate schedule options

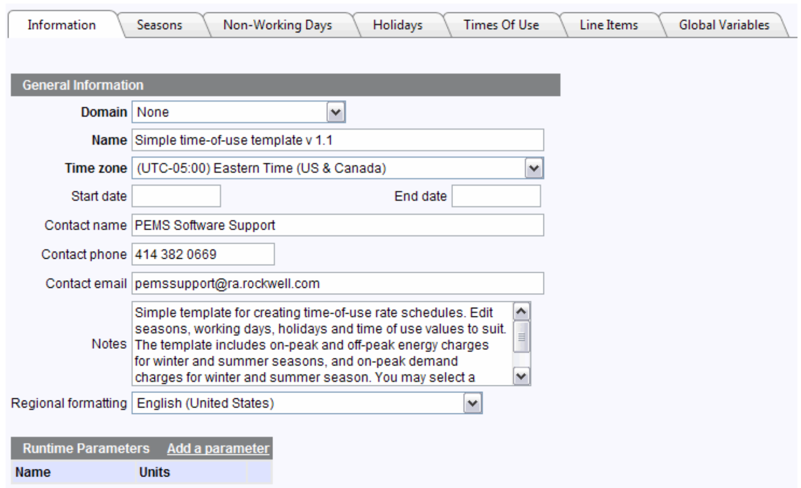
Use this button:	To:
Export	Export a rate schedule to an XML file.
Import	Import a rate schedule. • To import and overwrite an existing rate schedule, navigate to the existing rate schedule's setup page and click **Import**. • To import a rate schedule without overwriting an existing rate schedule, navigate to the group rate schedule screen and click **Import**. If the file is not in the correct format, the import will fail.
Print	Generates a PDF file containing a full listing of the rate schedule general information, seasons, non-working days, holidays, time-of-use periods, global variables, and line items.

Adding rate schedules

To provide rate schedule information:

1. On the **System** tab, open the **Rate Schedules** folder.
2. Select the **Global Rate Schedules** folder or a domain.
3. The **Rate Schedules** page appears.
4. Click the **Add a rate schedule** link.

   The **Add Rate Schedule** page appears.
5. On the **Information** tab, type general information about the rate schedule.



a. Select a **domain**. You may select any configured domain or select None for a global rate schedule.

Domain

A **domain** is a group that is assigned roles and users. Rate schedules and reports may also be assigned to domains. Users assigned to a domain may only access objects assigned to that specific domain. This feature permits an administrator to allow certain users access to only parts of the system he or she chooses.

b. Give the rate schedule a **name**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period

(.), single quote (') or pound sign (#) characters.

- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

c. Select a **time zone** for the rate schedule.

Select time zone for a rate schedule

The default rate schedule time zone is the logged-in user time zone.

d. If the rate schedule only applies over a time, enter the **start and end dates**.

Date fields

Enter dates date fields according to the short date format set in Windows Regional Settings in the server. For U.S. English regional settings the default short date format is mm/dd/yyyy.

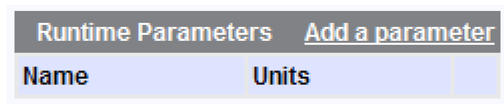
e. Enter contact information and **notes** as appropriate.

Note fields

Notes fields (other than Rate Schedule notes fields) may be up to 255 characters in length, with no limitation on character selection. Notes fields in Rate Schedules may be any length.

f. If desired, select a regional formatting for the report. The selections in this list correspond with Windows regional settings on the server and govern number formats and currency symbols used in a billing report. Only languages that are installed on the server are supported. If a selection chooses a language that is not installed, for instance, certain right-to-left and scripted languages, the billing report displays the ASCII representation of the currency symbol in the selected language.

g. If you want to, set up one or more **runtime parameters**. Use a runtime parameter to enter parameters that are not logged automatically but are needed in the report calculations. For example, your gas bill may include a BTU factor per hundred cubic feet that changes from month to month.



Line item scripts operate on runtime parameters using the name you assign at set-up time, but with spaces omitted. For example, the line item script would refer to a runtime parameter named "BTU Factor Per CCF" as "BTUFactorPerCCF."

Important: When you assign a name to a runtime parameter, be careful to avoid duplicating other runtime parameter, predefined variable or function names as report errors may result.

Tip: There are special **naming conventions** for runtime parameters.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

Adding seasons

Many energy providers apply different charges to energy and demand according to the season of the year in which the energy is used. FactoryTalk EnergyMetrix allows you to specify an unlimited number of seasons in the rate schedule top accommodate any imaginable utility tariff.

The default number of seasons in a rate schedule is zero. You must create and assign names, start dates and end dates for seasons.

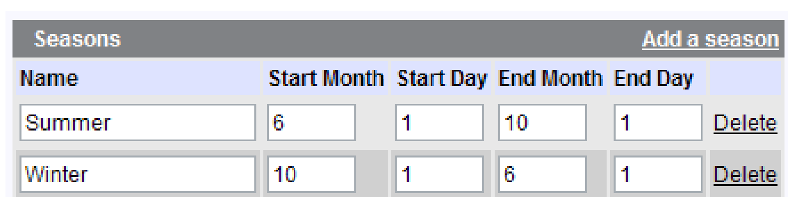
A season begins at 12:00 am on the Start Day in the Start Month and ends at 12:00 am on the End Day of the End Month. Seasons repeat each year for the effective duration of the rate schedule (between the rate schedule's Start Date and End Date).

To add a season:

1. On the **Add Rate Schedule** page, click the **Seasons** tab, and then click the **Add a season** link.
2. Type the Name, Start Month, Start Day, End Month and End Day.

   A name may be a string of any length. Months must be in the range 1 to 12, and days must be in the range 1 to the number of days in the month. If you attempt to save a season with incorrect information, FactoryTalk EnergyMetrix will return you to the edit page with errors flagged.

   The figure below depicts a Winter and Summer season.



Line item scripts in the rate schedule use the names you assign as enumerated arguments. For example, the following script returns the total real energy consumed during the season defined as "Summer":

```
Quantity = Total(ValueType.RealEnergyNet,
SeasonType.Summer)
```

There are special naming conventions for Season names. **Learn more**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character

- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

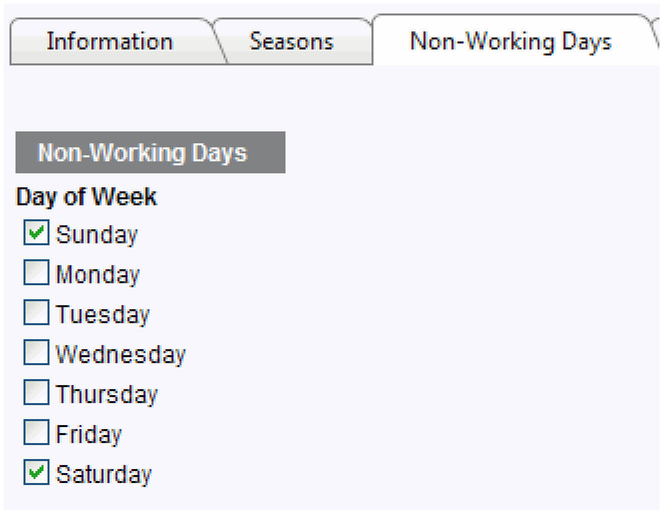
Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

Tip: Take care that the seasons completely account for all days in the year. FactoryTalk EnergyMetrix does not check that seasons cover a complete year without overlapping.

Adding non-working days of the week

To add non-working days of the week:

1. On the **Add Rate Schedule** page, click the **Non-Working Days** tab.
2. Select the check box next to each day that is to be a **non-working day**.



The selected non-working days will repeat weekly.

By default Saturday and Sunday are selected.

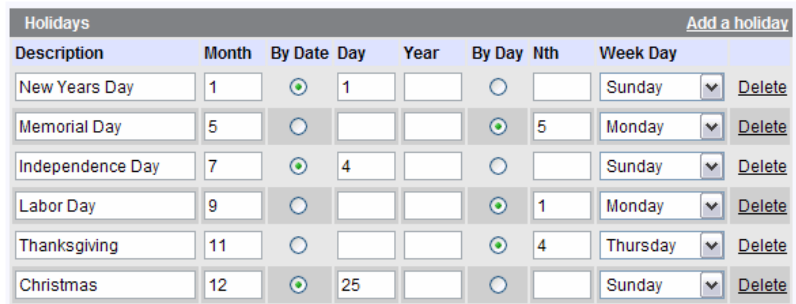
Days you select as non-working days are evaluated by the line item scripts as DayType.NonWorkingDay. Use the **Holidays** tab to define non-working days that do not repeat weekly.

Adding holidays

To add holidays:

1. On the **Add Rate Schedule** page, click the **Holidays** tab.
2. Click the **Add a holiday** link.

   You may create an unlimited number of **holidays**. You may specify holidays By Date or By Day.



- Click **By Date** for holidays that repeat on the same date (or do not repeat). Enter a fixed date in the format mm/d-d/yyyy and a description. Leave the Year field blank for holidays that repeat each year, such as Christmas and New Years Day.
- Click **By Day** to specify holidays that occur on a certain weekday in the month such as Labor Day which is celebrated on the first Monday in September in the US. Holidays that are specified by week day apply to all years in the report interval.

Descriptions may be any string and are for your convenience only. They do not appear on billing reports, are not used as script variables, and do not need to be unique.

When you create a new rate schedule, no holidays are defined.

Holidays are evaluated by the line item scripts as DayType.NonWorkingDay. For defining non-working days that repeat weekly, use the **Non-Working Days** tab. For details, see "Adding non-working days of the week" (page 282).

Adding time of use periods

To add time of use (TOU) periods:

1. On the **Add Rate Schedule** page, click the **Times of Use** tab.
2. Click the **Add a time of use** link.
3. Under **Times of Use**, define TOU periods which may then be referenced in line item scripts.

Times Of Use					Add a time of use
Name	Start Hour	Start Minute	End Hour	End Minute	
EnergyOnPeakWinter	7	0	22	0	Delete
EnergyOnPeakSummer	7	0	23	0	Delete
EnergyOfPeakWinter	22	0	7	0	Delete
EnergyOffPeakSummer	23	0	7	0	Delete
DemandOnPeakAMWin	10	0	12	0	Delete

The TOU period names should be unique and follow common **naming conventions**.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.

- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

When you reference times of use in the line items scripts, write their names without blank spaces between characters. For example, if you specify time of use named "Off Peak", it should be referenced in scripts as `TimeOfUseType.OffPeak`.

Tip: In **Peak**, **Average**, and **Min** functions the calculation interval includes the time of use end point but does not include the start point . For example, if time of use starts at 6:30 and ends at 17:30, a **Peak** calculation will be performed on logged data in the range from 6:31 to 17:30. The **Total** function calculation interval includes both start and end points.

Adding global variables

To add global variables:

- On the **Add Rate Schedule** page, click the **Global Variables** tab.

  The **Global Variables tab** allows you to declare global variables that can be used by all line item scripts. You may declare a global variable and change its value in any line item script, and it will retain the value across the following line item scripts . You can also declare constants for values that will not be changed by line item scripts.

  You may declare global variables (or constants) using the Dim (or Const) statement and assign default values. Use the following syntax:

```
Dim MyVariable [As <Type>] [= <value>]
Const MyVariable [As <Type>] = <value>
```

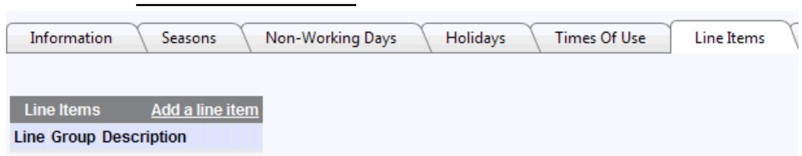
In this tab you may only declare global variables or constants and set their default value. You may not write any script code.

Click **Validate** to verify the syntax of your declaration statements.

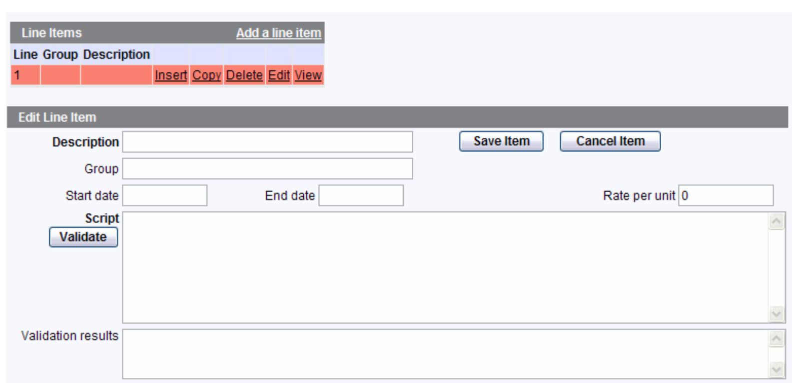
Defining line items

To define line items:

1. On the **Add Rate Schedule** page, click **Line Items** tab.
2. Click the **Add a line item** link.



3. Type the line item Description. The description may be any string and appears in the billing report.
4. (Optional.) Type the Group title. You may arrange line items on a billing report subdivided by groups such as "Energy charges," Demand charges," Facility charges," etc. If no group names are entered then the billing report will not be subdivided. If group names are used, then the billing report will be subdivided into as many groups as there are unique group names.



5. (Optional.) Type the **Start and End** dates for the line item. The line item will perform calculations on all database records referenced by its script between 12:00 a.m. on the Start Date and 11:59:59 p.m. on the End Date. If no dates are entered, the line item is always effective.

   Date fields

   Enter dates date fields according to the short date format set in Windows Regional Settings in the server. For U.S. English regional settings the default short date format is mm/d-d/yyyy.

7. (Optional.) Type a Rate per unit. If used, your script may refer to this value using the RatePerUnit system variable.
8. Type and validate the line item scripting. For details, see "Line item scripting" (page 290).
9. Click **Save**.

   A number assigned to the line item indicate its positions in the list.

10. Repeat the steps for another line item.

    You may also use the links in the **line item header** to insert line items before an existing line item, copy an existing line item, delete a line item or move line items up and down in the list.

Line item scripting

The billing report executes rate schedule line item scripts at report runtime. The scripts define the quantities, units and charges shown in the billing report.

Tip: Save your script frequently. When you save a script, a validation is performed and if errors exist the script will not be saved. To save a script you must correct any script errors or temporarily convert the offending script element to a remark. You may wish to utilize another application such as Notepad or a VBA editing window to create and edit the script and then copy and paste the script into the script field. Your user login will not time out while a rate schedule page is in Edit mode.

Functions

You create line item scripts using Microsoft Visual Basic .NET. Predefined functions assist you in calculating billing report charges, for example, total consumption, peak, average and ratcheted demand, etc. Each function includes arguments that pass logged values from the database, seasons, day types, time-of-use information and other variables to the function.

Your script may also call functions in the .NET System.Math namespace. Refer to the .NET Framework documentation from Microsoft for details on these functions.

Variables

Several predefined input and output variables may be used in the line item script.

Input variables have pre-set values which should not be modified in the script:

- **TotalCharges:** Passes the sum of the charges in lower-numbered line items to the script. Provided for sales tax calculations. Returns a Double value

- **RatePerUnit:** This variable passes to the script the Rate per Unit value that you enter when you create or edit the line item. Returns a Double value
- **BillingPeriodDayCount:** Passes the number of days in the current billing period to the script. Returns an Integer value.

Output variables control the line item properties on the billing report:

- **Quantity:** Determines the value shown in the quantity column.
- **Unit**: Displays units in the line item, e.g. "kWh"
- **Charge:** The monetary value shown in the line item.
- **Visible:** Local Boolean variable that controls visibility of a line item. Default = True (show)
- **SuppressGrandTotal:** Global Boolean variable that controls the visibility of the Total Charge field. Default = False
- **SuppressGroupTotals:** Global Boolean variable that controls the visibility of group subtotals. Default = False

You may also declare local or global variables (or constants) using the Dim (or Const) statement. Use the following syntax:

```
Dim MyVariable [As <Type>] [= <value>]
Const MyVariable [As <Type>] = <value>
```

You may use local variables to structure and simplify scripts that represent complex charges. Local variables do not appear in the report output but may be used to calculate Quantity, Unit, Charge or Visible. Declare local variables in each line item script. Declare global variables in the **Global Variables** tab.

Tip: There are special **naming conventions** for parameters and variables used in line item scripts.

Scripting functions

The following predefined functions are for use in rate schedule scripting. Except as noted, each function operates on logged values between the report start and end dates which occur within the defined season, day and time-of-use periods.

Scripting function	Description
"Average function" (page 293)	Calculates the average value of a tag.
"Band function" (page 294)	Calculates stepped or banded charges, e.g. "first 1000, next 2000" units of a tag.
"CostAllocateCharge function" (page 295)	Used in Cost Allocation rate schedule to apportion a fixed or demand charge.
"GetData function" (page 296)	Retrieves a specific logged value from the database.
"GetUnit function" (page 297)	Reads the units from the database for use in a report.
"Lowest function" (page 298)	Calculates the minimum value of a tag.
"LowestTimestamp function" (page 299)	Determines when a minimum value occurred.
"NLowest function" (page 300)	Calculates the 'n' lowest values of a tag.
"NLowestTimestamps function" (page 301)	Determines when the 'n' minimum values occurred.
"NPeaks function" (page 303)	Calculates the 'n' highest values of a tag.
"NPeakTimestamps function" (page 304)	Determines when the 'n' maximum values occurred.
"Peak function" (page 305)	Calculated the maximum value of a tag.
"PeakTimestamp function" (page 306)	Determines the date and time a peak occurred for a tag.
"ProRateMonthlyCharge function" (page	Used to prorate demand and fixed monthly charges when report period is less than a

Scripting function	Description
307)	month.
"Ratchet function" (page 309)	Used for calculating demand penalties for peaks which occur within a defined period prior to the report period.
"SeasonDayCount function" (page 310)	Returns the number of days in the billing period that are in the specified season.
"SetDateRange function" (page 311)	Used to obtain reports that compare usage over two different reporting periods.
"Sum function" (page 313)	Calculates the arithmetic sum of a non-cumulative tag.
"Total function" (page 314)	Calculates consumption of a consumption tag such as energy.
"TotalRTPCharge function" (page 315)	Calculates the total charge for a consumption tag such as kWh, using real time pricing data.

Average function

The Average function returns the mathematical average of the selected value logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. It returns a DateTime value.

Usage

```
Quantity = Average(ValueType.enumValue)

Quantity = Average(ValueType.enumValue,
SeasonType.enumValue)

Quantity = Average(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue)

Quantity = Average(ValueType.enumValue,
DayType.enumValue)

Quantity = Average(ValueType.enumValue, startHour,
endHour)

Quantity = Average(ValueType.enumValue,
TimeOfUseType.enumValue)
```

```
Quantity = Average(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour)

Quantity = Average(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)

Quantity = Average(ValueType.enumValue,
DayType.enumValue, TimeOfUseType.enumValue)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the average real demand power that occurred during the Summer season, on working days, during the hours of 10:00 am to 4:00 pm:

```
Quantity = Average(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.NonWorkingDay, 10, 16)
```

Band function

The Band function provides a shortcut for calculating "banded" charges (see the Example). This function comprises the following script code:

```
If (Val > Max) Then Result = Max - Min

Else If (Value > Min) Then Result = Val - Min

Else Result = 0
```

It returns a Double value.

Usage

```
Quantity = Band(val, min, [max])
```

Comments

Variables Val, Min and Max may be constants or expressions that return a Double value.

Max is optional.

Example

In this example, a utility charges 7.12 cents per kWh for the first 1000 kWh, 5.23 cents per kWh for the next 2000, and 3.15 cents per kWh thereafter. The script returns the total energy used and the banded charge.

```
Quantity = Total(ValueType.RealEnergyNet)

Charge = Band(Total(ValueType.RealEnergyNet), 0, 1000) *
0.0712 +

   Band(Total(ValueType.RealEnergyNet), 1000, 3000) *
0.0523 +

   Band(Total(ValueType.RealEnergyNet), 3000) * 0.0315
```

CostAllocateCharge function

The CostAllocateCharge function allocates a monthly charge (typically a demand or fixed charge) according to the meter's contribution to the total. It provides a simple way to implement the following calculation:

```
Result = [ fixedCharg * (meterValue / totalValue) ]
```

It returns a Double value.

Usage

```
Charge = CostAllocateCharge(fixedCharge, totalValue,
meterValue)
```

Comments

fixedCharge, totalValue and meterValue are all Double values.

GetData function

The GetData function returns the selected value from the database.

Usage

```
Object = GetData(ValueType.enumValue)

Object = GetData(ValueType.enumValue, DateTime TimeStamp)
```

Comments

The value selected is the last value logged within one logging interval before the Report Start Date or the specified Time Stamp. It returns an Object value.

The time stamp may be expressed in a few different formats, for example "1/30/2003 12:30 PM" or "2/28/1999".

The most reliable method is to use the .NET DateTime object:

```
new DateTime(year, month, day, hour, minute, second)
```

Example

The following example returns the Real Energy Net value logged from the selected meter(s)

```
Quantity = GetData(ValueType.RealEnergyNet, new DateTime
(2003, 5, 9, 15, 0, 0))
```

The GetData function will return either Nothing or a Double value. If the above sample code returns Nothing (a null object), the quantity will appear as 0. If you intend to use the value from the GetData function for further calculations, you may use this code to check the return value:

```
Dim result

result = GetData(ValueType.RealEnergyNet, new DateTime
(2003, 7, 9, 15, 0, 0))
```

```
If result = Nothing Then
    Quantity = 0
Else
    Quantity = result * 10
End If
```

GetUnit function

The GetUnit function returns the units associated with the selected value from the database. It returns a String value.

Usage

```
Unit = GetUnit(ValueType.enumValue)
```

Comments

Normally used with the predefined variable Unit to display the correct units in the report. The GetUnit function is used when the ValueType is assigned by the script. If the units do not change, it is more efficient to assign a string value in the script. Example:

```
Unit = "kWh"
```

Example

This example line item script shows a simple energy charge using the GetUnit function and the report output.

```
Quantity = Total(ValueType.RealEnergyNet)
Unit = GetUnit(ValueType.RealEnergyNet)
Charge = Quantity*RatePerUnit
```

Report output:

Energy charges

Description	Quantity	Rate	Charge
energy	2,209.6 kWh	0.03215	$71.04

Lowest function

The Lowest function returns the minimum of the selected value logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, and TimeOfUseType (or StartHour and EndHour) arguments. The Lowest function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns a Double value.

Usage

```
Quantity = Lowest(ValueType.enumValue)

Quantity = Lowest(ValueType.enumValue,
SeasonType.enumValue)

Quantity = Lowest(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue)

Quantity = Lowest(ValueType.enumValue, DayType.enumValue)

Quantity = Lowest(ValueType.enumValue, startHour,
endHour)

Quantity = Lowest(ValueType.enumValue,
TimeOfUseType.enumValue)

Quantity = Lowest(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour)

Quantity = Lowest(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)

Quantity = Lowest(ValueType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the minimum real demand power that occurred during the Summer season, on working days, during the hours of 10:00 am to 4:00 pm:

```
Quantity = Lowest(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, 10, 16)
```

LowestTimestamp function

The LowestTimestamp function returns the time and date that the minimum of the selected value was logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. The LowestTimestamp function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns a DateTime value.

Usage

```
Quantity = LowestTimestamp(ValueType.enumValue)

Quantity = LowestTimestamp(ValueType.enumValue,
SeasonType.enumValue)

Quantity = LowestTimestamp(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue)

Quantity = LowestTimestamp(ValueType.enumValue,
DayType.enumValue)

Quantity = LowestTimestamp(ValueType.enumValue,
startHour, endHour)

Quantity = LowestTimestamp(ValueType.enumValue,
TimeOfUseType.enumValue)

Quantity = LowestTimestamp(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour)

Quantity = LowestTimestamp(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)

Quantity = LowestTimestamp(ValueType.enumValue,
DayType.enumValue, TimeOfUseType.enumValue)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script returns the time stamp of the real demand power minimum value that occurred during the Summer season, on working days, during the hours of 10:00 a.m. to 4:00 p.m.:

```
Dim dtMin As DateTime

dtMin = LowestTimestamp(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, 10, 16)
```

NLowest function

The NLowest function returns the N smallest instances of the selected value logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. The NLowest function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns a Double array of N elements.

Usage

```
Quantity = NLowest(ValueType.enumValue, N)

Quantity = NLowest(ValueType.enumValue,
SeasonType.enumValue, N)

Quantity = NLowest(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, N)

Quantity = NLowest(ValueType.enumValue,
DayType.enumValue, N)

Quantity = NLowest(ValueType.enumValue, startHour,
endHour, N)

Quantity = NLowest(ValueType.enumValue,
TimeOfUseType.enumValue, N)
```

```
Quantity = NLowest(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour, N)

Quantity = NLowest(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue, N)

Quantity = NLowest(ValueType.enumValue,
DayType.enumValue, TimeOfUseType.enumValue, N)
```

Comments

N is an integer representing the number of minimum values to be returned.

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the 3 lowest real demand power values that occurred during the Summer season, on working days, during the hours of 10:00 am to 4:00 pm:

```
Dim dblDemandMins(3) [as Double]

dblDemandMins= NLowest(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, 10, 16, 3)
```

NLowestTimestamps function

The NLowestTimestamps function returns the time and date that the N largest instances of the selected value was logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. The NLowestTimestamps function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns an array of N DateTime values.

Usage

```
Quantity = NLowestTimestamps(ValueType.enumValue)
Quantity = NLowestTimestamps(ValueType.enumValue, SeasonType.enumValue)
Quantity = NLowestTimestamps(ValueType.enumValue, SeasonType.enumValue, DayType.enumValue)
Quantity = NLowestTimestamps(ValueType.enumValue, DayType.enumValue)
Quantity = NLowestTimestamps(ValueType.enumValue, startHour, endHour)
Quantity = NLowestTimestamps(ValueType.enumValue, TimeOfUseType.enumValue)
Quantity = NLowestTimestamps(ValueType.enumValue, SeasonType.enumValue, DayType.enumValue, startHour, endHour)
Quantity = NLowestTimestamps(ValueType.enumValue, SeasonType.enumValue, DayType.enumValue, TimeOfUseType.enumValue)
Quantity = NLowestTimestamps(ValueType.enumValue, DayType.enumValue, TimeOfUseType.enumValue)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script returns the time stamp of the real demand power minimum that occurred during the Summer season, on working days, during the hours of 10:00 a.m. to 4:00 p.m.:

```
dim dtMins(3) [as DateTime]
dtMins = NLowestTimestamps(ValueType.RealPowerDemand, SeasonType.Summer, DayType.WorkingDay, 10, 16, 3)
```

NPeaks function

The NPeaks function returns the N largest instances of the selected value logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. The NPeaks function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns a Double array of N elements.

Usage

```
Quantity = NPeaks(ValueType.enumValue, N)

Quantity = NPeaks(ValueType.enumValue,
SeasonType.enumValue, N)

Quantity = NPeaks(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, N)

Quantity = NPeaks(ValueType.enumValue, DayType.enumValue,
N)

Quantity = NPeaks(ValueType.enumValue, startHour,
endHour, N)

Quantity = NPeaks(ValueType.enumValue,
TimeOfUseType.enumValue, N)

Quantity = NPeaks(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour, N)

Quantity = NPeaks(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue, N)

Quantity = NPeaks(ValueType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue, N)
```

Comments

N is an integer representing the number of peak values to be returned.

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the 3 highest real demand power values that occurred during the Summer season, on working days, during the hours of 10:00 am to 4:00 pm:

```
Dim dblDemandPeaks(3) [as Double]

dblDemandPeaks = NPeaks(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, 10, 16, 3)
```

NPeakTimestamps function

The NPeakTimestamps function returns the time and date that the N largest instances of the selected value was logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. The NPeakTimestamps function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns an array of N DateTime values.

Usage

```
Quantity = NPeakTimestamps(ValueType.enumValue)

Quantity = NPeakTimestamps(ValueType.enumValue,
SeasonType.enumValue)

Quantity = NPeakTimestamps(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue)

Quantity = NPeakTimestamps(ValueType.enumValue,
DayType.enumValue)

Quantity = NPeakTimestamps(ValueType.enumValue,
startHour, endHour)

Quantity = NPeakTimestamps(ValueType.enumValue,
TimeOfUseType.enumValue)

Quantity = NPeakTimestamps(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour)

Quantity = NPeakTimestamps(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)
```

```
Quantity = NPeakTimestamps(ValueType.enumValue,
DayType.enumValue, TimeOfUseType.enumValue)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script returns the time stamp of the real demand power peak that occurred during the Summer season, on working days, during the hours of 10:00 a.m. to 4:00 p.m.:

```
dim dtPeaks(3) [as DateTime]

dtPeaks = NPeakTimestamps(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, 10, 16, 3)
```

Peak function

The Peak function returns the maximum of the selected value logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. The Peak function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns a Double value.

Usage

```
Quantity = Peak(ValueType.enumValue)

Quantity = Peak(ValueType.enumValue,
SeasonType.enumValue)

Quantity = Peak(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue)

Quantity = Peak(ValueType.enumValue, DayType.enumValue)

Quantity = Peak(ValueType.enumValue, startHour, endHour)

Quantity = Peak(ValueType.enumValue,
TimeOfUseType.enumValue)
```

```
Quantity = Peak(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour)

Quantity = Peak(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)

Quantity = Peak(ValueType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)
```

Comments

For calculating peaks which occur outside the report period, use the "Ratchet function" (page 309).

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the peak real demand power that occurred during the Summer season, on working days, during the hours of 10:00 am to 4:00 pm:

```
Quantity = Peak(ValueType.RealPowerDemand, SeasonType.Sum-
mer, DayType.WorkingDay, 10, 16)
```

PeakTimestamp function

The PeakTimestamp function returns the time and date that the maximum of the selected value was logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, TimeOfUseType (or StartHour and EndHour) arguments. The PeakTimestamp function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns a DateTime value.

Usage

```
Quantity = PeakTimestamp(ValueType.enumValue)
```

```
Quantity = PeakTimestamp(ValueType.enumValue,
SeasonType.enumValue)

Quantity = PeakTimestamp(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue)

Quantity = PeakTimestamp(ValueType.enumValue,
DayType.enumValue)

Quantity = PeakTimestamp(ValueType.enumValue, startHour,
endHour)

Quantity = PeakTimestamp(ValueType.enumValue,
TimeOfUseType.enumValue)

Quantity = PeakTimestamp(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour)

Quantity = PeakTimestamp(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)

Quantity = PeakTimestamp(ValueType.enumValue,
DayType.enumValue, TimeOfUseType.enumValue)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script returns the time stamp of the real demand power peak that occurred during the Summer season, on working days, during the hours of 10:00 a.m. to 4:00 p.m.:

```
dim dtPeak [as DateTime]

dtPeak = PeakTimestamp(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, 10, 16)
```

ProRateMonthlyCharge function

The ProRateMonthlyCharge function is used with monthly charges such as demand and fixed charges to display the appropriate charges on reports where the report period is less than one month. It returns a Double value.

Usage

```
Charge = ProRateMonthlyCharge(monthlyCharge)
```

Comments

The monthlyCharge argument is an expression which returns a Double value.

Example

The following example assigns a proration factor as a global variable for Demand charges if the billing report period is less than or greater than a month.

```
'Declare a global variable
Dim dblProRateFactor As Double

'In the first line item, add following script
dblProRateFactor = 1
If BillingPeriodDayCount < 28 Or BillingPeriodDayCount >
31 Then
    dblProRateFactor =  ProRateMonthlyCharge(1)
End If

'In Demand line items, multiply the Charge by the pro-
ration factor
If Charge = 0 then Visible = False
Quantity = Peak(ValueType.RealPowerDemand)
Unit = "kW"
RatePerUnit = 2.35 'rate per kw of demand
Charge = Quantity * RatePerUnit * dblProRateFactor
```

Ratchet function

The Ratchet function returns the maximum of the selected value logged during the defined period, defined by the endDate and intervalInMonths arguments, as well as the periods defined by the SeasonType, DayType, and TimeOfUseType (or StartHour and EndHour) arguments. The Ratchet function is generally used for rate-of-change values such as demand real and reactive power (kW, kVAR). It returns a Double value.

Usage

```
Quantity = Ratchet(ValueType.enumValue, [endDate], inter-
valInMonths)

Quantity = Ratchet(ValueType.enumValue,
SeasonType.enumValue, [endDate], intervalInMonths)

Quantity = Ratchet(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, [endDate], inter-
valInMonths)

Quantity = Ratchet(ValueType.enumValue,
DayType.enumValue, [endDate], intervalInMonths)

Quantity = Ratchet(ValueType.enumValue, startHour,
endHour, [endDate], intervalInMonths)

Quantity = Ratchet(ValueType.enumValue,
TimeOfUseType.enumValue, [endDate], intervalInMonths)

Quantity = Ratchet(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour, [endDate], intervalInMonths)

Quantity = Ratchet(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue, [endDate], intervalInMonths)

Quantity = Ratchet(ValueType.enumValue,
DayType.enumValue, TimeOfUseType.enumValue, [endDate],
intervalInMonths)
```

Comments

Use the Ratchet function to calculate a demand penalty, in which a charge is based on the peak demand in the previous six months, year or other period. For calculating peaks which occur within the report period, use the "Peak function" (page 305).

The endDate argument is optional. The function defaults to the report end date. If used, endDate is a string in the format "mm/dd/yyyy [hh:mm [am/pm]]". The best way to express the date is to use the .NET DateTime object:

```
new DateTime(year, month, day, hour, minute, second)
```

The intervalInMonths argument is an integer which defines the ratchet demand period. it is usually 6 or 12 depending on the utility tariff.

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the peak real demand power that occurred during the year ending at the report end date, during the Summer season, on working days, during the user-defined 'On Peak' time-of-use period:

```
Quantity = Ratchet(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay,
TimeOfUseType.OnPeak, 12)
```

SeasonDayCount function

The SeasonDayCount function returns the number of days within the current billing period that are also in the specified Season. It returns an Integer value.

Usage

```
MyVariable = SeasonDayCount(SeasonType.enumValue)
```

Comments

This function is usually used in combination with the BillingPeriodDayCount input variable. For details, see "Enumeration values for functions" (page 318).

Example

In this example, a contracted demand charge is apportioned between summer and non-summer seasons which occur within the same billing period.

```
Dim SummerRate, NonSummerRate, ContractedDemand

Charge = (SeasonDayCount(SeasonType.NonSummer) /
BillingPeriodDayCount) * ContractedDemand * NonSummerRate
+ (SeasonDayCount(SeasonType.Summer) / BillingPeri-
odDayCount) * ContractedDemand * SummerRate
```

SetDateRange function

The SetDateRange function changes the calculation start and end dates with respect to the Report End Date. It operates only on the current line item. SetDateRange returns no value. This function may be used to generate reports that compare current usage with historical usage or to accommodate billing charges that apply for a certain number of hours in each billing period.

Usage

```
SetDateRange(DateOffset.enumValue)
```

[valid enumValues for DateOffset in this usage are PreviousMonth, PreviousYear, YearToDate. CurrentYear has no effect.]

```
SetDateRange(DateOffset.enumValue, Month.enumValue)
```

[valid enumValues for DateOffset in this usage are PreviousYear, CurrentYear. PreviousMonth has no effect.]

```
SetDateRange(DateOffset.enumValue, hours)
```

[allowable enumValues for DateOffset in this usage are Before, After]

Comments

For details, see "Enumeration values for functions" (page 318).

The `hours` argument is an integer. Assigning a value larger than the number of hours in the billing month will return invalid results.

Do not call this function more than once in the same line item.

This function modifies the reporting for all subsequent function calls in the current line item only. All other line items in the rate schedule utilize the original report start and end dates.

SetDateRange(DateOffset.Before, hours) will set the line item end date to (report start date + hours), with an upper limit of the original report end date.

Calling SetDateRange(DateOffset.After, hours) will set the line item start date to (initial report start date + hours), with an upper limit of the original report end date.

Examples

1. Example 1 uses this function to access data from the previous year for the same billing period.

   ```
   SetDateRange(DateOffset.PreviousYear)
   'Perform calculations...
   ```

2. Example 2 uses this function to access data for a specific month in the current year.

   ```
   SetDateRange(DateOffset.CurrentYear,Month.January)
   'Perform calculations...
   ```

3. Example 3 uses this function to address a special charge that applies for the first 250 hours of the billing month.

```
SetDateRange(DateOffset.Before,250)
'Calculate value and multiply by rate...
```

Sum function

The Sum function calculates the arithmetic sum of logged non-cumulative (delta-logged) consumption or production values over the report period or other period defined by the function arguments. It returns a Double value.

Usage

```
Quantity = Sum(ValueType.enumValue)
Quantity = Sum(ValueType.enumValue, intervalInMonths)
Quantity = Sum(ValueType.enumValue, endDate, inter-
valInMonths)
Quantity = Sum(ValueType.enumValue, SeasonType.enumValue)
Quantity = Sum(ValueType.enumValue, SeasonType.enumValue,
DayType.enumValue)
Quantity = Sum(ValueType.enumValue, DayType.enumValue)
Quantity = Sum(ValueType.enumValue, startHour, endHour)
Quantity = Sum(ValueType.enumValue,
TimeOfUseType.enumValue)
Quantity = Sum(ValueType.enumValue, SeasonType.enumValue,
DayType.enumValue, startHour, endHour)
Quantity = Sum(ValueType.enumValue, SeasonType.enumValue,
DayType.enumValue, TimeOfUseType.enumValue)
Quantity = Sum(ValueType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)
```

Comments

`intervalInMonths` is an integer value 0 or greater that defines the interval over which the sum is calculated. The interval ends at the report end date or the data defined by the `endDate` argument if included.

`endDate` is a string expressing the date. The time stamp may be expressed in a few different formats, for example "1/30/2003 12:30 PM" or "2/28/1999".

The most reliable method is to use the .NET DateTime object:

```
new DateTime(year, month, day, hour, minute, second)
```

Use care to select only non-cumulative (delta-logged) values for the ValueType. For accumulating value types, use the Total() function.

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the sum of weekly production values entered into a manual tag with user-defined Value Type named 'Weekly Production.'

```
Quantity = Sum(ValueType.WeeklyProduction)
```

Total function

The Total function returns the accumulated usage of the selected value logged between the report start and end dates, and during the periods defined by the SeasonType, DayType, and TimeOfUseType (or StartHour and EndHour) arguments. The Total function is generally used for values such as energy (kWh, kVARh, gallons of oil) and production units. It returns a Double value.

Usage

```
Quantity = Total(ValueType.enumValue)
```

```
Quantity = Total(ValueType.enumValue,
SeasonType.enumValue)

Quantity = Total(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue)

Quantity = Total(ValueType.enumValue, DayType.enumValue)

Quantity = Total(ValueType.enumValue, startHour, endHour)

Quantity = Total(ValueType.enumValue,
TimeOfUseType.enumValue)

Quantity = Total(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour)

Quantity = Total(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)

Quantity = Total(ValueType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Example

The following script calculates the total kWh used during the Summer season, on working days, during the user-defined On Peak time-of-use period:

```
Quantity = Total(ValueType.RealEnergyNet, SeasonType.Sum-
mer, DayType.NonWorkingDay, TimeOfUseType.OnPeak)
```

TotalRTPCharge function

The TotalRTPCharge calculates the total charge for consumption values such as kWh, kVARh, etc., using real time pricing data. It returns a Double value.

Meter tags that contain price data are passed as the priceMeterTagPath parameter by listing the tag name as a **fully-qualified or shortcut method tag name**.

Referencing tag names in scripts

Applies to:

- Derived tags
- TotalRTPCharge function

Fully-qualified tag name

Tags may be referenced in scripts by listing the fully-qualified tag name which specifies the path to the tag from the root level domain down to the tag name. Domains, groups and tag names within the fully-qualified tag name are separated with periods.

Because domains, groups, and tag names can have characters in them that are not valid in Visual Basic for .NET script code, the fully-qualified tag name must be enclosed with a pair of '#' characters.

Example: to reference the "Real Power Demand" tag in the Acme domain's Main meter, you would use the following fully-qualified tag name:

```
#Acme.Main.Real Power Demand#
```

Shortcut tag name

Tags may also be referenced by a "shortcut" method using the meter tag ID. This would be the shortcut method using the meter tag id:

```
#MeterTagId507#
```

Tip: When scripts reference tags using the fully-qualified tag name then any change to a domain name, group name, or the tag name of that tag will require the script to be updated.

Only Device and Manual meter tags may be referenced in derived tag scripts. Only Price Meter tags may be referenced in real time pricing scripts.

Usage

```
Charge = TotalRTPCharge(ValueType.enumValue,
priceMeterTagPath)

Charge = TotalRTPCharge(ValueType.enumValue,
SeasonType.enumValue, priceMeterTagPath)

Charge = TotalRTPCharge(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
priceMeterTagPath)

Charge = TotalRTPCharge(ValueType.enumValue,
DayType.enumValue, priceMeterTagPath)

Charge = TotalRTPCharge(ValueType.enumValue, startHour,
endHour, priceMeterTagPath)

Charge = TotalRTPCharge(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue, startHour,
endHour, priceMeterTagPath)

Charge = TotalRTPCharge(ValueType.enumValue,
TimeOfUseType.enumValue, priceMeterTagPath)

Charge = TotalRTPCharge(ValueType.enumValue,
SeasonType.enumValue, DayType.enumValue,
TimeOfUseType.enumValue, priceMeterTagPath)
```

Comments

The startHour and endHour arguments are integers in the range of 1 to 24, where 24 = midnight.

For details, see "Enumeration values for functions" (page 318).

Meter tags that contain price data should specify log rate that corresponds to price effectiveness period. For example, if price changes once per hour, price meter tag log rate should be set to 60 minutes.

Scripts that reference tags using the fully-qualified tag name will need to be updated by the user if any change to the domain names, group names, or tag name of that tag are made.

Example

The following script calculates the total charge for kWh used during the Summer season, on working days, during the user-defined On Peak time-of-use period. Real time pricing data is stored in the Acme Bushing domain, Main meter, 'RTP' tag:

```
Charge = TotalRTPCharge(ValueType.RealEnergyNet,
SeasonType.Summer, DayType.NonWorkingDay,
TimeOfUseType.OnPeak, #Acme Bushing.Main.RTP#)
```

Enumeration values for functions

Enumeration values are named constants for use in functions. There are the following accepted enumeration values:

- RealEnergyNet
- RealEnergyExported
- RealEnergyImported
- ReactiveEnergyNet
- ReactiveEnergyExported
- ReactiveEnergyImported
- RealPowerDemand
- ReactivePowerDemand
- ApparentPowerDemand

Tip: The ValueType enumeration values correspond to entries in the ValueTypes table in the database. As new entries are added in the database, new allowable enumeration values are also added. The new enumeration values correspond to the value type names in the database but with spaces omitted. For example, a value type name of "Demand

Current" will correspond to an enumeration value of DemandCurrent.

Add new value types using the **Unit Setup** item on the **System** tab.

DayType

- `Sunday`
- `Monday`
- `Tuesday`
- `Wednesday`
- `Thursday`
- `Friday`
- `Saturday`
- `AllDays`
- `WorkingDay`
- `NonWorkingDay`

Month

- `January`
- `February`
- `March`
- `April`
- `May`
- `June`
- `July`
- `August`
- `September`
- `October`

- `November`
- `December`

SeasonType

Enumeration values correspond to user-defined season names but with spaces omitted. For instance, a user-defined season named "First Quarter" corresponds to an enumeration value of `FirstQuarter`.

TimeOfUseType

Enumeration values correspond to user defined time-of-use period names but with spaces omitted. For instance, a user-defined time-of-use period named "Off Peak Summer" corresponds to an enumeration value of `OffPeakSummer`.

Tip: here are special **naming conventions** for enumeration values such as Value Types, Seasons and Time-of-Use Periods.

Name fields

Name fields may be up to 50 characters in length, except Rate Schedule names may be any length. Names do not need to be unique, although it is recommended that you select names that make the item easy to recognize.

There are no restrictions on character usage, except:

- Group and domain names may not contain period (.), single quote (') or pound sign (#) characters.
- Meter and meter tag names may not contain period (.) or pound sign (#) characters.

Names used in line item scripting

Certain names are used in line item scripting and must comply with Visual Basic naming conventions. These names include:

- Value Types
- Seasons
- Time-of-Use periods
- Runtime parameters

These names must comply with the following:

- The name must start with an alpha character
- The name may contain only letters, numbers, blank spaces and underscore characters (_).

  If a name contains spaces, it is referenced in line item scripts without a space. For instance, the season name 'Summer Season' will be referenced as 'SeasonType.SummerSeason' in a line item script. If the space is entered into the script, the script will fail to validate and compile.

The Rate Schedule Setup and Unit Setup screens perform invalid character checking when you enter a name.

Caution: No checking is performed or possible if you enter Value Type, Season, or Manually-entered parameter names directly into the database.

DateOffset

Enumeration values are dependent on the function signature used. For details, see "SetDateRange function" (page 311).

- `PreviousMonth`

- `PreviousYear`
- `CurrentYear`
- `YearToDate`
- `Before`
- `After`

All `DateOffset` values are calculated from the original report end date.

Replicating your utility bill

A sample utility tariff

This sample utility tariff is based on the Wisconsin Public Service Corporation schedule Cp-1, Large Commercial and Industrial Service - General. It is used only as an example of how to configure a rate schedule in FactoryTalk EnergyMetrix to reflect charges that appear frequently in utility tariffs.

Among the interesting features of WPS Schedule Cp-1 are:

- Seasonal billing differential
- Energy and demand time-of-use billing
- Different time-of-use periods for different seasons
- Ratcheting demand penalty
- Fixed charge
- Sales tax

```
MONTHLY RATE
Energy Charge
1. On-Peak
   a. Winter (Calendar Months Oct-May): $.03594/Kwh
      7AM-10PM Mon - Fri (Except Holidays)
   b. Summer (Calendar Months Jun-Sep): $.03594/Kwh
      7AM-11PM Mon - Fri (Except Holidays)
```

```
2. Off-Peak

   a. Winter (Calendar Months Oct-May): $.01558/Kwh

      10PM-7AM Mon - Fri, all day Sat., Sun., and Hol-
idays.

   b. Summer (Calendar Months Jun-Sep): $.01558/Kwh

      11PM-7AM Mon - Fri, all day Sat., Sun., and Hol-
idays.

Demand Charge

1. Generation System Demand

   Highest dollar amount of the following (only one of
the three):

   a. Peak Load

      1) Winter (Calendar Months Oct-May): $4.84/Kw

         10AM-12Noon, and 5PM-8PM Mon - Fri (Except Hol-
idays)

      2) Summer (Calendar Months Jun-Sep): $8.63/Kw

         10AM-8PM Mon - Fri (Except Holidays)

   b. Intermediate Load

      1) Winter (Calendar Months Oct-May): $3.63/Kw

         7AM-10AM, 12Noon-5PM, 8PM-10PM Mon - Fri (Except
Holidays).

      2) Summer (Calendar Months Jun-Sep): $6.47/Kw

         7AM-10AM, 8PM-11PM Mon - Fri (Except Holidays)

   c. Base Load

      1) Winter (Calendar Months Oct-May): $0.00/Kw

         10PM-7AM Mon - Fri, all day Sat., Sun., and Hol-
idays

      2) Summer (Calendar Months Jun-Sep): $0.00/Kw

         11PM-7AM Mon - Fri, all day Sat., Sun., and Hol-
idays

2. Transmission Demand:     $.85/Kw

   Per Kw of maximum demand of the Peak and Intermediate
Generation System

   Demand periods for the month.

3. Customer Demand:       $1.30/Kw
```

```
   Per Kw of maximum demand during the current or pre-
ceding 11 months.

Customer Charge

   For customers with company metering equipment
installed at:

      Under 6,000 volts $240.00/Month

      6,000 volts to 15,000 volts, inclusive
$290.00/Month

      Over 15,000 volts $700.00/Month

   The above listed voltages are phase-to-ground for wye-
connected company systems

   and phase-to-phase for delta-connected company sys-
tems.

Sales Tax

   5% sales and use tax applies on the total of all
charges.
```

Seasons

The seasons in the sample tariff are easily entered into the rate schedule seasons tab.

Seasons					Add a season
Name	**Start Month**	**Start Day**	**End Month**	**End Day**	
WInter	10	1	6	1	Delete
Summer	6	1	10	1	Delete

Holidays

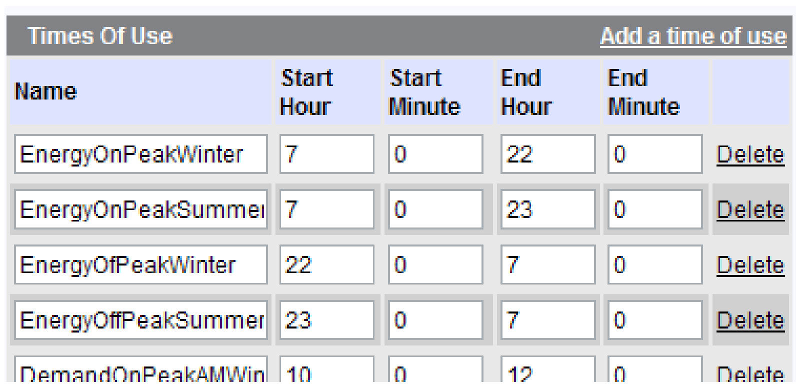
The **Holidays** tab to the WPS Cp-1 tariff is shown below. Only Good Friday must be entered each year.

Holidays								Add a holiday
Description	**Month**	**By Date**	**Day**	**Year**	**By Day**	**Nth**	**Week Day**	
New Years Day	1	●	1		○		Sunday	Delete
Memorial Day	5	○			●	5	Monday	Delete
Independence Day	7	●	4		○		Sunday	Delete
Labor Day	9	○			●	1	Monday	Delete
Thanksgiving	11	○			●	4	Thursday	Delete
Christmas	12	●	25		○		Sunday	Delete

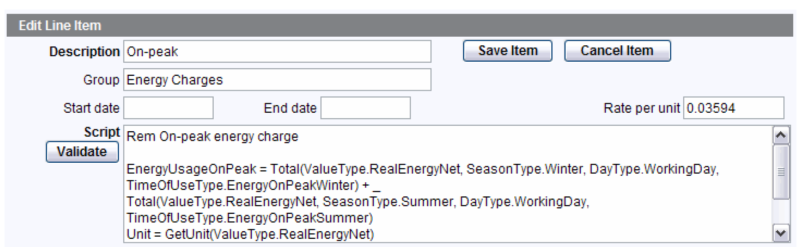
A sample time-of-use energy charge script

A sample script that implements the time-of-use metering specified in the sample tariff is shown below. Note that it implements different time-of-use schedules for summer and winter.

The script uses the Energy Times of Use definitions as entered in the **Times of use** tab:



The script configuration page:



And the actual line-item script:

```
Rem On-peak energy charge

EnergyUsageOnPeak = Total(ValueType.RealEnergyNet,
SeasonType.Winter, DayType.WorkingDay, TimeOfUseType.En-
ergyOnPeakWinter) + _

Total(ValueType.RealEnergyNet, SeasonType.Summer,
DayType.WorkingDay, TimeOfUseType.EnergyOnPeakSummer)

Unit = GetUnit(ValueType.RealEnergyNet)

Quantity = EnergyUsageOnPeak
```

```
Charge = Quantity * RatePerUnit
If Charge = 0 then Visible = False
```

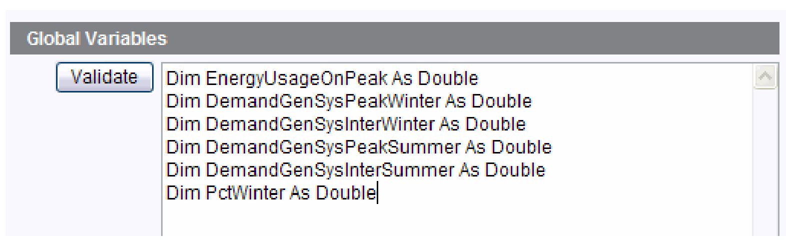
A sample demand charges script

Demand charges may become fairly complex, as are the Generations System and Transmission Demand charges in the sample tariff. The example addresses this tariff requirement using a number of rate schedule features:

- Global variables
- Times of Use
- Proration

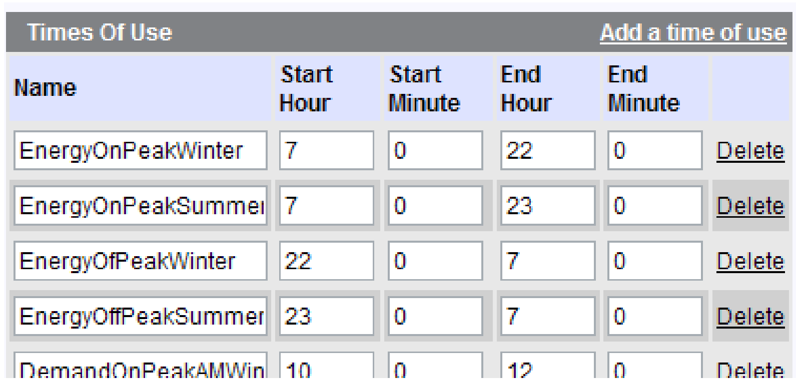
Global variables

The following Global Variables are used in the Demand calculations. Global variables permit passing of results from one line item to other line items.



Times of Use

The Demand scripts use the Demand Times of Use definitions.



Times Of Use					Add a time of use
Name	Start Hour	Start Minute	End Hour	End Minute	
EnergyOnPeakWinter	7	0	22	0	Delete
EnergyOnPeakSummer	7	0	23	0	Delete
EnergyOfPeakWinter	22	0	7	0	Delete
EnergyOffPeakSummer	23	0	7	0	Delete
DemandOnPeakAMWin	10	0	12	0	Delete

Line items

Generation System Demand Calcs

The first line item calculates the various peak demand values listed in the rate tariff. The results of the calculations in this line item are assigned to Global variables.

```
rem Intermediate calculations for Generator System Demand
and Transmission Demand

Dim TestQty As Double


rem calculate larger of AM and PM Winter peak demand

DemandGenSysPeakWinter = Peak(ValueType.RealPowerDemand,
SeasonType.Winter, DayType.WorkingDay, TimeOfUseType.De-
mandOnPeakAMWinter)

TestQty = Peak(ValueType.RealPowerDemand,
SeasonType.Winter, DayType.WorkingDay, TimeOfUseType.De-
mandOnPeakPMWinter)

If TestQty > DemandGenSysPeakWinter Then DemandGenSysPeak-
Winter = TestQty


rem calculate larger of AM, mid-day and PM Winter inter-
mediate peak demand

DemandGenSysInterWinter = Peak(ValueType.RealPowerDemand,
SeasonType.Winter, DayType.WorkingDay, TimeOfUseType.De-
mandInterAMWinter)
```

```
TestQty = Peak(ValueType.RealPowerDemand,
SeasonType.Winter, DayType.WorkingDay, TimeOfUseType.De-
mandInterMidWinter)
If TestQty > DemandGenSysInterWinter Then DemandGenSysIn-
terWinter = TestQty
TestQty = Peak(ValueType.RealPowerDemand,
SeasonType.Winter, DayType.WorkingDay, TimeOfUseType.De-
mandInterPMWinter)
If TestQty > DemandGenSysInterWinter Then DemandGenSysIn-
terWinter = TestQty


rem calculate Summer peak demand
DemandGenSysPeakSummer = Peak(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, TimeOfUseType.De-
mandOnPeakSummer)


rem calculate larger of AM and PM Summer intermediate
peak demand
DemandGenSysInterSummer = Peak(ValueType.RealPowerDemand,
SeasonType.Summer, DayType.WorkingDay, TimeOfUseType.De-
mandInterAMSummer)
TestQty = Peak(ValueType.RealPowerDemand, SeasonType.Sum-
mer, DayType.WorkingDay, TimeOfUseType.De-
mandInterPMSummer)
If TestQty > DemandGenSysInterSummer Then DemandGenSysIn-
terSummer = TestQty


rem hide this line item in the report output
Visible = False
```

Generation system demand

The second line item determines the largest dollar amount among the various demand values. If the report period includes days in both seasons, the predominate season determines the charge. This line items uses global variables assigned in the previous line item. Recall that Quantity, Charge, RatePerUnit and Unit are the pre-defined report output variables.

```
Dim TestQty As Double
```

```
Dim TestCharge

Unit = GetUnit(ValueType.RealPowerDemand)

Quantity = 0

Rem Determine % of billing period in winter season
PctWinter = 100 * SeasonDayCount (SeasonType.Winter) /
BillingPeriodDayCount

Rem select winter if 50% or more in winter season
Select Case PctWinter
Case < 50 rem Summer season
rem summer peak load
Quantity = DemandGenSysPeakSummer
Charge = Quantity * 8.63
RatePerUnit = 8.63
rem summer intermediate load
TestQty = DemandGenSysInterSummer
TestCharge = TestQty * 6.47
If TestCharge > Charge Then
    Charge = TestCharge
    Quantity = TestQty
    RatePerUnit = 6.47
End If

Case Else
rem Winter peak load
Quantity = DemandGenSysPeakWinter
Charge = Quantity * 4.84
RatePerUnit = 4.84
rem Winter intermediate load
TestQty = DemandGenSysInterWinter
TestCharge = TestQty * 3.63
```

```
If TestCharge > Charge Then
    Charge = TestCharge
    Quantity = TestQty
    RatePerUnit = 3.63
End If
End Select

Charge = ProRateMonthlyCharge(Charge)
If Charge = 0 then Visible = False
```

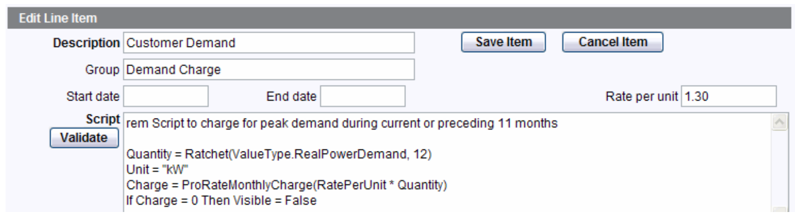
Transmission demand

This line item uses global variables assigned in the first line item above, determines the largest demand variable, assigns the rate per kw and prorates the charge.

```
Dim TestQty

Unit = GetUnit(ValueType.RealPowerDemand)
Quantity = 0

Select Case PctWinter
Case >= 50
Quantity = DemandGenSysPeakWinter
TestQty = DemandGenSysInterWinter : If TestQty > Quantity
Then Quantity = TestQty

Case Else
TestQty = DemandGenSysPeakSummer : If TestQty > Quantity
Then Quantity = TestQty
TestQty = DemandGenSysInterSummer : If TestQty > Quantity
Then Quantity = TestQty
End Select

Charge = ProRateMonthlyCharge(Quantity * RatePerUnit)
If Charge = 0 then Visible = False
```

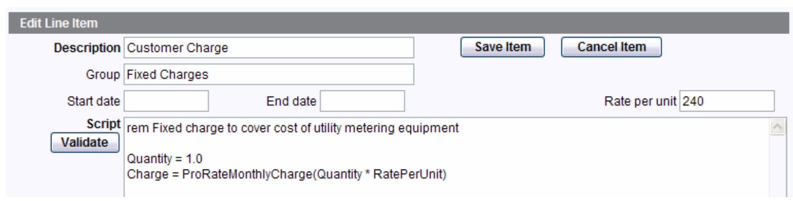
Penalties

This example script shows the use of the Ratchet function to implement the demand penalty entitled "Customer Demand" in the sample tariff. The ProRateMonthlyCharge function applies the appropriate proration of the demand charge if the report period is less than a month.



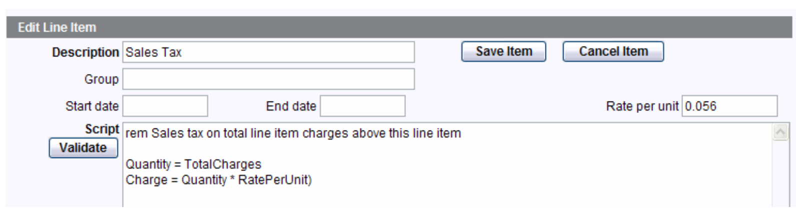
Fixed charges

The sample tariff includes a fixed monthly charge for the metering equipment installed at the customer site. The charge is prorated to apply the appropriate fraction is the report period is less than a month.



Taxes and fees

The TotalCharges variable is used to calculate sales and use tax or other charges that are based on the total dollar amount of preceding line items.



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ReportsPlus

ReportsPlus provides you a package of enhanced reports in addition to the **standard reports** included in Manager.

Consumption Report

The report provides consumption values (kWh, kVARh, etc.) for selected meter(s) or group(s) for a specified date/time range. The consumption report aggregates data from each selected meter based on consumption value types, that is, value types with the Consumption flag selected. The report comprises one line item per meter with totals by group. The group and meter names are listed in the left hand column and a column is added for each consumption value type that exists in the selected meter(s). If more than three consumption value types exist the line items may be truncated.

Note: If any meter in the group is missing data, the report will contain no data.

Demand Analysis Report

The report provides kW demand values for selected meter(s) or group(s) for a specified date/time range. Reports "worst case scenario" peak demand that would have occurred if each meter or group's peak demand had occurred in the same demand interval. The demand analysis report selects from each selected group or meter value types with the Demand flag selected. The report is organized in groups by value type, e.g., "kVA", "kW".

Billing Report

The report provides billing information for selected group(s) or meter(s) for a specified date/time range. The report outputs a list of line items and a total charge amount. Each line item consists of a description, quantity, rate and charge. Billing reports select value types and calculate the report line items based on "Configuring billing rate schedules" (page 271) that you configure. The billing report displays currency symbols and numeric formatting based on the Windows regional setting that is selected in the rate schedule.

Cost Allocation Report

The report lists each meter's contribution to the total energy cost, based on a rate schedule that you configure. The reports are generated in the Microsoft Excel output format.

Power Quality Report

The report combines a graph and a grid display of power quality (sag and swell) events. You can use it with the following power monitor models:

- Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 and M8 models with their sag and swell setpoints configured.
- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models and will report IEEE 1159 sag and swell events.

To use the report, select the **Enable PQ events logging** option on the **Device Setup** page of a power monitor. With this option selected, FactoryTalk EnergyMetrix periodically reads the power monitor event log and stores power quality events in the database.

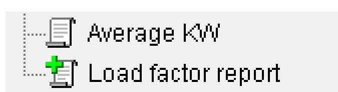
Each sag and swell record lists the time, duration and maximum deviation of the sag or swell. The report displays the events logged during the selected report interval on a ITI/CBEMA chart and in a grid (tabular) listing.

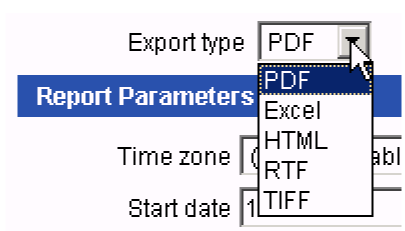
System Configuration Report

The report documents the configuration of the FactoryTalk EnergyMetrix project.

ReportsPlus reports are set up and viewed in the same way as standard Manager reports and may be configured to automatically run on a schedule and optionally send the report output to one or more email addresses.

ReportsPlus reports can be identified by their **distinctive icon** in the report list. You may choose the **report output type** among PDF (the default), Microsoft Excel, HTML, Rich Text Format (RTF), or Tagged Image File Format (TIFF).





The ReportsPlus functionality includes also the following reports:

Multi-purpose report

The Multi-Purpose Report ("MPR") supports a free-form type of report output that is driven by script code stored in a Multi-Purpose Report Script. For details, see "Multi-purpose reports" (page 347).

Efficiency report

The purpose of this report is to give you information on the "energy efficiency" of part or all of your process, plant or enterprise. You will be able to define an efficiency equation and then execute the equation over a period of time and a group of meters. Examples of how this report may be used are:

- Calculating efficiency of a boiler system based on BTU of gas consumed versus steam produced.
- Calculating production efficiency of a batch manufacturing line by calculating tons of product versus energy consumed.

The efficiency report will calculate not only average efficiency over the selected time range, but also snapshots of the efficiency during the range at user-specified intervals. Report output will be graphical and tabular, with a graph of efficiency versus time. The efficiency report is based on a simple Rate Schedule script.

Load factor report

The Load Factor report lists minimum, average and peak real power demand, load factor and time of peak demand. You may select Meters to include in the report, as well as the report date range and calculation intervals. The report output contains a tabular report and a graphical chart.

Power factor report

The Power Factor report lists real energy net, reactive energy net, and power factor (which is calculated from the real energy and reactive energy values) for selected meters for a selected date range divided into specified calculation intervals (hours, days, or months). Report output is tabular with a chart of power factor on the first page.

For this report to function, the selected meters or groups must be logging Real Energy Net and Reactive Energy Net.

Electrical summary report

The Electrical Summary report lists various electrical summary values for selected meters for the selected date and time period. These summaries are:

- Total Energy kWh, kVARh and kVAh.
- Average Demand for kW, kVAR and kVA.
- Load Factor for kW and kVA.
- Min and Max values for kW, kVAR, kVA and Power Factor and the date/time they occurred along with the coincident values for the other parameters.

The selected meters must be logging the relevant data in order for it to show up on the report (for example, if Real Power Demand is not logged then there will be no kW figures on the report). Power Factor is calculated from any two of the other three parameters (kW, kVAR, kVA).

Efficiency report

The efficiency report provides information on the "energy efficiency" of part or all of a process, using an efficiency formula defined in a rate schedule.

The report calculates average efficiency over the selected date/-time range and also calculates a snapshot of the efficiency at user-selected intervals. Report output is tabular plus a chart showing efficiency versus time. The chart plots efficiency for each calculation interval, a rolling average of the efficiency for each calculation interval and the overall average efficiency.

Tip: You must have purchased and installed the ReportsPlus option to use the Efficiency report.

Examples of Efficiency reports

- Calculating efficiency of a boiler system based on BTU of gas consumed versus steam produced.
- Calculating production efficiency of a batch manufacturing line by calculating tons of product produced versus energy consumed.

Rate schedule setup

Before you set up an efficiency report, set up a Rate schedule that defines the efficiency calculation. Enter the efficiency calculation in Line Item 1 in the rate schedule. Set up the line item script to perform the efficiency calculation and set the Quantity variable to the result. A sample line item script for calculating boiler efficiency (in British units) is provided below:

```
Dim avg_gas, avg_steam
avg_steam=Average(ValueType.SteamFlow)
avg_gas=Average(ValueType.GasFlow)
if avg_gas=0
    Quantity=0
else
    Quantity=avg_steam*99.4 / avg_gas
end if
```

Tip: The script example utilizes user-defined value typesSteam FlowandGas Flow. For details, see "Unit Setup page" (page 55).

To configure an efficiency report:

1. On the **Reports** tab in the navigation tree, click the **Global Reports** folder or a domain.

   The **No Report Selected** page appears.
2. Click **Add**.

   The **Add a new report** page appears.
3. Provide the following information:
   - **Report name**

     Enter a name for the new report.
   - **Report template**

     Select **Efficiency** from the list.
   - **Report file**

     Use the default file **Efficiency.rpx**.
   - **Report parent group**

     Leave **None** selected for a Global report or select a parent group from the list.
   - **Meter selections**

     Select Meters or Groups from the tree.
     - Click **Groups** to switch to the groups view.
     - Click **Meters** to switch to the meters view.
   - **Rate schedule**

     Select the rate schedule that contains the efficiency formula for the report.

4. Click **Save**.

To configure report run-time options and view the report:

1. On the **Reports** tab in the navigation tree, click a report that you want to configure.

   The **Reports** page appears.

2. Under **Report Parameters**, configure the following items:

   - **Time zone**

     Select the time zone in which you wish the report to run

   - **Start date and End date and times**

     Select a predefined or custom report period. If fiscal calendar functionality is enabled, predefined fiscal periods will appear in the list. Use the Pick links to graphically select the dates.

   - **Calculation interval**

     Select Hours, Days (default) or Months from the list.

3. Click **View**.

Electrical Summary report

The electrical summary report lists various electrical summary values for selected meters for the selected date and time period.

These summaries are:

- Total Energy kWh, kVARh and kVAh
- Average Demand for kW, kVAR and kVA
- Load Factor for kW and kVA
- Min and Max values for kW, kVAR, kVA and Power Factor and the date/time they occurred along with the coincident values for the other parameters.

The selected meters must be logging the relevant data in order for it to show up on the report (for example, if Real Power Demand is not logged then there will be no kW figures on the report). Power Factor is calculated from any two of the other three parameters (kW, kVAR, kVA).

Tip: You must have purchased and installed the ReportsPlus option to use the Electrical Summary report.

To configure an electrical summary report:

1. On the **Reports** tab in the navigation tree, click the **Global Reports** folder or a domain.

   The **No Report Selected** page appears.
2. Click **Add**.

   The **Add a new report** page appears.
3. Provide the following information:
   - **Report name**

     Enter a name for the new report.
   - **Report template**

     Select **Electrical Summary** from the list.
   - **Report file**

     Use the default file **ElectricalSummary.rpx**.
   - **Report parent group**

     Leave **None** selected for a Global report or select a parent group from the list.
   - **Meter selections**

     Select Meters or Groups from the tree.

- Click **Groups** to switch to the groups view.
- Click **Meters** to switch to the meters view.

4. Click **Save**.

To configure report run-time options and view the report:

1. On the **Reports** tab in the navigation tree, click a report that you want to configure.

   The **Reports** page appears.

2. Under **Report Parameters**, configure the following items:

   - **Time zone**

     Select the time zone in which you wish the report to run.

   - **Start date and End date and times**

     Select a predefined or custom report period. If fiscal calendar functionality is enabled, predefined fiscal periods will appear in the list. Use the Pick links to graphically select the dates.

3. Click **View**.

Load Factor report

The load factor report lists minimum, average and peak real power demand, load factor and time of peak demand. You may select Meters to include in the report, as well as the report date range and calculation intervals. The report output contains a tabular report and a graphical chart.

The report output contains a tabular report and a chart in .pdf format.

Tip: You must have purchased and installed the ReportsPlus option to use the Load Factor report.

To configure a load factor report:

1. On the **Reports** tab in the navigation tree, click the **Global Reports** folder or a domain.

   The **No Report Selected** page appears.

2. Click **Add**.

   The **Add a new report** page appears.

3. Provide the following information:

   - **Report name**

     Enter a name for the new report.

   - **Report template**

     Select **Load Factor** from the list.

   - **Report file**

     Use the default file **LoadFactory.rpx**.

   - **Report parent group**

     Leave **None** selected for a Global report or select a parent group from the list.

   - **Meter selections**

     Select Meters or Groups from the tree.

     - Click **Groups** to switch to the groups view.
     - Click **Meters** to switch to the meters view.

4. Click **Save**.

To configure report run-time options and view the report:

1. On the **Reports** tab in the navigation tree, click a report that you want to configure.

The **Reports** page appears.

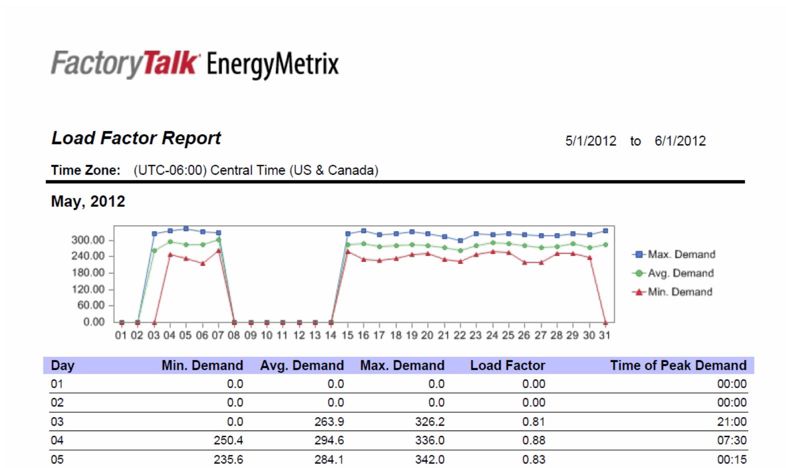
2. Under **Report Parameters**, configure the following items:
   - **Time zone**

     Select the time zone in which you wish the report to run
   - **Start date and End date and times**

     Select a predefined or custom report period. If fiscal calendar functionality is enabled, predefined fiscal periods will appear in the list. Use the Pick links to graphically select the dates.
   - **Calculation interval**

     Select Days (default) or Months from the list.
3. Click **View**.

Sample report output



Day	Min. Demand	Avg. Demand	Max. Demand	Load Factor	Time of Peak Demand
01	0.0	0.0	0.0	0.00	00:00
02	0.0	0.0	0.0	0.00	00:00
03	0.0	263.9	326.2	0.81	21:00
04	250.4	294.6	336.0	0.88	07:30
05	235.6	284.1	342.0	0.83	00:15

Power Factor report

The power factor report lists real energy net, reactive energy net, and power factor (which is calculated from the real energy and reactive energy values) for selected meters for a selected date range divided into specified calculation intervals (hours, days, or months). Report output is tabular with a chart of power factor on the first page. Power factor values are signed: a negative sign indicates lagging power factor and a positive sign indicates a leading power factor. The chart is arranged with unity power factor as the horizontal axis with leading power factor displayed above the axis and lagging power factor below the axis.

For this report to function, the selected meters or groups must be logging Real Energy Net and Reactive Energy Net.

Tip: You must have purchased and installed the ReportsPlus option to use the Power Factor report.

To configure a power factor report:

1. On the **Reports** tab in the navigation tree, click the **Global Reports** folder or a domain.

   The **No Report Selected** page appears.

2. Click **Add**.

   The **Add a new report** page appears.

3. Provide the following information:

   - **Report name**

     Enter a name for the new report.

   - **Report template**

     Select **Power Factor** from the list.

   - **Report file**

     Use the default file **PowerFactor.rpx**.

- **Report parent group**

  Leave **None** selected for a Global report or select a parent group from the list.

- **Meter selections**

  Select Meters or Groups from the tree.

  - Click **Groups** to switch to the groups view.
  - Click **Meters** to switch to the meters view.

4. Click **Save**.

To configure report run-time options and view the report:

1. On the **Reports** tab in the navigation tree, click a report that you want to configure.

   The **Reports** page appears.

2. Under **Report Parameters**, configure the following items:

   - **Time zone**

     Select the time zone in which you wish the report to run

   - **Start date and End date and times**

     Select a predefined or custom report period. If fiscal calendar functionality is enabled, predefined fiscal periods will appear in the list. Use the Pick links to graphically select the dates.

   - **Calculation interval**

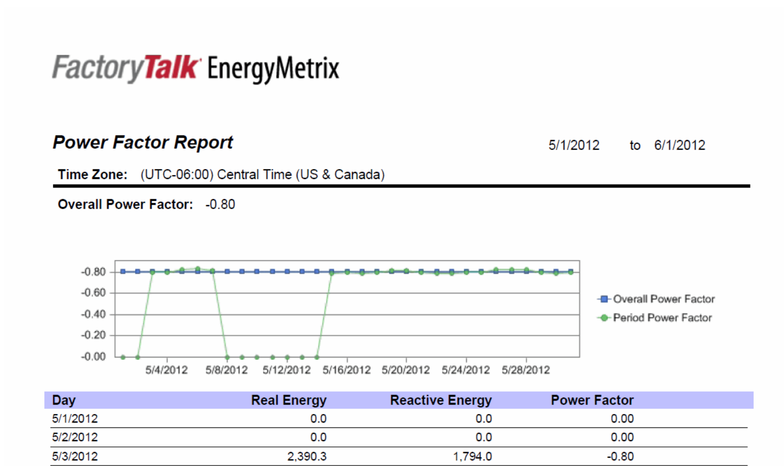
     Select Hours, Days (default) or Months from the list.

3. Click **View**.

Tip: To limit the size of reports, FactoryTalk EnergyMetrix limits the Date range based on your selection of Calculation interval according to the following table:

Calculation interval	Maximum Date range
Hours	40 days
Days	400 days
Months	No limit

Sample report output



Multi-purpose reports

The Multi-Purpose Report (MPR) is a free-form report driven by script code stored in a Multi-Purpose Report Script. The MPR is part of the "ReportsPlus" (page 333) functionality.

Multi-purpose report script

A MPR script defines what a MPR contains and what it looks like. A MPR script is conceptually similar to a rate schedule. Like a rate schedule, a MPR script is combined with selected meters or groups to form a specific report instance. This allows a script to be reused for different meters and groups.

MPR scripts are listed in a new sub-tree under the System tab and may be Global or assigned to a domain.

MPR scripts contain Visual Basic for .NET scripting that utilizes the MPR object model to select and format the content of the report.

User qualifications

MPR users are assumed to be familiar with FactoryTalk EnergyMetrix, in particular with its reporting and rate schedule functionality, and the Visual Basic for .NET scripting language.

Multi-purpose report elements

You may select one or more of the following elements, or objects, when configuring an MPR. Each provides a different way to view your energy, cost and production data:

Item	Description
Grid	Displays data in tabular format. The MPR script contains code that creates a Grid, specifies the number, width and heading text of columns, and populates the rows of the grid with data.
Bar Chart	Displays a bar graph of data. The MPR script contains code that creates a bar chart, defines the x and y axes and selects the data to be displayed in one or more data series.
Trend Chart	Displays a line graph of data. The MPR script contains code that creates a trend chart, defines the x and y axes and selects the data to be displayed in one or more data series. **Tip:** Bar chart series can be mixed with trend chart series in the same chart. Charts may have multiple Y axes.
Pie Chart	Displays a series of data as wedges of different sizes in a pie-shaped graphic. The MPR script contains code that creates a Pie Chart and populates it with data.
Rich Text Box	Provides a way to place text on a MPR. The MPR script contains code that creates the Rich Text Box and controls its location, size, content and formatting.

Item	Description
Page Header and Footer	Contains identifying elements such as the report title, the report headings from the Group setup, the report time range and time zone, and a user-selectable graphic element. The page footer contains the report page number and the date and time the report was printed.MPR script code controls the header graphic element selection and the visibility or the header and footer.
Intervals	Provide an easy way for MPR script code to process data in intervals specified by the user when they run a Multi-Purpose Report. Interval types are Day, Week, Month. Enable Intervals by selecting the Use Intervals check box on the MPR script setup screen.
Excel	Moves the report output and formatting from the MPR script into Excel. Since the report output is now Excel all of the functionality of Excel is now available to the report.

Sample MPR scripts

- "Consumption by group pie chart" (page 378)
- "Cost by group pie chart" (page 378)
- "Consumption by group trend chart" (page 377)
- "Consumption and cost per meter grid" (page 375)
- "Fiscal calendar listing" (page 379)
- "An RTF sample" (page 382)
- "An Excel spreadsheet sample" (page 384)

To learn how to set up a multi-purpose report, see "Configuring multi-purpose reports (MRP)" (page 349).

Configuring multi-purpose reports (MRP)

Configuring multi-purpose reports consists of the following steps:

1. "Creating MPR scripts" (page 350)
2. "Creating MPR objects" (page 355)
3. "Configuring MPR objects" (page 356)
4. "Populating the MPR with data" (page 358)
5. "Adding objects to the MPR" (page 360)

6. "Configuring report objects" (page 363)
7. "Running the MPR" (page 365)

Creating MPR scripts

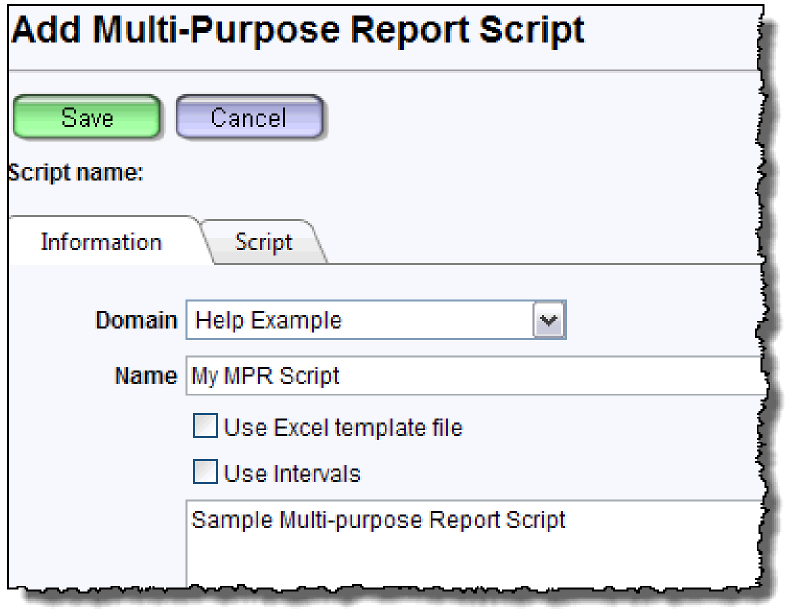
MPR scripts are written in the Microsoft Visual Basic for .NET scripting language. Selected elements of scripting are discussed in this topic. For further information on the Visual Basic for .NET language, please refer to the Visual Basic Language Reference available online at http://www.msdn.microsoft.com.

MPR scripts may be Global or assigned to Domains and are organized in the **Multi-Purpose Report Scripts** folder on the **System** tab.

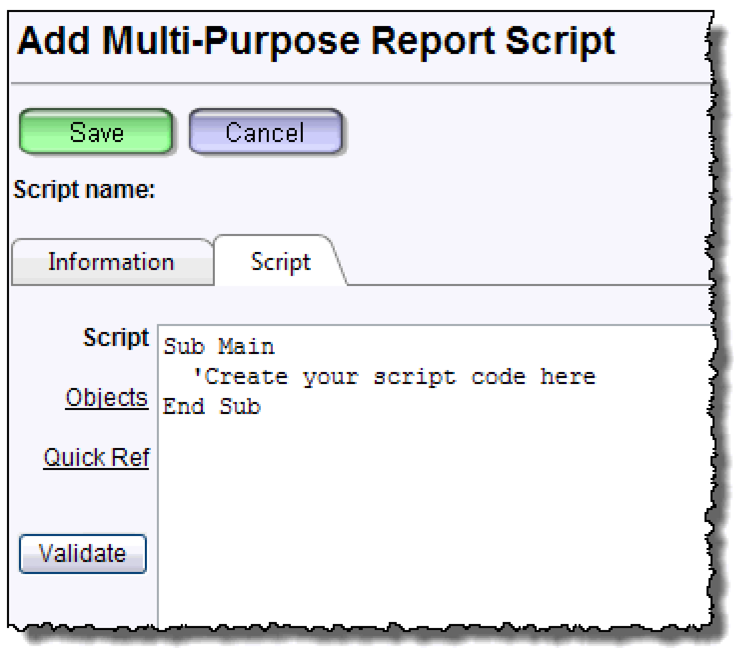
To create a MPR script:

1. Expand the **Multi-Purpose Report Scripts** folder.
2. Click either the **Global Multi-Purpose Report Scripts** folder or the desired domain.
3. Click the **Add a multi-purpose report script** link.

   The **Add Multi-Purpose Report Script** page appears.
4. In the **Name** box, type a name for the script.
5. Select the **Use Intervals** check box if you want to allow the report user to select the report interval from among Days, Weeks and Months at report run-time.

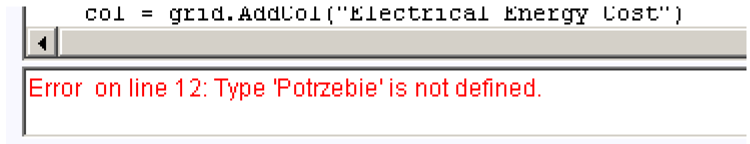


6. In the **Notes** box, type notes (optional).
7. Click the **Script** tab.

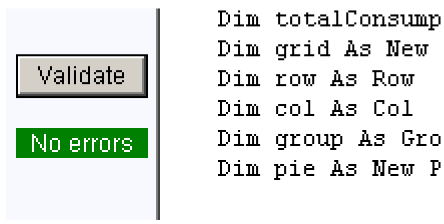


8. In the **Script** box, type the MPR script.
9. Click **Validate**.

   Any errors are displayed in the **Validation results** box at the bottom of the page.



   If no error is found, a message appears under the **Validate** button.



10. Additionally, you may:
    - Click the **Objects** link to open the MPR object help topic
    - Click the **Quick Ref** link to open MPR Scripting Quick Reference Chart.
11. Click **Save**.

Tips:

- The editing window does not display line numbers. To help determine the line number of an error, temporarily add a line before the error line with an obvious syntax error, such as a number. Click **Validate** and the new line will be displayed with its line number.
- Save your script frequently. When you save a script, a validation is performed and if errors exist the script will not be saved. To save a script you must correct any script errors or temporarily convert the offending script element to a remark. You may wish to utilize another application such as Notepad or a VBA editing window to create and edit the MPR script and then copy and paste the

script into the MPR script field. Your user login will not time out while the MPR script page is in the Edit mode.

MPR Script elements

A MPR script consists of several required and optional elements as described below.

Declarations

Declarations are required (Option Explicit checking is enabled).

Certain objects are created automatically when the MPR script is created. These include:

- Report object
- Days collection and Day objects
- Groups collection
- Intervals collection and Interval objects
- Meters collection
- Months collection and Month objects
- Weeks collection and Week objects

All other MPR objects must be declared as the applicable Object type. Variables and constants should be declared as the appropriate data type. The first character of any script element name must be an alphabetic character, a digit, or an underscore.

The following are examples of declarations:

```
Dim totalConsumption As Double 'declares a variable named
totalConsumption as a Double data type

Dim group As Group 'declares the object named group as a
Group object type
```

```
Const weeksInYear as Integer = 52 'declares an integer constant named weeksInYear and assigns 52 as its value

Dim richText as New RichTextBox() 'declares a RichTextBox object named richText and creates an instance of the object
```

Declarations placed at the beginning of the MPR script (prior to the Sub Main() statement) are global to the entire script. Declarations placed within a routine or function are local to that routine or function.

Main routine

The MPR script must contain at least a Main routine, as shown below:

```
Sub Main()

[declarations]

[main routine script]

End Sub
```

Optional elements

- **Subroutines**

  The MPR script may also contain subroutines called from the main routine:

  ```
  Sub Main()

  [declarations]

  [main routine script]

  For Each item In collection

  Routine2(arg1, arg2, ...)

  Next item

  End Sub


  Sub Routine2(arg1 As Type, arg2 As Type, ...)
  ```

```
[declarations]
[subroutine script]
End Sub
```

- **Functions**

  The MPR script may also contain user-defined functions:

```
Sub Main()
[declarations]
[main routine script]
For Each item In collection
variable = Function1(arg1, arg2, ...)
Next item
End Sub


Function Function1(arg1 As Type, arg2 As Type,
...)
[declarations]
[function script]
End Function
```

Creating MPR objects

The MPR report objects include a grid, a trend chart, a pie chart, and a rich text box.Each report object may differ in some details. Refer to the MPR Object Model for detailed object specifications.

Declaring a MPR object

Declare an object using a Dim statement in the Main routine or Subroutine where the object will be accessed in the script:

```
Dim pieChart As PieChart 'declares a PieChart object with
the name of pieChart
```

The object may be created at the same time as it is declared by using the New method:

```
Dim objRichTextBox1 As New RichTextBox() 'declares a
RichTextBox object named objRichTextBox1 and creates an
```

```
instance of the object. The paired parentheses after the
object type are optional in this usage
```

The script must also declare variables that reference the properties of the object so they may be accessed in the script:

```
Dim objGrid1 As Grid 'declares a Grid object named
objGrid1
Dim objRow As Row 'declares a Row object named objRow
Dim objCol As Col 'declares a Col object named objCol
```

Creating a MPR object

Create an object in the MPR script as shown in the examples below.

```
objPieChart = New PieChart()
objGrid1 = New Grid()
```

Tip: Do not create an object in this manner if it has already been created when it was declared or a run-time error will result.

Configuring MPR objects

The properties and methods of MPR objects permit a great deal of customizing and formatting. Each object has a unique set of configurable properties. Refer to the MPR object model for details of each. Below are a few examples of using script to configure MPR objects.

Configuring Grid objects

The following example creates a Grid object and adds two columns, changes the header height and font size from their default values of 0.12 and 10 respectively, defines the header text and width of each column, and formats the text alignment and number format of the second column.

```
dim grid As New Grid
dim col As Col
...
```

```
With grid : HeaderHeight = 0.25 : .FontSize = 12 : End
With
col = grid.AddCol("Column 1") : col.Width = 1.5
col = grid.AddCol("Column 2") : col.Width = 3 : _
    col.Alignment = TextAlignment.Right : col.Out-
putFormat = "$##,##0.##"
```

Tip: Note the use of the colon ":" which allows multiple statements on the same line, and the underscore "_" character which continues the present line onto the next line. The With ... End With statements simplify accessing the properties of the grid object. The same effect would be accomplished using this code: grid.HeaderHeight = 0.25 : grid.FontSize = 12 .

Configuring TrendChart objects

Configuring a TrendChart object is a two-step process. Attributes that apply to the trend chart should be addressed after the object is created but before the object is populated with data. Data series attributes such as its legend should be addressed after each data series has been added during the data population process. The following example creates a trend chart and configures its properties.

```
dim chart1 as TrendChart()
...
chart1 = New TrendChart()
With chart1
.XAxis.Title = "Week ending date"
.YAxis.Title = "Consumption"
.XAxis.Step = 7
.XAxis.Format = AxisFormat.Date
.XAxis.CustomFormat = "MMM dd"
.YAxis.CustomFormat = "#"
.SeriesLegendBox = True
End With
...
```

```
'as each data series is created, the following configures
the data series legend:
chart1.SeriesLegend = <expression>
```

Configuring PieChart objects

A PieChart object has only a few configurable properties. The following example creates a pie chart object and configures its properties.

```
dim chart2 As PieChart()
...
chart2 = New PieChart()
With chart2
.Title.Text = "Energy Dollars (thousands)"
.Chart3D = False
.CustomFormat ' "$#,##0,"
End With
```

Configuring RichTextBox objects

A RichTextBox object has only a few configurable properties, including Top, Left, Height and Width. Formatting of the text within a rich text box is done using RTF control codes. For details, see "RichTextBox object" (page 431).

Populating the MPR with data

To populate the MPR with data:

1. Use the Add method of the MPR object to create a data display element such as a Row in a Grid object
2. Define the data content of the data display element

In general, the data content must be defined in the script immediately after the data display element is created. Refer to the following examples.

Pie Chart example

```
Sub Main()
'declarations omitted
...
For Each group in Report.Groups
consumption = group.Total(ValueType.RealEnergyNet) 'cal-
culates value of consumption variable
pieChart.AddData(group.Name, consumption)          'adds
segment to the pie chart
'gives the segment the group name
'assigns the segment the consumption variable
Next group
...
End Sub
```

Grid example

This example populates a Grid object that lists real energy consumption and cost per meter. The Grid object is configured with four columns, headed "Meter," "Actual Consumption," units, and "Actual Cost."

```
Sub Main()
'declarations omitted
...
'object creation and configuration omitted
...
For Each meter In Report.Meters
actualConsumption = meter.Total(ValueType.RealEnergyNet)
actualCost = meter.CostAllocate("Electric Billing
Report", "Electric Cost Allocation")

row = grid.AddRow()
row(0) = meter.Name
row(1) = actualConsumption
```

```
row(2) = Functions.GetUnit(ValueType.RealEnergyNet)
row(3) = actualCost
Next meter
```

Tip: The CostAllocate method of the Meter and Group objects requires specific rate schedule configuration. For details, see "Using the MPR for cost allocation" (page 371).

Trend Chart example

This example populates a TrendChart object configured to chart real energy consumption by group per week. A separate trend line is plotted for each group.

```
Sub Main()
'declarations omitted
...
'object creation and configuration omitted
...
For Each group In Report.Groups
trendChart.SeriesLegend = group.Name    'assigns the
Group name to the data series

For Each week In Report.Weeks
consumption = group.Total(ValueType.RealEnergyNet _
    week.StartDate, week.EndDate)
trendChart.AddData(week.EndDate, consumption)   'assigns
data for the current data series
Next week

trendChart.NextSeries() 'adds a new data series to the
trend chart
Next Group
```

Adding objects to the MPR

Adding a report object

Adding the MPR object is the last step in placing a report element into a MPR. Use the Add Method of the Report object to add a

MPR object to a Report. Before the MPR script adds a MPR object to the report, the object must be created, configured and populated with data. Once an object is added to the report, it may no longer be accessed by the MPR script.

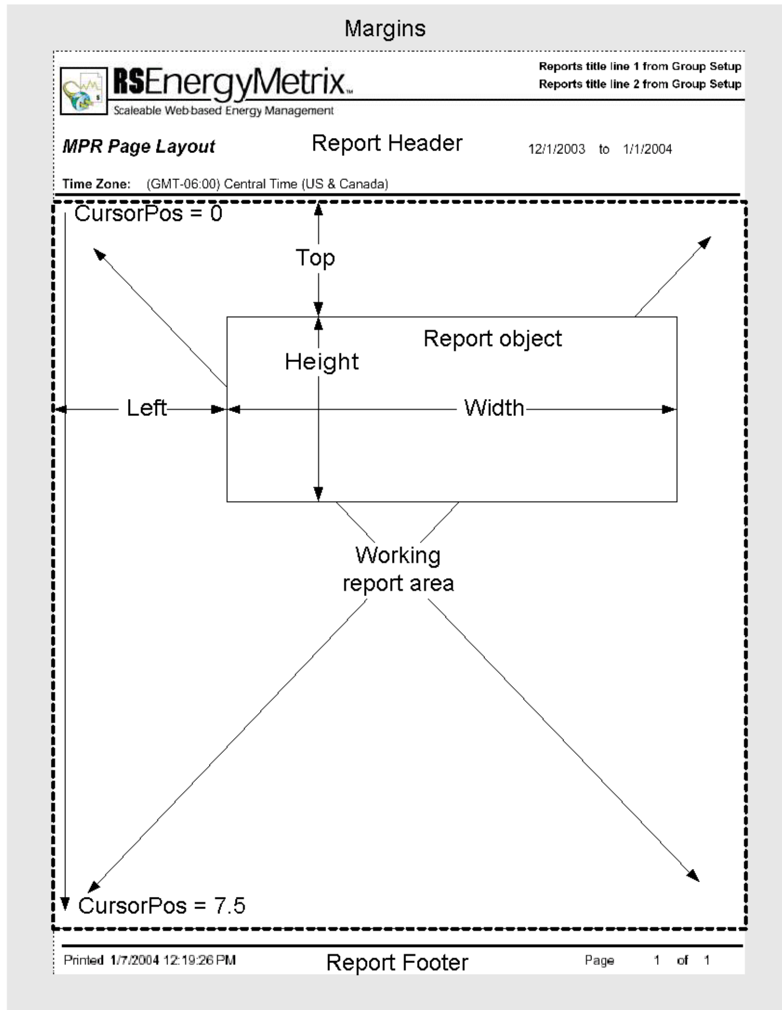
The following examples demonstrate the use of the Add method.

```
Dim trendChart As New TrendChart()
...
Report.Add(trendChart, 0, 0, 7.5, 7.5) ' adds a
TrendChart 7.5 inches square at the upper left-had corner
of the working report area


Dim grid As New Grid()
...
Report.Add(grid, 0.5, Functions.CursorPos) ' adds a Grid
to the report 1/2 inch from the left margin at the cur-
rent cursor position
```

MPR Page Layout

The default **MPR page** is based on a letter-sized sheet in "portrait" orientation. The page margins are 0.5 inches all around. The header is 1.5 inches high and the footer is 0.5 inches high. The working report area on each page is a rectangle 7.5 inches square. All dimensions are approximate and may vary depending on your specific printer.



Page layout variables

The MPR provides several scripting elements used to locate MPR objects on the page and determine their size and shape.

- **[Functions].CursorPos** is a global read/write variable that corresponds to the vertical distance from the top of the working report area

- **[Functions].MoveCursorPos(Inches)** is a global function that moves the cursor vertically on the page by the specified amount (downward for positive Inches), from the previous CursorPos

Tip: Adding a MPR object does not automatically move the **CusrsorPos** to the bottom of the object.

Top and Left are arguments used with the **Add** method of the Report object to locate report objects with respect to the top and left edges of the working report area

Width and Height are arguments used with the **Add** method of the Report object to determine the size of report objects such as the **TrendChart** and **PieChart**

Configuring report objects

The Report object includes among its members several properties and methods that control the overall appearance of a Multi-Purpose Report ("MPR").

You can use the following properties:

ShowLogo

Use this method to control whether the logo graphic is displayed in the report header. The default is True, and the default logo is the FactoryTalk EnergyMetrix logo:

```
Report.ShowLogo = False 'turns off the visibility of the
logo graphic
```

ShowPageHeader, ShowPageFooter

Use these methods to control the visibility of the report header and footer.

Add Method

Use this method to add MPR objects such as Grids, PieCharts, etc. to a report. For details, see "Adding objects to the MPR" (page 360).

AddLine Method

Use this method to add lines to the report page. The examples below show the usage of this method.

```
Report.AddLine(0,0,7.5,0) ' adds a line with weight of 1 pixel across the top of the report working area.

Report.AddLine(0,0,7.5,7.5,3) ' adds a line with weight of 3 pixels from the upper left-had corner to the lower right-hand corner of the report working area.
```

AddLogo Method

Use this method to substitute a custom logo in the report header. It is good practice to run this method within an error trap. Otherwise, if the file is not found, a report run-time error will result.

```
Try

Report.ShowLogo = False

Report.AddLogo(0,0,4,1, "C:\MyLogo.gif") 'places the specified file in the header at the upper left-hand corner with a size of 1 inch high and 4 inches wide.

Catch

Report.ShowLogo = True 'shows the standard logo if the file is not found

End Try
```

PageBreak Method

Use this method to add a page break at the current cursor position.

```
Report.PageBreak()
```

Tip: Adding a MPR object does not automatically move theCursorPosto the bottom of the object.

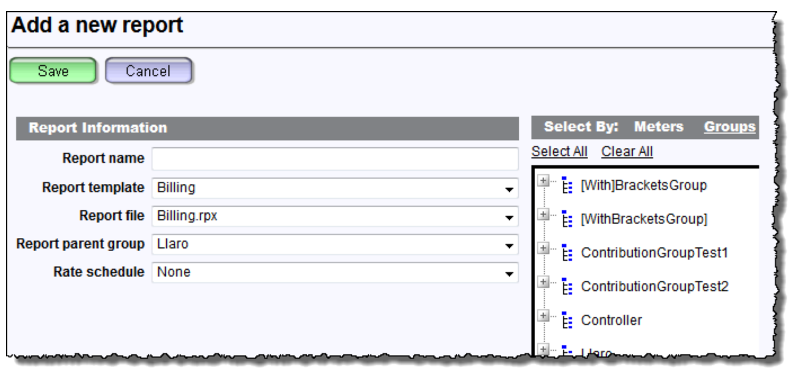
Running the MPR

Once the MPR script is completed, set up a Multi-Purpose Report ("MPR"), assign it groups and/or meters. a time zone and the MPR script and then view the report.

To configure a MPR:

1. Select the **Reports** tab.
2. Click the domain in which you wish to locate your MPR.
3. Click **Add**.

   The **Add a new report page** appears.



4. Type a **Report name**.
5. In the **Report template** list, select a multi-purpose report.
6. In the list, select a **Report parent group**.
7. In the list, select a **Multi-purpose report script**.
8. In the tree, select meters and/or groups for the report. For details, see "Selecting groups and meters in the MPR" (page 368).

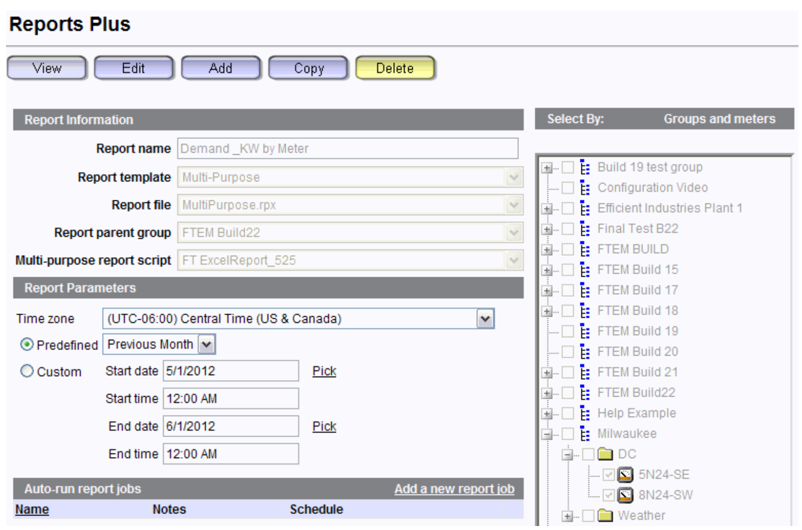
To view the report:

1. On the **Reports** tab, click the multi-purpose report.
2. Under **Report Information**, in the **Export type** list, select the file format to which you want the report exported.

   You can choose among the following file formats:

   - PDF (default)
   - Microsoft Excel
   - HTML
   - RTF
   - TIFF

   MPR Excel reports are exported to a Microsoft Excel .xlsx file.
3. Select a time zone and predefined or custom report date and time range.



4. Click **View**.

Tip: When first developing and debugging a multi-purpose report script, it may be helpful to open a second Internet Explorer window, with one window accessing the MPR script setup window and the other the ReportsPlus window. To open a second window, select an open Internet Explorer window and press Ctrl+N.

Creating MPR Excel reports

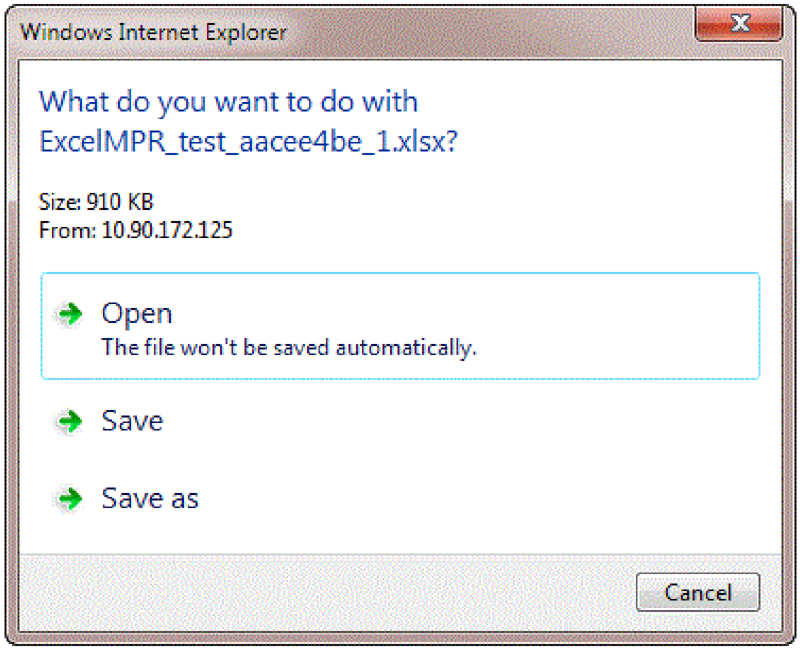
Creating an Excel report is very similar to the process for creating a standard multi purpose report.

The process is based on starting by creating a formatted Microsoft Excel workbook, to hold the data and content from the FactoryTalk EnergyMetrix database. Then that Excel file is saved onto the ExcelTemplates share/folder on the FactoryTalk EnergyMetrix server, and a MPR script is created for that Excel template.

The main difference from a standard multi purpose report is, that:

- The Use Excel Template file setting is checked,
- The script is named the same name as the Excel template file
- The code in the script is based on working with the Excel model as opposed to the standard Report model.

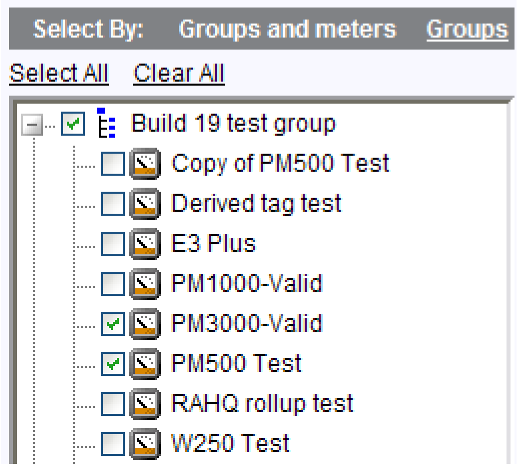
The rest of the process of configuring the report object and running it is the same as with the standard multi-purpose report, but the output is generated to the XLSX format. Once the report is generated, you can either download or open it with Microsoft Excel:



Selecting groups and meters in the MPR

It is important to understand the relationship between the Group and Meter selections made when setting up a Multi-purpose Report and the methods for accessing the selected Groups and Meters in the MPR script.

The members of the Groups, Meters, and Nested Groups collections are selected on the **Reports** page **selection tree**. The organization and membership of the collections depend upon the Select By mode chosen. Note the Select Alland Clear All links to assist in selection.



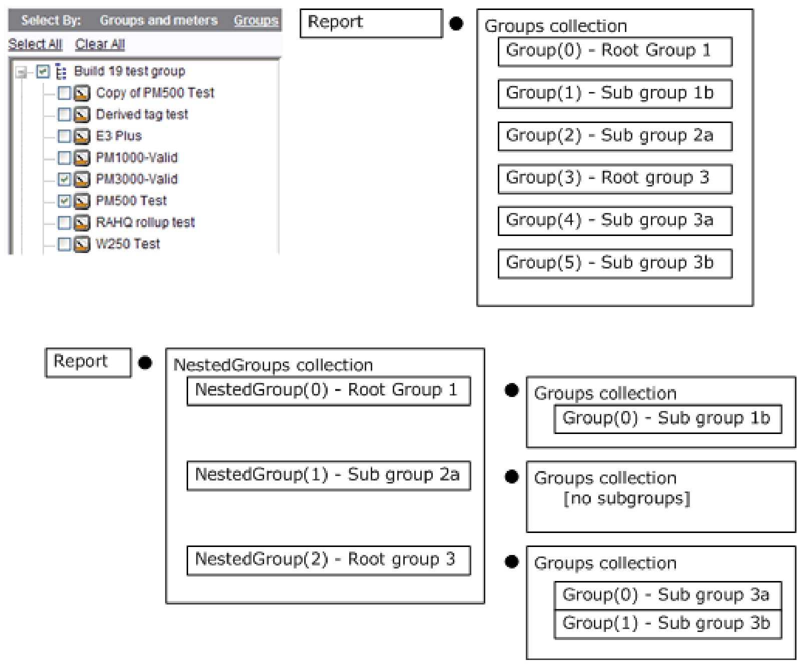
Select By: Groups is the default mode. Click the underlined link to change the selection mode to **Select By: Groups and Meters**. The active selection mode is not underlined.

Select by: Groups

Select By: Groups adds each selected Group into the Report.Groups collection. This is a flat array of groups organized in the order the selected groups appear in the tree, from top to bottom. All meters in each selected Group are added into the Report.Group(index).Meters collection, where index = 0, 1, 2, etc., up to the number of groups selected-1.

Select By: Groups also adds the top group in each selected sub-tree to the Report.NestedGroups collection. Then each child group in each selected subtree is added to each top group's group.Groups collection. This process continues until all selected groups have been added to a hierarchical collection of Group objects that mimics the tree structure of the report selection tree. All meters in each group are added to the applicable group.Meters collection.

This example illustrates how the Report.Groups and Report.NestedGroups collections are populated. In the example, Sub group 3a may be addressed Report.Group(4) or Report.NestedGroup (2).Group(0).



Select By: Groups and Meters

Select By: Groups and Meters populates the Report.Groups and Report.NestedGroups collections (and child groups) in exactly the same way as Select By: Groups. However, only the selected meters in each selected group are included in that groups group.Meters collection.

Meters may be selected that are not contained in selected groups. These meters become members of the Report.Meters collection (the Report.Meters collection is empty in Select By: Groups mode).

Accessing groups and meters in the MPR script

In practice, a For Each ... Next construct is used in MPR scripting to address all selected groups and meters. Using nested groups requires recursion to traverse all selected child groups. For details, see "NestedGroups collection" (page 420).

Tip: Index numbers for the Report.Groups and Meters collections are assigned in the same order as the expanded tree appears in the selection window, sorted from top to bottom.

Using the MPR for cost allocation

True “cost allocation” across groups and meters may be performed using MPR scripts by calling the CostAllocate method of the Group or Meter objects. The two most common types of cost allocation include:

- Calculating an overall energy rate for a site and applying it to groups or meters within the site.
- Finding site peak demand and allocating cost to groups or meters based on their contribution to that peak demand.

Tip: The CostAllocate method runs a billing report, passes a parameter to another rate schedule, and then runs the second rate schedule to calculate an output value. Repeating this process for a number of report line items can load down the server and cause long report run times. It is suggested to set up the cost allocation rate schedule to return a rate variable, which may then be buffered in a declared variable and used to calculate the report line items.

Setting up Rate Schedules for Cost Allocation

Before cost allocation can be performed from MPR script code you must set up at least two rate schedules.

Billing report rate schedule requirements

- Set up a billing report rate schedule that reflects the energy supplier rate tariff. The rate schedule should calculate the total cost for energy for the report period

- Set up at least one run-time parameter to be used to pass the cost allocation rate to the Cost Allocation rate schedule. Other run-time parameters may be set up to pass other variables, for example, the peak demand UTC timestamp string.
- In the billing report rate schedule, add a line item which calculates the cost allocation rate and assigns it to the run time parameter. This line item is typically of the form Cost Allocation Rate = (Total Energy Cost) / (Energy Measurement Units) with the usual protections against division by zero. To suppress display of the line item on a standard billing report, you may set the line item Visibility to False

Cost Allocation rate schedule requirements

- Set up a cost allocation rate schedule that applies the cost allocation rate to the energy usage of each selected group and/or meter
- Set up a run-time parameter with the identical name as the cost allocation rate run-time parameter in the billing rate schedule

Billing report requirements

A cost allocation rate schedule must be assigned to a group such that when the CostAllocate method of a Group or Meter object is called then the billing report and rate schedule can be located by searching up the tree from the group or meter. If either the billing report or the cost allocation rate schedule cannot be found then the CostAllocate method will return a value of zero.

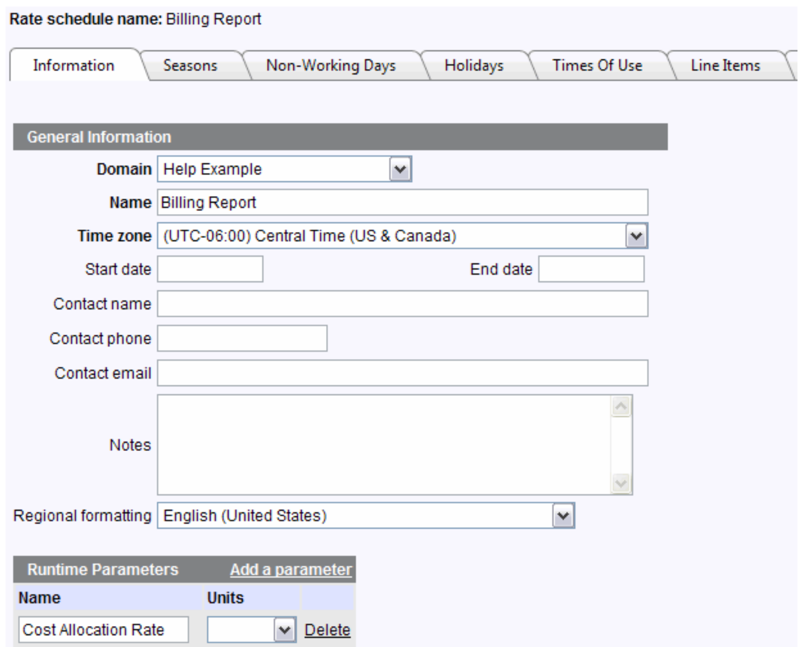
Cost Allocation example

This example shows how to set up a billing report and cost allocation rate schedule to perform cost allocation using a blended kWh charge.

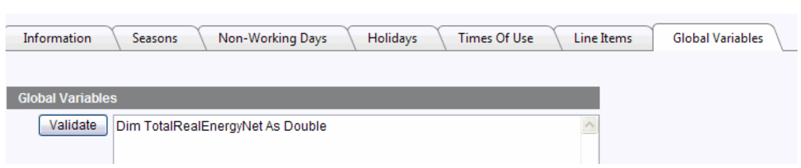
1. Create a billing report to calculate the cost allocation rate.
2. Add a runtime parameter called "Cost Allocation Rate".

   This would normally calculate the total site cost and divide by the kWh consumed to arrive at a blended kWh rate.

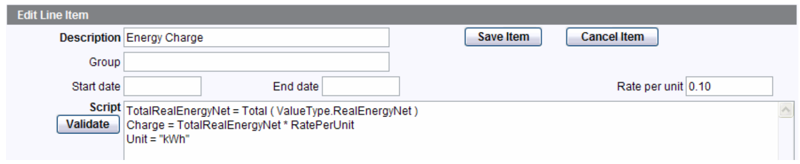
   This example includes a fixed monthly charge that is prorated based on the report date range.



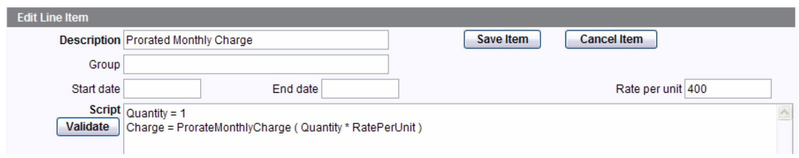
3. Add a global variable named TotalRealEnergyNet.



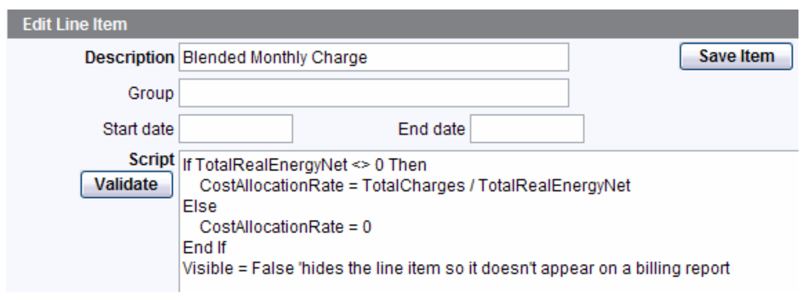
4. Add Line Item 1 which calculates the charge for real energy net.



5. Add Line Item 2 which calculates a prorated fixed monthly charge.

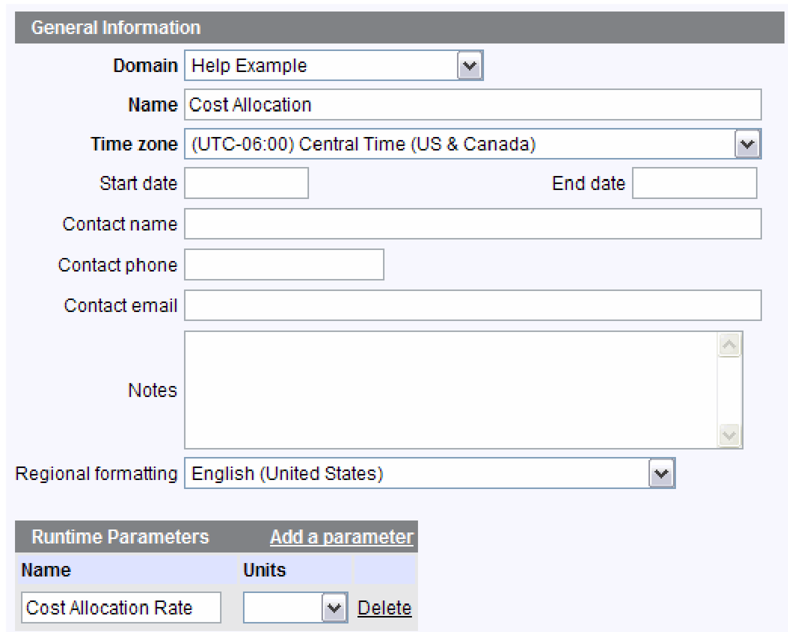


6. Add Line Item 3 which calculates the cost allocation rate.

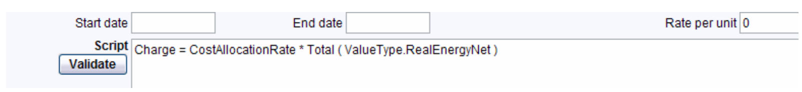


7. Save the Billing Report rate schedule.
8. Create a Billing Report based on the Billing Report rate schedule.
9. Create a new Cost Allocation rate schedule with a run-time parameter named the same as the run-time parameter in the billing rate schedule.

   This will normally be quite a simple rate schedule as it is just taking the rate passed from the billing report and applying it to the consumption.



10. Create a line item to apply the cost allocation rate to each meter's consumption.



11. Create the MPR script code to call the CostAllocate method of a Group or Meter object.

```
Dim charge As Double

Charge = Group.CostAllocate("Billing Report", "Cost
Allocation")
```

Sample scripts

Consumption and cost per meter grid

The report generated by this sample MPR script uses a Grid object to list real energy consumption and cost by meter. Each meter shows up on the report as a row of data within the grid. Meters must be selected "By Meter" in the report setup selection tree. The grid will be sorted by cost, descending. Costs are calculated using the Cost Allocate method of the Meter object. Rate schedules must be set up to support cost allocation. For details, see "Using the MPR for cost allocation" (page 371).

```
Sub Main()
Dim actualConsumption As Double
Dim actualCost As Double
Dim meter As Meter
Dim grid As New Grid
Dim col As Col
Dim row As Row

col = grid.AddCol("Meter") : col.Width = 1.75
col = grid.AddCol("Actual Consumption") : col.Width = 1 : _
col.Alignment = TextAlignment.Right : col.OutputFormat = "##.##0"
col = grid.AddCol() : col.Width = 0.5    'this column is for the units label
col = grid.AddCol("Actual Cost") : col.Width = 0.9 : col.Alignment = _
TextAlignment.Right : col.OutputFormat = "$##.##0"

For Each meter In Report.Meters
actualConsumption = meter.Total(ValueType.RealEnergyNet)
actualCost = meter.CostAllocate("Electric Billing Report", "Electric Cost Allocation")

row = grid.AddRow()
row(0) = meter.Name
row(1) = actualConsumption
row(2) = "kWh"
row(3) = actualCost
Next meter

grid.HeaderHeight = 0.5
```

```
grid.Sort(3, SortOrder.Descending) 'sorts the grid by
cost (column 3), descending

report.Add(grid, 0.2, CursorPos)

End Sub
```

Consumption by group trend chart

The report generated by this script contains a trend chart that plots real energy consumption by group per interval. The report will handle any number of groups, plotting a separate line in the chart for each one.

The script uses the Groups and Intervals collections and the Group, Report, Interval and TrendChart objects. To use this script, check the **Use Intervals** check box on the MPR script setup page. Select By Groups to run this report.

```
    Sub Main()
        Dim objGroup As Group
        Dim intInterval As Interval
        Dim consumption As Double
        Dim trendChart As New TrendChart()
        With trendChart
            .XAxis.Title = Report.IntervalTypeString & "
Ending Date"
            .YAxis.Title = "Consumption (kWh)"
            '.XAxis.Step = 7
            .XAxis.Format = AxisFormat.Date
            .XAxis.CustomFormat = "MMM dd"
            .YAxis.CustomFormat = "#"
            .SeriesLegendBox = True
        End With
        For Each objGroup In Report.Groups
            trendChart.SeriesLegend = objGroup.Name
            For Each intInterval In Report.Intervals
                consumption = objGroup.Total
(ValueType.RealEnergyNet, intInterval.StartDate, intIn-
terval.EndDate)
```

```
                trendChart.AddData(intInterval.EndDate,
consumption)
            Next intInterval
            trendChart.NextSeries()
        Next objGroup
        Report.Add(trendChart, 0, 0, 7.5, 7.5)
    End Sub
```

Consumption by group pie chart

This sample MPR script generates a report with a pie chart showing real energy consumption by group. It uses the groups collection and the Group, PieChart and Report objects. This script is set up to use Select by Groups.

Tip: In this script, the group name is included in the custom format just before each data slice is added to the pie chart. This provide each slice with a unique label.

```
Sub Main()
  Dim objGroup As Group
  Dim objPieChart As New PieChart()
  objPieChart.Title.Text = "Consumption (kWh) by Group"
  objPieChart.Border = True
  For Each objGroup In Report.Groups
    objPieChart.CustomFormat = objGroup.Name & " #"
    objPieChart.AddData(objGroup.Name, objGroup.Total
(ValueType.RealEnergyNet))
  Next
  Report.Add(objPieChart , 0, 0, 4.5, 2.5)
End Sub
```

Cost by group pie chart

This sample MPR script generates a report with a pie chart showing cost by group. Each group consists of multiple utilities and each utility has its own rate schedule. The utility costs for each group are prorated based on the monthly site rate schedule for the utility. Rate schedules must be set up to support cost allocation. For details, see "Using the MPR for cost allocation" (page 371).

The script uses the Groups collection and the Group, PieChart and Report objects. It is designed for Select By Groups.

```
Sub Main()
Dim group As Group
Dim cost As Double
Dim pieChart As New PieChart

For Each group In Report.Groups
cost = group.CostAllocate("Electric Billing Report", "Electric Cost Allocation")
cost += group.CostAllocate("Gas Billing Report", "Gas Cost Allocation")
cost += group.CostAllocate("Water Billing Report", "Water Cost Allocation")
pieChart.AddData(group.Name, cost)
Next group

Report.Add(pieChart, 0, 0, 7.5, 7.5)
End Sub
```

Fiscal calendar listing

This sample Multi Purpose Report script will populate several sheets in a spreadsheet of the same name as the report script. The Script sets properties for the spreadsheet, sets some values in fields in the spreadsheet, create and delete sheets in the workbook, populates sheets with meter data, creating a bar chart as well as a trend the meter data.

```
Sub Main
    ' Set predefined properties of the Excel workbook.
    Excel.Workbook.Properties.Author = "Author name"
    Excel.Workbook.Properties.Title = "This ia an Excel MPR report"
    Excel.Workbook.Properties.Subject = "Subject goes here"
    Excel.Workbook.Properties.Category = "This is the category"
```

```
    Excel.Workbook.Properties.Comments = "Some comments"
    Excel.Workbook.Properties.Keywords = "keyword1
keyword2 keyword3"
    Excel.Workbook.Properties.Status = "Status goes here"
    Excel.Workbook.Properties.LastModifiedBy = "Last mod-
ified by"
    Excel.Workbook.Properties.Company = "Company Name"
    Excel.Workbook.Properties.Manager = "Manager Name"
    ' Create and set some custom properties of the Excel
workbook.
    Excel.Workbook.CustomProperties.Add("ACus-
tomStringProperty", "String property")
    Excel.Workbook.CustomProperties.Add("ACus-
tomDateProperty", DateTime.Now)
    Excel.Workbook.CustomProperties.Add("ACus-
tomNumberProperty", 123.456)
    ' Create some new worksheets.
    Excel.Workbook.Worksheets.Add("New Sheet 1")
    Excel.Workbook.Worksheets.Add("New Sheet 2")
    ' Delete a worksheet.
    Excel.Workbook.Worksheets.Delete("New Sheet 2")
    DoSingleCellPopulationWorksheet
    DoMultiCellPopulationWorksheet
    DoDailyEnergyBarChart
    DoDailyEnergyTrendChart
End Sub


Sub DoSingleCellPopulationWorksheet
    Dim worksheetName As String
    worksheetName = "Single Cell Population"
    Excel.SetCell(worksheetName, 11, 1, "This is a
string")
    Excel.SetCell(worksheetName, 17, 1, 123456.78)
    Excel.SetCell(worksheetName, "SimpleDataPopulation_
NamedRange1", "This is a named range")
End Sub
```

```
Sub DoMultiCellPopulationWorksheet
    Dim worksheetName As String
    worksheetName = "Tag Data"
    Dim tagData As TagData
    tagData = Report.Meters(0).GetData(ValueType.RealEn-
ergyNet, Report.StartDateTime, Report.EndDateTime)
    Excel.SetCells(worksheetName, 3, 1, tagData)
End Sub

Sub DoDailyEnergyBarChart
    Dim worksheetName As String
    worksheetName = "Daily Energy Bar Chart"
    Dim meter As Meter
    Dim day As Day
    Dim kwh As Integer
    Dim row As Integer
    Dim startdate as object
    meter = Report.Meters(0)
    Excel.SetCell(worksheetName, 20, 1, meter.Name)
    row = 22
    For Each day in Report.Days
        startdate = day.StartDate
        kwh = meter.Total(ValueType.RealEnergyNet,
Day.StartDate, Day.EndDate)
        Excel.SetCell(worksheetName, row, 1,
startdate.ToString())
        Excel.SetCell(worksheetName, row, 2, kwh)
        row = row + 1
    Next day
End Sub

Sub DoDailyEnergyTrendChart
    Dim worksheetName As String
    worksheetName = "Trend Chart"
```

```
    Dim meter As Meter
    Dim day As Day
    Dim kwh As Integer
    Dim row As Integer
    Dim startdate as object
    meter = Report.Meters(0)
    Excel.SetCell(worksheetName, 29, 1, meter.Name)
    row = 31
    For Each day in Report.Days
        startdate = day.StartDate
        kwh = meter.Average(ValueType.RealEnergyNet,
Day.StartDate, Day.EndDate)
        Excel.SetCell(worksheetName, row, 1,
startdate.ToString())
        Excel.SetCell(worksheetName, row, 2, kwh)
        row = row + 1
    Next day
End Sub
```

An RTF sample

This sample script provides an example of using RTF codes to construct specialized dashboard indicators using text graphics, colors, etc. The script also demonstrates the use of subroutines with parameters being passed to them by the calling routine.

```
Sub Main()
        Report.Orientation = PageOrientation.Landscape
        MakeHorizBarChart1("Natural Gas", 123456, 234567,
345678, 7, 10, 3.5, 2, 0.15, Functions.CursorPos)
        MakeHorizBarChart1("Electric", 234567, 345678,
456789, 5, 11, 3.5, 2, 3.65, Functions.CursorPos)
        MakeHorizBarChart1("Water", 345678, 456789,
567890, 4, 4, 3.5, 2, 7.15, Functions.CursorPos)
    End Sub


    Sub MakeHorizBarChart1(ByVal strUtility As String, _
        ByVal dblCost1 As Double, _
```

```
        ByVal dblCost2 As Double, _
        ByVal dblCost3 As Double, _
        ByVal intDays1 As Integer, _
        ByVal intDays2 As Integer, _
        ByVal dblWidth As Double, _
        ByVal dblHeight As Double, _
        ByVal dblLeft As Double, _
        ByVal dblTop As Double)


        ' local variable declarations
        Dim dblTotalAccrual As Double = dblCost2 +
dblCost3   'special case
        Dim intDaysAll As Integer = Report.Days.Count
        If intDaysAll > 35 Then intDaysAll = 35
        Dim objRtb1 As New RichTextBox()
        Dim objRtb2 As New RichTextBox()
        'populate utility name and total accruals lines
        With objRtb1
            .Text = "\fs20\caps\b " & strUtility &
"\caps0\par "
            .Text &= "Total Accrual:  " & Format
(dblTotalAccrual, "c") & "\b0\par "
        End With
        'populate horiz bar charts and legend
        'uses RTF color table and font table, don't
change
        With objRtb2
            .Text = "{\colort-
bl;\red0\-
green0\blue0;\red0\green0\blue255;\red0\green255\blue255;"
            .Text &= "\red0\-
green255\blue0;\red255\-
green0\blue255;\red255\green0\blue0;"
            .Text &= "\red255\-
green255\blue0;\red255\-
green255\blue255;\red0\green0\blue128;"
```

```
            .Text &= "\red0\-
green128\blue128;\red0\-
green128\blue0;\red128\green0\blue128;"
            .Text &= "\red128\-
green0\blue0;\red128\-
green128\blue0;\red128\green128\blue128;"
            .Text &= "\red192\green192\blue192;}"
            .Text &= "{\fonttbl{\f0\fnil;}{\f1 Ariel;}
{\f2 Courier New;}}"
            .Text &= "\f2\fs20\cf2\cb8\b " & StrDup
(intDays1, "Z")
            .Text &= "\cf5\cb8 " & StrDup((intDays2 -
intDays1), "X")
            .Text &= "\cf6\cb8 " & StrDup((intDaysAll -
intDays2), "N") & "\par\b0 "
            .Text &= "\f2 " & Space(15) & "\f2\cf2\cb8\b
Z \f0\cf0\cb8 " & Format(dblCost1, "c") & "\b0\par "
            .Text &= "\f2 " & Space(15) & "\f2\cf5\cb8\b
X \f0\cf0\cb8 " & Format(dblCost2, "c") & "\b0\par "
            .Text &= "\f2 " & Space(15) & "\f2\cf6\cb8\b
N \f0\cf0\cb8 " & Format(dblCost3, "c") & "\b0\par "
        End With
        'Add rich text box objects to report
        Report.Add(objRtb1, dblLeft, dblTop, dblWidth,
0.3)
        Report.Add(objRtb2, dblLeft, dblTop + 0.3,
dblWidth, dblHeight)
    End Sub
```

An Excel spreadsheet sample

This sample MPR Excel Report script populates an existing Excel spreadsheet with document properties, basic cell values as well as populate the sheet with meter data, that could be used for trend charts, bar charts etc. in excel. It uses the Excel.SetCell function that simplifies the process of populating Excel cells with various content.

Tip: In this script, the worksheet name is included in the Excel.SetCell calls as the first parameter, and the preceding parameters define the location and content.

```
    Sub Main()
```

```
  ' Define variables used with the routine.
  Dim worksheetName As String
  Dim meter As Meter
  Dim day As Day
  Dim kwh As Integer
  Dim row As Integer
  Dim startdate as object
  ' Set predefined properties of the Excel workbook.
  Excel.Workbook.Properties.Author = "Author name"
  Excel.Workbook.Properties.Title = "This ia an Excel MPR 
report"
  Excel.Workbook.Properties.Subject = "Subject goes here"
  Excel.Workbook.Properties.Category = "This is the cat-
egory"
  Excel.Workbook.Properties.Comments = "Some comments"
  Excel.Workbook.Properties.Keywords = "keyword1 keyword2 
keyword3"
  Excel.Workbook.Properties.Status = "Status goes here"
  Excel.Workbook.Properties.LastModifiedBy = "Last mod-
ified by"
  Excel.Workbook.Properties.Company = "Company Name"
  Excel.Workbook.Properties.Manager = "Manager Name"
  ' Create and set some custom properties of the Excel 
workbook.
  Excel.Workbook.CustomProperties.Add("ACus-
tomStringProperty", "String property")
  Excel.Workbook.CustomProperties.Add("ACus-
tomDateProperty", DateTime.Now)
  Excel.Workbook.CustomProperties.Add("ACus-
tomNumberProperty", 123.456)
  ' Populate values and strings in empty cells in a sheet 
of the workbook
  worksheetName = "Single Cell Population"
  Excel.SetCell(worksheetName, 11, 1, "This is a string")
  Excel.SetCell(worksheetName, 17, 1, 123456.78)
  Excel.SetCell(worksheetName, "SimpleDataPopulation_
NamedRange1", "This is a named range")
```

```
    ' Populate daily meter data a sheet of the workbook
    ' - and the data is then used to fill a bar chart
    worksheetName = "Daily Energy Bar Chart"
    meter = Report.Meters(0)
    Excel.SetCell(worksheetName, 20, 1, meter.Name)
    row = 22
    For Each day in Report.Days
        startdate = day.StartDate
        kwh = meter.Total(ValueType.RealEnergyNet,
  Day.StartDate, Day.EndDate)
        Excel.SetCell(worksheetName, row, 1,
  startdate.ToString())
        Excel.SetCell(worksheetName, row, 2, kwh)
        row = row + 1
    Next day
  End Sub
```

MPR object model

In this chapter you will learn about the following:

Axis object

The Axis object is used to modify axis properties on a trend or bar chart.

Instancing

The Axis object is not a creatable object.

Accessing

MPR script code can access the XAxis and YAxis objects as properties of a TrendChart or BarChart object

Properties

Property	R/W	Description
CustomFormat As String	R/W	Sets a custom format to be used for displaying the labels along the tick marks on the axis
Font As	R/W	Specifies the Font object associated with the axis
Format As AxisFormat	R/W	Specifies one of the standard formats to use for displaying the labels along the tick marks on the axis
Gridlines As Boolean	R/W	Controls the visibility of gridlines at the tick marks on the axis
LabelAngle As Double	R/W	Specifies the text rotation in degrees for the labels on the selected axis. Range is -90 to 90, with a default value of 0
Step As Double	R/W	Specifies the interval of major tick marks and gridlines (if visible) on the selected axis. It also controls the gap or interval between labels in the selected axis
Title As String	R/W	The text that appears as the title of the axis

Enums

Enum	Description
AxisFormat.Date	Displays a Short Date, as defined in the International section of the Control Panel. This is the default format for the XAxis object on a TrendChart object
AxisFormat.Number	Displays a Number, as defined in the International section of the Control Panel. This is the default value for the YAxis object on a TrendChart object

BarChart object

The BarChart object is used to display a bar chart on the report. The bar charts may display one or more data series in a side-by-side or stacked format. Side-by-side and stacked may be combined in the same chart.

Instancing

The BarChart object is a creatable object.

Accessing

MPR script code can create BarChart objects as needed using the New operator.

Properties

Property	R/W	Description
Border As Boolean	R/W	Controls the visibility of a border around the entire bar chart area, including title and legend areas. Default is false
Title.Text As String	R/W	The title that will appear above the bar chart
XAxis As Axis	R	Axis properties for the X axis of the bar chart
XAxisSort As String	R/W	Controls the left-to-right sort order of bars in the chart. Allowable values are: • “XValue ASC” (default), which sorts by the data label name in ascending order. This is the same as in previous versions. • "XValue DESC", which sorts by the data label name in descending order. • "Value ASC", which sorts by the value of data in each bar in ascending order. • "Value DESC", which sorts by the value of data in each bar in descending order.
YAxis As Axis	R	Axis properties for the Y axis of the bar chart
ChartType As ChartType	W	Controls the type of chart shown. See the Enums. Default is Bar
PointLabels As Boolean	W	Controls the display of data values above chart markers. Default is false
SeriesSecondaryYAxis As Boolean	W	The current data series will use the primary Y axis if false, the secondary Y axis if true. Default is false
SeriesLegendBox As	R/W	Controls the visibility of the legend box. Default is false

Property	R/W	Description
Boolean		
SeriesLegend As String	W	The legend text for the current data series
SeriesStacked As Boolean	W	Allows stacking of bar chart data series. If true, the current data series will be stacked on the previous bar chart data series. Default is false
SeriesType As ChartType	W	Sets the chart type for the current data series. See the Enums. Default is bar

Methods

Method	Description
BarChart() As BarChart	Create a BarChart object
AddData(Data As Double)	Add a data point to the bar chart
AddData (Timestamp As DateTime, Data As Double)	Add a time series data point to the bar chart
NextSeries()	Close the current data series and create a new one. This is used when the bar chart will contain multiple data series. When a BarChart object is created, the first series is automatically opened so this method should not be called if the bar chart is only to display one series

Enums

Constant	Description
ChartType.Bar ChartType.Gantt	Specifies a chart type

Constant	Description
ChartType.Trend	

Example

This example Multi-Purpose Report script creates a chart with three data series. The first two data series will be displayed as stacked bars and the third data series will be displayed as a normal bar next to the stacked bars.

```
Dim barChart As New BarChart()
barChart.AddData("Jan", 100)
barChart.AddData("Feb", 200)
barChart.AddData("Mar", 300)

barChart.NextSeries
barChart.SeriesStacked = true
barChart.AddData("Jan", 5420)
barChart.AddData("Feb", 3500)
barChart.AddData("Mar", 10405)

barChart.NextSeries
barChart.AddData("Jan", 3340)
barChart.AddData("Feb", 5200)
barChart.AddData("Mar", 1500)

Report.Add(barChart, 3, 2, 5, 3)
```

Cell object

The Cell object presents a cell within a worksheet of the workbook that the MPR Excel script is working with.

Instancing

The Cell object is not a creatable object.

Accessing

The Workbook object automatically creates Cell objects for each worksheet in the workbook (accessible using the Excel.Workbook.Worksheets.Ranges property) and MPR Excel script code can access any cell in a worksheet using the Cell objects.

Methods

Method	Description
InsertRowsAbove(NumberOfRows As Integer)	Insert a number of rows above the rows of the cell
InsertRowsBelow(NumberOfRows As Integer)	Insert a number of rows below the rows of the cell
InsertColumnsBefore(NumberOfColumns As Integer)	Insert a number of columns before the columns of the cell
InsertColumnsAfter(NumberOfColumns As Integer)	Insert a number of columns after the columns of the cell

Excel Col object

The Col object represents one column in a Grid object

Instancing

The Col object is a creatable object

Accessing

MPR script code can create Col objects using one of the AddCol methods of a Grid object

Properties

Property	R/W	Description
Alignment As TextAlignment	R/W	Controls the alignment of text within the column
HeaderText As String	R/W	The text that will appear in the column header. The text will automatically word wrap

Property	R/W	Description
		to fit in the column’s specified width
OutputFormat As String	R/W	Sets a custom format to be used for displaying the data in the rows of the column.
Width As Float	R/W	The width of the column (in inches). The default is one inch

Methods

Method	Description
Col([HeaderText As String]) As Col	Create a Col object (with the specified header text if the optional HeaderText string is present)

Enums

Enum	Description
TextAlignment.Left TextAlignment.Center TextAlignment.Right TextAlignment.Justify	Controls the alignment of text

Columns collection

The Columns object is a collection of Excel Column objects.

Instancing

The Columns object is not a creatable object.

Accessing

The Workbook object automatically creates one Columns object for each worksheet in the workbook.

Properties

Property	R/W	Description
"Column object" (page	R	Collection of Column objects that represent

Property	R/W	Description
393) (index) As Column		the columns in the worksheet.

Column object

The Column object presents a column within a worksheet of the workbook that the MPR Excel script is working with.

Instancing

The Column object is not a creatable object.

Accessing

The Workbook object automatically creates Column objects for each worksheet in the workbook (accessible using the Excel.Workbook.Worksheets.Columns property) and MPR Excel script code can access any column in a worksheet using the Column objects.

Methods

Method	Description
InsertColumnsBefore(NumberOfColumns As Integer)	Insert a number of columns before the columns in the range
InsertColumnsAfter(NumberOfColumns As Integer)	Insert a number of columns after the columns in the range
Delete()	Deletes the column

Days collection

The Days object is a collection of Day objects. The Days and Day objects provide an easy way for MPR script code to process data in daily periods.

Instancing

The Days object is a creatable object.

Accessing

The Report object automatically creates one Days object (accessible using the Report.Days property) and MPR script code can create additional Days objects if needed.

Properties

Property	R/W	Description
Day(index) As Day	R	Collection of Day objects that represent the report date range in periods of days

Methods

Method	Description
Days(StartDate As DateTime, EndDate As DateTime)	Create a Days object containing Day objects representing the days between StartDate and EndDate, inclusive

Day object

The Day object presents a time period of one day.

Instancing

The Day object is a creatable object.

Accessing

The Days object automatically creates Day objects (accessible using the Day property) and MPR script code can create additional Day objects if needed.

Properties

Property	R/W	Description
StartDate As DateTime	R	The starting date of the Day object (eg. 1/1/2003 00:00:00)
EndDate As DateTime	R	The ending date of the Day object (eg. 1/2/2003 00:00:00)

Methods

Method	Description
Day(Date As DateTime)	Create a Day object representing a time period of one day

Excel object

The Excel object provides the capability to create Excel report via the MPR scripting capability. This functionality is based on utilizing an existing Excel spreadsheet with formatting, trends and charts already defined, and then using the script to populate the spreadsheet with data from FactoryTalk EnergyMetrix.

Instancing

The Excel object is not a creatable object.

Accessing

The Excel object is accessible from a MPR script via the Report global variable.

Properties

Property	R/W	Description
"Workbook object" (page 439) as XLWorkbook.	R/W	The workbook to work on within the MPR Excel report

Methods

Method	Description
SetCell(worksheetName As String, row As Integer|String, col As Integer|String, value As String|Double)	Fill a cell in the worksheet with a string or number value. The cell can be defined either by row and column numbers or by row and column string identifiers.
SetCell(worksheetName As String, namedRange As String, value As String|Double)	Fill a cell in the worksheet with a string or number value. The cell is defined by a named range string.
SetCell(worksheetName As String, row As Integer|String, col As Integer|String, tagData as TagData)	Fill a multiple cells in the worksheet with a meter tag data. The starting cell can be defined either by row and column numbers or by row and column string identifiers.

FiscalMonth object

The FiscalMonth object represents one fiscal month.

Instancing

The FiscalMonth object is not a creatable object

Accessing

Each FiscalMonth object is accessed via the FiscalMonths collection

Properties

Property	R/W	Description
FiscalYearNumber As Integer	R	The fiscal year number (e.g. 2009)
FiscalMonthNumber As Integer	R	The fiscal month number (1 to 12)
StartDate As DateTime	R	The starting date of the fiscal month (e.g. 9/28/2009 00:00:00)
EndDate As DateTime	R	The ending date of the fiscal month (e.g. 10/4/2010 00:00:00)

Methods

Method	Description
AddFiscalMonths(int numFiscalMonths) As FiscalMonth	Gets the fiscal month object for the fiscal month specified as an offset from the current fiscal month object. Returns value of Nothing if there is no fiscal month configured for that period.

Usage

For details, see "Fiscal calendar listing" (page 379)

FiscalMonths collection

The FiscalMonths object is a collection of FiscalMonth objects. The FiscalMonths and FiscalMonth objects provide an easy way for MPR script code to process data in fiscal month periods.

Instancing

The FiscalMonths object is not a creatable object.

Accessing

The Report object automatically creates one FiscalMonths object (accessible using the Report.FiscalMonths property).

Properties

Property	R/W	Description
FiscalMonths(index) As FiscalMonth	R	Collection of FiscalYear objects that represent the report date range in periods of fiscal years

FiscalQuarter object

The FiscalQuarter object represents one fiscal quarter.

Instancing

The FiscalQuarter object is not a creatable object

Accessing

Each FiscalQuarter object is accessed via the FiscalQuarters collection

Properties

Property	R/W	Description
FiscalYearNumber As Integer	R	The fiscal year number (e.g. 2009).
FiscalQuarterNumber As Integer	R	The fiscal quarter number (1 to 4).
StartDate As DateTime	R	The starting date of the fiscal quarter (e.g. 9/28/2009 00:00:00)
EndDate As DateTime	R	The ending date of the fiscal quarter (e.g. 1/4/2010 00:00:00)

Methods

Method	Description
AddFiscalQuarters(int numFiscalQuarters) As FiscalQuarter	Gets the fiscal year object for the fiscal year specified as an offset from the current fiscal year object. Returns null if there is no fiscal year configured for that period.

FiscalQuarters collection

The FiscalQuarters object is a collection of FiscalQuarter objects. The FiscalQuarters and FiscalQuarter objects provide an easy way for MPR script code to process data in fiscal quarter periods.

Instancing

The FiscalQuarters object is not a creatable object.

Accessing

The Report object automatically creates one FiscalQuarters object (accessible using the Report.FiscalQuarters property).

Properties

Property	R/W	Description
FiscalQuarters (index) As FiscalQuarter	R	Collection of FiscalYear objects that represent the report date range in periods of fiscal years

FiscalWeek object

The FiscalWeek object represents one fiscal week.

Instancing

The FiscalWeek object is not a creatable object

Accessing

Each FiscalWeek object is accessed via the FiscalWeeks collection

Properties

Property	R/W	Description
FiscalYearNumber As Integer	R	The fiscal year number (e.g. 2009)
FiscalWeekNumber As Integer	R	The fiscal week number (1 to 53)
StartDate As DateTime	R	The starting date of the fiscal week (e.g. 9/28/2009 00:00:00)
EndDate As DateTime	R	The ending date of the fiscal week (e.g. 10/4/2009 00:00:00)

Methods

Method	Description
AddFiscalWeeks(int numFiscalWeeks) As FiscalWeek	Gets the fiscal week object for the fiscal year specified as an offset from the current fiscal week object. Returns null if there is no fiscal year configured for that period.

FiscalWeeks collection

The FiscalWeeks object is a collection of FiscalWeek objects. The FiscalWeeks and FiscalWeek objects provide an easy way for MPR script code to process data in fiscal week periods.

Instancing

The FiscalWeeks object is not a creatable object.

Accessing

The Report object automatically creates one FiscalWeeks object (accessible using the Report.FiscalWeeks property).

Properties

Property	R/W	Description
FiscalWeeks (index) As FiscalWeek	R	Collection of FiscalYear objects that represent the report date range in periods of fiscal years

FiscalYear object

The FiscalYear object represents one fiscal year.

Instancing

The FiscalYear object is not a creatable object

Accessing

Each FiscalYear object is accessed via the FiscalYears collection

Properties

Property	R/W	Description
FiscalYearNumber As Integer	R	The fiscal year number (e.g. 2009)
StartDate As DateTime	R	The starting date of the fiscal year (e.g. 9/28/2009 00:00:00)
EndDate As DateTime	R	The ending date of the fiscal year (e.g. 10/4/2010 00:00:00)

Methods

Method	Description
AddFiscalYears(int numFiscalYears) As FiscalYear	Gets the fiscal year object for the fiscal year specified as an offset from the current fiscal year object. Returns null if there is no fiscal year configured for that period.

FiscalYears collection

The FiscalYears object is a collection of FiscalYear objects. The FiscalYears and FiscalYear objects provide an easy way for MPR script code to process data in fiscal year periods.

Instancing

The FiscalYears object is not a creatable object.

Accessing

The Report object automatically creates one FiscalYears object (accessible using the Report.FiscalYears property).

Properties

Property	R/W	Description
FiscalYears(index) As FiscalYear	R	Collection of FiscalYear objects that represent the report date range in periods of fiscal years

Font object

The Font object permits changing the fonts used in Multi-Purpose Report chart objects from the default font (Arial, 8 pt.).

Applies to

The Font object allow changing the font through scripting for the following chart objects:

- [ChartObject].XAxis
- [ChartObject].YAxis
- [ChartObject].SeriesLegendBox
- [ChartObject].Title

Instancing

The Font object is a member object of the above-listed chart objects and must be created before its properties may be assigned.

Accessing

MPR script code creates new instances of the Font object using the New operator

Properties

Property	R/W	Description
XAxis.Font As Font	R/W	The font object assigned to the X axis
YAxis.Font As Font	R/W	The font object assigned to the Y axis
SeriesLegendBoxFont As Font	R/W	The font object assigned to the series legend box
Title.Font As Font	R/W	The font object assigned to the title

Examples

This script creates and sets the properties of the font object for the barChart X axis, Y axis, series legend box and title:

```
barChart.XAxis.Font = new Font("Arial", 10)
barChart.YAxis.Font = new Font("Arial", 10)
barChart.SeriesLegendBoxFont = new Font("Arial", 12)
barChart.Title.Font = new Font("Arial", 12,
FontStyle.Bold)
```

More information

Consult the Microsoft .NET Framework documentation for more information on the System.Drawing.Font class including various ways to construct new Font objects.

Global functions and variables

MPR script may use these functions and variables to format the report output.

Variables

Variable	R/W	Description
[Functions].CursorPos As Double	R/W	The current position of the cursor on the report. The cursor represents the current vertical position on a report. This can be used to help place objects on a report

Functions

Function	Description
[Functions].GetUnit(ValueType As Integer) As String	Get the string value for the engineering units used by ValueType. For example, Functions.GetUnit(ValueType.RealEnergyNet) would return "kWh"
[Functions].MoveCursorPos(Inches As Double)	Move the cursor position by the specified amount (in inches).

Grid object

The Grid object provides a way to output data organized in columns and rows.

Instancing

The Grid object is a creatable object.

Accessing

The Grid object is created using the New operator.

Properties

Property	R/W	Description
Cols As ArrayList	R	The collection of Col objects contained in the grid
FontSize As Integer	R/W	The font size (in points) for grid text. Default is 10
HeaderHeight As Float	R/W	The height of the column headers (in inches). Default is .125
Rows As ArrayList	R	The collection of Row objects contained in the grid
ShowHorizontalLines As Boolean	R/W	Controls the display of horizontal grid lines. Default is False
ShowVerticalLines As Boolean	R/W	Controls the display of vertical grid lines. Default is False

Methods

Method	Description
AddCol([HeaderText As String]) As Col	Add a Col object to the grid (and set the header text to the optional HeaderText string if present)
AddRow() As Row	Add a Row object to the grid
Grid() As Grid	Create a Grid object
Sort(ColIndex As Integer, SortOrder As SortOrder)	Sort the grid by the specified column and sort order

Enums

Enum	Description
SortOrder.Ascending SortOrder-.Descending	Controls the sort order of the Sort method

Groups collection

The Groups object is a collection of Group objects.

Instancing

The Groups object is a creatable object.

Accessing

The Report object automatically creates Groups objects (accessible using the Report.Groups and group.Groups properties) and MPR script code can create additional Groups objects if needed.

Using nested groups requires recursion to traverse all selected children groups.

For details, see "NestedGroups collection" (page 420).

Properties

Property	R/W	Description
Group (index) As Group	R	Collection of Group objects that represent the groups that are selected in the report's groups/meters tree

Group object

The Group object represents one group that is selected on the report groups/meters tree. For details, see "Selecting groups and meters in the MPR" (page 368).

Instancing

The Group object is a creatable object.

Accessing

Group objects are normally referenced using the index operator of the Groups collection object.

For more information on usage of methods based on Rate Schedule functions (e.g. Average, Lowest, PeakTimestamp, Ratchet, etc.), see "Scripting functions" (page 292).

Properties

Property	R/W	Description
GroupId As Int	R/W	The database id that identifies the group
Groups As Groups		The collection of Group objects that represents the selected child groups in the report selection tree
Meters As Meters	R/W	The collection of Meter objects that are selected in the report groups/meters tree
Name As String	R/W	The name of the group

Methods

Value type or tag related methods (e.g. Average, Peak, etc.) of the Group object return aggregated results based on all meters included in the selected Group(index).Meters collection. For more information on usage of the methods, refer to the applicable rate schedule functions.

Method	Description
AddMeter(fullyQualifiedPathName As String | MeterID As Integer)	Adds an existing Meter to a Group object. The meter may be specified using either its fully qualified path name (example "PlantDomainName.DepartmentName.MeterName") or its Meter ID number.
Average(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Calculates the average of the specified value type over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
CostAllocate(billingReport As String, costAllocationRateSchedule As String[, DateTime startDate, DateTime endDate]) As Double	Calculate the cost allocation using the specified billing report and rate schedule for the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
FixedTarget(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the value of the most recent instance of the selected ValueType with a time stamp less than or equal to the report startDate (or specified startDate if optional startDate and endDate arguments are present). Returns a Double value. If no value is found, returns the value Double.NaN. If multiple targets are active within the group then the values are aggregated and their total is returned.
GetData(ValueType.enumValue, DateTime utcTimeStamp)	Returns the value of the most recent logged value of the selected ValueType, looking back from the utcTimeStamp argument for a duration of one logging interval. The result is an Object variable which contains the tag value or Nothing if no tag value can be found
GetTagData(int meterTagId, DateTime utcTimeStamp)	Returns the value of the most recent instance of the selected meterTagId, looking back from the utcTimeStamp argument for a duration of one logging interval. The result is an Object variable which contains the tag value or Nothing if no tag value can be found
GetUnit(ValueType.enumValue)	Returns a String containing the Units value associated with the selected value type
Lowest(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the smallest instance of the selected ValueType over the report date/-time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value

Method	Description
LowestTimestamp(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns a DateTime structure containing the UTC time stamp of the smallest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NLowest(ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a Double array of N elements containing the N smallest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NLowestTimestamps(ValueType.enumValue, int N [, DateTime startDate, DateTime endDate])	Returns a DateTime array of N elements containing the UTC time stamps of the N smallest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NPeaks(ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a Double array of N elements containing the N largest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NPeakTimestamps(ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a DateTime array of N elements containing the UTC time stamps of the N largest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
Peak(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the largest instance of the selected ValueType over the report date/-time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
PeakTimestamp(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns a DateTime structure containing the UTC time stamp of the largets instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
Ratchet(ValueType.enumValue, int inter-valInMonths[, DateTime ratchetEndDate])	Returns the largest instance of the selected ValueType over the specified intervalInMonths ending with the report date/time range (or the specified date/time range if the optional ratchetEndDate argument is present). The

Method	Description
	intervalInMonths overlaps the effective date/time range. Returns a Double value
RunRateSchedule(rateScheduleName As String [, variableName As String] [, DateTime startDate, DateTime endDate])	Run a rate schedule against the meters in the group for the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present) and return the value of the specified variableName argument as a Double value. The variableName argument may be any of the following: • The rate schedule's TotalCharges variable. This is the default value and will be returned if the variableName argument is omitted. • Charge or RatePerUnit of the final line item in the rate schedule. • Any run-time parameter in the rate schedule. • Any global variable declared in the rate schedule.
Sum(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the arithmetic sum of the selected ValueType over the report date/-time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
TargetTotal(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Calculates the target value of the specified value type for the group for the report date/time range (or the specified date/time range if the optional startDate and endDate arguments are present). This method works with targets saved for the group in ChartsPlus X-Y trend charts. The active target selected is the target with a start date/time less than or equal to the report (or interval) start date/time. Saved targets are selected based on the associated Y (ordinate) value type and represent a linear relationship with up to 3 X (abscissa) value types. For example, in a target of Consumption per Unit Production, Consumption is the Y quantity and Production is the X quantity. Returns a Double value. If no active target is found, returns zero. If multiple targets are active within the group then the values are aggregated and their total is returned.
Total(valueType As Integer[, DateTime startDate, DateTime endDate])	Calculate the consumption of the specified value type for the group for the report date/time range (or the specified date/time range if optional startDate

Method	Description
	and endDate arguments are present). If the 'Log Delta Value' attribute is selected, this function is equivalent to the Sum() function. Returns a Double value
TotalRTPCharge(ValueType.enumValue, int priceTagId[, DateTime startDate, DateTime endDate])	Calculates the total charge for consumption values using real time pricing data contained in the meter tag priceTagId. The function operates over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). It returns a Double value

Intervals collection

The Intervals object is a collection of Interval objects. The Intervals and Interval objects provide an easy way for MPR script code to process data in intervals specified by the user when they run a Multi-Purpose Report. Interval types are Day, Week, Month.

Instancing

The Intervals object is a creatable object.

Accessing

The Report object automatically creates one Intervals object (accessible using the Report.Intervals property) and MPR script code can create additional Intervals objects if needed.

Properties

Property	R/W	Description
Interval(index) As Interval	R	Collection of Interval objects that represent the report date range in intervals

Methods

Method	Description
Intervals(IntervalType intervalType, DateTime startDate, DateTime endDate)	Create an Intervals object containing Interval objects representing the intervals between StartDate and EndDate, inclusive

Enums

Enum	Description
IntervalType.Day IntervalType.Month IntervalType.Week	The types of intervals available. The user selects one of these types when they run a Multi-Purpose report

Interval object

The Interval object presents a time period selected by the user when the Multi-Purpose Report is run.

Instancing

The Interval object is a creatable object.

Accessing

The Intervals object automatically creates Interval objects (accessible using the Interval property) and MPR script code can create additional Interval objects if needed.

Properties

Property	R/W	Description
StartDate As DateTime	R	The starting date of the Interval object (eg. 1/1/2003 00:00:00)

Property	R/W	Description
EndDate As DateTime	R	The ending date of the Interval object (eg. 1/2/2003 00:00:00)

Methods

Method	Description
Interval (startDate As DateTime, endDate As DateTime)	Create an Interval object representing a time period

Meters collection

The Meters object is a collection of Meter objects. For details, see "Selecting groups and meters in the MPR" (page 368).

Instancing

The Meters object is a creatable object.

Accessing

The Report object automatically creates one Meters object (accessible using the Report.Meters property) and MPR script code can create additional Meters objects if needed.

Properties

Property	R/W	Description
Meter (index) As Meter	R	Collection of Meter objects that represent the meters that are selected in the report's groups/meter tree

Meter object

The Meter object represents one meter that is selected on the report groups/meters tree. For details, see "Selecting groups and meters in the MPR" (page 368).

Instancing

The Meter object is a creatable object.

Accessing

Meter objects are normally referenced using the index operator of the Meters collection object.

For more information on usage of methods based on Rate Schedule functions (e.g. Average, Lowest, PeakTimestamp, Ratchet, etc.), see "Scripting functions" (page 292).

Properties

Property	R/W	Description
GroupId As Int	R/W	The database id that identifies the group containing the meter
MeterId As Int	R/W	The database id that identifies the meter
MeterType As Int	R/W	The type of the meter
Name As String	R/W	The name of the meter

Methods

Value type or tag related methods (e.g. Average, Peak, etc.) of the Meter object return results based on the selected meter. For more information on usage of the methods, refer to the applicable rate schedule functions.

Method	Description
Average (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Calculates the average of the specified value type over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
CostAllocate(billingReport As String, costAl-locationRateSchedule As String[, DateTime startDate, DateTime endDate]) As Double	Calculate the cost allocation using the specified billing report and rate schedule for the report date/-time range (or the specified date/time range if optional startDate and endDate arguments are present)
FixedTarget (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the value of the most recent instance of the selected ValueType with a time stamp less than or equal to the report startDate (or specified startDate if optional startDate and endDate arguments are present). Returns a Double value. If no value is found, returns the value Double.NaN.
GetData (ValueType.enumValue, DateTime utcTimeStamp)	Returns the value of the most recent logged value of the selected ValueType, looking back from the utcTimeStamp argument for a duration of one logging interval. The result is an Object variable which contains the tag value or Nothing if no tag value can be found
GetTagData(int meterTagId, DateTime utcTimeStamp)	Returns the value of the most recent instance of the selected meterTagId, looking back from the utcTimeStamp argument for a duration of one logging interval. The result is an Object variable which contains the tag value or Nothing if no tag value can be found
GetUnit (ValueType.enumValue)	Returns a String containing the Units value associated with the selected value type
Lowest (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the smallest instance of the selected ValueType over the report date/time range (or the spe-cified date/time range if optional startDate and endDate arguments are present). Returns a Double value
LowestTimestamp (ValueType.enumValue[,	Returns a DateTime structure containing the UTC time stamp of the smallest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate

Method	Description
DateTime startDate, DateTime endDate])	and endDate arguments are present)
NLowest (ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a Double array of N elements containing the N smallest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NLowestTimestamps (ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a DateTime array of N elements containing the UTC time stamps of the N smallest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NPeaks (ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a Double array of N elements containing the N largest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NPeakTimestamps (ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a DateTime array of N elements containing the UTC time stamps of the N largest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
Peak (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the largest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
PeakTimestamp (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns a DateTime structure containing the UTC time stamp of the largest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
Ratchet (ValueType.enumValue, int	Returns the largest instance of the selected ValueType over the specified intervalInMonths ending with the report date/time range (or the specified date/time range if the optional ratchetEndDate argu-

Method	Description
intervalInMonths[, DateTime ratchetEndDate])	ment is present). The intervalInMonths overlaps the effective date/time range. Returns a Double value
RunRateSchedule (rateScheduleName As String [, variableName As String] [, DateTime startDate, DateTime endDate])	Run a rate schedule against the meter for the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present) and return the value of the specified variableName argument as a Double value. The variableName argument may be any of the following: • The rate schedule's TotalCharges variable. This is the default value and will be returned if the variableName argument is omitted. • Charge or RatePerUnit of the final line item in the rate schedule. • Any run-time parameter in the rate schedule. • Any global variable declared in the rate schedule.
Sum (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the arithmetic sum of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
TargetTotal (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Calculates the target value of the specified value type for the meter for the report date/time range (or the specified date/time range if the optional startDate and endDate arguments are present). This method works with targets saved for the meter in ChartsPlus X-Y trend charts. The active target selected is the target with a start date/time less than or equal to the report (or interval) start date/time. Saved targets are selected based on the associated Y (ordinate) value type and represent a linear relationship with up to 3 X (abscissa) value types. For example, in a target of Consumption per Unit Production, Consumption is the Y quantity and Production is the X quantity. Returns a Double value. If no active target is found, returns zero.
Total(valueType As Integer [, DateTime startDate, DateTime endDate])	Calculate the consumption of the specified value type for the group for the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). If the 'Log Delta Value' attribute is selected, this function is equivalent to the Sum() function. Returns a Double value
TotalRTPCharge (ValueType.enumValue, int	Calculates the total charge for consumption values using real time pricing data contained in the meter tag priceTagId. The function operates over the report date/time range (or the specified date/-

Method	Description
priceTagId[, DateTime startDate, DateTime endDate])	time range if optional startDate and endDate arguments are present). It returns a Double value

Enums

Enum	Description
MeterType.Manual MeterType.Water MeterType.Air MeterType.Gas MeterType.Electric MeterType.Steam MeterType.Environmental	The type of the meter. If additional meter types are created in the database, the additional meter type names may be used as enums

Months collection

The Months object is a collection of Month objects. The Months and Month objects provide an easy way for MPR script code to process data in monthly periods.

Instancing

The Months object is a creatable object.

Accessing

The Report object automatically creates one Months object (accessible using the Report.Months property) and MPR script code can create additional Months objects if needed.

Properties

Property	R/W	Description
Month(index) As Month	R	Collection of Month objects that represent the report date range in periods of months

Methods

Method	Description
Months(StartDate As DateTime, EndDate As DateTime)	Create a Months object containing Month objects representing the months between StartDate and EndDate, inclusive

Month object

The Month object presents a time period of one month. A month begins at midnight on the first day of a month and ends at midnight on the first day of the following month.

Instancing

The Month object is a creatable object.

Accessing

The Months object automatically creates Month objects (accessible using the Months property) and MPR script code can create additional Month objects if needed.

Properties

Property	R/W	Description
StartDate As DateTime	R	The starting date of the Month object (eg. 1/1/2003 00:00:00)

Property	R/W	Description
EndDate As DateTime	R	The ending date of the Month object (eg. 2/1/2003 00:00:00)

Methods

Method	Description
Month(Date As DateTime)	Create a Month object representing a time period of one month

NestedGroups collection

The NestedGroups object is similar to the Report.Groups object in that it contains a collection of Group objects. However, Report.Groups is a flat array of Groups, while Report.NestedGroups is a hierarchical collection of Group objects that mimics the tree structure of the report selection tree. The members of the collection are selected in the MPR setup. For details, see "Selecting groups and meters in the MPR" (page 368).

Instancing

The NestedGroups object is a creatable object.

Accessing

The Report object automatically creates one NestedGroups object (accessible using the Report.NestedGroups property) and MPR script code can create additional Groups objects if needed.

Using nested groups requires recursion to traverse all selected children groups. See the example below.

Properties

Property	R/W	Description
Group (index) As Group	R	Collection of Group objects that represent the groups that are selected in the report's groups/meters tree

Example

The following sample MPR script demonstrates the use of recursion to select nested groups.

```
Dim grid As New Grid
Dim row As Row
Sub Main()
Dim group As Group
Dim col As Col
    col = grid.AddCol("Name") : col.Width = 10
    ' First call of recursive procedure
    For Each group in Report.NestedGroups
        row = grid.AddRow()
        row(0) = group.Name
        BuildNestedGroupsGrid(group, "    ")
    Next group
    Report.Add(grid,0,0)
End Sub
Sub BuildNestedGroupsGrid (parentGroup As Group, tabSpace
As String)
    Dim group As Group
    ' Add children groups to grid and call itself recurs-
ively
    For Each group in parentGroup.Groups
        row = grid.AddRow()
        row(0) = tabSpace + group.Name
```

```
            BuildNestedGroupsGrid(group, "    " + tabSpace)
        Next group
    End Sub
```

PieChart object

The PieChart object is used to create a pie chart on the report.

Instancing

The PieChart object is a creatable object.

Accessing

MPR script code can create PieChart objects as needed using the New operator.

Properties

Property	R/W	Description
Border As Boolean	R/W	Controls the visibility of a border around the entire pie chart area, including title and legend areas. Default value is false
Chart3D As Boolean	R/W	Set to false to display a 2D pie chart and to true to display a 3D pie chart. Default value is true
CustomFormat As String	R/W	Set a custom format to be used for displaying the pie chart data labels. This format is applied to each point as it is added to the chart. Default format string is "#"
Shadow As Boolean	R/W	Add a shadow effect to 2D pie chart. Default value is true
Title.Text As String	R/W	The title that will appear above the pie chart

Methods

Method	Description
PieChart() As PieChart	Create a PieChart object
AddData(Name As String, Data As Double)	Add a slice of data to the pie chart

Range object

The Range object presents a range within a worksheet of the workbook that the MPR Excel script is working with.

Instancing

The Interval object is not a creatable object.

Accessing

The Workbook object automatically creates Range objects for each worksheet in the workbook (accessible using the Excel.Workbook.Worksheets.Ranges property) and MPR Excel script code can access any range in a worksheet using the Range objects.

Methods

Method	Description
FirstCell() as Cell	Returns part of Range to identify the ranges cells, columns and rows etc.
FirstCellUsed()as Cell	Returns part of Range to identify the ranges cells, columns and rows etc.
FirstColumn() as Column	Returns part of Range to identify the ranges cells, columns and rows etc.
FirstColumnUsed() as Column	Returns part of Range to identify the ranges cells, columns and rows etc.

Method	Description
FirstRow() as Row	Returns part of Range to identify the ranges cells, columns and rows etc.
FirstRowUsed() as Row	Returns part of Range to identify the ranges cells, columns and rows etc.
LastCell() as Cell	Returns part of Range to identify the ranges cells, columns and rows etc.
LastCellUsed() as Cell	Returns part of Range to identify the ranges cells, columns and rows etc.
LastColumn() as Column	Returns part of Range to identify the ranges cells, columns and rows etc.
LastColumnUsed() as Column	Returns part of Range to identify the ranges cells, columns and rows etc.
LastRow() as Row	Returns part of Range to identify the ranges cells, columns and rows etc.
LastRowUsed() as Row	Returns part of Range to identify the ranges cells, columns and rows etc.
Merge()	Merges the cells in the range into a single cell
Unmerge()	Removes the merging of cells in the range.
InsertRowsAbove(NumberOfRows As Integer)	Insert a number of rows above the rows in the range
InsertRowsBelow(NumberOfRows As Integer)	Insert a number of rows below the rows in the range
InsertColumnsBefore(NumberOfColumns As Integer)	Insert a number of columns before the columns in the range

Method	Description
InsertColumnsAfter(NumberOfColumns As Integer)	Insert a number of columns after the columns in the range
Delete(ShiftDelete as enum XLShiftDeletedCells)	Deletes the specified range, and shift the cells based on the selected Cell shift method.

Enums

Constant	Description
XLShiftDeletedCells.ShiftCellsLeft XLShiftDeletedCells.ShiftCellsUp	Specifies how cells are shifted when a specified range is deleted.

Report object

The Report object provides access to various aspects of the report. It can be considered the “top-level” object of a report.

Instancing

The Report object is not a creatable object.

Accessing

The Report object is accessible from a MPR script via the Report global variable.

Properties

Property	R/W	Description
Days As Days	R	Collection of Day objects that represent the report date range in periods of day length
EndDateTime As DateTime	R/W	The ending date/time of the report date range

Property	R/W	Description
Groups As Groups	R	Collection of Group objects that represent the groups that are selected on the report's group tree
IntervalTypeString As String	R	The interval type selected by the user when the report is run (Day, Week, Month)
Meters As Meters	R	Collection of Meter objects that represent the meters that are selected on the report's meter tree
Months As Months	R	Collection of Month objects that represent the report date range in periods of month length
ReportPeriod As ReportPeriod	R	Returns an Integer representing the selected report date range. See Enums. If a custom date range is selected, ReportPeriod.None is returned
ReportPeriodString As String	R	Returns a string from the Enum list that describes the report date range selected. If a custom date range is selected, ReportPeriod.None is returned.
ReportPeriodIsFiscal As Boolean	R	Set to true if ReportPeriod is a fiscal period, false if not
Orientation As PageOrientation	W	Sets the page orientation. See Enums. Default is Portrait
PaperKind As PaperKind	W	Sets the paper size. See Enums. Default is Letter
PaperHeight As Double	R/W	Sets the height of the custom paper size in inches. This property is only used when PaperKind is set to Custom
PaperWidth As Double	R/W	Sets the width of the custom paper size in inches. This property is only used when PaperKind is set to Custom
LeftMargin As Double	R/W	Specifies the left margin (in inches) for the current page. Default is 0.5
RightMargin As Double	R/W	Specifies the right margin (in inches) for the current page. Default is 0.5
TopMargin As Double	R/W	Specifies the top margin (in inches) for the current page. Default is 0.5
BottomMargin As Double	R/W	Specifies the bottom margin (in inches) for the current page. Default is 0.5

Property	R/W	Description
ShowLogo As Boolean	R/W	Controls the visibility of the standard logo in the page header. Default value is true
ShowPageHeader As Boolean	R/W	Controls the visibility of the standard page header. Default value is true
ShowPageFooter As Boolean	R/W	Controls the visibility of the standard page footer. Default value is true
StartDateTime As DateTime	R/W	The starting date/time of the report date range
Weeks As Weeks	R	Collection of Week objects that represent the report date range in periods of week length

Methods

Value type or tag related methods (e.g. Average, Peak, etc.) of the Report object return aggregated results based on all selected meters in the report. For more information on usage of the methods, refer to the applicable rate schedule functions.

Method	Description
Add(Grid As Grid, Left As Double, Top As Double)	Add a grid object to the report at the specified coordinates. Any subsequent changes to the grid object will not appear on the report
Add(PieChart As PieChart, Left As Double, Top As Double, Width As Double, Height As Double)	Add a pie chart object to the report with the specified coordinates and size. Any subsequent changes to the pie chart object will not appear on the report
Add(TrendChart As TrendChart, Left As Double, Top As Double, Width As Double, Height As Double)	Add a trend chart object to the report with the specified coordinates and size. Any subsequent changes to the trend chart object will not appear on the report
Add(RichTextBox As RichTextBox, Left As Double, Top As Double, Width As Double, Height As Double)	Add a rich text box object to the report with the specified coordinates and size. Any subsequent changes to the rich text box object will not appear on the report

Method	Description
AddGroup()	Add a new logical group to the report in addition to the groups selected in the report setup page. Typical usage: Dim groupName As Group groupName = report.AddGroup() The new group may be accessed using its group name or index number (Report.Groups(n)). It may be populated with meters using the AddMeters method of the Group object.
AddLine(float X1, float Y2, float Y1, float Y2[, float LineWeight])	Add a line to the report at the specified coordinates. The line weight will be one (or defined by the optional LineWeight argument if present)
AddLogo(Left As Double, Top As Double, Width As Double, Height As Double, File As String)	Add a picture to the report page header with the specified coordinates and size. If the original picture is not the same size as the specified size then the picture will be re-scaled to fit and the aspect ratio of the picture will not be maintained if the specified size is different from the original size. The File parameter can be either an absolute file path (C:\Logos\OurLogo.gif) or a relative file path (..\Logos\OurLogo.gif). Relative paths will be relative to the FactoryTalk EnergyMetrix\bin directory
AddPicture(Left As Double, Top As Double, Width As Double, Height As Double, File As String)	Add a picture to the report body with the specified coordinates and size. If the original picture is not the same size as the specified size then the picture will be re-scaled to fit and the aspect ratio of the picture will not be maintained if the specified size is different from the original size. The File parameter can be either an absolute file path (C:\Pictures\MyPicture.gif) or a relative file path (..\Pictures\ MyPicture.gif). Relative paths will be relative to the FactoryTalk EnergyMetrix\bin directory
Average(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Calculates the average of the specified value type over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
GetData(ValueType.enumValue, DateTime utcTimeStamp)	Returns the value of the most recent logged value of the selected ValueType, looking back from the utcTimeStamp argument for a duration of one logging interval. The result is an Object variable which contains the tag value or Nothing if no tag value can be found

Method	Description
GetTagData(int meterTagId, DateTime utcTimeStamp)	Returns the value of the most recent logged value of the selected meterTagId, looking back from the utcTimeStamp argument for a duration of one logging interval. The result is an Object variable which contains the tag value or Nothing if no tag value can be found
GetUnit(ValueType.enumValue)	Returns a String containing the Units value associated with the selected value type
Lowest(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the smallest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
LowestTimestamp (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns a DateTime structure containing the UTC time stamp of the smallest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NLowest(ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a Double array of N elements containing the N smallest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NLowestTimestamps (ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a DateTime array of N elements containing the UTC time stamps of the N smallest instances of the selected ValueType over the report date/time range (or the specified date/-time range if optional startDate and endDate arguments are present)
NPeaks(ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a Double array of N elements containing the N largest instances of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
NPeakTimestamps (ValueType.enumValue, int N[, DateTime startDate, DateTime endDate])	Returns a DateTime array of N elements containing the UTC time stamps of the N largest instances of the selected ValueType over the report date/time range (or the specified date/-time range if optional startDate and endDate arguments are present)
PageBreak()	Insert a page break at the current cursor position

Method	Description
Peak(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the largest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
PeakTimestamp (ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns a DateTime structure containing the UTC time stamp of the smallest instance of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present)
Ratchet(ValueType.enumValue, int intervalInMonths[, DateTime ratchetEndDate])	Returns the largest instance of the selected ValueType over the specified intervalInMonths ending with the report date/time range (or the specified date/time range if the optional ratchetEndDate argument is present). The intervalInMonths overlaps the effective date/time range. Returns a Double value
Sum(ValueType.enumValue[, DateTime startDate, DateTime endDate])	Returns the arithmetic sum of the selected ValueType over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). Returns a Double value
Total(valueType As Integer[, DateTime startDate, DateTime endDate])	Calculate the consumption of the specified value type for the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). If the 'Log Delta Value' attribute is selected, this function is equivalent to the Sum() function. Returns a Double value
TotalRTPCharge (ValueType.enumValue, int priceTagId[, DateTime startDate, DateTime endDate])	Calculates the total charge for consumption values using real time pricing data contained in the meter tag priceTagId. The function operates over the report date/time range (or the specified date/time range if optional startDate and endDate arguments are present). It returns a Double value

Enums

Constant	Description
PageOrientation.Portrait PageOrientation.Landscape	Specifies the page orientation.

Constant	Description
PaperKind.A2 PaperKind.A3 PaperKind.A4 PaperKind.B4 PaperKind.B5 PaperKind.B6 PaperKind.Custom PaperKind.Executive PaperKind.Legal PaperKind.Letter PaperKind.Tabloid	Specifies the paper size.
ReportPeriod.None ReportPeriod.Yesterday ReportPeriod.Today ReportPeriod.LastWeek ReportPeriod.PreviousWeek ReportPeriod.MonthToDate ReportPeriod.PreviousYear ReportPeriod.YearToDate ReportPeriod.FiscalMonthToDate ReportPeriod.PreviousFiscalMonth ReportPeriod.SecondPreviousFiscalMonth ReportPeriod.FiscalQuarterToDate ReportPeriod.PreviousFiscalQuarter ReportPeriod.SecondPreviousFiscalQuarter ReportPeriod.FiscalYearToDate ReportPeriod.PreviousFiscalYear ReportPeriod.SecondPreviousFiscalYear	Corresponds to the predefined report period selected when the report is run.

RichTextBox object

The RichTextBox object provides a way to place large amounts of text on a report. Text may be formatted using RTF control codes. Some of the more common codes include:

- \par Begin a new paragraph (i.e. begin a new line)
- \b Turn on bold
- \b0 Turn off bold
- \ul Turn on continuous underline.
- \plain Reset to plain text.
- \fs Select font size in half-points, i.e. \fs36 selects 18 point font, fs48 selects 24 point font.

Tip: All codes must be followed by a space character. As an example, "\fs24 My Text \b Is Bold \b0 " will work while "\fs24 My Text \b Is Bold \b0" will cause a run-time error because there is no space character after the \b0 code.

Instancing

The RichTextBox object is a creatable object.

Accessing

RichTextBox objects are created using the New operator.

Properties

Property	R/W	Description
Text As String	R/W	The text within the rich text box

Methods

Method	Description
AddText(Text As String)	Append specified text to the text within the rich text box
RichTextBox() As RichTextBox	Create a RichTextBox object

Method	Description
RichTextBox(Left As Double, Top As Double, Width As Double, Height As Double, rtfText As String)As RichTextBox	Create a RichTextBox at the specified coordinates and size and set the initial text to the rtfText string

Usage

More information on Rich Text Format (rft) usage and syntax may be found on the Web. Suggested search key "RTF Specification".

Row object

The Row object represents one row of data in a Grid object.

Instancing

The Row object is a creatable object.

Accessing

MPR script code can create Row objects using the AddRow method of a Grid object.

Properties

Property	R/W	Description
Row(Index As Integer)	R/W	The data at column Index. The first column is Index value zero.

Rows collection

The Rows object is a collection of Excel Row objects.

Instancing

The Rows object is not a creatable object.

Accessing

The Workbook object automatically creates one Rows object for each worksheet in the workbook.

Properties

Property	R/W	Description
"Excel Row object" (page 434) (index) As Row.	R	Collection of Row objects that represent the rows in the worksheet.

Excel Row object

The Row object presents a row within a worksheet of the workbook that the MPR Excel script is working with.

Instancing

The Row object is not a creatable object.

Accessing

The Workbook object automatically creates Row objects for each worksheet in the workbook (accessible using the Excel.Workbook.Worksheets.Rows property) and MPR Excel script code can access any row in a worksheet using the Row objects.

Methods

Method	Description
InsertRowsAbove(NumberOfRows As Integer)	Insert a number of rows above the rows in the range
InsertRowsBelow(NumberOfRows As Integer)	Insert a number of rows below the rows in the range
Delete()	Deletes the row

TrendChart object

The TrendChart object is used to create a trend chart on the report.

Instancing

The TrendChart object is a creatable object.

Accessing

MPR script code can create TrendChart objects as needed using the New operator.

Properties

Property	R/W	Description
Border As Boolean	R/W	Controls the visibility of a border around the entire pie chart area, including title and legend areas
Title.Text As String	R/W	The title that will appear above the trend chart
XAxis As Axis	R	Axis properties for the X axis of the trend chart
YAxis As Axis	R	Axis properties for the Y axis of the trend chart
MarkerSize As Short	W	Controls size of data markers on trend line. Default is 3. Value of 0 hides the data markers
PointLabels As Boolean	W	Controls the display of data values above chart markers. Default is false
SeriesSecondaryYAxis As Boolean	W	The current data series will use the primary Y axis if false, the secondary Y axis if true. Default is false
SeriesLegendBox As	R/W	Controls the visibility of the legend box. Default

Property	R/W	Description
Boolean		is False
SeriesLegend As String	W	The legend text for the current data series
SeriesType As SeriesType	W	Sets the chart type for the current data series. See the Enums. Default is Trend

Methods

Method	Description
TrendChart() As TrendChart	Create a TrendChart object
AddData(Data As Double)	Add a data point to the trend chart
AddData(Timestamp As DateTime, Data As Double)	Add a time series data point to the trend chart
NextSeries()	Close the current data series and create a new one. This is used when the trend chart will contain multiple data series. When a TrendChart object is created, the first series is automatically opened so this method should not be called if the trend chart is only to display one series

Enums

Constant	Description
ChartType.Bar ChartType.Gantt ChartType.Trend	Specifies a chart type

Example

This example Multi-Purpose Report script creates a trend chart with three data series. The first data series will be displayed as a bar chart and the second and third data series will be displayed as trend lines.

```
Dim trendChart As New TrendChart()
trendChart.SeriesType = SeriesType.Bar
trendChart.AddData("Jan", 100)
trendChart.AddData("Feb", 200)
trendChart.AddData("Mar", 300)

trendChart.NextSeries
trendChart.SeriesStacked = true
trendChart.AddData("Jan", 5420)
trendChart.AddData("Feb", 3500)
trendChart.AddData("Mar", 10405)

trendChart.NextSeries
trendChart.AddData("Jan", 3340)
trendChart.AddData("Feb", 5200)
trendChart.AddData("Mar", 1500)

Report.Add(trendChart, 3, 2, 5, 3)
```

Weeks collection

The Weeks object is a collection of Week objects. The Weeks and Week objects provide an easy way for MPR script code to process data in weekly periods.

Instancing

The Weeks object is a creatable object.

Accessing

The Report object automatically creates one Weeks object (accessible using the Report.Weeks property) and MPR script code can create additional Weeks objects if needed.

Properties

Property	R/W	Description
Week(index) As Week	R	Collection of Week objects that represent the report date range in periods of weeks

Methods

Method	Description
Weeks(StartDate As DateTime, EndDate As DateTime)	Create a Weeks object containing Week objects representing the weeks between StartDate and EndDate, inclusive

Week object

The Week object presents a time period of one week. A week begins at midnight on Sunday and ends at midnight the following Sunday.

Instancing

The Week object is a creatable object.

Accessing

The Weeks object automatically creates Week objects (accessible using the Week property) and MPR script code can create additional Week objects if needed.

Properties

Property	R/W	Description
StartDate As DateTime	R	The starting date of the Week object (eg. 1/5/2003 00:00:00)
EndDate As DateTime	R	The ending date of the Week object (eg. 1/12/2003 00:00:00)

Methods

Method	Description
Week(Date As DateTime)	Create a Week object representing a time period of one week

Workbook object

The Workbook object is use as the main reference to the workbook that the script works with.

Instancing

The Workbook object is not a creatable object. For the MPR Excel reporting function, the system expects a excel workbook with the same name as the script to be located on the FactoryTalk EnergyMetrix server on the ExcelTemplates share/folder.

Accessing

MPR Excel script code accesses the workbook that is automatically opened when the script runs.

Properties

Property	R/W	Description
Properties As DocProperties	R/W	Document properties collection that can be used to set specific properties for any Office XML document, such as: Author, Title, Subject, Category, Comments, Keywords, Status, LastModifiedBy, Company, Manager etc.
CustomProperties As CustomProperties	R/W	Custom Document properties collection used to add/edit custom properties with the document/workbook.
"Worksheets collection" (page 440)	R/W	Collection of worksheets in the workbook

Methods

Method	Description
Add(Worksheet As Worksheet, Name as String)	Create a Worksheet object

Worksheets collection

The Worksheets object is a collection of Worksheet objects. The Worksheets and Worksheet object provide access to the worksheets in the workbook, for populating data in those sheets, for retrieving data and ranges of data from those worksheets etc.

Instancing

The Worksheets object is not a creatable object.

Accessing

The Workbook object automatically creates one Worksheet object for each worksheet in the workbook (accessible using the Excel.Workbook.Worksheets property) and MPR Excel script code can create additional worksheet objects if needed, as well as delete existing ones if needed.

Properties

Property	R/W	Description
"Worksheet object" (page 441) (index) As Worksheet	R	Collection of Worksheet objects that represent the worksheets in the workbook.

Methods

Method	Description
Add(WorksheetName As String)	Create a Worksheet within the workbook and returns a worksheet object
Delete(WorksheetName As String)	Delete a Worksheet within the workbook

Worksheet object

The Worksheet object presents a worksheet within the workbook that the MPR Excel script is working with.

Instancing

The Worksheet object is a creatable object.

Accessing

The Workbook object automatically creates one Worksheet object for each worksheet in the workbook (accessible using the Excel.Workbook.Worksheets property) and MPR Excel script code can create additional worksheet objects if needed, as well as delete existing ones if needed.

Properties

Property	R/W	Description
Name as String	R	Worksheet name for the work-sheet
"Range object" (page 423) (range identifier) as Excel range	R	Range object to get access to any range in the worksheet
"Cell object" (page 390) (cell iden-tifier) as Excel cell	R	Cell object to get access to any cell in the worksheet
"Rows collection" (page 433) as Rows	R	Collection of rows in the work-sheets
"Columns collection" (page 392) as Columns	R	Collection of columns in the work-sheet

Methods

Method	Description
Worksheet (Work-sheetName as String)	Create an Worksheet object representing a work-sheet in the workbook.
RangeUsed() as Range	The Range identifying the cells used in the work-sheet.

ChartsPlus

ChartsPlus is an optional package that offers extensive custom charting capabilities. ChartsPlus is a Microsoft ClickOnce application that downloads and runs on the client computer. Its look and feel is that of a traditional Windows application rather than a web application. ChartsPlus is included in FactoryTalk EnergyMetrix software and requires a separate activation.

ChartsPlus provides you with the ability to create customized graphical views of your energy data. Some of the possibilities include:

- **Enhanced trend**

  Plots up to 8 variables with a lot of flexibility. Different time ranges may be selected for each variable and you may select various summary methods for each variable (eg. you can plot the average Monday for one variable vs. a specific Monday for the same variable or another variable). Also, the chart control itself has many built-in functions such as zoom, scroll, print, export, user customization, etc.

- **X-Y trend**

  Plots one dependent variable against up to 3 independent variables, plots a linear least squares regression line along with targeting and CUSUM analysis.

- **Enhanced calendar trend**

Same as standard Calendar Trend but can overlay different months and multiple variables.

- **Load factor chart**

  Plots a trend of load factor over a one-month period as well as daily min, max and average demand.

- **Overlay chart**

  Graphically displays a tag value with user-definable overlays.

Tip: ChartsPlus is best viewed with a Windows appearance scheme with standard sized fonts. Windows appearance schemes with large or extra large fonts may distort the appearance of ChartsPlus.

ChartsPlus client requirements

There are the following client requirements for compatibility with FactoryTalk EnergyMetrix:

- Microsoft Windows 7
- Internet Explorer 11 or 10
- Adobe Acrobat Reader 11 or newer versions

  This component is required for viewing reports.
- Microsoft .NET Framework 3.5 SP1

  This component is required for using the RealTime (RT) and Charts Plus options.

  .NET Framework 3.5 SP1 is included on the installation DVD or may be downloaded at no charge from Microsoft.

  Note: The .NET Framework must be installed when IIS is already installed and running. Otherwise, you will need to reinstall the .NET Framework components.

- Microsoft .NET Framework 4.0

  This component is required for using the **Waveform Viewer** application, and may be downloaded at no charge from Microsoft.

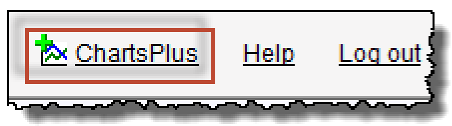
Your client workstation must also be permitted Intranet or Internet to the FactoryTalk EnergyMetrix server. Contact your IT support personnel for assistance.

Tip: Your browser should be set to check for newer versions of stored pages automatically, not every visit to the page.

Starting ChartsPlus

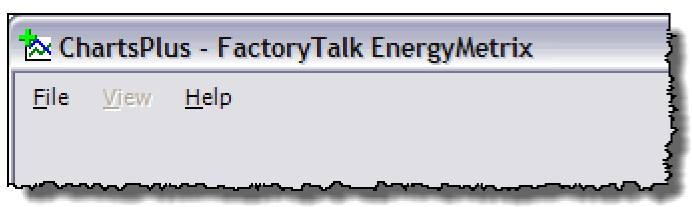
To open ChartsPlus:

- Click **ChartsPlus**.



The ChartsPlus ClickOnce application downloads from the server to your client computer. Depending on the speed and loading of your network, this operation may take up to a minute to complete.

The initial ChartsPlus window is blank with a few menu items.



You can do the following:

- On the **File** menu, click:

- **New Chart**, to create a chart using the available chart types.
- **Chart Manager**,to open a chart.
- **Exit**, to close the application.

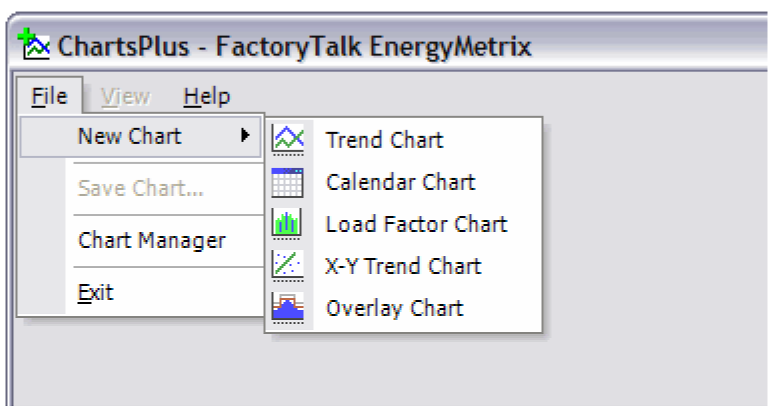
- On the **Help** menu, click:
  - **Overview of ChartsPlus**, to read the help.
  - **About ChartsPlus**, to read the legal information on the application.
- On the **View** menu, click the available options to display or hide options.

  The **View** menu is available when a chart is open in the application.

Creating new charts

To create a new chart in ChartsPlus:

1. On the **File** menu, click **New Chart**, and then click a chart type.



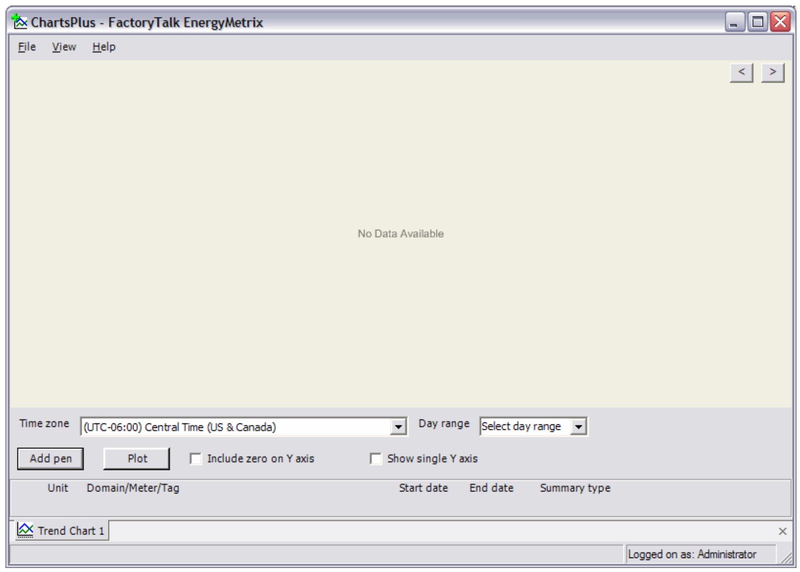
2. Configure the chart options.
3. On the **File** menu, click **Save Chart**.

   The **Save Chart** dialog box appears.

4. Type the chart name.
5. Configure additional options.
6. Click **Save**.

Configuring trend charts

The following figure presents the settings for the **trend chart** .



You can configure the following:

Time zone

Sets the time zone reference for the trend chart. Data from meters outside the selected time zone will be offset by the time zone difference.

Day range

You may select a chart time scale from the list or enter a number of days into the field.

Include zero on Y axis

Check this box if you wish to have a zero reference in the chart.

Show single Y-axis

Check this box if you want a combined Y-axis. Leave it Cleared if you want individual Y-axes for each pen.

Add pen

This button launches a dialog box from which you may select meter tags to display in the trend.

Group

Select the group of which the desired meter is a member.

View data

Select By meters to view an individual meter. Select By groups to aggregate a group's meters into a single trend line.

Meter

Select the desired meter from the list. This field is disabled (grayed-out) if By groups is selected.

Meter tag

Select the meter tag from the list.

Start date

Select a start date from the calendar. You may select the same or different start dates for different pens.

Summary type

A summary type of None returns a simple trend of the meter tags over the selected Day range. A summary type of Average Sunday through Average Saturday returns a one-day trend with the average values for that day over the selected Day range.

Add

Click **Add** to save your configuration.

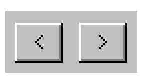
Cancel

Click **Cancel** to discard your changes.

Plot

Click **Plot** to retrieve data from the database and generate the trend chart.

Navigation buttons



These buttons adjust the start date earlier or later by the duration of the Day range.

Pen navigation buttons

Select/edit

Click the colored button to the left of the tag name to open the pen configuration dialog box.

H

Click this button to hide the pen.

X

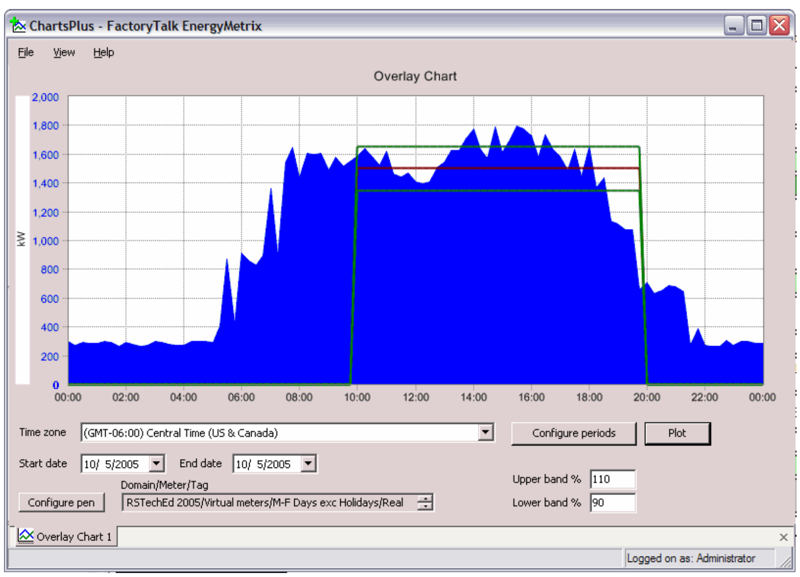
Click this button to delete the pen.

D

Click this button to set all pens to the same starting date as the selected pen.

Configuring overlay charts

An **overlay chart** graphically displays a selected meter tag value with one or more user-defined overlays. Up to 10 overlays may be defined, each with a start time, end time and limit. Overlay periods are saved with the chart setup in the database.



You can configure the following:

Time zone

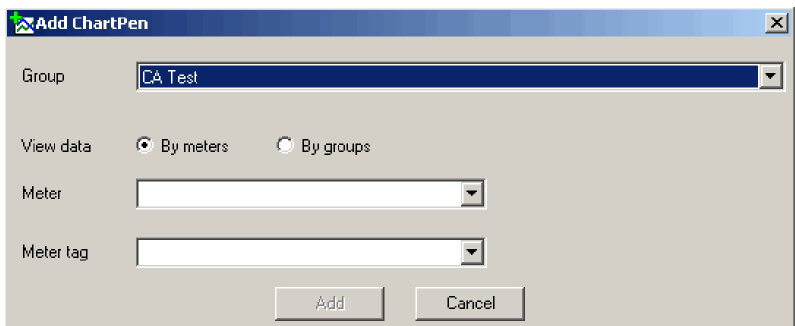
Sets the time zone reference for the trend chart. Data from meters outside the selected time zone will be offset by the time zone difference.

Start and end dates

Select the range for the chart.

Configure pen

This button launches the **Add ChartPen** dialog box, from which you may select a meter tag to display in the chart.



Group

Select the group of which the desired meter is a member.

View data

Select By meters to view an individual meter. Select By groups to aggregate a group's meters into a single trend line.

Meter

Select the desired meter from the list. This field is disabled (grayed-out) if By groups is selected.

Meter tag

Select the meter tag from the list.

Add

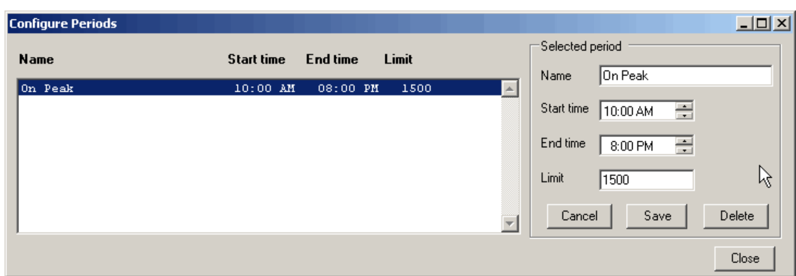
Click **Add** to save your configuration.

Cancel

Click **Cancel** to discard your changes.

Configure periods

This button launches the **Configure Periods** dialog box, from which you may configure the period overlays.



Name

The name of the selected period.

Start time

The start time of the period. Must be earlier than the end time.

End time

The end time of the period. Must be later than the start time.

Limit

The value of the horizontal bar drawn in the chart between the start and end times. May not be zero.

Add button

Enabled when the dialog box first appears. Click after entering time and limit values to add the new period.

Cancel button

Cancels changes to the selected period configuration without saving

Save button

Saves changes to the selected existing period.

Delete button

Deletes the selected period.

Close button

Closes the dialog box without saving any unsaved changes.

Plot

Click **Plot** to retrieve data from the database and generate the overlay chart.

Changing the appearance of charts

ChartsPlus and RT allow you to modify the way graphics appear. You may use the methods described below to customize the appearance of the following:

RT graphics

- Harmonic graphs
- Oscillographs
- Transient captures
- Waveform charts

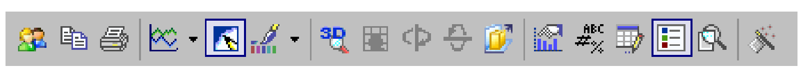
ChartsPlus

- Trend charts
- Calendar chart zoomed view

You may not change the appearance of standard trend and calendar trend charts.

Standard toolbar

The **standard toolbar** contains buttons that provide you with a wide assortment of formatting options.



-  **Personalized charts** button (not functional in this release)
-  **Copy** button lets you copy the chart as a graphic (bitmap or metafile) or as data (.csv format)
-  **Print** button calls up the system print dialog box

- **Gallery** button allows you to select from chart appearance options. See Gallery below
- **Anti-alias** button toggles anti-aliasing which provides a smoother on-screen appearance
- **Palette** button lets you select a palette of colors for your chart
- **3D** button toggles between 2D (flat) and 3D views
- **Rotated view** button toggles a rotated 3D view on and off. Use the and to rotate
- **Clustered (Z-axis)** button adds a Z-axis offset between pens when more than one is defined
- **Axes settings** button lets you adjust the look of the x and y axes. Options brings up the **Properties** dialog box.
- **Point labels** button toggles data labels on and off. Most useful in zoomed views
- **Data editor** button lets you temporarily change one or more data point values
- **Legend box** button turns data legends on and off
- **Zoom** button allows you to zoom in by drawing a box around part of the display with the left mouse button
- **Properties** button launches the chart properties dialog box

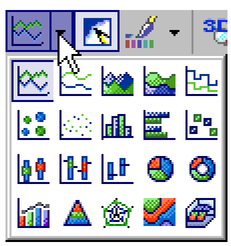
Annotation toolbar

The **annotation toolbar** contains buttons that allow you to add notes and highlights to your chart.

- Click a shape button to insert a rectangle, ellipse, arrow, arc, text box, callout (balloon) or polygon
- The fill and line color buttons let you choose from a palette of colors
- The copy, paste, bring to front, send to back, group, ungroup, flip and rotate buttons do what their names imply and are enabled when a shape or collection of shapes is selected

Gallery

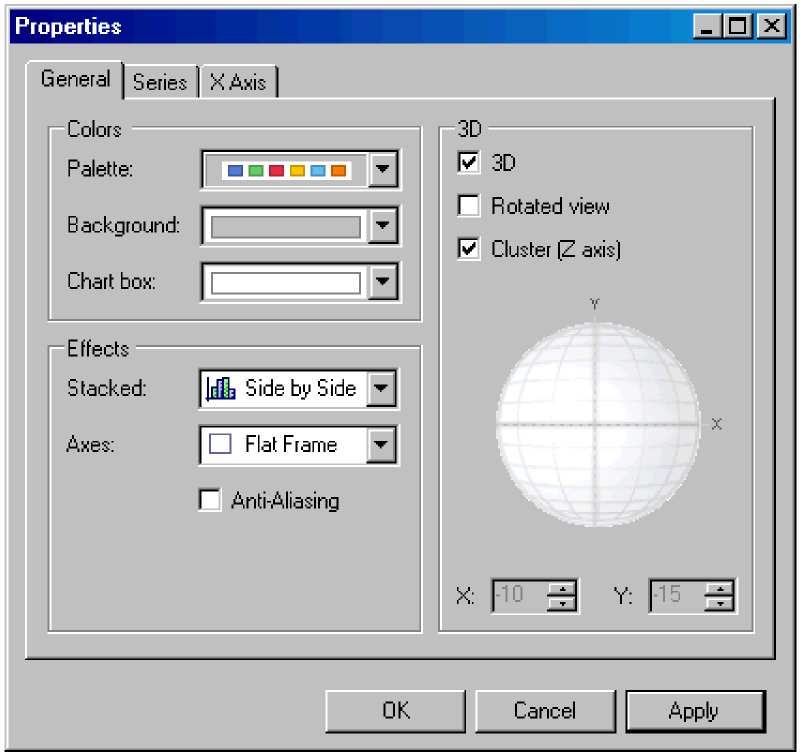
The gallery provides a **graphical menu** of chart types you may select.



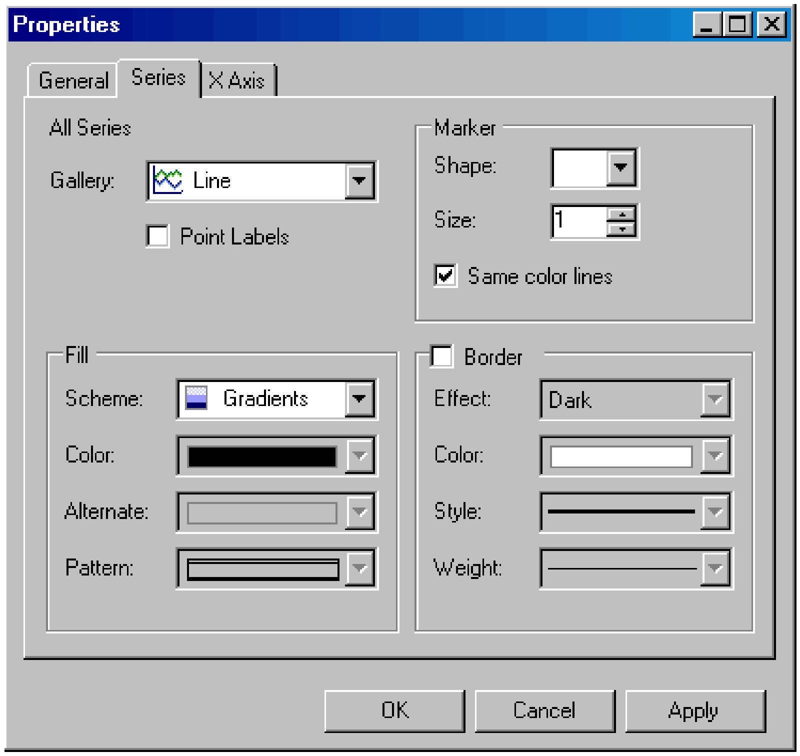
Note: Not all chart types will provide a meaningful appearance for your data series.

Properties

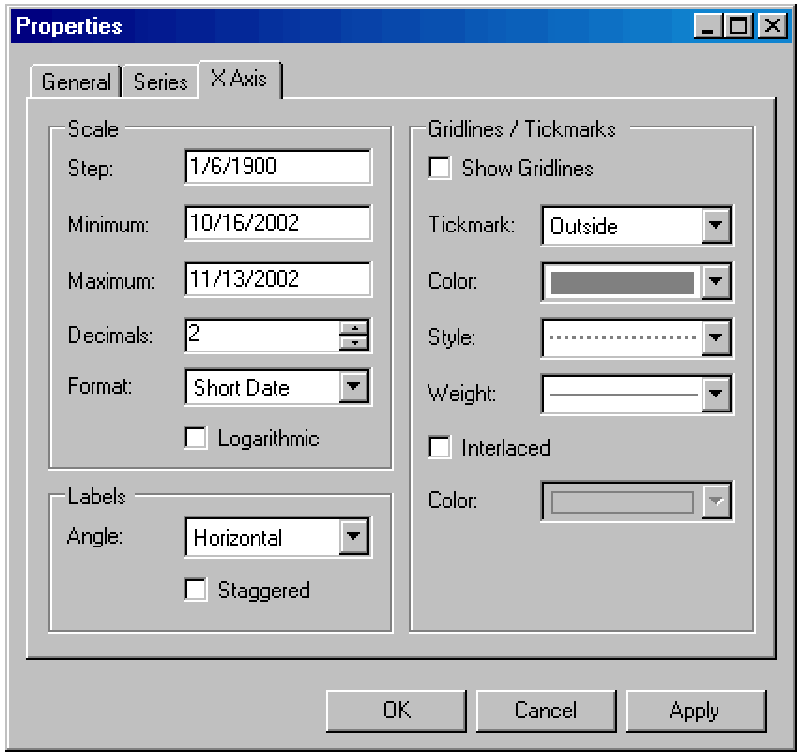
You may call up the **Properties** dialog box by clicking **Properties** in the standard toolbar or from a context menu. The **Properties** dialog box contains a variety of formatting selections organized in three tabs. Many options are the same as those available in the standard toolbar. The **General tab** allows you to control the colors, axis and data series effects and 3D view.



The **Series tab** provides selections that let you adjust the appearance of the data series chart. To adjust the line weight, for instance, check the Border box and select a line weight from the list.



The **X Axis tab** lets you customize the appearance of the chart scale, labels and grid lines.



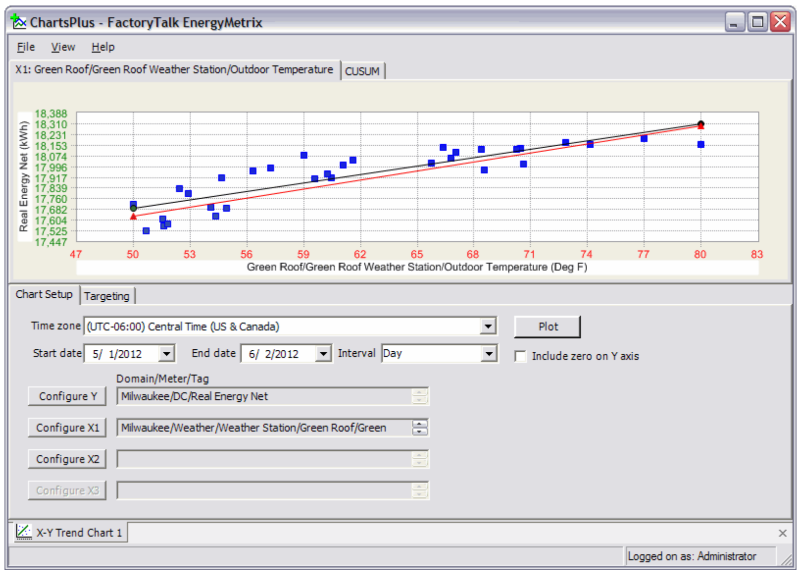
Context (right mouse-click) menus

You will find a number of context menus that appear when you position the cursor over the chart background, a chart line or other object in the ChartsPlus window and click the right (non-primary) mouse button. Each context menu contains a list of formatting options for the object selected and allows you to select the **Properties** dialog box. The **data series context menu**, for example, lets you open the Gallery, select a line color, or open the **Properties** dialog box.

Using X-Y charting and targeting

The X-Y chart provides graphical tools to help you analyze energy usage and identify areas for reducing cost. The X-Y chart plots one dependent (Y) variable against up to 3 independent (X) variables. It performs statistical analysis methods including linear regression, targeting and CUSUM (cumulative sum) analysis.

Tip: The **X-Y Trend Chart** is included in the ChartsPlus option.



Calculation Interval

The calculation interval specifies the time each point on the X-Y chart represents. Data for each point is aggregated depending upon the meter tag and value type of the selected X and Y variables. For Consumption type value types, each point represents the total usage during the time (regardless of whether the Log Delta Reading attribute is set or not). For other value types, each point represents the average of the values during the time.

You may select among three intervals:

- All data - each point represents a single logged value, or one logging interval
- Day - each point represents a summary of one day's logged values
- Week - each point represents a weekly summary

Regression analysis

ChartsPlus displays the standard regression line as a black line on the X-Y trend chart.

The regression line (known as the least squares line) is a plot of the expected value of the dependent variable for all values of the independent variable. The regression line is the one that best fits the data on a scatter plot. A linear regression on X-Y chart is calculated using the least squares method.

The regression coefficients correspond to the formula:

```
y = (m1 * x1) + b
```

The coefficient m1 represents the slope of the regression line, and b represents the Y-intercept, which is the value of Y when X1 is zero.

The correlation coefficient R expresses the strength of the linear relationship between X and Y. The values of correlation coefficient range from -1 to 1. The closer the correlation coefficient to 0, the weaker the relationship between regression variables. For example, -0.9 describes strong negative correlation, 0.9 describes strong positive correlation, and 0.2 describes weak positive correlation.

Multi-variable regression

You may specify up to 3 independent X variables. Since a multi-variable plot cannot be displayed in 2 dimensions, a separate chart tab will appear for each selected X variable, each showing the relationship between the selected Xn and Y variables. The **Targeting** tab displays the regression coefficients in the Standard X1, Standard X2 and Standard X3 rows. The coefficients correspond to the formula:

```
    y = (m1 * x1) + (m2 * x2) + (m3 * x3) + b
```

Excluded points

You may exclude points by double-clicking them with the mouse. Excluded points appear as a red X in the chart. When a point is excluded, the standard regression line is recalculated. To restore a single excluded point, double-click it once more. To restore all excluded points, click **Reset** on the **Targeting** tab.

Targeting

Targeting compares the data set to a user-selected target line, which appears as a red line on the X-Y chart. You may select among four types of targets:

- Conservative - drops all data points above the standard line to the standard line
- Aggressive - discards all data points above the standard line
- Use all data - target line = standard line
- Manual - you may select and enter coefficients into data entry fields and click **Update**.

To clear the target line select the **Chart Setup** tab, and then click **Plot**. The target line will not appear if more than one independent (Xn) variable is selected.

You may save the current target by clicking **Save Target** on the **Targeting** tab. You may also view and delete saved targets by clicking **Target Manager**.

Tip: Saved targets may be accessed in Multi-purpose Report scripts (included in the ReportsPlus option) using the TargetTotal method of the Meter and Group objects.

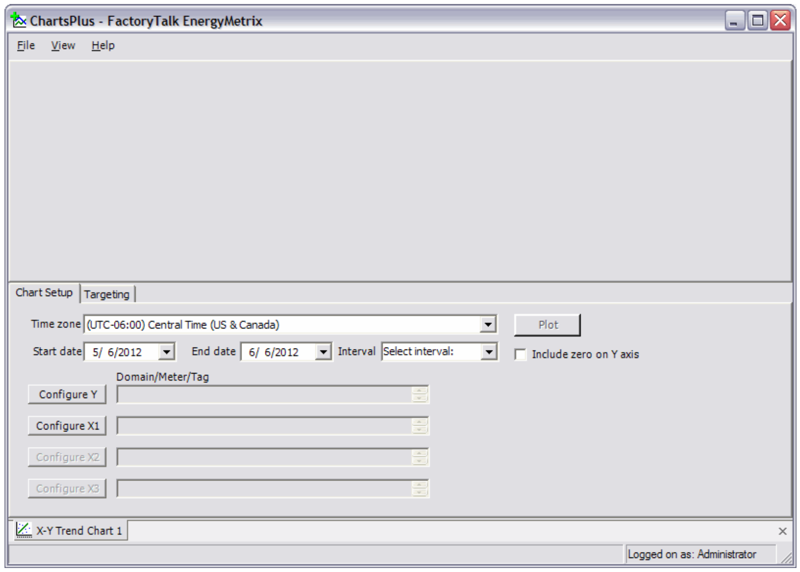
CUSUM analysis

The CUSUM chart displays the CUmulative SUm of the deviation between actual and target dependent variable in successive intervals. The CUSUM chart has a number of properties that provide tools in analyzing your energy usage.

- When the trend is horizontal or nearly so, it signifies that deviances are equally balanced around zero, i.e., that the monitored process is operating near the current target
- An upward trend signifies persistent over-consumption relative to the current target, while a downward trend indicates cumulative savings
- Points of inflection (where the slope changes markedly) signifies a change in the behavior of the monitored process and can point to opportunities for improvement

Configuring X-Y trend charts

ChartsPlus provides a number of options for customizing X-Y trend charts.



You can configure the following:

Time zone

Sets the time zone reference for the trend chart. Data from meters outside the selected time zone will be offset by the time zone difference.

Start date and End date

Select a chart time scale by entering start and end dates into the field. You may also select start and end dates from a calendar by clicking the down arrow button next to the field.

Include zero on Y axis

Check this box if you wish to have a zero reference in the chart.

Calculation interval

Select from 3 choices from the list:

- All data
- Day
- Week

Configure Y, Configure X1, X2, X3

This button launches a dialog box from which you may select meter tags to display in the trend.

Group

Select the group of which the desired meter is a member.

View data

Select By meters to view an individual meter. Select By groups to aggregate a group's meters into a single trend line.

Meter

Select the desired meter from the list. This field is disabled (grayed-out) if By groups is selected.

Meter tag

Select the meter tag from the list.

Add - Update - Cancel buttons

Click **Add** or **Update** to save your configuration selections or **Cancel** to discard them.

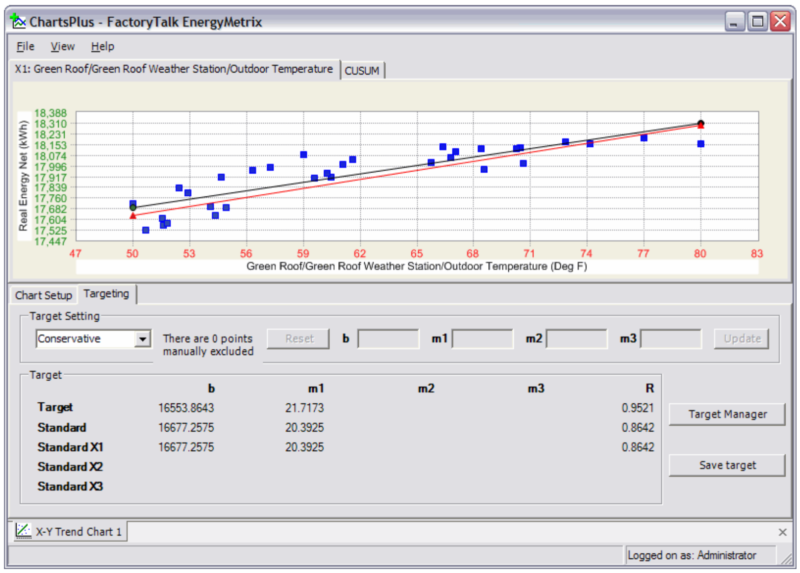
Tip: Independent (Xn) variables may only be added in order X1, X2 and X3, and removed in reverse order, X3, X2, and X1.

Plot

Click **Plot** to retrieve data from the database and generate the trend chart. The **Plot** button will also clear any target settings and excluded points.

Using targeting

To use targeting, first set up an X-Y trend chart then select the **Targeting** tab.



Fields

Select target type

Choose from among the following options

- Conservative - moves all scatter chart points above the regression line to the regression line
- Aggressive - deletes all scatter chart points above the regression line
- All data - makes no changes to the scatter chart points

- Manual

  If you select Manual, then enter the applicable b, m1, m2 and m3 coefficients in the fields provided and click **Update** to apply them.

When you have selected the target type, a red target line will be displayed in the chart. No target line will appear if more than 1 independent (Xn) variable has been selected.

Buttons

Update

Works with the Manual target type to apply the user-entered coefficients.

Save target

Brings up the **Target Manager** dialog box that allows you to save the current target.

Tip: Saved targets may be accessed in Multi-purpose Report scripts (included in the ReportsPlus option) using the TargetTotal method of the Meter and Group objects.

b, m1, m2, m3, R

Data entry fields that allow you to edit the coefficients prior to saving the target.

Date target will become effective

The target becomes inactive when another target for the current selected Y variable becomes active.

Show targets selection

Displays all targets or only those for the currently selected Y variable.

Save button

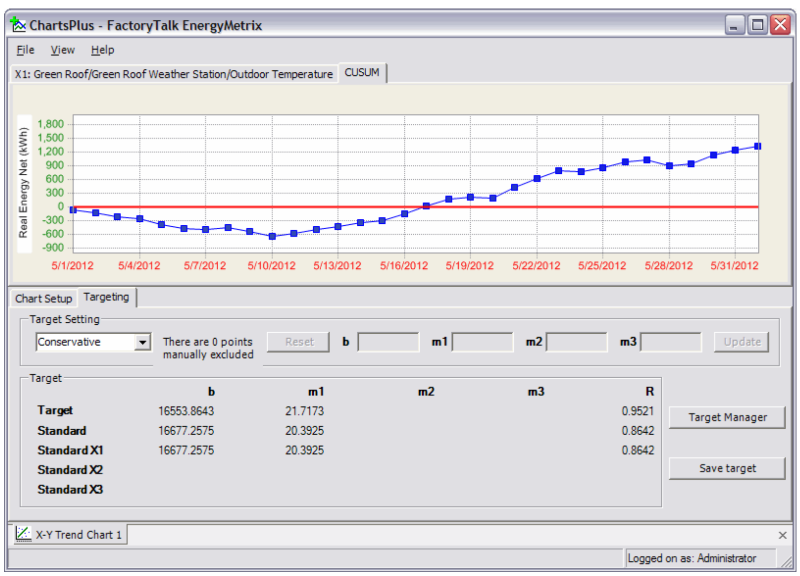
Saves the current target parameters.

Excluding points

You may exclude points by double-clicking them with the mouse. Excluded points appear as a red X in the chart. When a point is excluded, the standard regression line is recalculated. To restore a single excluded point, double-click it once more. To restore all excluded points, click **Reset** on the **Targeting** tab.

Using the CUSUM chart

Once you have set up an X-Y trend chart and targeting, the CUSUM chart provides additional tools to analyze your energy usage. Select the **CUSUM** tab in the **Targeting** view.



The CUSUM chart displays the **CU**mulative **SUM** of the deviation between actual and target dependent variable in successive intervals. The CUSUM chart has a number of properties that provide tools in analyzing your energy usage.

- When the trend is horizontal or nearly so, it signifies that deviances are equally balanced around zero, i.e., that the monitored process is operating near the current target.
- An upward trend signifies persistent over-consumption relative to the current target, while a downward trend indicates cumulative savings.
- Points of inflection (where the slope changes markedly) signifies a change in the behavior of the monitored process and can point to opportunities for improvement.

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RealTime (RT)

Use FactoryTalk EnergyMetrix RealTime (RT) to configure Allen-Bradley power monitors and display their real-time data and power quality information. RT is a ClickOnce application installed with FactoryTalk EnergyMetrix that requires a separate activation. Once activated, RT device configuration and device viewer links become operational from device setup pages and the RT device viewer links becomes operational meter pages.

Use Microsoft Internet Explorer to interact with RT.

RT complements Manager's data logging, cost allocation, profiling and reporting functions by allowing you to configure power monitors and to view, print, and save data from power monitors. With RT, you can:

- Download and upload power monitor configurations and save the configurations to the database.
- View and print all of the real-time parameters in power monitor.
- Manually capture oscillographs and view, print and save automatically captured oscillographs.
- View, save, and print all of the data logs in the power monitor.

RealTime client requirements

There are the following client requirements for compatibility with FactoryTalk EnergyMetrix:

- Microsoft Windows 7

- Internet Explorer 11 or 10
- Adobe Acrobat Reader 11 or newer versions

  This component is required for viewing reports.
- Microsoft .NET Framework 3.5 SP1

  This component is required for using the RealTime (RT) and Charts Plus options.

  .NET Framework 3.5 SP1 is included on the installation DVD or may be downloaded at no charge from Microsoft.

  Note: The .NET Framework must be installed when IIS is already installed and running. Otherwise, you will need to reinstall the .NET Framework components.
- Microsoft .NET Framework 4.0

  This component is required for using the **Waveform Viewer** application, and may be downloaded at no charge from Microsoft.

Your client workstation must also be permitted Intranet or Internet to the FactoryTalk EnergyMetrix server. Contact your IT support personnel for assistance.

Tip: Your browser should be set to check for newer versions of stored pages automatically, not every visit to the page.

RealTime (RT) applications

You may launch the RT option from two pages within the web interface:

- The Device Setup page for an Allen-Bradley power monitor has links for the **Device Viewer** and the **Device Configuration** windows.
- The Meter Setup page for a meter associated with to an Allen-Bradley power monitor links to the **Device Viewer** by clicking the **Device Class** link.

RT provides two types of user interface. The title bar of each window displays the power monitor's Device Name.

Device Configuration window

The Device Configuration Window allows the user to change or view the configuration of an individual power monitor.

Device Viewer window

This window is the real-time viewer for all of the power monitor data.

The Device Configuration window and the Device Viewer are separate windows which appear "on top" of Internet Explorer. You may **move**, **resize**, maximize, or minimize the windows. If you maximize a window, it may overlap and hide the other windows. To display a hidden or minimized window again, click its name on the Windows Task Bar.

To move a window:

1. Click the title bar of the window.
2. Press and hold the primary mouse button while dragging the window to its new location.
3. Release the mouse button.

To resize a window:

1. Click any border or corner of the window.
2. Press and hold the primary mouse button while dragging the window to its new size.
3. Release the mouse button.

Viewing power monitor data

To open the device viewer for a meter from the Meters tab:

1. On the **Meters** tab in the navigation tree, click a power monitor.

   The power monitor page appears.

2. At the top of the power monitor page, click the device class link.

To open the device viewer for a meter from the System tab:

1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

   The **Device Setup** page appears.

2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

Allen-Bradley Bulletin 1426 PowerMonitor 5000

To view the data:

- **Open the device viewer**.

  To open the device viewer for a meter from the Meters tab:

  1. On the **Meters** tab in the navigation tree, click a power monitor.

The power monitor page appears.

2. At the top of the power monitor page, click the device class link.

To open the device viewer for a meter from the System tab:

1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

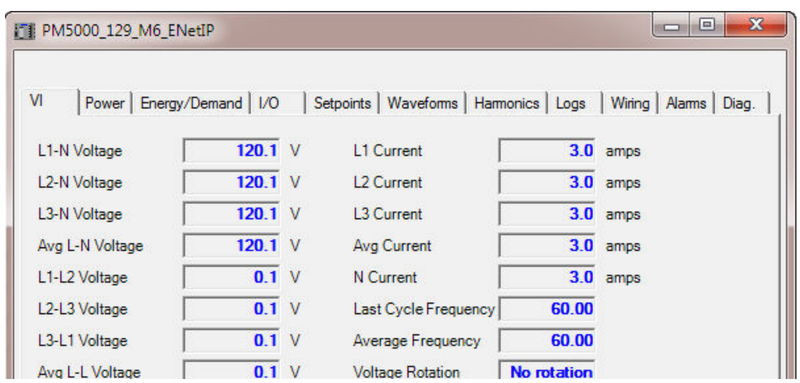
   The **Device Setup** page appears.

2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

The device viewer window appears.



The window title bar displays the device name of the power monitor.

Click **Pause** at the bottom of the window to pause updating the data.

Important: Set up groups and power monitor devices before using RT to view the power monitor configuration. If security is enabled in the power monitor, you must enter a valid application-class user name and password to view or clear logs, preset energy values or change any configuration settings in the power monitor.

Voltage/Current tab

Voltage Data

This displays voltage information produced by the power monitor, including the following:

- Line to line voltage per phase and average
- Line to neutral voltage per phase and average (in Wye, single-phase, and high-leg Delta metering modes)

Current Data

This displays current information produced by the power monitor, including the following:

- Current per phase and average
- Neutral current

Frequency

- Last cycle frequency
- Average frequency over the last N cycles (determined by power monitor configuration)

Phase Rotation

This shows the phase rotation of the voltage. If the power monitor is measuring a single-phase system, this field will display "No Rotation."

Voltage and current sequence components

This shows the results of symmetrical component analysis and the voltage and current unbalance values.

Power tab

Power Data

This displays the power information produced by the power monitor:

- Real power per phase and average
- Reactive power per phase and average
- Apparent power per phase and average

Power Factor Data

This shows the power factor information produced by the power monitor:

- True power factor per phase and average
- Displacement power factor per phase and average

Per-phase power values display as zero in Delta metering modes.

Energy/Demand tab

Energy Data

This displays all of the energy information produced by the power monitor, including the following:

- Forward, reverse, and net real energy
- Forward, reverse, and net reactive energy
- Apparent energy
- Amp hours

Elapsed Time

The amount of time (in minutes) that has elapsed within the current demand period.

Current Demand

The calculated demand for average current.

Power Demand

The calculated demand for total real power.

Reactive Power Demand

The calculated demand for total reactive power.

Apparent Power Demand

The calculated demand for total apparent power.

Note: The demand values are displayed for the most recent complete demand interval.

Projection Data

The calculated projected values for current, power, reactive power and apparent power.

Input/Output tab

Status Inputs

This shows the current state of the configured **status inputs**. A highlighted indicator means the external contact wired to that status input is closed. A dark indicator means the external contact wired to the status input is open.

Status inputs

Status inputs are the physical inputs of the power monitor.

To configure status inputs:

1. Select a power monitor icon in the project outline of the RT window.
2. On the **View** menu, click **Device Configuration**.

To monitor status inputs:

1. Double-click a power monitor icon in the project outline of the RT window, or select a power monitor icon.
2. On the **View** menu, click **Device Viewer**.

Allen-Bradley Bulletin 1400 PowerMonitor

Four status inputs (S1 through S4) on the Allen-Bradley Bulletin 1400 PowerMonitor respond to an externally applied voltage. If the input voltage is below 9V AC or 9V DC, the power monitor senses the input as inactive. If the input voltage is over 20V AC or 20V DC, the power monitor senses the input as active. The power monitor requires a minimum pulse width of 40 milliseconds for reliable sensing of status input changes.

Allen-Bradley Bulletin 1403 PowerMonitor II

Four self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 1 may be used to synchronize demand intervals.

Allen-Bradley Bulletin 1404 PowerMonitor 3000, Allen-Bradley Bulletin 1408 PowerMonitor 1000, Allen-Bradley Bulletin 1426 PowerMonitor 5000

Self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 2 may be used to synchronize demand intervals. 1404 and 1408 units have two status inputs, and the 1426 has four.

Status input counters

This counts the number of times the Status Input closed. To reset any counter to zero, click **Reset Counter** next to the counter field.

Relays

This shows the current state of relays, based on configured settings. A highlighted indicator means the relay is **energized**. A dark indicator means the relay is de-energized or restored to its normal state.

Energized

Indicates that contacts have changed from their default state. Normally open contacts have closed, or normally closed contacts have opened.

- To force a change in state, click either Close or Open.
- The status of the relay is displayed, e.g. "Forced Energized".

- To cancel the manual relay override and return the relay to configured operation, click **Release**.

Reset Counter

This resets the associated counter to zero. If the **Reset Counter** button does not operate and the text is gray, this power monitor has been configured to not allow counter resets. Refer to the device configuration

Close (Relay)

This manually forces a relay closed.

Open

This manually forces a relay open.

Release

This cancels the relay manual override and returns the relay to configured operation.

Setpoint tab

The **Setpoint** tab is comprised of the following tabs:

- "Setpoint Status tab" (page 481)
- "Logic Gate Status tab" (page 482)
- "Setpoint Output Status tab" (page 482)

Setpoint Status tab

Input Parameter

This shows the input parameter for the setpoint.

Threshold

This shows the threshold for the setpoint.

Status

This shows the current value for the Setpoint - True or False.

Logic Gate Status tab

Gate

This shows the gate number: From 1 to 10.

Type

This shows the Gate type: AND, NAND, OR, NOR, XOR or XNOR.

Input

This shows the inputs for the gate: between two and four inputs depending on the gate type.

Inverted

This shows if the inputs are inverted before they are input to the Gate.

Gate Input

This shows the status of each input to the Gate.

Gate Output

This shows the resulting output of the Gate.

Setpoint Output Status tab

Input Source

This shows the input source to trigger the output.

Output Action

This shows the action for the output.

Status

This shows the current value for the Output - True or False.

Waveforms tab

This tab displays captured oscillographs from an Allen-Bradley 1426 PowerMonitor 5000 M6 or M8. **Oscillography** features include:

Oscillography

Allen-Bradley Bulletin 1400 PowerMonitor

The power monitor samples the line voltages and line currents, at a rate of 128 samples per 60 Hz cycle. This allows the power monitor to have a 2-cycle waveform display.

Allen-Bradley Bulletin 1403 PowerMonitor II

The PowerMonitor II also samples line voltages and line currents, but at a rate of 10.8 kHz to generate waveform images of the line voltages and line currents. The 2-cycle display shows 2 cycles at 50 Hz, and the 12-cycle display shows 12 cycles at 50 Hz. The waveform image displays more cycles for line voltages and line currents at higher frequencies. The number of cycles displayed is scaled proportional to the frequency. The display includes the actual value of the pre-trigger number of cycles configured in the power monitor.

Example

Suppose you are monitoring a 60 Hz signal and want 6 cycles pre-triggered for any waveform image.

- The actual number of cycles for a 2-cycle display = 2 cycles x 60 Hz / 50 Hz = 2.4 cycles

- The actual number of cycles for a 12-cycle display = 12 cycles x 60 Hz / 50 Hz = 14.4 cycles

To set the pre-trigger number, pre-trigger = actual x 50 Hz / 6 x 50 Hz / 60 Hz = 5 cycles

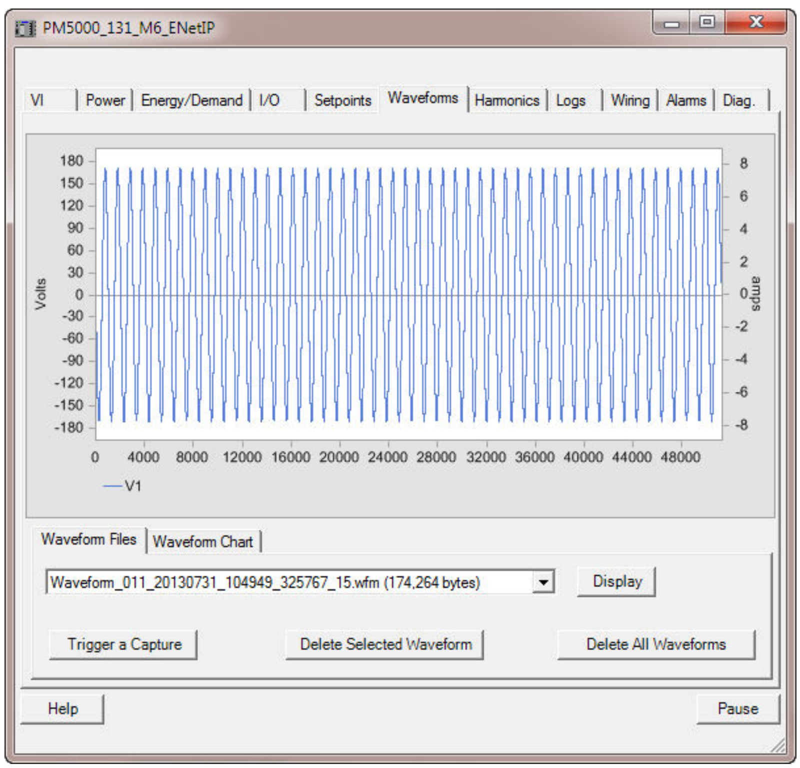
Allen-Bradley Bulletin 1404 PowerMonitor 3000 (models M6, and M8)

The PowerMonitor 3000 provides 6 selections of sampling rate and data resolution.

Sampling Rate	Data Resolution	Samples per Cycle at 60 / 50 Hz	Total Cycles per Channel at 60 / 50 Hz	Capture Duration (seconds)
5.4 kHz	13-bit w/sign	90 / 108	51.1 / 42.6	0.85
2.7 kHz	45 / 54	102.2 / 85.2	1.70	
1.35 kHz	22.5 / 27	204.4 / 170.3	3.40	
5.4 kHz	7-bit w/sign	90 / 108	102.2 / 85.2	1.70
2.7 kHz	45 / 54	204.4 / 170.3	3.40	
1.35 kHz	22.5 / 27	408.8 / 340.7	6.81	

- Simultaneous capture of all eight (8) voltage and current channels.
- Up to 61.4 kHz sampling rate (1024 samples/cycle at 50 or 60 Hz). Captures include up to the 63rd (M6) or 127th (M8) harmonic.
- Up to 256 waveform files or 21,600 cycles of waveform data are stored in non-volatile memory.

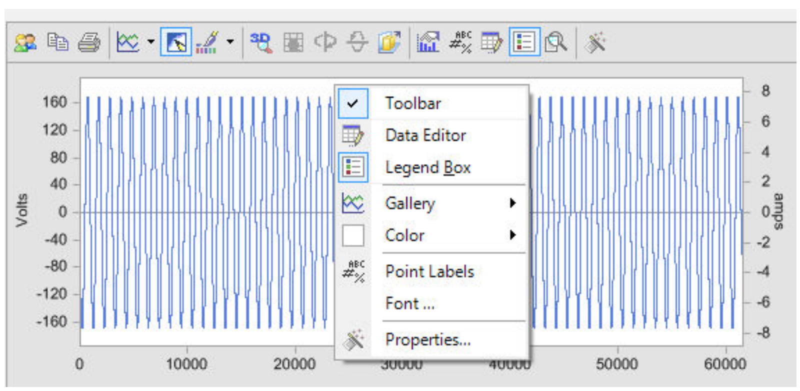
- Each capture may contain up to 3600 cycles of data per channel plus the pre- and post-event cycles as configured.
- Waveform data is comprised of cycle-by-cycle FFT data and is stored in compressed format.
- Configurable pre- and post-event cycles (up to 10 cycles pre and 30 cycles post) allows capture of data surrounding the triggering event.
- Waveform capture is triggered in three ways:
  - Manually, through a command;
  - Automatically by the power monitor when it detects a sag or swell event; and
  - In response to a waveform synchronization broadcast message.



Waveform Files Tab

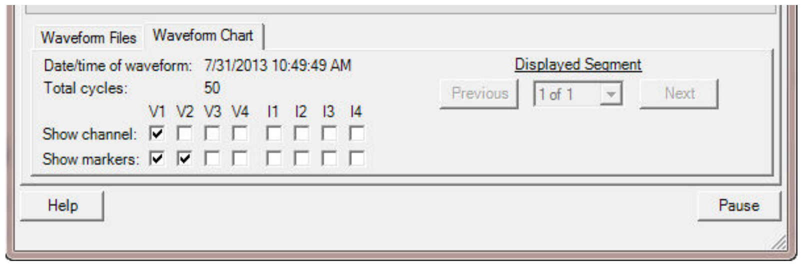
In the **Waveform Files** tab, the individual waveform files to view can be selected in the list. The waveform files are identified by trigger, date, capture number, size etc. Once a waveform file is selected and the **Display** button is pressed, the viewer will start to load the waveform file and show the progress in the status bar of the dialog box. It can take some time to load the waveform files, but once they are loaded the waveform will be displayed in the trend chart above the tab, with the first Voltage channel selected.

Tip: To activate the toolbar for zooming and otherwise change the chart, you right-click in the white space below or above the chart and a menu will appear that will allow you to show the toolbar.



Waveform Chart Tab

In the **Waveform Charts** tab, the various segments of the chart can be displayed, the individual channels to view can be selected, as well as selecting to show markers on the trend.



Date/Time of waveform

This displays date and time when the waveform was captured

Total cycles

This displays the number of cycles captured

Show Channel

This shows which channels are displayed and allows for selection of channels to display

Show Markers

For each channel this displays markers when the channel is selected

Trigger a Capture

This triggers a new waveform capture in the PowerMonitor 5000. There must be a least one open capture slot in order to trigger a new capture.

Delete Selected Waveform

This button presents a menu allowing clearing of one or all waveform captures.

Delete All Waveform

This button presents a menu allowing clearing of one or all waveform captures.

Harmonics tab

The **Harmonics** tab displays information divided into the following tabs:

- The **Summary Data** tab.

  This tab displays information on the crest factors, k-factors, and the total harmonic distortion (THD).

  The THD information is provided on the selected channel and calculated using IEEE and IEC methods.

- The **Details** tab.

  This tab provides a graphical representation of harmonic-related data.

  The information is available for **M6** and **M8** models only.

  You can use the **Details** tab to perform the following actions:

  - "Visualizing harmonics in charts (M6 and M8 models)" (page 489).
  - "Visualizing 5 Hz spectral components in charts (M8 model only)" (page 492).
  - "Displaying harmonic data in tables (M6 and M8 models)" (page 494).
  - "Displaying 5 Hz spectral components in tables (M8 model only)" (page 497).
  - "Displaying harmonics of two meters simultaneously (M6 and M8 models)" (page 498).

Visualizing harmonics in charts (M6 and M8 models)

To visualize harmonics in a chart:

1. On the **Harmonics** tab, click the **Details** tab.
2. (**M8 models only.**) Select **additional options**.

   Choose one of the following harmonic options:

   - **Harmonics**

     This is the default setting for basic harmonic data.

   - **Harmonic Groups**

     When you click this option, the **Group selection** list appears.

     In the list, choose the time span from which aggregated data will be displayed. The default setting is 200 milliseconds.

   - **Interharmonic Groups**

     When you click this option, the **Group selection** list appears.

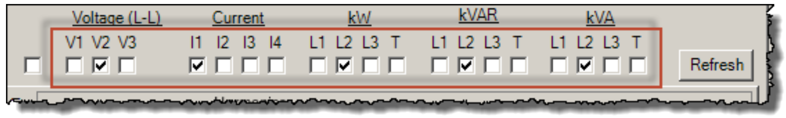
     In the list, choose the time span from which aggregated data will be displayed. The default setting is 200 milliseconds.

   - **5 Hz Spectral Components**

     For more information on this option, see "Visualizing 5 Hz spectral components in charts (M8 model only)" (page 492).

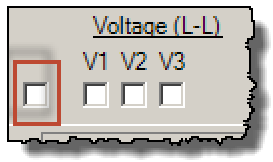
3. Select harmonic channels using the check boxes.

   Note: The lists of available harmonic channels differ depending on the harmonic option that you have selected.



Tips:

- To select all the channels, select the leftmost check box.

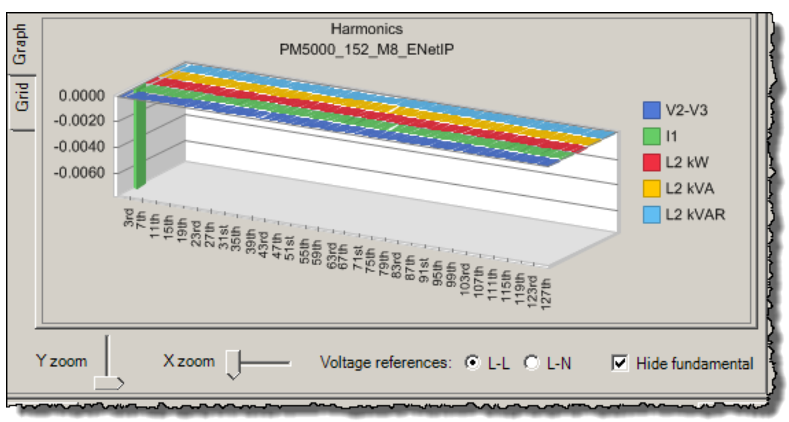


- To remove the selection of all the channels, clear the check box.

4. Click **Refresh**.

   Tip: The displayed data is not updated automatically. Every time you make a change (e.g., when you choose another set of harmonic channels), click **Refresh** to update the data.

   The data is displayed in a chart on the **Graph** tab.



The bar chart displays RMS harmonic magnitudes for each selected channel, from the fundamental frequency through the 63rd order (the M6 model) or the 127th order (the M8 model).The height of each bar represents the harmonic value. Each channel is marked with a different color.

The time span of the displayed data differs depending on the harmonic option that you have selected:

- For the **Harmonics** option, live data is displayed. It is updated each time you click **Refresh**.
- For the **Harmonic Groups** and **Interharmonic Groups** options, live data aggregated from the time span that you have selected in the **Group selection** list is displayed. It is updated when you click **Refresh**, provided that the selected time span has elapsed.

  The selected time span is indicated in the chart title:

- For the **5 Hz Spectral Components** option, see "Visualizing 5 Hz spectral components in charts (M8 model only)" (page 492).

You can perform the following actions in the chart:

- Use the **Y zoom** and **X zoom** sliders to narrow down the data presented on the Y and X axis respectively.
- Choose either of the available voltage references:
  - Click **L-L** to select the Line to Line reference. This is the default setting.
  - Click **L-N** to select the Line to Neutral reference.
- Click **Hide fundamental** to enhance the view of the individual harmonics.

  This check box is available for the **Harmonics** option only.

- Change the look and feel of the chart. For details, see "Changing the appearance of charts" (page 454).

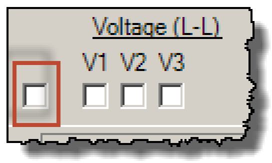
Visualizing 5 Hz spectral components in charts (M8 model only)

To visualize 5 Hz spectral components in a chart:

1. On the **Harmonics** tab, click the **Details** tab.
2. Click **5 Hz Spectral Components**.
3. Select harmonic channels using the check boxes.

   Tips:

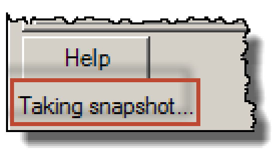
   - To select all the channels, select the leftmost check box.

   - To remove the selection of all the channels, clear the check box.
4. Click **Take snapshot**.

   As soon as you click the button, all the meter data is saved to a snapshot file on the power monitor.

   The process of taking the snapshot is indicated at the bottom of the window:

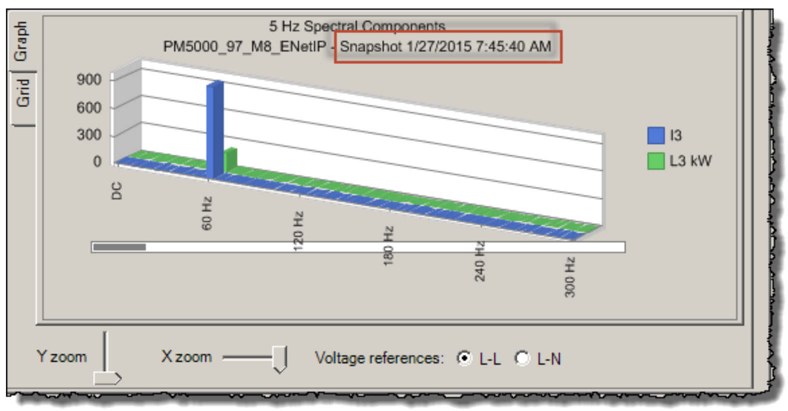
Note: This procedure guides you through displaying the snapshot data for the first time. If you do this on a regular basis, it is recommended that you first click **Refresh** before you click **Take snapshot** in order to display the data from the last snapshot saved on the meter. Once you view the data, you can then decide whether you need to take a fresh snapshot. The recommendation results from the fact that each time you click **Take snapshot**, the snapshot file is overwritten with the latest data.

5. Click **Refresh**.

   Tip: The displayed data is not updated automatically. Every time you make a change (e.g., when you choose another set of harmonic channels), click **Refresh** to update the data.

   The data from the snapshot file is displayed in a chart on the **Graph** tab.

   The chart title provides the specific time on the meter at which the snapshot was taken:



   The chart shows the RMS magnitude of interharmonics in 5 Hz increments from 0 to 3000 Hz (DC to the 50th harmonic order) for each selected channel. The heights of the bars display the magnitudes of each 5 Hz increment. The key indicates the color used to display each channel. The horizontal axis indicates the frequency that each bar represents.

   The table displays 5 Hz spectral component data from the most recent snapshot.

   You can perform the following actions in the chart:

   - Use the **Y zoom** and **X zoom** sliders to narrow down the data presented on the Y and X axis respectively.

- Choose either of the available voltage references:
  - Click **L-L** to select the Line to Line reference. This is the default setting.
  - Click **L-N** to select the Line to Neutral reference.
- Click **Hide fundamental** to enhance the view of the individual harmonics.

  This check box is available for the **Harmonics** option only.
- Change the look and feel of the chart. For details, see "Changing the appearance of charts" (page 454).

Tip: If you want to display data in a table, do not select another meter for comparison.

Displaying harmonic data in tables (M6 and M8 models)

To display harmonic data in a table:

1. On the **Harmonics** tab, click the **Details** tab.
2. (**M8 models only.**) Select **additional options**.

   Choose one of the following harmonic options:

   - **Harmonics**

     This is the default setting for basic harmonic data.
   - **Harmonic Groups**

     When you click this option, the **Group selection** list appears.

     In the list, choose the time span from which aggregated data will be displayed. The default setting is 200 milliseconds.

- **Interharmonic Groups**

  When you click this option, the **Group selection** list appears.

  In the list, choose the time span from which aggregated data will be displayed. The default setting is 200 milliseconds.

- **5 Hz Spectral Components**

  For more information on this option, see "Displaying 5 Hz spectral components in tables (M8 model only)" (page 497).

3. Select the check box next to the harmonic channel for which you want to display the data.

   Tip: You can select only one channel.

4. Click **Refresh**.

   Tip: The displayed data is not updated automatically. Every time you make a change (e.g., when you choose another set of harmonic channels), click **Refresh** to update the data.

   The data for the selected harmonic channel is displayed on the **Grid** tab.

   The content of the table differs depending on the harmonic option that you have selected:

For this harmonic option:	The table displays these data points:			
	Harmonic	Angle	Distortion	Magnitude
Harmonics	x	x	x	x

<table>
<tr><th rowspan="2">For this harmonic option:</th><th colspan="4">The table displays these data points:</th></tr>
<tr><th>Harmonic</th><th>Angle</th><th>Distortion</th><th>Magnitude</th></tr>
<tr><td>Harmonic Groups</td><td rowspan="2">x</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">x</td></tr>
<tr><td>Interharmonic Groups</td></tr>
<tr><td>5 Hz Spectral Components</td><td>-</td><td>x</td><td>-</td><td>x</td></tr>
</table>

The following figure shows the data displayed for the **Harmonic** option.

Harmonic	Angle	Distortion	Magnitude
DC	0	2.47	10.404
1st	-147.7	100	420.404
2nd	-359.6	0.76	3.198
3rd	-357.2	0.49	2.063
4th	-355.6	0.37	1.535
5th	-354	0.29	1.223
6th	-352.2	0.24	1.014
7th	-350.9	0.21	0.865
8th	-349.6	0.18	0.758
9th	-348.2	0.16	0.673
10th	-346.7	0.14	0.605
11th	-345.6	0.13	0.547

The time span of the displayed data differs depending on the harmonic option that you have selected:

- For the **Harmonics** option, live data is displayed. It is updated each time you click **Refresh**.
- For the **Harmonic Groups** and **Interharmonic Groups** options, live data aggregated from the time span that you

have selected in the **Group selection** list is displayed. It is updated when you click **Refresh**, provided that the selected time span has elapsed.

- For the **5 Hz Spectral Components** option, data from the most recent snapshot is displayed. For details, see "Displaying 5 Hz spectral components in tables (M8 model only)" (page 497).

Tip: If you want to display data in a table, do not select another meter for comparison.

Displaying 5 Hz spectral components in tables (M8 model only)

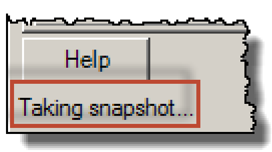
To display 5 Hz spectral components in a table:

1. On the **Harmonics** tab, click the **Details** tab.
2. Click **5 Hz Spectral Components**.
3. Select the check box next to the harmonic channel for which you want to display the data.

   Tip: You can select only one channel.
4. Click **Take snapshot**.

   As soon as you click the button, all the meter data is saved to a snapshot file on the power monitor.

   The process of taking the snapshot is indicated at the bottom of the window:

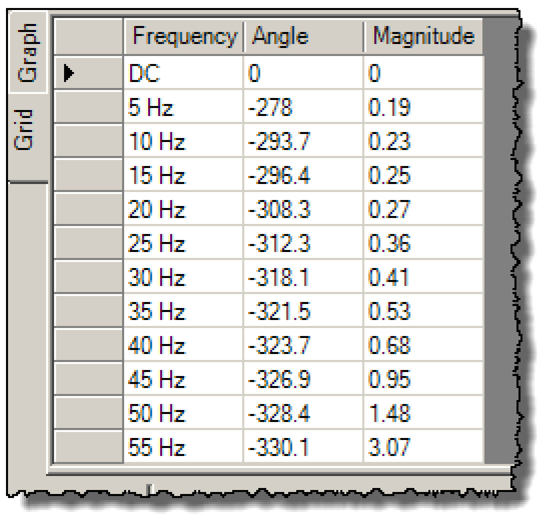
   

   Note: This procedure guides you through displaying the snapshot data for the first time. If you do this on a regular basis, it is recommended that you first click **Refresh** before you click **Take snapshot** in order to display the data from the last snapshot saved on the meter. Once you view the data, you can then decide whether you need to take a fresh snapshot. The recommendation results from the fact that each time you click **Take snapshot**, the snapshot file is overwritten with the latest data.

5. Click **Refresh**.

   Tip: The displayed data is not updated automatically. Every time you make a change (e.g., when you choose another set of harmonic channels), click **Refresh** to update the data.

   The data for the selected harmonic channel from the snapshot file is displayed in a table on the **Grid** tab.



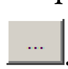
Frequency	Angle	Magnitude
DC	0	0
5 Hz	-278	0.19
10 Hz	-293.7	0.23
15 Hz	-296.4	0.25
20 Hz	-308.3	0.27
25 Hz	-312.3	0.36
30 Hz	-318.1	0.41
35 Hz	-321.5	0.53
40 Hz	-323.7	0.68
45 Hz	-326.9	0.95
50 Hz	-328.4	1.48
55 Hz	-330.1	3.07

   The table displays the frequency, angle, and magnitude data points from the most recent snapshot.

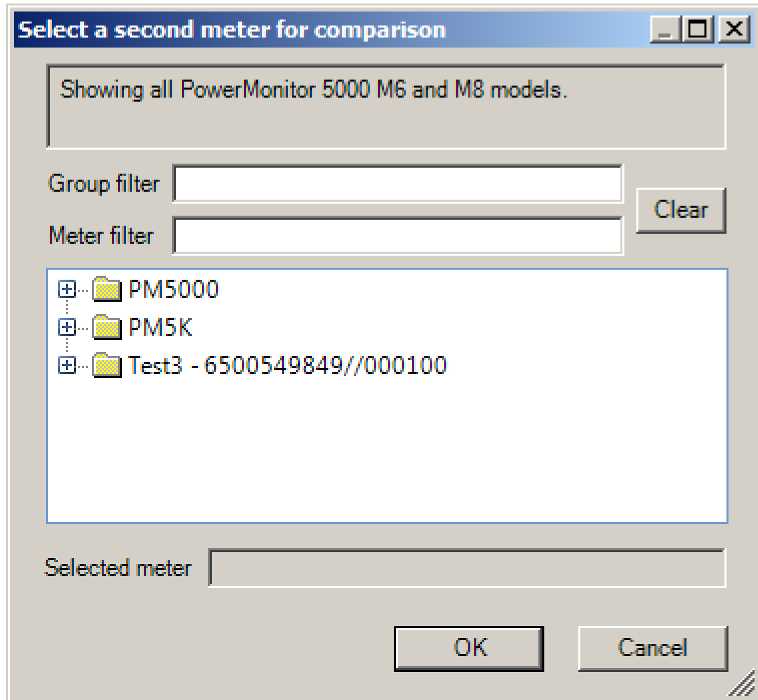
Displaying harmonics of two meters simultaneously (M6 and M8 models)

To display harmonics of two meters simultaneously:

1. On the **Harmonics** tab, select the **Second meter for comparison** option.

2. Click .

   The **Select a second meter for comparison** dialog box appears.



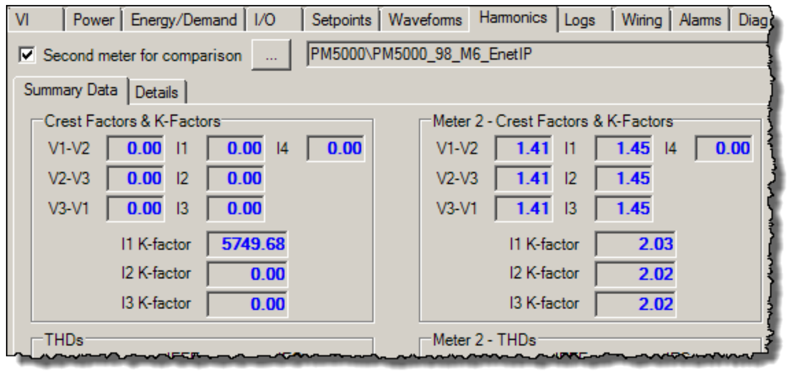
3. Do either of the following:
   - Start typing a group or meter name in the **Group filter** or **Meter filter** boxes to narrow down the search.

     Click **Clear** to reset both filters.
   - Select a meter in the tree.

     The meter of your choosing is listed in the **Selected meter** box.
4. Click **OK**.

   The selected meter is listed on the **Harmonics** tab.

   Its data is presented in the right pane of the tab.



Logs tab

Events tab

This displays the event log from the power monitor. The event log stores events encountered during runtime, including power up, parameter changes, alarm conditions, relay changes, and status input changes. The log updates continuously, with newest events overwriting oldest events.

Alarms tab

This displays sag/swell and other notifications from the Alarm log.

Min/Max tab

This displays the Min/Max log from the power monitor. Maximum and minimum values are maintained since the last time the log was reset.

TOU tab

This displays the time of use (TOU) records from the TOU log in the power monitor.

Load Factor Log Tab (M6 and M8 only)

This displays the load factor log from the power monitor, including load factor results for real power, reactive power, apparent power and current, for the current and previous 12 months.

Setpoints tab

This displays the record of setpoint status in the power monitor.

Data tab, Energy tab

These tabs provide access to the power monitors logs where you can view specific logs. The data is sorted from newest to oldest by date.

Sag/Swell tab (M6 and M8 only)

This displays the sag and swell events from the Event Log against the ITI voltage tolerance envelope (CBEMA Curve). The duration of the sag or swell event is displayed along the X-axis, while the percentage of nominal voltage during an event is displayed along the Y-axis.

The ITI curve shows the events against the base ITI sag/swell curve, as well as SEMI F47-0706 for the three phase standard. The SEMI F47 sag curve aligns with the ITI sag curve. The points in which the curves do not align are marked in red.

The options below the chart let you switch between displaying the IEEE 1159 events and the user-defined events. By default, the **IEEE 1159 events** option is selected.

Note: The options are available only for the following models:

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 with firmware in version

3.x or newer.

- Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8.

Starting with version 3.0 of the PowerMonitor 5000 firmware, the user-defined sag/swell event thresholds are changed to 0 and 200 respectively .

Trigger Data tab (M6 and M8 only)

This displays the trigger data log from the Power Monitor. These data logs are created from either a setpoint or a logic gate output in the M6 or M8 model.

Once a trigger file is selected from the **File list** tab, then the **File Records** tab is renamed to the title of the trigger file selected and the data from the trigger file will be displayed.

Refresh

Reads new values from the power monitor.

Tip: To copy the currently displayed log into an application such as Microsoft Excel, click in the log display window with the mouse. Press Ctrl+A and Ctrl+C to select and copy the log. Then, press Ctrl+V to paste the copied data into the application.

Forward check box

Normally logs are read in reverse chronological order. The forward check box is for reading them in forward chronological order.

This is an option in the **Data, Energy and Trigger** tab.

Clear...

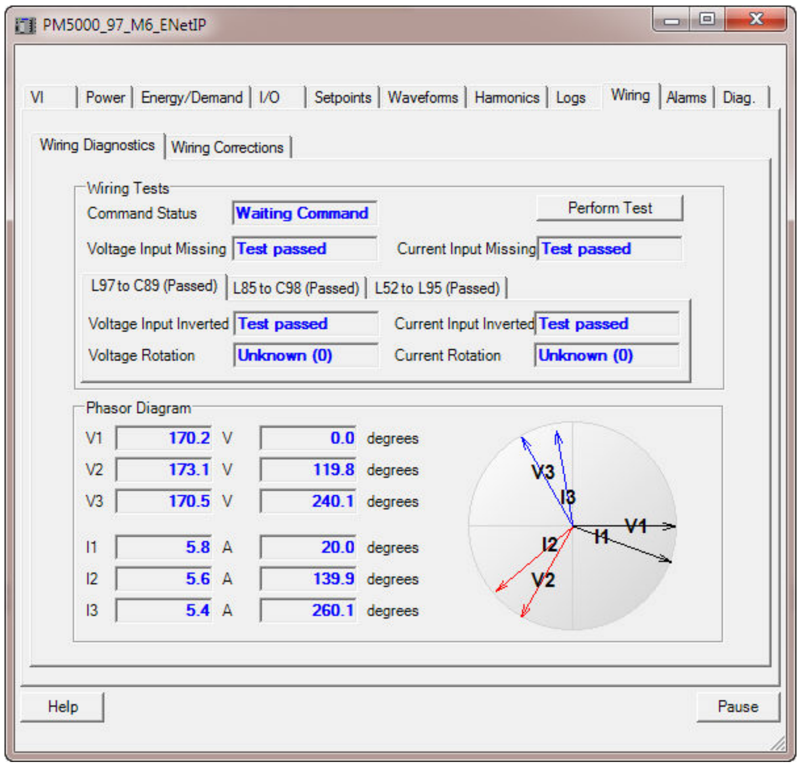
This clears the log you select from the list from the power monitor.

Wiring tab

The **Wiring** tab is comprised of two tabs:

- "Wiring Diagnostics tab" (page 503)
- "Wiring Corrections tab" (page 505)

Wiring Diagnostics tab



Perform Test

Click this button to initiate wiring diagnostics. Wiring diagnostics results are updated for 30 minutes after a command is issued.

Wiring tests

Command status

Indicates the status of the wiring diagnostics command:

- 0 = Command Active
- 1 = Input Level Low
- 2 = Disabled
- 3 = Waiting Command

Voltage / current input missing

The voltage and current input missing results point to errors in wiring the voltage and current inputs. "Missing" means that the indicated input(s) have not been wired to the voltage or current terminals.

The remaining wiring diagnostics results are grouped in tabs for each of three power factor ranges (Ranges indicate inductive, L, and capacitive, C, with the power factor percent value):

- L97 to C89
- L85 to C98
- L52 to L95

Overall wiring status

- Pass: wiring is correct
- Fail: wiring is incorrect, see the additional test results

Voltage / current input inverted

The voltage and current input inverted results point to errors in wiring the voltage and current inputs. "Inverted" indicates that a voltage or current is present but is inverted in phase.

Voltage / current rotation

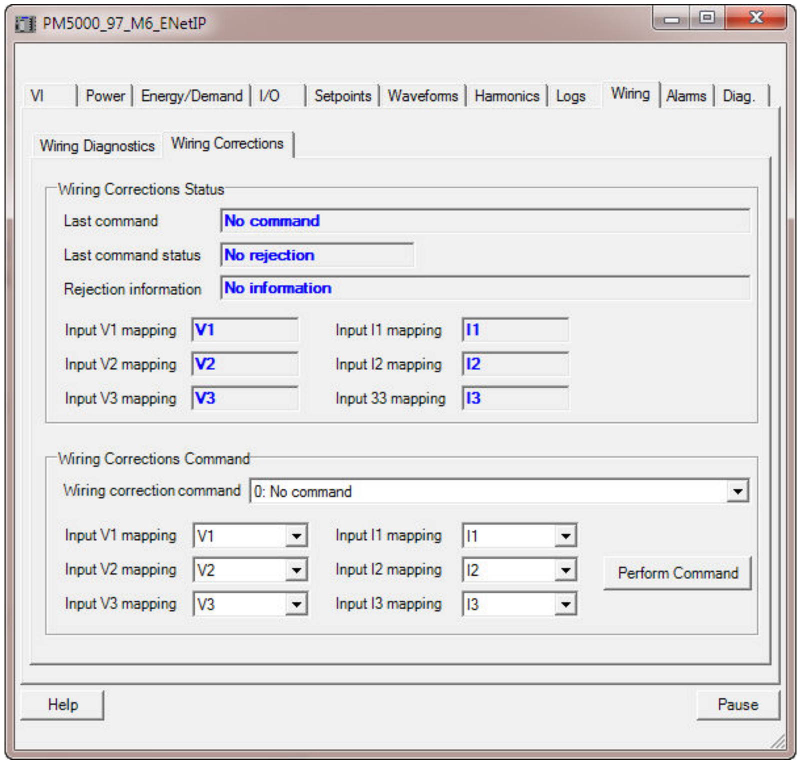
These indicate comparative rotation of the voltage and current signals. If both are 123, then the wiring is correct. If voltage is 123 and current is 321 then current signals 1 and 3 are swapped. If voltage rotation is 123 and current rotation is 231 then the current signals are offset by one phase.

Phasor diagram

The diagram graphically indicates the relationship of the rotating voltage and current phasors. In the diagram, correct phase rotation is counter-clockwise. Voltages displayed in Delta metering modes are offset by 30 degrees from those displayed in Wye modes.

Wiring Corrections tab

This tab allows for performing wiring correction commands for the PowerMonitor 5000 as well displays the wiring mapping and the status of the last command performed.



Perform Command

Click this button to initiate wiring correction command.

Last Command

Displays the last wiring correction command, the command status and rejection information if the command was rejected.

Input mapping

Displays the current Input mapping for the three voltage inputs and three current inputs.

Wiring Correction Command Section

Allows for performing wiring corrections on the PowerMonitor 5000

Wiring Correction command

Indicates the status of the wiring diagnostics command:

- 0 = No command
- 1 = Correct wiring using range 1 results, lagging 97 PF to leading 89 PF
- 2 = Correct wiring using range 2 results, lagging 85 PF to leading 98 PF
- 3 = Correct wiring using range 3 results, lagging 52 PF to lagging 95 PF
- 4 = Correct wiring using manual input parameters
- 5 = Remove all wiring corrections

Input mapping

Used to define the Input mapping for manually correcting the wiring connections

Alarms tab

Radio Selection

Selection between showing only active alarms or all alarms

Columns

The alarm table shows the alarm description as well as the status of the alarm

Diagnostics tab

Information

Displays general information about the device.

General status

Displays general status about the device.

Runtime status

Displays firmware revisions and operating data about the hardware and firmware assemblies in the power monitor.

Communication status

Displays communication status from the device.

IEEE 1588 status

Displays the IEEE 1588 (Precision Time Protocol) information and status about the device.

EN50160 Compliance tab (M8 model only)

The tab displays EN50160 compliance information retrieved from the power monitor.

For information on each parameter, refer to the Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 user manual.

EN61000-4-30 Metering Results tab (M8 model only)

The tab displays EN61000-4-30 metering results information retrieved from the power monitor.

For information on each parameter, refer to the Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 user manual.

EN61000-4-30 Power Quality tab (M8 model only)

The tab displays EN61000-4-30 power quality information retrieved from the power monitor. It is further divided into the following tabs with EN61000-4-30 data sets:

- HSG
- THD
- Sequence
- Aggregation

For information on each parameter, refer to the Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8 user manual.

Allen-Bradley Bulletin 1420 PowerMonitor 500

To view the data:

- **Open the device viewer**.

  To open the device viewer for a meter from the Meters tab:

  1. On the **Meters** tab in the navigation tree, click a power monitor.

     The power monitor page appears.
  2. At the top of the power monitor page, click the device class link.

  To open the device viewer for a meter from the System tab:

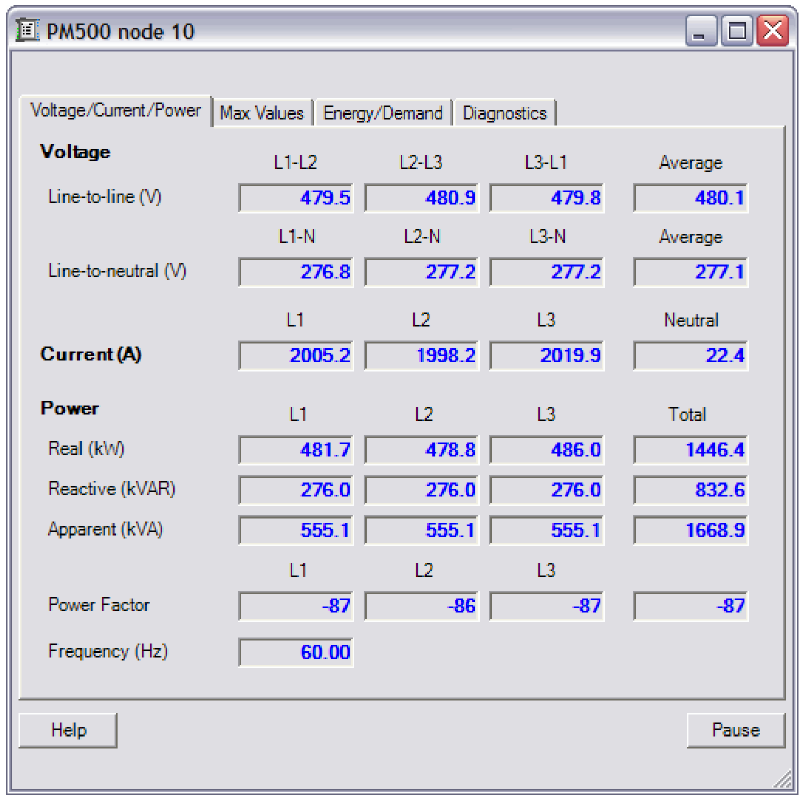
  1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

     The **Device Setup** page appears.
  2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

The device viewer window appears.



The window title bar displays the device name of the power monitor.

Click **Pause** at the bottom of the window to pause updating the data.

Important: Set up groups and power monitor devices before using RT to view or modify the power monitor configuration.

Voltage/Current/Power tab

Voltage

This displays the voltage information produced by the power monitor, including the following:

- Line to line voltage per phase and average
- Line to neutral voltage per phase and average.

  Line-to-neutral voltage values are displayed as zero in Delta wiring modes.

Current

This displays the current information produced by the power monitor, including the following:

- Current per phase and average

Power

- Real power, per phase and total
- Reactive power, per phase and total
- Apparent power, per phase and total
- Power factor, per phase and total
- Last cycle frequency

Max Values tab

This tab displays the maximum values measured by the Allen-Bradley Bulletin 1420 PowerMonitor 500 since its most recent reset.

Voltage

This displays the voltage information produced by the power monitor, including the following:

- Line to line voltage per phase and average
- Line to neutral voltage per phase and average

  Line-to-neutral voltage values are displayed as zero in Delta wiring modes.

Current

This displays the current information produced by the power monitor, including the following:

- Current per phase and average

Power

- Real power, per phase and total
- Reactive power, per phase and total
- Apparent power, per phase and total
- Power factor, per phase and total
- Last cycle frequency

Energy/Demand tab

This tab displays the value of total and partial energy counters in the Allen-Bradley Bulletin 1420 PowerMonitor 500.

Total real and reactive energy

Displays the total energy consumed since initial power-up of the power monitor.

Partial real and reactive energy

The partial energy values may be reset by the user. The partial real and reactive energy consumed since the last reset are displayed.

Hours counter

Displays the total hours since the last reset. May be reset by the user.

Real, Reactive, Apparent Power Demand

Displays each type of Demand as of the most recent completed demand interval. Demand is the average rate of energy consumption during the demand interval.

Diagnostics tab

The **Diagnostics** tab displays information about the power monitor, including:

- Model
- Base and analog (if present) firmware revisions
- Serial number
- Date and time

Allen-Bradley Bulletin 1415 Wireless PowerMonitor W250

To view the data:

- **Open the device viewer**.

  To open the device viewer for a meter from the Meters tab:

  1. On the **Meters** tab in the navigation tree, click a power monitor.

     The power monitor page appears.

  2. At the top of the power monitor page, click the device class link.

To open the device viewer for a meter from the System tab:

1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

   The **Device Setup** page appears.
2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

The device viewer window appears.

The window title bar displays the device name of the power monitor.

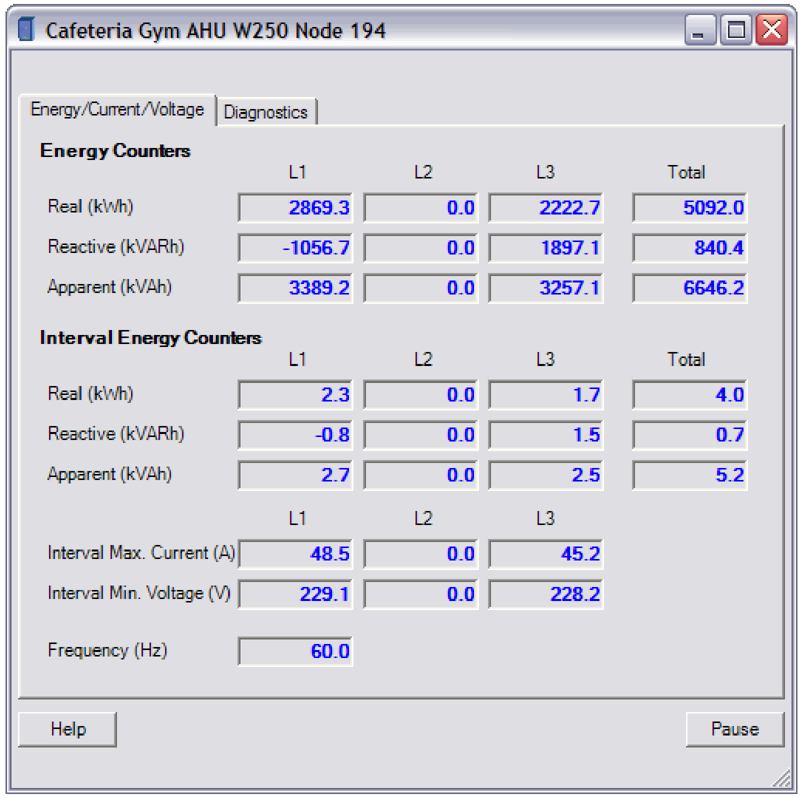
Click **Pause** at the bottom of the window to pause updating the data.

Tip: The PowerMonitor W250 returns a limited set of values. L2 values are typically zero. Because the W250 utilizes the two-wattmeter method of calculating energy, only the total energy values are meaningful. The L1 and L3 values indicate the intermediate results of each individual wattmeter calculation.

Important: Set up groups and power monitor devices before using RT.

Energy/Current/Voltage tab

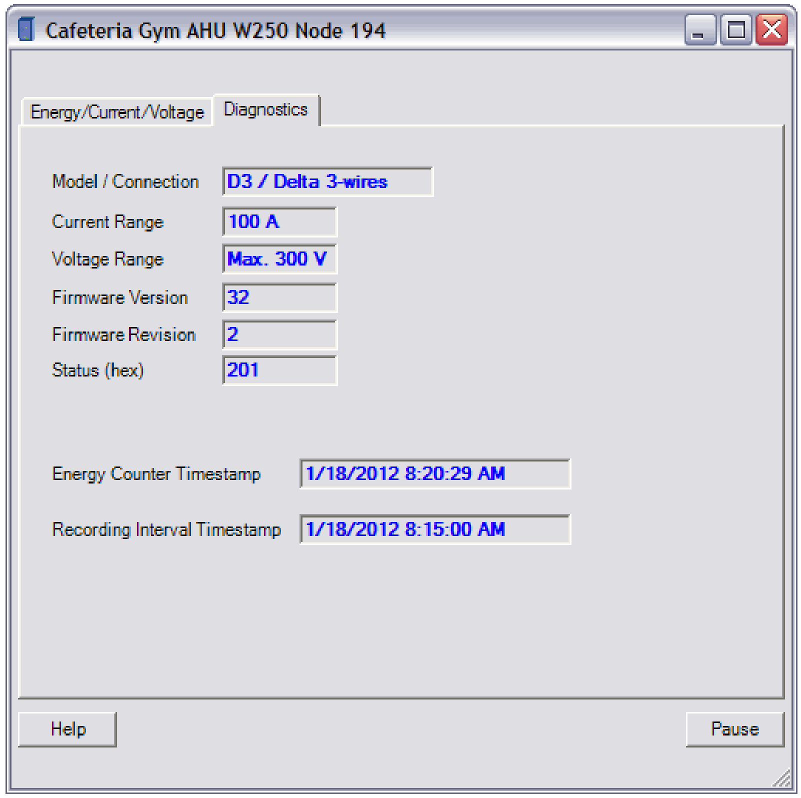
The Energy/Current/Voltage tab provides information on energy counters, interval energy counters, interval maximum current, interval minimum voltage, and frequency.



For details, refer to the Allen-Bradley Bulletin 1415 Wireless PowerMonitor W250 user documentation.

Diagnostics tab

The Diagnostics tab provides information about the W250 unit, along with the most recent time and date stamps of the energy and interval data values. Data is read from the PC Receiver. If these date and time values are old by more than one or two recording intervals, it indicates a loss of wireless communications between the PC Receiver and the power monitor.



For details, refer to the Allen-Bradley Bulletin 1415 Wireless PowerMonitor W250 user documentation.

PowerMonitor W250 PC Receiver configuration

The **PowerMonitor W250 PC Receiver Setup** page provides a status and diagnostic view of the wireless mesh network.

To open the page for a meter from the Meters tab:

1. On the **Meters** tab in the navigation tree, click a power monitor.

   The power monitor page appears.

2. On the power monitor page, click the **PC Receiver Setup** link.

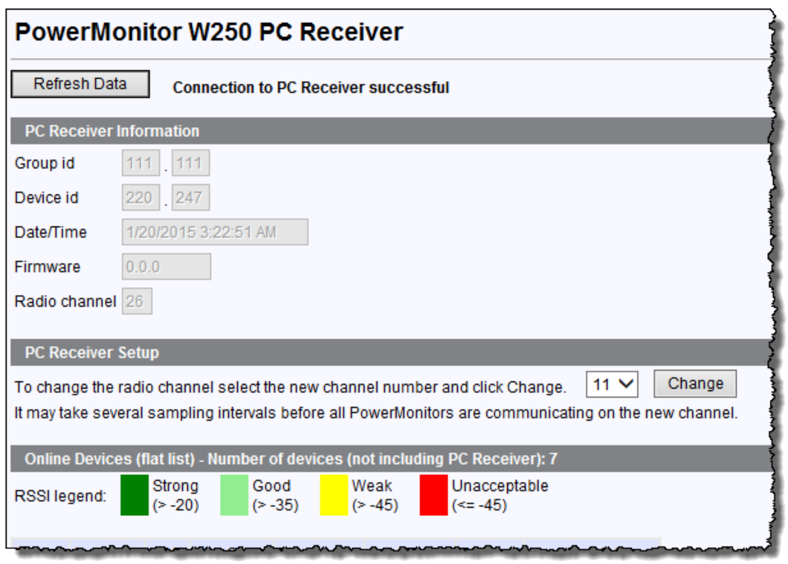
To open the page for a meter from the System tab:

1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

   The **Device Setup** page appears.

2. Click the **PC Receiver Setup** link.

The **PowerMonitor W250 PC Receiver Setup** page is displayed in a new browser window.



You may change the radio channel by selecting a channel in the list and clicking **Change**. Refer to the Wireless PowerMonitor user documentation for more information.

Online Devices (flat list)

In this section, you will find a flat listing of the online devices. This listing provides statistical and diagnostic data on the network and devices, including device IDs, RSSI (radio signal strength indicator), the number of hops and the first / last hop node IDs, the radio channel in use and the data sampling interval of each device. The second number in the Device ID is the Modbus node address of that device.

Online Devices (flat list) - Number of devices (not including PC Receiver): 10

RSSI legend: Strong (> -20) Good (> -35) Weak (> -45) Unacceptable (<= -45)

Type	Device Id	RSSI	Hop Count	First Hop Id	Last Hop Id	Channel	Sampling Interval
W250	27.3	-18	1	220.247	27.3	26	30 seconds
W250	26.114	-21	3	212.224	211.218	26	30 seconds
W250	26.184	-14	2	211.226	211.226	26	30 seconds
W250	4.195	-8	3	212.222	211.226	26	30 seconds
Router	211.218	-19	1	220.247	211.218	26	900 seconds
Router	212.220	-43	3	210.237	211.218	26	300 seconds
Router	212.222	-30	2	211.226	211.226	26	300 seconds
Router	212.224	-42	2	211.218	211.218	26	300 seconds
Router	211.226	-6	1	220.247	211.226	26	900 seconds
Router	210.237	-39	2	211.218	211.218	26	300 seconds

Online Devices (tree list)

The tree list provides a more graphical view of the radio signal path among devices in the mesh network. Only the current hops, not parallel paths, are displayed.

Online Devices (tree list) - Number of devices in tree (not including PC Receiver): 10

Type	Device ID	RSSI
PC Receiver	220.247	
W250	27.3	-18
Router	211.218	-19
Router	212.224	-42
W250	26.114	-21
Router	210.237	-39
Router	212.220	-43
Router	211.226	-6
W250	26.184	-14
Router	212.222	-30
W250	4.195	-8

Allen-Bradley Bulletin 1404 PowerMonitor 3000

To view the data:

- **Open the device viewer**.

To open the device viewer for a meter from the Meters tab:

1. On the **Meters** tab in the navigation tree, click a power monitor.

   The power monitor page appears.
2. At the top of the power monitor page, click the device class link.

To open the device viewer for a meter from the System tab:

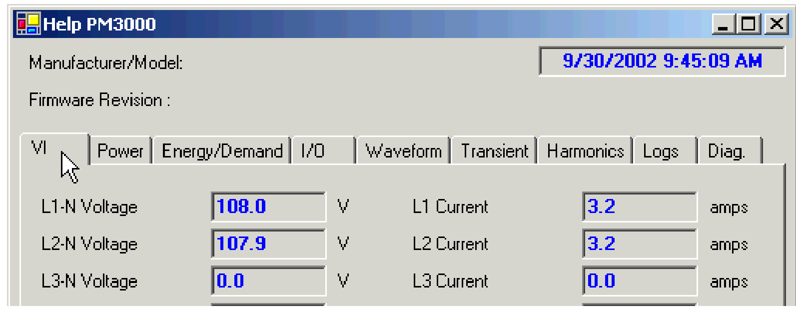
1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

   The **Device Setup** page appears.
2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

The device viewer window appears.



The window title bar displays the device name of the power monitor.

Click **Pause** at the bottom of the window to pause updating the data.

Important: Set up groups and power monitor devices before using RT to view or modify the power monitor configuration. You must enter a valid password to clear logs, preset energy values or change any configuration settings in the power monitor.

Voltage/Current tab

Voltage Data

This displays voltage information produced by the power monitor, including the following:

- Line to line voltage per phase and average
- Line to neutral voltage per phase and average
- Positive and negative sequence voltage
- Percent voltage unbalance

  Line-to-neutral voltage values are displayed as zero in Delta wiring modes.

Current data

This displays current information produced by the power monitor, including the following:

- Current per phase and average
- Neutral voltage
- Positive and negative sequence current
- Percent current unbalance

Frequency

- Last cycle frequency
- Average frequency over the last N cycles (determined by power monitor configuration)

Phase Rotation

This shows the phase rotation of the power measured by the power monitor. If the power monitor is measuring a single-phase signal, this field will display "No Rotation."

Power tab

Power Data

This displays the power information produced by the power monitor, including the following:

- Real power per phase and average
- Reactive power per phase and average
- Apparent power per phase and average

Power Factor Data

This shows the power factor information produced by the power monitor, including the following information:

- True power factor per phase and average
- Displacement power factor per phase and average
- Distortion power factor per phase and average

Per-phase power values are displayed as zero in Delta wiring modes.

Energy/Demand tab

Energy Data

This displays all of the energy information produced by the power monitor, including the following:

- Forward, reverse, and net real energy
- Forward, reverse, and net reactive energy
- Apparent energy
- Amp hours

Elapsed Time

The amount of time (in minutes) that has elapsed within the current demand period.

Current Demand

The calculated demand for average current.

Power Demand

The calculated demand for total real power.

Reactive Power Demand

The calculated demand for total reactive power.

Apparent Power Demand

The calculated demand for total apparent power.

Projection Data

The calculated projected values for current, power, reactive power and apparent power. The method of projection is determined by the Predicted Demand Type configuration parameter.

Input/Output tab

Status Inputs

This shows the current state of the configured **status inputs**. A highlighted indicator means the external contact wired to that status input is closed. A dark indicator means the external contact wired to the status input is open.

Status inputs

Status inputs are the physical inputs of the power monitor.

To configure status inputs:

1. Select a power monitor icon in the project outline of the RT window.
2. On the **View** menu, click **Device Configuration**.

To monitor status inputs:

1. Double-click a power monitor icon in the project outline of the RT window, or select a power monitor icon.
2. On the **View** menu, click **Device Viewer**.

Allen-Bradley Bulletin 1400 PowerMonitor

Four status inputs (S1 through S4) on the Allen-Bradley Bulletin 1400 PowerMonitor respond to an externally applied voltage. If the input voltage is below 9V AC or 9V DC, the power monitor senses the input as inactive. If the input voltage is over 20V AC or 20V DC, the power monitor senses the input as active. The power monitor requires a minimum pulse width of 40 milliseconds for reliable sensing of status input changes.

Allen-Bradley Bulletin 1403 PowerMonitor II

Four self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 1 may be used to synchronize demand intervals.

Allen-Bradley Bulletin 1404 PowerMonitor 3000, Allen-Bradley Bulletin 1408 PowerMonitor 1000, Allen-Bradley Bulletin 1426 PowerMonitor 5000

Self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 2 may be used to synchronize demand intervals. 1404 and 1408 units have two status inputs, and the 1426 has four.

Status Input Counters

This counts the number of times the Status Input closed. To reset any counter to zero, click **Reset** next to the counter field.

Relays

This shows the current state of relays, based on configured settings. A highlighted indicator means the relay is **energized**. A dark indicator means the relay is de-energized or restored to its normal state.

Energized

Indicates that contacts have changed from their default state. Normally open contacts have closed, or normally closed contacts have opened.

- To force a change in state, click either Close or Open. An "F" (for Forced) in the **status box** indicates a manual relay override. You must enter a valid password to force a change of state.

Relay status

Condition of the output relays on the power monitors.

- To cancel the manual relay override and return the relay to configured operation, click **Release**.

Setpoints

This shows the current state of configured setpoint values. A highlighted indicator means the setpoint is active. A dark indicator means the setpoint is inactive.

The setpoint accumulated time values may be reset by clicking anywhere on the setpoints grid display. A confirmation window will pop up. Click **Yes** to reset all setpoint accumulated times or **No** to cancel. You must enter a valid password to change any configuration settings in the power monitor.

For help understanding setpoints, see the User Manual for the Bulletin 1404 Power-monitor 3000.

Reset

This resets the associated counter to zero. If the **Reset** button does not operate and the text is gray, this power monitor has been configured to not allow counter resets. Refer to the device configuration

Close (Relay)

This manually forces a relay closed.

Open

This manually forces a relay open.

Release

This cancels the relay manual override and returns the relay to configured operation.

Waveform tab

This displays captured oscillographs from an Allen-Bradley Bulletin 1404 PowerMonitor 3000 M6 or M8. **Oscillography** features include:

Oscillography

Allen-Bradley Bulletin 1400 PowerMonitor

The power monitor samples the line voltages and line currents, at a rate of 128 samples per 60 Hz cycle. This allows the power monitor to have a 2-cycle waveform display.

Allen-Bradley Bulletin 1403 PowerMonitor II

The PowerMonitor II also samples line voltages and line currents, but at a rate of 10.8 kHz to generate waveform images of the line voltages and line currents. The 2-cycle display shows 2 cycles at 50 Hz, and the 12-cycle display shows 12 cycles at 50 Hz. The waveform image displays more cycles for line voltages and line currents at higher frequencies. The number of cycles displayed is scaled proportional to the frequency. The display includes the actual value of the pre-trigger number of cycles configured in the power monitor.

Example

Suppose you are monitoring a 60 Hz signal and want 6 cycles pre-triggered for any waveform image.

- The actual number of cycles for a 2-cycle display = 2 cycles x 60 Hz / 50 Hz = 2.4 cycles
- The actual number of cycles for a 12-cycle display = 12 cycles x 60 Hz / 50 Hz = 14.4 cycles

To set the pre-trigger number, pre-trigger = actual x 50 Hz / 6 x 50 Hz / 60 Hz = 5 cycles

Allen-Bradley Bulletin 1404 PowerMonitor 3000 (models M6, and M8)

The PowerMonitor 3000 provides 6 selections of sampling rate and data resolution.

Sampling Rate	Data Resolution	Samples per Cycle at 60 / 50 Hz	Total Cycles per Channel at 60 / 50 Hz	Capture Duration (seconds)
5.4 kHz	13-bit w/sign	90 / 108	51.1 / 42.6	0.85
2.7 kHz	45 / 54	102.2 / 85.2	1.70	
1.35 kHz	22.5 / 27	204.4 / 170.3	3.40	
5.4 kHz	7-bit w/sign	90 / 108	102.2 / 85.2	1.70
2.7 kHz	45 / 54	204.4 / 170.3	3.40	
1.35 kHz	22.5 / 27	408.8 / 340.7	6.81	

- Simultaneous capture of all seven voltage and current channels.
- Up to 5.4 kHz sampling rate (90 samples/cycle at 60 Hz).
- Up to 8 captures (M6) or 2 captures (M8) are stored in non-volatile memory.
- Each capture may contain up to 408 cycles of data per channel (at 60 Hz).
- The magnitude of each data point may be represented as 13-bit w/sign or 7-bit w/sign.
- Configurable pre-trigger allows capture of data before the event that triggers the capture occurs.
- Capture can be triggered by a setpoint, or the native or optional communications port.

When a capture is displayed, a vertical dashed red line marks the trigger position.

Capture Number, Trigger and Date/Time

This area displays the trigger and date/time for each capture buffer. There are eight capture buffers in the M6 and two in the M8. To select a capture press the option button corresponding to the capture number. Only one capture at a time may be displayed. If a different capture is selected, any currently displayed capture will be cleared when any channel display button is pressed.

Tip: Drag with the left mouse button to zoom in. Drag with the right mouse button to scroll the display. Double-click in the waveform window to return to the default display.

Center on Trigger Position

Pressing this button will force the waveform graph to be centered on the trigger position. This is most useful when the graph is zoomed in and you wish to examine the waveform around the trigger position.

Channel Buttons

This displays the captured waveform for the associated channel and selected capture number. To see a definition of each waveform button, slide the mouse pointer under each button without clicking. The upload of the waveform data may be cancelled by clicking **Cancel**.

Trigger a Capture

This triggers a new waveform capture in the PowerMonitor 3000. There must be a least one open capture slot in order to trigger a new capture.

Clear

This button presents a menu allowing clearing of one or all waveform captures.

Transient tab (M8 model only)

This displays transient metering and captures from an Allen-Bradley 1404 PowerMonitor 3000 M8. Because of the large amount of information shown on this tab, there are sub-tabs which divide up the information into metering results and waveform display.

Trip Channel

Indicates the input channel that tripped the transient capture.

Trip Index

The value of the voltage or current transient index that caused the trip.

Thresholds

Indicates the voltage and current trip threshold values that were configured at the time of the trip.

Capture Number and Date/Time

This area displays the trigger and date/time for each transient capture slot in the PowerMonitor 3000. There are six available capture slots in the M8. To select a capture press the option button corresponding to the capture number. Only one capture at a time may be displayed. If a different capture is selected, any currently displayed capture will be cleared when the metering results button or any channel display button is clicked.

Tip: Drag with the left mouse button to zoom in. Drag with the right mouse button to scroll the display. Double-click in the waveform window to return to the default display.

Metering Results

This displays the RMS calculations that the M8 performed on each of the 12 cycles that were captured.

Channel Buttons

This displays the captured oscillograph for the associated channel and selected capture number. To see a definition of each waveform button, slide the mouse pointer under each button without clicking. The upload of the waveform data may be cancelled by clicking **Cancel**.

Clear

This button presents a menu allowing clearing of one or all transient captures.

Harmonics tab

This displays waveform harmonics data from an Allen-Bradley 1404 PowerMonitor 3000. In the M6 and M8 models, the window displays individual harmonics in in either graphical or grid view.

The Bulletin 1404 PowerMonitor 3000 calculates the values for harmonics approximately every 30 seconds. When a button is clicked to display a harmonic, RT uploads and displays the harmonic data stored in the power monitor at that particular moment.

Tip: To see a definition of each harmonics button, slide the mouse pointer under each button without clicking.

Channel

This shows the channel currently being displayed.

Total Harmonic Distortion Data

This displays the total harmonic distortion on the selected channel calculated using IEEE and IEC methods for determining THD.

Crest Factor

This displays the crest factor of the selected channel.

The Bulletin 1404 M6 and M8 models also display the following:

TIF Value

This displays the telephone interference factor value of the selected channel.

K-factor

This displays the K-factor of the selected channel.

Meets IEEE 519

This displays whether the channel is within the IEEE 519 standard limits on total harmonic content.

IEEE 519 TDD

This displays the IEEE 519 Total Demand Distortion. TDD is defined as the root sum square of the current distortion expressed as a percent of the maximum fundamental demand load current (based on the maximum demand over the application demand interval).

Harmonics Buttons

This selects the harmonic channel to display.

Graph

This displays a graphical view of the waveform frequency response. The graph shows only the magnitude. The first blue bar represents the fundamental harmonic, with a value of 100%. The remaining blue bars represent up to 41 (M6) or 63 (M8) harmonics. The height of each bar represents the ratio of that harmonic to the fundamental.

Grid

This displays the distortion and magnitude data points in a spreadsheet format. The fundamental distortion has a value of 100%. The remaining harmonics represent a percent based on the fundamental.

Hide Fundamental Check box

This check box hides the fundamental to enhance the display of the individual harmonics.

Event Log Tab

This displays the event log from the power monitor. The event log stores the 50 (M4/M5), 100 (M6/M8) most recent events encountered during runtime, including power up, parameter changes, alarm conditions, relay changes, and status input changes. The log updates continuously, with newest events overwriting oldest events.

Sag/Swell Log Tag

This displays the sag and swell events from the Event Log against the ITI voltage tolerance envelope (CBEMA Curve). The duration of the sag or swell event appears along the x-axis and the setpoint release voltage appears along the Y-axis.

The ITI curve shows the events against the base ITIC sag curve, as well as the SEMI F47-0706 for three phase-to-phase standard. The SEMI F47 sag curve aligns with the ITIC sag curve except where shown in red.

Min/Max Tab

This displays the Min/Max log from the power monitor. The Min/Max log records up to 74 parameters. Maximum and minimum values are maintained since the last time the log was reset. To reset the values in this log to values currently stored in the power monitor, click the **Clear Min/Max** button. You must enter a valid password to clear logs. You can enable or disable the Min/Max logging function in the RT Device Configuration window.

Trend Log Tab

The trend log records up to 16 parameters at defined time intervals or when triggered by a setpoint. The size of the trend log is determined by how many parameters are selected to be logged and how often they are logged. You can change the polling interval for the trend log or configure setpoints to trigger the trend log in RT by reconfiguring the power monitor.

The trend log can be set to "fill and hold" or "overwrite". To capture new trend log records once the log is full and set to "fill and hold", the log must be manually cleared. To clear the trend log click **Clear Trend**. You must enter a valid password to clear logs.

Load Factor Log Tab (M6 and M8 only)

This displays the load factor log from the power monitor. Load factor is a demand management metric that indicates how ‘spiky’ or level a load is over a period of time. Load factor is simply the average demand divided by peak demand for a given period of time (typically one month). The lower the load factor value, the greater the potential for demand management.

The power monitor calculates load factor for real power, reactive power, apparent power and current and also stores the last 12 load factor results in non-volatile memory.

Refresh

Reads new values from the PowerMonitor II into the RT log viewer.

Tip: To copy the currently displayed log into an application such as Microsoft Excel, click in the log display window with the mouse. Press<ctrl> Athen<ctrl> C to copy the log, then paste the copied data into the application.

Clear Button

This clears the log you select from the list (trend or min/max) from the power monitor.

Tip: To change the column width of a log display, place the cursor on the boundary between columns, click and hold, and move the cursor to the desired position.

Diagnostics tab

This tab displays diagnostics information about the 1404 Power-Monitor 3000 unit, including:

- Model
- Base and analog (if present) firmware revisions
- Serial number
- Date and time

Allen-Bradley Bulletin 1408 PowerMonitor 1000

To view the data:

- **Open the device viewer**.

To open the device viewer for a meter from the Meters tab:

1. On the **Meters** tab in the navigation tree, click a power monitor.

   The power monitor page appears.

2. At the top of the power monitor page, click the device class link.

To open the device viewer for a meter from the System tab:

1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

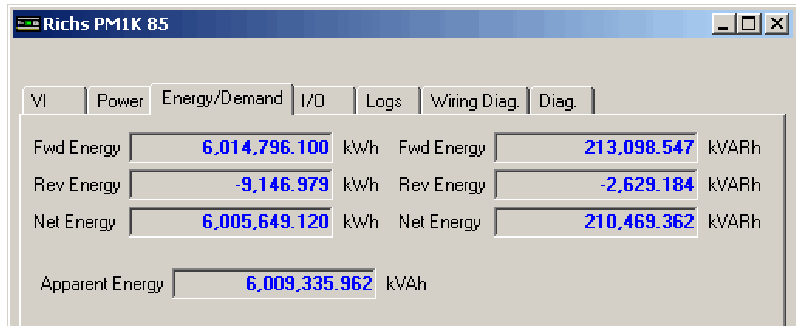
   The **Device Setup** page appears.

2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

The device viewer window appears.



The window title bar displays the device name of the power monitor.

Click **Pause** at the bottom of the window to pause updating the data.

Important: Set up groups and power monitor devices before using RT to view or modify the power monitor configuration.

VI Voltage and Current tab

Voltage data

This displays information produced by the power monitor, including the following:

- Line to line voltage per phase and average
- Line to neutral voltage per phase and average (displayed as zero in Delta wiring modes)
- Percent voltage unbalance

Current data

This displays current information produced by the power monitor, including the following:

- Current per phase and average
- Percent current unbalance

Frequency

- Last cycle or average frequency as selected in the power monitor configuration

Power tab

Power Data

This displays the power information produced by the power monitor, including the following:

- Real power per phase and average
- Reactive power per phase and average
- Apparent power per phase and average

Power Factor Data

This shows the power factor information produced by the power monitor, including the following information:

- True power factor per phase and average
- Displacement power factor per phase and average
- Distortion power factor per phase and average

  Per-phase power values are displayed as zero in Delta wiring modes.

Energy/Demand tab

Energy Data

This displays energy information produced by the power monitor, including the following:

- Forward, reverse, and net real energy
- Forward, reverse, and net reactive energy (EM2 and EM3 only)
- Apparent energy (EM2 and EM3 only)

Demand Data (EM2 and EM3 only)

Elapsed Time

The amount of time (in minutes) that has elapsed within the current demand period.

Demand PF

The average power factor during the previous demand interval.

Power Demand

The calculated demand for total real power during the previous demand interval.

Reactive Power Demand

The calculated demand for total reactive power during the previous demand interval.

Apparent Power Demand

The calculated demand for total apparent power during the previous demand interval.

Projection Data

The projected values for power, reactive power and apparent power during the present demand interval.

I/O Input and Output tab

Status Inputs

This shows the current state of the **status inputs**. A highlighted indicator means the external contact wired to that status input is closed. A dark indicator means the external contact wired to the status input is open.

Status inputs

Status inputs are the physical inputs of the power monitor.

To configure status inputs:

1. Select a power monitor icon in the project outline of the RT window.
2. On the **View** menu, click **Device Configuration**.

To monitor status inputs:

1. Double-click a power monitor icon in the project outline of the RT window, or select a power monitor icon.
2. On the **View** menu, click **Device Viewer**.

Allen-Bradley Bulletin 1400 PowerMonitor

Four status inputs (S1 through S4) on the Allen-Bradley Bulletin 1400 PowerMonitor respond to an externally applied voltage. If the input voltage is below 9V AC or 9V DC, the power monitor senses the input as inactive. If the input voltage is over 20V AC or 20V DC, the power monitor senses the input as active. The power monitor requires a minimum pulse width of 40 milliseconds for reliable sensing of status input changes.

Allen-Bradley Bulletin 1403 PowerMonitor II

Four self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 1 may be used to synchronize demand intervals.

Allen-Bradley Bulletin 1404 PowerMonitor 3000, Allen-Bradley Bulletin 1408 PowerMonitor 1000, Allen-Bradley Bulletin 1426 PowerMonitor 5000

Self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 2 may be used to synchronize demand intervals. 1404 and 1408 units have two status inputs, and the 1426 has four.

Status Input Counters

This counts the number of times the Status Input closed. To reset any counter to zero, click the **Reset Counter** button next to the counter field.

KYZ

This shows the current state of the KYZ output. A highlighted indicator means the output is energized.

- To force a change in state, click either Close or Open.
- To cancel the manual override and return the relay to configured operation, click **Release**.

Reset

This resets the associated counter to zero. If the **Reset** button does not operate and the text is gray, this power monitor has been configured to not allow counter resets. Refer to the device configuration

Close (KYZ)

This manually forces the output on.

Open

This forces the output off.

Release

This cancels the override and returns the KYZ to configured operation.

Logs tab

This displays the contents of the logs stored in a PowerMonitor 1000.

Unit status log tab

This displays the unit status log from the power monitor. The unit status log stores the 50 most recent events encountered during runtime, including power up, parameter changes, alarm conditions, output changes, and status input changes if selected. The log updates continuously, with newest events overwriting oldest events.

Min/Max tab (TR1, TR2 and EM3 only)

This displays the Min/Max log from the power monitor. The Min/Max log records up to 35 parameters, depending on the model. Maximum and minimum values are maintained since the last time the log was reset. To reset the values in this log to values currently stored in the power monitor, click **Clear Min/Max**.

Energy log tab (EM1, EM2, EM3 only)

The energy log records energy, demand and scaled status input counts at defined time intervals. The energy log contains up to 17,280 records. You can change the polling interval for the energy log in the RT device configuration window.

To clear the energy log click **Clear**.

Time-of-Use log tab (EM1, EM2 and EM3 only)

This displays the time-of-use (TOU) records for the current month and the last 12 months.

Load Factor log tab (EM2, EM3 only)

This displays the load factor log from the power monitor. Load factor indicates how 'spiky' or level a load is over a period of time. Load factor is the average demand divided by peak demand for a given period of time (typically one month). The lower the load factor value, the greater the potential for demand management.

The PowerMonitor 1000 calculates load factor for real power, reactive power, apparent power and stores the last 12 load factor results.

Refresh/Cancel

Reads new values from the power monitor into the RT log viewer. When a log is being refreshed, the button legend becomes **Cancel**. Click to cancel the active refresh request.

Tip: To copy the currently displayed log into an application such as Microsoft Excel, click in the log display window with the mouse. Press<ctrl> Athen<ctrl> C to copy the log, then paste the copied data into the application.

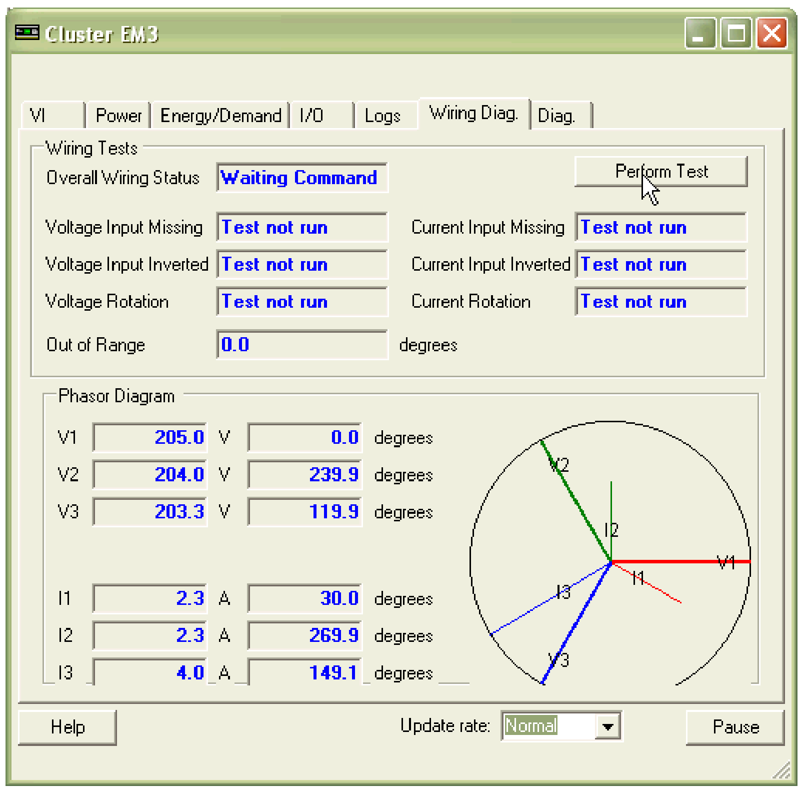
Clear Button

This clears the log you select from the list (energy, TOU, load factor or min/max) from the power monitor.

Tip: To change the column width of a log display, place the cursor on the boundary between columns, click and hold, and move the cursor to the desired position.

Wiring Diagnostics tab

The **Wiring Diagnostics** tab displays the results of the PowerMonitor 1000 wiring diagnostic test.



Perform Test

Click this button to initiate wiring diagnostics. Wiring diagnostics is active for approximately five minutes after a command is issued.

Wiring tests

Overall wiring status

- Waiting command: wiring diagnostics has not been requested yet
- Pass: wiring is correct
- Fail: wiring is incorrect, see the additional test results
- Input level low: measured current is less than 10% of full scale, so wiring diagnostic tests were not performed
- Disabled: power monitor is in 1PT1CT mode
- Out of range: measured power factor is outside the selected range

Voltage / current input missing / inverted

The voltage and current input missing / inverted results point to errors in wiring the voltage and current inputs. "Missing" means that the indicated input(s) have not been wired to the voltage or current terminals. "Inverted" indicates that a voltage or current is present but is inverted in phase.

Voltage / current rotation

These indicate comparative rotation of the voltage and current signals. If both are 123, then the wiring is correct. If voltage is 123 and current is 321 then current signals 1 and 3 are swapped. If voltage rotation is 123 and current rotation is 231 then the current signals are offset by one phase.

Out of range

If the overall wiring status is Out of Range, this parameter estimates how many degrees the angle between the voltage and current phasors exceeds the selected power factor range.

Tip: Select the system power factor range using the **VI Demand** tab in the RT device configuration window

Phasor diagram (not available on EM1 and EM2 models)

The diagram graphically indicates the relationship of the rotating voltage and current phasors. In the diagram, correct phase rotation is counter-clockwise.

Caution: Wiring corrections must be made only by qualified personnel following accepted safety procedures.

Diagnostics tab

This tab displays diagnostics information about the PowerMonitor 1000 unit, including:

- Model
- Base and analog (if present) firmware revisions
- Serial number
- Date and time

Allen-Bradley Bulletin 1403 PowerMonitor II

To view the data:

- **Open the device viewer**.

  To open the device viewer for a meter from the Meters tab:

  1. On the **Meters** tab in the navigation tree, click a

power monitor.

The power monitor page appears.

2. At the top of the power monitor page, click the device class link.

To open the device viewer for a meter from the System tab:

1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

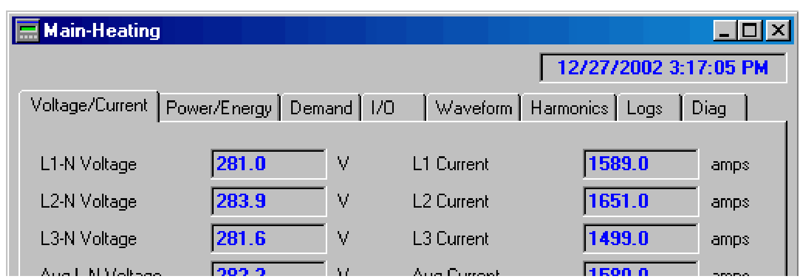
   The **Device Setup** page appears.

2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

The device viewer window appears.



The window title bar displays the device name of the power monitor.

Click **Pause** at the bottom of the window to pause updating the data.

Important: Configure groups and power monitor devices in the project before using RT to view or modify the power monitor configuration. You must enter a valid password to clear logs, preset energy counters or change any configuration settings in the power monitor.

Voltage/Current tab

Voltage Data

This displays all of the voltage information produced by the power monitor, including the following:

- Line to line voltage per phase and average
- Line to neutral voltage per phase and average
- Auxiliary voltage
- Positive and negative sequence voltage
- Percent voltage unbalance

  Line-to-neutral voltage values are displayed as zero in Delta wiring modes.

Current data

This displays all of the current information produced by the power monitor, including the following:

- Current per phase and average
- Neutral voltage
- Positive and negative sequence current
- Percent current unbalance

Frequency

This shows the frequency of the power measured by the power monitor.

Phase Rotation

This shows the phase rotation of the power measured by the power monitor. If the power monitor is measuring a single-phase signal, this field will display "No Rotation."

Power tab

Power Data

This displays all of the power information produced by the power monitor, including the following:

- Real power per phase and average
- Reactive power per phase and average
- Apparent power per phase and average

Energy Data

This displays all of the energy information produced by the power monitor, including the following:

- Forward, reverse, and net real energy
- Forward, reverse, and net reactive energy

Power Factor Data

This shows the power factor information produced by the power monitor, including the following information:

- True power factor per phase and average
- Displacement power factor per phase and average
- Distortion power factor per phase and average

  Per-phase power values are displayed as zero in Delta wiring modes.

Demand tab

Elapsed Time

This shows the elapsed time in the present demand interval.

Current Demand

This displays the total current demand over the present interval.

Real Power Demand

This shows the real power demand calculated during the present interval.

Reactive Power Demand

Apparent Power Demand

Projection 1 Data

Projection 2 Data

Projection 3 Data

Input/Output tab

Status Inputs

This shows the current state of the configured **status inputs**. A highlighted indicator means the external contact wired to that status input is closed. A dark indicator means the external contact wired to the status input is open.

Status inputs

Status inputs are the physical inputs of the power monitor.

To configure status inputs:

1. Select a power monitor icon in the project outline of the RT window.
2. On the **View** menu, click **Device Configuration**.

To monitor status inputs:

1. Double-click a power monitor icon in the project outline of the RT window, or select a power monitor icon.
2. On the **View** menu, click **Device Viewer**.

Allen-Bradley Bulletin 1400 PowerMonitor

Four status inputs (S1 through S4) on the Allen-Bradley Bulletin 1400 PowerMonitor respond to an externally applied voltage. If the input voltage is below 9V AC or 9V DC, the power monitor senses the input as inactive. If the input voltage is over 20V AC or 20V DC, the power monitor senses the input as active. The power monitor requires a minimum pulse width of 40 milliseconds for reliable sensing of status input changes.

Allen-Bradley Bulletin 1403 PowerMonitor II

Four self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 1 may be used to synchronize demand intervals.

Allen-Bradley Bulletin 1404 PowerMonitor 3000, Allen-Bradley Bulletin 1408 PowerMonitor 1000, Allen-Bradley Bulletin 1426 PowerMonitor 5000

Self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 2 may be used to synchronize demand intervals. 1404 and 1408 units have two status inputs, and the 1426 has four.

Status Input Counters

This counts the number of times the Status Input closed. To reset any counter to zero, click **Reset** next to the counter field.

Relays

This shows the current state of relays, based on configured settings. A highlighted indicator means the relay is **energized**. A dark indicator means the relay is de-energized or restored to its normal state.

Energized

Indicates that contacts have changed from their default state. Normally open contacts have closed, or normally closed contacts have opened.

- To force a change in state, click either Close or Open. An "F" (for Forced) in the **status box** indicates a manual relay override.

Relay status

Condition of the output relays on the power monitors.

- To cancel the manual relay override and return the relay to configured operation, click **Release**.

Setpoints

This shows the current state of configured setpoint values. A highlighted indicator means the setpoint is active. A dark indicator means the setpoint is inactive.

For help understanding setpoints, see the Allen-Bradley "Instruction Sheet for the Bulletin 1403 Power-monitor II."

Reset

This resets the associated counter to zero. If the **Reset** button does not operate and the text is gray, this power monitor has been configured to not allow counter resets. Refer to the device configuration

Close (Relay)

This manually forces a relay closed.

Open

This manually forces a relay open.

Release

This cancels the relay manual override and returns the relay to configured operation.

Harmonics tab

This displays waveform harmonics data in either graphical or grid view from an Allen-Bradley 1403 PowerMonitor II. Note that the LM version does not support harmonics.

The Bulletin 1403 PowerMonitor II calculates the values for harmonics approximately every 30 seconds. When a button is clicked to display a harmonic, RT uploads and displays the harmonic data stored in the power monitor at that particular moment.

Channel

This shows the channel currently being displayed.

Total Harmonic Distortion Data

This displays the total harmonic distortion on the selected channel calculated using the IEEE and IEC methods for determining THD.

TIF Value

This displays the telephone interference factor value of the selected channel.

Crest Factor

This displays the crest factor of the selected channel

K-factor

This displays the K-factor of the selected channel.

Meets IEEE 519

This displays whether the channel is within the IEEE 519 standard limits on total harmonic content.

Harmonics Buttons

This selects the harmonic channel to display.

Graph

This displays a graphical view of the waveform frequency response. The graph shows only the magnitude and does not include the phase angle. The first red bar represents the fundamental harmonic, with a value of 100%. The remaining red bars represent up to 41 harmonics. Blue bars represent even harmonics. The height of each bar represents the ratio of that harmonic to the fundamental.

Grid

This displays the distortion, magnitude, and phase angle data points in a spreadsheet format. The fundamental distortion has a value of 100%. The remaining harmonics represent a percent based on the fundamental.

Hide Fundamental Check box

This check box hides the fundamental to enhance the display of the individual harmonics.

Waveform tab

This displays captured waveforms from an Allen-Bradley 1403 PowerMonitor II. Note that the LM version does not support waveform capture.

The PowerMonitor II samples line voltages and line currents at a rate of 10.8 kHz to generate waveform images of the voltages and line currents. The 2-cycle display shows 2 cycles at 50 Hz, and the 12-cycle display shows 12 cycles at 50 Hz. The power monitor scales the number of cycles displayed proportional to the frequency.

Date and Time

This is the date and time the displayed waveform was triggered. This data is displayed on the upper right corner of the waveform graph.

Waveform Buttons

This displays either 2 cycle (V1, V2, V3, I1, I2, I3 and I4) or 12 cycle (A, B) waveform images. A and B 12-cycle waveforms are defined in the **Waveform** tab in the device configuration window.

Refresh

This triggers the capture of new waveform data and displays the new information for the currently displayed waveform images.

Clear Hold

This cancels the hold of the waveform image in the power monitor, allowing a new waveform to be triggered by a setpoint. This button is only accessible if the hold is set; therefore, if the power monitor is configured to overwrite oscillograph captures or if no waveform has been captured by the power monitor, this button is disabled.

Logs tab

This displays the contents of the logs stored by an Allen-Bradley 1403 PowerMonitor II.

Snapshot log tabs

The snapshot log records 46 parameters at defined time intervals or when triggered by a setpoint. The 50 most recent snapshots are stored by the power monitor and displayed with their time and date stamps. You can change the polling interval for the snapshot log or configure setpoints to trigger the snapshot log in RT by reconfiguring the power monitor.

The snapshot log can be set to "fill and hold" or "overwrite". To capture new snapshots once the log is full and set to "fill and hold", the log must be manually cleared. To clear the snapshot log click **Clear Snapshot**.

- V/I. This displays current and voltage data from the snapshot log, from newest to oldest.
- Power. This displays power data from the snapshot log, from newest to oldest.

Min/Max log tab

This displays the Min/Max log from the power monitor. The Min/Max log records up to 84 parameters. Maximum and minimum values are maintained since the last time the log was reset. To reset the values in this log to values currently stored in the power monitor, click **Clear Min/Max**. You can enable or disable the Min/Max logging function in the RT Device Configuration window. The Bulletin 1403-LM supports fewer parameters; if a parameter is not supported, its description appears as N/A.

Event log tab

This displays the event log from the power monitor. The event log stores the 100 most recent events encountered during runtime, including power up, parameter changes, alarm conditions, relay changes, and status input changes. The log updates continuously, with newest events overwriting oldest events.

Refresh

Reads new values from the PowerMonitor II into the RT log viewer.

Tip: To copy the currently displayed log into an application such as Microsoft Excel, click in the log display window with the mouse. Press<ctrl> Athen<ctrl> C to copy the log, then paste the copied data into the application.

Clear Snapshot

This clears values from the snapshot log.

Clear Min/Max

This resets the Min/Max log stored in the power monitor.

Tip: To change the column width of a log display, place the cursor on the boundary between columns, click and hold, and move the cursor to the desired position.

Diag tab

This tab displays diagnostics information about the 1403 Power-Monitor II unit, including:

- Model
- Base and analog (if present) firmware revisions
- Serial number
- Date and time

Allen-Bradley Bulletin 1400 PowerMonitor

To view the data:

- **Open the device viewer**.

To open the device viewer for a meter from the Meters tab:

1. On the **Meters** tab in the navigation tree, click a power monitor.

   The power monitor page appears.

2. At the top of the power monitor page, click the device class link.

To open the device viewer for a meter from the System tab:

1. On the **Systems** tab in the navigation tree, click a power monitor from the **Devices** folder.

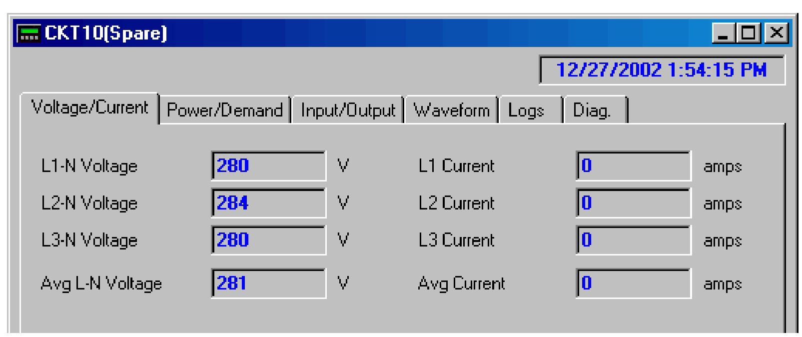
   The **Device Setup** page appears.

2. Click **Device Viewer**.

The device viewer application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

The device viewer window appears.



The window title bar displays the device name of the power monitor.

Click **Pause** at the bottom of the window to pause updating the data.

Important: The 1400 PowerMonitor does not increment years. For example, when the date changes from December 31 to January 1, the month and day change but the year does not. If the year stored in the power monitor is incorrect, use the Device Configuration window to synchronize the date in the hardware with the date in your computer.

Tip: To view data in different units in each tab of the device viewer window, click the unit label to the right of the display field. Each click will cycle through the available units for that measurement.

Voltage/Current tab

Voltage Data

This displays all of the voltage information produced by the power monitor, including the following:

- Line to line voltage per phase and average
- Line to neutral voltage per phase and average
- Auxiliary voltage
- Positive and negative sequence voltage
- Percent voltage unbalance

Current data

This displays all of the current information produced by the power monitor, including the following:

- Current per phase and average
- Neutral voltage
- Positive and negative sequence current

- Percent current unbalance

Frequency

This shows the frequency of the power measured by the power monitor.

Phase Rotation

This shows the phase rotation of the power measured by the power monitor. If the power monitor is measuring a single-phase signal, this field will display "No Rotation."

Power/Demand tab

Power Data

This displays all of the power information produced by the power monitor, including the following:

- Real power per phase and average
- Reactive power per phase and average
- Apparent power per phase and average

Energy Data

This displays all of the energy information produced by the power monitor, including the following:

- Forward, reverse, and net real energy
- Forward, reverse, and net reactive energy

Total True Power Factor

This shows the total true power factor measured by the power monitor.

Power Demand

This displays the real power demand measured by the power monitor.

Apparent Power Demand

This displays the apparent power demand measured by the power monitor.

Input/Output tab

Status inputs

This shows the current state of the configured **status inputs**. A highlighted indicator means the external contact wired to that status input is closed. A dark indicator means the external contact wired to the status input is open.

Status inputs

Status inputs are the physical inputs of the power monitor.

To configure status inputs:

1. Select a power monitor icon in the project outline of the RT window.
2. On the **View** menu, click **Device Configuration**.

To monitor status inputs:

1. Double-click a power monitor icon in the project outline of the RT window, or select a power monitor icon.
2. On the **View** menu, click **Device Viewer**.

Allen-Bradley Bulletin 1400 PowerMonitor

Four status inputs (S1 through S4) on the Allen-Bradley Bulletin 1400 PowerMonitor respond to an externally applied voltage. If the input voltage is below 9V AC or 9V DC, the power monitor senses the input as inactive. If the input voltage is over 20V AC or 20V DC, the power monitor senses the input as active. The power monitor requires a minimum pulse width of 40 milliseconds for reliable sensing of status input changes.

Allen-Bradley Bulletin 1403 PowerMonitor II

Four self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 1 may be used to synchronize demand intervals.

Allen-Bradley Bulletin 1404 PowerMonitor 3000, Allen-Bradley Bulletin 1408 PowerMonitor 1000, Allen-Bradley Bulletin 1426 PowerMonitor 5000

Self-powered status inputs can sense and control the state of an external contact. Each status input has a counter associated with it. Status input 2 may be used to synchronize demand intervals. 1404 and 1408 units have two status inputs, and the 1426 has four.

S1 Counter

This counts the number of times the S1 Status Input closed. To reset the counter to zero, click **Reset**.

Relays

This shows the current state of relays, based on configured settings. A highlighted indicator means the relay is **energized**. A dark indicator means the relay is **de-energized** or restored to its normal state.

Energized

Indicates that contacts have changed from their default state. Normally open contacts have closed, or normally closed contacts have opened.

De-energized

Contacts are restored to their normal state. Normally open contacts are open; normally closed contacts are closed.

- To force a change in state, click either Close or Open. An "F" (for Forced) in the **status box** indicates a manual relay override.

  #### Relay status

  Condition of the output relays on the power monitors.

- To cancel the manual relay override and return the relay to configured operation, click **Release**.

Setpoints

This shows the current state of configured setpoint values. A highlighted indicator means:

- For an **over setpoint**, the measured value for the setpoint parameter has exceeded the high limit and has not yet gone below the low limit.

Over setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

An over setpoint becomes active when the monitored parameter exceeds the high limit, and remains over the limit for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An over setpoint becomes inactive when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- For an **under setpoint**, the measured value for the setpoint parameter has fallen below the low limit and has not yet gone above the high limit.

Under setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

An under setpoint becomes active when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An under setpoint becomes inactive when the monitored parameter exceeds the high limit, and remains above the limit for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- For a **binary setpoint**, the measured value for the setpoint is TRUE.

Binary setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

A binary setpoint becomes active when the monitored parameter is true, and remains true, for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

A binary setpoint becomes inactive when the monitored parameter is false, and remains false, for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

For help understanding setpoints, see the Allen-Bradley "Installation and Operation Manual for the Bulletin 1400 PowerMonitor

Display and Block Module." For details, see "PowerMonitor set-point types" (page 664)..

Reset

This resets the S1 Counter to zero. If the **Reset** button does not operate and the text is gray, this power monitor has been configured to not allow counter resets. Refer to the device configuration

Close (Relay)

This manually forces a relay closed.

Open

This manually forces a relay open.

Release

This cancels the relay manual override and returns the relay to configured operation.

Waveform tab

This displays waveform and harmonic data from an Allen-Bradley 1400 PowerMonitor, triggered and stored at a particular point in time. The display is static and does not update until another voltage or current button is clicked.

The 1400 PowerMonitor generates oscillographs based on the frequency downloaded to the power monitor and not on the frequency of the incoming power. When a waveform image triggers, the power monitor increases its sampling rate from 16 times per cycle to 128 times per cycle. The frequency downloaded to the power monitor determines the cycle length.

Caution: The 1400 PowerMonitor does not include timestamps with waveform displays. Displaying multiple waveforms on the page may be misleading because the waveforms may have been triggered during different times.

To display a waveform and harmonic, click a voltage or current button near the bottom of the window. To clear the display, select the **Auto Clear** check box or click **Clear**.

Waveforms Box

This shows a single cycle, based on the frequency set in the power monitor. RT scales the waveform image to fit the data retrieved from the power monitor. If voltage and current waveform images are overlaid, be aware that each uses a different scale.

Harmonics Box

The first bar represents the first harmonic, assigned a value of 100%. RT shows subsequent harmonics as a percentage of the first harmonic.

Logs tab

Snapshot lag tab

This displays the snapshot log from the power monitor. The snapshot log records average voltage and current values, plus total values for kW and kVAR, at defined time intervals. The 100 most recent snapshots are displayed. You can change the polling interval for the snapshot log in RT by reconfiguring the power monitor.

Min/Max log tab

This displays the Min/Max log from the power monitor. The Min/Max log records maximum and minimum values for voltages, currents, power, and other measured parameters. Maximum and minimum values are maintained over the current period from the last time the log was reset. To reset the values in this log to values currently stored in the power monitor, click **Clear Min/Max**.

Event log tab

This displays the event log from the power monitor. The event log stores the 50 most recent events encountered during runtime including power up, parameter changes, alarm conditions, relay changes, and status input changes.

Refresh

Reads new values from the PowerMonitor II into the RT log viewer.

Tip: To copy the currently displayed log into an application such as Microsoft Excel, click in the log display window with the mouse. Press<ctrl> Athen<ctrl> C to copy the log, then paste the copied data into the application.

Clear Min/Max

This clears the min/max log.

Tip: To change the column width of a log display, place the cursor on the boundary between columns, click and hold, and move the cursor to the desired position.

Diag tab

This tab displays diagnostics information about the 1400 Power-Monitor unit, including:

- Model
- Base and analog (if present) firmware revisions
- Serial number
- Date and time

Configuring power monitors using RT

You must configure groups and power monitors as devices so that you may work with the power monitors in RT.

To launch the device configuration window, select a power monitor device on the **System** tab, and click **Device Configuration** on the **Device Setup** page. If the power monitor is already configured, you may **upload** its settings to RT. Or you can enter new configuration data in RT and **download** the settings to the power monitor.

Upload

Transfers the configuration settings from a physical power monitor to the device configuration window.

Download

Transfers configuration settings from the device configuration window to a physical power monitor.

To open the device configuration window:

1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.

To edit the power monitor configuration:

1. In the device configuration window, edit the configuration or **upload** it from the power monitor.

   Upload

   Transfers the configuration settings from a physical power monitor to the device configuration window.

3. Click **Download**.

   The new settings are downloaded to the power monitor.

Important: To prevent downloading a default configuration to a previously-configured power monitor, you should always upload first, then make any changes desired, then download. Downloading is password protected. The password for each power monitor is entered on the **Device Setup** page, so you do not need to enter it each time a download occurs.

Tips:

- Refer to the applicable product documentation for information on setting up power monitors. Power monitors are shipped with electronic documentation on a CD. Product documentation is also available online in the Rockwell Automation Literature library.
- To configure an existing power monitor, select the power monitor in the **System** tab, **Devices** folder, and click **Device Configuration** on the **Device Setup** page.

Allen-Bradley Bulletin 1426 PowerMonitor 5000

To open the device configuration window:

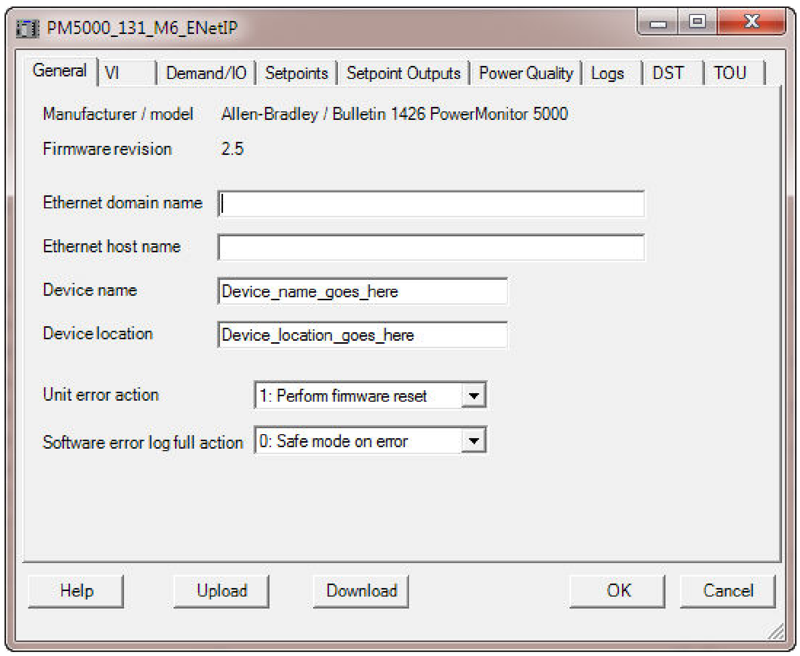
1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.



Important: Set up groups and power monitor devices before using RT to modify the power monitor configuration. If security is enabled in the power monitor, there must be a valid application-class user name and password entered on the **Device Setup** page to change any configuration settings in the power monitor.

OK

This saves the entries on all tabs to the database and closes the window.

Cancel

This cancels the entries from all tabs and closes the window.

Upload

This **uploads** configuration settings from the power monitor to RT. After uploading, click **OK**.

Upload

Transfers the configuration settings from a physical power monitor to the device configuration window.

Download

This **downloads** configuration settings from the database to the power monitor. After downloading, click **OK**.

Download

Transfers configuration settings from the device configuration window to a physical power monitor.

General tab

Manufacturer/Model

This is "Allen-Bradley 1426" for the Bulletin 1426 PowerMonitor 5000.

Firmware Revision

This lists the firmware revision of the power monitor Master Module.

Unit Error Action

Defines the default action when there is a unit error: safe mode or firmware reset.

Software Error Log Full Action

Defines the default action when there is a software error: safe mode or firmware reset.

Voltage/Current tab

This displays and sets operating parameters, including wiring mode, and current and voltage scaling (PT and CT ratios), for an Allen-Bradley 1426 PowerMonitor 5000.

Metering mode

From the list, select the mode that represents the power monitor wiring configuration. An incorrect setting will cause the power monitor to calculate incorrect values.

Real time update rate

This controls how fast the power monitor updates measured values and how many cycles are averaged to provide results with less variation.

Nominal system frequency

Select 50 or 60 Hz.

Voltage PT and VN PT

- **Primary**. Enter the first value from 1 to 10,000,000 for the PT (potential transformer) ratio (XXX:XXX), indicating the voltage rating at the high end of the transformer.

- **Secondary**. Enter the second value from 1 to 600 for the PT ratio (XXX:XXX), indicating the voltage rating at the low end of the transformer. This value also determines whether the master module uses high or low voltage input signals.

Current CT and Neutral Current I4 CT

- **Primary**. Enter the first value from 1 to 10,000,000 for the CT (current transformer) ratio (XXX:XXX), indicating the current rating at the high end of the transformer.
- **Secondary**. Enter the second value from 1 to 5 for the CT ratio (XXX:XXX), indicating the current rating at the low end of the transformer.

Nominal system voltage

Enter a value that represents the nominal voltage of the system. This parameter is used in the metering functions and in conjunction with voltage sag and swell functions.

Demand/IO tab

This displays and sets demand parameters, output control parameters and status input counter input scaling factors for an Allen-Bradley 1426 PowerMonitor 5000.

Period length (minutes)

Enter the length of the demand period.

- 1 to 99. The power monitor internal clock measures the period for both the actual and the projected demand values.
- 0. Disables projected demand. If Demand source is set to 0, internal time, disables demand calculation.

Number of periods

Enter 1 to 15 to set the number of demand periods to be averaged.

Demand source

Selects the source of the demand period timing.

Forced demand sync. delay (seconds)

Defines how long the power monitor waits for an external end of interval signal before it starts a new demand period.

Relay outputs

Select the following parameters for each of the relay outputs KYZ relay, Relay 1, 2 and 3:

Control source

Selects which parameter is used to control the relay output.

Output scale

For energy pulse operation, defines how many increments of the Metering Parameter occur to pulsed or toggle the output. Range: 1 to 100,000.

Pulse width (mS)

Sets the duration of the output pulse (in milliseconds). Range: 50 to 1000, or zero for KYZ-style toggle output.

Default state on comm loss

Defines the behavior of outputs in the event a Class 1 Exclusive Owner connection is lost.

Status input scale

Defines the scaling factor applied to the status input S1 thru S4 counters. Range: 1 to 1,000,000.

Load factor log auto reset/clear day

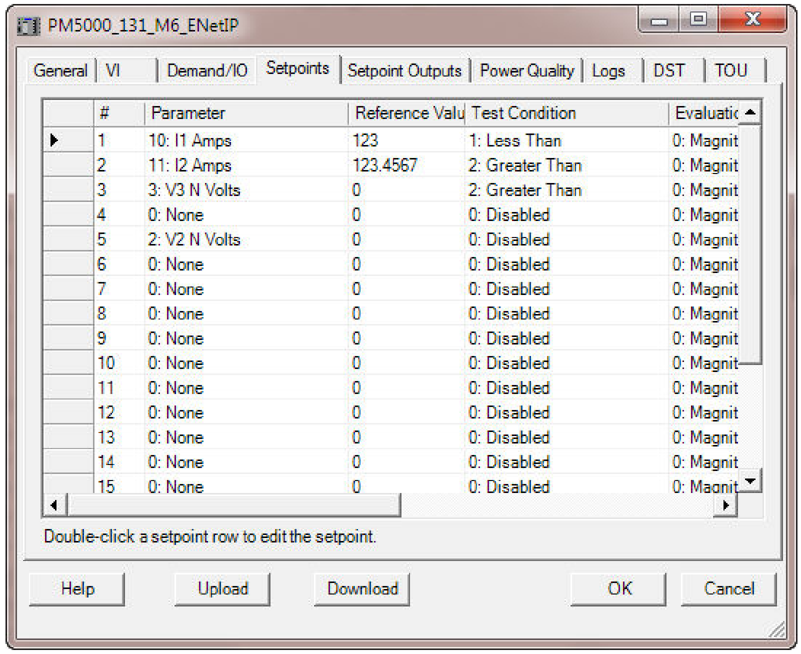
Automatically stores the current peak, average and load factor results as a record in the non-volatile load factor log and clears the peak and average demand values at the end of the specified day of each month.

If this parameter is set to 29 to 31 and the month does not contain that many days, the record will be saved on the last day of that month. The parameter may also be set to Disable.

Setpoints tab

This establishes setpoint parameters for the 1426 PowerMonitor 5000. The power monitor uses setpoints to generate alarms and control relays based on metering parameter values.

Caution: Allen-Bradley power monitors are NOT intended to function as protective relay devices.



Setpoint Parameters

A setpoint is a group of seven parameters. To edit a setpoint, select it in the list and double-click the box containing the arrow indicator.

- **Parameter**. This identifies which parameter to monitor.
- **Reference Value**. This identifies reference value for comparison/evaluation.
- **Test Condition**. Defines how the parameter is evaluated: Greater than, less than, or equal to.
- **Evaluation type**. Magnitude (analog), state (discrete), Percent of Reference or Percent of Sliding Reference.
- **Threshold**. This is the value at which to trigger a setpoint action.
- **Hysteresis**. This is the dead-band around the threshold.

- **Assert Delay**. This is the amount of time to wait before triggering a setpoint action after satisfying the setpoint test condition.
- **De-assert Delay**. This is the amount of time to wait before releasing a setpoint action after a setpoint condition is no longer satisfied.

Setpoint Outputs tab

This relates setpoints to output actions for the Allen-Bradley Bulletin 1426 PowerMonitor 5000.

Input source

Setpoints 1 through 20.

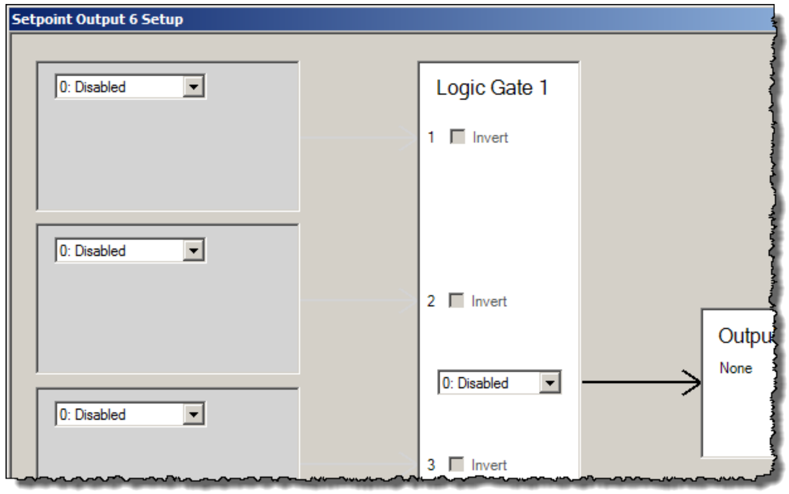
Input can also be a Logic Gate, and the Logic Gate is then defined in the **Setpoint Output Logic Gate** dialog box. For details, see "Setpoint Output Logic Gate dialog box" (page 579).

Output action

Select actions from the list.

Setpoint Output Logic Gate dialog box

This dialog box defines the output action related to a setpoint output logic gate for the 1426 PowerMonitor 5000.



Configuration

- **Input source**

  Between two and four setpoint can be defined as inputs

- **Logic Gate**

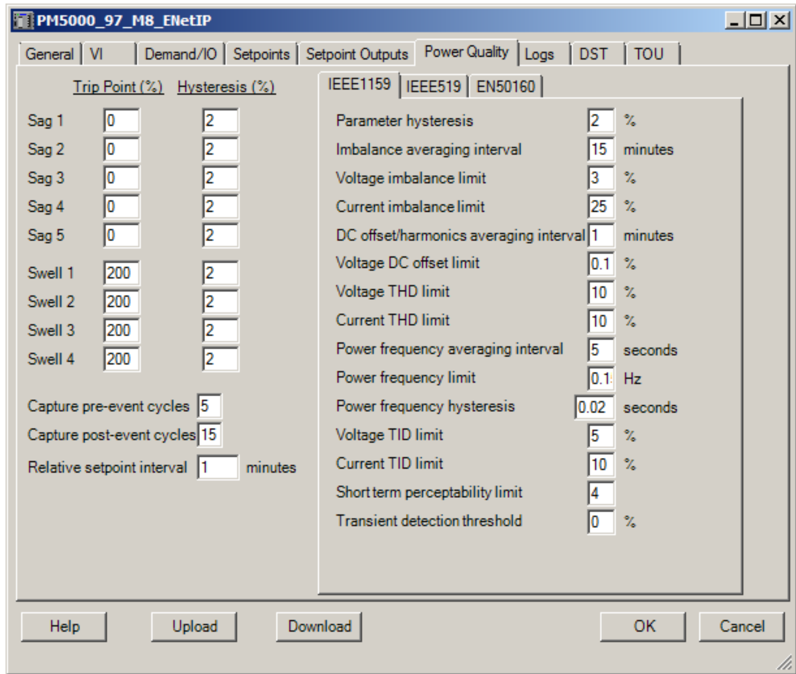
  Logical functions can be one of the following: AND, NAND, OR, NOR, XOR, XNOR

Each defined input setpoint can be inverted.

Power Quality tab

On this tab you can configure the following power quality settings for Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models:

- Sags
- Swells
- IEEE 1159
- IEEE 519
- EN 50160 (M8 model only)



Sag and Swell

Defines the Trip Point in percent as well as the Hysteresis. Also defines the number of cycles to capture pre event and post event.

IEEE 1159

Identifies the levels between nominal conditions and deviations from these nominal conditions for electrical characteristics in power systems according to IEEE standard 1159: 1159-2009 - IEEE Recommended Practice for Monitoring Electric Power Quality.

IEEE 519

Identifies the settings for Harmonic Control in power systems according to IEEE standard 519: 519-1992 - IEEE Recommended

Practices and Requirements for Harmonic Control in Electrical Power Systems.

EN 50160

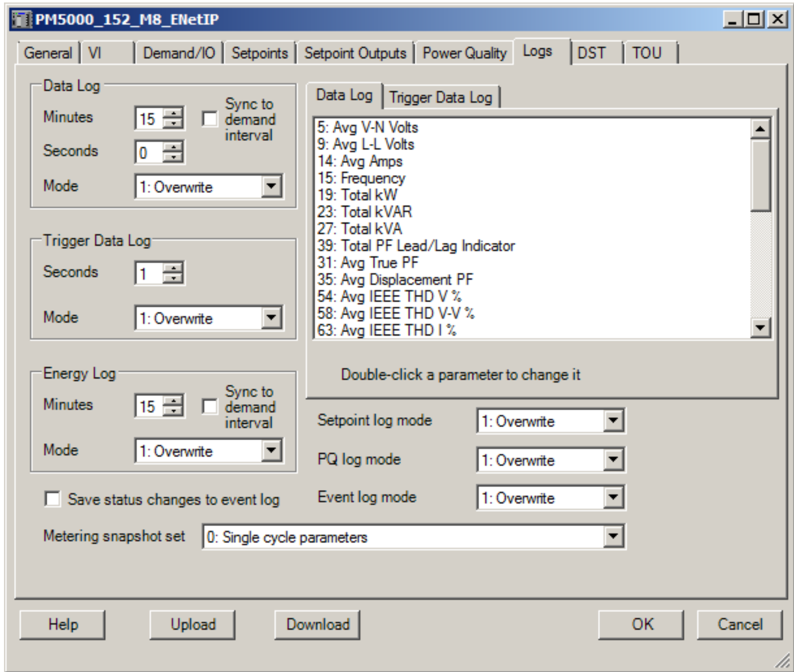
Identifies the configuration settings related to the European standard that defines, describes, and specifies characteristics of voltage supplied in public power supply networks.

Logs tab

Use this tab to configure the following features of Allen-Bradley Bulletin 1426 PowerMonitor 5000:

- Trend log
- Minimum/maximum log
- Event log.

The content of the tab depends on the selected model of the power monitor. The following figure presents the **Logs** tab for Allen-Bradley Bulletin 1426 PowerMonitor 5000 M8:



Notes:

- The **Metering snapshot set** setting is available for the M8 model only.
- The **Trigger Data Log** settings are available for M6 and M8 models only.
- The **PQ log mode** setting is available for M6 and M8 models only.

Data, Trigger and Energy Logging Interval

Defines the interval for the data and energy logs. If you check Sync to demand interval, the values for minutes [and seconds] are ignored.

- **Minutes**: 0 to 60.
- **Seconds**: 0 to 59.

Mode

This identifies whether logging stops or overwrites the oldest records and continues logging when the log becomes full.

- **Overwrite**. This option continuously fills the log with updated records. When the log becomes full, it overwrites the oldest records.
- **Fill and Stop**. This option fills the log and then holds those records and stops updating until the log is cleared. You can clear the log manually in the RT Device Viewer.

Data Log and Trigger Log Parameters

Selects up to 32 parameters to record in the data log and up to 8 parameters to record in the trigger log. To change a selection click the row that you want to change. Another window will pop up. Select a parameter and click **OK**.

Save status changes to event log

Select this check box to write input activity to the event log. Clear the check box to NOT record input activity.

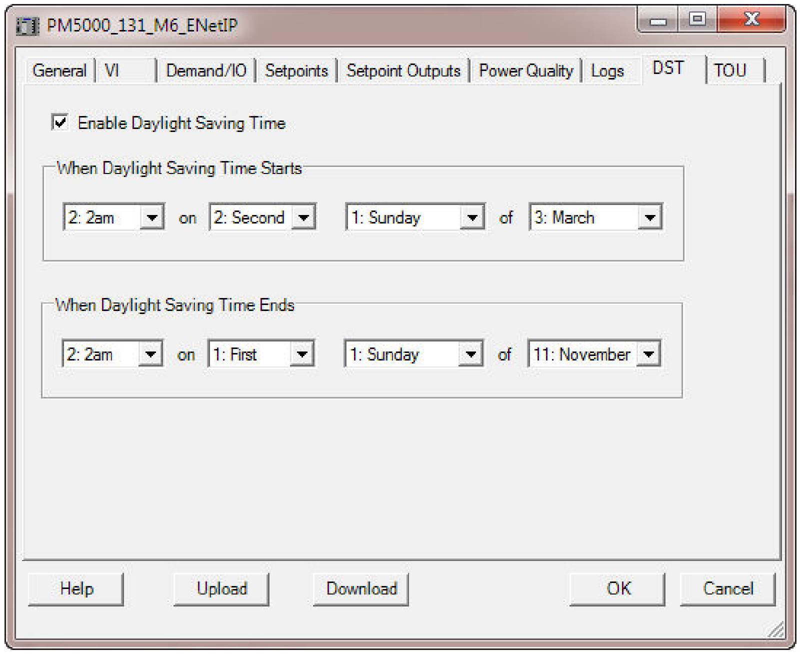
Metering snapshot set

Select one of the following modes to configure the meter to capture harmonics:

- 0: Single cycle parameters.
- 1: Harmonics voltage and current HDS and IHDS parameters.
- 2: Hz harmonic results through the 50th harmonic.

DST tab

PowerMonitor 5000 units may be configured to automatically adjust for daylight saving time. DST is disabled by default.



Enable Daylight Saving Time

Enables the daylight savings time function. Range 0 = disable, 1 = enable.

When Daylight Saving Time Starts

Start hour

Selects the hour of the day when DST begins. Range 0 = midnight, 1 = 1:00 a.m., ... , 23 = 11:00 p.m.

Start day instance

Selects which instance of the DST start day in the DST start month when DST begins. Range 1 = first, 2 = second, 3 = third, 4 = fourth, 5 = last.

Start day

Selects the day of the week when daylight savings time begins. Range 0 = Sunday, 1 = Monday, ... , 7 = Saturday.

Start month

Selects the calendar month when daylight savings time begins. Range 1 = January, 2 = February, ... , 12 = December.

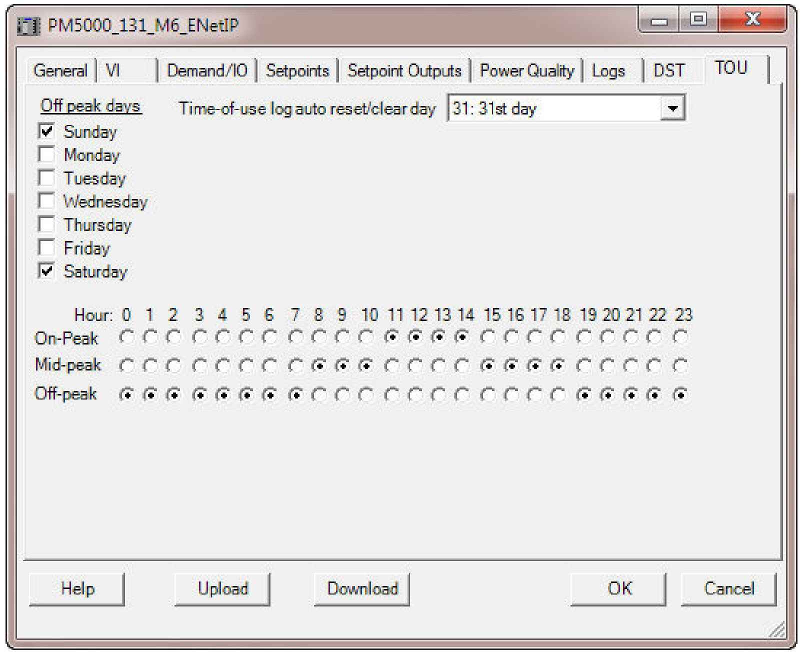
When Daylight Saving Time Ends

Configured the same as the start parameters above.

DST is disabled by default. When enabled, the default start time is 2:00 a.m. on the second Sunday in March, and the default end time is 2:00 a.m. on the first Sunday in November.

TOU tab

This tab lets you set up a custom time-of-use (TOU) profile in the PowerMonitor 5000 for logging energy and demand into the TOU log.



Off-peak days

Select days that are defined as off-peak. All usage and demand that occurs on selected days is recorded in the off-peak field.

Peak, mid-peak and off-peak hours

Select hours for each TOU category according to the TOU provisions of your energy provider tariff. These selections apply only on days not selected as off-peak.

Time-of-use log auto reset/clear day

- 1-31: Automatically pushes the in-process record into the monthly record stack on the selected day, then clears the in-process record. 29 through 31 are interpreted as the last day of the month.
- 0: Disables the auto-clear function.

Allen-Bradley Bulletin 1408 PowerMonitor 1000

To open the device configuration window:

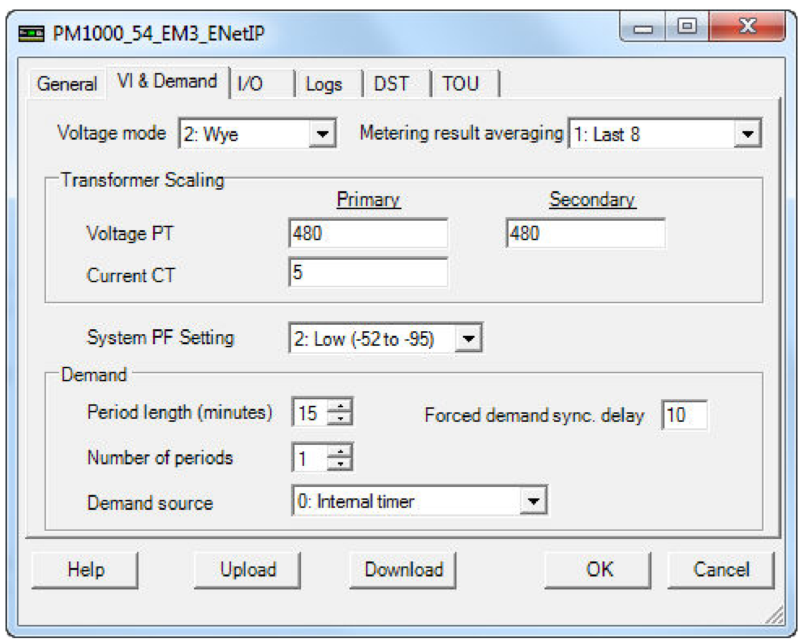
1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.



Important: Set up groups and power monitor devices before using RT to view or modify the power monitor configuration. There must be a valid password entered on the **Device Setup** page to change any configuration settings in the power monitor.

Buttons

OK

This saves the entries on all tabs to the database and closes the window.

Cancel

This cancels the entries from all tabs and closes the window.

Upload

This **uploads** configuration settings from the power monitor to RT. After uploading, click **OK**.

Upload

Transfers the configuration settings from a physical power monitor to the device configuration window.

Download

This **downloads** configuration settings from the database to the power monitor. After downloading, click **OK**.

Download

Transfers configuration settings from the device configuration window to a physical power monitor.

General tab

Manufacturer/Model

This is "Allen-Bradley 1408" for the PowerMonitor 1000.

Firmware Revision

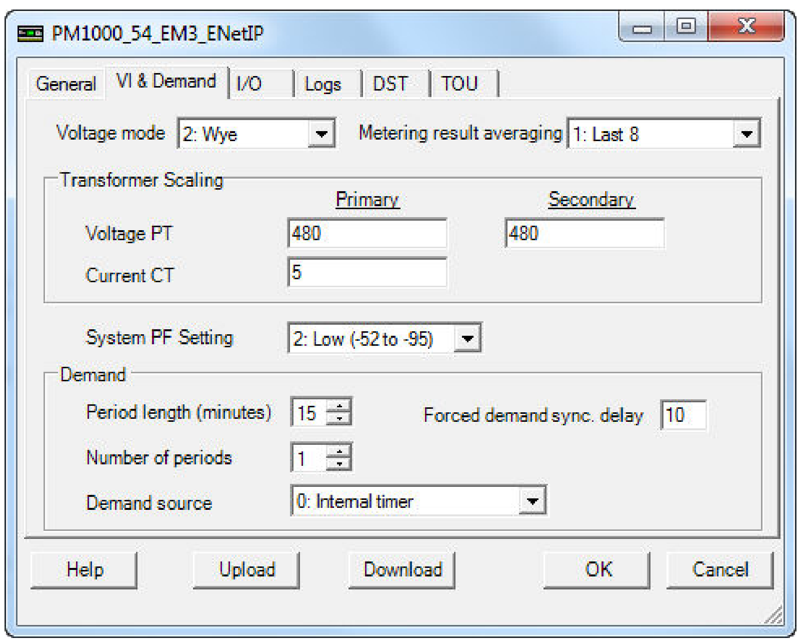
This lists the firmware revision of the power monitor.

Change Password

This calls a window where the user can set the password in the power monitor.

VI and Demand tab

The **VI and Demand** tab displays and sets operating parameters, including wiring mode, transformer scaling (PT and CT ratios), and demand settings for a 1408 PowerMonitor 1000.



Voltage Mode

From the list, select the mode that represents the power monitor wiring configuration. A wrong setting causes the power monitor to calculate incorrect values.

Metering Results Averaging

Number of consecutive results to average together.

- **No Averaging**. Provides the fastest response to signal change.
- **Last 8**. Each result is the average of the last 8 calculations; provides less variation in the output.

Transformer Scaling

Voltage PT

- **Primary**. Enter the first value from 1 to 50,000 for the PT (potential transformer) ratio (XXX:XXX), indicating the voltage rating at the high end of the transformer.
- **Secondary**. Enter the second value from 1 to 600.00 for the PT ratio (XXX:XXX), indicating the voltage rating at the low end of the transformer.

Current CT Scaling

- **Primary**. Enter the first value from 5 to 50,000 for the CT (current transformer) ratio (XXX:XXX), indicating the current rating at the high end of the transformer. The CT secondary is fixed at 5 amperes.

System PF Setting

This parameter sets the expected range of power factor for Wiring Diagnostics. For details, see "Wiring Diagnostics tab" (page 544).

Demand

Period length (minutes)

This parameter works with the Demand Source to configure the demand and projected demand calculations.

- **1 to 99**. The period for the projected demand values; if Demand source = "0: Internal timer", also the period for actual demand.
- **0**. Projected demand calculation is disabled; if Demand source = "0: Internal timer", all demand calculation is disabled.

Forced demand sync. delay

If Demand source ≠ 0 AND Period length ≠ 0 THEN this parameter determined how many minutes the unit waits for an end-of-interval (EOI) pulse, command or broadcast after the expected control pulse has not been received. If the EOI signal is not received before the waiting period expires, a new demand period starts and a record is entered in the status log.

- Range: 0 to 999; special case: 0 = Wait forever

Number of periods

Enter 1 to 15 to set the number of demand periods to be averaged.

Demand source

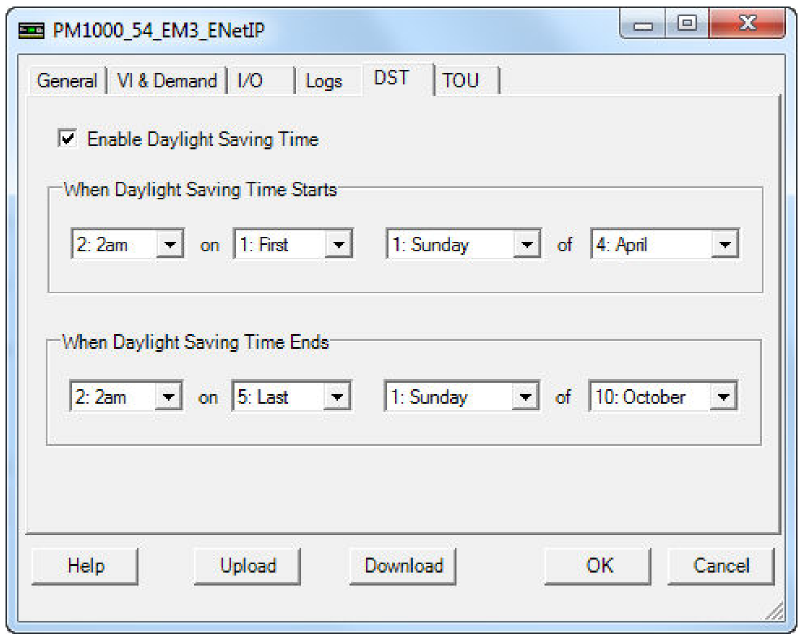
Selects the basis for the actual demand calculation. Select from:

- 0: Internal timer

- 1: Status input 2
- 2: Controller command
- 3: Ethernet demand broadcast

DST daylight saving time tab

PowerMonitor 1000 units may be configured to automatically adjust for daylight saving time. **DST** is disabled by default.



Fields

- **Enable DST**

  Enables the daylight saving time function
- **When Daylight Saving Time Starts**
  - **Start hour**

    Selects the hour of the day when DST begins. Range 0 = midnight, 1 = 1:00 a.m., ... , 23 = 11:00 p.m.

- **Start day instance**

  Selects which instance of the DST start day in the DST start month when DST begins. Range 1 = first, 2 = second, 3 = third, 4 = fourth, 5 = last

- **Start day**

  Selects the day of the week when daylight saving time begins. Range 0 = Sunday, 1 = Monday, ... , 7 = Saturday

- **Start month**

  Selects the calendar month when daylight saving time begins. Range 1 = January, 2 = February, ... , 12 = December

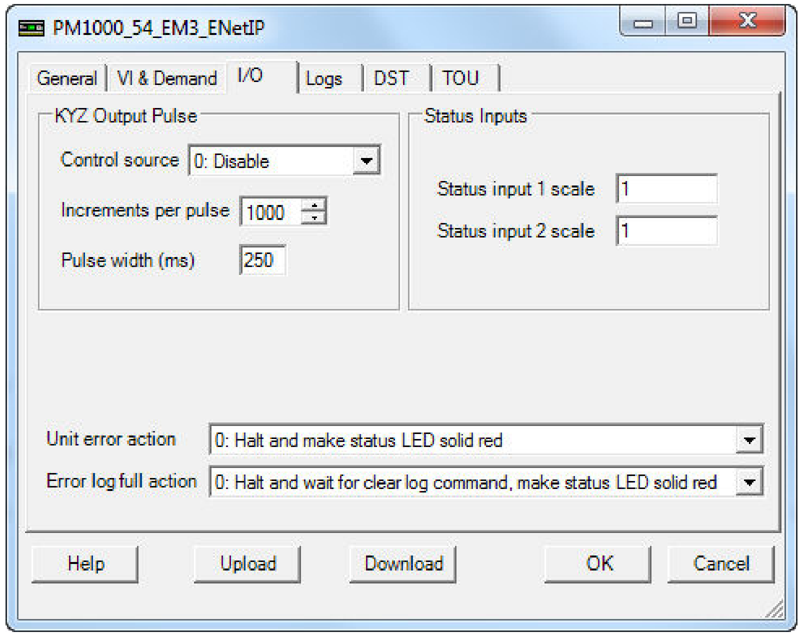
- **When Daylight Saving Time Ends**

  Configured the same as the start parameters above.

When enabled, the default start time is 2:00 a.m. on the second Sunday in March, and the default end time is 2:00 a.m. on the first Sunday in November.

I/O tab

This tab provides configuration selections for the PowerMonitor 1000 **status inputs and KYZ output**.



Status Inputs

Enter scaling factors for status input 1 and 2 pulse counters. Range: 1 to 1,000,000. Each false-to-true transition of a status input adds its scale factor to its counter. The counter rolls over to zero after counting up to 9,999,999.

KYZ Output Pulse

Select the following parameters for the KYZ output:

Control source

Selects which parameter is used to control the KYZ output

- 0: Disable
- 1: Wh Forward
- 2: Wh Reverse
- 3: VARh Forward

- 4: VARh Reverse
- 5: Vah

Increments per pulse

Defines how many increments of the metering parameter defined by Control source occur to pulse or transition the KYZ output. Enter a value from 1 to 100,000.

Pulse width

Sets the duration of the output pulse (in milliseconds). Enter a value from 50 to 1000 or set to zero for KYZ-style transition output.

Unit error action

Specifies the action to take when an internal error has been detected. An internal error can occur as a result of an extreme environmental condition or an internal firmware error. Select from the following choices:

- 0: Halt and make status LED solid red
- 1: Reset PowerMonitor 1000 hardware (default)

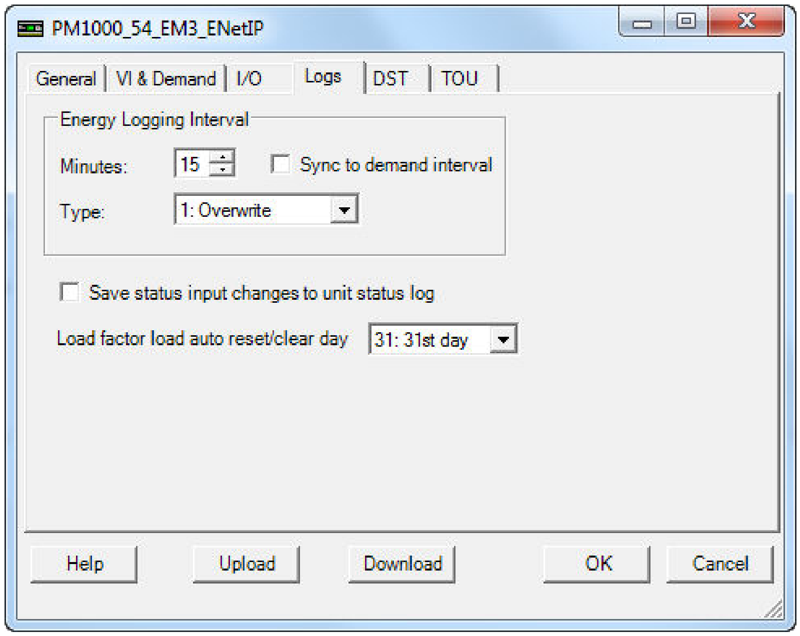
Error log full action

Specifies the action to take if the internal error log has filled. Select from the following choices:

- 0: Halt and wait for clear log command; make status LED solid red
- 1: Perform a firmware reset (default)

Logs tab

This sets various options for the Allen-Bradley 1408 Power-Monitor 1000 energy load factor, TOU and event **logs**.



Energy Logging Interval (EM1, EM2, EM3 only)

The energy log records a set of metered values at defined time intervals, and stored with date and time stamps. The size of the trend log is determined by the interval and type. For synchronous updating, use the Minutes and Seconds boxes to enter recording intervals for the log.

- Minutes: 1 to 60, 0 disables the energy log

Type

This identifies whether the energy log stops logging data when it becomes full or overwrites the oldest records and continues logging.

- **Overwrite**. This option continuously fills the trend log with updated records. When the log becomes full, it overwrites the oldest records.
- **Fill and stop**. This option fills the trend and then stops updating until the trend log is cleared. You can clear the log manually in the RT Device Viewer.

Save status input changes to unit status log

Select this check box to write status input activity to the unit status log. Clear the check box to NOT record input activity.

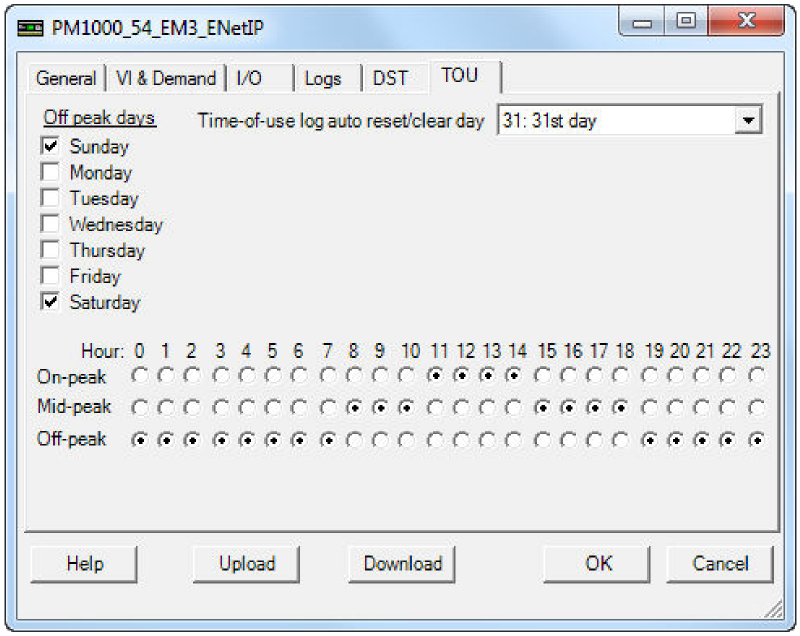
Load factor log auto reset/clear day (EM2, EM3 only)

Automatically stores the current peak, average, and load factor results as a record in the non-volatile load factor log and resets the log at the specified day of the month.

- 0 = Disables the auto clear feature.
- 1 = Store and clear the table on the 1st day of each month.
- 2 = 2nd day of the month.
- 3 = 3rd day of the month.
- 29 to 31 = Store and clear table on the last day of the month.

Time-of-Use tab

The **TOU** tab lets you set up a custom time-of-use (TOU) profile in the PowerMonitor 1000 for logging energy and demand into the TOU log.



Off-peak days

Select days that are defined as off-peak. All usage and demand that occurs on selected days is recorded in the off-peak field.

Peak, mid-peak and off-peak hours

Select hours for each TOU category according to the TOU provisions of your energy provider tariff. These selections apply only on days not selected as off-peak.

Time-of-use log auto reset/clear day (EM1, EM2, EM3 only)

- 1-31: Automatically pushes the in-process record into the monthly record stack on the selected day, then clears the in-process record. 29 through 31 are interpreted as the last day of the month.
- 0: Disables the auto-clear function.

Allen-Bradley Bulletin 1404 PowerMonitor 3000

To open the device configuration window:

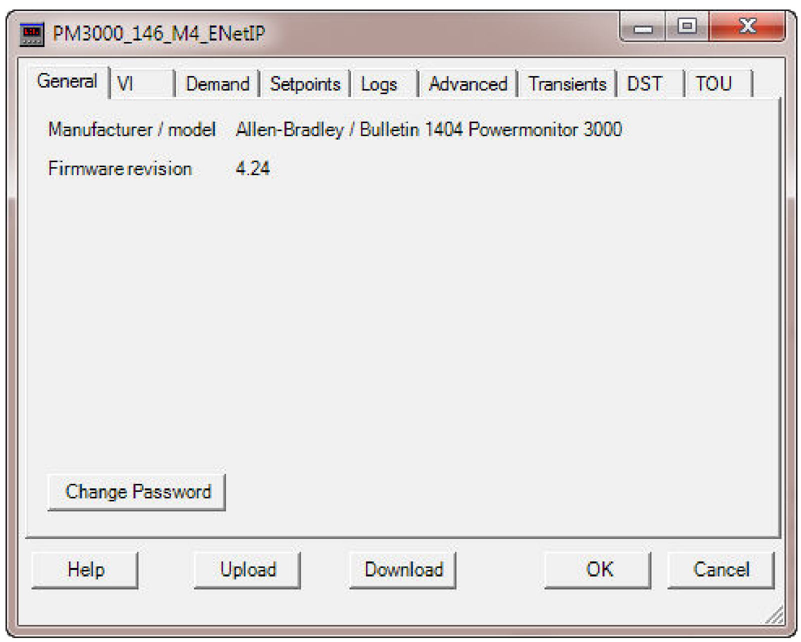
1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.



Important: Set up groups and power monitor devices before using RT to view or modify the power monitor configuration. There must be a valid password entered on the **Device Setup** page to change any configuration settings in the power monitor.

Buttons

OK

This saves the entries on all tabs to the database and closes the window.

Cancel

This cancels the entries from all tabs and closes the window.

Upload

This **uploads** configuration settings from the power monitor to RT. After uploading, click **OK**.

Upload

Transfers the configuration settings from a physical power monitor to the device configuration window.

Download

This **downloads** configuration settings from the database to the power monitor. After downloading, click **OK**.

Download

Transfers configuration settings from the device configuration window to a physical power monitor.

Tip: The first time you upload from a PowerMonitor 3000, it may be necessary to close and re-open the device configuration window in order to access all the functions provided by the PowerMonitor 3000 model.

General tab

Manufacturer/Model

This is "Allen-Bradley 1404" for the Bulletin 1404 PowerMonitor 3000.

Firmware Revision

This lists the firmware revision of the power monitor Master Module.

Change Password

This calls a window where the user can set the password in the power monitor.

Voltage/Current tab

This displays and sets operating parameters, including wiring mode, and current and voltage scaling (PT and CT ratios), for an Allen-Bradley 1404 PowerMonitor 3000.

Voltage Mode

From the list, select the mode that represents the power monitor wiring configuration. A wrong setting causes the power monitor to calculate incorrect values.

RMS Resolution

This controls how fast the power monitor updates measured values.

- **Nominal**. Allows for faster updates.
- **High**. Provides more accurate RMS results when significant level of harmonics is present.

RMS Results Averaging

Number of consecutive RMS results to average together.

- **No Averaging**. Provides the fastest response to signal change.
- **Last 8 Calculations**. Each RMS result is the average of the last 8 calculations; provides smoother output.

Frequency Averaging

Number of consecutive frequency to average together for calculating Average Frequency.

- **No Averaging**. Provides the fastest response to signal change.
- **Last 8 Calculations**. Each frequency result is the average of the last 8 calculations; provides smoother output.

Voltage (PT) Scaling

- **Primary**. Enter the first value from 1 to 10,000,000 for the PT (potential transformer) ratio (XXX:XXX), indicating the voltage rating at the high end of the transformer.
- **Secondary**. Enter the second value from 1 to 600 for the PT ratio (XXX:XXX), indicating the voltage rating at the low end of the transformer. This value also determines whether the master module uses high or low voltage input signals.

Current (CT) Scaling

- **Primary**. Enter the first value from 1 to 10,000,000 for the CT (current transformer) ratio (XXX:XXX), indicating the current rating at the high end of the transformer.

- **Secondary**. Enter the second value from 1 to 5 for the CT ratio (XXX:XXX), indicating the current rating at the low end of the transformer.
- Neutral Current (CT) Scaling
  - **Primary**. Enter the first value from 1 to 10,000,000 for the CT (current transformer) ratio (XXX:XXX), indicating the current rating at the high end of the transformer.
  - **Secondary**. Enter the second value from 1 to 5 for the CT ratio (XXX:XXX), indicating the current rating at the low end of the transformer.

Nominal Voltage

Enter a value that represents the nominal voltage of the system. This is used in conjunction with voltage sag and swell setpoints and applies in only the M6 and M8 models.

Enable Harmonics

This enables or disables the calculation of TIF, K-Factor, IEEE 519 and individual harmonic results (M6 and M8 only)

IEEE 519 Maximum Short Circuit Current

Enter a value that represents the maximum short circuit current - a parameter necessary for calculating compliance with IEEE-519.

IEEE 519 Maximum Demand/Load Current

Enter a value that represents the demand load current - a parameter necessary for calculating compliance with IEEE-519.

Demand tab

Demand Period Length

Enter the length of time to be used in calculating demand. To base demand calculations on an external pulse, see Pulse Input, below.

- **1 to 99**. The power monitor internal clock measures the period for both the actual and the projected demand values.
- **0**. An external pulse connected to the S2 Status Input defines the period for the actual demand values while disabling the projected demand values.

Demand Number of Periods

Enter 1 to 15 to set the number of demand periods to be averaged.

Predicted Demand Type

Selects the type of predicted demand calculation that is performed for demand measurement. Choose from Instantaneous, 1st Order or 2nd Order.

Pulse Input

- To base demand calculations on an external pulse, select the **Use Status Input #2 to define the Period** check box. An external pulse connected to the S2 Status Input defines the period for the actual demand values while using the internal clock for the projected demand values. To base demand calculations on the power monitor's internal clock, clear the check box.

Select the following parameters for each of the relay outputs:

Metering Parameter

Selects which parameter is used to control the relay output

- None
- Wh Forward
- Wh Reverse
- VARh Forward
- VARh Reverse
- Vah
- Ah

Increments per Pulse

Defines how many increments of the Metering Parameter must occur before the output is pulsed or transitions. Enter a value from 1 to 32767.

Pulse Width

Sets the duration of the output pulse (in milliseconds). Enter a value from 40 to 2000 or set to zero for KYZ-style toggle output.

Load Factor Log Auto Reset/Clear Day (M6/M8 only)

Automatically stores the current peak, average and load factor results as a record in the non-volatile load factor log and clears the peak and average demand values at the end of the specified day of each month.

If this parameter is set to 29 to 31 and the month does not contain that many days, the record will be saved on the last day of that month. The parameter may also be set to Disabled.

Setpoints tab

This establishes setpoint parameters for the 1404 PowerMonitor 3000. The power monitor uses setpoints to monitor many parameters at the same time and to generate alarms and control relays based on these parameter values. The M4/M5 models support up to 10 different setpoints and the M6/M8 up to 20 setpoints.

Caution: Allen-Bradley power monitors are NOT intended to function as protective relay devices.

Setpoint parameters

A setpoint is a group of seven parameters:

- **Setpoint Type**. This identifies which parameter to monitor. To select a parameter, click the arrow to the right in the Setpoint Type column. Click a parameter from the list to assign it to the setpoint.
- **Evaluation Condition**. Evaluates data and operates or releases relays based on **over forward**, **over reverse**, **under forward**, **under reverse**, **equal**, and **not equal** conditions.

Over forward setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An over forward setpoint becomes active when the monitored parameter exceeds the setpoint high limit in the positive direction, and remains over the limit for longer than the time specified in the Operate Delay setting. When a setpoint becomes active, it causes an action identified by the Action type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An over forward setpoint becomes inactive when the monitored parameter falls below the setpoint low limit in the positive direction, and remains below the limit for longer than the time specified in the Release Delay setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Over reverse setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An over reverse setpoint becomes active when the monitored parameter exceeds the setpoint high limit in the negative direction, and remains over the limit for longer than the time specified in the **Operate Delay** setting. When a setpoint becomes active, it causes an action identified by the **Action** type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An over reverse setpoint becomes inactive when the monitored parameter falls below the setpoint low limit in the negative direction, and remains below the limit for longer than the time specified in the **Release Delay** setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Under forward setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An under forward setpoint becomes active when the monitored parameter falls below the setpoint low limit in the positive direction, and remains below the limit for longer than the time specified in the **Operate Delay** setting. When a setpoint becomes active, it causes an action identified by the Action type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An under forward setpoint becomes inactive when the monitored parameter exceeds the setpoint high limit in the positive direction, and remains above the limit for longer than the time specified in the **Release Delay** setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Under reverse setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An under reverse setpoint becomes active when the monitored parameter falls below the setpoint low limit in the negative direction, and remains below the limit for longer than the time specified in the **Operate Delay** setting. When a setpoint becomes active, it causes an action identified by the **Action** type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An under reverse setpoint becomes inactive when the monitored parameter exceeds the setpoint high limit in the negative direction, and remains above the limit for longer than the time specified in the **Release Delay** setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Equal setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An equal setpoint becomes active when the monitored parameter equals the setpoint high limit. An equal setpoint becomes inactive when the monitored parameter does not equal the setpoint high limit. The equal setpoint is most useful for non-numeric values, such as phase rotation, IEEE-519 status, and status input states. When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Not equal setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

A not equal setpoint becomes active when the monitored parameter does not equal the setpoint high limit. A not equal setpoint becomes inactive when the monitored parameter equals the setpoint high limit. The not equal setpoint is most useful for non-numeric values, such as phase rotation, IEEE-519 status, and status input states.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **High Limit**. This is the value at which to trigger a setpoint action. It is not applicable for an equal or not equal setpoint.
- **Low Limit.** This is the value at which to trigger a setpoint action. It is not applicable for an equal or not equal setpoint.
- **Operate Delay.** This is the amount of time, in seconds, to wait before triggering a setpoint action after reaching the high limit for an over forward or over reverse setpoint condition, low limit for an under forward or under reverse setpoint condition, or true for an equal or not equal setpoint condition.
- **Release Delay.** This is the amount of time, in seconds, to wait before triggering a setpoint action after reaching the low limit for an over forward or over reverse setpoint condition, high limit for an under forward or under reverse setpoint condition, or false for an equal or not equal condition.

- **Action.** This is the This is the **action** that occurs when a setpoint condition is met.

Setpoint actions

Allen-Bradley Bulletin 1400 PowerMonitor:

- No action
- Energize relay 1
- Energize relay 2
- Energize relay 3
- Energize relay 4

Allen-Bradley Bulletin 1403 PowerMonitor II:

- No action
- Energize relay 1 and set alarm flag 1
- Energize relay 2 and set alarm flag 2
- Set corresponding alarm flags (flag 3 through flag 16)
- Trigger waveform
- Capture snapshot
- Clear kWh power counter
- Clear kVARh power counter

Allen-Bradley Bulletin 1404 PowerMonitor 3000:

- No action
- Energize relay and set alarm flag 1
- Energize KYZ and set alarm flag 2
- Set selected alarm flag 3 thru 16

- Save a trend log record
- Clear kWh, kVARh, kVAh or Ah result
- Clear all energy results
- Clear selected setpoint timer
- Capture oscillograph

Examples

Setpoint example 1: simple demand management

Setpoint example 1: Simple demand management

To configure setpoint 1 to energize output relay 1 when projected demand exceeds 100 kW for more than one second and de-energize relay 1 when projected demand falls below 90 kW for more than two seconds, you could use the following settings.

Setpoint number	1
Setpoint type	17 – Projected Watt Demand
Setpoint evaluation condition	Over forward
Setpoint high limit	100,000 watts
Setpoint low limit	90,000 watts
Setpoint action delay	1 second (M4, M5), 10 tenths of a second (M6, M8)
Setpoint release delay	2 seconds (M4, M5), 20 tenths of a second (M6, M8)
Setpoint action type	1 - Energize relay 1 and set alarm flag 1

Setpoint example 2: trigger an oscillograph

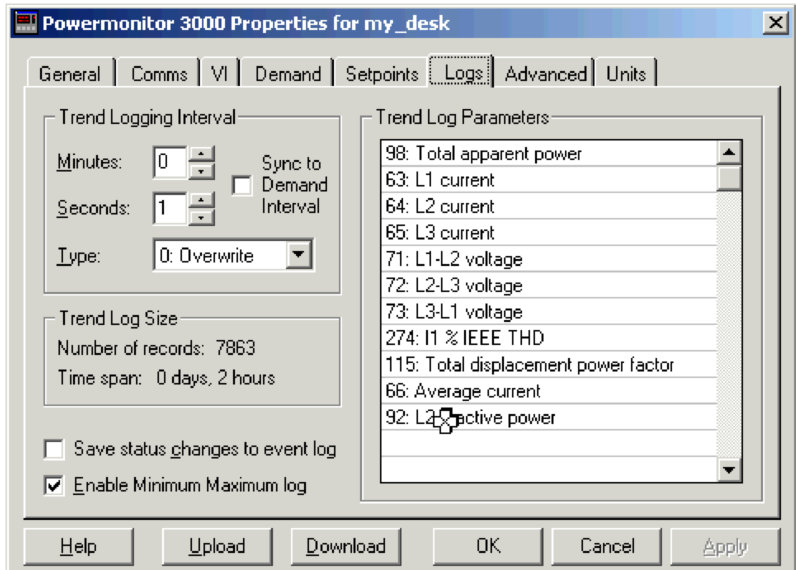
Example 2 – Oscillograph capture on demand

To use setpoint 3 to capture an oscillograph when you click a button connected to status input number 2, you could use these settings.

Setpoint number	3
Setpoint type	32 – Status input No. 2
Setpoint evaluation condition	Equal
Setpoint high limit	On
Setpoint low limit	Not used
Setpoint action delay	N/A (M4, M5), 5 tenths of a second (M6, M8)
Setpoint release delay	N/A (M4, M5), 5 tenths of a second (M6, M8)
Setpoint action type	43 - Capture oscillogram

Logs tab

This sets **various options** for the Allen-Bradley Bulletin 1404 PowerMonitor 3000 trend log, minimum/maximum log, and event log.



Trend Logging Interval

The trend log records between 1 and 16 values at defined time intervals or triggered by setpoints, and stored with date and time stamps. The size of the trend log is determined by the interval and type. For synchronous updating, use the Minutes and Seconds boxes to enter recording intervals for the log. For asynchronous updating, configure a setpoint to trigger a log record, and enter 0 in the **Minutes** and **Seconds** boxes.

- **Minutes**: 0 to 60.
- **Seconds**: 0 to 59.

Type

This identifies whether the trend log stops logging data when it becomes full or overwrites the oldest records and continues logging.

- **Overwrite**. This option continuously fills the trend log with updated records. When the log becomes full, it overwrites the oldest records.

- **Fill and Hold**. This option fills the trend and then holds those records and stops updating until the trend log is cleared. You can clear the log manually in the RT Device Viewer.

Trend Logging Parameters

Selects up to 16 parameters to record in the trend log. With DeviceNet PowerMonitor 3000s only 8 parameters can actually be read from the device.

To change a selection click the row that you want to change. Another window will pop up. Select a parameter and click **OK**.

Save Status Changes to Event Log

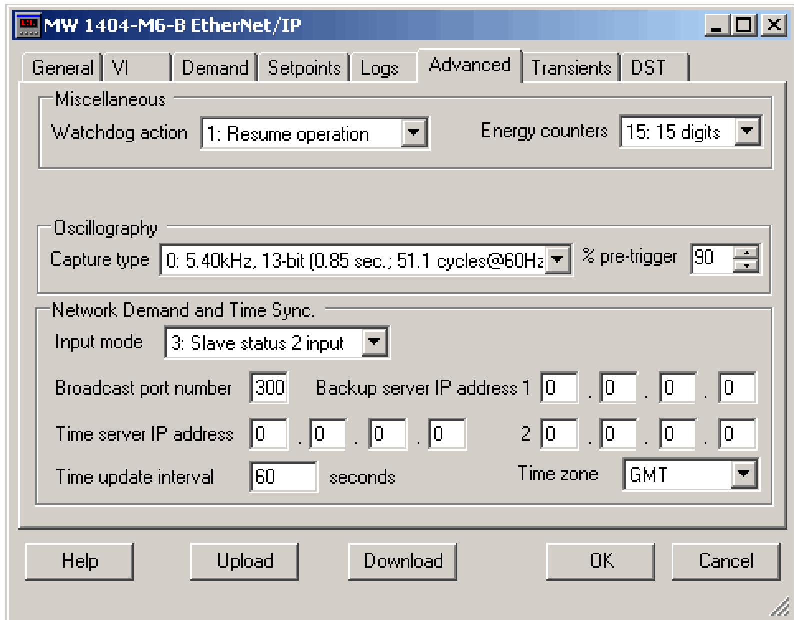
Select this check box to write input activity to the event log. Clear the check box to NOT record input activity.

Enable Min/Max Log

The Minimum/Maximum log records the minimum and maximum values for up to 74 parameters. The log updates continuously until it is cleared or until the log is disabled. Select the **Enable Min/Max Log** check box to continuously record minimum and maximum values. To stop recording in the log, clear the check box. Disabling the Min/Max log increases the real-time metering update rate by 10 milliseconds.

Advanced tab

This displays and sets **configuration options** for the following Allen-Bradley 1404 PowerMonitor 3000 functions:



Network demand and time synchronization

The Ethernet Series B PowerMonitor 3000 supports demand period synchronization via the Ethernet network. Demand period synchronization makes use of UDP (User Datagram Protocol) messaging. A power monitor may be configured as a Master or a Slave. A Master may be configured to receive an end-of-interval (EOI) signal either via a status input or a Controller Command. When a Master receives an EOI input, it broadcasts an EOI message to the configured Slaves.

Input Mode

Sets the unit network time sync mode. Select from the following options:

- 0: Master command input
- 1: Master status 2 input

- 2: Slave broadcast input
- 3: Slave status 2 input (default)

Broadcast port number

Defines the UDP port number for the master slave configuration. Range 300 to 400, default 300.

Series B Ethernet units support synchronization of their internal clocks from an SNTP server, at a configurable synchronization interval. Since SNTP servers operate in UTC (Universal Coordinated Time), a time zone for the PowerMonitor 3000 must also be configured for the correct time to be set. The time zone is configured as an offset in hours from UTC (formerly known as GMT). PowerMonitor 3000 units with master module firmware revision 2.5x or higher support backup time servers.

Time server IP address

The (primary) SNTP time server address

Backup server IP address 1 (MM FRN 2.5x only)

The first backup SNTP time server address

Backup server IP address 2 (MM FRN 2.5x only)

The second backup SNTP time server address

Time zone

Select a time zone in GMT +/- a number of hours from the list

Time set update interval

Determines how often the PowerMonitor 3000 time is set. Range: 0 to 32,766 seconds. 0 disables the time set function, default is 60 seconds.

Oscillography

Oscillography

Allen-Bradley Bulletin 1400 PowerMonitor

The power monitor samples the line voltages and line currents, at a rate of 128 samples per 60 Hz cycle. This allows the power monitor to have a 2-cycle waveform display.

Allen-Bradley Bulletin 1403 PowerMonitor II

The PowerMonitor II also samples line voltages and line currents, but at a rate of 10.8 kHz to generate waveform images of the line voltages and line currents. The 2-cycle display shows 2 cycles at 50 Hz, and the 12-cycle display shows 12 cycles at 50 Hz. The waveform image displays more cycles for line voltages and line currents at higher frequencies. The number of cycles displayed is scaled proportional to the frequency. The display includes the actual value of the pre-trigger number of cycles configured in the power monitor.

Example

Suppose you are monitoring a 60 Hz signal and want 6 cycles pre-triggered for any waveform image.

- The actual number of cycles for a 2-cycle display = 2 cycles x 60 Hz / 50 Hz = 2.4 cycles

- The actual number of cycles for a 12-cycle display = 12 cycles x 60 Hz / 50 Hz = 14.4 cycles

To set the pre-trigger number, pre-trigger = actual x 50 Hz / 6 x 50 Hz / 60 Hz = 5 cycles

Allen-Bradley Bulletin 1404 PowerMonitor 3000 (models M6, and M8)

The PowerMonitor 3000 provides 6 selections of sampling rate and data resolution.

Sampling Rate	Data Resolution	Samples per Cycle at 60 / 50 Hz	Total Cycles per Channel at 60 / 50 Hz	Capture Duration (seconds)
5.4 kHz	13-bit w/sign	90 / 108	51.1 / 42.6	0.85
2.7 kHz	45 / 54	102.2 / 85.2	1.70	
1.35 kHz	22.5 / 27	204.4 / 170.3	3.40	
5.4 kHz	7-bit w/sign	90 / 108	102.2 / 85.2	1.70
2.7 kHz	45 / 54	204.4 / 170.3	3.40	
1.35 kHz	22.5 / 27	408.8 / 340.7	6.81	

Capture Type

The different capture types allow you to adjust sample rate, magnitude resolution, and total cycles recorded for each capture. A higher sample rate allows for a more accurate representation of the waveform when higher-order harmonics and transients are present. A higher magnitude resolution provides more granularity of voltage or current magnitude for each data point. Capture Type 5 has a lower sample rate and magnitude resolution, but allows the user to capture 408 cycles of all 7 channels. The oscillography settings do not affect the resolution or sample rate of the data used for metering.

Capture type details

Capture Type	Sample Rate	Magnitude Resolution	Samples/Cycle @ 60 Hz	Cycles per Channel @ 60 Hz	Capture Duration (seconds)
0	5.4 kHz	13-bit w/sign	90	51.1	0.85
1	2.7 kHz	13-bit w/sign	45	102.2	1.70
2	1.35 kHz	13-bit w/sign	27.5	204.4	3.40
3	5.4 kHz	7-bit w/sign	90	102.1	1.70
4	2.7 kHz	7-bit w/sign	45	204.4	3.40
5	1.35 kHz	7-bit w/sign	27.5	408.8	6.81

% Pre-trigger

The Pre-Trigger parameter determines how much of the waveform is recorded by the power monitor prior to the event that caused the trigger. A pre-trigger setting of 100% causes all of the waveform data prior to the trigger event to be saved. A pre-trigger setting of 50% indicates half of the waveform data to be saved prior to the trigger event and half of the data to be saved after the trigger event.

Miscellaneous functions

Meter Result Set (M8 model only)

Select from the following choices:

- **All**. Calculate all metering results. New results are calculated every 50 milliseconds.
- **Transducer Mode**. Calculate only V, A, W, VAR, VA, true PF and frequency. New results are calculated every 30 milliseconds.
- **Energy Meter Mode**. Calculate only average V, average A, total W, frequency and kWh net. New results are calculated every 30 milliseconds.

Watchdog Action

Specifies the action to take when an internal watchdog timeout has occurred. A watchdog timeout can occur as a result of an extreme environmental condition or an internal firmware error. Select from the following choices:

- **Resume Operation**. Restart the firmware, log an event and resume operation.
- **Stop Operation**. Restart the firmware, log an event, stop metering, and disable all functionality except the Display Module and communications. For applications that use the PM3000 for control it is recommended to stay with the default (Resume Operation).

Energy Counters

Specifies the number of decimal digits that energy results accumulate to before rollover over to zero. All **energy counters** are affected (Wh. VARh, Vah, Ah). Choose from four to fifteen digits.

Setting energy counters

To set an energy counter:

1. From the **Set Counters** list, select either **kWh** or **kVARh**.
2. In the **New Value** box, enter a cumulative value.
3. From the list to the right, select a unit of measure.

k	Kilo (*103)
M	Mega (*106)
G	Giga (*109)
T	Tera (*1012)
P	Peta (*1015)

4. Click **Set Value**.

Transients tab (M8 model only)

This sets configuration options for the Allen-Bradley 1404 Power-Monitor 3000 M8 transient capture feature, which includes:

- Simultaneous capture of all seven voltage and current channels when a transient is detected.
- Up to 6 captures and metering results stored in non-volatile memory.
- Captures 6 cycles of pre-trigger data and 6 cycles of post-trigger data.
- 13-bit w/sign resolution.

Detection Mode

This determines what inputs the M8 will monitor for transients. Select from the following choices:

- Disable Transient Detection
- Enable Transient Detection on Voltage Channels Only (recommended)
- Enable Transient Detection on Current Channels Only

Auto Threshold Set Duration

This specifies the time (in seconds) to average the transient index as part of the auto calculation for voltage trip threshold and current trip threshold. Enter any value from 1 to 3600 seconds.

Auto Threshold Set Margin

This is used to calculate the voltage trip threshold and current trip threshold when an auto threshold set is performed. This specifies the percent auto margin to add to the average transient index. Enter any value from 1 to 100%.

Voltage Trip Threshold

This specifies the severity of an asymmetrical transient on one of the voltage channels that will cause a capture and analysis of the waveform containing the transient. Enter any value from 0.1 to 100 volts.

Current Trip Threshold

This specifies the severity of an asymmetrical transient on one of the current channels that will cause a capture and analysis of the waveform containing the transient. Enter any value from 0.1 to 100 volts.

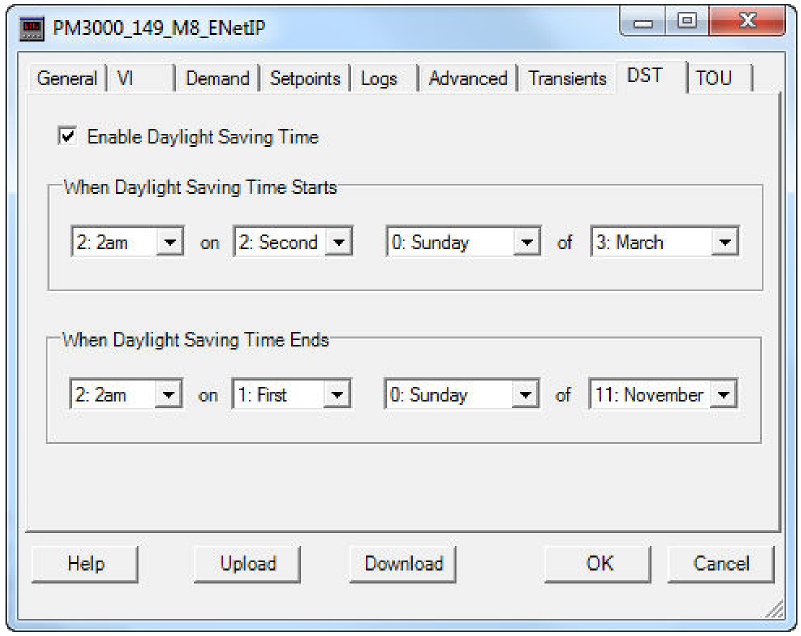
Auto Threshold Set

This button is used to automatically set a new voltage trip threshold and current trip threshold. When this button is pressed, the M8 determines the average transient index over a period of time specified by the Auto Threshold Set Duration parameter, adds a percentage of this average specified by the Auto Threshold Set Margin then sets the thresholds to these new values. The M8 only calculates threshold for enabled channels (for example, if Detection Mode is set to Enable Transient Detection on Voltage Channels Only then the M8 will calculate threshold only for the voltage channels).

After pressing this button you must wait the number of seconds specified by the Auto Threshold Set Duration parameter and then perform an upload from the M8 to see the calculated threshold values.

DST daylight saving time tab

PowerMonitor 3000 units may be configured to automatically adjust for daylight saving time. **DST** is disabled by default.



Fields

- **Enable DST**

  Enables the daylight saving time function. Range 0 = disable, 1 = enable

- **When Daylight Saving Time Starts**
  - **Start hour**

    Selects the hour of the day when DST begins. Range 0 = midnight, 1 = 1:00 a.m., … , 23 = 11:00 p.m.

  - **Start day instance**

    Selects which instance of the DST start day in the DST start month when DST begins. Range 1 = first, 2 = second, 3 = third, 4 = fourth, 5 = last

  - **Start day**

    Selects the day of the week when daylight saving time begins. Range 0 = Sunday, 1 = Monday, ... , 7 = Saturday

  - **Start month**

    Selects the calendar month when daylight saving time begins. Range 1 = January, 2 = February, ... , 12 = December

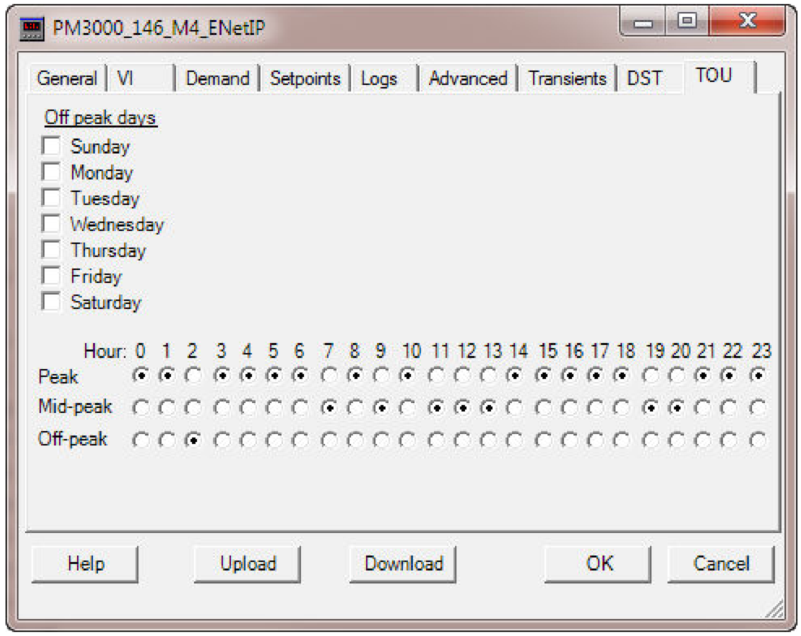
- **When Daylight Saving Time Ends**

  Configured the same as the start parameters above.

DST is disabled by default. When enabled, the default start time is 2:00 a.m. on the second Sunday in March, and the default end time is 2:00 a.m. on the first Sunday in November.

TOU tab

This tab lets you set up a custom time-of-use (TOU) profile in the PowerMonitor 3000 for logging energy and demand into the TOU log.



Off-peak days

Select days that are defined as off-peak. All usage and demand that occurs on selected days is recorded in the off-peak field.

Peak, mid-peak and off-peak hours

Select hours for each TOU category according to the TOU provisions of your energy provider tariff. These selections apply only on days not selected as off-peak.

Allen-Bradley Bulletin 1403 PowerMonitor II

To open the device configuration window:

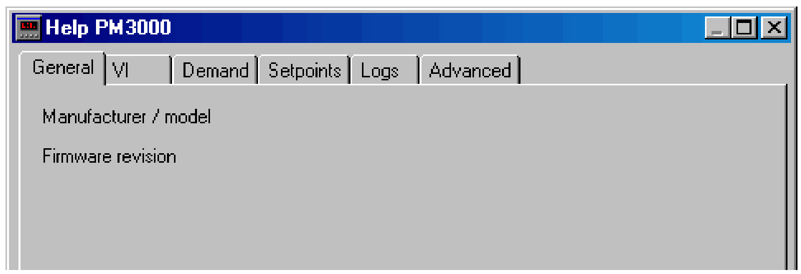
1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.



Important: You must configure groups and power monitor devices in the project before using RT to view or modify the power monitor configuration.

There must be a valid password entered on the **Device Setup** page to change any configuration settings in the power monitor.

Buttons

OK

This saves the entries on all tabs to the database and closes the window.

Cancel

This cancels the entries from all tabs and closes the window.

Upload

This **uploads** configuration settings from the power monitor to RT. After uploading, click **OK**.

Upload

Transfers the configuration settings from a physical power monitor to the device configuration window.

Download

This **downloads** configuration settings from the database to the power monitor. After downloading, click **OK**.

Download

Transfers configuration settings from the device configuration window to a physical power monitor.

General tab

Manufacturer/Model

This is "Allen-Bradley 1403" for the 1403 PowerMonitor II. If the power monitor is an LM version, "LM" will appear in this field.

Firmware Revision

This is the firmware revision of the power monitor and the power monitor communications card.

Device ID

This is the factory-assigned identification number of the power monitor stored in the power monitor firmware.

Change Password

This button calls a window where the user can set the password in the power monitor.

Voltage/Current tab

This displays and sets operating parameters, including wiring mode, and current and voltage scaling (PT and CT ratios), for a 1403 PowerMonitor II.

Voltage Mode

From the list, select the mode that represents the power monitor wiring configuration. A wrong setting causes the power monitor to calculate incorrect values.

Vaux Voltage Mode

Select AC or DC

Filter Mode

Enter a number from 1 to 3 to set the update rate. The number entered controls how fast the power monitor updates measured values.

- 1 - Fastest update rate (28 msec nominal).
- 2 - Default update rate.
- 3 - Slowest update rate (90 msec nominal) for best accuracy with harmonics.

IEEE 519 Maximum Short Circuit Current

Enter a number from 0 to 10,000,000. This value represents the maximum short circuit current - a parameter necessary for calculating compliance with IEEE-519.

IEEE 519 Maximum Demand/Load Current

Enter a number from 0 to 10,000,000. This value represents the demand load current - a parameter necessary for calculating compliance with IEEE-519.

Voltage (PT) Scaling

- **Primary**. Enter the first value from 1 to 10,000,000 for the PT (potential transformer) ratio (XXX:XXX), indicating the voltage rating at the high end of the transformer.
- **Secondary**. Enter the second value from 1 to 600 for the PT ratio (XXX:XXX), indicating the voltage rating at the low end of the transformer. This value also determines whether the master module uses high or low voltage input signals.

Current (CT) Scaling

- **Primary**. Enter the first value from 1 to 10,000,000 for the CT (current transformer) ratio (XXX:XXX), indicating the current rating at the high end of the transformer.
- **Secondary**. Enter the second value from 1 to 5 for the CT ratio (XXX:XXX), indicating the current rating at the low end of the transformer.

Analog input Vaux (PT) Scaling

- **Primary**. Enter the first value from 1 to 10,000,000 for the Vaux ratio (XXX:XXX), indicating the voltage rating at the high end of the transformer.
- **Secondary**. Enter the second value from 1 to 999 for the Vaux ratio (XXX:XXX), indicating the voltage rating at the low end of the transformer. This value also determines

whether the master module uses high or low voltage input signals.

Neutral Current (CT) Scaling

- **Primary**. Enter the first value from 1 to 10,000,000 for the CT (current transformer) ratio (XXX:XXX), indicating the current rating at the high end of the transformer.
- **Secondary**. Enter the second value from 1 to 5 for the CT ratio (XXX:XXX), indicating the current rating at the low end of the transformer.

Demand tab

This displays and sets demand parameters and output pulse parameters for an Allen-Bradley 1403 PowerMonitor II.

Demand Period Length

Enter the length of time to be used in calculating demand. To base demand calculations on an external pulse, see Pulse Input, below.

- **1 to 99**. The power monitor internal clock measures the period for both the actual and the projected demand values.
- **0**. An external pulse connected to the S4 Status Input defines the period for the actual demand values while disabling the projected demand values.

Demand Number of Periods

Enter 1 to 15 to set the number of demand periods to be averaged.

Disable Predicted Demand Values

Select this to disable calculation of predicted demand.

Pulse Input

- To base demand calculations on an external pulse, select the **Use Status Input #4 to define the Period** check box. An external pulse connected to the S4 Status Input defines the period for the actual demand values while using the internal clock for the projected demand values. To base demand calculations on the power monitor's internal clock, clear the check box.

Output pulse

Select the following parameters for each of the relay outputs:

Metering Parameter

Selects which parameter is used to control the relay output

- None
- Wh Forward
- Wh Reverse
- VARh Forward
- VARh Reverse
- Vah
- Ah

Increments per Pulse

Defines how many increments of the Metering Parameter must occur before the output is pulsed or transitions. Enter a value from 1 to 32767.

Pulse Width

Sets the duration of the output pulse (in milliseconds). Enter a value from 40 to 2000 or set to zero for KYZ-style transition output.

Setpoints tab

This establishes setpoint parameters for the 1403 PowerMonitor II. The power monitor uses setpoints to monitor many parameters at the same time and to generate alarms and control relays based on these parameter values. The PowerMonitor II supports up to 20 different setpoints.

Caution: Allen-Bradley power monitors are NOT intended to function as protective relay devices.

Setpoint parameters

A setpoint is a group of seven parameters:

- **Setpoint Type.** This identifies which parameter to monitor. To select a parameter, click the arrow to the right in the Setpoint Type column. Click a parameter from the list to assign it to the setpoint.
- **Evaluation Condition.** Evaluates data and operates or releases relays based on **over forward**, **over reverse**, **under forward**, **under reverse**, **equal**, and **not equal** conditions.

Over forward setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An over forward setpoint becomes active when the monitored parameter exceeds the setpoint high limit in the positive direction, and remains over the limit for longer than the time specified in the Operate Delay setting. When a setpoint becomes active, it causes an action identified by the Action type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An over forward setpoint becomes inactive when the monitored parameter falls below the setpoint low limit in the positive direction, and remains below the limit for longer than the time specified in the Release Delay setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Over reverse setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An over reverse setpoint becomes active when the monitored parameter exceeds the setpoint high limit in the negative direction, and remains over the limit for longer than the time specified in the **Operate Delay** setting. When a setpoint becomes active, it causes an action identified by the **Action** type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

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An equal setpoint becomes active when the monitored parameter equals the setpoint high limit. An equal setpoint becomes inactive when the monitored parameter does not equal the setpoint high limit. The equal setpoint is most useful for non-numeric values, such as phase rotation, IEEE-519 status, and status input states. When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Not equal setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

A not equal setpoint becomes active when the monitored parameter does not equal the setpoint high limit. A not equal setpoint becomes inactive when the monitored parameter equals the setpoint high limit. The not equal setpoint is most useful for non-numeric values, such as phase rotation, IEEE-519 status, and status input states.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **High Limit.** This is the value at which to trigger a setpoint action. It is not applicable for an equal or not equal setpoint.
- **Low Limit**. This is the value at which to trigger a setpoint action. It is not applicable for an equal or not equal setpoint.
- **Operate Delay.** This is the amount of time, in seconds, to wait before triggering a setpoint action after reaching the high limit for an over forward or over reverse setpoint condition, low limit for an under forward or under reverse setpoint condition, or true for an equal or not equal setpoint condition.
- **Release Delay.** This is the amount of time, in seconds, to wait before triggering a setpoint action after reaching the low limit for an over forward or over reverse setpoint condition, high limit for an under forward or under reverse setpoint condition, or false for an equal or not equal condition.

- **Action.** This is the **action** that occurs when a setpoint condition is met.

Setpoint actions

Allen-Bradley Bulletin 1400 PowerMonitor:

- No action
- Energize relay 1
- Energize relay 2
- Energize relay 3
- Energize relay 4

Allen-Bradley Bulletin 1403 PowerMonitor II:

- No action
- Energize relay 1 and set alarm flag 1
- Energize relay 2 and set alarm flag 2
- Set corresponding alarm flags (flag 3 through flag 16)
- Trigger waveform
- Capture snapshot
- Clear kWh power counter
- Clear kVARh power counter

Allen-Bradley Bulletin 1404 PowerMonitor 3000:

- No action
- Energize relay and set alarm flag 1
- Energize KYZ and set alarm flag 2
- Set selected alarm flag 3 thru 16

- Save a trend log record
- Clear kWh, kVARh, kVAh or Ah result
- Clear all energy results
- Clear selected setpoint timer
- Capture oscillograph

Log/Oscillography tab

This sets scanning and trigger options for the Allen-Bradley Bulletin 1403 PowerMonitor IIsnapshot log, minimum/maximum log, and oscillography. The PowerMonitor II samples line voltages and line currents at a rate of 10.8 kHz to generate waveform images of the voltages and line currents. The 2-cycle display shows 2 cycles at 50 Hz, and the 12-cycle display shows 12 cycles at 50 Hz.

The Bulletin 1403-LM version does not support oscillography, harmonics bar graph view, or the harmonics spreadsheet view.

Snapshot Log Rate

The snapshot log contains voltage, current, and power values recorded at defined time intervals or triggered by setpoints, and stored with date and time stamps. The snapshot log holds 50 records, and each record includes 46 parameters. For synchronous updating, use the Hours, Minutes, and Seconds boxes to enter scanning intervals for the log. For asynchronous updating, configure a setpoint to trigger a snapshot, and enter 0 in the Hours, Minutes, and Seconds boxes.

- Hours. 0 to 99.
- Minutes. 0 to 59.
- Seconds. 0 to 59.

Buffer Type

This identifies whether the snapshot log stops logging data when it reaches 50 records or overwrites the oldest records and continues logging.

- **Circular**. This option continuously fills the snapshot log with updated records. When the log reaches 50 records, it overwrites the oldest records.
- **Fill and Hold**. This option fills the snapshot log with 50 records, and then holds those records and stops updating until the snapshot log is cleared. You can clear the log manually in the RT Device Viewer.

Save status changes to Event Log

Select this check box to write status change activity to an event log. Clear the check box to NOT record status changes.

Enable Min/Max Log

The minimum/maximum log records the minimum and maximum values for up to 84 parameters. The log updates continuously until it is cleared or until the log is disabled. Select the **Enable Min/Max Log** check box to continuously record minimum and maximum values. To stop recording in the log, clear the check box. Disabling the min/max log increases the real-time metering update rate by 10 milliseconds.

The Bulletin 1403-LM supports fewer parameters; if a parameter is not supported, its description appears as N/A.

Oscillography

Oscillography

Allen-Bradley Bulletin 1400 PowerMonitor

The power monitor samples the line voltages and line currents, at a rate of 128 samples per 60 Hz cycle. This allows the power monitor to have a 2-cycle waveform display.

Allen-Bradley Bulletin 1403 PowerMonitor II

The PowerMonitor II also samples line voltages and line currents, but at a rate of 10.8 kHz to generate waveform images of the line voltages and line currents. The 2-cycle display shows 2 cycles at 50 Hz, and the 12-cycle display shows 12 cycles at 50 Hz. The waveform image displays more cycles for line voltages and line currents at higher frequencies. The number of cycles displayed is scaled proportional to the frequency. The display includes the actual value of the pre-trigger number of cycles configured in the power monitor.

Example

Suppose you are monitoring a 60 Hz signal and want 6 cycles pre-triggered for any waveform image.

- The actual number of cycles for a 2-cycle display = 2 cycles x 60 Hz / 50 Hz = 2.4 cycles
- The actual number of cycles for a 12-cycle display = 12 cycles x 60 Hz / 50 Hz = 14.4 cycles

To set the pre-trigger number, pre-trigger = actual x 50 Hz / 6 x 50 Hz / 60 Hz = 5 cycles

Allen-Bradley Bulletin 1404 PowerMonitor 3000 (models M6, and M8)

The PowerMonitor 3000 provides 6 selections of sampling rate and data resolution.

Sampling Rate	Data Resolution	Samples per Cycle at 60 / 50 Hz	Total Cycles per Channel at 60 / 50 Hz	Capture Duration (seconds)
5.4 kHz	13-bit w/sign	90 / 108	51.1 / 42.6	0.85
2.7 kHz	45 / 54	102.2 / 85.2	1.70	
1.35 kHz	22.5 / 27	204.4 / 170.3	3.40	
5.4 kHz	7-bit w/sign	90 / 108	102.2 / 85.2	1.70
2.7 kHz	45 / 54	204.4 / 170.3	3.40	
1.35 kHz	22.5 / 27	408.8 / 340.7	6.81	

The Allen-Bradley Bulletin 1403 PowerMonitor II and RT provide several options for triggering and displaying oscillographs. Those options are:

- Manual triggering and display of 2-cycle oscillographs in RT.
- Configuring setpoints in the power monitor using RT to trigger 2-cycle oscillographs, and then displaying the resulting waveform images in RT.
- Configuring options in RT to trigger and display 12-cycle oscillographs for up to 2 voltage or current parameters. See below. below.

Channel A 12 Cycle

From the list, select a voltage or current parameter for which you want to generate and display 12-cycle oscillographs. You can manually trigger and display 12-cycle oscillographs in RT.

Channel B 12 Cycle

From the list, select a voltage or current parameter for which you want to generate and display 12-cycle oscillographs. You can manually trigger and display 12-cycle waveform images in RT.

Pre-trigger Number of Cycles

This works with the 12-cycle waveform option. Enter a number from 1 through 8 to set the number of backlogged cycles to be included with a waveform display in RT. For example, if you set 4 as the pre-trigger, when you trigger a waveform in RT, the resulting display shows a full 12 cycles (assuming a 50 Hz signal). The first 4 waveform cycles represent the last 4 cycles saved in memory before the waveform was triggered. The next 8 cycles represent real-time data as of the moment the waveform was triggered.

Like the 12-cycle waveform, the pre-trigger value is also based on a 50 Hz signal. If you change the frequency, the power monitor scales the number of oscillographs accordingly.

To disable the pre-trigger, enter 0. Disabling the pre-trigger slightly increases the real-time metering update rate.

Oscillography Buffer Type

From the list, select either:

- **Hold**. This holds a waveform and does not allow another waveform to trigger until the hold is manually cleared. A held waveform can be cleared manually using RT.
- **Overwrite**. This overwrites a held waveform each time a new waveform triggers.

Log/Oscillograph tab for FRN 3.00 and later

This sets scanning and trigger options for the Allen-Bradley Bulletin 1403 PowerMonitor II snapshot log, minimum/maximum log, and waveforms. The PowerMonitor II samples line voltages and line currents at a user-selectable rate of 2.7 kHz, 5.4 kHz or 10.8 kHz to generate waveform images of the voltages and line currents. Up to two waveform captures may be stored simultaneously.

The 1403-LM version does not support waveform capture, harmonics bar graph view, or the harmonics spreadsheet view.

Snapshot Log Rate

The snapshot log contains 1 to 46 voltage, current, and power values recorded at defined time intervals or triggered by setpoints, and stored with date and time stamps. The snapshot log holds a variable number of records depending on how many parameters are being logged. For synchronous updating, use the Hours, Minutes, and Seconds boxes to enter scanning intervals for the log. For asynchronous updating, configure a setpoint to trigger a snapshot, and enter 0 in the Hours, Minutes, and Seconds boxes.

- Hours. 0 to 99.
- Minutes. 0 to 59.
- Seconds. 0 to 59.

Buffer Type

This identifies whether the snapshot log stops logging data when it becomes full or overwrites the oldest records and continues logging.

- **Circular**. This option continuously fills the snapshot log with updated records. When the log becomes full, it overwrites the oldest records.
- **Fill and Hold**. This option fills the snapshot log, and then holds those records and stops updating until the snapshot log is cleared. You can clear the log manually in the RT Device Viewer.

Snapshot Log Type

This controls how many parameters the snapshot log records. In the "1 parameter" mode, one user-selectable parameter is logged. In the "3 & 7 parameters" mode, three user-selectable parameters and four predefined parameters are logged. In all other modes, all of the parameters are always predefined.

Snapshot Log Parameters 1, 2 and 3

This identifies which parameters will be logged to the snapshot log. These selections are only available with the "1 parameter" and "3 & 7 parameters" snapshot log types.

The Status Input #1 to #4 Counter parameters are only available with MM firmware release 3.05 and later.

Log Activity on Inputs

Select this check box to write input activity to an event log. Clear the check box to NOT record input activity.

Enable Min/Max Log

The minimum/maximum log records the minimum and maximum values for up to 84 parameters. The log updates continuously until it is cleared or until the log is disabled. Select the **Enable Min/Max Log** check box to continuously record minimum and maximum values. To stop recording in the log, clear the check box. Disabling the Min/Max log increases the real-time metering update rate by 10 milliseconds.

The Bulletin 1403-LM supports fewer parameters; if a parameter is not supported, its description appears as N/A.

Oscillography

Oscillography

Allen-Bradley Bulletin 1400 PowerMonitor

The power monitor samples the line voltages and line currents, at a rate of 128 samples per 60 Hz cycle. This allows the power monitor to have a 2-cycle waveform display.

Allen-Bradley Bulletin 1403 PowerMonitor II

The PowerMonitor II also samples line voltages and line currents, but at a rate of 10.8 kHz to generate waveform images of the line voltages and line currents. The 2-cycle display shows 2 cycles at 50 Hz, and the 12-cycle display shows 12 cycles at 50 Hz. The waveform image displays more cycles for line voltages and line currents at higher frequencies. The number of cycles displayed is scaled proportional to the frequency. The display includes the actual value of the pre-trigger number of cycles configured in the power monitor.

Example

Suppose you are monitoring a 60 Hz signal and want 6 cycles pre-triggered for any waveform image.

- The actual number of cycles for a 2-cycle display = 2 cycles x 60 Hz / 50 Hz = 2.4 cycles
- The actual number of cycles for a 12-cycle display = 12 cycles x 60 Hz / 50 Hz = 14.4 cycles

To set the pre-trigger number, pre-trigger = actual x 50 Hz / 6 x 50 Hz / 60 Hz = 5 cycles

Allen-Bradley Bulletin 1404 PowerMonitor 3000 (models M6, and M8)

The PowerMonitor 3000 provides 6 selections of sampling rate and data resolution.

Sampling Rate	Data Resolution	Samples per Cycle at 60 / 50 Hz	Total Cycles per Channel at 60 / 50 Hz	Capture Duration (seconds)
5.4 kHz	13-bit w/sign	90 / 108	51.1 / 42.6	0.85
2.7 kHz	45 / 54	102.2 / 85.2	1.70	
1.35 kHz	22.5 / 27	204.4 / 170.3	3.40	
5.4 kHz	7-bit w/sign	90 / 108	102.2 / 85.2	1.70
2.7 kHz	45 / 54	204.4 / 170.3	3.40	
1.35 kHz	22.5 / 27	408.8 / 340.7	6.81	

The and RT provide several options for triggering and displaying oscillographs. Those options are:

- Manual triggering and display of oscillographs in RT.
- Configuring setpoints in the power monitor using RT to trigger oscillographs and then displaying the resulting waveform images in RT.

Oscillography Type

This controls the waveform capture sampling rate and number of captures stored in the power monitor.

Pre-trigger Number of Cycles

Select from 1 through 8 to set the number of backlogged cycles to be included with a waveform display in RT.

To disable the pre-trigger, enter 0. Disabling the pre-trigger slightly increases the real-time metering update rate.

Oscillography Buffer Type

From the list, select either:

- **Hold**. This holds a waveform and does not allow another waveform to trigger until the hold is manually cleared or the Oscillography Overwrite Timeout expires. A held waveform can be cleared manually using RT.
- **Overwrite**. This overwrites a held waveform each time a new waveform triggers.

Oscillography Overwrite Timeout

If the Oscillography Buffer Timeout is set to "Overwrite" mode, a new oscillograph cannot be initiated until the Overwrite Timeout expires. Enter a value of from 1 to 4320 (seconds).

Adjusting the metering update rate

The 1403 PowerMonitor II provides several configuration options for increasing the metering update rate of the hardware. You can do any or all of the following:

- Select the fastest update rate (28 msec nominal). This provides the fastest update speed with the lowest accuracy. For highest accuracy, select the slowest update rate.

- Disable 12-cycle waveform pre-triggers. The pre-trigger identifies the number of backlogged cycles included with a 12-cycle waveform display in the Device Viewer window.
- Disable minimum/maximum logging.

To increase the metering update rate:

1. In the device configuration window for the power meter, click the **Current/Voltage** tab.
2. In the **Filter Mode** box, type 1 to select the fastest update rate.
3. Click the **Log/Wave** tab.
4. In the **Pre-trigger Number of Cycles** box, type 0 to disable 12-cycle waveform pre-triggers.
5. Clear the **Enable Min/Max Log** check box to disable minimum/maximum logging.
6. Click **Download**, and then click **OK**.

   Download

   Transfers configuration settings from the device configuration window to a physical power monitor.

Tip: For RS232 and RS485 **serial communications**, if opening PowerMonitor II runtime data seems extremely slow, try changing the number of retries in the DF1 Polling Master to 1. To accomplish this, in RSLinx Classic go to Protocol Settings in the DF1 Polling Master driver. Set Qty Retries to 1.

Serial communications

RS232 offers point-to-point serial communications with only one power monitor at a maximum distance of 50 feet. To communicate over distances greater than 50 feet, or to communicate with multiple power monitors via the same serial port, use RS485 serial communications. Using RS485 communications requires either an external RS232-RS485 converter or an internal RS485 serial card installed in the computer.

Set up serial communications using the appropriate RSLinx Classic driver.

Tip: If you are using the 1403-NSC communications card with firmware revision 1.03 or later, the PowerMonitor II configuration window includes an option to set the **Communications card data format**. Typically, the Floating Point data format provides faster update times.

Communications card data format

Applies to the Bulletin 1403 PowerMonitor II. Available only with the 1403-NSC Smart Communications Card firmware revision 1.03 or later or with the 1404-NENET Ethernet Communications Card.

Data format options include:

- **Integer - Exponent**. Values from data tables are communicated as single words, when possible. However, if a value is larger than a single word of data, then the value is converted into two words using the following formula:

  The first word is the mantissa value. The second word is the exponent value for the power of ten. For example, if the value is 10,000, then the first word is 10 and the second word is 3 (10 * 10 ^ 3). Converting values into exponents can slow down communications speed.

- **Floating Point**. Values from data tables are communicated as the two words that make up the IEEE floating point double word.

Caution: Changing the data format setting may affect ladder logic programs that access data in the PowerMonitor II hardware. For example, if the ladder is programmed for integer-exponent values, changing the PowerMonitor II communications card data format to floating point will not work correctly without also changing the ladder logic programming.

Selecting a data format automatically writes data to the Communications Setup table in the PowerMonitor II. This stops ALL communications to the PowerMonitor II for about 60 seconds, while the hardware resets. Avoid downloading to the PowerMonitor II and avoid allowing other computers to communicate with the PowerMonitor II while communications are suspended and the hardware resets.

Allen-Bradley Bulletin 1400 PowerMonitor

To open the device configuration window:

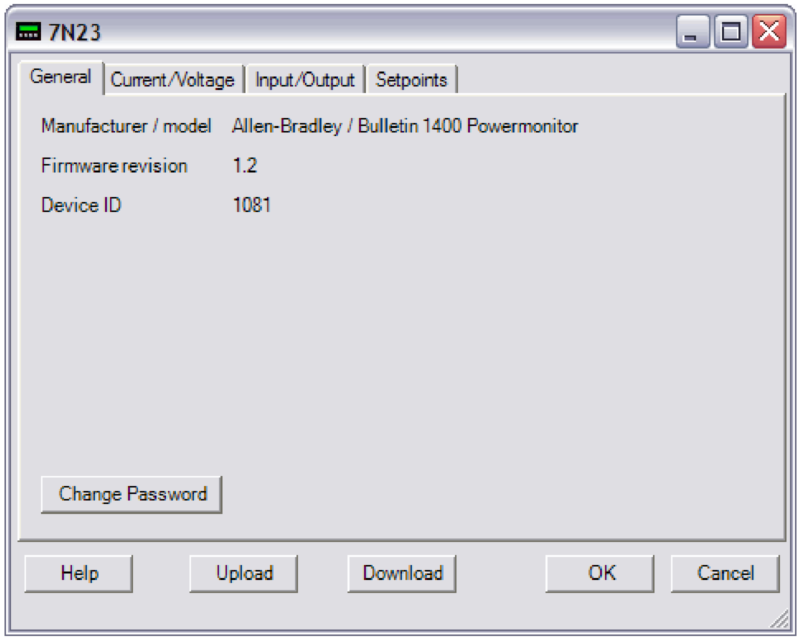
1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.



Important: You must configure groups and power monitor devices before using RT to view or modify the power monitor configuration.

There must be a valid password entered on the **Device Setup** page to change any configuration settings in the power monitor.

Buttons

OK

This saves the entries on all tabs to the database and closes the window.

Cancel

This cancels the entries from all tabs and closes the window.

Apply

This applies the entries from all tabs.

Upload

This **uploads** configuration settings from the power monitor to RT. After uploading, click **OK**.

Upload

Transfers the configuration settings from a physical power monitor to the device configuration window.

Download

This **downloads** configuration settings from the database to the power monitor. After downloading, click **OK**.

Download

Transfers configuration settings from the device configuration window to a physical power monitor.

General tab

This identifies general information of an Allen-Bradley Bulletin 1400 PowerMonitor.

Manufacturer/Model

For the Allen-Bradley Bulletin 1400 Power-monitor, this value is "Allen-Bradley 1400".

Firmware Revision

This is the firmware revision of the power monitor and of the power monitor communication card.

Device ID

This is the identification number of the power monitor stored in the power monitor firmware.

Voltage/Current tab

This displays and sets operating parameters, including wiring mode, and current and voltage scaling (PT and CT ratios), for an Allen-Bradley Bulletin 1400 PowerMonitor.

Voltage Mode

From the list, select the mode that represents how the power monitor is connected. A wrong setting causes the power monitor to calculate incorrect values.

Nominal Frequency

From the list, select the frequency that corresponds to the frequency of the power system.

Phase Rotation

From the list, select the normal phase sequence.

Volts Scale

A value from 0 to 999,999 volts can be entered. This sets the full-scale AC input voltage.

Amps Scale

A value from 0 to 30,000 amps can be entered. This sets the full-scale AC input current for A, B, and C phases (CT primary current rating).

Neutral Amps Scale

Enter a value from 0 to 9999 to scale the neutral (ground) current.

Snapshot Log Rate Options

The snapshot log contains voltage, current, and power values recorded and stored at defined time intervals with date and time stamps. Use the Days, Hours, Minutes, and Seconds boxes to enter scanning intervals for the log. For example, to record a snapshot every 30 minutes, enter 30 in the Minutes box. The slowest possible snapshot log rate is 400 days, 0 hours, 0 minutes, 0 seconds. If you leave all of the boxes set to 0, RT stops logging snapshots unless triggered by a setpoint operation.

- **Days** 0 to 400
- **Hours** 0 to 23
- **Minutes** 0 to 59
- **Seconds** 0 to 59

Demand Period (Minutes)

Enter 0 to select external sync mode, or enter 1 to 99 to define the number of minutes in each demand period to be used in calculating demand values.

Demand Number of Periods

Enter 1 to 15 to set the number of demand periods to be averaged.

Input/Output tab

This identifies whether to log status input activity for an Allen-Bradley Bulletin 1400 PowerMonitor. It sets parameters for analog output, relay outputs, and analog voltage input.

Status Inputs Options

Four status inputs (S1 through S4) on the Bulletin 1400 Power-Monitor respond to an externally applied voltage. If the input voltage is below 9V AC or 9V DC, the power monitor senses the input as inactive. If the input voltage is over 20V AC or 20V DC, the power monitor senses the input as active. The power monitor requires a minimum pulse width of 40 milliseconds to reliably sense status input changes.

To log status input changes in the **event log**, select the **Status Inputs** check boxes.

Event log

A data file which contains activity information about the power monitor, including setpoint alarm activity, relay activity, status input activity, power up, and changes to setup parameters.

Analog Output Options

The power monitor is equipped with an analog current output that can be programmed to deliver a current proportional to any measured parameter or as commanded by a programmable controller.

To program the analog current output, you must set three parameters:

- **Key**. From the list, specify to which measured parameter the current output will be proportional.

- **Scale**. Type a number to identify the value of the parameter corresponding to the full scale current output.
- **Range**. Select whether the output mode is 0-20 mA or 4-20 mA. The selected output range proportions the full scale input range to the full scale output range.

Relay Output Options

The power monitor provides three control relays (R1, R2, and R3). Each relay can switch AC loads of up to 277V AC and DC loads of up to 30V DC. For each relay output, set the mode and duration.

- **Mode**. Select the type of relay control. To select a parameter, click the arrow to the right in the Mode column. Click a parameter from the list to assign it to the relay.
- **Duration**. Type a number. For setpoint mode, set the pulse duration. For kWh pulse, kVARh pulse, or kVAh pulse mode, set the number of unit-hours between pulses.

AUX Voltage Scale

Analog voltage input measures and displays an external voltage from a nominal 1V AC/DC to a maximum 1.25V AC/DC. Type a number to define a multiplier. The multiplier identifies what the meter will display with a 1.000 VAC RMS full scale input applied.

Setpoints tab

Establishes setpoint parameters for an Allen-Bradley Bulletin 1400 PowerMonitor. The power monitor uses setpoints to monitor many parameters at the same time and to generate alarms and control relays based on these parameter values. The Allen-Bradley Bulletin 1400 PowerMonitor currently supports up to 17 different setpoints.

Setpoints can function as **over setpoints**, **under setpoints**, or **binary setpoints**. For help configuring setpoints, see the Allen-Bradley "Installation and Operation Manual for the Bulletin 1400 PowerMonitor Display and Block Module."

Over setpoint

Applies to the Bulletin 1400 PowerMonitor.

An over setpoint becomes active when the monitored parameter exceeds the high limit, and remains over the limit for longer than the number of seconds specified in the Operate Delay setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An over setpoint becomes inactive when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the Release Delay setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Under setpoint

Applies to the Bulletin 1400 PowerMonitor.

An under setpoint becomes active when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the Operate Delay setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An under setpoint becomes inactive when the monitored parameter exceeds the high limit, and remains above the limit for longer than the number of seconds specified in the Release Delay setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Binary setpoints

Applies to the Bulletin 1400 PowerMonitor.

A binary setpoint becomes active when the monitored parameter is true, and remains true, for longer than the number of seconds specified in the Operate Delay setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

A binary setpoint becomes inactive when the monitored parameter is false, and remains false, for longer than the number of seconds specified in the Release Delay setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Caution: Allen-Bradley power monitors are NOT intended to function as protective relay devices.

Setpoint options

Each setpoint configuration is composed of a group of six parameters:

- **Setpoint Type.** This identifies which parameter to monitor. To select a parameter, click the arrow to the right in the Setpoint Type column. Click a parameter from the list to assign it to the setpoint. For details, see "PowerMonitor setpoint types" (page 664).
- **High Limit.** For an over setpoint, this is the value at which to operate a relay. For an under setpoint, this is the value at which to release a relay. This parameter is not applicable for a binary setpoint.
- **Low Limit.** For an over setpoint, this is the value at which to release a relay. For an under setpoint, this is the value at which to operate a relay. This parameter is not applicable for a binary setpoint.
- **Operate Delay.** This parameter sets the amount of time, in seconds, to wait before operating a relay after reaching the high limit for an over setpoint condition, low limit for an under setpoint condition, or true for a binary setpoint condition.
- **Release Delay.** This parameter sets the amount of time, in seconds, to wait before releasing the relay after reaching the low limit for an over setpoint condition, high limit for an under setpoint condition, or false for a binary condition.

- **Relay Number.** This parameter identifies which relay to operate, if any.

PowerMonitor setpoint types

Setpoints can function as **over setpoints**, **under setpoints**, or **binary setpoints**.

Over setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

An over setpoint becomes active when the monitored parameter exceeds the high limit, and remains over the limit for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An over setpoint becomes inactive when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Under setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

An under setpoint becomes active when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An under setpoint becomes inactive when the monitored parameter exceeds the high limit, and remains above the limit for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Binary setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

A binary setpoint becomes active when the monitored parameter is true, and remains true, for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

A binary setpoint becomes inactive when the monitored parameter is false, and remains false, for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

The setpoint type automatically determines the setpoint function.

Setpoint Type	Function
Current Unbalance	Over setpoint; Measure of % difference between the most extreme and the average current

Setpoint Type	Function
Over Aux Current	Over setpoint; Over auxiliary I4 current
Over Current	Over setpoint; Highest phase current
Over Frequency	Over setpoint; Frequency x 10 (for example, 60Hz = 600)
Over kVA	Over setpoint
Over kVA Demand	Over setpoint
Over kVAR Forward	Over setpoint; Imported - reactive power
Over kVAR Reverse	Over setpoint; Exported - feeding reactive power into utility grid
Over kW Demand	Over setpoint
Over kW Forward	Over setpoint; Imported - active power
Over kW Reverse	Over setpoint; Exported - feeding active power into utility grid
Over Vaux	Over setpoint; Over auxiliary voltage
Over Voltage	Over setpoint; Highest phase voltage
Phase Reversal	Binary setpoint; TRUE when the phase sequence is opposite the configured phase sequence, otherwise FALSE.
S1, S2, S3, or S4 Input Active	Binary setpoint. TRUE when an individual status input is **energized** and active. FALSE when the status input is **de-energized**. **Energized** Indicates that contacts have changed from their default state. Normally open contacts have closed, or normally closed contacts have opened. **De-energized** Contacts are restored to their normal state. Normally open contacts are open; normally closed contacts are closed.

Setpoint Type	Function
S1, S2, S3, or S4 Input Normal	Binary setpoint; TRUE when an individual status input is de-energized. FALSE when the status input is energized and active.
Sx Input Active	Binary setpoint; TRUE when ANY status input is energized and active. FALSE when ALL status inputs are de-energized.
Sx Input Normal	Binary setpoint; TRUE when ANY status input is de-energized. FALSE when ALL status inputs are energized and active.
Under Frequency	Under setpoint; Frequency x 10 (for example, 60Hz=600)
Under PF Lagging	Under setpoint; Under power factor lagging
Under PF Leading	Under setpoint; Under power factor leading
Under Vaux	Under setpoint; Under auxiliary voltage
Under Voltage	Under setpoint; Lowest phase voltage
Voltage Unbalance	Over setpoint; Measure of % difference between the most extreme and the average voltage

Allen-Bradley Bulletin 1420 PowerMonitor 500

To open the device configuration window:

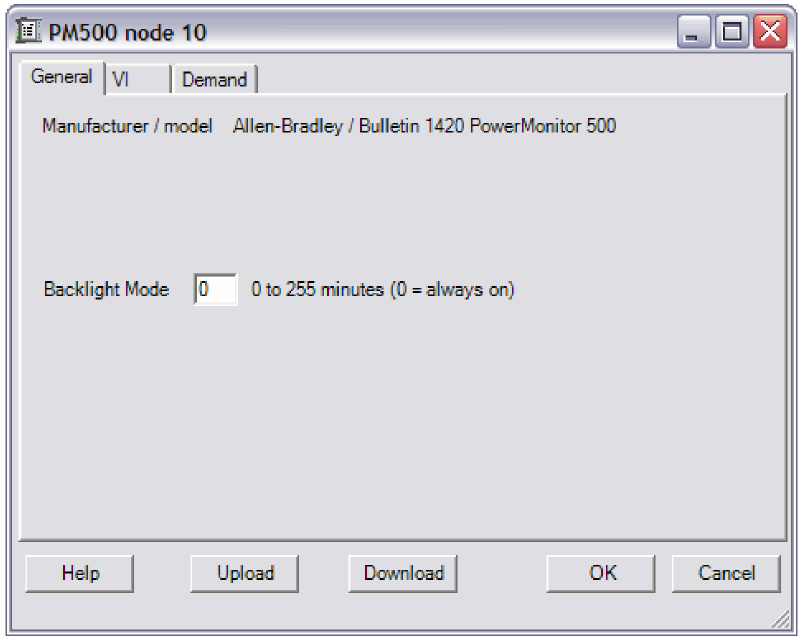
1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.



Important: Set up groups and power monitor devices before using RT to view or modify the power monitor configuration.

Please refer to the PowerMonitor 500 user manual for additional information on configuration selections.

General tab

You may adjust the time-out setting for the display backlight, from 0 to 255 minutes.

VI tab

Voltage mode

Selects the voltage mode of the power monitor.

Filter and coefficient

Adjusts parameters for filtering of the metering results.

Transformer scaling

Adjusts the power monitor to match the ratios of instrument transformers used to connect to the power circuit being monitored.

Demand tab

Calculation

Selects fixed or sliding window method.

Time interval

Selects a demand interval for the calculation.

Synchronization

Selects whether the demand interval is synchronized to the internal clock.

Allen-Bradley Bulletin 1415 Wireless PowerMonitor W250

To open the device configuration window:

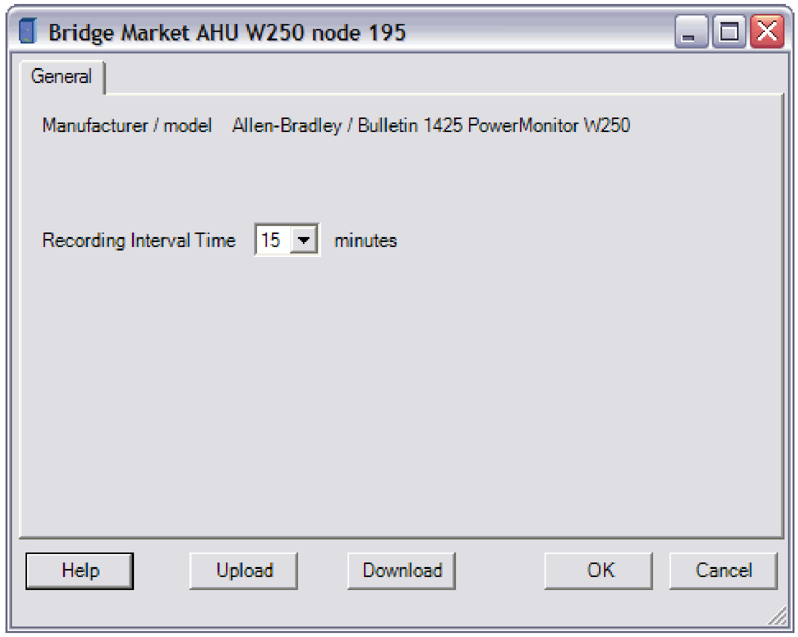
1. On the **Systems** tab in the navigation tree, open the **Devices** folder, and then click a power monitor.

   The **Device Setup** page appears.

2. Click **Device Configuration**.

   The device configuration application is downloaded and displayed.

The content of the application window differs depending on the selected power monitor type.



Only the recording interval time is configurable in the Wireless PowerMonitor W250. The default is 15 minutes. The recording interval time must correspond to the utility demand interval to calculate demand values correctly.

Important: Set up groups and power monitor devices before using RT to view or modify the power monitor configuration.

Uploading configuration from power monitors

Uploading takes the configuration contained within the power monitor and places it in the database. An upload is typically performed when connecting to an existing power monitor system for the first time.

To upload a power monitor configuration:

1. Click **Upload** in the device configuration window.

Upload

Transfers the configuration settings from a physical power monitor to the device configuration window.

The **Confirm Upload** dialog box appears.

2. Click **Yes**.

Downloading configuration to power monitors

Downloading writes the configuration file stored in the database to the configuration registers contained in the power monitor. Downloading is password protected. The password for each power monitor is entered on the **Device Setup** page, so you do not need to enter it each time a download occurs.

To download a power monitor configuration:

1. Click **Download** in the device configuration window.

   Download

   Transfers configuration settings from the device configuration window to a physical power monitor.

   The **Confirm Download** dialog box appears.

2. Click **Yes**.

Caution: To prevent downloading a default configuration to a previously-configured power monitor, you should always upload first, then make any changes desired, then download. There must be a valid password entered on the **Device Setup** page to change any configuration settings in the power monitor.

Working with setpoints

Many Allen-Bradley power monitors use setpoints to monitor parameters and to generate alarms, control relays, trigger snapshots, and trigger waveforms based on these parameter values.

Caution: Allen-Bradley power monitors are NOT intended to function as protective relay devices.

To configure setpoints:

1. Open the device configuration window, and then click the **Setpoints** tab.
2. Enter setpoint information, and then click **Download**.

Download

Transfers configuration settings from the device configuration window to a physical power monitor.

Types of setpoints

- **Binary setpoints**

Binary setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

A binary setpoint becomes active when the monitored parameter is true, and remains true, for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

A binary setpoint becomes inactive when the monitored parameter is false, and remains false, for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Over setpoints**

Over setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

An over setpoint becomes active when the monitored parameter exceeds the high limit, and remains over the limit for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An over setpoint becomes inactive when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Over forward setpoints**

Over forward setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An over forward setpoint becomes active when the monitored parameter exceeds the setpoint high limit in the positive direction, and remains over the limit for longer than the time specified in the Operate Delay setting. When a setpoint becomes active, it causes an action identified by the Action type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An over forward setpoint becomes inactive when the monitored parameter falls below the setpoint low limit in the positive direction, and remains below the limit for longer than the time specified in the Release Delay setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Over reverse setpoints**

Over reverse setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An over reverse setpoint becomes active when the monitored parameter exceeds the setpoint high limit in the negative direction, and remains over the limit for longer than the time specified in the **Operate Delay** setting. When a setpoint becomes active, it causes an action identified by the **Action** type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An over reverse setpoint becomes inactive when the monitored parameter falls below the setpoint low limit in the negative direction, and remains below the limit for longer than the time specified in the **Release Delay** setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Under setpoints**

Under setpoint (Allen-Bradley Bulletin 1400 PowerMonitor)

An under setpoint becomes active when the monitored parameter falls below the low limit, and remains below the limit for longer than the number of seconds specified in the **Operate Delay** setting. When a setpoint becomes active, it operates the selected relay, unless the selected relay is NONE. If NONE, the setpoint does not change any relay.

An under setpoint becomes inactive when the monitored parameter exceeds the high limit, and remains above the limit for longer than the number of seconds specified in the **Release Delay** setting. When a setpoint becomes inactive, it releases the selected relay.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Under forward setpoints**

Under forward setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An under forward setpoint becomes active when the monitored parameter falls below the setpoint low limit in the positive direction, and remains below the limit for longer than the time specified in the **Operate Delay** setting. When a setpoint becomes active, it causes an action identified by the Action type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An under forward setpoint becomes inactive when the monitored parameter exceeds the setpoint high limit in the positive direction, and remains above the limit for longer than the time specified in the **Release Delay** setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Under reverse setpoints**

Under reverse setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An under reverse setpoint becomes active when the monitored parameter falls below the setpoint low limit in the negative direction, and remains below the limit for longer than the time specified in the **Operate Delay** setting. When a setpoint becomes active, it causes an action identified by the **Action** type to occur and logs the occurrence in the event log. If the action energizes a relay or sets an alarm bit, the action remains true until the setpoint becomes inactive.

An under reverse setpoint becomes inactive when the monitored parameter exceeds the setpoint high limit in the negative direction, and remains above the limit for longer than the time specified in the **Release Delay** setting.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Equal setpoints**

Equal setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

An equal setpoint becomes active when the monitored parameter equals the setpoint high limit. An equal setpoint becomes inactive when the monitored parameter does not equal the setpoint high limit. The equal setpoint is most useful for non-numeric values, such as phase rotation, IEEE-519 status, and status input states. When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

- **Not equal setpoints**

Not equal setpoint (Allen-Bradley Bulletin 1403 PowerMonitor II and Allen-Bradley Bulletin 1404 PowerMonitor 3000)

A not equal setpoint becomes active when the monitored parameter does not equal the setpoint high limit. A not equal setpoint becomes inactive when the monitored parameter equals the setpoint high limit. The not equal setpoint is most useful for non-numeric values, such as phase rotation, IEEE-519 status, and status input states.

When a setpoint becomes either active or inactive, the event log stores the change of status with the time and value of the parameter at that instant.

Setpoint examples

These examples are based on the PowerMonitor 3000. Details of setpoint configuration are different for the PowerMonitor and PowerMonitor II.

- **Setpoint example 1: simple demand management**.

Setpoint example 1: Simple demand management

To configure setpoint 1 to energize output relay 1 when projected demand exceeds 100 kW for more than one second and de-energize relay 1 when projected demand falls below 90 kW for more than two seconds, you could use the following settings.

Setpoint number	1
Setpoint type	17 – Projected Watt Demand
Setpoint evaluation condition	Over forward
Setpoint high limit	100,000 watts
Setpoint low limit	90,000 watts
Setpoint action delay	1 second (M4, M5), 10 tenths of a second (M6, M8)
Setpoint release	2 seconds (M4, M5), 20 tenths of a second (M6,

Setpoint number	1
delay	M8)
Setpoint action type	1 - Energize relay 1 and set alarm flag 1

- **Setpoint example 2: trigger an oscillograph**.

Example 2 – Oscillograph capture on demand

To use setpoint 3 to capture an oscillograph when you push a button connected to status input number 2, you could use these settings.

Setpoint number	3
Setpoint type	32 – Status input No. 2
Setpoint evaluation condition	Equal
Setpoint high limit	On
Setpoint low limit	Not used
Setpoint action delay	N/A (M4, M5), 5 tenths of a second (M6, M8)
Setpoint release delay	N/A (M4, M5), 5 tenths of a second (M6, M8)
Setpoint action type	43 - Capture oscillogram

Using the Waveform Viewer

The Waveform Viewer displays waveforms from power quality events captured by Allen-Bradley Bulletin 1426 PowerMonitor 5000 M6 and M8 models.

You can perform the following actions on waveforms in the Waveform Viewer:

- "Opening waveforms" (page 680).
- "Adding or removing waveform channels" (page 680).
- "Adding waveforms" (page 681).
- "Changing the display of waveforms" (page 684).
- "Changing the color theme of the waveform charts" (page 691).
- "Removing waveforms" (page 691).

Opening waveforms

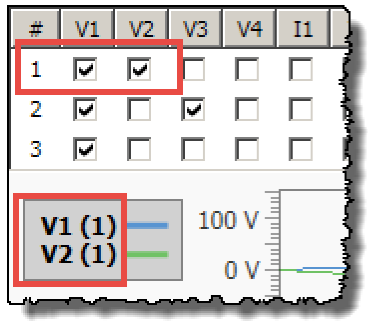
To open a waveform for a selected power quality event in the Waveform Viewer, click **View** on the **Power Quality Event Details** page. For details, see "Viewing power quality events" (page 65).

Adding or removing waveform channels

To add a waveform channel to the chart:

- Click a check box in the channel column of a waveform.

  The selected channel appears in the chart and the chart legend.



To remove a waveform channel from the chart:

- Clear the selection of the channel check box.

Adding waveforms

To add waveforms:

1. On the Waveform Viewer ribbon, click **Open Browser Window**.

   The Waveform Browser window appears.

   Tip: The Waveform Browser is available only when you open the Waveform Viewer from the **Power Quality Event Details** page. It will not be available when you open a locally saved waveform file (.WFM).

2. In the **Start date** and **End date** boxes, set the time range from which you want to search power quality events with associated waveforms.

   Tip: By default, the start date is set to one month before your current date, and the end date is set to your current date.

3. Click **Get Power Quality Events**.

   The table is populated with power quality events that have associated waveforms and match the selected time range.

   By default, the search results are sorted descending, by the waveform trigger date and time.

Tip: You can change how your search results are sorted, filtered, and grouped. For details, see:

- "Sorting search results" (page 682).
- "Filtering search results" (page 683).
- "Grouping search results" (page 683)

4. Select the check box next to the event for which you want to view the waveform.

   To select all the events, select the check box at the top of the table.

   Note: You can view up to 6 waveforms in the Waveform Viewer. If you select more waveforms, only the first six will be displayed.

5. (Optional.) Clear **Limit waveform size**, if you want to have the entire waveform that is longer than 5 seconds loaded and displayed in the Waveform Viewer.

   This option is selected by default, which means that only the first 5 seconds of a waveform are loaded and displayed in the Waveform Viewer.

6. (Optional.) Select **Close loaded waveforms**, if you want to close the waveforms that are already displayed in the Waveform Viewer before the new ones are loaded.
7. Click **Load Selected Waveforms**.

   The selected waveforms are displayed in the Waveform Viewer.

   Tip: Displaying the waveforms may take some time.

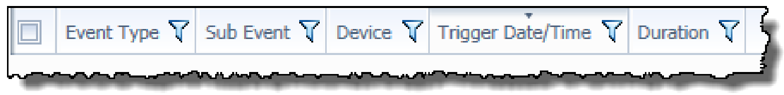
Sorting search results

To sort search results:

1. Click the column header by which you want to sort the search results.

The search results are sorted by the data type indicated with the column header, in the descending order.

The sorting order is indicated with the down (descending) or up (ascending) arrow at the top of the column header.



2. Click the column header again to change the sorting order to ascending.

Filtering search results

To filter search results:

1. In the column by which you want to filter the search results, click .

   The filter dialog box appears.

2. Set your filtering criteria.
3. Click **Filter**.
4. Close the filter dialog box.

   The column by which the search results are filtered is marked with in the column header.

To reset the filter settings:

1. Click .

   The filter dialog box appears.

2. Click **Clear Filter**.

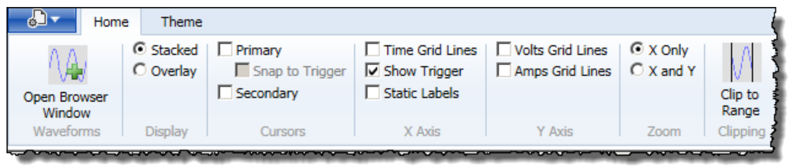
Grouping search results

To group search results:

- Drag the header of the column by which you want to group the search results and drop it onto this box:

Changing the display of wave-forms

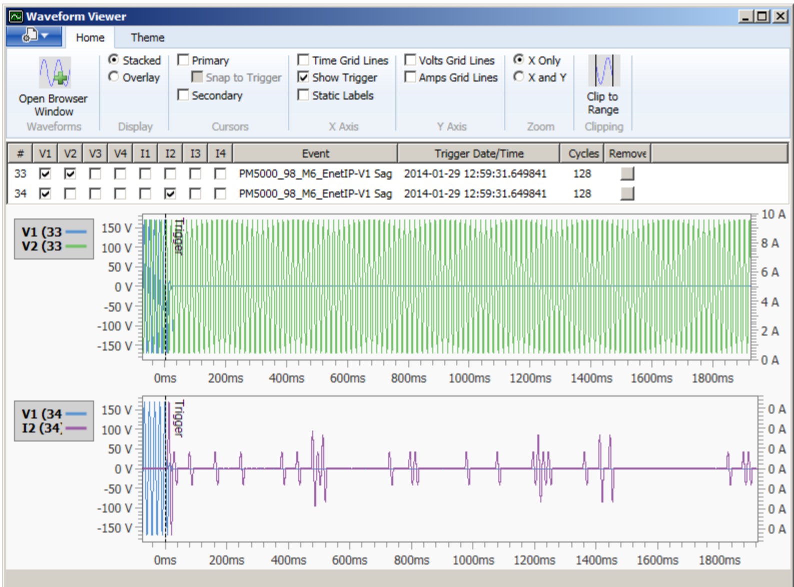
Once you open a waveform, you can change the way it is displayed using the following tools that are available on the ribbon in the Waveform Viewer window:

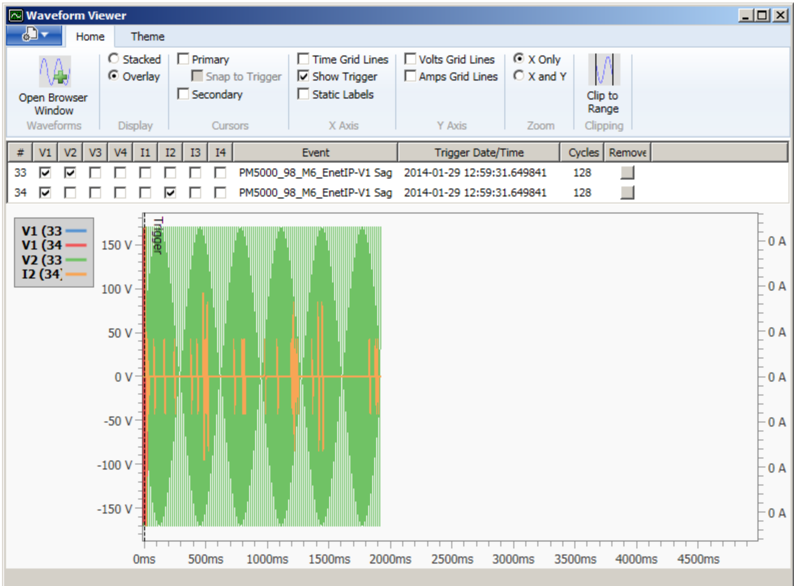


- "Display" (page 684)
- "Cursors" (page 686)
- "X Axis" (page 689)
- "Y Axis" (page 690)
- "Zoom" (page 690)
- "Clipping" (page 691)

Display

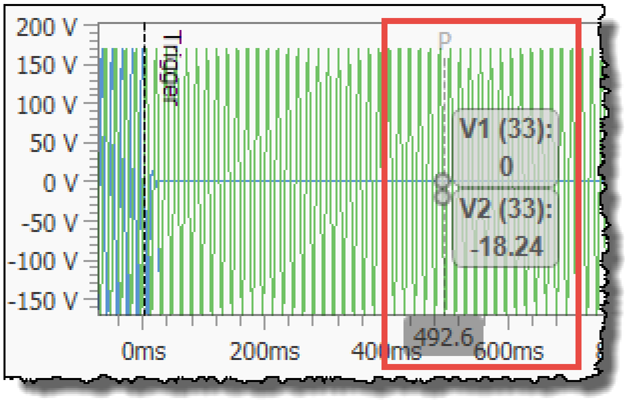
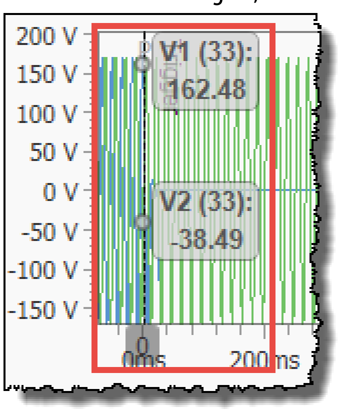
Use this option:	To display:
Stacked	Up to 6 waveforms, each on a separate chart.

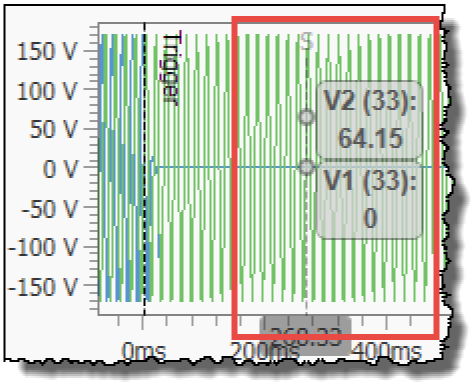
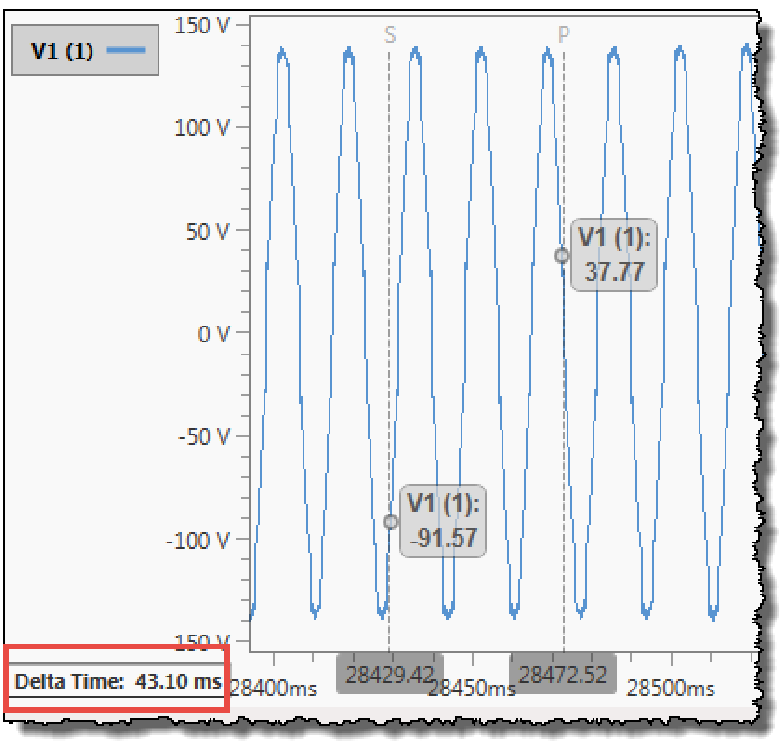
Use this option:	To display:
	 This option is selected by default.
Overlay	Up to 6 waveforms, all on a single chart. All the waveforms that you want to display in this mode must be a part of the same WSB set of waveforms, which means that they have the exact same trigger time.

Use this option:	To display:
	

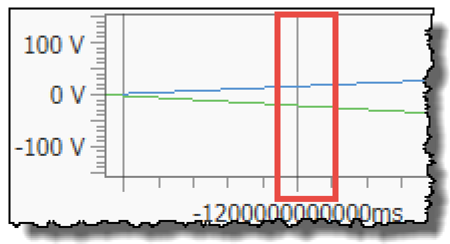
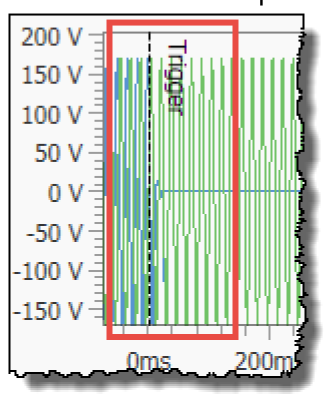
Cursors

Use this option:	To:
Primary	Display a primary cursor on the chart. The cursor displays the value of each selected channel where it intersects the cursor. The cursor type is indicated with the capital **P** at the top of it. Move the cursor along the chart to see intersection values.

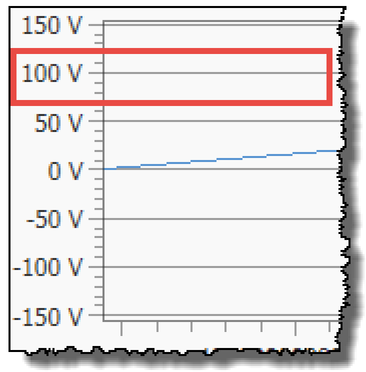
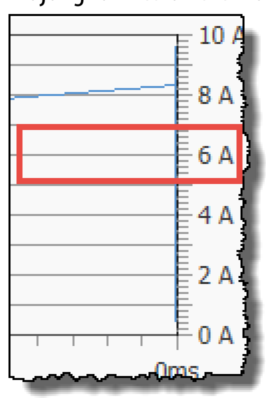
Use this option:	To:
	
Snap to Trigger	Set the primary cursor to the zero position on the X axis. With this option selected you cannot move the cursor along the axis. To move the cursor again, clear the **Snap to Trigger** check box.  This option is available only with the **Primary** option selected.
Secondary	Display a secondary cursor on the chart. The cursor displays the value of each selected channel where it intersects the cursor. The cursor type is indicated with the capital **S** at the top of it. Move the cursor along the chart to see intersection values.

Use this option:	To:
	 When you turn on both the primary and secondary cursors, and then move either of them, the delta time between the cursors is shown to the left of the chart. 

X Axis

Use this option:	To display:
Time Grid Lines	Major grid lines on the X axis. 
Show Trigger	A dashed line at the zero position on the X axis.  This option is selected by default.
Static Labels	The labels on the X axis in place as the chart is scrolled horizontally. The labels are displayed in their original locations and their content is updated as you scroll the chart. When you clear the check box, the labels move along with the chart. You can observe how the behavior of the labels changes depending on the setting of the **Static Labels** option when you zoom on the chart. For details, see "Zoom" (page 690).

Y Axis

Use this option:	To display:
Volts Grid Lines	Major grid lines on the Y axis voltage scale. 
Amps Grid Lines	Major grid lines on the Y axis amps scale. 

Zoom

Use this option:	To:
X Only	Zoom on the chart in the X direction only. This option is selected by default.
X and Y	Zoom on the chart in both the X and Y direction.

To zoom in on the chart:

- Right-click and drag the mouse pointer to draw a gray box over the chart area on which you want to zoom in.

To zoom out to the original view of the chart:

- Double-click the chart.

Tip: If you want to make the zoomed-in area fit the entire chart view, use the clipping option. For details, see "Clipping" (page 691).

Clipping

Click this button:	To:
Clip to Range	Make the zoomed-in area fit the entire chart view. To restore the chart to its original view, click the button again. For details on clipping the chart view, see "Zoom" (page 690).

Changing the color theme of the waveform charts

To change the color theme of the charts:

1. On the Waveform Viewer ribbon, click **Theme**.
2. In the list, select the theme that you want to use.

   The theme is applied to all the charts displayed in the Waveform Viewer.

Removing waveforms

To remove a waveform:

- In the **Remove** column, click the button next to the waveform that you want to remove.

  Note: You cannot undo this action.

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Administering FactoryTalk EnergyMetrix

In FactoryTalk EnergyMetrix software, database administration is performed using the functions and features of Microsoft SQL Server Management Studio. Please refer to the SQL Server documentation for information on database management and administration.

Changing your password

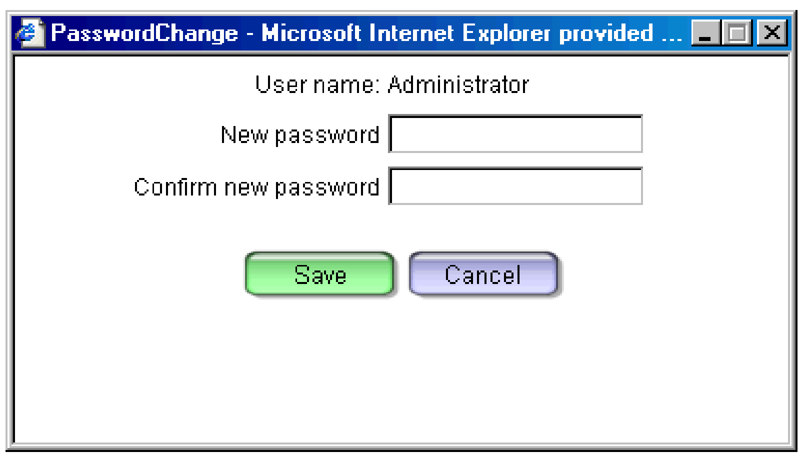
To change your password:

1. On the **System** tab, click **My User Settings**.

   The **User Setup** page appears.

2. Click **Password**.

   The **PasswordChange** dialog box appears.



3. In the **New password** box, type your new password.
4. In the **Confirm new password** box, repeat your new password.
5. Click **Save**.

Note: If using Windows Active Directory security, there is no need to change the password in FactoryTalk EnergyMetrix.

Backing up the database

FactoryTalk EnergyMetrix connects to the Microsoft SQL database named "EMMA" to store configuration parameters and logged data. It is important to perform routine, frequent backups of the EMMA database. Routine backup creates a recent record of the database so it may be restored in case of database corruption, hard disk crash, etc. Routine backup also controls the growth of the SQL transaction log.

Many FactoryTalk EnergyMetrix users maintain established backup and archiving procedures for business databases. FactoryTalk EnergyMetrix does not require any unusual or extraordinary handling of its data, so established IT database procedures should meet the backup needs.

We recommend a daily scheduled backup and shrink of the EMMA database.

For users without an established database administration routine, please refer to Microsoft SQL Server documentation for database backup, shrink and restore procedures.

Extending FactoryTalk EnergyMetrix functionality

Upgrading meter limits

You may increase the meter limit on your server at any time by purchasing and installing an additional Manager package from Rockwell Automation, Inc.. When installed, the number of meters in the upgrade is added to the previously installed meter limit. For example, adding a 50 meter Manager activation to an existing 10 meter Manager package provides a limit of 60 meters.

Adding options

You may also add options such as RT, FTEMOPC, ChartsPlus and ReportsPlus in the same manner. Check with your local Rockwell Automation, Inc. representative for option pricing and availability.

Installing options

Options are shipped with only an activation packet and an information sheet. To install an option or upgrade, simply install the activation to the FactoryTalk EnergyMetrix server.

Upgrading to a new version

You can upgrade to FactoryTalk EnergyMetrix 2.20.00 from versions 2.10.00 and 2.11.00.

For information on the upgrade steps, please refer to the FactoryTalk EnergyMetrix articles available on Rockwell Automation, Inc. Knowledgebase.

Important: If you are upgrading from FactoryTalk EnergyMetrix software activated with EvRSI (master disk) activation, please contact your local Rockwell Automation, Inc. sales office or Technical Support for information to migrate your activations to FactoryTalk Activations.

For Rockwell Automation, Inc. Technical Support in the U.S., call 1 (440) 646-3434. Outside the U.S., see http://www.rockwellautomation.com/locations/.

Moving your installation to a new server

If you want to relocate your installation of FactoryTalk EnergyMetrix to a new Windows server machine, make backup copies of the following files and configurations:

- Back up the FactoryTalk EnergyMetrix database, named "EMMA" to a portable memory device or network shared folder. You may use a backup of the database if you are staying with the same version of Microsoft SQL Server. However, if you are upgrading to a more recent version of SQL server, then backing up the database files EMMA.mdf and EMMA_log.ldf may be required.

- Back up the RSLinx Classic configuration using the Backup/Restore utility. Copy the .rsx file to a portable memory device or network shared folder.
- Back up the configuration(s) of any 3rd party OPC servers installed on the server.
- Rehost the activations using FactoryTalk Activation manager.
- If 3rd party applications are installed, follow the vendor's copy protection instructions.

Once these items are suitably backed up, perform a clean installation of FactoryTalk EnergyMetrix on the new server. Restore the backed-up configurations and activations at the appropriate point.

Tip: Restore the EMMA database to the new machine prior to installing FactoryTalk EnergyMetrix.

Note: For details on installing FactoryTalk EnergyMetrix, see *Release Notes*.

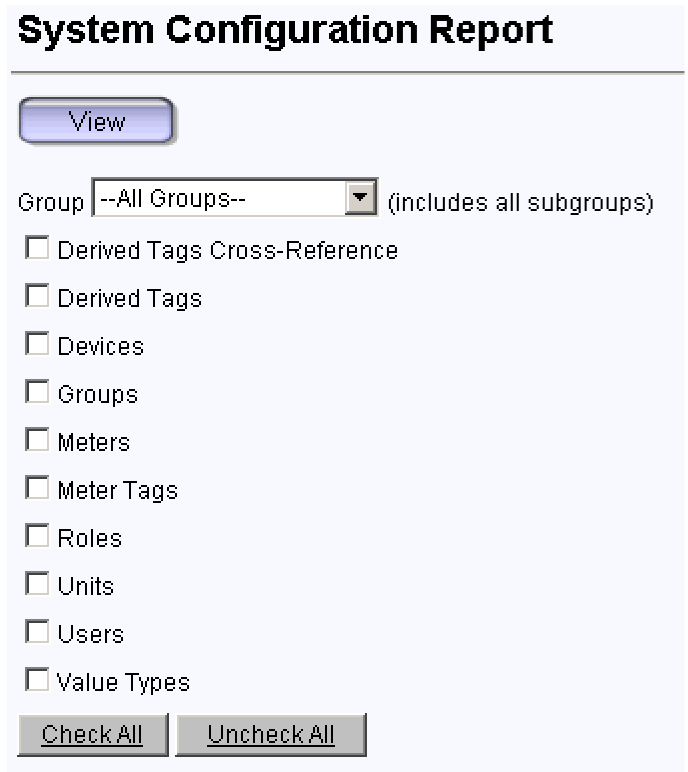
Using the system configuration report

Use the system configuration report to document the configuration of any or all of the objects listed in the **System Configuration Report** page. In addition, you may select all groups or an individual group / domain and its subgroups. Groups are limited to those accessible to your logon role.

To open the configuration report:

- On the **System** tab, click **Configuration Report**.

The **System Configuration Report** dialog box appears.



Selections of Roles, Units, Users and Value types return results from All Groups regardless or the group selection.

Tip: Selecting all options and all groups may cause the report to take a long time to generate.

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Troubleshooting FAQ

The questions and answers listed below should help you resolve most issues you encounter with installation and operation. Additional assistance may be found on the Rockwell Automation, Inc. Knowledgebase.

Q: I receive a Server Error the first time I log in to an installation of version 1.8 and later.

A: Version 1.8 and later requires Microsoft .NET Framework version 3.5 SP1, which uses ASPNET version 2.0. It is likely that the web page is configured to use ASPNET 1.1.

Perform the following steps:

1. Open Internet Information Services Manager in the Administrative Tools on the server.
2. Expand **Sites** > **Default Web Site**.
3. Right-click the FactoryTalk EnergyMetrix web page.
4. Select **Properties**.
5. Select the **ASP.NET** tab.
6. Select **ASP.NET version 2.0.50727** from the list.
7. **OK**.

Q: I can't find the RSLinx Classic icon in the notification area of the server. Where is it?

A: The RSLinx Classic user interface is not supported in 64-bit Windows operating systems.

Q: I receive error messages when I try to launch Charts Plus or RT. What should I check?

A: RT and ChartsPlus should be enabled to run as ClickOnce applications. Verify the configuration and security settings if needed.

Q: I just finished the installation. When I tried to log on, I got a "No Manager activation found - cannot log in" message.

A: It is likely that the activations were not installed. Install the activation(s) supplied with the software.

Q: "Access to the path..." error occurs when attempting to open web trend or calendar trend charts.

A: The solution for this error is to allow the computer user "Internet Guest Account" read/write access to the **ChartFXNet** folder located in the **program folder**.

Program folder

The default program folder is:

- For 32-bit servers:

```
C:\Program Files\Rockwell Software\FactoryTalk
EnergyMetrix
```

- For 64-bit servers:

```
C:\Program Files (x86)\Rockwell Soft-
ware\FactoryTalk EnergyMetrix
```

Perform the following steps:

1. Right-click the folder, and the select **Sharing and Security**.
2. Select the **Security** tab.
3. Click **Add**.
4. Click **Advanced**.
5. Click **Find Now**.
6. Find the user named **IUSR_<computer name>**. In Windows 2008 Server, find the user named `IUSR` or `IIS_IUSRS`.
7. Click **OK**.
8. Make sure the user has **Read** and **Write** permission boxes checked.
9. Click **OK**.

Notes:

- If IIS 6.0 is configured to use "IIS 5.0 isolation mode" then select the user named ASPNET instead of IUSR_<computer name>.
- If the steps above do not resolve the issue, also check that user Network Services has read/write access to the directory.

Q: I just upgraded my installation with a core file set downloaded from the web. I ran setup.exe and now the program no longer works.

A: Running setup.exe the first time uninstalls the software. Setup must be run once more to re-install the program. Remember, you must enter the SQL Server system administrator credentials during installation.

Q: I purchased ChartsPlus (or RT, or ReportsPlus) option. Where do I find the ChartsPlus software?

A: You do not need to install any additional software. Simply install the program activation supplied with the optional software you purchased.

Q: After I log in, the Navigation tree does not appear, only what looks like 'program code'. What should I check?

A: Java must be enabled in Internet Explorer.

Perform the following steps:

1. Open Internet Explorer.
2. On the **Tools** menu, click **Internet Options**.

   The **Internet Options** dialog box appears.
3. Click the **Security** tab.
4. Click **Trusted sites**.
5. Click **Custom level**.

   The **Security Settings - Trusted Sites Zones** dialog box appears.
6. Scroll down to the **Scripting** section.
7. Make sure that the **Scripting of Java applets** item is set to **Enable**.

If your computer does not show this option, contact your system administrator or IT help desk.

Q: The navigation tree takes a very long time to refresh. What can I do?

A: If your project includes a large number of groups, domains and meters (numbered in the thousands), the tree refresh may become slow or possibly time our, resulting in a server error. In the Configuration page, enable on-demand tree loading.

Q: Error message "Object reference not set to an instance of an object" appears when trying to save a new Device.

A: No Domain has been created. Or you tried to create a domain with illegal characters ('.' or '#') in the group name. Create a Domain with a valid name then create a Device.

Q: I do not receive email notification when an alarm occurs.

A: Check the following:

- Enable alarm notifications is checked in your User Settings page
- You have an alarm subscription configured in your User Setting page
- The alarm is configured correctly and includes your email address
- A record of the alarm appears in the Alarm Log in the System Status page
- A smtp server is correctly configured in the Configuration page

Q: Reports do not run. I click View but nothing happens.

A: It is likely that Internet Explorer or a helper application (such as Google toolbar) is configured to block popups. Turn off the popup blocker for the FactoryTalk EnergyMetrix website.

Q: Reports do not run. The report builder page just runs forever. What should I check?

A: The **Reports Output** folder in the program folder needs the same users assigned with read/write access as in the "Access to the path..." FAQ above.

Q: Reports run, but I get a prompt to save the .pdf file and a message saying "The file you are downloading cannot be opened by the default program. It is either corrupted or it has an incorrect file type." What should I do?

A: Follow the instruction below.

Perform the following steps:

1. Open Adobe Acrobat Reader on your client computer.
2. On the **Edit** menu, click **Preferences**.

   The **Preferences** dialog box appears.
3. Under **Categories**, click **Internet**.
4. Clear the **Display PDF in browser** check box.
5. Click **OK**.
6. Run the report again. The report output will open in a new Adobe Acrobat Reader window.

Q: I ran a consumption (or billing) report and the results are very different from expected. What should I check?

A: There can be a number of issues that show themselves in bad report output. To troubleshoot these issues, it is best to narrow down the process to one meter at a time. Select one meter and run the report again. If the results look okay, select another meter. Repeat the process until the bad report output appears. Select that meter in the **Meters** tab, then select the **Trend** tab. View a trend for the consumption variable and the report time. The trend line should extend (in most cases) from the lower left to the upper right. There may be a rollover. There may be discontinuities such as a meter reset or replacement, or erroneous zero readings. If there is a rollover, verify that the rollover value in the meter tag setup is present and correct. To reduce the impact of data irregularities, set an appropriate value in the 'maximum consumption per hour' field in the meter tag setup.

Q: The tags (including derived tags) that I configured are shown on the Meter Status page but no data has been logged. What should I check?

A: Check that both Enable device and Enable real-time logging are selected on the **Device Setup**. Also, Edit and then Save the Meter Setup, to refresh the database snapshot in use by the data logger. For details, see "Configuring devices" (page 140).

Q: When I click Test Connection it returns a Connection Failed' message. What should I check?

A: The Connection Failed message indicates that there is no communications with the target device. This could be caused by a number of issues.

- Try again. It may be a temporary issue.
- There may be a problem with the target device. It may have lost power or not be configured correctly.
- The target device may not be configured in the RSLinx Classic driver on the server.
- For EtherNet/IP devices such as ControlLogix, CompactLogix, PowerMonitor 1000 and 3000 devices, open RSWho on the server computer, drill down to and select the power monitor or Logix processor module. Then try Test Connection again.
- Access the server computer and Ping the devices from a command window. If the Ping fails, correct the networking problem and try again.

Q: When I click the Devices folder in the System tab, the device status page does not display. Instead, this message appears: "Error getting status data: Can not create or open a memory file mapping. Error code: 2. Use the Visual C++ Error Lookup utility to see the text of the error message. "

A: This message indicates that the logger service has stopped. On the server, start the service. Check the Windows Application Event Log for troubleshooting information. Check the logger service properties to verify that the first recovery action is set to "Restart the Service."

Q: When I open a folder in the navigation tree, sometimes the icons take a long time to refresh. What should I check?

A: In Internet Explorer, select Tools > Internet Options from the main menu. On the **General** tab of the **Internet Options** dialog box, click **Settings** in Temporary Internet Files. The browser should be set to check for newer versions of stored pages automatically, not every visit to the page. Another possibility is that the server has inadequate memory installed. Refer to Server Requirements.

Q: I replaced a Series A Ethernet PowerMonitor 3000 with a Series B unit. How do I start communicating with it again?

A: Open RSLinx Classic on the server. Remove the IP address of the replaced unit from the Ethernet Devices driver and close the driver configuration window. Open the driver configuration window again and type the IP address of the replaced unit. This will re-establish communications using EtherNet/IP.

Q: When I look at the Meter Data page with a Group selected, there is no or missing data. What should I check?

A: The Group view uses aggregated data. Aggregation of data requires that data is available from each meter in the group. Check each meter to determine which meter(s) are not logging data.

Q: When I look at the Meter Data page, some entries in the list have no data. What should I check?

A: Missing data in the database is an indication that communications with the device is timing out. There are a number of possible causes for this.

- Other devices may be communicating with the target device. For instance, a system may include a PLC controller and an HMI application that are also reading data from a power monitor. It may be necessary adjust the update rates of the competing applications so that the device may respond adequately to all of them.

- For pass-thru devices such as Remote I/O power monitors, other applications may be reading data from the parent device. It may be necessary adjust the update rates of the competing applications so that the device may respond adequately to all of them.
- For systems with many devices, meters and/or tags, meter tag logging rates may be set too low to complete the logging task in the time allotted. In most cases, it is not necessary to log more frequently that the utility demand interval.
- For systems that utilize a wide area network or modem communications, the additional communications time may cause missed data.
- In rare cases it may be necessary to select Enable automatic data repopulation and clear Enable real-time logging to improve system performance.

Q: Some data is missing from a Wireless PowerMonitor W250 meter. What should I check?

A: Missing data records is an indication of poor communications. There are a number of possible causes.

- Communications to the PC Receiver is via a Digi-One SP serial to Ethernet converter RealPort virtual COM port, and more than one computer is attempting to use the SP converter. The SP will support multiple connections, however, there will be messaging conflicts between the COM ports resulting in lost data. Use a Digi-One IA set up as an Industrial Automation server with Modbus slave protocol.
- The wireless mesh network design is not robust, is experiencing RF interference or poor signal strength, or devices

in the RF signal chain have lost power or failed. Troubleshoot the RF mesh network using the PC Receiver Setup page, which is linked from each Wireless PM W250 device setup page.

Q: When I write a MPR script, and then click Validate, an error message appears and the script is not validated. How can I fix it? I have Internet Information Services (IIS) 7 installed.

A: You need to change the IIS settings.

Perform the following steps:

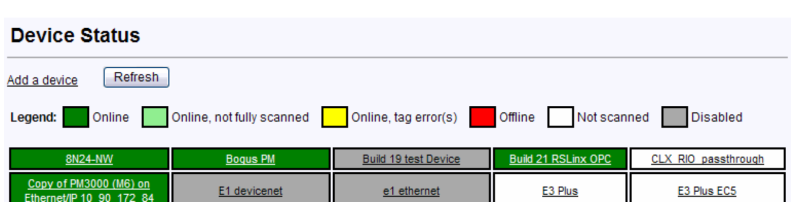
1. Go to **Start** > **All Programs** > **Administrative Tools** > **Internet Information Services (IIS) Manager**.

   The **Internet Information Services (IIS) Manager** window appears.
2. In the tree, expand **Application Pools**.
3. In the right pane, right-click **DefaultAppPool**, and then click **Basic Settings**.

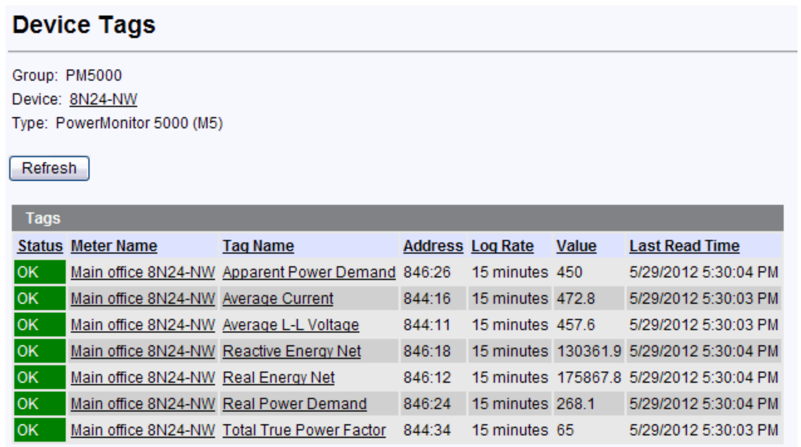
   The **Edit Application Pool** dialog box appears.
4. Under **Managed pipeline mode**, select **Classic**.
5. Click **OK**.

Viewing the device status

The **Device Status** display provides a color-coded summary of the communication status of all devices in a group or domain at a glance.



Click any device link to open a new browser window with detailed information on the device and its associated meters and meter tags.


Device Tags

Group: PM5000
Device: 8N24-NW
Type: PowerMonitor 5000 (M5)

Refresh

Tags

Status	Meter Name	Tag Name	Address	Log Rate	Value	Last Read Time
OK	Main office 8N24-NW	Apparent Power Demand	846:26	15 minutes	450	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Average Current	844:16	15 minutes	472.8	5/29/2012 5:30:03 PM
OK	Main office 8N24-NW	Average L-L Voltage	844:11	15 minutes	457.6	5/29/2012 5:30:03 PM
OK	Main office 8N24-NW	Reactive Energy Net	846:18	15 minutes	130361.9	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Real Energy Net	846:12	15 minutes	175867.8	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Real Power Demand	846:24	15 minutes	268.1	5/29/2012 5:30:04 PM
OK	Main office 8N24-NW	Total True Power Factor	844:34	15 minutes	65	5/29/2012 5:30:03 PM

Connecting to the FactoryTalk EnergyMetrix server using Telnet

You may connect to the FactoryTalk EnergyMetrix server using Telnet to perform a number of diagnostic tasks.

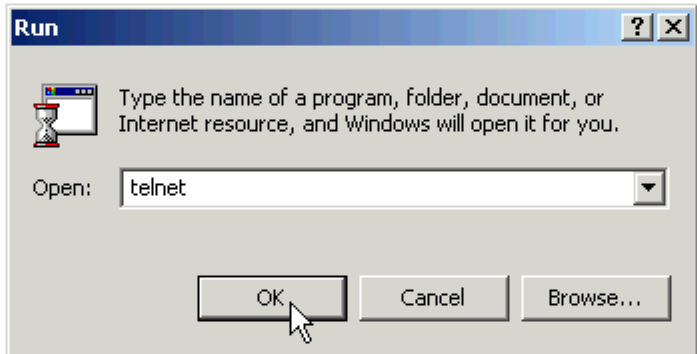
You may enable or disable Telnet on the **Configuration** page. It is disabled by default.

You may also select a remote debug port (default 23) and a password (default ""). For details, see "Using the System Configuration page" (page 122).

To use Telnet:

1. In the **Start** menu, click **Run**.

The **Run** dialog box appears.

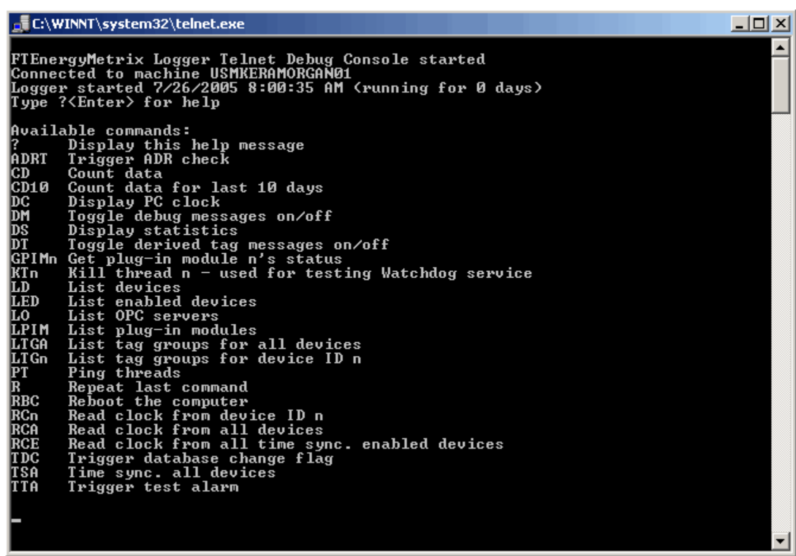


2. In the **Open** box, type `telnet`, and then click **OK**.
3. At the command prompt, type:

```
open [server name or IP address]
```

The logger debug console window appears.

4. Type a question mark, and then press Enter to list the available commands.



In addition to processing the commands you enter, the console will display a running record of logging activity

5. Press Ctrl+] to close the Telnet session.

Time zone issues

Time zones are independently set for meters, devices, rate schedules, reports, and the server. All data is stored in the database with a UTC time stamp. The time zone you select affects the time-zone related offset applied to the data when it is logged from a meter or accessed by a report or trend. The offset between UTC and the server, device and/or meter affects the following:

- Time stamps during data logging
- Database logging intervals
- Synchronization of device clocks
- Consumption and Billing reports
- Trend graphs
- Calendar trend graphs

Tip: Daylight saving time is accounted for during data logging and data retrieval.

Meter time zone

Select time zone for a meter

The time zone you select for a meter during set up will determine the Co-ordinated Universal Time (UTC) time logged in the database.

For example, data scanned at 9:00 AM for a meter in the Eastern time will have a UTC timestamp of 1400 hrs.

Important: The time zone selected for a meter during meter setup must match the time zone in which the meter is physically located.

Meter data, trends and calendar trends are viewed in the logged-in user time zone.

Device time zone

Select time zone for a device

The time zone you select for a device will determine the Co-ordinated Universal Time (UTC) logged in the database.

For example, data scanned at 9:00 AM for a device in the Eastern time zone will have a UTC timestamp of 1400 hrs.

In addition, the time zone you specify for a device during set up is used when synchronizing the device clocks with the server clock.

Important: The time zone selected for a device during setup must match the time zone in which the device is physically located.

Server time zone

Select time zone for the server

The server time zone must be properly set up in Windows since all data logging intervals are based on the server clock. In addition, the server clock is used for synchronization with device clocks.

For detailed information on how to set up server time zone, refer to your Windows OS documentation.

Rate schedule time zone

Select time zone for a rate schedule

The default rate schedule time zone is the logged-in user time zone.

Reports time zone

Select time zone for a report

Reports default to the logged-in user time zone. You may override the default time zone for a report by selecting a different time zone from the list under report parameters.

Error codes

Error codes listed on the **System Status** or **Device Status** pages are passed through from RSLinx Classic. The most common error codes are listed here.

Error code	Error description	Details
1	Driver name is invalid	This error can usually be corrected simply by opening RSWho in RSLinx and verifying the device is communicating (i.e. there is no red X through the device).
27	I/O operation not attempted	Can be caused by configuring the device as on "Ethernet" but the device is actually EtherNet/IP (or vice versa) or by the device's Remote I/O rack/group address not being in the processor's scan list, if it is a Remote I/O device.
158	Driver name is invalid	The RSLinx driver name is incorrect or the driver is not configured in RSLinx.
261 or 261024	Application layer timed out waiting for a response	This is a timeout error indicating a physical problem with the link between RSLinx and the device or a problem with the device itself. Check cabling and the health of the device (is it faulted, etc).

Error code	Error description	Details
272	Illegal command or format, including an odd address	This is typically caused by a bad tag address. Check that the tag address is correct. If the tag is located in a ControlLogix processor verify that the PLC mapped file is present and is the correct file number and the tag is mapped to that file number.

Tips for RSLinx Classic running on a 64-bit server

When you set up devices such as power monitors, PLCs, etc., you will need to access RSLinx Classic software running on the server to configure drivers and network addresses of devices.

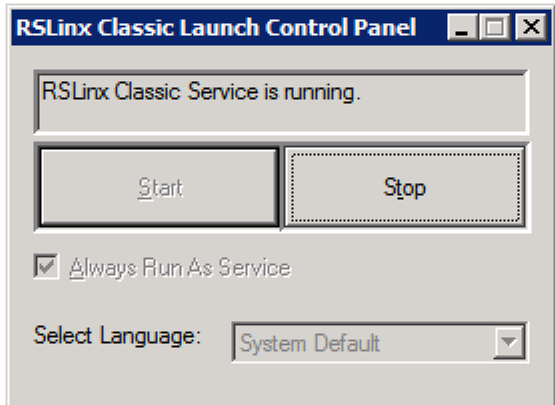
RSLinx Classic is required to run as a Windows service. On Windows 2008 Server, when RSLinx Classic runs as a service the user interface is not available to the user. The user interface is only available when RSLinx Classic runs as an application.

To access the user interface of RSLinx Classic on Windows 2008 Server:

1. On the **Start** menu, click **All Programs > Administrative Tools > Services**.

   The **Services** window appears.
2. Navigate to, and then stop the **RSEnergyMetrix Logger** service.
3. On the **Start** menu, click **All Programs > Rockwell Software > RSLinx > RSLinx Classic Launch Control Panel**.

   The **RSLinx Classic Launch Control Panel** dialog box appears.



4. Click **Stop**.
5. Clear the **Always Run As Service** check box.

   The status message in the dialog box changes to:

   `RSLinx Classic Application is not running.`
6. Click **Start**.

   RSLinx Classic is started as an application.
7. In the notification area, click .

   The **RSLinx Classic** window appears.
8. Make the desired changes.
9. On the **Start** menu, click **All Programs** > **Rockwell Software** > **RSLinx** > **RSLinx Classic Launch Control Panel**.

   The **RSLinx Classic Launch Control Panel** dialog box appears.
10. Click **Stop**.
11. Select the **Always Run As Service** check box.

    The status message in the dialog box changes to:

    `RSLinx Classic Service is not running.`

12. Click **Start**.

    RSLinx Classic is started as a service.

13. On the **Start** menu, click **All Programs > Administrative Tools > Services**.

    The **Services** window appears.

14. Navigate to, and then start the **RSEnergyMetrix Logger** service.

To add a shortcut to the server desktop:

1. Copy a shortcut to the RSLinx Classic Launch Control Panel to the server desktop.
2. Right-click the server desktop, select **New > Shortcut**.
3. In the item location box, type `c:\Windows\SysWOW64\services.msc /s`.
4. Click **Next**.
5. Click **Finish**.

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Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support/ you can find technical and application notes, sample code, and links to software service packs. You can also visit our Support Center at https://rockwellautomation.custhelp.com/ for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/services/online-phone.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/rockwellautomation/support/overview.page, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

Rockwell Automation maintains current product environmental information on its website at http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page.

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