JEMWARE II

Configuration Software for the JEMStar II Meter

User Manual

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AMETEK Power Instruments
255 N. Union Street
Rochester, New York 14605

Tel: (585) 263-7700
Fax: (585) 262-4771
Web: www.ametekpower.com

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INTRODUCTION

JEMWARE II™ is a Microsoft Windows® based program used with the JEMStar II polyphase electricity meters. The primary function of the program is to establish communications with the meter and select and configure all register types displayed on the meter. You can also configure the meter's primary calibration, communications interface, load-profile configuration, time-of-use schedules, and other meter parameters.

JEMWARE II can be used to program the meter, retrieve the meter's configuration, and set the time on the meter. Additionally, it can retrieve the meter's Load Profile and Register data, Event Logs, Meter Status and Phasor display. It includes file-management capabilities to save and open meter configurations that are stored on the computer's hard drive. The hunt feature can be used to browse for a configuration.

The program is easy to use, and each operation is accessible through typical Windows pull-down menus and/or toolbar icons. Fields with up/down arrows are also editable. JEMWARE II has many functions that enable you to efficiently process and organize data from metering devices.

MINIMUM SYSTEM REQUIREMENTS

To operate JEMWARE II successfully, you must have a PC with the following features:

Pentium™-IV processor or equivalent using Windows.
DVD drive
2 GB RAM
100 MB Hard disk space for the application
50 MB Hard disk space for storing meter configuration files.
USB or RS-232C Serial Communications Port
Ethernet Port

SOFTWARE INSTALLATION (WINDOWS XP, 7, 8, 10, 11)

Installation is easy using the windows installer to guide you through the steps.

- Both individual and multiple-site licensing are supported.

To begin the installation procedure:

1. Insert the JEMWare II CD in your computer's drive or copy the software to a folder if received in other ways.
2. Run Setup.exe and follow the instructions on the screen to complete the installation.

Note: The installation process will check for several standard Microsoft applications that we use with our Software; therefore, it is recommended to have a connection to the network so it can download the latest versions.
When installing a new version of this software, you must first uninstall the previous version installed or it may create conflicts.

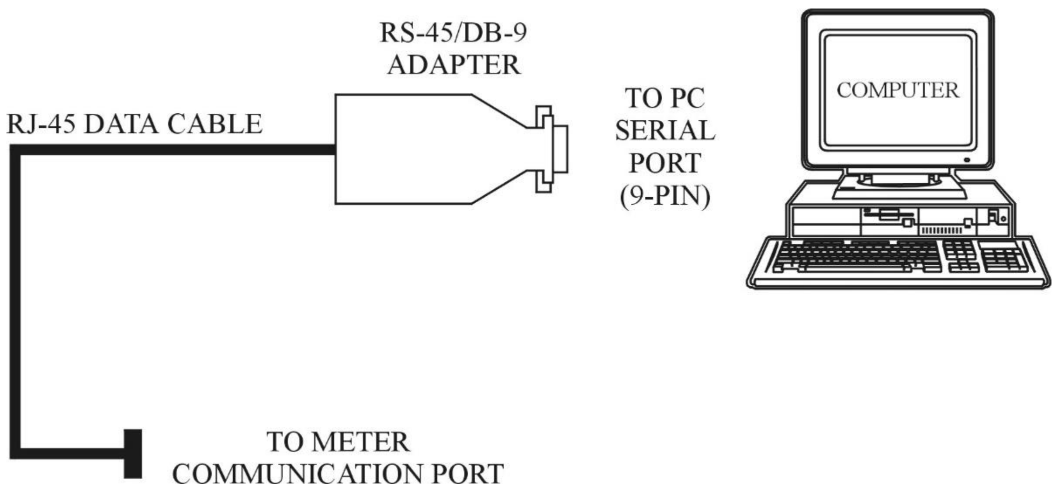
Uninstalling JEMWare II

In the Control Panel, double-click on the “Add/Remove Programs” icon.
Select “JEMWare II” from the list and click on the “Add/Remove” button.
If you click on the Yes button, all JEMWare II files and shortcuts installed during setup will be removed.

Connecting to a Meter

Step 1: Connect the Hardware
You can connect a meter to your computer locally or remotely using any of the following methods. Ethernet is the recommended method for speed and ease of use.

- **Ethernet Connection** This can be a local or remote connection. The default IP Address in the meter is 192.168.250.100
- **Serial Connection** uses your computer’s RS-232 COM port wired directly to the RS-232/USB port on the meter. This is the simplest method, but limits the distance to about 50 ft.



You can also create an RS-485 network to connect one or more meters to your computer at a time, which will increase the maximum cable distance to about 4000 ft. To use RS-485 communications, you must install an RS-232 to RS-485 converter at your computer’s COM port. If you do not already have this device, AMETEK offers all the necessary hardware.

Plug the RS-232/485 converter box into your PC serial port.

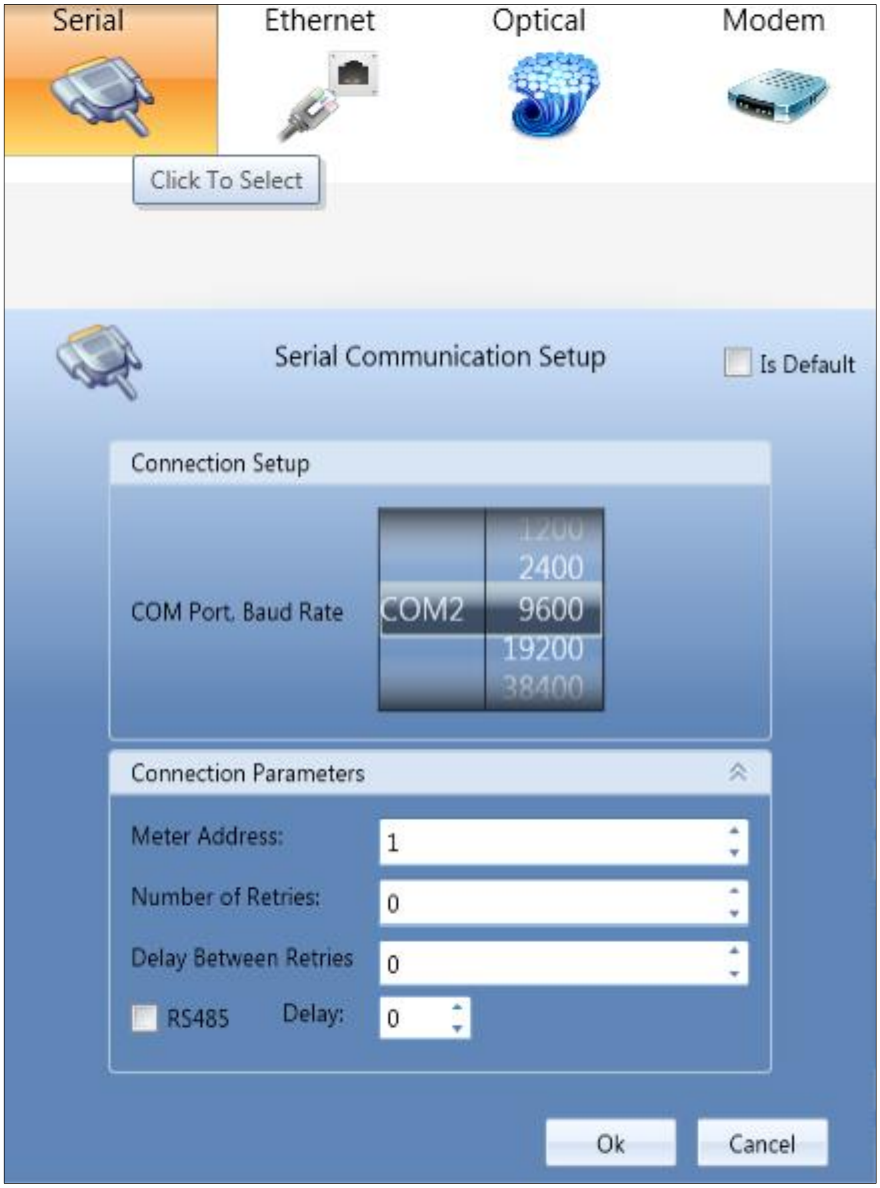
Connect the RJ-45 phone cable between COM1 on the meter and the back of the converter.

If you are creating your own serial cable, refer to the JEMStar II User Manual for the required connector types and pinout arrangements.

- **Optical connection**: Each meter is equipped so an optical sensor can be connected to the front of the meter. This provides an RS-232 output that is used the same as the Direct Connection style.
- **Modem Connection** can be used if your meter has an internal modem. JEMWare II will dial up the phone number associated with the meter and allow meter communications over any distance.

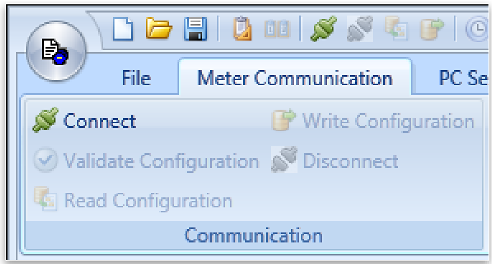
Step 2: Set up the communication parameters.
Open the JEMWare II application by double-clicking the icon on your desktop. The Main window will appear. If this is a first-time use, go to the menu labeled PC Settings then click PC Communications, and select the hardware method configured in step 1.

You must select whether your communication is Serial, Ethernet, Optical, or modem.

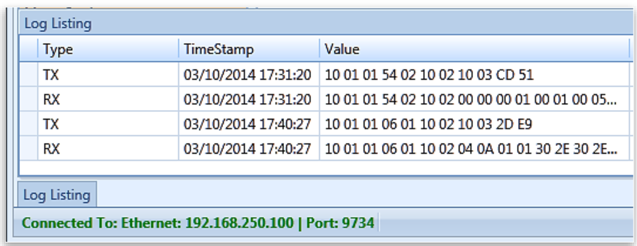


If Ethernet is used, enter the IP Address of the meter. (Default is 192.168.250.100 port 2001)
If a modem is used, you must enter an initialization string to direct the modem to connect properly (the standard Hayes "ATZ" string is provided as the default). If this is an optical probe connection, be sure to select the proper probe type from the scroll wheel.
Enter the appropriate information for your meter connection type and click OK to close the setup screen.
To use this connection method each time you connect to the meter, you must check the "Is Default" box. Otherwise, you will be prompted with the PC Communication dialog box each time you connect to the meter.

Click the Connect icon at the top or in the Communication group of the Meter Communication menu.



If successful, you will be notified of a proper connection. The bottom left corner will display live status.



Step 3: Configure the Meter

Once you are connected to the meter, you have several options.

1. You can read the existing configuration in the meter, make changes as necessary in JEMWare II, and then write the new configuration back to the meter.
2. You can write a previously saved JEMWare II configuration to the meter.
3. You can also make minor changes to the meter's configuration such as setting the time or sending a Freeze command without going through the main setup process.
4. You can retrieve the meter's real-time Status, Logs and Register values.

Be sure to save all new configurations for future reference.

Meter Configuration

All the parameters that determine the meter's operation can be set by using the JEMWare II configuration software. JEMWare II includes a file-management system for storing configurations, configuration-editing screens for setting the various parameters, and communication channel setups to program the meter. JEMWare II provides the ability to read the existing configuration from the meter and to read the time on the meter through serial communications.

NOTE: You may use the latest version of JEMWare II to open a configuration file saved with a prior version, or to read the configuration from a JEMStar II meter that was programmed with a prior version. If you do this, however, you must verify all settings in the configuration before saving it or programming it into a meter. Verify the settings by opening each item in the Meter Settings menu and reviewing the settings. This ensures confidence that the correct settings are in place and allows JEMWare II to insert appropriate default settings for features that may not have been present in the older version of JEMWare II.

Changing Meter Configurations

Certain features of the JEMStar II meter are forced to be re-initialized when portions of the meter's configuration are changed. This section summarizes the changes that will force a re-initialization. Note that when a new configuration is loaded into a meter, the meter determines individually if each section has changed from the currently stored configuration. These features are re-initialized ONLY if the particular configuration sections are different. Re-initialization means that the data in that particular register is set to zero.

Display Registers

The Display Registers feature includes the following parts of the JEMStar II:

- Registers in the Normal, Alternate, Test display list
- Self Read registers (Max of 8)

The following configuration sections, if modified, will cause the Display Registers feature to be re-initialized, erasing all previous data:

- Normal, Alternate, Test display list
- Demand settings
- Self Read settings.
- Primary Scaling settings (including changing VT/CT Ratio from the meter front panel.)
- Demand, Load Profile Interval Timing settings

Load Profile

The Load Profile features (which does not include individual Event Logs) will be erased and re-initialized if these configuration sections are modified:

- Demand, Load Profile Interval Timing settings
- Load Profile channel assignments
- Primary Scaling settings (including changing VT/CT Ratio from the meter front panel)

Energy Pulses

The Energy Pulse feature will be re-initialized if these configuration sections are changed:

- Energy pulse channel assignments

Measurement Logs

The Measurement Logging feature will be re-initialized if these configuration sections are changed:

- Energy pulse channel assignments

Changing Meter Configurations (MID Meters)

Changes to the meter that result in a reset of the MID Registers or Load Profile are prohibited. MID meters have the internal security jumper installed which prevent access to the following configuration items:

- Configure Primary/PTCT Settings
- Configure Display Registers
- Configure Load Profile
- Configure Loss Compensation
- Configure TOU/DST Settings
- Configure Input/Output Settings
- Configure Trigger Settings
- Configure Demand Settings
- Configure Transformer Correction
- Firmware/Option Upgrade
- Activate Test Mode
- Preset Registers

As a result, these items will be pre-configured at the factory prior to shipment.

The following commands will be allowed with the security key installed:

- Configure Meter Identification
- Configure Communication Settings
- Configure Protocol Settings
- Configure Display Settings
- Configure User Admin
- Change Password
- Set Time
- Freeze Registers
- Meter/Battery Status
- Read Triggered Alarms
- Read Display Registers
- Read Load Profile
- Read Event/Diagnostic Logs
- Read Security Logs

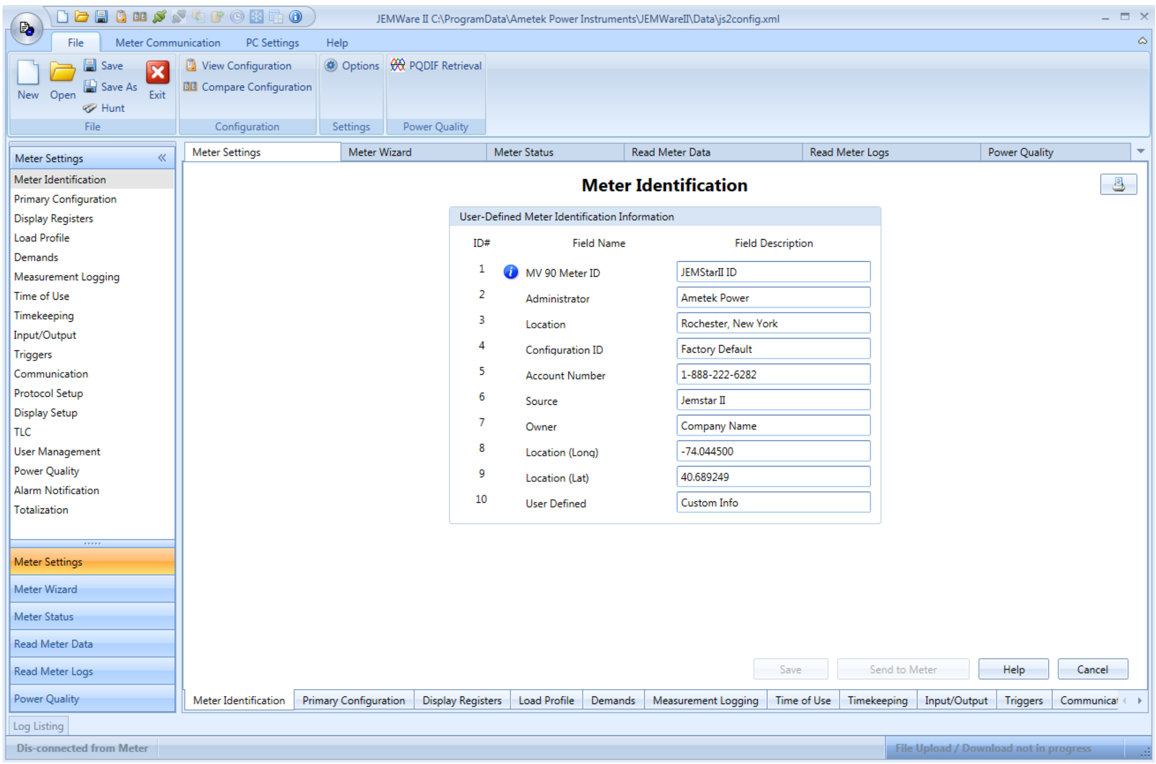
MID meters will also have the second internal security jumper installed which prevents access to the Billing Reset pushbutton located under the meter front cover.

Access to the internal security jumpers is prevented by the manufacture seal.

OVERVIEW

JEMWare II is comprised of a main window with the following sections:

- Menu Layout (across top)
- Navigation Bar (left side)
- Client Area (center)

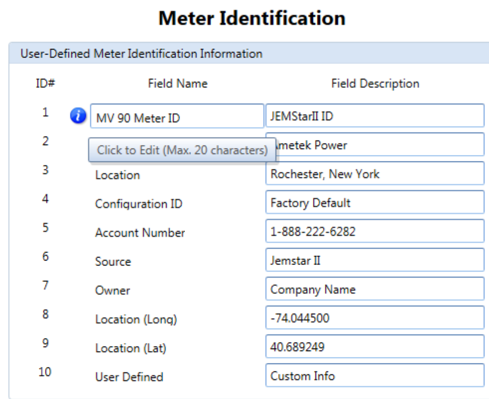


Notes: Navigation is available along the top, left and bottom perimeter of the application. The left and bottom items mirror each other. The two bottom corners indicate the status of activity.

Information and Tooltips:

Helpful tooltips appear throughout the application if you hold/hover your mouse over the fields. When you see the small next to a field, hover your mouse over it for extra information applicable to the screen you are currently configuring. Help is also available on all dialogs accessed by the help button or by pressing F1.

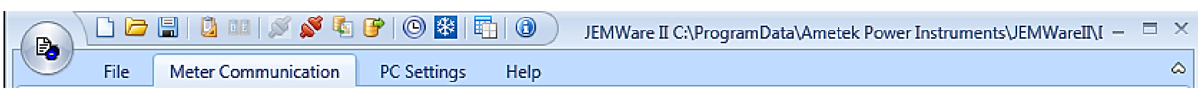
Examples:



MENU LAYOUT (ACROSS TOP)

Quick Access Toolbar

At the very top of the menu layout is a quick access/shortcut toolbar for commonly used tasks.



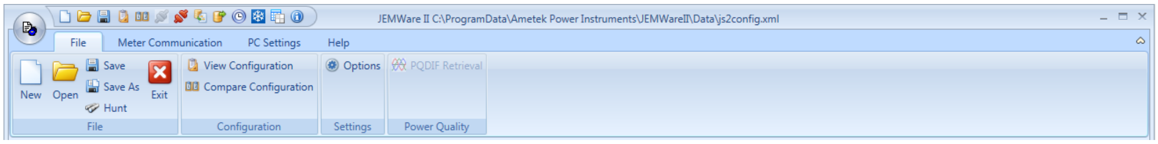
If you place your mouse over the icon, a tool tip identifies its function. From Left to Right:

Quick access toolbar items:

New, create a new meter configuration.
Open an existing meter configuration.
Save the meter configuration you are working on.
View the current configuration file.
Connect PC to the meter
Disconnect PC from the meter
Read meter configuration
Write meter configuration.

Configure the meter's time.
Send freeze command to connected meter
Review the meter's connection status.
About: Display program information (version number, copyright)

File Menu



JEMWare II manages meter configuration files through the File Menu. The File Menu also provides you access to a default configuration as a point of reference.

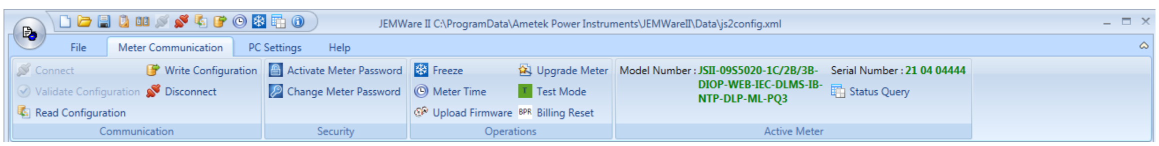
File: New, open, save, save as, & hunt for configuration files. Exit the program here.

Configuration: Use this feature to view and or create a report on the current configuration. This can be viewed, printed/exported as required. Compare configuration files.

Settings: Provides individual customization of the user interface. You can set user preferences for the configuration wizard, user interface themes, Connection Options and Log Listings.

Power Quality: Use this feature to schedule PQDIF file retrieval.

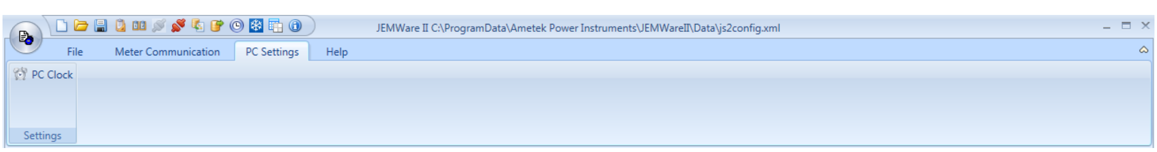
Meter Communication Menu



The Meter Communication Menu performs the actual communication with the meter to download or retrieve meter configurations. You can also perform operations such as a meter Freeze and Set or Get the meter's time or Upload Firmware from this section.

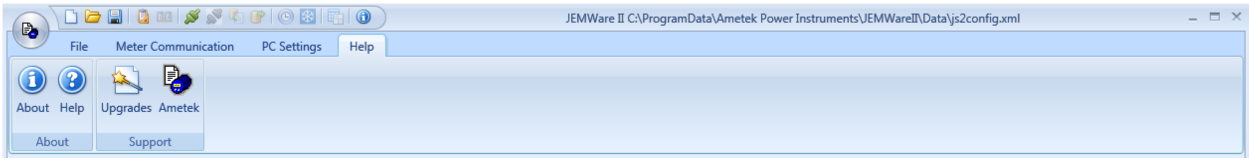
It is divided into four sections, Communication, Security, Operations and Active meter. Each item listed on the menu brings up a window that defines certain aspects of the meter's configuration. Some of the menus bring up submenus that break down the setup of these parameters even further. The Security section is where you manage passwords.

PC Settings Menu



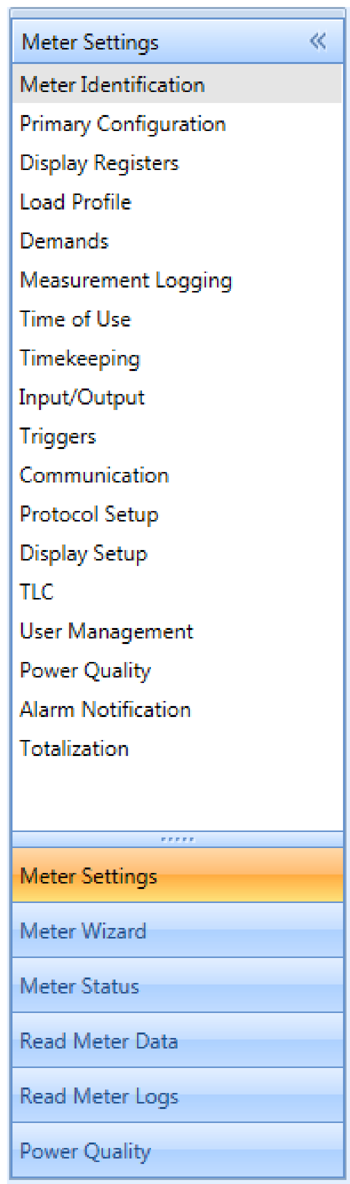
PC Clock: Set the meter time and date.

Help Menu



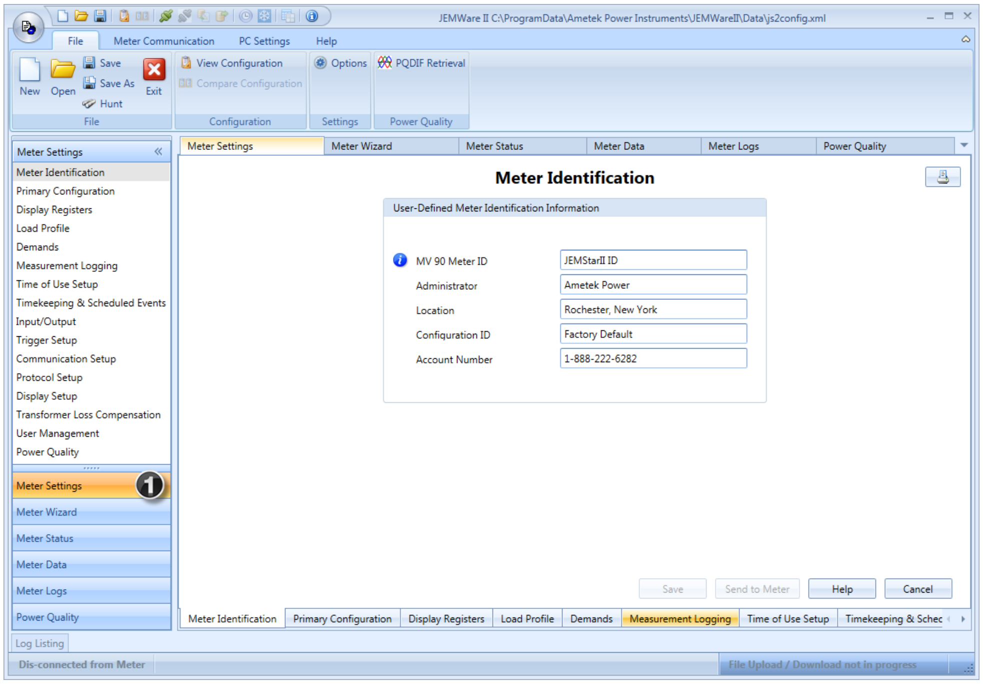
JEMWARE II is equipped with a traditional Help system to aid with each page and program functions. Most Help screens include a help button. And can also be accessed by pressing F1. Some fields have tooltip descriptions and further information on the function and valid ranges when you hover your mouse over them.

NAVIGATION BAR (LEFT SIDE)



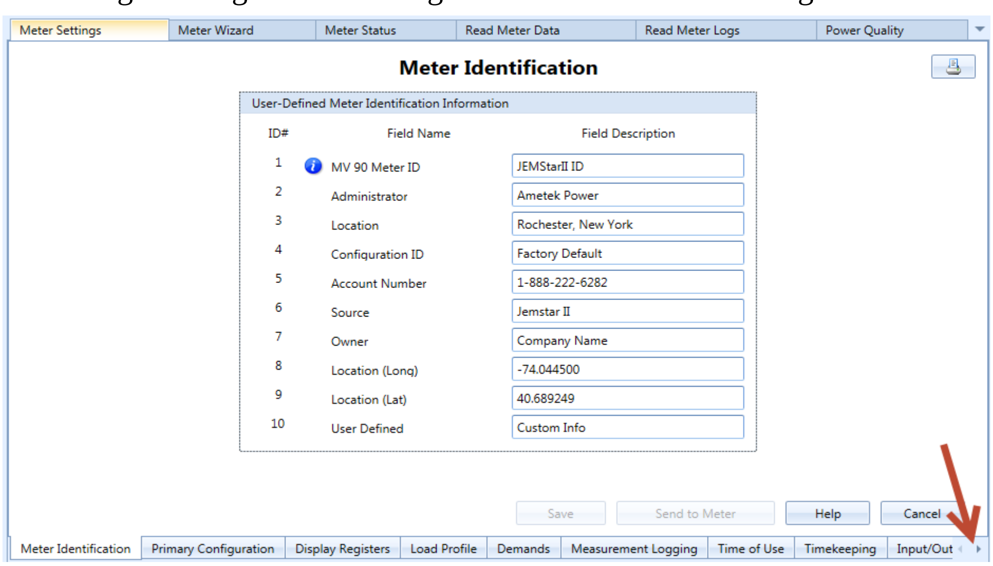
Note: Meter setting configuration options will change depending on the Meter type you are using.

1. Meter Settings – the Navigation bar displays settings options and the corresponding configuration parameters are displayed in the center Client Area (see following).



CLIENT AREA (CENTER)

Navigation tabs in the Client Area mirror the headings in the Navigation Bar. You can also navigate using the left and right tab arrows to scroll through tabs shown below.



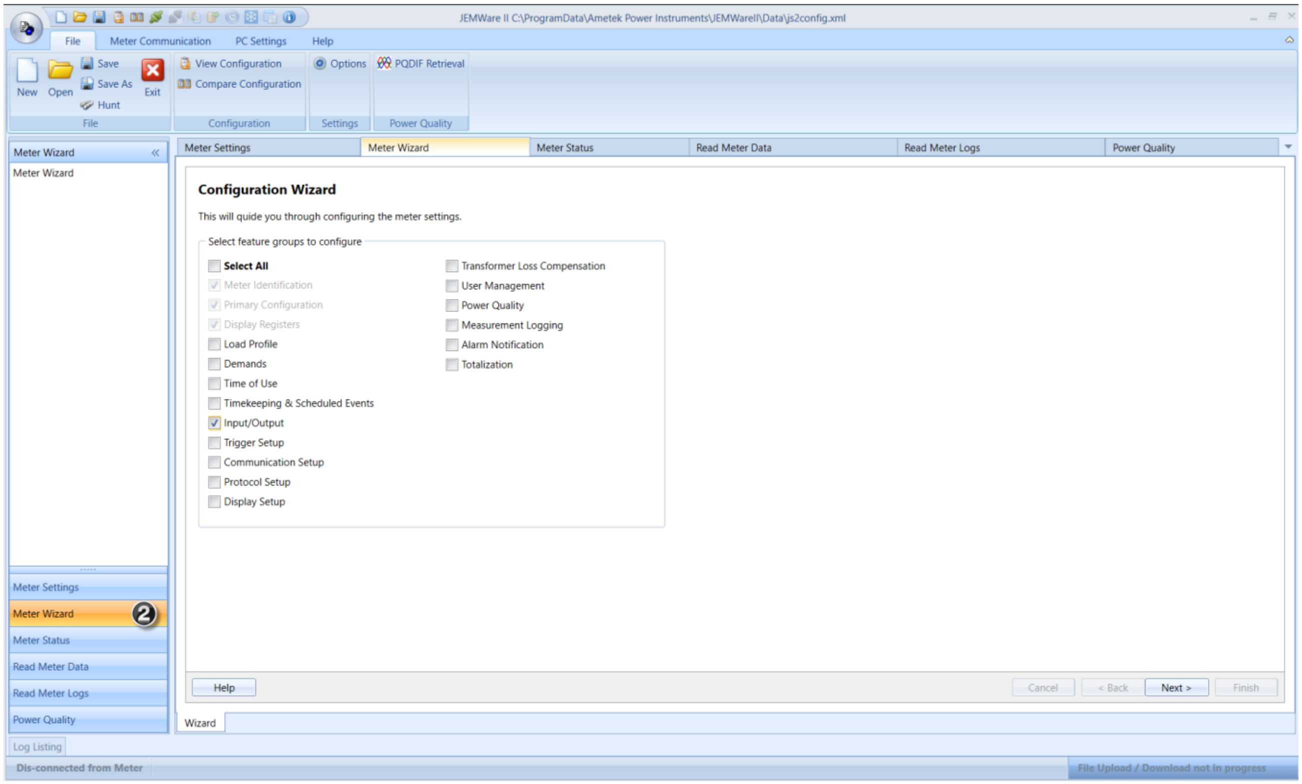
The Client Area contains the configuration pages for Meter Settings to configure meter parameters. Subdivisions include:

- Meter Identification
- Primary Configuration
- Display Registers
- Load Profile
- Demands
- Measurement Logging (option)
- Time of Use (TOU)
- Timekeeping & Scheduled Events
- Input/Output
- Trigger Setup
- Communication Setup
- Protocol Setup
- Display Setup
- Transformer Loss Compensation (TLC)
- User Management
- Power Quality (option)
- Alarm Notification
- Totalization

The bottom corners of the Client Area display status information updated live.

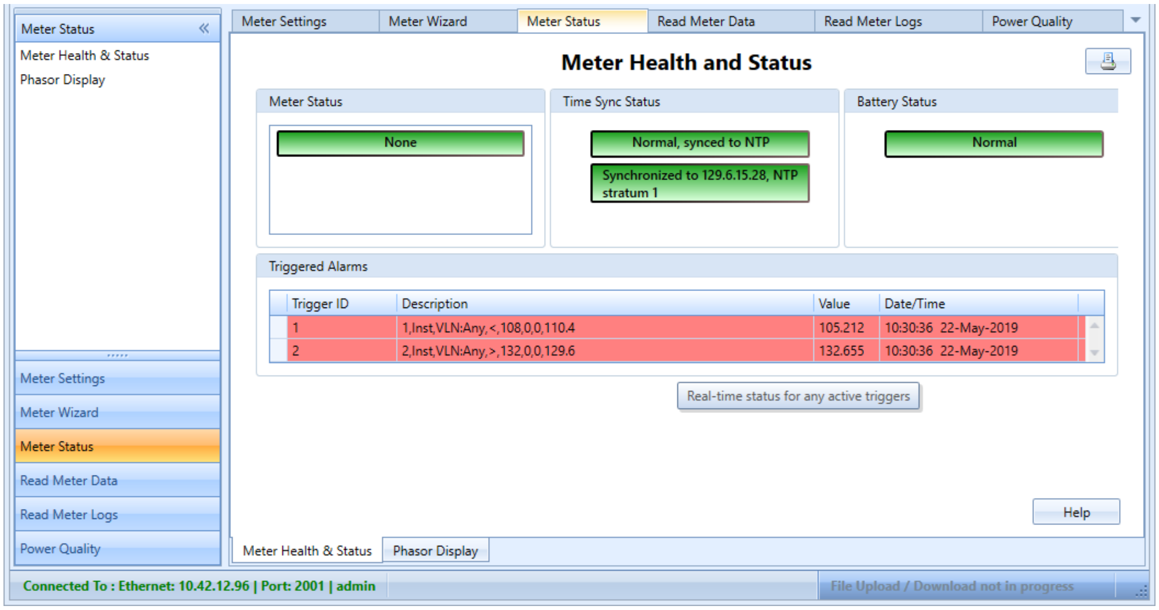
1. Connection Status
2. Show Read Configuration: File download operation is in progress.

2. Meter Wizard – to configure the wizard, select the desired options. The wizard guides you through selecting meter settings when creating a new configuration.

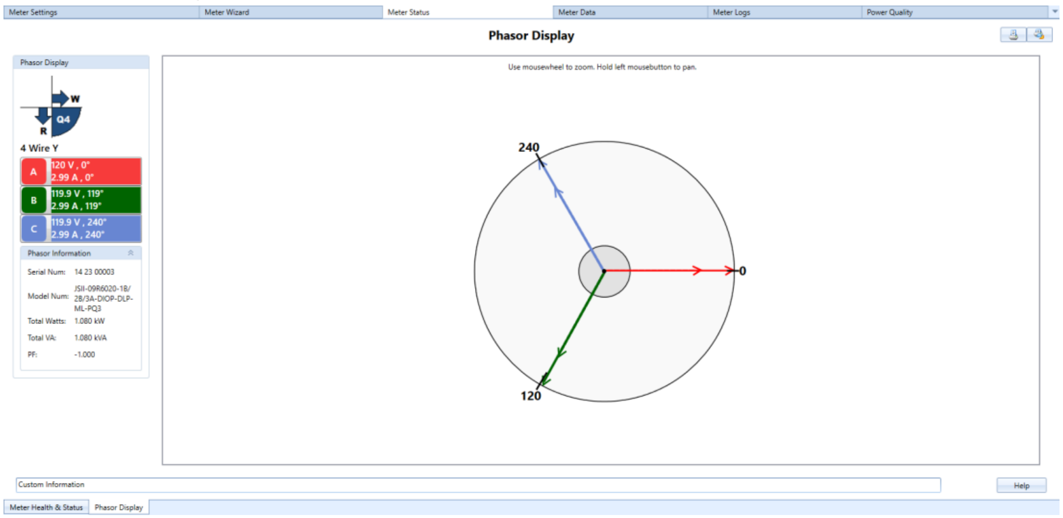


3. Meter Status – Available when connected to a meter this displays the active status for the Meter Health and Status, Triggered Alarms and Phasor Display.

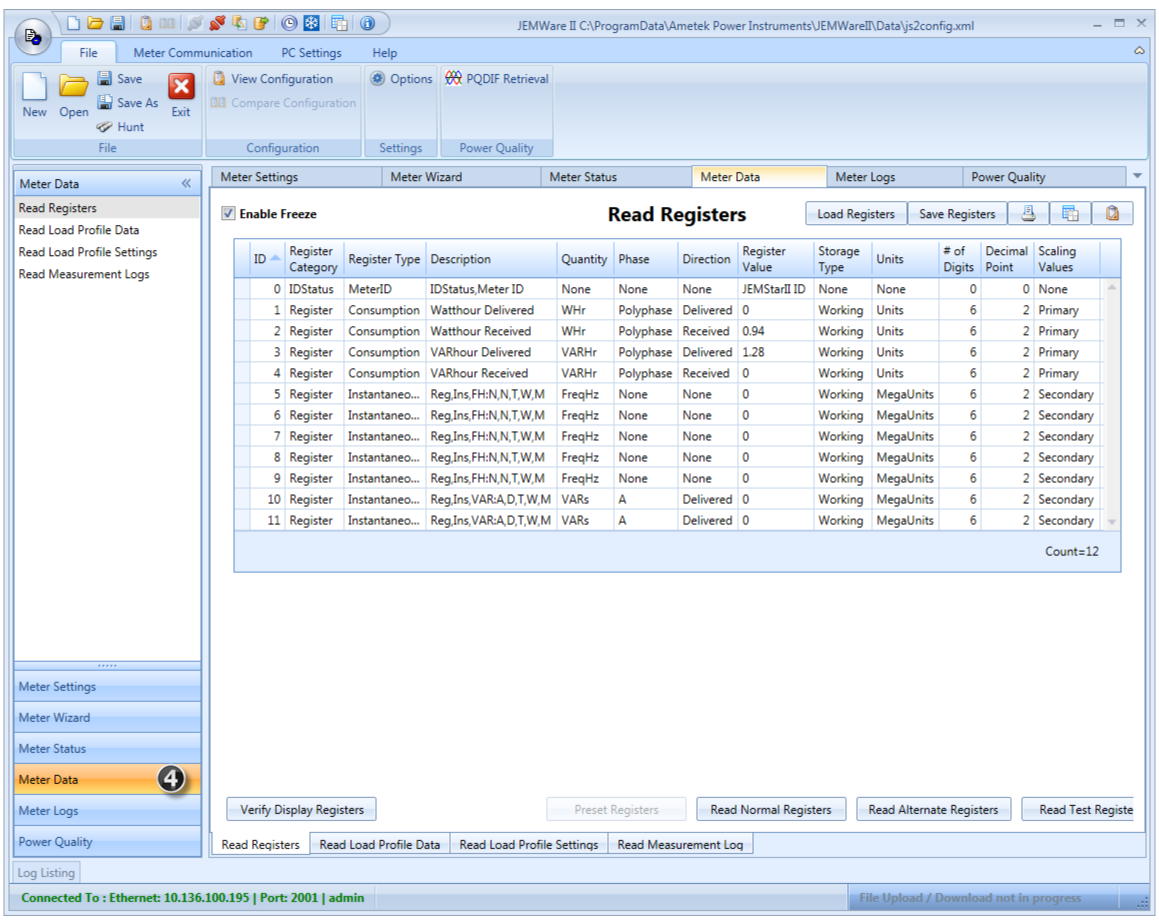
Meter Health & Status



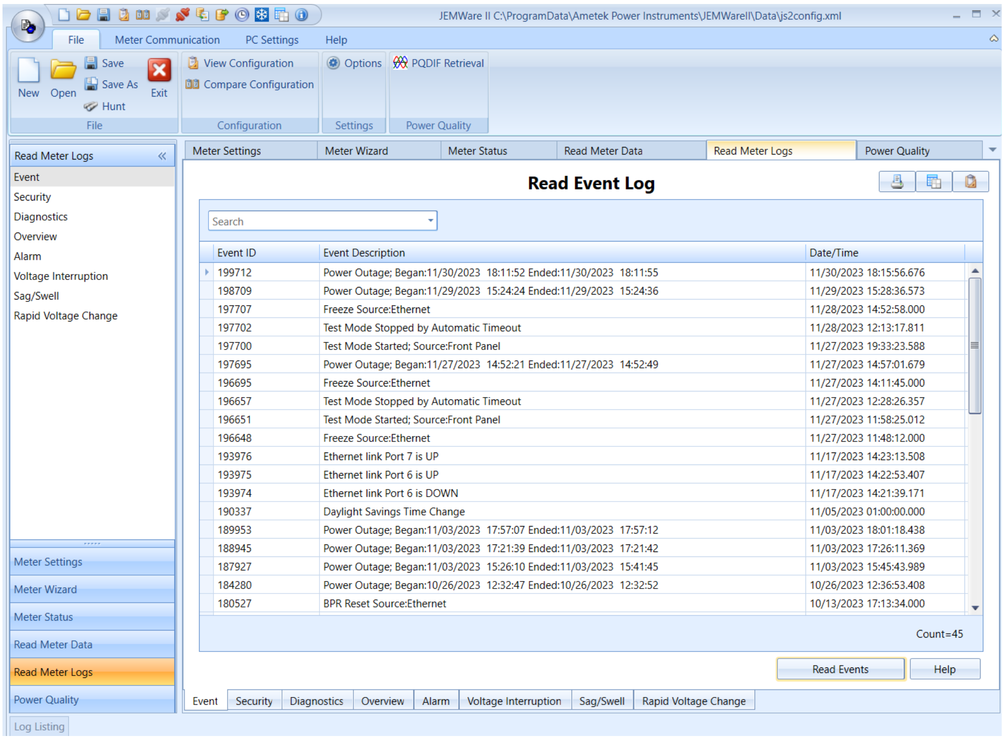
Phasor Display



4. Meter Data – Read and Display Register Data, Load Profile Data and Load Profile settings, Read Measurement Logs



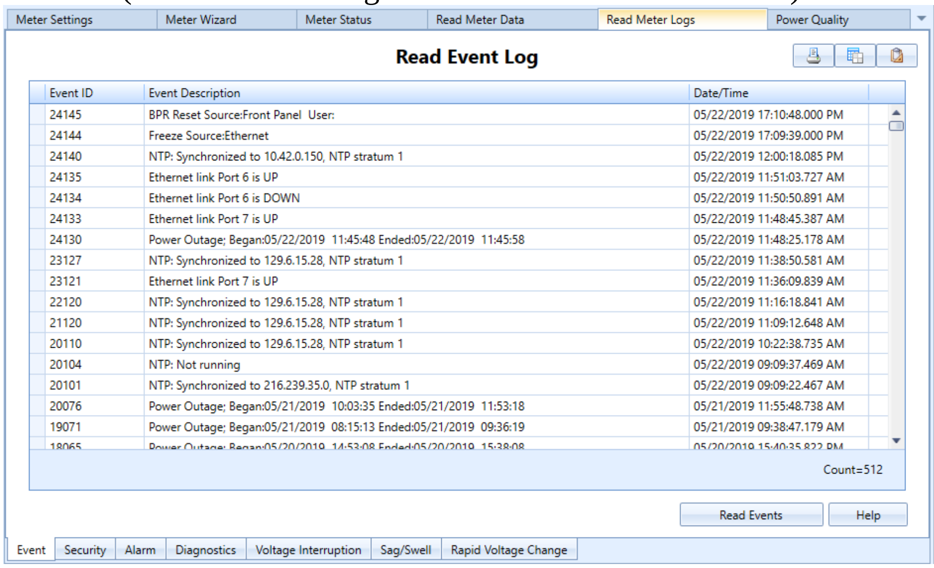
5. Meter Logs – JEMWare II records Read Event, Security, Alarm and Diagnostic logs, Overview, Read Voltage Interruptions, Sag/Swell Events, and Rapid Voltage Changes.

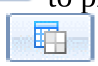


Logs of the following event types available:

- Read Event Log
- Read Security Log
- Read Alarm Log
- Read Diagnostic Log
- Read Overview Log
- Read Voltage Interruption Log
- Read Sag/Swell Events Log
- Read Rapid Voltage Change Log

Example Event Log: records metering related events like Billing Period Resets and Register Freezes. (Refer to Meter Logs section for further information)

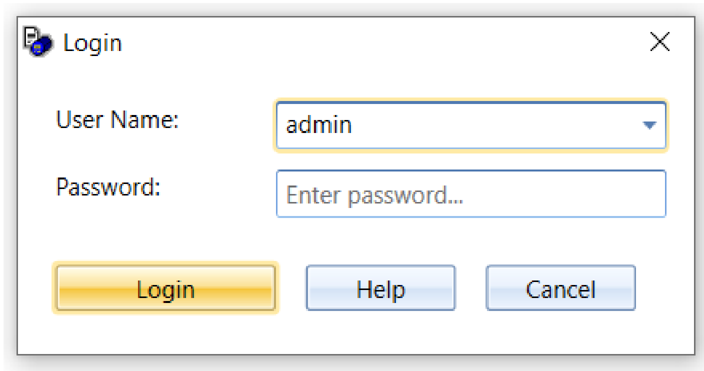


- Select the printer icon  to print and export these logs for further analysis.
- Select the spreadsheet icon  to export directly to Excel for further analysis.
- Select the report icon  to export these logs to CSV format for further analysis.

USING JEMWARE II

FIRST TIME USE

Open the program by double-clicking on the JEMWare II icon on your desktop. The AMETEK/JEMWare II Splash Screen will appear briefly, after which you can login.



You will be initially presented with a login screen. All users will be required to login with a User Name and Password.
After login, the default configuration file is loaded whenever you start JEMWare II. It can be edited and saved with a new file name.
Each custom configuration is saved as an individual file. If you already have custom configuration files, click the Open button to locate and load the desired file.

There are different ways to create and use a meter configuration.

1. You can create a new default configuration by selecting "New" in the File menu. This opens the js2config.xml file.
2. You can open an existing file by selecting "Open" in the File menu and browsing to the file location.
3. You can connect to a meter, retrieve the configuration file, make changes, and save it with a new name.
4. You can Hunt for an existing configuration. Hunt resides in the File menu. See the Menu Features section for more information.

JEMWare II includes a factory default configuration (js2config.xml) that you can edit to suit your own needs. Then save it for future meter configurations. Any time you select "New", JEMWare II will start with this configuration file.

All meter configuration pages are saved to a single .xml file. This can be done using the main Save function in the File menu.
Each meter setting configuration page has a "Save" button that saves any changes made to that page into the configuration file.
If you have more than one typical meter setup, save each template with its own name by selecting "Save As" in the File menu.

We recommend that you save each meter's configuration with a unique name.

The top or bottom of the application window will show which file you are working with.

Passwords/Privileges

JEMWare II is designed with built-in security protection that only allows designated users to access and edit important meter configuration files.

- The **Admin** level allows access to all the features. Passwords can be changed, and all meter configuration controls are available.

Admin Login

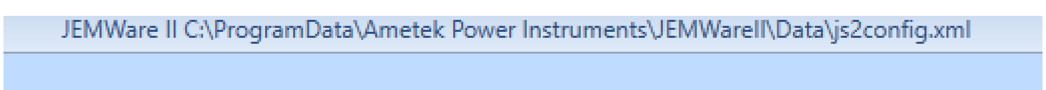
If this is a first-time use, select **admin** from the drop-down box and click Login. You must enter the default password "admin" and click Login.
Once you have access to the program, you can change the password to something of your choosing by going to the User Management section in the Meter Settings pane. When you save these changes to the default configuration file that opens when you start the JEMWare II Software, the next time you log into JEMWare II, it will require the new passwords.

User Login

Enter **user 1** Name and password "user1", click Login to continue.
Enter **user 2** Name and password "user2", click Login to continue.
Enter **pq** Name and password "pq", click Login to continue.

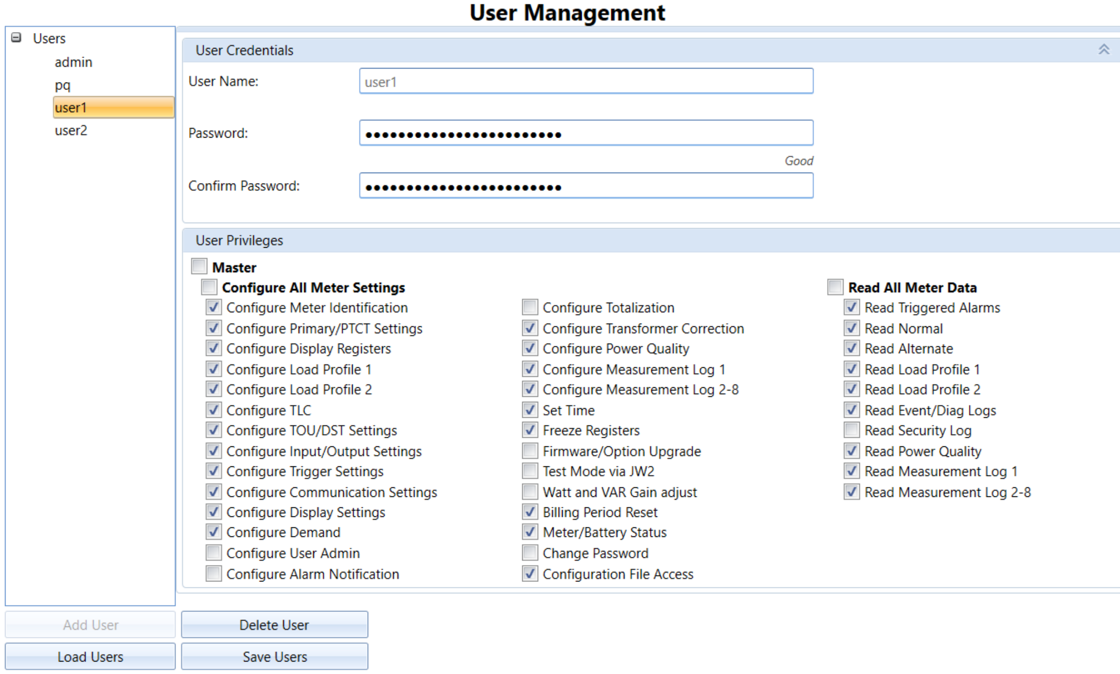
JEMWare II Passwords vs Meter Passwords

When you log into the JEMWare II Software with a username/password, this same username/password combination is also used to connect to the meter.
For example, if you log into the JEMWare II Software with password *user2*, then it would be enabled to connect to a meter with password: *user2*
If the meter password is different from the JEMWare II Software password you will need to activate this password for connection to that meter. (refer to the section on Meter Communications)
The passwords associated with a meter are stored in the meter.
The passwords used for logging into the JEMWare II software are controlled by the JEMStar Default Config File: js2config.xml (User Management Screen)
When you start up JEMWare II it automatically starts with js2config.xml which is displayed at the top of the page.



Any passwords set in the User Management screen of the JEMStar Default Config File (js2config.xml) control how you log into the JEMWare II Software.
Note: If you make a change to the passwords in the default config and save it, this will impact how you gain access to JEMWare.

User Management



METER CONFIGURATIONS

Meter configurations can be created while connected to a meter or offline with no meter connected.
The meter configuration consists of 18 main set up screens dedicated to specific functions of the meter. You only need to configure the screens that apply to your meter application.

All the meter configuration screens are saved to a single (.xml) file. This can be done using the main Save function under the File tab.

Each meter configuration screen has its own ‘Save’ button that will save any changes made to that screen into the main configuration file.

The software includes a factory default configuration (js2config.xml) to get you started. You can edit this default file to fit your own needs and save it for use in creating future meter configurations. Anytime you select ‘New’ in the file tab, it will go to this default configuration file (js2config.xml).

The top (or bottom) toolbar on the software will always show you which file you are working on.

Whenever you edit a configuration screen, you will see an asterisk next to the screen name in the Meter Settings List. The asterisk will indicate that a change was made but hasn’t been saved. Once you save it (either on the configuration screen itself or the main Save function in the File tab), the asterisk will go away.

Creating a Meter Configuration

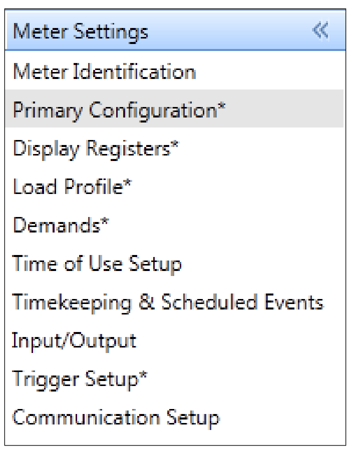
There are different ways to create and use a meter configuration.

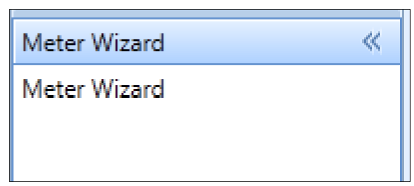
1. You can create a new default configuration by selecting “New” in the File menu. This opens the js2config.xml file.
2. You can open an existing file by selecting “Open” in the File menu and browsing to the file location.
3. You can connect to a meter, retrieve the configuration file, make changes, and save it with a new name.
4. You can Hunt for an existing configuration. Hunt resides in the File menu. See the Menu Features section for more information.

Default Template
The software comes with a default configuration called js2config.xml. You can edit this so that it matches your typical meter setups. When done, save the changes so the default will always come up with your changes. As a safeguard, save the file in your own location in case it gets changed accidentally.

If you have more than one typical meter setup, save each template to its own name.
It is recommended that you save a unique configuration filename for each meter. After opening your default template, save the file to a unique name.

Creating a new configuration
When creating a new meter configuration, you can manually go to each meter configuration screen as shown in the drop-down Meter Settings Tab or use the Configuration Wizard which automatically goes from one screen to another ensuring that you don't miss an important set-up.





Editing a Meter Configuration

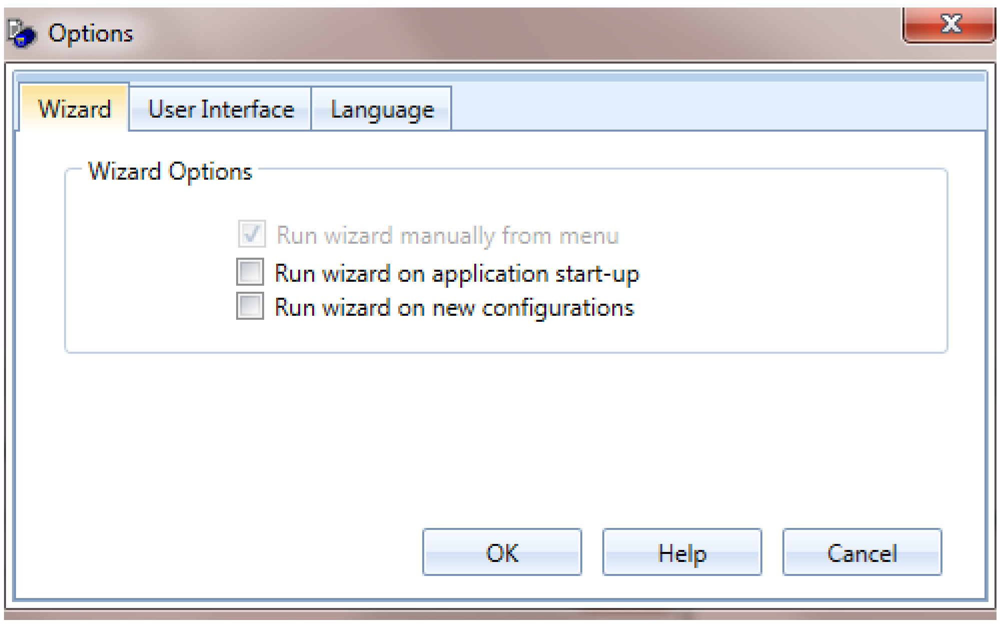
To edit an existing meter configuration, you can either edit the configuration file off-line and resend that to the meter or read the configuration from the meter and make edits to specific areas by either sending the changes one page at a time or sending the whole configuration.

MID Meter Configurations

These meters have internal security jumpers installed preventing the changing of certain parameters. This will also prevent you from sending the whole configuration file to the meter as some changes may not be authorized.
To edit a MID Meter configuration, you need to connect to the meter and read the configuration file. You can selectively make the changes to each screen (if allowed to do so) and send the changes one page at a time.

CONFIGURATION WIZARD

The Wizard is designed to be self-explanatory and automatically guide you through step-by-step procedures to build a configuration file that corresponds to your meter application. As you progress through each step of the Wizard, you will logically insert information as needed. Once you become familiar with the JEMWare II process and have some saved configurations, you may wish to bypass Wizard and go directly to the pull-down menus for editing specific sections.
To choose when you want the Wizard to be activated, go to File > Settings > Options > Wizard tab and check your preferences.



To begin the Configuration Wizard manually, click Meter Wizard in the navigation bar on the left. After you select the user, the default arrangement will have all the check boxes selected. If you do not have or want to use a particular option, you can de-select it and the Wizard will bypass those from setups.

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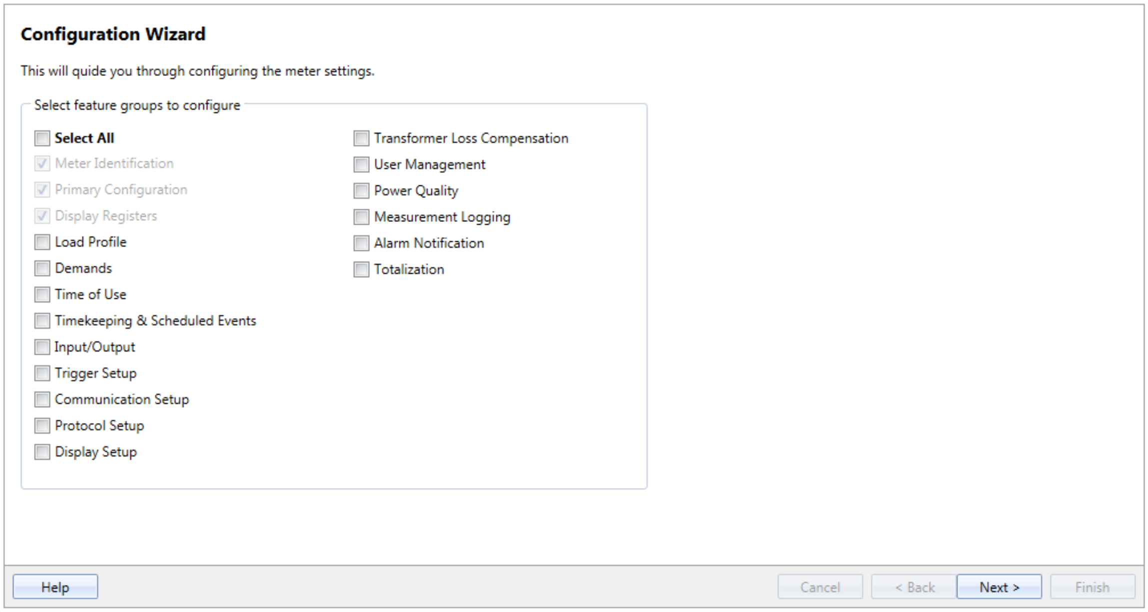


Once you have selected the correct features for your meter, step through Wizard by clicking the Next button at the end of each progressive screen. The features you selected in the first Wizard screen will determine which screens must be filled in and the sequence. Use the online Help buttons available on each screen if you have any questions about setting up a field.

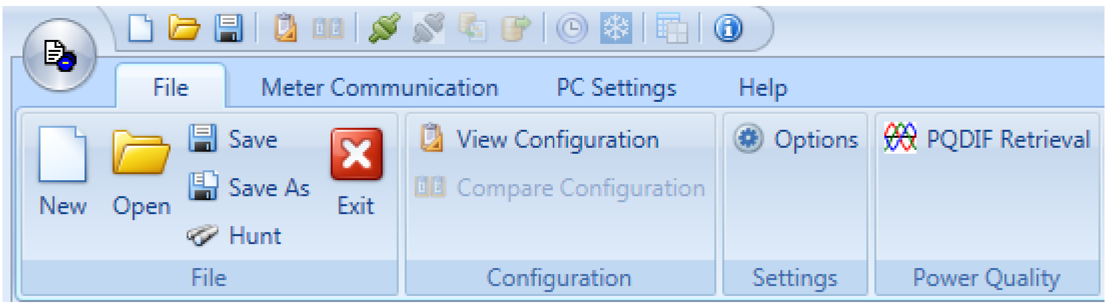
Each Wizard screen has a matching standalone configuration window that is accessible through the navigation bar. Refer to the next section of this manual for a detailed description of each menu function.

MENU FEATURES

Whether you use the Wizard or the navigation pane, each configuration window will look the same. The Wizard will automatically switch from window to window progressively, where the specific menus must be accessed individually. This section will explain each menu in detail.

FILE MENU

The File menu includes the standard Windows functions such as New, Open, Save, Save As, Hunt, Print, & Exit. In addition, the following features are special to the JEMWare II application.



New

Clicking the 'New' icon will revert the changes in the js2config.xml to the default file.

Open

Clicking the 'Open' icon will invoke a standard browse window where you can look for your file.

Save

Clicking the 'Save' icon will save all changes made to any of the configuration screens into the current configuration file name. The current configuration file name is always displayed on the top or bottom toolbar of the software.

Save As

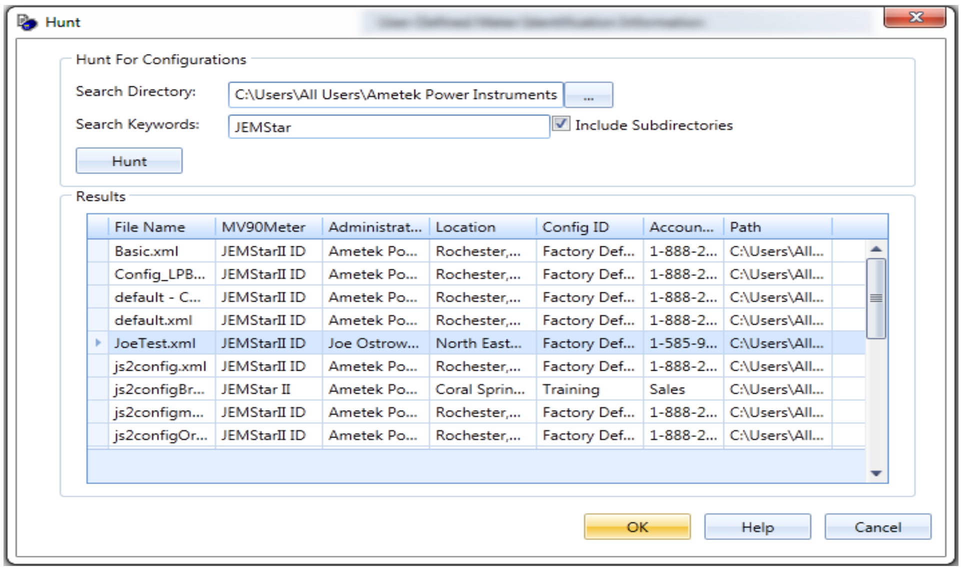
Clicking the 'Save As' icon will invoke a standard window where you can enter a unique file name and location for your file.

Hunt

Clicking the Hunt button (Binoculars icon) in the toolbar will open a search tool to fund your configuration file.

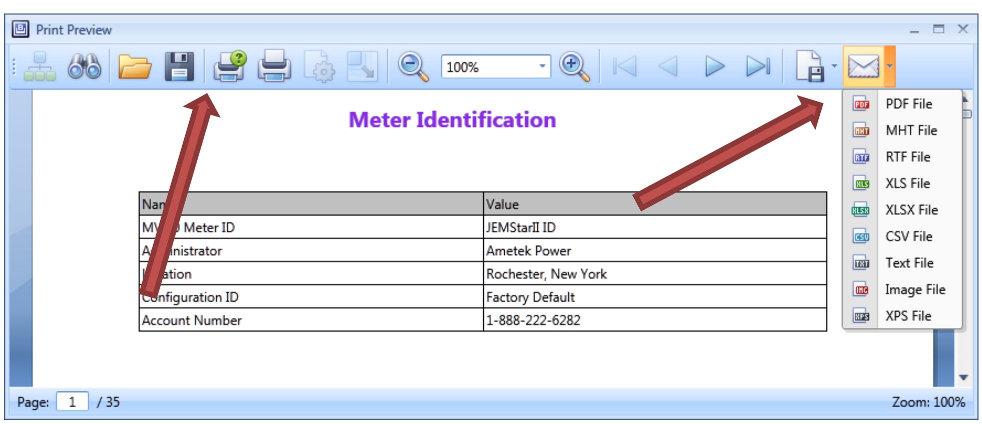
Simply type in a Directory and/or Keyword in the top two fields and click the Hunt button.
The keyword can consist of any text that you entered in the five Meter ID fields (such as the Meter Name, Location, etc.). The program will search the specified directory in your hard drive for **.xml** files. JEMWare II will locate and display all the .xml files that contain your keyword(s).

Click to select the file you wish to open and choose OK to load this configuration file.



VIEW CONFIGURATION

This shows the configuration of the currently loaded file. It will most likely be a multi-page document. A couple examples of the contents are shown here.
Both reports can be printed and saved in various formats as shown by the red arrows.



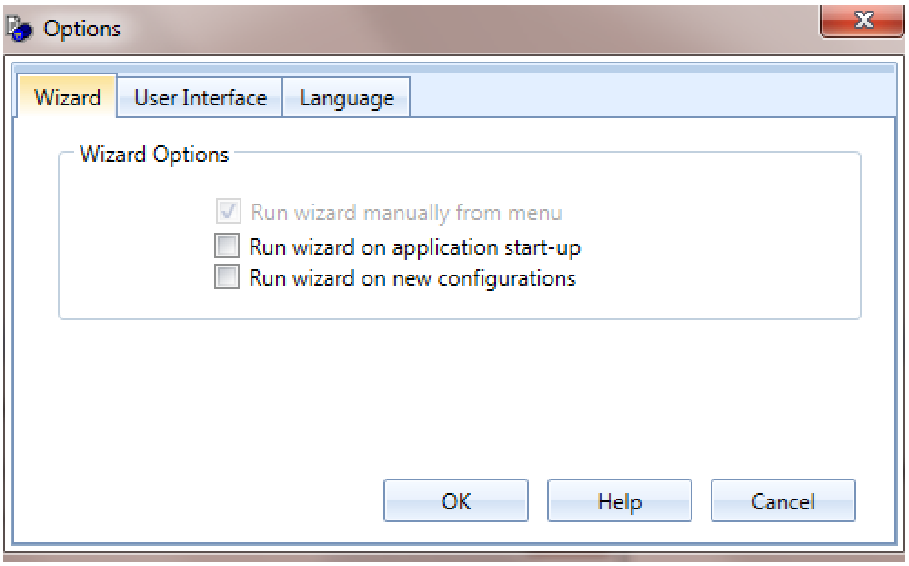
SETTINGS

Options

You can set user preferences in the options section. Options provide individual customization of the user interface. To choose when you want the Wizard to be activated and set preferences on themes/colors and languages.

Wizard

This lets you select how the configuration wizard will be made available upon startup.

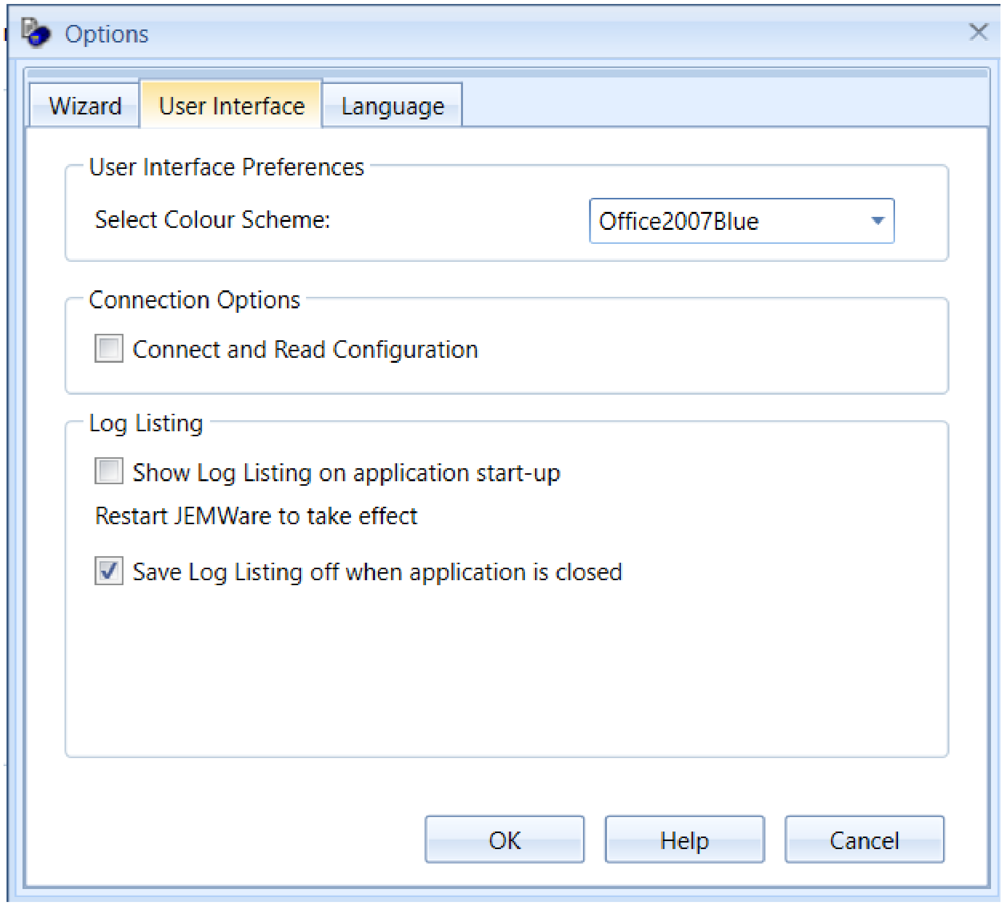


User Interface

User Interface Preferences
This lets you adjust the color scheme for the software.

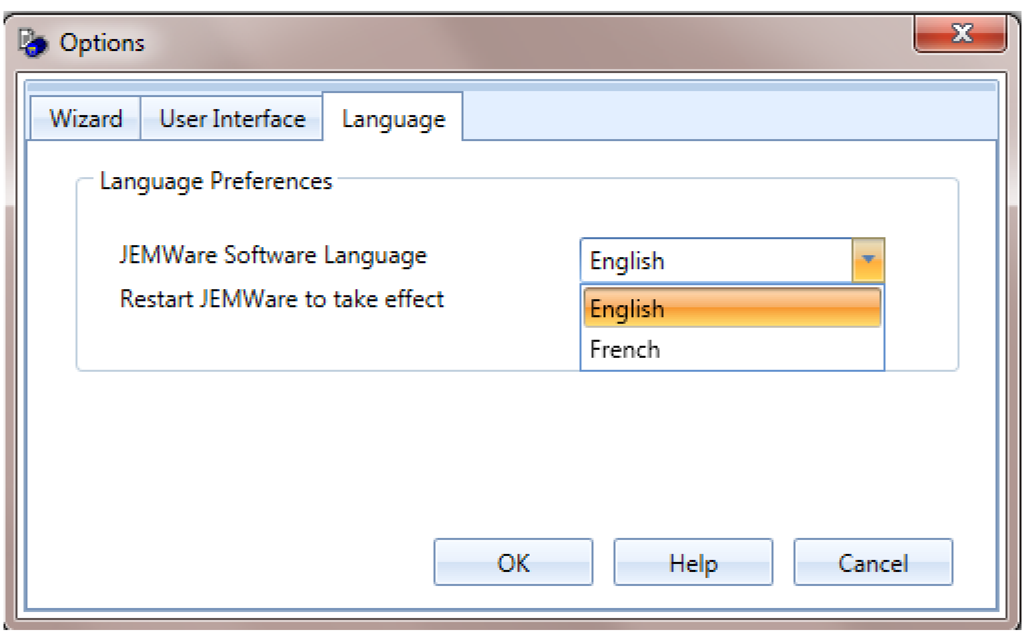
Connection Options
You can enable this option that will on initial connection to a meter it will automatically read back the configuration from the meter. By default, this is not enabled.

Log Listing
This lets you select to show the Log Listing on application startup. A restart of the JW2 application will be required if you enable this option.
There is also an option to save off the most recent log listing data when the application is closed. The log listing will have details on the communication to and interaction with a meter and will record the meter connection status information as well as operational and diagnostic data. This is enabled by default.



Language

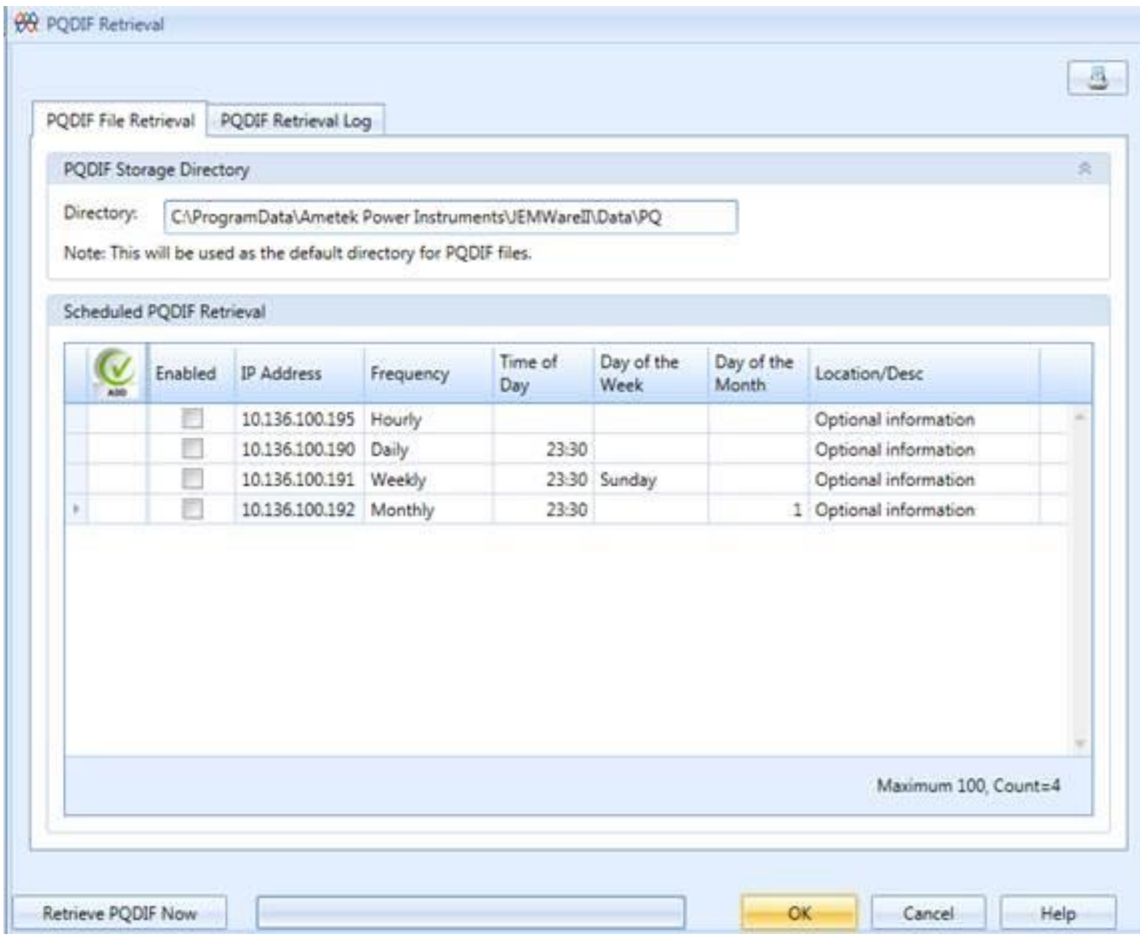
This provides the ability to set the language for subsequent sessions of JEMWare II. You must close JEMWare II and restart it to start seeing the other languages.
Note: Some user selections will default in English although most Menus and screens will be displayed in the language selected.



POWER QUALITY

PQDIF Retrieval

This is used to automatically retrieve Power Quality PQDIF files from several meters by schedule. With the scheduled retrieval, you create a database of all the meters you wish to retrieve data from and the timing when you wish to retrieve the data. The setup screen for this is shown below.
Note: The JEMWare II Software will display all PQ files for viewing in the default directory location shown on this screen.



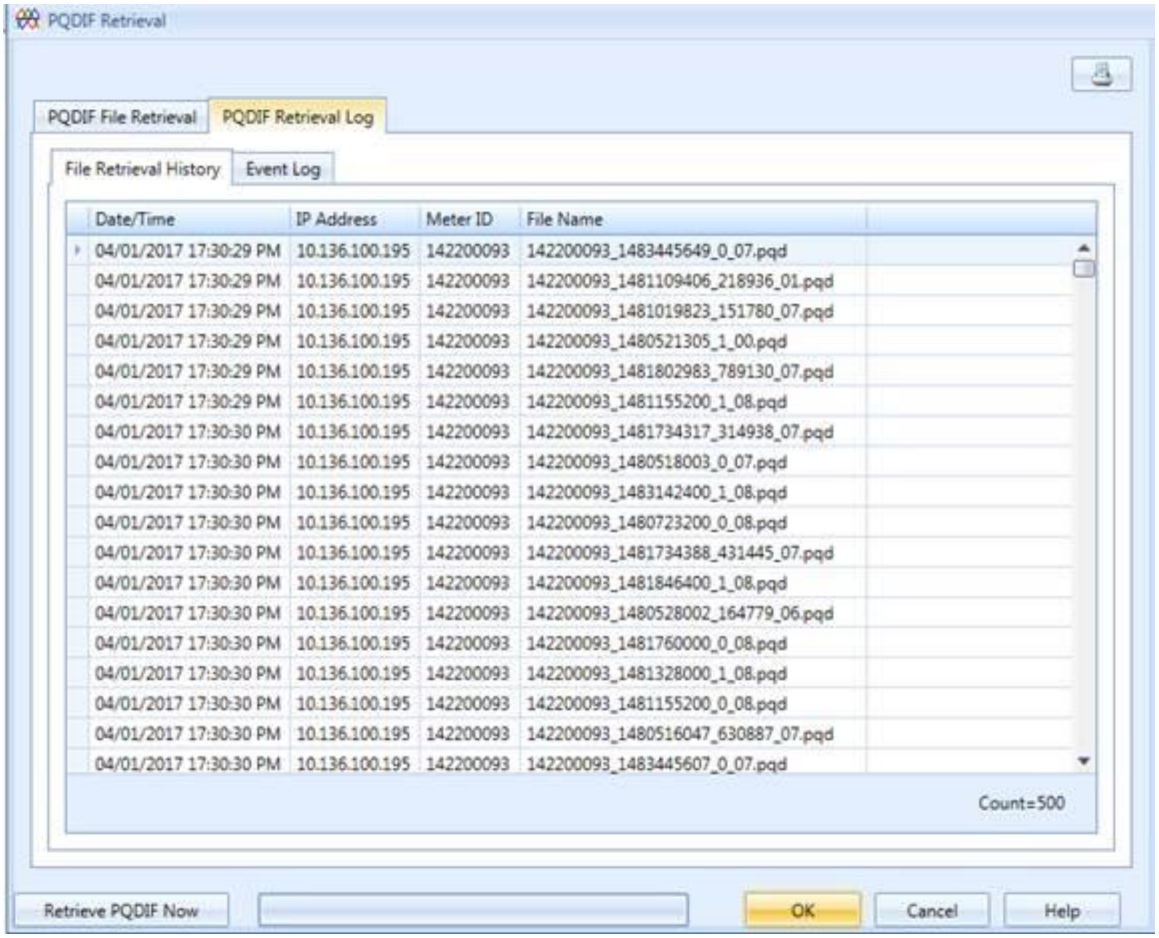
The frequency of retrieval can be configured as hourly, daily, weekly, or monthly. The hourly read starts at the top of the hour. Additional settings are provided for daily, weekly, and monthly.
You can enable or disable a meter from the scheduled polling using the checkbox provided.

Retrieve PQDIF Now

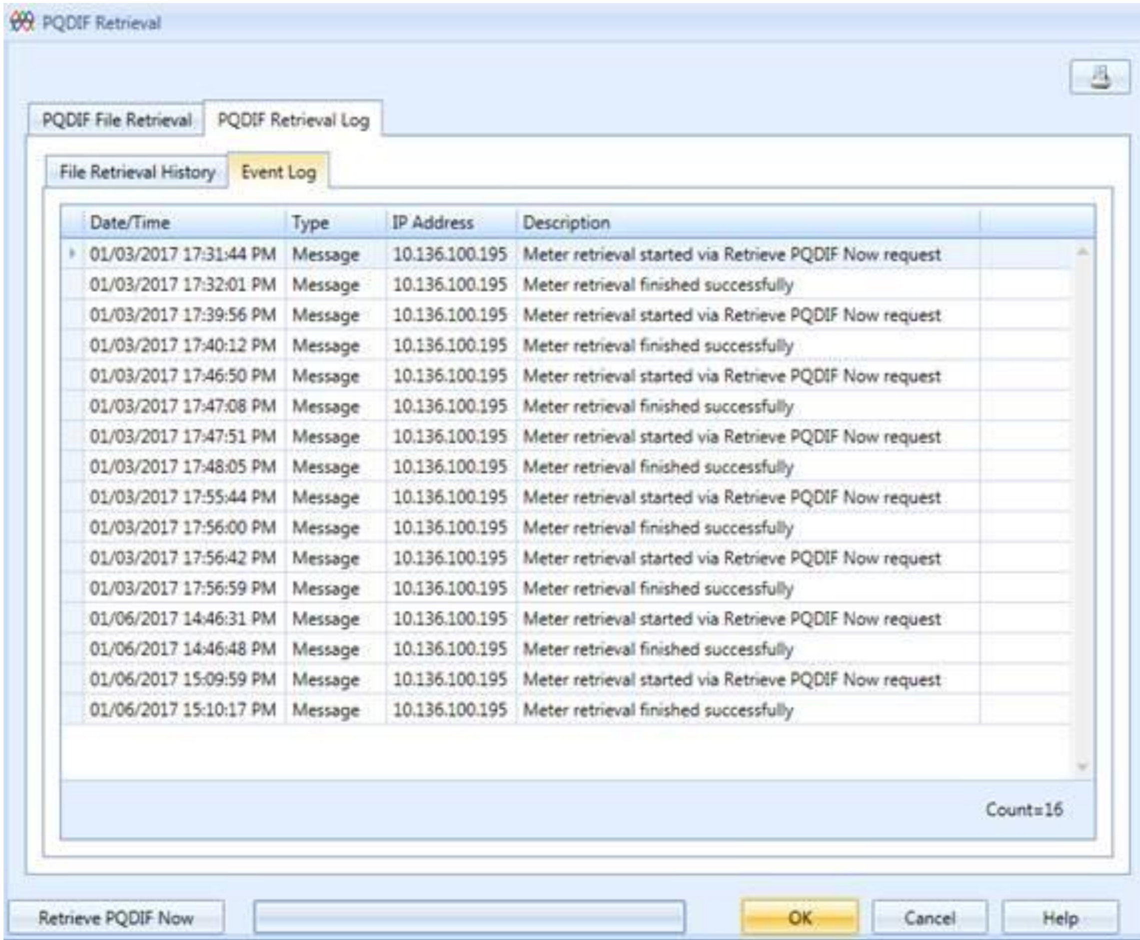
You can initiate the polling of all meters enabled with the Retrieve PQDIF Now button.

The Retrieve PQDIF Now button will override any scheduled settings and will connect to any of the enabled meters and retrieve any PQDIF files.

The PQDIF Retrieval Log will document the retrieval history and show what files have been retrieved from what Meter ID and at what time.



The PQDIF Event Log will document each tasks progression and logs information on the tasks status.



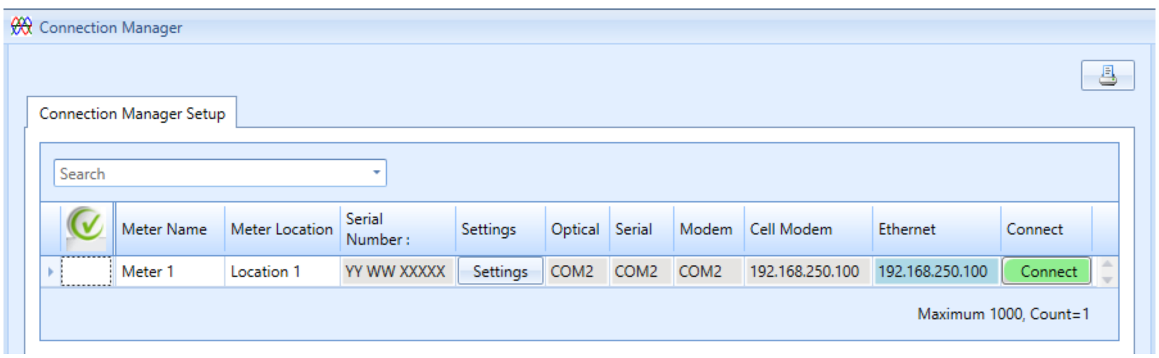
METER COMMUNICATION

You must first set up your PC Settings before communicating with the meter. The Connection Manager lets you store the connection details for all your meters.

CONNECTION MANAGER

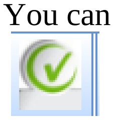
The ‘Green’ Connect button is used to access the Connection manager.

The Connection Manager starts out with the default communication settings as shown below.



The Meter Name and Meter Location fields are user defined fields for each meter. The Serial Number field will be automatically filled once you connect to the meter.

You can Add new meters using the Green Add button.



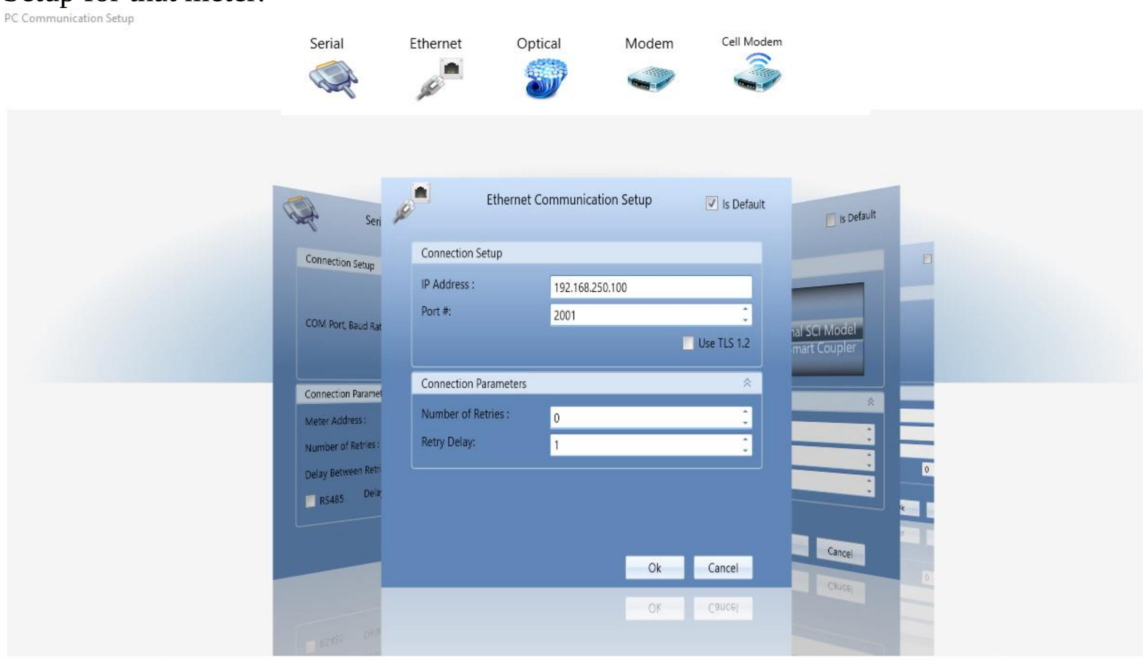
You can also copy and paste previous meter connection settings.

The ‘Settings’ field is used to set up all the different connection methods available between the meter and the PC running JEMWARE. One of these connection methods will be set up as the default for connecting to the meter. It will be highlighted Blue as shown on the screen above for Ethernet.

Settings

This screen is used to configure the PC Communication Setup for connecting the JEMWare II Software to the meter. You can connect to the meter locally or remotely using the Optical Port, Serial Ports, Modem, Cell Modem or Ethernet Communications. Once you configure the settings, you will need to select one of the communication methods as the 'default' so it will automatically use this configured method going forward. Ethernet Communications is recommended for updating the meter configuration, downloading new firmware, and retrieving large amounts of data.

Click the Settings button on the Connection Manager to bring up the PC Communication Setup for that meter.



There are separate pages that can be scrolled for the different PC Communication Setups:

- Serial
- Ethernet
- Optical
- Modem
- Cell Modem

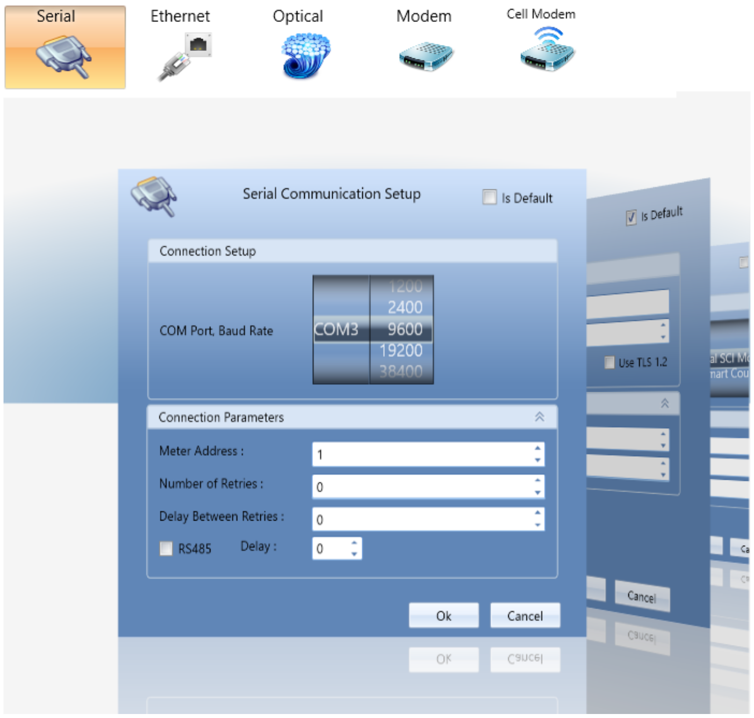
Enter the parameters in the corresponding fields for the chosen communication setup. Note: some features are optional; check your model number to determine availability in your meter. When you are finished select ok to save your settings also select the Is Default check box on the top right hand of the communication setup screen, to set how you would like to default future connections.

Pro Tip: Optical Port settings are typically the same for all meters. You can create a separate entry to select the default for Optical and use it on all meters.

Serial Communication

To configure the meter's serial data interface, click on the Serial icon.

Serial Communication Setup



Enter the parameters in the corresponding fields.

Connection Setup:

Use the scroll wheel to choose the PC COM Port and Baud Rate for communicating with your meter.

Connection Parameters:

Meter Address: Assign a unique number for each meter if you are connecting meters in a network. Use address numbers 1 – 254 for connecting JEMWare II to a meter.

Number of Retries: Enter the number of connection retries if there is a failure.

Delay Between Retries: Enter the number of seconds to wait before attempting a connection retry.

RS485 Delay: Select RS485 if using RS-485 communications and enter the number of seconds to wait before

Check the “Is Default” check box if you are routinely going to connect to the meter via serial port. If the “Is Default” is not checked on any of the 5 configuration pages, then you will be prompted to select a default connection method.

Ethernet Configuration

From the PC Communication Setup, click on the Ethernet icon.

Connection Setup:

IP Address: Once you have connected the JEMStar II to the network and determined its IP address, check the connection by issuing a “ping” command from a computer on the same network. On most computers, get a command prompt and type “ping” followed by the meter’s IP address, then enter. For example: “Ping 10.42.3.47 <enter>”. If you see one or more messages saying, “Reply from (IP address) …” the meter is connected and communicating. If you see “No reply…” messages, re-check the meter’s configuration and wiring.

Port: Enter the port number JEMWare II will use to communicate with the meter. The default for Binary protocol is 2001 and should be used unless the meter has been modified.

TLS 1.2: This is used to communicate to the meter using JEM Binary Encryption. You will need to configure the meter first for Binary Encryption before enabling this. Refer to the section in the manual for Meter Settings and Communications/Advanced Settings. ***Note:*** Only meters with the Firmware (6.5.2/5.5.2) or newer will support encryption.

Connection Parameters:

Number of Retries: Enter the number of connection retries if there is a failure.

Retry Delay: Enter the number of seconds to wait before attempting a connection retry.

Ethernet Communication

Any software that supports communication with a meter over an Ethernet interface will require at least the meter’s IP address and port number. The Ethernet option consists of a JEMStar II comm option board and Ethernet cable. The board is installed in the comm option position within the JEMStar II, and the Ethernet cable runs from that position out through the base of the meter to a standard RJ-45 Ethernet jack. (For Switchboard models; Ethernet connections are on the back of the meter.)

The Ethernet interface is compatible with any 10Base-T Ethernet network that transports TCP/IP packets. It also works on 100Base-T networks that can accept 10-megabit connections.

The Ethernet option allows users to communicate with the JEMStar II meter over a typical Ethernet LAN. It supports up to twelve simultaneous connections, which are treated as virtual serial channels. Any serial command protocol installed in the JEMStar II may be used over one or more of these virtual connections.

Physical Connection

Connecting the JEMStar II Ethernet interface to a local network is straightforward. Use a standard 10Base-T patch cable (with RJ-45 plugs on each end) to connect the JEMStar II’s Ethernet pigtail to a network hub or router. Dress the wiring to avoid power leads that may couple electrical noise into the Ethernet cables.

- Check the “Is Default” check box if you are routinely going to connect to the meter via Ethernet port. If the “Is Default” is not checked on any of the 5 configuration pages, then you will be prompted to select a default connection method.
- Obtain the correct IP address, netmask, and default gateway address from your network administrator and configure them into the meter before connecting it to the network. Failure to do this may cause network problems that extend beyond the meter.
- You may also bypass the network and connect the JEMStar II directly to a computer’s Ethernet jack using any Ethernet cable. You must configure both your computer and JEMStar II with fixed IP addresses first since neither will have access to a DHCP server.

Networking Terminology:

10Base-T: Standard Ethernet physical interface using unshielded twisted pair (UTP) wiring. 10Base-T can carry up to 10 megabits of data per second although most devices cannot sustain that rate except in short bursts.

IP Address (Internet Protocol)***:*** The numeric address of a device on a TCP/IP network. An IP address is usually expressed as four numbers separated by dots (periods), such as 192.168.1.2. An IP address can be assigned to a network device automatically using DHCP (dynamic address), or manually by the network's administrator (static address). IP addresses may be duplicated on different networks but using the same IP address on two or more devices on the same network causes confusion and communication failures.

MAC Address (Media Access Controller)***:*** A six-byte number that is unique to every network-capable device and is assigned by the device manufacturer. It is used for low-level Ethernet communications and to help DHCP servers identify devices that have been assigned automatic IP addresses.

DHCP *(*Dynamic Host Configuration Protocol): A method for automatically providing suitable IP address settings to a network device when it is connected or turned on. A network that supports DHCP has a server that newly connected devices contact to obtain an IP address, Netmask, Default gateway, and other settings necessary to communicate on the network. (Not supported)

Netmask: A bit field, usually expressed in the same format as an IP address, that helps the device to recognize messages from other legitimate network devices and reject messages from foreign devices. Netmask is assigned automatically (DHCP) or manually by the network's administrator.

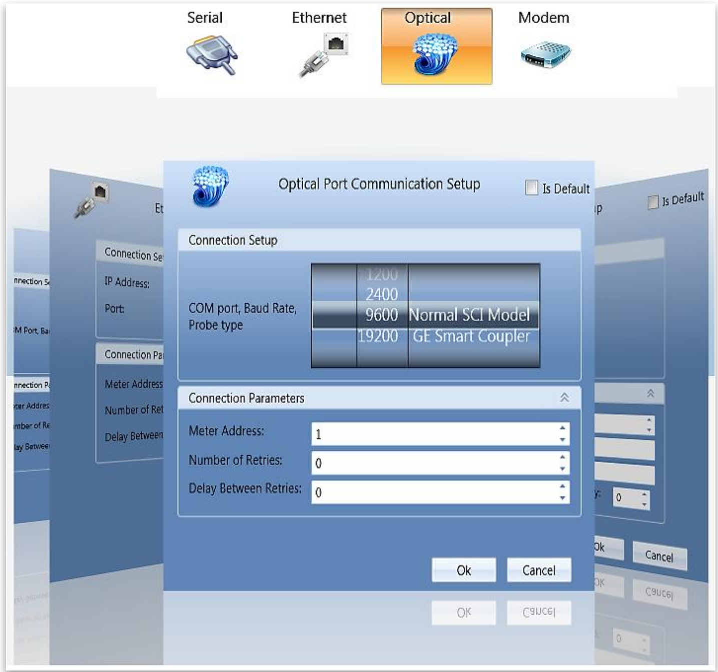
Default Gateway: The IP address to which network devices send messages when they don't know where else to send them. The default gateway is responsible for deciding whether to route messages to other devices on the network or to devices on other networks. The default gateway address may be provided automatically by DHCP or manually by the network administrator.

Network administrator (Net Admin): Responsible for setting up, operating, and maintaining a network. Provides IP addresses, netmask values, and default gateway addresses manually, or may set up a DHCP server to provide them automatically.

TCP/IP (Transmission Control Protocol / Internet Protocol): The set of network protocols used by the JEMStar II Ethernet interface.

Optical Communication:

From the PC Communication Setup, click on the Optical icon.



Optical Port Communication Setup:

Enter the parameters in the corresponding fields. Note: some features are optional; check your model number to determine availability in your meter.

Connection Setup:

Use the scroll wheel to choose the COM Port, Baud Rate and Probe type for communicating with your meter.

Connection Parameters:

Meter Address: Assign a unique number for each meter if you are connecting meters in a network. Use address numbers 1 – 254 for connecting JEMWare II to a meter. This number must match the Device Address stored in the meter under Meter Settings > Communication Setup > Optical (Port 1).

Number of Retries: Enter the number of connection retries if there is a failure.

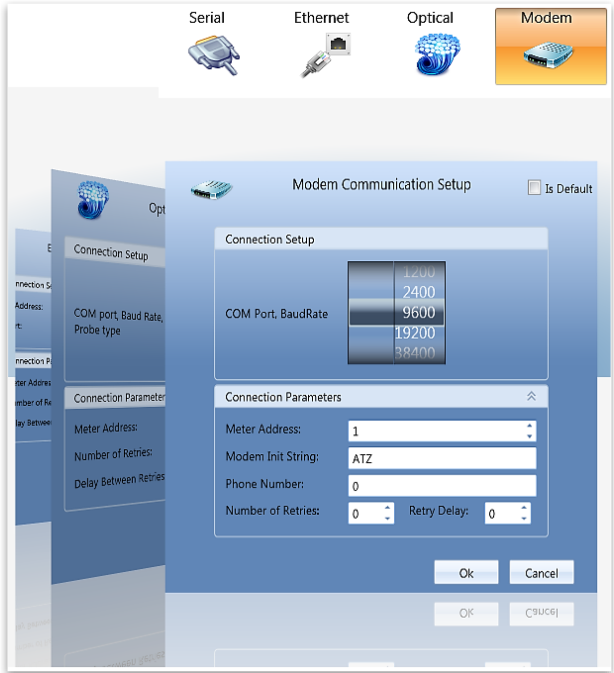
Retry Delay: Enter the number of seconds to wait before attempting a connection retry.

Check the “Is Default” check box if you are routinely going to connect to the meter via Optical port. If the “Is Default” is not checked on any of the 5 configuration pages, then you will be prompted to select a default connection method.

Modem Communication

From the PC Communication Setup, click on the Modem icon.

The JEMStar II has an internal modem and is configured to auto answer.



Modem Communication Setup

Enter the parameters in the corresponding fields.

Connection Setup:

Use the scroll wheel to choose the COM Port and Baud Rate for communicating with your meter.

Connection Parameters:

Meter Address: Assign a unique number for each meter if you are connecting meters in a network. Use address numbers 1 – 254 for connecting JEMWare II to a meter.

Modem Init String: Use the standard default shown unless you have a special requirement.

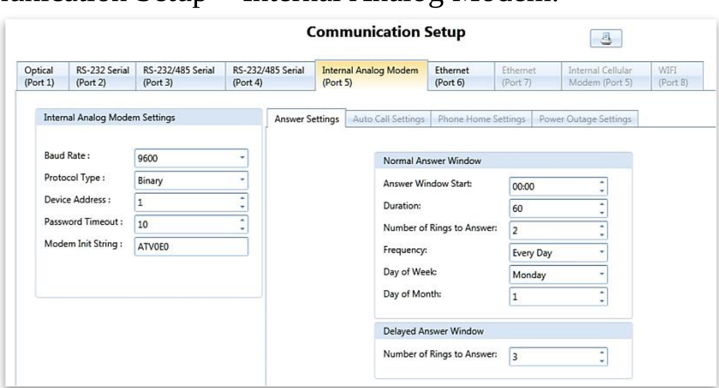
Phone Number: Enter the Phone Number exactly as you would dial it, including line access codes, area codes etc. You can enter up to 50 characters in the phone number field.

Number of Retries: Enter the number of connection retries if there is a failure.

Delay Between Retries: Enter the number of seconds to wait before attempting a connection retry.

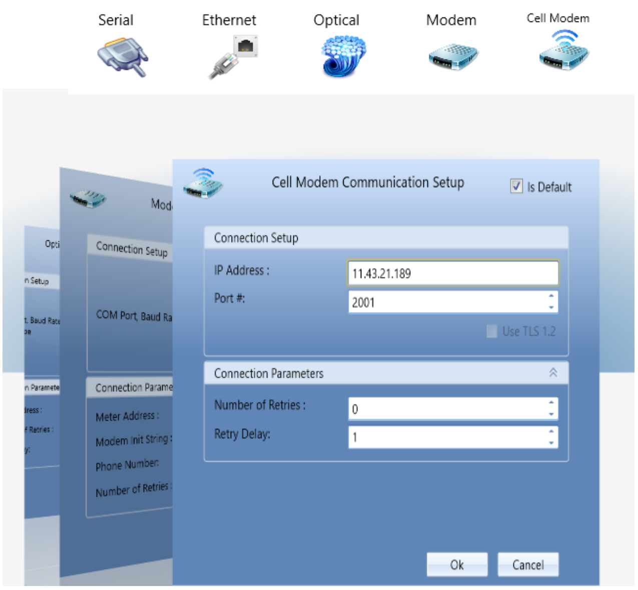
Check the “Is Default” check box if you are routinely going to connect to the meter via Modem. If the “Is Default” is not checked on any of the 5 configuration pages, then you will be prompted to select a default connection method.

To configure the parameters for the modem in the JEMStar II meter, see section Meter Settings > Communication Setup > Internal Analog Modem.



Internal Cell Modem Communication

To communicate to meters with an internal cell modem installed, click on the Cell Modem icon on the PC Communication Setup screen.



Cell Modem Communication Setup

Enter the parameters in the corresponding fields.

Connection Setup:

Enter the IP Address and Port # from the cell modem installed in the meter.

Connection Parameters:

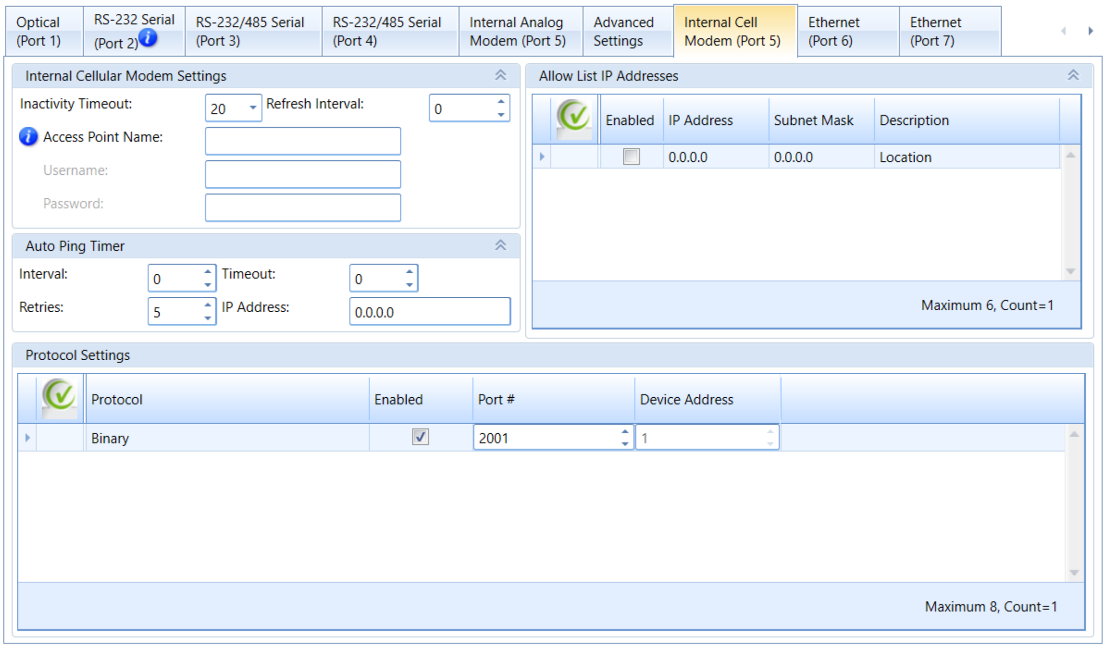
Number of Retries: Enter the number of connection retries if there is a failure.

Retry Delay: Enter the number of seconds to wait before attempting a connection retry. To configure the parameters for the modem in the JEMStar II meter, see section Meter Settings > Communication Setup > Internal Cell Modem.

Check the “Is Default” check box if you are routinely going to connect to the meter via Modem. If the “Is Default” is not checked on any of the 5 configuration pages, then you will be prompted to select a default connection method.

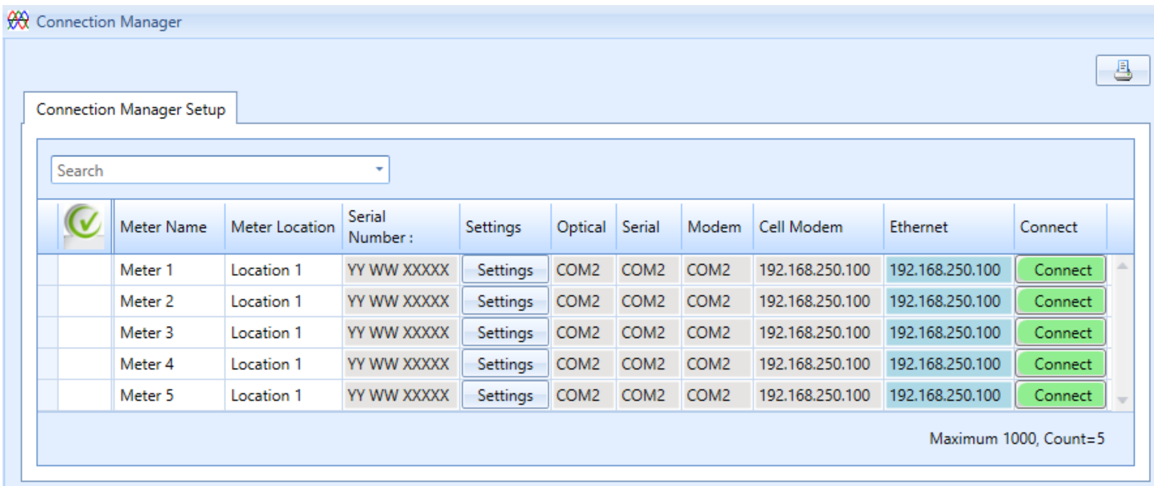
To configure the parameters for the modem in the JEMStar II meter, see section Meter Settings > Communication Setup > Internal Cell Modem.

Communication Setup Settings

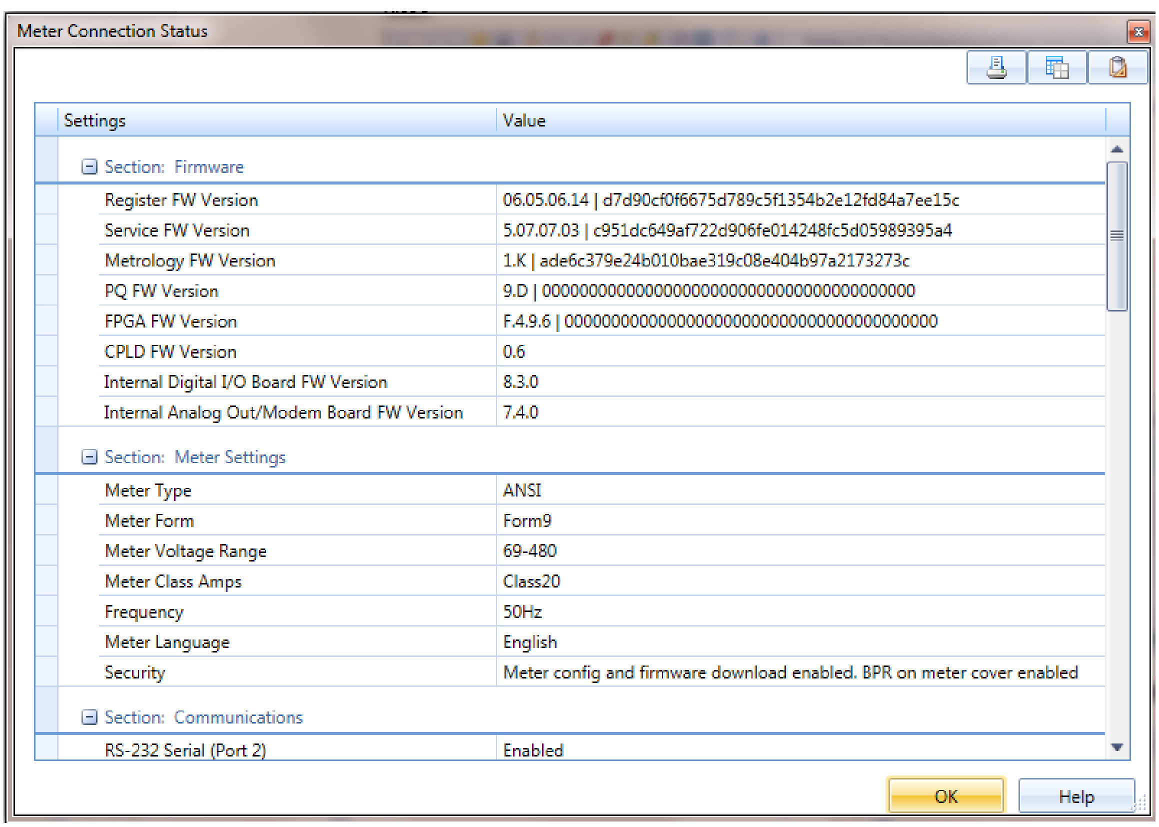


CONNECT TO METER

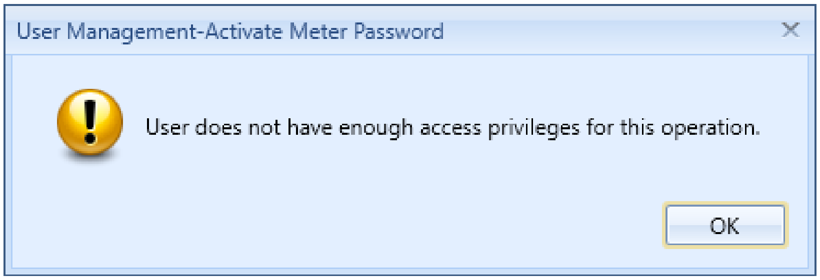
To connect to a meter, select from the list of meters you configured and press the Green Connect button on the right. It will connect to the meter using the default connection method (highlighted in blue).



When you have successfully connected to the meter, you will see the Meter Connection Status which details all the features on your meter.



Note: The password used to log into JEMWare II is used to connect to the meter. If the meter password is different, you will get the following message after you connect to the meter and close the status screen:



If this occurs, you will need to Activate the Meter Password before you can make changes, read meter data, etc. (Refer to next section on security).

Meter Security Status

In the Connection Status software screen, we identify the security status of the meter through the two internal security jumpers. (Refer to the JEMStar II User Manual for details on the Security Jumpers)

Section: Meter Settings

Meter Type	ANSI
Meter Form	Form9
Meter Voltage Range	69-480
Meter Class Amps	Class20
Frequency	60Hz
Meter Language	English
Security	Meter config and firmware download enabled. BPR on meter cover enabled

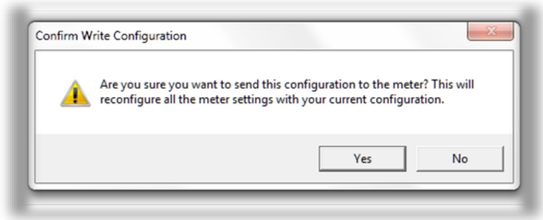
The function of the security jumpers is detailed below:

Security Jumper	Function
Billing Period Reset Jumper	This jumper will enable or disable the 'Reset' pushbutton on the front of the meter. The Reset button is used for a Billing Period Reset.
Meter Config and firmware download jumper	This enables or disables all functions that could impact meteorological measurements which includes configuration changes from the front panel keypad menus, plus configuration commands when accessing the meter via remote communications using JEMWare II. In addition, it enables or disables the upgrading of firmware.

The following messages will be presented in the meter Connection Status depending on the position of the meter security jumpers.

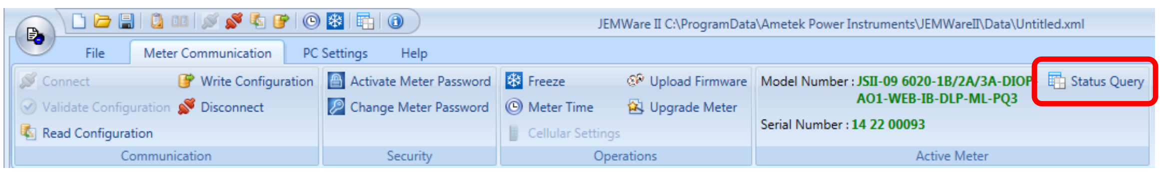
BPR Jumper	Config Jumper	Meter Status Message
On	On	Meter config and firmware download disabled. BPR on meter cover disabled.

Off	Off	Meter config and firmware download enabled. BPR on meter cover enabled.
Off	On	Meter config and firmware download disabled.
On	Off	BPR on meter cover disabled.



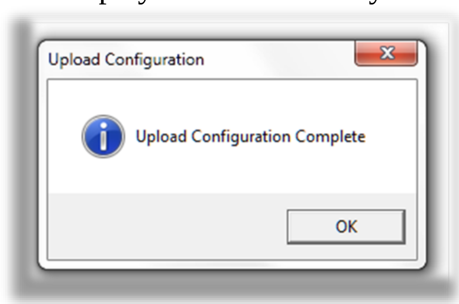
The Status Query screen can be printed /downloaded in Excel or CSV format.

Note: You can also recall the Meter Connection Status at any time while connected via the Meter Communication/Active Meter/Status Query Option.

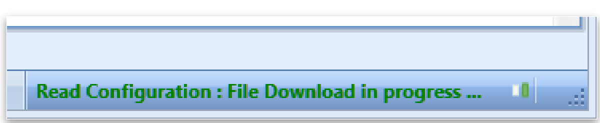


Read Configuration

This selection will read the meter's existing configuration and display it as the currently open configuration file.
During the read, live status will be displayed in the bottom right corner.



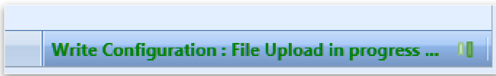
When the progress indicator is finished, you will see the configuration file name at the bottom of the screen change to “Untitled.xml”. The data is not saved until you save as a configuration (.xml) file. Select OK to download.



Write Configuration

This selection is used to send the active configuration file to the meter. After you click on this menu choice, you must acknowledge the **Confirm Write Configuration** prompt. This will send the new configuration to the meter.

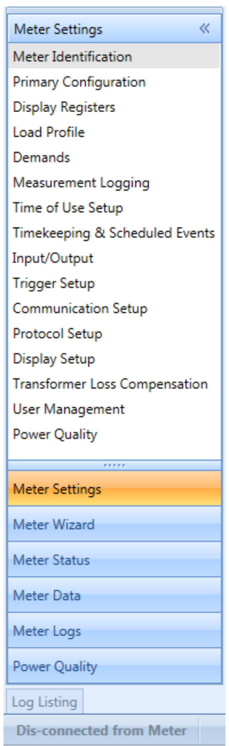
In the bottom right corner is a live status update. If the meter password you used to connect to the meter does not have privileges for all commands (for example, if you are only privileged to change the meter's communication settings) you may see errors.



If you choose No the configuration session will end with the meter remaining unchanged. In the Upload Configuration box click OK.

Disconnect

You can either click the disconnect icon at the top or in the Communication group of the Meter Communication menu. This choice will end the communications connection between the PC and meter.



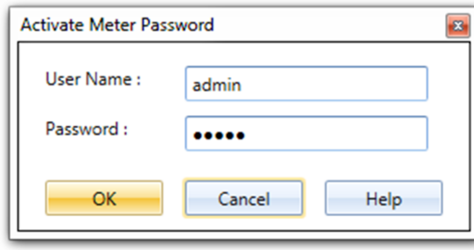
Note: Connection and Disconnection status will be displayed in the bottom left corner.

Security

The password used to log into the JEMWare II Software is used when connecting to a meter. If the meter password is different from the JEMWare II Software password, you need to activate the meter password. These screens are used to activate the meter password or make changes to the meter password.

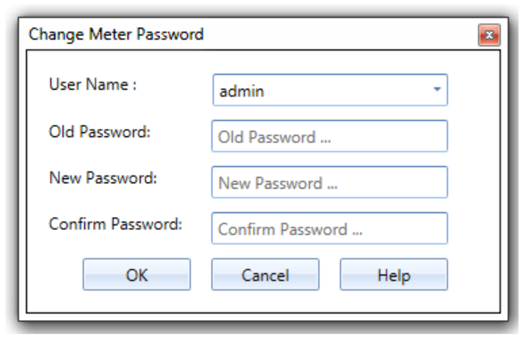
Activate Meter Password

Upon connection to the meter, use this screen to enter the meter username and password (if different from the ones used to log into JEMWare II). This will provide access to configuration changes and reading meter data if approved to do so with the username/password combination provided.



Change Meter Password

This window is used to program the meter's password. You must first establish a connection to the meter before you can enter the password. The password must be a 6-digit alphanumeric string.



Using the User Name pull-down menu, select which user password to change. You can have up to four passwords, each with its own set of permissible features (see the Passwords/Permissions menu).

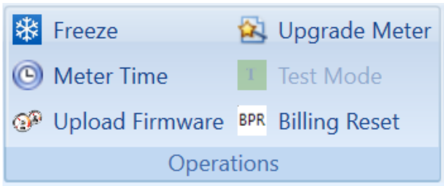
If this is a new meter, the factory-default password setting is "admin". Enter this in the Old Password field, then enter your custom password in the New Password and Confirm Password fields and click OK.

CAUTION: If the Meter Password is lost, the only way to access the meter is to perform a RESET USERS & PASSWORDS. This will erase all user data in memory and return the meter to factory default settings.

To perform a RESET USERS & PASSWORDS:

1. Go into User Menu using the left arrow buttons under the globe.
2. Unlock meter using the proper user name and password
3. Select METER STATUS by using the arrows and SET button.
4. Select RESET USERS & PASSWORDS by using the arrows and SET button.
5. Select Yes to confirm the operations.
6. Power cycle meter power with 15 seconds

OPERATIONS



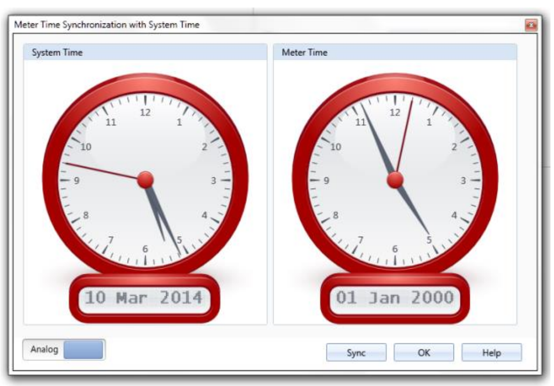
Freeze

The Freeze function will store the values of all registers at the moment you perform a Freeze and will remain stored until the next meter Freeze. Whenever retrieving register data via JEMWare II and JEMRead, the register information presented will be at the time of the Freeze.

Meter Time

Use this command to set the clock inside the meter. You can either sync the time to automatically match the PC clock, or manually set it to any specific time that you enter via the keyboard.

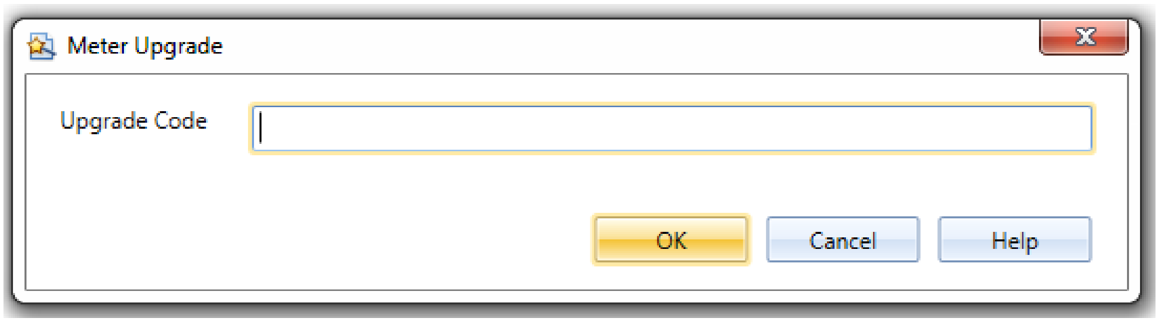
Click Meter Time to change the meter's time/date. You can also change the display from analog to digital.



Upgrade Meter

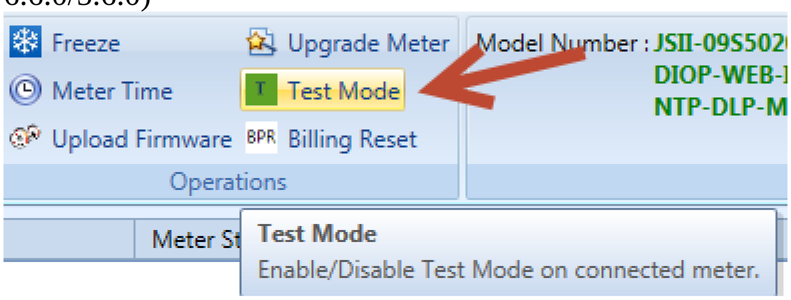
Certain meter features can be enabled in the field with an Upgrade Code.

For example, with Power Quality when meters are equipped with this option, they include all the hardware to support a future Power Quality Upgrade to option PQ1, PQ2 or PQ3. Once the specific option is purchased, the meter can be enabled with a software key provided by AMETEK. This option is useful when you may want a future PQ upgrade without having to change out the meter.



Test Mode

This can be used to remotely put the meter into Test Mode as an alternative to removing the meter cover and enabling Test Mode via the user display. (Requires FW update to 6.6.0/5.6.0)



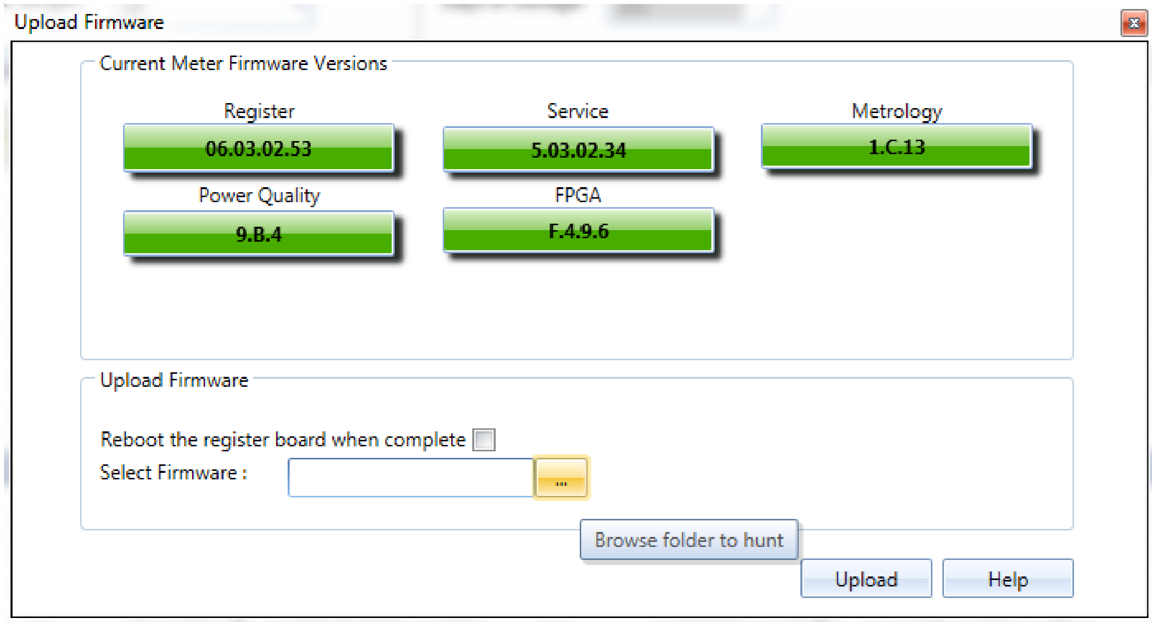
Billing Period Reset (BPR)

This will allow you to perform a Billing Period Reset from the JEMWare Software. You must be authorized to perform this command as selected in the User Management. (requires username and password)

Upload Firmware via JEMWare

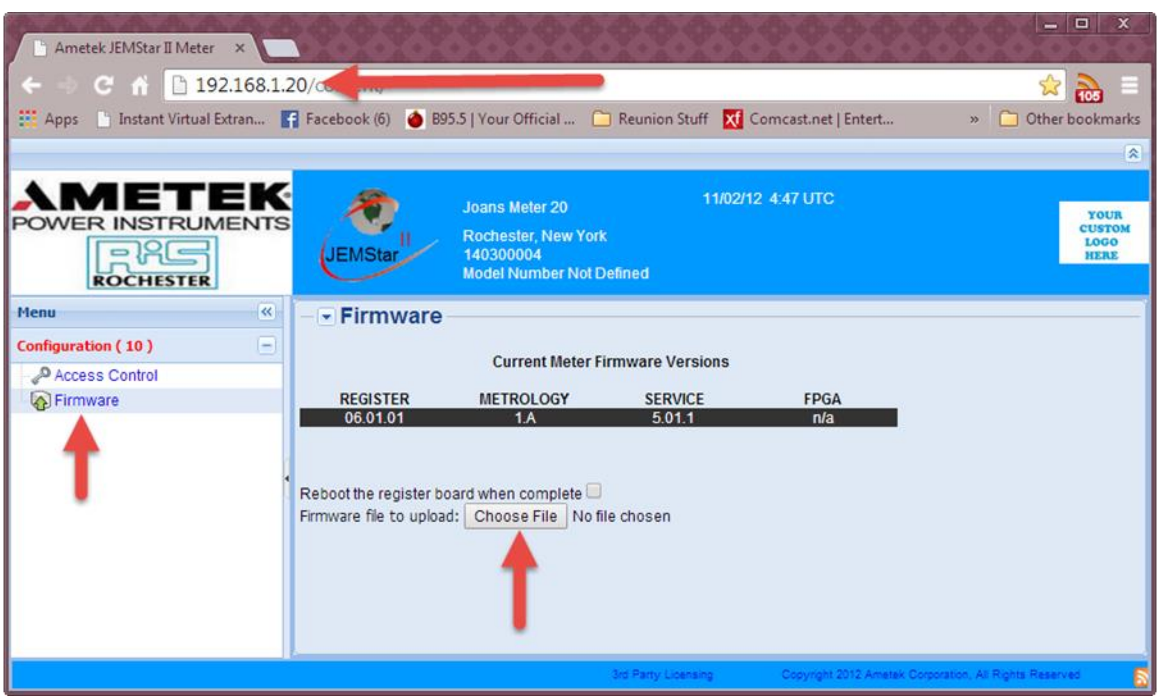
Connect the computer to the Meter. Prior to upgrading it is recommended to download the configuration file and meter data from the meter if you don't already have a copy of it.

Select the firmware browse button labeled '…'. This will allow you to browse to and select the firmware file. Once selected, select the Upload button. When completed, perform a cold start on the meter.

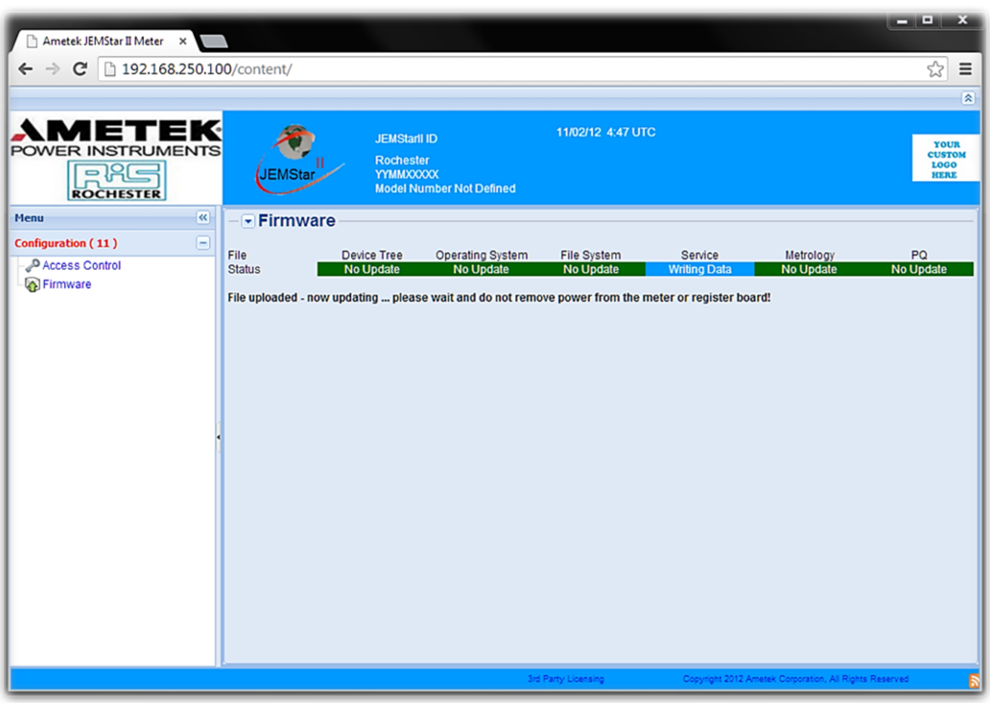


Upload Firmware Via the Web Browser

To upload new firmware, open a browser and type in the meter's IP address.
After entering the admin password, click on the Firmware link on the left side. Proceed to select the file by clicking the "Choose File" button.

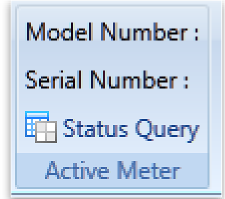


Note: MID Meters cannot be upgraded or have their firmware updated as they have the internal security jumpers installed. These meters must be returned to the factory for



upgrades.

Active Meter



Model Number

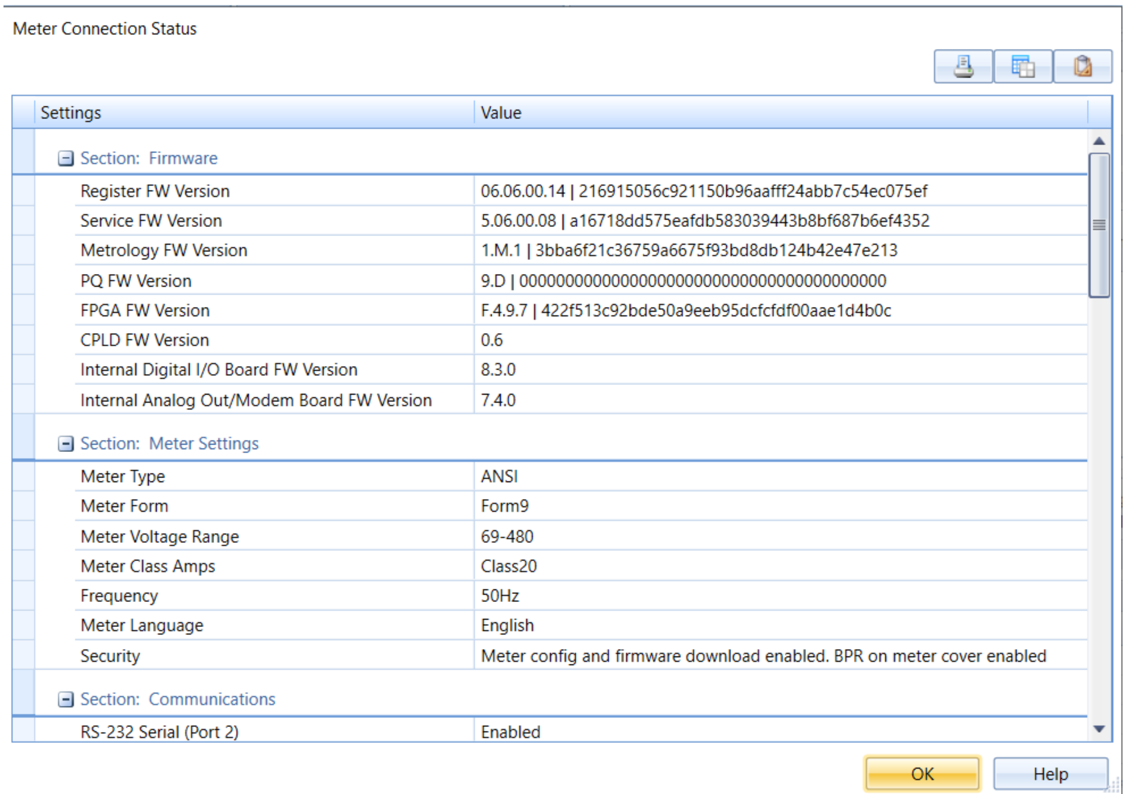
The meter's model number is displayed here.

Serial Number

The meter's serial number is displayed here.

Status Query

Retrieves the meter's operating capabilities.
Select this menu choice to interrogate the connected meter and report the meter's firmware version, basic operating type, and installed hardware/software options.



Meter Connection Status

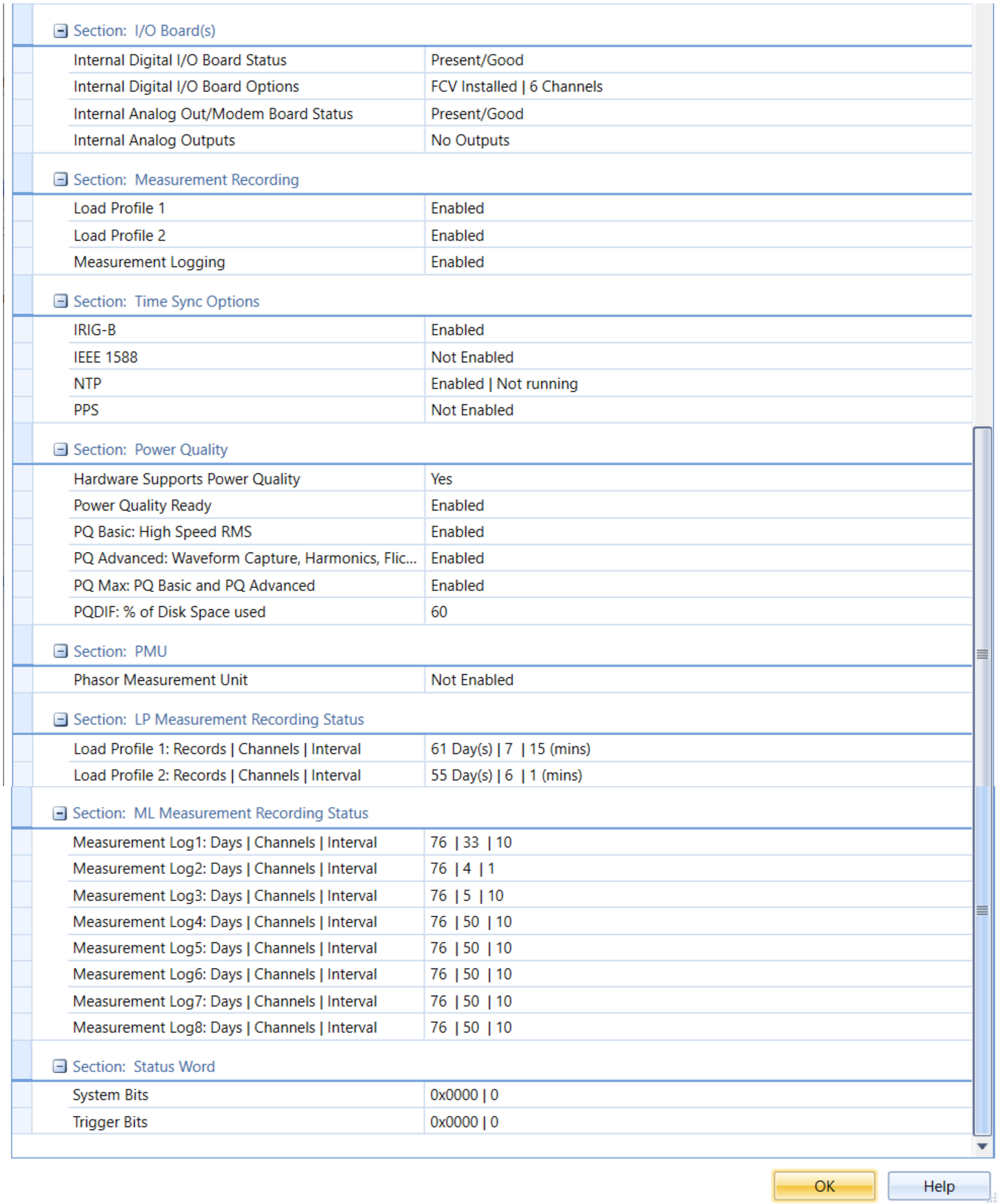
Settings	Value
Section: Firmware	
Register FW Version	06.06.00.14 | 216915056c921150b96aafff24abb7c54ec075ef
Service FW Version	5.06.00.08 | a16718dd575eafdb583039443b8bf687b6ef4352
Metrology FW Version	1.M.1 | 3bba6f21c36759a6675f93bd8db124b42e47e213
PQ FW Version	9.D | 0000000000000000000000000000000000000000
FPGA FW Version	F.4.9.7 | 422f513c92bde50a9eeb95dcfcfdf00aae1d4b0c
CPLD FW Version	0.6
Internal Digital I/O Board FW Version	8.3.0
Internal Analog Out/Modem Board FW Version	7.4.0
Section: Meter Settings	
Meter Type	ANSI
Meter Form	Form9
Meter Voltage Range	69-480
Meter Class Amps	Class20
Frequency	50Hz
Meter Language	English
Security	Meter config and firmware download enabled. BPR on meter cover enabled
Section: Communications	
RS-232 Serial (Port 2)	Enabled

OK Help

Meter Connection Status:

Meter Connection Status

Settings	Value
Section: Firmware	
Register FW Version	06.06.00.17 | 403abff4981ae594444db4813e95ef89890dde53
Service FW Version	5.06.00.08 | a16718dd575eafdb583039443b8bf687b6ef4352
Metrology FW Version	1.M.2 | 3c1637fc32ba835880fd06effaa63d18732a49f3
PQ FW Version	9.D | 0000000000000000000000000000000000000000
FPGA FW Version	F.4.9.7 | 422f513c92bde50a9eeb95dcfcfdf00aae1d4b0c
CPLD FW Version	0.6
Internal Digital I/O Board FW Version	8.3.0
Internal Analog Out/Modem Board FW Version	7.4.0
Section: Meter Settings	
Meter Type	ANSI
Meter Form	Form9
Meter Voltage Range	69-480
Meter Class Amps	Class20
Frequency	50Hz
Meter Language	English
Security	Meter config and firmware download enabled. BPR on meter cover enabled
Section: Communications	
RS-232 Serial (Port 2)	Enabled
RS-232/485 Serial (Port 3)	Enabled
RS-232/485 Serial (Port 4)	Enabled
Ethernet (Port 6)	Enabled
Ethernet (Port 7)	Enabled
Secure File Transfer	Enabled:22
Web Server	Enabled
IEC 61850	Enabled
DLMS	Enabled
Communication Repeater	Not Enabled
Modem (Port 5)	Cell GSM, IP:0.0.0.0, Signal Strength:0 (dBm)
Modem Settings	FW:0.00.0.0, CCID:0000000000000000000, IMEI:0000000000000000000
Phone Home on Powerfail	Not Enabled
Test Mode	Off



Section: I/O Board(s)	
Internal Digital I/O Board Status	Present/Good
Internal Digital I/O Board Options	FCV Installed | 6 Channels
Internal Analog Out/Modem Board Status	Present/Good
Internal Analog Outputs	No Outputs
Section: Measurement Recording	
Load Profile 1	Enabled
Load Profile 2	Enabled
Measurement Logging	Enabled
Section: Time Sync Options	
IRIG-B	Enabled
IEEE 1588	Not Enabled
NTP	Enabled | Not running
PPS	Not Enabled
Section: Power Quality	
Hardware Supports Power Quality	Yes
Power Quality Ready	Enabled
PQ Basic: High Speed RMS	Enabled
PQ Advanced: Waveform Capture, Harmonics, Flic...	Enabled
PQ Max: PQ Basic and PQ Advanced	Enabled
PQDIF: % of Disk Space used	60
Section: PMU	
Phasor Measurement Unit	Not Enabled
Section: LP Measurement Recording Status	
Load Profile 1: Records | Channels | Interval	61 Day(s) | 7 | 15 (mins)
Load Profile 2: Records | Channels | Interval	55 Day(s) | 6 | 1 (mins)
Section: ML Measurement Recording Status	
Measurement Log1: Days | Channels | Interval	76 | 33 | 10
Measurement Log2: Days | Channels | Interval	76 | 4 | 1
Measurement Log3: Days | Channels | Interval	76 | 5 | 10
Measurement Log4: Days | Channels | Interval	76 | 50 | 10
Measurement Log5: Days | Channels | Interval	76 | 50 | 10
Measurement Log6: Days | Channels | Interval	76 | 50 | 10
Measurement Log7: Days | Channels | Interval	76 | 50 | 10
Measurement Log8: Days | Channels | Interval	76 | 50 | 10
Section: Status Word	
System Bits	0x0000 | 0
Trigger Bits	0x0000 | 0

OK Help

The status Query screen shows the following information:

<u>Firmware Versions</u>
List of all firmware versions installed in the meter. Firmware can be upgraded through JEMWare II or through a web browser. Refer to the JEMStar II User manual for details.

<u>Meter Settings</u>
Details on the voltage and current ranges, meter form and frequency. Details on the Security Jumper Status.

<u>Communication Options</u>

List of all communication options installed in the meter. All meters include an Optical Port (not shown)

Digital I/O Options
List of Digital I/O options installed in the meter and their current status.

Measurement Recording Options enabled.
Information on number of Load Profile and Measurement Logs enabled in the meter. Every meter comes with a single Load Profile Log.

Time Sync Options enabled.
List of Time Sync options installed in the meter. The meter uses an internal clock that is accurate to 0.5 seconds/day when no external time sync options are installed.

Power Quality Options enabled.
This specifies whether the meters have the Power Quality Ready option (hardware supports future PQ upgrades) or have the Power Quality options installed like High-Speed RMS, Waveform Capture, Harmonics, Flicker, etc.
The Power Quality Ready option needs to be specified at time of order for future PQ upgrades. The amount of memory available for PQDIF File Storage is also included for display.
Every meter includes Sag/Swell Recording capability. Meters equipped with Power Quality Hardware also include Class A Sag/Swell.
Note: The Status screen also checks the version of hardware used in the meter. If the meter has the PQ Ready option and the ‘Hardware to support Power Quality’ shows ‘no’, the meter must be upgraded at the factory.

PMU option enabled.
This is a future option.

Measurement Recording Status
This section shows how many recording channels are configured on the meter and how much data is currently recorded on the meter.
For example, in the meter below, there are 50 channels of Measurement Log 1 configured with 10 minute recording intervals and there are 23 days recorded on the meter.

Section: LP Measurement Recording Status	
Load Profile 1: Records | Channels | Interval	8 Day(s) | 7 | 15 (mins)
Load Profile 2: Records | Channels | Interval	22 Day(s) | 6 | 1 (mins)
Section: ML Measurement Recording Status	
Measurement Log1: Days | Channels | Interval	23 | 33 | 10
Measurement Log2: Days | Channels | Interval	23 | 4 | 1
Measurement Log3: Days | Channels | Interval	23 | 5 | 10
Measurement Log4: Days | Channels | Interval	23 | 50 | 10
Measurement Log5: Days | Channels | Interval	23 | 50 | 10
Measurement Log6: Days | Channels | Interval	23 | 50 | 10
Measurement Log7: Days | Channels | Interval	23 | 50 | 10
Measurement Log8: Days | Channels | Interval	23 | 50 | 10

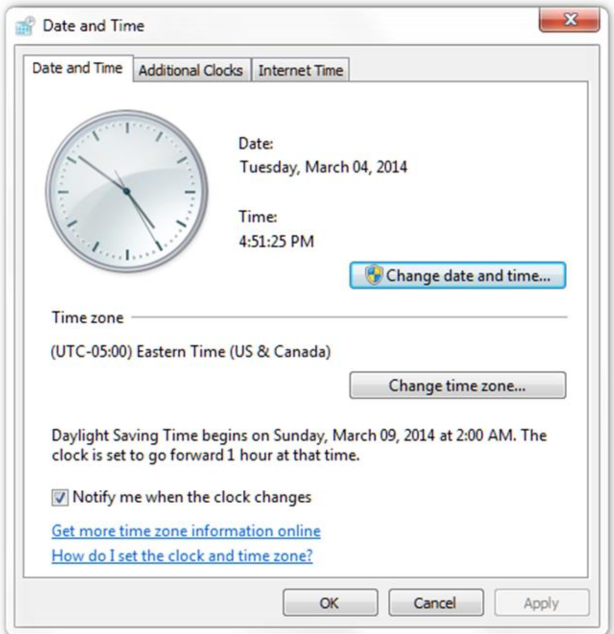
Note: When upgrading the meter for various hardware and software options, the status Query screen will be updated accordingly.

The Status Query screen can be printed or downloaded in Excel or CSV format.

PC CLOCK

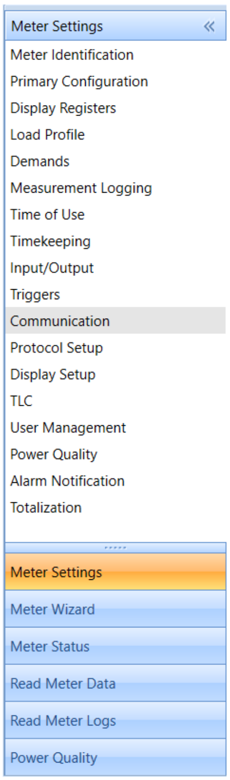
This selection displays the current Date and Time that is running on the computer, and simply mimics the standard Windows display. You can change the PC time and date in this window.

To set the meter time and date, click PC Clock in the PC Settings menu.

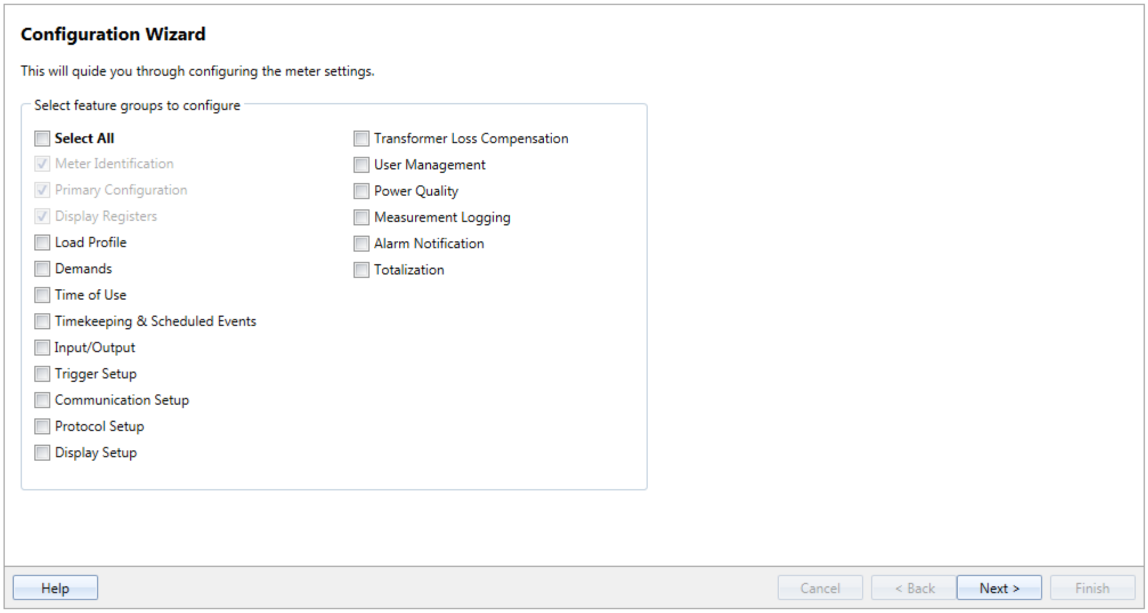


METER CONFIGURATION

The meter settings may vary depending on which meter options you have. Use this menu to configure all the meter's parameters. Each menu selection shows a page that allows you to access and enter data specific to that feature. In some instances, the information that you enter in one location is automatically copied to other menu features as necessary to perform the internal calculations.



To start a meter configuration, you can proceed from one set up screen to another (see list above) or you can select the Meter Wizard which will let you select in advance all screens you wish to configure, and it will navigate from one to the other until the process is complete. You can save changes individually on each screen or you can save the whole configuration using File: Save or File: Save As



MID METERS

MID (Measurement Instruments Directive) is a set of requirements to protect legally relevant billing information.
Meters enabled for MID will have the MID option in the model code. These meters have the internal security jumpers installed preventing access to change the following screens:

- Configure Primary/PTCT Settings
- Configure Display Registers
- Configure Load Profile
- Configure Loss Compensation
- Configure TOU/DST Settings
- Configure Input/Output Settings
- Configure Trigger Settings
- Configure Demand Settings
- Configure Transformer Correction
- Firmware/Option Upgrade
- Activate Test Mode

These items need to be configured at the factory before the meter is shipped.
Some items, such as the MID Registers and Load Profile Channels will be fixed in every meter.

MID Billing Registers

The following MID Registers will be included in every meter:

Normal Registers

- Whr Delivered, working.

- Whr Received, working.
- VARhr Delivered, working.
- VARhr Received, working.

Alternate Registers

- Whr Delivered, BPR
- Whr Received, BPR
- VARhr Delivered, BPR
- VARhr Received, BPR
- Billing Reset time and date.

A *Working Register* will store the selected data in real time and update the displayed quantity on a continual basis. When a BPR (billing period reset) is performed, the contents of the working register are transferred to the BPR storage register. The working register continues to increment. The BPR register will only update at the next Billing Period Reset.

Note: Other registers can be configured in addition to the MID registers shown. Max 50

MID Load Profile Channels

The following MID Load Profile Channels will be included in every meter:

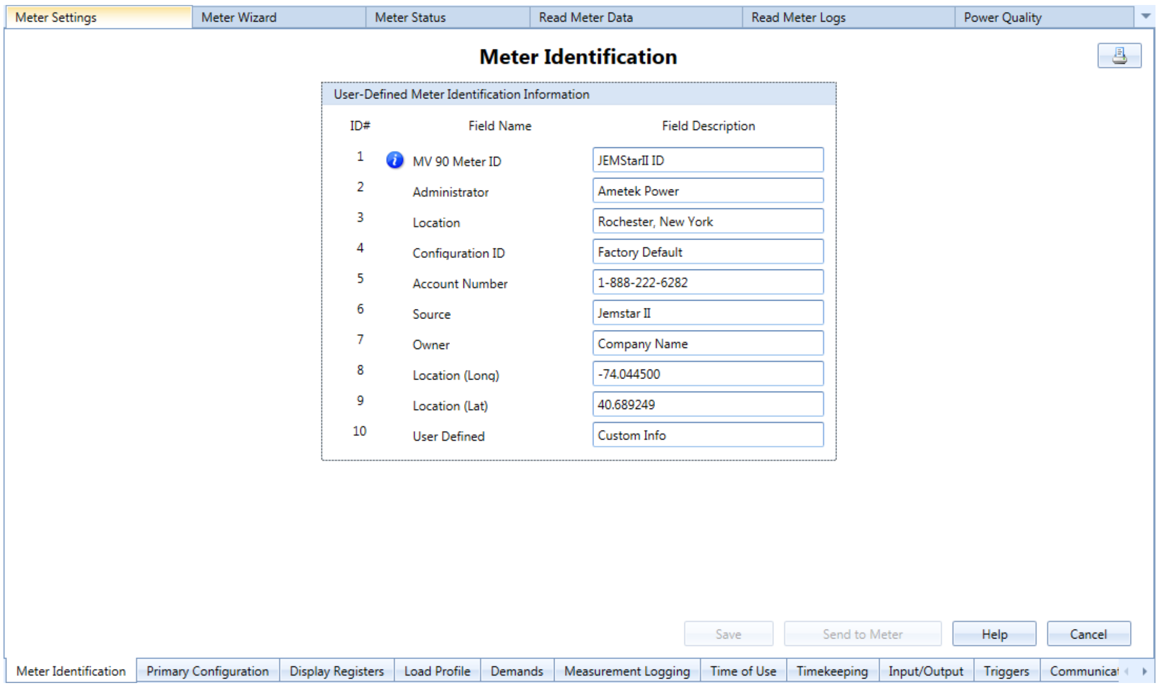
Load Profile Channels

- Whr Delivered
- Whr Received
- VARhr Delivered
- VARhr Received

Note: Other Load Profile channels can be configured in addition to the MID Load Profile Channels shown. A maximum of 16 channels is allowed per Load Profile Group.

METER IDENTIFICATION

The Meter Identification settings provide basic information about a meter. However, this information is not necessary for meter operation. Each of the ten ID fields will accept up to 24 alphanumeric characters. A helpful tooltip appears if you hold your mouse over a field.



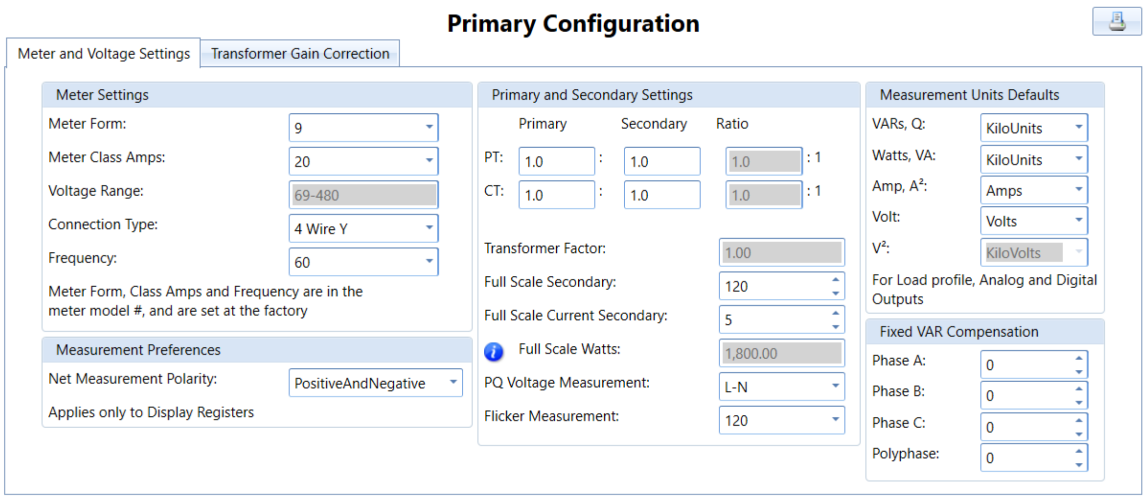
Note: The MV 90 Meter ID field is used by MV90 as the Meter ID if using that software.

The Meter ID Titles shown in the illustration are the defaults; however, you can customize it by entering a new title. In this manner, you can create any category you wish to keep as part of the meter data record.

The ID Fields (as shown) are available for use in the Alarm Notification setup described in another section.

PRIMARY CONFIGURATION

The data in this window *must* be entered correctly for proper meter operation. These are the fields that define the nominal voltage, circuit type, voltage and current ratios, and other scaling factors. The grayed-out fields are view-only in this screen and cannot be edited; the data was calculated or taken from other setup screens.



Meter and Voltage Settings

These settings are used to enter the input parameters to the meter.

Meter Settings

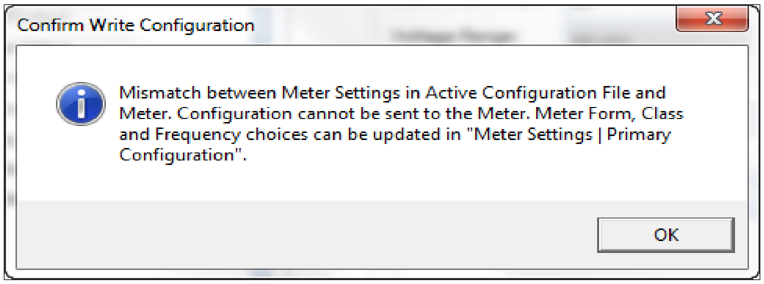
Note: The Meter's Form, Class Amps and Frequency are factory set before shipment. You cannot modify these 3 configuration values. They are editable only for creating configuration files off-line.

Meter Form & **Meter Class Amps:**
Use the pull-down menu to select meter form and class.
Connection Type:
Select Meter Form first. The pull-down menu list is dependent on the Meter Form selection. Select the appropriate frequency from the pull-down menu.
Frequency:
Select Frequency of meter (50/60Hz)

Measurement Preferences

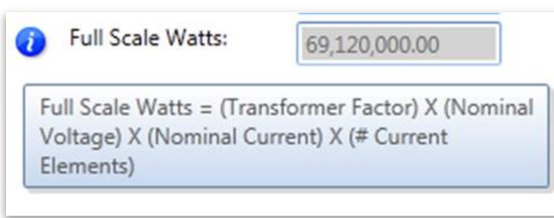
Net Measurement Polarity
Use the pull-down menu to select Net Measurement Polarity. Select from PositiveAndNegative or PositiveOnly. The default setting is PositiveAndNegative. The Net Measurement Polarity setting applies only to Display Registers.

When working with JEMStar II on-line, first send the “Read Configuration” command so meter settings are displayed prior to making changes. If you attempt to send a configuration with conflicting values, it will be rejected, and the following warning issued.



Primary and Secondary Settings

PT/CT ratios:
Enter the nominal primary and secondary voltage of the VTs to be metered. Enter primary and secondary amps for the CTs. The Transformer factor is a read-only calculation derived by multiplying the VT and CT ratio.
Full Scale Secondary & **Full Scale Current Secondary:**
Use the pull-down menu to select the meter’s operating parameters.
Note: The values entered for Full Scale Secondary and Full Scale Current Secondary are used to calculate the Full Scale Watts. The Full Scale Secondary is also used as a baseline for setting alarm triggers.
Full Scale Watts:
This is a read only field and is the calculation result of previously entered values. By placing your mouse over the information icon, the formula is displayed.
The Full Scale Watts calculation is used as a verification that the correct PT and CT values were entered and it is also used in the calculation for a recommended Km value in Load Profile.



PQ Voltage Measurement:
Each connection type shown below has a default voltage measurement of L-N or L-L. In some PQ applications, you may want to set alarm triggers and record data in the measurement log in something other than the default. This field will let you change the default power quality measurements from L-N to L-L. It will be reflected in the trigger settings screen and measurement log.
Note: as many L-L connection types don't have a neutral connection, you won't be able to change the default L-L to L-N.

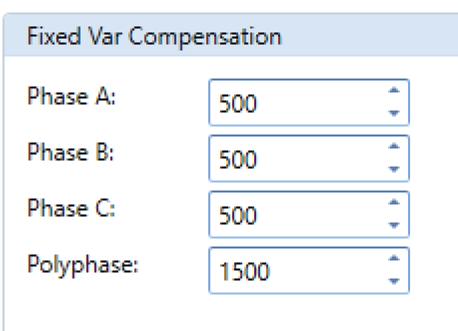
Connection Type	Voltage Measurement Default
3 wire Delta	L-L
3 wire Open Delta	L-L
3 wire Network	L-N
3 wire Wye	L-L
4 wire Wye	L-N
4 wire Wye, 2 ½ element	L-N
4 wire Delta	L-N

Measurement Units Defaults

Select the scaling of units (kilo, mega, etc.) that will be used in the meter's calculations. *It is important to remember these units.*
The Analog Outputs, Digital Outputs, Alarms, and Load Profile will use these units of measure in their calculations.

Fixed VAR Compensation (Future)

This is used in applications where you would like to remove a set amount of VARs from the meter before any VAR measurements are performed. This could be used in a case where a customer provides their own VAR compensation equipment.
VAR compensation can be entered individually per phase, or you could enter the total Polyphone amount which will be distributed equally across all phases.



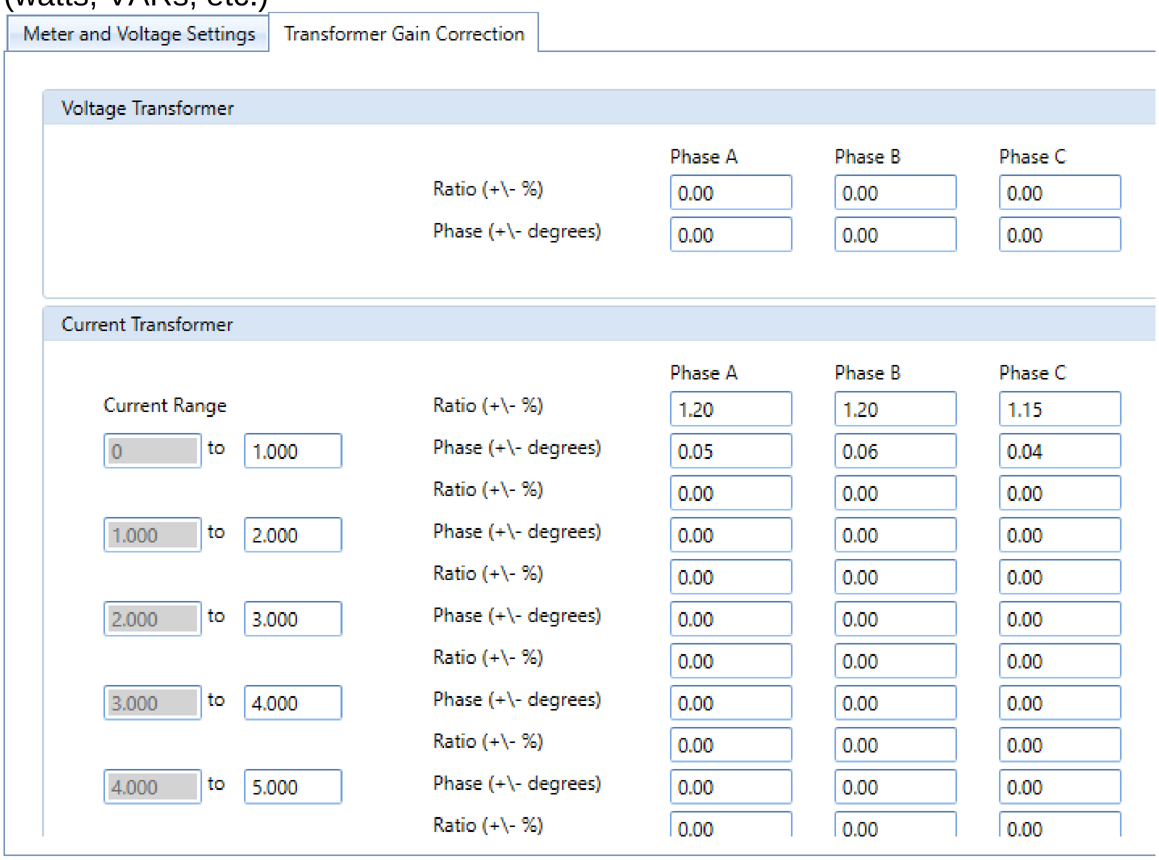
Transformer Gain Correction

This is used to fine tune the input to the meter taking into consideration the operating characteristics of the PT or CT used with the meter. You will need to

know the exact operating parameters of the transformers (provided by the manufacturer) to make these adjustments.
The user may enter gain correction percentages for each voltage and current phase input. You can enter a single correction factor for the Voltage Transformer and up to 8 correction factors for the current transformer. Each correction factor includes adjustments for magnitude (ratio) and phase angle (degrees).

For voltage inputs, the single correction factor is applied across the entire range although you should mainly be interested in adjusting for the nominal voltage input.
For current inputs, you can divide up the current range into 8 or less segments. Example: 0 to 1 Amp, 1 to 2 Amps, 2 to 3 Amps, etc.

For magnitude adjustments, the user may enter any percentage between -10.00% and +10.00% in 0.01% increments.
For phase angle adjustments, the user may enter any amount in degrees between -5.00 and +5.00 degrees in 0.01 degree increments.
Entering a positive percentage for magnitude increases the meter's registration of the corresponding signal (volts or amps) and all measurements that depend on it (watts, VARs, etc.)



Note: This correction does not affect the meter's factory-established calibration. Changing the gain of a voltage or current input will cause any single-phase measurement using that input to increase or decrease by the amount of the change. For example, changing the Phase A Volts by +1.00% will cause all Phase A measurements to read 1% high (except for amp quantities). Polyphase measurements will change by the average of the changes made to each individual phase. For example, if Phase A Volts is changed by +1.00%, Phase B Volts by +2.00% and Phase C Volts by +4.00%, the change to polyphase watts is (1+2+4)/3=2.333%.

When sharing a single configuration file among multiple meters, be sure to verify that the gain corrections are correct for all meters, or else edit them to the appropriate value for the meter about to be programmed.

DISPLAY REGISTERS

This choice allows you to determine which electrical quantities are to be stored in the meter's memory (registers). The information in the Display Registers can be viewed on the meter's LCD panel and can be read via JEMWare II > Meter Data > Read Registers page. In the JEMStar II, you can configure a maximum of 50 Normal registers, 50 Alternate registers, and 50 Test registers. Normal and Alternate registers can be used interchangeably to store any parameters. It is your choice whether to assign a quantity to a Normal or Alternate register, and it is simply a preference to sort functions as you choose. The Test registers are for temporary storage and only used when in the Test Mode.

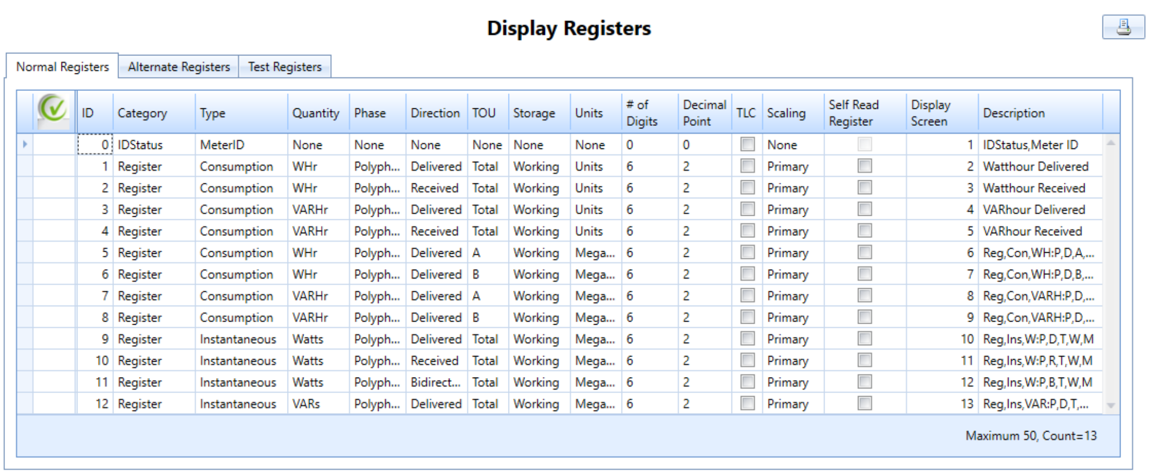
NOTE: *All the data in a Test register is cleared when Test Mode is exited.*

The register ID numbers are grouped as follows:

Register Types	**ID Numbers**
Normal	0-49
Alternate	100-149
Test	200-249

The following illustration shows the main Display Registers configuration screen. At the top, you will notice that the screen has three-page tabs: Normal, Alternate, and Test. Click on the tab for the section you will be modifying, then proceed to Add, Edit, or Delete registers as described in the following pages.

The Normal and Alternate display register values are shown on the meter's front panel. They represent the values stored at the time of the last Freeze command. Each page can display up to 4 registers at a time. You must set the values in the "Display Screen" column to the desired order and groupings of displayed registers. Additionally, the number of digits and places to the right of the decimal can be configured.



Display Registers

Normal Registers | Alternate Registers | Test Registers

ID	Category	Type	Quantity	Phase	Direction	TOU	Storage	Units	# of Digits	Decimal Point	TLC	Scaling	Self Read Register	Display Screen	Description
0	IDStatus	MeterID	None	None	None	None	None	None	0	0		None		1	IDStatus,Meter ID
1	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	Units	6	2		Primary		2	Watthour Delivered
2	Register	Consumption	WHr	Polyph...	Received	Total	Working	Units	6	2		Primary		3	Watthour Received
3	Register	Consumption	VARHr	Polyph...	Delivered	Total	Working	Units	6	2		Primary		4	VARhour Delivered
4	Register	Consumption	VARHr	Polyph...	Received	Total	Working	Units	6	2		Primary		5	VARhour Received
5	Register	Consumption	WHr	Polyph...	Delivered	A	Working	Mega...	6	2		Primary		6	Reg,Con,WH:P,D,A,...
6	Register	Consumption	WHr	Polyph...	Delivered	B	Working	Mega...	6	2		Primary		7	Reg,Con,WH:P,D,B,...
7	Register	Consumption	VARHr	Polyph...	Delivered	A	Working	Mega...	6	2		Primary		8	Reg,Con,VARH:P,D,...
8	Register	Consumption	VARHr	Polyph...	Delivered	B	Working	Mega...	6	2		Primary		9	Reg,Con,VARH:P,D,...
9	Register	Instantaneous	Watts	Polyph...	Delivered	Total	Working	Mega...	6	2		Primary		10	Reg,Ins,W:P,D,T,W,M
10	Register	Instantaneous	Watts	Polyph...	Received	Total	Working	Mega...	6	2		Primary		11	Reg,Ins,W:P,R,T,W,M
11	Register	Instantaneous	Watts	Polyph...	Bidirect...	Total	Working	Mega...	6	2		Primary		12	Reg,Ins,W:P,B,T,W,M
12	Register	Instantaneous	VARs	Polyph...	Delivered	Total	Working	Mega...	6	2		Primary		13	Reg,Ins,VAR:P,D,T,...

Maximum 50, Count=13

The following screen shots demonstrate display screen groupings. With this configuration, the first 3 screens would look like the examples provided here.

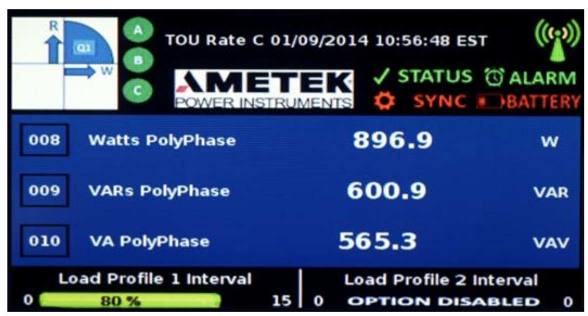
Normal Registers | Alternate Registers | Test Registers

ID	Register Category	Register Type	Quantity	Phase	Direction	TOU	Storage Type	Units	# of Digits	Decimal Point	TLC	Scaling Values	Display Screen	Description
1	IDStatus	MeterID	None	None	None	None	None	None	0	0		None	8	IDStatus,Meter ID
2	IDStatus	Administrator	None	None	None	None	None	None	0	0		None	7	IDStatus,Administrator
3	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	KiloUnits	6	2		None	1	Reg,Con,WH:P,D,T,W,K
4	IDStatus	AlarmDisplay	None	None	None	None	None	None	0	0		None	5	Watt-Hour Delivered
5	Register	Consumption	WHr	Polyph...	Received	Total	Working	MegaU...	8	2		Primary	1	Watt-Hour Received
6	IDStatus	Communicati...	None	None	None	None	None	None	0	0		None	6	IDStatus,Comm Status
7	IDStatus	PhasorDisplay	None	None	None	None	None	None	0	0		None	7	IDStatus,Phasor Display
8	Register	Instantaneous	Watts	Polyph...	Delivered	Total	Working	MegaU...	8	2		Primary	2	Watts PolyPhase
9	Register	Instantaneous	VARs	Polyph...	Delivered	Total	Working	MegaU...	6	3		Primary	2	VARs PolyPhase
10	Register	Instantaneous	VAVect...	Polyph...	Delivered	Total	Working	MegaU...	6	3		Primary	2	VA PolyPhase
11	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	KiloUnits	8	2		Primary	3	Watthour Delivered
12	Register	Consumption	WHr	Polyph...	Received	Total	Working	KiloUnits	8	2		Primary	3	Watthour Received
13	Register	Consumption	VARHr	Polyph...	Delivered	Total	Working	Units	8	2		Primary	3	VARHour Delivered
14	Register	Consumption	VARHr	Polyph...	Received	Total	Working	Units	8	2		Second...	3	VARHour Received

LCD Page 1: Dual Register display (Registers 3 & 5 both have Screen set to 1). Yellow highlight.

LCD Page 2: Triple Register display (Registers 8, 9 & 10 have Screen set to 2). Blue highlight.

LCD Page 3: Quad Register display (Registers 11, 12, 13 & 14 have Screen set to 3). Orange highlight.



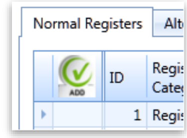
To group registers follow these steps.

1. Select multiple rows by holding down <CTRL> or <SHIFT> to select contiguous rows and click in any column.
2. Once you have rows selected, set the Screen value in the top row. This will be the value for all of the rows.
3. With the mouse point in the Screen column, right-click and select "Group" from the pop-up menu, as shown below.

10	Register	Instantaneous	VAVect...	Polyph...	Delivered	Total	Working	MegaU...	6	3		Primary	2	VA PolyPhase
11	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	KiloUnits	8	2		Primary	3	Watthour Delivered
12	Register	Consumption	WHr	Polyph...	Received	Total	Working	KiloUnits	8	2		Primary	5	Watthour Received
13	Register	Consumption	VARHr	Polyph...	Delivered	Total	Working	Units	8	2		Primary	7	VARHour Delivered
14	Register	Consumption	VARHr	Polyph...	Received	Total	Working	Units	8	2		Second...	8	VARHour Received

Group Registers
Delete
Copy
Paste
nt=14

Adding a new Display Register



Click the Add button (top left corner) to add another line of register information.

Fill in the fields sequentially from left to right, because some selections affect the settings of later ones. Each field is described as follows.

ID

Assigns a Register Identification number. The ID Number can be edited by the user as long as it stays within the list of valid ID numbers shown below. When adding a new register, the ID Number will automatically fill in the next available number starting at the lowest available number first.

Register	Valid ID Numbers
Normal	0-49
Alternate	100-149
Test	200-249

Register Category

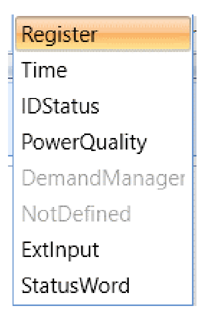
Select from the register categories:

- *Register*: Stores all types of quantitative data.
- *Time*: Stores time/date information, and associates time of other event occurrences such as BPR, freezes, etc.
- *ID Status*: Stores meter health status, firmware versions, segment check, BPR count, diagnostics vector display and descriptive user text information.
- *Power Quality*: Stores power quality measurements
- *Ext Input*: Stores the status of a digital input or can be used as a pulse counter.

NOTE: Your selection of Register Category determines which choices are available in the following fields. The "Register" selection is used for the following examples. Your choices may be different if you choose Time, or IDStatus.

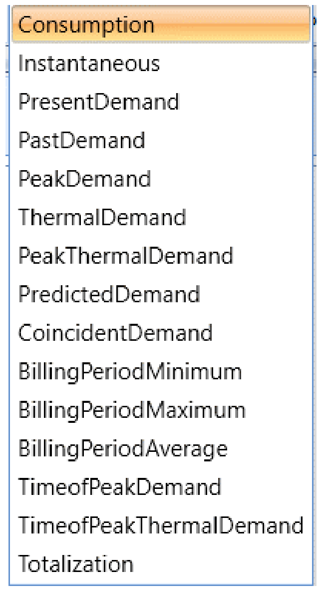
Register Category:Register

Choose the type of register from the selections shown.



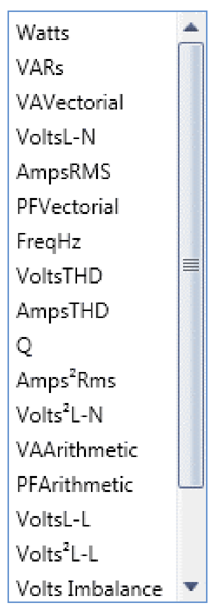
Register Type

Your selection of Register Type determines which choices are available. The Peak Demand selection is used for the following examples. Your choices may be different if you select a different Register Type.



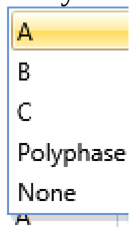
Quantity

Select an electrical quantity from the pull-down list. Your options may vary, depending on your previous choices.



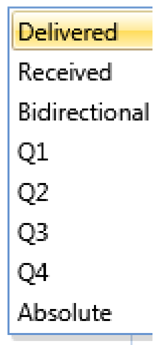
Phase

Choose from the available choices. In this case, choose Phase A, B, C, or Polyphase. Average is available for Amps or Amps^2 only.



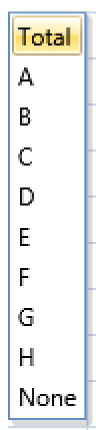
Direction

Depending upon your earlier selections, you may be able to choose the power flow direction.
NOTE: If you are configuring an Instantaneous register, you can also set it for Bi-directional.

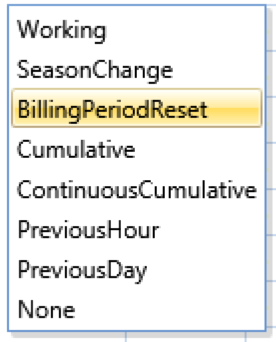


TOU

The Time of Use rate is selected next if you are using this feature. The default is Total, but any of eight other rates can be chosen. Refer to the Time of Use Setup menu for configuring the actual rate schedules.

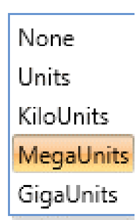


Storage Type



The Storage Type selection is used to define how the register data will be saved.
A Working register will store the selected data in real time and update the saved quantity on a continual basis. When a BPR occurs, the Working register is reset to zero.
A Season Change register stores the selected quantity only when a Season Change command occurs. The quantity in the register is saved until the next Season Change command, at which time the data is overwritten.
A *Billing Period Reset* register will store the selected quantity only when a BPR occurs. The quantity in the register is saved until the next BPR command, at which time the old quantity is overwritten.
A *Cumulative* register will store the selected quantity when a BPR occurs. The quantity in the register is saved until the next BPR command, at which time the quantity is added to the existing quantity.
A *Continuous Cumulative* register will sum the selected quantity read at BPR plus the quantity from the Working register. The sum is continuously updated.
NOTE: Any alteration to the BPR configuration will reset these registers.
A *Display Prev Hour* register will show the value in the register as of the top of the hour. This storage type is only available for Consumption registers.

Units



Choose measurement unit here.

of Digits & Decimal Point

# of Digits	Decimal Point
6	2
6	2
6	2
6	2
6	2

Choose the total number of digits you want to display (up to 10), and then select the number of digits to be displayed to the right of the decimal point (up to 3). An example will be shown below your choices to confirm that your selection is correct.

NOTE: If you select an 8-digit display using the meter front panel menu or the "Display Setup" screen, the setting shown here will be overridden.

TLC

Check the box in this column if you want transformer loss compensation enabled for the register.

TLC
☐
☐
☑
☐
☐

Scaling Values

Values	Screen
Primary	1
Seconda...	2
Seconda...	2
Seconda...	3
Seconda...	3

Self Read Register

Check this box to indicate that the register is also chosen as a 'Self Read Register'. Up to 8 Normal Registers and 8 Alternate Registers can be selected as 'Self Read'. These registers measurements will be recorded at a configured interval consisting of every hour, day, week, month, upon a BPR (Billing Period Reset) or at the end of a demand interval. There is enough memory allocated to store 96 values per register. If storing a register every day, you would be able to retrieve the previous 96 days of measurements.

Self Read Register
☐
☐
☐
☐
☐

Screen

Display order: Up to four (4) registers can be mapped to one screen by repeating the screen number. Explained above. Note: these ID/Status registers are full-screen and should be displayed alone.

- Alarm
- Blank Screen
- Phasor Display
- Comm Status
- White Screen

Description

Each register can contain up to a 21-character description. One is created for you based on the settings selected in previous columns. If a custom description is warranted, highlight the field, and select the checkbox preceding the description. This replaces the automatic description.

Default Register Abbreviation Definitions

Abbreviation	Description
Cons	Consumption
AvPF	Average Power Factor
PkD	Peak Demand
TPkD	Time of Peak Demand
CndD	Coincident Demand
Inst	Instantaneous
Thrm	Thermal
PkT	Peak Thermal
TPkT	Time of Peak Thermal
CndT	Coincident Thermal
PresD	Present Demand
PastD	Past Demand
Pred	Predicted Demand
WH	Watthour
VARH	VARhour
VAH	VoltAmp hour
QH	Qhour
AmpH	Amp hour
PF	Power Factor
W	Watt
VAR	VAR
Q	Q
Amp	Ampere
Volt	Volt
Time	Time
Date	Date
Freq	Frequency
VTHD	Volts Total Harmonic Distortion
ATHD	Amps Total Harmonic Distortion
A	Phase A
B	Phase B
C	Phase C

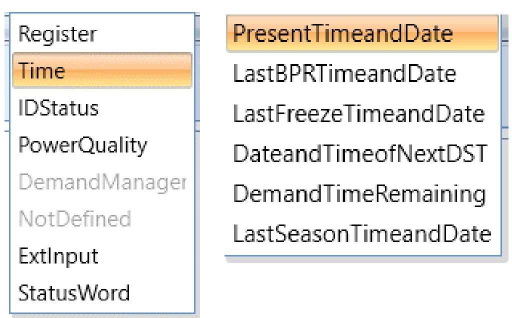
P	Polyphase
N	Neutral
RE	Received
DE	Delivered
Q1 (2,3,4)	Quadrant 1(2,3,4)
T	Total
Wk	Working
SC	Season Change
BP	Billing Period Reset
Fr	Freeze
Cm	Cumulative
CC	Continuous Cumulative
Amp^2	Amp Squared
$Volt^2$	Volt Squared
Amp^2H	Amp Squared Hour
$Volt^2H$	Volt Squared Hour
Av	Average

Register Category:Time

If you select the Time register category, there are several items you can select related to time and dates.

The Time Register category includes the following:

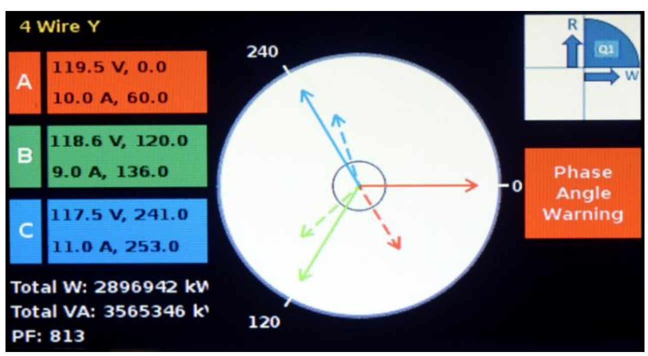
- Present Time and Date
- Last Billing Period Reset Time and Date
- Last Freeze Time and Date
- Date and Time of next daylight savings
- Time remaining in current demand interval
- Last 'Time of Use' Season data and time

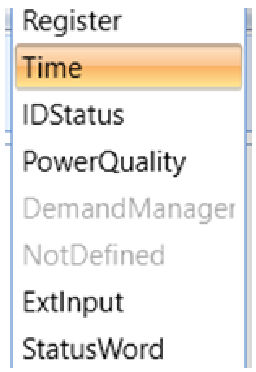


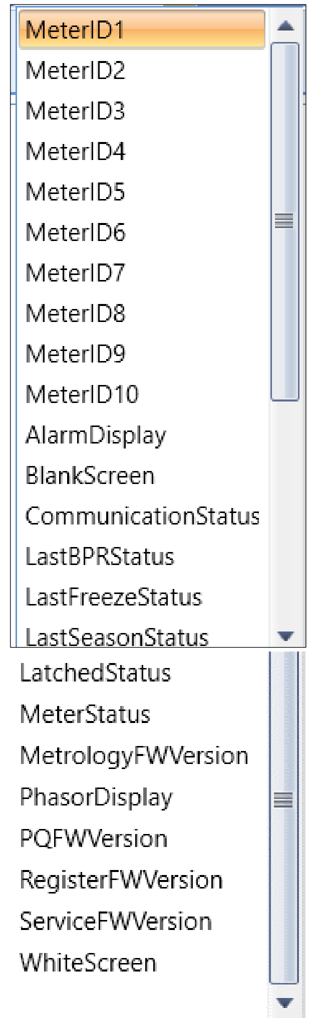
Register Category:ID/Status

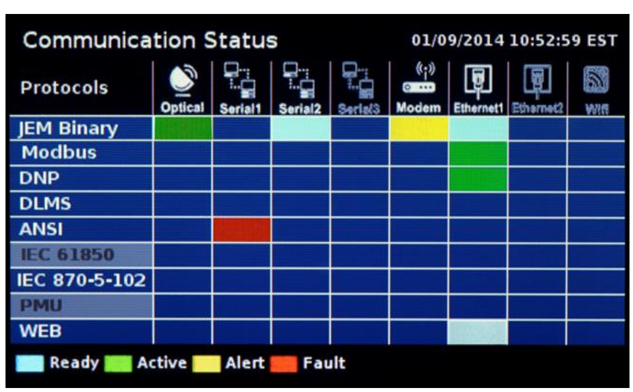
If you select the ID/Status Register category, there are several functions that can be assigned to a register.

- **Meter Status** displays a hex value which represents the meter's health status in real-time. This value corresponds to the "Status" icon on the meter's display. If = 0, no failures. Other than 0, the icon will be red, and the value indicates the problem.
- **Latched Status** contains the same information as Meter Status, but bits are never cleared. If Latched Status contains a value other than 0, and the icon is green it indicates a past failure that was cleared. See the Diagnostic Event Log under Meter Logs for a history of meter and latched status related events.
- **Alarm Display** shows the real-time state of Triggers.
- **Communication Status** displays the real-time state of all external communications in the meter. A full display register page is allocated for this.
- **Last BPR, Freeze, Season Status** are not currently implemented and display 0.
- **Meter ID, Administrator, Location, Configuration ID, & Account** settings show values configured in the Meter ID section of Meter Settings.
- **Register, Metrology, Service & PQ Firmware** display the requested firmware version for the respective microprocessor.
- **Blank Screen** display that can be used for data security if you do not want any information viewable on the meter. All display pixels will be black.
- **White Screen** sets all display pixels to white. Useful to identify a defective LCD.
- **Phasor Display** shows the voltage and current quantities as a vector diagram on the meter. A full display register page is allocated for this. Example shown below.




Register
Time
IDStatus
PowerQuality
DemandManager
NotDefined
ExtInput
StatusWord


MeterID1
MeterID2
MeterID3
MeterID4
MeterID5
MeterID6
MeterID7
MeterID8
MeterID9
MeterID10
AlarmDisplay
BlankScreen
CommunicationStatus
LastBPRStatus
LastFreezeStatus
LastSeasonStatus
LatchedStatus
MeterStatus
MetrologyFWVersion
PhasorDisplay
PQFWVersion
RegisterFWVersion
ServiceFWVersion
WhiteScreen


Communication Status
01/09/2014 10:52:59 EST
Protocols
Optical
Serial1
Serial2
Serial3
Modem
Ethernet1
Ethernet2
Wifi
JEM Binary
Modbus
DNP
DLMS
ANSI
IEC 61850
IEC 870-5-102
PMU
WEB
Ready
Active
Alert
Fault

Register Category: Power Quality

If you select the Power Quality register category, you can select from a range of Flicker and Harmonic Measurements. *Note: The meter must be enabled with option PQ2, PQ3.*

Flicker Measurements

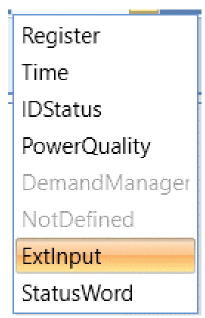
Quantity	**Phase**
Pst	A, B, C
Plt	A, B, C
Pinst	A, B, C

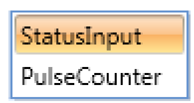
Harmonic Measurements

Quantity	**Phase**
Volts THD	A, B, C
Amps THD	A, B, C
Volts THD odd	A, B, C
Volts THD even	A, B, C
Amps THD odd	A, B, C
Amps THD even	A, B, C
TDD	A, B, C
TDD odd	A, B, C
TDD even	A, B, C
Crest Factor	A, B, C
Neg Seq Ratio Voltage	Polyphase
Neg Seq Ratio Current	Polyphase
Zero Seq Ratio Voltage	Polyphase
Zero Seq Ratio Current	Polyphase

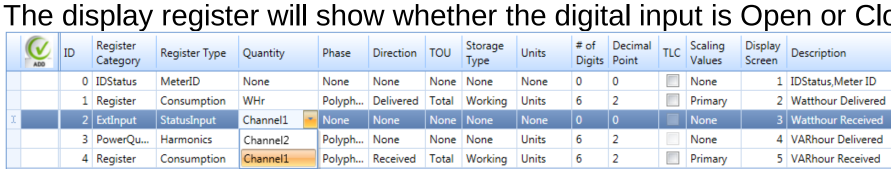
Register Category: External Input

If you select the External Input register category, you can select Status Input or Pulse Counter.





- Status Input
  When selecting this, the Quantity field will let you select which of the digital inputs are available. You must first configure the 'Input/Output' settings to assign which Digital I/O is a Status Input. (Only available Digital Inputs configured as Status Inputs will be shown.)
  The display register will show whether the digital input is Open or Closed.



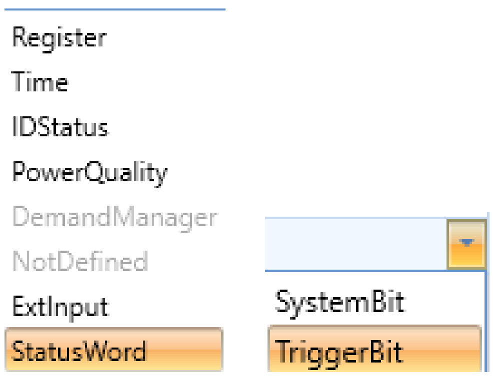
ID	Register Category	Register Type	Quantity	Phase	Direction	TOU	Storage Type	Units	# of Digits	Decimal Point	TLC	Scaling Values	Display Screen	Description
0	IDStatus	MeterID	None	None	None	None	None	None	0	0		None	1	IDStatus,Meter ID
1	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	Units	6	2		Primary	2	Watthour Delivered
2	ExtInput	StatusInput	Channel1	None	None	None	None	None	0	0		None	3	Watthour Received
3	PowerQu...	Harmonics	Channel2	Polyph...	None	None	None	Units	6	2		None	4	VARhour Delivered
4	Register	Consumption	Channel1	Polyph...	Received	Total	Working	Units	6	2		Primary	5	VARhour Received

- Pulse Counter
  When selecting this, the Quantity field will let you select which of the digital inputs are available. You must first configure the 'Input/Output' settings to assign which Digital I/O is a Pulsed Counter. (Only available

Digital Inputs configured as Pulse Counter will be shown.)
The Display Register will show the quantity of digital input transitions in accordance with the assigned digital input.

Register Category:Status Word

If you select the Status Word register category, you can select System Bit or a Triggered Bit. These Status Words provide the current status of the meter in the form of a 16-bit string (presented as a Hex Word) with each bit signifying a separate condition of the meter. Refer to the section on Meter Status for more information on Status Word.

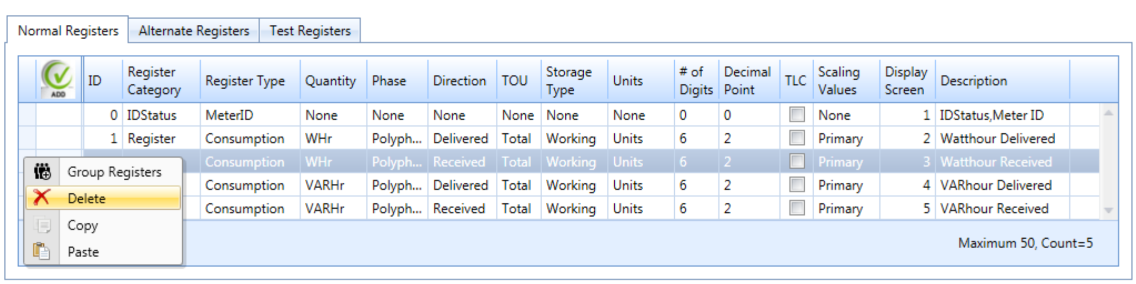


Edit an Existing Display Register

Highlight the register in the list that you want to change and then either type in or choose specific entries from the related drop-down menus.
Click Save after all changes have been made.

Delete a Display Register

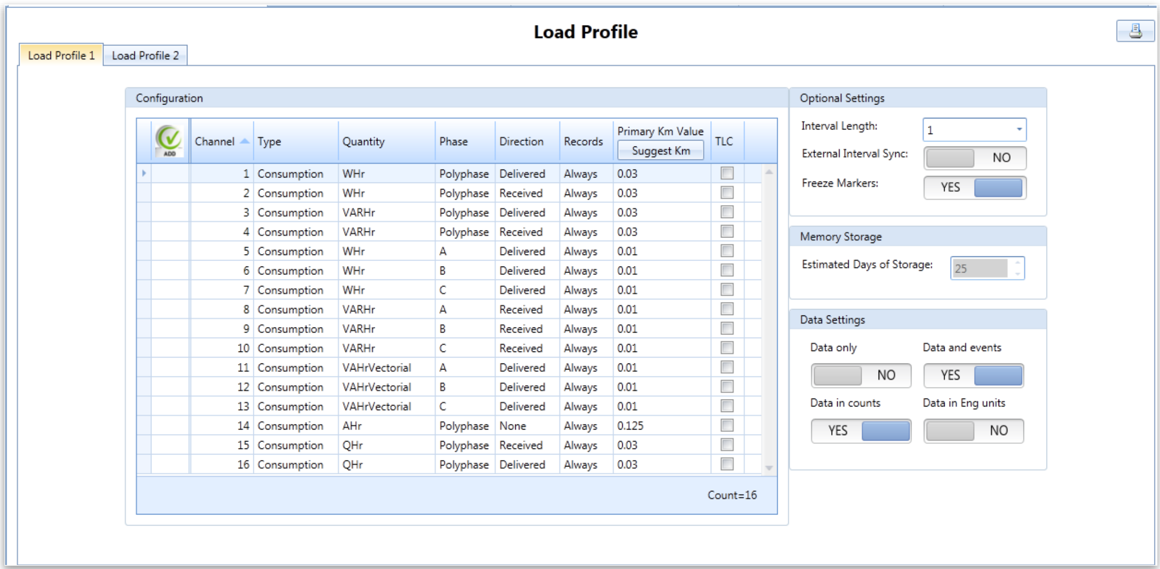
Right click with your mouse on a register, from the context menu choose Delete. To delete multiple rows, hold down the <CTRL or <Shift> keys to select rows then right-click and choose Delete from the context menu.



LOAD PROFILE

The Load Profile screen contains parameters that set up the Load Profile storage areas in the meter. This configuration is only necessary if you are using the Load Profile features of the meter.

A meter can be equipped with 16 Load Profile channels (*standard*) or an additional 16 channels in a second Load Profile (*optional*). If the meter has the "Dual Load Profile" option installed, a second tabbed page will be available to configure the 16 additional and independent Load Profile settings.



The following parameters are common to all channels:

Interval Length

Each Load Profile is divided into a user-defined interval. The interval length is the same for all channels so that the channel data can be compared to each other. Choose from the pull-down choices of 1 – 60 minutes, Daily, Weekly and Monthly.

External Interval Sync

The External Interval Sync can be used to trigger the start of a Load Profile Interval from a remote source. If enabled, this will override the Interval Length setting and start a new interval immediately upon sensing an input pulse. To use this feature, you must have the Digital Input/Digital Output (DI/DO) board installed in your meter. Then you configure one of the channels to an "Input" with the selection "Interval Sync".

Freeze Markers

Check this box if you want the event list to include data showing when Freezes are generated. Note that this will use some of the Load Profile storage memory, thus decreasing the total number of LP days available.

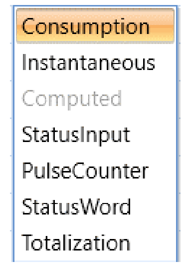
Estimated Days of Storage

These are read-only fields that display the approximate number of days of Load Profile data the meter can store in memory. The amount of storage is based on the number of LP channels in the meter and the profile interval length.

Edit a Load Profile

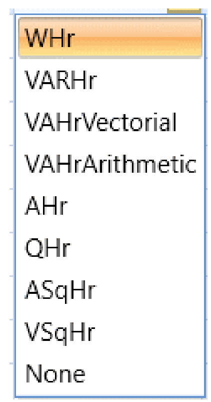
To edit an existing profile, highlight the channel number and either type in or choose an entry from the drop-down menu. It is important to edit fields from left to right as the drop-down lists are dynamically created based on the previous column's setting. The following attributes can be specified for each individual channel:

Type



From the pull-down list, choose consumption, instantaneous, status input or Pulse Counter.
When selecting a consumption value, the integrated value will be summed over the interval.
When selecting Instantaneous, the interval will contain an average value over the length of the interval.
When selecting Status Input, the interval will report the status (on/off) over the interval.
When selecting the Pulse Counter, the total quantity of pulses will be summed over the interval.
When selecting Status Word, the Quantity field will let you choose the System Bit or Triggered Bit. The current meter status during the recording interval will be stored. For meter status items that return to normal during an interval, the alarm condition will be latched on for that interval.

Quantity



From the pull-down list, choose the electrical quantity that will be profiled for this channel. The list of quantities will be different based on the measurement Type selected. The list of integrated values to the right is shown when selecting Consumption measurement type.
When selecting Instantaneous measurements, the Quantity field will show a list of instantaneous measurements, like volts, amps, watts.
When selecting Pulse Counter or Status Input, the Quantity field will show the Digital Input Channel available for this function. (Note: you must first set up the Input/Output channel assignments before selecting this.)

Phase

Choose the phase(s) to be profiled: A | B | C | Polyphase | None.

- If Quantity is Volts, Watts, Watt-Hours, VARs, VAR-Hours, VA, VoltAmp-Hours, A^2, V^2, A^2-Hour, V^2-Hour, or PF, select one choice of A, B, C, or Polyphase.
- If Quantity is Amps or Amps^2, select one choice of A, B, C, N, or Poly.
- If Quantity is V-THD, or A-THD, select one choice A, B, or C.
- If Quantity is any other, there are no phase choices.

Direction

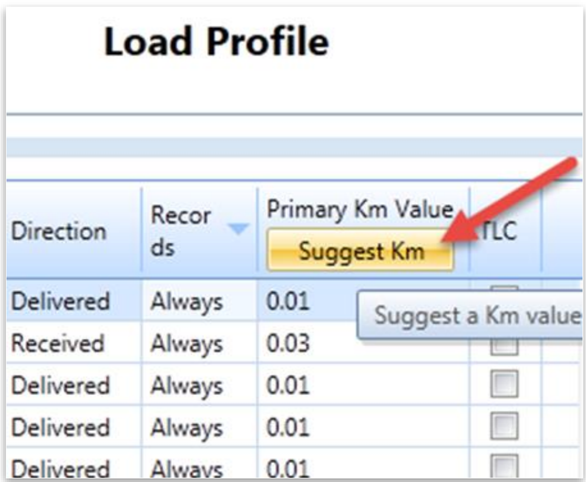
Select whether the measured quantity is Received or Delivered power. Note: If Amp-Hours, Volts, Amps, Hz, Volts-THD, A^2, V^2, A^2-Hour, V^2-Hour or Amps-THD are chosen as the Quantity, the Direction is not selectable. Q1, Q2, Q3, and Q4 are enabled only when VAR or VAR-Hours is selected.

Records

Choose how you want the LP Channel to record data. The standard selection is Always. If you want to control the recording of LP data, you can select During TOU Override or Digital Input. The Time of Use Override feature is set on the Input/Output > Internal I/O > Digital I/O configuration screen. By using one of the Contact Inputs as an external trigger, you can switch Load Profile recording on and off in conjunction with the Time of Use register settings. For the Digital Input setting, the DI/DO board must also be configured such that one channel is an "Input" with a selection of "Record Load Profile". Refer to the Load Profile description in the JEMStar II User Manual.

Primary Km Value

Enter a Km constant that represents the desired Load Profile pulse weight. This value should be based on the units (kilo, mega, etc.) that were previously chosen in the Primary configuration screen under "Measurement Units for Meter Outputs".
If you click the "Suggest Km" button in the column heading, all column values will be adjusted with an appropriate value based on the chosen quantity measurement.

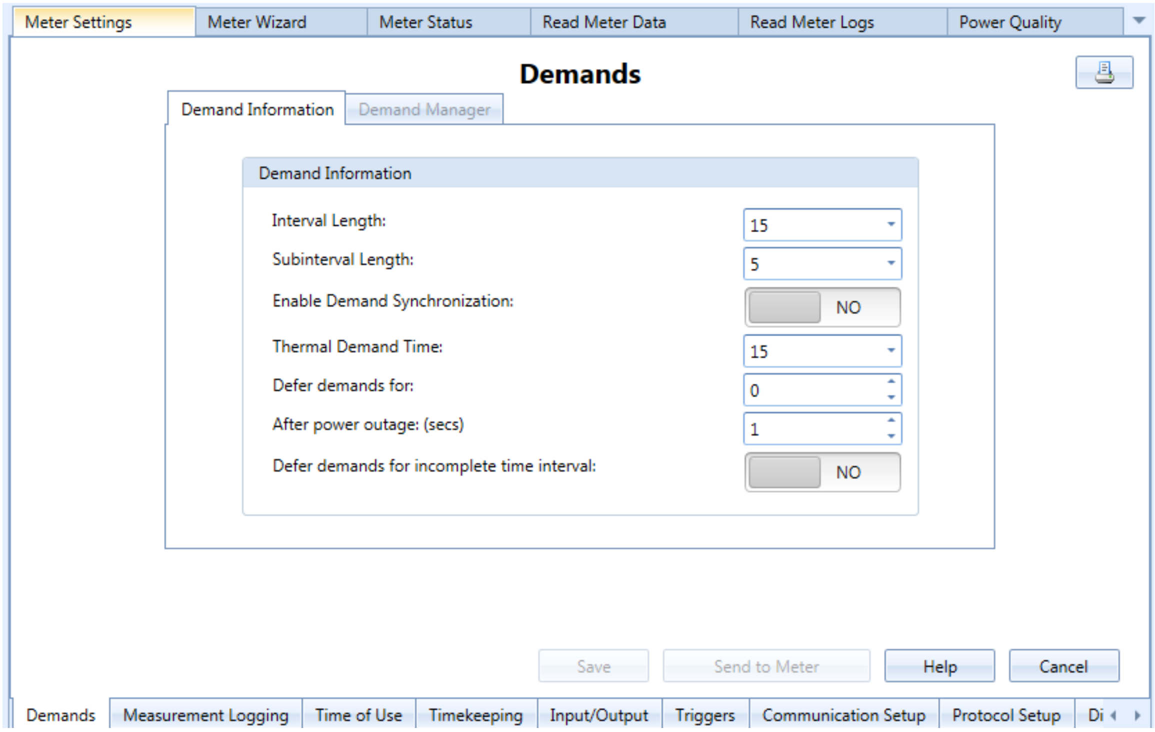


TLC

Checking this box forces the quantity measured by this Load Profile channel to have Loss Compensation applied.

DEMANDS

This menu selection contains setup data that configures the timing parameters for all types of Demand Registers. The actual Demand Register types (Peak, etc.) are defined in the Display Registers Type configuration list. This configuration is only necessary if you are using the Demand functions of the meter.



Interval Length

The Demand Interval is the user-defined period of time that is used to calculate the average of the measured quantity. Use the pull-down menu to choose the Demand Interval Length in minutes (1 – 60).

Subinterval Length

Optionally, subintervals can be assigned to a Demand Interval to create a “Rolling Interval” or “Sliding Window”. This type of measurement consists of the average value calculated over multiple consecutive subintervals. A calculation is performed at the completion of each subinterval, and then the calculations are averaged over the length of the main Interval. Use the pull-down menu to choose the Demand Subinterval length in minutes (1 – 60).
The subinterval length must be set less than the interval length and must be an integral divider of it.

NOTE: If the Subinterval Length is set to equal the Interval Length, the meter will record standard Block Intervals consisting of the time period you have set.

Enable Demand Synchronization

You can use the Pulse Input option to trigger the start of a Demand Interval. Refer to the Pulse Input/Output menu section for instructions on assigning operating parameters to the I/O ports. This feature is enabled when the slider control displays “Yes”.

To use this feature, you must have the Digital Input/Digital Output (DI/DO) board installed in your meter. Then you configure one of the channels to an “Input” with selection “Interval Sync”.

Thermal Demand Time

Thermal Demand is a measurement filtered through a time delay such that step changes in the measurement are reflected slowly in the output. This is commonly used to simulate the effects of current heating on power distribution equipment.

The Thermal Demand Time is the time required for a Thermal Demand Register to reflect 90% of a step change in input. This is similar to the time characteristic of mechanical thermal demand meters. Select from 1 – 60 minutes if you are using this feature.

Defer Demands for

After a power outage occurs, the initial demand upon restoration of power can be a tremendous surge. Demand recording can be delayed for a user-specified number of demand subintervals, so that this large surge is not factored into the regular measurements.

After power outage

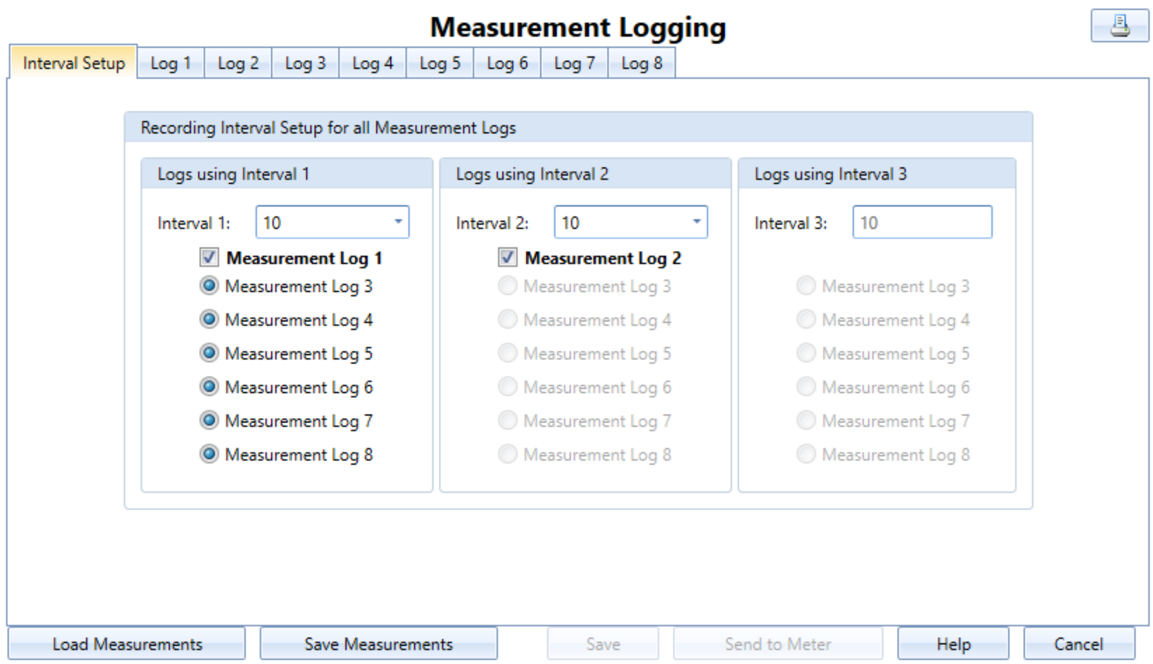
Assign a time period (0 – 60 seconds) that the length of the power outage must exceed to initiate the demand deferral.

Defer Demands for incomplete time interval:

Select this option to defer demands for an incomplete time interval.

MEASUREMENT LOGGING (OPTION)

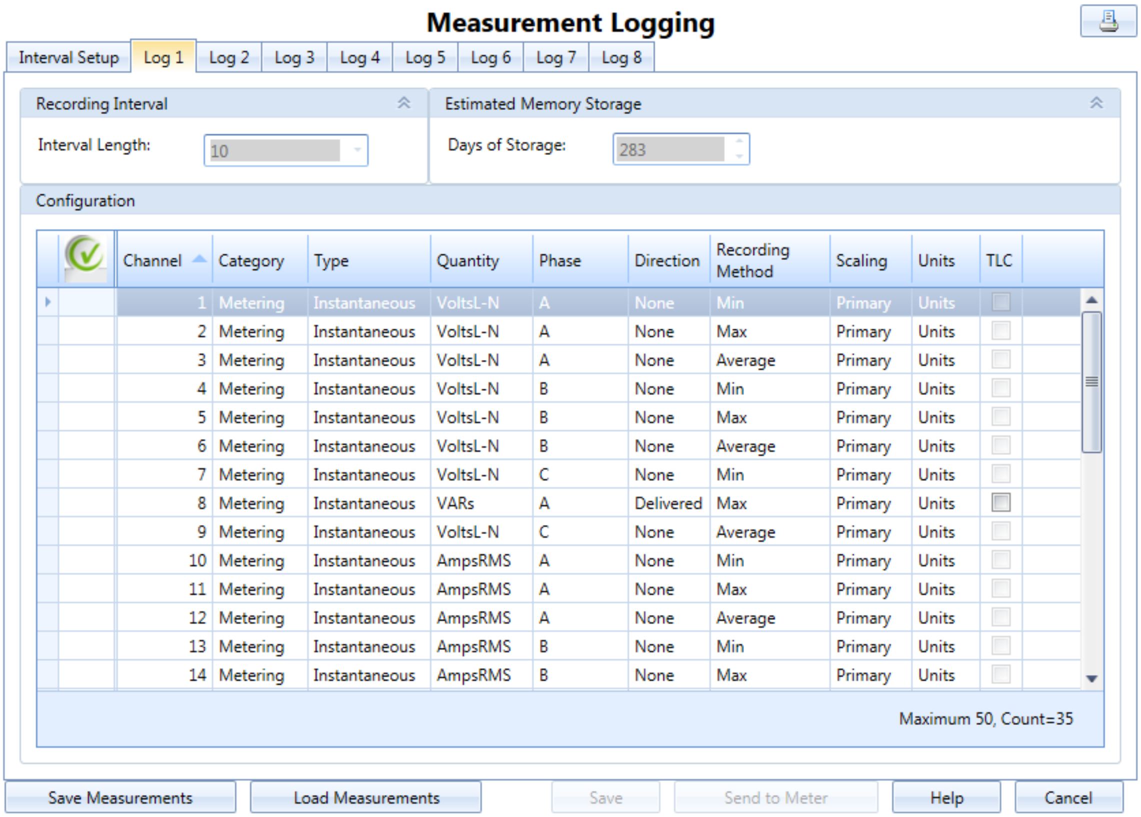
This menu is used to configure the Measurement Log. The meter must have the Measurement Log Option (ML) or Power Quality options (PQ2, PQ3) enabled. If you don't have these options enabled, the configuration settings on this screen will be ignored. The measurement log contains a list of measurements that you can record at intervals from 150/180 cycles to 120 minutes. Up to 400 channels can be recorded, divided into eight groups of 50. Each group of eight can be assigned to one of three configurable recording intervals. While like Load Profile, the measurement log includes a wider choice of measurements and recording intervals and it does not record the various metering events like meter freeze, midnight event, billing reset, etc. The measurement log allocates its non-volatile memory using FIFO storage (first in, first out) and all measurements are stored in 32-bit format.



Recording Interval

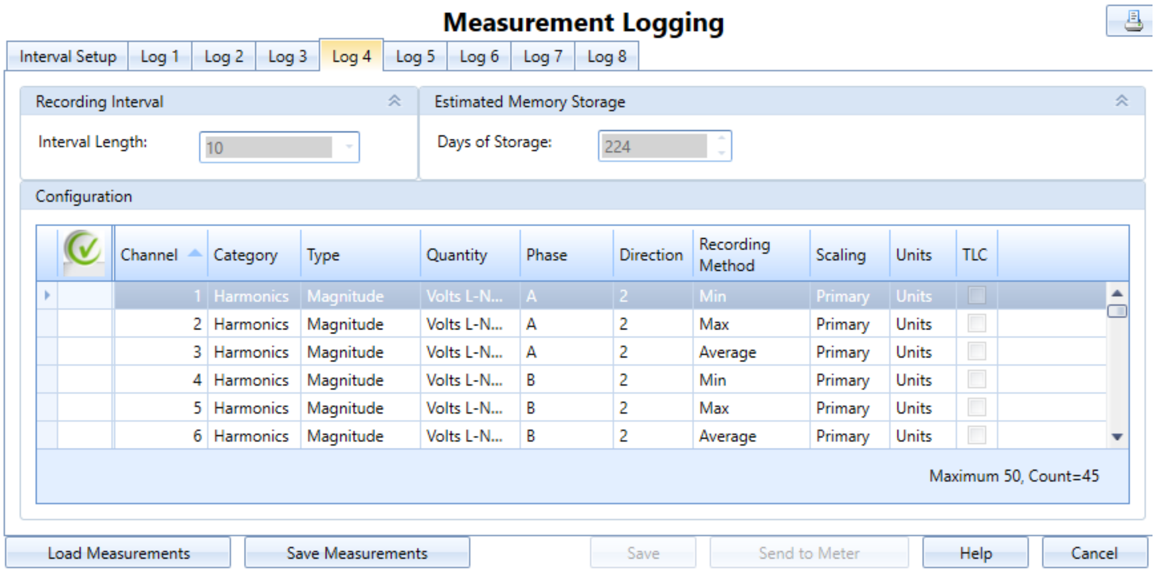
The measurement log includes eight groups of 50 measurement channels. Each group of 50 channels can be assigned to one of three configurable recording intervals. The available recording intervals are:

- 150/180 Cycles
- 1 minute
- 2 Minutes
- 3 Minutes
- 4 Minutes
- 5 Minutes
- 10 Minutes
- 15 Minutes
- 20 Minutes
- 30 Minutes
- 60 Minutes
- 120 Minutes



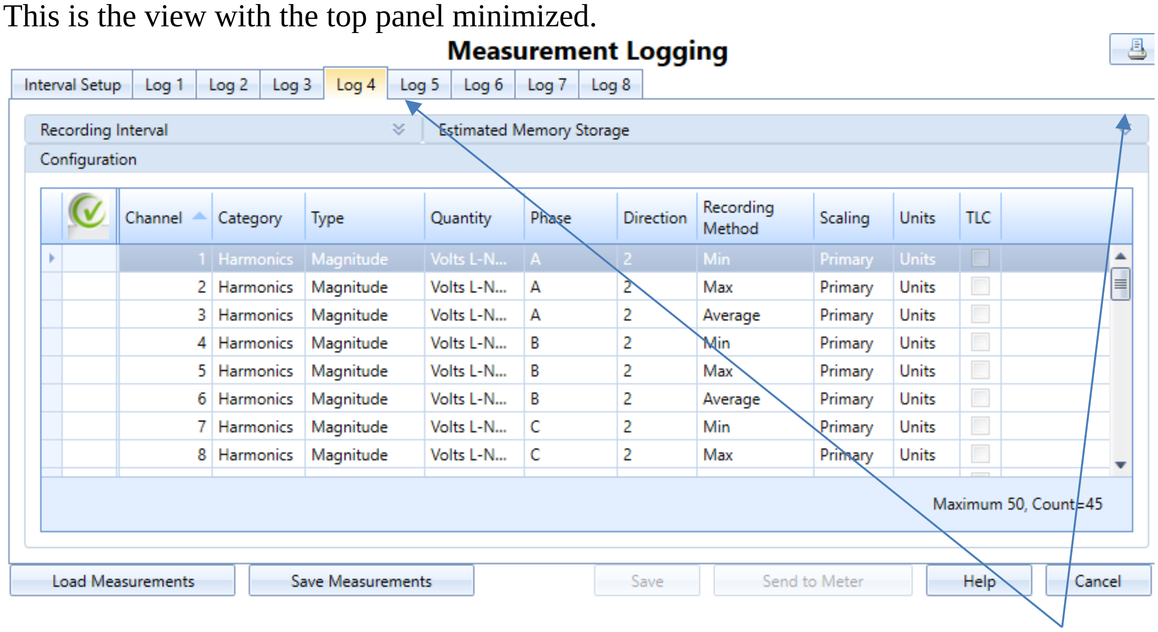
Measurement Log Storage:
The Measurement Log is stored inside the meter for retrieval via JEMWARE. The software will indicate the number of days storage based on the number of channels and recording interval.
The log has a maximum storage of 1,095 days. The meter memory will support approximately 1,460,000 measurements per 50 channel log.

Example:
If using all 50 channels with a recording interval every 10 minutes, that's 144 x 50 channels per day = 7,200 measurements per day. With a maximum of 1,460,000 measurements, that equates to approximately 203 days.

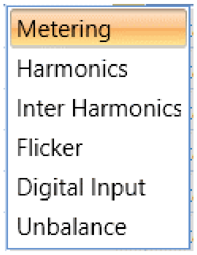


Important tip:
When trying to display screens on a laptop or small display, many of the JEMWare II screens will allow a partial minimization to allow better viewing. If you see the double arrows, you can use these to minimize parts of the display.

This is the view with the top panel minimized.



Configuring Measurements:
A drop-down box will let you select the measurements and parameters associated with each selection. The available measurement categories, measurement types and quantities include:



Measurements:
The available measurements include:

- **Metering**
  Instantaneous: Volts, Amps, Watts, VA, VARs, PF, Freq, Q, $Volts^2$, $Amps^2$, Unbalance Integrated: Whr, VARhr, VAhr. Qhr, Amphr, Amp^2hr, $Volt^2hr$
- **Harmonics**
  Magnitude and Phase Angle of harmonics 1-64, THD, TDD, Crest Factor
- **Interharmonics**
  Magnitude of inter harmonics 1-50
- **Flicker**
  Short term, long term, instantaneous
- **Digital Inputs**
  Contact Inputs
- **Unbalance**
  Negative Sequence S2 All, Positive Sequence S1 All, Zero Sequence S0 All, S2/S1 All, S0/S1 All

Note: Harmonic, Interharmonic, Flicker and Unbalance measurements are only available with options PQ2 and PQ3. For each selection, you can select a phase, direction (if applicable), recording method (min, max, avg, snapshot or total), scaling value (primary/secondary) and engineering units (units, kilo, mega, giga). Not all selections are available depending on the measurement selected.

When selecting Individual harmonics, the Direction field is used to select the individual harmonic.

An example of a single channel for the measurement log would be:
Phase A Voltage Minimum. To record the min/max/avg for all 3 Phase voltages would require 9 channels.

Measurement Recording Methods:
For each of the above measurements, the measurement can be recorded as:

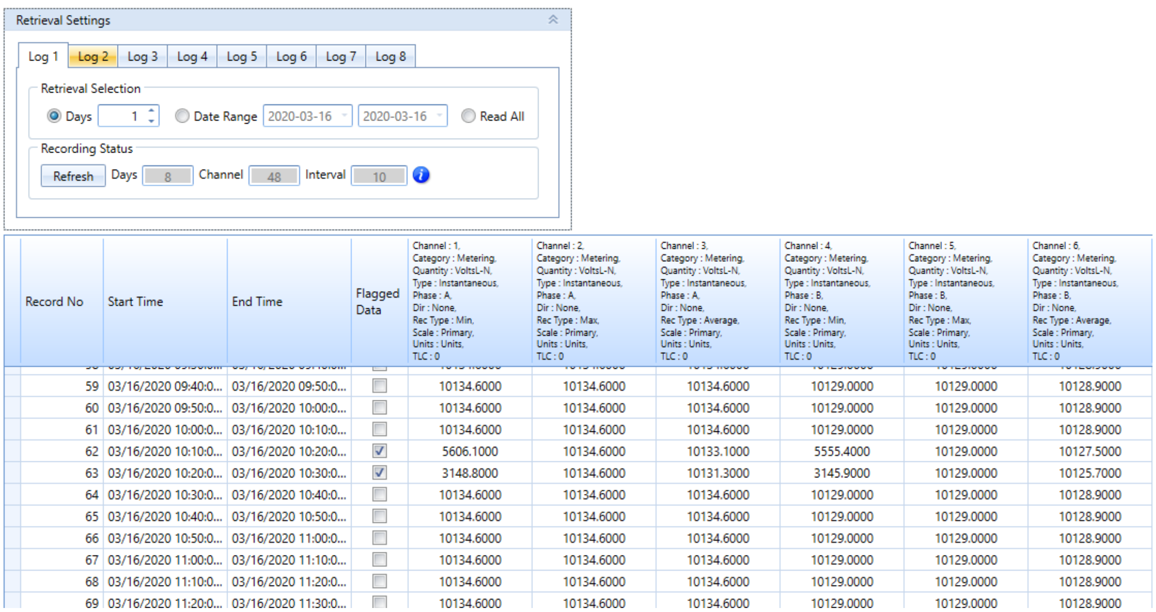
- **Minimum**
  Lowest recorded value over the recording interval
- **Maximum**
  Highest recorded value over the recording interval
- **Average**
  Average value calculated over the recording interval (using 10/12 cycle measurements)

- **Total**
  Total value recorded over the interval (used for integrated measurements)
- **Snapshot**
  Value recorded at the end of that interval

For each measurement, you can select whether it is a primary or secondary value, engineering units for the value (units, kilo, mega, etc.) and whether to include transformer compensation (if applicable).

Viewing and Retrieval of Measurement Log:
The measurement log is automatically recorded in its own log for viewing and download via the JEMWare II Software. Refer to the section on Meter Data for more details. Read Measurement Logs

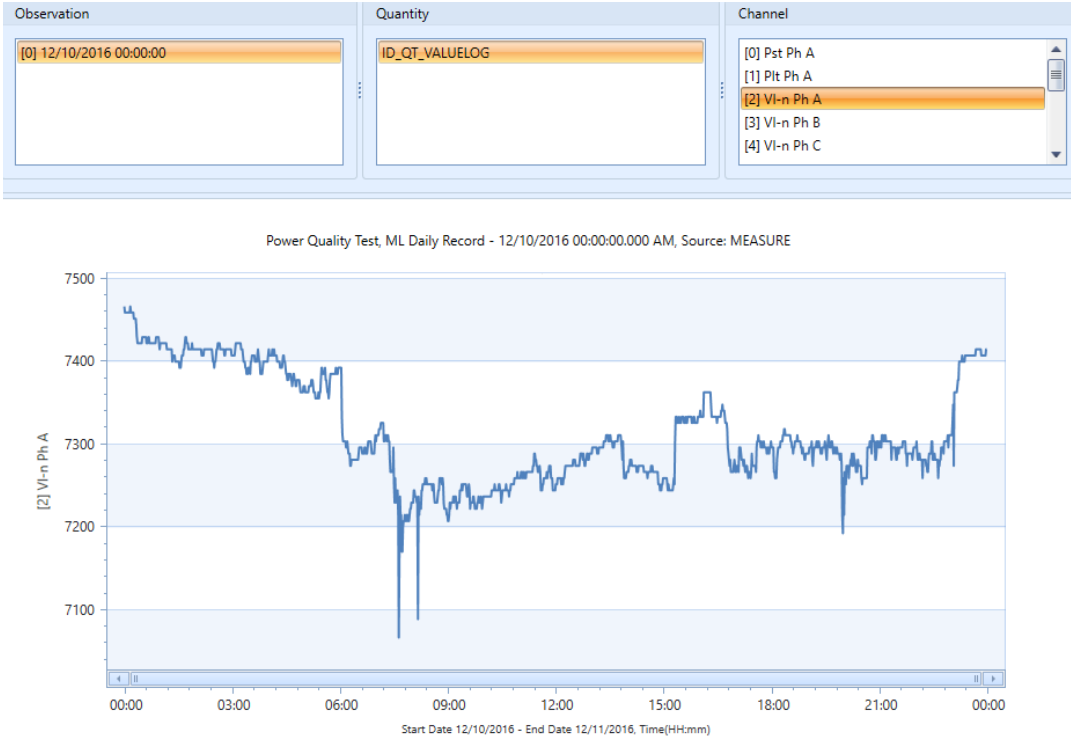
Measurement Log Display:
The Measurement Log can be retrieved via JEMWare II and downloaded into Excel and CSV formats. And if configured it can be stored in a daily PQDIF file.



Record No	Start Time	End Time	Flagged Data	Channel : 1, Category : Metering, Quantity : VoltsL-N, Type : Instantaneous, Phase : A, Dir : None, Rec Type : Min, Scale : Primary, Units : Units, TLC : 0	Channel : 2, Category : Metering, Quantity : VoltsL-N, Type : Instantaneous, Phase : A, Dir : None, Rec Type : Max, Scale : Primary, Units : Units, TLC : 0	Channel : 3, Category : Metering, Quantity : VoltsL-N, Type : Instantaneous, Phase : A, Dir : None, Rec Type : Average, Scale : Primary, Units : Units, TLC : 0	Channel : 4, Category : Metering, Quantity : VoltsL-N, Type : Instantaneous, Phase : B, Dir : None, Rec Type : Min, Scale : Primary, Units : Units, TLC : 0	Channel : 5, Category : Metering, Quantity : VoltsL-N, Type : Instantaneous, Phase : B, Dir : None, Rec Type : Max, Scale : Primary, Units : Units, TLC : 0	Channel : 6, Category : Metering, Quantity : VoltsL-N, Type : Instantaneous, Phase : B, Dir : None, Rec Type : Average, Scale : Primary, Units : Units, TLC : 0
59	03/16/2020 09:40:0...	03/16/2020 09:50:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
60	03/16/2020 09:50:0...	03/16/2020 10:00:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
61	03/16/2020 10:00:0...	03/16/2020 10:10:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
62	03/16/2020 10:10:0...	03/16/2020 10:20:0...	☑	5606.1000	10134.6000	10133.1000	5555.4000	10129.0000	10127.5000
63	03/16/2020 10:20:0...	03/16/2020 10:30:0...	☑	3148.8000	10134.6000	10131.3000	3145.9000	10129.0000	10125.7000
64	03/16/2020 10:30:0...	03/16/2020 10:40:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
65	03/16/2020 10:40:0...	03/16/2020 10:50:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
66	03/16/2020 10:50:0...	03/16/2020 11:00:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
67	03/16/2020 11:00:0...	03/16/2020 11:10:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
68	03/16/2020 11:10:0...	03/16/2020 11:20:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000
69	03/16/2020 11:20:0...	03/16/2020 11:30:0...	☐	10134.6000	10134.6000	10134.6000	10129.0000	10129.0000	10128.9000

The measurement log has a column for flagged data to indicate that a voltage sag/swell or interruption occurred within that recording interval. This is used to highlight the data recorded during that event in case it falls outside of typical trend data.

When the measurement log is stored in PQDIF format, it can be displayed graphically in JEMWare II as shown below.



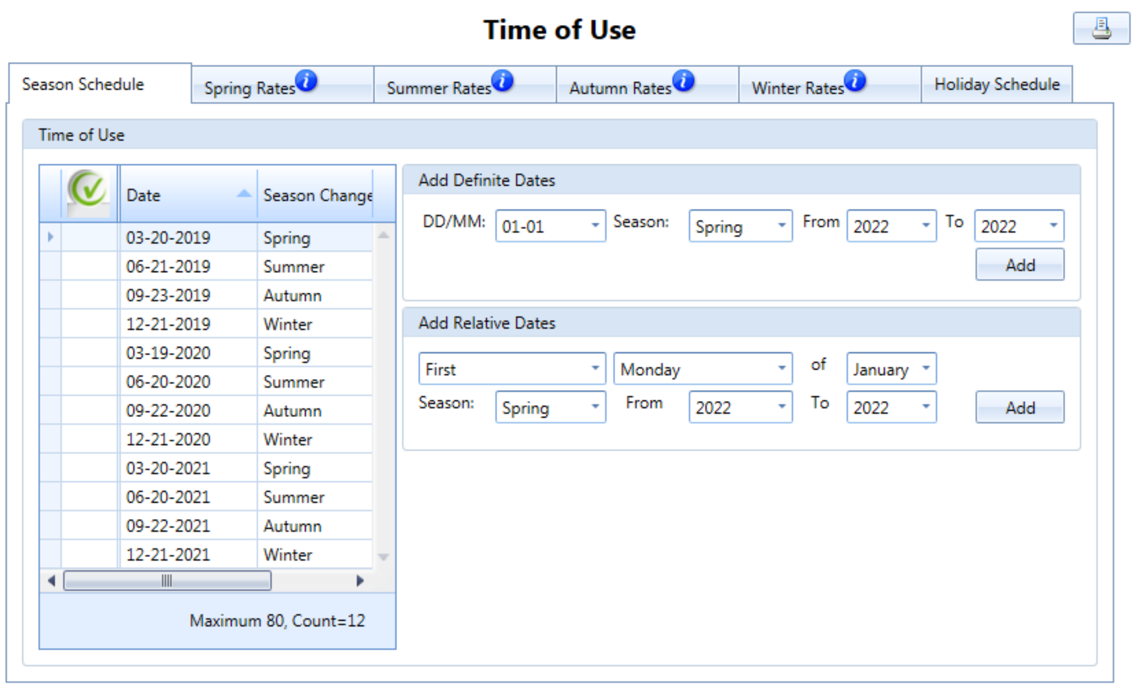
In the Power Quality configuration screen, the meter can be configured to store the measurement log in the PQDIF File format every 24 hours. The file starts recording values at midnight and finishes 24 hours later. More details are provided in the Power Quality sections.

TIME OF USE SETUP

Time of Use is a standard feature that is used to automatically adjust billing rates on a user-defined calendar. There are up to 8 possible TOU rates that can be programmed to meet a wide variety of scheduling needs. Each rate can be set to take effect at any time of any day. In addition, schedules can be arranged to change on the start of a season period or a single holiday date.

There are six category tabs at the top of the TOU screen. The function of each tab is described below.

- Season Schedule – programs the start dates of the season changes.
- Spring, Summer, Autumn, and Winter Rates – allows up to 8 rate changes per day for each day of the week, plus two holidays.
- Holiday Schedule – programs single date occurrences for holiday rate changes.



Season Schedule

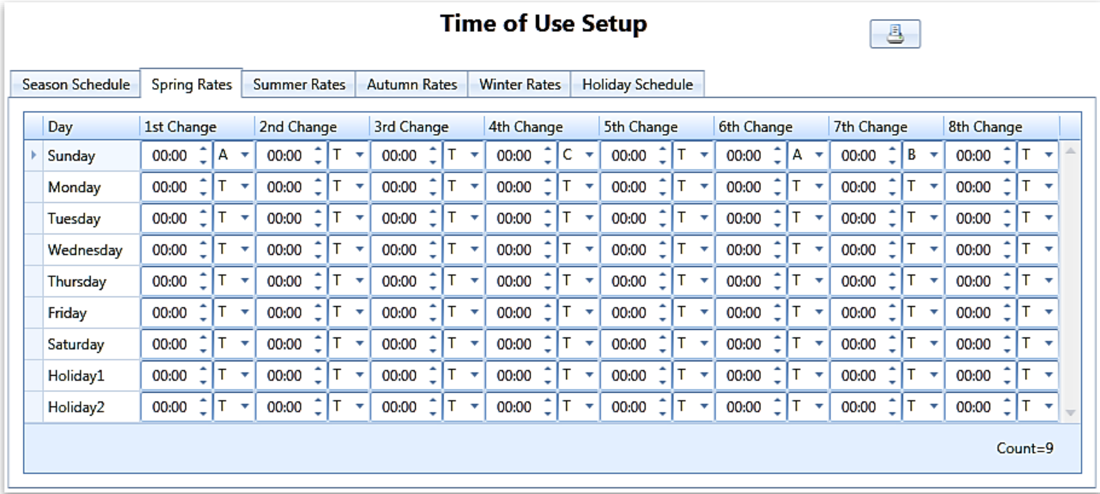
There are 4 season schedules available. When entering seasonal data, you can program up to 80 season changes (20 years).

Season changes can be added as definite dates (i.e. 4th of July), or as relative dates (i.e. first Sunday of May).

Rate Schedules (one for each of the 4 seasons, Spring Rates as shown in screen shot below)

There are up to 8 configurable TOU rates available (A-H), plus a Total (T).

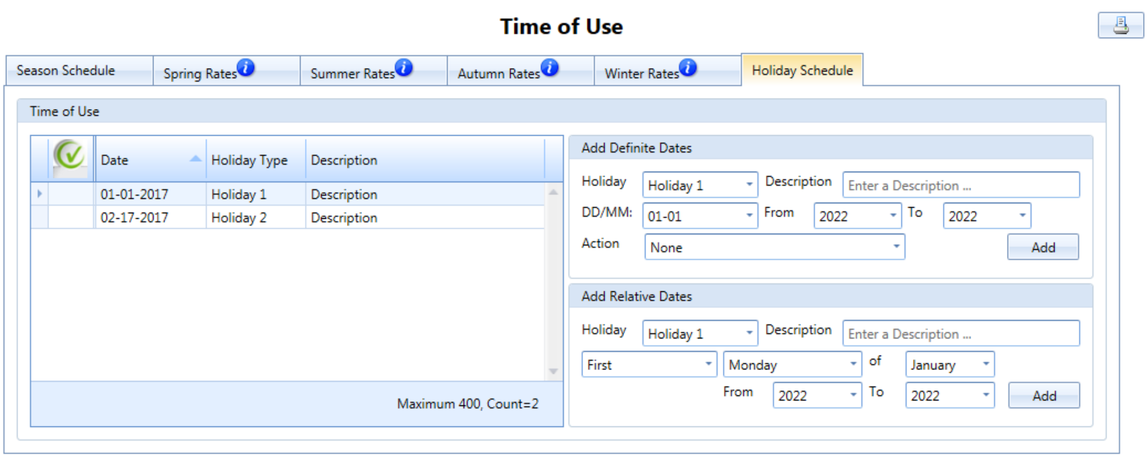
Each schedule can accept up to 8 rate changes per day, for each day of the week, and two holidays. Each rate change must be configured with the time of day when it will occur, and the rate (A – H) that is to apply.



To set a Rate Change configuration, go to the proper season tab, highlight a line in the day list, and then either type in or select an entry using the arrow keys in the field.

You can enter up to eight rate-change times for the chosen day, then map a rate (A – H) for each time. Time is always entered in 24-hour format. Click Save when this day is complete and continue in the same manner for the rest of your daily TOU settings.

Holiday Schedule



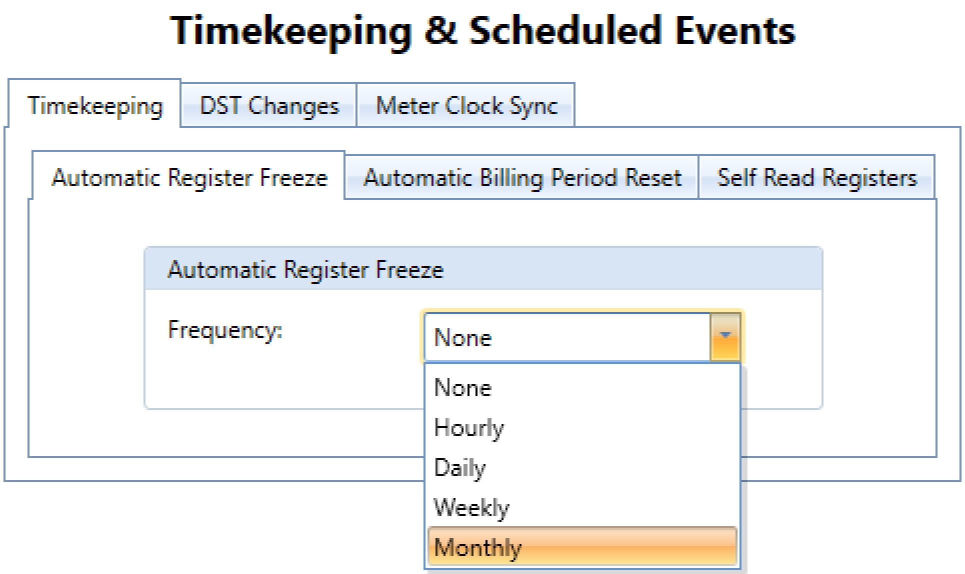
This schedule can list up to 400 holidays. Each holiday definition consists of a date when it occurs and a corresponding designation for "Holiday 1" or "Holiday 2". A description is optional and is only used for reference when viewing JEMWare II.

Holidays can be added as definite dates (i.e. 4th of July) or as relative dates (i.e. first Sunday of May) over a range of years.

Note: Each rate period (Spring, Summer, Autumn, Winter) can have separate Holiday 1 and Holiday 2 rates. Be sure that you are in the correct rate period that encompasses the holiday date when you configure the TOU rate.

TIMEKEEPING & SCHEDULED EVENTS

Use this menu to set up the meter's Time and Date functions, including Daylight Savings Time (DST) adjustments. Note that there are multiple tabs to this screen. The first is the Timekeeping page. Click the tab labeled DST Changes to set up the meter for Daylight Savings Time or Meter Clock Sync to change the time synchronization options.



Automatic Register Freeze

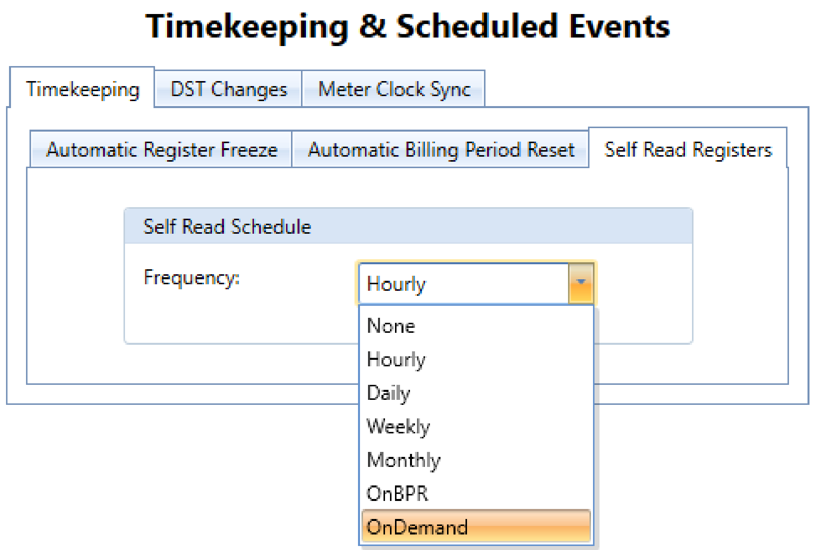
Configure this Group Box for the exact time you want a Register Freeze to occur. A register Freeze will record the current value in all registers at that moment of time. It will be retained into memory until the next Freeze occurs. Automatic Freezes can be configured to occur hourly, daily, weekly, monthly.

Automatic Billing Period Reset

Configure this Group Box for the exact time you want to perform a BPR. A Billing Period Reset will transfer the values of the working registers into a register configured as Billing Period Reset and it will reset all Peak Demands. The Automatic BPR can be configured to occur hourly, daily, weekly, monthly.

Self Read Registers

This is used to select the recording interval for the Self Read Registers configured in the Display Register screens. Self Read Registers can be configured to occur hourly, daily, weekly, monthly, on a BPR or at the end of demand interval.



DST Changes

This page is used to incorporate Daylight Savings Time adjustments that may be required, depending upon the meter's location. The standard United States DST table is saved as the factory default (see example), but this can be edited or deleted at any time. The DST table can be saved in the directory on your computer as a completely independent file. This allows you to make a custom table based on your particular time zone, save it, and easily load it into multiple meters, just as you would a configuration (.xml) file.

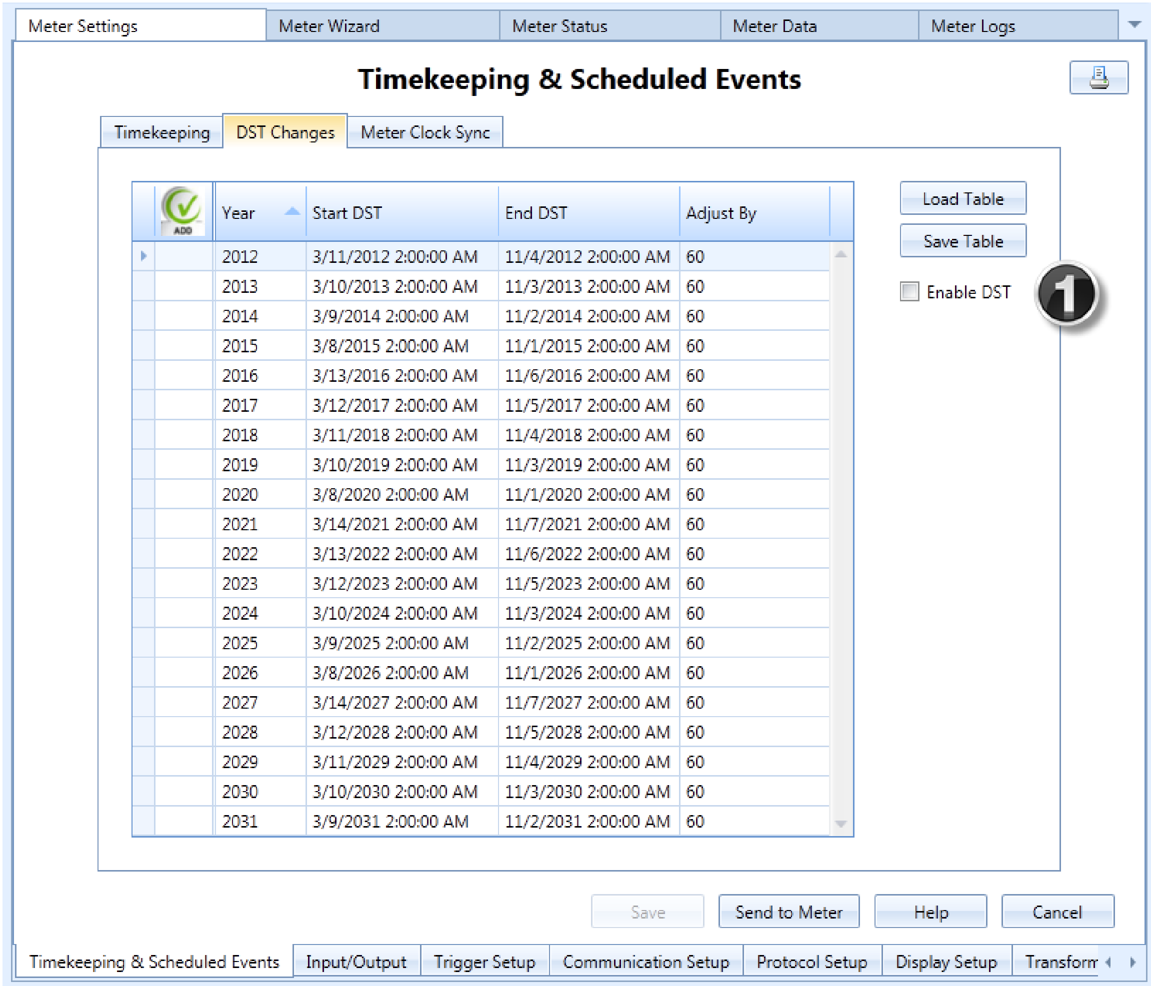
Using the DST Settings

You can add a new year (up to 2038) to the table at any time. Use the Edit button to make changes to an existing year.

Load Table is used to assign an existing file to the current configuration. When you click the button, it will prompt you to browse your computer and select an .xml file.

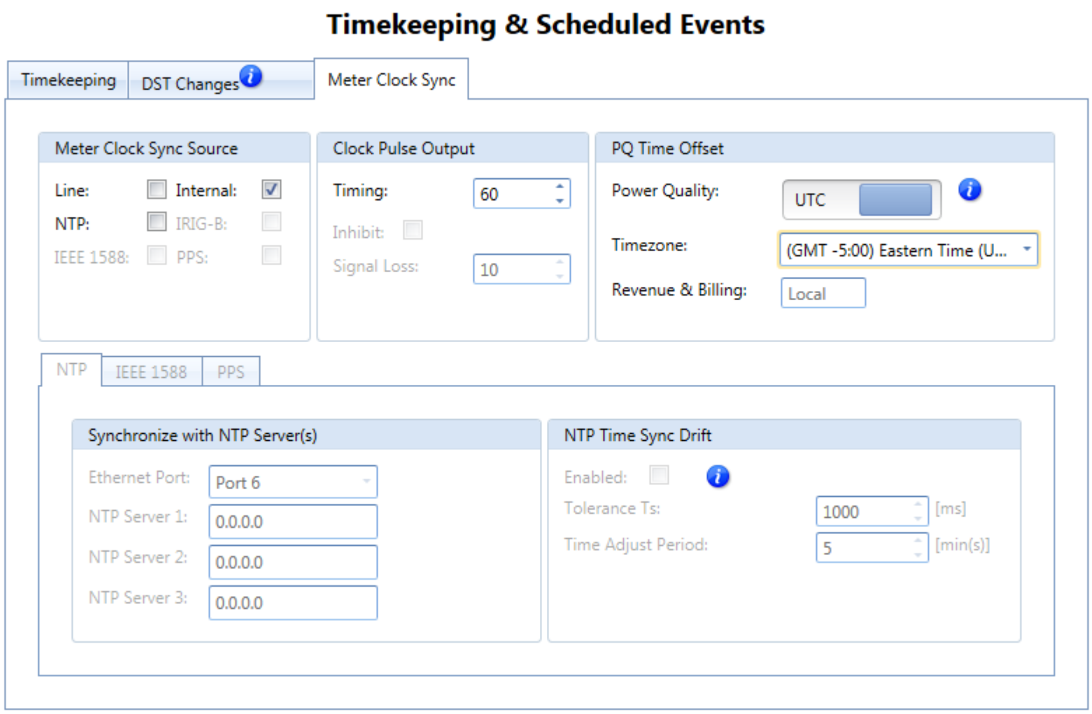
Save Table will save a new or modified table in .xml format. You must assign a name to the new table, just as you would save any Windows file.

Click the Enable DST check box to activate the settings you have just created. Make sure this box is unchecked if you are not using DST.



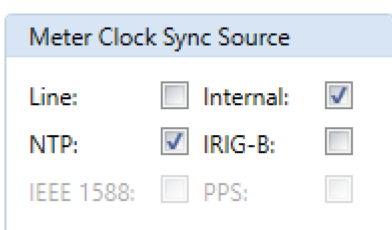
Year	Start DST	End DST	Adjust By
2012	3/11/2012 2:00:00 AM	11/4/2012 2:00:00 AM	60
2013	3/10/2013 2:00:00 AM	11/3/2013 2:00:00 AM	60
2014	3/9/2014 2:00:00 AM	11/2/2014 2:00:00 AM	60
2015	3/8/2015 2:00:00 AM	11/1/2015 2:00:00 AM	60
2016	3/13/2016 2:00:00 AM	11/6/2016 2:00:00 AM	60
2017	3/12/2017 2:00:00 AM	11/5/2017 2:00:00 AM	60
2018	3/11/2018 2:00:00 AM	11/4/2018 2:00:00 AM	60
2019	3/10/2019 2:00:00 AM	11/3/2019 2:00:00 AM	60
2020	3/8/2020 2:00:00 AM	11/1/2020 2:00:00 AM	60
2021	3/14/2021 2:00:00 AM	11/7/2021 2:00:00 AM	60
2022	3/13/2022 2:00:00 AM	11/6/2022 2:00:00 AM	60
2023	3/12/2023 2:00:00 AM	11/5/2023 2:00:00 AM	60
2024	3/10/2024 2:00:00 AM	11/3/2024 2:00:00 AM	60
2025	3/9/2025 2:00:00 AM	11/2/2025 2:00:00 AM	60
2026	3/8/2026 2:00:00 AM	11/1/2026 2:00:00 AM	60
2027	3/14/2027 2:00:00 AM	11/7/2027 2:00:00 AM	60
2028	3/12/2028 2:00:00 AM	11/5/2028 2:00:00 AM	60
2029	3/11/2029 2:00:00 AM	11/4/2029 2:00:00 AM	60
2030	3/10/2030 2:00:00 AM	11/3/2030 2:00:00 AM	60
2031	3/9/2031 2:00:00 AM	11/2/2031 2:00:00 AM	60

Meter Clock Sync



Meter Clock Sync Source

This is used to determine how your meter clock will be synchronized.



Line Frequency: The line frequency option is taken directly from the A-phase input and automatically interprets whether the meter is 50Hz or 60Hz.

Internal Sync: Internal sync uses the meter's internal crystal oscillator which is accurate to 0.5sec/day. When using Internal Time Sync, you can manually set the time clock through the meter front panel display, with JEMWare II and MV90 Software and the communication protocols (DNP, DLMS)

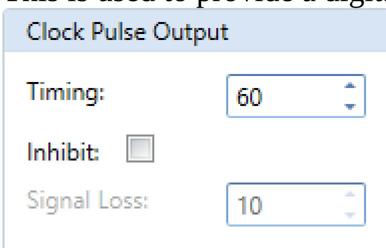
NTP Time Sync: The NTP option provides a time sync through the Ethernet Port. Up to three NTP Servers can be listed. When using NTP, the time sent to the meter will be in UTC time. You will need to set your Local Time Zone for revenue and billing data (and PQ if desired) in the 'PQ Time Offset'.

IRIG-B: The IRIG-B option provides a time sync from an external time clock that has the IRIG-B output. We support both modulated and de-modulated time signals (autosensing). When using IRIG-B, some clocks will provide a local time, and some will provide UTC time. If using UTC time, you will need to set your Local Time Zone for revenue and billing data (and PQ if desired) in the ‘PQ Time Offset’.

Note: Multiple time sync selections can be made. The meter will use the best available time source in this order: IRIG-B, NTP, Line Sync, Internal Clock. If the time source selected goes off-line, it will use the next best available time source.

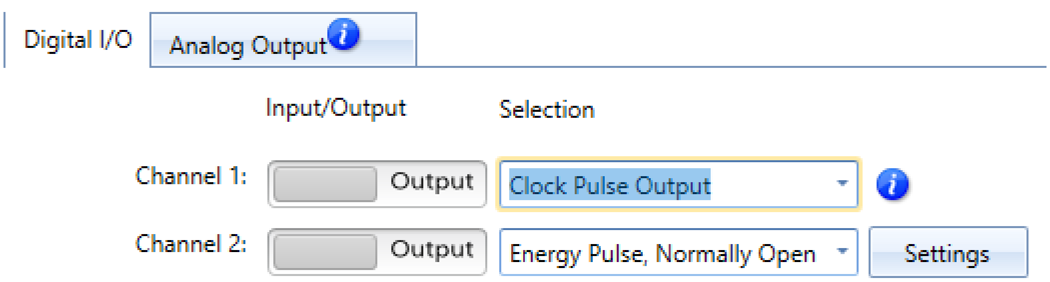
Clock Pulse Output

This is used to provide a digital pulse output synchronized to the meter clock.



The Timing selection adjusts how often the clock pulse occurs; from 1-60 minutes at the top of the minute. This is commonly used to synchronize other meters to the one clock. There is a selection to temporarily disable the clock pulse output when you lose an external time sync option like NTP or IRIG-B. To use this, select the Inhibit box and the time in hours (1 to 168 hours) after a loss of time sync. If the external time sync is not restored after the time period expires, it will restart the timer to whatever the setting is.

Note: The meter must have the DIO (Digital I/O option module in the meter and a digital output channel configured for Clock Pulse as shown below.



PQ Time Offset: (Dual Time Zone)

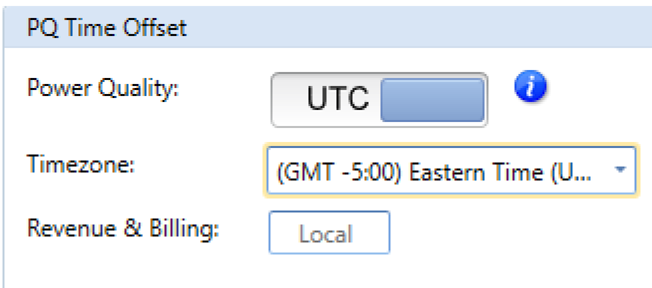
The meter can be configured for a dual time zone so that Power Quality data can be in a separate time zone from Revenue and Billing data. By default, the revenue and billing data is presented in the local time zone. This includes:

- Load Profile
- Meter display
- Meter Event Log
- Security Log
- Diagnostic Log.

The power quality data consists of:

- Alarm Log
- Sag/Swell Log
- Voltage Interruption Log
- Rapid Voltage Change Log
- Measurement Log
- PQDIF Files (PQ Recordings)

The settings for the PQ Time Offset include:



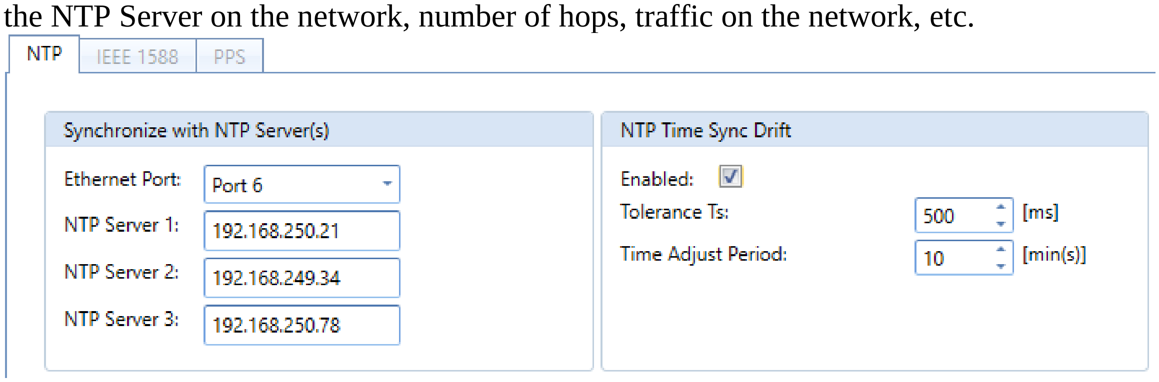
Power Quality: This is used to select either a UTC Time Zone for PQ or use the Local Time Zone (same as Revenue and Billing Data).

Timezone: Enter the local time zone of the meter.
This selection is used to either set the time zone for power quality or for revenue and billing depending on the time source selected. If the time sync source is NTP (which uses UTC), the time zone setting is used to determine the local time zone for Revenue and Billing data (and Power Quality if selected for Local Time Zone). Conversely, if the time sync source is 'Internal' (which uses local time zone)', the time zone setting is used to calculate UTC time for Power Quality data (if UTC is selected).

Note: Keep in mind that the local time will reflect DST if enabled.

NTP Time Sync

The NTP (Network Time Protocol) option can be used to synchronize the meter clock from up to three NTP time servers located on your network. NTP relies on the Ethernet network as the transport medium and the accuracy can be dependent on the distance from the NTP Server on the network, number of hops, traffic on the network, etc.



The following configuration parameters are available for meters equipped with the NTP Option.

Ethernet Port Selection:
For meters equipped with the dual Ethernet option, you can select either Port 6 or Port 7 for connection to your NTP Server. Otherwise, Port 6 is the default.

NTP Server Selection:
You can identify up to 3 different NTP servers to synchronize to. The meter will try to connect with NTP Server 1 first and use the others as backups in that order.

NTP Time Sync Drift:
The NTP Time Sync Drift (if enabled) will let you identify a tolerance (Ts) from 10 to 10,000 msec which will only update the meter clock if the NTP time is different from the internal clock by more than the Ts threshold. This prevents frequent time sets.

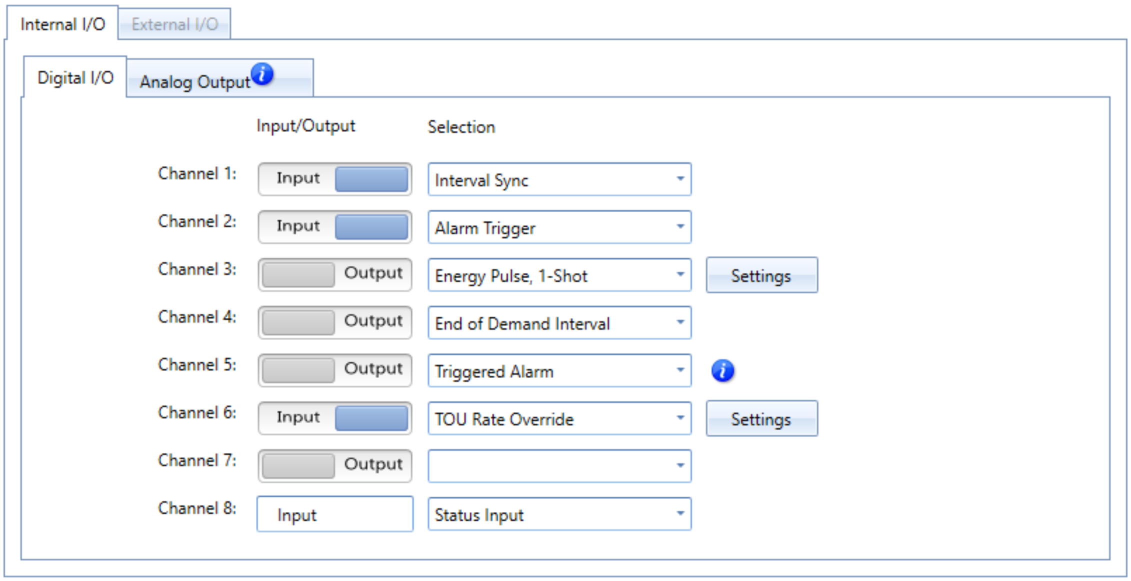
NTP Time Adjust Period:
The Time Adjust Period can be set from 1 to 1,440 minutes which is how often the meter will compare the NTP time to the internal clock.

As an example, if the Ts was set for 500ms and the Time Adjust Period was set for 10 minutes, the meter would compare the NTP time against the internal clock every 10 minutes and if it was off by more than 500ms, it would perform a Time Set. Every time set is logged as an event.

INPUT / OUTPUT

This page is used to assign the operating configuration of the Input/Output channels.

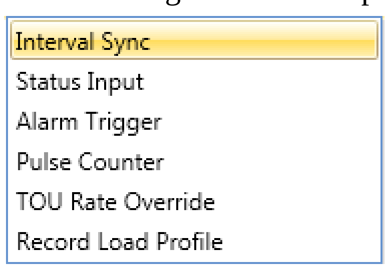
Input/Output



Internal I/O

On the ANSI Meter, there are 6 digital Input/Output channels available which can be individually selected as an input or output.
On the IEC Meter, there are eight digital Input/Output channels available, of which the first 7 can be configured as either a digital input or output. The 8th channel is reserved for Digital Inputs only.
The digital inputs require a switched external voltage source of 10 – 40 Vdc to activate them. Digital outputs are dry contacts. Refer to the JEMStar II User Manual 1079-697 (ANSI) 1079-694 (IEC) for input ratings and wiring information.

Any of the following functions can be assigned to each Input channel:



Interval Sync

This setting can be used to configure meter to accept an external momentary contact closure on the meter's digital input that will trigger the start of a Demand Interval and/or Load profile interval. The meter will use the external synchronization pulse for load profile and demand interval timing when properly connected to meter digital input and configured in meter programming. Go to Load Profile page and set External Interval Sync = YES to enable external interval sync for Load Profile. Go to the Demands page and set Enable Demand Synchronization = YES to enable external demand sync for display registers. Refer to the JEMSTAR II User Manual for digital input wiring connections.

Status Input

This setting will monitor an external contact and report its open/closed status via a display register, load profile or serial communications. To configure meter with one or more status type inputs, select a Channel on Digital I/O tab and set Input/Output = Input. Then set Selection for that Channel = Status Input. The input status can be reported via DNP Binary Objects tab - Read Binary Inputs table, or via MODBUS Binary Objects tab, Read Input Status table in the Protocol Setup section.

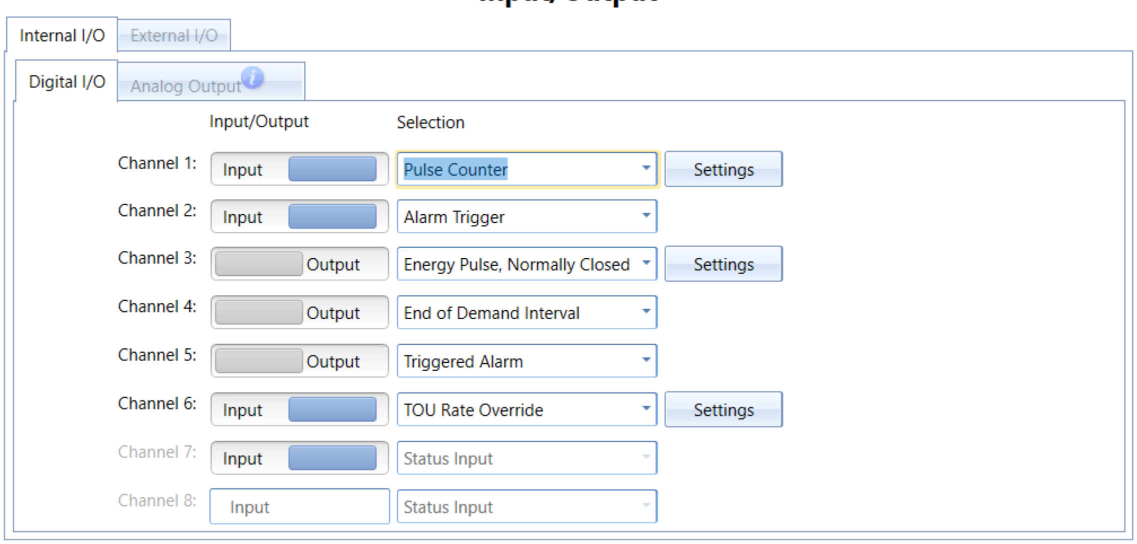
Alarm Trigger (Triggered Alarm)

A Digital Input may be used to initiate a Triggered Alarm in the meter. To set up an alarm trigger input, select a channel on the Digital I/O tab and set Input/Output to Input. In the Selection field for that channel, select Alarm Trigger. In the Trigger Setup portion of JEMWare II, add a trigger and set its Trigger Measurement to Digital Input. Then select the desired digital input channel in the Trigger On column.

Pulse Counter

A digital input can be selected for counting the pulse inputs and storing the data as a configurable display register or in Load Profile.
The Pulse Counter will recognize a two wire Form A digital input. The meter will count one pulse on every complete digital input transition from open to closed and back to open.

Input/Output

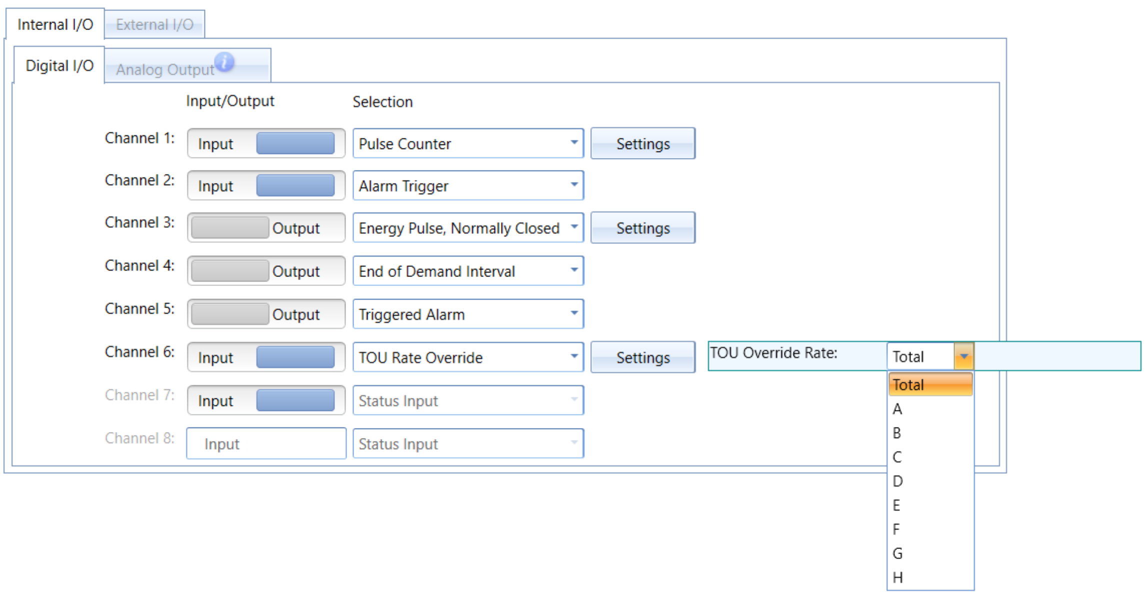


TOU Rate Override

This setting will permit an external contact closure to trigger a forced override of the current Time of Use rate for display registers configured to use TOU. When this type of Pulse Input is active, it will switch the pre-existing TOU rate (that was programmed in the Time of Use menu) to the one set on this screen using the Settings box. As long as the external contact is closed, the override rate is in effect. When the contact opens, the meter will automatically revert to the scheduled TOU rate. The TOU Rate Override can also be configured to control when a Load Profile channel accumulates energy. When this type of Pulse Input is active a Load Profile Channel configured for During TOU Override will also accumulate energy.

Refer to JEMSTAR II User Manual for Input/Output wiring details.

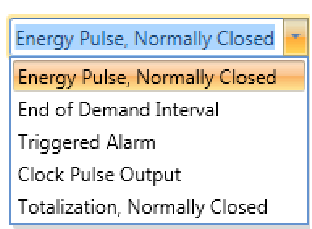
Input/Output



Record Load Profile

This setting can be used to control when selected Load Profile channels are recorded. To set up selective Load Profile recording, choose a Digital I/O channel and set it to Input, then choose Record Load Profile in the Selection column. In Load Profile settings, set the Records column for any desired channels to Digital Input. These channels will only record measurements while the configured Digital Input is active. At any other time, they will record zero.

Any of the following functions can be assigned to each Output channel:

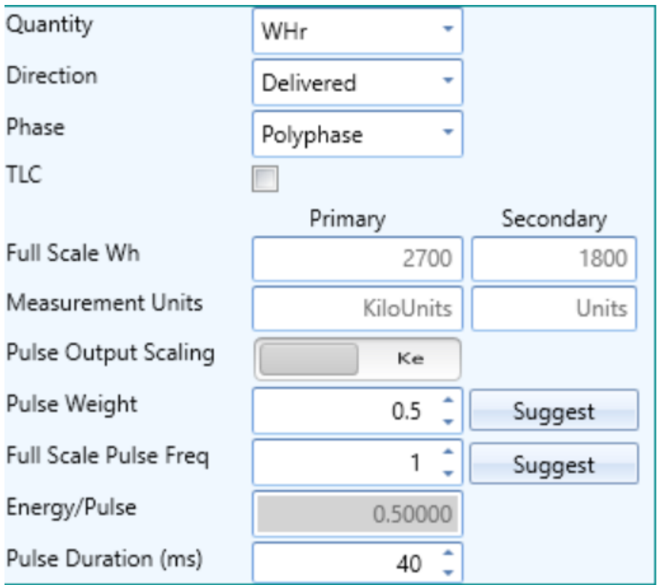


Energy Pulse

First choose from the pull-down menu how you want the energy pulse output to respond:

- Energy Pulse Normally Closed (NC): Output opens on first count, then closes on second count.

Next, click the Settings button next to the channel that you want to configure, and a submenu will appear. Select the Energy Quantity from the pull- down choices, the power flow direction, and the phase(s) to be considered. The energy pulse output can be set with any desired pulse weight. Refer to guide below:



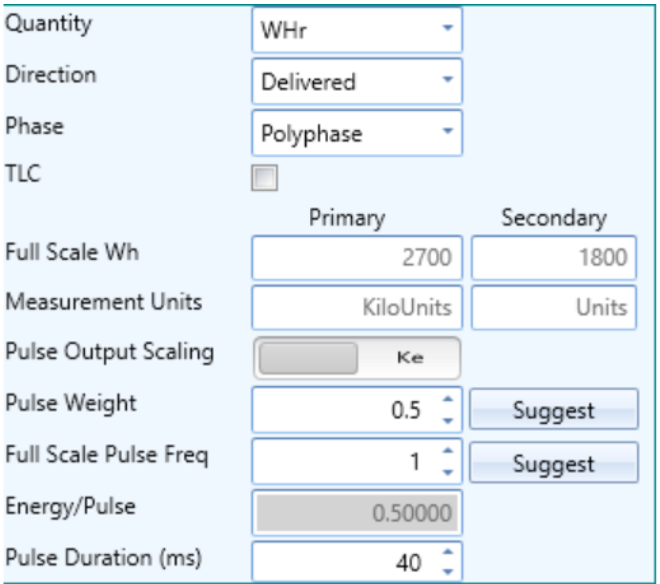
Setting the Ke and pKe
The Pulse output scaling can be made based on primary values (pKe) or secondary values (Ke).

Ke = Total Measurement in meter (secondary) / # KYZ Pulses

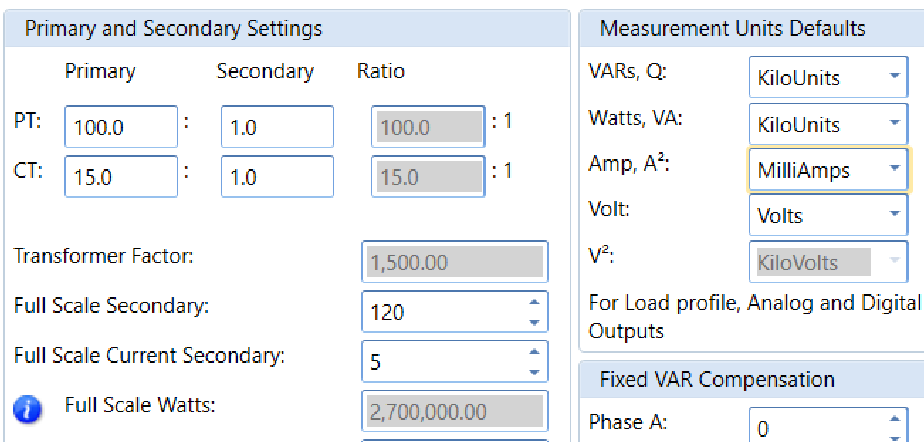
> Example: 3Ph4W meter with 5A @120V inputs 1,800 watts full scale
> Objective: Provide 2 pulses per watt. Ke = 1 watt/ 2 Pulses = 0.5
> At full scale, 1,800 watts, there would be 3,600 pulses per hour or 1 per second.

pKe = Total Measurement in meter (primary) / # KYZ Pulses

The following software tool is used to assist with the entry of the Ke or pKe pulse weights.



After entering your measurement quantity, direction, and phases; use the tool tips to come up with a Ke or pKe pulse weight.
The tool will determine your full-scale primary and secondary Wh based on the entries in the Primary Configuration page.



As shown above; the tool tip indicates that the Primary Configuration settings reflect a 2,700 kilowatt primary and 1,800 watt secondary.
If you know how many secondary watts per pulse is desired (or primary kilowatts per pulse), then enter that in the pulse weight field. (Example: a Ke setting of 0.5 indicates that you will get 2 pulses per watt.) If you want to see what your pulse frequency at full scale is based on the ratio entered, press the ‘suggest’ button next to pulse frequency to see how many pulses per second will be generated at full scale.
If you are looking for a specific pulse frequency at full scale, then enter the desired number of pulses per second and press the ‘suggest’ button for the pulse weight to calculate the pulse weight based on the pulse frequency.
The energy/pulse is calculated based on your settings.

Application notes:

- If you have selected the quantity “A Hr” or “A^2 Hr”, then “Delivered” and “Received” are invalid choices.

- The only time Q1, Q2, Q3, and Q4 are valid choices is when “VAR Hr” is selected.

End of Demand Interval

When chosen, a single contact closure will be generated that indicates when a Demand interval (or sub-interval, if a sliding window has been selected) has ended.

Triggered Alarm

A Digital Output channel may be configured to close when a Triggered Alarm is active. To enable this feature, select a Digital I/O channel and choose Triggered Alarm in the Selection column. Go to the Trigger Setup section of JEMWare II and set the Digital Output column to the desired Digital I/O channel on any triggers that should activate that output when in the alarm state.

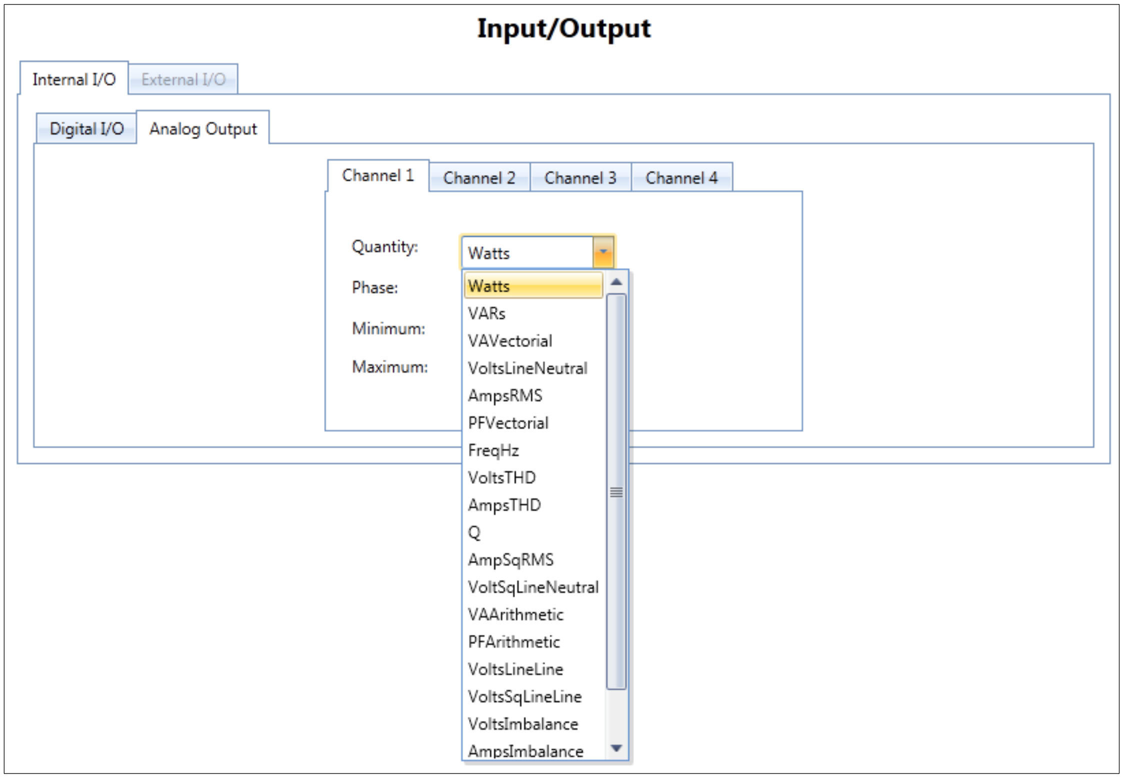
Clock Pulse Output

This will provide a clock pulse that is synchronized to the internal meter clock. The settings for the frequency of clock pulses are provided in the Time Keeping configuration.

Analog Outputs (ANSI Meters only)

The JEMStar II can be equipped with 4 analog outputs. These outputs are factory installed and can be either +/- 0-1ma or 4-20ma. Each of the channels can be configured independently.

First, select a power quantity from the pull-down menu.



Second, select the Phase(s) that will be monitored. The pull down menu should only contain appropriate settings.

Minimum and Maximum Values

The analog outputs are factory configured for either 0-1 mA or 4-20 mA; consult the model number ordering code to determine which type is provided and set this appropriately.

Enter the minimum and maximum input values for the range that you will monitor. From the data, the meter will calculate and display an output table.

Example:

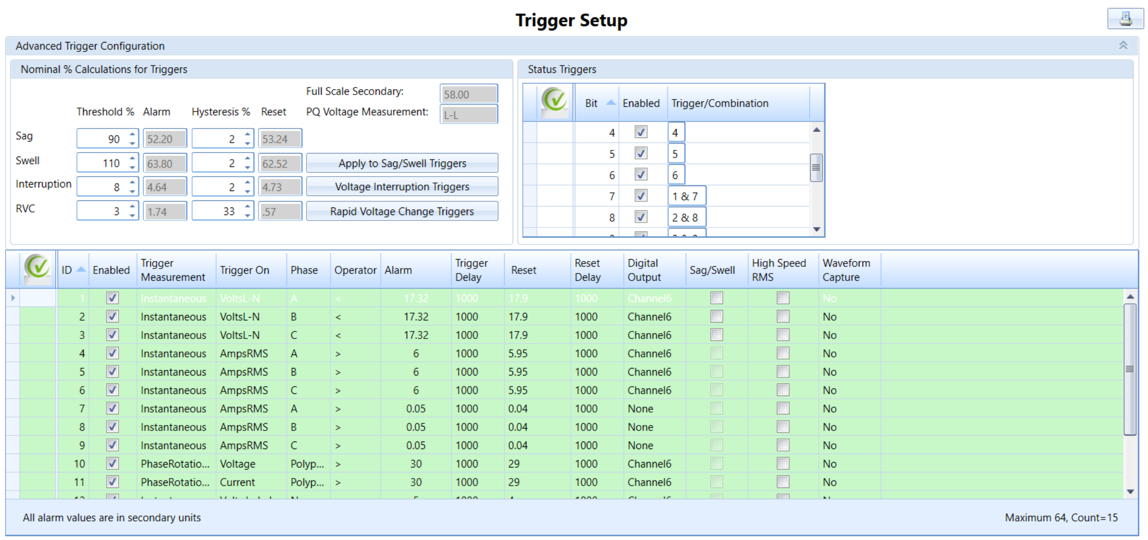
Quantity	Analog Output
+1000 Watts	20 mA
0 Watts	9.33 mA
- 500 Watts	4 mA

Repeat this procedure for all channels.

NOTE: All outputs must be the same (i.e. 0-1mA, or 4-20mA, but not both).

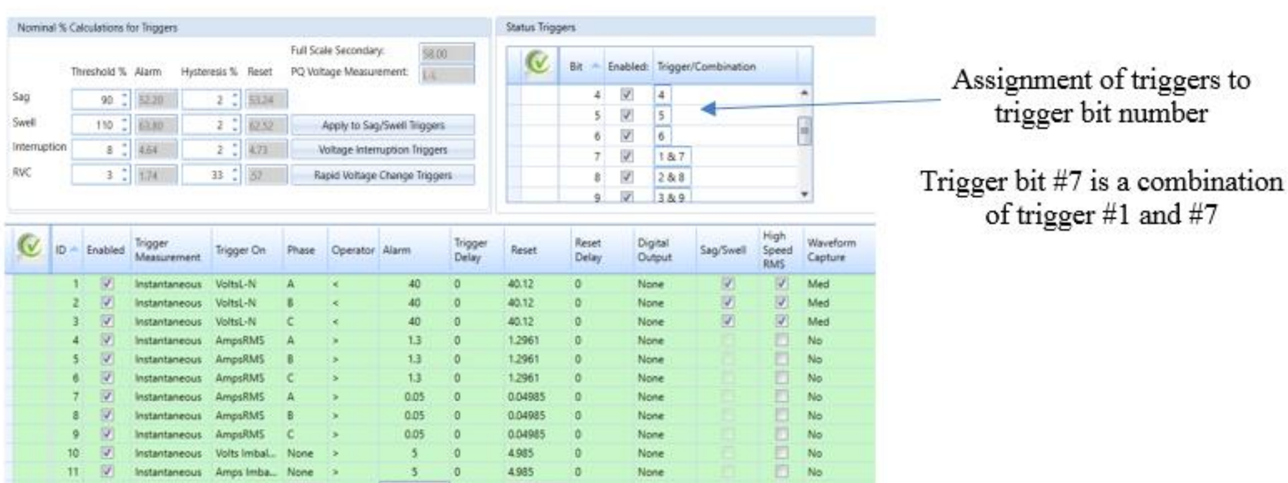
TRIGGER SETUP

Triggers can be used to create alarms when measurements exceed a threshold value. When this occurs, an alarm is automatically logged in the meter with the trigger measurement, triggered value and date/time. The meter display has an alarm icon that goes from a green color to red to indicate an alarm. For each alarm trigger, you can select a digital output channel that will indicate the status of the alarm (closed = in alarm, open = normal). For voltage triggers, you can also enable the Power Quality Sag/Swell recording. If the meter is equipped with the Power Quality Options, you can select High Speed RMS recording and Waveform Capture recording upon the trigger. The trigger status is also available in the Modbus and DNP Protocols. The basic default settings are all triggers are disabled; you must enable each one that you want active.



To enable a Trigger Alarm, click the check box associated with the parameter. When the value is exceeded, an alarm will be generated.

Typical JEMWare Configuration for Status Word:



Alarm Notification

For every alarm trigger configured, you can select to have that included as a WEB based notification message. Refer to the Alarm Notification configuration details for information on enabling this feature.

Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset	Reset Delay	Digital Output	Sag/Swell	High Speed RMS	Waveform Capture	Web
VoltageInterruption	VoltsL-N	All	<	60	0	61.2	0	None	☐	☐	No	☑
Instantaneous	VoltsL-N	Any	<	108	0	110.4	0	None	☑	☐	No	☑
Instantaneous	VoltsL-N	Any	>	132	0	129.6	0	None	☑	☐	No	☑
PowerQuality	VoltsTHD	A	>=	8	0	7.976	0	None	☐	☐	No	☑

Trigger Settings

Up to 64 triggers can be created: each one with its own triggering criteria and recording modes.

Trigger Measurements

Category	Measurements			
Instantaneous	Volts	Frequency	Watt	Volt^2
	Amps	Power Factor	VAR	Amp^2
	Volts THD %	Volts Imbalance	VA	
	Amps THD%	Amps Imbalance	Q	
Power Quality	Flicker	TDD	Volts THD Odd %	Volts THD Even%
	Volts THD %	TDD Odd	Amps THD Odd%	Amps THD Even%
	Amps THD%	TDD Even	Crest Factor	
Fault	Negative Sequence, Positive Sequence, Zero Sequence			
Digital Input	On/Off			
Transient	Transient Voltage Trigger			
Phase Loss	Dedicated trigger to detect a loss of a voltage phase			
Phase Rotation	Trigger to detect a phase angle outside of the threshold			
Voltage Interruption	Trigger used for power outages (Threshold based on all 3 voltage inputs)			
RVC	Trigger for Rapid Voltage Changes			

Trigger Operation

The measurements used for triggers are calculated with a full cycle of sampled data updated every half cycle. The measurements are sampled at a fixed rate of 512 samples per cycle.

Trigger settings can be filtered by adding delays in milliseconds. Trigger delays extend the time before a trigger is activated to help reduce nuisance alarms. A setting of 0 indicates no delay.

There is a separate setting for the trigger reset (Hysteresis). This setting determines the level when the trigger returns to normal. In addition to a reset threshold, there is a configurable delay for reset conditions. This prevents the instantaneous return to normal when the trigger condition goes above the reset level.

When a trigger is activated, it will turn the Alarm indicator on the meter to red and the trigger will be recorded in the Alarm Log which can be retrieved by JEMWARE. The Alarm Log indicates the trigger number, value of the trigger and time and date when it triggered. A separate log entry keeps track when the trigger returns to normal.

Read Alarm Log

Trigger ID	Trigger Description	Value	Date/Time
2	2,Inst,VLN:Any,>,132,0,0,129.6,A CLEARED	12.410	05/22/2019 18:18:09.231 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A CLEARED	121.666	05/22/2019 17:16:24.818 PM
3	3,Trans,VLN:A,>,150,3,0,120 CLEARED	150.000	05/22/2019 17:16:24.805 PM
1	1,Inst,VLN:Any,<,108,0,0,110.4,A CLEARED	121.666	05/22/2019 17:16:24.804 PM
3	3,Trans,VLN:A,>,150,3,0,120	150.000	05/22/2019 17:16:24.797 PM
5	5,Potential Inactive Phase A,<,50,0,0,50.15 CLEARED	87.210	05/22/2019 17:16:24.797 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A	149.098	05/22/2019 17:16:11.759 PM
3	3,Trans,VLN:A,>,150,3,0,120 CLEARED	150.000	05/22/2019 17:16:11.755 PM
5	5,Potential Inactive Phase A,<,50,0,0,50.15	0.044	05/22/2019 17:16:11.755 PM
3	3,Trans,VLN:A,>,150,3,0,120	150.000	05/22/2019 17:16:11.747 PM
1	1,Inst,VLN:Any,<,108,0,0,110.4,A	85.923	05/22/2019 17:16:11.745 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A CLEARED	119.679	05/22/2019 17:15:45.790 PM
3	3,Trans,VLN:A,>,150,3,0,120 CLEARED	150.000	05/22/2019 17:15:45.788 PM
3	3,Trans,VLN:A,>,150,3,0,120	150.000	05/22/2019 17:15:45.780 PM
1	1,Inst,VLN:Any,<,108,0,0,110.4,A CLEARED	231.398	05/22/2019 17:15:15.472 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A	233.193	05/22/2019 17:15:15.463 PM
1	1,Inst,VLN:Any,<,108,0,0,110.4,A	95.488	05/22/2019 17:15:15.463 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A FORCED OFF	0.000	05/22/2019 17:15:00.406 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A	136.856	05/22/2019 17:14:54.628 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A CLEARED	121.809	05/22/2019 16:25:36.313 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A	340.287	05/22/2019 16:25:36.284 PM
1	1,Inst,VLN:Any,<,108,0,0,110.4,A CLEARED	340.185	05/22/2019 16:25:36.284 PM
2	2,Inst,VLN:Any,>,132,0,0,129.6,A CLEARED	13.164	05/22/2019 16:25:10.204 PM

Count=42

Meter Health and Status

Meter Status: None

Time Sync Status: Normal, synced to Internal; NTP: Not running

Battery Status: Normal

Triggered Alarms

Trigger ID	Description	Value	Date/Time
1	1,Inst,VLN:Any,<,108,0,0,110.4	87.697	05/22/2019 17:22:25
2	2,Inst,VLN:Any,>,132,0,0,129.6	159.303	05/22/2019 17:22:25
5	5,Potential Inactive Phase A,<	0.181	05/22/2019 17:22:25

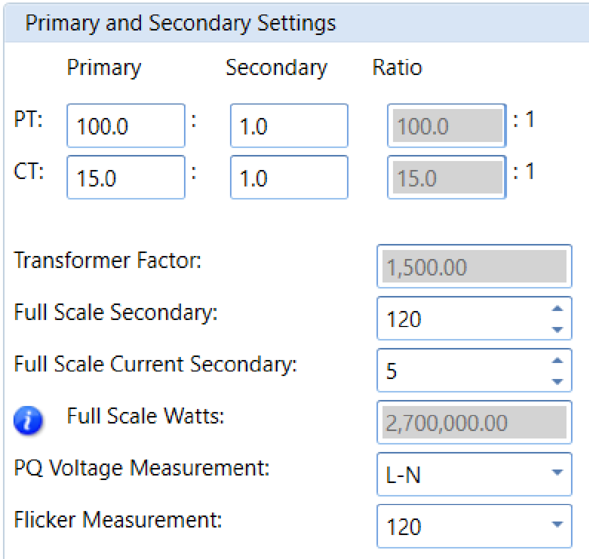
In addition to logging the alarm, you can select several items that can be activated by the triggered alarm such as:

- Digital Output (must have the DIO option)
- Sag/Swell Capture
- High Speed RMS Recording
- Waveform Capture Recording (low, medium, high resolution)

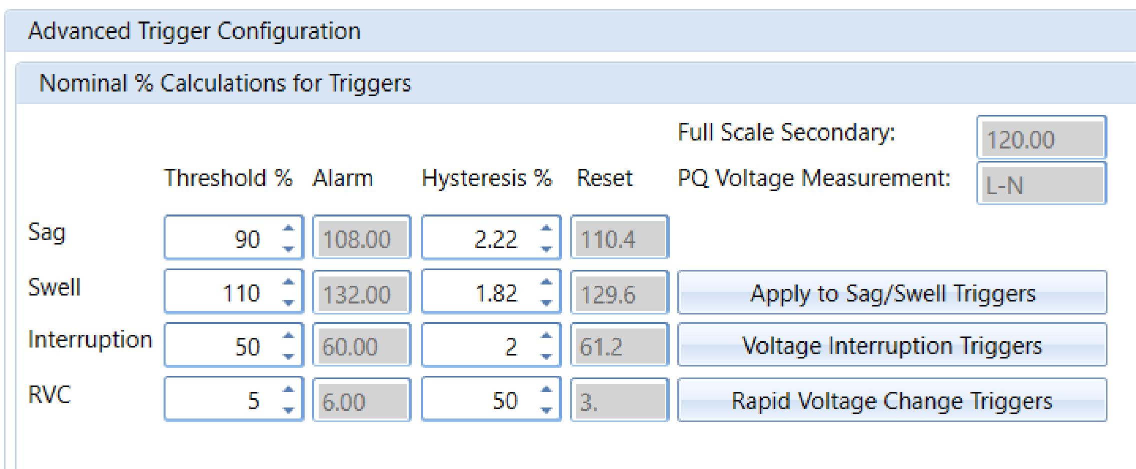
Note: *Some or all these selections are available depending on the measurement and options installed in the meter. For example, The Sag/Swell capture only applies to Voltage triggers; High Speed RMS and Waveform capture require the power quality options.*

Trigger Setup:

The Full Scale Secondary and PQ Voltage Measurement configured on the Primary Configuration page are used to set up the trigger thresholds.



The values entered will be carried over to the trigger setup page as shown below:

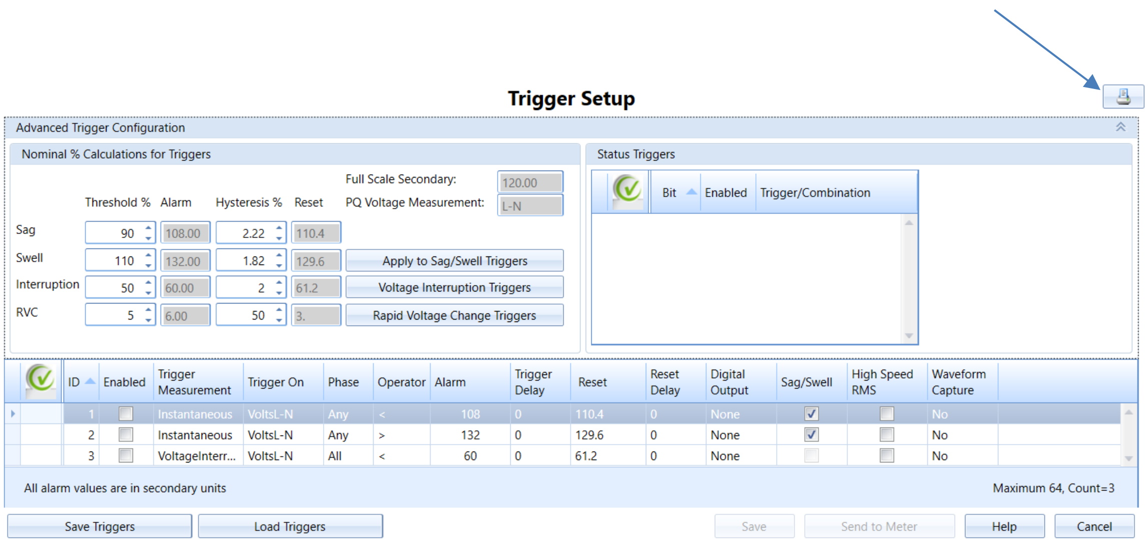


The trigger tool shown above is used to help facilitate your trigger settings as compared to nominal secondary voltages. The threshold % will calculate the alarm and reset thresholds.
By pressing the ‘Apply to Sag/Swell Triggers’ button, it will transfer the calculated values to the actual alarm triggers below.
You must first have an alarm trigger configured for each of the above calculated settings before you can transfer them. See example below of the 4 alarm triggers corresponding to the trigger calculations above.

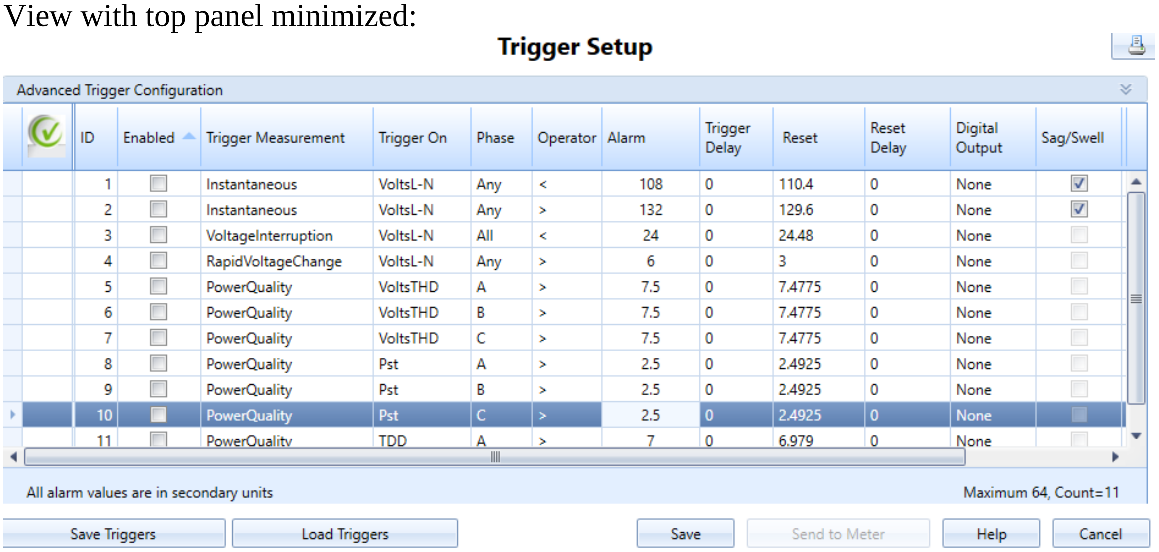
ID	Enabled	Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset	Reset Delay	Digital Output	Sag/Swell	High Speed RMS	Waveform Capture
1	☐	Instantaneous	VoltsL-N	Any	<	108	0	110.4	0	None	☑	☑	Med
2	☐	Instantaneous	VoltsL-N	Any	>	132	0	129.6	0	None	☑	☑	Med
3	☐	VoltageInterruption	VoltsL-N	All	<	24	0	24.48	0	None	☐	☑	No
4	☐	RapidVoltageChange	VoltsL-N	Any	>	6	0	3	0	None	☐	☑	High

The Sag and Swell triggers trigger on instantaneous voltage and are designated by checking the Sag/Swell box shown above.
You can also manually change the alarm and reset thresholds using the trigger configuration drop down boxes.
Note: Only one Voltage Sag and Swell trigger are allowed per alarm threshold setting.

Layout tip:
When trying to display screens on a laptop or small display, many of the JEMWare II screens will allow a partial minimization to allow better viewing. If you see the double arrows, you can use these to minimize parts of the display.



View with top panel minimized:



STATUS WORD

The Status Word provides the current status of the meter. The Status Word can be configured as a Display Register and logged into Load Profile for each interval. The Status Word consists of two 16 Bit words: System Bit and Triggered Bit. Each individual bit provides the status of a particular item as listed below:

System Bit
This provides the current status of the meter with regards to internal diagnostics and external influences. The following items and their location within the 16-bit word are shown below:

Bit #	Status Indicator	Description
1	Battery Failure	Indicates that the internal battery needs replacing. Stays active until the battery reset is performed.
2	Auxiliary Power Loss	Future
3	General Failure	Indicates an internal error which could include a Service comm error, PQ Firmware CRC error, Metrology Firmware CRC error, Service Firmware CRC error, PQ Comm error, Metrology Comm error, CRC Error in Calibration Data, PQDIF Storage error, Config Update Request. (Note: all of these are reported separately in the Diagnostic Log)
4	Load Profile overflow	The Load Profile Counts have exceeded the maximum 16-bit storage range of 16,383 Note: Load Profile is stored in engineering units uses a single-precision. It uses the IEEE 754 single-precision format. Its numeric range is ±1.18E−38 to ±3.4E38.
5	Pulse Output overflow	Pulse output rate has exceeded 10 pulses/sec
6	Loss of Time Sync	Indicates a loss of external time sync from NTP or IRIG-B
7	NTP Time Sync Drift	It shall go into alarm when the internal clock is more than the configurable tolerance Ts which is adjustable from 10ms to 10,000 msec. Default is 500msec
8	DST	Indicates when the meter is using Daylight Savings Time. DST time and dates are configured in JEMWARE.
9	Terminal / Service Cover Removed	Indicates that the terminal cover or service cover have been opened up.
10	Manual Time Change	The meter time was changed manually.
11	Configuration Change	The meter configuration was changed.
12	Firmware Changed	The meter firmware was changed.
13-16	Future	

Note: All of the above status indicators will stay active for the duration of the condition with a minimum duration equal to the current Load Profile Interval.
For example, if using a 15-minute Load Profile Interval, and the terminal cover was removed for 5 seconds, the ‘Terminal Cover’ bit would stay active during the 15 minute interval in which it occurred.

The system bit will be presented as a Hex word which can be converted into a 16-bit string with 1’s or 0’s representing the status of each item above. As shown below; a System Bit presented as: 00 21 Hex (Binary: 0000 0000 0010 0001) would indicate a ‘Battery Failure’ and ‘Loss of Time Sync’.

Example	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	**1**

Bit Position	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Trigger Bit
This provides the current status of the meter with regards to alarm triggers that you can configure in JEMWARE. A typical example of various triggered alarm bits is shown below:

Bit	Status Indicator	Description
1	Loss of voltage V1	<0.4 x Vn
2	Loss of voltage V2	<0.4 x Vn
3	Loss of voltage V3	<0.4 x Vn
4	Overcurrent I1	>1.3 x In
5	Overcurrent I2	>1.3 x In
6	Overcurrent I3	>1.3 x In
7	Loss of Voltage V1 with	V1<0.4 x Vn & I1>0.05 x In
8	Loss of Voltage V2 with	V2<0.4 x Vn & I2>0.05 x In
9	Loss of Voltage V3 with	V3<0.4 x Vn & I2>0.05 x In
10	Phase Voltage Rotation Error	Angle between two phases < 90 and >150 degrees
11	Phase Current Rotation Error	Angle between two phases <60 and >180 degrees
12	Voltage Unbalance	>0.05 x Vn
13	Current Unbalance	>0.05 x In
14	External Fault 1	Via Digital Input
15	External Fault 2	Via Digital Input
16	Future	

V1 = Voltage Phase A *V2 = Voltage Phase B* *V3 = Voltage Phase C*
I1 = Current Phase A *I2 = Current Phase B* *I3 = Current Phase C*
Vn = Nominal Voltage *In = Nominal Current*

Some of the trigger bits can be a combination of alarm triggers as shown in Bits 6-8
Note: All of the above status indicators will stay active for the duration of the condition with a minimum duration equal to the current Load Profile Interval.

Configuring the Status Word Triggered Bit

The Status Word Triggered Bit can be configured by first setting your alarm triggers.

ID	Enabled	Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset
1	☑	Instantaneous	VoltsL-N	A	<	40	0	40.12
2	☑	Instantaneous	VoltsL-N	B	<	40	0	40.12
3	☑	Instantaneous	VoltsL-N	C	<	40	0	40.12
4	☑	Instantaneous	AmpsRMS	A	>	1.3	0	1.2961
5	☑	Instantaneous	AmpsRMS	B	>	1.3	0	1.2961
6	☑	Instantaneous	AmpsRMS	C	>	1.3	0	1.2961
7	☑	Instantaneous	AmpsRMS	A	>	0.05	0	0.04985
8	☑	Instantaneous	AmpsRMS	B	>	0.05	0	0.04985

Note: Only enabled Alarm Triggers can be configured for Status Word.

Status Triggers:
The Assignment of Alarm Triggers to the status Bit position is done with the configuration screen shown below.

Status Triggers

Bit	Enabled:	Trigger/Combination
3	☑	3
4	☑	4
5	☑	5 | 9
6	☑	6
7	☑	1 & 7
8	☑	2 & 8

Bit:
The bit positions range from 1-16.

Enabled:
You can enable or disable a triggered bit

Trigger Combination:
This is a list of pre-configured Alarm Triggers that will be used for the individual bit. As shown above, Trigger Bit position 3 will provide the status of Alarm Trigger #3 In addition to assigning individual alarm triggers to a status bit, you can also group multiple triggers together by using '&' for AND combinations and '|' for OR combinations. Only two Alarm Triggers can be combined in a single Status bit.

In the screenshot above, Status Word Trigger Bit position 5 indicates the status of Alarm trigger 5 OR 9. If either alarm is triggered, the Triggered Bit will show an alarm.

In the same screenshot, Status Word Trigger Bit position 7 indicates the status of alarm trigger 1 AND 7. This means that both Alarm Trigger #1 and #7 must both be triggered before they indicate an alarm.

Note: Only ‘enabled’ alarm triggers can be assigned to the Status Trigger.

COMMUNICATION SETUP

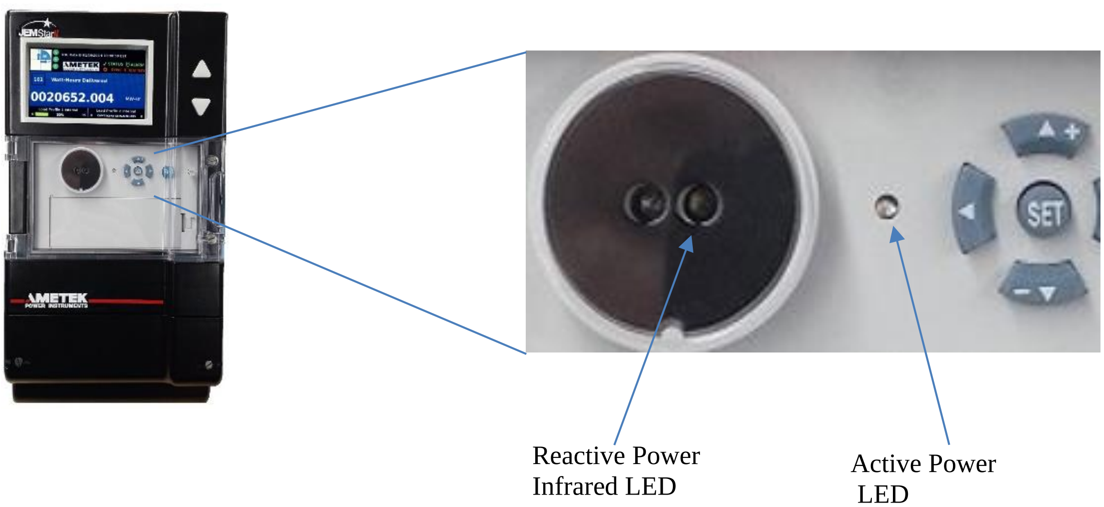
Optical (Port 1)

Optical Port Settings is where you set:

- Baud Rate
- Protocol Type

Detailed Settings is where you set:

- Meter Address
- Password Timeout
- LED Test Pulse
- Optical Test Pulse
- Test Pulse Scaling



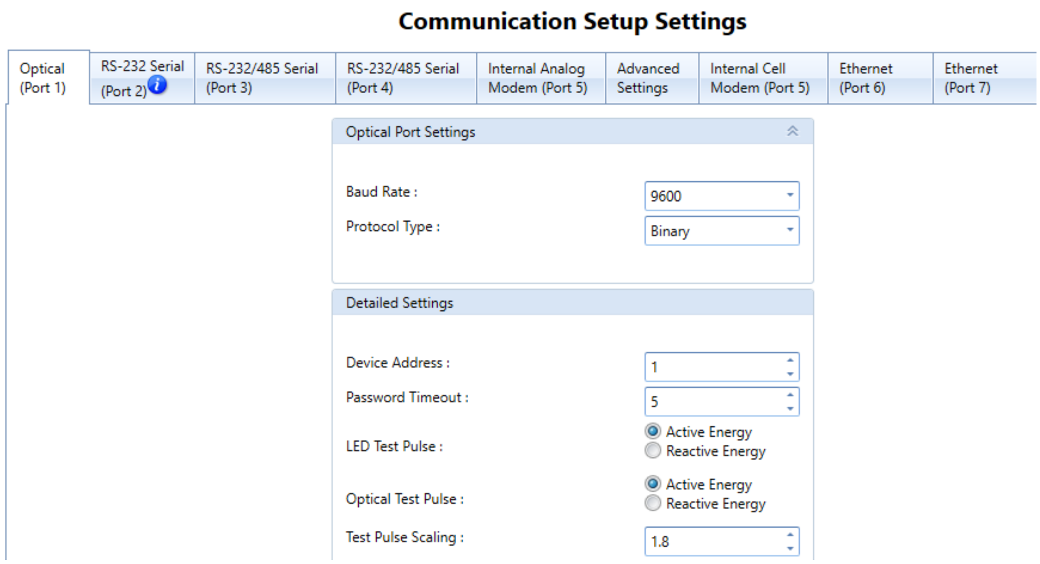
Optical Port Settings

The Optical Port can be used for communication to the meter and for a continuous energy pulse. The energy pulse will remain active during normal mode, but it will stop as soon as a communication attempt is detected. It will automatically restart after the communication has finished.

The settings for the Optical Port include:

Baud Rate:	The Baud Rate can be configured from 1,200 to 19,200 Baud.
Protocol Type:	The available communication protocols for the Optical Port are JEM Binary and DLMS
Device Address:	This can be configured from 0-254 (0 is a global address)
Password Timeout:	This can be configured from 1-60 minutes.
LED Test Pulse	
Optical Test Pulse	

Test Pulse Scaling



Active and Reactive Energy Test Pulse

The meter has an Optical Infrared Port and a LED for outputting the Active and Reactive Energy test pules. You can select if the test pulse will follow Watt-hours or VAR-hours. The measurement will be based on secondary values: polyphase, bi-directional, uncompensated.

You can also adjust the scaling of these test pulses similar to Test Mode.

When the meter powers up, the test pulses will start within 10 seconds, which is before the display is fully loaded.
Whenever you use the Optical Port for other communications, the test pulses stop, and the optical port communications start. When you finish communicating via the Optical Port, the test pulses will resume within a minute.

Serial Ports

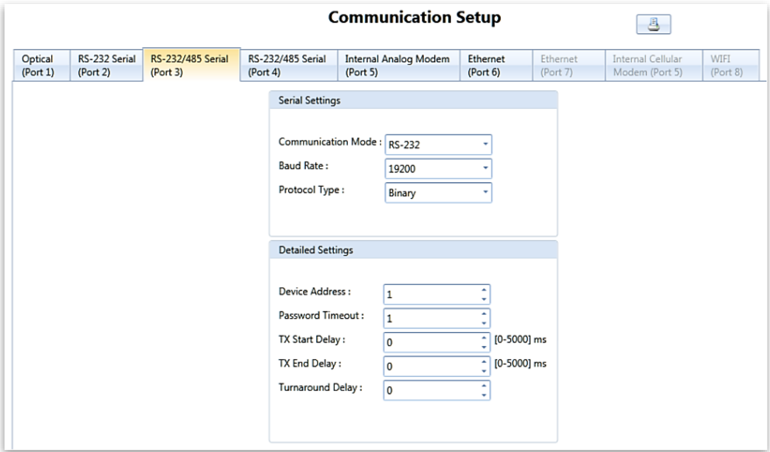
RS-232 Serial Port 2 (ANSI only) & RS-232/485 Serial Ports 3 & 4

Serial Settings is where you set:

- Comm Mode
- Baud Rate
- Protocol Type

Detailed Settings is where you set:

- Device Address
- Password Timeout
- TX Start Delay
- TX End Delay
- Turnaround Delay

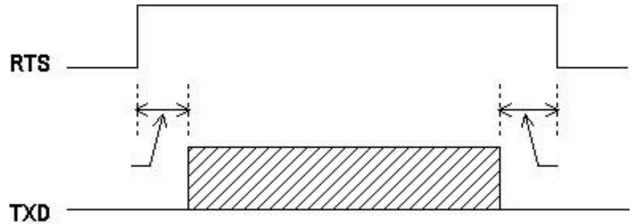


Enter the following parameters.

Device Address: If this is a single meter-to-master connection, we recommend using the default address 1. Several meters can be networked together if they are equipped with the CommRepeater option. Assign a unique number for each meter connected on a network. *Use only address numbers from 0 – 254 with MODBUS.*

Password Time Out: This value is Protocol Type dependent. For Binary this determines how long to wait before the password must be re-entered if JEMWare II is inactive. It does not apply to MODBUS communications. We recommend using a value of 1.

TX Start Delay / TX End Delay / Turnaround Delay: Certain parameters are required for radio-modem applications that use the RS-232 Request To Send (RTS) handshaking signal. If a meter is not used in such applications, simply set the TX Start and TX End delays to 0 ms. TX Start and TX End Delay values are also typically used in RS-485 mode communication networks. These delay values may need adjustment to optimize RS-485 communications with the meter.



TX Start Delay TX End Delay

Data Block

TX Start Delay

Initially, a value of 40ms is suggested for RS-485 mode. Corresponds to the delay between the time that the RTS line is asserted and the time that the data is transmitted.

TX End Delay

Initially, a value of 40ms is suggested for RS-485 mode. Corresponds to the delay from the time that a meter stops sending data and the time that the RTS line is de-asserted.

Turnaround Delay

Initially, a value of 0ms is suggested for RS-485 mode. Corresponds to the delay from the time that a meter finishes receiving a command and asserts RTS to begin transmitting a reply. Allows the master station time to turn off its own transmitter.

If configured as RS-485, appropriate values must be entered for:

TX Start Delay – 40ms / TX End Delay – 40ms / Turnaround Delay – 0ms.

If configured as RS-232, the above values would be 0.

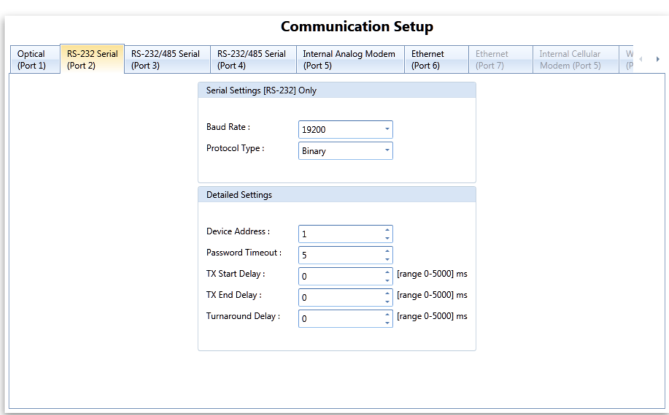
If you are configuring the serial port for use with JEMWare II, note the following:

- The Baud Rate should be the same value as that configured in PC Settings for the PC port used for meter connection.
- The Protocol Type should be set for Binary.
- The Device Address must match the “Meter Address” configured in PC Settings for the PC port used for meter connection.
- The Password Timeout allows you to increase security. If no changes are sent to the meter and the password times out, you will be prompted to enter it again before sending additional changes.

The delays are implemented in the meter as follows:

- TX Turnaround Delay: occurs before the RTS line is set. After the delay, the RTS line is SET.
- TX Start Delay: occurs after RTS line is set, but before characters are written to the port. Characters are sent after the delay is complete.

TX End Delay: occurs after characters are sent and TX buffer is drained. After the delay is complete, the RTS line is RESET.



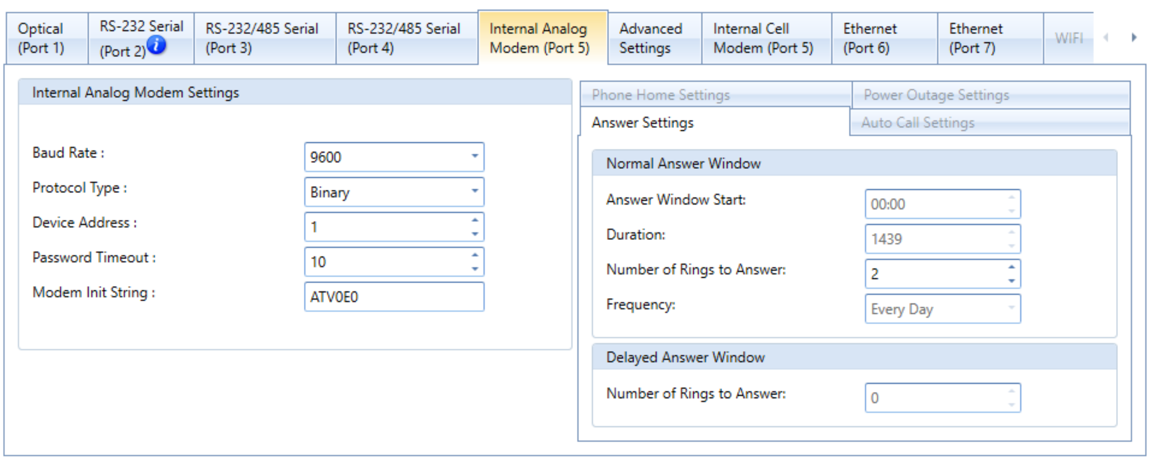
Internal Analog Modem (Port 5)

The modem is configurable for any communication address supported by the meter, and can be set for 300 – 56K bits per second. A custom initialization string can also be configured to adapt the modem to specific conditions

Internal Analog Modem Settings is where you set:

- Baud Rate
- Protocol Type: Binary, DLMS
- Device Address
- Password Timeout
- Modem Init String

Communication Setup Settings

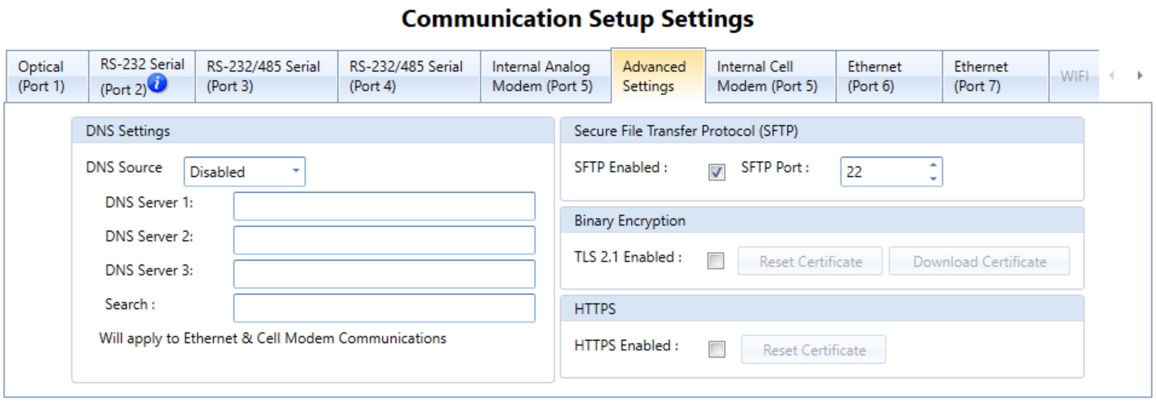


The remaining tabs are for configuring the modem communication parameters for:

- Answer Settings
    - The modem can be configured for two different answering periods (number of rings) per day. When selected, it will answer after a selected number of rings for a defined period each day, and after some other number of rings for the rest of the day.
- Auto Call Settings
- Phone Home Settings
- Power Outage Settings

Advanced Settings

The Advanced settings are used for setting up the DNS and SFTP parameters. They will apply to both Ethernet Ports (if used) and the internal Cell Modem (if used).
Note: Only meters with the Firmware (5.5.2/6.5.2) or newer will support the Advanced Settings.



DNS Settings:

DNS settings are used in cases where you need the meter to form a connection to a URL as opposed to a specific IP address. The following parameters can be configured.

DNS Source:

Disabled:	Can be set as disabled if not using.
Manual:	Manually entered DNS Server IP's will overrule other sources
Cellular:	Cellular will use DNS Servers supplied by the Cell Carrier

DNS Server 1:
Enter the DNS Server addresses.

Search:
Domain name to be used for DNS lookup queries.

Secure File Transfer Protocol (SFTP)

This is used to enable or disable the use of SFTP access to or from the meter.
If enabled, enter the Ethernet port number on which the SFTP service is to be made available. (Port 22 is the default)

SFTP is used in the following situations:

- Uploading new firmware to the meter using the JEMWare II Software
- Downloading PQDIF Files from the meter using JEMWare II Software
- Automatic download of PQDIF files to your remote server
- Manual connection to the meter using a SFTP Server for retrieval of PQDIF files.

SFTP access is restricted by the username/password configuration in User Management.

Retrieving Power Quality files via SFTP is available for users that have 'Read Power Quality' password access enabled. Uploading new firmware to the meter via SFTP is available for users that have 'Firmware/Option Upgrade' enabled.
Note: SFTP access is enabled or disabled on all Ports (applies to single or dual Ethernet, Cell Modem)

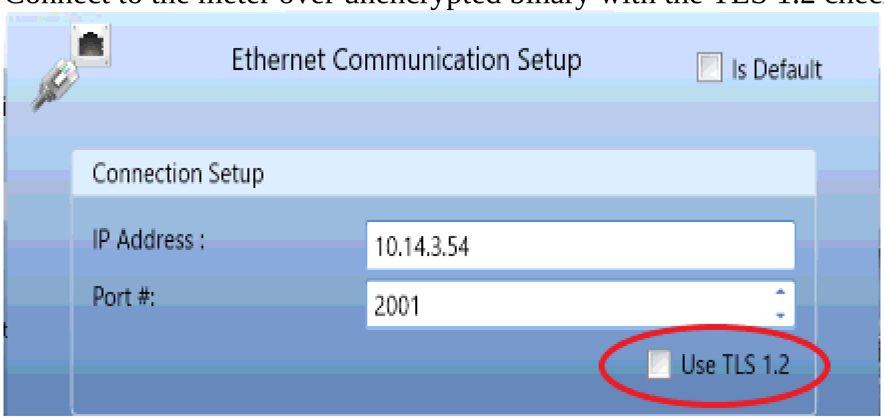
Binary Encryption

The JEM Binary protocol is used for meter communications to the AMETEK Software (JEMWare II and JEMRead) and for third party software applications; like MV90, Primeread, Energy ICT, KEPWARE and others.
The use of TLS encryption can be selected with this configuration screen.

Note: When using the encrypted protocol, make sure that the software used with the meter supports this encryption first. Failure to do so may restrict access to the meter. Only use versions of JEMWare II 2.5.2 and higher when using Binary Encryption.

Enabling TLS 1.2 Binary Encryption

1. Connect to the meter over unencrypted binary with the TLS 1.2 checkbox cleared.



2. Read the configuration & navigate to "Communication -> Advanced Settings".

3. If disabled, turn on SFTP & send the configuration to the meter. JEMWare II will download the X509 certificate over an SFTP connection. SFTP can be disabled after the download, if not required.

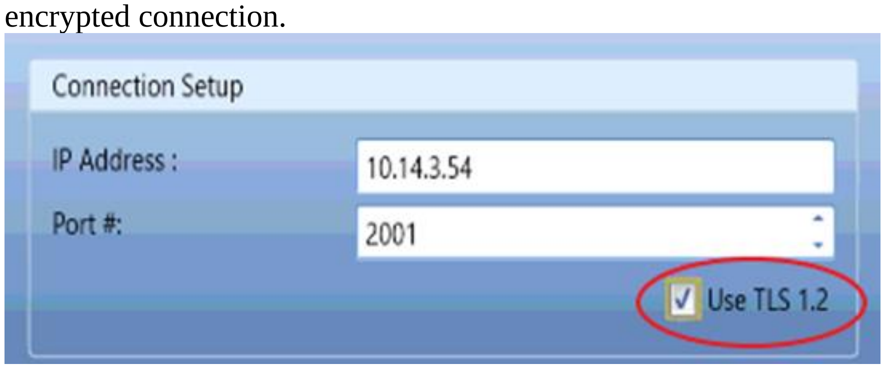
4. Click on "Meter Time" & ensure that the time displayed is valid. X509 certificates will contain a start & end date, both of which are determined by the

meter time & must be valid.

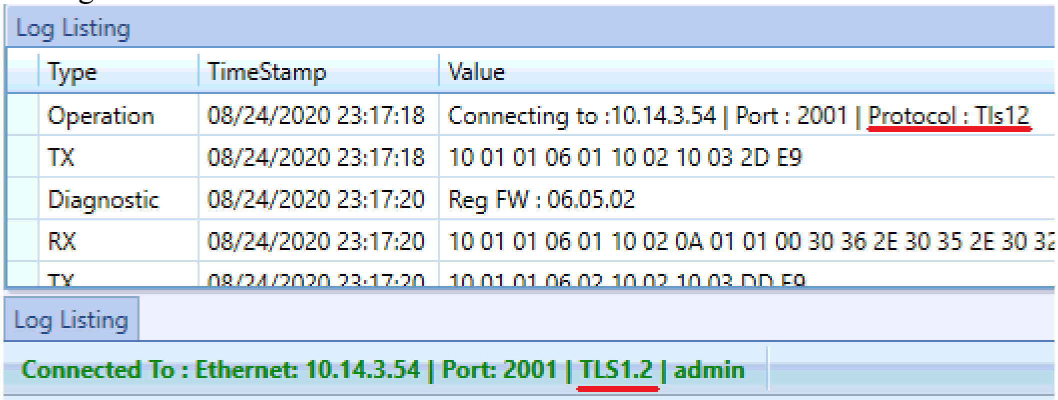
5. Click on “Reset Certificate”, wait for about 5 minutes & click “Download Certificate”.

6. Enable TLS 1.2 & send the configuration to the meter. The active connection will be dropped & the meter will switch over to accept only TLS 1.2 encrypted connections.

7. Reconnect to the meter with the TLS 1.2 checkbox set to form a TLS 1.2 encrypted connection.



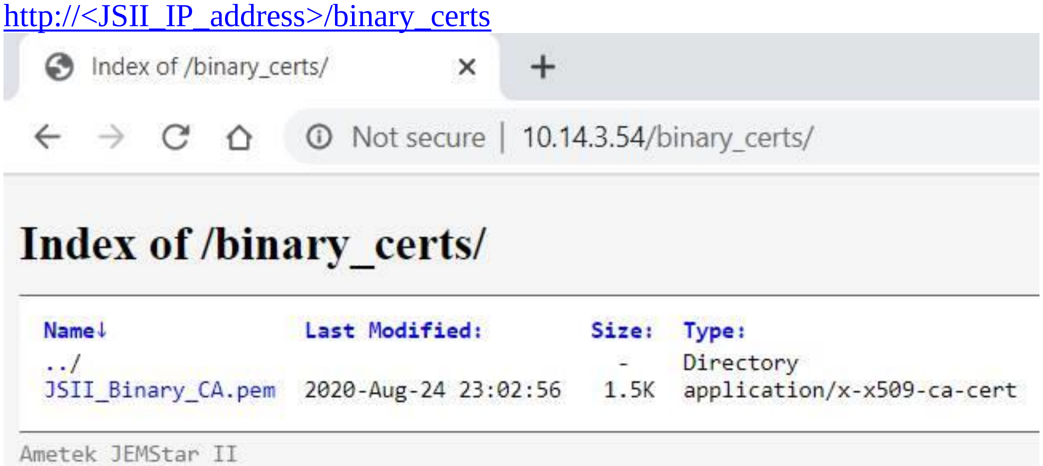
8. A successfully encrypted TLS 1.2 connection can be confirmed from the "Log Listing" as well as the JEMWare II connection status indication at the bottom left.



NOTE: If TLS 1.2 is enabled without the X.509 certificate being downloaded for any reason, JEMWare II will fail to connect to the meter. In such a scenario, you may regain access by downloading the certificate from the web interface & manually placing it in the data directory of JEMWare II. This should only be used for recovery purposes so that JEMWare II may connect & download the certificate correctly over SFTP.

The following steps explain this process –

1. Using a web browser of your choice, open the URL http://<JSII_IP_address>/binary_certs



2. Click on "JSII_Binary_CA.pem" to download the X.509 certificate.

3. Copy this file to C:\ProgramData\Ametek Power Instruments\JEMWAREII\Data\Binary_Certs

4. Connect to the meter with the TLS 1.2 checkbox enabled as shown above. Go to the Meter Settings, "Communication -> Advanced Settings" configuration screen & click the "Download Certificate" button in to download the certificate over SFTP.

5. Delete the JSII_Binary_CA.pem certificate from the PC.

HTTPS

The meter has a built-in web server that can be accessed via a standard web browser using either HTTP (Port 80) or HTTPS (Port 443).
http:// <JEMStar_II_IP_Address> or https:// <JEMStar_II_IP_Address>.

If you need to restrict access to the meter for HTTPS only, select the checkbox and set up the security certificates as detailed below.

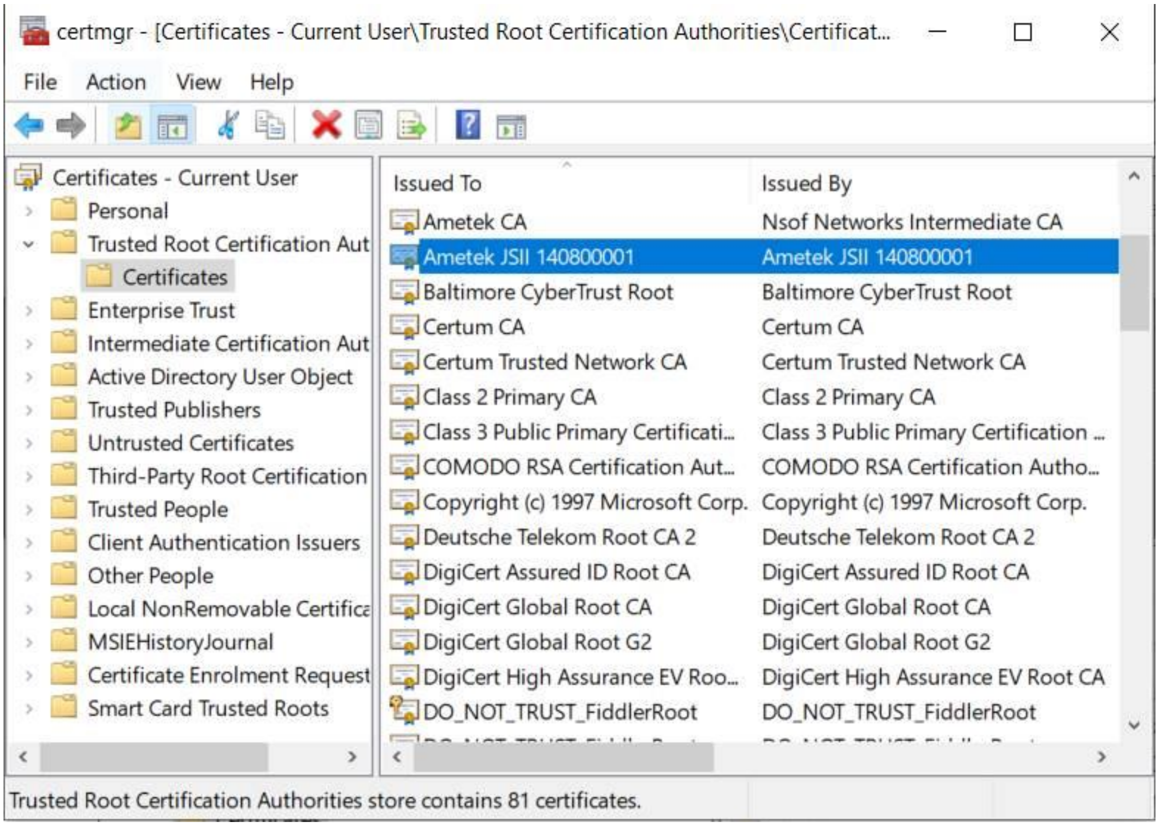
Generating the HTTPS CA certificate

1. Connect to the meter via JEMWare II Software, navigate to “Communication -> Advanced Settings”.
2. Click on “Meter Time” & ensure that the time displayed is valid. X509 certificates will contain a start & end date, both of which are determined by the meter time & must be valid.
3. Click on the “Reset Certificate” button in order to generate new certificates. This process will happen in the background & takes about 5 minutes. If this is the first time, you’re setting up HTTPS on the meter, it is mandatory to perform this reset operation.

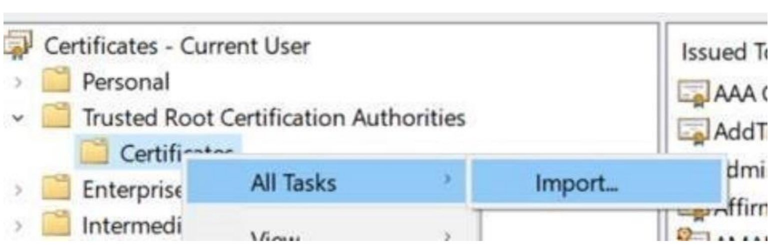
Installing the HTTPS CA certificate

1. Go to the URL http://<JEMStar_II_IP_Address>/https_certs (Ex: http://192.168.250.100/https_certs) from your browser & click on the certificate to download it.

2. Hit “Windows + R” to open the “Run” dialog, enter “certmgr.msc” & click OK.

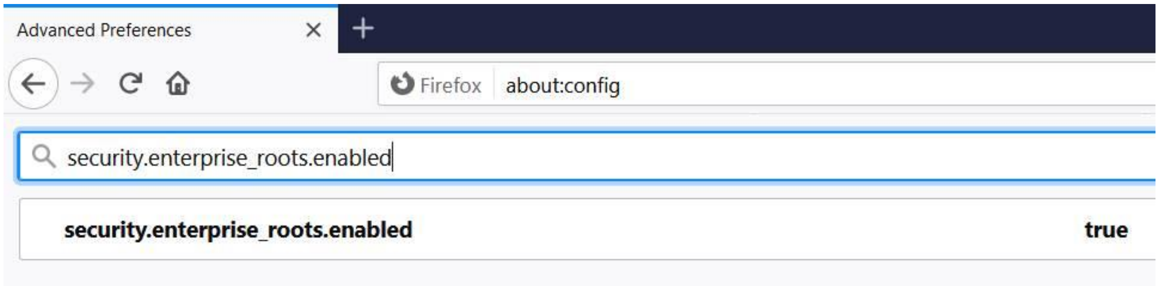


3. Go to “Trusted Root Certification Authorities -> Certificates” as shown above. Right-click on “Certificates” & select “All Tasks -> Import…”



4. Click “Next”, locate & select the file downloaded in step 1 & keep hitting “Next”/”Finish” until the import is complete. You may get a warning about the certificate being self-signed, etc. Hit OK/Accept.

5. Restart Chrome & Edge for the import to take effect. For Firefox, go to “about:config”, accept the warning message & search for the field “security.enterprise_roots.enabled”. Set the value to true & restart the browser.



Turning HTTPS ON/OFF on the meter

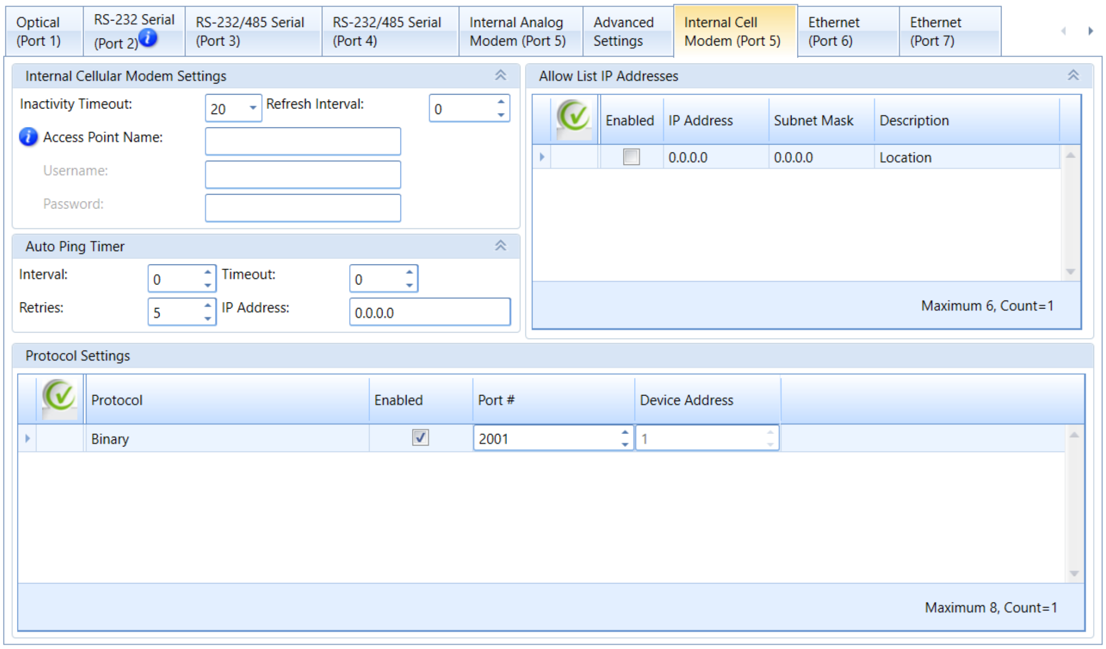
1. Connect to the meter via JWII, download the configuration from the meter, if necessary, & navigate to “Communication -> Advanced Settings”.
2. Set/Clear the “HTTPS Enabled” checkbox & send the configuration to the meter.

3. If HTTPS is being turned off, it may be necessary to clear your browser’s history, cache, etc. if you’ve previously connected to the meter over HTTPS.

Internal Cell Modem (ANSI Meter)

The Internal Cell Modem settings are used to set up communication parameters. The settings apply to all cell modem types: Verizon, GSM (AT&T, T-Mobile) and Sprint.

Communication Setup Settings



Internal Cellular Modem Settings

Inactivity Timeout: This will automatically disconnect the cell modem connection when there is no activity. Timeout settings are: 5,10,15,20,30,60 minutes or No timeout.

Refresh Interval: Select the connection refresh interval to refresh the cellular data link. The Refresh Interval will be in 10 minute steps. [range 0-1440] (0 indicates that the refresh timer is off).

- The connection refresh timer ("Refresh Interval") is used by the meter to restart the PPP connection with the Janus modem (and thereby re-registering with the cell carrier). Typically, this will just restart the pppd process without the need for resetting the modem. However, if the PPP connection isn't resurrected as expected, the meter will automatically power cycle the modem & restore the link. Many carriers have restrictions on how long a data link can be left open (between the modem and the carrier) & expect the modem to re-connect regularly. This feature allows users to setup an interval of their choice in consultation with their carrier.

Access Point Names (APN): An Access Point Name (APN) is the name of a gateway between the cellular mobile network and another computer network which can be your own private network. The APN is used by the cellular carrier to assign network parameters to the modem which can include a DNS setting (along with the IP Address) and security method used for the cell modem.

The Advanced Settings configuration (in the previous section of the manual) allows users to keep the DNS settings provided by the cell carrier or use the manually entered ones. *(The APN is provided by your cell carrier. It is a required field for cell modem operation)*

APN Structure
An Access Point Name consists of two parts:

- the network identifier
- the operator identifier

The operator identifier in turn consists of two other parts:

- Mobile Network Code (MNC)
- Mobile Country Code (MCC)

<u>N e t w o r k I D </u> . <u>M N C . M C C </u> . GPRS
Network identifier   Operator identifier

Auto Ping Timer:
The auto-ping timer if used allows the meter to ping a user-selected IP address at regular intervals with a timeout for each ping attempt.
The user can select a max number of retries before deciding that there's an issue with the connection. When this happens, the meter will cycle power to the modem to restore connectivity.

Interval: Select the Time interval between successive pings in secs. [range 0-300] (0 indicates that the timer is off)

Timeout: Select the Duration for which the meter will wait for each ping to succeed in secs. [range 0-5] Note: Timeout cannot be greater than the Interval between pings.

Retries: Select the number of pings to try before resetting the modem. [range 0-60]

IP Address: Enter the IP address which the meter will ping via the cell modem.

Allow list of IP Addresses
This is a list of IP Addresses that are authorized to connect to the Cell Modem. This prevents unauthorized users from freely gaining access to the meter.
The IP Address should be your Public IP Address - not your Private PC IP Address. To determine your Public IP Address, you can contact your network administrator (or search for it in a google prompt 'whats my IP')
It is recommended to enter your list of Public IP Addresses. Otherwise, at a minimum, you will need to enter (and enable) the generic IP 0.0.0.0 and Subnet 0.0.0.0 which provides access to all.
(*Note: You will not be able to connect to the cell modem if there are no IP addresses enabled*)

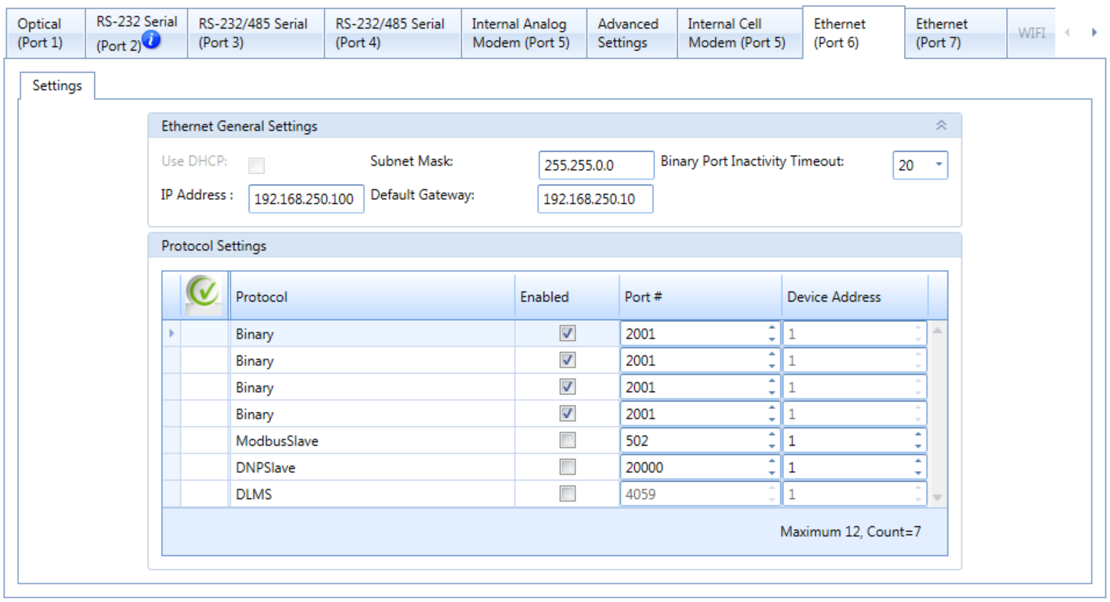
Protocol Settings
The Cell Modem can support up to 8 simultaneous connections using JEM Binary and DNP protocols. (Qty 4 of each). When selecting JEM Binary, you can use any available Port Address, although each of the JEM Binary connections (up to 4) must have the same address. For DNP, you can select a different Port Address for each connection.

Note: Only meters with the Firmware (5.5.2/6.5.2) or newer will support the Internal Cell Modem Settings.

Ethernet: (Port 6, 7)

The Ethernet Options are single port and dual independent ports. The settings are the same for each port, although you must select different IP Addresses for each port. All other settings can be the same or different.

Communication Setup Settings



The Ethernet port supports all JEMStar II protocols.
Up to twelve simultaneous connections are possible, permitting each user to access whatever metering information is necessary.

Ethernet General Settings is where you configure the network settings:

- DHCP – Normally should be disabled (Not checked). As it allows the IP address to be set dynamically. A meter cannot be accessed remotely via Ethernet.
- IP Address – Meter IP address. It is critical that each meter on a network has a unique IP address.
- Subnet Mask
- Default Gateway
- Binary Port Inactivity Timeout

Binary Port Inactivity Timeout

The Binary Port Inactivity Timeout allows you to configure an automatic disconnect of the JEM Binary Protocol Port when there is no activity. The default is no timeout. You can configure the meter to automatically disconnect the JEM Binary Port from 5 to 60 minutes of no activity. This could be used if you have situations where the Network connection is disabled. It could be caused from an unplugged cable, loss of service, etc. If the meter was configured for a single Binary Port and the connection was disabled, it would prevent additional Ethernet Binary connections to the meter.

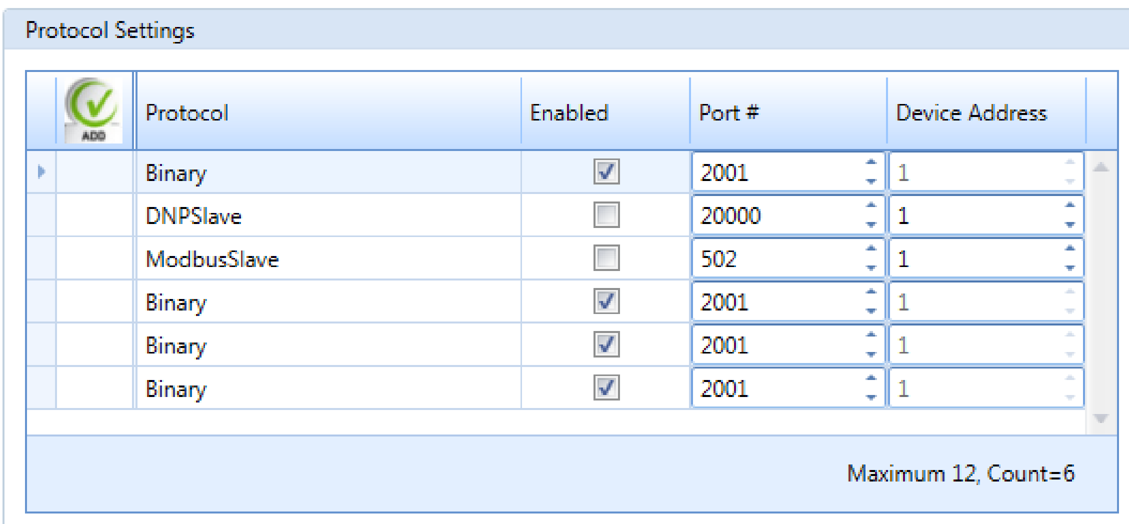
Ethernet Protocol Assignments

Each Ethernet Port supports up to 12 simultaneous protocol connections with the maximum quantity of connections per protocol shown below.

Protocol	Port 6	Port 7
	Ethernet	Ethernet
JEM Binary	4	4
Modbus TCP/IP	2	2
DNP	5	5
DLMS	1	1
IEC 61850	1	1

If you require multiple simultaneous connections for a single protocol, just add the same protocol multiple times. For example, if you need 4 simultaneous connections for JEM Binary, add it four times in the protocol settings configuration as detailed in the screen shot below.

Note: When using JEM Binary Protocol, it is good to configure extra connections in case you experience network issues where a connection could be hung up. The default config provides all 4 connections which can all be enabled even if only using one or two.



The Enable check box allows you to configure the meter for a protocol without enabling the port. If a port is NOT enabled (not checked), the associated firmware for that protocol will not run on the meter. In general, protocols should NOT be enabled unless the associated application (i.e. DNP Master, Modbus Master) are ready to run and connect to the meter. Otherwise, it could produce a communication error.

Dual Ethernet Operation:
The Dual Ethernet option allows simultaneous operation from two different Ethernet ports, each with their own IP address. In the JEMWARE configuration, each Ethernet port can have its own group of supported communication protocols (maximum 12 connections per port).

When using just one of the Ethernet Ports, you need to connect this to the Ethernet 1 Port (Port 6 in the JEMWARE configuration).

Reference Protocol options for further configuration on: Modbus Slave, DNP Slave
Note: Once you have selected Modbus or DNP protocol the next step is to configure the MODBUS-specific parameters.

Secure File Transfer Protocol (SFTP)

SFTP protocol is used for retrieving PQDIF files from the meter using the JEMWare II software or automatically via an SSH transfer using a remote SFTP server. SFTP is also used for upgrading the meter firmware from JEMWare II. The default port address for SFTP is 22, but in some cases; they may be blocked by your company network. You can change this port address to any unused address in these cases. SFTP is only used on one Ethernet Port when meters are equipped with dual Ethernet Ports.

Note: As an alternative to using SFTP, you can retrieve PQDIF Files and upgrade your meter firmware using the WEB Browser port 80.

Ethernet Port Number Assignments

You can assign your own port number for each protocol. This allows you to have simultaneous communication channels on the single Ethernet IP Address.

Each protocol should have a different port number.

Protocol	Port Number
Binary	2001
DLMS	4059
Modbus Slave	502
DNP Slave	20000
DNP Slave	20001
IEC 61850	102
Secure File Transfer (SFTP)	22

When using multiple connections for the same protocol, you can use a different port number for each connection. For example, if you had two DNP Master Devices trying to connect to the meter at the same time, you could use port number 20000 for one connection and 20001 for the second connection.

Exception: When using multiple JEM Binary connections, they will automatically use the same port number.

Important: Make sure you don't assign a Port Number that conflicts with other devices on the network; like Port 80, which is used for Internet browsers, Port 21 used for FTP applications, Port 102 which is used with IEC61850, Port 502 which is reserved for Modbus, etc. In general, anything over port number 2000 is safe. Device Address, Destination Address and Destination IP Address are protocol specific.
They may not be necessary, depending on the protocol.

Dual Ethernet Operation:

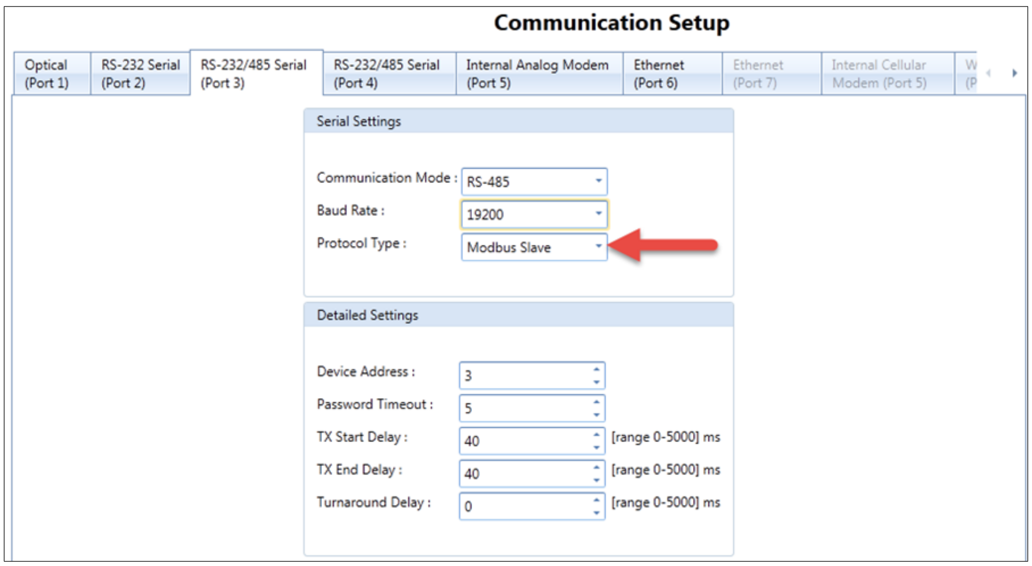
The Dual Ethernet option allows simultaneous operation from two different Ethernet ports, each with their own IP address. In the JEMWare II configuration, each Ethernet port can have its own group of supported communication protocols (maximum 12 connections per port). When using just one of the Ethernet Ports, you need to connect this to the Ethernet 1 Port (Port 6 in the JEMWare II configuration).

PROTOCOL SETUP

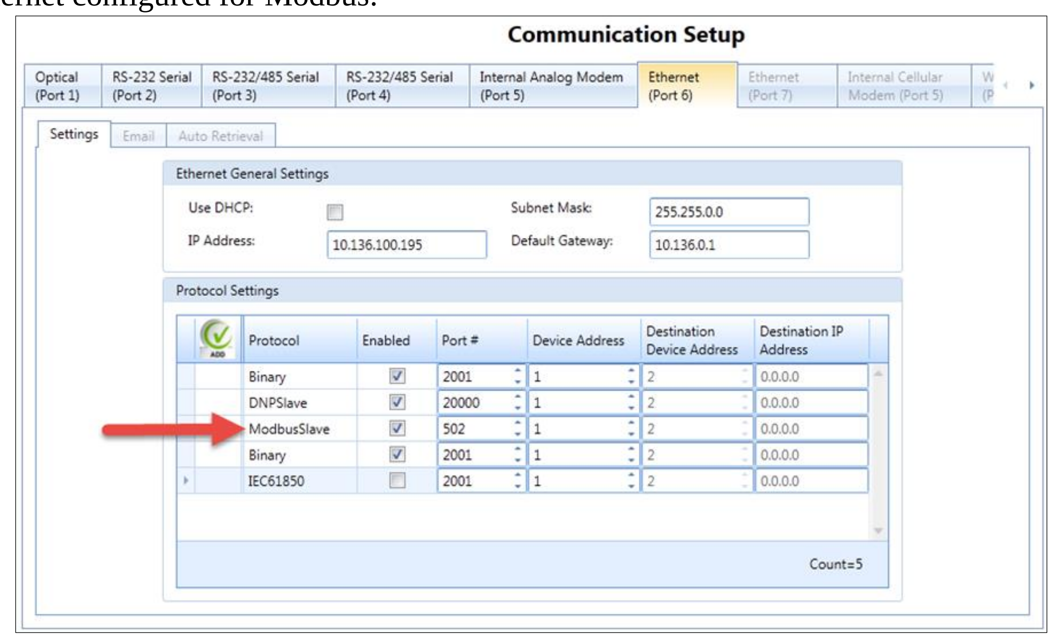
Use this configuration menu to set up the communication protocols. Please refer to the appendices at the end of this manual for a complete description of features, including the DNP Device Profile Document and point lists.

MODBUS

Start by selecting which communication port will be used for MODBUS.
Set the Protocol Type to Modbus Slave as shown in the example.
Port 3 configured for Modbus:



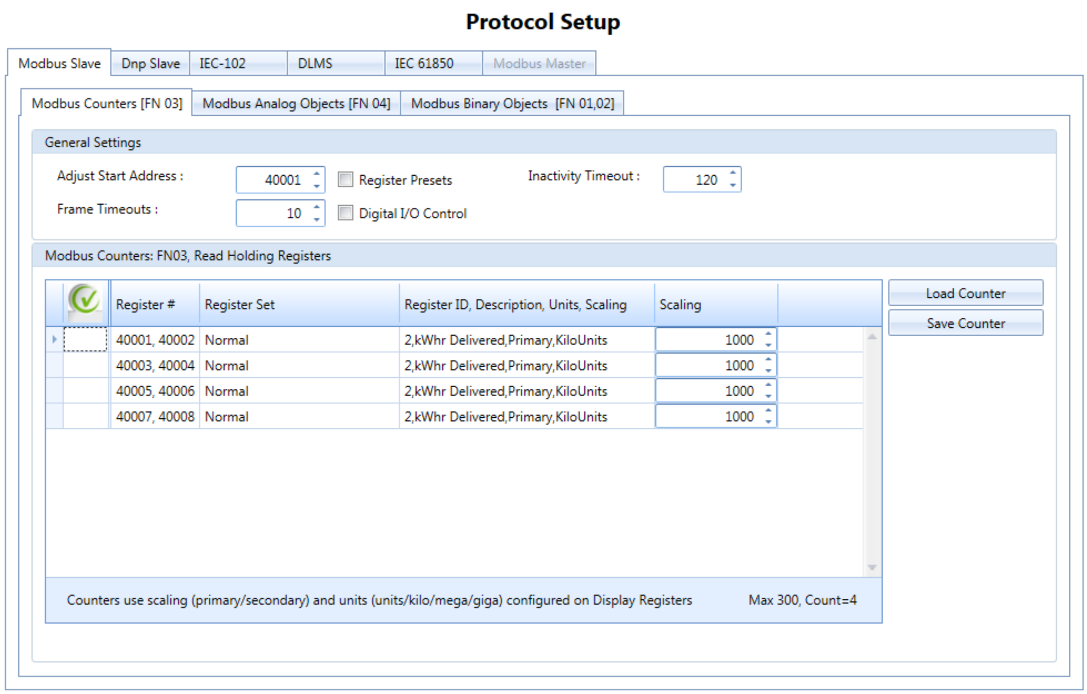
Ethernet configured for Modbus:



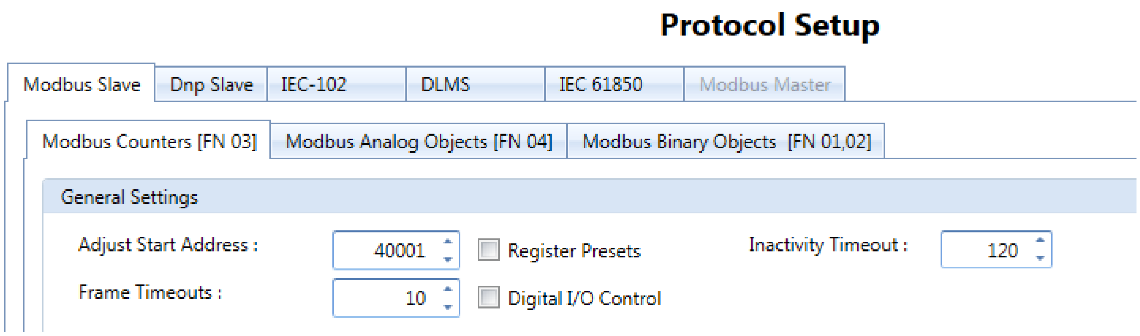
The JEMStarII meter can support up to 3 concurrent serial MODBUS, as well as 2 concurrent MODBUS TCP ports on a single Ethernet port per meter.

MODBUS Slave

After selecting MODBUS Slave in communication setup for Serial/Ethernet or modem communications, you can configure these MODBUS specific parameters.



Modbus Counters [FN 03]:



*__Application Note__: Where Load/Save Buttons appear these buttons allow the user to save the current grids of data and quickly load it into another configuration, sparing the user from the effort of re-entering the same list into multiple meters' configurations.

General Settings

Adjust Start Address:

Select the starting address for your meter.

Frame Timeouts:

Select the amount of time that the meter's MODBUS port will wait to complete a query before it times out. A timeout begins as soon as there is no data flow and continues for the user-specified time. If a command is not completed when the port times out, the Master must initiate a new command.

Register Presets:

Check this box if you want the meter to be able to receive and process register preset data from the MODBUS Master.

Digital I/O Control

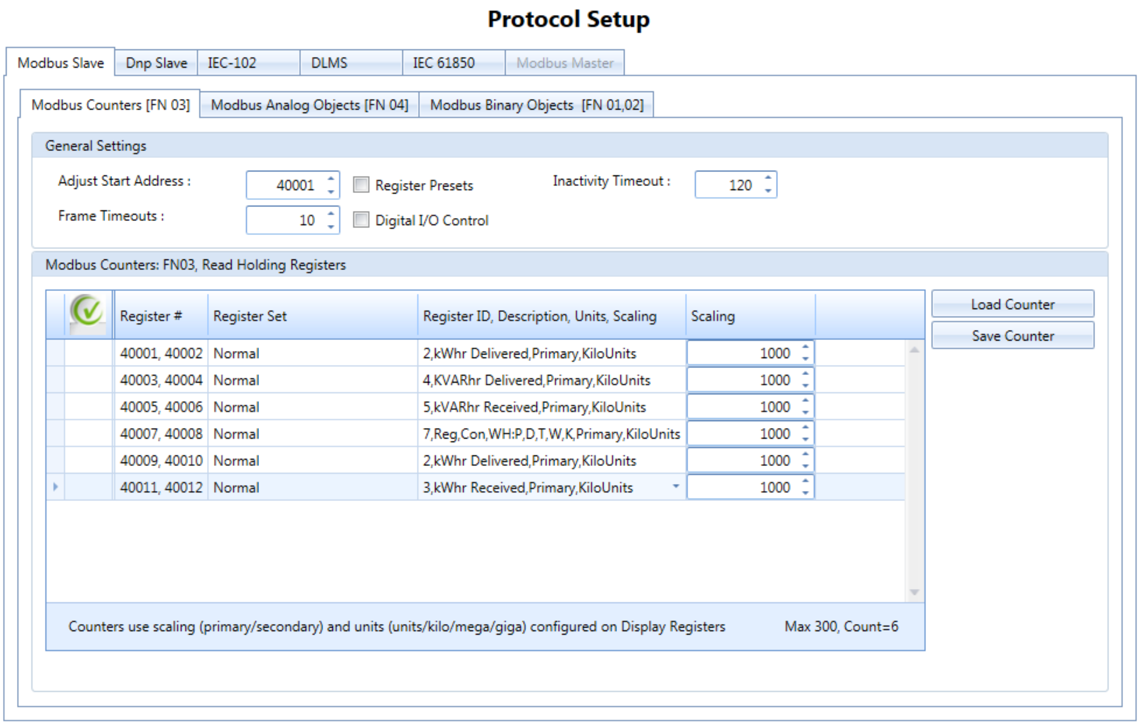
The MODBUS port can be used by the Master to drive any of the meter's four digital outputs. There are four discrete points in the MODBUS implementation, corresponding to meter contact outputs 1 – 6. The outputs may be controlled via MODBUS Functions 05 and 15.

To set up a Contact output for MODBUS control:

- Click the check box Allow Digital Outputs Control in the above screen.
- Go to the Meter Settings / Input/Outputs menu. Choose which Output Channels (1 – 6) you want to assign as MODBUS-controlled.

***NOTE**: The Meter will return the MODBUS "Illegal Function" exception to the Master if the outputs are not set properly.*

Modbus Counters: [FN 03], Read Holding Registers



Register #:

There are 300 potential Modbus "Register" sent during a communication session. You can arrange the sequence of your transmitted data by assigning the first data to register 40001, 40002, next to register 40003, 40004, etc.

Register Set:

This determines which meter register group will be used to assign data to the Modbus point. The choices are:

- **Normal**: Takes data from one of the 50 Normal display registers.
- **Alternate**: Takes data from one of the 50 Alternate display registers.

Register ID/Description:

Select the ID number and description of the register that you want associated with the Modbus point.

Valid register numbers are:

Normal display registers: 0 – 49
Alternate display registers 100 – 149

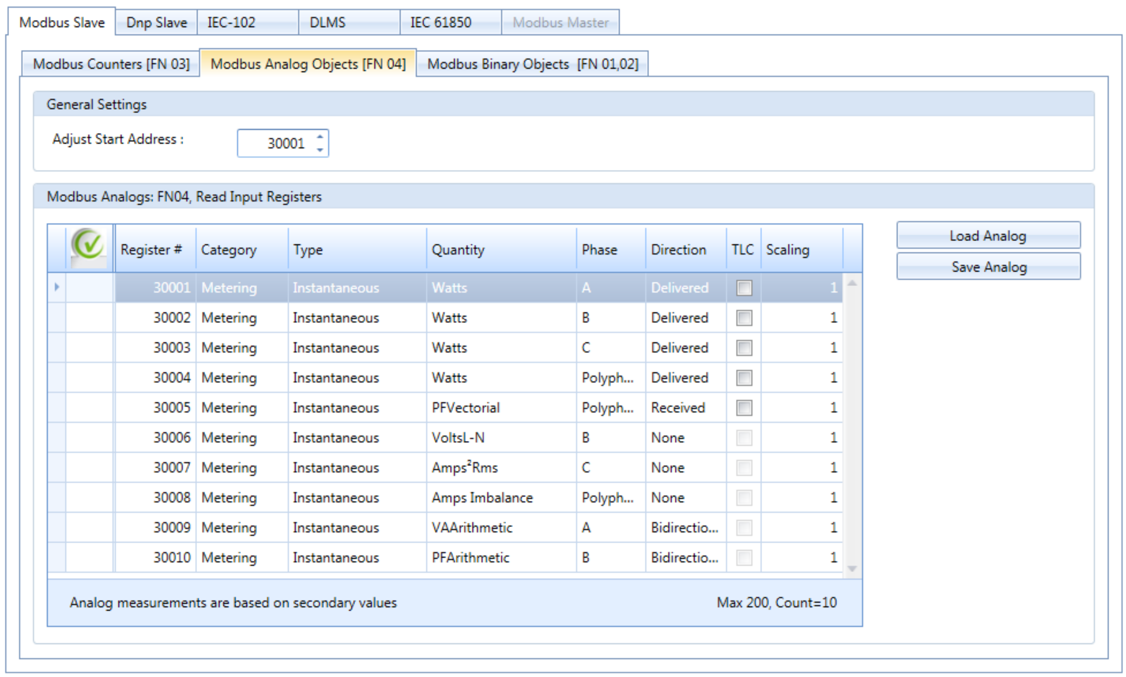
Scaling:

The Modbus Counter will duplicate the settings in the display register, so if the measurement is selected as 'Primary' with engineering units 'kilo', the corresponding counter point will match.

When configuring the MODBUS Counter, you can select your own scale factor from 1 to 1,000.

Modbus Analog Objects [FN 04]:

Protocol Setup



Register #	Category	Type	Quantity	Phase	Direction	TLC	Scaling
30001	Metering	Instantaneous	Watts	A	Delivered	☐	1
30002	Metering	Instantaneous	Watts	B	Delivered	☐	1
30003	Metering	Instantaneous	Watts	C	Delivered	☐	1
30004	Metering	Instantaneous	Watts	Polyph...	Delivered	☐	1
30005	Metering	Instantaneous	PFVectorial	Polyph...	Received	☐	1
30006	Metering	Instantaneous	VoltsL-N	B	None	☐	1
30007	Metering	Instantaneous	Amps²Rms	C	None	☐	1
30008	Metering	Instantaneous	Amps Imbalance	Polyph...	None	☐	1
30009	Metering	Instantaneous	VAArithmetic	A	Bidirectio...	☐	1
30010	Metering	Instantaneous	PFArithmetic	B	Bidirectio...	☐	1

***Application Note**: Where Load/Save Buttons appear these buttons allow the user to save the current grids of data and quickly load it into another configuration, sparing the user from the effort of re-entering the same list into multiple meters' configurations.

Register #:

There are up to 200 Modbus Analog points sent during a communication session, numbered 0 – 199. You can arrange the sequence of your transmitted counter data by assigning the first data to register 30001, next to register 30002, etc.

Category

There are categories for Metering, Power Quality and Fault measurements.

Measurement Type

If the category Metering is selected, you will have a choice of instantaneous or integrated measurements. If Power Quality is selected, you will have a choice of Harmonic, Interharmonics and Flicker. If Fault is selected, you will have a choice of Negative. Positive and Zero Sequence measurements.

Quantity:

This further defines the exact measurement based on the category and measurement type.

Phase:

For each Modbus Analog point you must select a Phase. You may choose from Phase A, Phase B, Phase C, or Polyphase. If the Analog point quantity is Frequency, the phase is ignored. (Meters always measure frequency on Phase A.) If the Analog point quantity is Amps, you may also choose a phase of Neutral. When selecting individual harmonics, this field is used for the individual harmonic number.

Direction:

For each Modbus Analog point you must select the direction of the measurement, where applicable. Selections include Delivered, Received, Bidirectional, Absolute and Q1-Q4 (for VARS)

TLC:

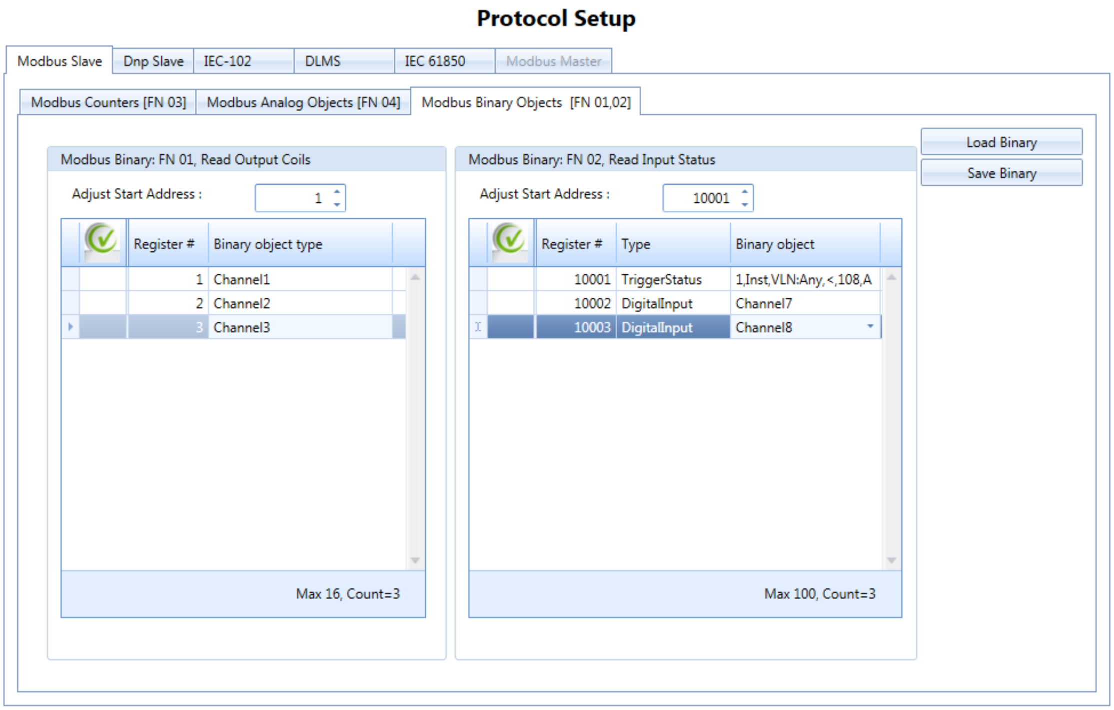
For each Modbus Analog point you must select whether to send a Compensated or Uncompensated value. Loss Compensation is available on any Watt, VAR, VA, Q, or PF quantity. For any other quantity, this setting is ignored.

Note*: If you want to limit the number of Modbus Analog points in the meter to less than 200, enter only the points you need and set the rest to Unused.*

Scaling:

For each Modbus Analog point you can apply scaling factors from 1 to 100. The scaling would be based on a value that is already optimized to fit within the 16 Bit storage limitations. Refer to the Appendix for additional details on scaling.

Modbus Binary Objects [FN 01, 02]:



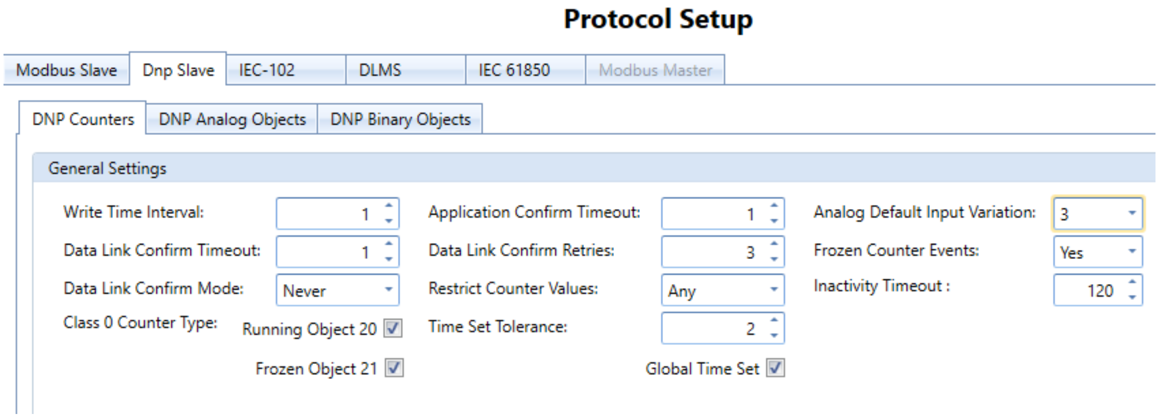
Modbus Binary: FN 01, Read Output Coils:
This will indicate the status of any Digital I/O configured as Outputs. In the screen shot above, DIO Channels 1,2 and 3 were configured as Outputs.

Modbus Binary: FN 02, Read Input Status:
This will indicate the status of any Digital I/O configured as Inputs, Trigger Status for any alarm thresholds configured and Meter Status on things like Phase Status, Battery Status, Firmware Status, etc.

***Application Note**: Where Load/Save Buttons appear these buttons allow the user to save the current grids of data and quickly load it into another configuration, sparing the user from the effort of re-entering the same list into multiple meters' configurations.

DNP SLAVE

Once you have selected to use a DNP Slave in communication setup for Serial/Ethernet or modem communications you can then configure these DNP specific parameters:



General Settings

Write Time Interval:

This field sets up a time synchronization request. The number of minutes between time sets requested from the master is specified here. Zero (0) means that no time sets will occur.

Data Link Confirm Timeout:

Time (in milliseconds) to wait for master Data Link confirm of the last frame sent before doing retries (only if frame sent with confirm requested).

Data Link Confirm Mode:

Determines whether the master sends a data link confirm of the last frame sent. The choices are: Always, Sometimes, or Never. Sometimes means only on multiframe fragments.

Class 0 Counter Type:

Running Object 20
Checking this field causes all the meter's working (i.e. displayed) register values to be included in a Class 0 data poll.
Frozen Object 21:
Checking this field causes all the meter's frozen register values (as of the last Register Freeze event) to be included in a Class 0 data poll.

Application Confirm Timeout:

Required for multi-fragment responses or event data.
The following formula describes this requirement:
Application Confirm Timeout > Data Link Confirm Timeout * (Data Link Retries + 1)

***NOTE**: If Application Layer Confirms is used with Data Link Confirms, ensure the Application Layer Confirm Timeout is set long enough for all data link retries to complete.*

Data Link Confirm Retries:

The number of times the meter will re-transmit a confirmed data link frame before aborting the transaction.

Restrict Counter Values:

A meter register configured as a DNP Counter point may contain a value as large as 999,999,999 (nine digits). Some DNP master devices cannot accept counter values this large. You may use this field to configure a meter to restrict the reported value of Counter points to 3, 4, 5, 6, 7, or 8 digits, or allow the full 9-digit precision to be reported. Restricting the number of digits reported affects only DNP counter points, not the actual display registers.

NOTE*: The DNP Counter digit restriction setting also applies to MODBUS holding registers. See the following section on configuring MODBUS communications for more information.*

Time Set Tolerance:

This field sets the sensitivity of the meter to time set operations. If the master performs a time set that causes a change in the meter's time of less than the number of seconds entered here, it is not recorded in the meter's Load Profile. This feature prevents Load Profile from being filled with time set events when regular time synchronizations occur.

Global Time Set:

This field allows you to set the time on the meter from other devices. When selected, the meter will allow remote time sets from other devices. When it is not selected, it will ignore any time set commands from other devices.

Analog Input Variation:

This selection will determine which Analog Input Variation is returned for Class Polls. A selection of 3 will return the 32-bit analog input without flag (object 30 Var 3) and a selection of 4 will return the 16-bit analog input without flag (object 30 Var 4). Any Analog Input variation supported (Object 30, Variation 0,1,2,3,4,5) can be requested individually regardless of this setting.

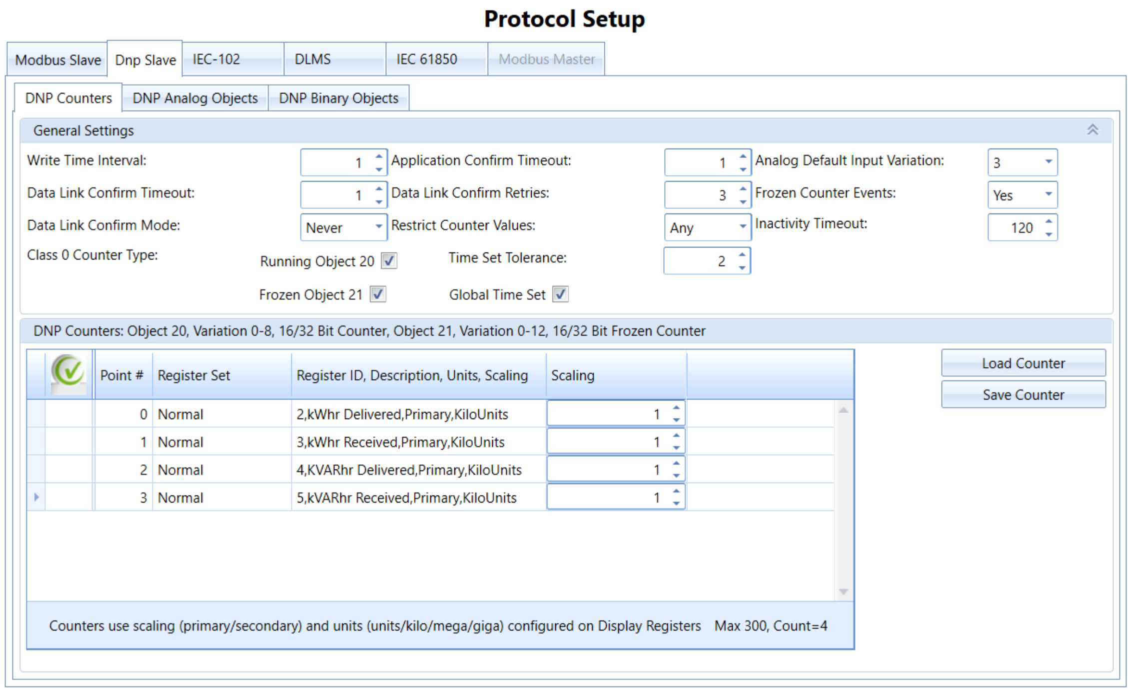
Frozen Counter Events:

Configurable as YES or NO. If YES, the meter will create a frozen counter event (Object 21 var 9) whenever an internal register freeze occurs. The scanning period is fixed at 5 seconds.

Inactivity Timeout:

This setting is used to automatically disconnect the Ethernet Connection when there is no activity from the master device. Enter the number of seconds before disconnecting the Ethernet connection.

DNP Counters



Point #:

There are up to 300 DNP “points” sent during a communication session, numbered 0–300. You can arrange the sequence of your transmitted data by assigning the first data to point 0, next to point 1, etc.

Register Set:

All counter measurements are derived from the normal and alternate registers. They must be configured first before setting up the DNP counters.

Register ID/Description:

Select the ID number and description of the register that you want to associate with the DNP point.

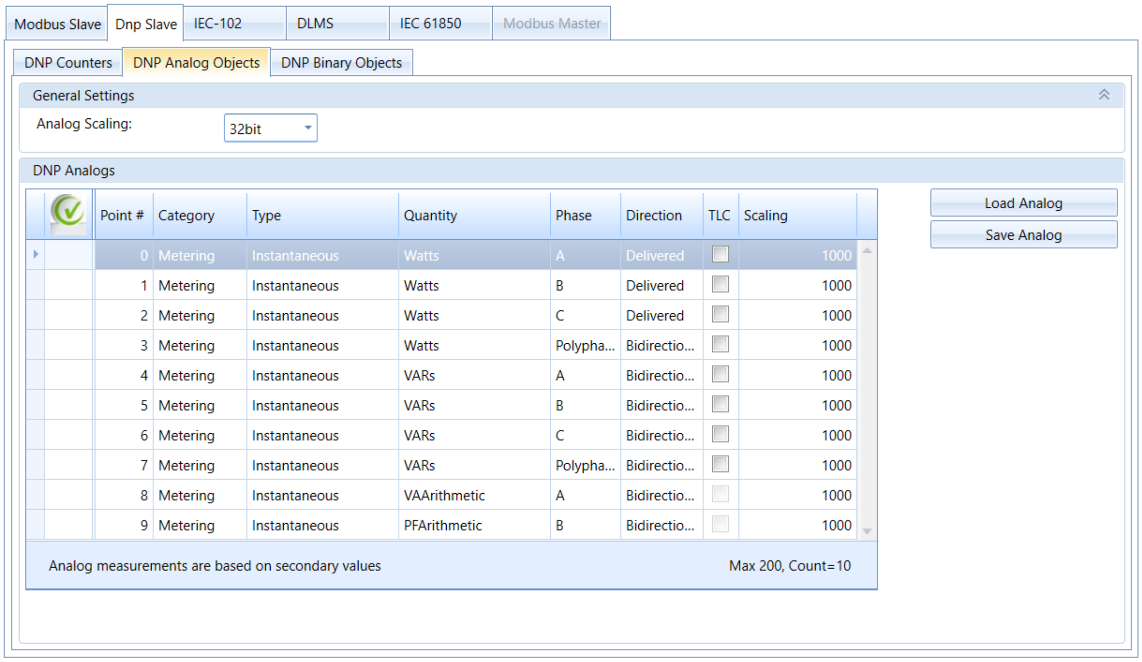
Scaling:

A JEMStar II register configured as a DNP Counter point may contain a value as large as 999,999,999 (nine digits). Some DNP master devices cannot accept counter values this large. You may configure JEMStar II to restrict the reported value of counter points to 3, 4, 5, 6, 7, or 8 digits, or allow the full 9-digit precision to be reported. Restricting the number of digits reported affects only DNP counter points, not the actual display registers.

The DNP Counter will duplicate the settings in the display register, so if the display register measurement selected is ‘Primary’ with engineering units ‘kilo’, the corresponding counter point will match.

DNP Analog Objects:

Protocol Setup



Point #	Category	Type	Quantity	Phase	Direction	TLC	Scaling
0	Metering	Instantaneous	Watts	A	Delivered		1000
1	Metering	Instantaneous	Watts	B	Delivered		1000
2	Metering	Instantaneous	Watts	C	Delivered		1000
3	Metering	Instantaneous	Watts	Polypha...	Bidirectio...		1000
4	Metering	Instantaneous	VARs	A	Bidirectio...		1000
5	Metering	Instantaneous	VARs	B	Bidirectio...		1000
6	Metering	Instantaneous	VARs	C	Bidirectio...		1000
7	Metering	Instantaneous	VARs	Polypha...	Bidirectio...		1000
8	Metering	Instantaneous	VAArithmetic	A	Bidirectio...		1000
9	Metering	Instantaneous	PFArithmetic	B	Bidirectio...		1000

***Application Note**: Where Load/Save Buttons appear these buttons allow the user to save the current grids of data and quickly load it into another configuration, sparing the user from the effort of re-entering the same list into multiple meters' configurations.

Analog Scaling

When using 32 Bit Analog Objects, you select 32 bit scaling. When using 16 Bit Analog Objects, we offer both 16 bit and 32 bit scaling options. For more details, refer to the section on scaling below.

Point #:

You can configure up to 200 Analog Measurements starting at 0. This is the DNP Index number.

Category

There are categories for Metering, Power Quality and Fault measurements.

Measurement Type

If the category Metering is selected, you will have a choice of instantaneous or integrated measurements. If Power Quality is selected, you will have a choice of Harmonic, Interharmonic and Flicker. If Fault is selected, you will have a choice of Negative. Positive and Zero Sequence measurements.

Quantity:

This further defines the exact measurement based on the category and measurement type.

Phase:

For each Modbus Analog point you must select a Phase. You may choose from Phase A, Phase B, Phase C, or Polyphase. If the Analog point quantity is Frequency, the phase is ignored. (Meters always measure frequency on Phase A.) If the Analog point quantity is

Amps, you may also choose a phase of Neutral. When selecting individual harmonics, this field is used for the individual harmonic number.

Direction:

For each DNP Analog point you must select the direction of the measurement, where applicable. Selections include Delivered, Received, Bidirectional, Absolute and Q1-Q4 (for VARS)

TLC:

For each DNP Analog point you must select whether to send a Compensated or Uncompensated value. Loss Compensation is available on any Watt, VAR, VA, Q, or PF quantity. For any other quantity, this setting is ignored.

Note: If you want to limit the number of DNP Analog points in the meter to less than 200, enter only the points you need and set the rest to Unused.

Scaling:

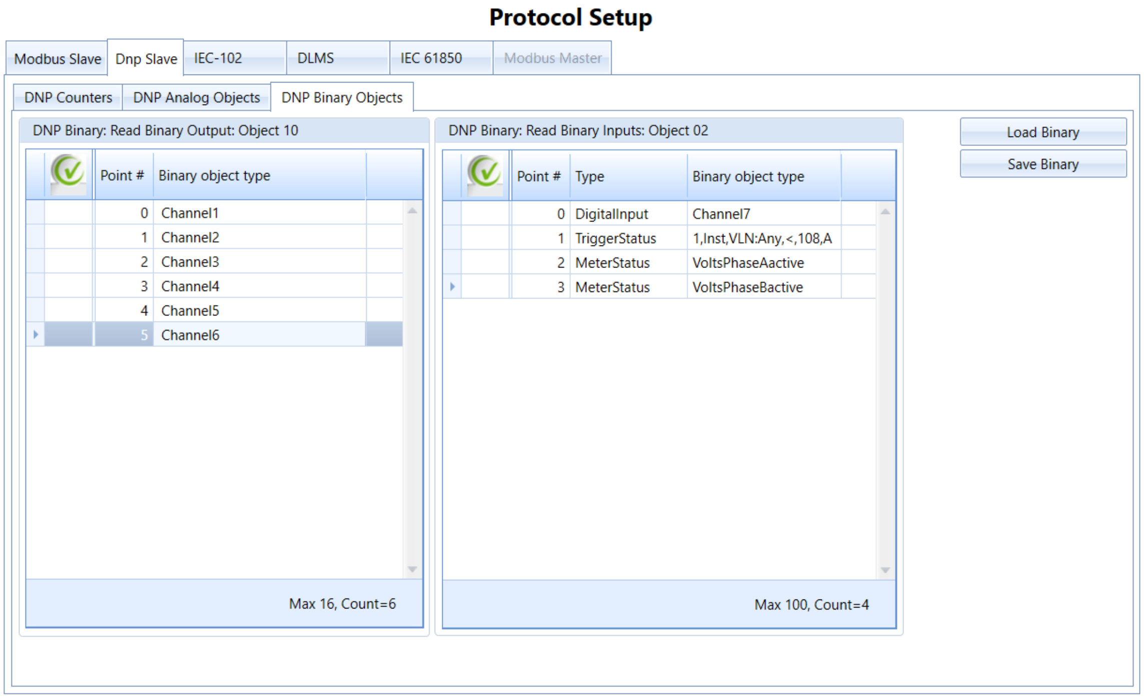
If using 32 Bit DNP Analog Objects, you will be able to scale the measurement from a range of 1 to 1,000.

When using 16 Bit DNP Analog Objects, you can choose at the top of the screen whether to use the 16 Bit or 32 Bit method for scaling.

The 32 bit method is a straight scaler that is applied to the measurement. Be careful not to overflow the register as the maximum value stored for 16 bit is 32,767.

The 16 bit scaling method is based on a value that is already optimized to fit within the 16 Bit storage limitations. Refer to the Appendix for additional details on scaling.

DNP Binary Objects:



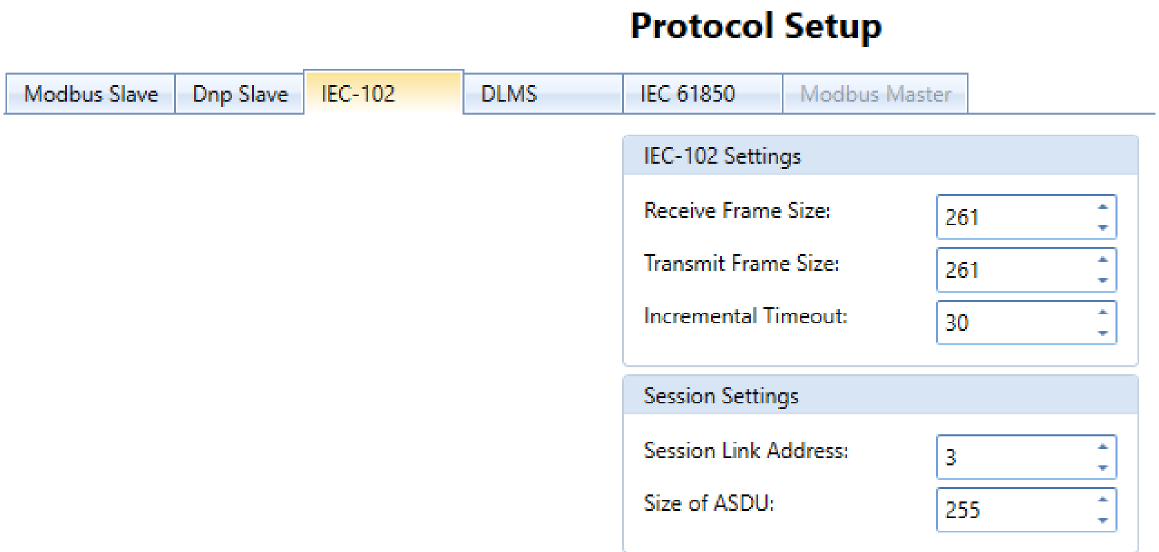
***Application Note**: Where Load/Save Buttons appear these buttons allow the user to save the current grids of data and quickly load it into another configuration, sparing the user from the effort of re-entering the same list into multiple meters' configurations.

DNP Binary: Read Binary Outputs: Object 10:
This will indicate the status of any Digital I/O configured as Outputs. In the screen shot above, DIO Channels 1 through 6 were configured as Outputs.

DNP Binary: Read Binary Inputs: Object 02:
This will indicate the status of any Digital I/O configured as Inputs, Trigger Status for any alarm thresholds configured and Meter Status on things like Phase Status, Battery Status, Firmware Status, etc.

IEC-870-5-102

The IEC-870-5-102 protocol is included with IEC Meters. (not included with ANSI Meters)
Once you have selected to use the IEC-102 protocol in communication setup for Serial or Ethernet communications you can then configure these specific parameters:



IEC102 Settings

Receive Frame Size:
Max Receive Frame size [range:1-261]; Default :261.

Transmit Frame Size:
Max Transmit Frame size [range:1-261]; Default :261.

Incremental Timeout:
Incremental timeout in msecs. [range0-4147200]; Default :30.

Session Settings

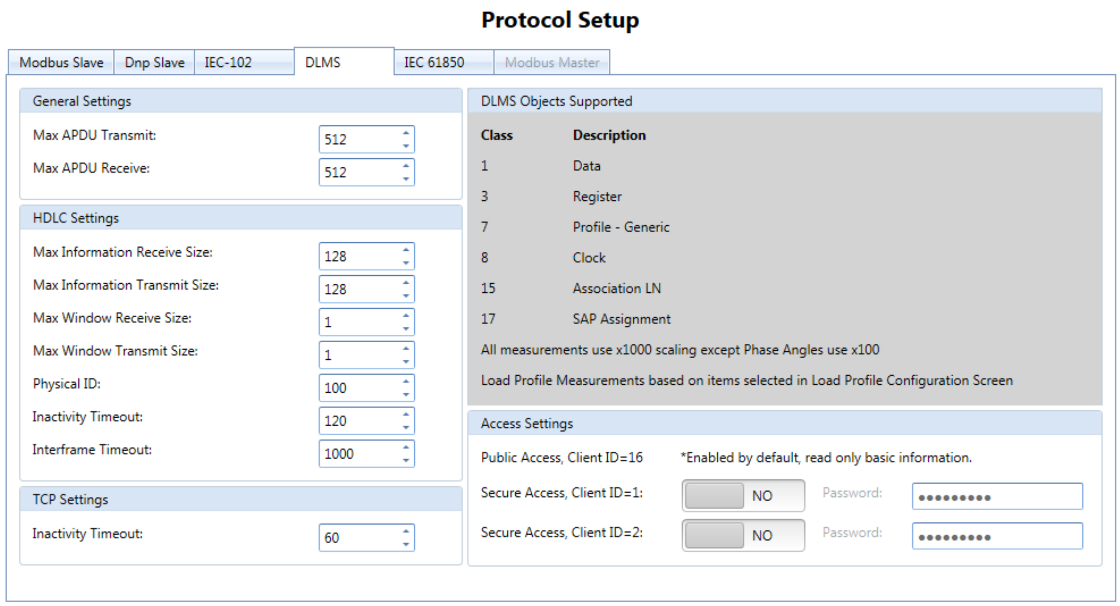
Session Link Address:
Session link address [range:1-65535]; Default :3.

Size of ASDU:
Max size of ASDU for session [range:1-256]; Default :255.

Note: For additional details on this protocol implementation, refer to Appendix G in this manual.

DLMS

DLMS is an optional protocol, normally used with IEC Meters.
Once you have selected to use the DLMS protocol in communication setup for Serial, Modem or Ethernet communications you can then configure these specific parameters:



In this DLMS implementation, we support a variety of measurements for Registers (IC3) and Load Profile (IC7). The list of available measurements including OBIS codes for both are shown in Appendix E of this manual.

Note: For Load Profile, the list of available measurements is based on the measurements configured in the Load Profile Screen.

General Settings

Max APDU Transmit:
Max APDU Transmit [range:0-65535]; Default :512.

Max APDU Receive:
Max APDU Receive [range:0-65535]; Default :512.

HDLC Settings

Max Information Receive Size:
HDLC Max Information size Receive; [range:64-2014]; Default :128.

Max Information Transmit Size:
HDLC Max Information size Transmit; [range:64-2014]; Default :128

Max Window Receive Size:

HDLC Max Windows size Receive. [range:1-7]; Default :1

Max Window Transmit Size:
HDLC Max Windows size Transmit. [range:1-7]; Default :1

Physical ID:
Physical ID for meter. [range:16-16381]; Default :100;

Inactivity Timeout:
Inactivity timeout in seconds. [range:0-65535]; Default :120;

Interframe Timeout:
HDLC inter octet/inter frame timeout in milli seconds. [range:20-6000]; Default :1000;

TCP Settings

Inactivity Timeout:
Inactivity Timeout for TCP in seconds. [range:0-65535]; Default :60;

Access Settings

Public Access, Client ID=16: (Current default – Public access)
This is the current default providing read option only for a list of basic objects like serial number, meter identification objects and meter time.
All other data objects will not be readable. Write/Set operation will not be allowed.

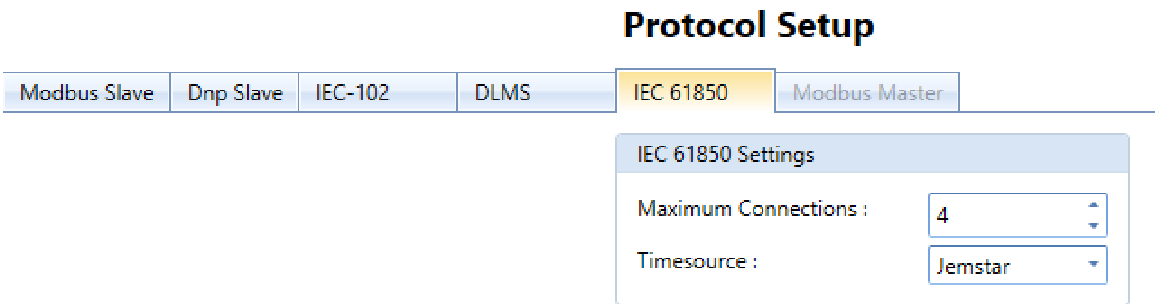
Secure Access, Client ID=1: (Read/Write access)
This will provide full access to all DLMS objects (Read DLMS objects, Set Time/Date.)
Password is required for accessing. (Default password will be set to ClientId1)

Secure Access, Client ID=2: (Read only access)
This will provide the ability to read all data objects, register objects, log objects, date and time.
User cannot set/modify the time/date object. Password is required for accessing. (Default password will be set to ClientId2)

Note: Only an ‘admin’ user will have the permission to turn on/off an association and to set/reset the password. To reset a lost or forgotten Client ID password a user will need to coldstart the meter. This will set the Secure Access settings and passwords back to defaults.

IEC 61850

IEC 61850 is an optional protocol that can be included with the meter.
Once you have selected to use the IEC 61850 protocol in communication setup for Ethernet communications you can then configure these specific parameters:



IEC 61850 Settings

Maximum Connections:
Max number of client connections allowed [range:1-10]; Default :4.

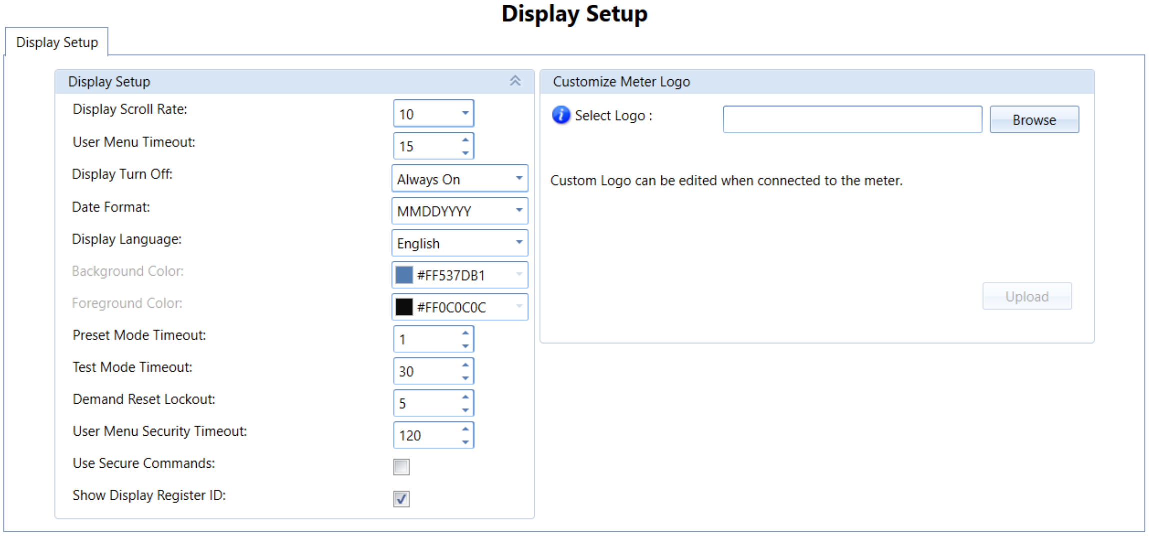
Timesource:
Timestamp to use for subscribed GOOSE packets.

When configuring a meter with IEC-61850, you will need to set up the IEC-61850 implementation using the Ametek IED Configuration Software. For additional details on the IEC-61850 Implementation, refer to Appendix F in this manual.

DISPLAY SETUP

Use this configuration menu to set up how the meter will display information on the Meter's LCD panel.

Display Setup



Display Scroll Rate (sec)

Enter a numeric integer for the number of seconds that the LCD will display each register before scrolling to the next one. The Scroll Rate can be selected from 1 – 20 seconds. To turn this feature off so that only the manually selected register is displayed, choose No in the pull-down menu.

User Menu Timeout (minutes)

Enter or scroll the time desired for the user menu time out.

Display Turnoff (minutes)

Enter or scroll the time desired for the display to automatically go blank. When you press a user button on the display (Read, Reset or arrow button) the display will turn on. If you don't want the screen to go blank, select 'Always on'.

Background Color (Future)

Use the pull-down menu to choose the background color.

Foreground Color (Future)

Use the pull-down menu to choose the foreground color.

Date Format

Use the pull-down menu to choose how you want the date displayed. Choices are MMDDYYYY, DDMMYYYY, or YYYYMMDD (where M=month, D=day, and Y=year). This will update the Date/Time format across all meter events and meter data.

Preset Mode Timeout

Enter a number (1–60) for the number of minutes that the LCD will display a Preset quantity before automatically returning to the standard display mode.

Test Mode Timeout

Enter a number (1–1000) for the number of minutes that the LCD will remain in Test Mode before automatically returning to the standard display mode.

Demand Reset Lockout

This also is referred to as a Billing Period Reset Lockout. The purpose is to eliminate accidental multiple BPR commands that could cause a loss of data. The Lockout only affects actions from the meter's front panel; a command from JEMRead will override the lockout and initiate a BPR. Enter a number (0–60) for the number of minutes that you must wait before the next BPR is valid.

User Menu Security Timeout

Adjust the amount of inactivity time before you must re-enter the username and password to make further changes.

User Secure Commands

Select to use secure commands when transmitting measurement data.

Show Display Register ID

Select to show or hide the Display Register ID on the meter front panel.

Customize Meter Logo

Your own logo can be uploaded to the meter and displayed on the meter's LCD panel. You must be connected to the meter when selecting a file to upload. The file must be in bmp format and sized 150 pixels wide by 35 pixels high.

Transformer Loss Compensation

Transformer Loss Compensators are defined in the IEEE Standard Dictionary of Electrical and Electronic Terms (reference 1) to be:

> "A(n)… electric network that is connected in series-parallel with a meter to add or subtract from the meter registration active or reactive components of registration proportional to predetermined iron and copper losses of transformers and transmission lines."

Typically, power dissipated in the transmission lines and in the cores of transformers cannot be measured by meters connected to the transformer secondary circuits. The technique of Transformer-Loss Compensation has been developed over the years to electrically or computationally account for the lost active and reactive power.

A set of equations has been derived which describes the amount of active (Watts) and reactive (VARs) power lost due to both copper and iron effects.

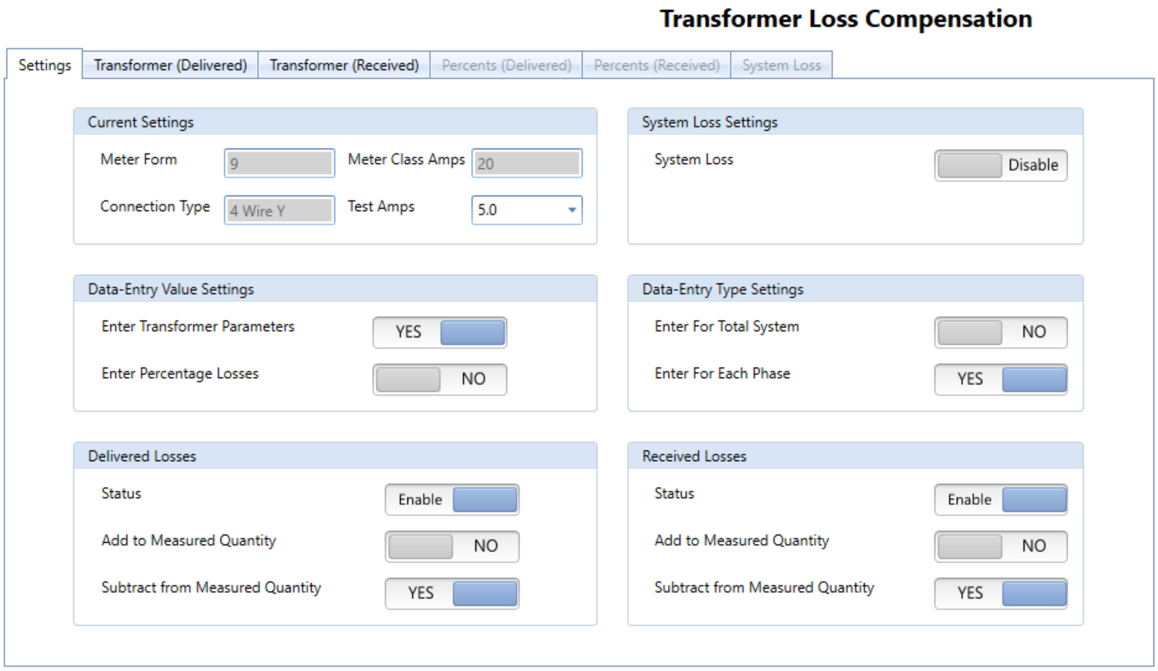
Loss Compensation in the meter is a mathematical method used to determine the amount of power loss in a transformer and power lines. This is a significant factor when you are using the meter to measure a large load (secondary side), and the utility billing point is prior to the transformer (primary side). Transformer losses such as hysteresis and eddy currents will affect the reading obtained at the meter and create a deviation from the utility reading.

Power transformers are tested for losses by the manufacturer prior to shipping, and test results are usually provided for each transformer. You will need specific data concerning the transformers involved. If specific test reports are not available, you may be able to obtain information from the transformer data plate.

When the proper information is entered on the Transformer Loss Compensation page, the meter will calculate and add or subtract the transformer and line losses to the actual reading at the meter. The resultant output of the meter will accurately reflect the amount of power used prior to the transformer. Transformer Loss Compensation is an optional configuration and can be enabled or disabled at any time.

Using Transformer Loss Compensation

Choose Transformer Loss Compensation from the navigation pane.



The following selection windows are used for configuring Transformer Loss Compensation:

Settings: Select the way by which you will enter transformer loss data.

Transformer (Delivered): Used to configure power sent to a load by entering transformer data. These values are typically added to the measured Watts and VARs (although JEMWare II permits adding or subtracting). If Enter Percentage Losses is selected on the Settings page, this page is left blank.

Transformer (Received): Used to configure power received from a load by entering transformer data. These values are typically subtracted from the measured Watts and VARs (although JEMWare II permits adding or subtracting). If Enter Percentage Losses is selected on the Settings page, this page is left blank.

Percents (Delivered): Used to configure power sent to a load by entering the percentage of compensation required at the Test Amps value selected on the Settings page. If Enter Transformer Parameters is selected on the Settings page, this page will display a summary of the loss percentages calculated from transformer data.

Percents (Received) is used to configure power sent to a load by entering the percentage of compensation required at the Test Amps value selected on the Settings page. If Enter Transformer Parameters is selected on the Settings page, this page will display a summary of the loss percentages calculated from transformer data.

System Loss is used to deduct power losses above and beyond the transformer loss compensation. It could be losses associated with the wires, connectors or other equipment that could be drawing some load.

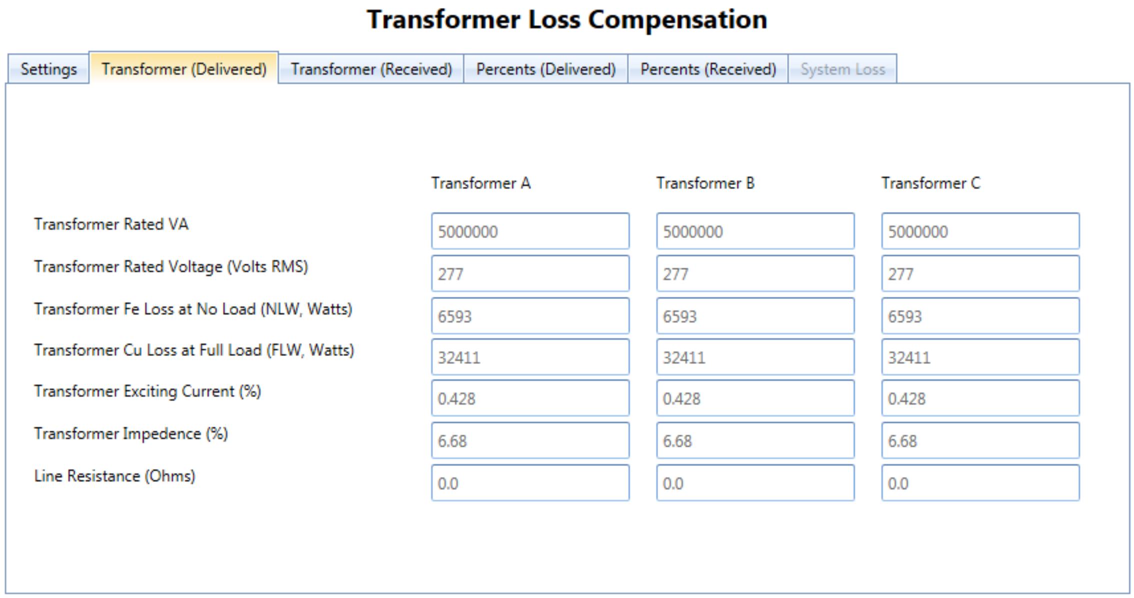
Setting up Loss Compensation

- Select the Settings tab.
- If you want to enter transformer data, select Enter Transformer Parameters.
- If you want to enter loss percentages directly, select Enter Percentage Losses.
- If you want to enter a single set of Transformer data or loss percentages that will apply to all phases, select Enter for Total System.
- If you want to enter loss data for each phase individually, select Enter for Each Phase.
- At Test Amps, select the test current at which percent losses will be entered or displayed.
- If you want to compensate received power status, select Status under Received Losses, and choose whether to add or subtract compensation from measured quantities.
- If you want to compensate delivered power flow, select Status under Delivered Losses, and choose whether to add or subtract compensation from measured quantities.

If you selected Enter Transformer Parameters:

A) Select the Transformer (Delivered) or Transformer (Received) tabs as shown, depending upon power flow.

B) If your transformer test data sheet provides data for the entire multi-phase transformer bank, or if a common core 3-phase transformer is used, select Enter for Total System on the Settings page and enter the values in the fields indicated. Enter the appropriate data in the three columns of edit fields labeled Transformer A, B, and C. Transformer rating information should be taken from the transformer test data sheet (see the following example), or transformer rating plate. Each value to be entered is per phase if you selected Enter for Each Phase on the Settings page. Use separate values for individual transformer units.



Transformer Rated VA: VA rating of the transformer tap used. This is a PER PHASE value, not the VA rating of the entire 3-phase bank or common core transformer. Data must be entered as VA (not kVA). In the following example, the total is 27,000,000VA. Divide the total by three phases and enter 9,000,000 in each field of the screen above. When you click OK to accept the entries, the number is displayed exponentially.

Transformer Rated Voltage: Rated voltage of the transformer. Use line to neutral voltage for 4-wire Wye (Forms 6 and 9), or 3-wire Network (Form 5 meter configured for network) services. Use line to line voltage for 3-wire and 4-wire Delta, and 3-wire ungrounded Wye services (Form 5 meters configured for Delta, Open Delta, or 3-wire Wye).

Transformer Fe loss at No Load: PER PHASE no load loss watts at rated voltage. This represents the watts loss due to the transformer core.

Transformer Cu loss at Full Load: PER PHASE loss watts at rated voltage and rated VA. This represents the watts loss due to the transformer windings.

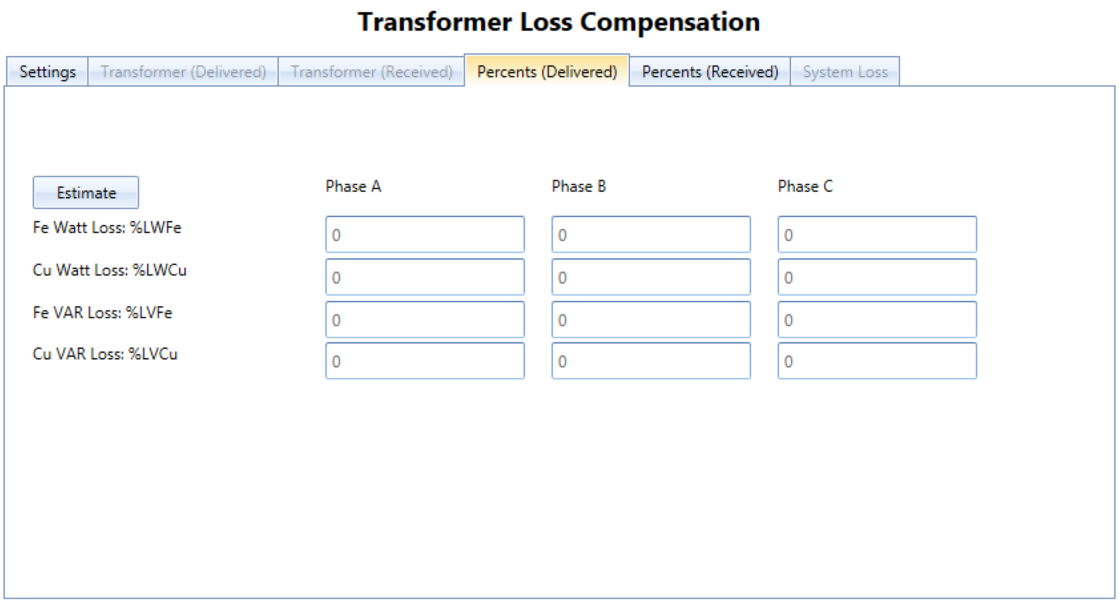
Transformer Exciting Current: % exciting current at rated voltage expressed as a percentage of the rated VA. This represents the VA loss due to the transformer core.

Transformer Impedance: % impedance at rated voltage and rated VA expressed as a percentage of rated VA. This represents the VA loss due to the transformer windings.

Line Resistance: Enter the total DC resistance (Ω) of the lines between the transformer secondary and the CT primary.

***NOTE**: The Line Loss entry is not required for JEMWare II to calculate Transformer Loss Compensation.*

If you selected Enter Percentage Losses:



- Select the Percents (Delivered) or Percents (Received) tab as shown above, depending upon power flow.

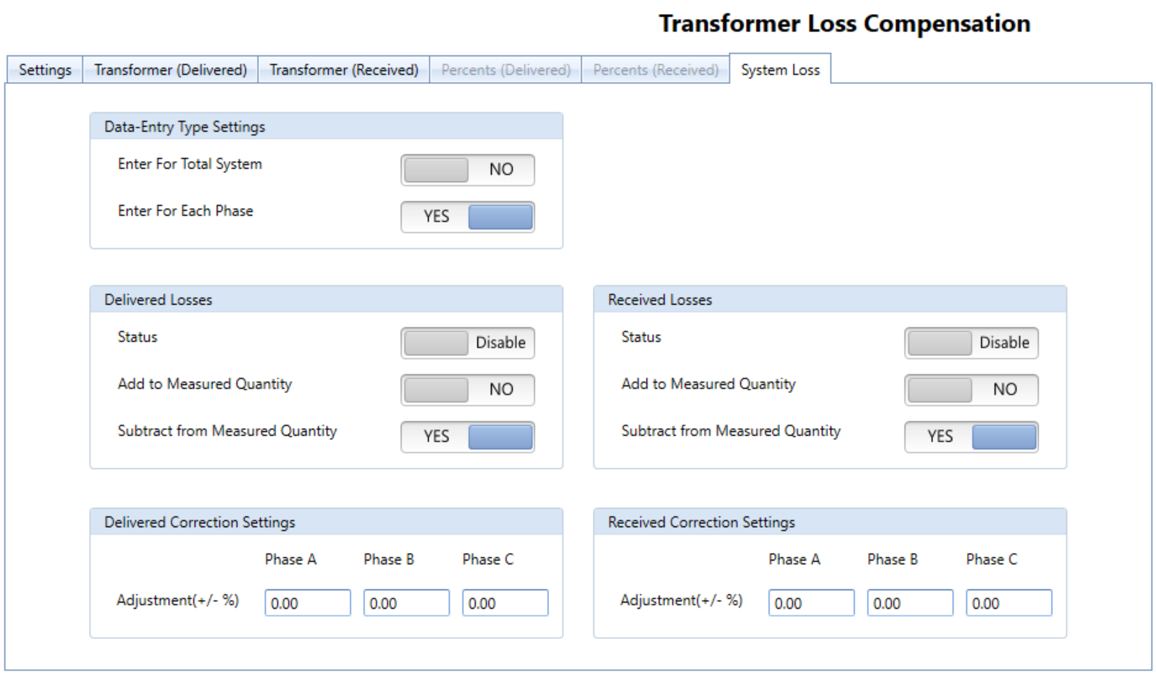
- Enter the desired percent losses in the fields indicated.
  Fe Watt Loss (Iron)
  Cu Watt Loss (Copper)
  Fe VAR Loss (Iron)
  Cu VAR Loss (Copper)

- Enter the percentages desired when the meter is operating at the Test Amps selected on the Settings page and the Nominal Voltage entered on the Primary Configuration screen.

If you selected Enter Transformer Parameters on the Settings page, this page will only display the percentages calculated from the transformer data entered elsewhere. It will not allow changes to be made to the displayed values.

Configuring System Loss:
When configuring System Loss, you enter a flat percentage loss, and this would be applied in conjunction with any losses already calculated by TLC. The calculated loss would be applied to the measurement over the full range from 0 to full scale after any TLC Calculation. Similar to TLC, this would be applied to display registers, Load Profile, Analog Outputs, KYZ Outputs and meter protocols if TLC was enabled for these items.

To configure System Loss, you need to enable the System Loss configuration on the General Settings page for Transformer Loss. This will unlock the System Configuration page shown below.



System Loss settings can be entered per phase as shown above or as a total for all 3 phases. There are separate configurations for delivered and received losses and you can add or subtract the loss values as shown.

The Meter will operate in the following modes:

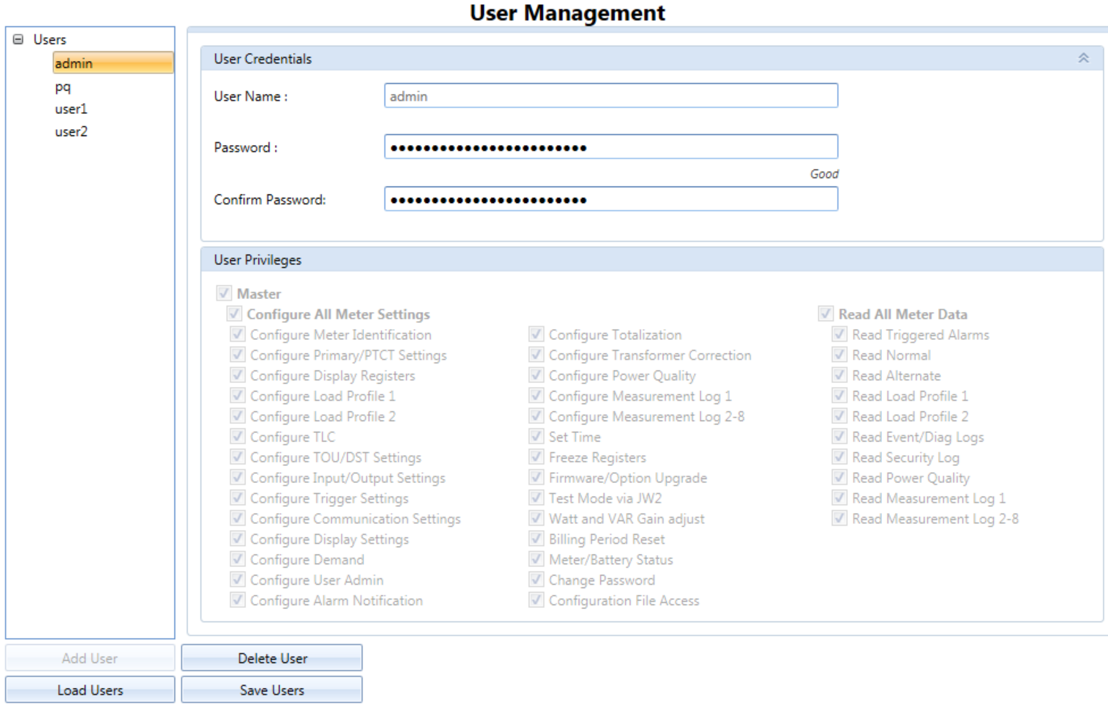
- No System Loss & No TLC
- TLC Only
- System Loss Only
- System Loss & TLC

When configuring meter measurements (registers, load profile, etc.), the TLC selection will apply to both TLC and System Loss depending on if one or both is enabled.

User Management

The list of privileges associated with each Meter Password is stored in the .xml configuration file. This menu selection associates a custom list of privileges to each Meter Password. Only the Admin meter password will allow changes to privileges. If you use an incorrect password level to perform a download, you will receive an error message.

User Management



Admin Password

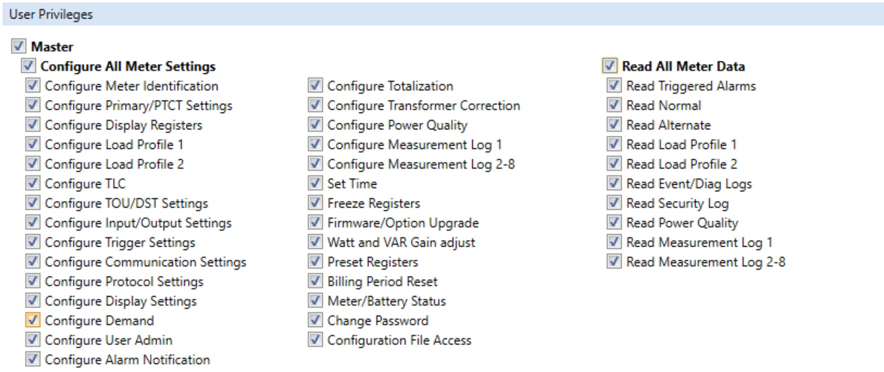
The Master password provides access privileges for all program features. The password can be up to 32 characters. To change the privilege list for all passwords you must login to JEMWare II using an Admin level password.

- The Admin level allows access to all the features.
  Passwords can be changed. (All meter configuration settings are enabled)

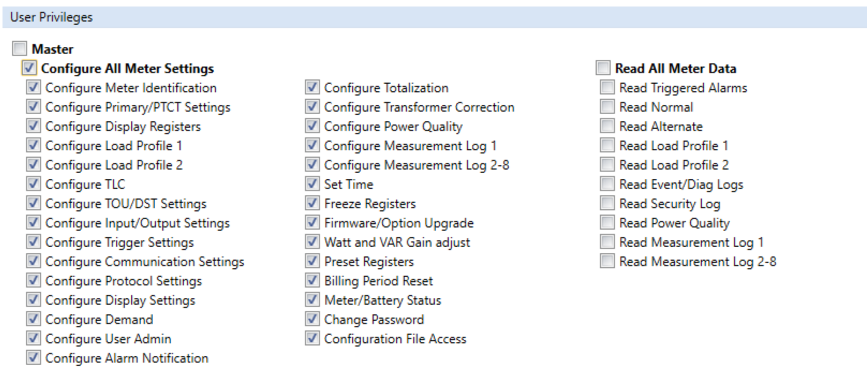
Other Users

For other users, there is an associated list of features that can be selected. If the user attempts an operation not allowed by the current session password, that operation will fail, and a failure status will be recorded in the Log for the user to view. Failed operations do not affect the success or failure of subsequent operations.

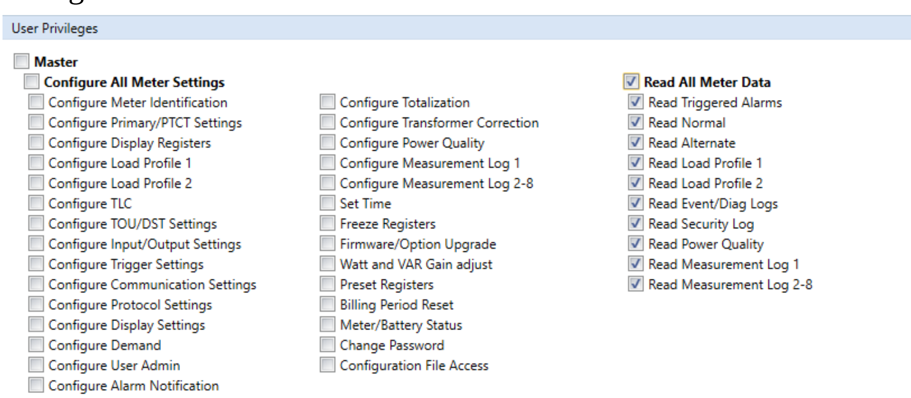
Groups and individual features can be separately assigned to each user. To assign Master privileges to another user you can select the Master checkbox and it will enable all privileges:



If you select the Configure All Meter Settings, it will select all privileges related to the meter configuration.



Alternatively, you may want to just setup a user that is only able to read meter configurations.



Note: JEMWare II supports up to 10 Username/Password combinations.

User Management Settings

User Management and JEMWare II Software Access

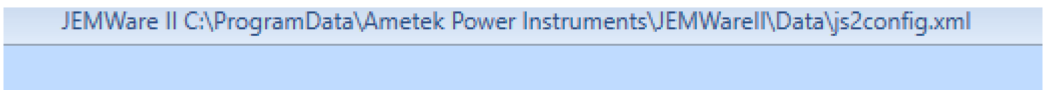
When creating a meter configuration, you can assign up to 10 different Username/Password combinations. These meter username/passwords are also used for logging into the JEMWare II Software.

When you log into the JEMWare II Software with a username/password, this same username/password combination is also used to connect to the meter.

For example, if you log into the JEMWare II Software with password *user2*, then it would be enabled to connect to a meter with password: *user2*

The passwords used for logging into the JEMWare II software are controlled by the JEMWare Default Config File: js2config.xml (User Management Screen)

When you start up JEMWare II it automatically starts with js2config.xml which is displayed at the top of the page.



Any passwords set in the User Management screen for your meter should be copied to the JEMWare Default Config File: **js2config.xml**

Configuration Permissions on Linked screens

Some configuration features rely on other configuration screens for sharing data. For example, the Trigger configuration screen is linked to the Protocol settings as you can have triggers selected as Binary Alarms. The Trigger screen is also linked to Power Quality, it uses details from the trigger set up. So, if you want to allow the changing of Trigger settings, you will need to enable Protocol and Power Quality settings for that user. If not, you will get a message that you don't have authority to make this change. The table below shows which main configuration screens are linked to other ones.

Primary Configuration Screen	Secondary Configuration Screen	Secondary Configuration Screen
Display Registers	Protocol	Input / Output
Input / Output	Protocol	
Triggers	Protocol	Power Quality

Reading the Meter Configuration

To read the meter configuration from a meter in JEMWare, the Username/Password needs to have the 'Read All Meter Data' selection enabled.

- [x] **Read All Meter Data**
  - [x] Read Triggered Alarms
  - [x] Read Normal
  - [x] Read Alternate
  - [x] Read Load Profile 1
  - [x] Read Load Profile 2
  - [x] Read Event/Diag Logs
  - [x] Read Security Log
  - [x] Read Power Quality
  - [x] Read Measurement Log 1
  - [x] Read Measurement Log 2-8

Writing the Meter Configuration

You can send configuration changes to a meter in JEMWare II using the 'Send to Meter' selection on each configuration page assuming your username/password allows you to make that specific change. You can also 'Write' the entire configuration file to the meter if your username/password provides access to all configuration items.

Restricting Configuration File Access

There is a User Management selection for Configuration File Access. When a user does not have 'Configuration File Access', they will not be able to view or edit any meter configuration file or configuration from a meter when signing into JEMWare II with their unique Username/Password.

When this user is responsible for writing configurations to the meter but doesn't have access to view or edit the meter configuration, you can disable the 'Configuration File Access' for this user but allow the meter configuration access so they can write the configuration to the meter.

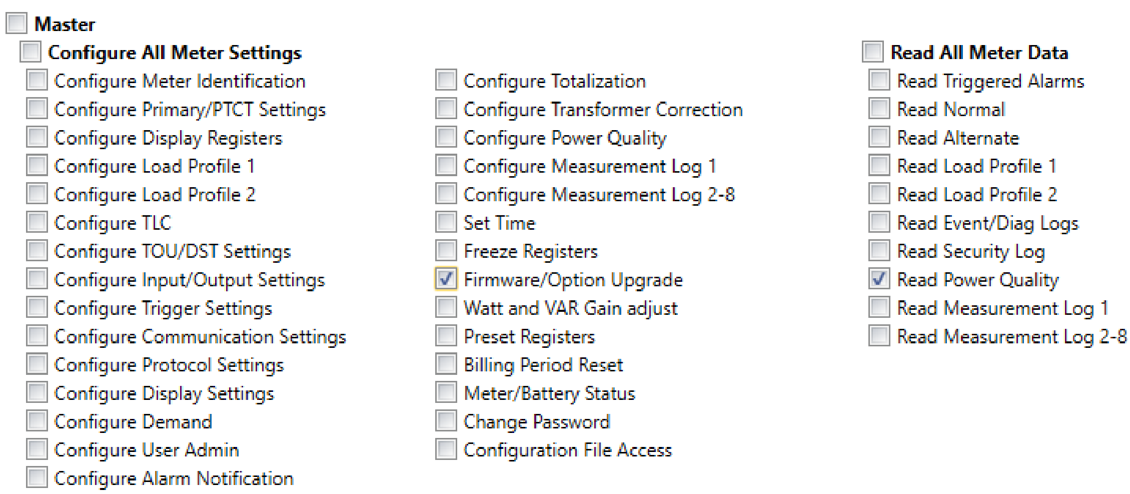
- [ ] **Configure All Meter Settings**
  - [x] Configure Meter Identification
  - [x] Configure Primary/PTCT Settings
  - [x] Configure Display Registers
  - [x] Configure Load Profile 1
  - [x] Configure Load Profile 2
  - [x] Configure TLC
  - [x] Configure TOU/DST Settings
  - [x] Configure Input/Output Settings
  - [x] Configure Trigger Settings
  - [x] Configure Communication Settings
  - [x] Configure Protocol Settings
  - [x] Configure Display Settings
  - [x] Configure Demand
  - [x] Configure User Admin
  - [x] Configure Alarm Notification
  - [x] Configure Totalization
  - [x] Configure Transformer Correction
  - [x] Configure Power Quality
  - [x] Configure Measurement Log 1
  - [x] Configure Measurement Log 2-8
  - [x] Set Time
  - [ ] Freeze Registers
  - [ ] Firmware/Option Upgrade
  - [ ] Watt and VAR Gain adjust
  - [ ] Preset Registers
  - [ ] Billing Period Reset
  - [ ] Meter/Battery Status
  - [x] Change Password
  - [ ] Configuration File Access

Configuration Changes via the Meter User Display
Some configuration settings can be performed on the meter User Display, so the same username/passwords used in JEMWare II are required for this. The configuration changes from the meter display can be disabled through the security jumper. (Refer to the meter user manual)

User Management on other Applications (other than JEMWare II)
If accessing the meter from other applications like a WEB Browser or secure FTP application, the meter User Management settings provide access with the username/passwords configured.

The WEB Browser can be used to retrieve PQDIF files from the meter if the Username/Password used to log into the WEB Browser has ‘Read Power Quality’ enabled. Similar for downloading new meter Firmware to the meter using the WEB Browser, the ‘Firmware/Option Upgrade’ must be enabled for that user.

If using a secure FTP application to retrieve the PQDIF Files from the meter, you must enter the username/password that has ‘‘Read Power Quality’ enabled.



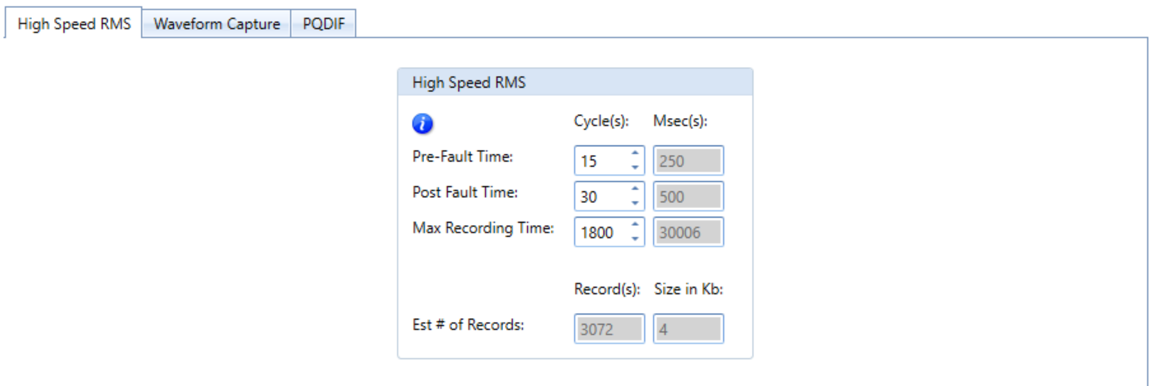
POWER QUALITY (OPTION)

The configuration of the power quality recordings and data retrieval is provided with these screens. The configuration consists of settings for the High Speed RMS (Option PQ1, PQ3) Waveform Capture (Option PQ2, PQ3) and for selecting the recording parameters of the PQDIF File used for storage of power quality data.

High Speed RMS

The settings for High Speed RMS apply to any alarm trigger that has High Speed RMS selected. The High Speed RMS consists of RMS voltage and current per phase recorded every half cycle (2 measurements per cycle). The power quality data is saved in PQDIF Format inside the meter.

Power Quality



The configuration settings are in cycles and the corresponding time in msec is shown (based on whether your meter is set up for 50 or 60 Hz).

Pre-Fault Time:

The recording starts prior to the alarm trigger using the pre-fault time which can be selected from 0 to 30 cycles for 60HZ. (0-25 cycles for 50HZ)

Post Fault Time:

When the trigger clears, we will continue to record for the duration of the post fault time which can be selected from 0 to 60 cycles for 60HZ. (0-50 cycles for 50Hz)

Max Recording Time:

You can set a maximum recording time from 60 to 3600 cycles for 60Hz. (50-3000 cycles for 50HZ) The max recording time includes the pre-fault, post fault and duration of the alarm trigger. The actual recording time can be less than the maximum selected, but never longer. If an event exceeds the maximum time, it will record the pre-fault followed by the event duration up to the maximum time. For example, using the settings shown above; if the trigger lasted 1,770 cycles; it would record 15 cycles pre-trigger, 1,770 cycles of the event and 15 cycles post trigger.

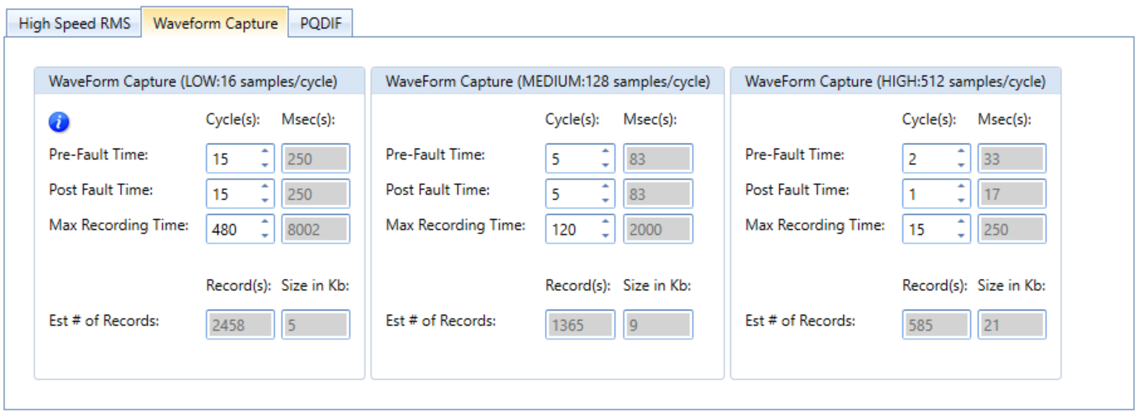
Est # of Records:

The configuration screen shows an estimate of how many records can be stored in the meter and the size of each record based on the configuration settings. The calculations are based on using compressed files (see PQDIF section) and contingent on other recording parameters such as wave form capture.

Waveform Capture

The settings for Waveform Capture apply to any alarm trigger that has Waveform Capture selected. The Waveform Capture consists of voltage and current per phase recorded at a Low, Medium or High Resolution Sampling rate. The trigger settings include a selection for Low/Med/High recording. If the trigger doesn't select one of the 3 recording resolutions, the configuration will be ignored. It is possible to have separate triggers with each of the different recording resolutions.

Power Quality



The configuration settings are in cycles and the corresponding time in msec is shown (based on whether your meter is set up for 50 or 60 Hz).

Pre-Fault Time:

The recording starts prior to the alarm trigger using the pre-fault time selected.

Post Fault Time:

When the trigger clears, we will continue to record for the duration of the post fault time selected.

Max Recording Time:

The max recording time includes the pre-fault, post fault and duration of the alarm trigger. The actual recording time can be less than the maximum selected, but never longer. If an event exceeds the maximum time, it will record the pre-fault followed by the event duration up to the maximum time.

Est # of Records:

The configuration screen shows an estimate of how many records can be stored in the meter and the size of each record based on the configuration settings. The calculations are based on using compressed files (see PQDIF section) and contingent on other recording parameters such as High Speed RMS recording.

Waveform Capture Settings

The available selections for the different recording modes can be seen by hovering the mouse over any configuration selection. The available recording times in cycles are shown below.

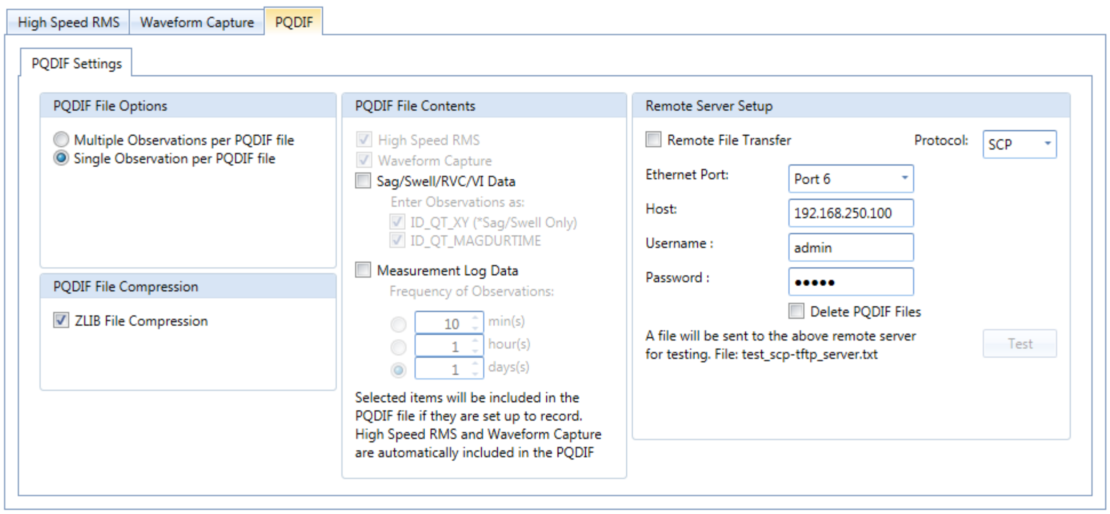
Recording Rate	Low (16 s/c)	Medium (128 s/c)	High (512 s/c)
Pre-Fault Time	30 (25)	10 (8)	5 (4)
Post Fault Time	30 (25)	10 (8)	5 (4)
Max Recording Time	960 (800)	240 (200)	30 (25)

60HZ (50HZ)

PQDIF

This configuration screen is used to set up the storage of your PQDIF file and the automatic download of PQDIF Files from the meter to your Server. If the meter is not equipped with the PQ Options (PQ1, PQ2, PQ3), you can still use this for Sag/Swell data which is always included in the meter.

Power Quality



PQDIF File Format

PQDIF (Power Quality Data Interchange Format) IEEE 1159.3 is a non-proprietary file format used for storing power quality data. It uses a standardized format for saving power quality information so different manufactures can present the data in one common format. While similar to the concept of COMTRADE which is a common open format for saving fault data, PQDIF is specifically designed for the type of data collected for power quality applications. The power quality data collected by the JEMStar II meter consists of an Observation, Quantity and Channel.

Observation	**Quantity**	**Channel**
PQ Data Type	Type of Recording	Individual Measurements
Triggered Recording	XY = Sag/Swell Record	Volts Phase A,B,C Amps Phase A,B,C VTHD Phase A,B,C ATHD Phase A,B,C Power Factor Phase A,B,C Frequency Phase A (provided with min/max/avg)
	MagDurTime = Sag/Swell Record MagDurTime = Ra[id Voltage Change MagDurTime = Voltage Interruption	Volts Phase A,B,C
	Phasor = High Speed RMS Recording	Volts Phase A,B,C Amps Phase A,B,C Phase Angle A,B,C
	Waveform = Waveform Capture Record	Volts Phase A,B,C Amps Phase A,B,C

Continuous Recording	Value Log = Measurement Log	Any measurement configured in the measurement logs
Each one is labeled with the Time and Date of occurrence		

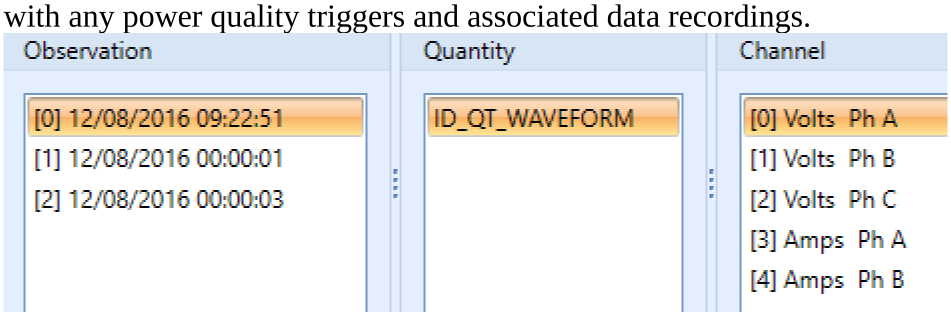
With the above structure, it is possible to have a single PQDIF File that contains multiple observations and multiple recording methods. It provides a complete picture of the power quality anomaly.

PQDIF File Options

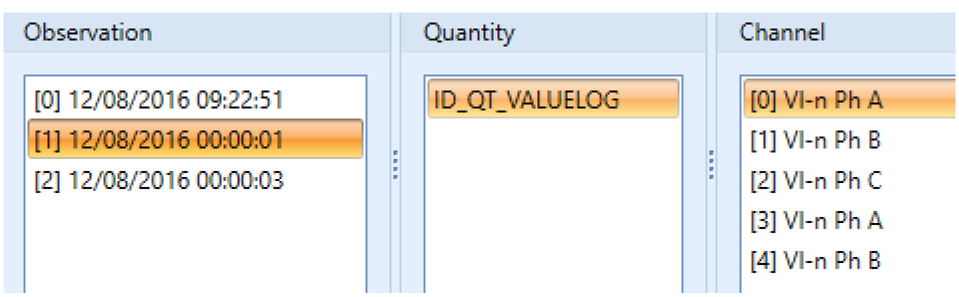
This configuration is used to select how frequent the PQDIF File is created inside the meter.

Multiple Observations per PQDIF File

This file will include any PQ recordings saved by the meter for the 24-hour period starting at midnight. If nothing is recorded, there will be no PQDIF file created. In this mode, a typical PQDIF File might include the 24-hour measurement log along with any power quality triggers and associated data recordings.



Example of a single PQDIF File displayed in JEMWare II Software. It has three observations over the 24-hour period. First observation at 12/08/2016 09:22:51 has a waveform capture.

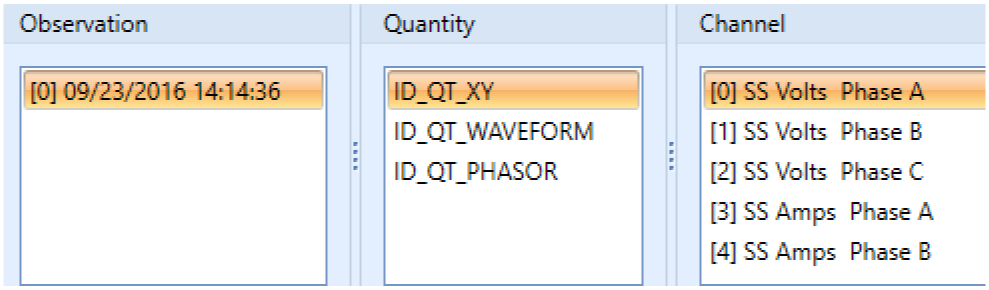


The second observation at 12/08/2016 00:00:01 contains the 24-hr. measurement log. If two measurement logs are used, there will be a separate observation for each 50 channel log.

Note*: The PQDIF File has a maximum size of 500K. In cases where the number of observations stored for this 24-hour period exceeds the 500K, a separate file(s) will be created to store the information.*

Single Observation per PQDIF File

In this mode, the PQDIF file will be generated upon every observation. An observation could be a trigger and associated data recordings. If a single trigger initiated the recording of a Sag/Swell Record, Waveform Capture and High-Speed RMS recording, all three would be included in the same observation. If the measurement log is included in the PQDIF file, it will be a separate PQDIF File generated at whatever interval is configured.



Example of a single PQDIF File with a single observation that contains a Sag/Swell Record, Waveform Capture and High-Speed RMS recording.

PQDIF File Compression

The JEMWare Software and many other applications support the use of compressed PQDIF Files. This allows you to store many more files in the meter. Only use 'non-compressed' files if using this with applications that don't support the compressed format.

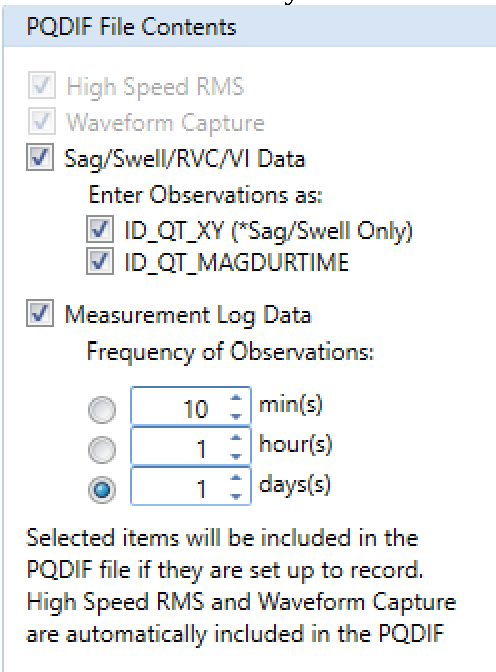
PQDIF File Contents

This configuration is used to select the different types of power quality recordings that will be included in the PQDIF File. The selections are:

- High Speed RMS
- Waveform Capture
- Sag/Swell Data
    - ID_QT_XY
    - ID_QT_MAGDURTIME
- Measurement Log

The High-Speed RMS and Waveform Capture are automatically selected as this is the only method available for storage. The measurement Log and Sag/Swell data is optional for PQDIF as we have separate internal logs in the meter for this data. The MAGDURTIME quantity is used for Sag/Swell. Rapid Voltage and Voltage Interruption events.

If Measurement Log is selected, you can choose the recording interval for each observation from every 10 minutes to 1 observation every 7 days.



In regards to the measurement log frequency of observations for the PQDIF File options of ‘Single Observation per PQDIF File’ and ‘Multiple Observations per PQDIF File’, refer to the ‘use’ cases below:

For a measurement log setting of 1 day per observation as shown in the screenshot above; the two file saving options will operate as follows.

Multiple Observations per PQDIF File
At midnight, a single PQDIF File will be generated consisting of an observation(s) of the 24-hour measurement log and any other observations that occurred in the previous 24 hours. If multiple Measurement Logs are used, then there will be a separate observation per log. (up to 8 logs of 50 channels each)

Single Observation per PQDIF File
At midnight, a PQDIF File will be generated consisting of an observation of the 24-hour measurement log. If multiple Measurement Logs are used, then there will be a separate PQDIF File per log. (up to 8 logs of 50 channels each)

For a measurement log setting of 1 hour per observation; the two file saving options will operate as follows.

Multiple Observations per PQDIF File
At midnight, a single PQDIF File will be generated consisting of 24 one hour observation(s) of the measurement log and any other observations that occurred in the previous 24 hours. If multiple Measurement Logs are used, then there will be a separate observation per log per hour. (up to 8 logs of 50 channels each)

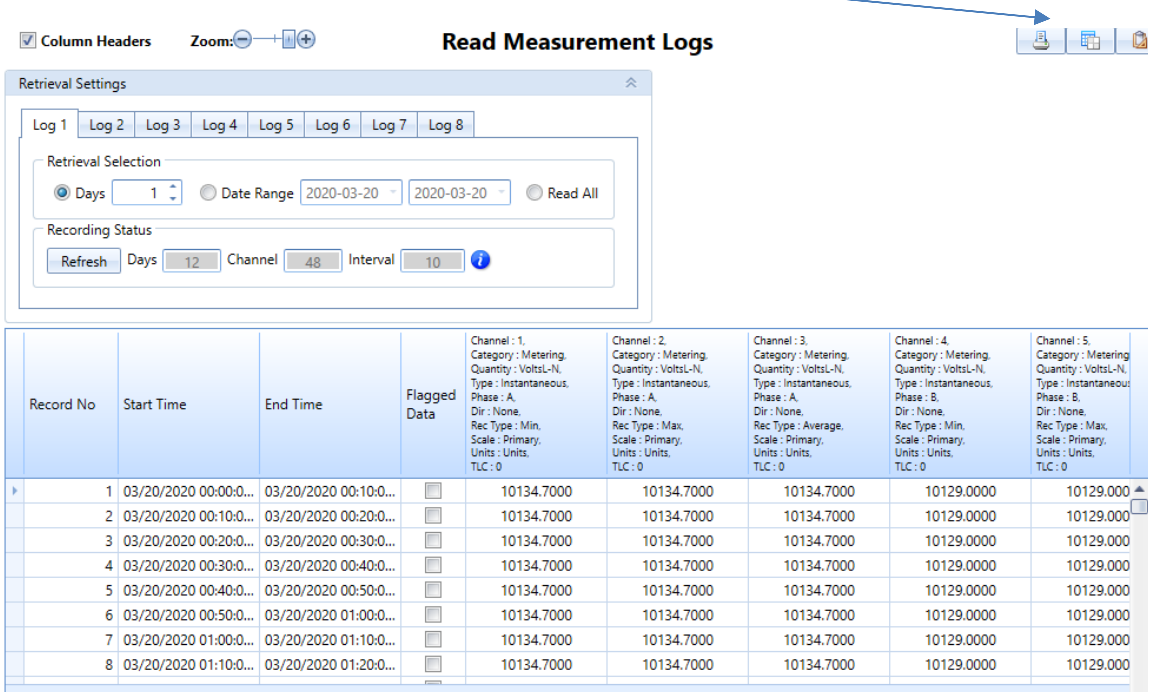
Single Observation per PQDIF File
Every hour, a PQDIF File will be generated consisting of an observation of the previous hour measurement log. If multiple Measurement Logs are used, then there will be a separate PQDIF File per log per hour. (up to 8 logs of 50 channels

each) If all 8 logs are used, you will have 8 PQDIF Files per hour for the measurement logs + any additional files for other observations that occur (sags/swells, etc.).

Note: The meter must be enabled with the necessary options (PQ1, PQ2, PQ3, ML) in order to get PQDIF files for High Speed RMS, Waveform Capture and Measurement Log.

Recommended Settings: The selection of a single PQDIF file per observation or multiple PQDIF files per observation depends on your ability to respond to PQ concerns in real time as they occur. If you are OK getting a report of the previous day's PQ events and measurements, then a setting of Multiple Observations per PQDIF file and a '1 day' measurement log would suffice.
If you want real time reporting of PQ issues as they occur, then select the single observation per PQDIF File. When doing this, you should set the frequency of Measurement logs depending on how frequently you require this data. In many cases, a 24-hour log is suitable but if you have an automated software to store these values, then you can select something else up to every 10 minutes.

Note: The measurement log is also provided in a format that can be retrieved at any moment using the JEMWare II Software. The JEMWare II Software can log up to 3 years of measurements and it is updated continuously. The measurement data retrieved can be saved and exported into a Microsoft Excel or csv format.



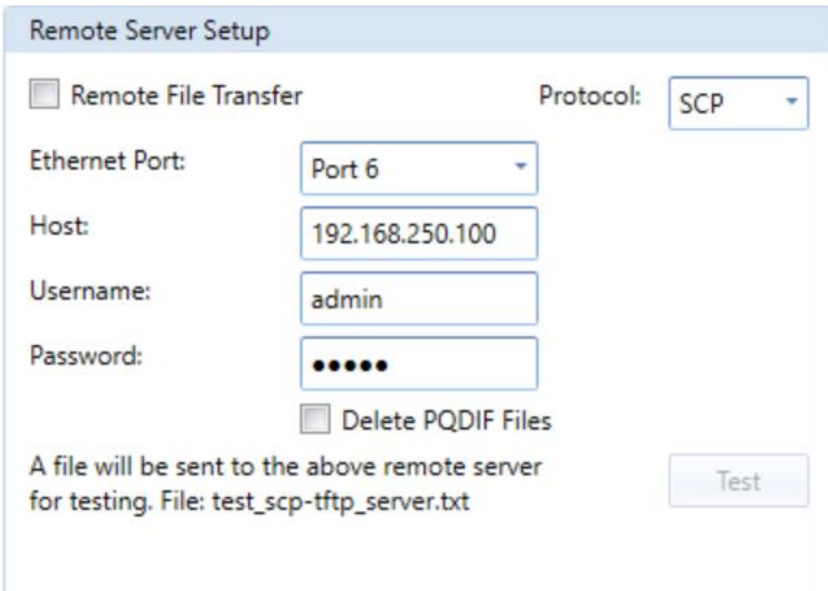
The measurement log has a column for flagged data to indicate that a voltage sag/swell or interruption occurred within that recording interval. This is used to highlight the data recorded during that event in case it falls outside of typical trend data.

Remote Server Set-up

The PQDIF Files generated by the meter can be retrieved in three different ways:

- Manual Retrieval via JEMWare
- Scheduled Retrieval JEMWare
- Automatic Retrieval

The Remote Server configuration is used to set up the automatic download of PQDIF Files from the meter to your Server. If the PQDIF Files are generated once a day, you will get the file right after midnight. If the PQDIF Files are generated for every Observation, they will be sent after all the data is captured.

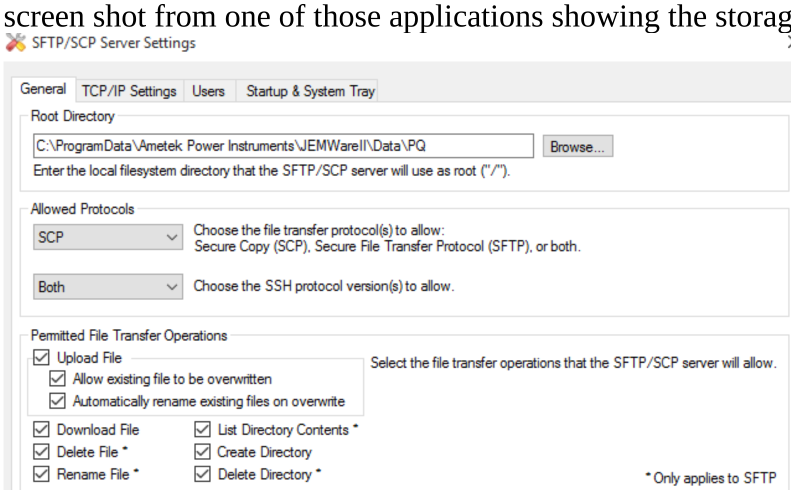


Remote File Transfer

Select this to start the automatic retrieval of PQDIF Files.

Protocol

You can select the protocol used for File Transfer as FTP (File Transfer Protocol) or SCP (Secure Copy Protocol). The remote server must be equipped with an application that can accept the FTP or SCP File Protocol and store it in a directory of your choosing. This is a screen shot from one of those applications showing the storage location of PQDIF Files.



Ethernet Port
If the meter is equipped with a single Ethernet Port, the only choice available is Port 6. For meters equipped with the Dual Ethernet Option, the choice for sending PQDIF files can be either Port 6 or Port 7.

Host
This is the IP Address of the Remote Server

Username
This is the username of the meter that can read power quality data.

Password
This is the password of the meter that is associated with the username selected.

Delete PQDIF Files
When enabling this, the PQDIF File will be deleted from the meter after it is sent to the server.
Note: The PQDIF File storage is non-volatile memory with a FIFO buffer where the oldest records will be overwritten.

Test
This will verify that the configuration used for the automatic retrieval is set up correctly at the meter and at the remote server. A sample file is sent after pressing test.

PQDIF File Naming Convention

The PQDIF files generated by the meter follow a naming convention that include the meter serial number, time and date of the event and type of data recorded.

The file name format used is: YYMMXXXXX_TimeStamp_microsecond_DataType.pqd

Where:

- YYMMXXXXX
  Serial number of the meter; with spaces removed

- TimeStamp
  10 digit time format (number of seconds elapsed since Jan 1, 1970) of when this file was created

- Microsecond
  Variable length number 0->999,999 indicating the microsecond of the TimeStamp when the first event occurred

- DataType
  A number representing the type of data stored in this file. See table below.

Single PQDIF File Generated by Observation	
01	Sag/Swell Recording
02	Waveform Capture
03	Sag/Swell and Waveform Capture
04	High Speed RMS
05	Sag/Swell and High Speed RMS
06	Waveform Capture and High Speed RMS
07	Sag/Swell, Waveform Capture and High Speed RMS
08	Measurement Log
16	Rapid Voltage Change
18	Rapid Voltage Change and Waveform Capture
20	Rapid Voltage Change and High Speed RMS
22	Rapid Voltage Change, Waveform Capture and High Speed RMS
32	Voltage Interruption
34	Voltage Interruption and Waveform Capture
36	Voltage Interruption and High Speed RMS
38	Voltage Interruption, Waveform Capture and High Speed RMS

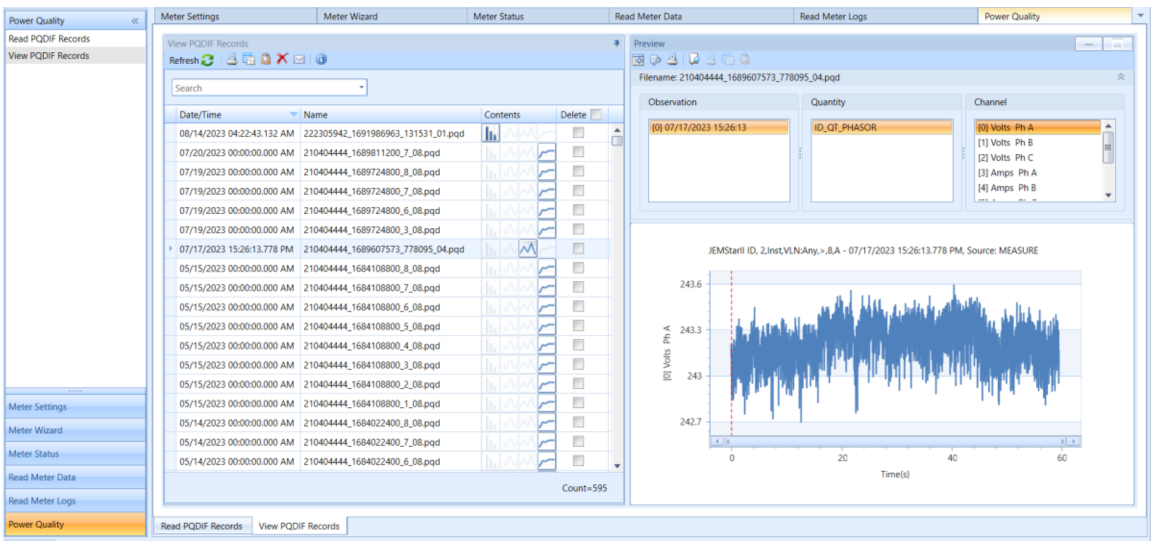
PQDIF File Generated Daily	
128	Can contain any or all of the following: Sag/Swell, Waveform Capture, High Speed RMS, Measurement Log

Example file name: 142300003_1454408745_133724_07.pqd

142300003	1454408745	133724	07

Meter Serial Number 14 23 00003 23rd week of 2014 Meter ID# 00003	February 02, 2016 10:25:45 GMT	133724 microseconds (when added to above, 02 Feb 2016 10:25:45:133724 GMT)	Sag/Swell, Waveform Capture, High Speed RMS Data

When PQDIF files are viewed the type of data is represented by an icon in the contents column to aid knowing the contents of the pqdif file prior to opening it. Refer to Power Quality for more information.

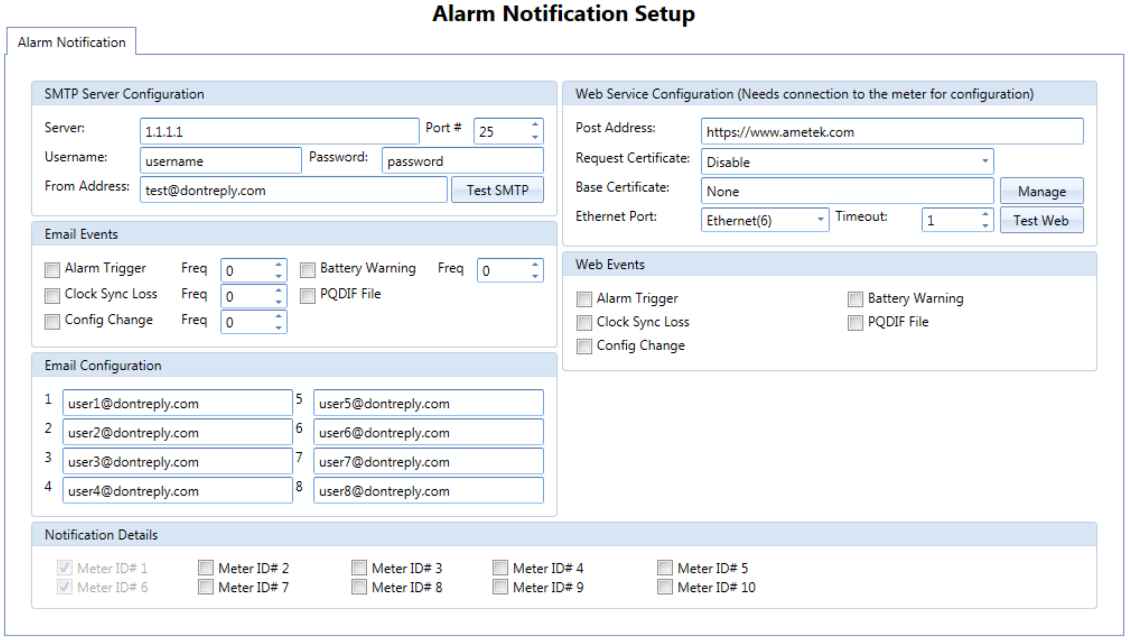


ALARM NOTIFICATION

The meter can be configured for two types of alarm notification: SMTP (EMAIL) and WEB Service (JSON & multi-part form requests). Each of these can be configured with their own criteria to activate an alarm and direct where the notification is sent.
Some of the functions on this screen can only be enabled when connected to a meter, such as testing the setup, managing security certificates, etc.
When using an Alarm Trigger to activate the Alarm Notification, the Trigger must be set for alarm notification.
The Alarm Notification message can include details on the meter or application which are configured in the Meter Identification screen.

Note: Only meters with the Firmware (6.5.2/5.5.2) or newer will support the Alarm Notification Settings.

Alarm Notification Setup

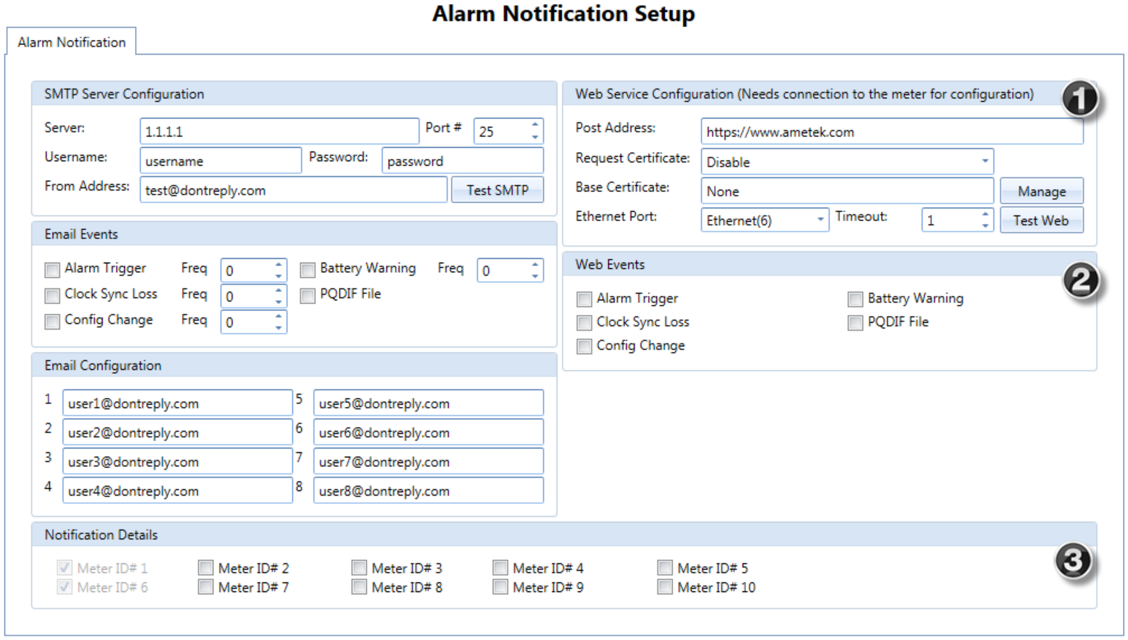


WEB Message Configuration

The WEB Message configuration consists of three parts:

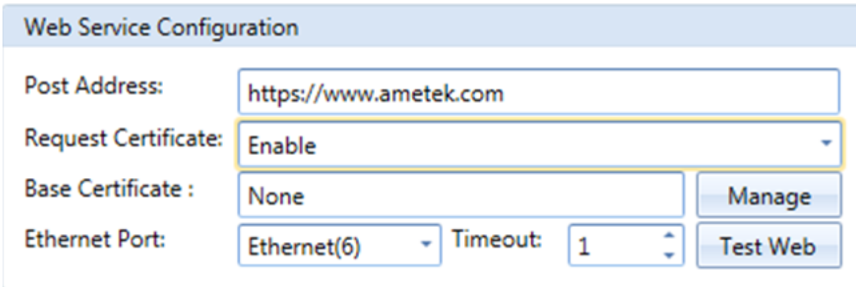
1. WEB Service
2. WEB Events
3. Notification Details

Alarm Notification Setup



WEB Service Configuration

The WEB Service configuration using the JSON or multi-part form request message format includes setting the server address where the message will be sent, usage of authentication certificates and the Ethernet Port used.



Post Address:
The meter will send events to external web services hosted by the clients using SSL Encryption (if the 'Request Certificate' setting is 'enable' or 'mandatory')
The Post Address is the address of the server where the JSON/multi-part form request message will be sent.

Request Certificate:
The meter can use authentication certificates if desired. The choices available are:

- Disable: No authentication certificate will be used.
- Enable: The meter will attempt to authenticate the endpoint's identity using the supplied certificate/s & send the notification over a secure connection. If a certificate isn't found or if the verification fails, the meter will send the notification via insecure mode.
- Mandatory: The meter will only send the message when certificate authentication using the supplied certificate(s) is successful.

Base Certificate:
Update the 'Base Certificate' to indicate which certificate is to be used as the 'Base' for forming a connection once it is loaded in the 'Manage' certificate screen. The meter will automatically select other certificates in the chain (if available).

Ethernet Port:
On meters with the Dual Ethernet or Cellular options, you can select which port will be used for the WEB service notifications.

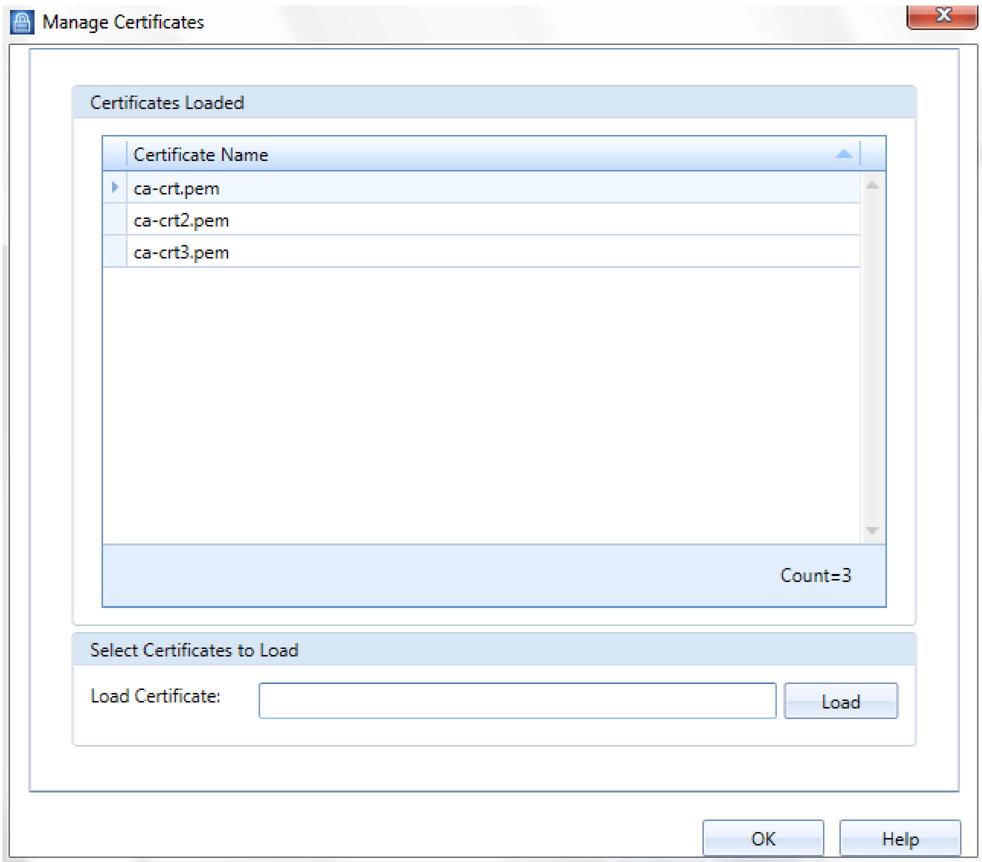
Timeout:
This allows you to use a timeout for transmitting WEB messages from 1 to 300 seconds. If there are delays in the network, it will automatically wait until the timeout period expires. This timeout covers the duration taken for the entire web notification transmission process including the certificate authentication and file upload (if 'PQDIF file' notification is enabled)

Test WEB:

Once the WEB Service settings have been configured, you can send out a Test Message to validate the settings. You must be connected to the meter, and it must have access to your server before testing.

Managing Certificates:

When connected to a meter, you can manage the process of loading, viewing or deleting certificates on the meter. If you are not connected to the meter, these fields will be grayed out. Multiple certificates can be added though you must select the Base Certificate which will be used as the default and add this information to the 'Base' Certificate field.



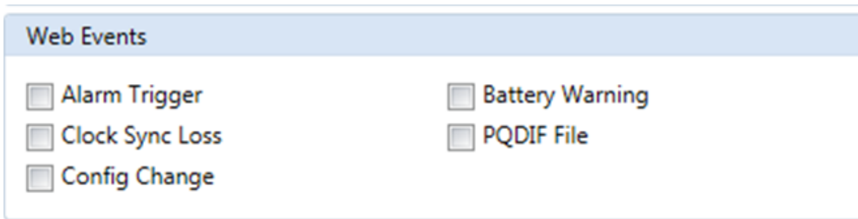
When selecting 'Manage' certificates, the certificates stored inside the meter will be displayed. Select and enter one of them as the 'Base' Certificate in the 'Base' Certificate field.

To load a new certificate to the meter, select the 'Load' button and this will bring up a prompt to locate the authentication certificate from **your PC**. (X.509 supported)
Once selected, pressing the 'OK' button on this screen will transfer it to the meter.

You can edit the certificates by deleting them (right click on certificate) or by pressing the delete key.

WEB Events Configuration

This is used to select which events will generate an alarm notification.



Alarm Trigger:
The Alarm Trigger will use any trigger that has the WEB notification enabled. Alarm triggers can be used for a loss of phase, outage, or any power quality condition.

Clock Sync Status:
This is used with external time sync options, like NTP and IRIG-B. When you lose time sync from one of these sources, it can generate an alarm.

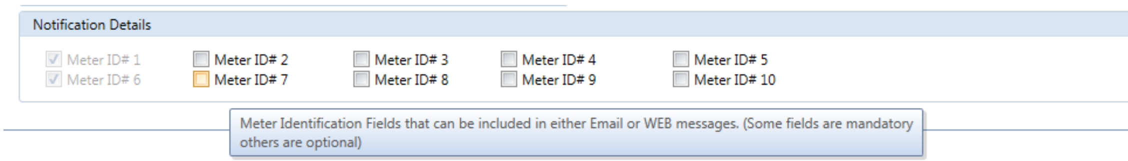
Config Change:
This will indicate an alarm message whenever the meter is configured.

Battery Warning:
This will indicate an alarm when the meter battery used for maintaining the internal clock needs to be replaced.

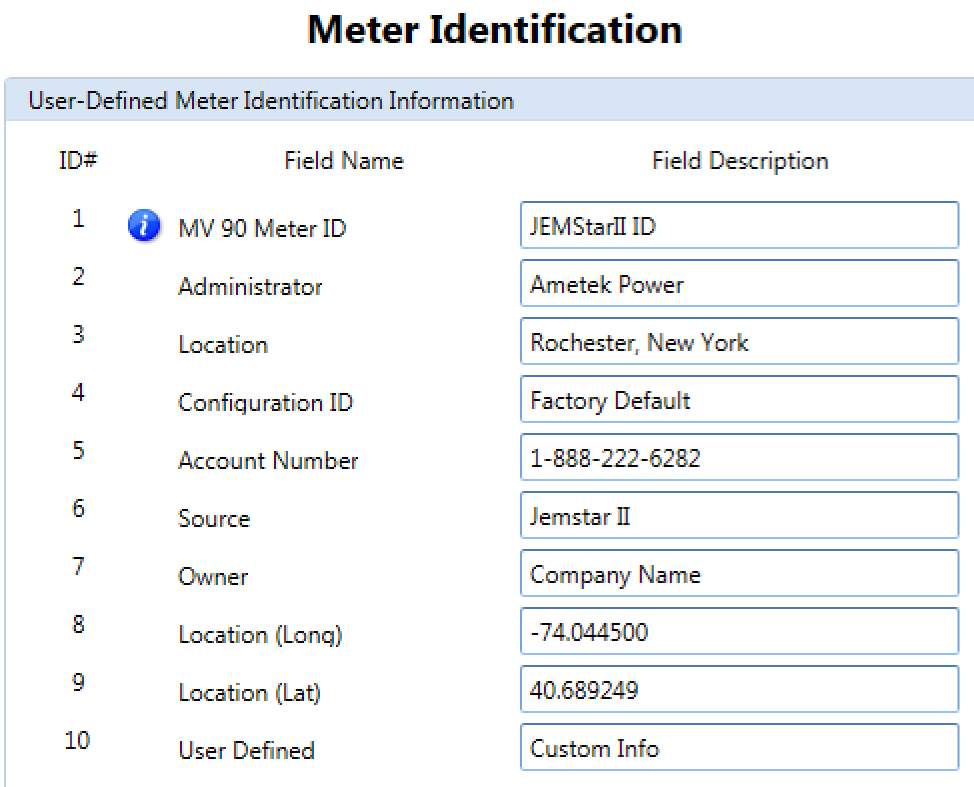
PQDIF File:
When enabling ‘PQDIF’ in a WEB event; a ‘multi-part’ message will be generated whenever a power quality file (PQDIF) is created. It will include the JSON Message and PQDIF file. The PQDIF file could be generated from an Alarm Trigger or via the measurement log if configured for periodic updates.

Notification Details Configuration

The following fields can be included with every WEB or EMAIL Message. As a default, the field used for Meter ID#1 and Meter ID#6; MV90 Meter ID and Source are always provided.



The fields are customized in the 'Meter Identification' screen in JEMWARE. Select all the fields that you wish to be included in the WEB/EMAIL message.



WEB Service Message Format

Each WEB Service message will contain a single event. The WEB Service message format will either be JSON or ‘Multi-Part’ for notifications that include the PQDIF File. The multi-part message format allows different types of messages combined into a single HTTP request. Our multi-part message supports two message types: JSON and PQDIF

The JSON format for is described below:

Content-Type: application/json

Value	Type	Description
EventType	string	See list of event types
DeviceId	string	As configured
Source	string	As configured
EventTime	DateTime	The time of event in ISO 8601. Valid examples: “2019-08-23T21:00:00Z” “2019-08-23T21:00:00-04:00”
EventId	string	Event identifier that uniquely identifies this event.
Owner	string	The owner of the device as configured (e.g., OPCO)
Location/Lat	double	The GPS Coordinates of the device at the time of the event. Latitude
Location/Long	double	The GPS Coordinates of the device at the time of the event. Longitude
Properties/<Key>	string	See list of ‘keys’
Properties/<Value>	string	See list of ‘values’

The multi-part form request message is used for sending PQDIF files via web notifications. This message has 2 parts:

1. JSON part – Uses the attribute name “json_msg” & has the same format & fields as mentioned above.
2. PQDIF file part – Uses the attribute name “pqdif_file” & the value would be the name of the generated PQDIF file.

JSON Format Values

Event Type

The Event Type is a quick reference to the type of alarm notification.

The list of available Event Types for the alarm triggers is shown below:

Event	**Alarm Trigger**	**Event Type**
Outage	3 Phase Voltage Interruption	OU
Sag/Swell	Voltage Sag or Swell	SS
PQ Alarm Trigger	Any other trigger used	PQ
Restored	Any trigger that returns to	RE

This is an example of 4 triggers enabled for the WEB alarm notification.

Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset	Reset Delay	Digital Output	Sag/Swell	High Speed RMS	Waveform Capture	Web
VoltageInterruption	VoltsL-N	All	<	60	0	61.2	0	None	☐	☐	No	☑
Instantaneous	VoltsL-N	Any	<	108	0	110.4	0	None	☑	☐	No	☑
Instantaneous	VoltsL-N	Any	>	132	0	129.6	0	None	☑	☐	No	☑
PowerQuality	VoltsTHD	A	>=	8	0	7.976	0	None	☐	☐	No	☑

The first trigger is used for an outage. (Event Type OU)
The second and third triggers are for Sag/Swell events (Event Type SS)
The 4th trigger shown is a standard alarm trigger (Event Type PQ)
***Note**: any trigger used that is not an outage or Sag/Swell is identified as a PQ trigger.*

For the non-triggered alarms, the following Event Types are used.

Other Alarms	Event Type
Battery Alarm	BAT
Loss of Time Sync	TS
Configuration	CFG
PQDIF File	PQD

Properties/<key>
For events initiated by an Alarm Trigger, the 'Key' will be the Trigger Description as shown in the Alarm log. This field can be customized in JEMWARE.
For the other events, the keys are listed below:

Other Events	Key
Battery Alarm	Internal Meter Battery
Loss of Time Sync	Loss of external Time
Configuration	Configuration Changed
PQDIF File	PQDIF File

Properties/<value>
For Events initiated by an Alarm Trigger, the 'Value' will be the value shown in the Alarm Log which indicates when it exceeded the threshold or when it returned to normal. Non triggered events will not have the 'value' field.

Sample Message
POST https://ua-adgateway.utilitycompany.com/api/deviceevent HTTP/1.1
User-Agent: administrator
Content-Type: Application/json
Host: ua-adgateway.utilitycompany.com
Content-Length: 296
{
"EventType": "OU",
"DeviceId": "12345678",
"EventTime": "2015-09-30T10:55:37.7430093Z",

1. JSON Message Samples

Sample Request:

```
POST https://testmachine-dt

Host: testmachine-dt
User-Agent: curl/7.68.0
Accept: */*
Content-Type: application/json
Content-Length: 401
```


```
{
   "Account Number": "1-888-222-6282",
   "Administrator": "Ametek Power",
   "Configuration ID": "Factory Default",
   "EventTime": "2020-07-12T18:15:00.618369Z",
   "EventType": "SS",
   "Location": "Rochester, New York",
   "Location(Lat)": "0.0",
   "Location(Long)": "0.0",
   "MV 90 Meter ID": "JEMStarII ID",
   "Owner": "Ametek",
   "Properties": {
      "1,Inst,VLN:Any,<,108,0,0,110.4,A": "0.092000"
   },
   "Source": "JEMStarII",
   "User defined": "User defined"
}
```


Sample Response:

```
< HTTP/1.0 200 OK
< Content-Type: text/html; charset=utf-8
< Content-Length: 6
< Server: Werkzeug/0.16.0 Python/3.8.1
< Date: Sun, 12 Jul 2020 18:01:22 GMT
<
```

2. Multi-part form data request samples

Sample request:
POST https://testmachine-dt

Host: testmachine-dt
User-Agent: curl/7.68.0
Accept: */*
Content-Length: 76356
Content-Type: multipart/form-data; boundary=------------------------eb807a8a5abf1a09
Expect: 100-continue


```
{
   "Account Number": "1-888-222-6282",
   "Administrator": "Ametek Power",
   "Configuration ID": "Factory Default",
   "EventTime": "2020-07-12T18:15:10.813931Z",
   "EventType": "PQD",
   "Location": "Rochester, New York",
   "Location(Lat)": "0.0",
   "Location(Long)": "0.0",
   "MV 90 Meter ID": "JEMStarII ID",
   "Owner": "Ametek",
   "Properties": {
      "PQDIF file": ""
   },
   "Source": "JEMStarII",
   "User defined": "User defined"
}
```


PQDIF File: 140800001_1594577710_813931_06.pqd

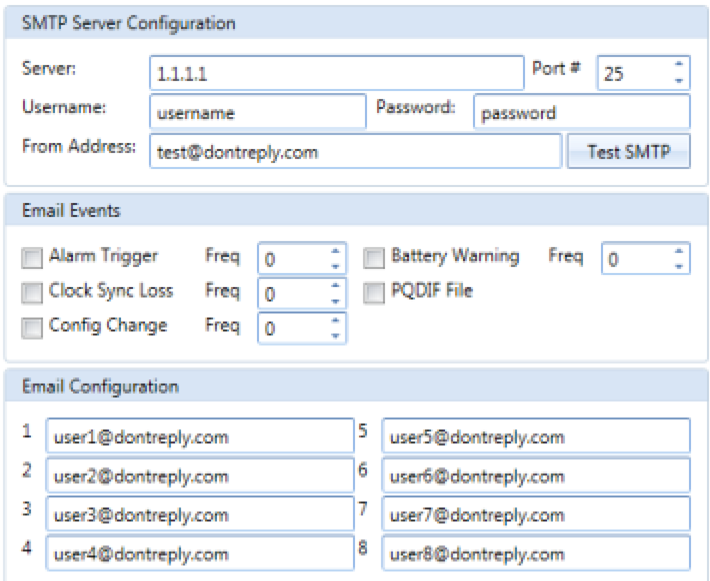
Sample response:

```
< HTTP/1.1 100 Continue
* We are completely uploaded and fine
* Mark bundle as not supporting multiuse
* HTTP 1.0, assume close after body
< HTTP/1.0 200 OK
< Content-Type: text/html; charset=utf-8
< Content-Length: 6
< Server: Werkzeug/0.16.0 Python/3.8.1
< Date: Sun, 12 Jul 2020 18:10:22 GMT
<
```

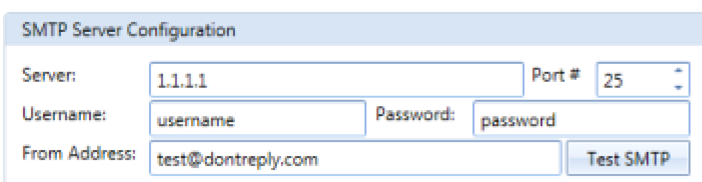
Email Configuration

The EMAIL Message configuration consists of four parts:

1. SMTP Server Configuration
2. Email Events
3. Email Configuration
4. Notification Details



SMTP Server Configuration



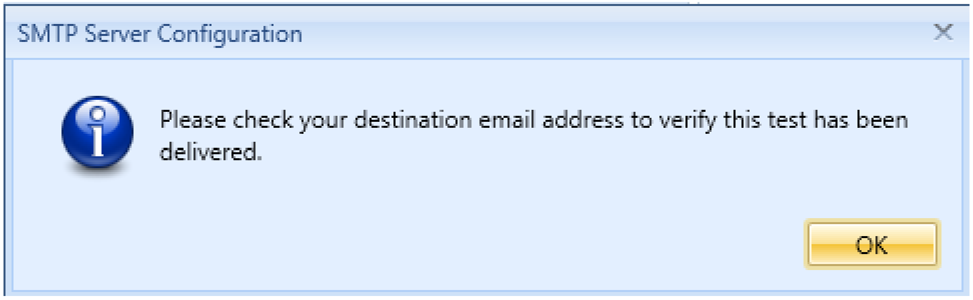
Server:
This is the address of the SMTP Server (IP/Domain name)

Port:
Enter a Port Address to use with the SMTP Server (Default is set to 25).

Username & Password:
Username and Password for the SMTP Server. If empty, then the username/password will not be used.

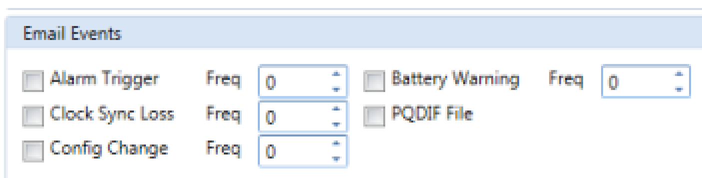
From Address:
Address that will be used for the sent from address in the email.

Test SMTP:
This will test if the SMTP server settings are correct and working and will send a test email.



EMAIL Events

This is used to select which events will generate an email.



Alarm Trigger:
The Alarm Trigger will use any trigger, triggers can be used for a loss of phase, outage, or any power quality condition.

Clock Sync Status:
This is used with external time sync options, like NTP and IRIG-B. When you lose time sync from one of these sources, it can generate an email.

Config Change:
This can initiate an email message whenever the meter is configured.

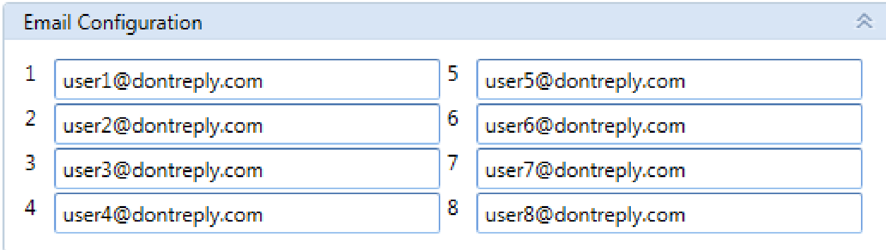
Battery Warning:
This can initiate an email when the meter battery used for maintaining the internal clock needs to be replaced.

PQDIF File:
This will generate a notification event whenever a PQDIF file is created and it will be attached to the file.

Frequency:
This setting lets you filter the email submittal in cases where multiple alarms can generate many emails. Settings from 0 to 60 in 1-minute increments. A setting of 0 will generate an email immediately after an event occurs. A setting of 60 will wait 60 minutes before generating an email. If multiple events occur within that timeframe, they will be combined in a single email.

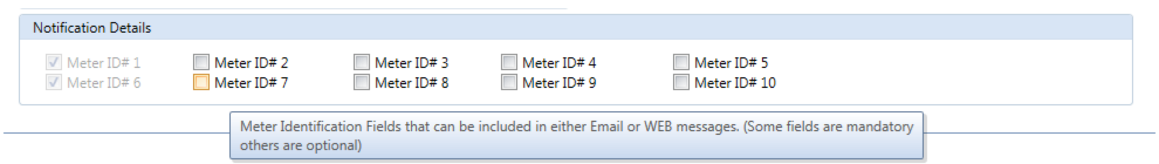
EMAIL Configuration

Up to 8 email addresses can be configured to receive an email notification.



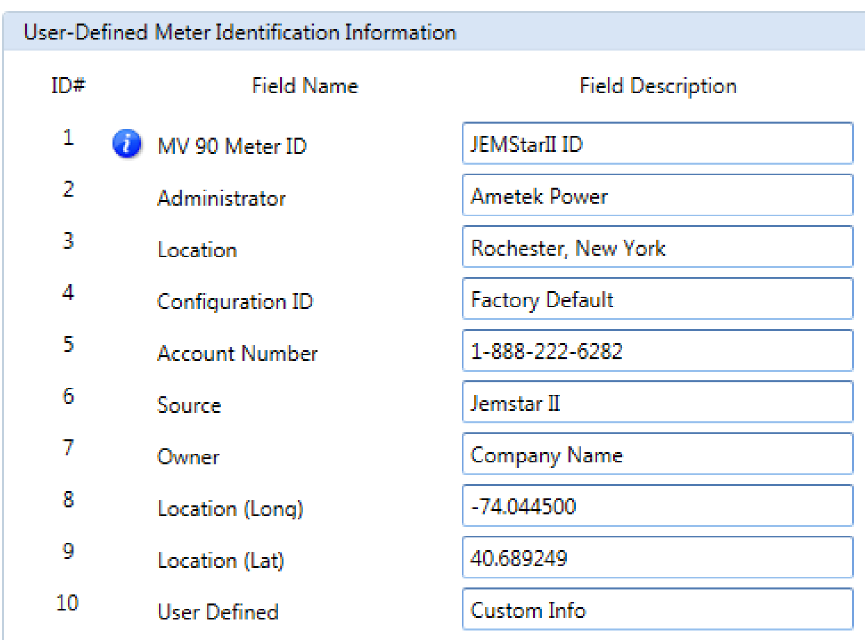
Notification Details Configuration

The following fields can be included with every WEB or EMAIL Message. As a default, the field used for Meter ID#1 and Meter ID#6; MV90 Meter ID and Source are always provided.



The fields are customized in the 'Meter Identification' screen in JEMWARE.
Select all the fields that you wish to be included in the WEB/EMAIL message.

Meter Identification



TOTALIZATION

Totalization is the process of summing measurements from several meters. For example, Meter A could be used to Totalize watt-hours from Meters B & C.
If Meters A, B and C each had 100 watt-hours, Meter A would provide a totalized value of 300 watt-hours.
In some cases, you may only want to totalize 2 of the 3 meters, so the Totalized values of Meters B & C would be 200 watt-hours.

You can create up to 16 different ‘Totalized’ formulas in the main meter doing the Totalization.

For example, one value could be the sum of meters A, B, C and D. Another could be B+C+D. Another could be A-B.

These Totalized values can be used in:

- Display Registers
- Load Profile
- Measurement Logging
- Input/Output
- Modbus and DNP Communication Protocols

In some cases, you might use Totalization to bring over the measurements from other meters so you can display them separately.
Meter A could have a display register for the watt-hours of Meter B. One advantage of Totalization is to minimize communications required between meters.
If you are only interested in retrieving watthours from each of three meters, you can bring the watt-hours from each meter to one main one using Totalization and then retrieve the watt-hours from each meter using communications to the main one only.

The method of bringing in totalized measurements from other meters is via digital contact inputs and via communications between JEMStar II Meters.
Totalizing via digital contact inputs. Digital contact inputs could come from another JEMStar II meter or any device that has a digital contact output in proportion to some measurement.
We can accept digital pulse inputs as Form A SPST or Form C SPDT (KYZ), keeping in mind that a KYZ has twice the amount of counts than a Form A.

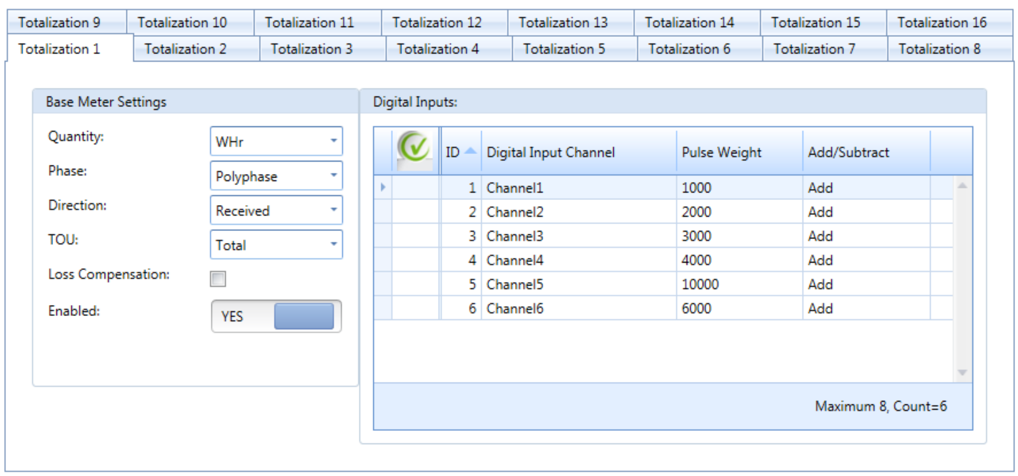
Totalized values are typically associated with integrated measurements (watt-hours, VAR-hours, etc.) although they could be used for anything.
We could totalize the btu’s per hour by simply taking digital contacts from a few gas meters and then summing them together.
Totalized measurements received in the form of contact inputs can be added, subtracted, and scaled as necessary.

For example, if Meter A, B and C were to be totalized for kilowatt-hours and Meter B provided an output of one pulse per kWhr and Meter C provided an output of one pulse per watt-hour, you could scale the Meter C input by 1000 so it was in kWhr the same as B. Or you could have an application where one meter has delivered power and another has received power, so you might want to subtract one from the other to get a Net amount.

Totalization Settings

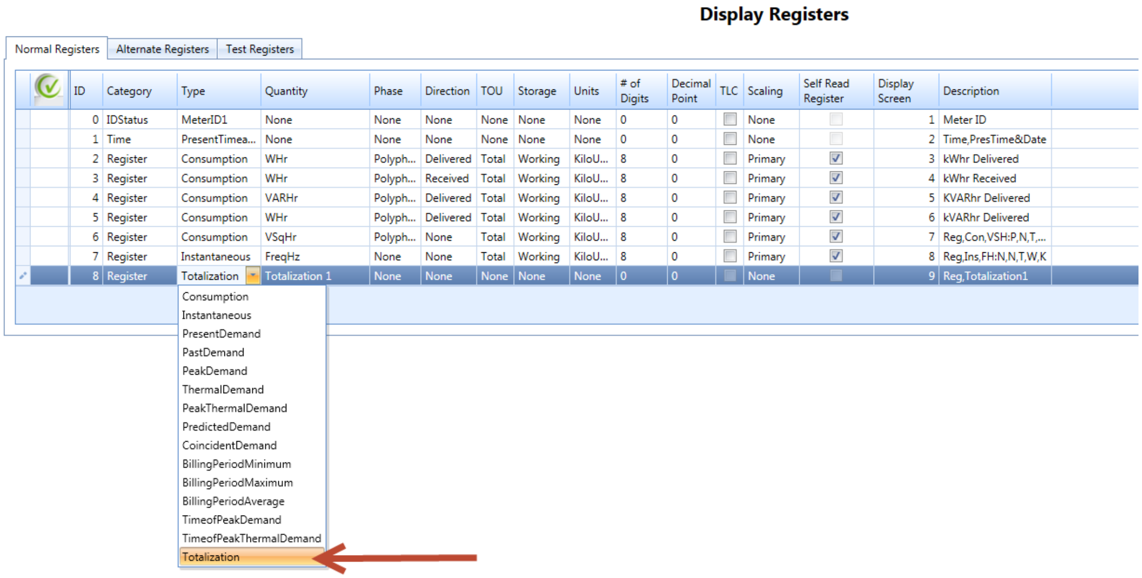
You select and configure any one of the Totalization Setting Tabs along the top, it will show the unique set of Digital Inputs used.
The end result of each Totalization is a new measurement, Totalization 1-16.
Totalization measurement 1 could come from the sum of three external meters.
Totalization measurement 2 could be the value from one of the external meters, etc.

Totalization Settings



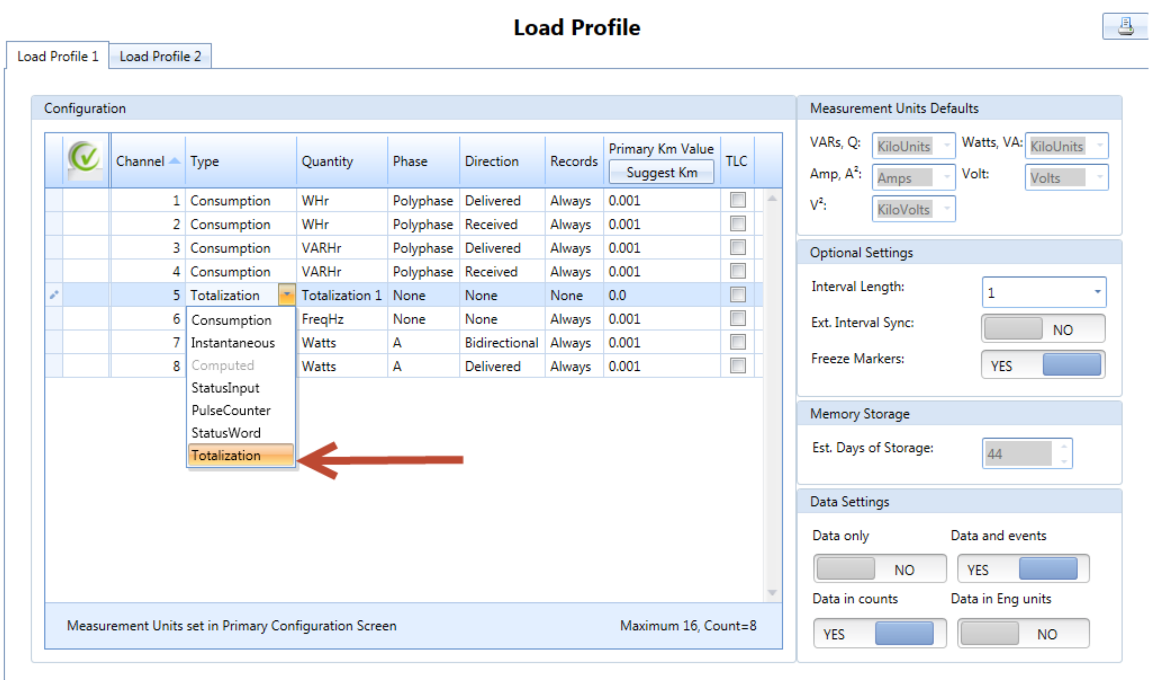
Used in Display Registers

The new Totalized measurements will be located under the Register Type selection.
You can add a new Register Type called Totalization.
When selected, the 'Quantity' field will come up with the 16 selections, Totalization 1-16. The Phase, Direction, TOU, Storage, Units, TLC and Scaling fields will be blank.
The default description will be editable. But the initial default will show 'Totalization 1-16', same as other measurements.



Used in Load Profile

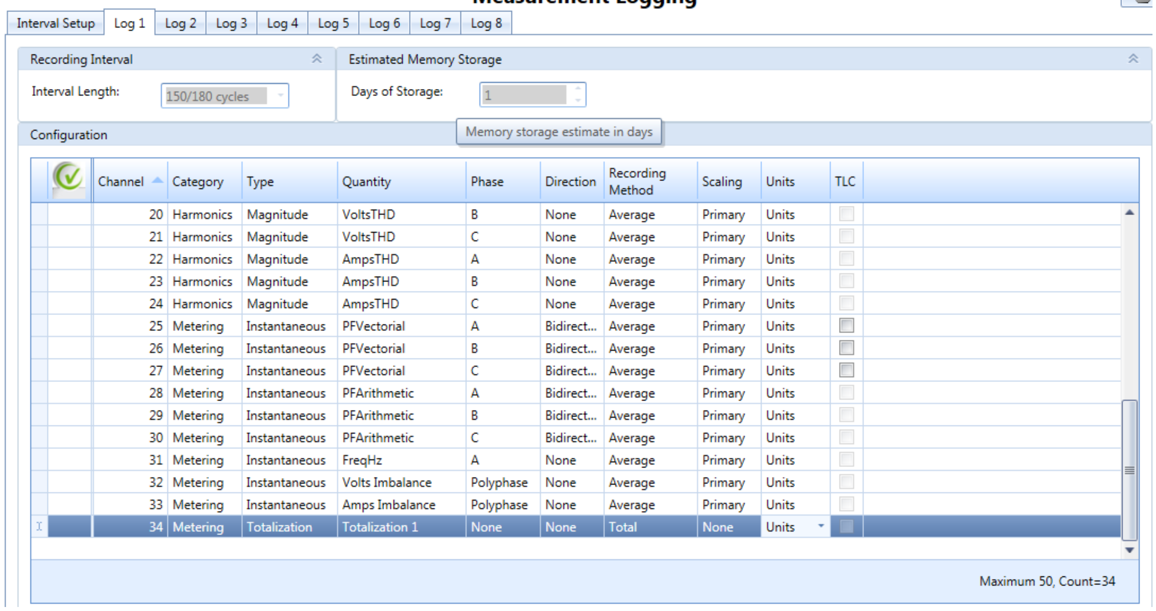
Select Totalization under ‘Type’. When selected, the ‘Quantity’ field will come up with the 16 selections, Totalization 1-16. The Phase, Direction, Records and TLC fields will be blank.



Used in Measurement Logging

Select Totalization under ‘Type’. When selected for Totalization, the ‘Quantity’ field will come up with the 16 selections, Totalization 1-16.
The Phase, Direction, Scaling and TLC fields will be blank. The ‘Recording Method’ will support Total. Units can be selected as ‘units, kilo, mega, giga’ and scaled accordingly.

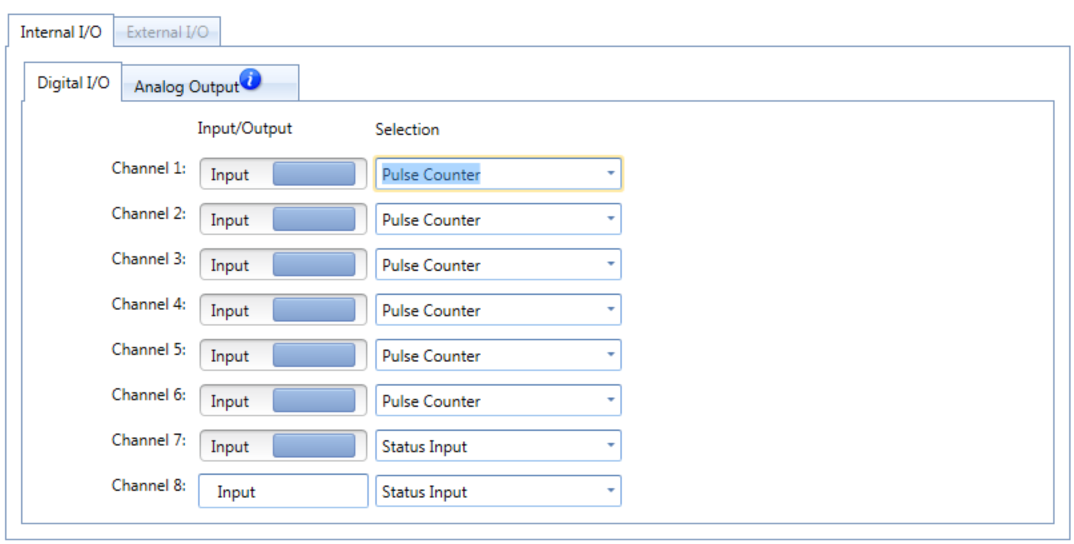
Measurement Logging



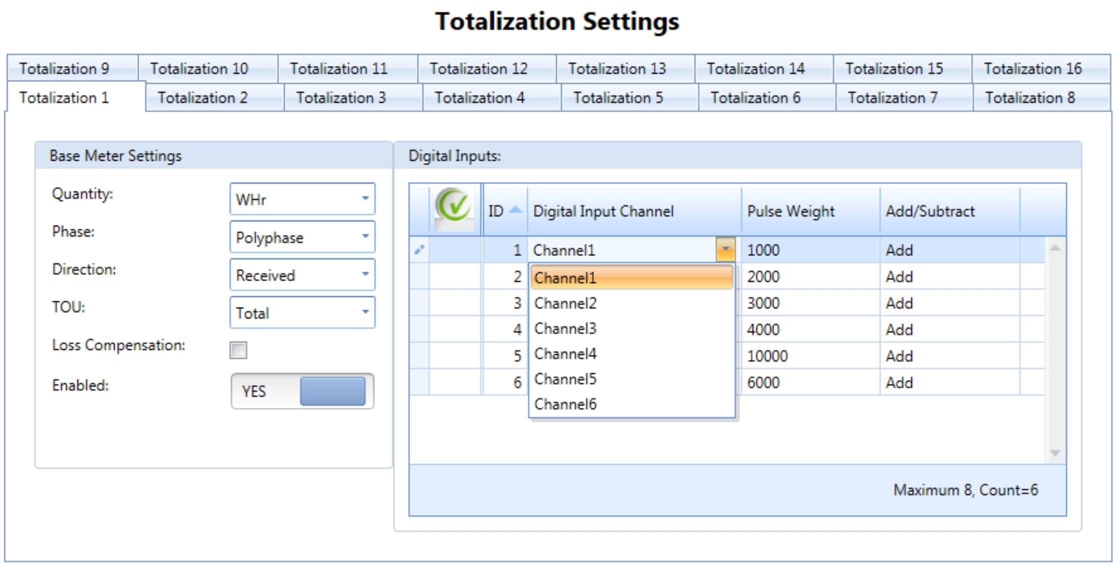
Used in Input/Output

Digital Inputs used for Totalization must be selected as a ‘Pulse Counter’.

Input/Output

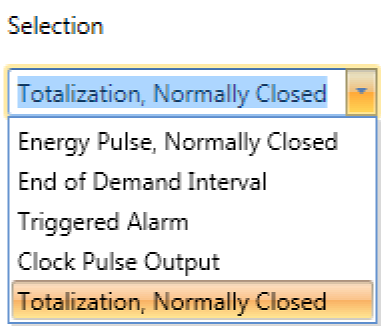


For example, if all I/O channels are configured as Pulse Counters, then all the Digital Input Channels will be shown on the Totalization Setup page. (As shown below) But if I/O channels 1,2,3, 6 are configured as Pulse Counters, then only Digital Input Channels 1,2,3,6 will be shown when you try to add to the Totalization Setup page.

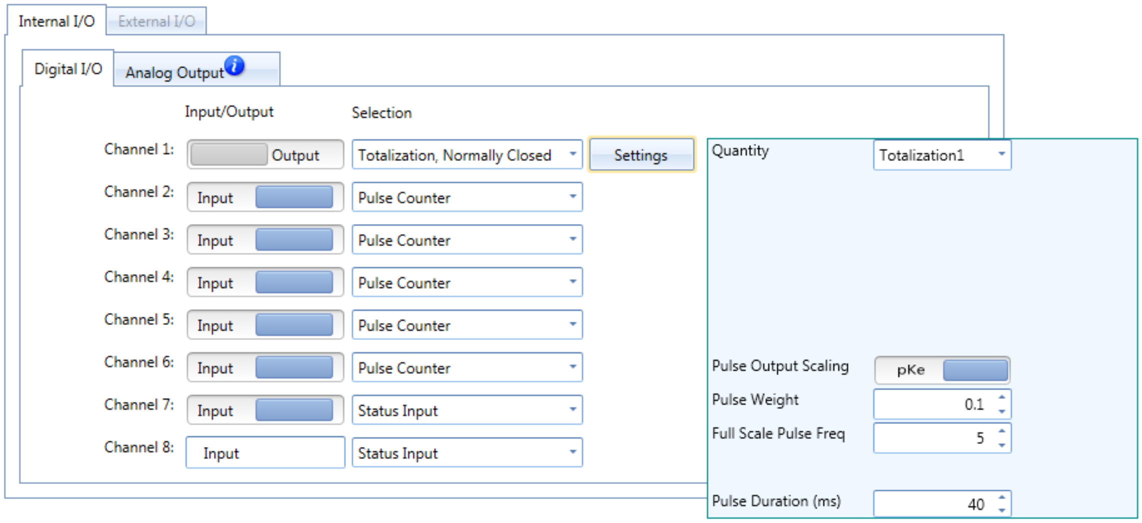


The resulting Totalization measurement (Totalization 1-16) can be used as an Output.

Choose the Selection option "Totalization, Normally Closed"



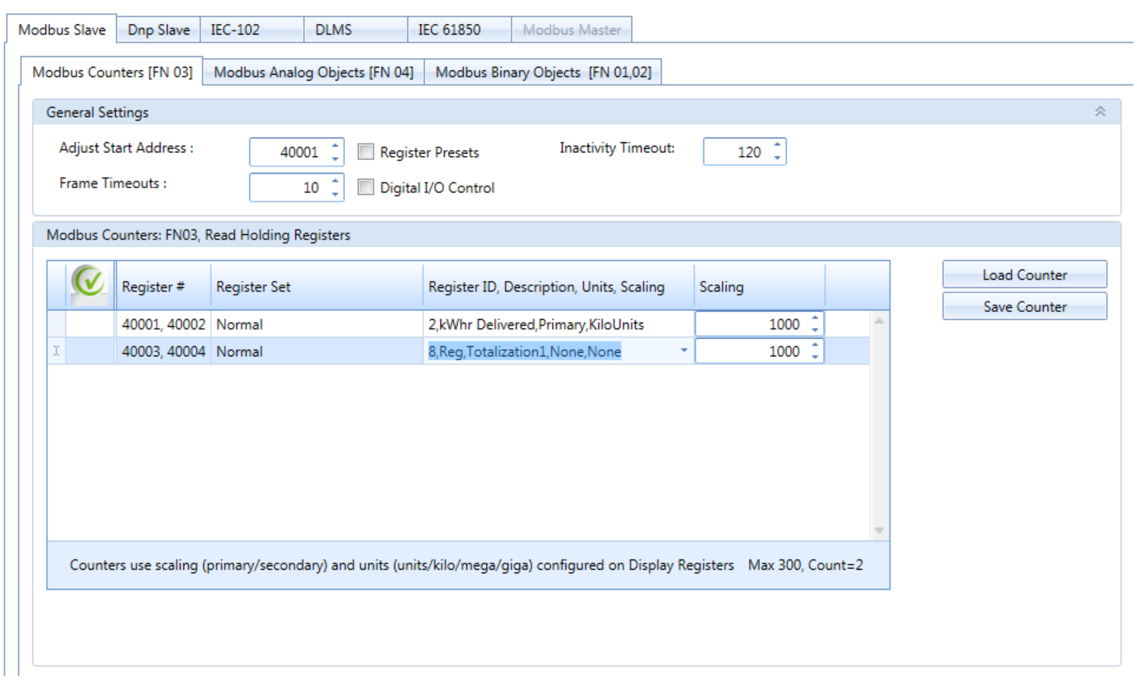
Choose the Quantity selection, Totalization 1-16 (16 selections).
When selecting Totalization X, the Pulse Output Scaling, Pulse Weight, Full Scale Pulse Freq and Pulse Duration can be applied.



Used in Modbus and DNP Communication Protocols

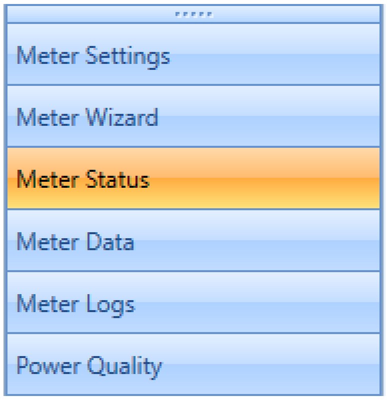
The Totalized measurements are made available in Modbus and DNP protocols as Counters if first configured as a Display Register. The Counters will display any value configured as a Normal and Alternate Register and this includes Totalized Channels. The scaling will apply, same as with any other measurement.

Protocol Setup



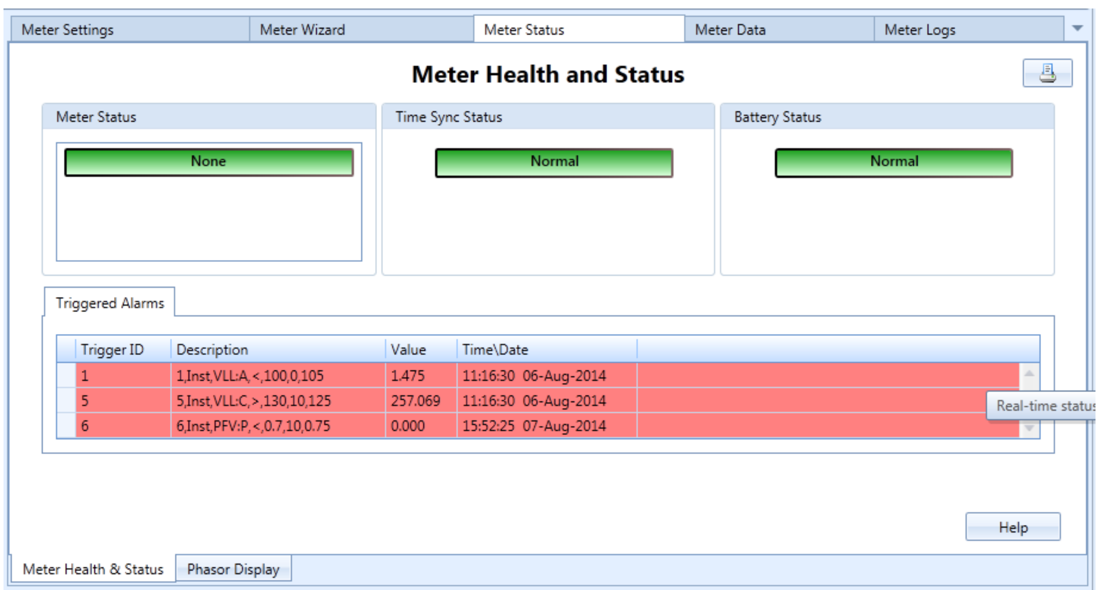
Meter Status

The Meter Status Screens are used when connected to a meter and they can display the Meter Health, Active Alarms and Phasor Display.



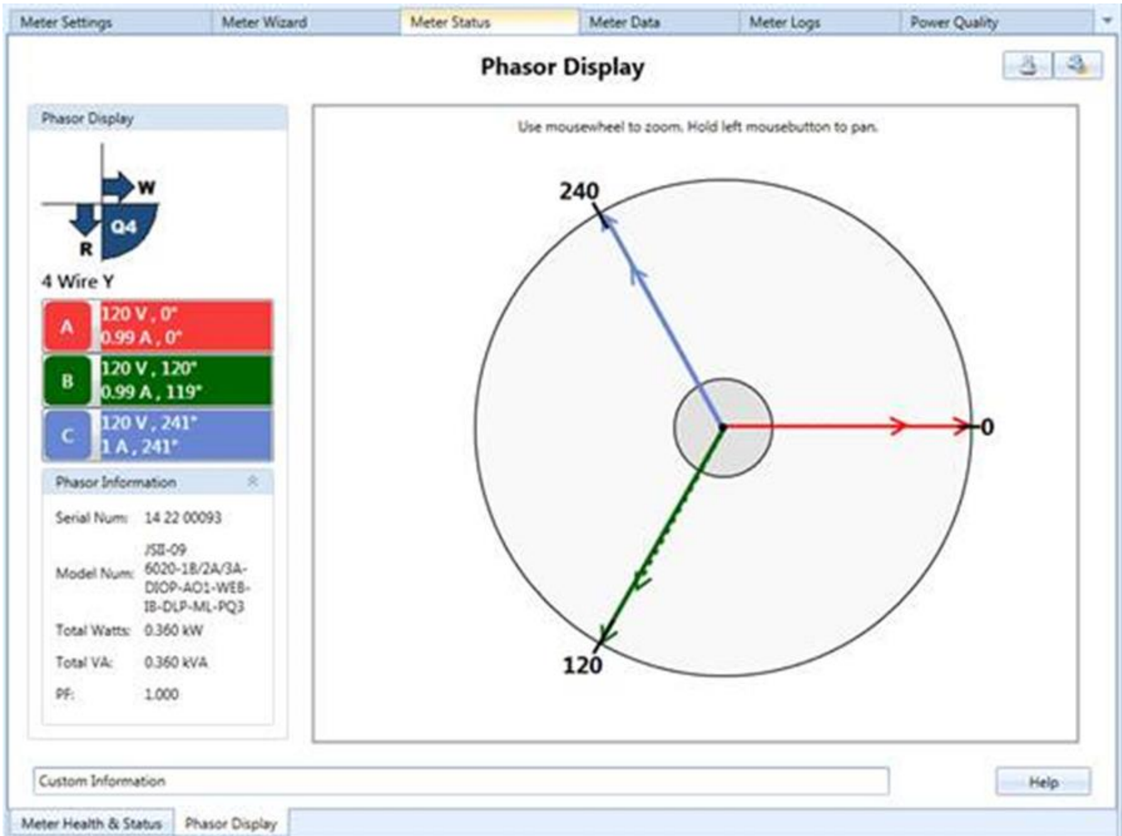
Meter Health & Status & Triggered Alarms

This screen will show real time Meter Health and Status and any active alarms on the meter.



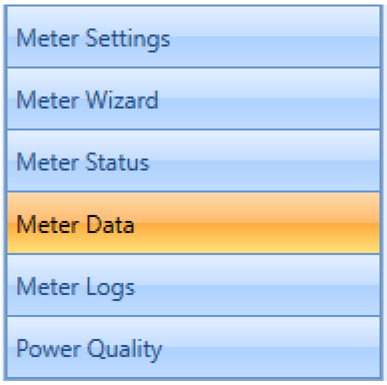
PHASOR DISPLAY

This shows a Graphical display of power flow in a connected meter. It is a Polar coordinate diagram showing 3 phase voltage and 3 phase current. Real time updated every 10 seconds.



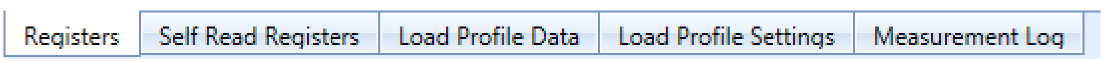
METER DATA

When connected to a meter, you can read all the meter data stored. You can print the data or download it in an Excel or CSV format.



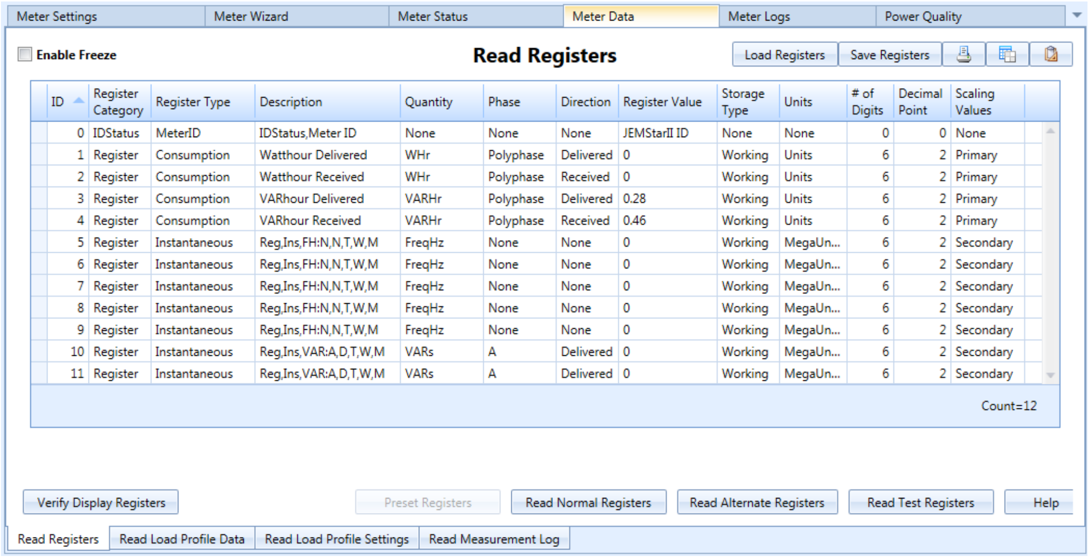
The following data can be retrieved from the meter.

- Register Data
- Self Read Register
- Load Profile Data
- Load Profile Settings
- Measurement Log Data (if equipped)



READ REGISTERS

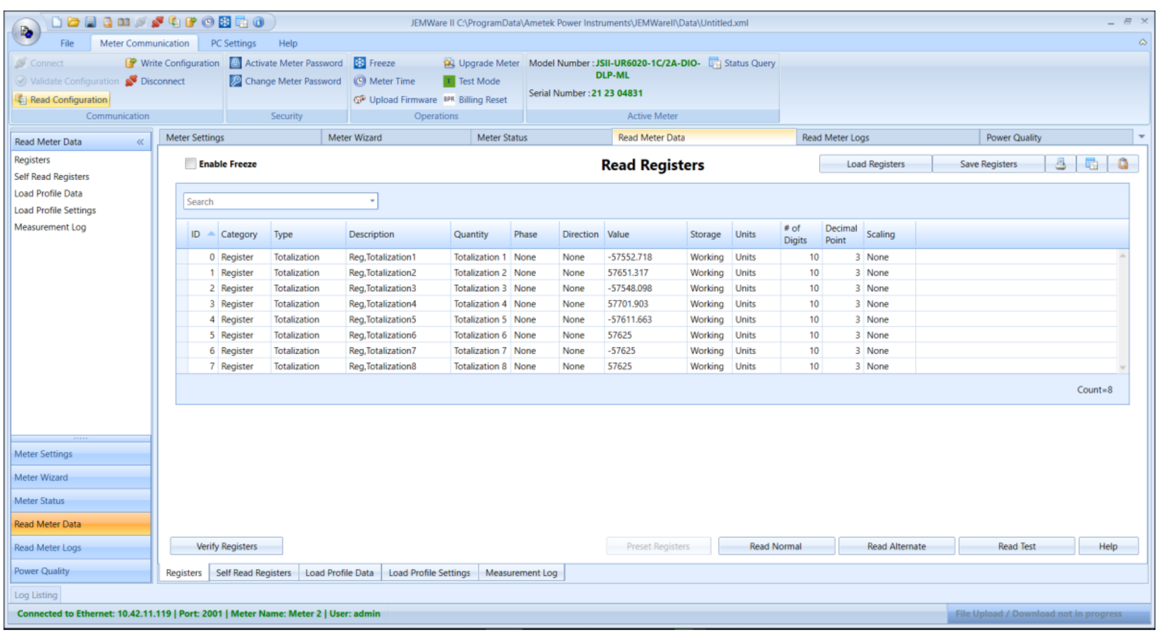
When connected to the meter, you can read and display the Normal, Alternate & Test Registers. There are buttons on the top right to print or download in Excel or CSV formats.



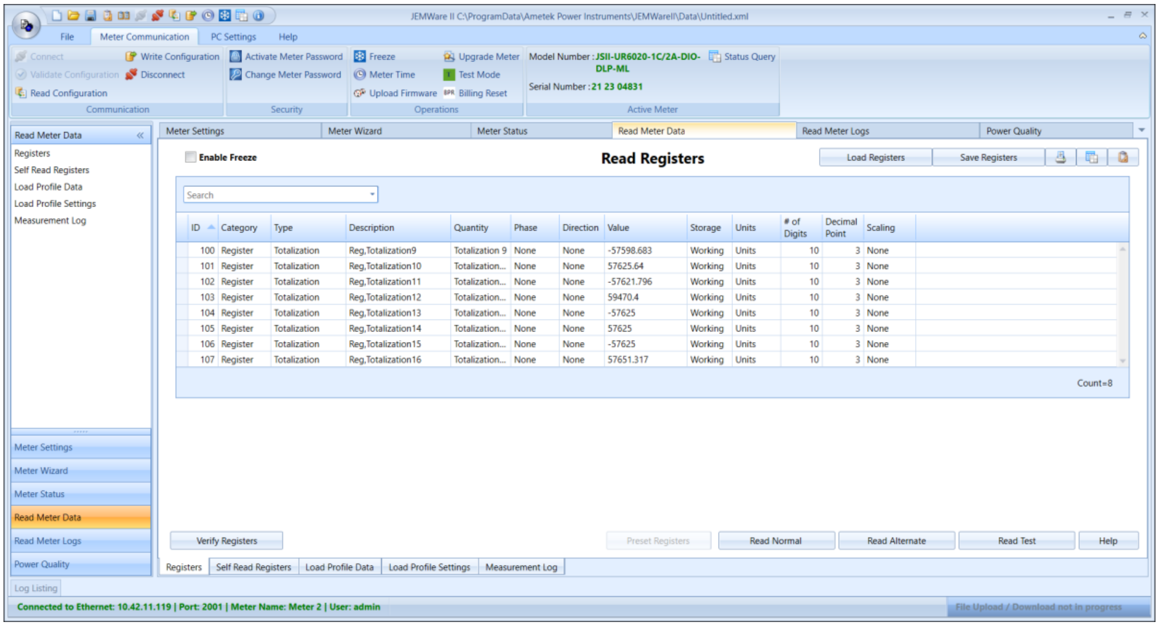
***Note**: You need to perform a 'Freeze' command before reading the registers. There is a checkbox option provided (top left) select to automatically perform a meter Freeze when reading a register.*

Totalization configured in Display Registers

Reading Normal registers configured to use Totalization:

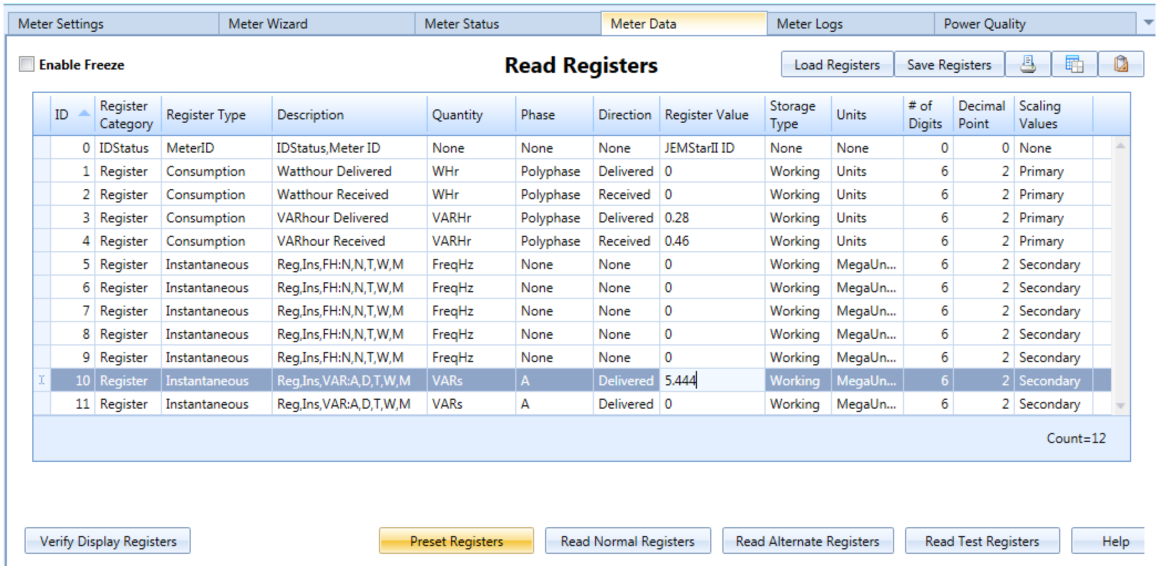


Reading Alternate registers configured to use Totalization:



Preset Registers (ANSI only)

The display registers can be preset with any value within the constraints of that measurement (# of digits, decimal point). To preset a register, type in the new value in the Register Value column and select the 'Preset Registers' button when done.

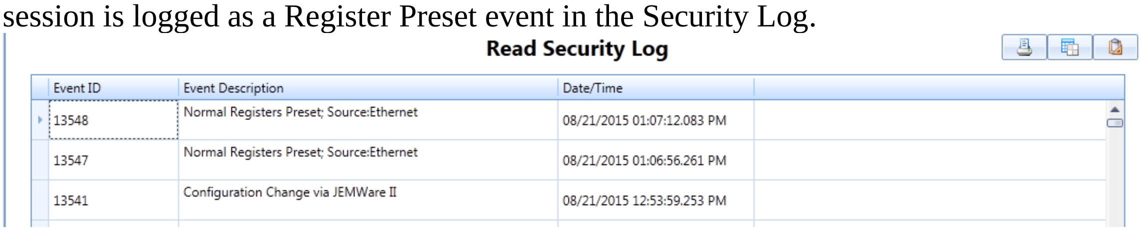


ID	Register Category	Register Type	Description	Quantity	Phase	Direction	Register Value	Storage Type	Units	# of Digits	Decimal Point	Scaling Values
0	IDStatus	MeterID	IDStatus,Meter ID	None	None	None	JEMStarII ID	None	None	0	0	None
1	Register	Consumption	Watthour Delivered	WHr	Polyphase	Delivered	0	Working	Units	6	2	Primary
2	Register	Consumption	Watthour Received	WHr	Polyphase	Received	0	Working	Units	6	2	Primary
3	Register	Consumption	VARhour Delivered	VARHr	Polyphase	Delivered	0.28	Working	Units	6	2	Primary
4	Register	Consumption	VARhour Received	VARHr	Polyphase	Received	0.46	Working	Units	6	2	Primary
5	Register	Instantaneous	Reg,Ins,FH:N,N,T,W,M	FreqHz	None	None	0	Working	MegaUn...	6	2	Secondary
6	Register	Instantaneous	Reg,Ins,FH:N,N,T,W,M	FreqHz	None	None	0	Working	MegaUn...	6	2	Secondary
7	Register	Instantaneous	Reg,Ins,FH:N,N,T,W,M	FreqHz	None	None	0	Working	MegaUn...	6	2	Secondary
8	Register	Instantaneous	Reg,Ins,FH:N,N,T,W,M	FreqHz	None	None	0	Working	MegaUn...	6	2	Secondary
9	Register	Instantaneous	Reg,Ins,FH:N,N,T,W,M	FreqHz	None	None	0	Working	MegaUn...	6	2	Secondary
10	Register	Instantaneous	Reg,Ins,VAR:A,D,T,W,M	VARs	A	Delivered	5.444	Working	MegaUn...	6	2	Secondary
11	Register	Instantaneous	Reg,Ins,VAR:A,D,T,W,M	VARs	A	Delivered	0	Working	MegaUn...	6	2	Secondary

Note: Presetting values only applies to integrated values as instantaneous values will update immediately to current values after the preset.

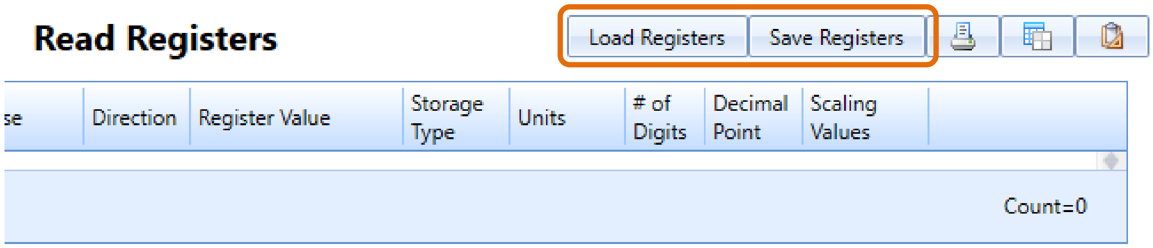
There are provisions to load and save the register values from a file. After reading the register values from a meter, you can save them in a file and then load them back into another meter. This is useful when replacing a meter in the field with a new one.

Since this may affect the correlation between Register and Load Profile readings, this session is logged as a Register Preset event in the Security Log.



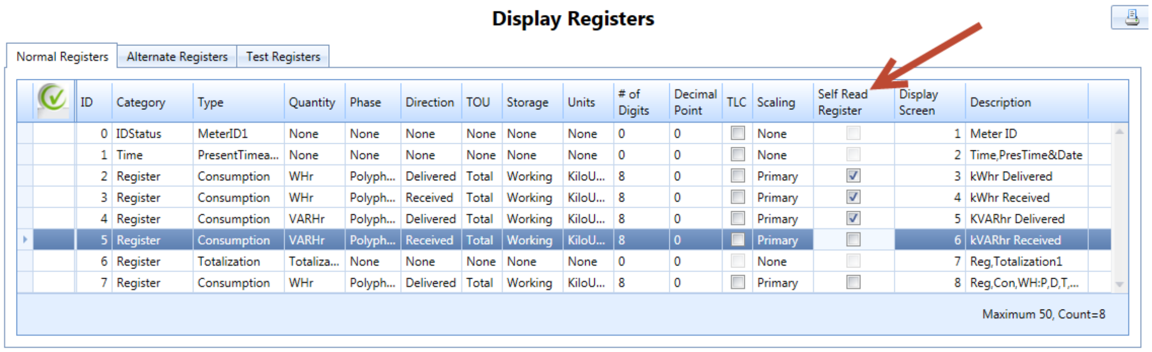
Event ID	Event Description	Date/Time
13548	Normal Registers Preset; Source:Ethernet	08/21/2015 01:07:12.083 PM
13547	Normal Registers Preset; Source:Ethernet	08/21/2015 01:06:56.261 PM
13541	Configuration Change via JEMWare II	08/21/2015 12:53:59.253 PM

There are provisions to load and save the register values from a file. After reading the register values from a meter, you can save them in a file and then load them back into another meter. This is useful when replacing a meter in the field with a new one.


Read Registers
Load Registers
Save Registers
se
Direction
Register Value
Storage Type
Units
# of Digits
Decimal Point
Scaling Values
Count=0

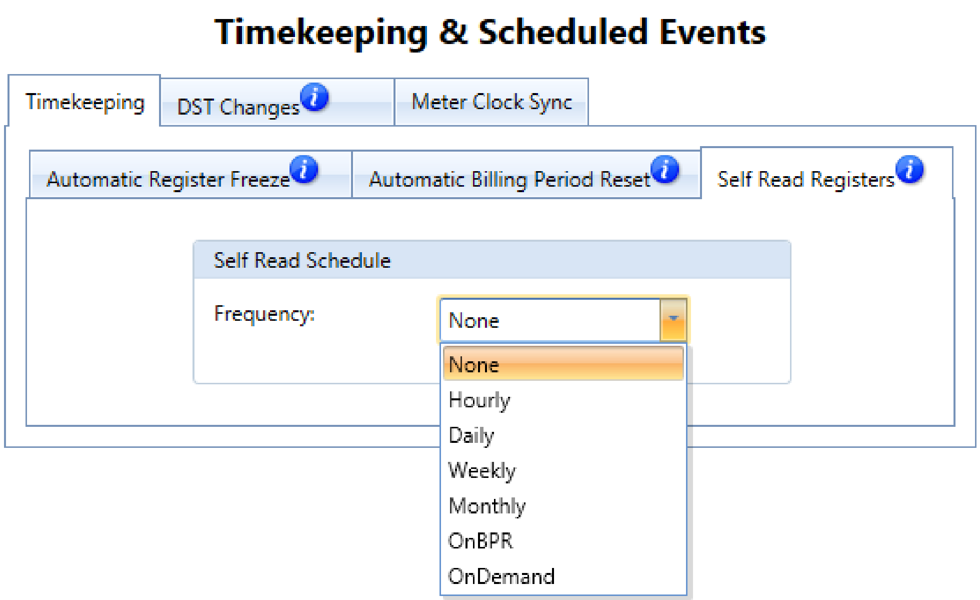
READ SELF READ REGISTERS

The JEMStar II meter can store up to 96 records of a maximum total of 16 self read registers. A max of 8 can be selected on Normal and Alternate Display registers.

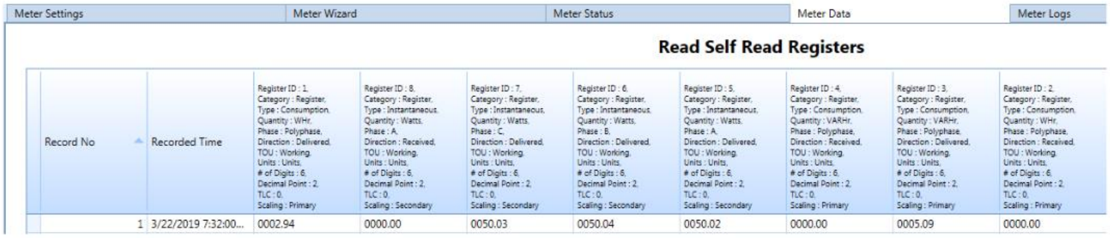


ID	Category	Type	Quantity	Phase	Direction	TOU	Storage	Units	# of Digits	Decimal Point	TLC	Scaling	Self Read Register	Display Screen	Description
0	IDStatus	MeterID1	None	None	None	None	None	None	0	0		None		1	Meter ID
1	Time	PresentTimea...	None	None	None	None	None	None	0	0		None		2	Time,PresTime&Date
2	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	KiloU...	8	0		Primary	✓	3	kWhr Delivered
3	Register	Consumption	WHr	Polyph...	Received	Total	Working	KiloU...	8	0		Primary	✓	4	kWhr Received
4	Register	Consumption	VARHr	Polyph...	Delivered	Total	Working	KiloU...	8	0		Primary	✓	5	KVARhr Delivered
5	Register	Consumption	VARHr	Polyph...	Received	Total	Working	KiloU...	8	0		Primary		6	kVARhr Received
6	Register	Totalization	Totaliza...	None	None	None	None	None	0	0		None		7	Reg,Totalization1
7	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	KiloU...	8	0		Primary		8	Reg,Con,WH:P,D,T,...

Go to the Timekeeping & Scheduled Events settings page for Self Read Registers tab selections of Hourly, Daily, Monthly, On BPR and On Demand Interval can be selected and saved as “Frequency:” intervals.



When connected to the meter, you can read back the Self Read Registers as shown below. There are buttons on the top right to print or download the load profile data in Excel or CSV formats.



Read Self Read Registers

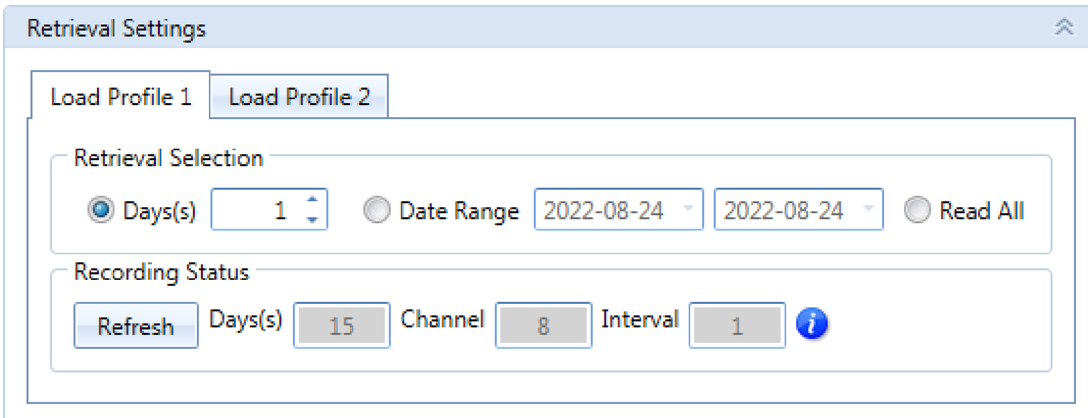
Record No	Recorded Time	Register ID : 1, Category : Register, Type : Consumption, Quantity : WHr, Phase : Polyphase, Direction : Delivered, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Primary	Register ID : 8, Category : Register, Type : Instantaneous, Quantity : Watts, Phase : A, Direction : Received, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Secondary	Register ID : 7, Category : Register, Type : Instantaneous, Quantity : Watts, Phase : C, Direction : Delivered, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Secondary	Register ID : 6, Category : Register, Type : Instantaneous, Quantity : Watts, Phase : B, Direction : Delivered, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Secondary	Register ID : 5, Category : Register, Type : Instantaneous, Quantity : Watts, Phase : A, Direction : Delivered, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Secondary	Register ID : 4, Category : Register, Type : Consumption, Quantity : VARHr, Phase : Polyphase, Direction : Received, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Primary	Register ID : 3, Category : Register, Type : Consumption, Quantity : VARHr, Phase : Polyphase, Direction : Delivered, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Primary	Register ID : 2, Category : Register, Type : Consumption, Quantity : WHr, Phase : Polyphase, Direction : Received, TOU : Working, Units : Units, # of Digits : 6, Decimal Point : 2, TLC : 0, Scaling : Primary
1	3/22/2019 7:32:00...	0002.94	0000.00	0050.03	0050.04	0050.02	0000.00	0005.09	0000.00

Read Load Profile Data

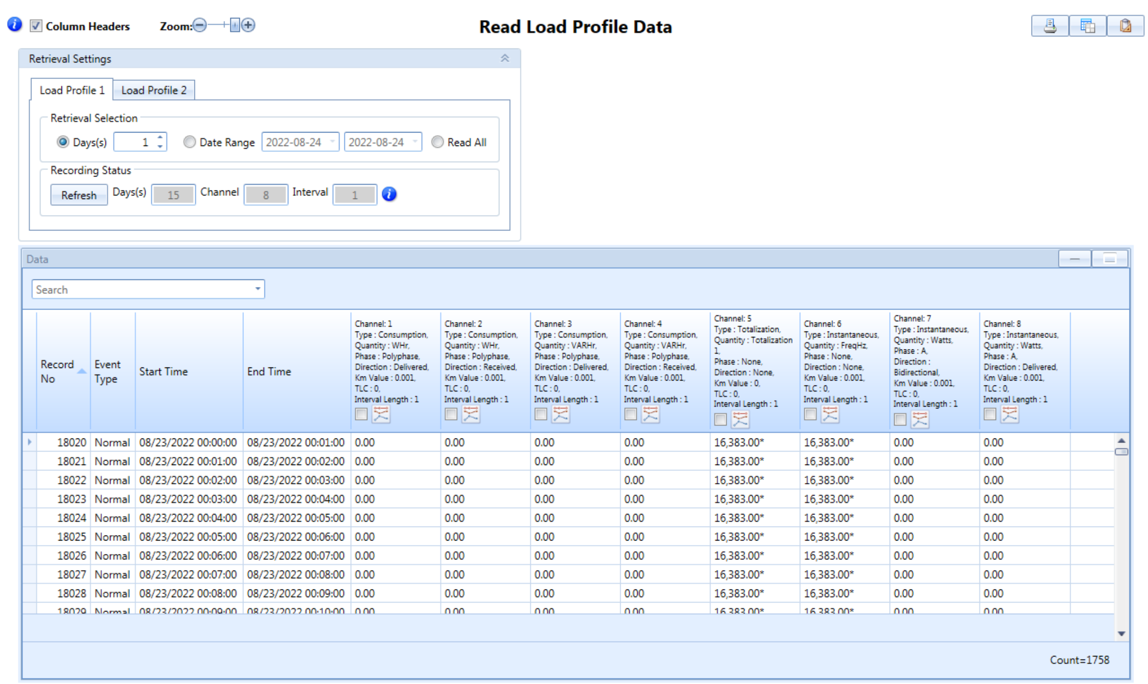
When connected to the meter, you can read and display the Load Profile Logs. All meters come with one 16 channel Load Profile Log and there is an option for a second log of 16 channels. The Load Profile Data will be presented in either 16 bit format or 32 bit format depending on how the meter was configured.

Note: Load Profile is stored in engineering units and uses a single-precision. It uses the IEEE 754 single-precision format. Its numeric range is ±1.18E−38 to ±3.4E38.

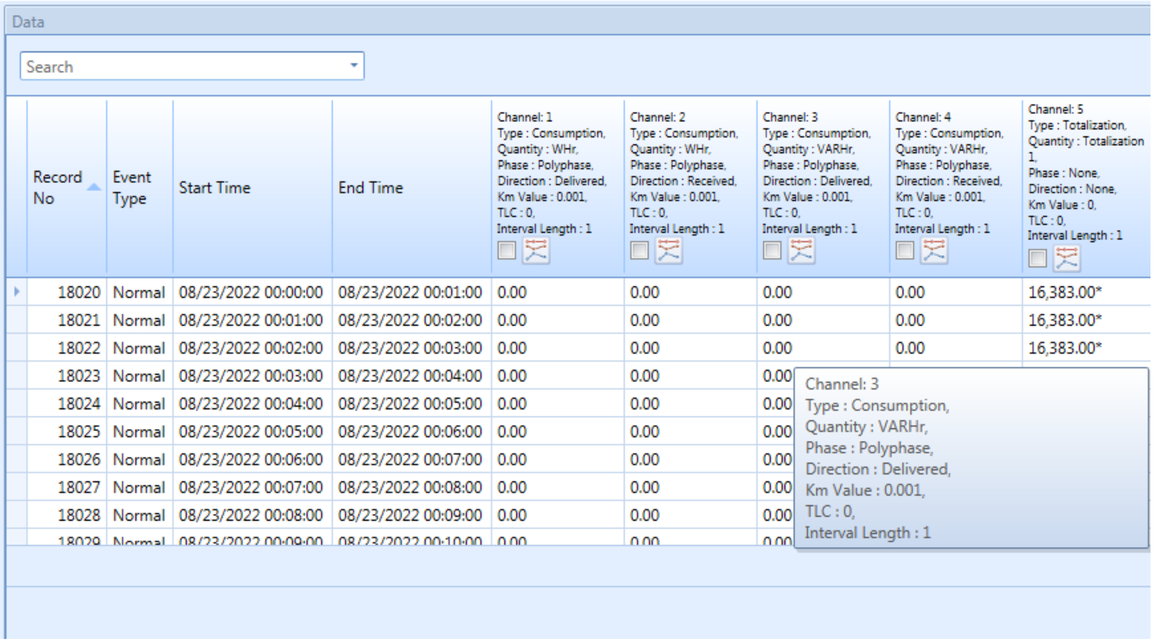
The top of the screen lets you retrieve a fixed quantity of days or all data.



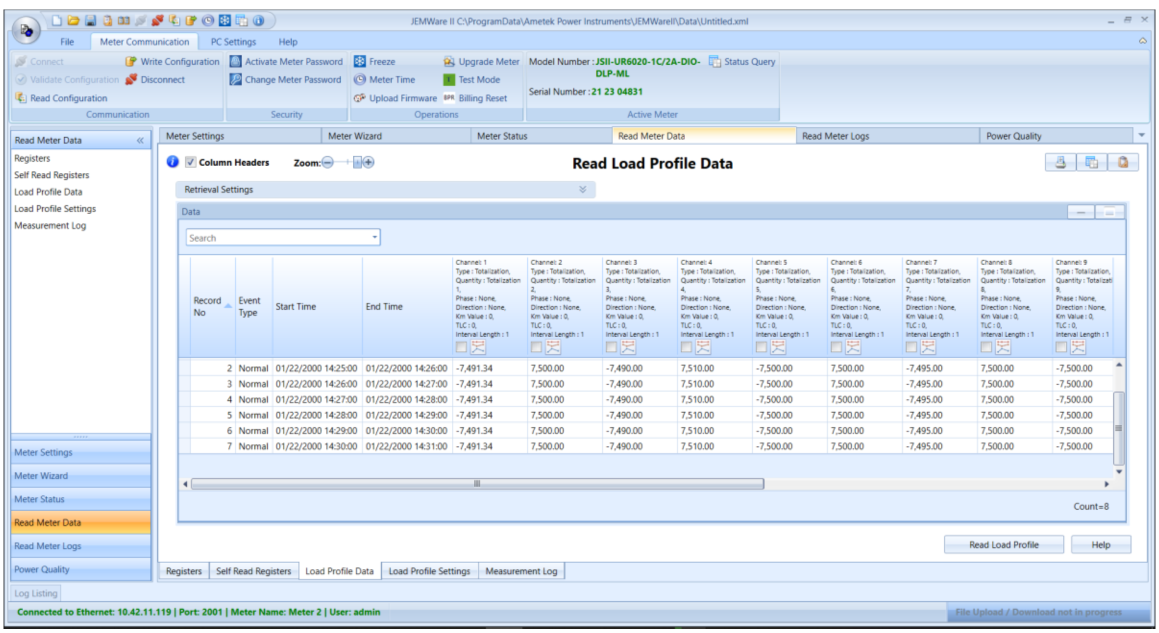
The Load Profile Status will display the number of days stored on the meter, number of channels and recording interval length.
There are buttons on the top right to print or download the load profile data in Excel or CSV formats.



***Note**: Moving the mouse over the Channels will automatically display the Load Profile settings for that channel.*



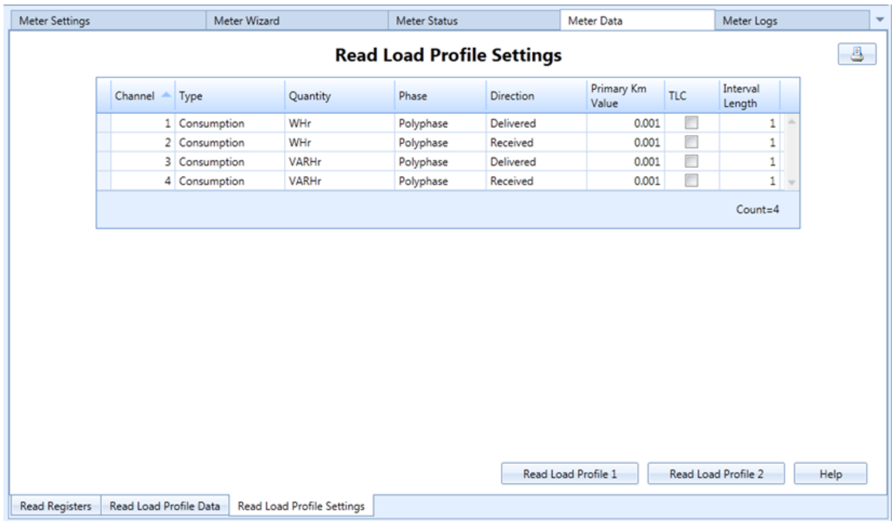
Example of Reading Load Profile configured to use Totalization:



Note: The Load Profile Data is stored in the non-volatile memory. It uses a FIFO buffer with the oldest records getting overwritten when full. The Load Profile Log is only deleted with a Cold Start or when reconfigured.

READ LOAD PROFILE SETTINGS

When connected to the meter, you can read and display the configured settings for the meter's Load Profile. There are buttons on the top right to print or download the load profile data in Excel or CSV formats.

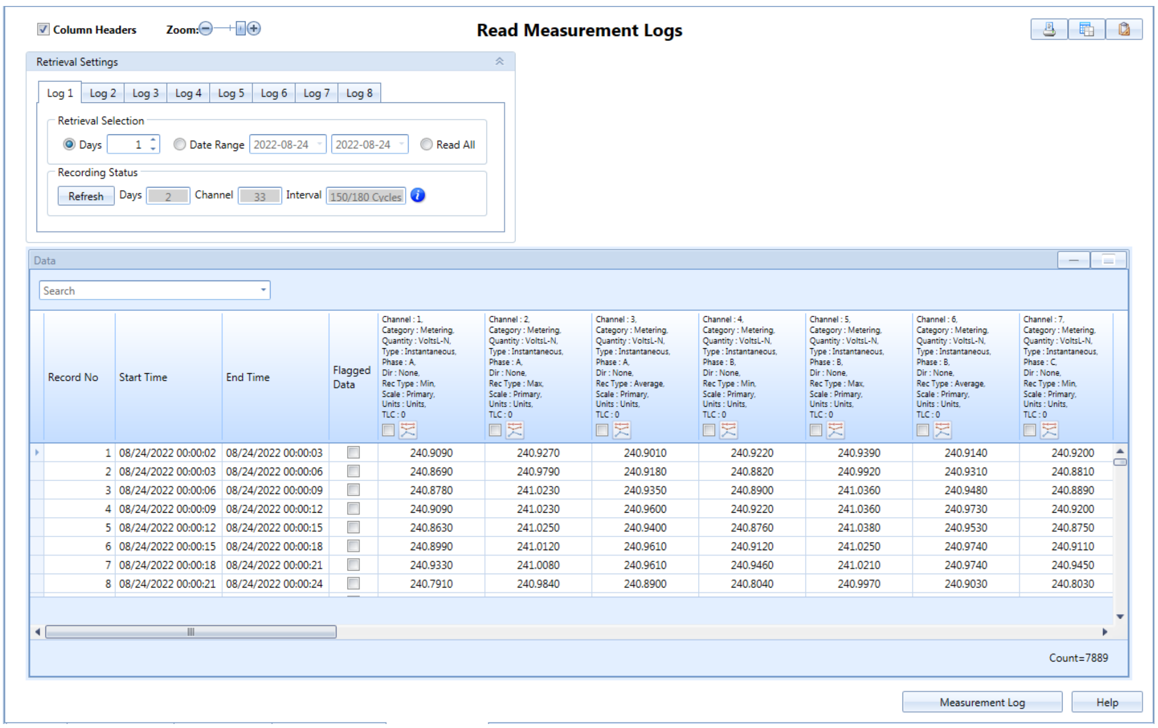


READ MEASUREMENT LOG

When connected to the meter, you can read and display the Measurement Log if equipped with this option.
The Retrieval Settings at the top of the screen lets you retrieve a fixed quantity of days, a date range, or all data. (Only available when connected to the meter).

The Recording Status will display the number of days stored on the meter, number of channels and recording interval length.

Note: There are buttons on the top right to print or download the load profile data in Excel or CSV formats.



The measurement log has a column for flagged data to indicate that a voltage sag/swell or interruption occurred within that recording interval. This is used to highlight the data recorded during that event in case it falls outside of typical trend data.

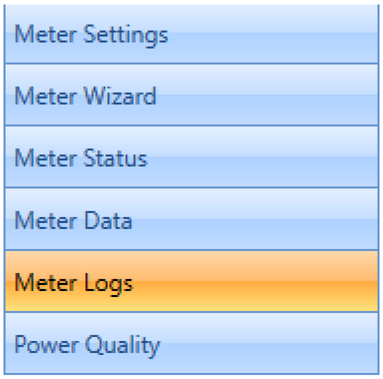
Note: The Measurement Log Data is stored in the non-volatile memory. It uses a FIFO buffer with the oldest records getting overwritten when full. It has a maximum capacity of 1,095 days. The meter memory will support approximately 1,460,000 measurements per 50 channel log. The Measurement Log is only deleted with a Cold Start or when reconfigured.

When the measurement log is stored in PQDIF format, it can be displayed graphically in JEMWARE as shown below.


Observation
[0] 12/10/2016 00:00:00
Quantity
ID_QT_VALUELOG
Channel
[0] Pst Ph A
[1] Plt Ph A
[2] Vl-n Ph A
[3] Vl-n Ph B
[4] Vl-n Ph C
Power Quality Test, ML Daily Record - 12/10/2016 00:00:00.000 AM, Source: MEASURE
7500
7400
7300
7200
7100
[2] Vl-n Ph A
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00

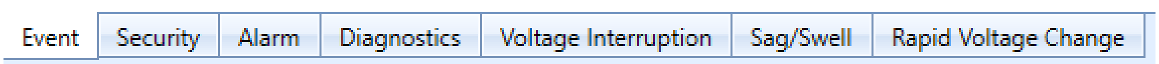
METER LOGS

When connected to a meter, you can read all the Logs stored. You have the ability to print them or download them in a Excel or CSV format.



The application will retrieve the following Meter Logs:

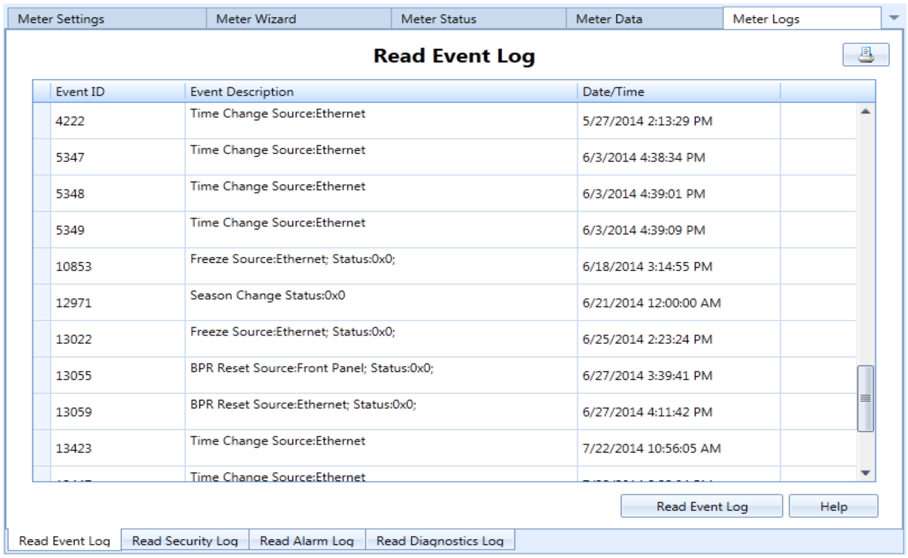
- Read Event Log
- Read Security Log
- Read Alarm Log
- Read Diagnostic Log
- Read Overview Log
- Read Voltage Interruption Log
- Read Sag/Swell Event Log
- Read Rapid Voltage Change Log



Note: The Meter Logs are stored in non-volatile memory.
It uses a FIFO buffer with the oldest records getting overwritten when full. They are only deleted by a Cold Start.

READ EVENT LOG

This command reads the contents of the meters Event Log, which records such metering-related events such as Billing Period Resets, Register Freezes.



Events

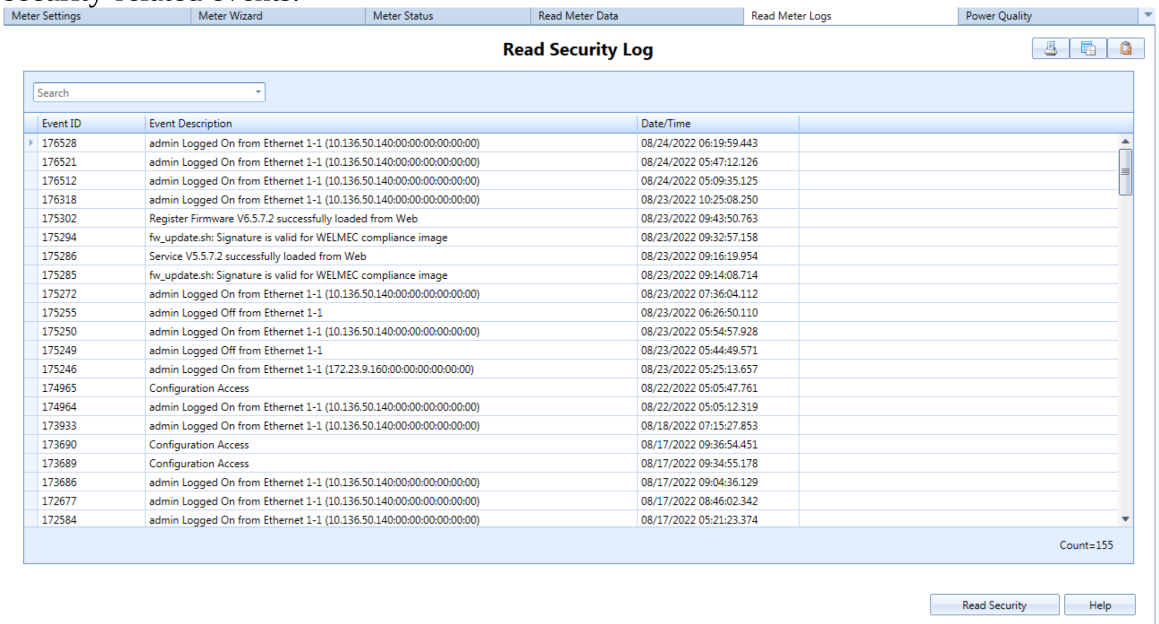
Below is a list of possible events:

Event	Example	Notes:
BPR Reset	BPR Reset Source:Front Panel Status:0x0F User: Admin	Source: Front Panel, OpticalPort, SerialPort(#), Ethernet(#), Modem, Automatic(*User will be blank)
Freeze	Freeze Source:Ethernet Status:0x0000ff	Source: How Freeze was initiated.
Season Change	Season Change Status:0x%x"	
Time Change	Time Change; Source:Serial 1; User: Admin	Source: Front Panel, OpticalPort, SerialPort(#), Ethernet(#), Modem, Automatic(*User will be blank)
Daylight Savings Time Change	Daylight Savings Time Change	
Normal Registers Preset	Normal Registers Preset; Source:%s	Source: Front Panel, OpticalPort, SerialPort(#), Ethernet(#), Modem, Automatic(*User will be blank)
Alternate Registers Preset	Alternate Registers Preset; Source:%s	Source: Front Panel, OpticalPort, SerialPort(#), Ethernet(#), Modem, Automatic(*User will be blank)
Power Outage0	Power Outage Event	Power Outage begin and End Time
Load Profile	Load Profile Pulse Overflow	Pulse Status Information
Test Mode	Test Mode Started; Source	Start and Stop information

***Note**: The STATUS format is used to provide a brief overview of the status of the meter. It is transmitted as a HEX_32, but each bit is a flag indicating the state of some item of interest.*

READ SECURITY LOG

This feature reads and displays the contents of the meter's Security Log, which contains records of user logins, failed login attempts, meter configuration changes and other security-related events.



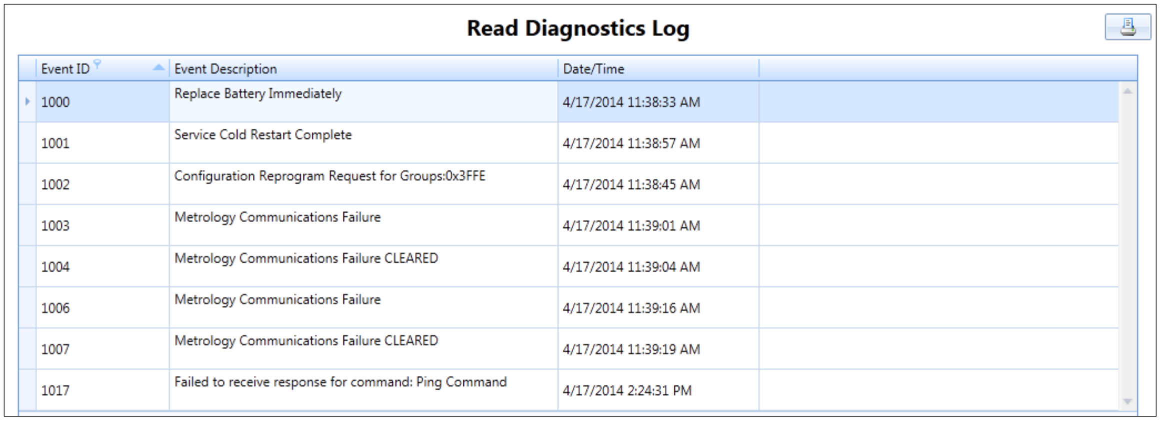
Events

Below is a list of all possible security events:

Event	Example	Notes:
Logged On	admin Logged On from Ethernet.	Source: Front Panel, OpticalPort, SerialPort(#), Ethernet(#), Modem.
Logged Off	admin Logged Off from Ethernet.	Source: Front Panel, OpticalPort, SerialPort(#), Ethernet(#), Modem.
Configuration Access	Configuration Access	Logged on Read Configuration.
Configuration Change	Configuration Change via JEMWare II	Source: JEMWare II or Front panel
Firmware Changed	Service Firmware Changed	Source: Service, Metrology, PQ, FPGA, Register
Password Attempts	Password Attempts Exceeded	
Cold Start	Cold Start Complete	

READ DIAGNOSTIC LOG

This feature reads and displays the contents of the meters Diagnostic Log, which records such diagnostic events as Service Communications Failure, Database Access Failure. Whenever the meter's LCD panel "Status" icon goes red it indicates some type of meter failure. If this occurs, an event will be entered into the diagnostic log. If a failure clears, this will be entered here. Below is an example of the diagnostic log.


Read Diagnostics Log

Event ID	Event Description	Date/Time
1000	Replace Battery Immediately	4/17/2014 11:38:33 AM
1001	Service Cold Restart Complete	4/17/2014 11:38:57 AM
1002	Configuration Reprogram Request for Groups:0x3FFE	4/17/2014 11:38:45 AM
1003	Metrology Communications Failure	4/17/2014 11:39:01 AM
1004	Metrology Communications Failure CLEARED	4/17/2014 11:39:04 AM
1006	Metrology Communications Failure	4/17/2014 11:39:16 AM
1007	Metrology Communications Failure CLEARED	4/17/2014 11:39:19 AM
1017	Failed to receive response for command: Ping Command	4/17/2014 2:24:31 PM

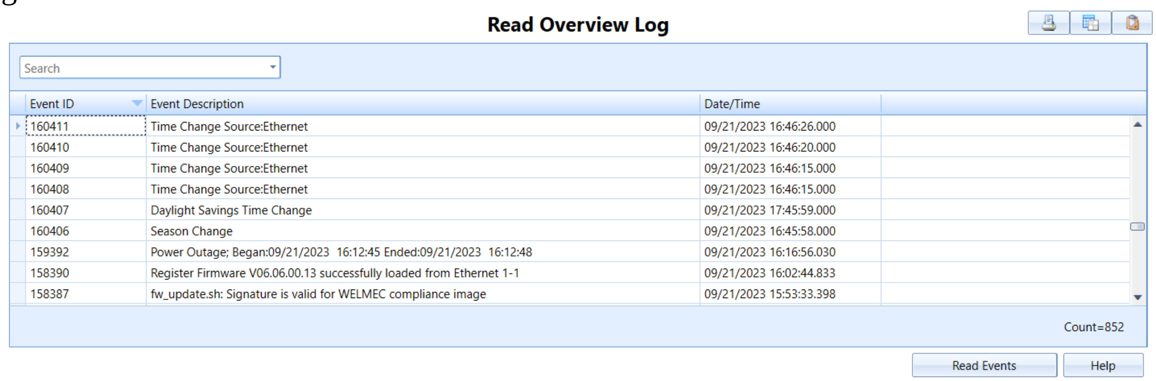
Events

Below is a list of all possible diagnostic events.

Event	Notes:
Service Communications Failure OR Service Communications Failure CLEARED	Bit 8 in Meter Status Set (0x100)
Database Access Failure	Bit 9 in Meter Status Set (0x200)
Replace Battery Immediately	Battery Status set
Clock Sync Failure OR Clock Sync Failure CLEARED	Sync Icon on front panel will go red when this error is present.
Metrology Communications Failure OR Metrology Communications Failure CLEARED	Meter Status bit 3 (0x04)
PQ Communications Failure OR PQ Communications Failure CLEARED	Meter Status bit 4 (0x10)
CRC Err Service Firmware OR CRC Err Service Firmware CLEARED	The Service board has 2 copies of firmware so it will reprogram itself and report all good with the CLEARED event.
CRC Err Metrology Firmware OR CRC Err Metrology Firmware CLEARED	The Metrology board has 2 copies of firmware so it will reprogram itself and report all good with the CLEARED event.
CRC Err PQ Firmware OR CRC Err PQ Firmware CLEARED	The PQ board has 2 copies of firmware so it will reprogram itself and report all good with the CLEARED event.
Configuration Reprogram Request for Groups: %s Where %s contains what configuration was corrupt.	Configuration is resent
CRC Errors in Calibration 20 data OR CRC Errors in Calibration 20 data CLEARED	Meter Status Set (0x02)
CRC Errors in Calibration 2 data OR CRC Errors in Calibration 2 data CLEARED	Meter Status Set (0x04)
Battery Status Reset; Source: %s	User initiates Reset Battery Status from front panel. This should only be done if the user replaces the battery.
Service Cold Restart Complete	User requested a Cold Start from the front panel. Configuration reset to defaults all event logs cleared.

READ OVERVIEW LOG

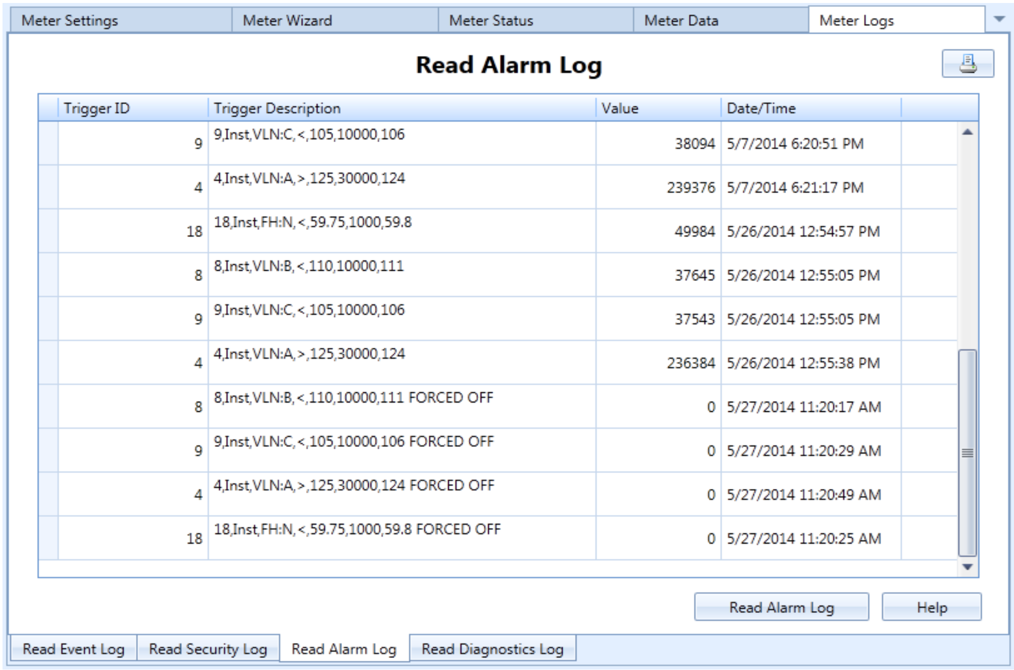
This feature reads and displays the contents of the following 3 Meter Logs: Event, Security and Diagnostic. The events are combined into one log and sorted by Event ID to give an overview of the meter events.



Event ID	Event Description	Date/Time
160411	Time Change Source:Ethernet	09/21/2023 16:46:26.000
160410	Time Change Source:Ethernet	09/21/2023 16:46:20.000
160409	Time Change Source:Ethernet	09/21/2023 16:46:15.000
160408	Time Change Source:Ethernet	09/21/2023 16:46:15.000
160407	Daylight Savings Time Change	09/21/2023 17:45:59.000
160406	Season Change	09/21/2023 16:45:58.000
159392	Power Outage; Began:09/21/2023 16:12:45 Ended:09/21/2023 16:12:48	09/21/2023 16:16:56.030
158390	Register Firmware V06.06.00.13 successfully loaded from Ethernet 1-1	09/21/2023 16:02:44.833
158387	fw_update.sh: Signature is valid for WELMEC compliance image	09/21/2023 15:53:33.398

READ ALARM LOG

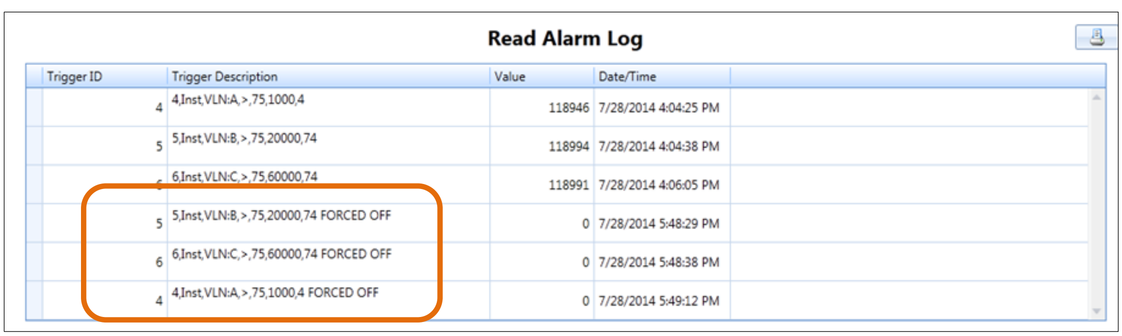
This feature reads and displays the contents of the meter's Alarm Event Log, which records events detected by the Alarm Trigger system.



Trigger ID	Trigger Description	Value	Date/Time
9	9,Inst,VLN:C,<,105,10000,106	38094	5/7/2014 6:20:51 PM
4	4,Inst,VLN:A,>,125,30000,124	239376	5/7/2014 6:21:17 PM
18	18,Inst,FH:N,<,59.75,1000,59.8	49984	5/26/2014 12:54:57 PM
8	8,Inst,VLN:B,<,110,10000,111	37645	5/26/2014 12:55:05 PM
9	9,Inst,VLN:C,<,105,10000,106	37543	5/26/2014 12:55:05 PM
4	4,Inst,VLN:A,>,125,30000,124	236384	5/26/2014 12:55:38 PM
8	8,Inst,VLN:B,<,110,10000,111 FORCED OFF	0	5/27/2014 11:20:17 AM
9	9,Inst,VLN:C,<,105,10000,106 FORCED OFF	0	5/27/2014 11:20:29 AM
4	4,Inst,VLN:A,>,125,30000,124 FORCED OFF	0	5/27/2014 11:20:49 AM
18	18,Inst,FH:N,<,59.75,1000,59.8 FORCED OFF	0	5/27/2014 11:20:25 AM

When the Alarm has gone ON, the events will read exactly as stored in description field of the trigger. When the Alarm has gone OFF the description will have the word “CLEARED” appended to it. This will clearly differentiate the 2 different states of the triggers.

Additionally, if a trigger is in the Alarm (ON) State and the user disables the trigger via the configuration then the word “FORCED OFF” will be appended to the event.



Trigger ID	Trigger Description	Value	Date/Time
4	4,Inst,VLN:A,>,75,1000,4	118946	7/28/2014 4:04:25 PM
5	5,Inst,VLN:B,>,75,20000,74	118994	7/28/2014 4:04:38 PM
6	6,Inst,VLN:C,>,75,60000,74	118991	7/28/2014 4:06:05 PM
5	5,Inst,VLN:B,>,75,20000,74 FORCED OFF	0	7/28/2014 5:48:29 PM
6	6,Inst,VLN:C,>,75,60000,74 FORCED OFF	0	7/28/2014 5:48:38 PM
4	4,Inst,VLN:A,>,75,1000,4 FORCED OFF	0	7/28/2014 5:49:12 PM

Read Voltage Interruption Log

The Voltage Interruption Log is used to store all interruptions of power. A trigger for voltage interruptions must be configured and enabled to log these events. All three phases need to fall below the trigger setting before an interruption is recorded.
The log includes the start and end time of each interruption, duration in cycles, and value of the voltages that triggered the event. There are buttons on the top right to print or download the load profile data in Excel or CSV formats.

Read Voltage Interruption Log

Event ID	Start	End	Cycles	Phase A Voltage	Phase B Voltage	Phase C Voltage
20	03/20/2020 18:31:23.950 PM	03/20/2020 18:31:25.081 PM	68	12.162	12.153	12.146
19	03/20/2020 18:30:02.149 PM	03/20/2020 18:30:02.363 PM	13	10.134	10.127	10.12
18	03/20/2020 18:29:14.899 PM	03/20/2020 18:29:15.513 PM	37	15.202	15.191	15.185
17	03/20/2020 18:27:11.714 PM	03/20/2020 18:27:12.328 PM	37	15.202	15.191	15.185
16	03/17/2020 20:31:09.039 PM	03/17/2020 20:31:20.568 PM	648.5	15.397	15.465	15.413

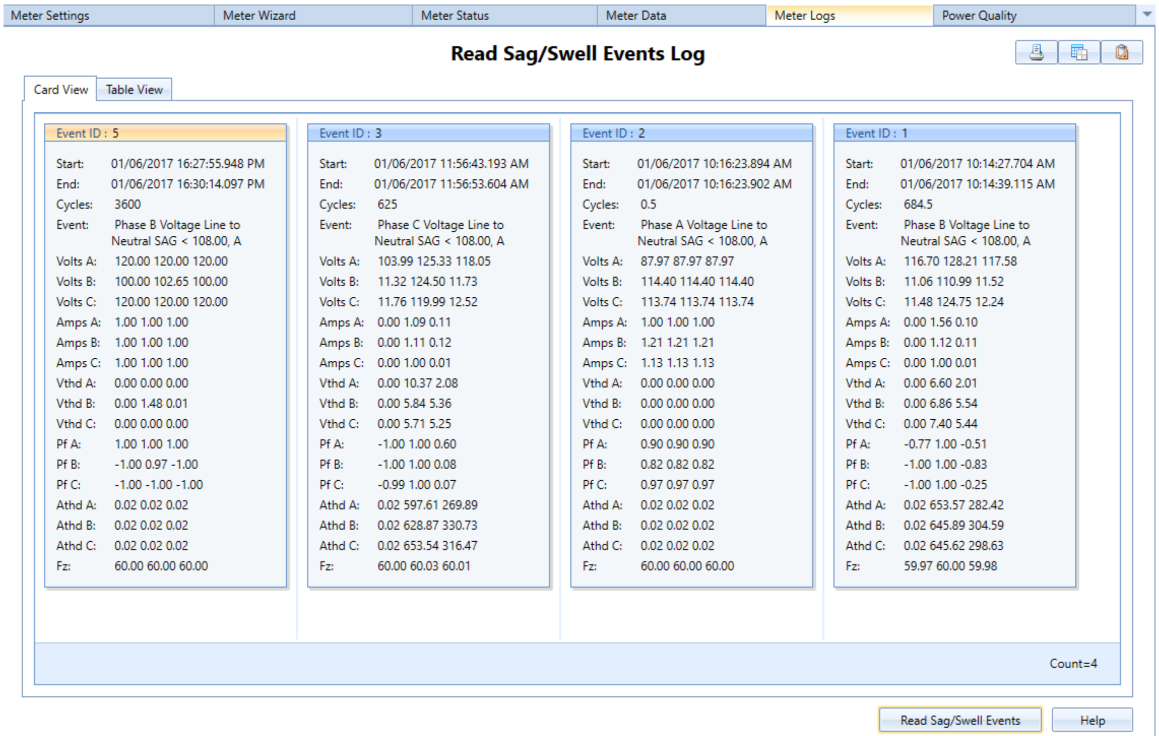
Trigger settings used for the above events are shown below:

ID	Enabled	Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset	Reset Delay
1	☑	Instantaneous	VoltsL-N	Any	<	90	0	92	0
2	☑	Instantaneous	VoltsL-N	Any	>	110	0	108	0
3	☑	VoltageInterruption	VoltsL-N	All	<	20	0	20.4	0
4	☑	RapidVoltageChange	VoltsL-N	Any	>	5	0	2.5	0

Trigger # 3 used for Voltage Interruptions.

READ SAG/SWELL EVENT LOG

This feature reads and displays the contents of the meters Sag/Swell Log. A Sag/Swell is recorded when the voltage exceeds the Sag or Swell Trigger.



Note: There are buttons on the top right to print or download the load profile data in Excel or CSV formats.

The Sag/Swell record includes following information:

- Time and date when it occurred (to the msec)
- Duration of the event in line cycles
- Trigger Setting and value that initiated the event
- Volts, Current, Power Factor, Frequency, Volts THD, Amps THD per phase (min/max/avg)

The data can be shown in Card View as shown in the picture or in Table View.

Trigger settings used for the above events are shown below:

ID	Enabled	Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset	Reset Delay
1	☑	Instantaneous	VoltsL-N	Any	<	90	0	92	0
2	☑	Instantaneous	VoltsL-N	Any	>	110	0	108	0
3	☑	VoltageInterruption	VoltsL-N	All	<	20	0	20.4	0
4	☑	RapidVoltageChange	VoltsL-N	Any	>	5	0	2.5	0

Trigger # 1 used for Voltage Sag and Trigger #2 for a Voltage Swell.

READ RAPID VOLTAGE CHANGE LOG

This feature reads and displays the contents of the Rapid Voltage Change (RVC) Log. A Rapid Voltage Change events is generated upon a trigger which is configured for this event.
Rapid Voltage Change triggers will operate in accordance with IEC 61000-4-30 Class A.

The RVC log includes the start and end time, duration, and the steady state (Uss) and max (Umax) values recorded.

Read Rapid Voltage Change Log

Event ID	Event Start	Event End	Duration	Phase A Umax	Phase A Uss	Phase B Umax	Phase B Uss	Phase C Umax	Phase C Uss	Polyphase Umax	Polyphase Uss
9	03/16/2020 13:37:2...	03/16/2020 13:37:2...	306	7.063	0.002	7.066	0.016	7.049	0.017	7.066	0.017
8	03/16/2020 13:11:1...	03/16/2020 13:11:1...	306	7.063	0.002	7.066	0.016	7.049	0.017	7.066	0.017
7	03/16/2020 10:27:4...	03/16/2020 10:27:4...	175	7.063	0.002	7.066	0.017	7.049	0.017	7.066	0.017
6	03/11/2020 09:35:0...	03/11/2020 09:35:0...	1108	16.214	0	16.206	0	16.192	0.012	16.214	0.012
5	03/11/2020 09:33:4...	03/11/2020 09:33:4...	1108	16.214	0	16.206	0	16.192	0.012	16.214	0.012

Trigger settings used for the above events are shown below:

ID	Enabled	Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset	Reset Delay
1	☑	Instantaneous	VoltsL-N	Any	<	90	0	92	0
2	☑	Instantaneous	VoltsL-N	Any	>	110	0	108	0
3	☑	VoltageInterruption	VoltsL-N	All	<	20	0	20.4	0
4	☑	RapidVoltageChange	VoltsL-N	Any	>	5	0	2.5	0

Trigger # 4 used for Rapid Voltage Change

They are used to record steady state changes in voltage that don't meet the criteria set for a Voltage Sag/Swell Trigger. The trigger threshold is based on comparing the previous cycle steady state RMS voltage to the current cycle.

They can be used to monitor motor starting, capacitor banks switching on/off, load switching or transformer tap-changer operations. In addition, they can occur from sudden load variations or by power output variations from distributed energy resources such as solar (clouds appear) or wind power systems (wind drops).

STATUS WORD

The Status Word provides the current status of the meter. The Status Word can be configured as a Display Register and logged into Load Profile for each interval. The Status Word is presented as a Hex word which consists of two 16 Bit words: System Bit and Triggered Bit. Each individual bit provides the status of a particular item as listed below:

System Bit
This provides the current status of the meter with regards to internal diagnostics and external influences. The following items and their location within the 16 bit word are shown below:

Bit #	Status Indicator	Description
1	Battery Failure	Indicates that the internal battery needs replacing. Stays active until the battery reset is performed.
2	Auxiliary Power Loss	Future
3	General Failure	Indicates an internal error which could include a Service comm error, PQ Firmware CRC error, Metrology Firmware CRC error, Service Firmware CRC error, PQ Comm error, Metrology Comm error, CRC Error in Calibration Data, PQDIF Storage error, Config Update Request. (Note: all of these are reported separately in the Diagnostic Log)
4	Load Profile overflow	The Load Profile Counts have exceeded the maximum 16 bit storage range of 16,383. Note: Load Profile is stored in engineering units uses a single-precision. It uses the IEEE 754 single-precision format. Its numeric range is ±1.18E−38 to ±3.4E38.
5	Pulse Output overflow	Pulse output rate has exceeded 10 pulses/sec
6	Loss of Time Sync	Indicates a loss of external time sync from NTP or IRIG-B
7	NTP Time Sync Drift	It shall go into alarm when the internal clock is more than the configurable tolerance Ts which is adjustable from 10ms to 10,000 msec. Default is 500msec
8	DST	Indicates when the meter is using Daylight Savings Time. DST time and dates are configured in JEMWARE.
9	Terminal / Service Cover Removed	Indicates that the terminal cover or service cover have been opened up.
10	Manual Time Change	The meter time was changed manually.
11	Configuration Change	The meter configuration was changed.
12	Firmware Changed	The meter firmware was changed.
13-16	Future	

Note: All of the above status indicators will stay active for the duration of the condition with a minimum duration equal to the current Load Profile Interval.
For example, if using a 15-minute Load Profile Interval, and the terminal cover was removed for 5 seconds, the 'Terminal Cover' bit would stay active during the 15 minute interval in which it occurred.

The system bit will be presented as a Hex word which can be converted into a 16 bit string with 1's or 0's representing the status of each item above. As shown below; a System Bit presented as: 00 21 hex (Binary: 0000 0000 0010 0001) would indicate a 'Battery Failure' and 'Loss of Time Sync'.

Example	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	0	**1**
Bit Position	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

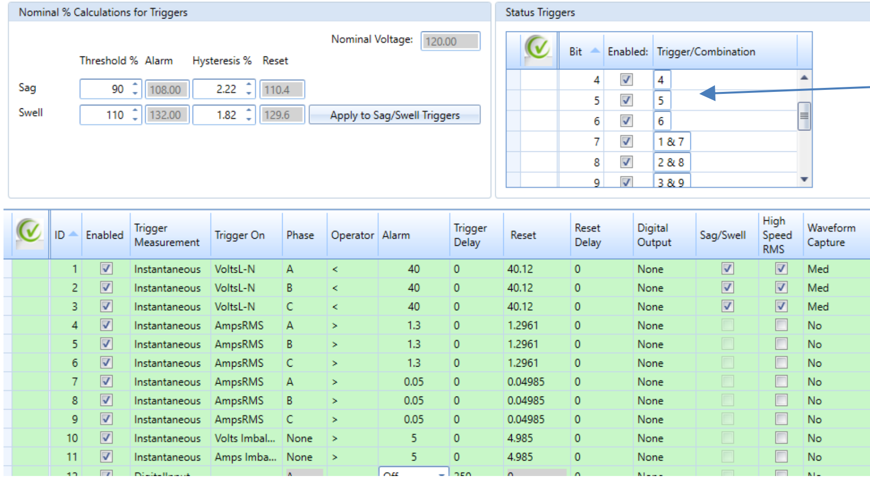
Trigger Bit
This provides the current status of the meter with regards to alarm triggers that you can configure in JEMWARE. A typical example of various triggered alarm bits is shown below:

Bit	**Status Indicator**	**Description**
1	Loss of voltage V1	<0.4 x Vn
2	Loss of voltage V2	<0.4 x Vn
3	Loss of voltage V3	<0.4 x Vn
4	Overcurrent I1	>1.3 x In
5	Overcurrent I2	>1.3 x In
6	Overcurrent I3	>1.3 x In
7	Loss of Voltage V1 with	V1<0.4 x Vn & I1>0.05 x In
8	Loss of Voltage V2 with	V2<0.4 x Vn & I2>0.05 x In
9	Loss of Voltage V3 with	V3<0.4 x Vn & I2>0.05 x In
10	Phase Voltage Rotation Error	Angle between two phases < 90 and >150 degrees
11	Phase Current Rotation Error	Angle between two phases <60 and >180 degrees
12	Voltage Unbalance	>0.05 x Vn
13	Current Unbalance	>0.05 x In
14	External Fault 1	Via Digital Input
15	External Fault 2	Via Digital Input
16	Future	

V1 = Voltage Phase A *V2 = Voltage Phase B* *V3 = Voltage Phase C*
I1 = Current Phase A *I2 = Current Phase B* *I3 = Current Phase C*
Vn = Nominal Voltage *In = Nominal Current*

Some of the trigger bits can be a combination of alarm triggers as shown in Bits 6-8
Note: All of the above status indicators will stay active for the duration of the condition with a minimum duration equal to the current Load Profile Interval.

Typical JEMWare Config for the Status Word



Assignment of triggers to trigger bit number

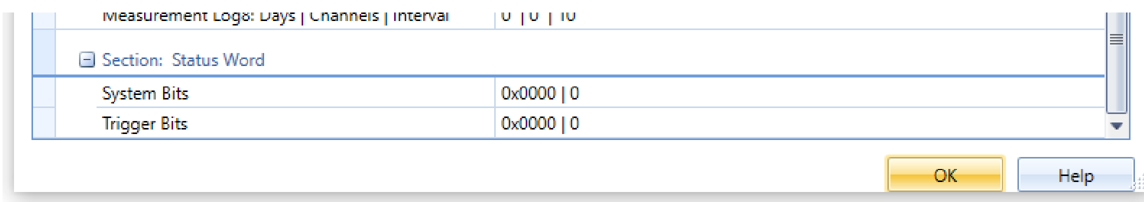
Trigger bit #7 is a combination of trigger #1 and #7

Displaying the Status Word

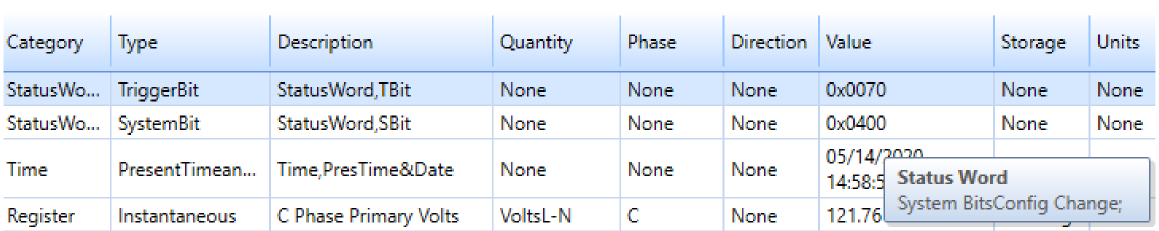
The Status Word can be presented when you connect to a meter in the Connection Status screen, as a display register, in load profile and in the communication protocols.
The value will be shown in Hex format which needs to be converted into Binary to determine the status of the 16 individual bit positions.

Some examples of this are shown below:

Meter Connection Status:
When you connect to the meter, the Connection Status screen will indicate the current value for the Status Word System Bit and Trigger Bit, as shown below.



Display Register:
If a display register is configured for the Status Word, the value will be shown when you read the register. Keep in mind that the current value for any register will be shown right after a meter freeze.



Category	Type	Description	Quantity	Phase	Direction	Value	Storage	Units
StatusWo...	TriggerBit	StatusWord,TBit	None	None	None	0x0070	None	None
StatusWo...	SystemBit	StatusWord,SBit	None	None	None	0x0400	None	None
Time	PresentTimean...	Time,PresTime&Date	None	None	None	05/14/2020 14:58:5		
Register	Instantaneous	C Phase Primary Volts	VoltsL-N	C	None	121.76		

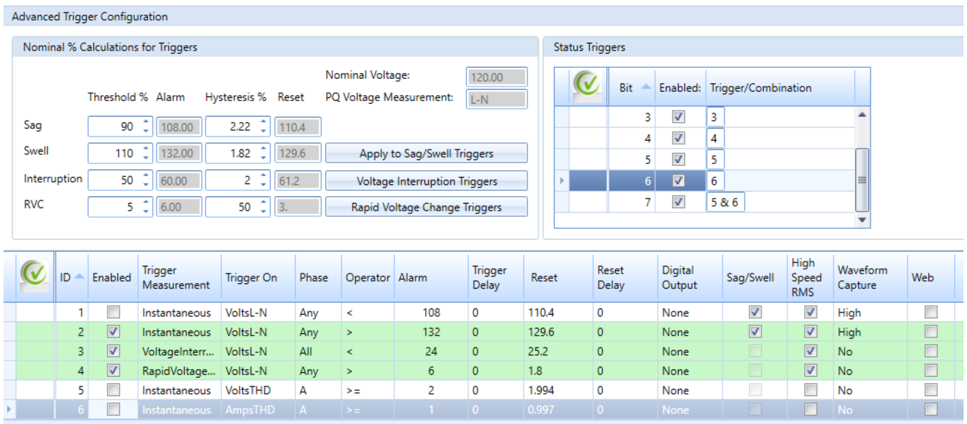
Status Word
System BitsConfig Change;

Note: When you hold your mouse over the Status Word displayed in JEMWARE, it will indicate the individual bit status. As shown above, the mouse indicates that the System Bit result of 0x0400 is a configuration change.

The Trigger Bit Hex value of 0x0070 in binary is: 0000 0000 0111 0000. This reflects trigger bit numbers 5, 6 and 7 in alarm.

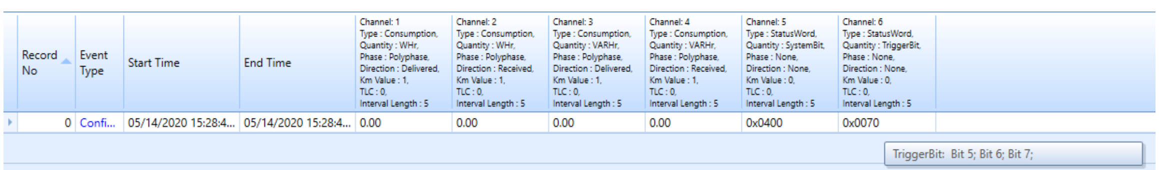
This is derived from the following Trigger Setup:

Trigger Setup



Load Profile:

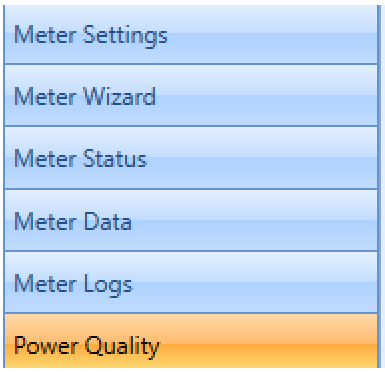
If a load profile channel is configured for the Status Word, it will show the current status for every interval. In the screenshot below, Load Profile Channel 5 is configured for the System Bit and Channel 6 is used for the Trigger Bit.



The Hex values displayed in Load Profile via JEMWare II will be identified by holding the mouse over them. As shown above, the trigger bit value in Hex 0x0070 is equal to trigger bits 5, 6 and 7.

Power Quality

The Power Quality tab in JEMWare II is used with manually retrieving and displaying power quality data for performing root cause analysis of these anomalies. If you don't have any power quality options enabled in the meter, you can still use this for retrieving and displaying Sag/Swell events in the PQDIF file format if you have selected this recording mode in the power quality setup (under PQDIF configuration).



Power quality data is internally stored in the meter logs and PQDIF File Format based on your configuration settings in JEMWARE. The following methods are available for power quality data storage:

PQ Data	Internal log	PQDIF
Sags and Swells	X	optional
Voltage Interruptions	X	optional
Rapid Voltage Change	X	optional
High Speed RMS		X
Waveform Capture		X
Measurement Log Harmonics InterHarmonics Flicker Metering	X	optional

X = always included   optional = Configurable in JEMWARE II

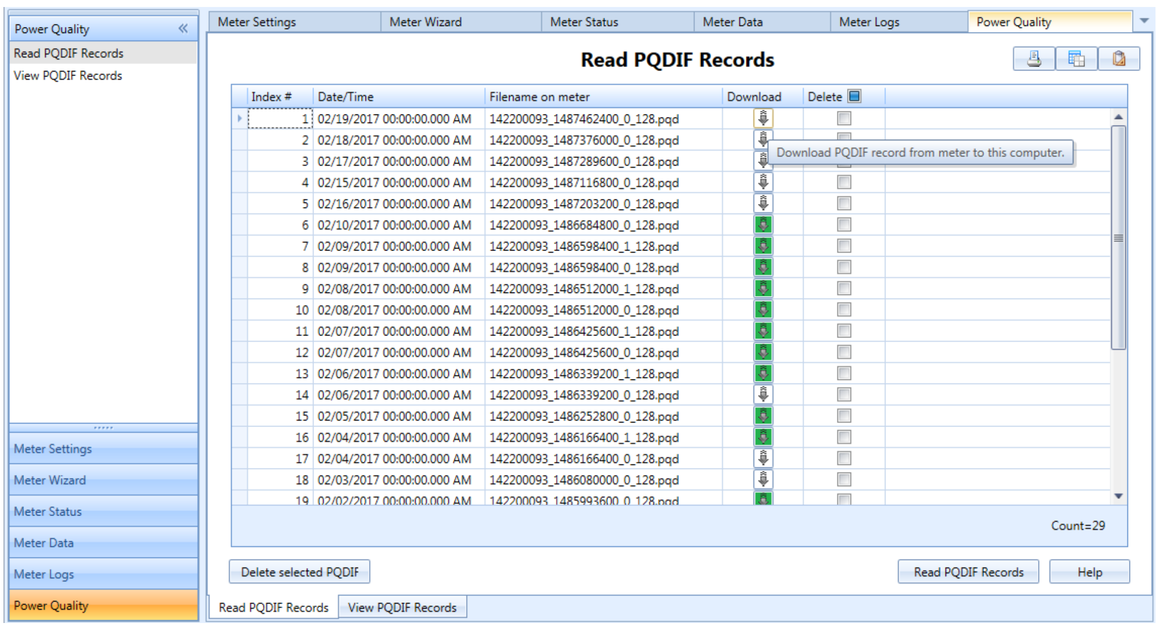
Note: The High-Speed RMS data requires option PQ1 or PQ3, Waveform Capture data requires option PQ2 or PQ3 and the Measurement Log requires options PQ2, PQ3 or ML.

If a meter is not equipped with the PQ options, you can still retrieve the Sag/Swell records in PQDIF file format if the meter is configured to do that.

Power Quality Options	
PQ	PQ Ready Meter can be upgraded in the field for a future PQ Option
PQ1	PQ Basic High Speed RMS
PQ2	PQ Advanced Waveform capture, Harmonic Recording, Flicker (includes Measurement Logging)
PQ3	PQ Max PQ Basic and PQ Advanced

The Power Quality records stored in PQDIF File Format can be retrieved from the meter Automatically (refer to Power Quality configuration screen), by Schedule (refer to File menu in JEMWare II) and manually.

When connected to a meter, you can use the Read PQDIF Records feature to download or delete any PQDIF files stored meter. After you have downloaded the PQDIF files you can use the View PQDIF Records and view them



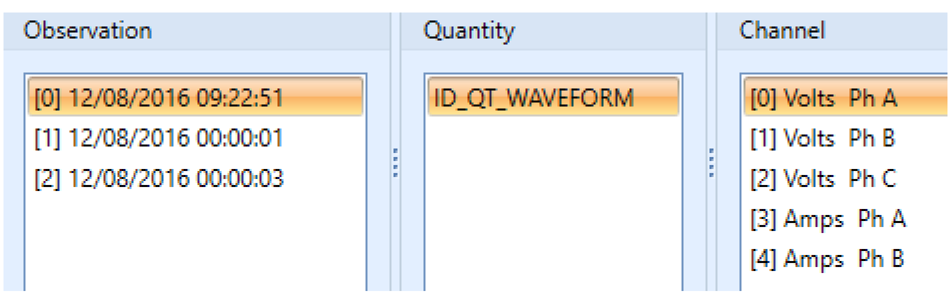
PQDIF File Format
PQDIF (Power Quality Data Interchange Format) IEEE 1159.3 is a non-proprietary file format used for storing power quality data. It uses a standardized format for saving power quality information so different manufactures can present the data in one common format. While similar to the concept of COMTRADE which is a common open format for saving fault data, PQDIF is specifically designed for the type of data collected for power quality applications. The power quality data collected by the JEMStar II meter consists of an Observation, Quantity and Channel.

Observation	Quantity	Channel
PQ Data Type -Triggered Recording -Measurement Log (24-hour period) Each one is labeled with the Time and Date of occurrence	Type of Recording XY = Sag/Swell Record MAGDURTIME = Sag/Swell Record, RVC, Voltage Interruption Waveform = Waveform Capture Record Phasor = High Speed RMS Recording Value Log = Measurement Log	Individual Measurements -Volts Phase A -Volts Phase B -Volts Phase C -AMPS Phase A -Volts Harmonic #3, Ph A (typical measurements)

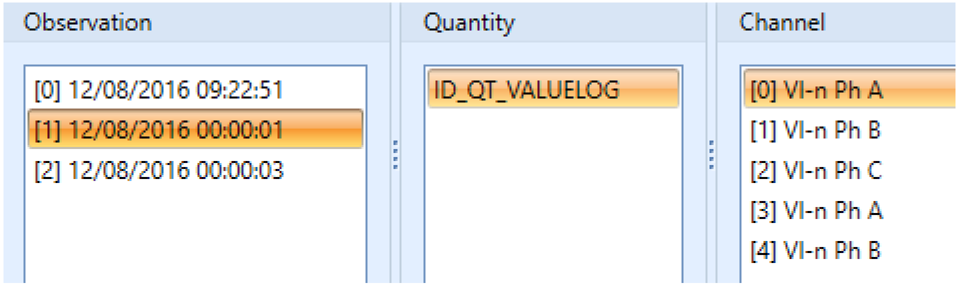
With the above structure, it is possible to have a single PQDIF File that contains multiple observations and multiple recording methods. It provides a complete picture of the power quality anomaly.

The JEMStar II meter saves the power quality data internally in PQDIF format, so there is no need to retrieve data and convert it. There are two options available for storing data in the PQDIF format.

- **Multiple Observations per PQDIF File**
  This file will include any PQ recordings saved by the meter for the 24 hour period starting at midnight. If nothing is recorded, there will be no PQDIF file created. In addition, you can select the time period for the measurement log duration from a minimum of 1 file every 10 minutes to 1 file every 7 days.



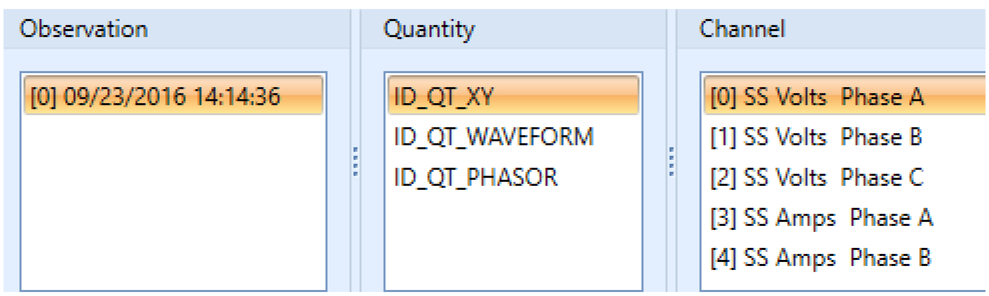
Example of a single PQDIF File displayed in JEMWare II Software. It has three observations over the 24-hour period. First observation at 12/08/2016 09:22:51 has a waveform capture.



Same PQDIF File as above. The second observation at 12/08/2016 00:00:01 contains the 24-hour measurement log.

Note*: The PQDIF File has a maximum size of 500K. In cases where the number of observations stored for this 24-hour period exceeds the 500K, a separate file(s) will be created to store the information.*

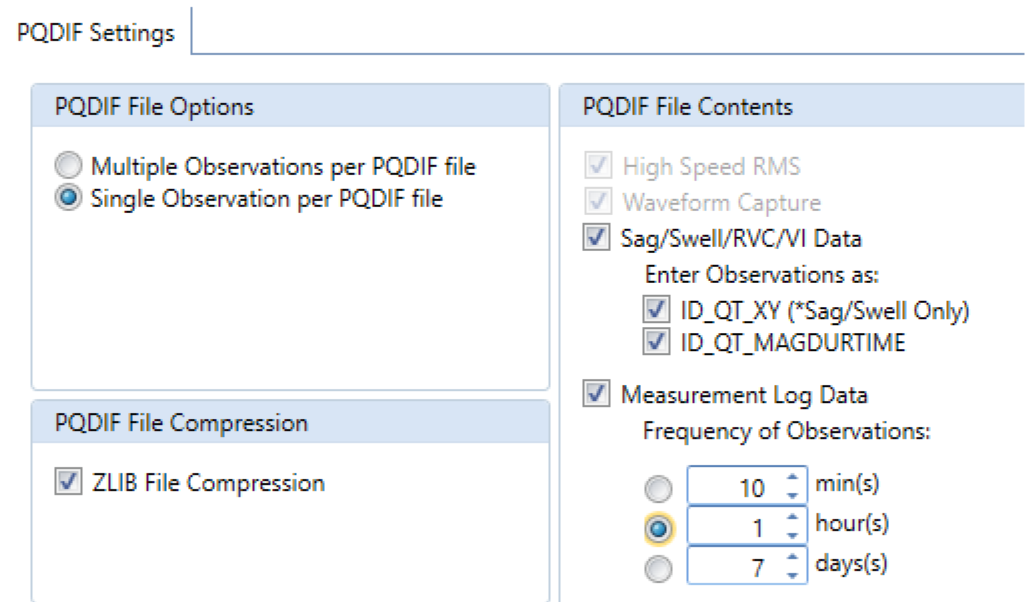
- **Single Observation per PQDIF File**
  In this mode, the PQDIF file will be generated upon every observation. An observation could be a trigger and associated data recordings. If a single trigger initiated the recording of a Sag/Swell Record, Waveform Capture and High Speed RMS recording, all three would be included in the same observation.



Example of a single PQDIF File with a single observation that contains a Sag/Swell Record, Waveform Capture and High Speed RMS recording.

Measurement Log Recording in PQDIF:

The measurement log will be stored in PQDIF format based on the PQDIF File Options and PQDIF File Contents selections.
If the meter is configured for ‘Single Observation per PQDIF file’, the observation frequency is then selected in the PQDIF File Contents selection with a range of 1 observation per 10 minutes to 1 observation per 7 days. If selected as 1 observation per hour, then a new PQDIF file will be created every hour. (If the measurement log is set to record measurements every 10 minutes, then each file will contain 6 intervals of data)



If the meter is configured to create a PQDIF file from multiple observations and the ‘PQDIF File Contents’ is configured for measurement log data observations every 1 hour, then each 24-hour PQDIF file will contain 24 observations of measurement log data.

Recommended Settings:
If you are interested in real time power quality data as it’s captured, then a selection of a single observation per PQDIF file is recommended. This way, a PQDIF file will be created immediately after a PQ event occurs. If you want to have access to measurement log every 10 minutes, then select the frequency of observations to 1 every 10 minutes. Just remember that you will end up with 144 PQDIF Files per day just for the measurement log in addition to any other files from PQ events.

If you are interested in a single PQDIF file once per day that contains all PQ events recorded in the previous 24 hours and all measurement log data, then select ‘Multiple Observations per PQDIF file’. The measurement log frequency of observations can be from 1 day to 7 days. (If set for 7 days, you will get 6 daily PQDIF files with no measurement log and the 7th day will include the measurement log for the whole week)

PQDIF File Naming Convention
The PQDIF files generated by the meter follow a naming convention that include the meter serial number, time and date of the event and type of data recorded.

The file name format used is: YYMMXXXXX_TimeStamp_microsecond_DataType.pqd

Where:

- **YYMMXXXXX**
  Serial number of the meter; with spaces removed

- **TimeStamp**
  10 digit time format (number of seconds elapsed since Jan 1, 1970) of when this file was created

- **Microsecond**
  Variable length number 0->999,999 indicating the microsecond of the TimeStamp when the first event occurred

- **DataType**
  A number representing the type of data stored in this file. See table below.

Single PQDIF File Generated by Observation	
01	Sag/Swell Recording
02	Waveform Capture
03	Sag/Swell and Waveform Capture
04	High Speed RMS
05	Sag/Swell and High Speed RMS
06	Waveform Capture and High Speed RMS
07	Sag/Swell, Waveform Capture and High Speed RMS
08	Measurement Log
16	Rapid Voltage Change
18	Rapid Voltage Change and Waveform Capture
20	Rapid Voltage Change and High Speed RMS
22	Rapid Voltage Change, Waveform Capture and High Speed RMS
32	Voltage Interruption
34	Voltage Interruption and Waveform Capture
36	Voltage Interruption and High Speed RMS
38	Voltage Interruption, Waveform Capture and High Speed RMS

PQDIF File Generated Daily	
128	Can contain any or all of the following: Sag/Swell, Waveform Capture, High Speed RMS, Measurement Log

Example file name: 142300003_1454408745_133724_07.pqd

142300003	**1454408745**	**133724**	**07**
Meter Serial Number 14 23 00003 *23rd week of 2014 Meter ID# 00003*	February 02, 2016 10:25:45 GMT	133724 microseconds (when added to above, 02 Feb 2016 10:25:45:133724 GMT)	Sag/Swell, Waveform Capture, High Speed RMS Data

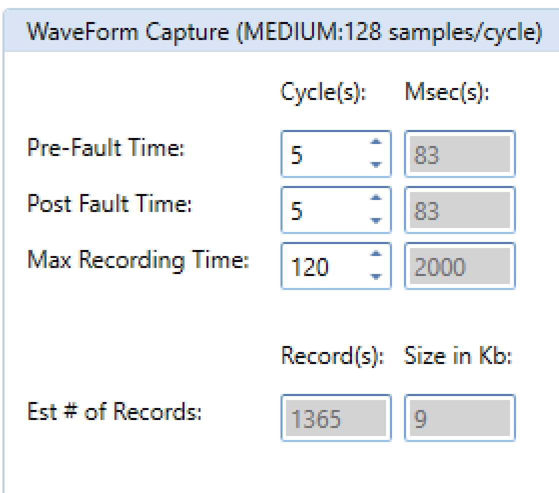
Note: For the Measurement Log, the log number from 1 thru 8 will precede the '08'. For example, …_02_08.pqd' indicates Measurement Log #2.

PQDIF File Storage in the Meter

The amount of PQDIF Files that can be stored in the meter depends on the recording parameters.

- Recording a single PQDIF File per day vs a PQDIF File per Observation
- Types of recording selected
  (Sag/Swell, High Speed RMS, Waveform Capture, Measurement Log)
- Recording Resolution (samples per cycle) and Maximum Recording Times

The power quality configuration page in JEMWARE provides an estimate of the number of files for each recording interval scenario.
In the example below, we can store approximately 1,365 Waveform Capture records with a max duration of 120 cycles and a recording rate of 128 samples per cycle. If the PQDIF File contains other data, like High Speed RMS, Sag/Swell and Measurement Log; this will limit the quantity of records. The PQDIF file storage is in a FIFO buffer with the oldest records overwritten.



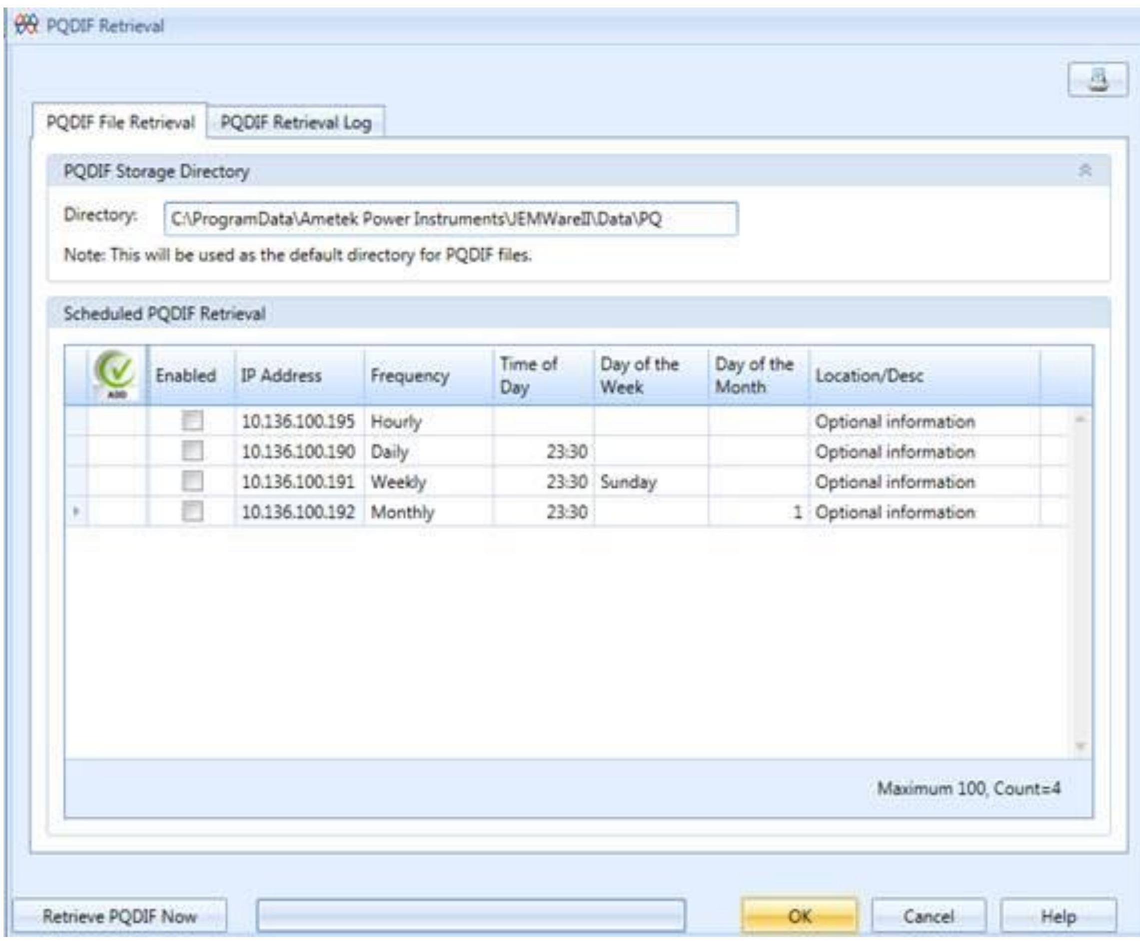
To maximize the storage capacity, make sure the file compression is enabled in the Power Quality Setup.

PQDIF RETRIEVAL VIA JEMWARE II

This is used to automatically retrieve Power Quality PQDIF files from several meters by schedule.
With the scheduled retrieval, you create a database of all the meters you wish to retrieve data from and the timing when you wish to retrieve the data.
The setup screen for this is shown below.

After setting up the group of meters and their IP Addresses, you can enter a folder on your PC where all the files will be saved.

Note: The JEMWARE Software will display all PQ files for viewing in the default directory location shown on this screen.
If you change the location, the files will not be visible on the PQDIF File viewer.

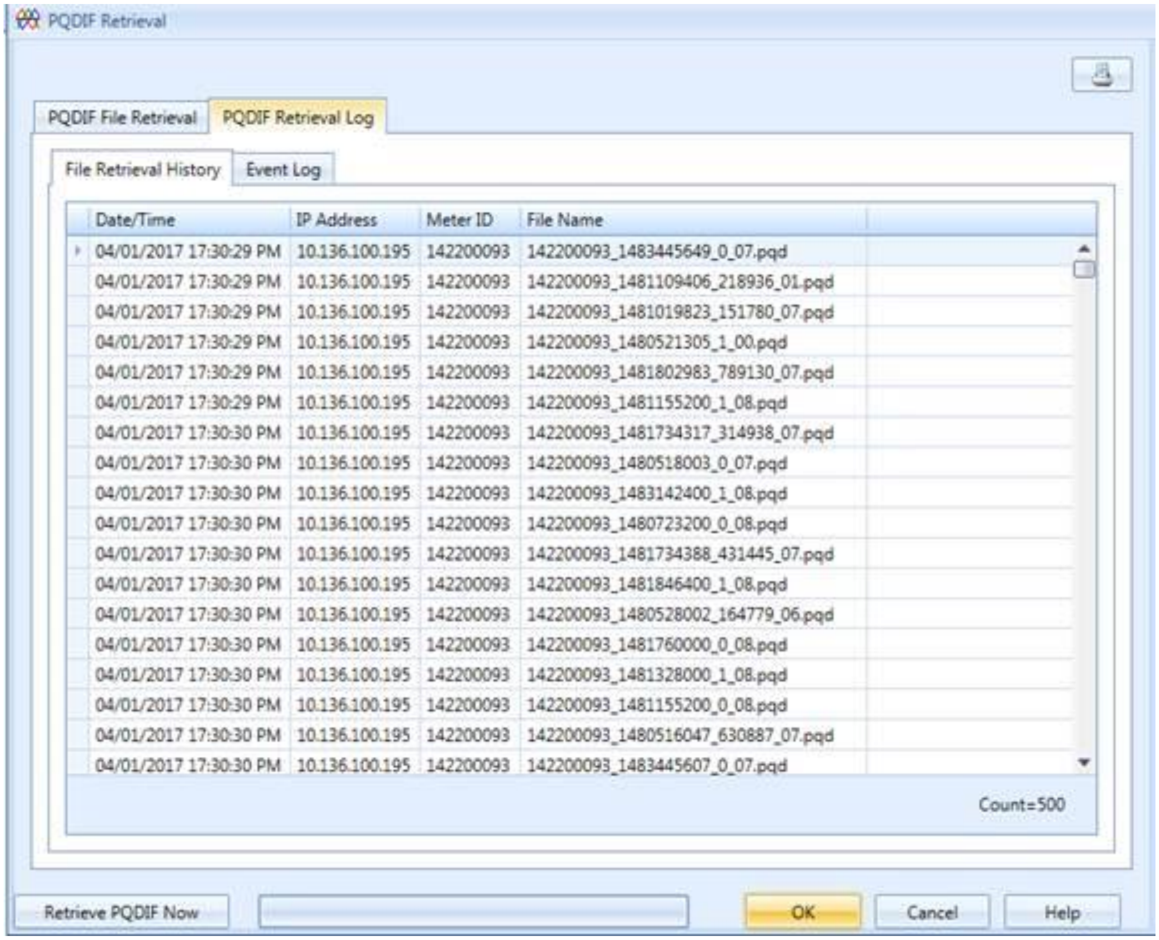


The frequency of retrieval can be configured as hourly, daily, weekly, or monthly.
The hourly read starts at the top of the hour. Additional settings are provided for daily, weekly, and monthly.
You can enable or disable a meter from the scheduled polling using the checkbox provided.

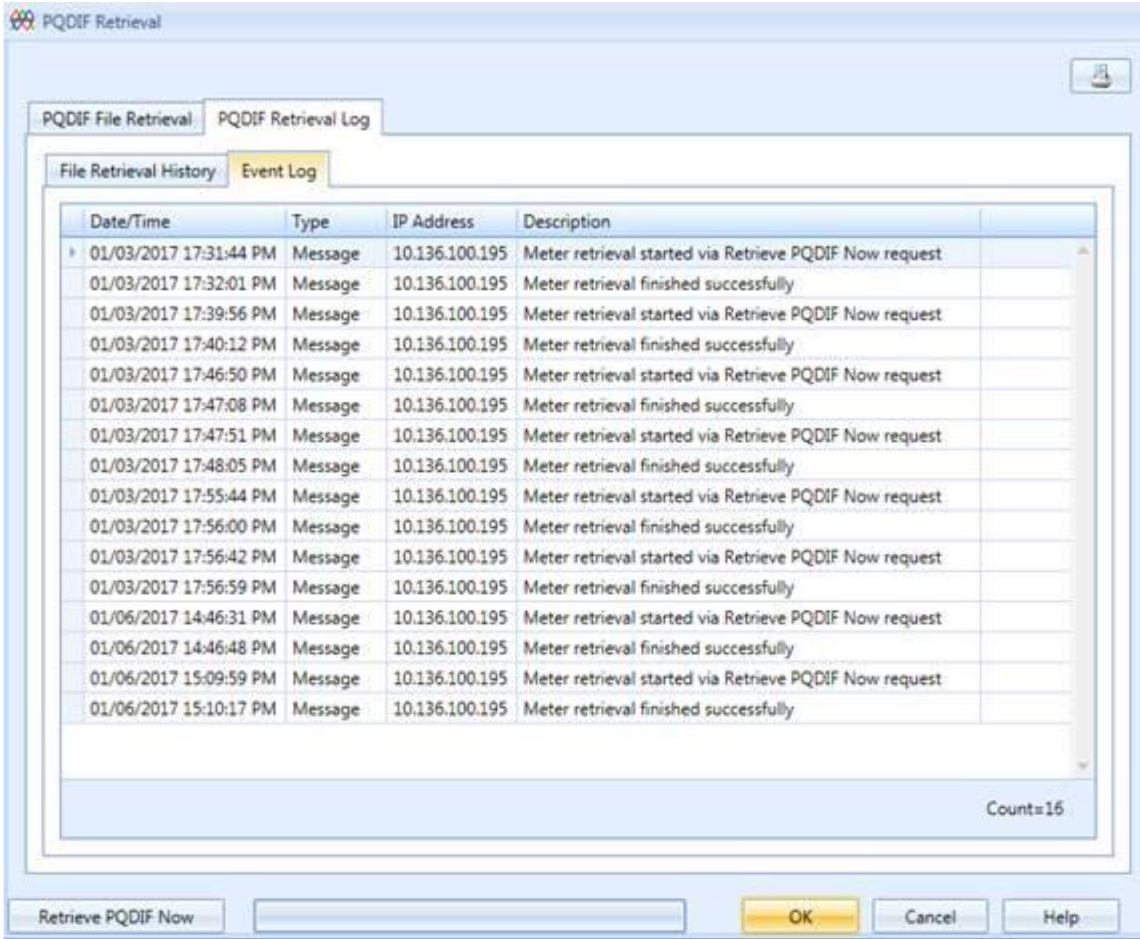
Retrieve PQDIF Now:

You can initiate the polling of all meters enabled with the Retrieve PQDIF Now button. The Retrieve PQDIF Now button will override any scheduled settings and will connect to any of the enabled meters and retrieve any PQDIF files.

The PQDIF Retrieval Log will document the retrieval history and show what files have been retrieved from what Meter ID and at what time.



The PQDIF Event Log will document each tasks progression and logs information on the tasks status.


PQDIF Retrieval
PQDIF File Retrieval
PQDIF Retrieval Log
File Retrieval History
Event Log
Date/Time
Type
IP Address
Description
01/03/2017 17:31:44 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/03/2017 17:32:01 PM Message 10.136.100.195 Meter retrieval finished successfully
01/03/2017 17:39:56 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/03/2017 17:40:12 PM Message 10.136.100.195 Meter retrieval finished successfully
01/03/2017 17:46:50 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/03/2017 17:47:08 PM Message 10.136.100.195 Meter retrieval finished successfully
01/03/2017 17:47:51 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/03/2017 17:48:05 PM Message 10.136.100.195 Meter retrieval finished successfully
01/03/2017 17:55:44 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/03/2017 17:56:00 PM Message 10.136.100.195 Meter retrieval finished successfully
01/03/2017 17:56:42 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/03/2017 17:56:59 PM Message 10.136.100.195 Meter retrieval finished successfully
01/06/2017 14:46:31 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/06/2017 14:46:48 PM Message 10.136.100.195 Meter retrieval finished successfully
01/06/2017 15:09:59 PM Message 10.136.100.195 Meter retrieval started via Retrieve PQDIF Now request
01/06/2017 15:10:17 PM Message 10.136.100.195 Meter retrieval finished successfully
Count=16
Retrieve PQDIF Now
OK
Cancel
Help

PQDIF RETRIEVAL VIA WEB BROWSER

A web browser can also be used to download the PQDIF Files.
When using the WEB Browser, the transfer is done via the web port 80.

Open a web browser using the meter IP Address followed by /pqdif
(Example: 192.168.250.100/pqdif)

Enter the username and password configured for the web browser. (Default is admin:admin or user:user)

Index of /pqdif/

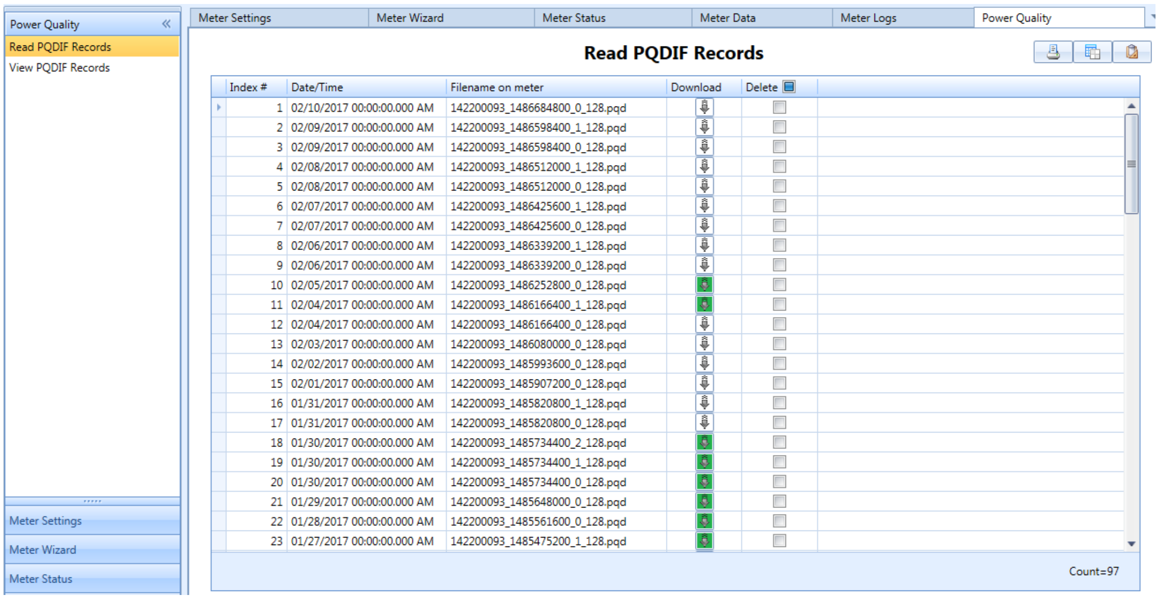
Name	Last Modified	Size	Type
Parent Directory/		-	Directory
hsrms/	2020-Mar-16 10:25:26	-	Directory
pqcomms/	2020-Mar-16 10:27:57	-	Directory
wfc/	2020-Mar-16 10:28:09	-	Directory
154800417_1578578162_100772_06.pqd	2020-Jan-09 13:56:13	13.8K	application/octet-stream
154800417_1578578162_116528_01.pqd	2020-Jan-09 13:56:04	4.8K	application/octet-stream
154800417_1578587851_700958_07.pqd	2020-Jan-09 16:37:43	13.8K	application/octet-stream
154800417_1578647360_451208_07.pqd	2020-Jan-10 09:09:30	12.3K	application/octet-stream
154800417_1578647371_101293_07.pqd	2020-Jan-10 09:09:43	12.3K	application/octet-stream
154800417_1578647378_318014_07.pqd	2020-Jan-10 09:09:50	12.3K	application/octet-stream
154800417_1578647386_34738_07.pqd	2020-Jan-10 09:09:57	12.3K	application/octet-stream
154800417_1578647392_884793_07.pqd	2020-Jan-10 09:10:03	12.3K	application/octet-stream
154800417_1578647853_854977_07.pqd	2020-Jan-10 09:17:45	12.2K	application/octet-stream
154800417_1578647859_321686_07.pqd	2020-Jan-10 09:17:50	12.2K	application/octet-stream
154800417_1578648057_206646_07.pqd	2020-Jan-10 09:21:05	10.0K	application/octet-stream
154800417_1578648062_890020_07.pqd	2020-Jan-10 09:21:10	10.0K	application/octet-stream
154800417_1578648231_482812_07.pqd	2020-Jan-10 09:24:02	12.8K	application/octet-stream
154800417_1578648252_449641_07.pqd	2020-Jan-10 09:24:23	13.2K	application/octet-stream

When you select a file, the browser will prompt you to open the file or save it to your PC. After it has been downloaded from the meter, it will be shown as a gray color.

READ PQDIF RECORDS

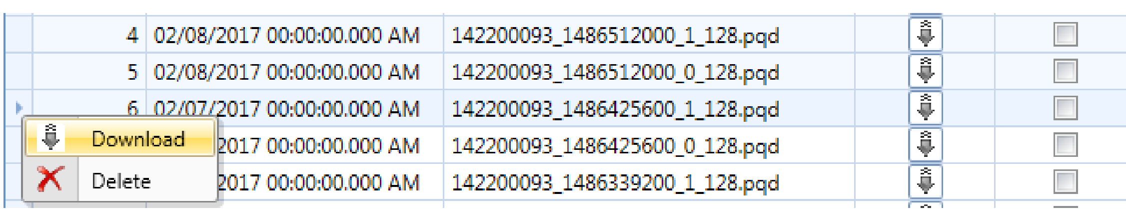
The 'Read PQDIF Records' screen is used for viewing the PQDIF files stored on the meter and downloading them to your PC.

With this screen, you need to connect to a meter and then select Read PQDIF Records.

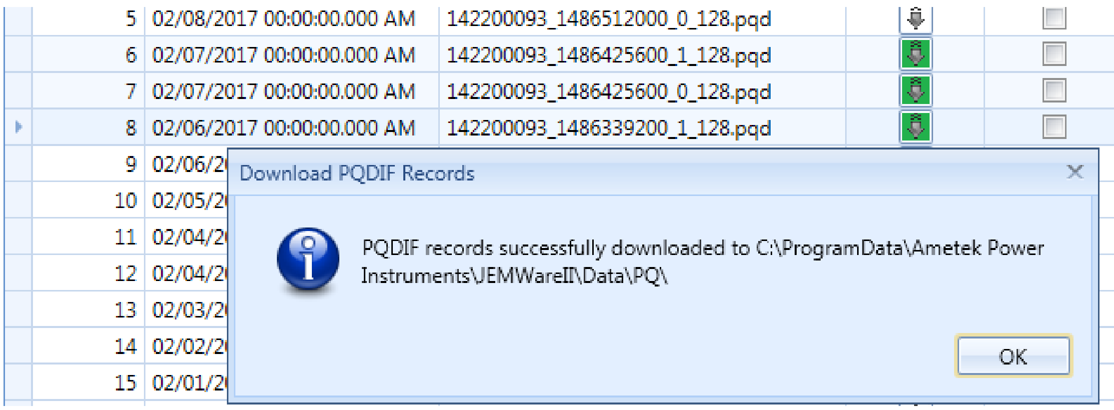


A list of files available to download from the meter are shown. To download the files from the meter, you can individually select each file and select the 'Download' icon or select multiple files using the shift or control keys and then 'right click' the mouse to download the files.

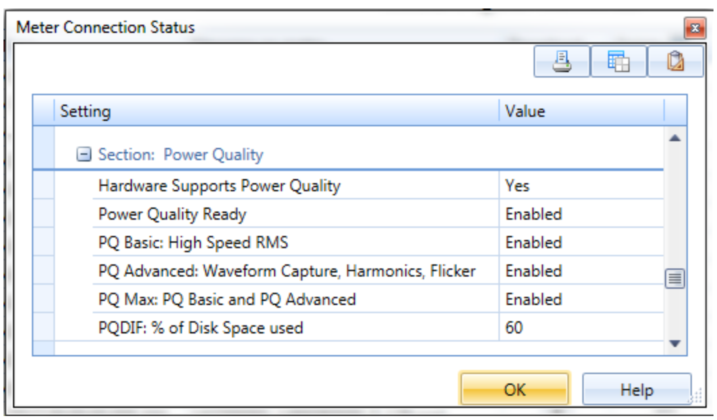
SFTP protocol is used for the transfer of files from the meter to the PC. The Ethernet Port designated for this is Port 22, but this can be changed in Communication Advanced Settings.



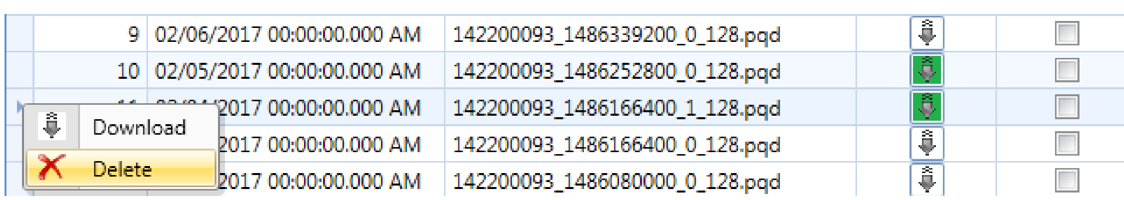
Once the files are downloaded to the PC, they will be shown by a green filled icon. You will also get a notification on download status from JEMWare:



This screen is also used to delete the PQDIF files from the meter. PQDIF Files are stored in non-volatile memory using uses a FIFO buffer with the oldest records getting overwritten when full. The % of disk space used for PQDIF files can be shown via the ‘Status Query’ screen.



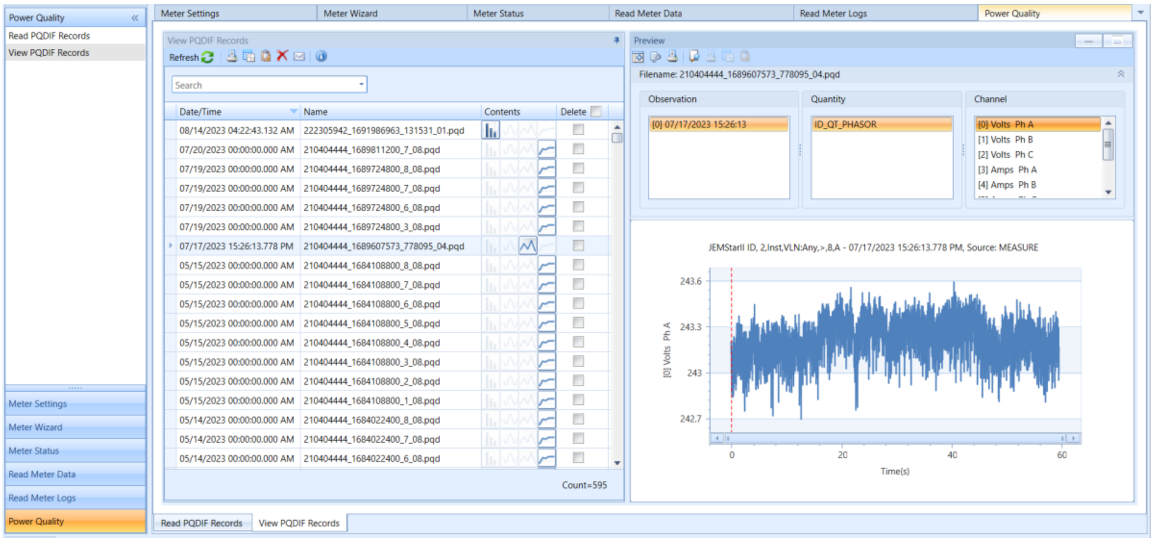
You can delete the PQDIF Files by individually selecting each file via the Delete box. When done, select the Delete selected PQDIF button on the lower left.
Or you can select multiple files using the shift or control keys and then ‘right click’ the mouse to delete the files.



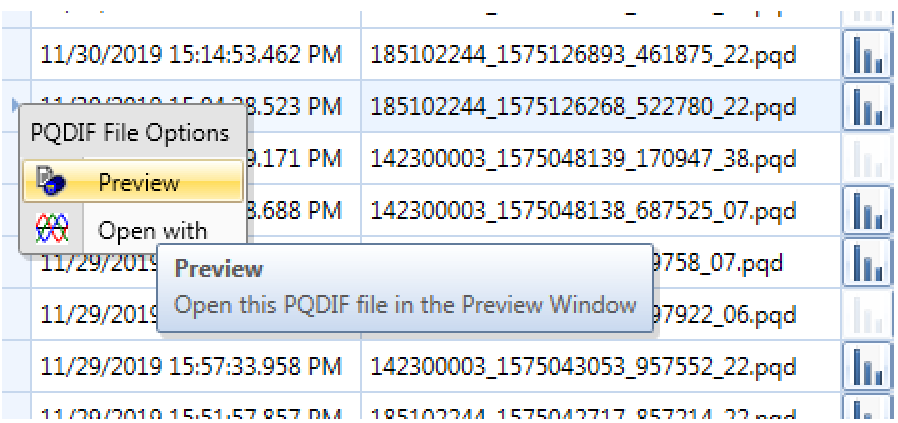
Note: If the file is deleted from your PC, it will no longer show that it has been downloaded from the meter (green icon). If you no longer require it, just delete the file from the meter.

VIEW PQDIF RECORDS

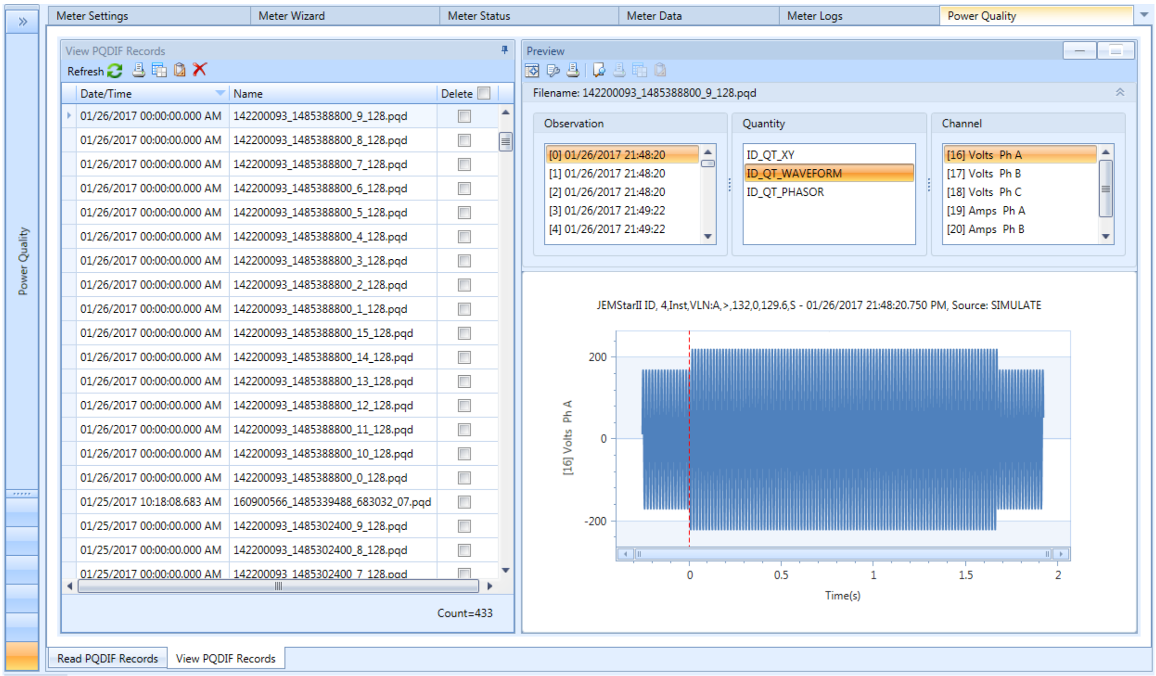
Once the PQDIF Files are retrieved from the meter in one of the methods provided (manual, by schedule, automatically), you can view or delete them in this software. The PQDIF files can be sorted by the Date/Time generated by clicking the field column or by name of the file.



To view a PQDIF file in JEMWare II, select it in the grid and double click it to show in the viewing pane. Or right click it and you can display it in JEMWare II or in PQ Diffractor (if installed).

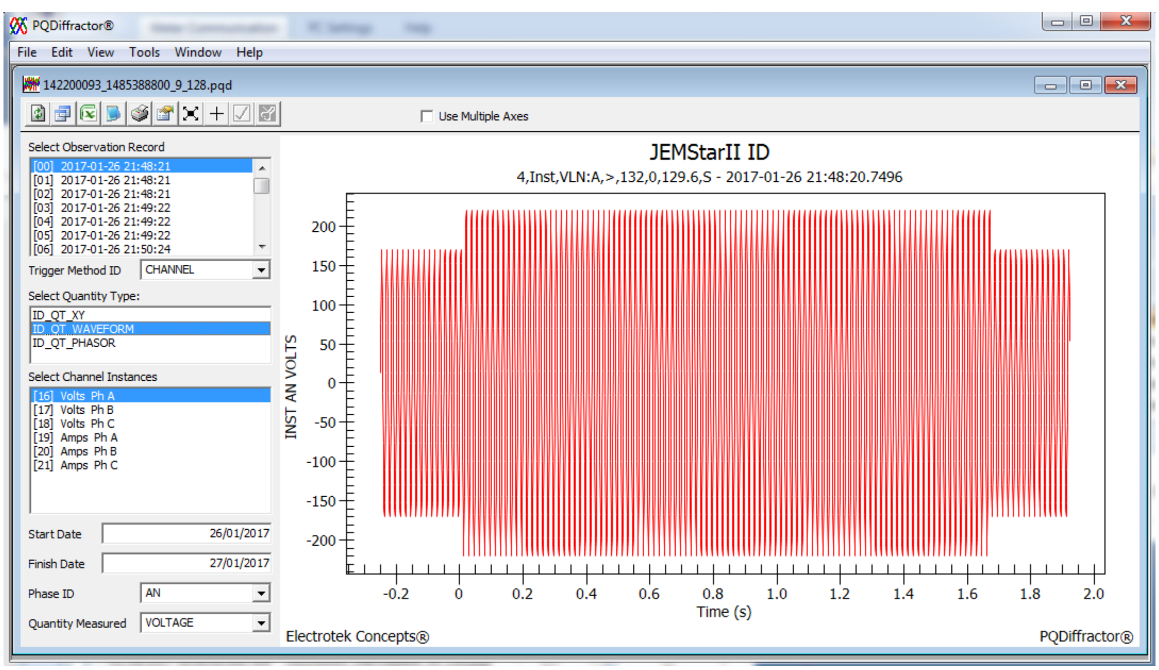


PQDIF file shown in a minimized view in the JEMWare II Preview pane:



Note: The files shown in the table are stored in your root directory in a folder called: C:\ProgramData\Ametek Power Instruments\JEMWareII\Data\PQ
The folder Program Data may be a hidden folder which you will need to unhide for viewing.

The same PQDIF file as shown in PQDiffractor:

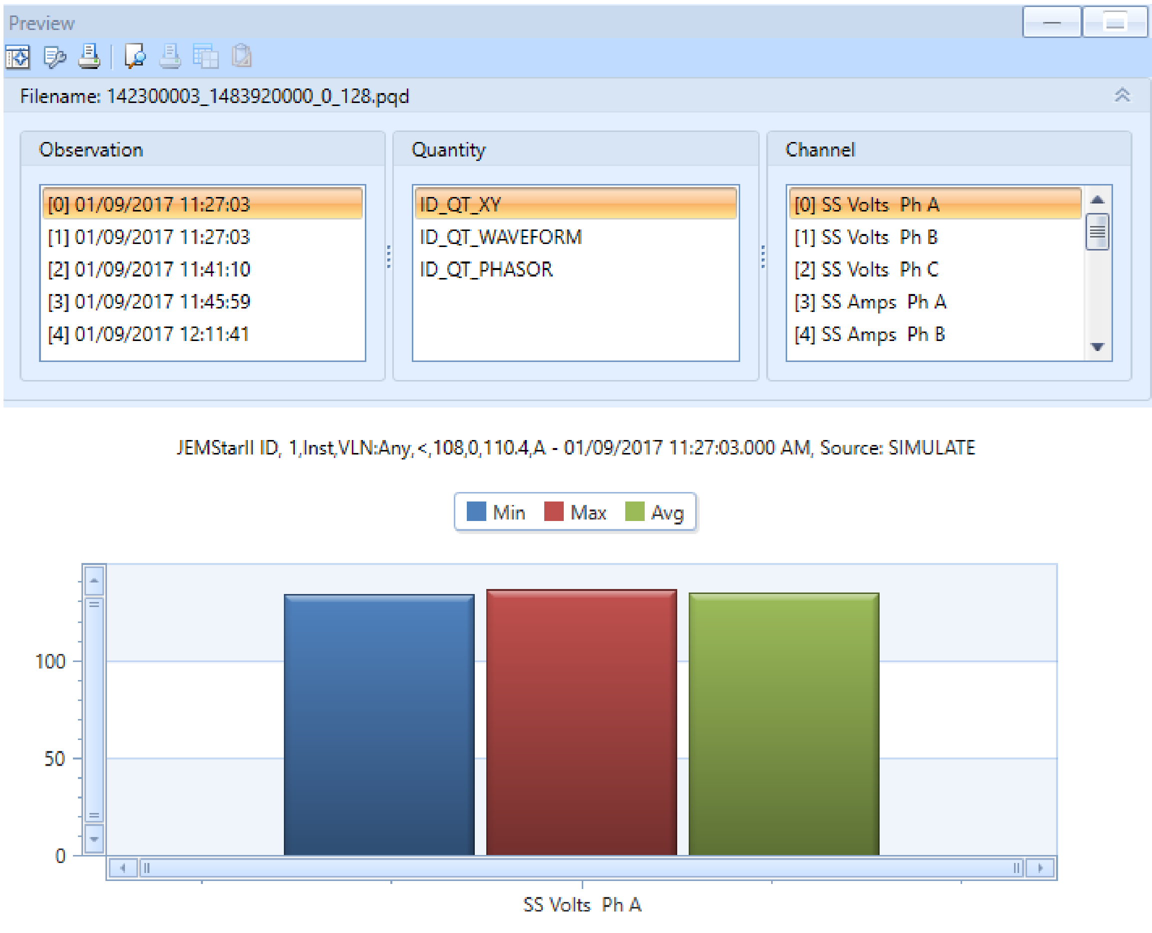


Viewing PQDIF Files

In the PQDIF File shown below, the meter was configured for a single PQDIF file per day. In the recording below, there are 5 observations in this single PQDIF file.
The first observation highlighted has 3 different 'Quantity' for the same observation.

The three Quantity's recorded are:

- ID_QT_XY (Sag/Swell Recording)
- ID_QT_WAVEFORM (Waveform Capture)
- ID_QT_PHASOR (High Speed RMS)



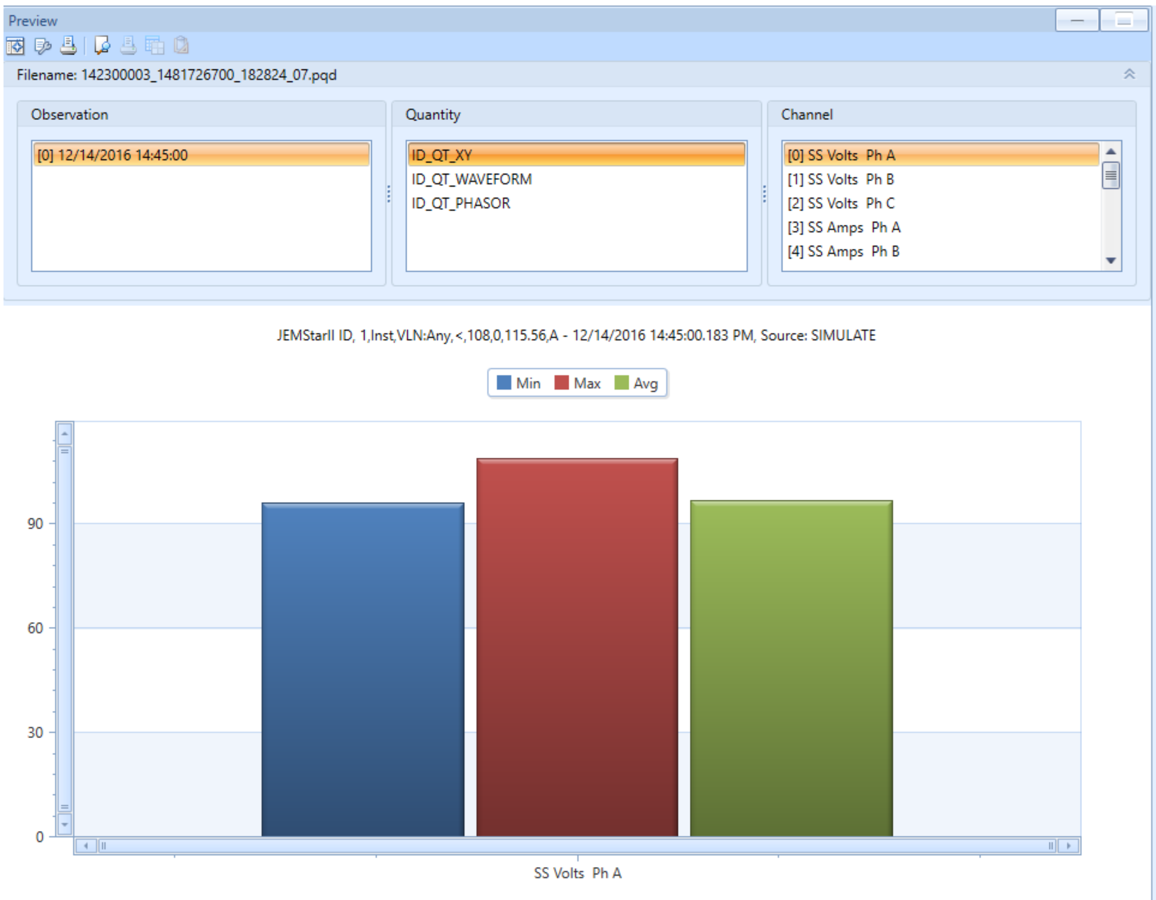
Note: The 3 different "quantity' above were generated from the alarm trigger configuration. For each trigger condition, all three recording modes were selected.

	ID	Enabled	Trigger Measurement	Trigger On	Phase	Operator	Alarm	Trigger Delay	Reset	Digital Output	Sag/ Swell	High Speed RMS	Waveform Capture
	1	☑	Instantaneous	VoltsL-N	Any	<	108	0	110.4	None	☑	☑	Med
	2	☑	Instantaneous	VoltsL-N	Any	>	132	0	129.6	None	☑	☑	Med

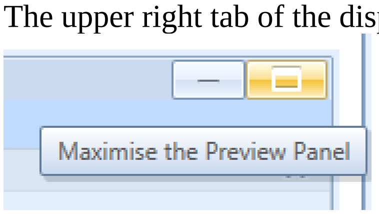
All alarm values are in secondary units

Display Tools and Tips

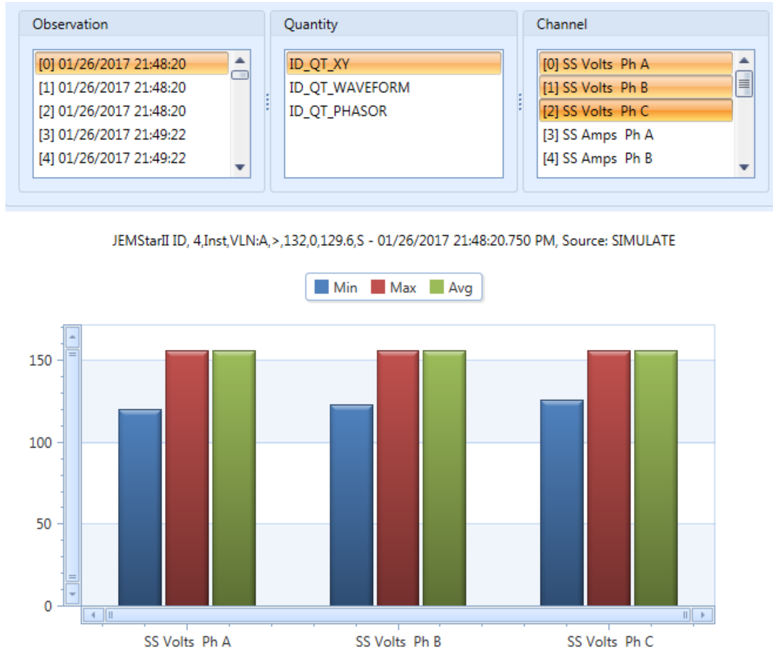
1. The top of the preview pane shows the PQDIF Filename. The top of the graphical display shows the Device ID (JEMStar II), trigger parameters that activated the recording and the time and date when the trigger occurred.



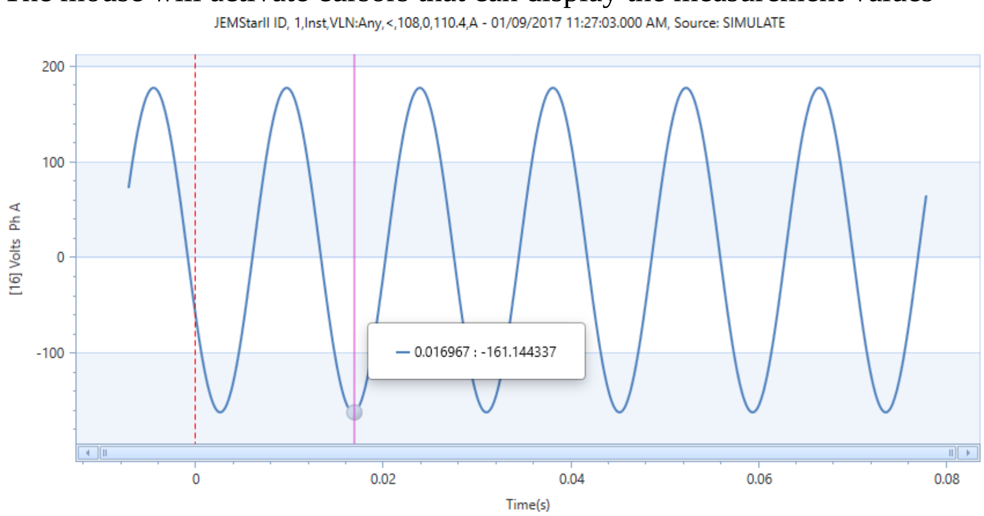
2. The upper right tab of the display will maximize the view window



3. Use the control and shift keys to select highlight multiple channels for simultaneous display.
   Note: Only display items together that have the same relative magnitudes. For example, Volts THD and Amps THD.



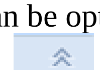
4. The mouse will activate cursors that can display the measurement values

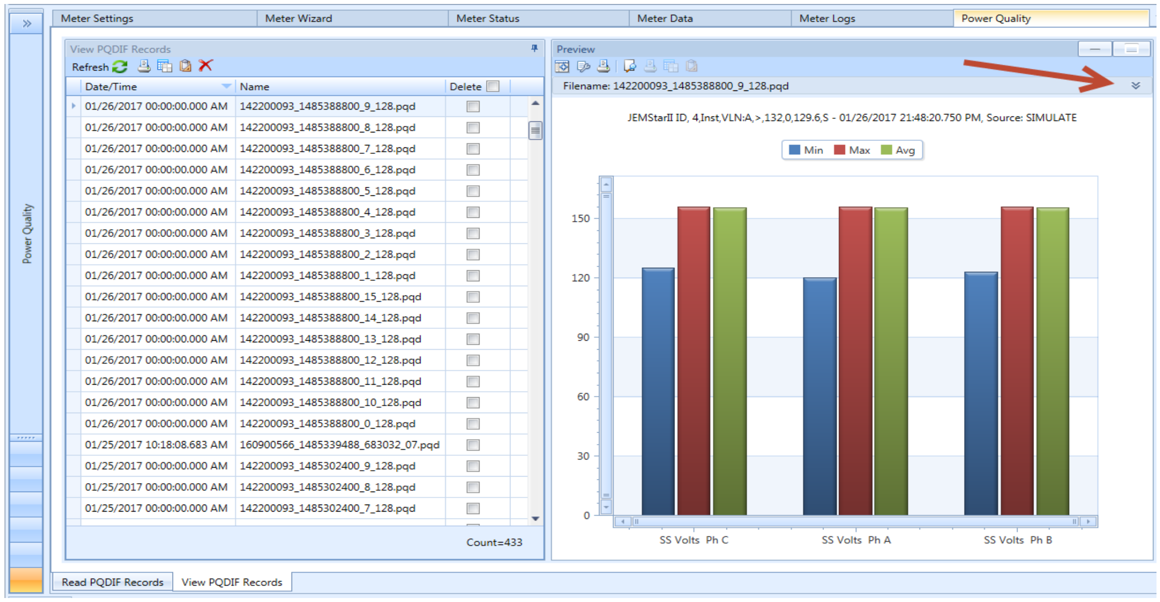


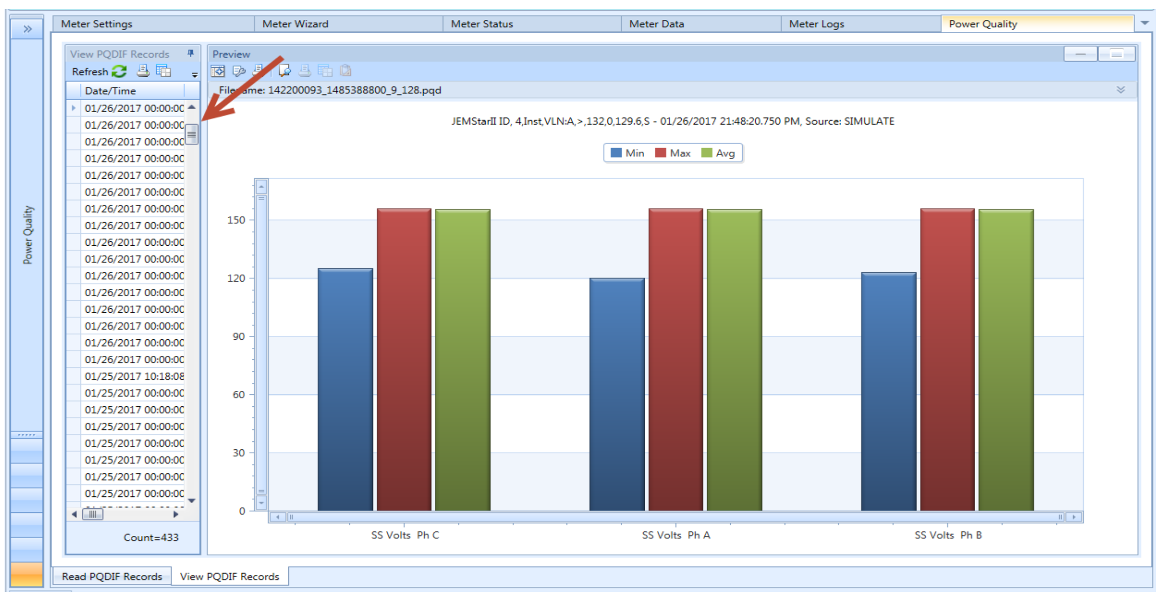
5. The graph timescale will show a dashed line at the zero-time mark to indicate when the trigger occurred. The 'zero' time corresponds to the timestamp displayed at the top of the graph.

6. The mouse thumbwheel will let you zoom in and out

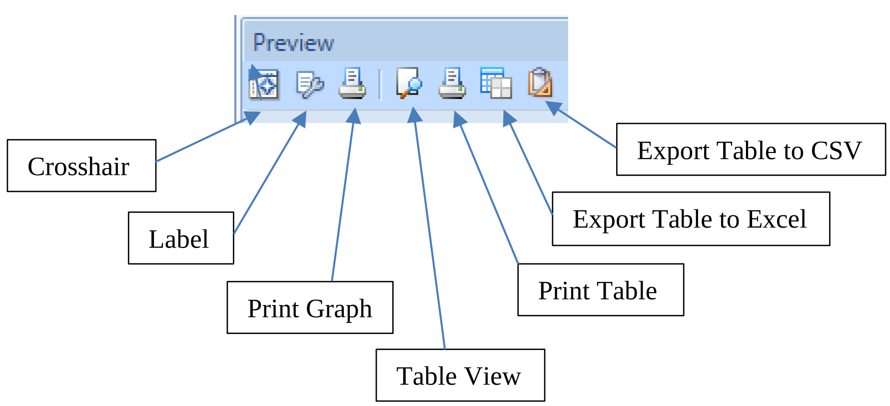
7. When you are zoomed in, you will be able to navigate over different parts of the graph by left clicking the mouse and holding it down to drag the view

8. The display panels can be optimized/resized to allow for more viewing space on the desktop using the  button or by resizing the panels.

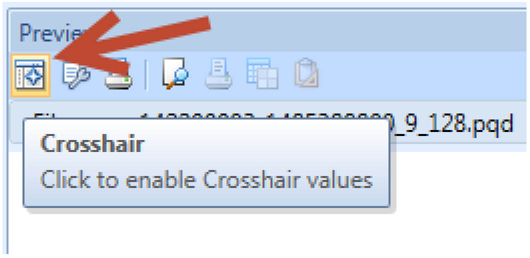




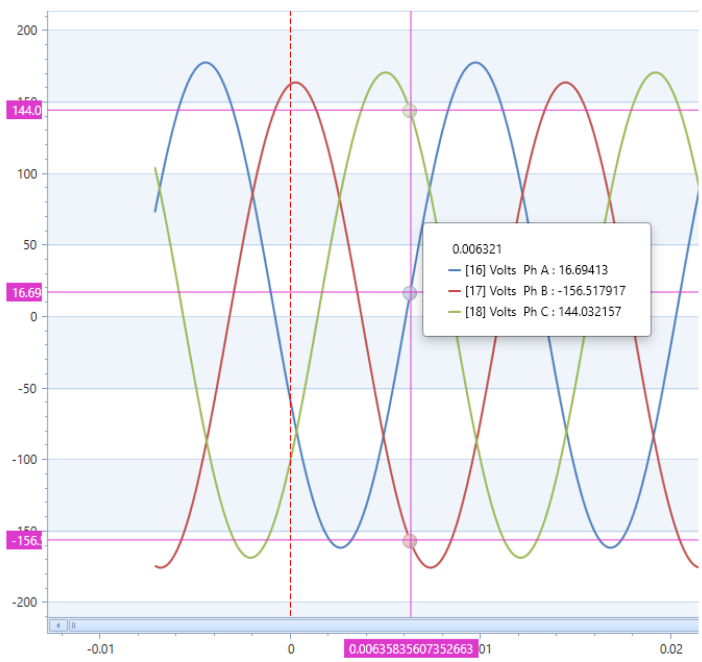
9. The upper left selection box provides additional display tools.



Crosshair

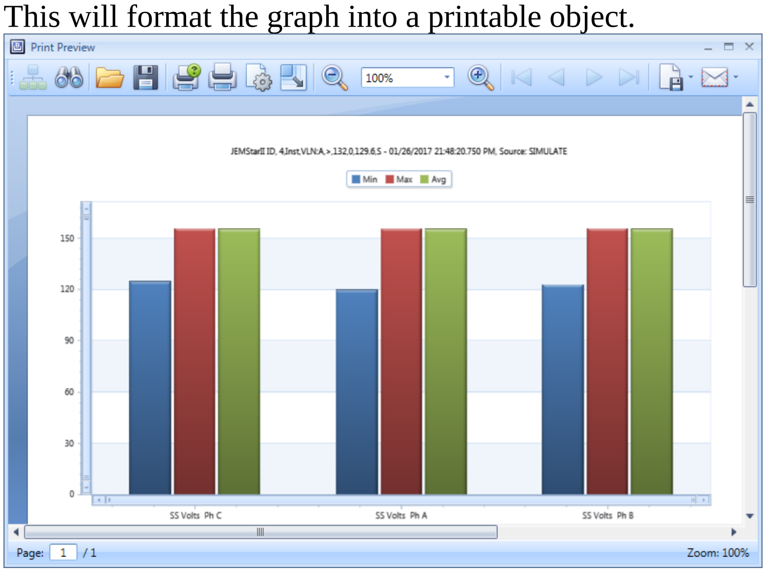


This provides a crosshair of the X Axis in relation to the cursor. Each measurement Channel will display the X Axis values on the left.



Print Graph

This will format the graph into a printable object.



Label

This will provide a measurement label for every single measurement captured. Caution: avoid using this with waveform captures as their too many data points.

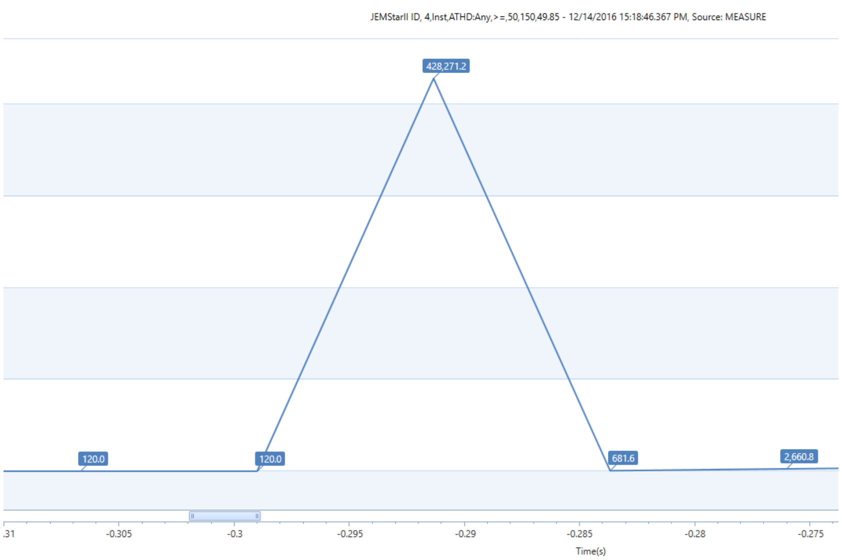


Table View

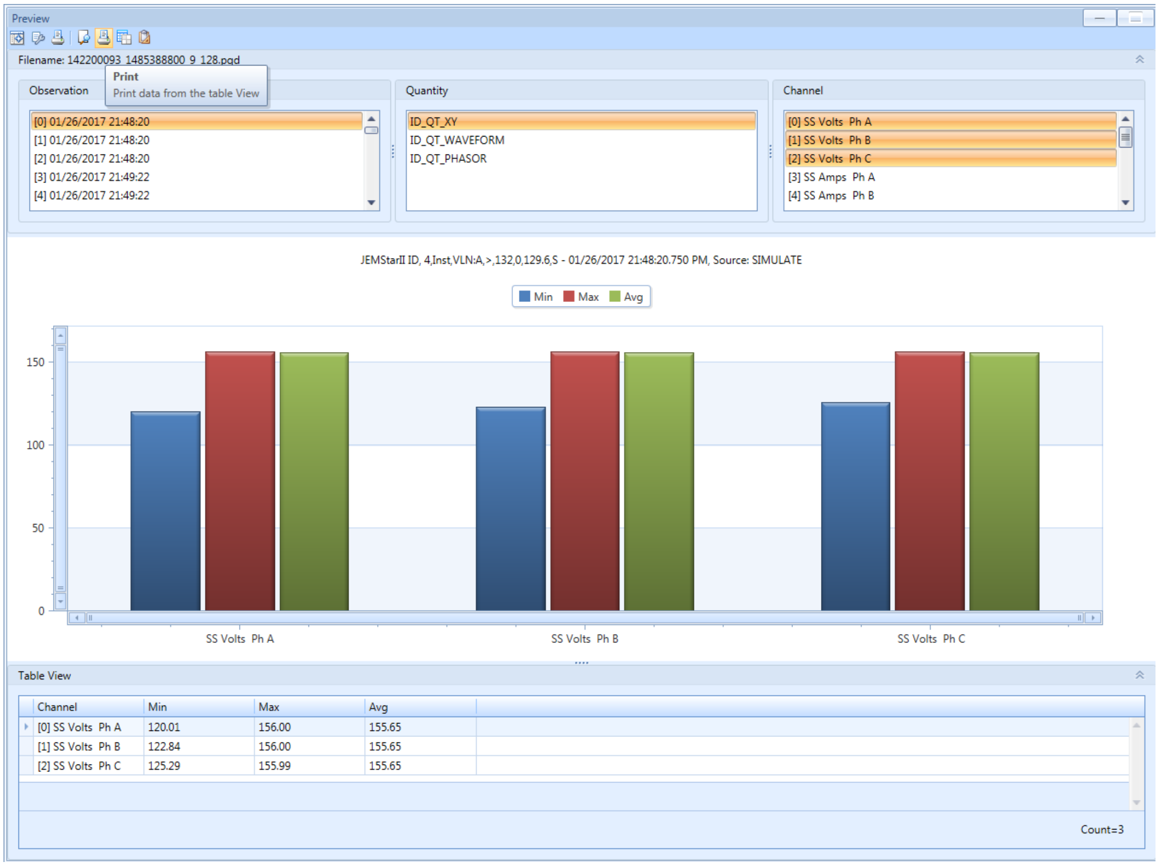
This will provide a table of all measurements in the graph with the timestamp of each measurement recorded.

Table View

Time(s)	[6] Volts Ph A	[7] Volts Ph B	[8] Volts Ph C
-0.214658	125.904	110.322	112.025
-0.206992	143.694	121.327	125.005
-0.199325	117.069	121.424	118.488
-0.191659	120.492	119.793	120.272
-0.183993	119.926	120.033	119.954
-0.176326	120.013	119.993	120.006
-0.16866	120	120	120
-0.160994	120	120	120
-0.153327	120	120	120
-0.145661	120	120	120
-0.137994	120	120	120
-0.130328	120	120	120

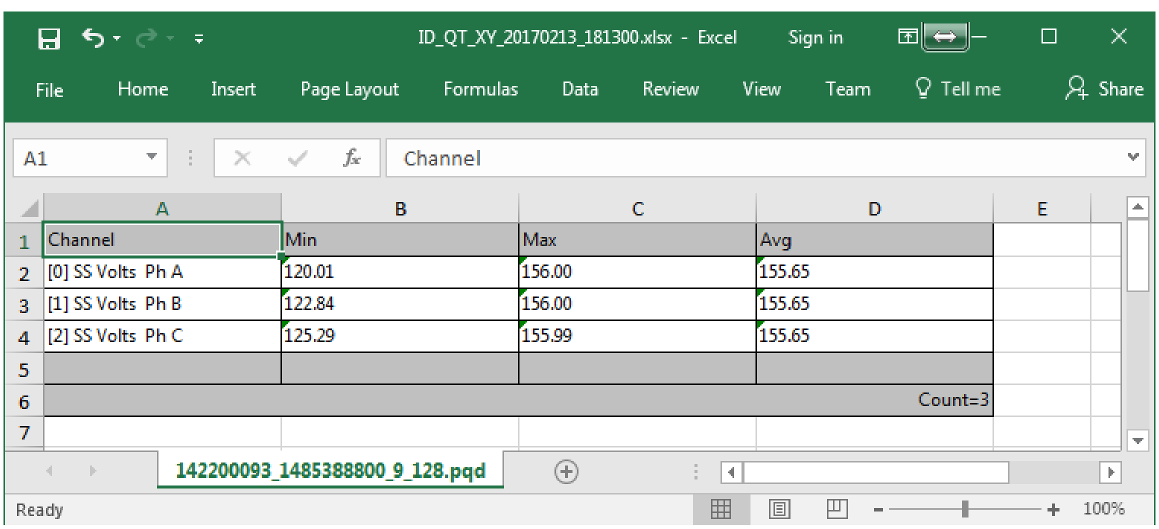
Print Table

This will format the Table View for Printing (only available when selecting Table View)



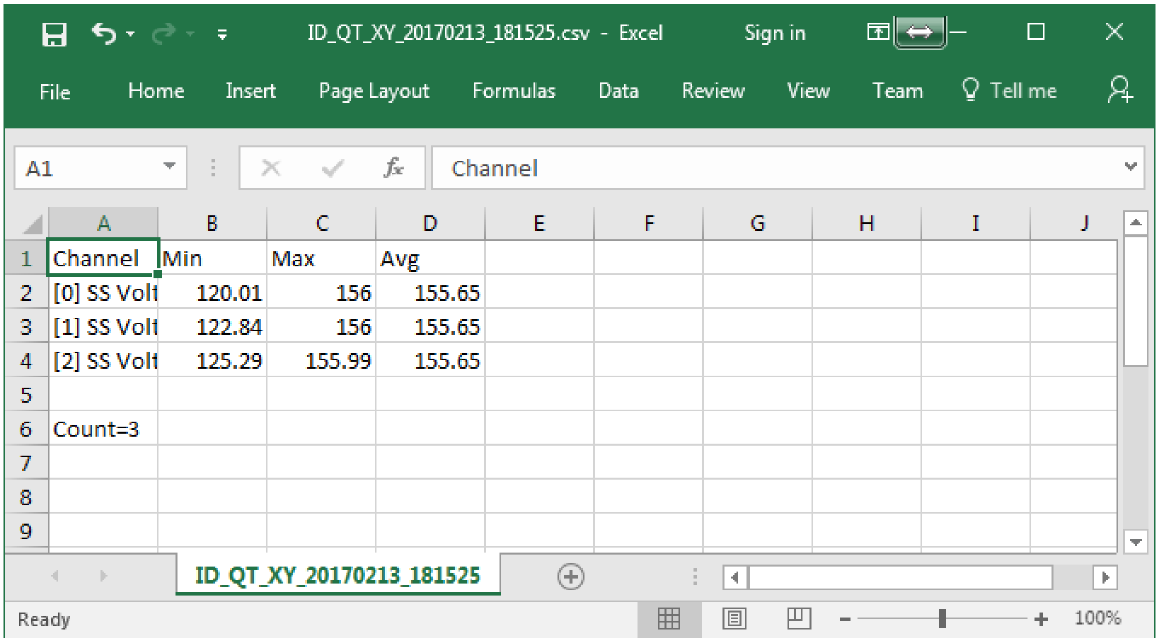
Export Table to Excel

This will download the measurements in the table into Excel Format. (only available when selecting Table View)



Export Table to CSV

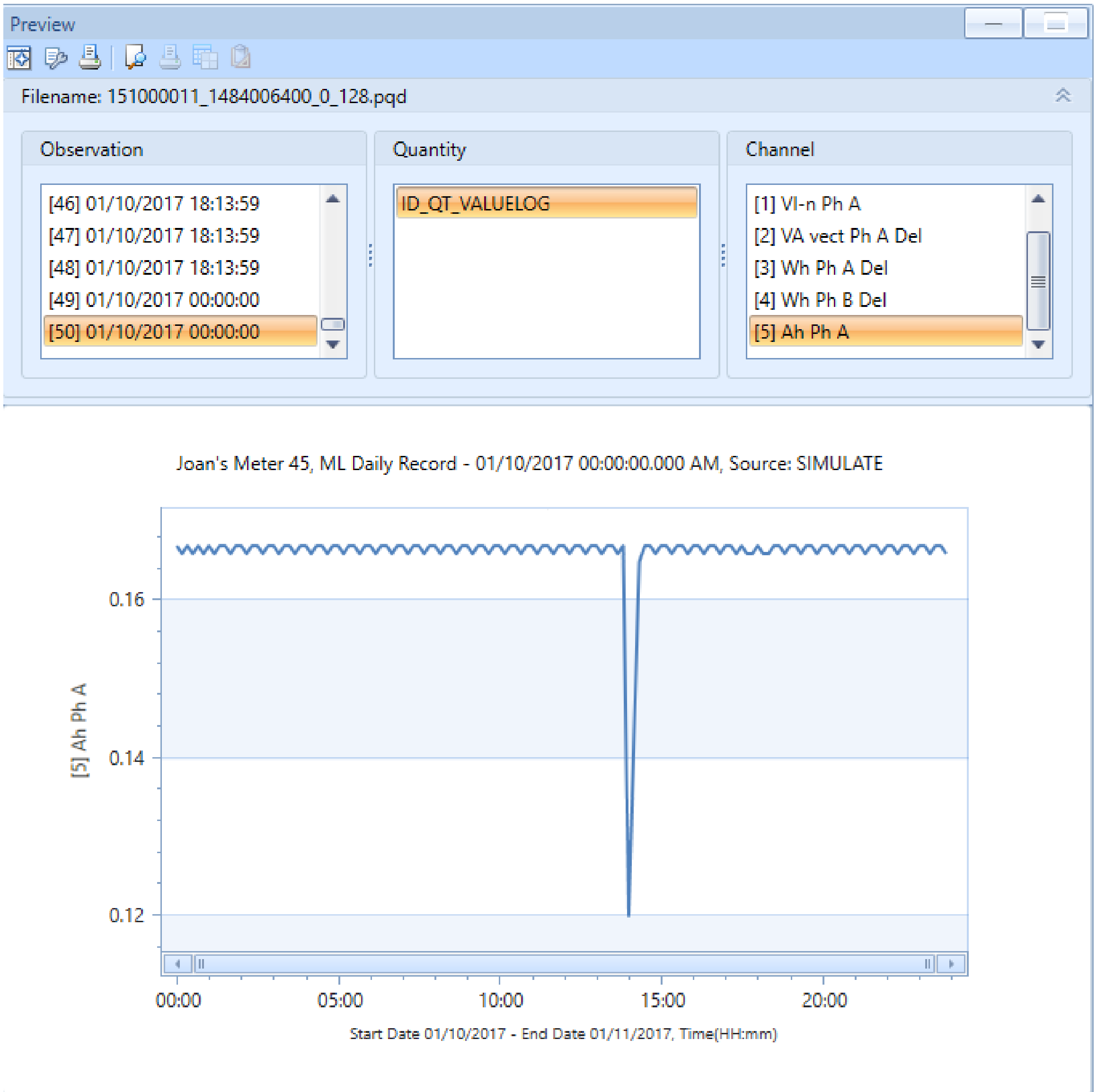
This will download the measurements in the table into CSV Format.
(only available when selecting Table View)



Channel	Min	Max	Avg
[0] SS Volt	120.01	156	155.65
[1] SS Volt	122.84	156	155.65
[2] SS Volt	125.29	155.99	155.65
Count=3			

Measurement Log Display

The Measurement Log is identified in the PQDIF File as Quantity: 'ID_QT_VALUE LOG'. The measurement log is a continuous recording that starts at midnight and goes for 24 hours. There are eight Measurement Logs available and each one will be shown as a separate observation.



24 Hour Measurement Log with Phase A Amp hours shown

Note: *If you wish to see multiple days of measurement recording, you can download the entire measurement log via the 'Read Measurement Log' feature as described in the Meter Data section of the manual.*

The channels available for display are based on the measurements configured in the measurement log.
The available measurements include:

- **Metering**
  Instantaneous: Volts, Amps, Watts, VA, VARs, PF, Freq
  Integrated: Whr, VARhr, VAhr
- **Harmonics**
  Magnitude and Phase Angle of harmonics 1-64
- **Interharmonics**
  Magnitude of inter harmonics 1-50
- **Flicker**
  Short term, long term, instantaneous
- **Digital Inputs**
  Contact Inputs
- **Fault**
  Positive, Negative, Zero Sequence Components

Note: Harmonic, Interharmonic, Flicker and Fault measurements are only available with options PQ2 and PQ3.

Measurement Recording Methods:
For each of the above measurements, the measurement can be recorded as:

- **Minimum**
  Lowest recorded value over the recording interval
- **Maximum**
  Highest recorded value over the recording interval
- **Average**
  Average value calculated over the recording interval (using 10/12 cycle measurements)
- **Total**
  Total value recorded over the interval (used for integrated measurements)
- **Snapshot**
  Value recorded at the end of that interval

For each measurement, you can select whether it is a primary or secondary value, engineering units for the value (units, kilo, mega, etc.) and whether to include transformer compensation (if applicable).

Recording Interval
Each group of 50 measurement channels can have its own recording interval. The available recording intervals are:

- 150/180 Cycles
- 1 minute
- 2 Minutes
- 3 Minutes
- 4 Minutes
- 5 Minutes
- 10 Minutes
- 15 Minutes
- 20 Minutes
- 30 Minutes
- 60 Minutes
- 120 Minutes

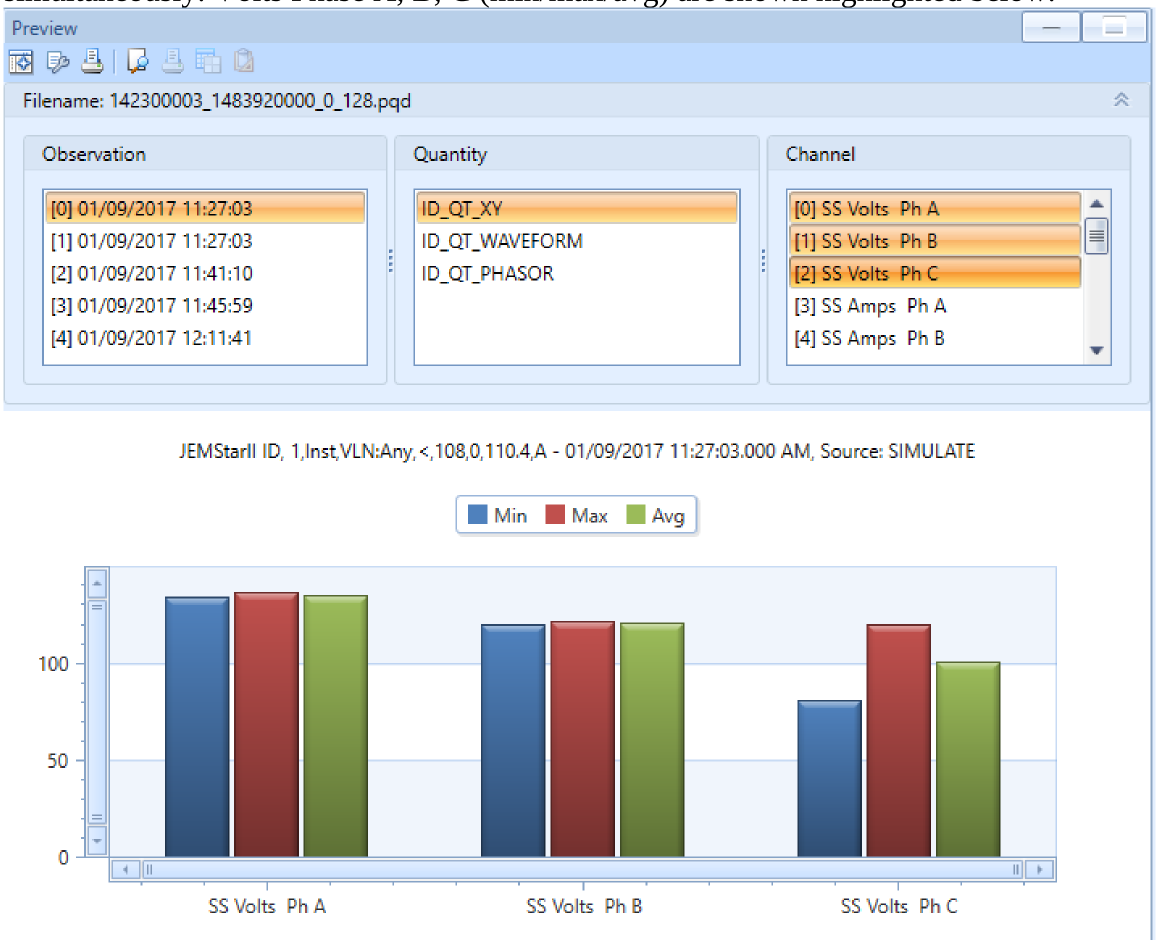
Sag/Swell Display

A Voltage Sag/Swell is identified in the PQDIF File as Quantity: 'ID_QT_XY'

When a Sag or Swell is recorded from a trigger, we capture and display the following min/max/avg secondary measurements per phase during the event:

- Volts
- Amps
- Volts THD
- Amps THD
- Power Factor
- Frequency

In the file below, the measurements listed above are shown as Channels you can display simultaneously. Volts Phase A, B, C (min/max/avg) are shown highlighted below.



Analysis Tips

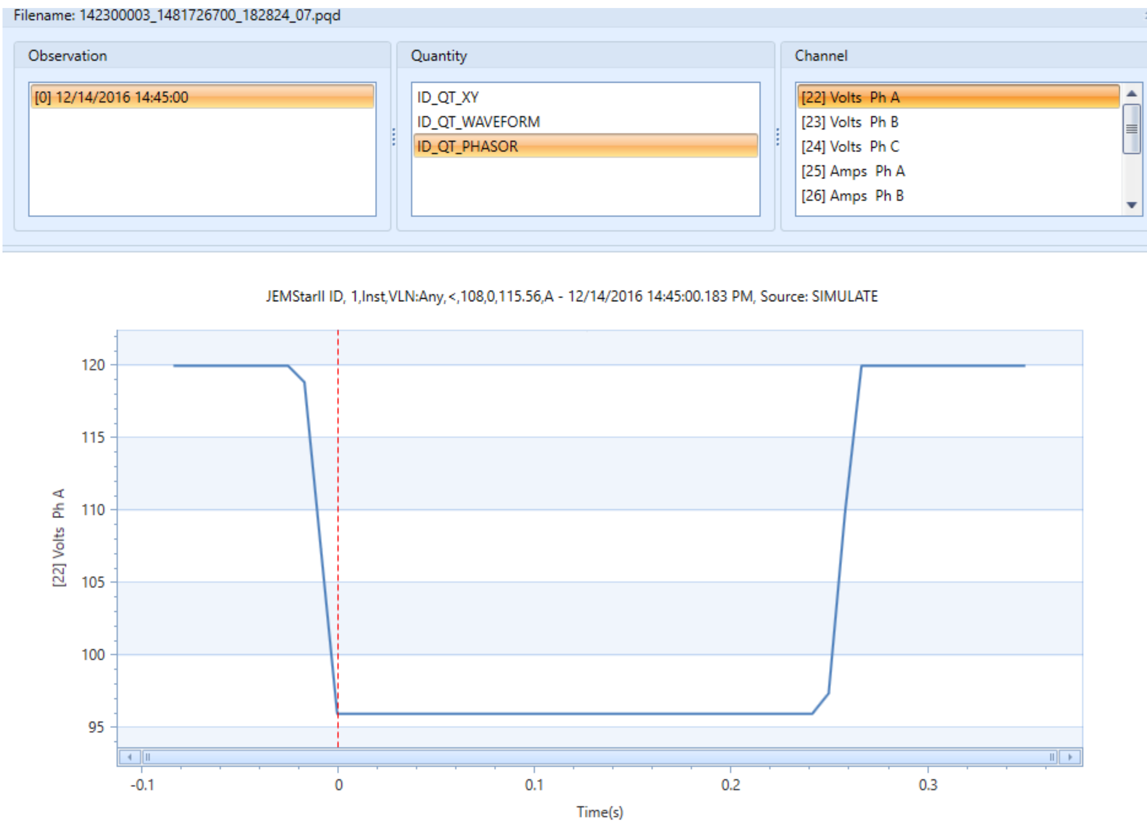
When analyzing Voltage Sags and Swells, it is common to review the min/max/avg voltage magnitudes in relation to the current. This combined with the THD and Power Factor can provide a quick view of what the root cause might be. For additional detail, you can set up the trigger to activate High Speed RMS and Waveform Capture for the same event.

High Speed RMS Display

High Speed RMS Capture is identified in the PQDIF File as Quantity: 'ID_QT_Phasor' When a High Speed RMS capture is recorded from a trigger, we capture and display the following secondary measurements per phase during the event:

- Volts RMS
- Amps RMS
- Phase Angle

The measurements are recorded at 2 samples per cycle and the recording time is based on the settings in the Power Quality configuration. A sample plot is shown below.



Analysis Tips

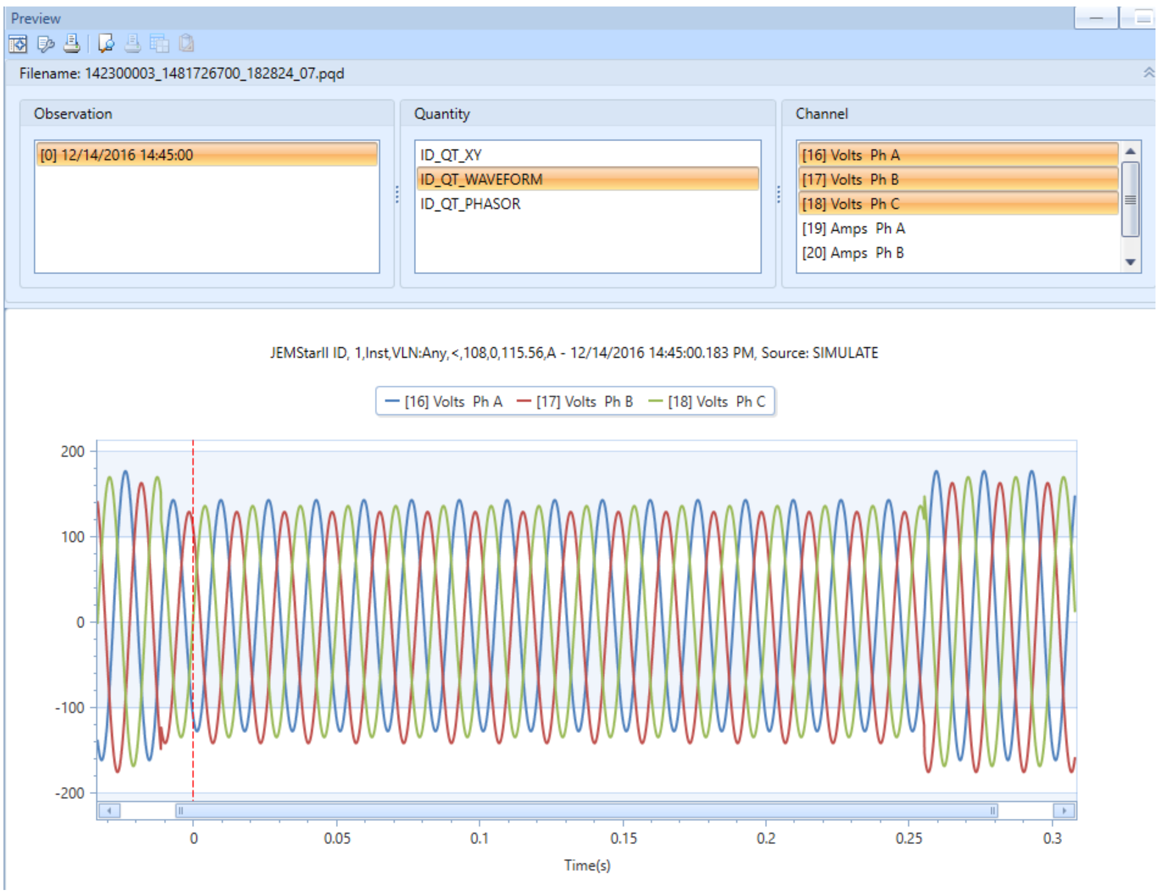
The High Speed RMS is ideal for analyzing Voltage Sags/Swells and longer term events like a distribution switching operation. When analyzing Sags and Swells, it is common to review the voltage magnitudes in relation to the current. This combined with the phase angle recorded can help determine whether the issue is upstream or downstream.

Waveform Capture Display

Waveform Capture is identified in the PQDIF File as Quantity: 'ID_QT_WAVEFORM' When a Waveform capture is recorded from a trigger, we capture and display the following secondary measurements per phase during the event:

- Volts (peak)
- Amps (peak)

The measurements are recorded at either 16 samples per cycle, 128 s/c or 512 s/c depending on the Trigger configuration. The recording time is based on the settings in the Power Quality configuration. A sample plot is shown below.



Analysis Tips

The Waveform Capture is ideal for analyzing Voltage Sags/Swells and shorter term events like transients. As the timing of these disturbances is short, you will need to zoom in to see additional detail. The selection of the sampling rate for recording depends on the type of disturbance you are trying to capture. The slower 16 s/c recording rate is good for slower evolving events while the 512 s/c recording rate is good for faster events. The max recording time for each selection will vary as well as slower recording rates can record for longer durations.

Power Quality Analysis

A listing of common power quality issues and the best recording methods to use in the meter.

		Recording Method			
Type	**Causes**	**Sag/Swell**	**High Speed RMS**	**Waveform Capture**	**Measurement Log**
Transient	Switching Inductive Loads on/off		X	X	
Transient	UPS Systems (Notching)			X	
Transient	Arcing Grounds			X	
Transient	Lightning			X	
Transient	Capacitor Switching			X	
Transient	Line Faults (tree branch)			X	
Transient	Utility Switching operations	X	X	X	
Voltage Sag	Starting large loads	X	X	X	
Voltage Sag	Overloaded wiring	X	X	X	
Voltage Sag	Breaker Operation	X	X	X	
Voltage Sag	Lighning (surge arrestors)	X	X	X	
Voltage Sag	Ground Faults	X	X	X	
Voltage Sag	Switchgear operations	X	X	X	
Voltage Swell	Removing large loads	X	X	X	
Voltage Swell	Open Conductor	X	X	X	
Voltage Swell	Fault on Line	X	X	X	
Voltage Swell	Improper wiring for load	X	X	X	
Flicker	Large cyclic loads (arc furnace, welders, large motors turning on)	X	X	X	X
Undervoltage	Overloaded wiring	X	X		X
Undervoltage	Unbalanced loads (3 phase systems)	X	X		X
Undervoltage	Loose or corroded wiring connections	X	X		X
Undervoltage	Incorrect transformer tap setting	X	X		X
Undervoltage	Recloser operations	X	X		X
Brownouts	High power demand	X	X		X
Brownouts	Poor wiring	X	X		X
Brownouts	Utility voltage reduction (to reduce loads)	X	X		X
Overvoltage	Improper application of power factor capacitors	X	X		X
Overvoltage	Incorrect transformer tap setting	X	X		X
Outage (momentary)	Operation of protection devices responding to faults	X	X		X
Outage (sustained)	Utility supply Issue	X			X
Outage (sustained)	Customer issue (equipment malfunction, breaker closure)	X			X
Harmonics	Variable speed drives (industrial applications)				X
Harmonics	Switching power supplies (computer equipment, LED lighting)				X
Harmonics	Non linear loads: Arc furnace, welders				X
Harmonics	Power electronics (SCR's, rectifiers)				X
Harmonics	Saturated Transformers				X

APPENDIX A – DNP COMMUNICATIONS

INTRODUCTION

Distributed Network Protocol (DNP 3.0) is an industry standard protocol for SCADA communications between Master Stations, Host computers, Remote Terminal Units (RTU), and Intelligent Electronics Devices (such as the meter). It is a public domain, non-proprietary protocol based on the IEC-870 standards, and is intended primarily for use in SCADA-like systems.

DNP as a protocol provides efficient, robust data communications through a system of 32-bit data link CRCs (Cyclical Redundancy Checks) and confirmation messages. However, DNP is much more than an error-detection-and-correction scheme. A DNP-compliant device, from the protocol's point of view, is considered a group of data "objects", each of which contains one or more "points". The DNP protocol specification defines the allowable object types and what constitutes a "point" for that object type.

DNP is *not* intended to be a general-purpose two-way communications link. Rather, it is highly optimized for SCADA and automation applications involving relatively small amounts of near-real-time data that is often read by the DNP master every few seconds. In the case of the meters, it is *not* used as a means of controlling or reconfiguring the meter.

DNP V3.00 DEVICE PROFILE

The purpose of this document is to describe the specific implementation of the **D**istributed **N**etwork **P**rotocol (DNP) 3.0 within the meter. This document, in conjunction with the DNP 3.0 Basic 4 Document Set, and the DNP Subset Definitions Document, provides complete information on how to communicate with the meter via the DNP 3.0 protocol.

The meter uses the Triangle MicroWorks™, Inc. DNP 3.0 Slave Source Code Library Version 2.19. This implementation of DNP 3.0, is fully compliant with DNP 3.0 Subset Definition Level 2, contains many Subset Level 3 features, and contains some functionality even beyond Subset Level 3.

The following sections, in conjunction with the Device Profile Document, provide a complete interoperability/configuration guide for the meter:

- The Implementation Table
- The Point List Tables
- Configuration Methods

DNP V3.00

DEVICE PROFILE DOCUMENT

Vendor Name: **AMETEK Power Instruments**

Device Name: **JEMStar II, using the Triangle MicroWorks, Inc. DNP 3.0 Slave Source Code Library, Ver 2.19**

Highest DNP Level Supported:	Device Function:
For Requests: **Level 2**	☐ Master
For Responses: **Level 2**	☒ **Slave**

Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table):

For static (non-change-event) object requests, request qualifier codes 00 and 01 (start-stop), 07 and 08 (limited quantity), and 17 and 28 (index) are supported in addition to request qualifier code 06 (no range – or all points). Static object requests received with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. Static object requests received with qualifiers 17 or 28 will be responded with qualifiers 17 or 28. For change-event object requests, qualifiers 17 or 28 are always responded.

The read and write function code for Object 50 (Time and Date), variation 1, is supported.

Maximum Data Link Frame Size (octets):	Maximum Application Fragment Size (octets):
Transmitted: **292**	Transmitted: **2048**
Received **292**	Received: **2048**

Maximum Data Link Re-tries:	Maximum Application Layer Re-tries:
Configurable from 0 to 255 – Via JEMWARE II	**None**

Requires Data Link Layer Confirmation:
Configurable as: Never, Only for multi-frame messages, or Always via JEMWARE II

Requires Application Layer Confirmation:
When sending multi-fragment responses
Sometimes

Timeouts while waiting for:

Data Link Confirm:	**Configurable via** JEMWARE II
Complete Appl. Fragment:	**None**
Application Confirm:	**Configurable via** JEMWARE II
Complete Appl. Response:	**None**

Others:

Transmission Delay:	**Configurable, via JEMWAREII**
Inter-character Timeout:	**1 sec.**
Need Time Delay:	**Configurable, via JEMWAREII**
Frozen Counter Event scanning period:	**FIXED AT 5 seconds**

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DEVICE PROFILE DOCUMENT

Sends/Executes Control Operations:

WRITE Binary Outputs	**Never**
SELECT/OPERATE	**Never**
DIRECT OPERATE	**Never**
DIRECT OPERATE – NO ACK	**Never**
Count > 1	**Never**
Pulse On	**Never**
Pulse Off	**Never**
Latch On	**Never**
Latch Off	**Never**
Queue	**Never**
Clear Queue	**Never**

Reports Binary Input Change Events when no specific variation requested: **Never**	Reports time-tagged Binary Input Change Events when no specific variation requested: **Never**
Sends Unsolicited Responses: **Never**	Sends Static Data in Unsolicited Responses: **Never** No other options are permitted.
Default Counter Object/Variation: **Default Object: 20** **Default Variation: 5** **Point-by-point list attached**	Counters Roll Over at: **32 Bits** **Other Value: 999,999,999** **Point-by-point list attached**
Sends Multi-Fragment Responses: **Yes**	

THE METER IMPLEMENTATION

The Meter DNP implementation conforms to the standard for a Level II slave device, with some additions. Implementation consists of the following **static** objects:

- (38) Single-bit Binary Input without flag (Object 1 Variation 1)
- (50) Analog Inputs, configurable with JEMWare II for either 32-bit analog input without flag points (Object 30 Variation 3), or 16-bit analog input without flag points (Object 30 Variation 4)
- A configurable number (up to 64) of 32-bit counters (Object 20 Variation 5) that can be assigned to any register in the Normal or Alternate display set
- A corresponding number of 32-bit frozen counter without flag (Object 21 variation 5) that represent the values of the counter points at the time of the last meter freeze.

IMPLEMENTATION TABLE

The following table identifies the variations, function codes, and qualifiers supported by the meter in both request messages and in response messages.

For static (non-change-event) objects, requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. Static object requests sent with qualifiers 17 or 28 will be responded with qualifiers 17 or 28. For change-event objects, qualifiers 17 or 28 are always responded.

In the table below text shaded as Subset Level 3 indicates Subset Level 3 functionality (beyond Subset Level 2), and text shaded as beyond Subset Level 3 indicates functionality beyond Subset Level 3.

Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
1	0	Binary Input (Variation 0 is used to request default variation)	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
1	1	Binary Input	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
1	2	Binary Input Change with Time	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
2	0	Binary Input Change (Variation 0 is default)	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index

Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
2	1	Binary Input Change w/o Time	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
2	2	Binary Input Change with Time	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
10	0	Binary Output (Variation 0 is default)	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
10	1	Binary Output w/o Status	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
10	2	Binary Output with Status	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
20	0	Binary Counter (Variation 0 is used to request default variation)	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
20	1	32-Bit Binary Counter	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
20	2	16-Bit Binary Counter	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
20	5	32-Bit Binary Counter w/o Flag	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
20	6	16-Bit Binary Counter w/o Flag	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
21	0	Frozen Counter (Variation 0 is used to request default variation)	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index

Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
21	1	32-Bit Frozen Counter	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
21	2	16-Bit Frozen Counter	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
21	9	32-Bit Frozen Counter w/o Flag	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
21	10	16-Bit Frozen Counter w/o Flag	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
23	0	Frozen Counter Event (Variation 0 is used to request default variation)	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
23	1	32-Bit Frozen Counter Event w/o Time	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
23	2	16-Bit Frozen Counter Event w/o Time	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
23	5	32-Bit Frozen Counter Event with Time	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index)
23	6	16-Bit Frozen Counter Event with Time	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
30	0	Analog Input (Variation 0 is used to request default variation)	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
30	1	32-Bit Analog Input	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index

Object Number	Variation Number	Description	Function Codes (dec)	Qualifier Codes (hex)	Function Codes (dec)	Qualifier Codes (hex)
30	2	16-Bit Analog Input	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
30	3	32-Bit Analog Input without Flag	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
30	4	16-Bit Analog Input without Flag	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
30	5	Short Floating Point Analog Input	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
50	0	Time and Date	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
50	1	Time and Date	1 (Read) 2 (Write)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
52	2	Time Delay Fine	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty) 17 , 28 (index)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
60	0	Class 0, 1, 2, and 3 Data	1 (Read)	06 (no range , or all)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
60	1	Class 0 Data	1 (Read)	06 (no range , or all)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
60	2	Class 1 Data	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
60	3	Class 2 Data	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
60	4	Class 3 Data	1 (Read)	00 , 01(start-stop) 06 (no range , or all) 07 , 08(limited qty)	129 (response)	00 , 01 (start-stop) 17 , 28 (index
		No Object (function code only) –See Note 3	13 (cold restart)			
		No Object (function code only)	14 (warm restart)			
		No Object (function code only)	23 (delay meas.)			

NOTE 1: For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. (For change-event objects, qualifiers 17 or 28 are always responded.)

NOTE 2: A cold restart is implemented as a warm restart – the meter is not restarted, but the DNP process is restarted.

DNP Mapping

The JEMStar II meter supports a flexible mapping scheme where you can select any data point in the location you want. The following categories of DNP objects are supported:

- Binary Inputs (Object 2)
- Binary Outputs (Object 10)
- Counters (Object 20, 21, 23)
- Analog Inputs (Object 30)
- Time and Date (Object 50)
- Class Polls (Object 60)

DNP Binary Objects

(Object 2, 10)

DNP Binary Objects support the Digital I/O with the following objects and variations:

Object	Variation	Description
2	1	Binary Input Change without time
	2	Binary Input Change with time
10	1	Binary Output without Status
	2	Binary Output with Status

We use DNP Object 10 to report the status of the Digital Outputs and we use DNP Object 2 to report the status of Digital Inputs and metering events as shown in the list below.

DNP Binary Objects

Object 10 Variation 0,1,2

DNP Index	Function
1	Digital Out #1
2	Digital Out #2
3	Digital Out #3
4	Digital Out #4
5	Digital Out #5
6	Digital Out #6
7	Digital Out #7
8	Digital Out #8
9	Digital Out #9
10	Digital Out #10
11	Digital Out #11
12	Digital Out #12
13	Digital Out #13
14	Digital Out #14

Object 2 Variation 0,1,2

DNP Index	Function
1	**Digital Input Status**
2	Ch. 1-14
3	**Trigger Status**
4	Ch. 1-64
5	**Meter Status**
6	Volts Ph A,B,C Status
7	Clock Sync Status
8	Battery Status
9	Internal Comm Status
|	Calibration Status Configuration Status
99	Firmware Status
100	Test Mode Status

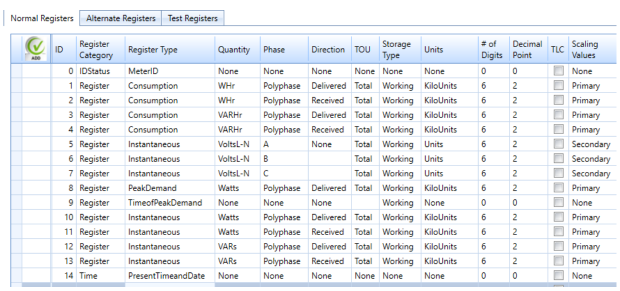
DNP Counters

(Object 20, 21, 23)

DNP Counters are implemented as 16 and 32-bit counter with the following objects and variations:

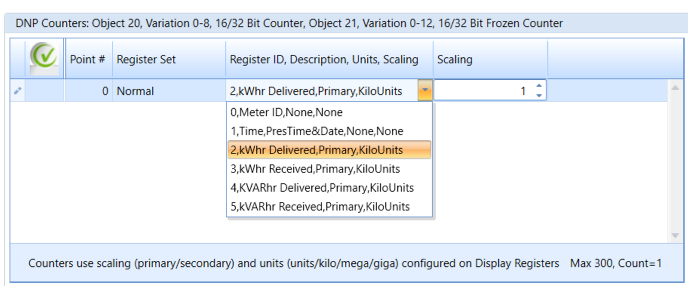
Object	Variation	Description
20	1	32-bit Counter with flag
	2	16-bit Counter with flag
	5	32-bit Counter without flag
	6	16-bit Counter without flag
21	1	32-bit Frozen Counter with flag
	2	16-bit Frozen Counter with flag
	9	32-bit Frozen Counter without flag
	10	16-bit Frozen Counter without flag
23	1	32-bit Counter without time
	2	16-bit Counter without time
	5	32-bit Counter with time
	6	16-bit Counter with time

The JEMStar II uses a flexible mapping system for DNP counters, with the ability to pick any Normal or Alternate Display register configured in the meter.



ID	Register Category	Register Type	Quantity	Phase	Direction	TOU	Storage Type	Units	# of Digits	Decimal Point	TLC	Scaling Values
0	IDStatus	MeterID	None	None	None	None	None	None	0	0		None
1	Register	Consumption	WHr	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
2	Register	Consumption	WHr	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
3	Register	Consumption	VARHr	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
4	Register	Consumption	VARHr	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
5	Register	Instantaneous	VoltsL-N	A	None	Total	Working	Units	6	2		Secondary
6	Register	Instantaneous	VoltsL-N	B		Total	Working	Units	6	2		Secondary
7	Register	Instantaneous	VoltsL-N	C		Total	Working	Units	6	2		Secondary
8	Register	PeakDemand	Watts	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
9	Register	TimeofPeakDemand	None	None	None		Working	None	0	0		None
10	Register	Instantaneous	Watts	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
11	Register	Instantaneous	Watts	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
12	Register	Instantaneous	VARs	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
13	Register	Instantaneous	VARs	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
14	Time	PresentTimeandDate	None	None	None	None	None	None	0	0		None

List of Normal Display Registers configured for meter



When configuring DNP Counters, you will see the complete list of Normal and Alternate Registers to choose from

Note: Counters are typically used for integrated measurements like Watthours, VARhours, etc. but you can choose from any Display register configured in the meter, such as instantaneous or demand measurements.

Other data formats that may be assigned to display registers include:

- Time and Date registers are represented as seconds since midnight 1/1/70
- Diagnostic and String register types will be represented as 0
- Status registers will be represented as a direct 16 (32)-bit mask value.

The list of available measurements configured for your DNP Counters is shown below:

Measurement Type	Measurement	Phase	Direction	TLC
Consumption	Whr, VARhr, Vahr(vect), Vahr(arith), Ahr, Qhr, A^2hr, V^2hr	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Instantaneous	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, VoltTHD, AmpTHD, V^2, A^2, Volt Imbalance, Amp Imbalence	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Demand: Peak (Max) Present Past Thermal Peak Thermal	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, VoltTHD, AmpTHD, V^2, A^2, Volt Imbalance, Amp Imbalence	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Minimum Maximum Average	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, VoltTHD, AmpTHD, V^2, A^2, Volt Imbalance, Amp Imbalence	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Power Quality	Volt THD, Amp THD, VoltTHD odd, VoltTHD even, Volt Imbalance, Amp Imbalance, TDD, TDD odd, TDD even, Crest Factor, Pst, Plt, Pinst	A,B,C		n/a
Fault	Negative Sequence Ratio (current and voltage), Zero Sequence Ratio (current and voltage)	A,B,C		n/a

Typical Configuration of DNP Counters

DNP Counters: Object 20, Variation 0-8, 16/32 Bit Counter, Object 21, Variation 0-12, 16/32 Bit Frozen Counter

Point #	Register Set	Register ID, Description, Units, Scaling	Scaling
0	Normal	2,kWhr Delivered,Primary,KiloUnits	1
1	Normal	3,kWhr Received,Primary,KiloUnits	1
2	Normal	4,KVARhr Delivered,Primary,KiloUnits	1
3	Normal	5,kVARhr Received,Primary,KiloUnits	1

Counters use scaling (primary/secondary) and units (units/kilo/mega/giga) configured on Display Registers   Max 300, Count=4

DNP Counter Scaling

A JEMStar II register configured as a DNP Counter point may contain a value as large as 999,999,999 (nine digits). Some DNP master devices cannot accept counter values this large. You may configure JEMStar II to restrict the reported value of counter points to 3, 4, 5, 6, 7, or 8 digits, or allow the full 9-digit precision to be reported. Restricting the number of digits reported affects only DNP counter points, not the actual display registers.

The DNP Counter will duplicate the settings in the display register, so if the display register measurement selected is ‘Primary’ with engineering units ‘kilo’, the corresponding counter point will match.
When configuring the DNP Counter, you can select your own scale factor from 0 to 1,000.

Note: The DNP Counter table must be configured after all Normal/Alternate display registers have been created for the configuration.

DNP Analogs

(Object 30)

DNP Analogs are implemented as 16 and 32-bit Analogs with the following objects and variations:

Object	Variation	Description
30	1	32-bit Analog with flag
	2	16-bit Analog with flag
	3	32-bit Analog without flag
	4	16-bit Analog without flag
	5	Short Floating Point Analog

The JEMStar II Meter supports a flexible DNP mapping system as you can select from any instantaneous, power quality and fault measurement. The list of available measurements that can be configured for your display registers is shown below:

Measurement Type	Measurement	Phase	Direction	TLC
Instantaneous	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, Volt THD, Amp THD, V^2, A^2, Volt Imbalance, Amp Imbalance	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Power Quality	Volt & Current Harmonic magnitude (2-64th harmonic), Volt & Current Harmonic phase angle (2-64th harmonic), Volt & Current Inter-Harmonic magnitude (2-50th harmonic), Volt THD, Amp THD, VoltTHD odd, VoltTHD even, Volt Imbalance, Amp Imbalance, TDD, TDD odd, TDD even, Crest Factor, Pst, Plt, Pinst	A,B,C		n/a
Fault	Neagtive, Positive, Zero Sequence (voltage/current magnitude and phase, Negative Sequence Ratio (current and voltage), Zero Sequence Ratio (current and voltage)	A,B,C		n/a

Typical Configuration of DNP Analogs

DNP Analogs

Point #	Category	Type	Quantity	Phase	Direction	TLC	Scaling
0	Metering	Instantaneous	Watts	A	Delivered		1
1	Metering	Instantaneous	Watts	B	Delivered		1
2	Metering	Instantaneous	Watts	C	Delivered		1
3	Metering	Instantaneous	Watts	Polyphase	Bidirectio...		1
4	Metering	Instantaneous	VARs	A	Bidirectio...		1
5	Metering	Instantaneous	VARs	B	Bidirectio...		1
6	Metering	Instantaneous	VARs	C	Bidirectio...		1
7	Metering	Instantaneous	VARs	Polyphase	Bidirectio...		1
8	Metering	Instantaneous	VAArithmetic	A	Bidirectio...		1
9	Metering	Instantaneous	PFArithmetic	B	Bidirectio...		1

Analog measurements are based on secondary values

Max 200, Count=10

DNP Analog Scaling

DNP Analog measurements are in secondary values. Several methods of scaling are used depending on if you are using 16 Bit or 32 Bit DNP Objects. When using 16 Bit DNP Objects, we offer two different methods.

32 Bit DNP Objects

All values are based on secondary values and include 3 places to the right of the decimal. For example, If the secondary value measured is 1825.438, it will be presented as 1825438. In addition, you can select an individual scaling factor from 0-1,000 to add more resolution. To convert the value into primary values, multiply it by the transformer factor/1000.

Example:

Secondary Measurement Value: 1,825.438 Watts

Primary Measurement Value: 36,508.76 kWwatts

Transformer Factor: 20,000

Scale Factor Used: 20

Measurement X 1,000 X Scale Factor = DNP Value

1,825.438 X 1000 X 20 = 36508760

***Note**: The maximum value allowed for a 32 bit DNP Analog Object is: 2,147,483,647*

16 Bit DNP Objects

If using a 16 Bit DNP Object and variations, you can select two different methods for scaling in the JEMWare II Software.

32 Bit Method

This is a similar approach to the 32 Bit, applying a straight scale factor from 0 to 1,000 to the measured value. Note: Keep in mind that the maximum 16-bit value that can be stored is 32,767, so make sure the scaling doesn't overflow the storage.

Example: if the maximum secondary watts = 3,600 Watts, your maximum scale factor is 9.

16 Bit Method

This method optimizes the usage of 16 Bit storage by automatically scaling the measurement to fit the maximum secondary ranges. As an example, the measurement range for watts is 0 to 10600 which is scaled to 0 to 32767. A measurement of 10600 watts would provide a DNP value of 32767. A value 10% of that (1060 watts) would provide a DNP value that is 10% of the full scale, or 3277.

Measurement	Measurement Range	Scaled Range
Volts	0 to 530	0 to 32767
Amps	0 to 20	0 to 32767
Frequency	0 to100	0 to 32767
Power Factor	-1.0 to 1.0	-32768 to 32768
Watts, VARS, VA (1 phase, del, rec, Q1-4, absolute)	0 to10600	0 to 32767
Watts, VARS, VA (3 phase, del, rec, Q1-4, absolute)	0 to 31800	0 to 32767
Watts, VARS, VA (1 phase, bi-directional)	-10600 to10600	-32768 to 32768
Watts, VARS, VA (3 phase, bi-directional)	-31800 to 31800	-32768 to 32768
Volts, Amps THD	0 to 100	0 to 32767
$Volt^2$	0 to 280900	0 to 32767
Amp^2 (1 phase)	0 to 400	0 to 32767
Amp^2 (3 phase)	0 to 1200	0 to 32767

These are some examples of how scaling can be applied to different measurements:

<u>Scaling Example 1:</u>

Amps	*12.56*
Measurement Range	*0 to 20*
Scaled Range	*0 to 32767*

<u>Formula:</u>

Measurement

-----------------   X   Scaled Range   =   DNP Value

Meas Range

12.56

-------------   X   32767   =   20578   DNP Value   (The DNP value of 20578 represents 12.56 Amps)

20

The DNP configuration also includes a user configurable scale factor of 1 to 100 selectable by measurement. A scale factor should be made so that the maximum value doesn't exceed the measurement range. For example, the 3-phase watt maximum is 31800. If your maximum watt value is less than 3180, you can use a scale factor of 10.

<u>Scaling Example 2:</u>

Polyphase Watts delivered	*1825.438*
Measurement Range	*0 to 31800*
Scaled Range	*0 to 32767*
Scale Factor Used	*10*

Formula:

Measurement

-----------------   X   Scaled Range   X   Scale Factor   =   DNP Value

Meas Range

1825.438

-------------   X   32767   X   10   =   18809 DNP Value = 1825.438 Watts

31800

Events

The JEMStar II DNP implementation includes frozen counter event objects. These are implemented as Object 23 Variations 0, 1, 2, 5 and 6. These provide a time-stamped snapshot of the corresponding counters at the time of freeze. The JEMStar II has storage for up to 500 frozen event objects when all 300 points are configured. An event is generated at each register freeze. Each event includes all corresponding registers at the time the freeze occurred.

If event data is not desired, the generation of events can be disabled using JEMWare II.

In JEMStar II, all event data is permanently assigned to Class 1.

Time and Date

Time and Date (object 50) is supported both for read and write. Using JEMWare II, you can configure the "Write Time Interval", which is the interval after which the JEMStar II will set the "Need Time" bit in the Internal Indications.

Configuration

JEMWare II software must be used to set up the configurable parameters that relate to DNP 3.0 in the meter, as well as configurable point assignments for the various DNP Objects that the meter supports. Please refer to the section in this manual titled “Protocols” for detailed procedures.

APPENDIX B – MODBUS COMMUNICATIONS

INTRODUCTION

The MODBUS protocol defines a message structure that electronic communications equipment will recognize and use, regardless of the type of networks over which they communicate. It describes the procedure a host piece of equipment called the MASTER uses to request access to another device called the SLAVE, how it will respond to requests from other devices, and how errors will be detected and reported. A common format is defined for the layout and contents of message fields.

The MODBUS protocol has two distinct forms, RTU mode and ASCII mode, the JEMStarII supports MODBUS RTU mode only.
RTU mode essentially means binary mode, where each byte of information is transmitted as an actual 8-bit binary byte.

Further information concerning MODBUS implementation standards can be found at the following website:

www.modicon.com/techpubs/toc7.html

The MODBUS Device Address, timeout, and communications parameters are configured via the JEMWare II software. **The meter will generally be a MODBUS slave device but in some applications may be a MODBUS master.**

COMMUNICATIONS

The following MODBUS communications parameters are configurable via JEMWare II:

- RTU mode
- Parity (None)
- Baud Rate (1200, 2400, 9600, 19200, 38400)
- RS-232 (half duplex) or RS-485 (half duplex) signal levels

SERIAL PORT CONNECTIONS

MODBUS Point-to-Point Connection Using RS-232 or RS-485

This method is used for connecting the meter MODBUS directly to a MODBUS Master device. The transmit and receive data pins on the MODBUS host system may vary between pin 2 and pin 3 according to the type of equipment used. Refer to the JEMStar II User manual for instructions on wiring/connecting JEMStar II serial ports.
NOTES:

- For RS-485 mode communications, we suggest using an RS-485 port TX Start/End Delay value of 40ms initially and Turnaround Delay of 0ms.

- The meter does not implement hardware handshaking signals with RS-232 or RS-485 serial data.
- The MODBUS port is connected via a pigtail I/O cable for S-base and A-Base meters and is connected via the terminal block on the rear of switchboard case meters. Refer to the JEMStar II manual for connection details.

DATA TRANSFERS USING MODBUS RTU

The meter MODBUS implementation will fully support all data transfers with the following commands:

Read Output Status	(Function code 01)
Read Input Status	(Function code 02)
Read Holding Registers	(Function code 03)
Read Input Registers	(Function code 04)
Force Single Coil	(Function code 05)
Force Multiple Coils	(Function code 15)
Preset Multiple Registers	(Function code 16)

As implied by the **Read Holding Registers** command, all available meter data will be stored in 16-bit Holding Registers. However, these registers will either hold the High Order or Low Order 16 bits (word) of a 32-bit quantity, or a single 16-bit register if Analog Scaling = 16 in JEMWare II protocol setup. Whenever a 32-bit quantity is accessed, the registers containing both the High Order & Low Order words must be included in the request, or the command will be rejected.

The meter MODBUS interface can access data in RTU mode only. The supported Register Sets and the MODBUS Function Codes (FC) used to retrieve the data are as follows.

Function Code (FC)	**Register Set**
01	Read Discrete Outputs
02	Read Discrete Inputs
03	Read Holding Registers (native data types)
04	Read Input Registers (Scaled and Cascaded)
05	Force Single Discrete Outputs
15	Force Multiple Discrete Outputs
16	Preset Multiple Holding Registers

CRC Calculation

The MODBUS interface uses CRC for error checking. The CRC value is two bytes, containing a 16 bit binary value. The CRC value is calculated by the transmitting device that appends the CRC to the message. The receiving device recalculates the CRC and compares it to the value in the message. If the values are not the same, the receiver will not process the message.

The CRC value is calculated according to the following procedure.

1. Initialize a 16 bit *CRC register* to 0xFFFF

2. Place the first 8 bit character from the message and place it into a *test register*.
3. Exclusive OR the *test character* with the *CRC register*, leaving the result in the *CRC register*.
4. The *CRC register* is shifted one bit toward the least significant bit, the least significant bit is saved into a *carry register*, and the most significant bit is zero filled.
5. If the old least significant bit was zero, go to step 6, if it was one, the *CRC register* is exclusive Ored with 0xa001.
6. Repeat steps 4 and 5, seven times.
7. Using each successive character in the message, repeat steps 3 through 6.
8. The CRC is the value in the CRC register.
9. The CRC value is placed into the message in hexadecimal format with the most significant byte going into the first CRC byte and the least significant byte going into the last CRC byte.

RTU MESSAGE FRAMING

In RTU mode, messages start with a silence interval of at least 3.5 character times. If the SLAVE device can monitor the network bus continuously, this silence interval can be used to identify the beginning of a new message, with the first field of a new message being the Device Address. Devices that use the silence interval to detect a new message expect the entire message frame to be transmitted continuously, and do not allow a silent interval of more than 1.5 characters to occur before completion of the entire message.

The meter MODBUS implementation does not monitor the network bus continuously, and thus will not detect any silence interval. Consequently, the strict rules about silence intervals will not be enforced. The start of a new message will be detected using a synchronization algorithm.

Typical meter RTU Queries:

Query Field	Read Holding Regs	Force Single Coil
Device Address	05	05
Function	03	05
Register Address	00 04	00 01
# Regs/Preset Value	00 06	FF 00
Error Check (CRC)	XX XX	XX XX

Communication Errors

Communication errors, consisting of a Parity, LRC or CRC error, will result in the message causing the error to be ignored by the meter. The MASTER Device will timeout and retransmit the message.

Exception Responses

The meter MODBUS implementation can produce 1 of 3 possible exceptions:

- **Illegal Function** (Exception Code 01)
- **Illegal Data Address** (Exception Code 02)
- **Illegal Data Value** (Exception Code 03)

An **Illegal Function** is self-explanatory. If the meter receives a MODBUS query that contains a function that it does not support (anything other than 01, 02 03, 04, 05, 15 or 16), an Illegal Function (Exception 01) will be returned.

The **Data Address** is the *Holding Register* or *Input Register* address. For example, an Illegal Data Address for a Function 03 command would be either a register value greater that 0xE7 or a register value that begins at the second word (Lo Order Word) of a 32-bit quantity. An Illegal Data Address for a Function 06 command would be any register other than 0x16.

The meaning of the **Data Value** depends upon the command. The Data Value for a Function 03 command is the number of Holding registers requested, starting with the first (Data Address) register. If the sum of the first register and the number of registers is either greater than 0x3F, or results in the request of only one word of any 32-bit quantity, an Illegal Data Value exception is generated.

An Exception Response is the meter's Device Address, the function value with the High Order Bit set to 1, and the Exception Code followed by either the LRC (ASCII mode) or the CRC (RTU mode). For example, in RTU mode an **Illegal Data Address** exception to a function 03 request would be:

Exception Byte	Contents	Example
1	Meter Device Address	5
2	Marked Function Code	83
3	Exception Code	02
4	High Order Byte CRC	XX
5	Low Order Byte CRC	XX

TIMEOUTS

RTU Mode

The timeout period (from the reception of a matching Device Address until that message is completed) is configurable using JEMWare II. If a timeout occurs, the portion of the message already processed is discarded and the meter will again look for a matching Device Address. The default timeout is 1 second but can be configured for 100 – 65000 mS.

REGISTER PRESETS

In the meter MODBUS implementation, meter registers (Normal and Alternate) may be cleared or set to a given value with the Preset Multiple Registers command (Function Code 16).

Note that the start register specified in the command must be the Hi-order register number of the appropriate register pair, and there cannot be more than 120 registers per request.

In addition, **Allow Register Presets** must be specifically enabled in the meter with JEMWare II (Go to menu Meter Settings/Protocols/MODBUS). If not enabled, MODBUS exception 01 (illegal function) will be returned if register presets are attempted.

Digital Output Control

The meter digital outputs may be forced to a high or low state via MODBUS using either the Force Single coil (Func 05) or Force Multiple Coils (Func 15) command. To use this feature, **Allow Digital Outputs Control** must be enabled in the meter with JEMWare II. If not enabled, MODBUS Exception 01 (Illegal Function) will be returned when this is attempted.

MODBUS REGISTER MAPS

The JEMStar II has a flexible map for the Modbus Protocol that you can customize in the JEMWare Software. The following Modbus Functions are supported:

Function Code (FC)	Register Set
03	Read Discrete Outputs
04	Read Discrete Inputs
03	Read Holding Registers (native data types)
04	Read Input Registers (Scaled and Cascaded)
05	Force Single Discrete Outputs
17	Force Multiple Discrete Outputs
18	Preset Multiple Holding Registers

Modbus Binary Objects

(Function 01 – Read Output Coils, Function 02 Read Input Status)

We use a single 16 bit register for multiple inputs and outputs. You can select from any of the digital I/O and metering events as shown in the list below.

Modbus Binary Objects

Function 01
Read Output Coils

Address	Function
00001	Digital Out #1
00002	Digital Out #2
00003	Digital Out #3
00004	Digital Out #4
00005	Digital Out #5
00006	Digital Out #6
00007	Digital Out #7
00008	Digital Out #8
00009	Digital Out #9
00010	Digital Out #10
00011	Digital Out #11
00012	Digital Out #12
00013	Digital Out #13
00014	Digital Out #14

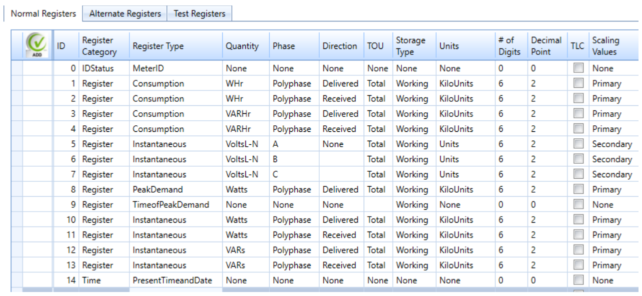
Function 02
Read Input Status

Address	Function
10001	**Digital Input Status**
10002	Ch. 1-14
10003	**Trigger Status**
10004	Ch. 1-64
10005	**Meter Status**
10006	Volts Ph A,B,C Status
10007	Clock Sync Status
10008	Battery Status
10009	Internal Comm Status
|	Calibration Status
	Configuration Status
10099	Firmware Status
10100	Test Mode Status

Modbus Counters

(Function 03 – Read Holding Registers)

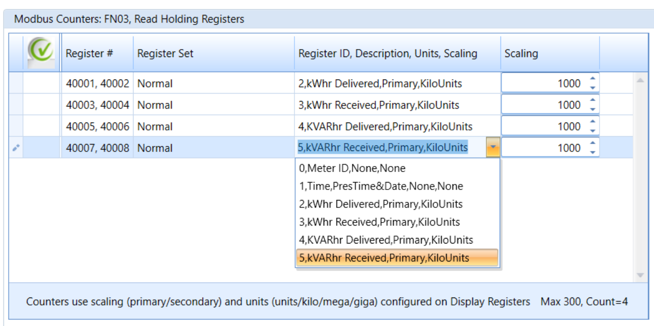
The JEMStar II uses a flexible mapping system for Modbus counters, with the ability to pick any Normal or Alternate Display register configured in the meter.



Normal Registers | Alternate Registers | Test Registers

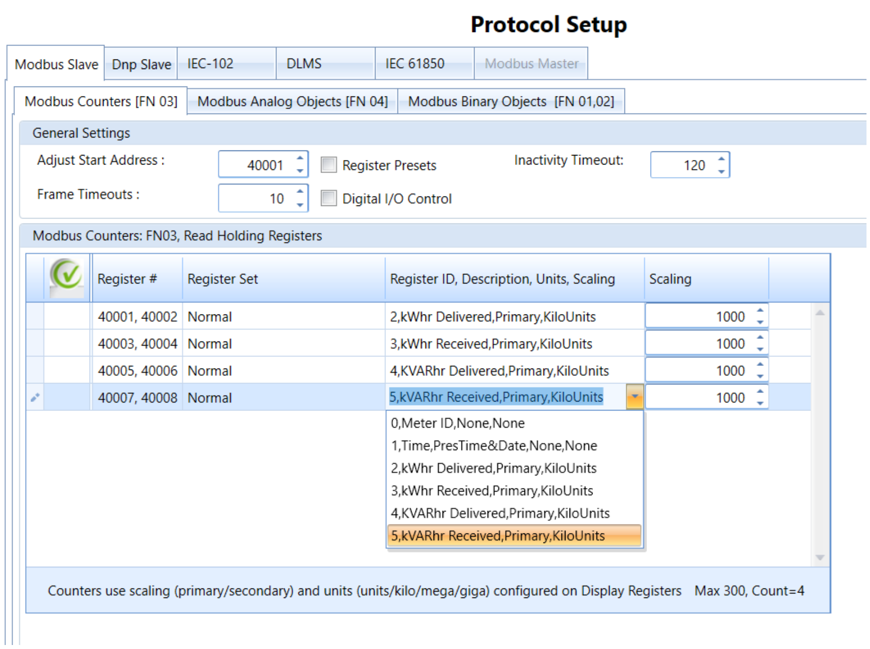
ID	Register Category	Register Type	Quantity	Phase	Direction	TOU	Storage Type	Units	# of Digits	Decimal Point	TLC	Scaling Values
0	IDStatus	MeterID	None	None	None	None	None	None	0	0		None
1	Register	Consumption	WHr	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
2	Register	Consumption	WHr	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
3	Register	Consumption	VARHr	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
4	Register	Consumption	VARHr	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
5	Register	Instantaneous	VoltsL-N	A	None	Total	Working	Units	6	2		Secondary
6	Register	Instantaneous	VoltsL-N	B		Total	Working	Units	6	2		Secondary
7	Register	Instantaneous	VoltsL-N	C		Total	Working	Units	6	2		Secondary
8	Register	PeakDemand	Watts	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
9	Register	TimeofPeakDemand	None	None	None		Working	None	0	0		None
10	Register	Instantaneous	Watts	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
11	Register	Instantaneous	Watts	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
12	Register	Instantaneous	VARs	Polyphase	Delivered	Total	Working	KiloUnits	6	2		Primary
13	Register	Instantaneous	VARs	Polyphase	Received	Total	Working	KiloUnits	6	2		Primary
14	Time	PresentTimeandDate	None	None	None	None	None	None	0	0		None

List of Normal Display Registers configured for meter



When configuring Modbus Counters, you will see the complete list of Normal and Alternate Registers to choose from

You can specify a register starting address (ex: 40001) and you can select an individual scaling factor from 0-1000.



The list of available measurements configured for your display registers is shown below:

Measurement Type	Measurement	Phase	Direction	TLC
Consumption	Whr, VARhr, Vahr(vect), Vahr(arith), Ahr, Qhr, A^2hr, V^2hr	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Instantaneous	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, VoltTHD, AmpTHD, V^2, A^2, Volt Imbalance, Amp Imbalence	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Demand: Peak (Max) Present Past Thermal Peak Thermal	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, VoltTHD, AmpTHD, V^2, A^2, Volt Imbalance, Amp Imbalence	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Minimum Maximum Average	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, VoltTHD, AmpTHD, V^2, A^2, Volt Imbalance, Amp Imbalence	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Power Quality	Volt THD, Amp THD, VoltTHD odd, VoltTHD even, Volt Imbalance, Amp Imbalance, TDD, TDD odd, TDD even, Crest Factor, Pst, Plt, Pinst	A,B,C		n/a
Fault	Negative Sequence Ratio (current and voltage), Zero Sequence Ratio (current and voltage)	A,B,C		n/a

Modbus Counter Scaling:

The Modbus Counter will duplicate the settings in the display register, so if the measurement is selected as ‘Primary’ with engineering units ‘kilo’, the corresponding counter point will match.

When configuring the MODBUS Counter, you can select your own scale factor from 1 to 1,000.

Note: The Modbus Counter table must be configured after all Normal/Alternate display registers have been created for the configuration.

The list of available measurements is based on what you have configured for your Normal and Alternate Display Registers.

Modbus Analogs

(Function 04 – Read Input Registers)

We use a single 16 bit register per measurement. You can select from any instantaneous measurement with selections for phase, direction, TLC and scaling. All values are based on secondary values. You can specify a register starting address (ex: 30001) and you can select an individual scaling factor from 0-100.

The list of available measurements that can be configured for your display registers is shown:

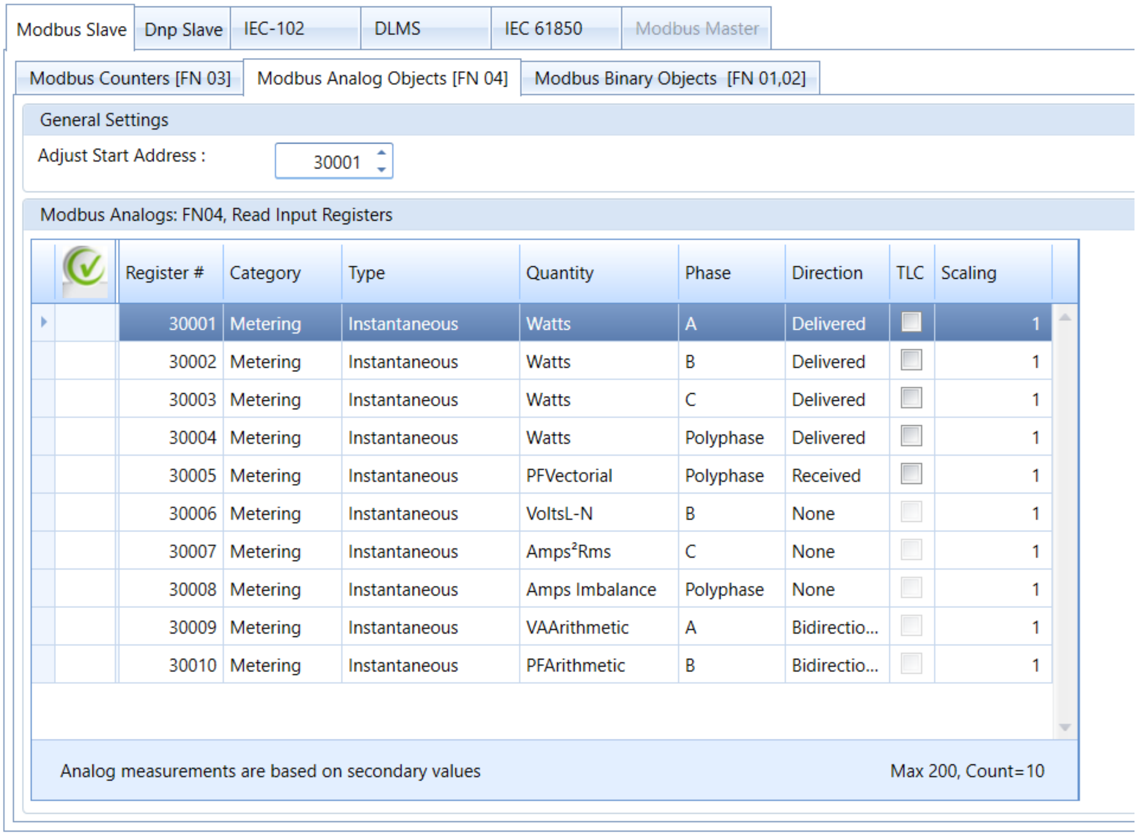
Address	Measurement
30001	Analog 1
30002	Analog 2
30003	Analog 3
|	|
30199	Analog 199
30200	Analog 200

Availabile Analog Measurements

Measurement Type	Measurement	Phase	Direction	TLC
Instantaneous	Volt, Amp, Watt, VAR, VA(vect), VA(arith), Freq, PF(vect), PF(arith), Q, VoltTHD, AmpTHD, V2, A2, Volt Imbalance, Amp Imbalence	A,B,C, Total	Del, Rec, Net, Abs, Q1-Q4	yes/no
Power Quality	Volt & Current Harmonic magnitude (2-64th harmonic), Volt & Current Harmonic phase angle (2-64th harmonic), Volt THD, Amp THD, VoltTHD odd, VoltTHD even, Volt Imbalance, Amp Imbalance, TDD, TDD odd, TDD even, Crest Factor	A,B,C		n/a
Fault	Neagtive, Positive, Zero Sequence (voltage/current magnitude and phase, Negative Sequence Ratio (current and voltage), Zero Sequence Ratio (current and voltage)	A,B,C		n/a

Typical Configuration of Modbus Analogs

Protocol Setup


Modbus Slave | Dnp Slave | IEC-102 | DLMS | IEC 61850 | Modbus Master

Modbus Counters [FN 03] | Modbus Analog Objects [FN 04] | Modbus Binary Objects [FN 01,02]

General Settings

Adjust Start Address : 30001

Modbus Analogs: FN04, Read Input Registers

Register #	Category	Type	Quantity	Phase	Direction	TLC	Scaling
30001	Metering	Instantaneous	Watts	A	Delivered		1
30002	Metering	Instantaneous	Watts	B	Delivered		1
30003	Metering	Instantaneous	Watts	C	Delivered		1
30004	Metering	Instantaneous	Watts	Polyphase	Delivered		1
30005	Metering	Instantaneous	PFVectorial	Polyphase	Received		1
30006	Metering	Instantaneous	VoltsL-N	B	None		1
30007	Metering	Instantaneous	Amps²Rms	C	None		1
30008	Metering	Instantaneous	Amps Imbalance	Polyphase	None		1
30009	Metering	Instantaneous	VAArithmetic	A	Bidirectio...		1
30010	Metering	Instantaneous	PFArithmetic	B	Bidirectio...		1

Analog measurements are based on secondary values

Max 200, Count=10

Modbus Analog Scaling:

Modbus Analog values are based on secondary values. Given the limitation of 16 bit storage of values, we automatically scale the measurements based on the measurement range.

This scaling method optimizes the usage of 16 Bit storage by automatically scaling the measurement to fit the maximum secondary ranges. *As an example, the measurement range for watts is 0 to 10600 which is scaled to 0 to 32767. A measurement of 10600 watts would provide a Modbus value of 32767. A value 10% of that (1060 watts) would provide a Modbus value that is 10% of the full scale, or 3277.*

Measurement	Measurement Range	Scaled Range
Volts	0 to 530	0 to 32767
Amps	0 to 20	0 to 32767
Frequency	0 to100	0 to 32767
Power Factor	-1.0 to 1.0	-32768 to 32768
Watts, VARS, VA (1 phase, del, rec, Q1-4, absolute)	0 to10600	0 to 32767
Watts, VARS, VA (3 phase, del, rec, Q1-4, absolute)	0 to 31800	0 to 32767

Watts, VARS, VA (1 phase, bi-directional)	-10600 to10600	-32768 to 32768
Watts, VARS, VA (3 phase, bi-directional)	-31800 to 31800	-32768 to 32768
Volts, Amps THD	0 to 100	0 to 32767
Volt2	0 to 280900	0 to 32767
Amp2 (1 phase)	0 to 400	0 to 32767
Amp2 (3 phase)	0 to 1200	0 to 32767

These are some examples of how scaling can be applied to different measurements:

Scaling Example 1:

Amps *12.56*

Measurement Range *0 to 20*

Scaled Range *0 to 32767*

Formula:

Measurement

----------------- *X Scaled Range = Modbus Value*

Meas Range

12.56

------------- *X 32767 = 20578 Modbus Value (The Modbus value of 20578 represents 12.56 Amps)*

20

The Modbus configuration also includes a user configurable scale factor of 1 to 100 selectable by measurement. A scale factor should be made so that the maximum value doesn't exceed the measurement range. For example, the 3-phase watt maximum is 31800. If your maximum watt value is less than 3180, you can use a scale factor of 10.

Scaling Example 2:

Polyphase Watts delivered *1825.438*

Measurement Range *0 to 31800*

Scaled Range *0 to 32767*

Scale Factor Used *10*

Formula:

Measurement

----------------- *X Scaled Range X Scale Factor = Modbus Value*

Meas Range

1825.438

------------- *X 32767 X 10 = 18809 Modbus Value = 1825.438 Watts*

31800

APPENDIX C – DEFAULT SETTINGS

The following is a list of the factory default settings that will be seen in a JEMStar II meter after a Cold Start is performed. Use JEMWare II software to program the meter with your custom configuration.

METER IDENTIFICATION

ID String 1: (JEMStarII ID)
ID String 2: (Ametek Power)
ID String 3: (Rochester, New York)
ID String 4: (Factory Default)
ID String 5: (1-888-222-6282)
ID Label 1: MV90 Meter ID
ID Label 2: Administrator
ID Label 3: Location
ID Label 4: Configuration ID
ID Label 5: Account Number

PRIMARY CONFIGURATION

Meter Settings:
Meter Form 9
Meter Class Amps 20
Voltage Range 69-480
Connection Type 4 Wire Y
Frequency 60hz

Primary and Secondary Settings:
PT:Primary 1
PT:Secondary 1
PT:Ratio 1
CT:Primary 1
CT:Secondary 1
CT:Ratio 1
Transformer Factor 1
Nominal Voltage 120
Nominal Current 0
Full Scale Watts 0

Register Scaling:
    VARs, Q Units
    Watts, VA Units
    Amp, A^2 MilliAmps
    Volt Volts
    V^2 KiloVolts

Display Registers

Normal Registers

Display Registers

Normal Registers | Alternate Registers | Test Registers

ID	Register Category	Register Type	Quantity	Phase	Direction	TOU	Storage Type	Units	# of Digits	Decimal Point	TLC	Scaling Values	Display Screen	Description
0	IDStatus	MeterID	None	None	None	None	None	None	0	0	☐	None	1	IDStatus,Meter ID
1	Register	Consumption	WHr	Polyph...	Delivered	Total	Working	Units	6	2	☐	Primary	2	Watthour Delivered
2	Register	Consumption	WHr	Polyph...	Received	Total	Working	Units	6	2	☐	Primary	3	Watthour Received
3	Register	Consumption	VARHr	Polyph...	Delivered	Total	Working	Units	6	2	☐	Primary	4	VARhour Delivered
4	Register	Consumption	VARHr	Polyph...	Received	Total	Working	Units	6	2	☐	Primary	5	VARhour Received

Alternate Registers

Display Registers

Normal Registers | Alternate Registers | Test Registers

ID	Register Category	Register Type	Quantity	Phase	Direction	TOU	Storage Type	Units	# of Digits	Decimal Point	TLC	Scaling Values	Display Screen	Description
100	IDStatus	PhasorDisplay	None	None	None	None	None	None	0	0	☐	None	1	IDStatus,Phasor Dis...
101	IDStatus	Communicati...	None	None	None	None	None	None	0	0	☐	None	2	IDStatus,Comm Sta...
102	Time	LastBPRTime...	None	None	None	None	None	None	0	0	☐	None	3	Time,BPRTime&Date
103	Register	Consumption	WHr	Polyph...	Delivered	Total	BillingP...	Units	6	2	☐	Primary	4	BPR Watthour Del
104	Register	Consumption	WHr	Polyph...	Received	Total	BillingP...	Units	6	2	☐	Primary	5	BPR Watthour Rec
105	Register	Consumption	VARHr	Polyph...	Delivered	Total	BillingP...	Units	6	2	☐	Primary	6	BPR VARhour Del
106	Register	Consumption	VARHr	Polyph...	Received	Total	BillingP...	Units	6	2	☐	Primary	7	BPR VARhour Rec

Test Registers

Display Registers

Normal Registers | Alternate Registers | Test Registers

ID	Register Category	Register Type	Quantity	Phase	Direction	Storage Type	Units	# of Digits	Decimal Point	Pulse Weight	TOU	TLC	Scaling Values	Display Screen	Description
200	Register	Consumption	WHr	Pol...	Delivered	Working	Units	6	2	1.80	Total	☐	Primary	1	Watthour Delivered
201	Register	Consumption	WHr	Pol...	Received	Working	Units	6	2	1.80	Total	☐	Primary	2	Watthour Received
202	Register	Consumption	VARHr	Pol...	Delivered	Working	Units	6	2	1.80	Total	☐	Primary	3	VARhour Delivered
203	Register	Consumption	WHr	A	Delivered	Working	Units	6	2	1.80	Total	☐	Primary	4	Watthour Del Phas...
204	Register	Consumption	WHr	B	Delivered	Working	Units	6	2	1.80	Total	☐	Primary	5	Watthour Del Phas...
205	Register	Consumption	WHr	C	Delivered	Working	Units	6	2	1.80	Total	☐	Primary	6	Watthour Del Phas...
206	Register	Consumption	WHr	A	Received	Working	Units	6	2	1.80	Total	☐	Primary	7	Watthour Rec Phas...
207	Register	Consumption	WHr	B	Received	Working	Units	6	2	1.80	Total	☐	Primary	8	Watthour Rec Phas...
208	Register	Consumption	WHr	C	Received	Working	Units	6	2	1.80	Total	☐	Primary	9	Watthour Rec Phas...

LOAD PROFILE

Load Profile 1

Channel	Type	Quantity	Phase	Direction	Records	Primary Km Value Suggest Km	TLC
1	Consumption	WHr	Polyphase	Delivered	Always	0.001	☐
2	Consumption	WHr	Polyphase	Received	Always	0.001	☐
3	Consumption	VARHr	Polyphase	Delivered	Always	0.001	☐
4	Consumption	VARHr	Polyphase	Received	Always	0.001	☐

Interval Length:	15 minutes
External Interval Sync:	No
Freeze Markers:	Yes
Data Only:	No
Data and Events:	Yes
Data in Counts:	Yes
Data in Eng units:	No

DEMAND

Interval Length:	15 min
Sub Interval Length:	5 min
Enable Demand Sync.	No
Thermal Demand Time:	15 min
Defer Demands for:	0 sec
After Power Outage (secs):	1

TIME OF USE SETUP

No Seasons or Time of Use schedules configured
No Override Rate
No Holidays schedules

TIMEKEEPING AND DST CHANGES

Meter Clock Sync: Internal
Auto Register Freeze: none
Auto Billing Period Reset: none
DST: not enabled

INPUT/OUTPUT

Channel 1: Input Interval Sync
Channel 2: Input Status Input
Channel 3: Output Energy Pulse, 1 shot, Wh polyphase, ke=1

Channel 4: Output Energy Pulse, 1 shot, VARh polyphase, pke=1
Channel 5: Output End of Demand Interval
Channel 6: Output Triggered Alarm

ANALOG OUTPUTS

Analog Output 1: Watts Phase A, 0-0
Analog Output 2: Watts Phase A, 0-0
Analog Output 3: Watts Phase A, 0-0
Analog Output 4: Watts Phase A, 0-0

TRIGGER SETUP

Channel 1: Volts Line-Neutral, Phase A, >100, not enabled
Channel 2: Volts Line-Neutral, Phase B, >100, not enabled
Channel 3: Volts Line-Neutral, Phase C, >100, not enabled

COMMUNICATION SETUP

Optical (Port 1):	9600 baud
	Binary protocol
	Device Address = 01
	Password timeout 1 min.
RS-232 (Port 2):	19200 baud
	Binary protocol
	Device Address = 01
	Password timeout 5 min.
	TX Start Delay =0
	TX End Delay = 0
	Turnaround Delay = 0
RS-232/485 (Port 3):	RS232
	19200 baud
	Binary protocol
	Device Address = 01
	Password timeout 5 min.
	TX Start Delay =0
	TX End Delay = 0
	Turnaround Delay = 0
RS-232/485 (Port 4):	RS232
	19200 baud
	Binary protocol
	Device Address = 01
	Password timeout 5 min.
	TX Start Delay =0
	TX End Delay = 0
	Turnaround Delay = 0

Int Modem (Port 5): 9600 baud
Binary protocol
Device Address = 01
Password timeout 10 min.
Modem Init String =ATV0E0
Normal Answer Window
Answer Window Start: 00:00
Duration: 1439
Number of rings to answer: 2
Frequency: Every Day
Delayed Answer Window
Number of rings to answer: 0

Ethernet (Port 6): DHCP: Not selected
IP Address: 192.168.250.100
Subnet Mask: 255.255.0.0
Default Gateway: 192.168.250.10
Port 502: Modbus Slave, Device Address 1, disabled
Port 2001: Binary, Device Address 1, enabled
Port 2000: DNP, Device Address 1, disabled

Ethernet (Port 7):

DHCP:	Not selected
IP Address:	192.168.250.101
Subnet Mask:	255.255.0.0
Default Gateway:	192.168.250.10

Port 502: Modbus Slave, Device Address 1, disabled
Port 2001: Binary, Device Address 1, enabled
Port 20000: DNP, Device Address 1, disabled

PROTOCOL SETUP

Modbus Slave

Modbus Counters: Start Address = 30001
Point 1 Watthour Delivered 0.001 scaling
Point 2 Watthour Received 0.001 scaling
Point 3 VARhour Delivered 0.001 scaling
Point 4 VARhour Received 0.001 scaling

Modbus Analogs: Start Address = 40001
Point 1 Watts Phase A
Point 2 Watts Phase B
Point 3 Watts Phase C
Point 4 Watts Polyphase

Point 5 VARS Phase A
Point 6 VARS Phase B
Point 7 VARS Phase C
Point 8 VARS Polyphase
Point 9 VA Phase A
Point 10 VA Phase B
Point 11 VA Phase C
Point 12 VA Polyphase
Point 13 Volts Phase A
Point 14 Volts Phase B
Point 15 Volts Phase C
Point 16 Amps Phase A
Point 17 Amps Phase B
Point 18 Amps Phase C

Modbus Binary: Read Output Coils
Start Address = 1
Point 1 Ch3
Point 2 Ch4
Read Input Status
Start Address = 10001
Point 1 Digital Input Ch 1
Point 2 Digital Input Ch 2
Point 3 Trigger Ch 1
Point 4 Trigger Ch 2
Point 5 Trigger Ch 3

DNP Slave

DNP Counters: Write Time Interval = 1
Data Link Timeout = 1
Data Link Mode = never
Application Timeout =1
Data Link Retries = 3
Restrict Counter = any
Time Set Tolerance = 2
Analog Input Variation = 3
Frozen Counter Events = yes
Analog Scaling = 16 bit
Class 0 Counter type = Running Object 20
Class 0 Counter type = Frozen Object 21
Global Time Set = enabled
Point 1 Watthour Delivered 0.001 scaling
Point 2 Watthour Received 0.001 scaling
Point 3 VARhour Delivered 0.001 scaling
Point 4 VARhour Received 0.001 scaling

DNP Analogs: Point 1 Watts Phase A
Point 2 Watts Phase B
Point 3 Watts Phase C

Point 4 Watts Polyphase
Point 5 VARS Phase A
Point 6 VARS Phase B
Point 7 VARS Phase C
Point 8 VARS Polyphase
Point 9 VA Phase A
Point 10 VA Phase B
Point 11 VA Phase C
Point 12 VA Polyphase
Point 13 Volts Phase A
Point 14 Volts Phase B
Point 15 Volts Phase C
Point 16 Amps Phase A
Point 17 Amps Phase B
Point 18 Amps Phase C

DNP Binary: Read Binary Output: Object 10
Point 1 Ch3
Point 2 Ch4
Point 3 Ch5
Point 4 Ch6
Read Binary Inputs: Object 2
Point 1 Digital Input Ch 1
Point 2 Digital Input Ch 2

DISPLAY SETUP

Display Scroll Rate: 7 sec
Display Timeout: 15 sec
Date Format: MM/DD/YYYY
Preset mode timeout: 1 minutes
Test Mode timeout: 30 minutes
Demand Reset lockout: 5 minutes
User Menu Timeout: 120 sec

TLC

Loss Compensation disabled

USER MANAGEMENT

Username: admin Password: admin
Access to all

Username: user1 Password: user1
Set time, freeze registers, activate test mode, billing period reset, preset registers, meter/battery status

Username: user2 Password: user2
Set time, billing period reset

Username: pq Password: pq

APPENDIX D -
ANSI TABLES COMMUNICATION

FOR FUTURE IMPLEMENTATION

APPENDIX E–
DLMS COMMUNICATION PROTOCOL

INTRODUCTION

DLMS (Device Language Messaging Specification) / COSEM (Companion Specification for Energy Metering) is used for obtaining all the meter measurements for revenue and billing. This implementation is based on IEC-62056 in accordance with the DLMS Blue Book 11th edition, Blue Book 10th edition, Green Book seventh edition, Yellow book third edition.

PHYSICAL LAYER

DLMS is available on the following serial communications ports:

- Optical (IEC 62056-21 Model E)
- RS-232, RS-485
- PSTN Modem
- GPRS Modem
- Ethernet

DATA LINK LAYER

The following operation selections for HDLC (ISO/IEC 13239) were chosen for use with DLMS:

- unbalanced connection-mode data link operation
- two-way alternate data transfer
- the selected HDLC class of procedure is UNC, extended with UI frames
- non-basic frame format transparency (HDLC Frame format type 3)

DLMS/COSEM Specification	**Supported**
Maximum Info Field Transmit	128
Maximum info field Receive	128
Maximum Window Size Transmit	1
Maximum Window Size Receive	1
Transparent transfer of long MSDUs	Not supported
Inactivity timeout	120 seconds
Inter-frame timeout	Configured Rx Timeout register value
Device Addressing Length	4 bytes
Physical Device Address	Configured in meter's Unit ID register value
Logical Device(s) Management	Logical Deviceonlyatspecifiedaddress0x0001

APPLICATION LAYER

The following classes were implemented:

Class		Attributes	
1	Data	1	logical name
		2	value
3	Register	1	logical name
		2	value
		3	scaler unit
7	Profile Generic	1	logical name
		2	buffer
		3	capture objects
		4	capture period
		5	sort method
		6	sort object
		7	entries in use
		8	profile entries
8	Clock	1	logical name
		2	time
		3	time zone
		4	status
		5	daylight savings begin
		6	daylight savings end
		7	daylight savings deviation
		8	daylight savings enabled
		9	clock base
15	Association LN	1	logical name
		2	object list
		3	Associated partners list
		4	Application context name
		5	xDLMS context info
		6	Authentication mechanism
		7	LLS secret
		8	Asoociation status
17	SAP Assignment	1	logical name
		2	SAP assignment list

DLMS/COSEM Specification	Supported Implementation
Supported application context	LN referencing
Available services	block-transfer-with-get
	get
	set (supported for time synchronization only)
	selective-access

COSEM LAYER

The meter supports Data, Registers, Load Profile, Clock and Association objects.

Data Objects (IC1)

Some of the data objects listed below are set at the factory; such as firmware versions, meter serial number. The remaining data items shown in *italics* are retrieved from the user configuration in JEMWARE.

Data Objects Available for DLMS

Description	OBIS						App Assoc	Type
	A	B	C	D	E	F	Attrib	Attrib 2
Register firmware version	0	0	0	2	1	255	RO	Visible string
Register firmware signature	0	0	0	2	8	255	RO	Octet string
Metrology firmware version	0	1	0	2	1	255	RO	Visible string
Metrology firmware signature	0	1	0	2	8	255	RO	Octet string
Service firmware version	0	2	0	2	1	255	RO	Visible string
Service firmware signature	0	2	0	2	8	255	RO	Octet string
PQ firmware version	0	3	0	2	1	255	RO	Visible string
PQ firmware signature	0	3	0	2	8	255	RO	Octet string
FPGA firmware version	0	4	0	2	1	255	RO	Visible string
FPGA firmware signature	0	4	0	2	8	255	RO	Octet string
Digital I/O firmware version	0	5	0	2	1	255	RO	Visible string
Analog Out/Modem firmware version	0	6	0	2	1	255	RO	Visible string
CPLD firmware version	0	7	0	2	1	255		
AMETEK Meter Serial Number	0	0	96	11	0	255	RO	Visible string
Meter ID #	0	0	96	11	1	255	RO	Visible string
Meter Administrator	0	0	96	11	2	255	RO	Visible string
Meter Location	0	0	96	11	3	255	RO	Visible string
Meter Configuration ID	0	0	96	11	4	255	RO	Visible string
Meter Account Number	0	0	96	11	5	255	RO	Visible string
Ch.0 Transformer ratio - Current Primary	1	0	0	4	2	255	RO	Double long unsigned(32 bit unsigned integer)
Ch.0 Transformer ratio - Voltage Primary	1	0	0	4	3	255	RO	Double long unsigned(32 bit unsigned integer)
Ch.0 Transformer ratio - Current Secondary	1	0	0	4	5	255	RO	Double long unsigned(32 bit unsigned integer)
Ch.0 Transformer ratio - Voltage Secondary	1	0	0	4	6	255	RO	Double long unsigned(32 bit unsigned integer)
Load Profile Group 1 Recording Interval	1	0	0	8	4	255	RO	Double long unsigned(32 bit unsigned integer)
Load Profile Group 2 Recording Interval	1	0	0	8	5	255	RO	Double long unsigned(32 bit unsigned integer)
Load Profile Group 1 Scaling Factor (Km)	1	128	103	0	0	255	RO	Array
Load Profile Group 2 Scaling Factor (Km)	1	128	104	0	0	255	RO	Array
Energy pulse settings	1	128	100	0	0	255	RO	Array
LED and Optical pulse settings	1	128	101	0	0	255	RO	Array

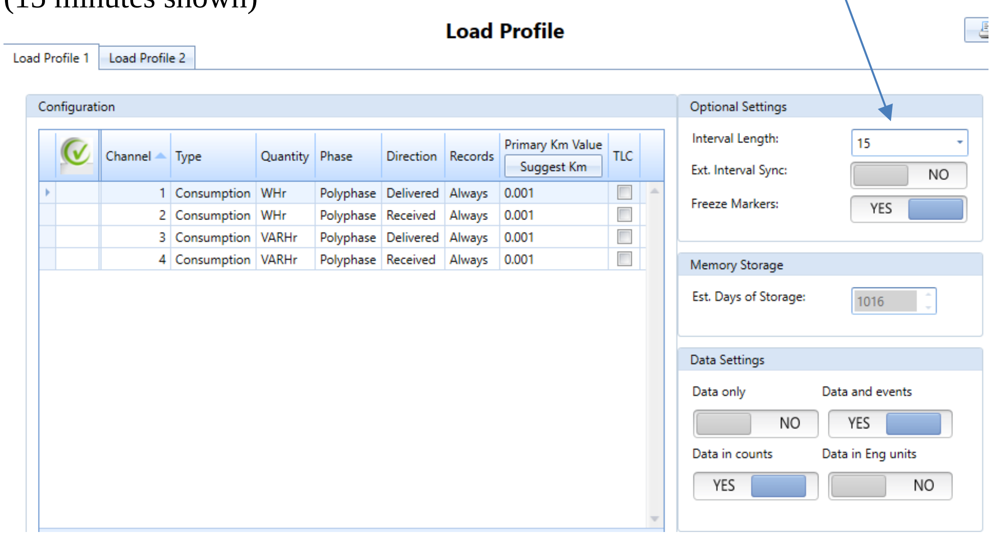
DLMS Details for Load Profile Recording Interval

Description	OBIS						App Assoc
	A	B	C	D	E	F	Attrib
Load Profile Group 1 Recording Interval	1	0	0	8	4	255	RO
Load Profile Group 2 Recording Interval	1	0	0	8	5	255	RO

Load Profile Recording Interval Values (typical for Load Profile Group #1 and #2)

Recording Interval	DLMS Value
1 minute	0
2 minutes	1
3 minutes	2
4 minutes	3
5 minutes	4
6 minutes	5
10 minutes	6
12 minutes	7
15 minutes	8
20 minutes	9
30 minutes	10
60 minutes	11
Daily	12
Weekly	13
Monthly	14

Load Profile Recording Interval configuration in JEMWARE
(15 minutes shown)



DLMS Values from above

Load Profile Scaling Factor Settings		
Load Profile Settings	**Setting**	**DLMS Value**
Interval Length	15 minutes	8

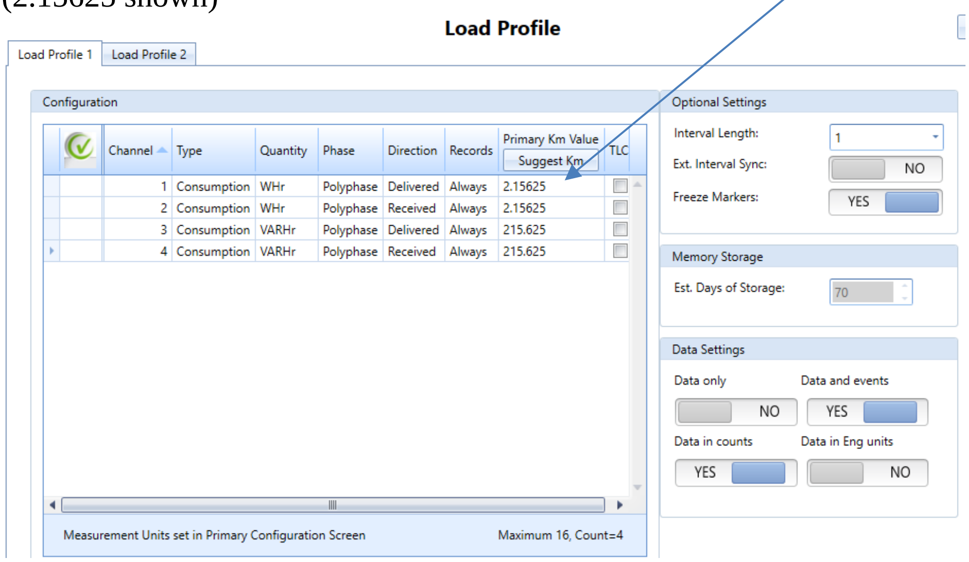
DLMS Details for Load Profile Scaling Factor (Km)

Description	OBIS						App Assoc
	A	**B**	**C**	**D**	**E**	**F**	**Attrib**
Load Profile Group 1 Scaling Factor (Km)	1	128	103	0	0	255	RO
Load Profile Group 2 Scaling Factor (Km)	1	128	104	0	0	255	RO

DLMS Array Details for Load Profile Scaling Factor Settings (typical for Load Profile Group #1 and #2)

Load Profile Scaling Factor Settings			
Value	DLMS Item	Load Profile Channel #	DLMS Value
	L1 Sub value (0)	1	Floating Point
	L1 Sub value (1)	2	Floating Point
	L1 Sub value (2)	3	Floating Point
	L1 Sub value (3)	4	Floating Point
	L1 Sub value (15)	16	Floating Point

Load Profile (Km) Scaling Factor configuration in JEMWARE (2.15625 shown)



DLMS Values from above

Load Profile Scaling Factor Settings			
Value	**Channel Settings**	**Setting**	**DLMS Value**
	L1 Sub value (0)	Load Profile Channel 1 Km	2.15625
	L1 Sub value (1)	Load Profile Channel 2 Km	2.15625
	L1 Sub value (2)	Load Profile Channel 3 Km	2.15625
	L1 Sub value (3)	Load Profile Channel 4 Km	2.15625

DLMS Array Details for Energy Pulse Settings

Description	OBIS						App Assoc
	A	B	C	D	E	F	Attrib
Energy Pulse Settings	1	128	100	0	0	255	RO

Energy Pulse Settings Array details

Energy Pulse Settings		
Value	Output Channel #	Channel Settings
	L1 Sub value (0)	L2 Sub value (0)
		L2 Sub value (1)
		L2 Sub value (2)
		L2 Sub value (3)
		L2 Sub value (4)
	L1 Sub value (1)	L2 Sub value (0)
		L2 Sub value (1)
		L2 Sub value (2)
		L2 Sub value (3)
		L2 Sub value (4)
	L1 Sub value (6)	L2 Sub value (0)
		L2 Sub value (1)
		L2 Sub value (2)
		L2 Sub value (3)
		L2 Sub value (4)

Output Channel #

L1 Sub value (0)	Channel 1	7 Possible Energy Output Channels
L1 Sub value (1)	Channel 2	
L1 Sub value (2)	Channel 3	
L1 Sub value (3)	Channel 4	
L1 Sub value (4)	Channel 5	
L1 Sub value (5)	Channel 6	
L1 Sub value (6)	Channel 7	

Note: There are a maximum of 7 Digital Output Channels that can be used as Energy Outputs.

Channel Settings

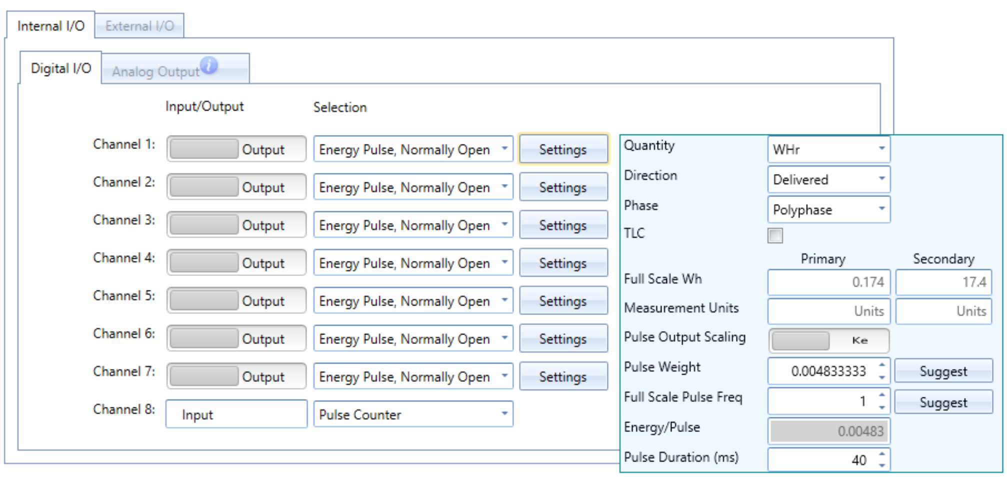
L2 Sub value (0)	**Output Channel #**		**DLMS Value**
	Channel #1 thru 7		1-7
L2 Sub value (1)	**Quantity**	**Measurement**	**DLMS Value**
		Whr	0
		VARhr	1
		VAhr Vectorial	2
		VAhr Arithmentic	3
		Ahr	4
		Qhr	5
		ASqhr	6
		VSqhr	7
L2 Sub value (2)	**Direction**	**Setting**	**DLMS Value**
		None	0
		Delivered	1

		Received	2
		Bidirectional	3
		Total	4
		Net	5
		Q1	6
		Q2	7
		Q3	8
		Q4	9
		Absolute	10
L2 Sub value (3)	**Phase**	**Setting**	**DLMS Value**
		A	0
		B	1
		C	2
		Polyphase	3
		Average	4
		Neutral	5
		System	6
		None	7
L2 Sub value (4)	**Pulse Weight**	**Setting**	**DLMS Value**
		As configured	Floating Point Value

Note: Only Digital I/O channels configured as 'Energy Outputs' will be displayed.

Example of a JEMWare II Configuration:

Input/Output



DLMS Values from above

Energy Pulse Settings				
Value	**Output Channel #**	**Channel Settings**	**Setting**	**DLMS Value**
	L1 Sub value (0)	L2 Sub value (0)	Channel 1	0
		L2 Sub value (1)	Whr	0
		L2 Sub value (2)	Delivered	1
		L2 Sub value (3)	Polyphase	3
		L2 Sub value (4)	Pulse weight	0.004833

Note: Only Channel 1 of 7 shown above.

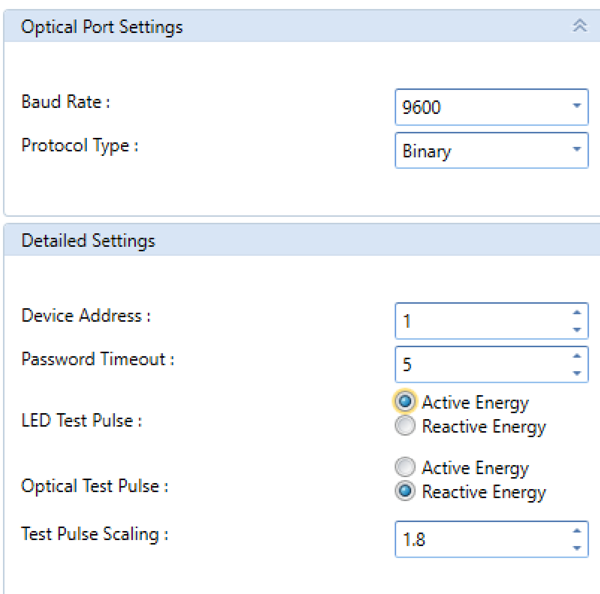
DLMS Array Details for LED and Optical Pulse Settings

Description	**OBIS**						**App Assoc**
	A	**B**	**C**	**D**	**E**	**F**	**Attrib**
LED and Optical pulse settings	1	128	101	0	0	255	RO

Energy Pulse Settings Array details

Energy Pulse Settings			
Value	L1 Sub value (0)	**LED Test Pulse Selection**	**DLMS Value**
		Active Energy	0
		Reactive Energy	1
	L1 Sub value (1)	**LED Test Pulse Sealing**	**DLMS Value**
		As configured	Floating Point
	L1 Sub value (2)	**Optical Test Pulse Selection**	**DLMS Value**
		Active Energy	0
		Reactive Energy	1
	L1 Sub value (3)	**Optical Test Pulse Scaling**	**DLMS Value**
		As configured	Floating Point

Example of a JEMWare II Configuration:



DLMS Values from above

Energy Pulse Settings			
Value	**Channel Settings**	**Setting**	**DLMS Value**
	L1 Sub value (0)	LED Test Pulse: Active Energy	0
	L1 Sub value (1)	LED Test Pulse Scaling: 1.8	1.8
	L1 Sub value (2)	Optical Test Pulse: Reactive Energy	1
	L1 Sub value (3)	Optical Test Pulse Scaling: 1.8	1.8

Register Objects (IC3)

The register and profile attributes listed in the table below are scaled by 1000 to provide resolution to three decimal points.

There is no configuration required in the meter to access any of the measurements listed below. The following Register objects are available in all meters.

Register Measurements Available for DLMS

Description	OBIS						App Assoc	Type	Unit
	A	B	C	D	E	F	Attrib	Attrib 2	Attrib 2
Active power+ (QI+QIV) Watts Del A	1	0	21	7	0	255	RO	Double long unsigned	W
Watts Del B	1	0	41	7	0	255	RO	Double long unsigned	W
Watts Del C	1	0	61	7	0	255	RO	Double long unsigned	W
Watts Del Poly	1	0	1	7	0	255	RO	Double long unsigned	W
Active power– (QII+QIII) Watts Rec A	1	0	22	7	0	255	RO	Double long unsigned	W
Watts RecB	1	0	42	7	0	255	RO	Double long unsigned	W
Watts Rec C	1	0	62	7	0	255	RO	Double long unsigned	W
Watts Rec Poly	1	0	2	7	0	255	RO	Double long unsigned	W
Reactive power+ (QI+QII) VARs Del A	1	0	23	7	0	255	RO	Double long unsigned	VAR
VARs Del B	1	0	43	7	0	255	RO	Double long unsigned	VAR
VARs Del C	1	0	63	7	0	255	RO	Double long unsigned	VAR
VARs Del Poly	1	0	3	7	0	255	RO	Double long unsigned	VAR
Reactive power– (QIII+QIV) VARs Rec A	1	0	24	7	0	255	RO	Double long unsigned	VAR
VARs Rec B	1	0	44	7	0	255	RO	Double long unsigned	VAR
VARs Rec C	1	0	64	7	0	255	RO	Double long unsigned	VAR
VARs Rec Poly	1	0	4	7	0	255	RO	Double long unsigned	VAR
Apparent power+ (QI+QIV) VA Arithmetic Delivered A	1	0	29	7	0	255	RO	Double long unsigned	VA
VA Arithmetic Delivered B	1	0	49	7	0	255	RO	Double long unsigned	VA
VA Arithmetic Delivered C	1	0	69	7	0	255	RO	Double long unsigned	VA
VA Arithmetic Delivered Poly	1	0	9	7	0	255	RO	Double long unsigned	VA
Apparent power– (QII+QIII) VA Arithmetic Received A	1	0	30	7	0	255	RO	Double long unsigned	VA
VA Arithmetic Received B	1	0	50	7	0	255	RO	Double long unsigned	VA
VA Arithmetic Received C	1	0	70	7	0	255	RO	Double long unsigned	VA
VA Arithmetic Received Poly	1	0	10	7	0	255	RO	Double long unsigned	VA
Voltage: any phase Volts RMS Phase A	1	0	32	7	0	255	RO	Double long unsigned	V
Volts RMS Phase B	1	0	52	7	0	255	RO	Double long unsigned	V
Volts RMS Phase C	1	0	72	7	0	255	RO	Double long unsigned	V
Volts RMS Average	1	0	12	4	0	255	RO	Double long unsigned	V
Current: any phase Amps RMS A	1	0	31	7	0	255	RO	Double long unsigned	A
Amps RMS B	1	0	51	7	0	255	RO	Double long unsigned	A
Amps RMS C	1	0	71	7	0	255	RO	Double long unsigned	A
Amps RMS Poly	1	0	90	7	0	255	RO	Double long unsigned	A
Amps RMS Neutral	1	0	91	7	0	255	RO	Double long unsigned	A
Amps RMS Average	1	0	90	4	0	255	RO	Double long unsigned	A
PF Arithmetic A	1	0	33	7	0	255	RO	Double long unsigned	
PF Arithmetic B	1	0	53	7	0	255	RO	Double long unsigned	
PF Arithmetic C	1	0	73	7	0	255	RO	Double long unsigned	

PF Arithmetic Poly	1	0	13	7	0	255	RO	Double long unsigned	
Frequency	1	0	34	7	0	255	RO	Double long unsigned	HZ
Fundamental Volts A Phase Angle	1	0	81	7	0	255	RO	Double long unsigned	Deg
Fundamental Volts B Phase Angle	1	0	81	7	1	255	RO	Double long unsigned	Deg
Fundamental Volts C Phase Angle	1	0	81	7	2	255	RO	Double long unsigned	Deg
Fundamental Amps A Phase Angle	1	0	81	7	4	255	RO	Double long unsigned	Deg
Fundamental Amps B Phase Angle	1	0	81	7	5	255	RO	Double long unsigned	Deg
Fundamental Amps C Phase Angle	1	0	81	7	6	255	RO	Double long unsigned	Deg
Watthours A Delivered	1	0	21	8	0	255	RO	Double long unsigned	Wh
Watthours B Delivered	1	0	41	8	0	255	RO	Double long unsigned	Wh
Watthours C Delivered	1	0	61	8	0	255	RO	Double long unsigned	Wh
Watthours Poly Delivered	1	0	1	8	0	255	RO	Double long unsigned	Wh
Watthours A Received	1	0	22	8	0	255	RO	Double long unsigned	Wh
Watthours B Received	1	0	42	8	0	255	RO	Double long unsigned	Wh
Watthours C Received	1	0	62	8	0	255	RO	Double long unsigned	Wh
Watthours Poly Received	1	0	2	8	0	255	RO	Double long unsigned	Wh

Register Object Details

Each Register Object (IC3) includes the following items:

(Sum Li Active power+ [QI+QIV] Instantaneous value shown below):

Name	**Value**	**Time Stamp**	**Data Type**	**Access Right**
Logical Name	1-0-1-7-0-255	Time of read	Octet String	RO
Value	X watts	Time of read	Double long unsigned	RO
Scaler Unit	0	Time of read	Structure	RO

Load Profile Objects (IC7)

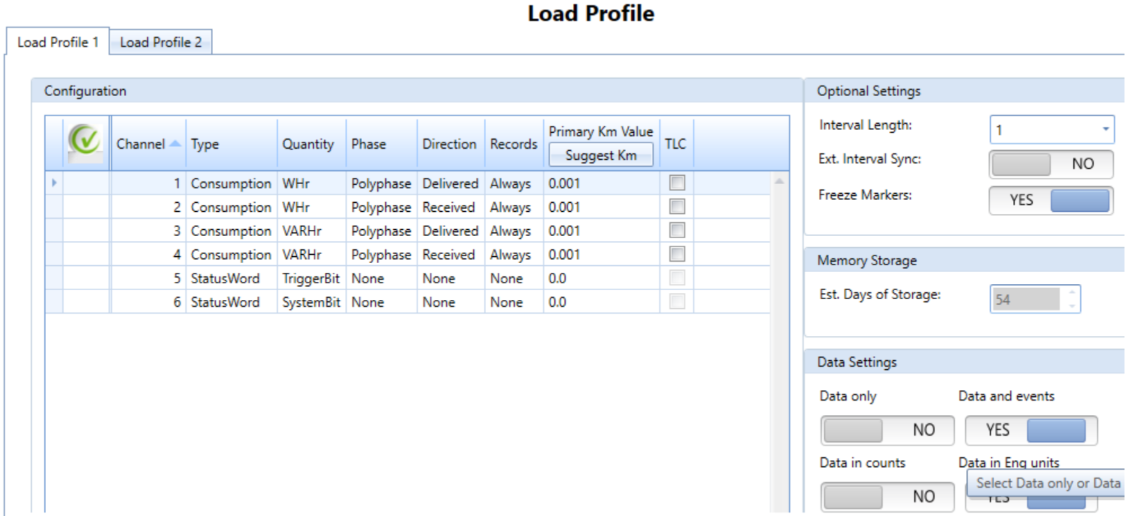
Up to 16 channels of Load Profile can be retrieved in IC7. Load profile can be retrieved by data range or by the number of records as determined by the selective access buffer.

Configuring Load Profile for DLMS using JEMWARE

The individual measurements used for DLMS need to be configured in the meter's Load Profile Configuration via JEMWare II first.

The Load Profile screen in JEMWare II contains parameters that set up the Load Profile storage areas in the meter. A meter can be equipped with 16 Load Profile channels (*standard*) or an additional 16 channels in a second Load Profile (*optional*). If the meter has the "Dual Load Profile" option installed, a second tabbed page will be available to configure the 16 additional and independent Load Profile settings.

Load Profile



Reference the JEMWare Manual 1079-699 for additional details on how to configure Load Profile.

The list of available measurements supported by DLMS are shown in Table 2 below.

Note 1: Only the measurements included in the meter's Load Profile setup will be available for DLMS IC7.

Note 2: The Load Profile setup in the meter must not include any measurements outside of this list of available measurements.

In the Load Profile screenshot above, 6 channels of Load Profile are configured, consisting of:

1. Whr Delivered Polyphase
2. Whr Received Polyphase
3. VARhr Delivered Polyphase
4. VARhr Received Polyphase
5. Status Word (Triggered Bit)
6. Status Word (System Bit)

Refer to Table 2 for other measurements supported in DLMS.

The interval length configured above is 1 minute.

Other selectable intervals are: 2,3,4,5,6,10,12,15,20,30,60 minutes.

DLMS Details for Load Profile (IC7)

Description	OBIS						App Assoc
	A	**B**	**C**	**D**	**E**	**F**	**Attrib**
Load Profile Group 1	1	0	99	1	0	255	RO
Load Profile Group 2	1	0	98	1	0	255	RO

Load Profile Details

The Load Profile Object (IC7) includes the following items: (typical for Load Profile Group #1 and #2)

Name	Value	Time Stamp	Data Type	Access Right
Logical Name	1.0.99.1.0.255	Time of Read	Octet String	RO
Buffer	Load Profile Values		Array	RO
Capture Objects	Defines list of buffer items		Array	RO
Capture Period	Interval length (sec)		Double Long Unsigned	RO
Sort Method	1 (oldest events first)		Enum	RO
Sort Object	None		Structure	RO
Entries in Use	Number of entries stored in the buffer		Double Long Unsigned	RO
Profile Entries	Maximum number of entries to be retained in the Buffer – dependent on number of LP channels configured.		Double Long Unsigned	RO
Selective Access for Buffer	User configurable range of load profile entries, defined by date range or number of values		Structure	RW

Buffer Objects shown

This is a list of Load Profile intervals in the meter.

Entry	Name	Value	Data Type
0	Value (0)	Clock Timestamp	Octet String
	Value (1)	Status	Double Long Unsigned
	Value (2)	Load Profile Ch 1 measurement	Float 32
	Value (3)	Load Profile Ch 2 measurement	Float 32
	Value (4)	Load Profile Ch 3 measurement	Float 32
	Value (5)	Load Profile Ch 4 measurement	Float 32
	Value (6)	Load Profile Ch 5 measurement	Float 32
	Value (7)	Load Profile Ch 6 measurement	Float 32
1	Value (0)	Clock Timestamp	Octet String
	Value (1)	Status	Double Long Unsigned
	Value (2)	Load Profile Ch 1 measurement	Float 32
	Value (3)	Load Profile Ch 2 measurement	Float 32
	Value (4)	Load Profile Ch 3 measurement	Float 32
	Value (5)	Load Profile Ch 4 measurement	Float 32
	Value (6)	Load Profile Ch 5 measurement	Float 32
	Value (7)	Load Profile Ch 6 measurement	Float 32

Two LP intervals shown above. The number of intervals provided is based on the selective access buffer.

Buffer Object Status

For every Load Profile Interval, the Value (1) in the Buffer Object will provide the status for that Load Profile Interval. The available Status Types are shown below:

Status Type	Status Value (in Hex)	Status Value (in Decimal)
Normal Interval	00 01	1
Midnight Event	00 02	2
Midnight Normal	00 03	3
Midnight Time Set	00 0A	10
Power Outage	00 04	4
Midnight Power Outage	00 06	6
Time Set	00 08	8
Daylight Savings Time Change	00 10	16
Test Mode	00 20	32
Meter Configuration	00 40	64
Freeze	00 80	128
Freeze Midnight	00 82	130
Billing Period Reset (BPR)	01 00	256
BPR Midnight	01 02	258
Register Preset (n/a for IEC Meter)	02 00	512
Midnight Register Preset	02 02	514
Recalibration	04 00	1024
Midnight Recalibration	04 02	1026
Diagnostic	08 00	2048
Midnight Diagnostic	08 02	2050

Note: When an event coincides with a Midnight timeframe, it will combine the Midnight event. For example, if a Billing Period Reset is configured to occur exactly at Midnight, we will report a single event called BPR Midnight.

Capture Objects shown

This provides a list of Load Profile Channels configured in the meter.

Entry	Name	Value	Data Type
0	Class ID	8	Long Unsigned
	Logical Name	Clock Timestamp	Octet String
	Att Index	2	Integer
	Data Index	0	Long Unsigned
1	Class ID	1	Long Unsigned
	Logical Name	Operating Status	Octet String
	Att Index	2	Integer
	Data Index	0	Long Unsigned
2	Class ID	3	Long Unsigned
	Logical Name	Load Profile Ch 1 measurement	Octet String
	Att Index	2	Integer
	Data Index	0	Long Unsigned
3	Class ID	3	Long Unsigned
	Logical Name	Load Profile Ch 2 measurement	Octet String
	Att Index	2	Integer
	Data Index	0	Long Unsigned

Two Load Profile channels shown in above example. A maximum of 16 channels is available.

Table 2: Load Profile Measurements Available for DLMS

Type	Quantity	Direction Phase	OBIS code
Consumption	Watt hours	Delivered A	1.0.21.29.0.255
		Delivered B	1.0.41.29.0.255
		Delivered C	1.0.61.29.0.255
		Delivered Poly	1.0.1.29.0.255
		Received A	1.0.22.29.0.255
		Received B	1.0.42.29.0.255
		Received C	1.0.62.29.0.255
		Received Poly	1.0.2.29.0.255
		Net A	1.0.36.29.0.255
		Net B	1.0.56.29.0.255
		Net C	1.0.76.29.0.255
		Net Poly	1.0.16.29.0.255
		Abs A	1.0.35.29.0.255
		Abs B	1.0.55.29.0.255
		Abs C	1.0.75.29.0.255
		Abs Poly	1.0.15.29.0.255
Consumption	VAR hours	Delivered A	1.0.23.29.0.255
		Delivered B	1.0.43.29.0.255
		Delivered C	1.0.63.29.0.255
		Delivered Poly	1.0.3.29.0.255
		Received A	1.0.24.29.0.255
		Received B	1.0.44.29.0.255
		Received C	1.0.64.29.0.255
		Received Poly	1.0.4.29.0.255
		Net A	1.128.23.29.0.255
		Net B	1.128.43.29.0.255
		Net C	1.128.63.29.0.255
		Net Poly	1.128.3.29.0.255
		Q1 A	1.0.25.29.0.255
		Q1 B	1.0.45.29.0.255
		Q1 C	1.0.65.29.0.255
		Q1 Poly	1.0.5.29.0.255
		Q2 A	1.0.26.29.0.255
		Q2 B	1.0.46.29.0.255
		Q2 C	1.0.66.29.0.255
		Q2 Poly	1.0.6.29.0.255
		Q3 A	1.0.27.29.0.255
		Q3 B	1.0.47.29.0.255
		Q3 C	1.0.67.29.0.255
		Q3 Poly	1.0.7.29.0.255
		Q4 A	1.0.28.29.0.255
		Q4 B	1.0.48.29.0.255
		Q4 C	1.0.68.29.0.255
		Q4 Poly	1.0.8.29.0.255

		Abs A	1.128.24.29.0.255
		Abs B	1.128.44.29.0.255
		Abs C	1.128.64.29.0.255
		Abs Poly	1.128.4.29.0.255
Consumption	VA hours Arithmetic	Delivered A	1.0.29.29.0.255
		Delivered B	1.0.49.29.0.255
		Delivered C	1.0.69.29.0.255
		Delivered Poly	1.0.9.29.0.255
		Received A	1.0.30.29.0.255
		Received B	1.0.50.29.0.255
		Received C	1.0.70.29.0.255
		Received Poly	1.0.10.29.0.255
		Net A	1.128.29.29.0.255
		Net B	1.128.49.29.0.255
		Net C	1.128.69.29.0.255
		Net Poly	1.128.9.29.0.255
		Abs A	1.128.30.29.0.255
		Abs B	1.128.50.29.0.255
		Abs C	1.128.70.29.0.255
		Abs Poly	1.128.10.29.0.255

Type	Phases	Direction Phase	OBIS code
Instantaneous	Watts(Avg)	Delivered A	1.0.21.27.0.255
		Delivered B	1.0.41.27.0.255
		Delivered C	1.0.61.27.0.255
		Delivered Poly	1.0.1.27.0.255
		Received A	1.0.22.27.0.255
		Received B	1.0.42.27.0.255
		Received C	1.0.62.27.0.255
		Received Poly	1.0.2.27.0.255
		BiDir A	1.128.21.27.0.255
		BiDir B	1.128.41.27.0.255
		BiDir C	1.128.61.27.0.255
		BiDir Poly	1.128.1.27.0.255
		Abs A	1.128.35.27.0.255
		Abs B	1.128.55.27.0.255
		Abs C	1.128.75.27.0.255
		Abs Poly	1.128.15.27.0.255
Instantaneous	Vars(avg)	Delivered A	1.0.23.27.0.255
		Delivered B	1.0.43.27.0.255
		Delivered C	1.0.63.27.0.255
		Delivered Poly	1.0.3.27.0.255
		Received A	1.0.24.27.0.255
		Received B	1.0.44.27.0.255
		Received C	1.0.64.27.0.255
		Received Poly	1.0.4.27.0.255
		BiDir A	1.128.23.27.0.255
		BiDir B	1.128.43.27.0.255
		BiDir C	1.128.63.27.0.255
		BiDir Poly	1.128.3.27.0.255
		Q1 A	1.0.25.27.0.255
		Q1 B	1.0.45.27.0.255
		Q1 C	1.0.65.27.0.255
		Q1 Poly	1.0.5.27.0.255
		Q2 A	1.0.26.27.0.255
		Q2 B	1.0.46.27.0.255
		Q2 C	1.0.66.27.0.255
		Q2 Poly	1.0.6.27.0.255
		Q3 A	1.0.27.27.0.255
		Q3 B	1.0.47.27.0.255
		Q3 C	1.0.67.27.0.255
		Q3 Poly	1.0.7.27.0.255
		Q4 A	1.0.28.27.0.255
		Q4 B	1.0.48.27.0.255
		Q4 C	1.0.68.27.0.255
		Q4 Poly	1.0.8.27.0.255
		Abs A	1.128.24.27.0.255
		Abs B	1.128.44.27.0.255
		Abs C	1.128.64.27.0.255
		Abs Poly	1.128.4.27.0.255

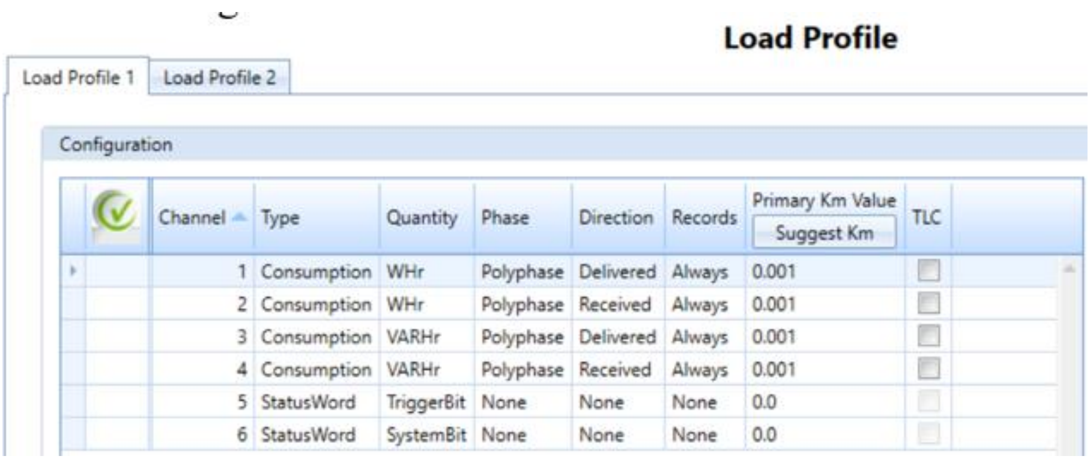
Instantaneous	VA Arithmetic(Avg)	Delivered A Delivered B Delivered C Delivered Poly Received A Received B Received C Received Poly BiDir A BiDir B BiDir C BiDir Poly Abs A Abs B Abs C Abs Poly	1.0.29.27.0.255 1.0.49.27.0.255 1.0.69.27.0.255 1.0.9.27.0.255 1.0.30.27.0.255 1.0.50.27.0.255 1.0.70.27.0.255 1.0.10.27.0.255 1.128.30.27.0.255 1.128.50.27.0.255 1.128.70.27.0.255 1.128.10.27.0.255 1.128.29.27.0.255 1.128.49.27.0.255 1.128.69.27.0.255 1.128.9.27.0.255
Instantaneous	Volts Line-Line(Avg)	A B C Avg	1.0.32.27.0.255 1.0.52.27.0.255 1.0.72.27.0.255 1.0.12.27.0.255
Instantaneous	Amps RMS(Avg)	A B C Poly Neutral	1.0.31.27.0.255 1.0.51.27.0.255 1.0.71.27.0.255 1.0.90.27.0.255 1.0.91.27.0.255
Instantaneous	PF Arithmetic(Avg)	BiDir A BiDir B BiDir C BiDir D	1.0.33.27.0.255 1.0.53.27.0.255 1.0.73.27.0.255 1.0.13.27.0.255
Instantaneous	Frequency(Avg)	n/a	1.0.34.27.0.255
Consumption	VAh Vectorial	Delivered A Delivered B Delivered C Delivered Poly Received A Received B Received C Received Poly Net A Net B Net C Net Poly Abs A Abs B Abs C Abs Poly	1.0.128.29.0.255 1.0.129.29.0.255 1.0.130.29.0.255 1.0.131.29.0.255 1.0.132.29.0.255 1.0.133.29.0.255 1.0.134.29.0.255 1.0.135.29.0.255 1.0.136.29.0.255 1.0.137.29.0.255 1.0.138.29.0.255 1.0.139.29.0.255 1.0.140.29.0.255 1.0.141.29.0.255 1.0.142.29.0.255 1.0.143.29.0.255
Consumption	Amp hours	None A None B None C	1.0.31.29.0.255 1.0.51.29.0.255 1.0.71.29.0.255

		None Poly	1.0.90.29.0.255
Consumption	Q hours	Delivered A	1.0.143.29.0.255
		Delivered B	1.0.144.29.0.255
		Delivered C	1.0.145.29.0.255
		Delivered Poly	1.0.146.29.0.255
		Received A	1.0.147.29.0.255
		Received B	1.0.148.29.0.255
		Received C	1.0.149.29.0.255
		Received Poly	1.0.150.29.0.255
		Net A	1.0.151.29.0.255
		Net B	1.0.152.29.0.255
		Net C	1.0.153.29.0.255
		Net Poly	1.0.154.29.0.255
		Abs A	1.0.155.29.0.255
		Abs B	1.0.156.29.0.255
		Abs C	1.0.157.29.0.255
		Abs Poly	1.0.158.29.0.255
Consumption	Amp squared hours	None A	1.128.88.29.0.255
		None B	1.129.88.29.0.255
		None C	1.130.88.29.0.255
		None Poly	1.0.88.29.0.255
		None Avg	1.131.88.29.0.255
Consumption	Volt squared hours	None A	1.128.89.29.0.255
		None B	1.129.89.29.0.255
		None C	1.130.89.29.0.255
		None Poly	1.0.89.29.0.255
Instantaneous	VA Vectorial	Delivered A	1.0.128.27.0.255
		Delivered B	1.0.129.27.0.255
		Delivered C	1.0.130.27.0.255
		Delivered Poly	1.0.131.27.0.255
		Received A	1.0.132.27.0.255
		Received B	1.0.133.27.0.255
		Received C	1.0.134.27.0.255
		Received Poly	1.0.135.27.0.255
		BiDir A	1.0.136.27.0.255
		BiDir B	1.0.137.27.0.255
		BiDir C	1.0.138.27.0.255
		BiDir Poly	1.0.139.27.0.255
		Abs A	1.0.140.27.0.255
		Abs B	1.0.141.27.0.255
		Abs C	1.0.142.27.0.255
		Abs Poly	1.0.143.27.0.255
Instantaneous	Volts Line-Neutral	None A	1.0.159.27.0.255
		None B	1.0.160.27.0.255
		None C	1.0.161.27.0.255
		None Avg	1.0.162.27.0.255
Instantaneous	Power Factor Arithmetic	Delivered A	1.128.33.27.0.255
		Delivered B	1.128.53.27.0.255
		Delivered C	1.128.73.27.0.255

		Delivered Poly Received A Received B Received C Received Poly	1.128.13.27.0.255 1.129.33.27.0.255 1.129.53.27.0.255 1.129.73.27.0.255 1.129.13.27.0.255
Instantaneous	Power Factor vectorial	Delivered A Delivered B Delivered C Delivered Poly Received A Received B Received C Received Poly BiDir A BiDir B BiDir C BiDir Poly	1.0.163.27.0.255 1.0.164.27.0.255 1.0.165.27.0.255 1.0.166.27.0.255 1.0.167.27.0.255 1.0.168.27.0.255 1.0.169.27.0.255 1.0.170.27.0.255 1.0.171.27.0.255 1.0.172.27.0.255 1.0.173.27.0.255 1.0.174.27.0.255
Instantaneous	Volts THD	None A None B None C	1.0.32.24.124.255 1.0.52.24.124.255 1.0.72.24.124.255
Instantaneous	Amps THD	None A None B None C	1.0.31.24.124.255 1.0.51.24.124.255 1.0.71.24.124.255
Instantaneous	Q	Delivered A Delivered B Delivered C Delivered Poly Received A Received B Received C Received Poly BiDir A BiDir B BiDir C BiDir Poly Abs A Abs B Abs C Abs Poly	1.0.143.27.0.255 1.0.144.27.0.255 1.0.145.27.0.255 1.0.146.27.0.255 1.0.147.27.0.255 1.0.148.27.0.255 1.0.149.27.0.255 1.0.150.27.0.255 1.0.151.27.0.255 1.0.152.27.0.255 1.0.153.27.0.255 1.0.154.27.0.255 1.0.155.27.0.255 1.0.156.27.0.255 1.0.157.27.0.255 1.0.158.27.0.255
Instantaneous	Amps squared RMS	None A None B None C None Poly None Neutral	1.0.175.27.0.255 1.0.176.27.0.255 1.0.177.27.0.255 1.0.178.27.0.255 1.0.179.27.0.255
Instantaneous	Volts squared L-N	None A None B None C None Avg	1.0.180.27.0.255 1.0.181.27.0.255 1.0.182.27.0.255 1.0.183.27.0.255
Instantaneous	Volts square L-L	None A	1.0.184.27.0.255

		None B None C None Avg	1.0.185.27.0.255 1.0.186.27.0.255 1.0.187.27.0.255
Instantaneous	Volts imbalance	None	1.0.188.27.0.255
Instantaneous	Amps imbalance	None	1.0.189.27.0.255
Status Input	Channel 1->8	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6	1.1.144.128.0.255 1.2.144.128.0.255 1.3.144.128.0.255 1.4.144.128.0.255 1.5.144.128.0.255 1.6.144.128.0.255
Pulse Counter	Channel 1->8	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6	1.1.82.128.0.255 1.2.82.128.0.255 1.3.82.128.0.255 1.4.82.128.0.255 1.5.82.128.0.255 1.6.82.128.0.255
Status Word	Trigger Bit System Bit	None None	1.0.191.27.0.255 1.0.192.27.0.255

Example showing 6 channels of Load Profile configured in JEMWare II



Channel	Type	Quantity	Phase	Direction	Records	Primary Km Value	TLC
1	Consumption	WHr	Polyphase	Delivered	Always	0.001	
2	Consumption	WHr	Polyphase	Received	Always	0.001	
3	Consumption	VARHr	Polyphase	Delivered	Always	0.001	
4	Consumption	VARHr	Polyphase	Received	Always	0.001	
5	StatusWord	TriggerBit	None	None	None	0.0	
6	StatusWord	SystemBit	None	None	None	0.0	

Example of data provided:

In the Load Profile screenshot above, 6 channels of Load Profile are configured, consisting of:

1. Whr Delivered Polyphase
2. Whr Received Polyphase
3. VARhr Delivered Polyphase
4. VARhr Received Polyphase
5. Status Word (Triggered Bit)
6. Status Word (System Bit)

5 Minute intervals were used

5 intervals of Data Recorded in the meter: (as retrieved by JEMWare II)

Record No	Event Type	Start Time	End Time	Channel: 1 WHr, Polyphase, Delivered	Channel: 2 WHr, Polyphase, Received	Channel: 3 VARHr, Polyphase, Delivered	Channel: 4 VARHr, Polyphase, Received	Channel: 5 StatusWord TriggerBit	Channel: 6 StatusWord SystemBit
0	Configuration	6/26/2019 13:18.13	6/26/2019 13:18.13	0.01	0.00	0.02	0.00	0x0000	0x0500
1	Normal	6/26/2019 13:18.13	6/26/2019 13:20.00	2.23	0.00	3.86	0.00	0x0000	0x0500
2	Normal	6/26/2019 13:20.00	6/26/2019 13:25.01	6.26	0.00	10.83	0.00	0x0000	0x0500
3	Normal	6/26/2019 13:25.01	6/26/2019 13:30.00	6.23	0.00	10.79	0.00	0x0000	0x0100
4	Normal	6/26/2019 13:30.00	6/26/2019 13:35.00	6.25	0.00	10.83	0.00	0x0000	0x0100

Note: The Status Word Trigger Bit and System Bit is displayed in JEMWare II is in Hex Format.

Per above, System Bit: 0x500 Hex = 1280 (decimal) = 0000 0101 0000 0000 (binary)

Refer to the manual to identify what each bit of the status word is used for.

The same 5 intervals of Load Profile Data were retrieved by DLMS.

DLMS Details

Name	Value	Time Stamp	Data Type	Access Right
Logical Name	1.0.99.1.0.255	Time of read	Octet String	RO
Buffer	Refer to array below		Array	RO
Capture Objects	List of Load Profile measurements		Array	RO
Capture Period	300 sec (5 min intervals)		Double Long Unsigned	RO
Sort Method	1		Enum	RO
Sort Object	n/a		Structure	RO
Entries in Use	5		Double Long Unsigned	RO
Profile Entries	78624		Double Long Unsigned	RO
Selective Access for Buffer	# records or date range		Structure	RW

Array of Buffer Values			
Entry	**Name**	**Value**	**Data Type**
0	Value (0)	6/26/2019 13:18	Octet String
	Value (1)	64	Double Long Unsigned
	Value (2)	0.01	Float 32
	Value (3)	0	Float 32
	Value (4)	0.017999999	Float 32
	Value (5)	0	Float 32
	Value (6)	0	Float 32
	Value (7)	1280	Float 32
1	Value (0)	6/26/2019 13:20	Octet String
	Value (1)	1	Double Long Unsigned
	Value (2)	2.230999947	Float 32
	Value (3)	0	Float 32
	Value (4)	3.861000061	Float 32
	Value (5)	0	Float 32
	Value (6)	0	Float 32
	Value (7)	1280	Float 32
2	Value (0)	6/26/2019 13:25	Octet String
	Value (1)	0	Double Long Unsigned
	Value (2)	10.82699966	Float 32
	Value (3)	0	Float 32
	Value (4)	0	Float 32
	Value (5)	1280	Float 32
	Value (6)	6.255000114	Float 32
	Value (7)	0	Float 32
3	Value (0)	6/26/2019 13:30	Octet String
	Value (1)	0	Double Long Unsigned
	Value (2)	10.7869997	Float 32
	Value (3)	0	Float 32
	Value (4)	0	Float 32
	Value (5)	256	Float 32
	Value (6)	6.231999874	Float 32
	Value (7)	0	Float 32
4	Value (0)	6/26/2019 13:35	Octet String
	Value (1)	0	Double Long Unsigned
	Value (2)	10.82600021	Float 32
	Value (3)	0	Float 32
	Value (4)	0	Float 32
	Value (5)	256	Float 32
	Value (6)	6.254000187	Float 32
	Value (7)	0	Float 32

Note:
The DLMS Status Word Value (5) is in decimal Format.
1280 (decimal) = 0000 0101 0000 0000 (binary)
Refer to the manual for the decoding of each status bit

DLMS Details for Ethernet Connection Status Log (IC7)

Description	OBIS						App Assoc
	A	B	C	D	E	F	Attrib
Ethernet Connection Log	0	0	99	98	0	255	RO

Ethernet Connection Log Details

Name	Value	Time Stamp	Data Type	Access Right
Logical Name	0.0.99.98.0.255	Time of Read	Octet String	RO
Buffer	Ethernet Status		Array	RO
Capture Objects	Array of two		Array	RO
Capture Period	N/A		Double Long Unsigned	RO
Sort Method	1 (oldest events first)		Enum	RO
Sort Object	None		Structure	RO
Entries in Use	Number of entries stored in the buffer		Double Long Unsigned	RO
Profile Entries	Maximum number of entries to be retained in the Buffer		Double Long Unsigned	RO
Selective Access for Buffer	User configurable range of Log entries, defined by date range or number of values		Structure	

Array of Buffer Objects

This is a list of the Ethernet Connection Status log in the meter.

Array of entry Entry = structure of {event timestamp, event value (ethernet status)}			
Entry	**Name**	**Value**	**Data Type**
0	Value (0)	Clock Timestamp	Octet String
	Value (1)	Status	Double Long Unsigned
1	Value (0)	Clock Timestamp	Octet String
	Value (1)	Status	Double Long Unsigned
2	Value (0)	Clock Timestamp	Octet String
	Value (1)	Status	Double Long Unsigned
3	Value (0)	Clock Timestamp	Octet String
	Value (1)	Status	Double Long Unsigned

Status: 0 = Ethernet Connect 1 = Ethernet Disconnect

Capture Objects shown

Array of two [0] = {IC=8, OBIS 0.0.1.0.0.255, Attribute = 2//Event Timestamp} [1] = {IC=8, OBIS 0.0.96.11.0.255, Attribute = 2//Ethernet Status}

Example of Ethernet Connection Status from JEMWare Security Log.

Read Security Log

Event ID	Event Description	Date/Time
40335	Configuration Access	07/07/2020 14:09:44.925 PM
40334	admin Logged On from Ethernet 1-1 (192.168.250.1:00:00:00:00:00:00)	07/07/2020 14:09:26.626 PM
40310	admin Logged On from Ethernet 1-1 (192.168.250.1:00:00:00:00:00:00)	06/26/2020 14:16:33.799 PM
40309	admin Logged On from Ethernet 1-1 (192.168.250.1:00:00:00:00:00:00)	06/26/2020 13:41:32.847 PM
40308	admin Logged Off from Ethernet 1-1	06/26/2020 11:50:07.094 AM
40307	Configuration Access	06/26/2020 11:48:52.718 AM
40306	admin Logged On from Ethernet 1-1 (192.168.250.1:00:00:00:00:00:00)	06/26/2020 11:48:36.581 AM
40305	admin Logged On from Ethernet 1-1 (192.168.250.1:00:00:00:00:00:00)	06/26/2020 10:33:28.156 AM

DLMS Values for above:

Array of Buffer Values			
Entry	**Name**	**Value**	**Data Type**
0	Value (0)	6/26/2020 10:33:28	Octet String
	Value (1)	0	Double Long Unsigned
1	Value (0)	6/26/2020 11:48:52	Octet String
	Value (1)	0	Double Long Unsigned
2	Value (0)	6/26/2020 11:50:07	Octet String
	Value (1)	1	Double Long Unsigned
3	Value (0)	6/26/2020 13:41:32	Octet String
	Value (1)	0	Double Long Unsigned
4	Value (0)	6/26/2020 14:16:33	Octet String
	Value (1)	0	Double Long Unsigned
5	Value (0)	7/07/2020 14:09:26	Octet String
	Value (1)	0	Double Long Unsigned

Clock Objects (IC8)

This implementation of DLMS time synchronization uses the SET service to write a new value for attribute 2 (time) on the Clock object.

Type	**Access**	**OBIS code**
Logical Name Time Time Zones Status Daylight Savings begin Daylight Savings end Daylight Savings deviation Daylight Savings enabled Clock Base	Read Only Read/Write Read Only Read Only Read Only Read Only Read Only Read Only Read Only Read Only	0.0.1.0.0.255

Association LN Objects (IC15)

Type	**OBIS code**
Logical Name Object List Associated Partners Application Context Name xDLMS Context Info Authentication Mechanism LLS Secret Association Status	0.0.40.0.1.255

COMMUNICATION EVENTS

COM_FAULT
DLMS Protocol is configured and Serial/Socket Port Open fails
Serial/TCP: Port read/write function fails
COM_READY
Port Initialization completed and No client has been connected/communicated
COM_ACTIVE
Server is in connected/Associated state (Communicating with Client)
COM_ALERT
Client has not been communicated to server for Inactivity Timeout period (120seconds) or Interframe timeout happens

APPENDIX F
IEC 61850 COMMUNICATION PROTOCOL

IEC 61850 is an optional communication protocol used over Ethernet. It is used to make the meter measurements and I/O status available for other IED's and applications.
In this implementation, the meter will be used as an IEC 61850 Server, publishing the status of the analog and digital I/O wired to the meter to other IEC 61850 enabled IED's.
It will support GOOSE messaging by transmitting the status of the digital inputs to other devices.

IED SETUP

ICD File
Each meter shall have an ICD file that describes all available options. The file will include information such as Internal I/O, External I/O and how it is configured for inputs or outputs. The ICD file shall also identify whether it is configured for power quality measurements and PMU.

CID File
The CID file shall be created using a software application (provided by Ametek) that allows you to take the ICD file and configure the various application requirements, including IED Properties, Goose Messaging, Buffered and Unbuffered Reports and definition of the Dataset. The Software shall allow the use of FTP to transfer the CID file into the meter.

IED Properties
The IED properties shall include the IED Name, Manufacture, Model Type, Station ID, Device ID, Firmware and Identification

LOGICAL NODES

The meter will support the following logical nodes:

Logical Node	IEC 61850 Name	Description	Measurements	Variations
Physical Device	LPHD	Contains physical information about our meter		
Logical	LLNO	Contains data about our meter		
Measuring- for operative purpose	MMXU1	Total Active Power Total Reactive Power Total Apparent Power Average Power factor Frequency Phase to phase voltages Phase to ground voltages Phase currents Phase active power Phase reactive power Phase apparent power Phase power factor	TotW TotVAR TotVA TotPF Hz PPV PhV A W VAr VA PF	 phsAB, phsBC, phsCA phsA, phsB, phsC phsA, phsB, phsC phsA, phsB, phsC phsA, phsB, phsC phsA, phsB, phsC phsA, phsB, phsC
Metering - for commercial purpose	MMTR1	Total Watt hours Total VAR hours Total VA hours Delivered Watt Hours Delivered VAR hours Received Watt hours Received VAR hours	TotWh TotVArh TotVAh SupWh SupVArh DmdWh DmsVArh	
Metering Statistics	MSTA	Average current Maximum current Minimum current Average voltage Maximum voltage Minimum voltage Average apparent power Maximum apparent power Minimum apparent power Average real power Maximum real power Minimum real power Average reactive power Maximum reactive power Minimum reactive power	AvAmps MaxAmps MinAmps AvVolts MaxVolts MinVolts AvVA MaxVA MinVA AvW MaxW MinW AvVAr MaxVAr MinVAr	
Digital Inputs	IN_GGIO1	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6	Ind1 Ind2 Ind3 Ind4 Ind5 Ind6	
Digital Outputs	Out_GGIO2	Channel 1 Channel 2 Channel 3 Channel 4 Channel 5 Channel 6	Ind1 Ind2 Ind3 Ind4 Ind5 Ind6	

GOOSE MESSAGING

GOOSE messaging is supported to allow re-transmission of any of the JEMStar II hardwired digital inputs.

REPORTS

The IEC-61850 Protocol supports up to 12 Un-buffered reports and 12 Buffered Reports. The reports shall be configured using the IEC-61850 Software application.
The reports shall be triggered for retrieval from any of three methods:

- Configurable trigger based on a change in a value as selected by a deadband value
- Report retrieved at a configurable time interval
- Report requested for retrieval by a client device

Data Set	**Report Type**
Meter Status	Unbuffered
Instantaneous	Unbuffered
Energy	Unbuffered
Statistics	Unbuffered
I/O	Buffered

DATASET

The 61850 Configuration Software shall provide the ability to configure 8 Data Sets of meter data (max 50 measurements) which will become available for the buffered and unbuffered reports. They shall start as a default list of values which the user can add/edit/delete the entries.
The Data Sets shall consist of:

Meter Status	This shall contain various health check conditions of the meter
Instantaneous	Group of instantaneous measurements from MMXU node
Energy	Group of energy measurements from MMTR node
Statistics	Group of min/max/avg measurements from MSTA node
Sequence	Group of sequence components from MSQI node
Power Quality	*(Future) Group of power quality measurements from MHAI node*
Disturbance	*(Furure) Group of disturbance measurements from RADR, RBDR, RDRE*
I/O	*(Future) Group of analog and digital I/O from GGIO node*

PERFORMANCE CLASS

The meter meets performance class M2 for revenue metering with accuracy class 0.2 (IEC 62053-22) and 0.1 (IEC 60044-8) and up to the 13th harmonic.

CONFIGURATION SOFTWARE

Configuration Software is provided for mapping the JEMStar II data items to other IED's using GOOSE Messaging and for selecting items in the Data set and Reports. The Software allows the import of other manufacture ICD files to assist with the mapping. The software creates a CID file that can be sent to the meter via FTP.
Refer to the 61850 Configuration Software manual for details.

APPENDIX G (IEC METER ONLY) IEC-870-5-102 COMMUNICATION PROTOCOL

IEC 870-5-102 protocol is used for retrieving power measurements from the JEMStar II IEC meter.

PROTOCOL DETAILS

Network Configuration:

- Point to Point
- Multiple Point to Point

Physical Layer

- Baud Rate up to 19,200 bit/s

Link Layer

- One octet
- Two octets

Application Layer

- Manufacture code

MEASUREMENTS

Load Profile

Type	**Quantity**	**Enum**
Consumption	Watt hr	0
	VAR hr	1
	VA hr vectorial	2
	VA hr arithmetic	3
	Amp hr	4
	Q hr	5
	A^2 hr	6
	V^2 hr	7
	Computed Meas	8
	Communicated Meas	9

Type	Quantity	Enum
Instantaneous	Watts	0
	VARs	1
	VA Vectorial	2
	Volts	3
	Amps	4
	PF Vectorial	5
	Freq-Hz	6
	Volts THD	7
	Amps THD	8
	Q	9
	Pulse Count	10
	Input Status	11
	$Amps^2$	12
	$Volts^2$	13
	Computed Meas	14
	Volts Imbalance	15
	Amps Imbalance	16
	Positive Sequence	17
	Negative Sequence	18
	Zero Sequence	19
	VA Arithmetic	20
	PF Arithmetic	21
	Volt Harmonic	22
	Amp Harmonic	23
	Communication Meas	24

Type	Quantity	Enum
Phase	A	0
	B	1
	C	2
	Polyphase	3
	Average	4
	Neutral	5
	System	6

Type	Quantity	Enum
Direction	None	0
	Delivered	1
	Received	2
	BiDirectional	3
	Total	4

	Net	5
	Q1	6
	Q2	7
	Q3	8
	Q4	9

GLOSSARY

Apparent Power

The product of the applied voltage and current in an ac circuit. Apparent power, or volt-amperes, is not the real power of the circuit because the power factor is not considered in the calculation.

A meter calculates Apparent Power $= \sqrt{Watts^2 + VARs^2}$

ARO

At Rated Output

Average Power Factor

The ratio of kilowatt-hour pulses to computed equivalent kVAh pulses for the billing period.

Billing Period

The period of time (commonly a month) between meter readings, when those readings are used for billing a power customer. Also, the period of time between two consecutive demand resets.

Billing Period Reset

A task commonly associated with the Billing Read is the Billing Period Reset. The Reset causes a "snapshot" of register readings to be copied to storage as well as clearing Peak Demand readings and updating Cumulative and Continuous Cumulative readings. You must break a seal to perform a Billing Period Reset on the front panel. The Reset is recorded in the Billing Period Reset event buffer.

Billing Read

A Billing Read is the task of reading billing information from the meter front panel. If the billing information is required to be available to anyone, it can be programmed into the Normal display list (See "Casual" Read).

Burden

Load imposed by a device on an input circuit, expressed in ohms or VA.

"Casual" Read

A "casual" read is the ability to see measurements on a sealed, functioning meter without breaking a seal or otherwise violating the meter's security. The type and amount of information available during a casual read can be selected by the meter setup programmer using JEMWare II.

For example, any non-secure readings may be placed in the Normal display list. If nothing is to be displayed to unauthorized users, the programmer may place the Blank or Segment Check display items in the Normal list.

Class; Class Amps

The maximum current for which a meter is specified to operate within its accuracy rating.

Coincident Demand Register

A Coincident Demand register is one that the user can set to capture data at the same time as any Peak Demand Register. The Coincident register is linked to a Peak Demand register through JEMWare II software. The Peak Demand register number is assigned in the TOU field of the Coincident Demand Registers. One or more registers can be set to “coincide” with a single Peak Demand register.

Cold Start

A procedure that will return the meter to factory default settings and erase all stored data in the meter registers.

To perform a cold start:

- From the Meter Display Menu, press the down button once and press Set. This takes you to the Meter Status menu.
- Using the navigation keys, move down to Cold Start and press the Set button.
- Acknowledge the warning by selecting Yes.
- The meter will prompt you to power down the meter within 15 seconds

Daily Schedule

The daily schedule is an array of times and rates, and it determines the moment at which a TOU period changes.

Demand

The average of some measurement over a defined period of time, traditionally calculated by accumulating the integrated measurement over the defined period (the "demand interval") and dividing by the time.

Demand Deferral

A period immediately following a power outage during which demands are not calculated. It is determined by the number of demand-interval closures following the power outage.

Demand Reset

A scheduled or user-initiated event that causes maximum demands to be zeroed and certain other calculations to occur.

DNP

Distributed Network Protocol: a serial communication protocol used in instrument networking. See Appendix

Element

A voltage and current input pair to a meter or transducer, typically from the same phase. A half element takes advantage of mathematical relationships present in a three phase power system to eliminate the need for one voltage measurement.

Energy Constant

A number used to represent a fixed electrical quantity in the meter. A meter uses the following constants to report various energy quantities:
Km = Load Profile pulse weight
Ke = Energy Pulse weight, Secondary side
pKe = Energy Pulse weight, Primary side
Kt = Test Pulse weight
Kh = # Watthours per each rotation (of a mechanical disk meter); Kh is still used as a constant in digital meters.

Full Scale

A reference condition corresponding to the highest rated value of a given measurement. For watts, this condition occurs at the user's input voltage, class current rating, and unity power factor. For VARs, full scale is at the user's input voltage, class current, and zero power factor.

Health / Status Read

A Health and Status Read is concerned with evaluating the correct operation of the meter and its installation, not its billing data. Health and Status display items may be programmed into either Normal or Alternate display lists at the user's discretion.

Holiday

For TOU purposes, a holiday is a date contained in the holiday schedule.

Holiday Schedule

A holiday schedule is an array of dates (in seconds time format at midnight) within the TOU schedule that enables the meter to identify holidays.

Instantaneous Quantities

Instantaneous quantities are short-term average or RMS measurements of electrical characteristics in a circuit. Instantaneous quantities are suitable for developing Instantaneous Register, Thermal Demand, or analog outputs.

Integrated Quantities

Integrated quantities are power measurement quantities that are integrated over time, and which may be accumulated. Integrated quantities are used for developing Consumption, Fixed or Sliding Window Demand (Peak or Coincident), Load Profile, or pulse outputs.

Interval

A period over which a demand is calculated consisting of one or more subintervals.

IRLED

Infrared Light Emitting Diode, such as the optical port on the meter.

Ke, Kh, Km, Kt

See Energy Constant

KYZ

A meter output that indicates energy by toggling a Form-C contact output at a frequency proportional to power flow. Each transition represents some constant amount of energy (typically referred to as Ke, "energy constant") that has been consumed. JEMStar II mimics this function by allowing the user to configure two solid-state contact outputs into a similar arrangement.

LLC

Line Loss Compensation: the ability of an instrument to measure or calculate the power lost in an imperfect conductor and to use that figure to modify its power or energy readings.

Liquid Crystal Display (LCD)

Display area on the meter face that contains alpha-numeric characters for data readout.

Load Linearity

Specifies the maximum deviation of performance in percent registration over a range of current (load) assuming all other conditions at nominal reference conditions.

Load Profile

A record of energy consumption stored periodically (typically every 1 – 60 minutes) and sequentially. Each stored "interval" (one record) contains one or more "channels" (a single integrated quantity accumulated during the interval just ended).

(Load Profile) Periodic Special Event

The meter stores pulses accumulated since the time of the previous LP interval closure.

Load Profile Interval

An LP interval is the period between two consecutive LP interval closures.

Load Profile Record

An LP record is the data in a segment of load-profile memory where the accumulated pulses from a single LP interval are stored.

Loss Compensation

A generic term used to include both TLC and LLC.

Measurement Quantity

A single measurable characteristic of power flow in a circuit, or a commonly used combination of measurement quantities. E.g. Volts Phase A, Watthours Delivered Total.

MODBUS™

A standard serial communication protocol used by programmable controllers.

Null Modem

Cable that emulates a modem to enable the connection of two DTE (Data Terminal Equipment) devices such as any two devices that would communicate with a modem (DCE) device.

Partial Load Profile Count

The total accumulated counts within an interval after the last special event or load profile interval closure.

Past Interval Demand

The demand for the most recently ended demand interval.

Peak Demand

(a.k.a. Maximum Demand) The highest demand reading in a Billing Period.

Phase

The timing relationship between two signals of the same frequency, expressed as an angle. E.g. the delay between voltage and current waveforms in an AC circuit, or between voltage waveforms in different circuits.

One of (usually) three circuits in a polyphase power distribution system. Each phase may be treated as an individual power source that is synchronized to the other phases in the system.

Polyphase
The sum, average, or combination (as appropriate) of measurements from all phases input to a meter.

Power Factor (PF)
The ratio of the real power (watts) to the apparent power (volt-amperes). PF is equal to the cosine of the phase angle between voltage and current.

Present TOU Period
The one Time of Use period that the meter determines to be active at the present time. This is determined by the present date and time of the meter and the TOU schedule.

Pulse
A state change in either direction of a binary metering signal.

Register
Used to refer to specific quantities to be displayed or retrieved.

Register Assembly
The term used to refer to the hardware implementation of the display or control of the I/O functions of the meter.

Register Freeze
A command that can be issued by the user to move recorded data into storage registers for the purpose of downloading or retrieving the information at a certain instant. The meter will continue to record data without interruption.

RMS
Root Mean Square: the equivalent DC value of a periodic (ac) signal. 5 amps RMS delivers the same amount of power to a given load as 5 amps dc.

Rolling Interval/Sliding Window
A demand measurement consisting of the summation of values calculated over multiple consecutive subintervals. A calculation is updated at the completion of each subinterval but includes a defined number of previous subintervals.

Season
A season is a range of dates whose start date is contained in the season schedule in seconds time format.

Season Schedule
A season schedule is an array of dates within the TOU schedule that enables the meter to identify the seasons.

Seconds Time Format
A 32-bit number in units of seconds referenced from January 1, 1990.

Special Event
An event stored in load-profile data such as a register freeze, power fail, time set, etc.

Storage Register
A copy of a quantity which could be a displayable register and is saved when triggered by a demand reset.

Subinterval

The increment of time in which demand calculations are updated.

THD

Total Harmonic Distortion: a measure of the amount of harmonic content in a periodic signal, expressed as a percentage. A pure sine wave at the fundamental frequency has 0% THD.

Thermal Demand

A measurement filtered through a time delay such that step changes in the measurement are reflected slowly in the output. Commonly used to simulate the effects of current heating on power distribution equipment.

Thermal Time Characteristic

The time required for a Thermal Demand Register to reflect 90% of a step change in input. Similar to the time characteristic of mechanical thermal demand meters.

Time

Time indicates hours, minutes, and seconds.

TLC

Transformer Loss Compensation: the ability of an instrument to measure or calculate the power lost in an imperfect transformer and to use that figure to modify its power or energy readings.

Total Registers

Those meter registers that are not TOU registers are called total registers. The total registers always are active.

TOU Period

A selected duration of time during which the consumption, demand, and other information are assigned to a set of Time of Use registers.

TOU Rate Indicator Output

A display segment that indicates the present TOU rate in effect.

TOU Register

A TOU register is a register of the meter that, for a designated TOU period, accumulates and may display amounts of electrical energy, demand, or other quantities measured or calculated.

TOU Schedule

The TOU schedule is a static, externally configured database within the meter. The data base contains information that allows the meter to determine the present TOU period based upon the real date and time of the meter.

VA

Volt Amperes or Volt Amps: the product of voltage and current in a circuit regardless of phase. Typically expressed in RMS units, this is also called "apparent" power.

A meter calculates VA = $\sqrt{Watts^2 + VARs^2}$

VAh

VA hour: VA integrated over time to produce a measurement that may be accumulated.

VAR

Volt Amps Reactive: the product of voltage and current in a circuit, times the sine of the phase shift between the two. Typically expressed in RMS units. The unit of "reactive" or "imaginary" power.

VARh

VAR hour: VAR integrated over time to produce a measurement that may be accumulated.

W

Watt: the product of voltage and current in a circuit, times the cosine of the phase shift between the two. Typically expressed in RMS units. The unit of "real" power.

Wh

Watt hour: W integrated over time to produce a measurement that may be accumulated.

PROCEDURES FOR FACTORY REPAIR AND RETURN

A. Obtain a Returned Material Authorization (RMA) number by calling the AMETEK Repair Department and giving the following information:

1. ***Model*** and ***Serial Number*** of the equipment.
2. Failure Symptom - **Be Specific**
3. Approximate date of installation.
4. The site name and address of the failed equipment.
5. Complete shipping information for the return of the equipment if other than the operating site.
6. Name and telephone number of person to contact if questions arise.

B. Enclose the information with the equipment and pack in a commercially accepted shipping container with sufficient packing material to insure that no shipping damage will occur. Mark the outside of the container with the RMA number.

Ship to the appropriate location:

Attention: Repair Department

AMETEK Power Instruments
255 North Union Street
Rochester, New York 14605 USA
Telephone: (585) 263-7700
Fax: (585) 262-4777

C. Your equipment will be tested, repaired, and inspected at the factory. Normal factory turn-around is ten working days or less (excluding shipping time).

WARRANTY — AMETEK warrants equipment of its own manufacture to be free from defects in material and workmanship, under normal conditions of use and service. AMETEK will replace any component found to be defective, upon its return, transportation charges prepaid, within five years of its original purchase. AMETEK will extend the same warranty protection on accessories, which is extended to AMETEK by the original manufacturer. AMETEK assumes no responsibility, expressed or implied, beyond its obligation to replace any component involved. Such warranty is in lieu of all other warranties expressed or implied.