GE VERNOVA

Instruction Manual

GE Vernova Communicator version: 5.00.0089

Manual Part Number: 1601-9020-AE

REGISTERED ISO 9001

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GE Vernova Communicator Instruction Manual for version 5.00.0089.

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Part number: 1601-9020-AE (January 2022)

Safety words and definitions

The following symbols used in this document indicate the following conditions

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates practices not related to personal injury

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GE Communicator

Chapter 1: Installing

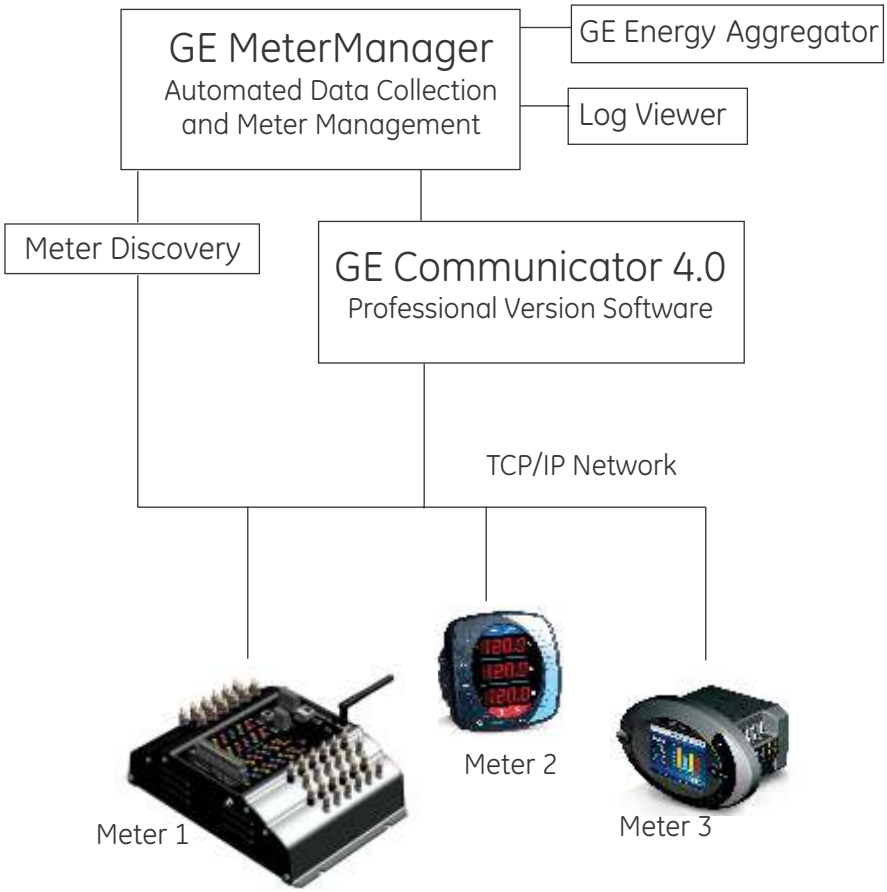
1.1 Overview

The GE Communicator 5.00.0089 application is part of the GE suite of energy management software. GE Communicator Professional, the fully licensed version of the software, includes GE MeterManager, a service that runs in conjunction with GE Communicator. When you install the GE Communicator software you also install GE MeterManager.

GE MeterManager acts as a launchpad and automation engine for GE Communicator by letting you perform many tasks for all the meters in your network, and providing a central location to:

- View meter status - Online or Offline - and check meter connections.
- Launch any of the GE meter applications using the App launcher, such as GE Communicator, Log Viewer, or GE Energy Aggregator Viewer used to view real time or stored data for a metered circuit.
- Connect to the meter to perform meter configuration and other tasks using GE Communicator software.
- View meter real time readings .
- Retrieve and view meter logs, such as historical or waveform fault records.
- Set up automatic log retrieval.
- Access the GE Energy Aggregator application to generate and view usage reporting and billing data.
- Update meter firmware.
- Search for newly installed meters on the network.

The following figure provides an illustration of how the GE Communicator software and GE MeterManager service work together.



1.2 System Requirements

The GE Communicator 4.0 application must be run on a computer with one of the following operating systems:

- Windows 10® Operating System
- Windows Server® 2008
- Windows Server® 2012
- Windows Server® 2016
  - If you are running Remote Desktop Host Server, you need to put it into Install mode before installing the GE Communicator software. See *Instructions for Remote Desktop Host Server* on page 1–4.
  - If you are running a Windows Server that has Microsoft's Enhanced Mitigation Experience Toolkit (EMET) 5.5 software installed, you need to "whitelist" commext.exe, logviewer.exe, logconverter.exe, and GE Script & Scheduler.exe, in order for these software applications to run correctly. That is because EMET 5.5, by default, blocks the execution of several GE Communicator application modules, thus preventing them from running. The following instructions will fix this problem:

a. Open EMET 5.5.

b. Click the Apps icon.

c. Make sure CommExt.exe, LogConverter.exe, LogViewer.exe, and GE Script & Scheduler.exe are not listed in the Mitigations table. If they are, delete them from the table.

d. Click the Add Wildcard icon.

e. Type CommExt.exe in the Text Box.

f. Repeat steps d and e for LogViewer.exe, LogConverter.exe, and GE Script & Scheduler.exe.

g. Make sure the DEP and Caller checkboxes are unchecked for all four applications.

h. Click **OK**.

i. Verify that the GE Communicator application now runs successfully.

In addition, the following are minimum hardware requirements:

- 16 GB RAM
- 1 TB storage
- 1440 x 768 display resolution

Also, note that the GE Communicator and GE MeterManager applications need .NET Framework 4 to be installed on the PC running the applications. If you do not have that version of the .NET Framework, the setup will install it and then exit. You will need to restart the PC if a message instructs you to do so. Whether or not you restart your PC, you will still need to restart the GE Communicator software setup.

NOTE

IMPORTANT CONSIDERATIONS:

If you have a valid license for an installed GE Communicator 3.0 application, please note that this license is not transferable to GE Communicator 4.0.

NOTE

After installing GE Communicator 4.0, the GE Communicator 3.0 software will no longer be functional and GE Communicator 4.0 software will be in demo mode until you enter a valid license key.

NOTE

If you have GE Communicator 4.0 software installed under an expired license, if you setup or reinstall the GE Communicator 4.0 application (for example, to repair the existing installation), the old license will be removed and the software will be in demo mode until you enter a valid license key that has not expired.

GE Communicator supports the following GE EPM meters:

Power Quality Meters:

EPM 2200 meters

EPM 6000 meters

EPM 6010 meters

EPM 7000 meters

EPM 7000P meters

EPM 9450 meters

EPM 9650 meters

EPM 9700 meters

EPM 9800 meters

EPM 9900 meters

EPM 9900P meters

Submetering:

EPM 4600 meters

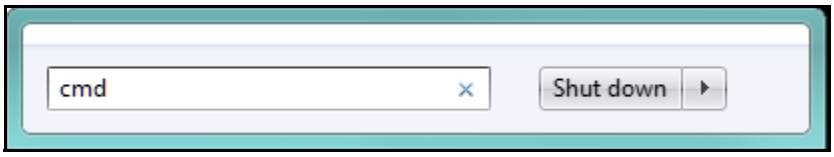
EPM 6100 meters

EPM 7100 meters

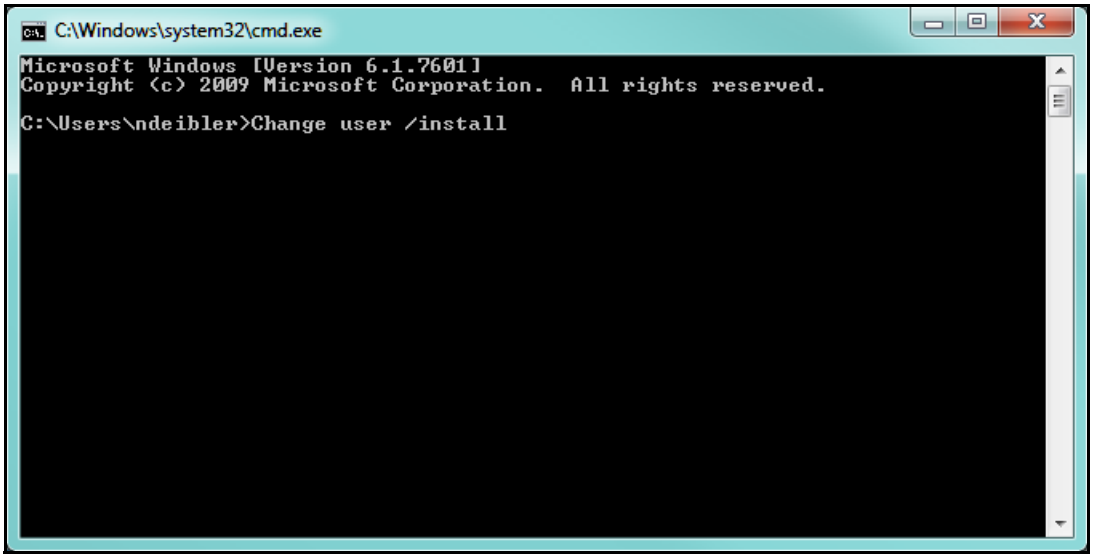
1.2.1 Instructions for Remote Desktop Host Server

If you are running Remote Desktop (RD) Host Server (formerly Windows Terminal Server) on the PC that GE Communicator software will be installed on, you first need to put the RD Session Host Server into Install mode. Follow these instructions:

1. Click **Start**, type **cmd** in the search field, and press **Enter**.

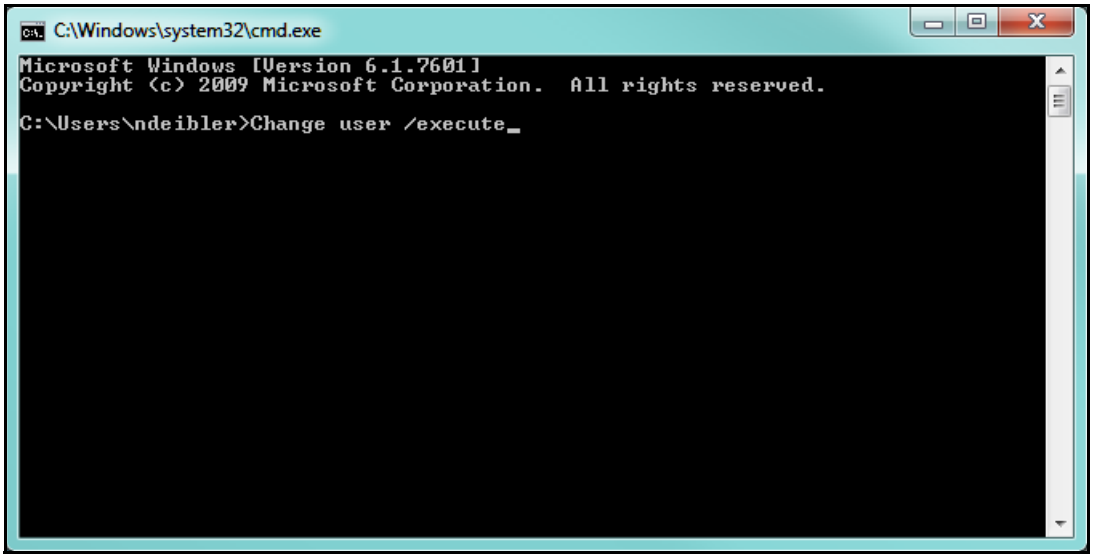


2. In the command line window, enter **Change user /install** at the C prompt. See the example screen, below.



3. Install the GE Communicator software application (see *Installing GE Communicator Software* on page 1–7).

4. When you have finished installing the GE Communicator software, repeat step 1 to open the command line window and enter **Change user /execute** at the C prompt to put the RD Session Host Server back into normal, execute mode. See the example screen, below.



1.3 Licensing

GE Communicator 5.00.0089 is available with a free Demo license for trial use, or a fully licensed Professional version. An unlicensed Demo version can be upgraded to a fully licensed Professional version with the purchase of a license.

GE Communicator license types	Features available
Demo license (free)	No Device Address greater than "1" can be used and no Output Modules can be used. Log Viewer Features are limited: • Cannot view data from multiple devices. • Cannot run multiple instances. • Cannot print pages to a printer. Script & Scheduler Features are limited: • Scheduler runs one script for one device with address "1". • Cannot print pages to a printer. GE MeterManager automation component is not available.
Professional license (paid)	Unlimited meter locations Output Modules can be used Full Log Viewer features Full Script and Scheduler features GE MeterManager is included

1.3.1 Order Codes

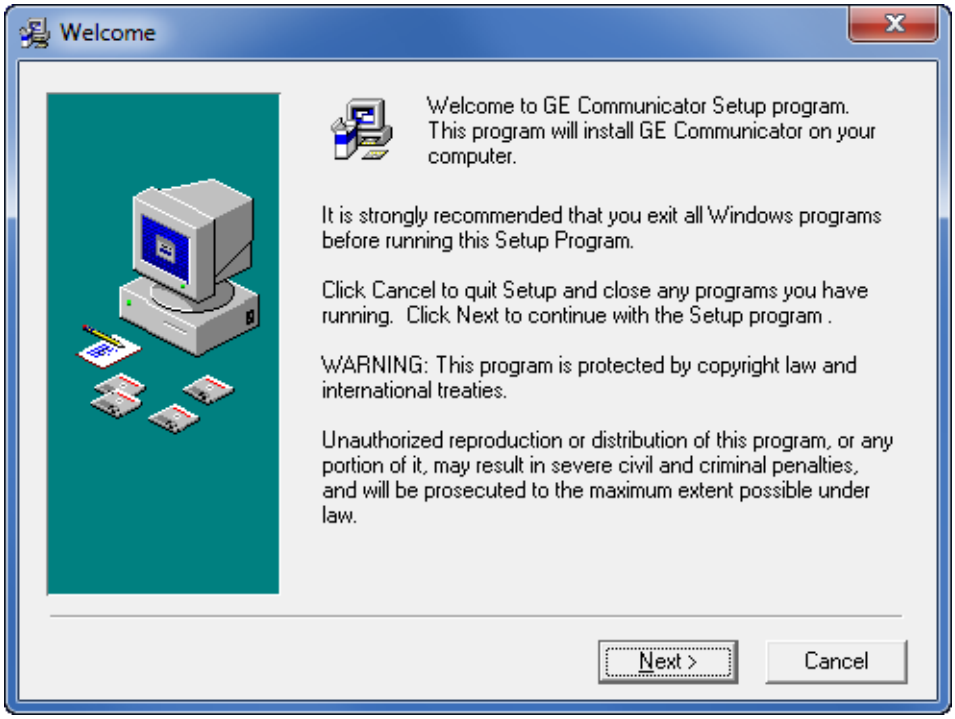
GE Communicator 5.00.0089 licenses are available for a single user or for three users.

	–	*	Description
PLSOFT	–	**COMS**	GE Communicator 4.0 Single User License

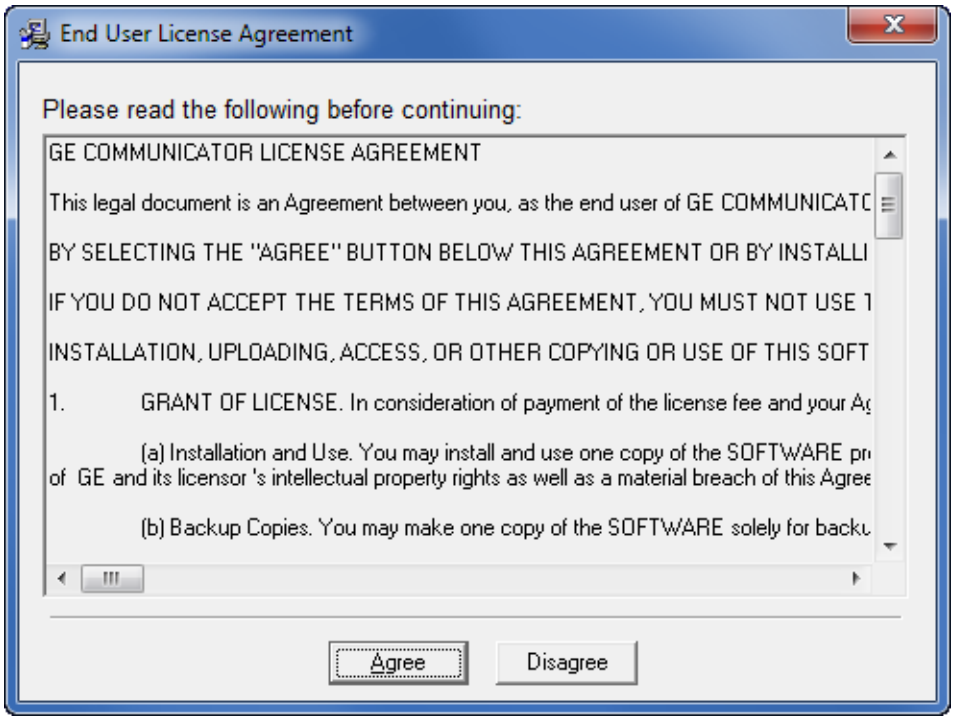
1.4 Installing GE Communicator Software

1. Download the GE Communicator software from the GE website:

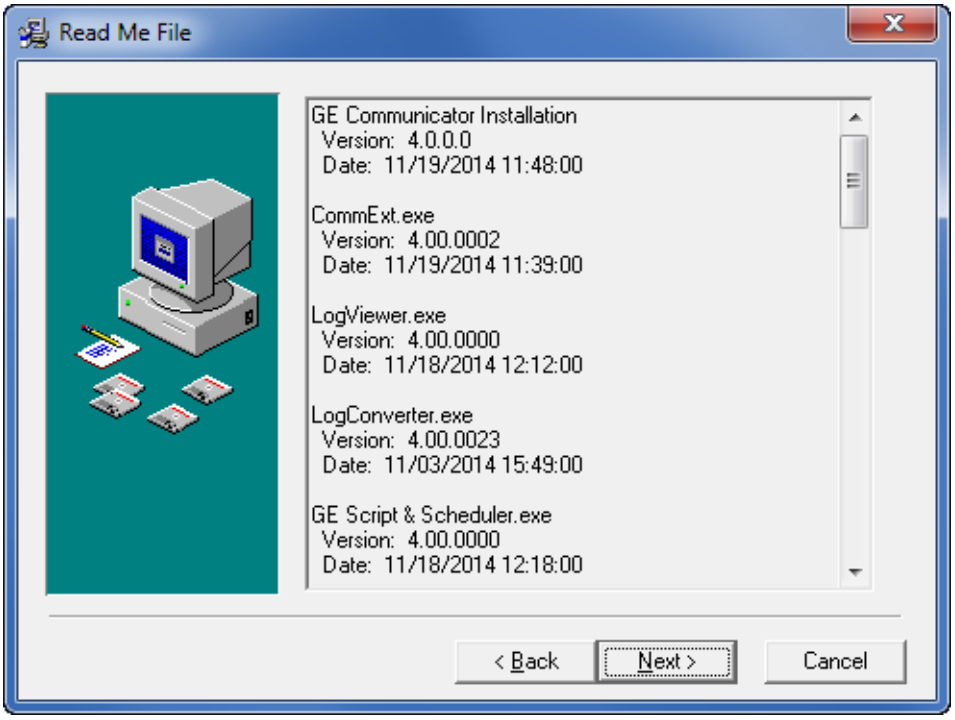
https://www.gegridsolutions.com/app/ViewFiles.aspx?prod=epm9900p&type=7



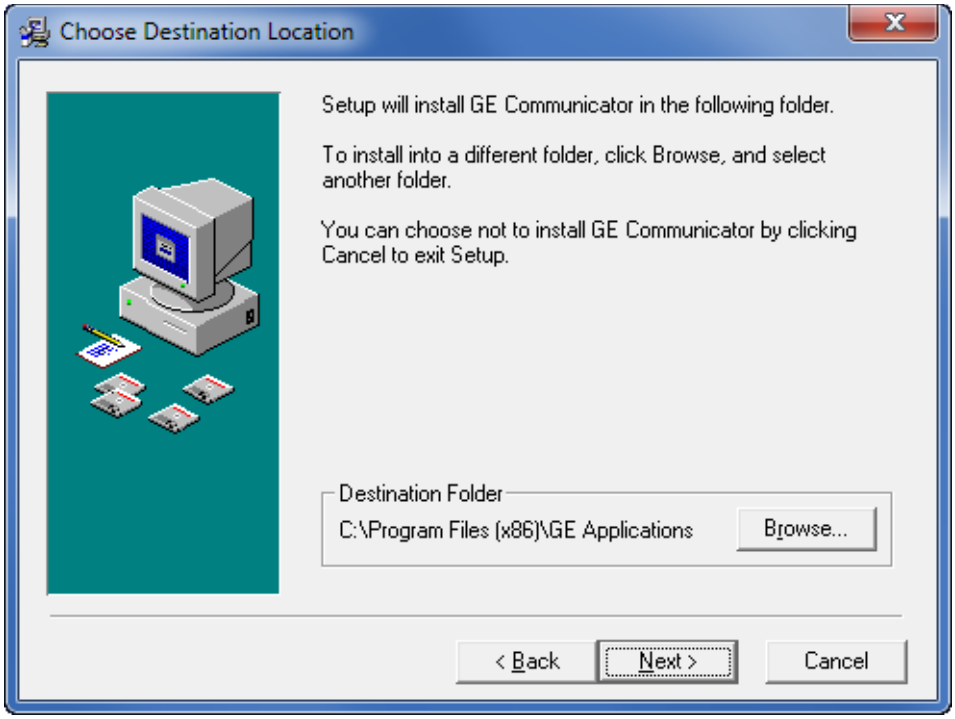
2. Close any open applications and click **Next**.



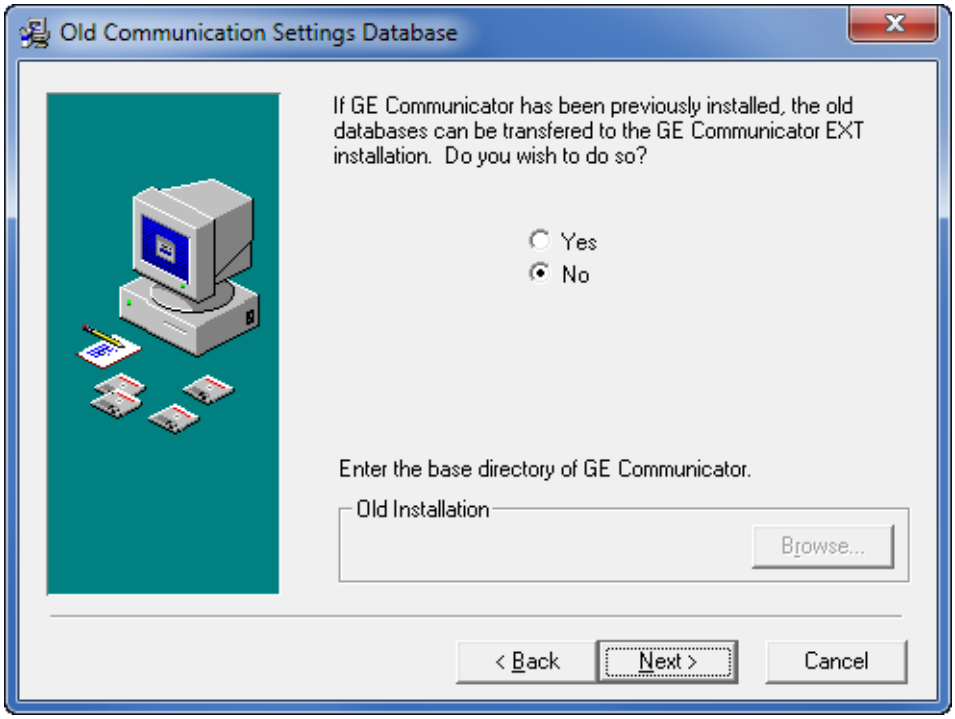
3. Use the scroll bar to view the entire document. Please make sure you read and agree to the terms of our End User License Agreement; then click Agree. By clicking Agree, you are agreeing to the full terms of this End User License Agreement.



4. The previous screen shows the version information for the application components that will be installed. Click Next to continue.



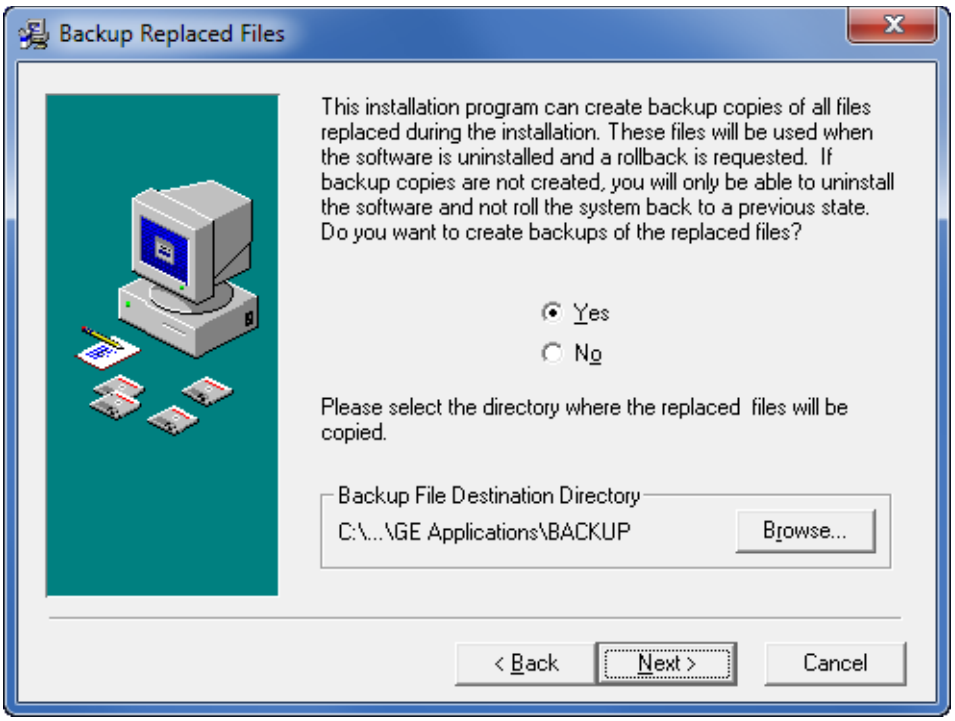
5. The default location of the application files is shown on this screen. You can browse to find a different location if you wish.



6. The previous screen is only applicable if you have an old version of the GE Communicator application and want to transfer the databases to the new application.

- If you want to transfer the old databases, click the radio button next to **Yes**.
- To skip any transfers, leave the **No** radio button selected.

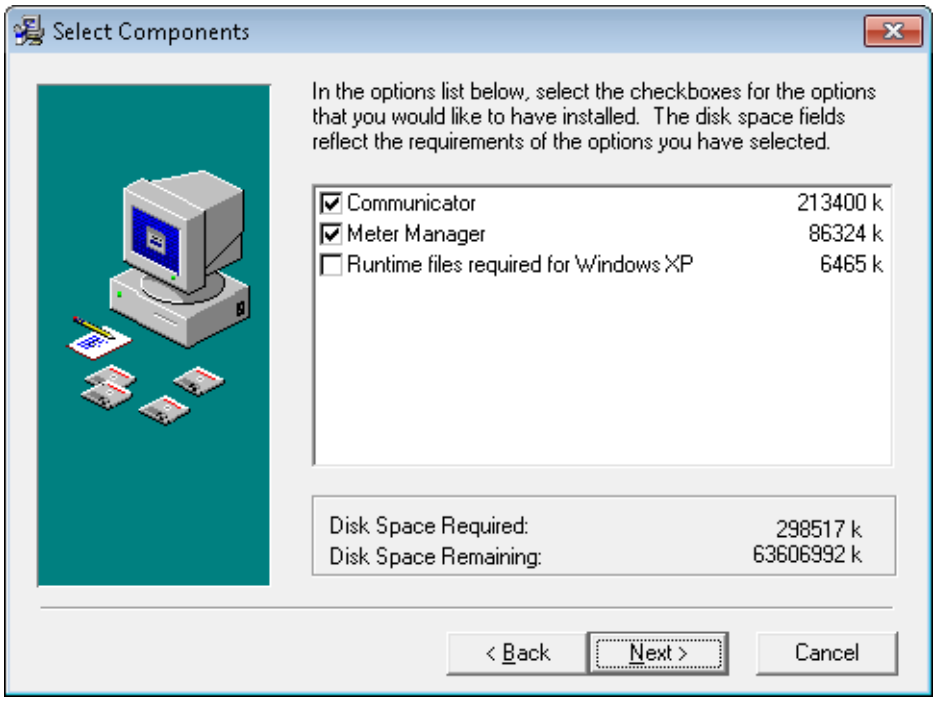
Click **Next**.



7. To create backup files leave the **Yes** button selected and either leave the default directory or Browse to select a new location for the backup files.

   If you don't want to create backup files, click the **No** radio button.

Click **Next**.



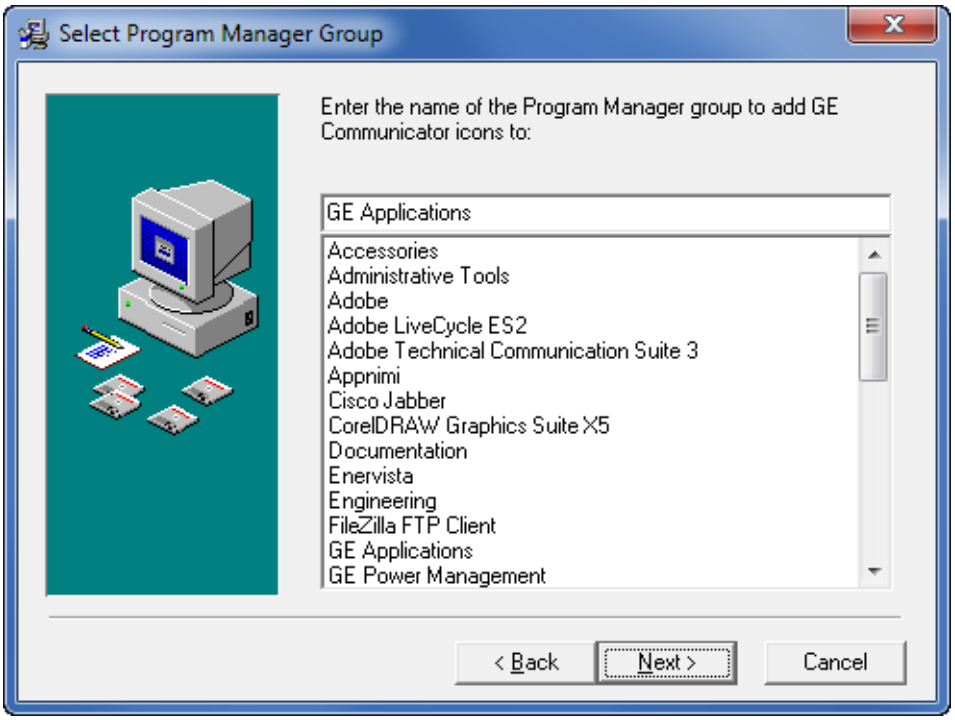
8. If you are installing the Professional (licensed) version of the GE Communicator application, install both GE Communicator and GE MeterManager.

NOTE

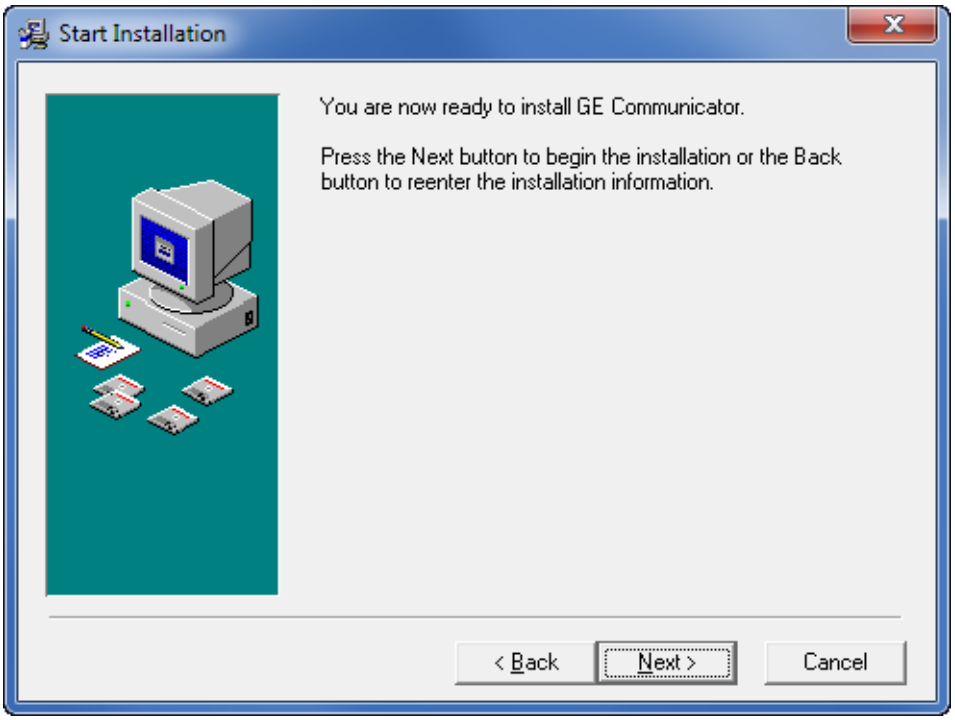
If your PC has the Windows XP® Operating System, click the third checkbox. This adds additional files needed for the Windows XP® Operating System.

Please note that while this option is available for legacy machines, the Windows XP® Operating System is no longer supported by the GE Communicator application and is not recommended for any new installation.

Click **Next**.

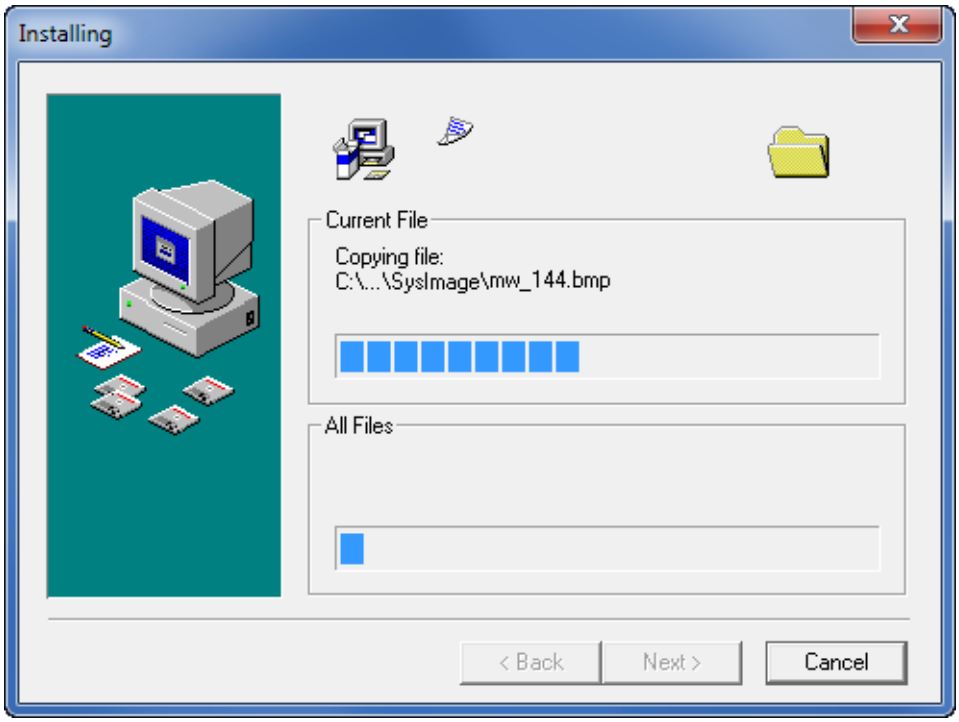


9. The default Program Manager group is GE Applications. If you want the application stored with another group, select it from the list; click **Next**.

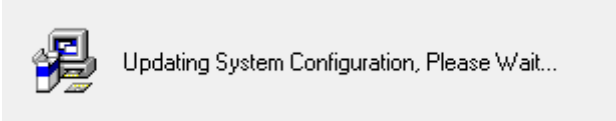


10. Click **Next** to install the application.

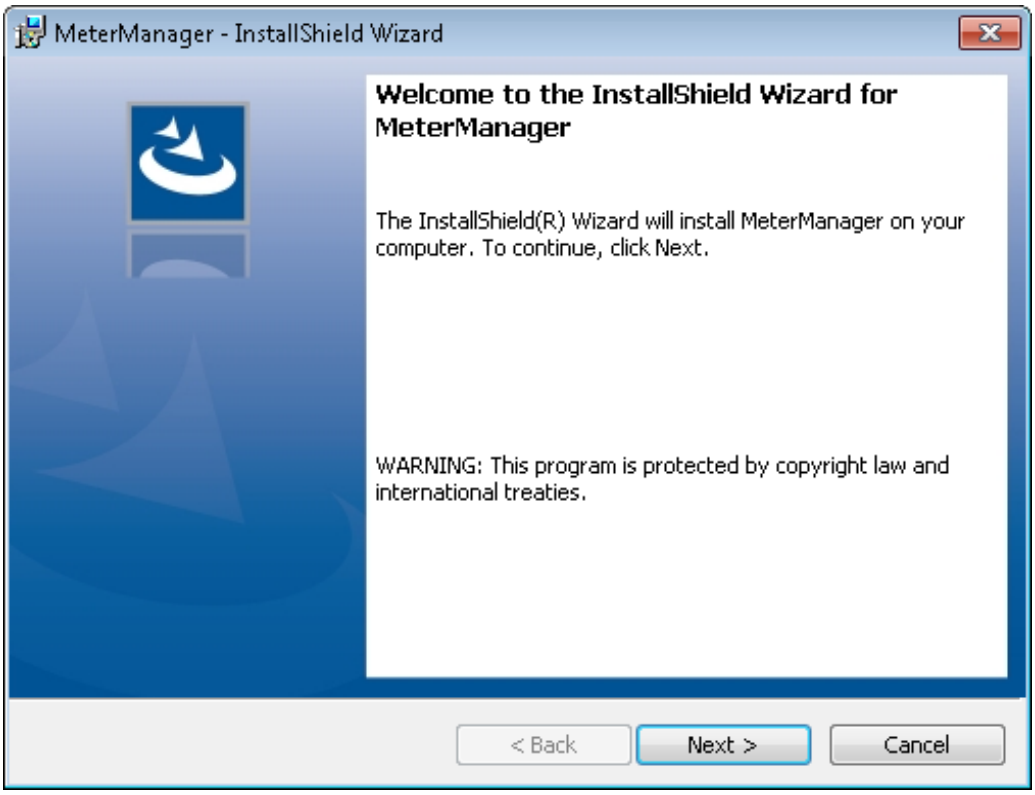
You will see a status screen as it is being installed.



11. Once installation is done you will see the following message.

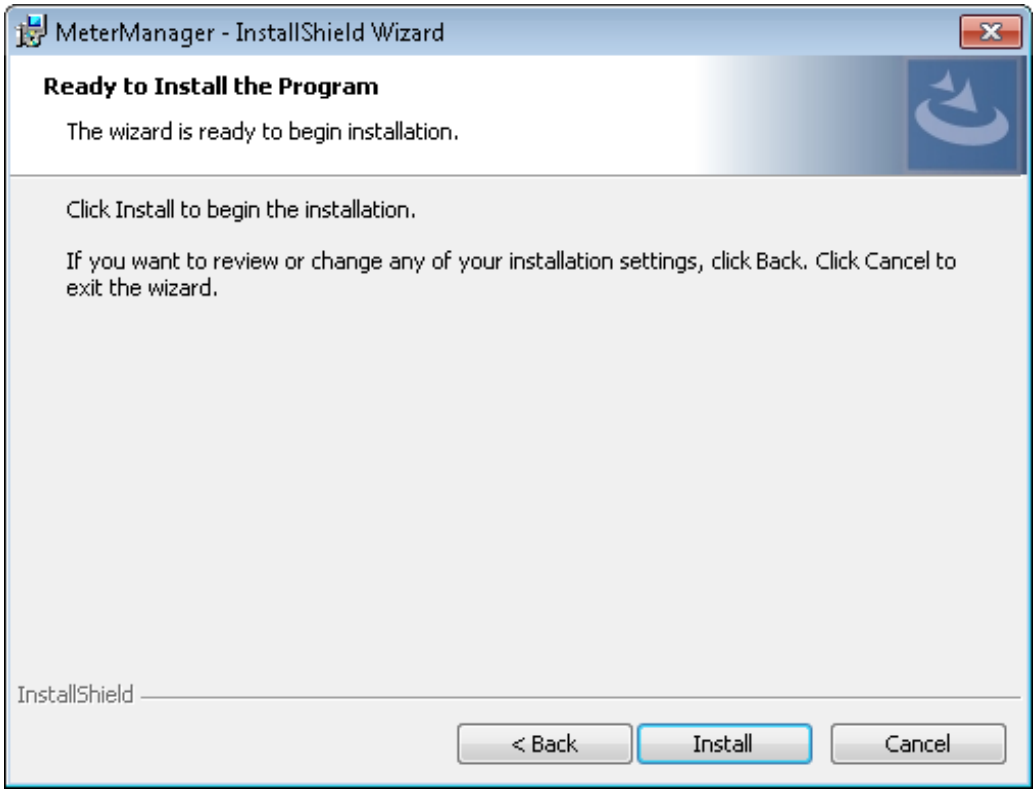


12. If you selected to install GE MeterManager in step 8, you will see the following screen. Click **Next** to continue.



13. You will see the End User License Agreement. Click the "I accept the terms in the license agreement" radio button to accept and Next to continue with the installation.

14. Click Install in the screen shown below to install GE MeterManager.

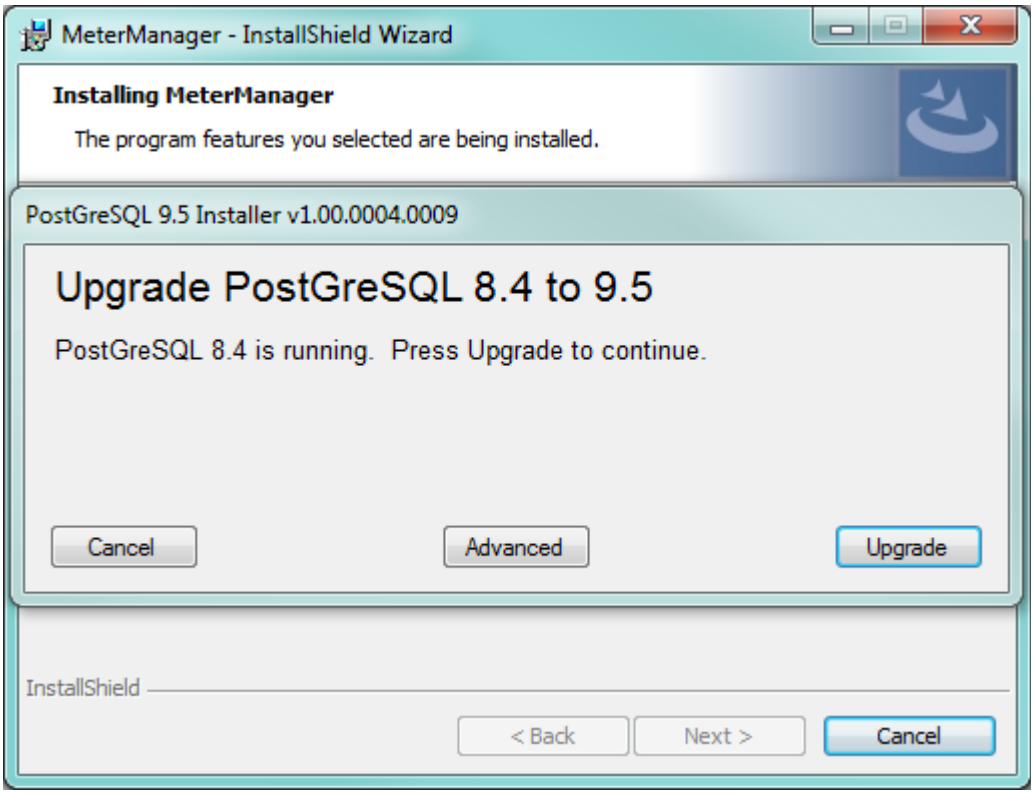


15. You will see messages as the application is being installed.
    - The GE MeterManager application uses PostGreSQL database server version 9.5. If you have an earlier version of the GE MeterManager or GE Energy Aggregator application running on your machine, you will probably have an earlier version of the PsotGreSQL database server (version 8.4).
    - The screen you see now depends on whether there is an earlier version of the PostGreSQL database server that needs to be updated, or whether this is a new installation in which the PostGreSQLdatabase server needs to be installed for the first time.

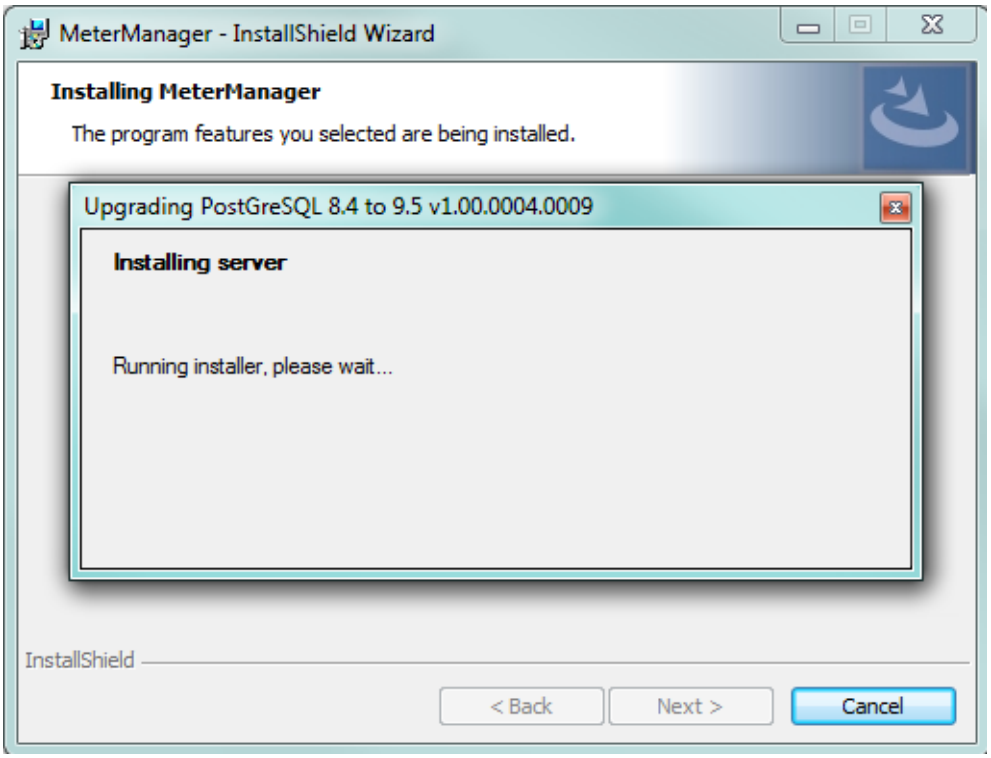
NOTE

The PostGreSQL database server version 9.5 is compatible with recent and current versions of Microsoft Windows® operating systems, and requires a 64-bit Operating system. For this reason, this version is not compatible with Windows® XP. If your machine is running Windows® XP, or if there is another reason you need to keep the earlier version of the PostGreSQL database server, follow the instructions in 1.3.1: Alternate Database Instructions, on page 1-20.

16. The example screen below is shown when an earlier version of the database server is already installed. Click Upgrade to continue. Note that you can choose different options, e.g., a specific hard drive location for the database server. To do so click the Advanced button and see1.4.1 *Alternate Database Instructions* on page 1–19, for instructions.

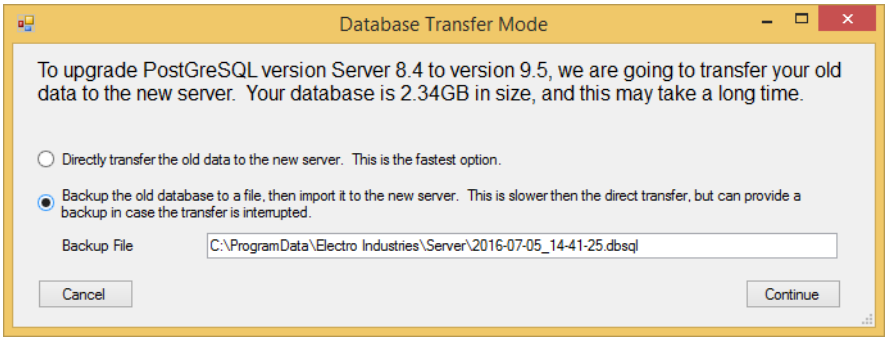


17. You will see messages while the server is being installed - see the example, below.



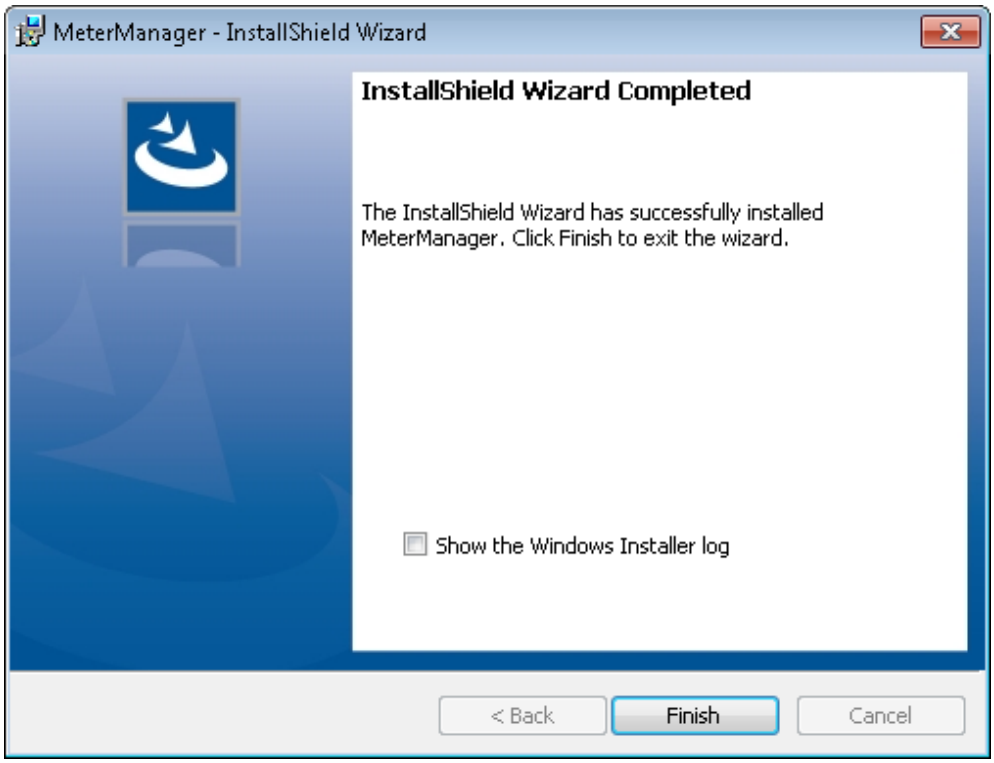
NOTE

If the database being upgraded is large, you will be given the option of using a backup file to perform the data transfer. This is a slower option, and requires extra space to store the backup file, but it can be used in case the upgrade fails as the result of the database size. See the example screen, below.

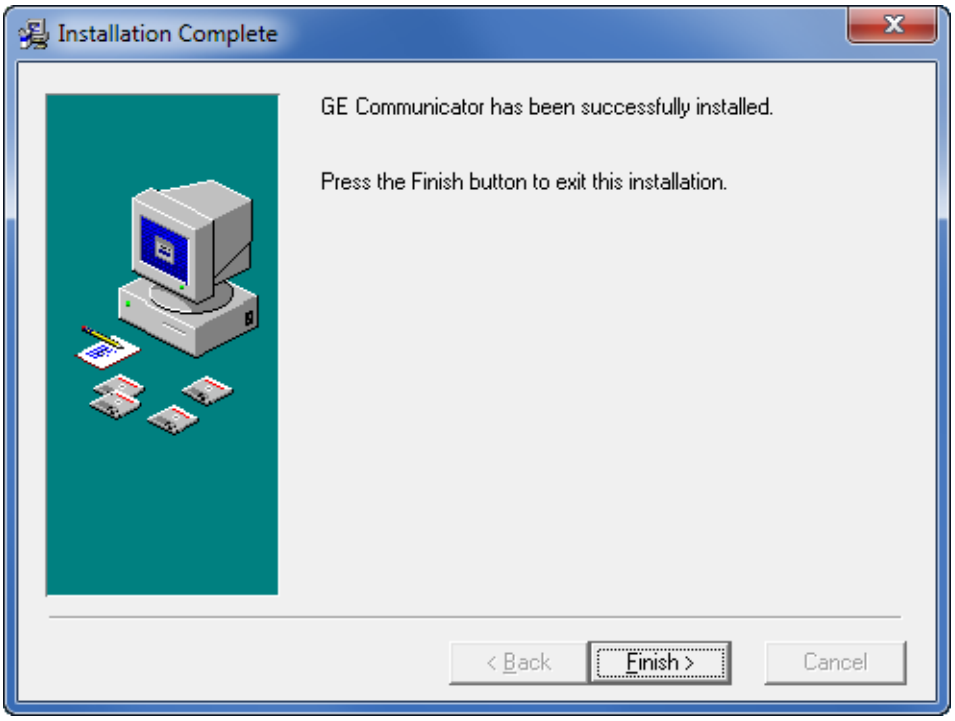


Click one of the options (to create a backup file, click the second radio button and enter a location for the file; to transfer the data directly, click the first radio button) and click **Continue**.

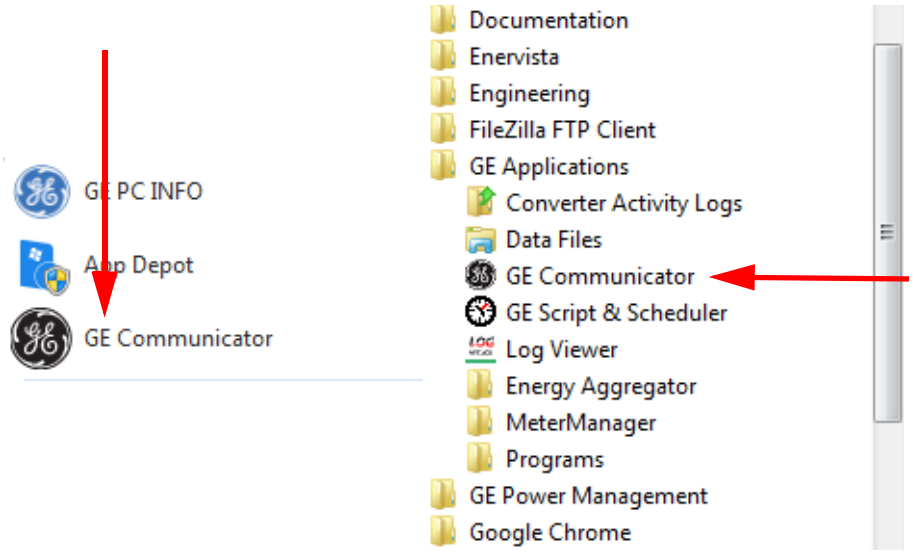
18. When the database server installation is complete, you will see the screen shown below.Click the Finish button. You will see the Installation Complete screen. Click **Finish** to continue.



19. You will see the screen, below, indicating that the GE Communicator application installation is complete. Click the **Finish** button to close it.



20. To run the application, select it from the start menu as shown.



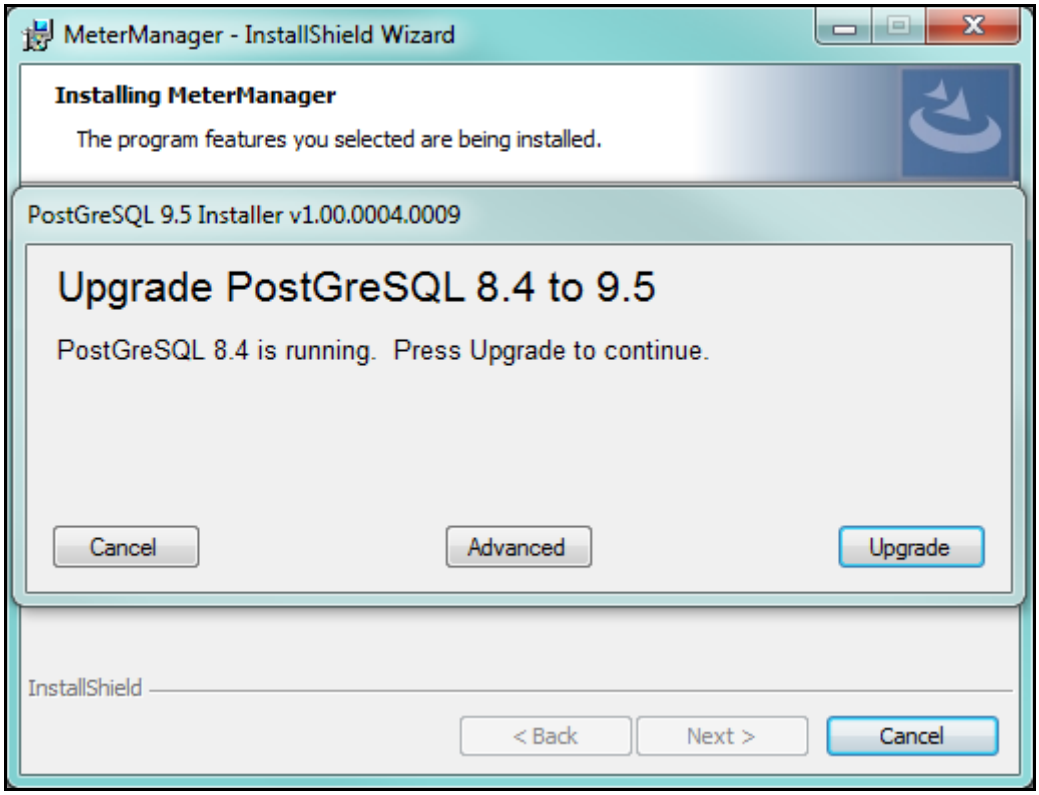
NOTE

If you have any installation issues, you can view the installation log file on your computer. It is located at: C:\E134-10\1\install.log

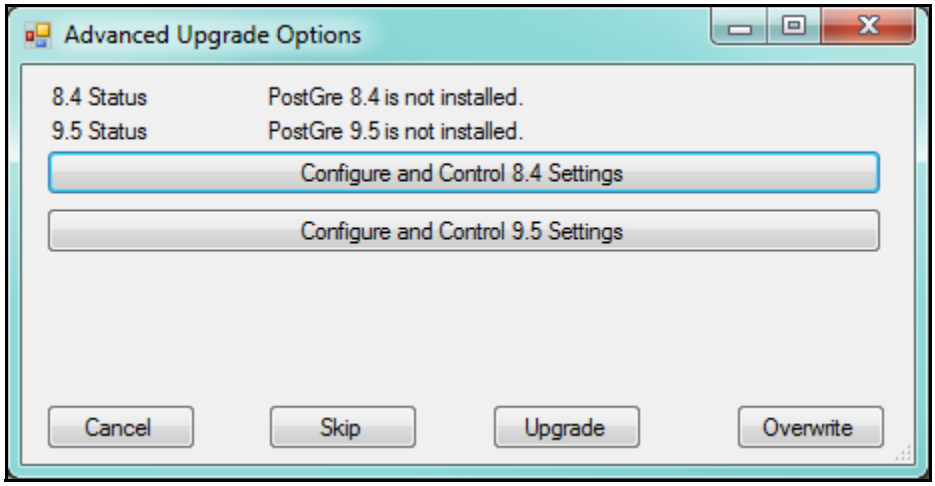
1.4.1 Alternate Database Instructions

MeterManager's PostGreSQL database installer gives you the option to 1. keep an earlier version of the PostGreSQL database server, and 2. customize the database installation. Follow these instructions:

1. From the screen shown below, click the Advanced button.

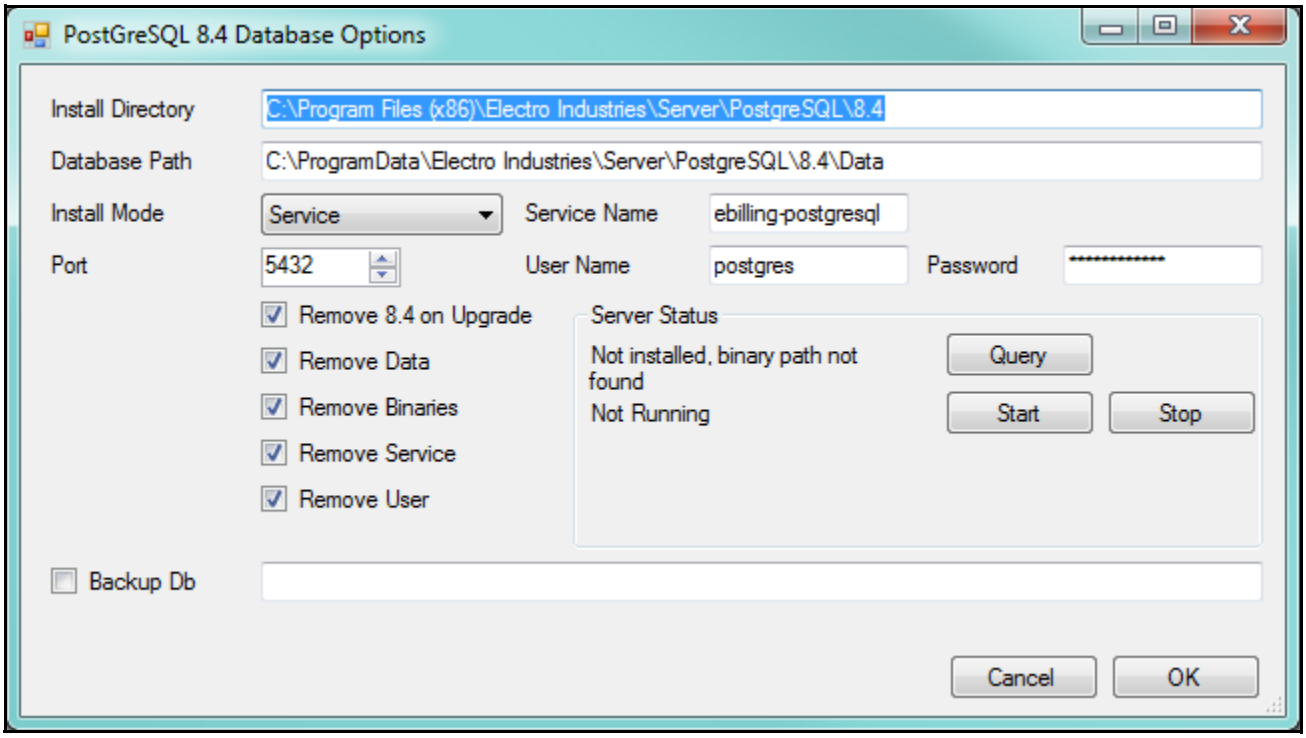


2. You will see the screen shown below.



- Note that if you already have either version of the PostGreSQL database server, this screen will tell you it is installed. If you want to keep the current version without changing anything, click the Skip button. The MeterManager installation will then continue.
- To cancel the MeterManager installation, click **Cancel**.

- To configure the discovery and removal options for PostGreSQL version 8.4, click "Configure and Control 8.4 Settings." Note that most of these options are auto-selected, and should not be changed.



Install Directory - This is the directory containing the PostGreSQL 8.4 binaries, which is used when removing the installed binaries.

Database Path - This is the directory in which the PostGreSQL 8.4 database is stored, which is used when removing the database.

Install Mode - This is the mode in which the PostGreSQL 8.4 service is running, which is used for restarting the service, and removing the service when done.

Port - This is the port used to connect to the PostGreSQL 8.4 service when transferring the database.

Remove - These are the things to remove on a successful upgrade. Please note the following:

- Uncheck "Remove Data" if you want to keep the old database intact.
- We highly recommend you DO NOT uncheck "Remove Service," as this may prevent the new server from operating correctly.

Service Name - This is the name of the PostGreSQL version 8.4 service, which is used for checking on the status of the service, and removing the service when done.

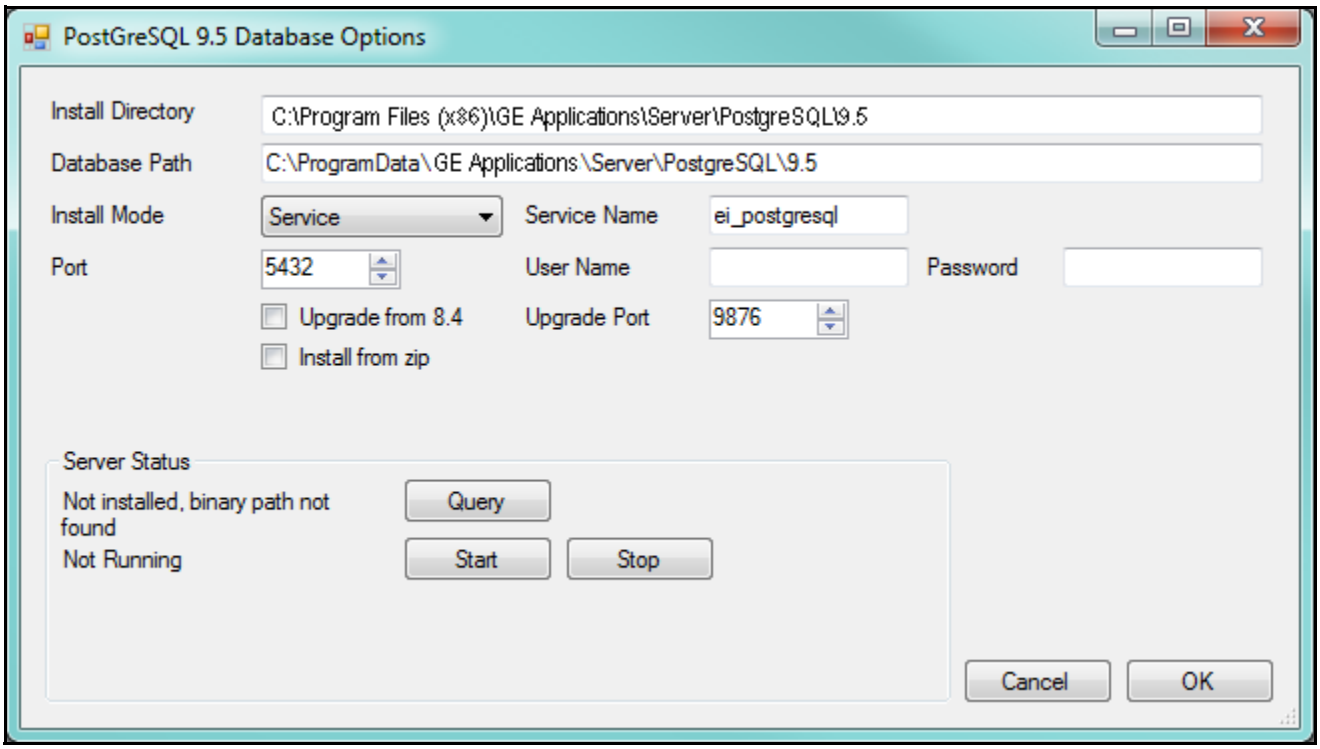
User Name - This is the name of the user that runs the PostGreSQL version 8.4 service: if "Remove User" is selected in step e, this user will be removed when the upgrade is done.

Backup Db - If you select this option, the database will be backed up to an archive file before it is transferred to version 9.5 of the database.

Server Status - You can use these options to start and stop the PostGreSQL version 8.4 server, to assist in upgrading to PostGreSQL version 9.5; e.g., to manually stop the service before performing the upgrade.

Click **OK** to process your selections; or **Cancel** to return to the Advanced settings screen without changing anything.

- To configure the installation and upgrade options for PostGreSQL version 9.5, click "Configure and Control 9.5 Settings."



Install Directory - This is the directory into which the PostGreSQL 9.5 binaries will be installed: this should not be changed.

Database Path - This is the directory into which the PostGreSQL 9.5 database will be installed. This should be a location with enough available space to accommodate the database as it increases in size.

Install Mode - This is the mode under which the database server is run. We recommend that this mode be "Service." "Local Run" mode is not recommended, but can be used if necessary, e.g., to install in the case of an environment with restricted computers.

Port - This is the port from which the PostGreSQL 9.5 database will run.

Upgrade from 8.4 - Check this box if you want to upgrade the database from a running PostGreSQL 8.4 database.

Upgrade Port - This is the port used by the PostGreSQL 9.5 database while upgrading: the use of this port is temporary.

Service Name - This is the name of the PostGreSQL 9.5 service.

Username/Password - This is the username and password under which the PostGreSQL 9.5 service is run. This setting should not be changed: leave these fields blank in order to install the server under Network Service.

Upgrade Mode - This is the mode used to upgrade the database: either Direct_Transfer or Backup_Import. You do not need to make a selection here, as the best option will be selected for you.

Service Status - This indicates the current status of the PostGreSQL 9.5 database, and allows you to start and stop the service, if necessary.

Click **OK** to process your selections; or **Cancel** to return to the Advanced settings screen without changing anything.

- Once you have configured the 8.4 or 9.5 version advanced options, click either:
    - **Upgrade** - to upgrade the server from 8.4 to 9.5 using the settings you made.
    - **Overwrite** - to install version 9.5 without upgrading from version 8.4 - **CAUTION**: this will remove any previously installed 8.4 version database and all of the data in it.

GE Communicator

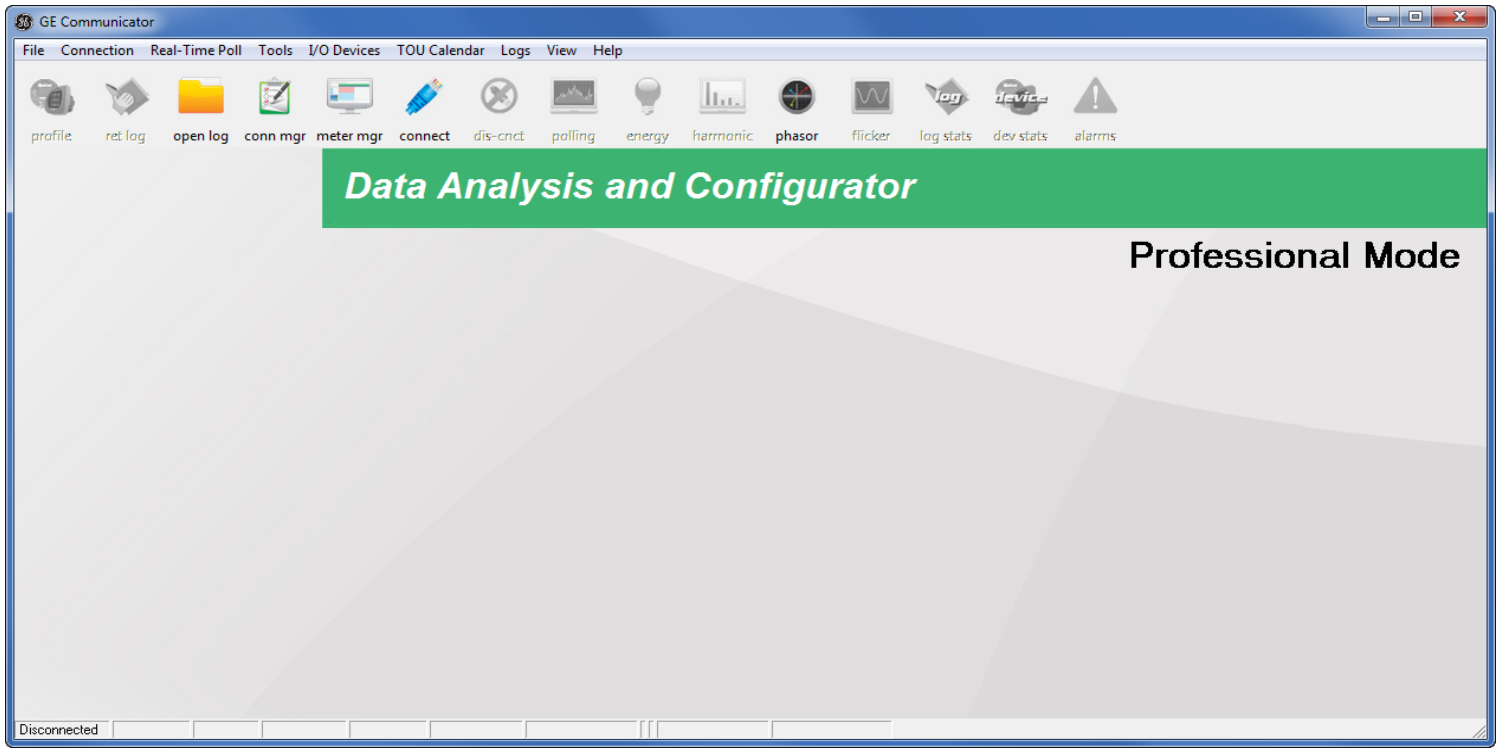
Chapter 2: Overview

2.1 Meter Comparisons

Settings for the meters vary depending on the meter model you are connected to. For example, certain meters support Flicker measurement while others do not. For a complete list of GE EPM meters and supported features see the Multilin™ Digital Metering Selector Guide at http://gegridsolutions.com/multilin/selector/Meters.pdf.

2.2 Main Screen

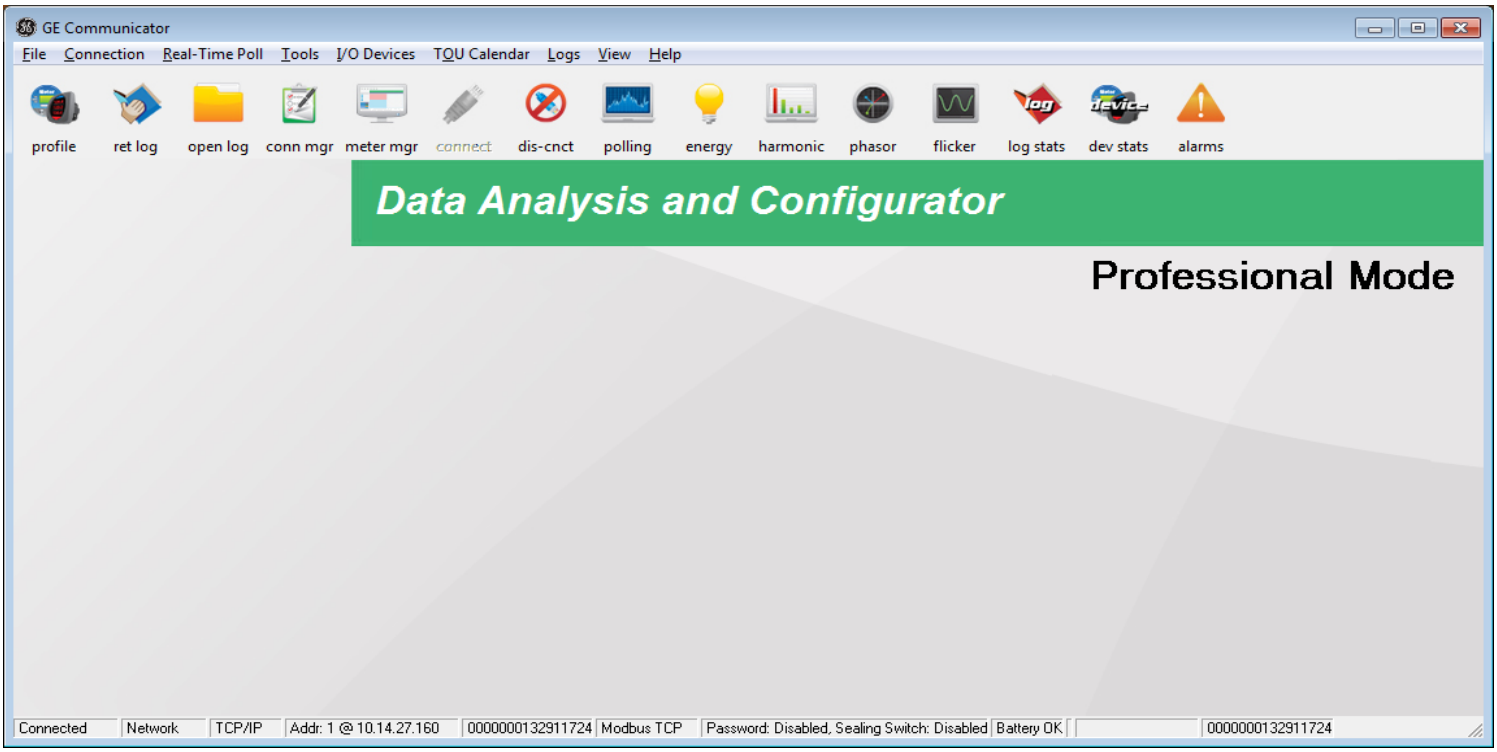
When you open the GE Communicator 4.0 application, either from the Start menu, or by connecting to a meter through GE MeterManager, you see the software Main screen. The following example has been opened from the Start menu and is not yet connected to a meter.



The screen says **Professional Mode** when you are using a fully licensed version of GE Communicator.

Notice that the **Connect**, **Open Log**, **Conn Mgr**, and **Meter Mgr** icons are available, but the other icons are grayed out and not selectable.

Once you have connected to a meter, the screen changes.



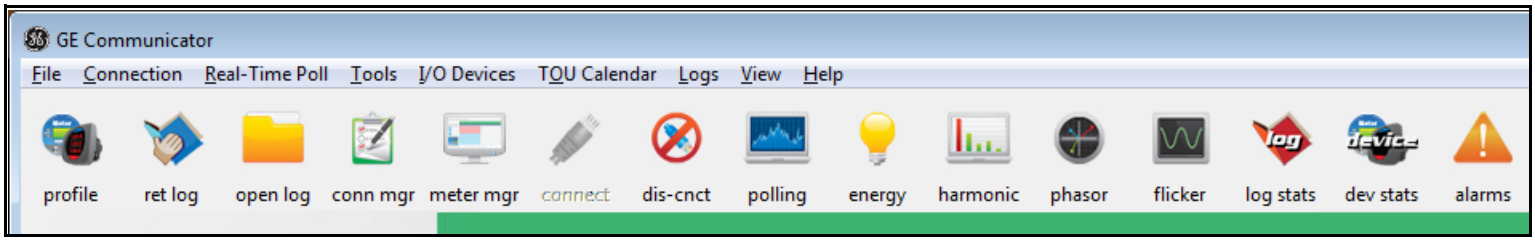
All of the icons in the Icon Bar are available for use, except for the **Connect** icon, since you are already connected to a meter.

The Main screen gives you access to all software features. The basic components are:

- **Icon Bar** - contains icons that open specific screens
- **Status Bar** - gives you information about the connected meter
- **Menu Bar** - accesses all GE Communicator commands and screens

These components are explained in the following sections.

2.2.1 Menu Bar Icons



From left to right, the icons in the Icon Bar and the actions they perform are as follows:

- **Profile**: Retrieves the Device Profile from the currently connected meter.
  Same as selecting **Tools > Edit Current Device Profile**.
  Use to configure the meter. (See the chapter for your meter model.)
- **Retrieve Logs**: Downloads logs from the currently connected meter to the computer.
  Same as selecting **Logs > Retrieve Log(s) from Device**. (See Chapter 19 "Viewing Logs".)
- **Open Log**: Opens a previously retrieved EPM Log File.
  Same as selecting **File > Open > EPM Log File**. (See Chapter 19 "Viewing Logs")
- **Connection Manager**: Establishes communication between the computer and multiple meters at local or remote sites.
  Same as selecting **Connection > Connection Manager**. (See Chapter 3 "Connecting to a GE Meter".)
- **MeterManager**: Opens the GE MeterManager monitor screen. (See Chapter 18 "GE MeterManager".)
- **Connect**: Establishes communication between the computer and one directly connected meter.
  Same as selecting **Connection > Quick Connect**. (See Chapter 3 "Connecting to a GE Meter".)
- **Disconnect**: Terminates the connection between the computer and the currently connected meter(s).
  Same as selecting **Connection > Disconnect**. (See Chapter 3 "Connecting to a GE Meter".)
- **Polling**: Displays instantaneous polling data from the currently connected meter.
  Same as selecting **Real-Time Poll > Instantaneous Polling**. (See Chapter 5 "Polling Your Meter".)
- **Energy**: Displays Power and Energy readings from the currently connected meter.
- **Harmonic:** If the meter you are connected to supports Harmonic magnitude measurement, this icon opens the Harmonics polling screen.
- **Phasors**: Displays a three-phase phasor diagram and data from the currently connected meter.
  Same as selecting **Real-Time Poll > Phasors**. (See Chapter 5 "Polling Your Meter".)
- **Flicker**: Displays Instantaneous, Short Term and Long Term Readings.
  Same as selecting **Real Time Poll > Power Quality & Alarms > Flicker**. (See Chapter 23 "EN 50160 / IEC 61000-4-30 Power Quality Analysis".)

- **Log Status**: Displays logging statistics for the currently connected EPM meter. Same as selecting **Logs > Statistics**. (See Chapter 19 "Viewing Logs".)
- **Device Status**: Displays list of the currently connected meter(s). Same as selecting **Tools > Device Status**. (See Chapter 3 "Connecting to a GE Meter".)
- **Alarms**: If the meter you are connected to supports Limits, click this icon to open the Limit Status polling screen. Same as selecting **Real Time Poll > Power Quality & Alarms > Alarm Status**. (See Chapter 5 "Polling Your Meter".)

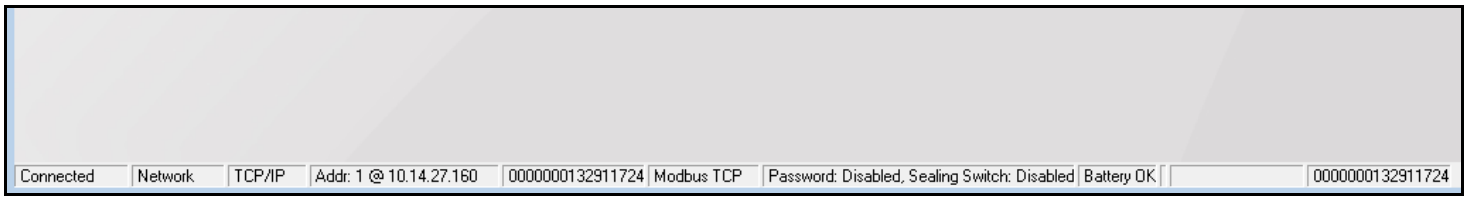
2.2.2 Main Screen Status Bar

The status bar is located at the bottom of the Main screen. The details of the information shown depend on your meter connection - through a Network or a serial port.

NOTE

If you are not connected to a meter, the first field will say **Disconnected** and the other fields will be blank; if you have tried to connect to a meter that the software can't locate, the first field will say **Not Found** and the other fields will be blank.

Figure 2-1: Status Bar for a Network Connection

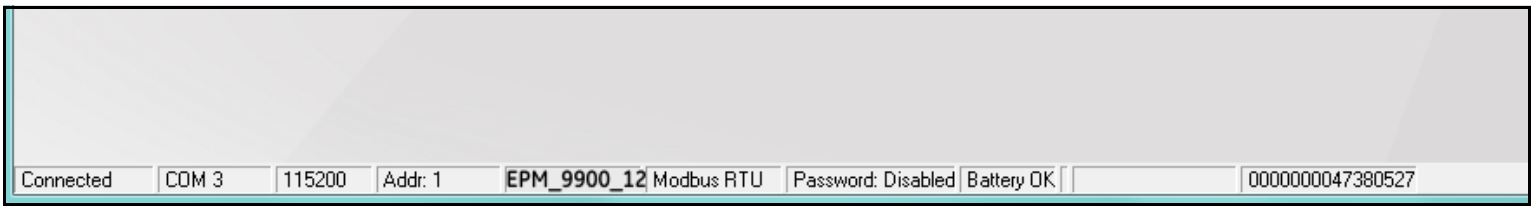


The information shown in the Status Bar, from left to right, is:

- Connection Status
- Type of Connection
- Network Protocol
- Meter Modbus address and IP address
- Meter ID
- Communication Protocol
- Security Status: Password and Sealing Switch (if available for the meter) Enabled or Disabled
- Battery Status (if applicable to the meter)*
- Memo Field- For select meters, if anything was entered into this field in the Labels setting screen, it is displayed here.

  Refer to your meter's programming chapter for instructions.
- Meter serial number

Figure 2-2: Status Bar for a Serial Port Connection



The information shown in the Status Bar, from left to right, is:

- Connection status: Connected or Disconnected
- Serial Port
- Baud Rate
- Meter Modbus address
- Meter ID
- Communication Protocol
- Security Status: Password and Sealing Switch (if available for the meter) Enabled or Disabled
- Battery Status (if applicable to the meter)*
- Memo Field - For EPM 9000 series meters, if anything was entered into this field in the Labels setting screen, it is displayed here. Refer to your meter's programming chapter for instructions.
- Meter Serial Number

NOTE

*For an EPM 9800 meter, the **Battery Status** field says **Low Bat** when the Internal or Modem battery is low, dead or missing.

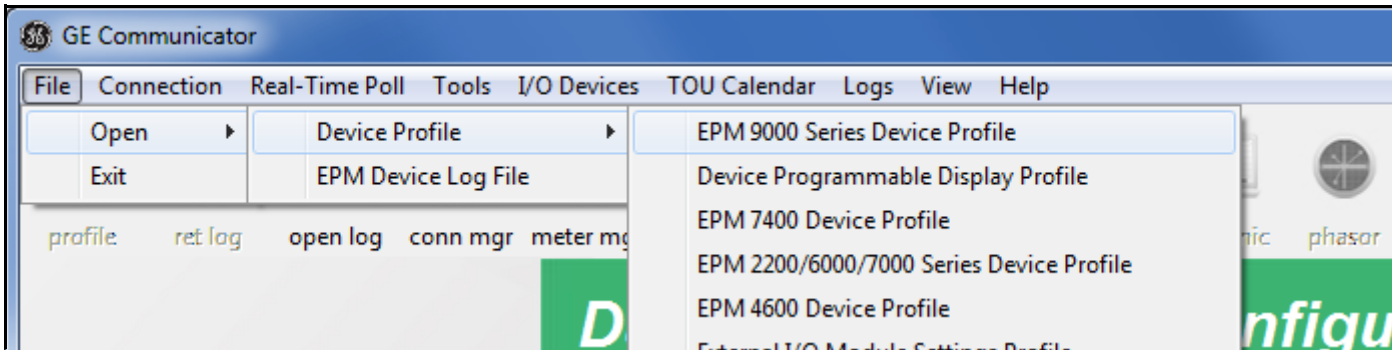
*For an EPM 9900/9900P meter, the Battery Status field displays Low Batt when the battery backing up the meter's clock is at 1.3 volts (EPM 9900)/2.55 volts (EPM 9900P). For the EPM 9900P, you can enable the battery status display from the Options screen - see 20.2.4 *Miscellaneous* on page 20–50 for instructions.

Consult your meter's instruction manual for details.

2.2.3 Main Screen Menu Bar

The Menu Bar, located at the top of the GE Communicator application Main screen, has the following options: File, Connection, Real-Time Poll, Tools, I/O Devices, TOU Calendar, Logs, View, and Help. Each of these options open menus and sub-menus when you click on them, giving you access to application features.

File: If you are not connected to a meter, this is the menu you will see; if you are connected to a meter, you will only see the **Exit** option, which you can click to close the application.

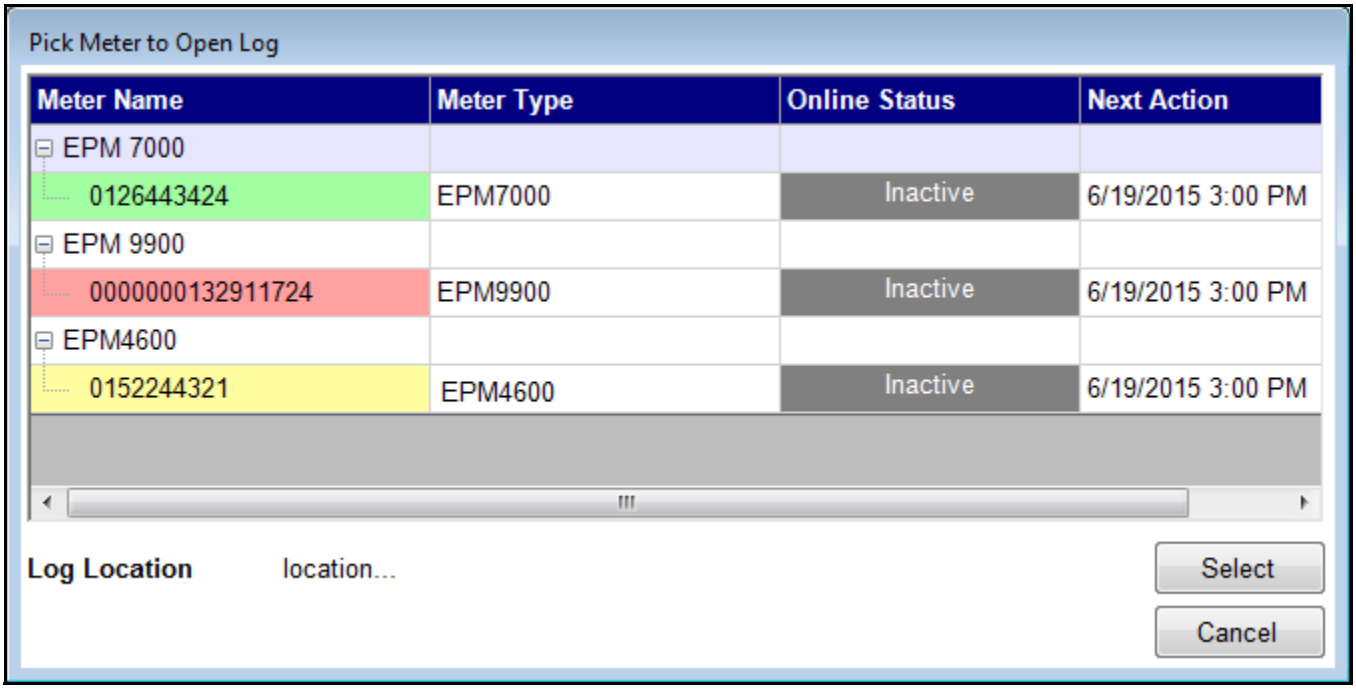


- Click **Open > Device Profile** and then one of the Profiles to edit the profile of a meter or device that you are not connected to.

- Click **Open > EPM Device Log File** to open the screen shown below if you have the Professional (licensed) version of GE Communicator.

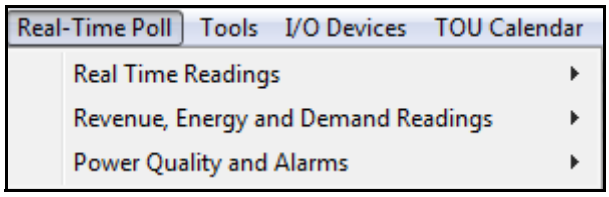
  To open a log, click on the meter you want to see the log for and click **Select**.

  If you have the demo version of the software, you will be prompted to select the log database file directly from the Database directory. See Chapter 16 "Databases and Log Data"for information on retrieving logs and see Chapter 19 "Viewing Logs" for information on viewing logs.

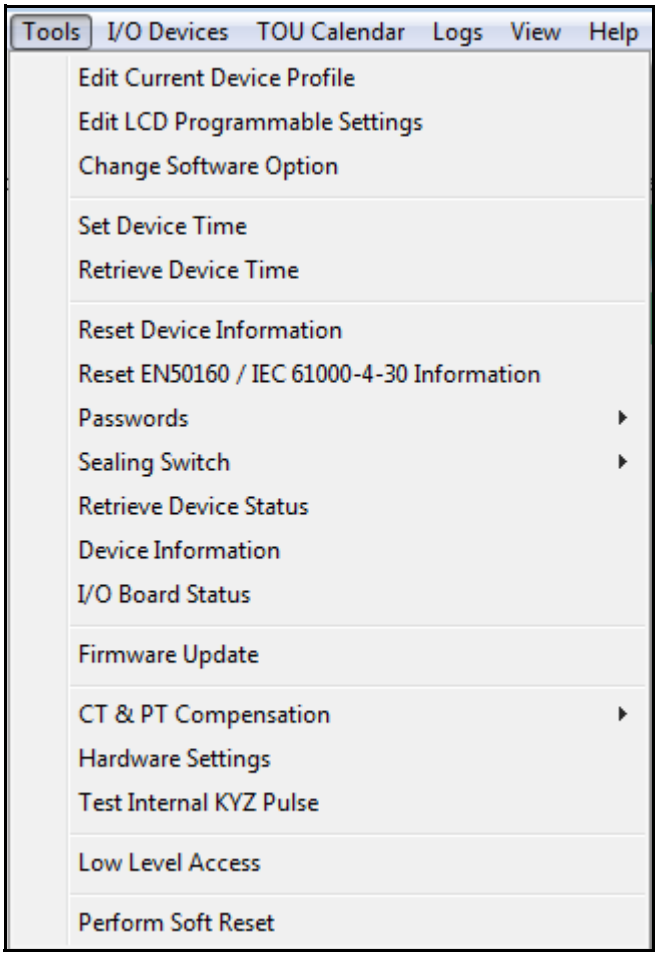


- Click **Open > Device Dial-In Log Index** to open a window that lets you browse for the log index file.

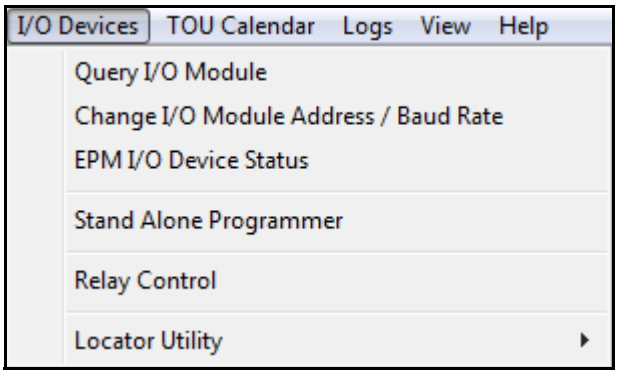
Real-Time: This menu gives you access to all of the polling screens for the connected meter. Depending on the meter you are connected to, you may see some different options than the ones shown in the example below. (See Chapter 5 "Polling Your Meter" for details on the polling screens.)



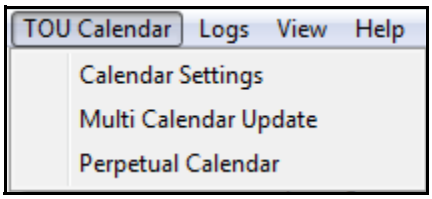
Tools: This menu gives you access to additional actions. Depending on the meter you are connected to, you may see some different options than the ones shown in the example below. See Chapter 20 "Other Functions and Screens" for details on the Tools options.



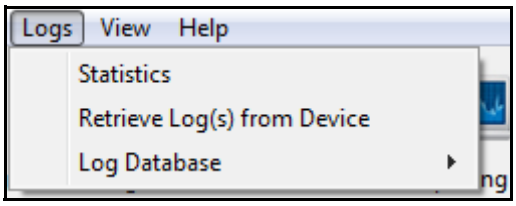
I/O Devices: You will see this menu if you are connected to an EPM 9000 series meter. It gives you access to programming and control screens for the meter's optional external I/O modules. See Chapter 14 "External I/O Modules" for detailed instructions on programming the external I/O devices.



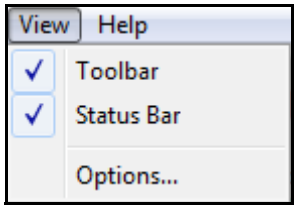
TOU: You will see this menu if you are connected to an EPM 9000 series meter. It gives you access to the Time of Use (TOU) Calendar settings. See Chapter 15 "Time-of-Use" for instructions on configuring TOU settings.



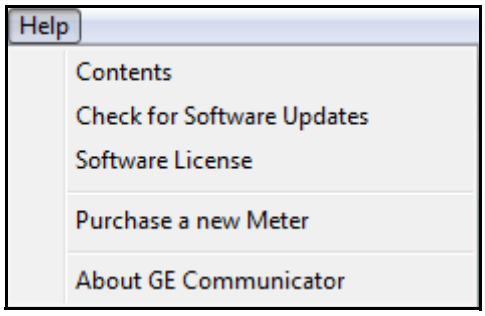
Logs: This menu gives you access to information about the connected meter's log status, lets you retrieve meter logs, and lets you load a saved log database file for viewing. See See Chapter 19 "Viewing Logs" for details on viewing meter logs.



View: This menu lets you choose to hide the Tool Bar and/or the Status Bar. It also gives you access to the Options menu.



Help Menu: This menu gives you access to additional information:



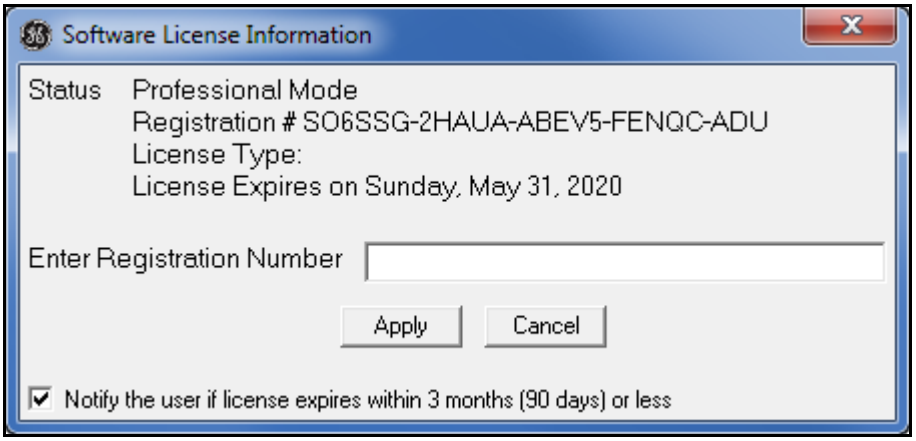
- **Contents** - click to open the *GE Communicator Instruction Manual*.
- **Check for Software Updates** - click to run a check for any updates to your software.

NOTE

Whenever you open the software application, there is an automatic check for updates.

- **Software License** - click to see the screen below. It gives you information about the status of your license for the application.

To upgrade to a professional version from the demo version of the software, or to renew a license, enter your Registration number and click Apply.



NOTE

To purchase a software license, contact your Regional sales representative

You can uncheck the box at the bottom of the screen if you do not want to be notified when you have three months or less left in your license.

- **Purchase a new meter** - click to access the GE online store.
- **About GE Communicator** - click to view software version details.

GE Communicator

Chapter 3: Connecting to a GE Meter

3.1 Overview

There are three methods for connecting to your meters:

- **Direct Connect** - through serial port, network, IrDA, or USB
- **Through Connection Manager** - used for modem communication, multiple meters on a bus, and a gateway communication
- **Using GE MeterManager** - automatically connects to meters in your network

  When connecting through an Ethernet network, using GE MeterManager as your primary launchpad is the most convenient way to use the system.

Depending on your meter type and the options it is configured with, you will have one or more ways of connecting to your specific meter. There are two aspects of connecting to a meter:

- Connection settings from your PC to the meter - covered in this chapter.
- Meter communication port settings - covered in individual meter programming chapters:

Both of these are set through GE Communicator software. See the programming chapter for your meter for the communication port settings:

- Chapter 8 “EPM 7000/7100 Meter”
- Chapter 9 “EPM 2200/6000/6010/6100 Meter”
- Chapter 10 “EPM 4600 Metering System”
- Chapter 11 “EPM 9900/9900P Meter”
- Chapter 12 “EPM 9800 Meter”
- Chapter 13 “EPM 9450/9650 Meter”
- Chapter 26 “EPM 9700 Meter”
- Chapter 27 “EPM 7000P Meter”

The following tables summarize the recommended settings for the EPM meters.

NOTE

- Except where specified, the Device Address field can be 1-247 for the Professional version of GE Communicator software. If you have the demo version, you cannot change the Device Address: it must be 1.
- The following tables shows you the settings needed in a PC to enable successful communication with the meter.
- If specific settings are not given in the table, make settings that match your installation requirements.

Table 3–1: EPM 2000/4000/6000/7000 Series Meter Connection Settings

Connection Type	EPM 2200	EPM 6000/6100	EPM 6010	EPM 7000/7100/7000P	EPM 4600
IrDA	NA	Device Address: 1 Port: the PC's USB Port Baud Rate: 57600 Protocol: Modbus ASCII; Flow Control: Hardware. (EPM 6000T/6100T meters do not support IrDA.)	Device Address: 1 Port: the PC's USB Port Baud Rate: 57600 Protocol: Modbus ASCII; Flow Control: Hardware. (EPM 6010T meters do not support IrDA.)	Device Address: 1 Port: the PC's USB Port Baud Rate: 57600 Protocol: Modbus ASCII; Flow Control: Hardware. (EPM 7000T/7100T/ 7000PT meters do not support IrDA.)	NA
RS485	Baud Rate: 9600; 19200; 38400; 57600 Port: COM 1 - COM 256 (OS dependent) Protocol: Modbus ASCII or RTU Flow Control: None or Hardware	Baud Rate: 9600; 19200; 38400; 57600 Port: COM 1 - COM 256 (OS dependent) Protocol: Modbus ASCII or RTU Flow Control: None or Hardware	NA	Baud Rate: 1200*, 2400*, 4800*, 9600, 19200, 38400, 57600 (for RS485 connection, Port: COM 1 - COM 256 (OS dependent) Protocol: Modbus ASCII or RTU Flow Control: None or Hardware	Protocol: Modbus ASCII or RTU
Ethernet/ WiFi	NA	Default Settings: Device Address:1 IP Address: 10.0.0.1 Port: 502 Protocol: Modbus TCP	Default Settings: Device Address:1 IP Address: 10.0.0.1 Port: 502 Protocol: Modbus TCP	Default Settings: Device Address:1 IP Address: 10.0.0.2 Port: 502 Protocol: Modbus TCP, and for EPM 7000/7100: DNP3 over Ethernet	Default Settings: Device Address:1 IP Address: 10.0.0.1 Port: 502 Protocol: Modbus TCP
Fiber Optic	NA	NA	NA	Baud Rate: 9600, 19200, 38400, 57600 Port: COM 1 - COM 256 (OS dependent) Protocol: Modbus ASCII or RTU, DNP3 Flow Control: None or Hardware Echo Mode: No Echo or Static Echo. Static Echo should only be used when connecting to Fiber Optic devices that are configured for Echo. Parity: None	NA
USB	NA	NA	NA	NA	Port: the PC's USB port Baud Rate: 57600 Protocol: ASCII 8 Data Bits, Parity None, 1 Stop Bit, Flow Control None

* With Runtime Firmware version 26 or higher

Table 3–2: EPM 9000 Series Meter Connection Settings

Connection Type	EPM 9450/9650/9700	EPM 9800	EPM 9900/9900P
ANSI Optical Port	NA	Port: the PC's USB Port Baud Rate up to 57600	Port: the PC's USB port Baud Rate up to 57600
RS485	Baud Rate: up to 115200 Protocol: Modbus RTU	Baud Rate: up to 115200 Protocol: Modbus RTU	Baud Rate: up to 115200 Protocol: Modbus RTU
Ethernet/WiFi/Fiber Optic (Fiber Optic is available only for the EPM 9900/ 9900P meters)	Default Settings are: Device Address:1 IP Address: 10.0.0.1 Port: 502 Protocol: Modbus TCP	Default Settings are: Device Address:1 IP Address: 10.0.0.1 Port: 502 Protocol: Modbus TCP	Default Settings are: Device Address:1 IP Address: 10.0.0.1 (10.0.0.2 for the second Ethernet card) Port: 502 Protocol: Modbus TCP
Internal Modem	EPM 9450/9650 only: Protocol: Modbus ASCII Device Address: 1	Protocol: Modbus ASCII Device Address: 1	NA
USB	EPM 9700 only: Port: the PC USB port Baud Rate: up to 115200 Protocol: Modbus RTU	NA	Port: the PC's USB port Baud Rate: up to 115200 Protocol: Modbus RTU

3.2 Connecting Directly to Your Meter

You can connect directly to your meter in one of three ways:

- Through a Serial Port (“Connect through a Serial Port” on page 3-4)
- Through a Network (“Connect through a Network” on page 3-6)
- Through an IrDA Port, if supported (see the meter Instruction Guide)

3.2.1 Connect through a Serial Port

When you connect to a meter through a serial port, you make a direct, wired connection between one of your PC ports and one of the meter ports. Depending on the meter, you will be using either the PC USB port or RS232 port to connect to either the USB port or RS485 port of the meter.

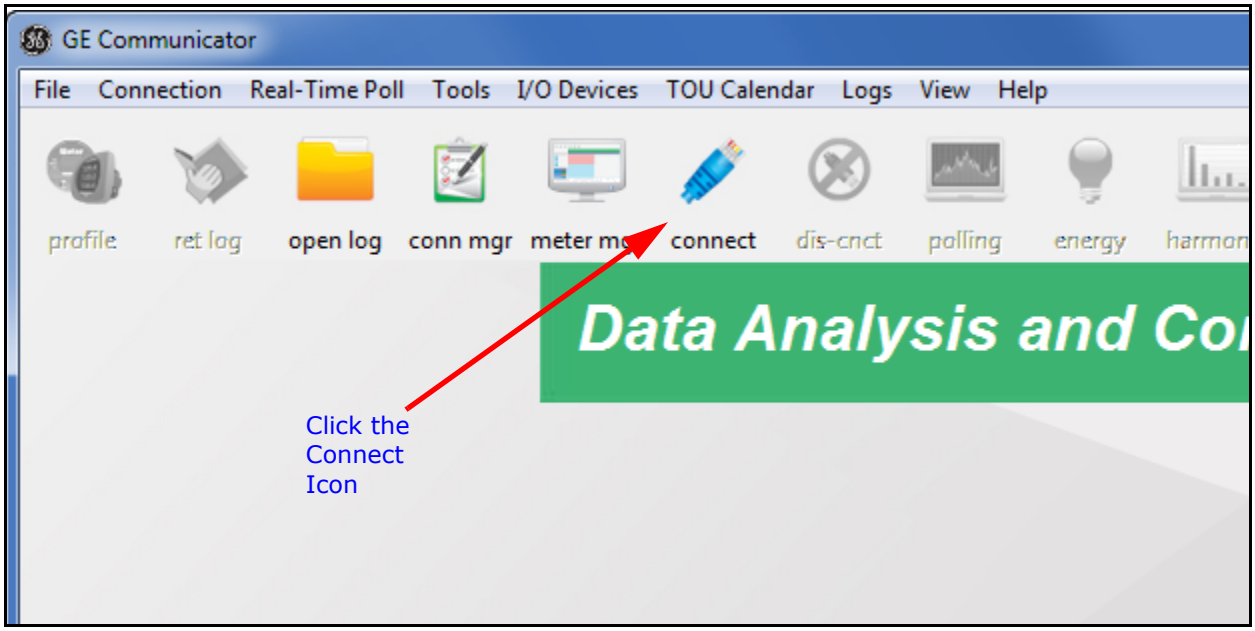
Since many newer PCs don’t have RS232 ports, you may need an adapter to convert your USB port to RS485 communication. If you do have an RS232 connection, you will need to use an RS232 to RS485 converter.

Irrespective of the type of serial connection, the screens you use to connect to the meter with GE Communicator software are the same. Refer to your meter instruction manual for wiring details for the serial connection.

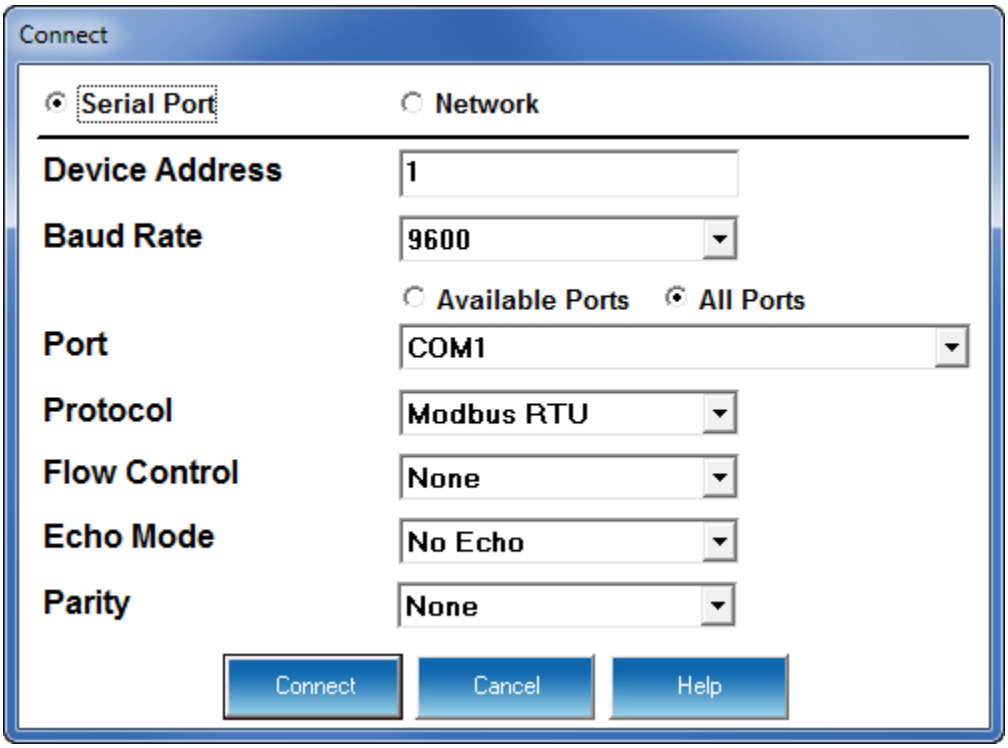
When connecting via a serial port or a modem, GE MeterManager is not an option. You must use the traditional GE Communicator software solutions, as described above.

1. From the GE Communicator application’s Mains screen, click on the Connect

icon. (You can also click **Connection > Quick Connect** from the Menu Bar.)



2. The Connect screen opens. You will use this screen to specify your serial connection settings.



3. Note that the **Serial Port** button is selected.

   Enter the following information:

   - **Device Address** - the Modbus address of the meter; you can change this address to any number 1-247, unless you have a demo version of GE Communicator software. In that case you cannot change the Device Address: it must be 1.
   - **Baud Rate** - select from the pull-down menu.
   - **Available Ports** - select the port to use from the pull-down menu. This button causes the software to search for the port it thinks will be appropriate for your use.
   - **Protocol** - select from the pull-down menu.
   - **Flow Control** - select **None** or **Hardware**.
   - **Echo Mode** - select **No Echo** or **Static Echo**. Static Echo should only be used when connecting to Fiber Optic devices that are configured for Echo.
   - **Parity** - select from **None**, **Even**, or **Odd**.

   EPM meters default to Modbus protocol and Parity: None.

   The user can change the baud rate as desired.

   The default protocol is almost always Modbus RTU, unless communicating using the IrDA port, or through the modem, in which case the protocol defaults to Modbus ASCII.

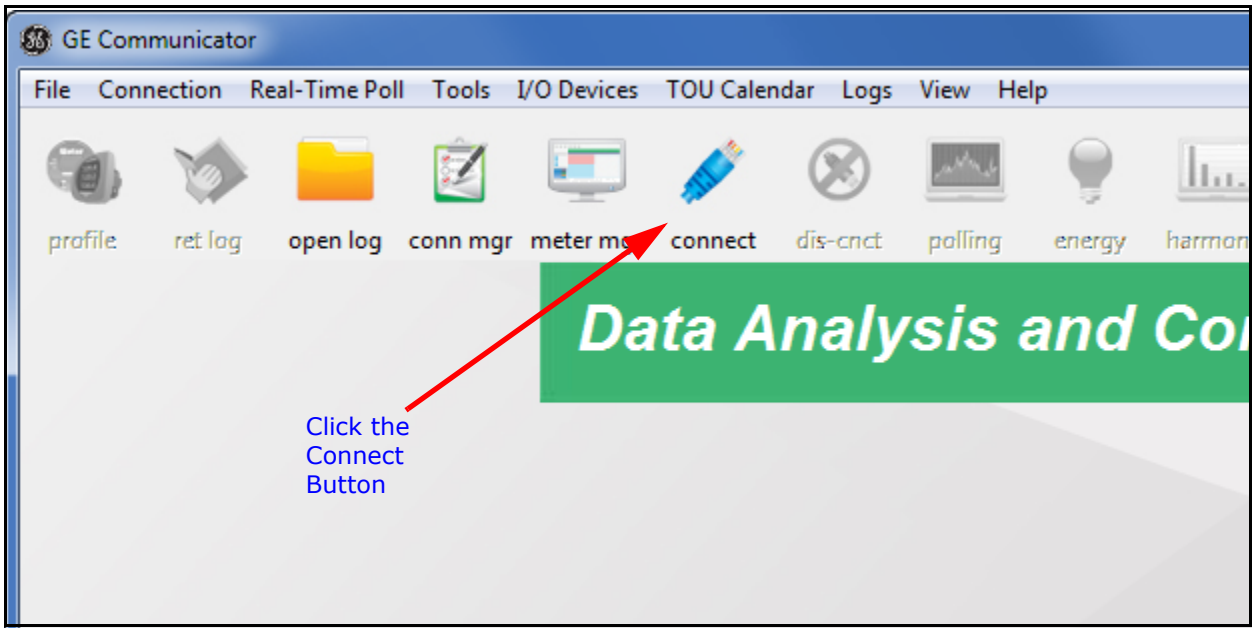
4. Click **Connect** to connect to the meter with these settings. Once you are connected, the Device Status screen for the meter opens.

3.2.2 Connect through a Network

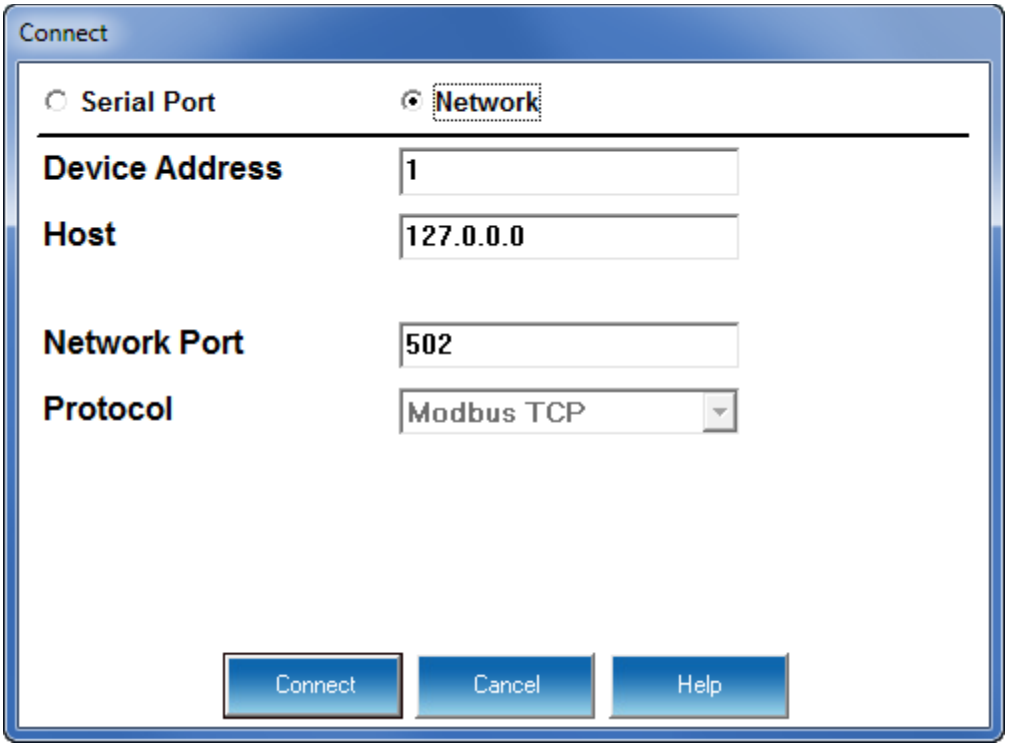
When you connect to a meter through a network you are not wired directly to the meter. Your network can be wireless or wired, depending on the meter you are connecting to.

All EPM meters offer either optional or standard 10/100BaseT Ethernet wired (RJ45) Network connections.

1. From the GE Communicator application Main screen, click the **Connect** button. (You can also click **Connection > Quick Connect** from the Menu Bar.)



2. The Connect screen opens. Click the **Network** button to change to the Network connection screen. You will use this screen to specify your network connection settings.



3. Enter the following information:
   - **Device Address** - the Modbus address of the meter; you can change this address to any number 1-247, unless you have a demo version of GE Communicator software. In that case you cannot change the Device Address: it must be 1.
   - **Host** - the meter's IP address.
   - **Network Port** - the default is 502; you can change this if necessary.
4. Click **Connect** to connect to the meter with these settings. Once you are connected, the Device Status screen for the meter appears.

   Connecting to a device through Quick Connect automatically adds the device to GE MeterManager. This is a convenient way to connect to gateway devices and Internet devices.

3.3 Using Connection Manager

Connection Manager is a feature of GE Communicator that lets you set up communication through a modem, for meters on an RS485 bus, and for meters connected through a gateway.

3.3.1 External Modem Setup

You can use an external modem to connect to EPM meters.

1. The meter communication port used for the modem connection must be configured to speak/listen to Modbus ASCII and operate at 9600 baud or match the speed of the remote modem. To configure the port, you need to establish a serial connection to the meter other than through the modem, and program the communication port following the instructions in this manual for programming your meter.
2. Install the modem connected to the computer (the "originate modem") and the modem connected to the EPM meter (the "remote modem"). See the meter Instruction Manual for details on the hardware requirements.
3. At the remote site, using RS485 communication with a Modem Manager is recommended. Set both the originate and the remote modem to operate at 9600 baud; enable Hardware Flow Control for both. If you are using a Modem Manager, you can set a higher baud rate for the meter (up to 38400).
   - If you are using RS232 communication without a Modem Manager, set both modems to operate at 9600 baud; disable Flow Control for both.
4. You then use Connection Manager to set up the communication through the Modem - see "Setting up Connection Manager" on page 3-9 for instructions.

3.3.2 Internal Modem Setup

EPM 9450/9650, and 9800 meters offer an optional Internal Modem and a Combo Ethernet/Modem option.

The Internal Modem option eliminates modem hardware and cabling to create modem connection that is easier to use. Simply install the modem connected to the computer (the originate modem) and add a phone line.

The meter must be configured to speak Modbus ASCII. The Internal Modem Option may operate at a programmable baud rate up to 57600. We recommend a baud rate of 57600.

To set the configuration:

1. Install the modem connected to the computer (the "originate modem"). See the meter Instruction Manual for details of the hardware requirements.
2. Set the originate modem to operate at 57600 baud; enable Hardware Flow Control. In the Baud Rate field, enter 57600 (recommended baud rate for internal modem connections).

NOTE

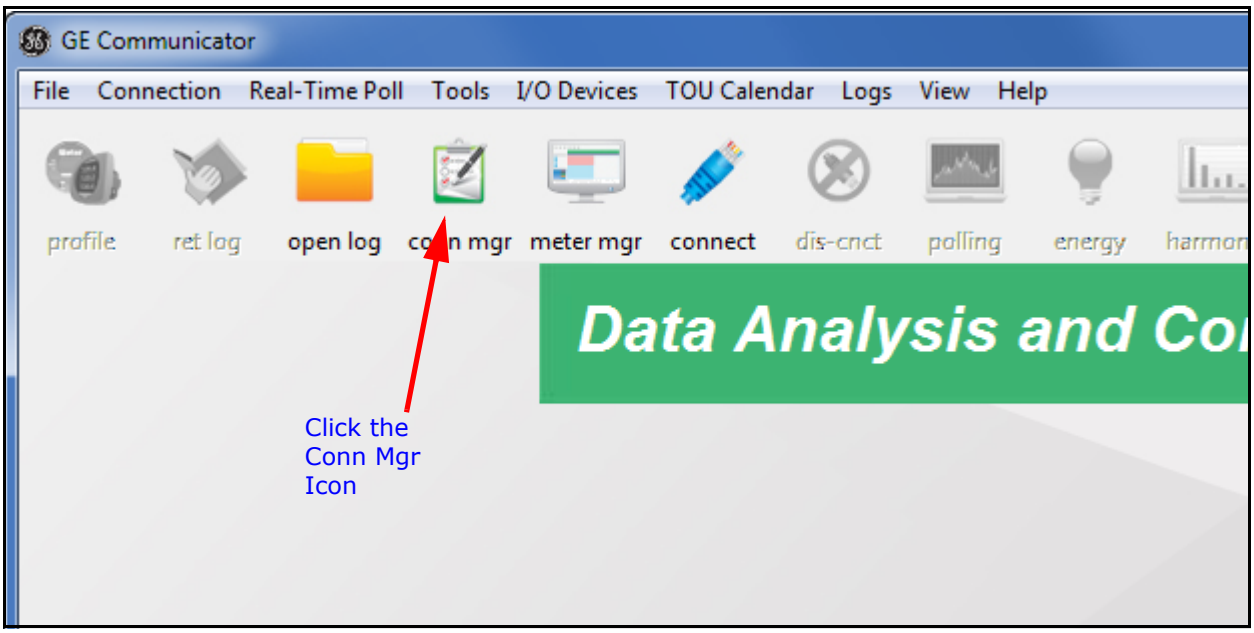
For modems prior to V.90, use a lower baud rate, e.g., 38400 for a 33.6k modem; 19200 for a 14.4k modem.

3. At the remote site, just plug a phone line into the meter. The address will be 1. (If you are connecting to multiple EPM units on a bus, you must also assign a unique address, other than 1, to each unit).
4. You then use Connection Manager to set up the communication through the Modem - see "Setting up Connection Manager" on page 3-9 for instructions.

3.3.3 Setting up Connection Manager

Use Connection Manager to add or remove connection locations and/or devices at locations.

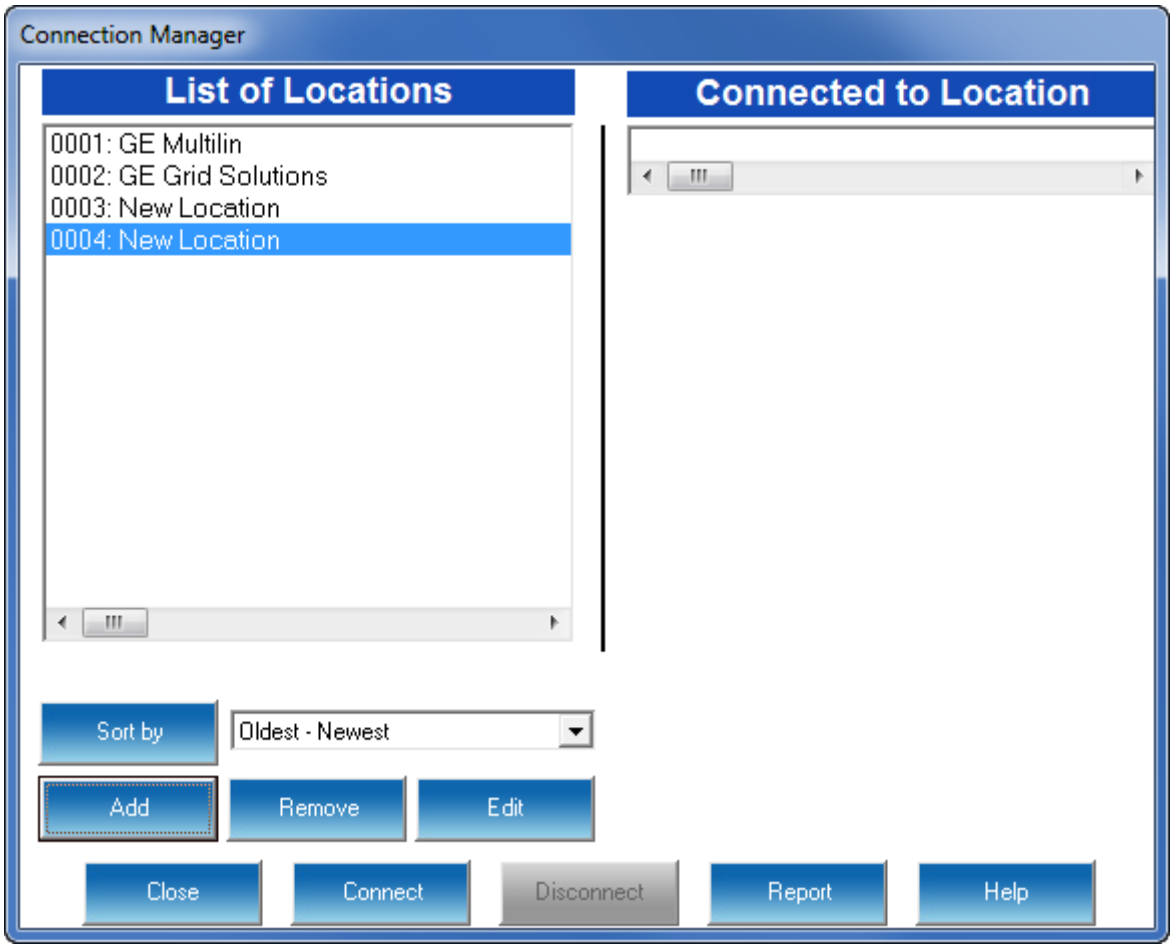
1. From the GE Communicator Main screen, click the **Connection Manager** (conn mgr) icon, or select **Connection > Connection Manager**.



2. The Connection Manager screen opens.

NOTE

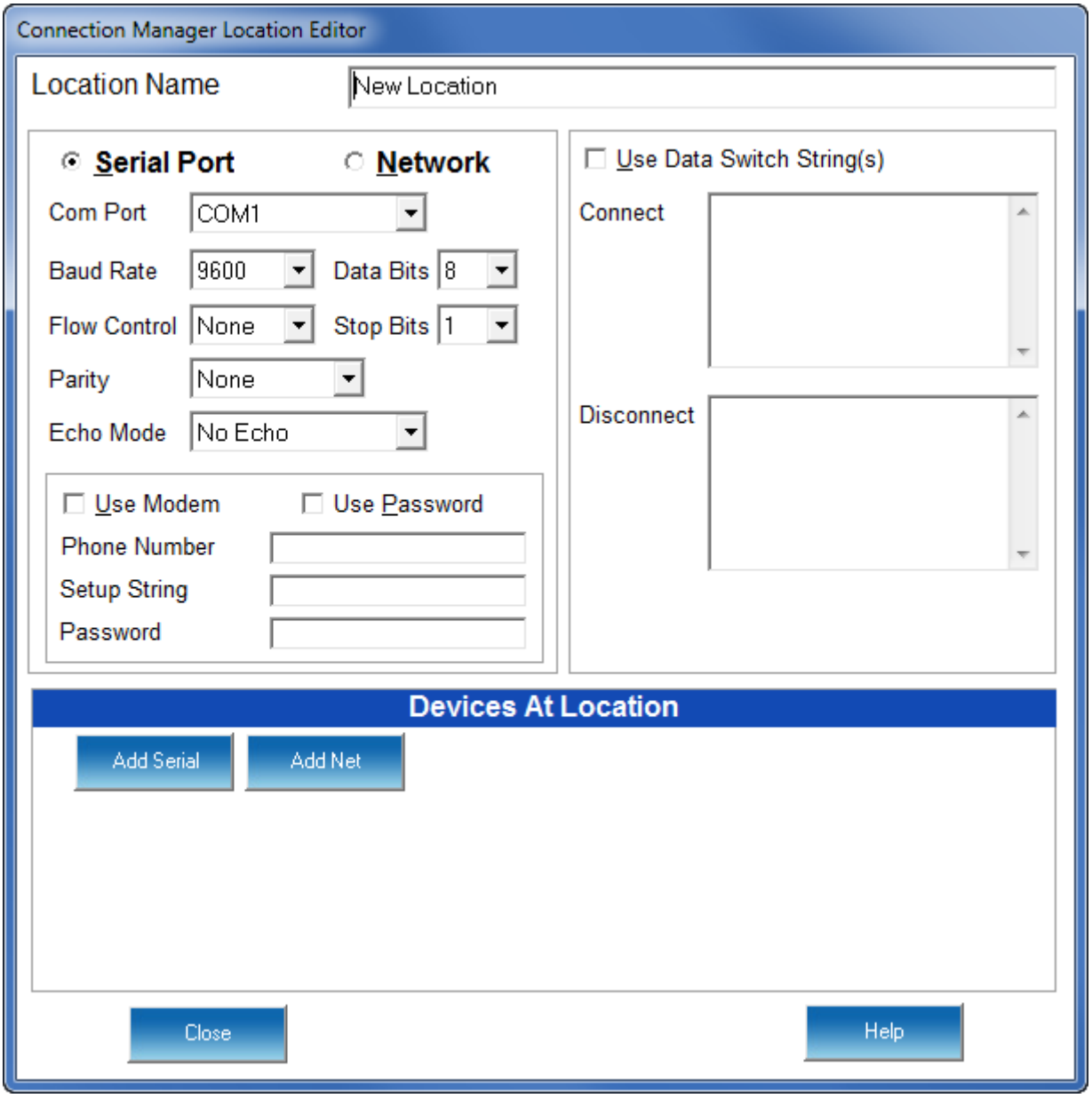
To copy the Connection Manager settings to other PCs, see "Merging Connection Manager Databases" on page 3-18.)



3. On the left side of the Connection Manager screen there is a List of Locations. These are the locations of one or more meters to which you can connect. You can add a location and/or a device; edit a location and/or device; or remove a location and/or device.
4. To add a location:

   ▷ Click on a New Location field.

▷ Click **Add**. You will see the Connection Manager Location Editor screen. On this screen, you program the communication settings for each New Location.



▷ Type a Name for the New Location.

▷ Click **Serial Port** or **Network**.

▷ Enter Communications Settings:

- **Com Port:** COM 1 - 99
- **Baud Rate:** 1200 - 115200
- **Flow Control:** None or Hardware
- **Data Bits:** 8 (or 7)
- **Stop Bits:** 1 (or 1.5, 2)

- **Parity:** None (or Even, Odd)
- **Echo Mode:** No Echo Static Echo
- **Modem:** check the box if you are using a modem and enter the modem's phone number and setup string, if applicable

  Refer to the tables in "Overview" on page 3-1 for modem communication settings and also to the meter's Installation and Operation manual for additional details, e.g., modem strings.

  This is just the initial Com settings. Specific devices must be added to connect, as specified below.
- **Password:** check the box if a password is required and enter the password

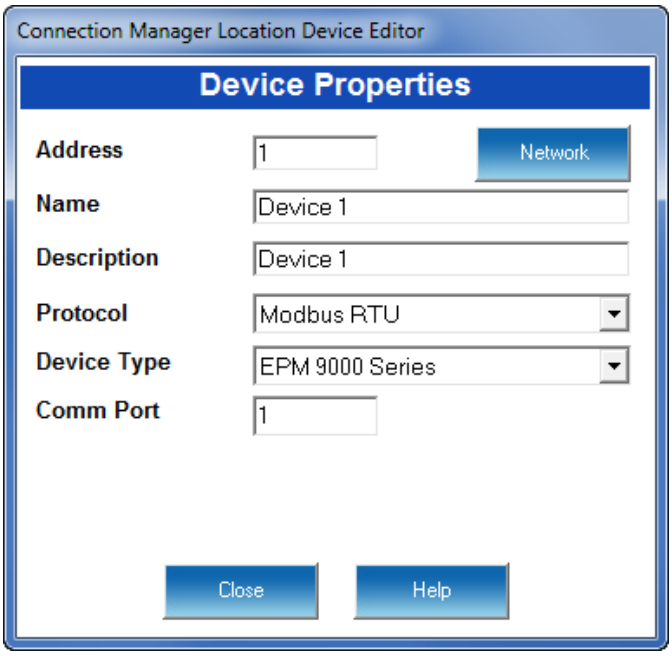
▷ To Add a Device, click **Add Serial** (to add a Serial Port connected device) or **Add Net** (to add a Network connected device) in the Devices at Location box. Then click on the Device and click **Edit**.

- To Edit a Device, select the Device from the Devices at Location box (scroll down to find all devices) and click Edit.
- To Remove a Device, select the Device from the Devices at Location box and click **Remove**.

  You can add up to 255 Devices (Serial Port and/or Network connected) at one Location.

  All devices must have the same connection parameters: Baud, Parity and Flow Control.

  Having multiple devices slows down polling.



▷ You will see the Connection Manager Location Device Editor screen, which you use to program the Device Properties for each device at a Location.

- If the Device has a Serial Port Device Connection, you will see the example screen on the left.
- If the Device has a Network Device Connection, you will see the example screen on the right.

  Click the **Network** or **Serial** buttons at the top of the screen to switch connection type screens.

▷ Enter Device Properties:

- **Address:** 1 - 247 (Unique Address)
- **Name**: Device Name
- **Description**: (Type and Number, for example)
- **Protocol**: Modbus RTU, Modbus ASCII, Modbus TCP, EI Protocol (when supported)
- **Device Type**: EPM 4600, etc.
- **Comm Port**: 1 -256 (Serial Port Only)
- **IP Address**:100.10.10.10 (for example) (Network Only)
- **Network Port**: 502 (Network Only)

▷ Click **Close** to save settings and return to the Connection Manager Location Editor screen.

5. To Edit a Location:

   ▷ Select a Location from the **List of Locations** box.

   ▷ Click **Edit**. The Connection Manager Location Editor screen appears, displaying the current settings for the location.

   ▷ Make any changes to settings and/or devices at the location.

   ▷ Click **Close** to exit the screen.

6. To Remove a Location:

   ▷ Select a Location from the **List of Locations** box.

   ▷ Click **Remove**.

   ▷ Click **Yes** in the Confirmation window that opens.

7. To Sort the List of Locations:

   ▷ Select a **sort method** (A-Z, Z-A, Newest-Oldest or Oldest-Newest) from the pull-down menu.

   ▷ Click **Sort By**.

8. To Connect to a Location:

   ▷ Select the Location you want to connect to from the List of Locations box.
   You may only connect to one location at a time. To change to a different location, you must disconnect from the current location by selecting it and clicking **Disconnect**.

   ▷ Click **Connect**.
   When the connection is made, the selected location appears in the **Connected To Location** field at the top of the screen.

▷ Click **Close**.
The Device Status screen opens, confirming the connection. The Computer Status Bar at the bottom of the screen also confirms the computer's connection parameters.

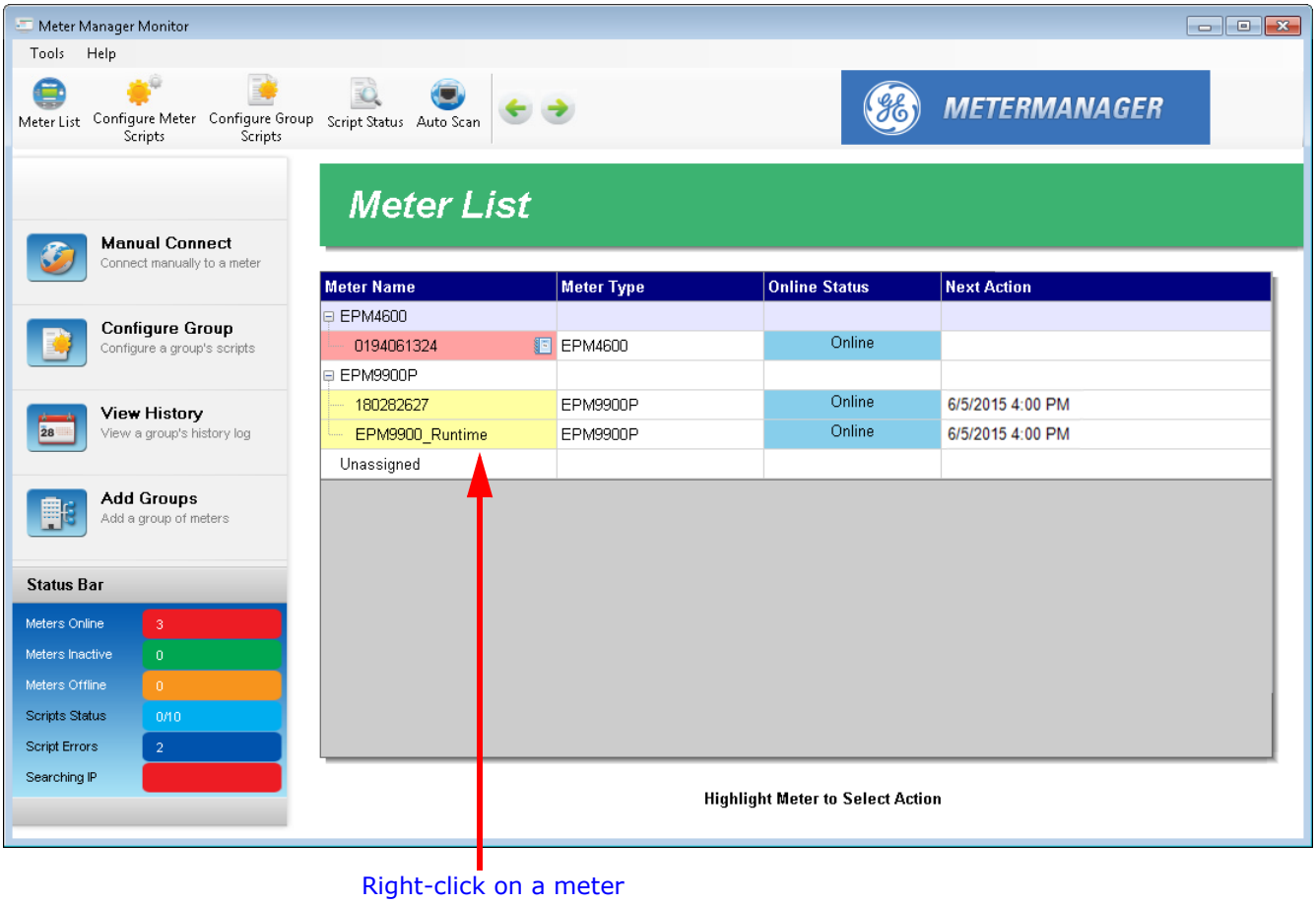
NOTE

If the connection fails, a popup screen will alert you. Check that all cables are secure, that the cable is connected to the correct COM Port on the PC, and that the PC is set to use the same baud rate and protocol as the EPM meter.

3.4 Using GE MeterManager

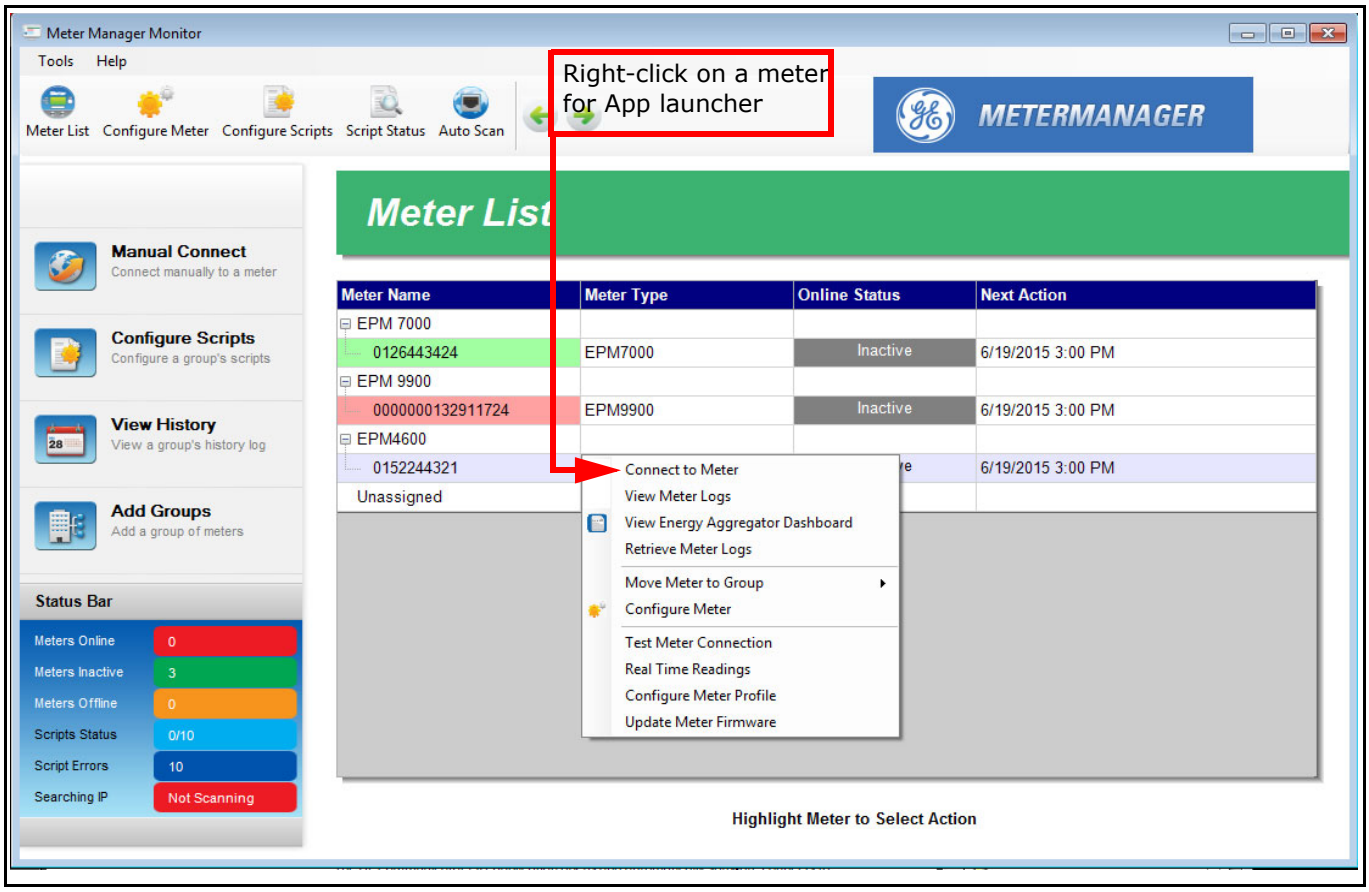
GE MeterManager gives you an easy method of connecting to your meters. The software automatically finds meters on your network and lists them by meter type, so that you can manage them and view their data easily. This is an Ethernet only solution. If you need to use a serial connection or modem, see the previous sections.

1. From the GE MeterManager Monitor right-click the meter you want to connect to.



Right-click on a meter

2. You will see the submenu shown below. The submenu provides you with a list of the different apps that can be launched, giving you multiple options for viewing the selected meter's data.



3. Click **Connect to Meter**.

   The GE Communicator application opens and automatically software connects to the meter. You will see the Main screen.

   If you want to view meter data right away, you can click **Real Time Readings** from the submenu to open the Real Time polling screen. See Chapter 5 "Polling Your Meter" for information on polling.

   See Chapter 18 "GE MeterManager" for a complete explanation of GE MeterManager.

3.5 Disconnecting from a Meter

To disconnect from an EPM meter or from a location (Connection Manager), do one of the following:

- From the GE Communicator Main screen, click the **Disconnect** icon.
- From the GE Communicator Main screen, select **Connection > Disconnect**.
- From the Connection Manager screen, select the location from the **Connected to Location** field and click **Disconnect**.

NOTE

When using a modem, it is important to disconnect from communications properly so that the remote modem receives a “hang up” command. Some modems may “freeze” when improperly disconnected.

3.6 Changing the Primary Device

One copy of GE Communicator connected to multiple EPM meters may only view data or edit Device Profiles from one device at a time—the Primary Device. (An exception is the Poll Multiple Devices screen; see Chapter 5 “Polling Your Meter” for details.)

To change the Primary Device:

1. Select **Connection > Change Primary Device**.
2. From the pull-down men, select the address of the device you want to designate as the Primary Device.
3. Click **OK**.

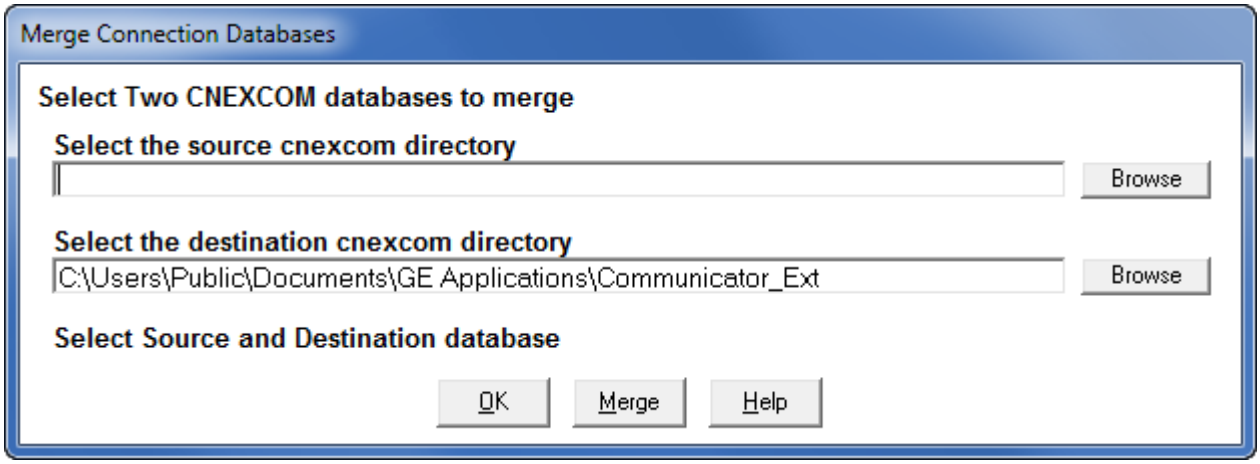
   The Device Status screen will now list the new Primary Device first.

3.7 Merging Connection Manager Databases

The Connection database is the database that stores all of the meter connection information. This feature allows you to combine two sets of cnexcom databases. You might want to do this to copy Connection Manager settings to another PC.

- This setting only applies to Connection Manager.

1. Click **Connection > Merge Connection Databases**.



2. Click the **Browse** button next to each field to select the two databases to combine.

   The Source cnexcom database will be merged into the Destination cnexcom database.

3. Click the **Merge** button to proceed with the merge; click **OK** to exit the screen.

GE Communicator

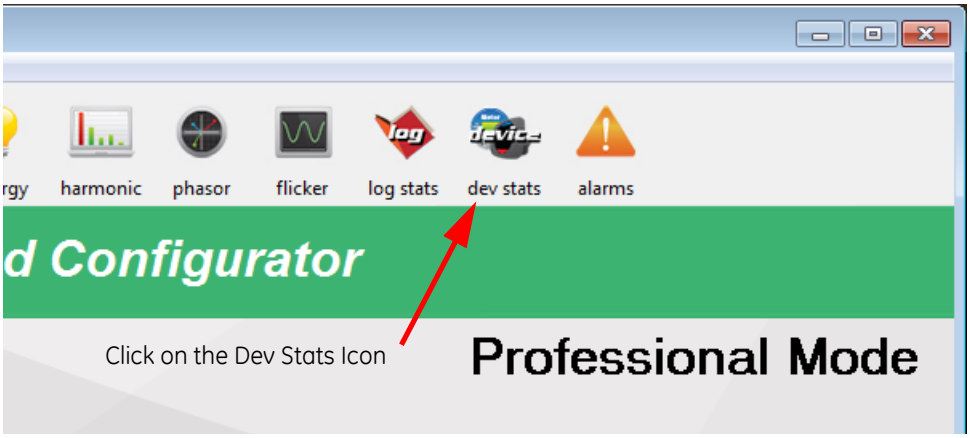
Chapter 4: Viewing Device Status

4.1 Device Status Screen

When you connect to a meter with GE Communicator software (see See Chapter 3 "Connecting to a GE Meter"), the Device Status screen of the meter you are connected to opens. You can also open the meter's Device Status screen by clicking on the **Dev Stats** icon or clicking **Tools > Retrieve Device Status**. (See See Chapter 19 "Viewing Logs" for more information on the Tools menu options.)

NOTE

If you connect to a meter through GE MeterManager, the Device Status screen does not automatically open.



The Device Status screen displays information about the meter: device ID, device type, device serial number, Software option, and firmware version. Some meter Device Status screens display additional information.

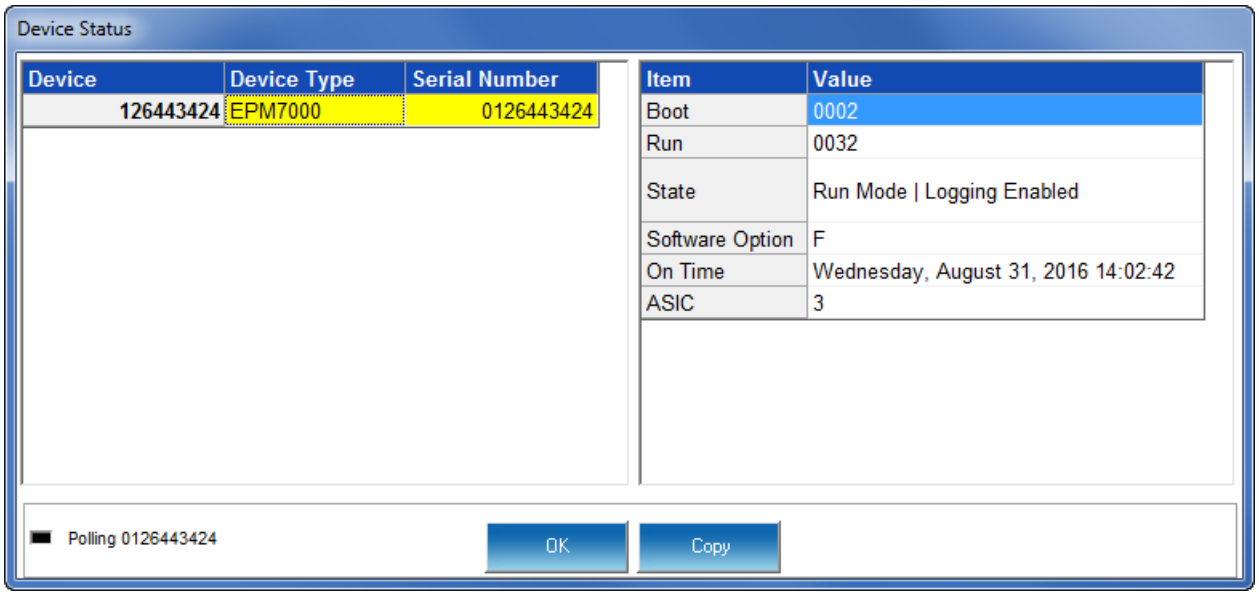
All of the Device Status screens have buttons at the bottom of the screen:

- **OK** - all of the screens have this button; click to close the screen.

- **Copy** - some of the screens have this button; click it to copy the information on the screen to the clipboard, from which you can paste it into another application, e.g., a document.
- **Help** - some of the screens have this button; click it to open information on this screen.

The following sections show all of the meter Device Status screens, with an explanation of the fields they contain.

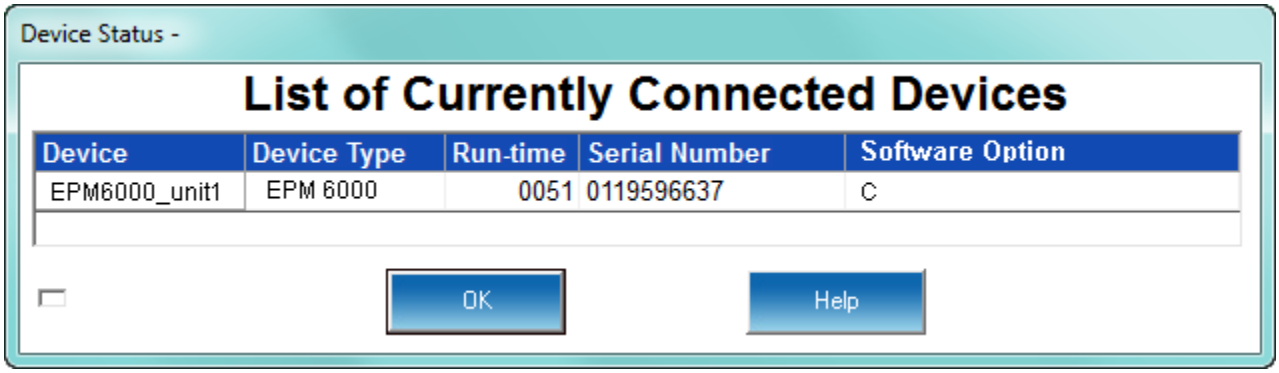
4.1.1 EPM 7000/7000T/7100 Meter



The EPM 7000/7000T/7100 Device Status screen displays:

- **Device** - the name assigned to the meter in the System Settings screen (see Chapter 8 "EPM 7000/7100 Meter".)
- **Device Type** - for example EPM 7000T - an EPM 7000 transducer
- **Serial Number**
- **Boot** - the version of the Boot firmware of the meter
- **Run** - the version of the Runtime firmware of the meter
- **State** - information about the meter, e.g., shown above Run Mode, Logging Enabled, means that the meter is running and logging is enabled for the meter
- **Software Option** - the letter of the software option currently installed in the meter
- **On Time** - the date and time the meter was last powered on
- **ASIC** - the EPM 7000 series meter has some specialized circuitry to provide advanced accuracy; this field is the internal chip hardware version

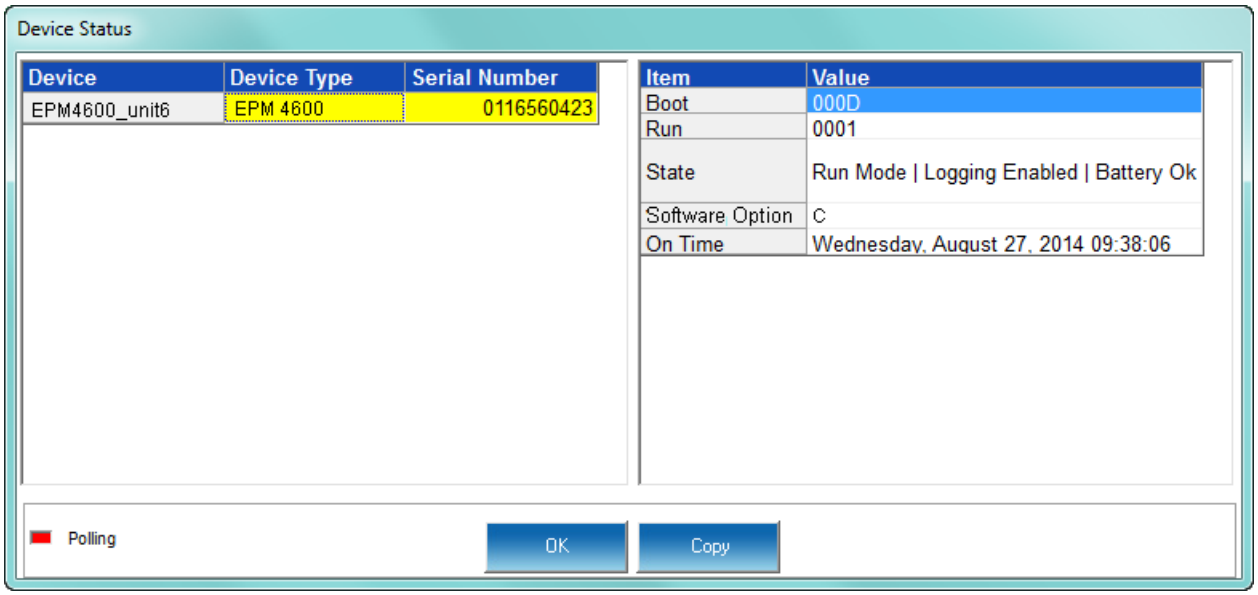
4.1.2 EPM 6000/6010/6100/2200 Meter



The EPM 6000/6010/6100/2200 Device Status screen displays:

- **Device** - the name assigned to the meter in the Settings screen (See Chapter 9 "EPM 2200/6000/6010/6100 Meter")
- **Device Type** - for example EPM 6010T - an EPM 6010T Digital Transducer meter
- **Run-time** - the version of the Runtime firmware of the meter
- **Serial Number**
- **Software Option** - the letter of the software option currently installed in the meter

4.1.3 EPM 4600 Metering System



The EPM 4600 Multi-feed Power and Energy Metering Solution Device Status screen displays the following:

- **Device** - the name assigned to the CPU in the System Settings screen (see Chapter 10 "EPM 4600 Metering System").
- **Device Type** - for example, EPM 4600
- **Serial Number**
- **Boot** - the version of the Boot firmware of the meter
- **Run** - the version of the Runtime firmware of the meter
- **State** - information about the meter, e.g., shown above Run Mode, Logging Enabled, Battery OK means that the meter is running, logging is enabled for the meter, and the meter battery has sufficient operating power
- **Software Option** - the letter of the software option currently installed in the meter
- **On Time** - the date and time the meter was last powered on

4.1.4 EPM 9700/9900/9900P Meter

Device Status

Device	Device Type	Serial Number
180282627	EPM 9900P	0000000180282627

Item	Value
Comm Boot	15.0001
Comm Run	15.0002
DSP Run	15.0000(9161RE0015.0000)
FPGA	11.3
DSP Run ID	9161
DSP Run Type	RE
Software Option	B
Comm State	IEC-61850 Server On, CTPT Calibration Table Selected, Using CID File with mismatched IP Address
DSP State	Healthy
Protection	Full Access - Password Protection Disabled and Sealing Switch Disabled
On Time	Tuesday, September 06, 2016
CF Serial #	99007150205130200165
CF FAT Type	FAT32
CF Model #	ATP COMPACT FLASH
Comm Boot Variation Strings	0005 192k Run 0006 SCL ENERGY 0007 xRAM 0008 -DSP1 0009 Cache/UPM
Comm Run Variation Strings	0005 192k Run 0006 SCL ENERGY 0007 128M 0008 -DSP1 0009 Cache/UPM 0010 Class A 00 0011 IEC61850SV
DSP Run Variation Strings	9161RE0015.0000 Multi-phasefreq Harmonics/inter 1205/10/14/2015
Current Class	20
Flags	Bit 0: 0 SNTP: No Fall Date: No Spring Date: No Cold Load: No Line Sync: No DST: Yes IRIG Active: No Bit 8: 0 IRIG Year Available: No Time Change: No Test Mode: Out Profile Change: Yes Internal Failure: No User Current Threshold: No Battery Status: OK

Polling 180282627 OK Copy

The EPM 9700/9900/9900P Device Status screen displays:

- **Device** - the name assigned to the meter in the Labels screen (see Chapter 11 "EPM 9900/9900P Meter")
- **Device Type** - for example, EPM 9900P
- **Serial Number**
- **Comm Boot** - the version of the Boot firmware of the meter's Communication processor
- **Comm Run** - the version of the Runtime firmware of the meter's Communication processor
- **DSP1/2 Boot** - the version of the Boot firmware of the meter's first/second digital signal processor (DSP1 is for EPM 9900 only)
- **DSP1/2 Run** - the version of the Runtime firmware of the meter's first/second digital signal processor (DSP1 is for EPM 9900 only)
- **FPGA** - the version of the FPGA firmware of the meter: the FPGA (field programmable gate array) is used for very high-speed sampling
- **DSP2 Run ID** - the version of the DSP2 Run ID firmware
- **DSP2 Run Type**- the version of the DSP2 Run Type firmware
- **Software Option** - the letter of the software option currently installed in the meter
- **Comm State** - the state of the meter's Communication Processor, e.g., Healthy or IEC 61850 Goose (EPM 9900P only)
- **DSP1/2 State** - the state of the meter's first/second digital signal processor, e.g., Healthy (DSP1 is for EPM 9900 only)
- **Protection** - status of meter security (password and sealing switch) - whether it is enabled or disabled
- **On Time** - the date and time the meter was last powered on
- **CF Serial #** - the manufacturer's serial number for the compact flash
- **CF FAT Type** - the file system type used on the compact flash for storage of log files
- **CF Model #** - the manufacturer's model number for the compact flash
- **Comm Boot/Run Variation Strings** - field used to indicate the configuration and functionality supported by the Boot/Run firmware (for developer use)
- **DSP1/2 Boot/Run Variation Strings** - the minimum hardware version needed to support the Boot/Run firmware (for developer use)
- **Current Class** - the Current Class supported by this meter

4.1.5 EPM 9450/9650/9800 Meter

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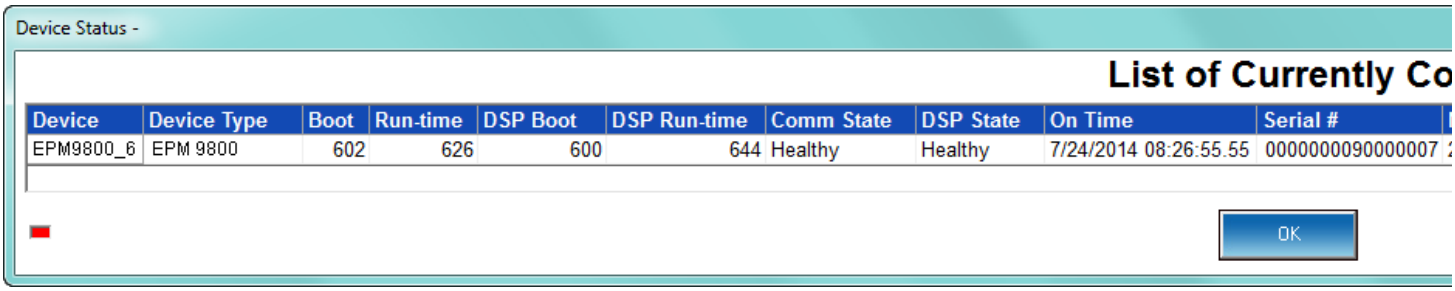
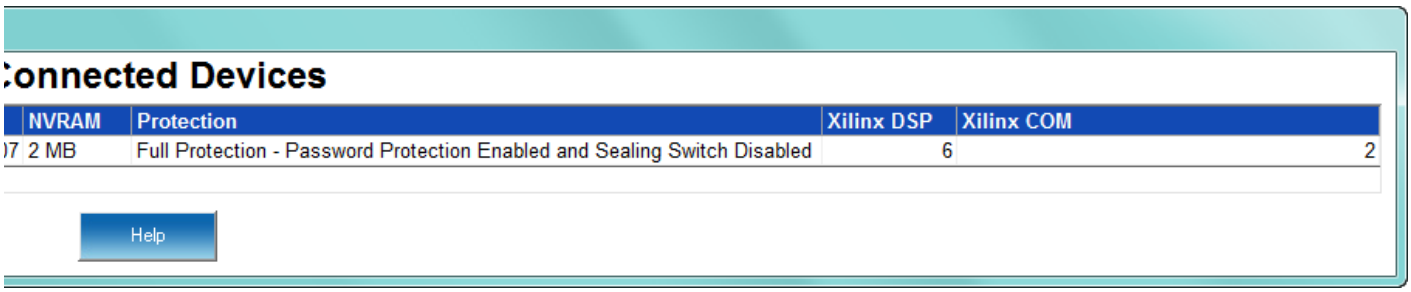


Device	Device Type	Boot	Run-time	DSP Boot	DSP Run-time	Comm State	DSP State	On Time	Serial #
EPM9800_6	EPM 9800	602	626	600	644	Healthy	Healthy	7/24/2014 08:26:55.55	0000000090000007

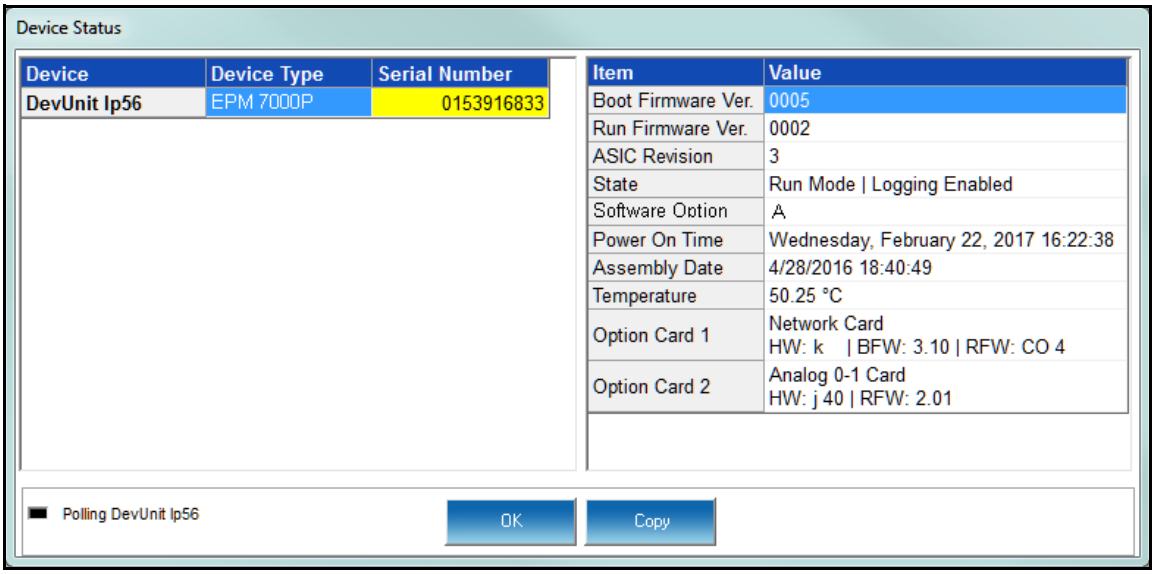


	NVRAM	Protection	Xilinx DSP	Xilinx COM
07	2 MB	Full Protection - Password Protection Enabled and Sealing Switch Disabled	6	2

The EPM 9450/9650/9800 Device Status screen displays:

- **Device** - the name assigned to the meter in the Labels screen (see Chapter 12 "EPM 9800 Meter" and Chapter 13 "EPM 9450/9650 Meter")
- **Device Type** - for example EPM 9650
- **Boot** - the version of the Boot firmware of the Communication Processor of the meter
- **Run time** - the version of the Runtime firmware of the Communication Processor of the meter
- **DSP Boot** - the version of the Boot firmware the of meter's digital signal processor
- **DSP Run time** - the version of the Runtime firmware of the meter's digital signal processor
- **Comm State** - the state of the meter's Communication Processor, e.g., Healthy
- **DSP State** - the state of the meter's digital signal processor, e.g., Healthy
- **On Time** - the date and time the meter was last powered on
- **Serial #**
- **NVRAM**
- **Protection** - status of meter security (password and sealing switch) - whether it is enabled or disabled
- **Xilinx DSP** - the build version of the gate array for the digital signal processor
- **Xilinx COM** - the build version of the gate array for the communication processor

4.1.6 EPM 7000P Meter



The EPM 7000P Device Status screen displays:

- **Boot Firmware Version**.
- **Run Firmware Version**.
- **ASIC Revision**: the meter has some specialized circuitry to provide its advanced accuracy - this field is the internal chip's hardware version.
- **State**: information about the meter, e.g., shown in the example screen, Run Mode, Logging Enabled, means that the meter is running and logging is enabled for the meter.
- **Software Option**: the current Software Option level.
- **Power On Time**: the date and time the meter was last powered on.
- **Assembly Date**: the date and time of meter manufacture.
- **Temperature**: temperature of the meter, in Celsius.
- **Option Card 1/Option Card 2**: information about any option cards in the meter.
- **Protection**: the 250 meter's screen shows the status of Security for the meter; e.g., Security: Passwords Enabled.

GE Communicator

Chapter 5: Polling Your Meter

5.1 Overview

EPM meters offer Real Time polling, which lets you view instantaneous and stored values within one or several meters. GE Communicator software provides tabular views of metered values, circuit measurements, interval data, power quality values, pulse data and Input/Output status and accumulations. The Real-Time Polling features are divided into three groups, accessed by clicking the Real-Time Poll menu:

- Real Time Readings
- Revenue, Energy and Demand Readings
- Power Quality and Alarms

In addition, the EPM 9900/9900P meter has a feature to view RTU data from connected slave devices. Other EPM meters also have a feature that allows for real-time trend polling.

Some polling screens are different for the different meter types. Depending on your meter type and ordered options, you may not have all of the polling screens shown in this chapter.

GE Communicator software receives data from one connected device at a time—the Primary Device. To view polling data from multiple devices, either select **Poll Multiple Devices** (5.2.4 *Poll Multiple Devices*) or change the Primary Device (select **Connection > Change Primary Device**; see 3.6 *Changing the Primary Device* for instructions).

Some of the polling screens are directly available by clicking on an icon in the Icon Bar. This is explained in the relevant sections.

5.1.1 Polling Screen Buttons

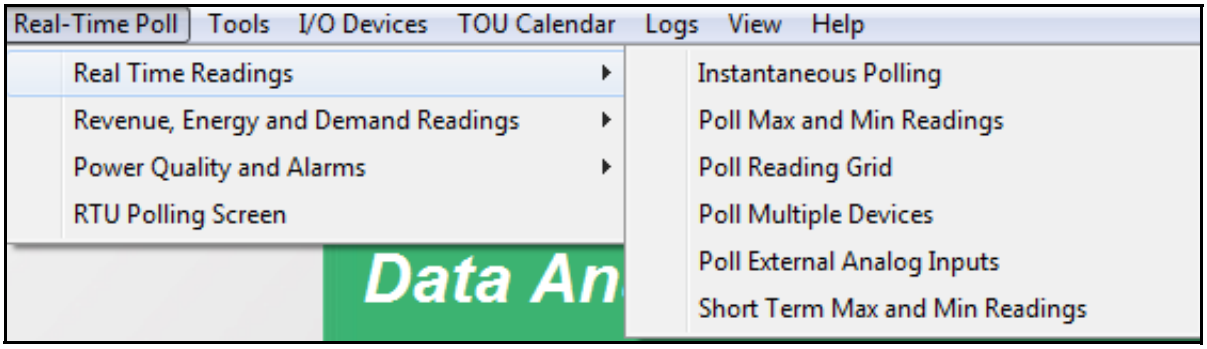
All of the polling screens have buttons at the bottom of the screen that let you perform certain tasks. The buttons and their actions are as follows:

- **Print** - click to send a copy of the screen to a printer.
- **Pause** - click to stop polling.
- **Resume** - click to restart polling which has been stopped.
- **Copy** - click to copy the data to the clipboard from where it can be brought into another application, e.g., a spreadsheet or an email.
- **Export** - click to export the data to a file - you will be prompted to set the file name and location.
- **Help** - click to view instructions for the screen.
- **OK** - click to return to the Main screen.

NOTE

The polling screen for a given meter will have some combination of the above buttons.

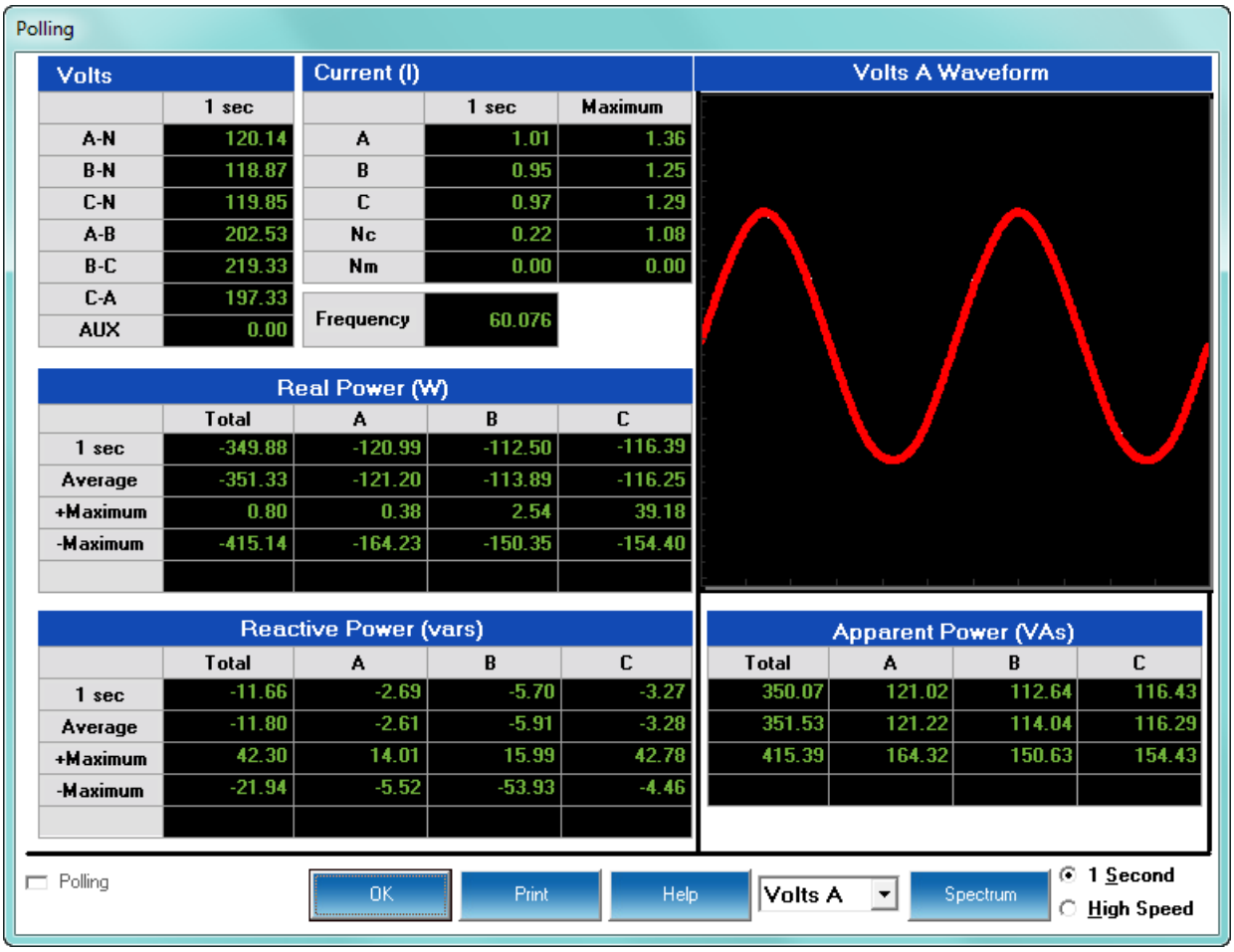
5.2 Real Time Readings



The menu above is for EPM 9900/9900P meter - the menu for your meter may look a bit different.

5.2.1 Instantaneous Polling

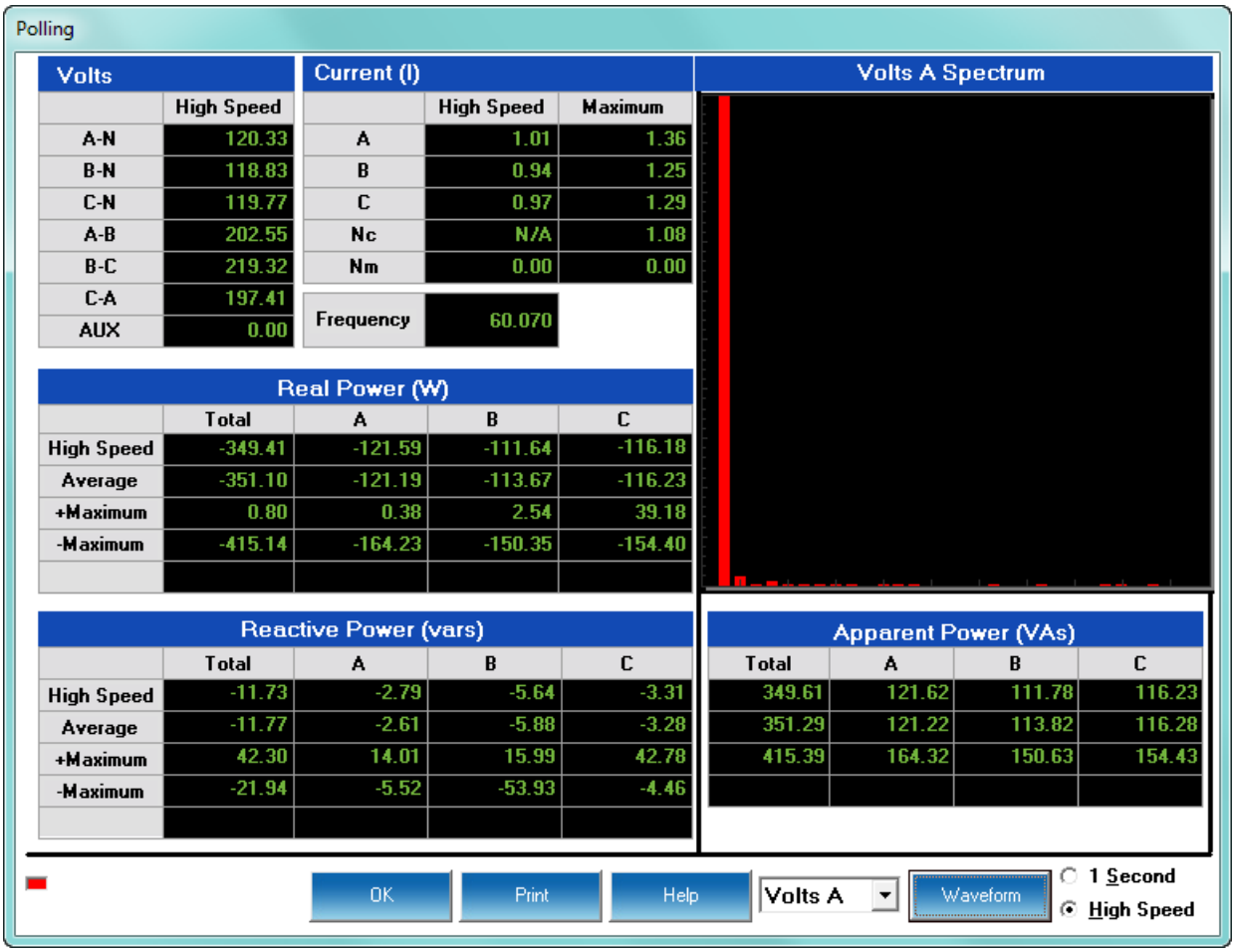
To view instantaneous polling data for the primary device, either select Instantaneous Polling from the **Real-Time Poll > Real Time Readings** menu, or click the **Polling** button in the Icon Bar.



If you are connected to EPM 9000 series meter, you will see the screen shown above. If you are connected to an EPM 7000 series meter you will see a similar screen, but without the “AUX” or “Nm” readings and with an “-Average” reading for Reactive Power.

The graphic representation on the right side of the screen is determined by the option selected from the pull-down menu at the bottom of the screen (Volts A, B, C; Current A, B, C). Select either spectrum or waveform view by clicking on the Spectrum/Waveform button.

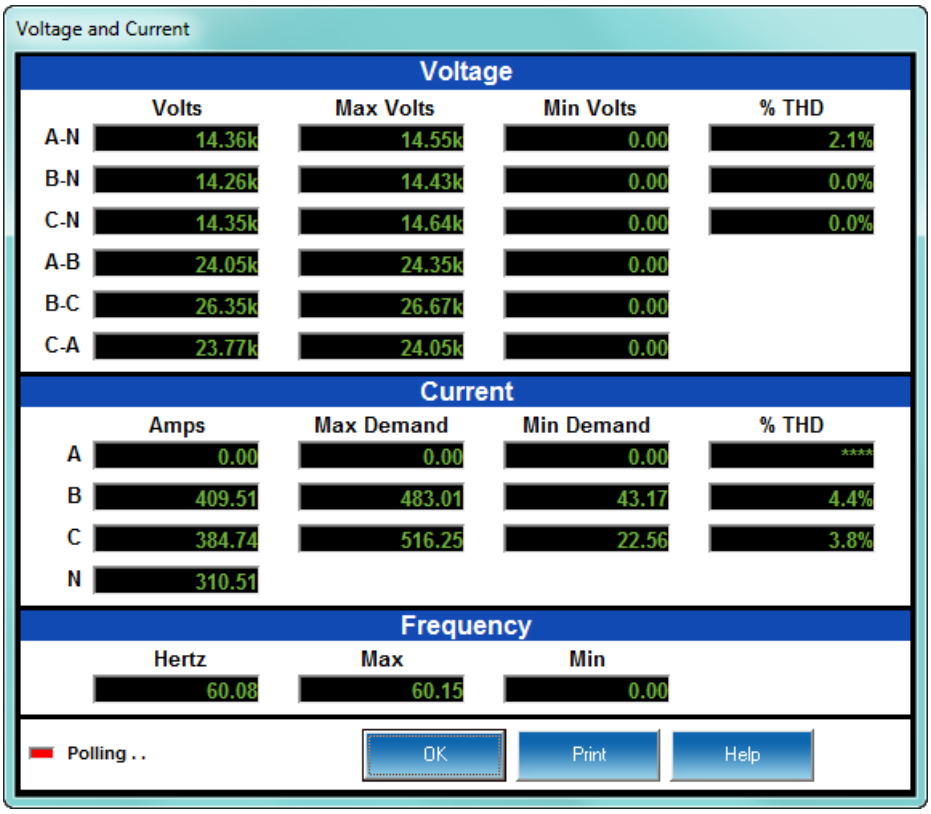
An example of the spectrum display is shown below.



- Click the radio button in the lower right corner to select either 1 Second or High Speed measurements for all data. The high-speed options is only available for EPM 9000 series meters with extensive high-speed readings.

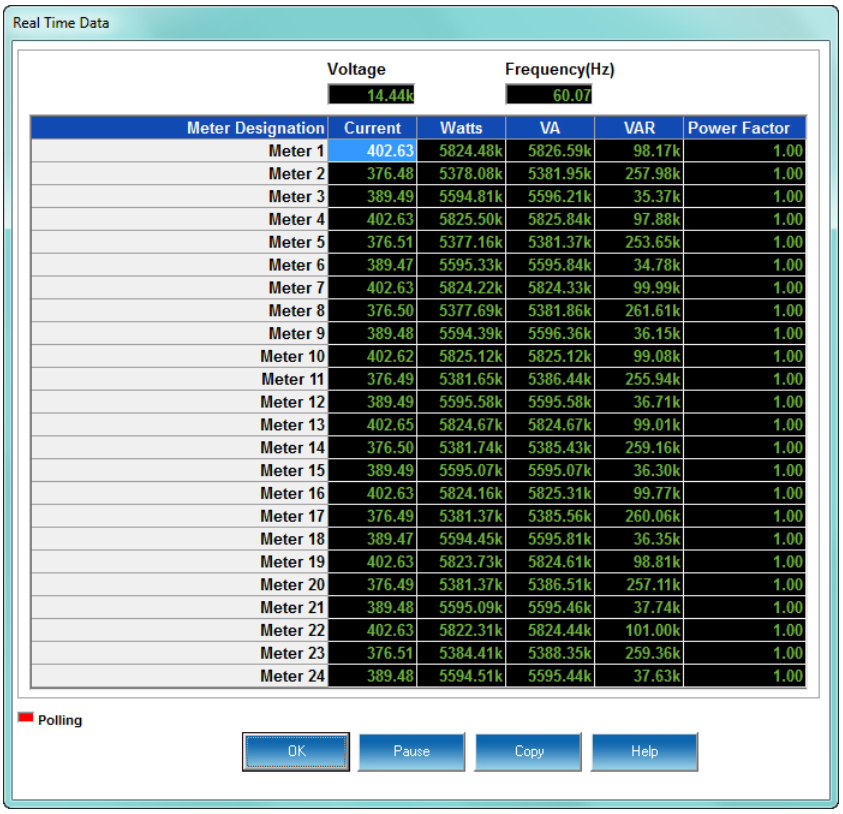
If you are connected to an EPM 6000 meter, you will see the following screen showing:

- Voltage per phase and phase to phase
- Maximum and minimum voltage readings
- THD for voltage
- Amps per phase
- Maximum and minimum Demand
- THD for current
- Frequency, including maximum and minimum frequency



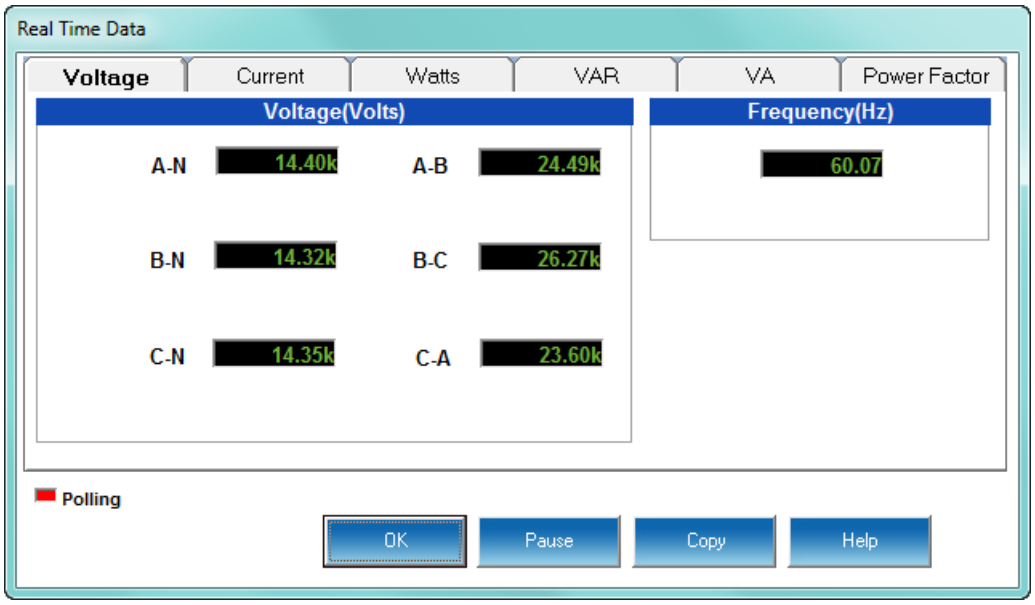
If you are connected to an EPM 4600 metering system, you will see one of the following screens:

- EPM 4600-S single phase configuration showing Voltage, Frequency, Current, Watts, VAR, VA, and Power Factor real time readings for all 24 meters:



Meter Designation	Current	Watts	VA	VAR	Power Factor
Meter 1	402.63	5824.48k	5826.59k	98.17k	1.00
Meter 2	376.48	5378.08k	5381.95k	257.98k	1.00
Meter 3	389.49	5594.81k	5596.21k	35.37k	1.00
Meter 4	402.63	5825.50k	5825.84k	97.88k	1.00
Meter 5	376.51	5377.16k	5381.37k	253.65k	1.00
Meter 6	389.47	5595.33k	5595.84k	34.78k	1.00
Meter 7	402.63	5824.22k	5824.33k	99.99k	1.00
Meter 8	376.50	5377.69k	5381.86k	261.61k	1.00
Meter 9	389.48	5594.39k	5596.36k	36.15k	1.00
Meter 10	402.62	5825.12k	5825.12k	99.08k	1.00
Meter 11	376.49	5381.65k	5386.44k	255.94k	1.00
Meter 12	389.49	5595.58k	5595.58k	36.71k	1.00
Meter 13	402.65	5824.67k	5824.67k	99.01k	1.00
Meter 14	376.50	5381.74k	5385.43k	259.16k	1.00
Meter 15	389.49	5595.07k	5595.07k	36.30k	1.00
Meter 16	402.63	5824.16k	5825.31k	99.77k	1.00
Meter 17	376.49	5381.37k	5385.56k	260.06k	1.00
Meter 18	389.47	5594.45k	5595.81k	36.35k	1.00
Meter 19	402.63	5823.73k	5824.61k	98.81k	1.00
Meter 20	376.49	5381.37k	5386.51k	257.11k	1.00
Meter 21	389.48	5595.09k	5595.46k	37.74k	1.00
Meter 22	402.63	5822.31k	5824.44k	101.00k	1.00
Meter 23	376.51	5384.41k	5388.35k	259.36k	1.00
Meter 24	389.48	5594.51k	5595.44k	37.63k	1.00

- EPM 4600-T three phase configuration with tabs showing Voltage, Current, Watts, VAR, VA, and Power Factor real time readings:



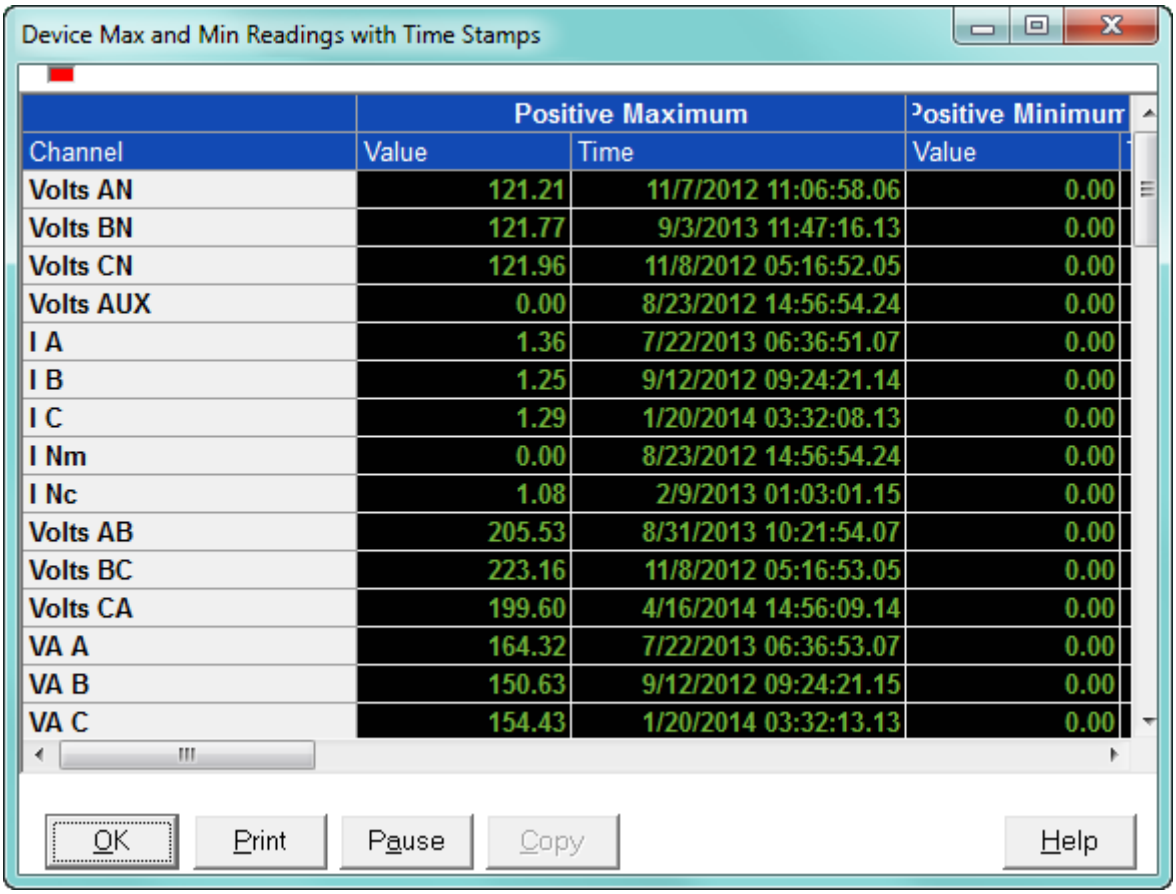
5.2.2 Poll Max and Min Readings

To view the maximum and minimum readings for the currently connected device, select **Poll Max and Min Readings** from the **Real-Time Poll > Real Time Readings** menu.

NOTE

The Max/Min is the Max/Min of the Thermal Average in the profile.

You will see the following screen above if you are connected to an EPM 9000 series meter.



	Positive Maximum		Positive Minimum
Channel	Value	Time	Value
Volts AN	121.21	11/7/2012 11:06:58.06	0.00
Volts BN	121.77	9/3/2013 11:47:16.13	0.00
Volts CN	121.96	11/8/2012 05:16:52.05	0.00
Volts AUX	0.00	8/23/2012 14:56:54.24	0.00
I A	1.36	7/22/2013 06:36:51.07	0.00
I B	1.25	9/12/2012 09:24:21.14	0.00
I C	1.29	1/20/2014 03:32:08.13	0.00
I Nm	0.00	8/23/2012 14:56:54.24	0.00
I Nc	1.08	2/9/2013 01:03:01.15	0.00
Volts AB	205.53	8/31/2013 10:21:54.07	0.00
Volts BC	223.16	11/8/2012 05:16:53.05	0.00
Volts CA	199.60	4/16/2014 14:56:09.14	0.00
VA A	164.32	7/22/2013 06:36:53.07	0.00
VA B	150.63	9/12/2012 09:24:21.15	0.00
VA C	154.43	1/20/2014 03:32:13.13	0.00

- Use the scroll bars to access all data.
- To adjust the column width, position the cursor on a line between columns at the top of the screen. When the cursor changes to a left/right arrow, hold down the left mouse button and drag the column border left or right. Release the button when the column is at the desired width.
- You need to pause polling (click the **Pause** button) before you can copy data from this screen.

You will see the following screen if you are connected to an EPM 4600-S metering system.

Maximum and Minimum Readings

Parameters	Maximum		Minimum	
	Value	Time	Value	Time
Voltage	14.57k	4/16/2014 14:57:12	0.00	1/24/2014 14:50:27
Frequency	60.08	1/24/2014 15:24:24	0.00	1/24/2014 14:50:27

Polling

Current | + Watts | - Watts | VA | + VAR | - VAR | + PF | - PF

Meter	Maximum	Maximum	Minimum	Minimum
	Value	Time	Value	Time
Meter 1	466.83	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 2	483.00	4/16/2014 15:00:00	3.79	1/24/2014 15:30:00
Meter 3	515.59	1/23/2014 07:15:00	1.96	1/24/2014 15:30:00
Meter 4	466.84	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 5	483.02	4/16/2014 15:00:00	3.79	1/24/2014 15:30:00
Meter 6	515.59	1/23/2014 07:15:00	1.96	1/24/2014 15:30:00
Meter 7	466.81	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 8	483.01	4/16/2014 15:00:00	3.79	1/24/2014 15:30:00
Meter 9	515.60	1/23/2014 07:15:00	1.96	1/24/2014 15:30:00
Meter 10	466.81	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 11	483.00	4/16/2014 15:00:00	3.78	1/24/2014 15:30:00
Meter 12	515.62	1/23/2014 07:15:00	1.96	1/24/2014 15:30:00
Meter 13	466.86	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 14	483.04	4/16/2014 15:00:00	3.79	1/24/2014 15:30:00
Meter 15	515.63	1/23/2014 07:15:00	1.96	1/24/2014 15:30:00
Meter 16	466.81	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 17	483.00	4/16/2014 15:00:00	3.78	1/24/2014 15:30:00
Meter 18	515.57	1/23/2014 07:15:00	1.96	1/24/2014 15:30:00
Meter 19	466.83	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 20	483.02	4/16/2014 15:00:00	3.78	1/24/2014 15:30:00
Meter 21	515.60	1/23/2014 07:15:00	1.96	1/24/2014 15:30:00
Meter 22	466.87	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
Meter 23	483.05	4/16/2014 15:00:00	3.79	1/24/2014 15:30:00
Meter 24	515.66	1/23/2014 07:15:00	1.97	1/24/2014 15:30:00

OK
Copy
Help

Maximum and minimum value and the time it occurred are shown for each of the readings. Click on the tabs to see readings for all of the 24 meters.

You will see the following screen if you are connected to an EPM 4600-T metering system.

Maximum and Minimum Readings

meter 5 | meter 6 | meter 7 | meter 8
meter 1 | meter 2 | meter 3 | meter 4

Reading Name	Maximum		Minimum	
	Value	Time	Value	Time
Volts A-N	14.57k	4/16/2014 14:40:37	0.00	1/24/2014 14:50:27
Volts B-N	14.45k	4/16/2014 14:45:34	0.00	1/24/2014 14:50:27
Volts C-N	14.67k	1/24/2014 15:38:41	0.00	1/24/2014 14:50:27
Volts A-B	25.06k	4/16/2014 14:42:13	0.00	1/24/2014 14:50:27
Volts B-C	26.60k	4/16/2014 14:27:36	0.00	1/24/2014 14:50:27
Volts C-A	23.85k	4/16/2014 14:37:17	0.00	1/24/2014 14:50:27
Frequency	60.08	8/29/2014 04:32:06	0.00	1/24/2014 14:50:27
I A	466.91	4/16/2014 15:15:00	6.14	1/24/2014 15:30:00
I B	483.09	4/16/2014 15:00:00	3.80	1/24/2014 15:30:00
I C	515.73	1/23/2014 07:15:00	1.99	1/24/2014 15:30:00
+Watts Total	19.87M	4/16/2014 15:15:00	137.44k	1/24/2014 15:30:00
+VAR Total	471.86k	4/16/2014 15:30:00	4119.60	1/24/2014 15:30:00
-Watts Total	-5.71	1/24/2014 15:30:00	0.00	1/14/2014 14:57:33
-VAR Total	-5084.13	1/14/2014 22:45:00	0.00	1/14/2014 14:57:33
VA Total	19.88M	4/16/2014 15:15:00	139.83k	1/24/2014 15:30:00
+Power Factor Total	0.97	1/24/2014 15:45:00	1.00	6/8/2014 22:45:00
-Power Factor Total	0.00	1/14/2014 14:57:33	0.00	1/24/2014 15:30:00
I N	591.70	7/7/2014 17:30:00	7.58	1/24/2014 15:30:00
+Watts A	6782.29k	4/16/2014 15:15:00	0.00	1/24/2014 15:15:00
+Watts B	6960.36k	4/16/2014 15:00:00	52.42k	1/24/2014 15:30:00
+Watts C	7378.50k	1/23/2014 07:15:00	0.00	1/24/2014 15:30:00
+VAR A	117.97k	4/16/2014 15:15:00	0.00	1/24/2014 15:15:00
+VAR B	316.71k	1/24/2014 15:00:00	2149.74	1/24/2014 15:30:00
+VAR C	64.44k	1/23/2014 07:15:00	0.00	1/14/2014 23:00:00
-Watts A	-9.92	1/24/2014 15:30:00	0.00	1/14/2014 14:57:33
-Watts B	-24.05	1/24/2014 15:45:00	0.00	1/14/2014 14:57:33
-Watts C	-82.09k	1/24/2014 15:45:00	0.00	1/14/2014 14:57:33
-VAR A	-393.58	1/24/2014 15:45:00	0.00	1/14/2014 14:57:33
-VAR B	-77.87	1/24/2014 15:30:00	0.00	1/14/2014 14:57:33
-VAR C	-84.29k	1/24/2014 15:00:00	0.00	1/14/2014 14:57:33
VA A	6783.48k	4/16/2014 15:15:00	0.00	1/24/2014 15:15:00
VA B	6970.27k	4/16/2014 15:00:00	53.62k	1/24/2014 15:30:00

Polling

OK

Copy

Help

Maximum and minimum value and the time it occurred are shown for all of the readings. Click on the meter tabs to see data for each of the 8 meters.

5.2.3 Poll Reading Grid

The Polling Grid screen is only available for EPM 9000 series meters. To view all available polling data of the currently connected device, select **Poll Reading Grid** from the **Real-Time Poll > Real Time Readings** menu. You will see the screen shown below.

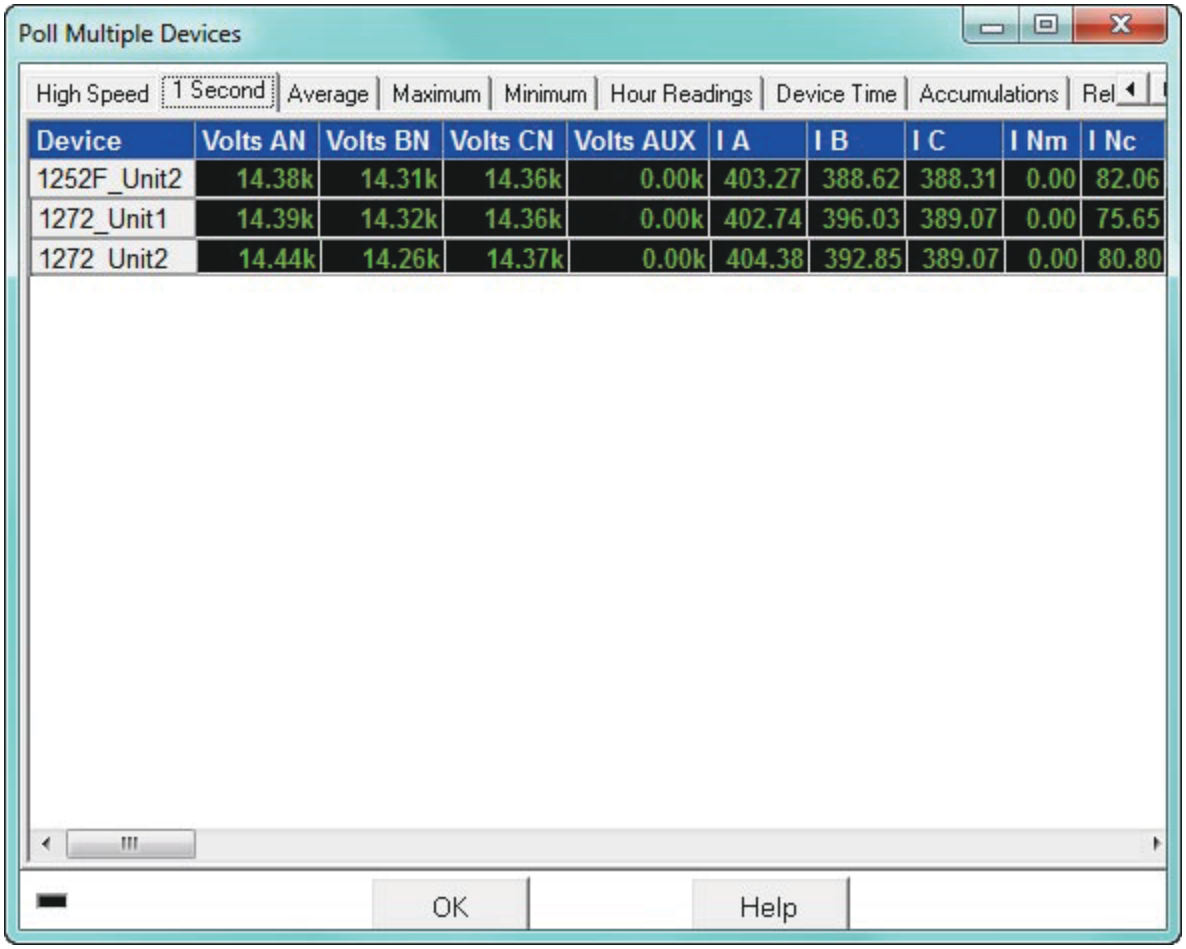
Channel	High Speed	1 second	Average	+Maximu
Volts AN	119.89	120.08	120.16	
Volts BN	119.33	119.33	119.09	
Volts CN	119.69	119.62	119.72	
Volts AUX	0.00	0.00	0.00	
I A	1.01	1.01	1.01	
I B	0.99	0.99	0.95	
I C	0.98	0.97	0.97	
I Nm	0.00	0.00	0.00	
I Nc	0.19	0.20	0.22	
Volts AB	202.34	202.36	202.46	
Volts BC	219.57	219.58	219.47	

Coincident Channel	P Max Watt	N Max Watt	P Min Watt	N Min Watt
Thermal Average VAR	2.25	-14.60	0.00	-0.01
Block Window Average VAR	0.00	-13.17	0.00	0.00
Rolling Window Average VAR	0.00	-14.90	0.00	0.00

- Use the scroll bars to access all data.
- The first two columns are Instantaneous values, column 3 is the Thermal average, columns 4 - 7 are the positive and negative Thermal maximum and minimum values, and column 8 is a single cycle value captured during the last screen update.
- To adjust the column width, position the cursor on a line between columns at the top of the screen. When the cursor changes to a left/right arrow, hold down the left mouse button and drag the column border left or right. Release the button when the column is at the desired width.
- You need to pause polling (click the **Pause** button) before you can copy the data in this screen.

5.2.4 Poll Multiple Devices

To view polled data from multiple devices connected to your computer, select Poll Multiple Devices from the Real-Time Poll>Real Time Readings menu. You will see the screen shown below.



Device	Volts AN	Volts BN	Volts CN	Volts AUX	I A	I B	I C	I Nm	I Nc
1252F_Unit2	14.38k	14.31k	14.36k	0.00k	403.27	388.62	388.31	0.00	82.06
1272_Unit1	14.39k	14.32k	14.36k	0.00k	402.74	396.03	389.07	0.00	75.65
1272_Unit2	14.44k	14.26k	14.37k	0.00k	404.38	392.85	389.07	0.00	80.80

This screen lets you see real time readings for all of the meters you are connected to; not just the primary meter as the other screens show. Click on the tabs to access the following readings:

NOTE

If a particular meter does not support a reading or option, there will be no data shown in the unsupported fields.

- **High Speed** - the following high speed readings for the meter: Volts AN, BN, CN, Aux, IA, B, C, Nm, Volts AB, BC, CA, VA A, B, C, Total, VAR A, B, C, Total, Watt A, B, C, Total, Freq, Power Factor A, B, C, Total, VAN Aux, Update Time.
- **1 Second** - the following 1 second readings: Volts AN, BN, CN, Aux, IA, B, C, Nm, Nc, Volts AB, BC, CA, VA A, B, C, Total, VAR A, B, C, Total, Watt A, B, C, Total, Freq, Power Factor A, B, C, Total, Imb V, I, Update Time.
- **Average** - average value of the following readings: Volts AN, BN, CN, Aux, IA, B, C, Nm, Nc, Volts AB, BC, CA, VA A, B, C, Total, VAR A, B, C, Total, Watt A, B, C, Total, Freq, Power Factor A, B, C, Total, Imb V, I, Update Time.

- **Maximum** - maximum value of the following readings: Volts AN, BN, CN, Aux, IA, B, C, Nm, Nc, Volts AB, BC, CA, VA A, B, C, Total, P VAR A, B, C, Total, N VAR A, B, C, Total, P Watt A, B, C, Total, N Watt A, B, C, Total, Update Time.
- **Minimum** - minimum value of the following readings: Volts AN, BN, CN, Aux, IA, B, C, Nm, Nc, Volts AB, BC, CA, VA A, B, C, Total, P VAR A, B, C, Total, N VAR A, B, C, Total, P Watt A, B, C, Total, N Watt A, B, C, Total, Update Time.
- **Hour Readings** - the following readings: Quad (1+4) Watthour, Quad 1 VAhour, Quad 1 VARhour, Quad 4 VAhour, Quad 4 VARhour, Quad (2+3) Watthour, Quad 2 VAhour, Quad 2 VARhour, Quad 3 VAhour, Quad 3 VARhour.
- **Device Time** - the Date and Time, Internal Temperature of the meter.
- **Accumulations** - the following readings: I Squared T A, I Squared T B, I Squared T C, V Squared T A, V Squared T B, V Squared T C.
- **Relay Status** - the status of any meter relays.
- **Internal Inputs** - the status of any meter internal inputs.

Use the scroll bars to access all data.

5.2.5 Poll External Analog Inputs

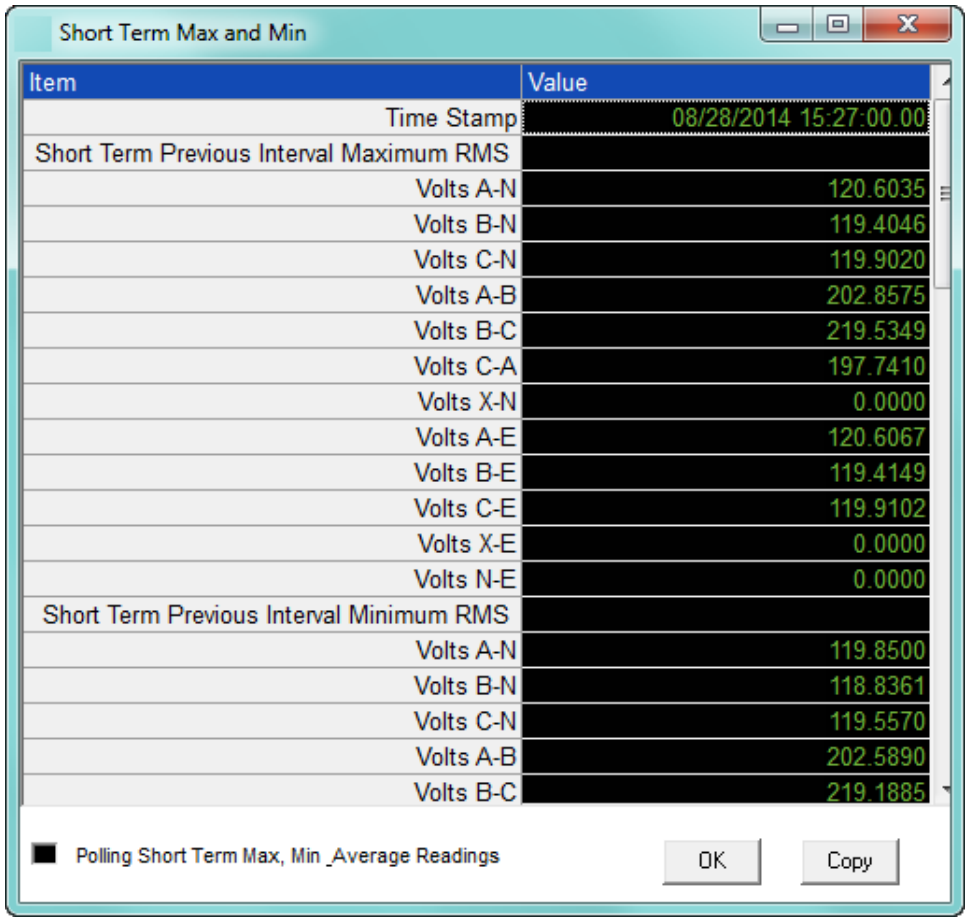
EPM 9000 series meters have the capability of receiving information from external analog input modules. These modules can tell a user about many different process values. Such values can include temperature, humidity, flow, and many others. Other EPM meters do not have this feature.

To view readings from any external Analog Input modules connected to your meter, select **Poll External Analog Inputs** from the **Real-Time Poll > Real Time Readings** menu. You will see the screen shown below.

- The name, Raw value and primary value are shown for each of the meter's external analog inputs. Use the scroll bar to display all of the data.
- The name can be programmed in the meter's programmable settings. See the individual meter chapters for instructions.

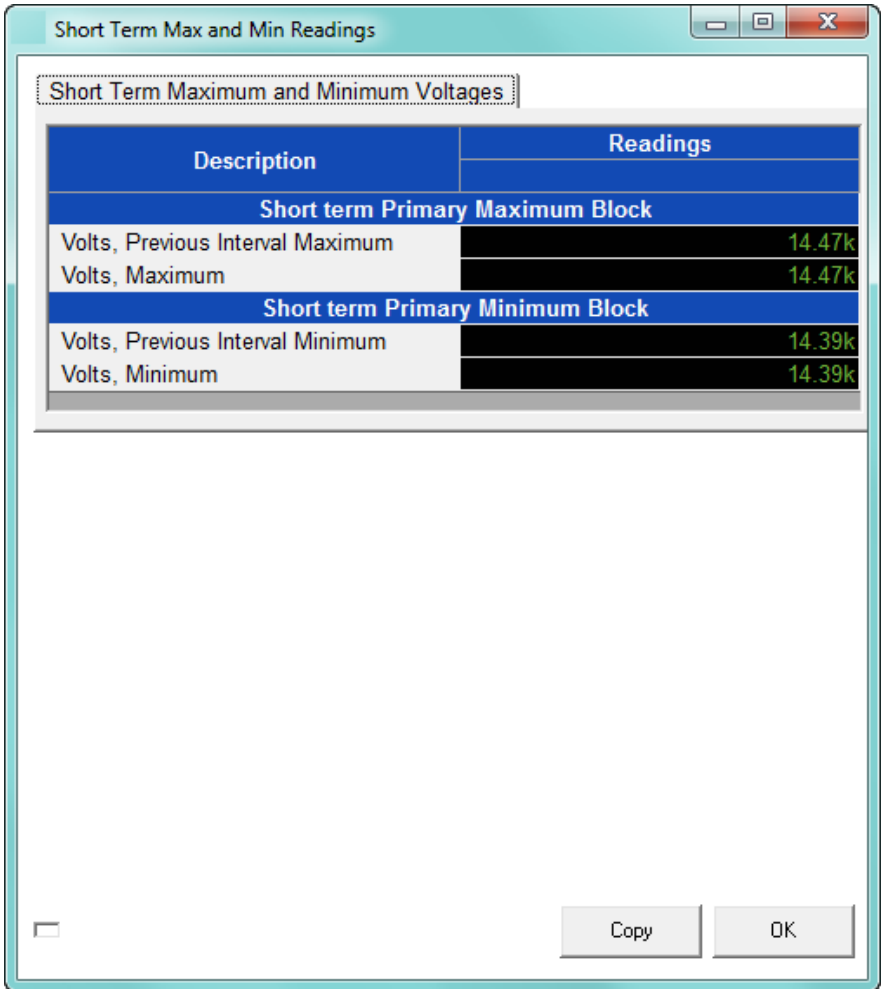
5.2.6 Poll Short Term Max and Min Readings

To see values for short term maximum and minimum readings, select **Poll Short Term Max and Min Readings** from the **Real-Time Poll > Real Time Readings** menu. You will see the screen shown below.



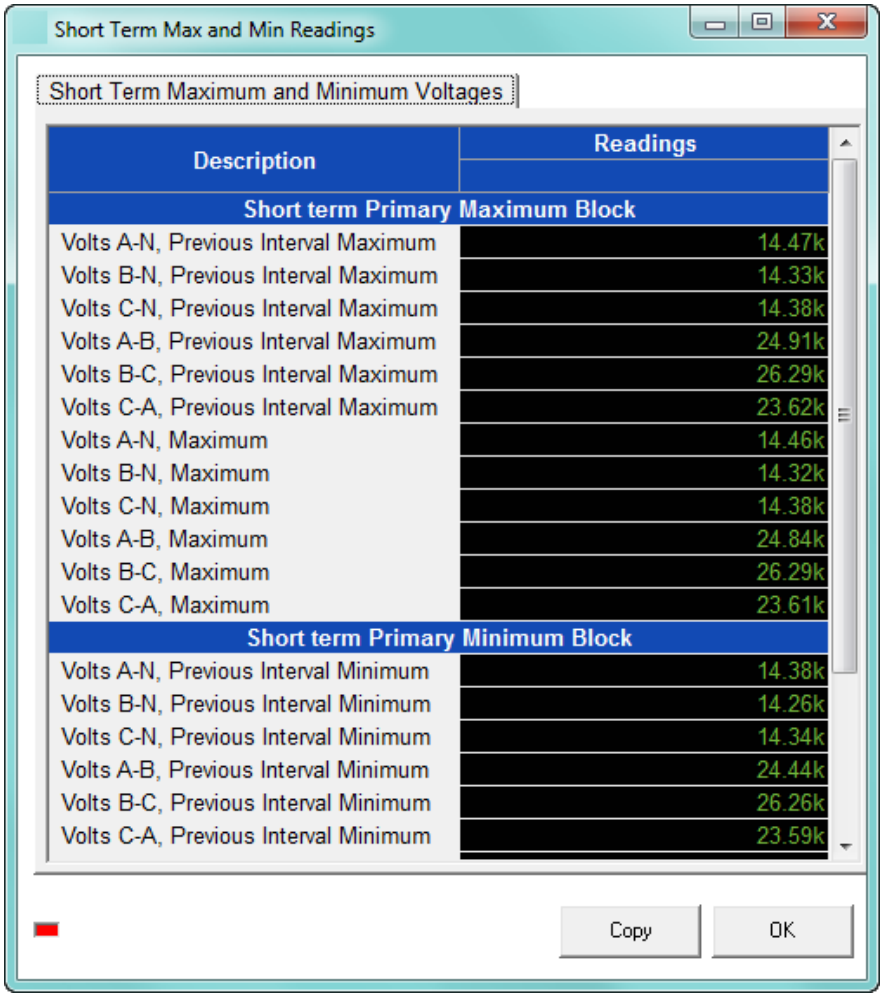
This screen shows the maximum and minimum values for the previous interval. The values are updated every second. You will see the screen above if you are connected to an EPM 9000/9900P meter. This feature is used to provide a user with the value of a maximum and minimum within a load profiling interval. This is generally very useful for logging voltage where the greatest excursion value is the only concern.

Note that if you are connected to an EPM 9000 meter, you do not see phase to earth readings and the interval for averaging and peak values is set to 15 minutes.



You will see the screen above if you are connected to an EPM 4600-S metering system. It shows the short term:

- Primary voltage maximum and previous interval maximum values
- Primary voltage minimum and previous minimum values

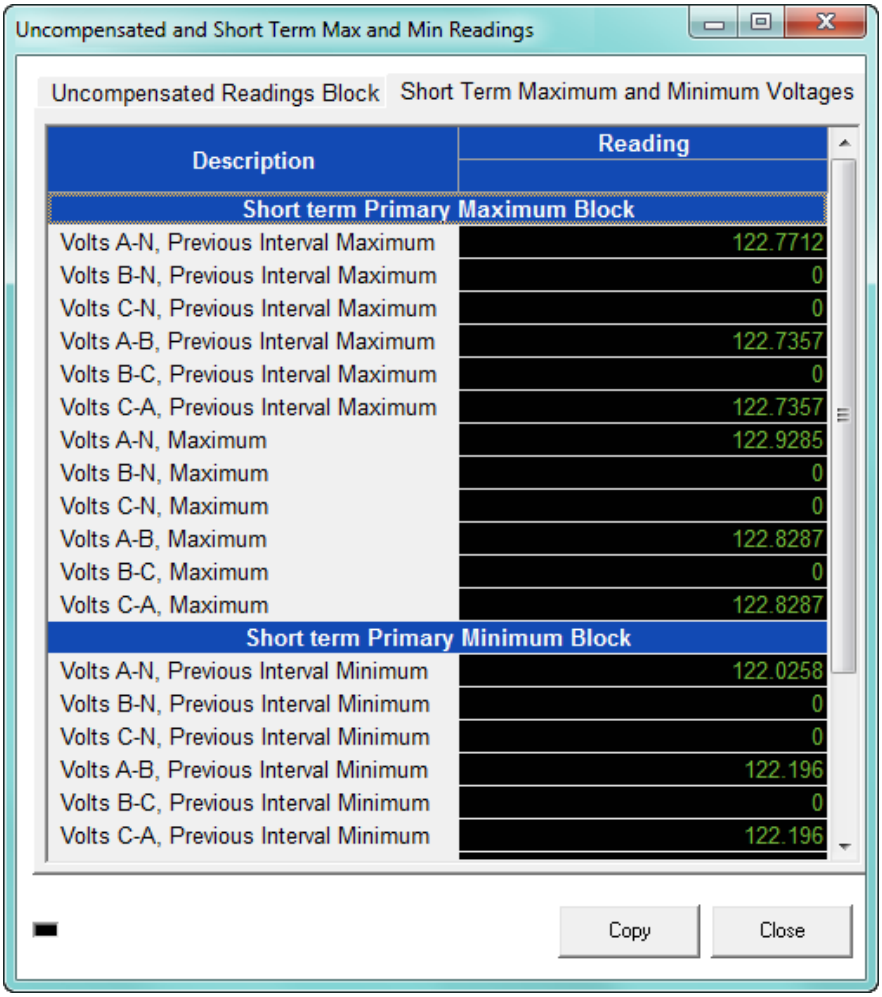


Description	Readings
Short term Primary Maximum Block	
Volts A-N, Previous Interval Maximum	14.47k
Volts B-N, Previous Interval Maximum	14.33k
Volts C-N, Previous Interval Maximum	14.38k
Volts A-B, Previous Interval Maximum	24.91k
Volts B-C, Previous Interval Maximum	26.29k
Volts C-A, Previous Interval Maximum	23.62k
Volts A-N, Maximum	14.46k
Volts B-N, Maximum	14.32k
Volts C-N, Maximum	14.38k
Volts A-B, Maximum	24.84k
Volts B-C, Maximum	26.29k
Volts C-A, Maximum	23.61k
Short term Primary Minimum Block	
Volts A-N, Previous Interval Minimum	14.38k
Volts B-N, Previous Interval Minimum	14.26k
Volts C-N, Previous Interval Minimum	14.34k
Volts A-B, Previous Interval Minimum	24.44k
Volts B-C, Previous Interval Minimum	26.26k
Volts C-A, Previous Interval Minimum	23.59k

You will see the screen shown above if you are connected to an EPM 4600-T metering system. It shows the short term primary voltage maximum and minimum values for phase to phase and phase to reference.

5.2.6.1 Uncompensated and Short Term Max and Min Readings (EPM 7000/7000P)

The EPM 7000/7000P meter has a screen that displays both short term maximum and minimum voltage readings and uncompensated power and energy readings. Select **Uncompensated and Short Term Max and Min Readings** from the **Real-Time Poll > Real Time Readings** menu.
You will see the screen shown below.

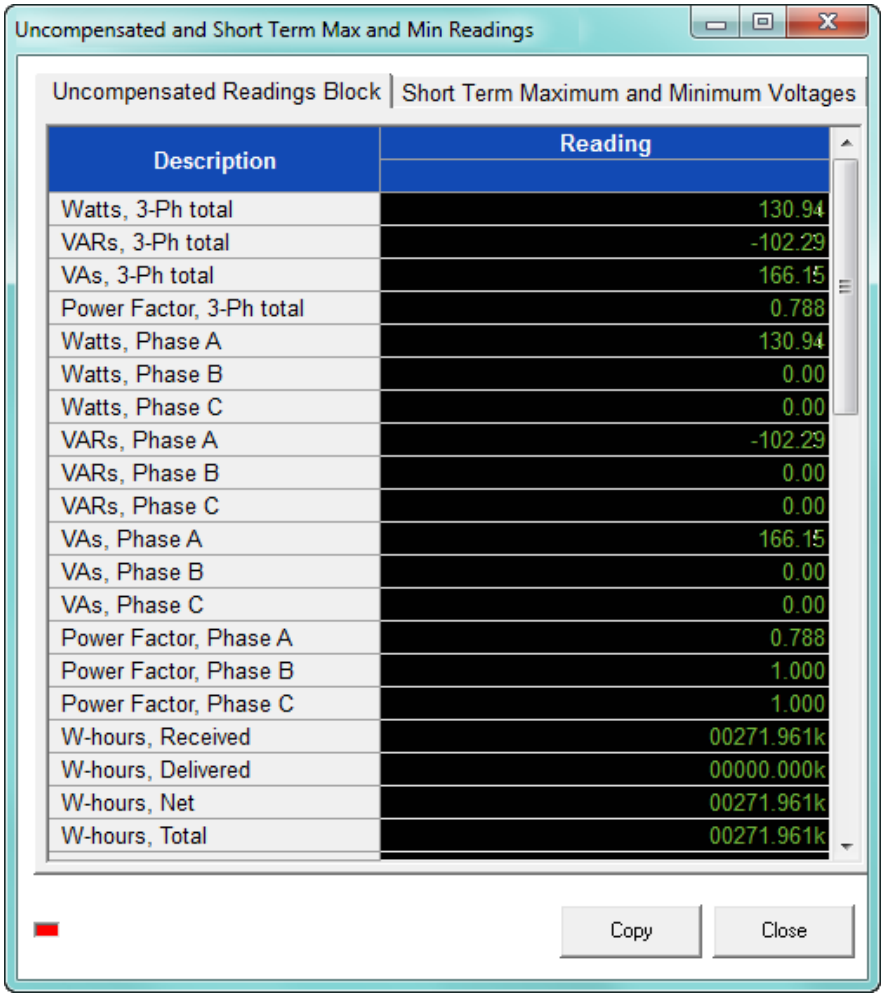


Description	Reading
Short term Primary Maximum Block	
Volts A-N, Previous Interval Maximum	122.7712
Volts B-N, Previous Interval Maximum	0
Volts C-N, Previous Interval Maximum	0
Volts A-B, Previous Interval Maximum	122.7357
Volts B-C, Previous Interval Maximum	0
Volts C-A, Previous Interval Maximum	122.7357
Volts A-N, Maximum	122.9285
Volts B-N, Maximum	0
Volts C-N, Maximum	0
Volts A-B, Maximum	122.8287
Volts B-C, Maximum	0
Volts C-A, Maximum	122.8287
Short term Primary Minimum Block	
Volts A-N, Previous Interval Minimum	122.0258
Volts B-N, Previous Interval Minimum	0
Volts C-N, Previous Interval Minimum	0
Volts A-B, Previous Interval Minimum	122.196
Volts B-C, Previous Interval Minimum	0
Volts C-A, Previous Interval Minimum	122.196

There are two tabs in this screen:

- Short Term Maximum and Minimum Voltages tab (shown above), which displays the Primary Voltage maximum and minimum values, for phase to phase and phase to reference. This reading is the maximum voltage seen within a logging interval and the minimum voltage seen within that same logging interval. This is often used to log in a history log so that a user is seeing the worst voltage excursion during the time period. It is often more useful data than an instantaneous log point or an average of the 15 minute voltage.

- Uncompensated Readings Block tab (shown below), which displays per phase, net, and total Power and Energy values that have not been adjusted by Transformer Loss Compensation. This screen allows the user to view what the uncompensated power and energy is if Transformer Loss Compensation is enabled. This way a log of uncompensated and compensated readings can be kept, at the same time.



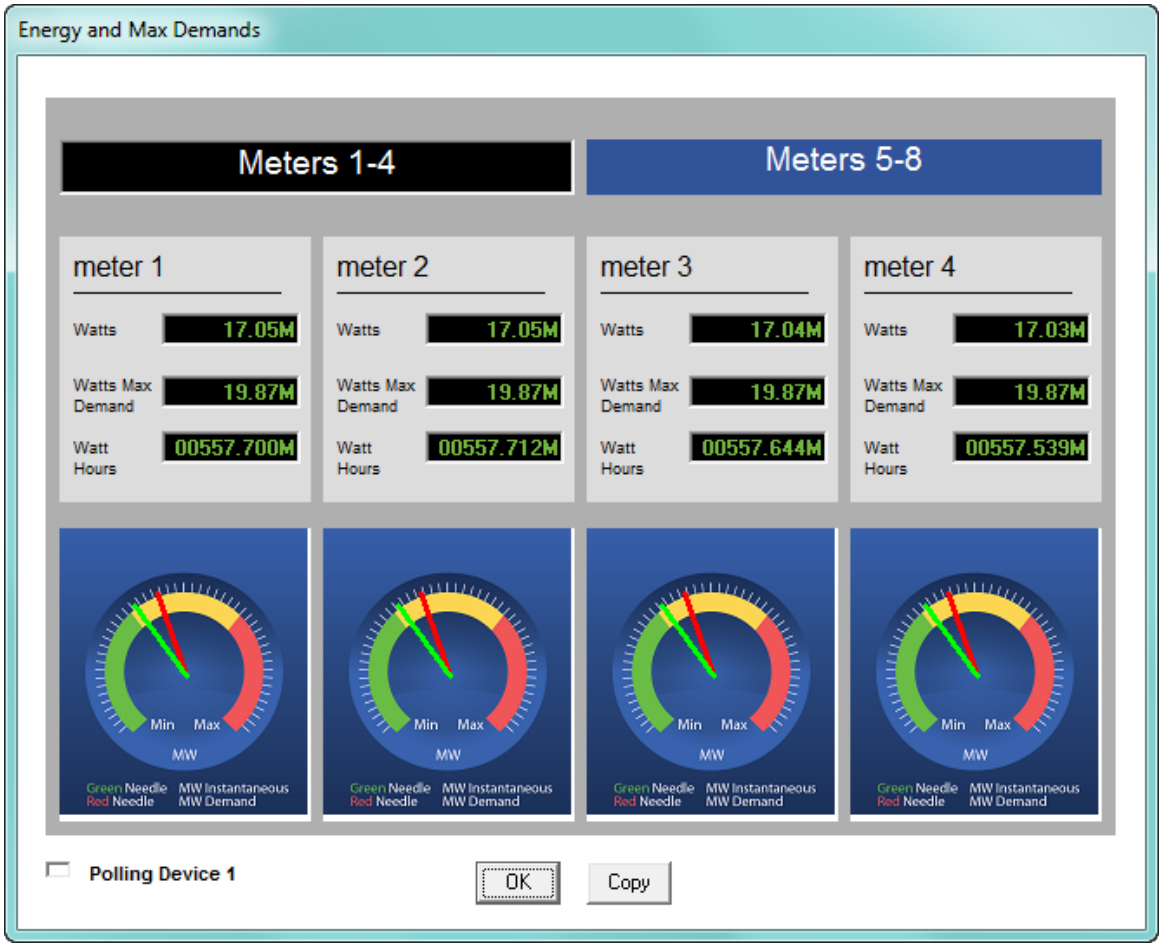
Description	Reading
Watts, 3-Ph total	130.94
VARs, 3-Ph total	-102.29
VAs, 3-Ph total	166.15
Power Factor, 3-Ph total	0.788
Watts, Phase A	130.94
Watts, Phase B	0.00
Watts, Phase C	0.00
VARs, Phase A	-102.29
VARs, Phase B	0.00
VARs, Phase C	0.00
VAs, Phase A	166.15
VAs, Phase B	0.00
VAs, Phase C	0.00
Power Factor, Phase A	0.788
Power Factor, Phase B	1.000
Power Factor, Phase C	1.000
W-hours, Received	00271.961k
W-hours, Delivered	00000.000k
W-hours, Net	00271.961k
W-hours, Total	00271.961k

5.2.7 Poll Energy and Max Demands (EPM 4600 Metering System)

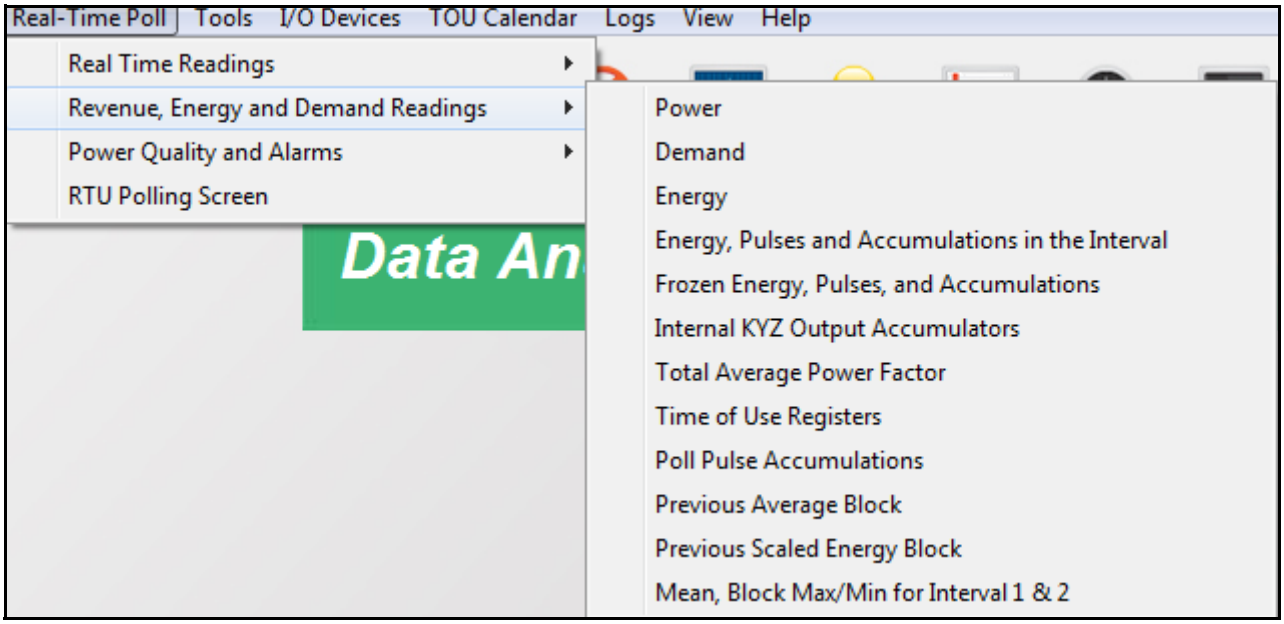
The EPM 4600 metering system has a unique screen that shows instantaneous Energy and maximum Demand readings. Select **Poll Energy and Max Demands** from the **Real-Time Poll > Real Time Readings** menu.

You will see the following screen if you are connected to an EPM 4600-S metering system.

You will see the following screen if you are connected to an EPM 4600-T metering system. Click on the tabs to display information the readings for the additional meters.



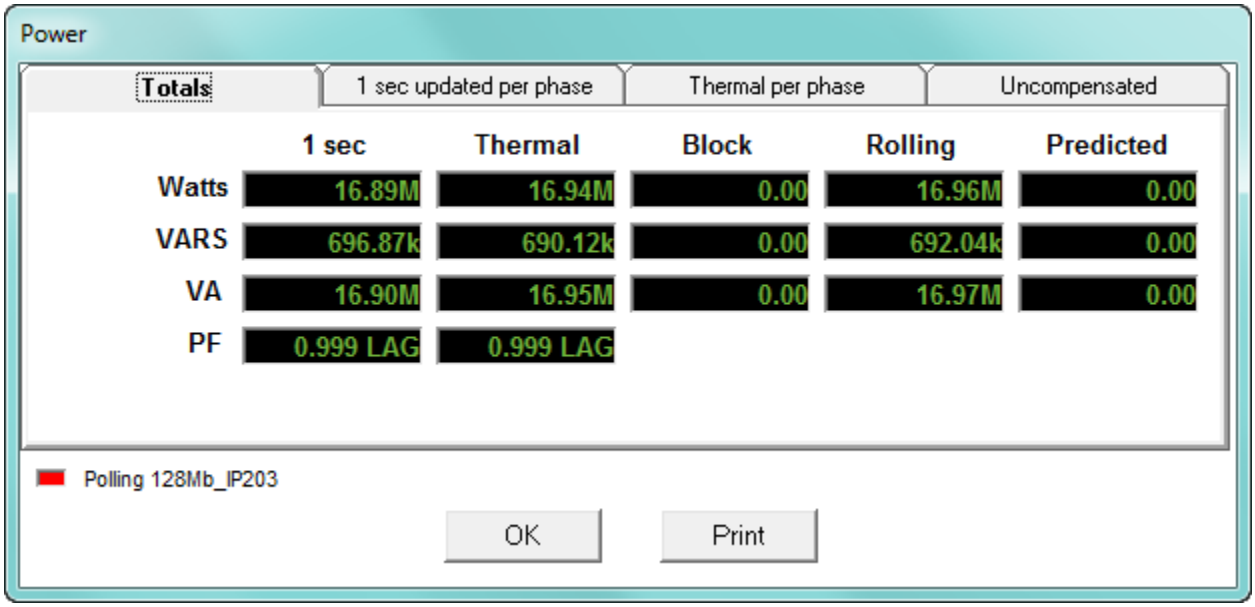
5.3 Revenue, Energy, and Demand Readings



The menu above is for an EPM 9900/9900P meter - the menu for your meter may look a bit different.

5.3.1 Poll Power

To view Power readings for the currently connected device, select **Poll Power** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the following screen if you are connected to an EPM 9900 series meter.



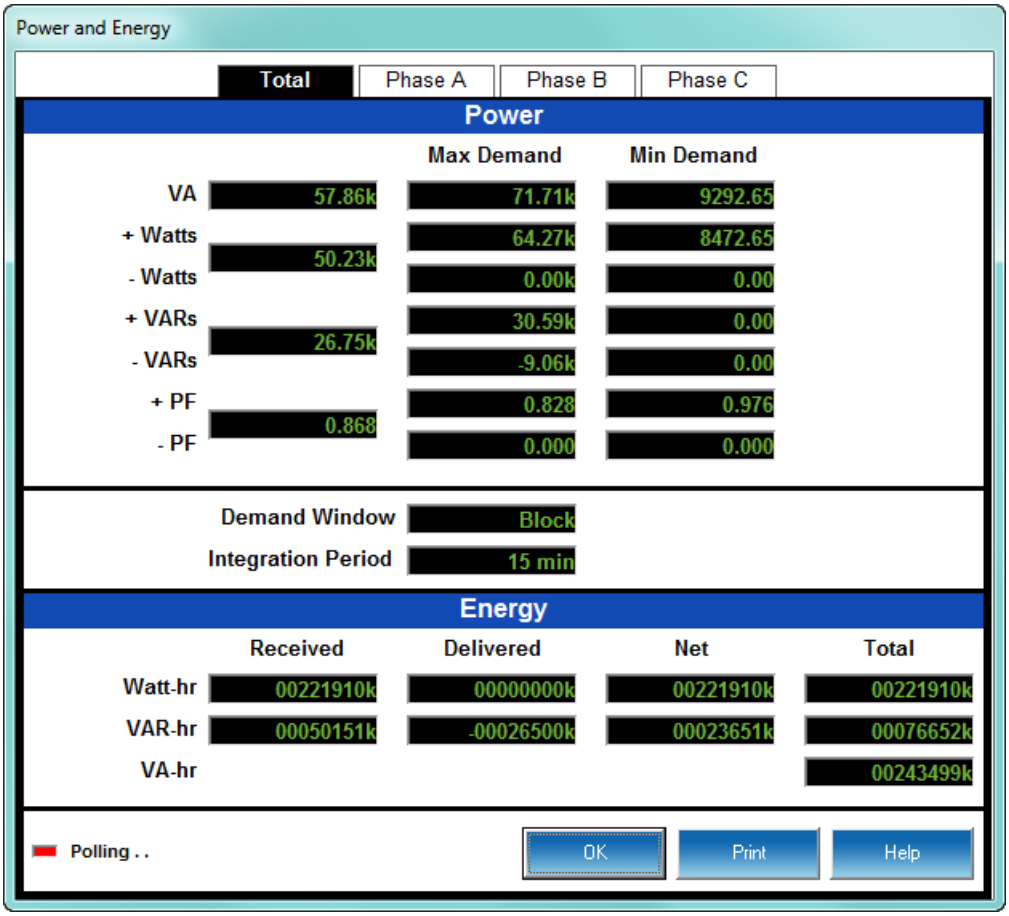
The tabs at the top of the screen let you access the following readings:

- **Totals** - 1 second, thermal, block, rolling, and predicted readings for Watts, VARS, VA and PF.
- **1 Second updated per phase** - Total and per phase readings updated every second for Watts, VARS, VA and PF.
- **Thermal per phase** - Total and per phase thermal readings for Watts, VARS, VA and PF.
- **Uncompensated** - Total and per phase uncompensated readings for Watts, VARS, and VA values that have not been adjusted by Transformer Loss Compensation.

5.3.1.1 Poll Power and Energy (EPM Meters)

Instead of separate Power and Energy polling screens, EPM meters (other than the EPM 9000 series) have a combined screen that shows both power and energy readings.

Click **Real-Time Poll > Revenue, Energy and Demand Readings > Power and Energy** to see the screen shown below.



The tabs at the top of the screen let you access the following readings:

- **Total** - Displays real time, maximum and minimum Demand; Demand window and interval; Received, Delivered, net, and total readings for Watthr and VARhr; and total readings for VAhr.
- **Phase A, B, and C tabs** - show the same readings as the totals, but just for that phase.

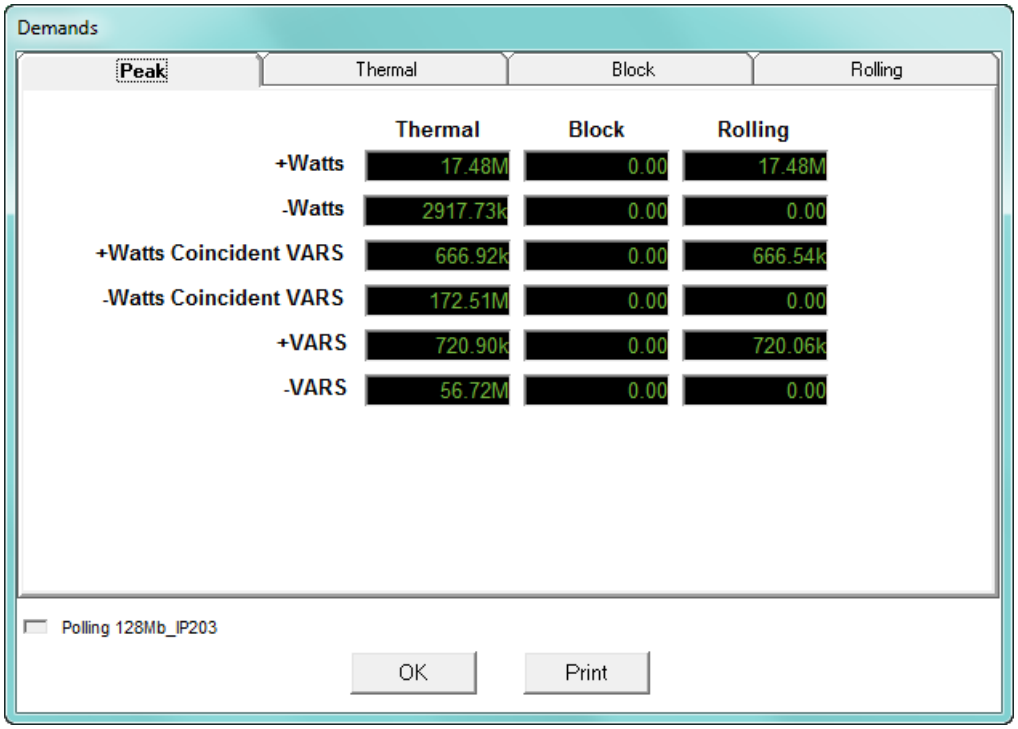
NOTE

If you are connected to an EPM 6000 meter, you will only see the Total tab.

5.3.2 Poll Demand

To view Demand data for the currently connected device, select **Demand** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.

You will see the screen shown below if you are connected to an EPM 9000 series meter.



The tabs at the top of the screen let you access the following readings:

- **Peak** - displays the Thermal, Block, and Rolling Peak Demand for +/- Watts, +/- Watts Coincident VARS, and +/- VARS.

  Peak, or Maximum Demand is the largest Average Value for the selected Demand interval.

- **Thermal** - displays averages, maximum, and minimum readings with timestamps for Watts, VARs, and VA.

  Thermal or Exponential Demand is used to emulate the operation of electromechanical Thermal Demand meters. This measurement responds like lagged thermal heating effects in electrical equipment.

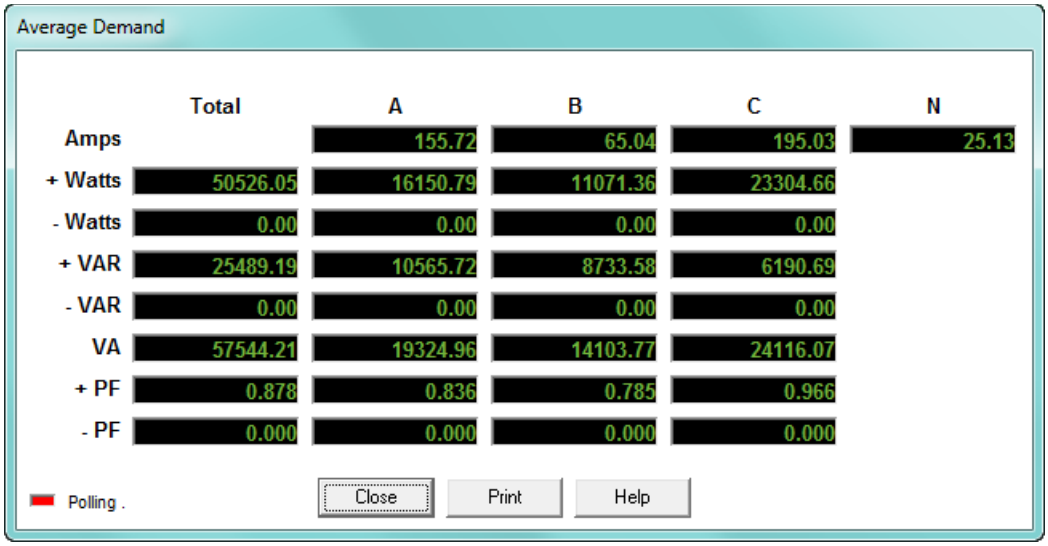
  Thermal Average VARS/VA are the exponential average VARs/VA. Exponential averages are used because they discount older values and respond more like the thermal effects.

- **Block** - displays averages, maximum, and minimum readings with timestamps for Watts, VARs, and VA; displays + and - Watt Coincident PF.
- **Rolling** - displays averages, maximum, and minimum readings with timestamps for Watts, VARs, and VA; displays + and - Watt Coincident PF.

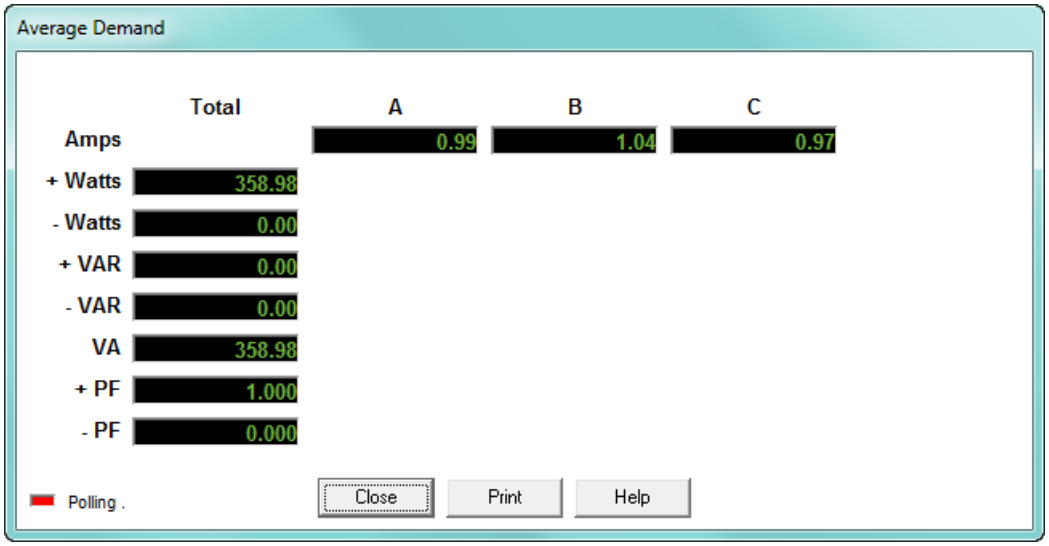
NOTE

The EPM 9700 meter Demand screen has a combined Block/Rolling tab.

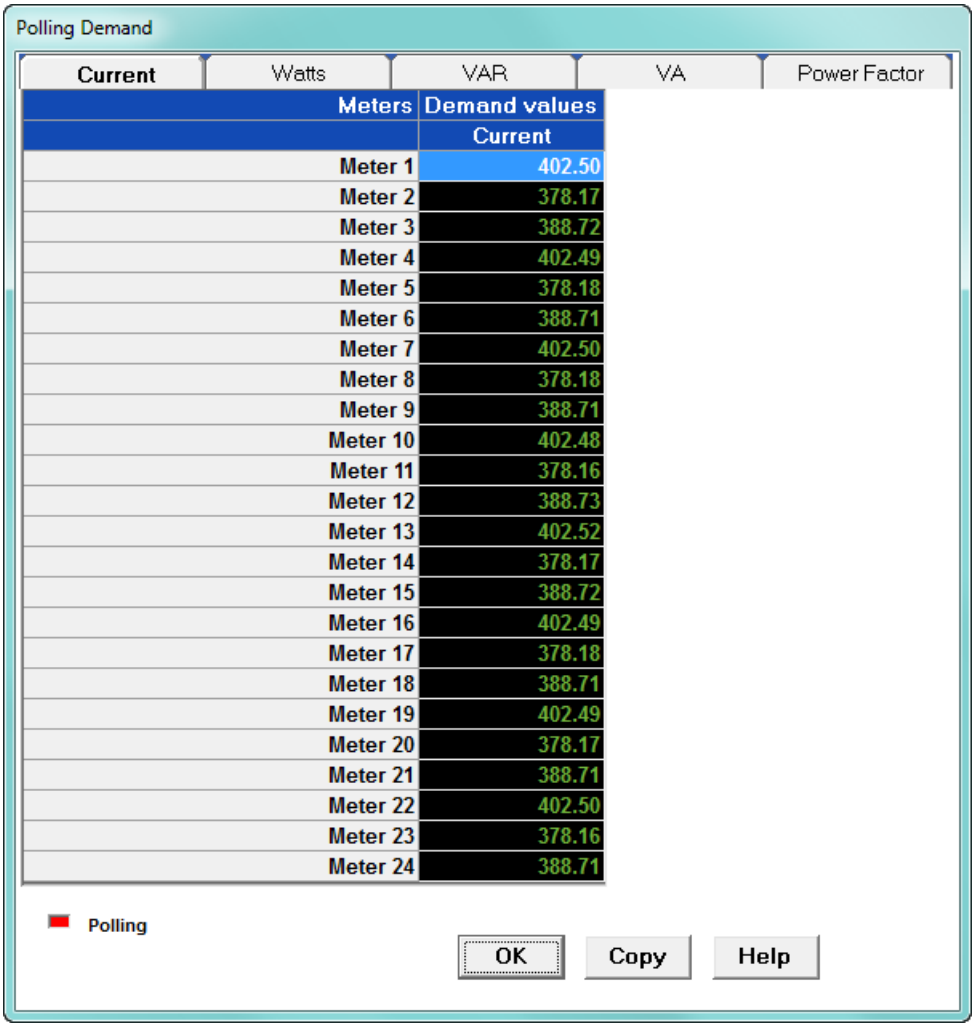
You will see the polling screen below if you are connected to an EPM 7000 series meter.



You will see the polling screen below if you are connected to an EPM 6000 series meter.



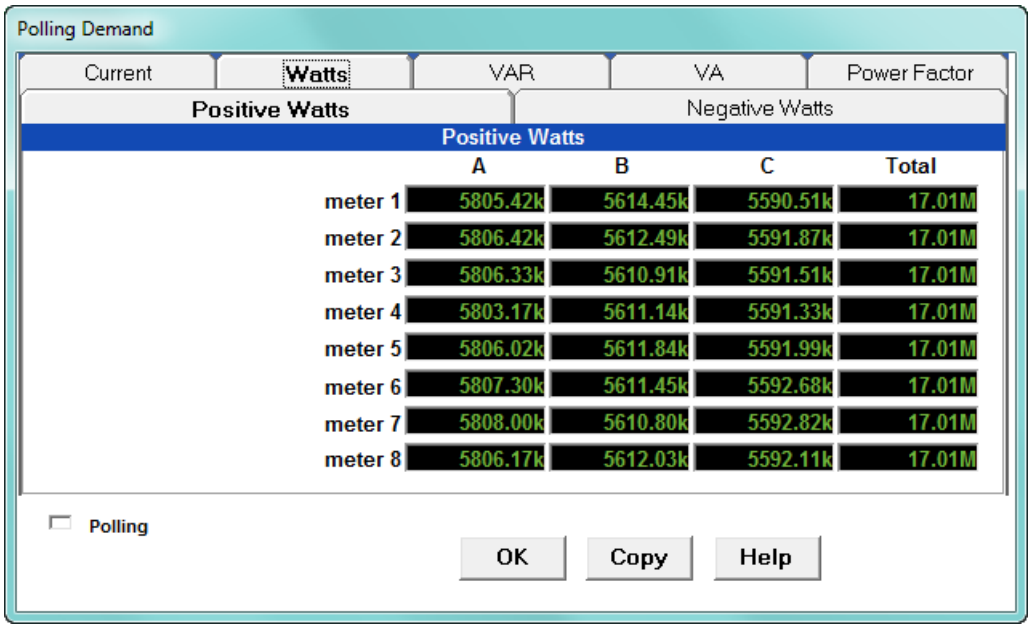
You will see the following screen if you are connected to an EPM 4600-S metering system.



Meters	Demand values
	Current
Meter 1	402.50
Meter 2	378.17
Meter 3	388.72
Meter 4	402.49
Meter 5	378.18
Meter 6	388.71
Meter 7	402.50
Meter 8	378.18
Meter 9	388.71
Meter 10	402.48
Meter 11	378.16
Meter 12	388.73
Meter 13	402.52
Meter 14	378.17
Meter 15	388.72
Meter 16	402.49
Meter 17	378.18
Meter 18	388.71
Meter 19	402.49
Meter 20	378.17
Meter 21	388.71
Meter 22	402.50
Meter 23	378.16
Meter 24	388.71

Click the tabs to display Current, Positive Watts, Negative Watts, VAR, VA, and Power Factor Demand readings for the 24 meters.

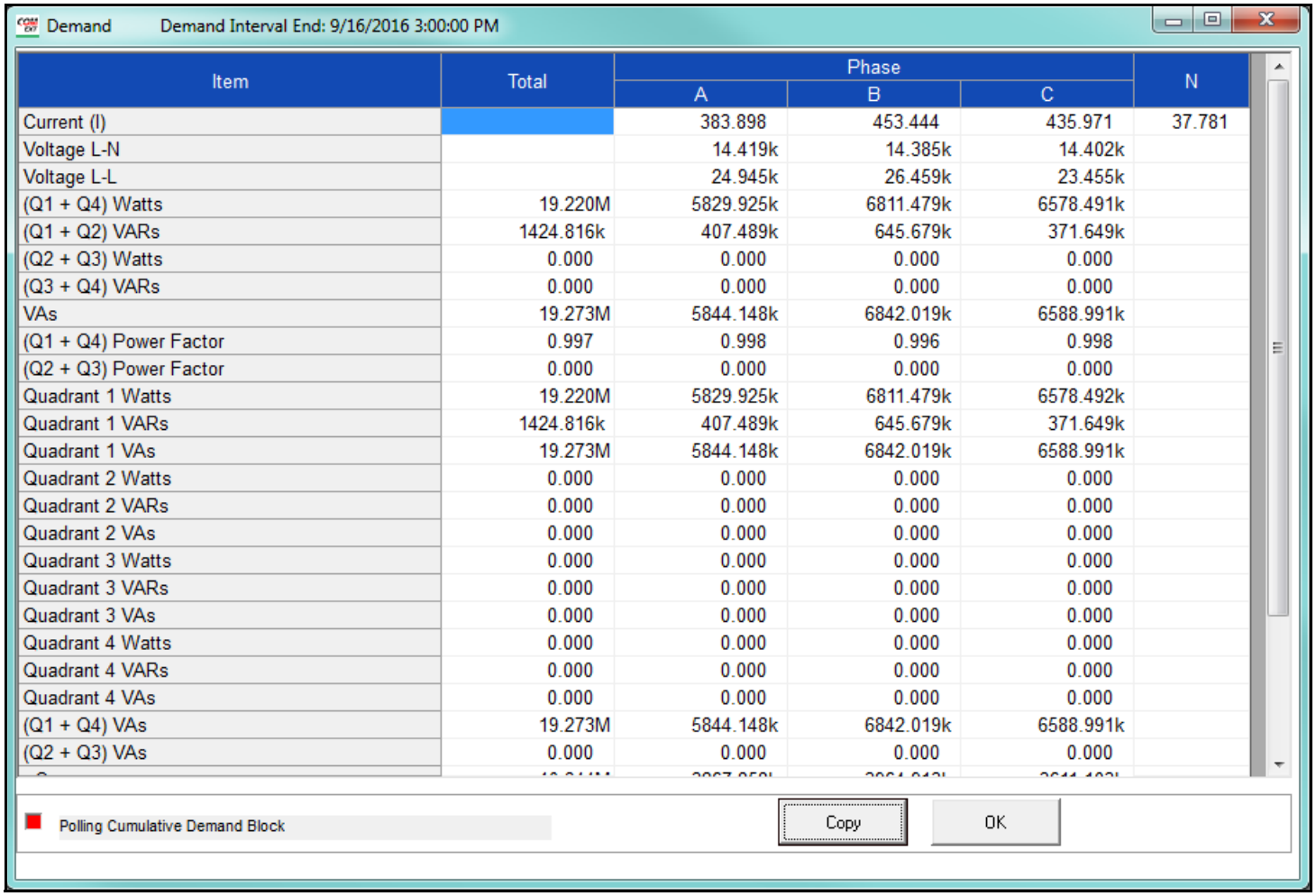
You will see the following screen if you are connected to an EPM 4600-T metering system.



Click the tabs to display Current, Positive Watts, Negative Watts, VAR, VA, and Power Factor Demand readings for the 8 meters.

5.3.2.1 Poll Demand Grid

The EPM 7000P meter has an additional Demand polling screen. Select **Demand Grid** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.



Item	Total	Phase A	Phase B	Phase C	N
Current (I)		383.898	453.444	435.971	37.781
Voltage L-N		14.419k	14.385k	14.402k	
Voltage L-L		24.945k	26.459k	23.455k	
(Q1 + Q4) Watts	19.220M	5829.925k	6811.479k	6578.491k	
(Q1 + Q2) VARs	1424.816k	407.489k	645.679k	371.649k	
(Q2 + Q3) Watts	0.000	0.000	0.000	0.000	
(Q3 + Q4) VARs	0.000	0.000	0.000	0.000	
VAs	19.273M	5844.148k	6842.019k	6588.991k	
(Q1 + Q4) Power Factor	0.997	0.998	0.996	0.998	
(Q2 + Q3) Power Factor	0.000	0.000	0.000	0.000	
Quadrant 1 Watts	19.220M	5829.925k	6811.479k	6578.492k	
Quadrant 1 VARs	1424.816k	407.489k	645.679k	371.649k	
Quadrant 1 VAs	19.273M	5844.148k	6842.019k	6588.991k	
Quadrant 2 Watts	0.000	0.000	0.000	0.000	
Quadrant 2 VARs	0.000	0.000	0.000	0.000	
Quadrant 2 VAs	0.000	0.000	0.000	0.000	
Quadrant 3 Watts	0.000	0.000	0.000	0.000	
Quadrant 3 VARs	0.000	0.000	0.000	0.000	
Quadrant 3 VAs	0.000	0.000	0.000	0.000	
Quadrant 4 Watts	0.000	0.000	0.000	0.000	
Quadrant 4 VARs	0.000	0.000	0.000	0.000	
Quadrant 4 VAs	0.000	0.000	0.000	0.000	
(Q1 + Q4) VAs	19.273M	5844.148k	6842.019k	6588.991k	
(Q2 + Q3) VAs	0.000	0.000	0.000	0.000	

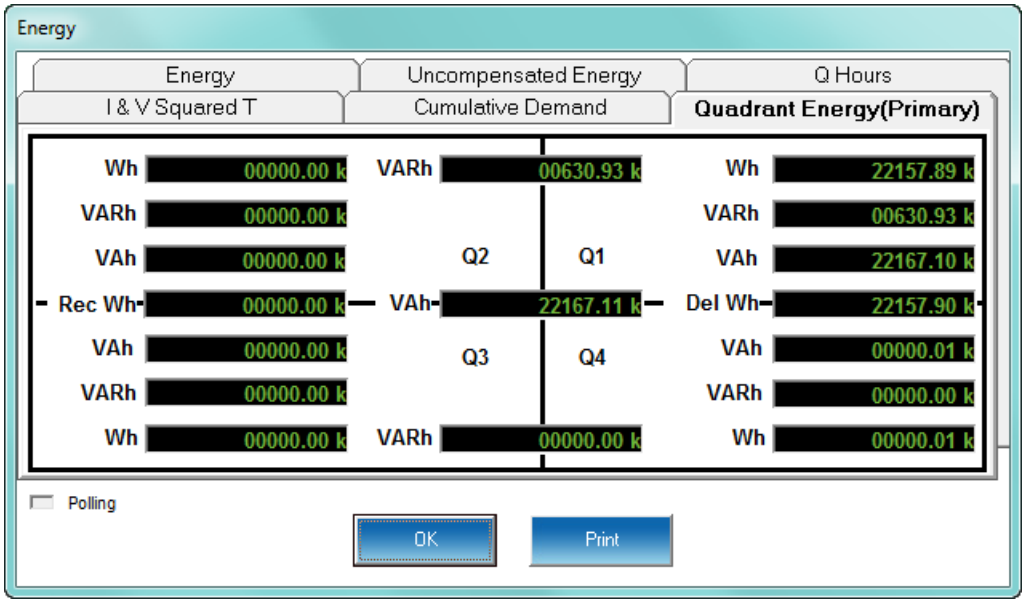
This screen shows the Total and per Phase Demand for the meter readings, as well as Cumulative and Continuous Cumulative values for the quadrants - use the scroll bar to display those fields.

5.3.3 Poll Energy

To view Energy data for the currently connected device, select **Energy** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.

5.3.3.1 Poll Energy (EPM 9000 Series meters)

You will see the screen shown below if you are connected to an EPM 9000 series meter.



The tabs at the top of the screen let you access the following readings:

- Quadrant Energy (Primary) - displays readings for each quadrant of the four-quadrant EPM 9000 series meter.
- Cumulative Demand - displays Delivered, Received, and Continuous Watts in Secondary and Primary.
- I & V Squared T - displays positive readings for phases A, B and C.
- Q Hours - displays positive and negative Qhr readings in Secondary and Primary.

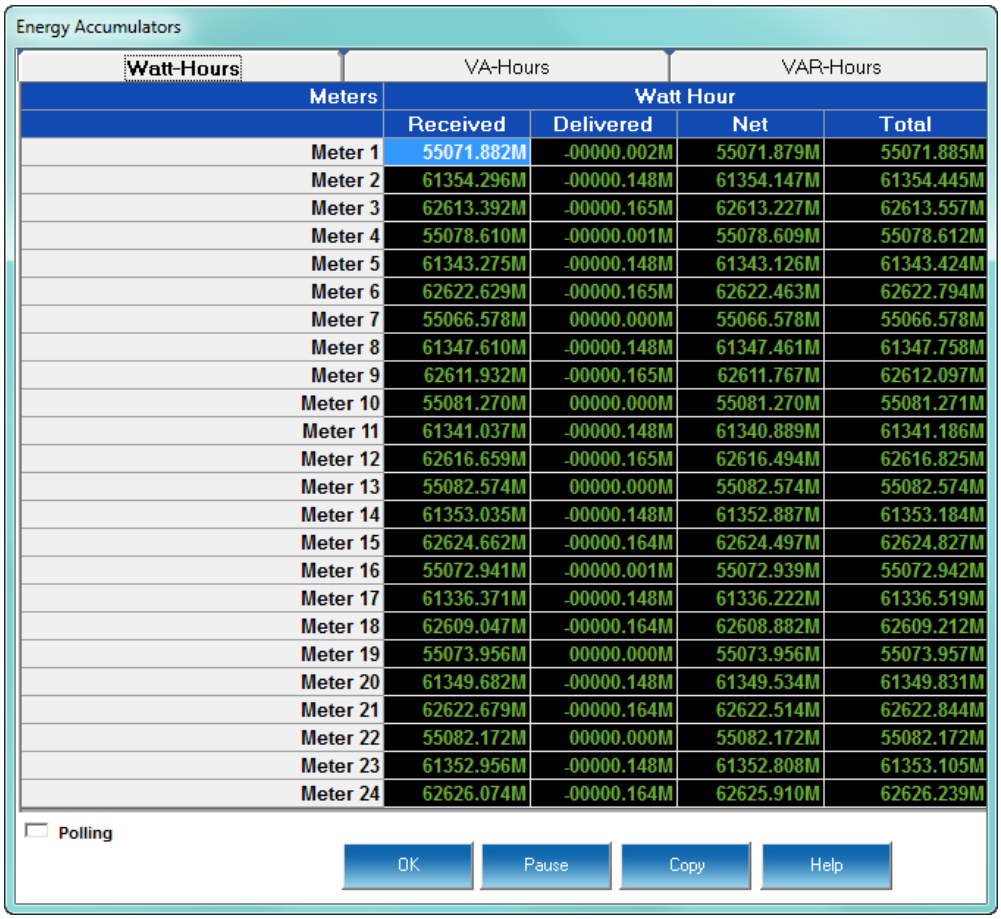
NOTE

The Q Hour reading lags the Watt hour reading by 60°. A Q Hour meter measures power between 150° and 270°, which are quadrants 2 and 3. Q is one of the values used in calculating quadenergy (VAR hours).

- Uncompensated Energy - displays + and - Watt, VAR and VA readings that have not been adjusted by Transformer Loss Compensation, in Secondary and Primary.
- Energy (Secondary): - displays + and - Watt, VAR and VA Readings.

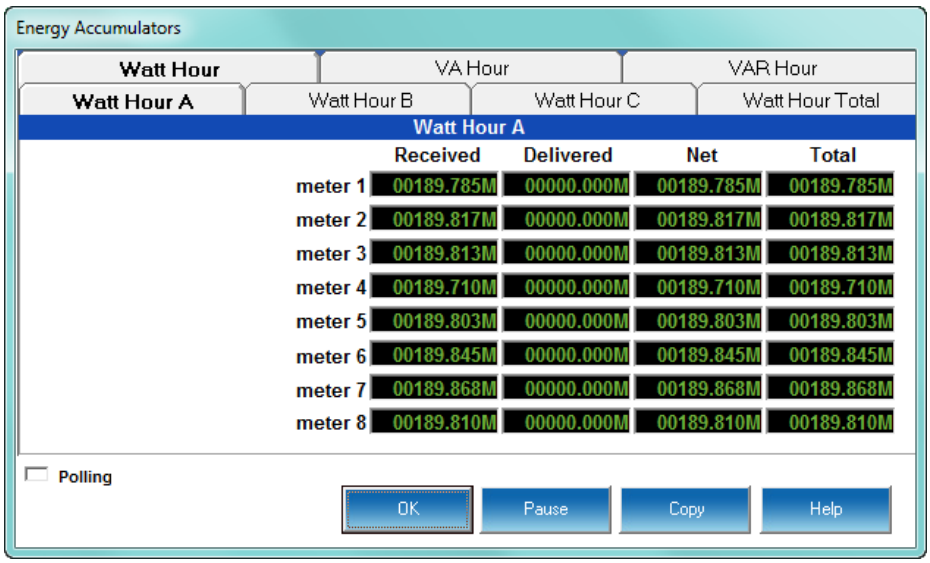
5.3.3.2 Poll Energy (EPM 4600 Metering System)

You will see the polling screen below if you are connected to an EPM 4600-S metering system. Click the tabs to display Watt-Hour, VA Hour, and VAR Hour readings for all 24 meters.



Meters	Watt Hour			
	Received	Delivered	Net	Total
Meter 1	55071.882M	-00000.002M	55071.879M	55071.885M
Meter 2	61354.296M	-00000.148M	61354.147M	61354.445M
Meter 3	62613.392M	-00000.165M	62613.227M	62613.557M
Meter 4	55078.610M	-00000.001M	55078.609M	55078.612M
Meter 5	61343.275M	-00000.148M	61343.126M	61343.424M
Meter 6	62622.629M	-00000.165M	62622.463M	62622.794M
Meter 7	55066.578M	00000.000M	55066.578M	55066.578M
Meter 8	61347.610M	-00000.148M	61347.461M	61347.758M
Meter 9	62611.932M	-00000.165M	62611.767M	62612.097M
Meter 10	55081.270M	00000.000M	55081.270M	55081.271M
Meter 11	61341.037M	-00000.148M	61340.889M	61341.186M
Meter 12	62616.659M	-00000.165M	62616.494M	62616.825M
Meter 13	55082.574M	00000.000M	55082.574M	55082.574M
Meter 14	61353.035M	-00000.148M	61352.887M	61353.184M
Meter 15	62624.662M	-00000.164M	62624.497M	62624.827M
Meter 16	55072.941M	-00000.001M	55072.939M	55072.942M
Meter 17	61336.371M	-00000.148M	61336.222M	61336.519M
Meter 18	62609.047M	-00000.164M	62608.882M	62609.212M
Meter 19	55073.956M	00000.000M	55073.956M	55073.957M
Meter 20	61349.682M	-00000.148M	61349.534M	61349.831M
Meter 21	62622.679M	-00000.164M	62622.514M	62622.844M
Meter 22	55082.172M	00000.000M	55082.172M	55082.172M
Meter 23	61352.956M	-00000.148M	61352.808M	61353.105M
Meter 24	62626.074M	-00000.164M	62625.910M	62626.239M

You will see the following polling screen if you are connected to an EPM 4600-T metering system. Click the tabs to display Watt-Hour, VA Hour, and VAR Hour readings for all 8 meters.


Energy Accumulators
Watt Hour
VA Hour
VAR Hour
Watt Hour A
Watt Hour B
Watt Hour C
Watt Hour Total
Watt Hour A
Received Delivered Net Total
meter 1 00189.785M 00000.000M 00189.785M 00189.785M
meter 2 00189.817M 00000.000M 00189.817M 00189.817M
meter 3 00189.813M 00000.000M 00189.813M 00189.813M
meter 4 00189.710M 00000.000M 00189.710M 00189.710M
meter 5 00189.803M 00000.000M 00189.803M 00189.803M
meter 6 00189.845M 00000.000M 00189.845M 00189.845M
meter 7 00189.868M 00000.000M 00189.868M 00189.868M
meter 8 00189.810M 00000.000M 00189.810M 00189.810M
Polling
OK
Pause
Copy
Help

5.3.3.3 Poll Energy Grid (EPM 7000P Meter)

You will see the screen below if you are connected to an EPM 7000P meter. It shows compensated and uncompensated readings for Energy, the Energy in the Interval, and Energy in the Interval (Pulse), for all Energy channels. Use the scroll bar to view additional Energy channels.

Energy

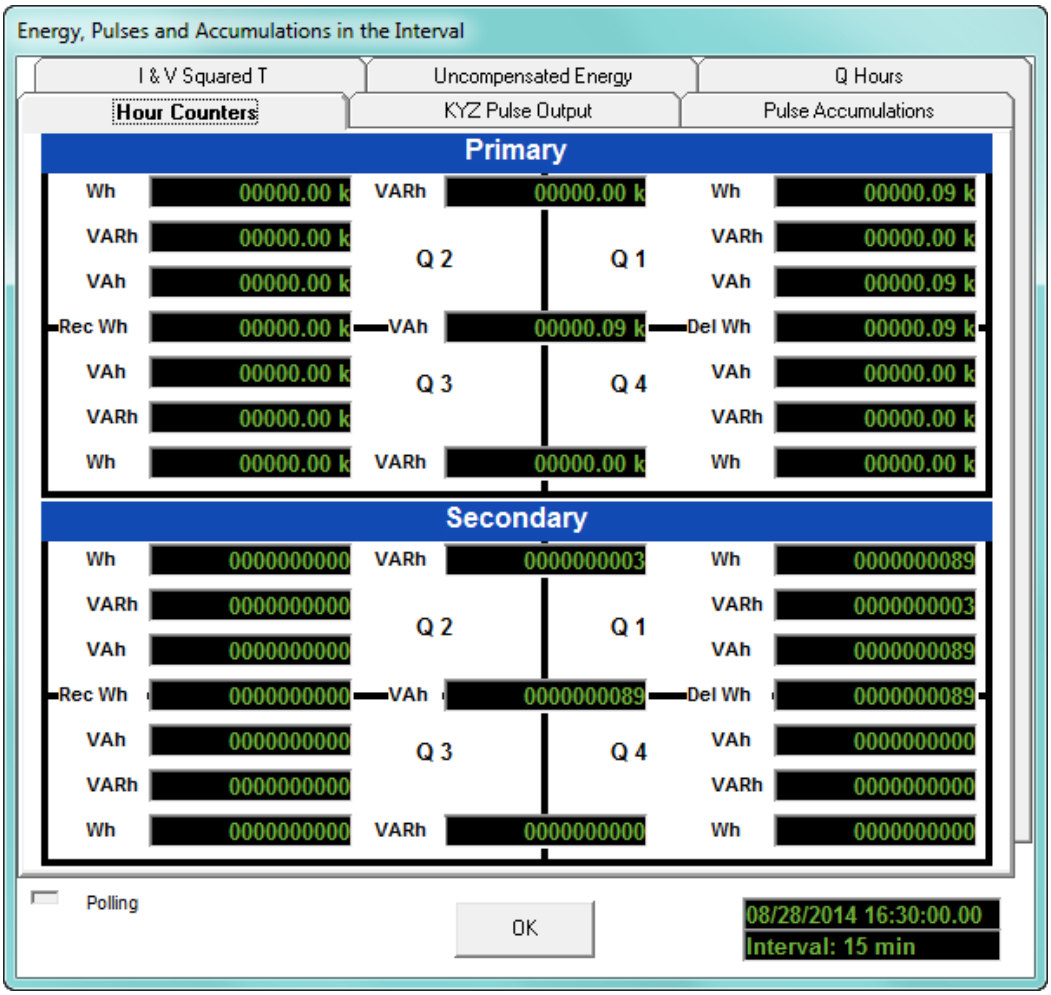
Item	Energy		Energy in the Interval		Energy in the Interval (Pulses)	
	Uncompensated	Compensated	Uncompensated	Compensated	Uncompensated	Compensated
Wh Delivered	000059.62 k	000059.62 k	000000.01 k	000000.01 k	00002543	00002668
Wh Received	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000000	00000000
Wh Net	000059.62 k	000059.62 k	000000.01 k	000000.01 k	00002543	00002668
Wh Total	000059.62 k	000059.62 k	000000.01 k	000000.00 k	00002543	00002669
VARh Delivered	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000073	00000198
VARh Received	-000086.96 k	-000086.96 k	000000.00 k	000000.00 k	00000000	00000000
VARh Net	-000086.96 k	-000086.96 k	000000.00 k	000000.00 k	00000073	00000198
VARh Total	000086.96 k	000086.96 k	000000.00 k	000000.01 k	00000073	00000198
VAh Total	000105.44 k	000105.45 k	000000.00 k	000000.01 k	00002544	00002675
Wh Delivered A	000019.88 k	000019.88 k	000000.01 k	000000.00 k	00000768	00000809
Wh Delivered B	000019.87 k	000019.87 k	000000.01 k	000000.00 k	00000903	00000946
Wh Delivered C	000019.86 k	000019.86 k	000000.00 k	000000.00 k	00000872	00000913
Wh Received A	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000000	00000000
Wh Received B	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000000	00000000
Wh Received C	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000000	00000000
Wh Net A	000019.88 k	000019.88 k	000000.01 k	000000.00 k	00000768	00000809
Wh Net B	000019.87 k	000019.87 k	000000.01 k	000000.00 k	00000903	00000946
Wh Net C	000019.86 k	000019.86 k	000000.00 k	000000.00 k	00000872	00000913
Wh Total A	000019.88 k	000019.88 k	000000.01 k	000000.00 k	00000768	00000809
Wh Total B	000019.87 k	000019.87 k	000000.01 k	000000.00 k	00000903	00000945
Wh Total C	000019.86 k	000019.87 k	000000.00 k	000000.01 k	00000872	00000913
VARh Delivered A	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000015	00000057
VARh Delivered B	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000048	00000089
VARh Delivered C	000000.00 k	000000.00 k	000000.00 k	000000.00 k	00000010	00000051
VARh Received A	-000029.00 k	-000029.00 k	000000.00 k	000000.00 k	00000000	00000000
VARh Received B	-000028.99 k	-000028.99 k	000000.00 k	000000.00 k	00000000	00000000

Polling Primary Uncompensated Energy in the Interval Block Copy OK

5.3.4 Poll Energy, Pulses, and Accumulations in the Interval

To view the Energy, Pulse & Accumulations in the Interval of the currently connected device, select **Energy, Pulse & Accumulations** in the Interval from the **Real-Time Poll>Revenue, Energy, and Demand Readings** menu. You will see the screen shown below if you are connected to an EPM 9900 series meter.

Energy in the interval is the energy that is accumulated within a load profiling interval. This is often the preferred method for logging because it is a summation of only that particular period of energy.



This screen displays readings from the Interval set on several screens (see the individual meter chapters for details):

- Demand Integration Intervals
- I and V Squared T Thresholds
- Interval in minutes (15 = Initial setting)
- Internal KYZ Outputs
- Pulse Accumulations

The Interval field at the bottom right of the screen is the interval that the values on the screen represent; in this example, a 15 minute interval. The tabs at the top of the screen let you access the following readings:

- Hour Counters - displays readings in all four quadrants for the interval programmed in the Device Profile, and displayed at the bottom right of the screen.
- Uncompensated Energy - displays interval readings that are not adjusted by Transformer Loss Compensation.
- Q Hours - displays Qhr interval readings.

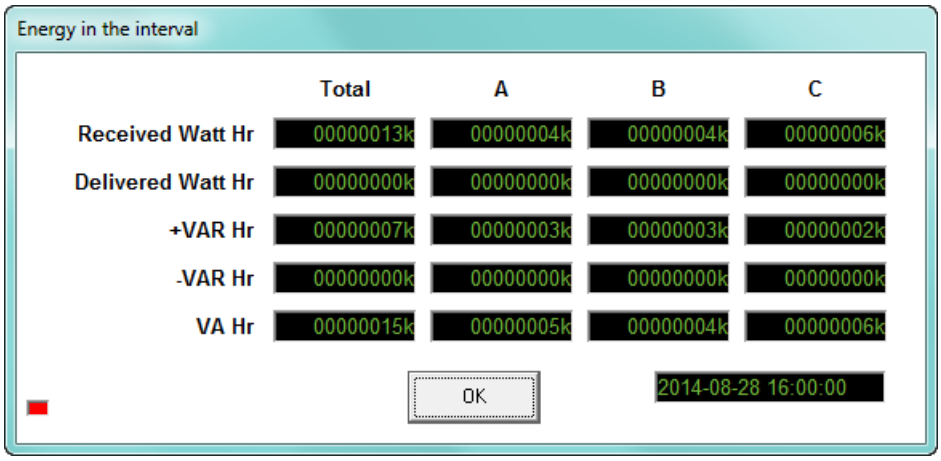
  Q is the quantity obtained by lagging the applied voltage to a Watt meter by 60 degrees.
- I V Squared T - displays I and V Squared T readings per phase.
- KYZ Pulse Output - displays readings for internal KYZ relays and LED.
- Pulse Accumulations - displays readings for the eight high speed internal inputs and aggregators (set up in the Pulse Accumulations screen of the meter's Device Profile).

5.3.4.1 Energy in the Interval/Interval Energy

The EPM 7000 meter and the EPM 4600 metering system have a polling screen that shows interval energy readings. The interval is set in the Demand Averaging settings - see Chapter 8 "EPM 7000/7100 Meter" and Chapter 10 "EPM 4600 Metering System" for details.

Energy in the interval is the amount of energy actually accumulated in a logging interval. This is commonly used as a load profiling value, so that the user can see usage without having to subtract energy counters.

- For the EPM 7000 meter, select Energy in the Interval from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.
- For the EPM 4600 metering system, select Interval Energy from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.



You will see the screen above if you are connected to EPM 7000 meter. The field at the right bottom of the screen tells the time and date that these readings are from.

You will see the following screen if you are connected to an EPM 4600-S metering system. Click the tabs to see Watt Hour VA Hour and VAR Hour positive, negative, net and total readings for all 24 meters.

Interval Energy

Watt Hour | VA Hour | VAR Hour

Meters	VAR Hour			
	Positive	Negative	Net	Total
Meter 1	00000.026M	00000.000M	00000.026M	00000.026M
Meter 2	00000.064M	00000.000M	00000.064M	00000.064M
Meter 3	00000.009M	00000.000M	00000.009M	00000.009M
Meter 4	00000.026M	00000.000M	00000.026M	00000.026M
Meter 5	00000.063M	00000.000M	00000.063M	00000.063M
Meter 6	00000.009M	00000.000M	00000.009M	00000.009M
Meter 7	00000.026M	00000.000M	00000.026M	00000.026M
Meter 8	00000.065M	00000.000M	00000.065M	00000.065M
Meter 9	00000.009M	00000.000M	00000.009M	00000.009M
Meter 10	00000.026M	00000.000M	00000.026M	00000.026M
Meter 11	00000.063M	00000.000M	00000.063M	00000.063M
Meter 12	00000.009M	00000.000M	00000.009M	00000.009M
Meter 13	00000.027M	00000.000M	00000.027M	00000.027M
Meter 14	00000.064M	00000.000M	00000.064M	00000.064M
Meter 15	00000.010M	00000.000M	00000.010M	00000.010M
Meter 16	00000.026M	00000.000M	00000.026M	00000.026M
Meter 17	00000.065M	00000.000M	00000.065M	00000.065M
Meter 18	00000.010M	00000.000M	00000.010M	00000.010M
Meter 19	00000.026M	00000.000M	00000.026M	00000.026M
Meter 20	00000.064M	00000.000M	00000.064M	00000.064M
Meter 21	00000.009M	00000.000M	00000.009M	00000.009M
Meter 22	00000.026M	00000.000M	00000.026M	00000.026M
Meter 23	00000.064M	00000.000M	00000.064M	00000.064M
Meter 24	00000.010M	00000.000M	00000.010M	00000.010M

Polling

OK Copy Help

You will see the following screen if you are connected to an EPM 4600-T metering system. Click the tabs to see Watt Hour received, delivered, net and total, per phase and totaled; VA Hour per phase and total; and VAR Hour positive, negative, net and total per phase and totaled.

Interval Energy

Watt Hour | VA Hour | VAR Hour

Watt Hour A | Watt Hour B | Watt Hour C | Watt Hour Total

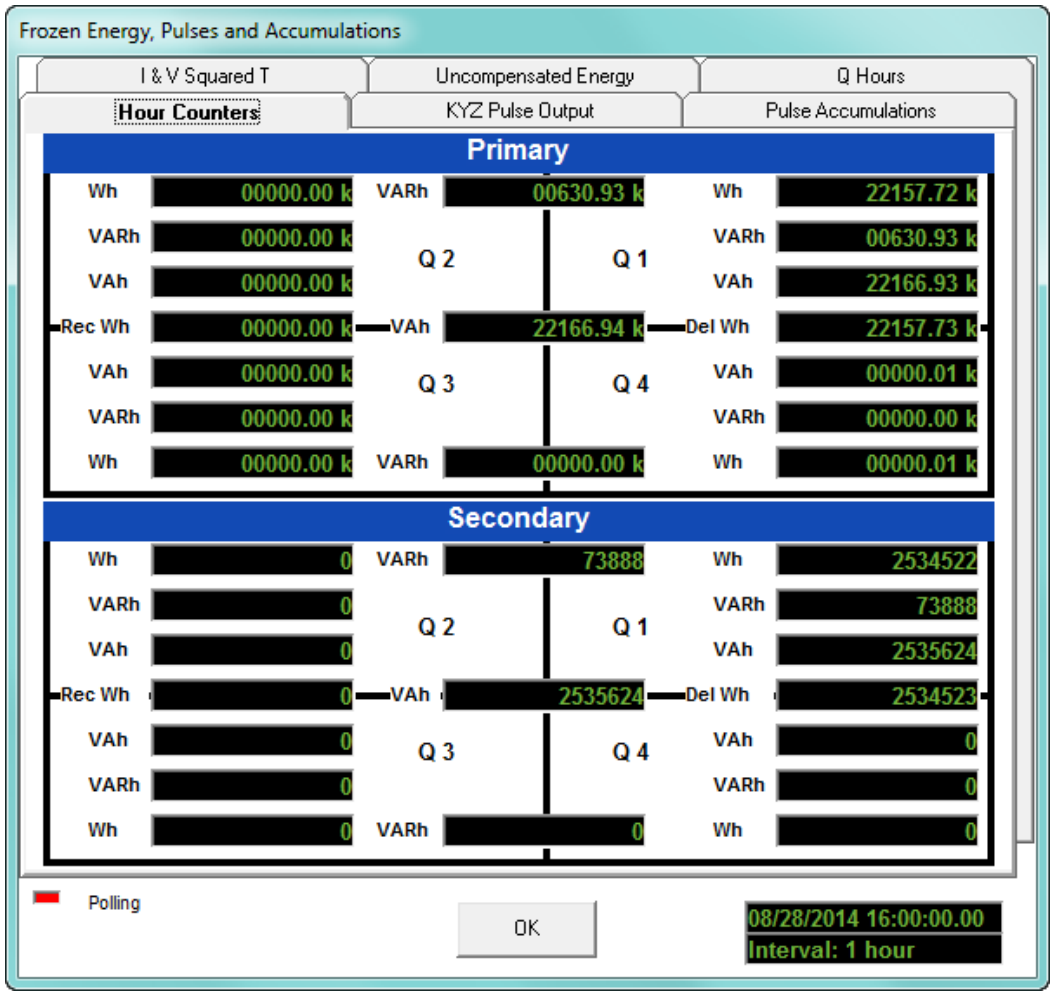
Watt Hour A				
	Received	Delivered	Net	Total
meter 1	00001.451M	00000.000M	00001.451M	00001.451M
meter 2	00001.451M	00000.000M	00001.451M	00001.451M
meter 3	00001.451M	00000.000M	00001.451M	00001.451M
meter 4	00001.450M	00000.000M	00001.450M	00001.450M
meter 5	00001.451M	00000.000M	00001.451M	00001.451M
meter 6	00001.452M	00000.000M	00001.452M	00001.452M
meter 7	00001.452M	00000.000M	00001.452M	00001.452M
meter 8	00001.452M	00000.000M	00001.452M	00001.452M

Polling

OK Copy Help

5.3.5 Poll Frozen Energy, Pulses, and Accumulations

To view the Frozen Energy, Pulse & Accumulations in the Interval for the currently connected EPM 9000 series meter, select **Frozen Energy, Pulse & Accumulations** in the Interval from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the screen shown below.



This screen shows the same readings as explained in 5.3.4 *Poll Energy, Pulses, and Accumulations in the Interval*, except that the values shown are frozen from the most recent hour, rather than updated on the programmed interval, e.g., every 15 minutes.

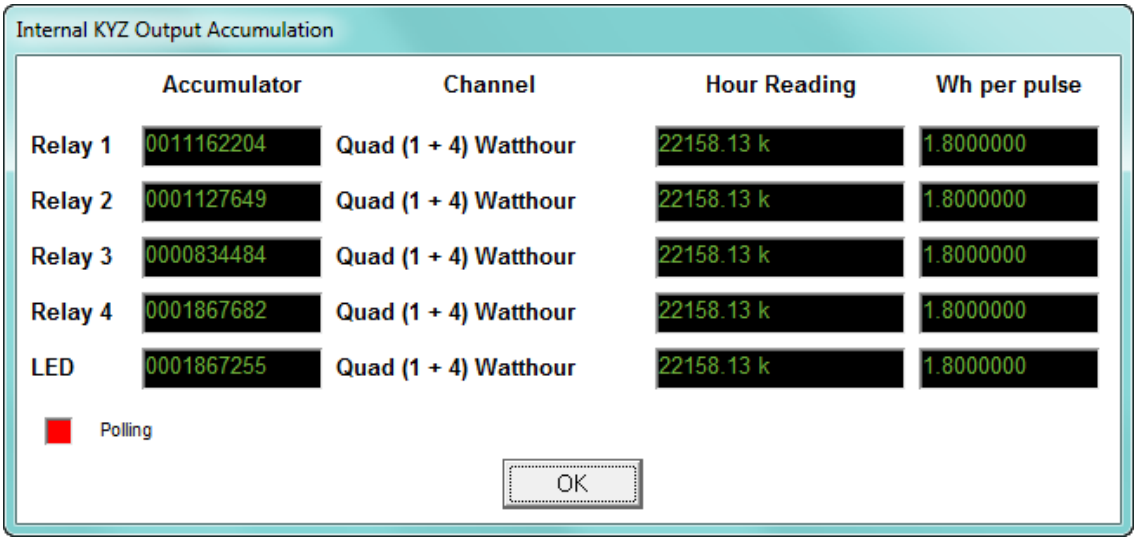
This is designed so that a utility RTU or SCADA system will be able to poll the data after the fact, without it changing, so that there is no risk of losing the data.

Click on the tabs to view additional readings - refer to 5.3.4 *Poll Energy, Pulses, and Accumulations in the Interval* for a description of the tabs.

5.3.6 Poll Internal KYZ Output Accumulations

To view the Internal KYZ Output Accumulations of the currently connected EPM 9000 series meter, select **Internal KYZ Output Accumulations** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.

You will see the screen shown below. (The menu for your meter may look a bit different)



This screen displays the readings from the KYZ Output Relays. Refer to the individual meter chapters for instructions on configuring the Internal KYZ Outputs.

NOTE

The screen shown here is from am EPM 9800 meter.

The screen for an EPM 9650 meter only shows the Heartbeat LED, however the heartbeat LED serves a dual purpose. It can be used as a meter heartbeat to signify that the system is working, or switched into a pulse mode to output a KYZ pulse to test and confirm accuracy.

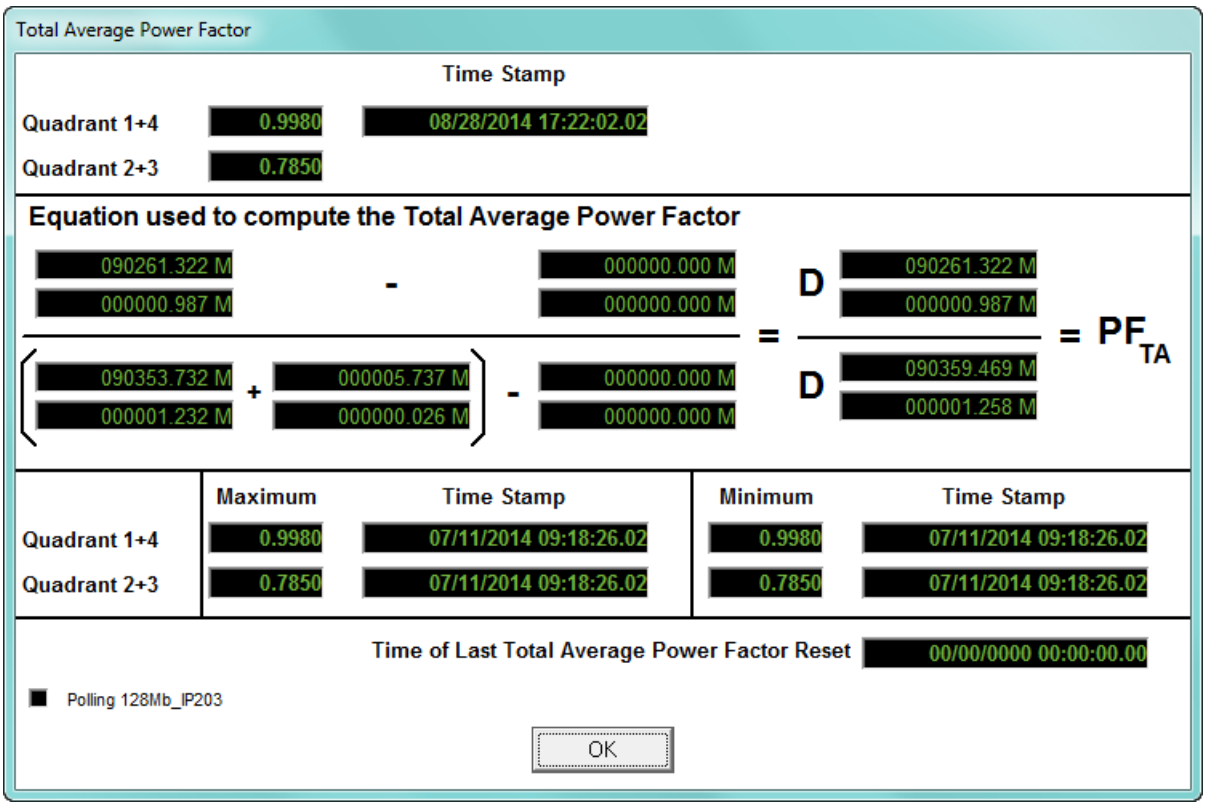
The screen for an EPM 9900/9900P meter only shows the relays.

The screen for an EPM 9700 meter shows two Test pulse LEDs and two Output pulses.

5.3.7 Poll Total Average Power Factor

To view Total Average Power Factor for the EPM 9000 series meter connected to your computer, select **Total Average Power Factor** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.

You will see the screen shown below.



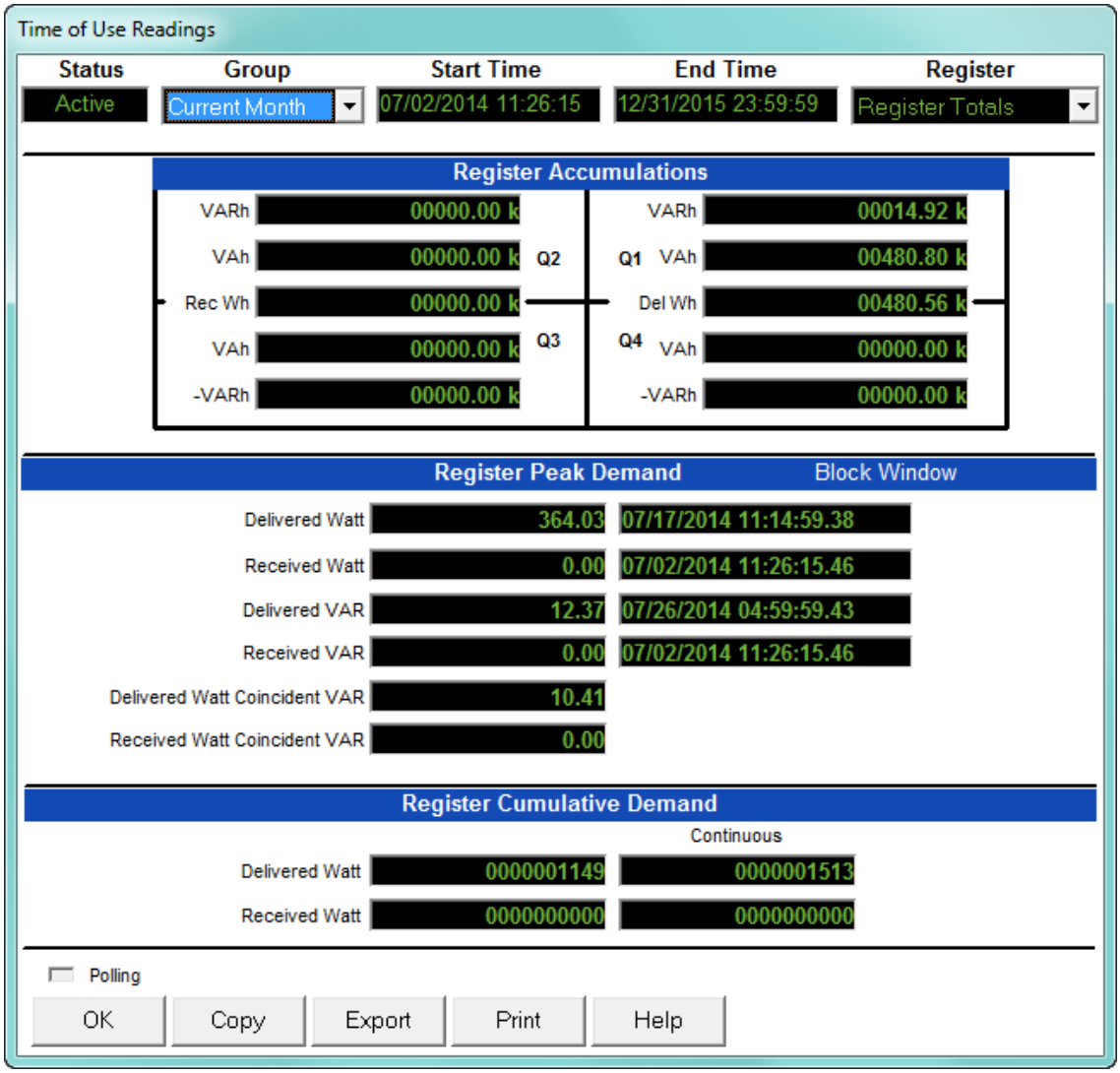
The readings on this screen are based on Power Factor settings (maximum and minimum power settings) from the Device Profile of the connected device.

NOTE

This feature is only available for EPM 9000 series meters, excluding the EPM 9700.

5.3.8 Poll Time of Use Registers

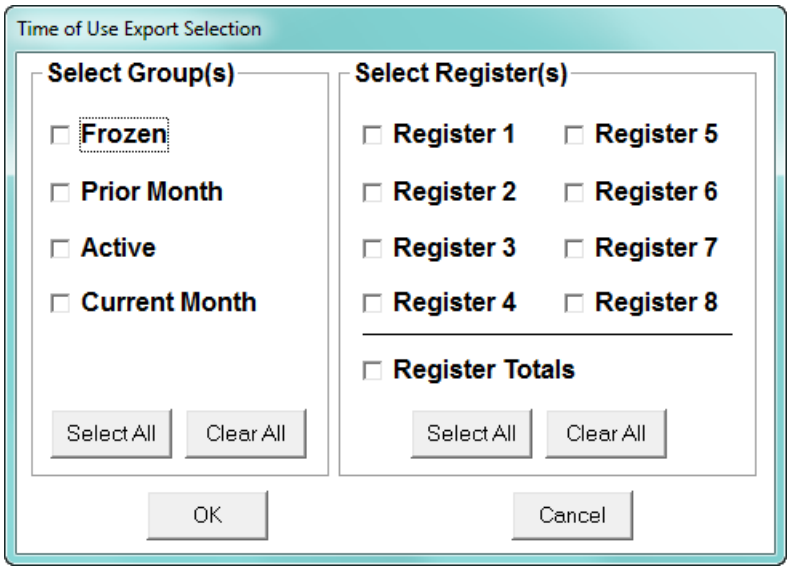
To view Time of Use Readings for the EPM 9000 series meter connected to your computer, select **Time of Use** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the screen shown below if you are connected to an EPM 9450/9650/9800 or 9900 meter.



The readings on this screen are based on the Time of Use settings for the connected device.

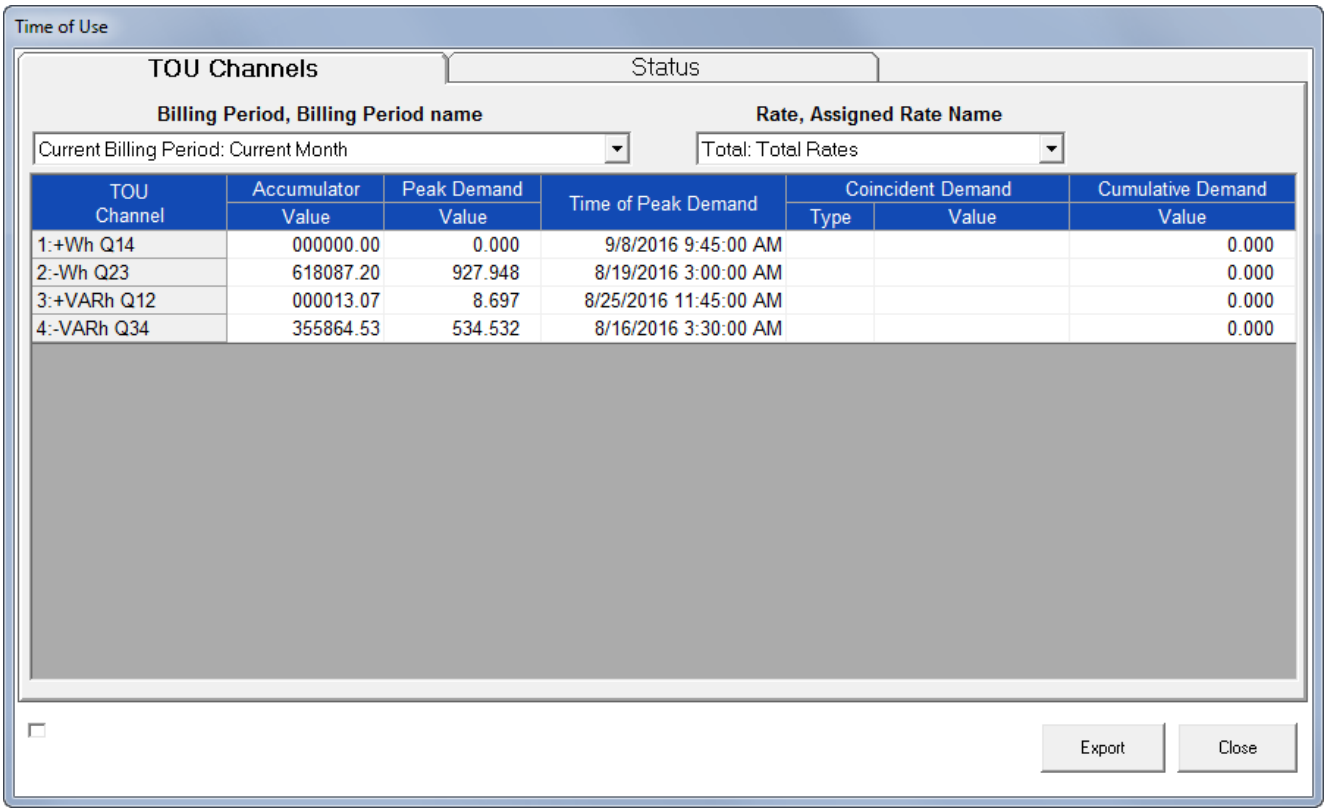
Use the drop-down menus at the top of the screen to view a choice of Groups and Registers.

To copy the data into another program, click Copy. You will see the screen shown on below. Select Groups and Registers and click OK. You will see a message that your data was copied to the clipboard. You can then paste it into a document.



Click Export to save the data as a CSV text file. You will see the screen above. Select Groups and Registers and click OK. You will be prompted to enter a name and location for the .csv file.

If you are connected to an EPM 9700/9900P or 7000P meter, you will see the screen shown below.

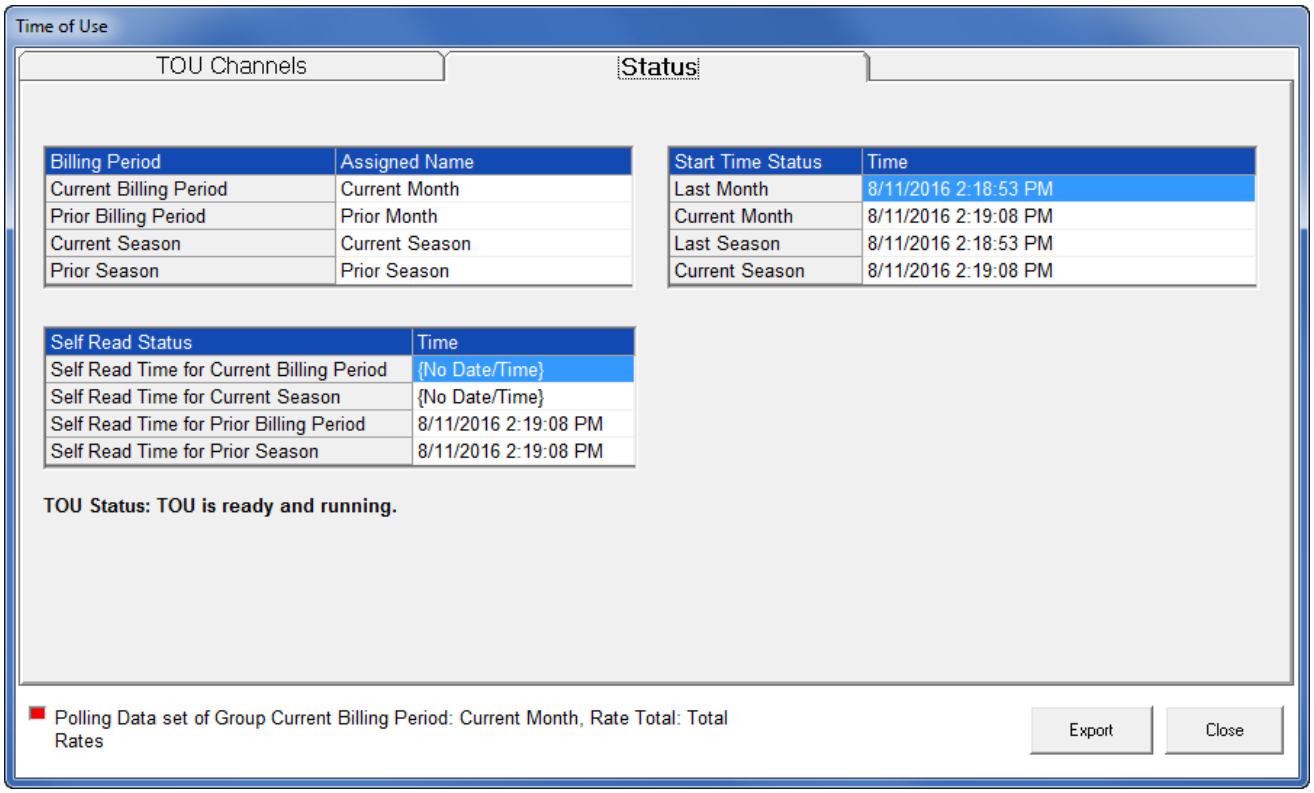


TOU Channel	Accumulator Value	Peak Demand Value	Time of Peak Demand	Coincident Demand Type	Coincident Demand Value	Cumulative Demand Value
1:+Wh Q14	000000.00	0.000	9/8/2016 9:45:00 AM			0.000
2:-Wh Q23	618087.20	927.948	8/19/2016 3:00:00 AM			0.000
3:+VARh Q12	000013.07	8.697	8/25/2016 11:45:00 AM			0.000
4:-VARh Q34	355864.53	534.532	8/16/2016 3:30:00 AM			0.000

This screen has two tabs - the one above shows the data for TOU Channels.

- Select the billing period for which you want to view data from the Billing Period pull-down menu.
- Select the rate for which you want to view data from the Rate pull-down menu.
- The following data is displayed for the billing period and rate you selected:
  - TOU channel, e.g., Positive Wh for Quadrants 1 and 4
  - Accumulator value for the channel
  - Peak Demand for the channel
  - Time of Peak Demand
  - Type of Coincident Demand for the channel
  - Coincident Demand value
  - Cumulative Demand value
  - Type of Cumulative Demand (EPM 7000P Meter)

Click the Status tab to display the screen shown below.



This screen displays information about the current TOU status.

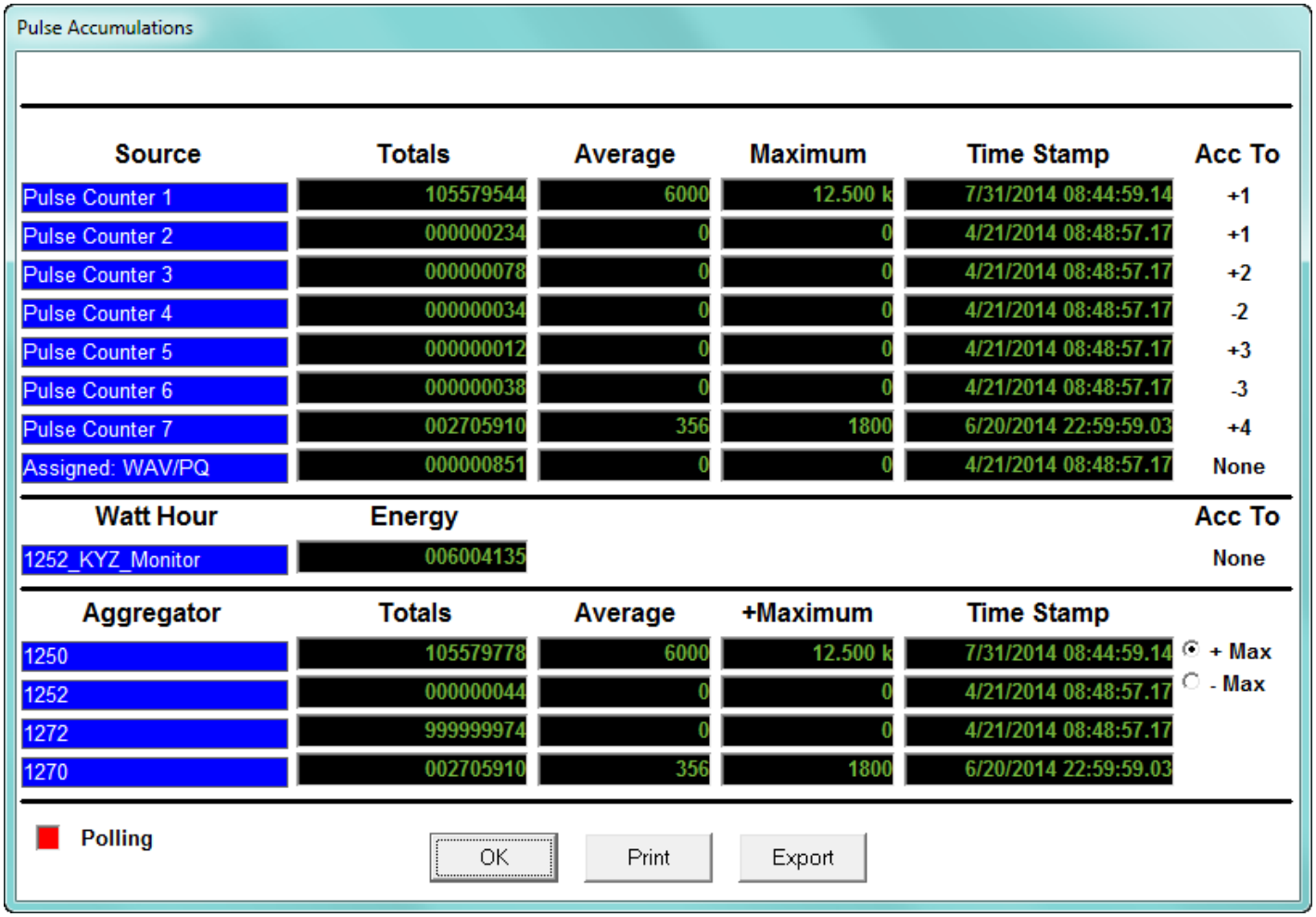
- The message toward the bottom of the screen tells you whether or not TOU is currently running.
- The Billing Period fields tell you the current billing period, previous billing period, current season, and prior season.
- The Self Read Status fields tell you the self read times for the current billing period and season, and the prior billing period and season.

- The Start Time Status fields tell you the TOU start time for the last month, current month, last season, and current season.

5.3.9 Poll Pulse Accumulations

To view the Pulse Accumulations readings for the currently connected EPM 9000 series meter, select **Poll Pulse Accumulations** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the screen shown below.

Pulse accumulators allow the meter to be used as a totalizer, to count and totalize pulses from external devices. This will allow a user to count pulses from other meters, such as other electric or gas meters.



This screen is the result of configuring the Pulse Accumulations setting in the meter Device Profile - see individual meter chapters for details. The EPM 9000 series meter can be programmed to accumulate and aggregate pulses from any pulse generating device.

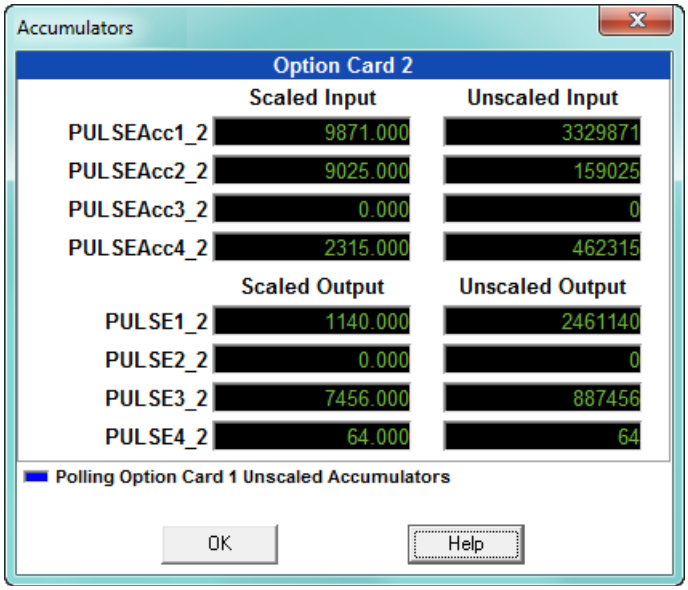
This screen displays:

- Scaled pulse accumulations from the EPM 9000 series meter's eight internal digital inputs

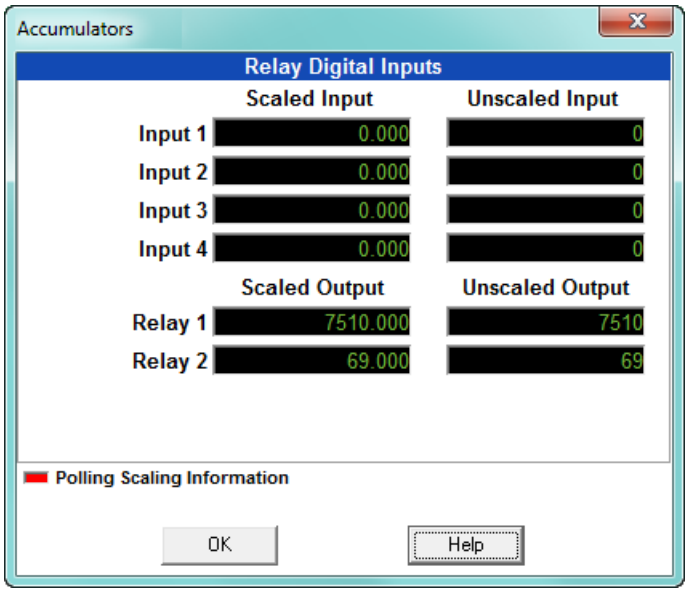
- Fixed Window average and maximum Demand, with timestamp, for the eight pulse accumulations
- Watt Hour Energy reading
- The Acc To field which indicates the count added to or subtracted from an Aggregator, e.g, in the sample screen, +2 means a count is added to Aggregator 2, and -3 means a count is subtracted from Aggregator 3. The pulse aggregators are set up in the meter's Device Profile, in the Pulse Accumulations setting. See 11.2.9 *Pulse Accumulations* (EPM 9900/9900P meter), 12.2.10 *Pulse Accumulations* (EPM 9800 meter), 26.2.6 *Pulse Accumulations* on page 26–28 (EPM 9700), and 13.2.10 *Pulse Accumulations* (EPM 9450/9650 meter) for details.
- Four totalizers (Aggregators), which are combinations of the eight internal inputs and the EPM meter's Watt Hour counter.

5.3.9.1 Poll Accumulators (EPM 7000/7000P and EPM 4600 Metering System)

The EPM 7000 meter equipped with a Pulse Output/Digital Input Card and the EPM 4600 metering system have a polling screen that displays accumulations for the Digital Inputs. Select **Accumulations** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu.



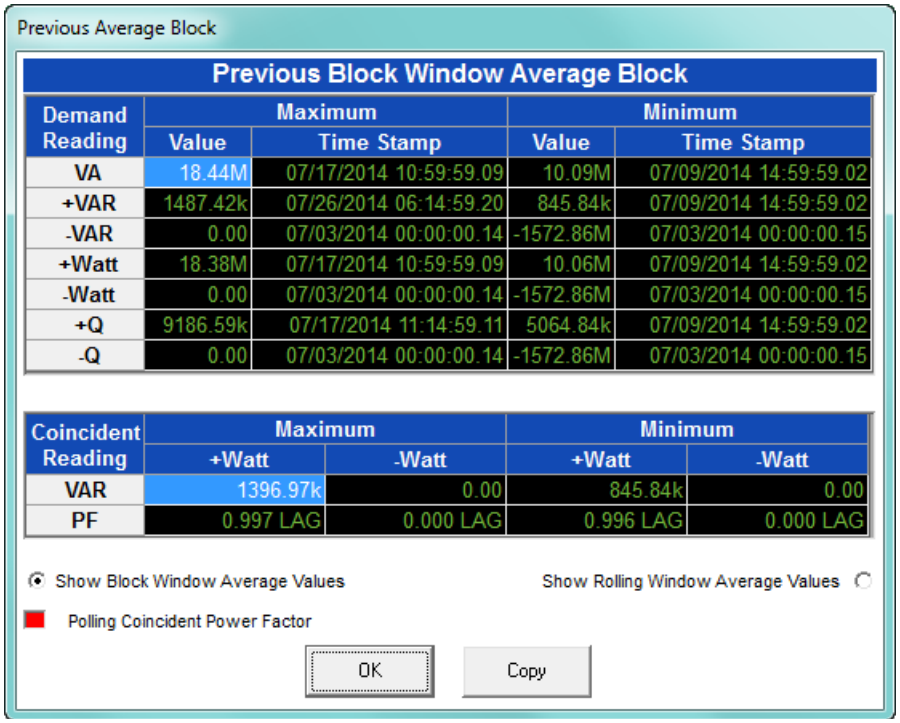
You will see the screen above if you are connected to EPM 7000/7000P meter with a Relay and/or Pulse Output/Digital Input option card. It displays the current readings for the Input and Output accumulators for the cards. The readings are shown after the configured Compression and Units/Count have been applied. See individual meter chapters for information on setting Compression and Units/Count for Accumulators.



You will see the screen above if you are connected to an EPM 4600 metering system. It shows the scaled and unscaled input and output for the embedded Relay Output/Digital Input card.

5.3.10 Poll Previous Average Block

To view the previous Average Block readings for the currently connected EPM 9000 series meter, select **Previous Average Block** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the screen shown below.



Demand Reading	Maximum Value	Maximum Time Stamp	Minimum Value	Minimum Time Stamp
VA	18.44M	07/17/2014 10:59:59.09	10.09M	07/09/2014 14:59:59.02
+VAR	1487.42k	07/26/2014 06:14:59.20	845.84k	07/09/2014 14:59:59.02
-VAR	0.00	07/03/2014 00:00:00.14	-1572.86M	07/03/2014 00:00:00.15
+Watt	18.38M	07/17/2014 10:59:59.09	10.06M	07/09/2014 14:59:59.02
-Watt	0.00	07/03/2014 00:00:00.14	-1572.86M	07/03/2014 00:00:00.15
+Q	9186.59k	07/17/2014 11:14:59.11	5064.84k	07/09/2014 14:59:59.02
-Q	0.00	07/03/2014 00:00:00.14	-1572.86M	07/03/2014 00:00:00.15

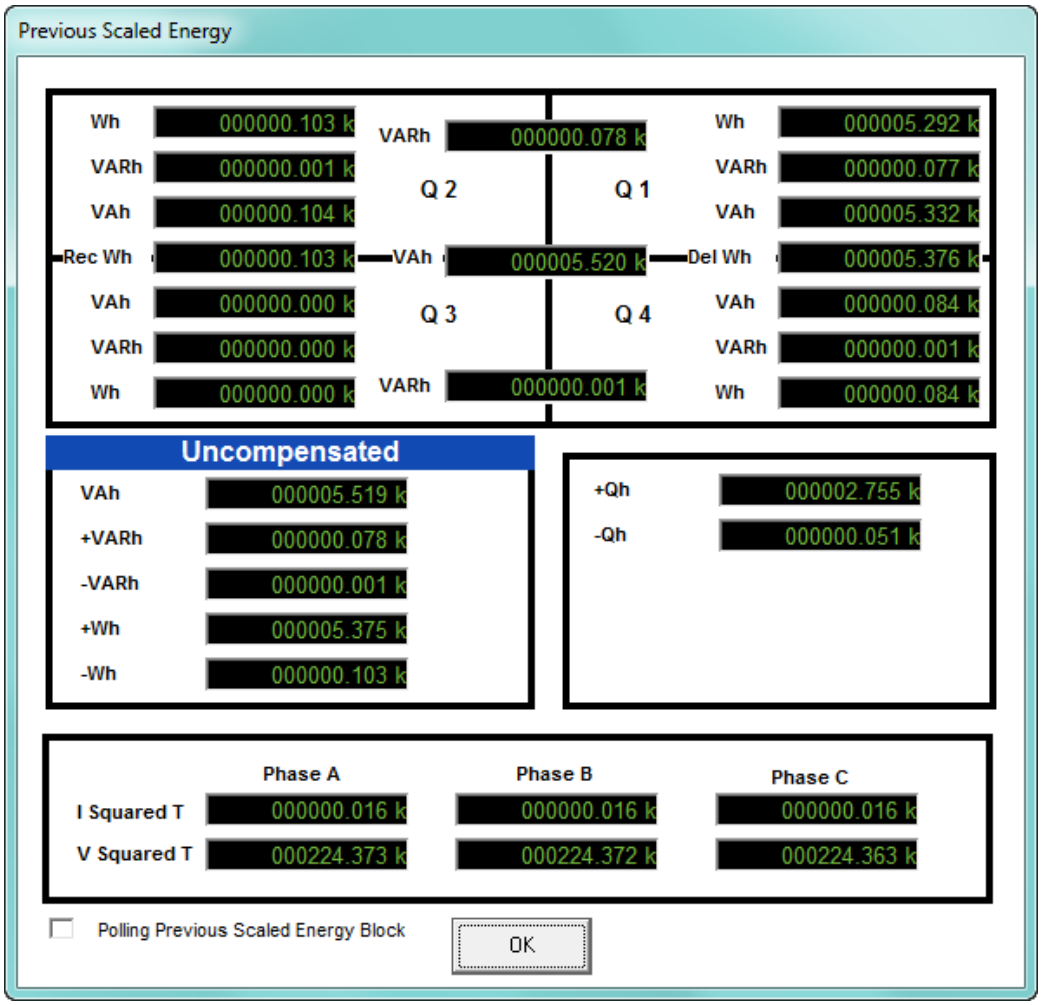
Coincident Reading	Maximum +Watt	Maximum -Watt	Minimum +Watt	Minimum -Watt
VAR	1396.97k	0.00	845.84k	0.00
PF	0.997 LAG	0.000 LAG	0.996 LAG	0.000 LAG

You can view Block Window Average Values or Rolling Window Average Values by clicking the radio button next to either option.

This is a similar feature to a frozen register in that it provides the ability to capture a previous window of data. In this manner, the data can be polled and collected without risk that the data will be erased.

5.3.11 Poll Previous Scaled Energy Block

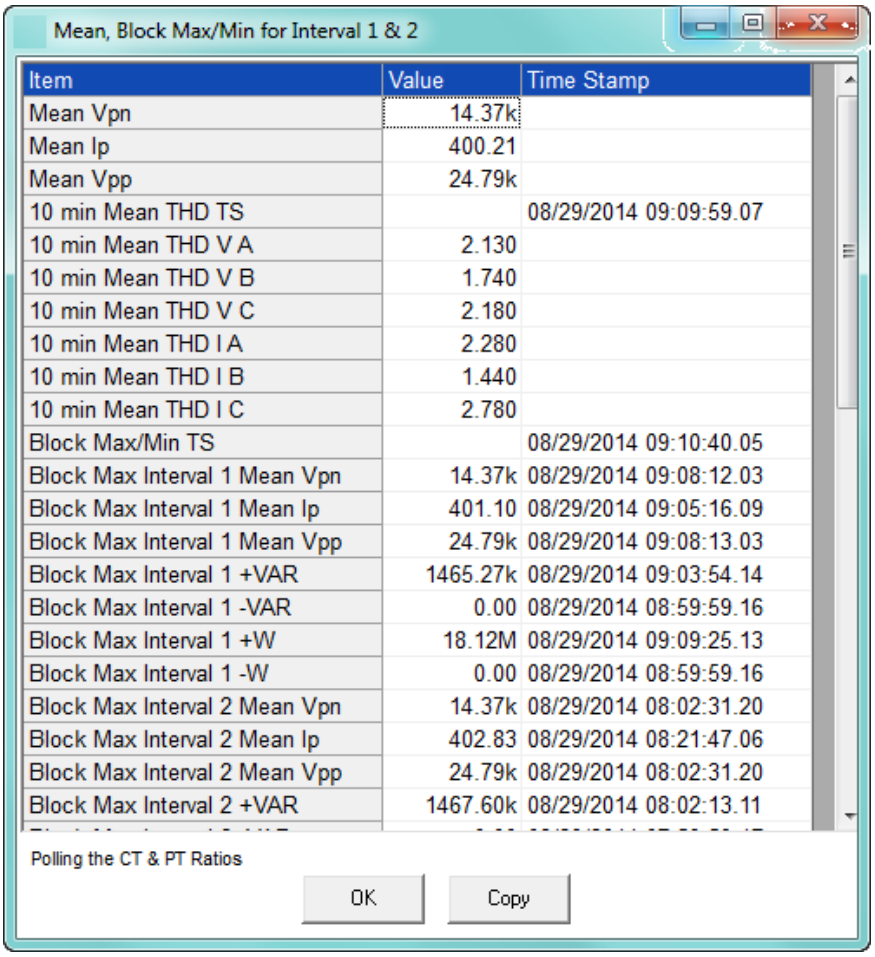
To view the previous Scaled Energy Block Readings for the currently connected EPM 9000 series meter, select **Previous Scaled Energy Block** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the screen shown below.



This screen shows scaled compensated and uncompensated energy readings.

5.3.12 Poll Mean, Block Max/Min for Interval 1 and 2

To view the previous Means and Block Max/Min readings for Interval 1 and 2 for the currently connected EPM 9000 Series meter, select Mean, Block Max/Min for Interval 1 and 2 from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the screen shown below.



Item	Value	Time Stamp
Mean Vpn	14.37k	
Mean Ip	400.21	
Mean Vpp	24.79k	
10 min Mean THD TS		08/29/2014 09:09:59.07
10 min Mean THD V A	2.130	
10 min Mean THD V B	1.740	
10 min Mean THD V C	2.180	
10 min Mean THD I A	2.280	
10 min Mean THD I B	1.440	
10 min Mean THD I C	2.780	
Block Max/Min TS		08/29/2014 09:10:40.05
Block Max Interval 1 Mean Vpn	14.37k	08/29/2014 09:08:12.03
Block Max Interval 1 Mean Ip	401.10	08/29/2014 09:05:16.09
Block Max Interval 1 Mean Vpp	24.79k	08/29/2014 09:08:13.03
Block Max Interval 1 +VAR	1465.27k	08/29/2014 09:03:54.14
Block Max Interval 1 -VAR	0.00	08/29/2014 08:59:59.16
Block Max Interval 1 +W	18.12M	08/29/2014 09:09:25.13
Block Max Interval 1 -W	0.00	08/29/2014 08:59:59.16
Block Max Interval 2 Mean Vpn	14.37k	08/29/2014 08:02:31.20
Block Max Interval 2 Mean Ip	402.83	08/29/2014 08:21:47.06
Block Max Interval 2 Mean Vpp	24.79k	08/29/2014 08:02:31.20
Block Max Interval 2 +VAR	1467.60k	08/29/2014 08:02:13.11

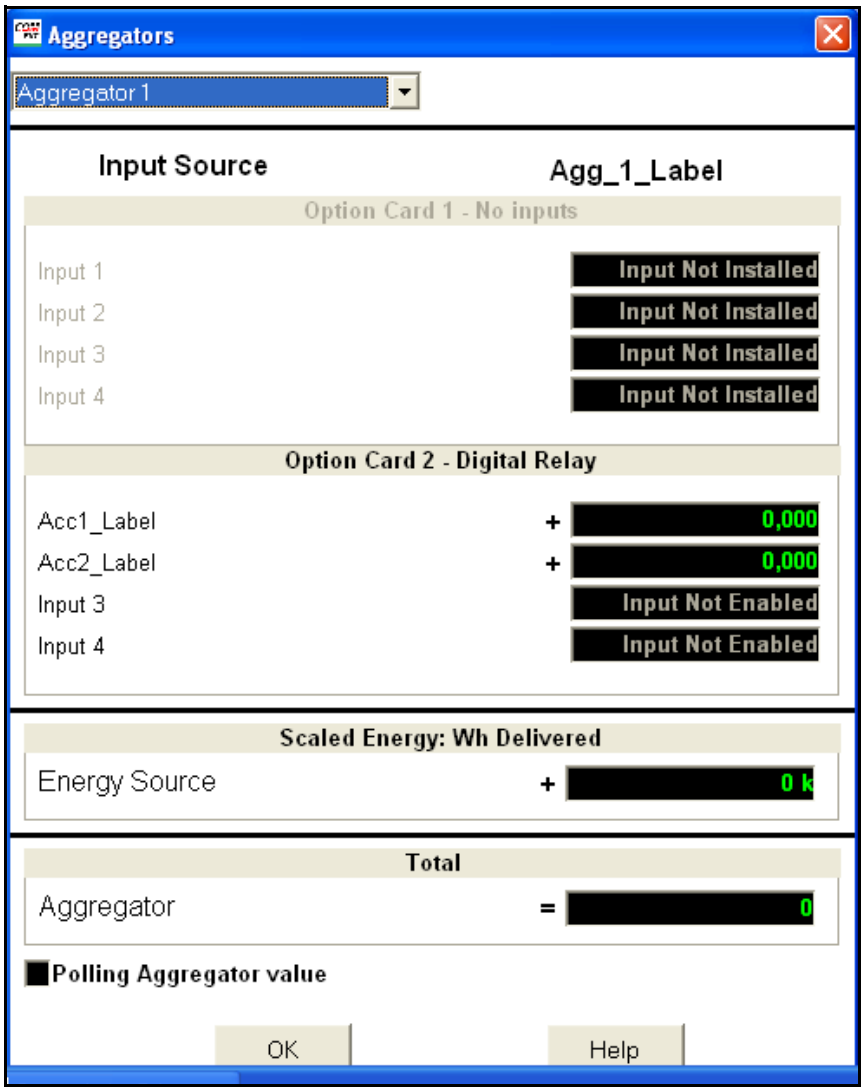
Use the scroll bar to view all of the data. The fields in this polling screen are as follows:

- Mean Vpn is the arithmetic average of all 3 phase to neutral voltages (Van +Vbn + Vcn / 3).
- Mean Ip is the arithmetic average of all 3 current phases (Ia +Ib + Ic / 3).
- Mean Vpp is the arithmetic average of all 3 phase to phase voltages (Vab +Vbc + Vca / 3).
- The 10 min Mean THD TS is the date and time of each 10 min intervals.
- The 10 min Mean THD Va,Vb,Vc,Ia,Ib,Ic, I the arithmetic average of each THD value within 10 minutes, sampled each second (e.g., THD Va at 1 second + THD Va 2 seconds....+THD Va at 600 seconds / 600 seconds).
- This polling screen was developed to meet a specific customer need. The concept of INTERVAL 1 and INTERVAL 2 because the application necessitated that some values be averaged within 10 minutes (e.g., THD,V, and I) and some other values be averaged within 5 minutes (e.g., Energy). INTERVAL 1 is equal to 10 minutes and INTERVAL 2 is equal to 5 minutes.

- Block Max / Min TS is the date and time of each interval.
- Block Max interval 1 mean Vpn/Ip/Vpp/+VAR/-VAR/+W/-W is the value of the sample with the highest value, of the 600 samples within 10 minutes.
- Block Max interval 2 mean Vpn/Ip/Vpp/+VAR/-VAR/+W/-W is the value of the sample with the highest value, of the 300 samples within 5 minutes.
- Block Min interval 1 mean Vpn/Ip/Vpp/+VAR/-VAR/+W/-W is the value of the sample with the lowest value, of the 600 samples within 10 minutes.
- Block Min interval 2 mean Vpn/Ip/Vpp/+VAR/-VAR/+W/-W is the value of the sample with the lowest value of the 300 samples within 5 minutes.

5.3.13 Poll Aggregators (EPM 7000P Meter)

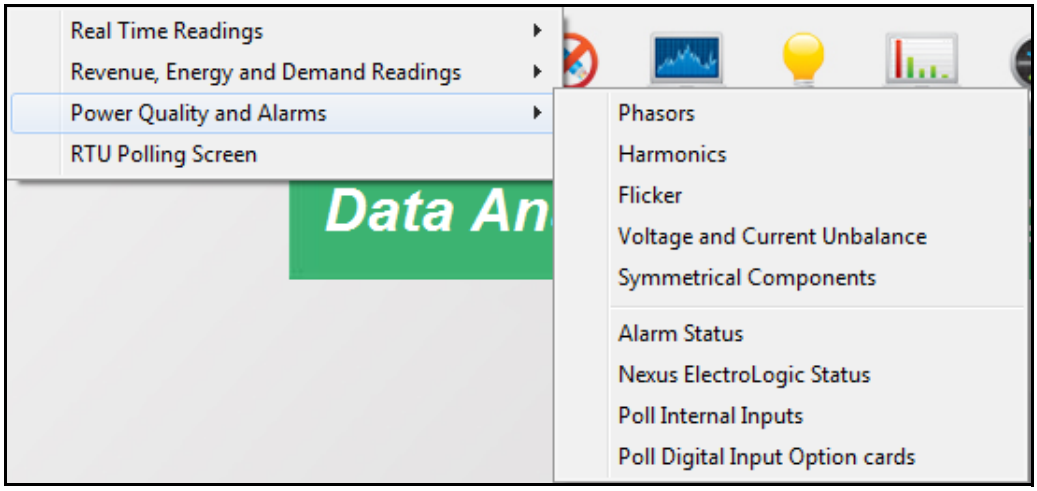
To view the values for the meter's Aggregators values for the meter's, select **Aggregators** from the **Real-Time Poll > Revenue, Energy, and Demand Readings** menu. You will see the screen shown below.



Select the Aggregator you want to view from the pull-down menu at the top of the screen.

- The screen shows any inputs and Energy source used to create the Aggregator.
- A plus sign next to the value means the input/energy value is added to the Aggregator; a minus sign means it is subtracted from the Aggregator.
- The Aggregator value is shown in the total field.

5.4 Power Quality and Alarms



The menu above is for EPM 9900P meter - the menu for your meter may look a bit different.

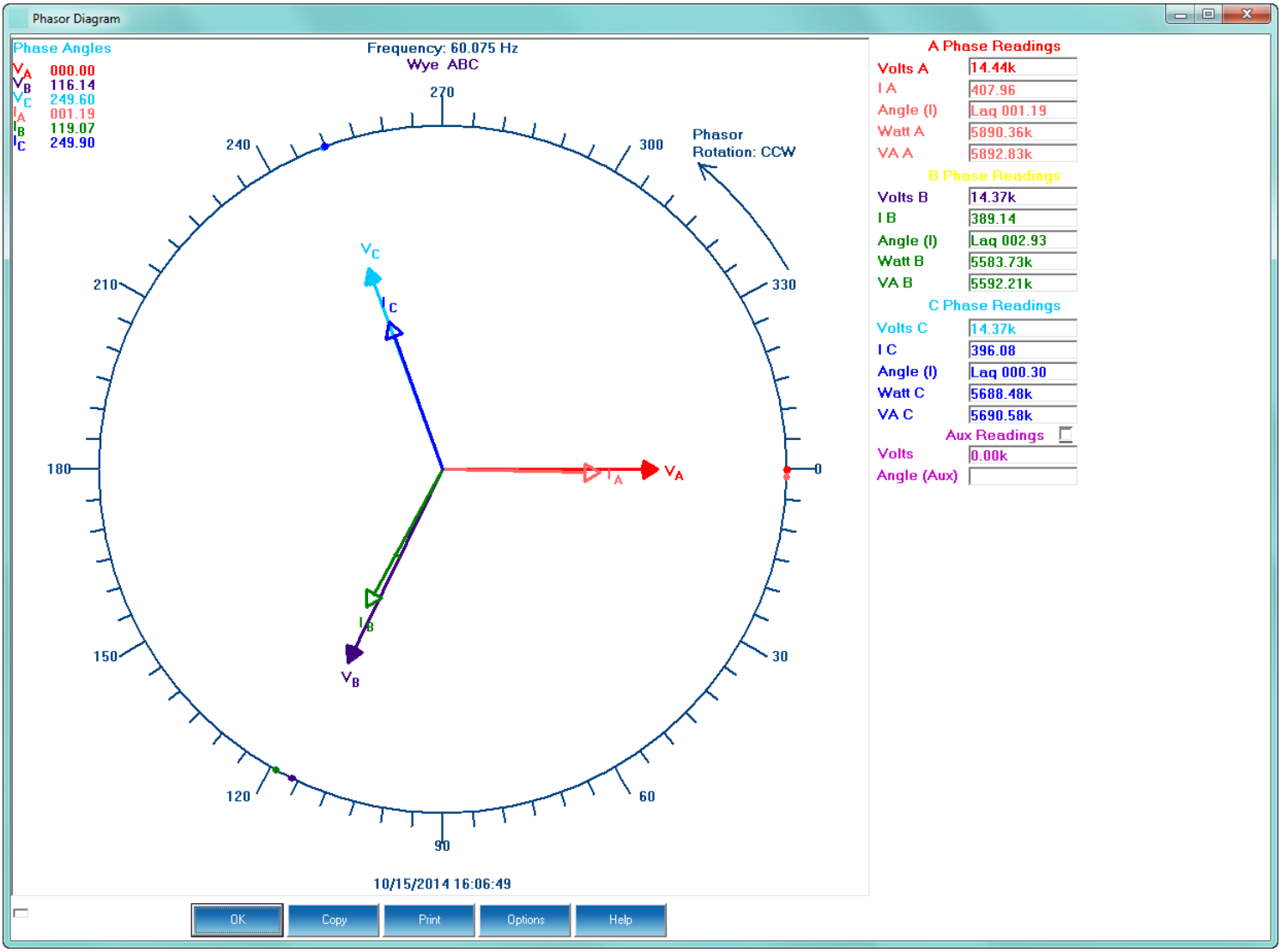
5.4.1 Poll Phasors

The Phasors screen displays the phase relationships of the voltages and the currents of the currently connected device. The Frequency, Configuration, and Form (EPM 9800 meter, only) are shown at the top of the screen.

NOTE

See E.1 *Troubleshooting Using the Phasor Diagram* for information on using the Phasors screen to diagnose wiring errors.

Select **Phasors** from the **Real-Time Poll > Power Quality and Alarms** menu, or click the **Phasors** icon in the Icon Bar. You will see the screen shown below if you are connected to an EPM 9900/9900P meter.



If you have an auxiliary voltage reading (i.e., generator and bus where the VAux is the generator), the Aux box and the VAux Phasor are displayed. The VAux Phasor is referenced to VA phase.

For the EPM 4600 metering system, depending on your circuit configuration, you'll see one of the following screens.

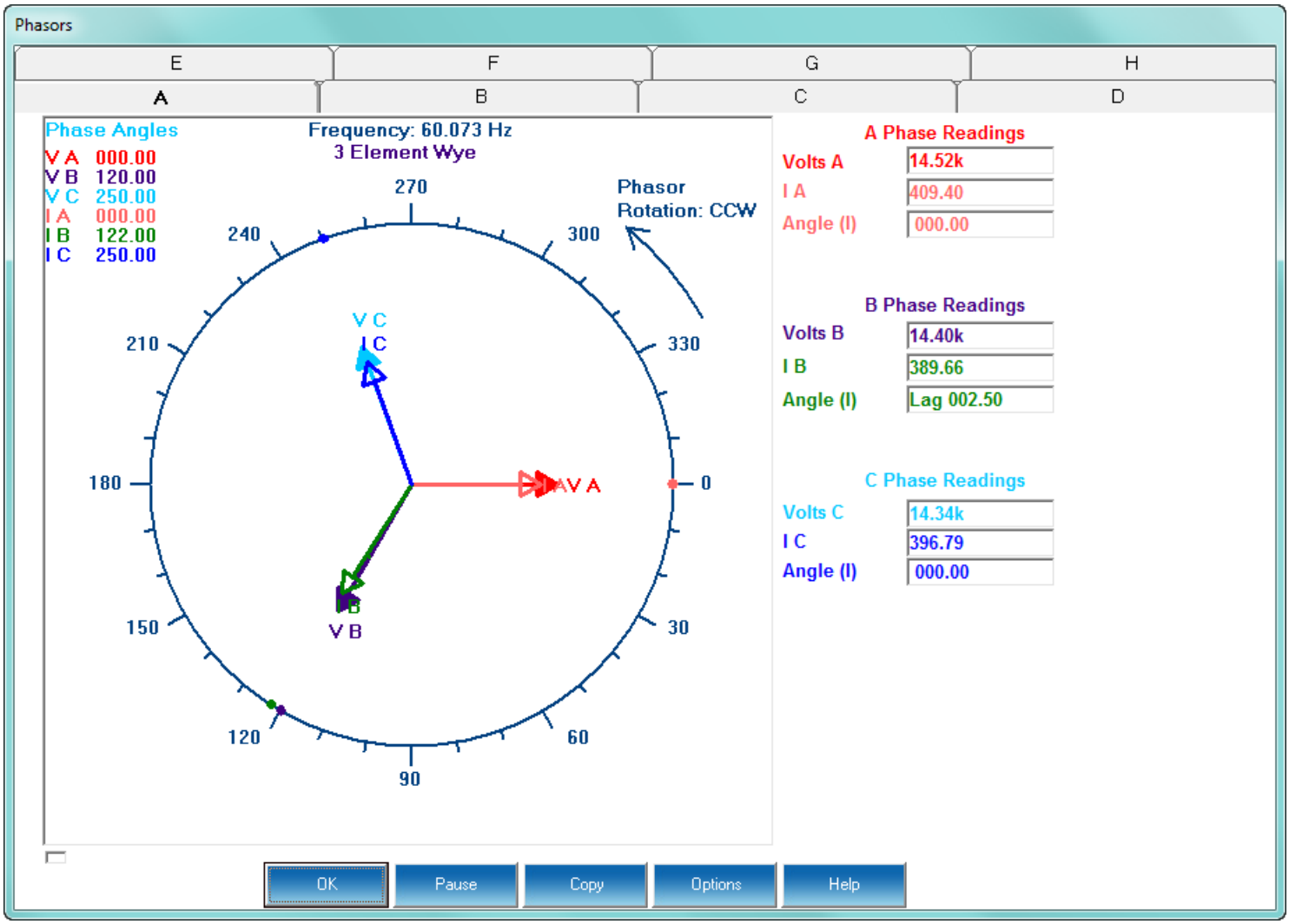


Figure 5-1: EPM 4600-T Metering System

Click on the tabs to see the phasor display for each of the 8 meters.

From the pull-down menu, select which of the 24 meters you want to see the phasor display for.

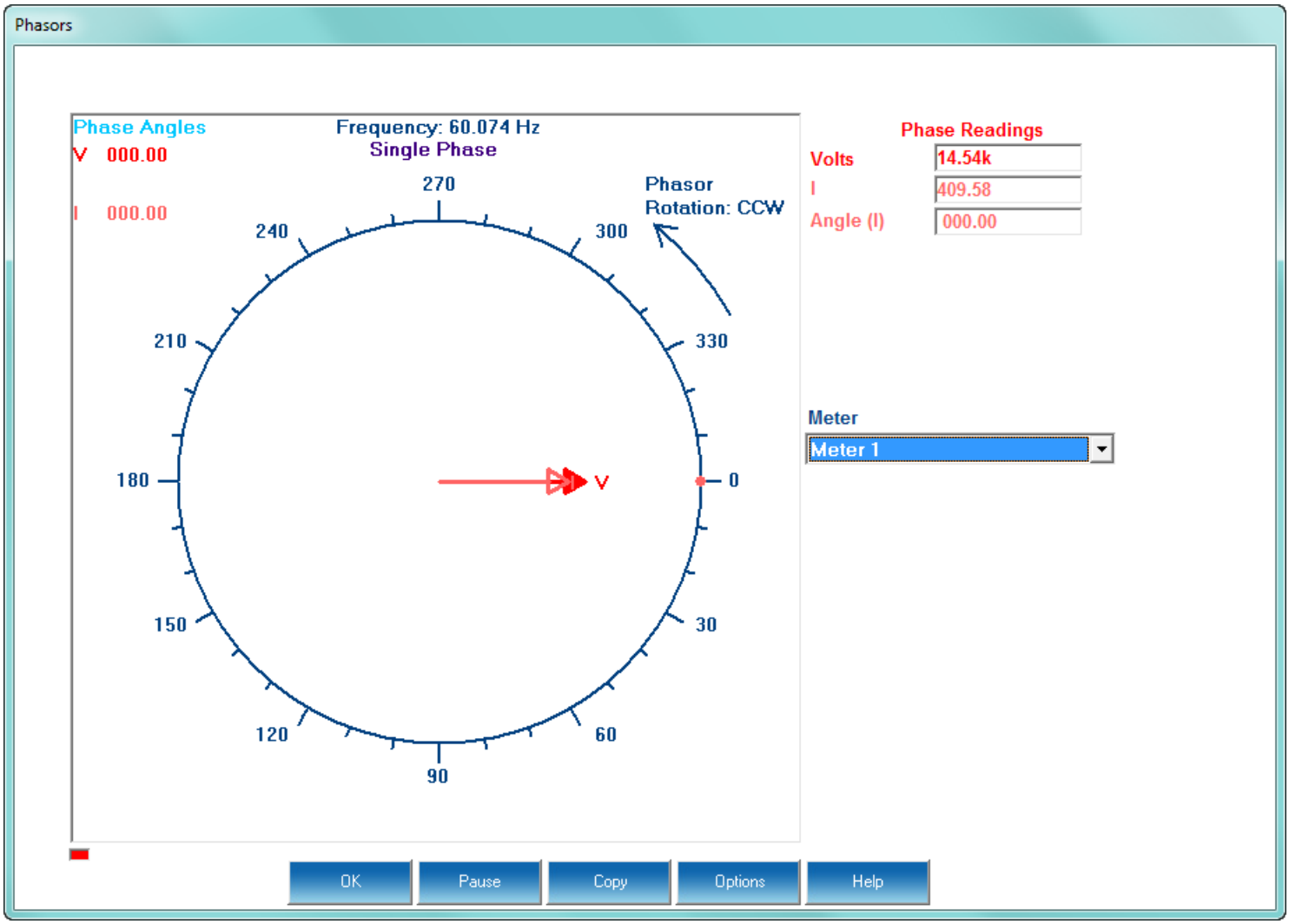
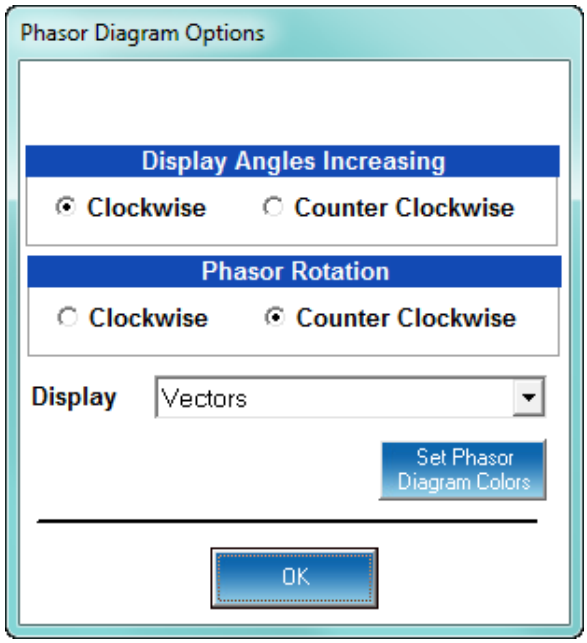


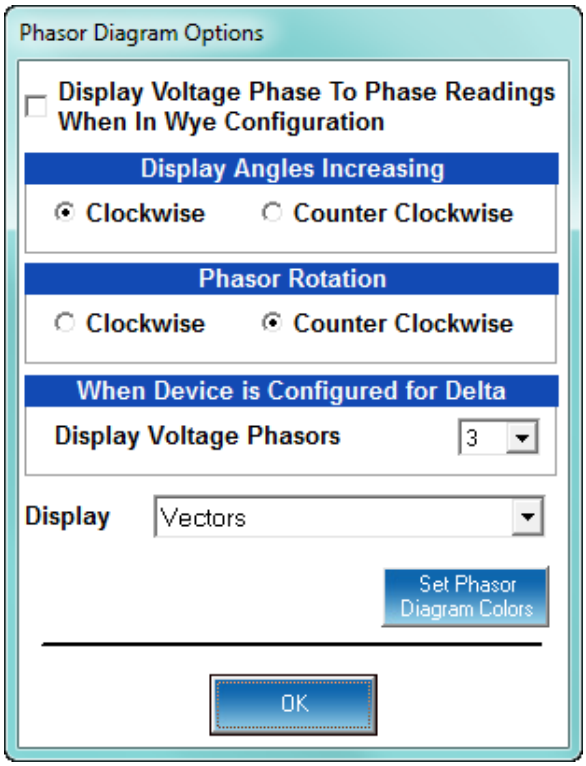
Figure 5-2: EPM 4600-S Metering System

The Phasor screen is a graphical representation of the voltage and current phase angles. Phase angles are the difference in phase between the voltage and current in an AC electrical system. In addition to the Phasor graphic, there are fields on the screen that give the phase angles and phase values for phases A,B,C of current and voltage and VAUX, if applicable

To adjust the Phasor display:

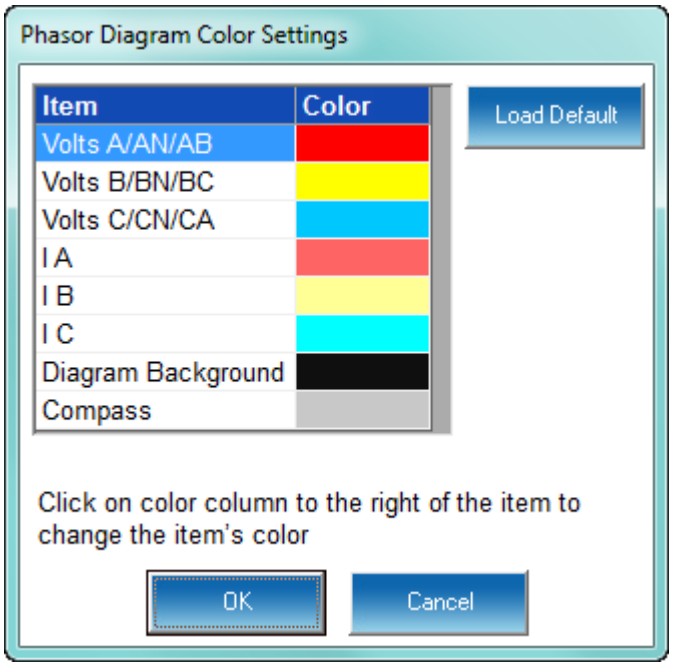
1. Click **Options** at the bottom of the screen. You will see one of the screens shown below, depending on your meter model..

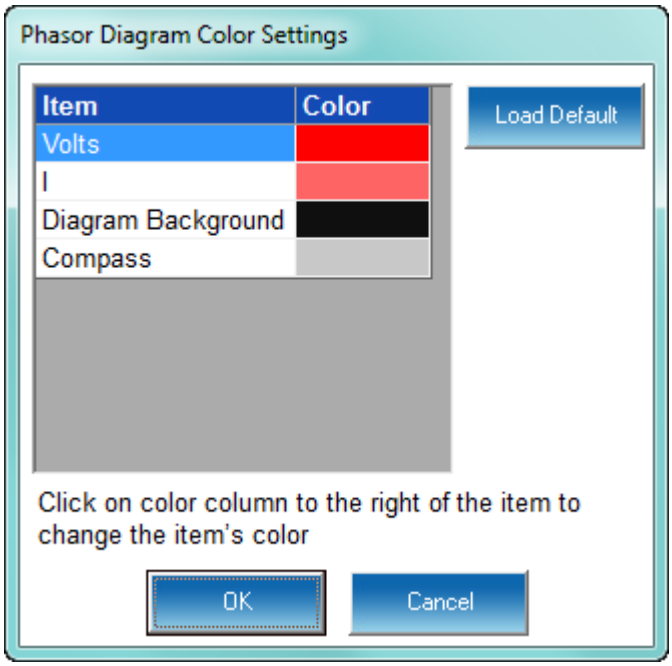




2. Click the checkbox next to **Display Voltage Phase To Phase Readings When In Wye Configuration**, if you want to include that reading in the graph. This option is only available for EPM 9900 series meters.
3. In the **Display Angles Increasing** and **Phasor Rotation** boxes, select either **Clockwise** or **Counter Clockwise** for the display.
4. For an EPM 9900 series meter, from the **When Device is Configured for Delta** pull-down menu, select 2 or 3 voltage phasors to display.
5. From the pull-down menu next to **Display**, select **Vectors**, **Triangles**, or **Vectors and Triangles** to change the graphic representation of the data.

6. To change the phasor diagram colors, click the **Set Phasor Diagram Colors** button. Depending on the meter you are connected to, you will see one of the following screens.





- To change a color for an element, click in the color field to the right of it. A small screen opens that lets you choose colors. Click on the color you want and click OK.
- To return to the original color scheme, click Load Default.

7. Click **OK** to close the Color Settings screen.
8. Click **OK** to close the Options screen and return to the phasor display.

5.4.2 Poll Harmonics

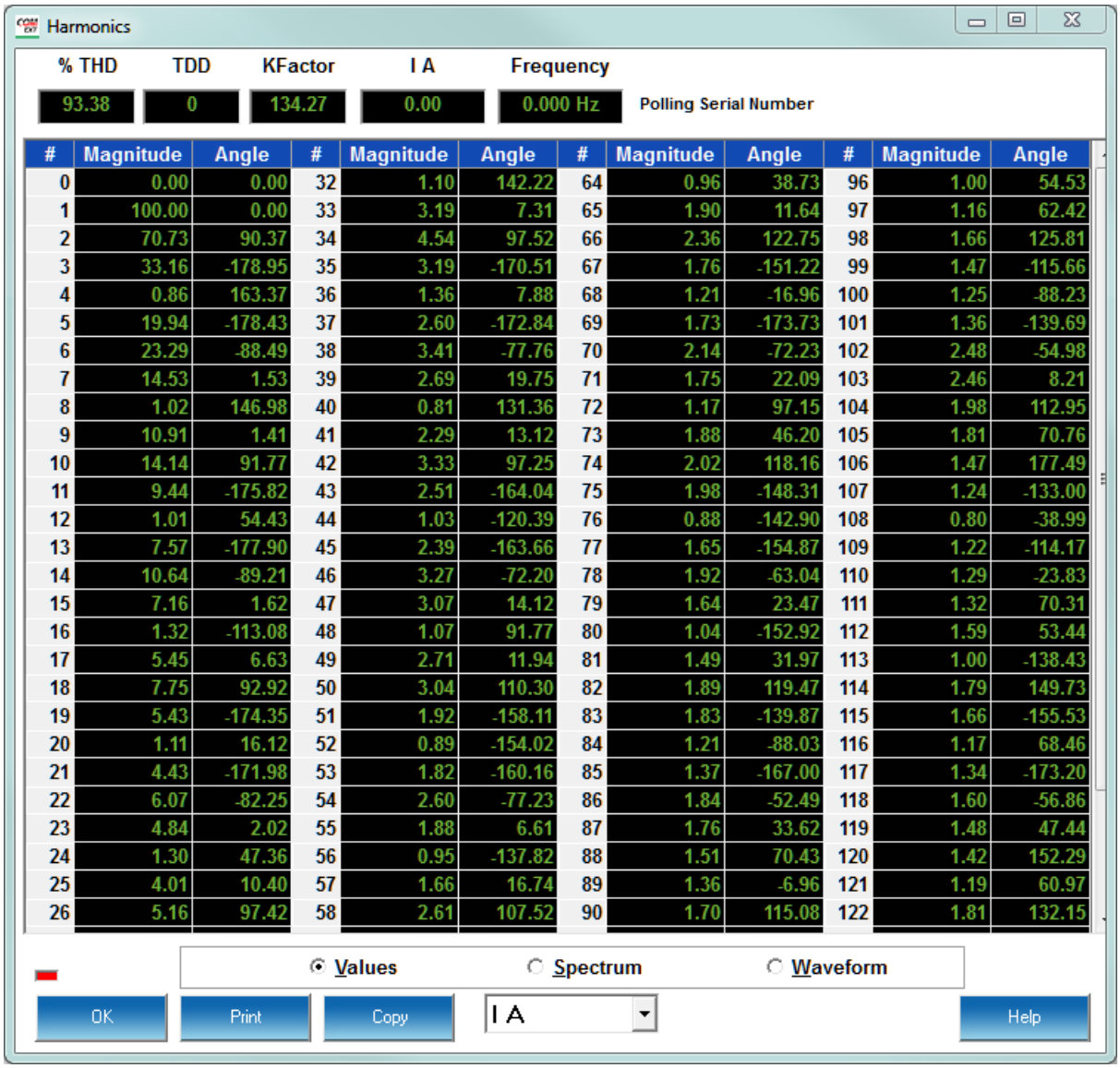
Many of the EPM meters have the ability to calculate the harmonic components of the electrical waveforms. These screens allow a user to conduct a harmonic analysis and view the amount of higher level harmonics on a line.

If Harmonic magnitude measurement is available for the connected meter, select **Poll Harmonics** from the **Real-Time Poll > Power Quality and Alarms** menu. You will see the screen shown below.

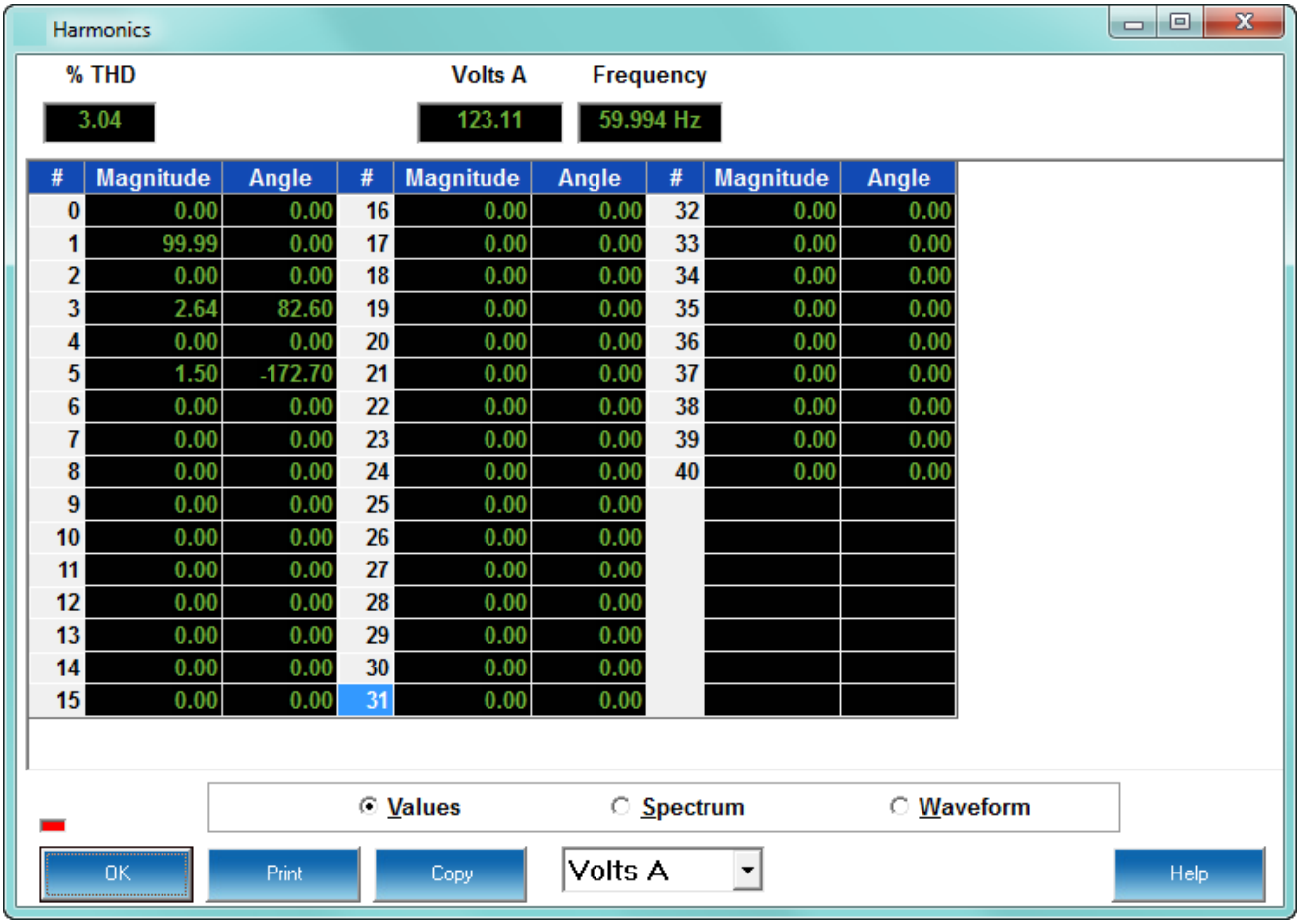
NOTE

You will only see the TDD and KFactor (EPM 9000 series meters only) fields when you are viewing Harmonic Magnitudes for Current.

You will see the following screen if you are connected to an EPM 9000 series meter.



#	Magnitude	Angle	#	Magnitude	Angle	#	Magnitude	Angle	#	Magnitude	Angle
0	0.00	0.00	32	1.10	142.22	64	0.96	38.73	96	1.00	54.53
1	100.00	0.00	33	3.19	7.31	65	1.90	11.64	97	1.16	62.42
2	70.73	90.37	34	4.54	97.52	66	2.36	122.75	98	1.66	125.81
3	33.16	-178.95	35	3.19	-170.51	67	1.76	-151.22	99	1.47	-115.66
4	0.86	163.37	36	1.36	7.88	68	1.21	-16.96	100	1.25	-88.23
5	19.94	-178.43	37	2.60	-172.84	69	1.73	-173.73	101	1.36	-139.69
6	23.29	-88.49	38	3.41	-77.76	70	2.14	-72.23	102	2.48	-54.98
7	14.53	1.53	39	2.69	19.75	71	1.75	22.09	103	2.46	8.21
8	1.02	146.98	40	0.81	131.36	72	1.17	97.15	104	1.98	112.95
9	10.91	1.41	41	2.29	13.12	73	1.88	46.20	105	1.81	70.76
10	14.14	91.77	42	3.33	97.25	74	2.02	118.16	106	1.47	177.49
11	9.44	-175.82	43	2.51	-164.04	75	1.98	-148.31	107	1.24	-133.00
12	1.01	54.43	44	1.03	-120.39	76	0.88	-142.90	108	0.80	-38.99
13	7.57	-177.90	45	2.39	-163.66	77	1.65	-154.87	109	1.22	-114.17
14	10.64	-89.21	46	3.27	-72.20	78	1.92	-63.04	110	1.29	-23.83
15	7.16	1.62	47	3.07	14.12	79	1.64	23.47	111	1.32	70.31
16	1.32	-113.08	48	1.07	91.77	80	1.04	-152.92	112	1.59	53.44
17	5.45	6.63	49	2.71	11.94	81	1.49	31.97	113	1.00	-138.43
18	7.75	92.92	50	3.04	110.30	82	1.89	119.47	114	1.79	149.73
19	5.43	-174.35	51	1.92	-158.11	83	1.83	-139.87	115	1.66	-155.53
20	1.11	16.12	52	0.89	-154.02	84	1.21	-88.03	116	1.17	68.46
21	4.43	-171.98	53	1.82	-160.16	85	1.37	-167.00	117	1.34	-173.20
22	6.07	-82.25	54	2.60	-77.23	86	1.84	-52.49	118	1.60	-56.86
23	4.84	2.02	55	1.88	6.61	87	1.76	33.62	119	1.48	47.44
24	1.30	47.36	56	0.95	-137.82	88	1.51	70.43	120	1.42	152.29
25	4.01	10.40	57	1.66	16.74	89	1.36	-6.96	121	1.19	60.97
26	5.16	97.42	58	2.61	107.52	90	1.70	115.08	122	1.81	132.15



#	Magnitude	Angle	#	Magnitude	Angle	#	Magnitude	Angle
0	0.00	0.00	16	0.00	0.00	32	0.00	0.00
1	99.99	0.00	17	0.00	0.00	33	0.00	0.00
2	0.00	0.00	18	0.00	0.00	34	0.00	0.00
3	2.64	82.60	19	0.00	0.00	35	0.00	0.00
4	0.00	0.00	20	0.00	0.00	36	0.00	0.00
5	1.50	-172.70	21	0.00	0.00	37	0.00	0.00
6	0.00	0.00	22	0.00	0.00	38	0.00	0.00
7	0.00	0.00	23	0.00	0.00	39	0.00	0.00
8	0.00	0.00	24	0.00	0.00	40	0.00	0.00
9	0.00	0.00	25	0.00	0.00			
10	0.00	0.00	26	0.00	0.00			
11	0.00	0.00	27	0.00	0.00			
12	0.00	0.00	28	0.00	0.00			
13	0.00	0.00	29	0.00	0.00			
14	0.00	0.00	30	0.00	0.00			
15	0.00	0.00	31	0.00	0.00			

You will see the screen above if you are connected to an EPM 7000 meter.

- To change the presentation format, click on the Values, Spectrum or Waveform buttons. The two previous screens are in Values mode. The Spectrum Mode and Waveform Mode screens are shown on the next page.
- The Waveform button works like a real time oscilloscope. It allows a user to view what the waveform would look like for the given harmonics. This is available for each voltage and current channel.

Figure 5-3: Harmonic Spectrum Analysis

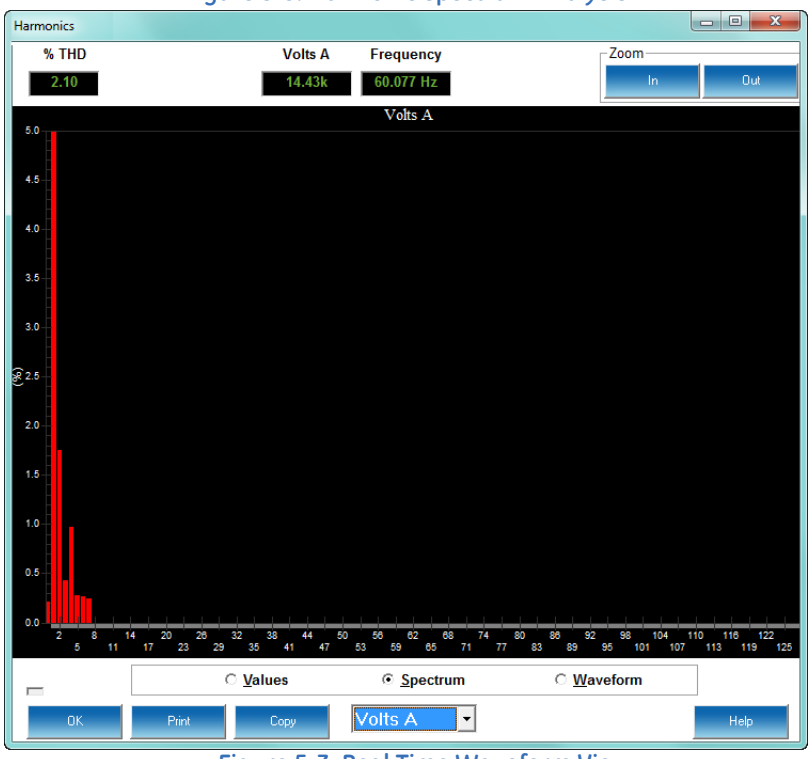
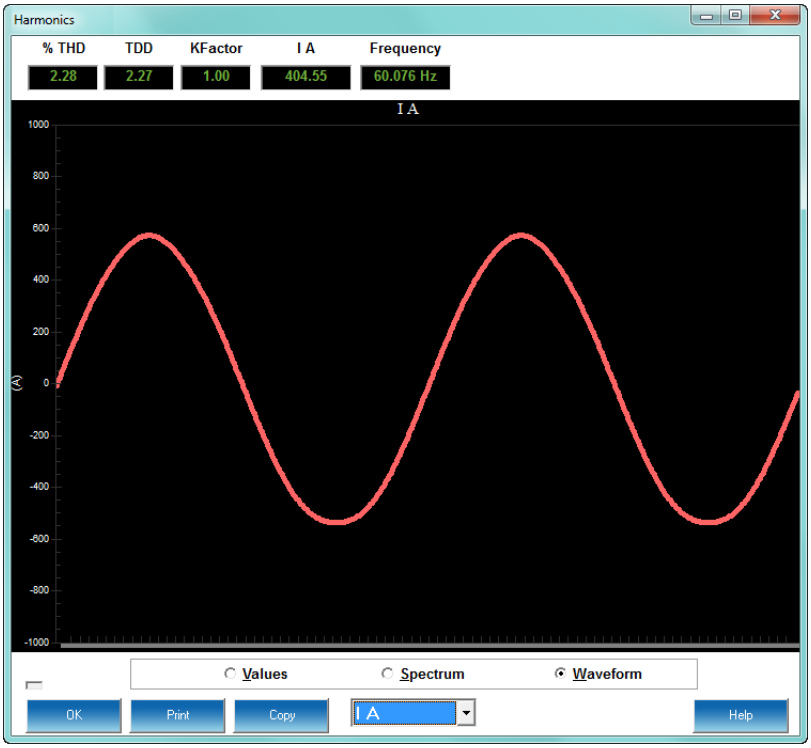


Figure 5-3: Real Time Waveform View

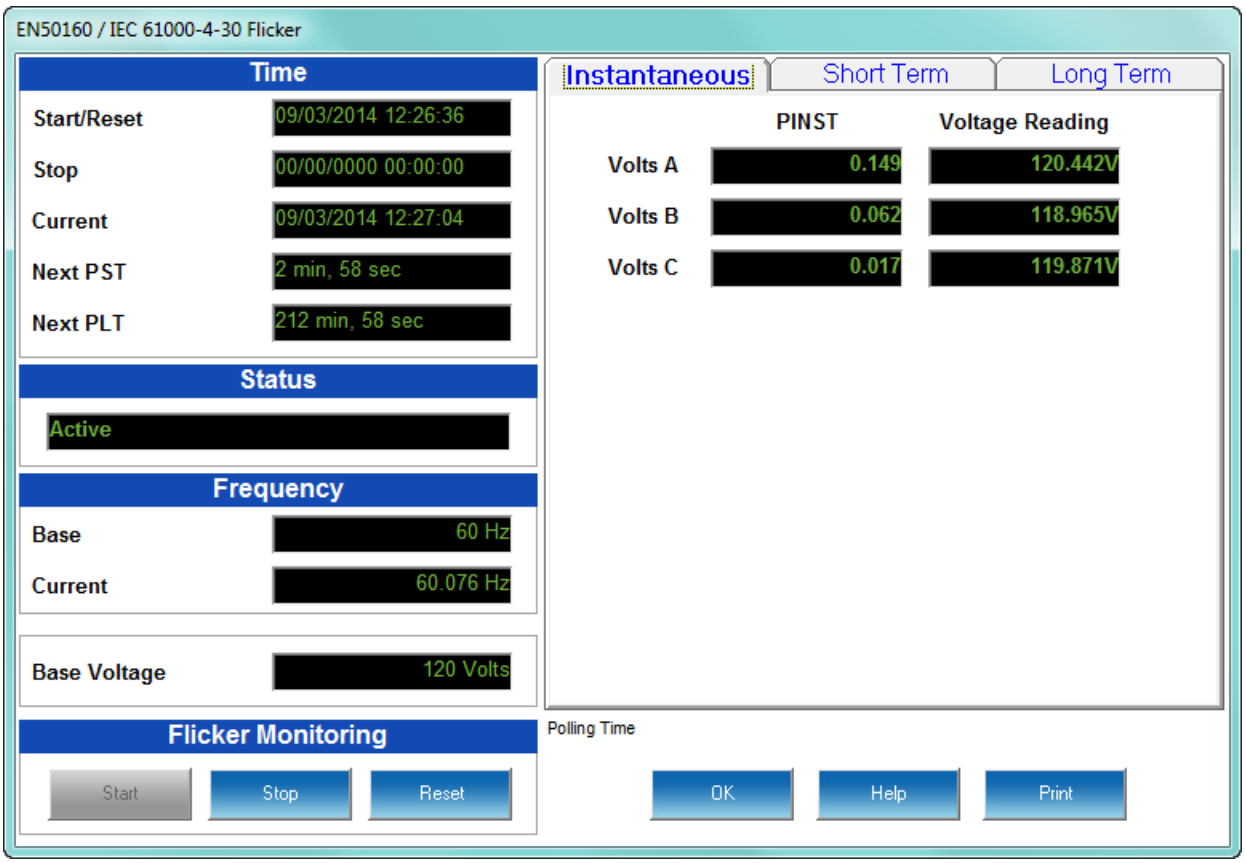


- To change the channel, use the pull-down menu beneath the Spectrum radio button to select from Volts A, B, C or Current (I) A, B, C.
- Use the scroll bar to view all of the data.

5.4.3 Flicker

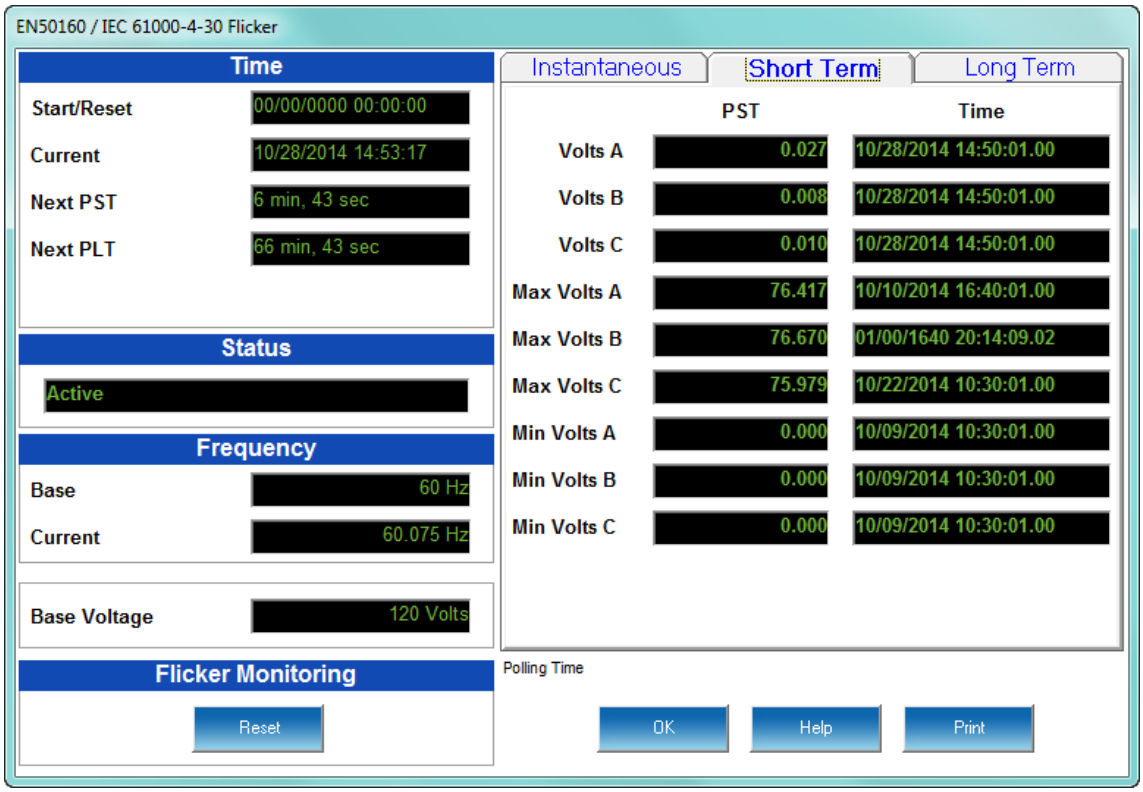
Flicker is a measurement of visible change of brightness of a lamp due to rapid fluctuations of voltage. If Flicker is beyond a reasonable point, it can cause detrimental effects to people. For this reason, our meters have the capability to measure Flicker.

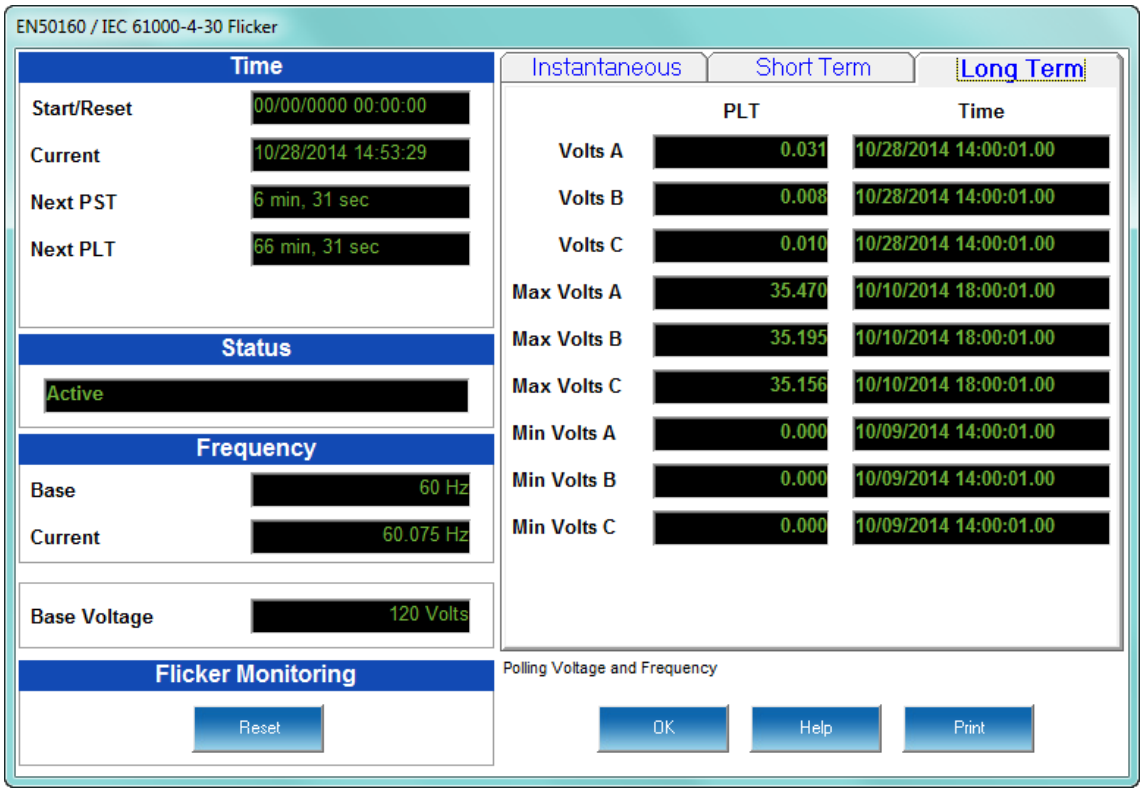
To view Flicker data for the currently connected EPM 9000 series meter, select **Flicker** from the **Real-Time Poll > Power Quality and Alarms** menu. You will see the screen shown below.



Flicker is generally calculated in EPM meters using the IEC 61000-4-15 and IEC 61000-4-30 Class A standards

- To view Short Term or Long Term Flicker data, click on the tabs at the top of the screen. You will see the screens shown.





- Use the Flicker Monitoring buttons to Start or Stop flicker monitoring or to Reset the meter's Flicker monitoring.

NOTE

If you are connected to an EPM 9000/9000P meter, you will only see the Reset button.

If level 2 password protection has been enabled for Flicker Start/Stop and Reset, and you have not signed on with the level 2 password, you will not see any buttons in the Flicker Monitoring section.

5.4.4 Poll Voltage and Current Unbalance

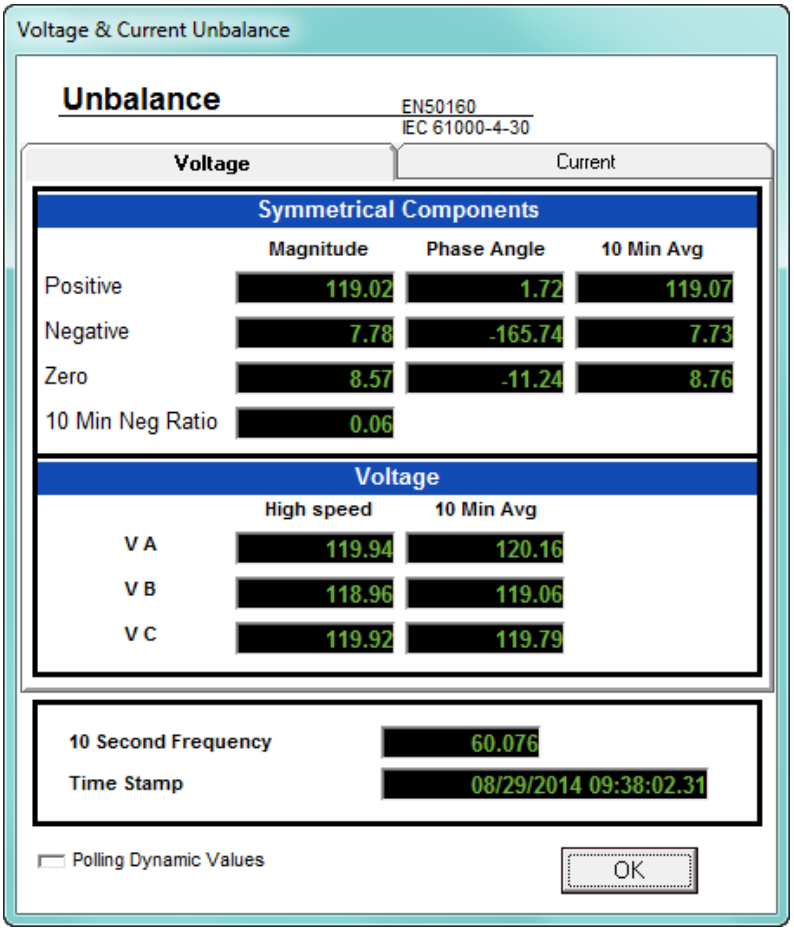
Unbalanced circuits are caused by many factors. A common factor is non-linear switching loads, which produce large amounts of 3rd order harmonics that add up in neutral wires. To view data concerning unbalance for the currently connected EPM 9000 series meter, select **Voltage and Current Unbalance** (EPM 9900/9900P) or **Voltage Unbalance** (other EPM 9000 meters) from the **Real-Time Poll>Power Quality and Alarms** Menu.

NOTE

For the EPM 7000 meter, select **Symmetrical Components** from the menu. See 5.4.5 *Poll Symmetrical Components*.

You will see the following screen.

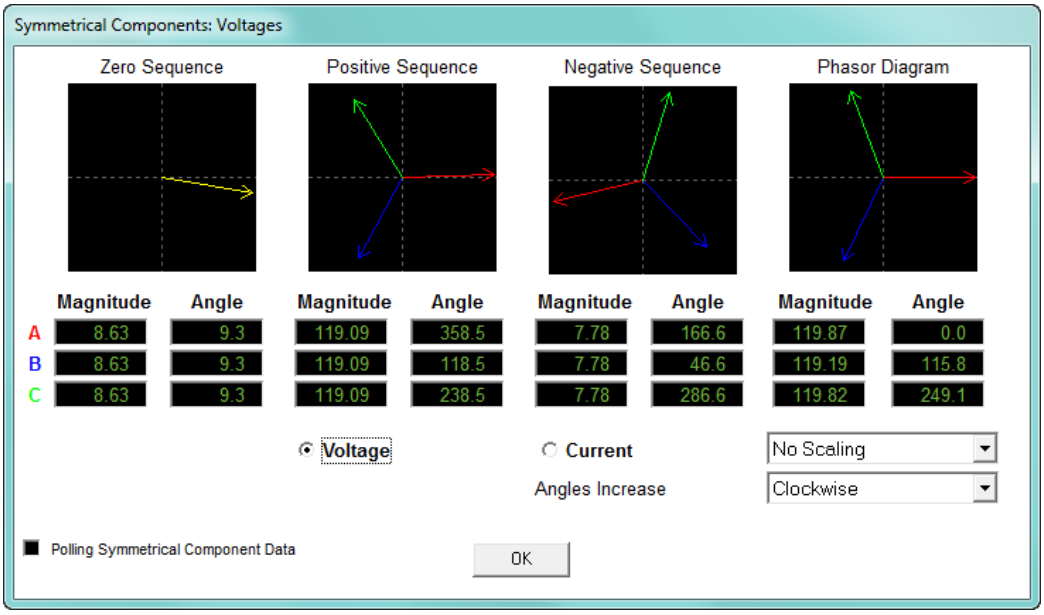
- The screen is for an EPM 9900/9900P meter. There are two tabs which let you view either Voltage or Current unbalance. For the other EPM 9000 series meters, you can only view Voltage unbalance.
- The EN50160/IEC61000-4-30 standards are applied to the voltage.
- In addition to the Positive, Negative, and Zero Symmetrical Components, there is a field called 10 Min Neg Ratio, which is the Negative Sequence reading divided by the Positive Sequence reading.



For the EPM 9900/9900P meter, click the **Current** tab to view Current unbalance data.

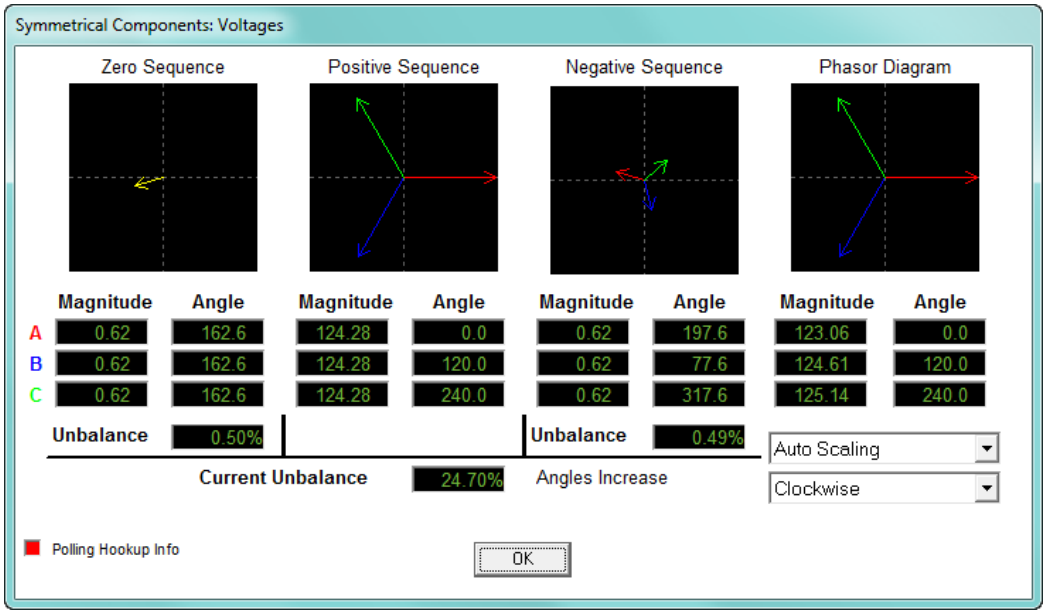
5.4.5 Poll Symmetrical Components

Symmetrical components are used to analyze unbalanced three phase power systems. To view Symmetrical Components data for the currently connected device, select **Symmetrical Components** from the **Real-Time Poll > Power Quality and Alarms** Menu. You will see the screen shown below if you are connected to an EPM 9000 series meter.



You can view the symmetrical components for Voltage or Current by clicking the radio button next to either option.

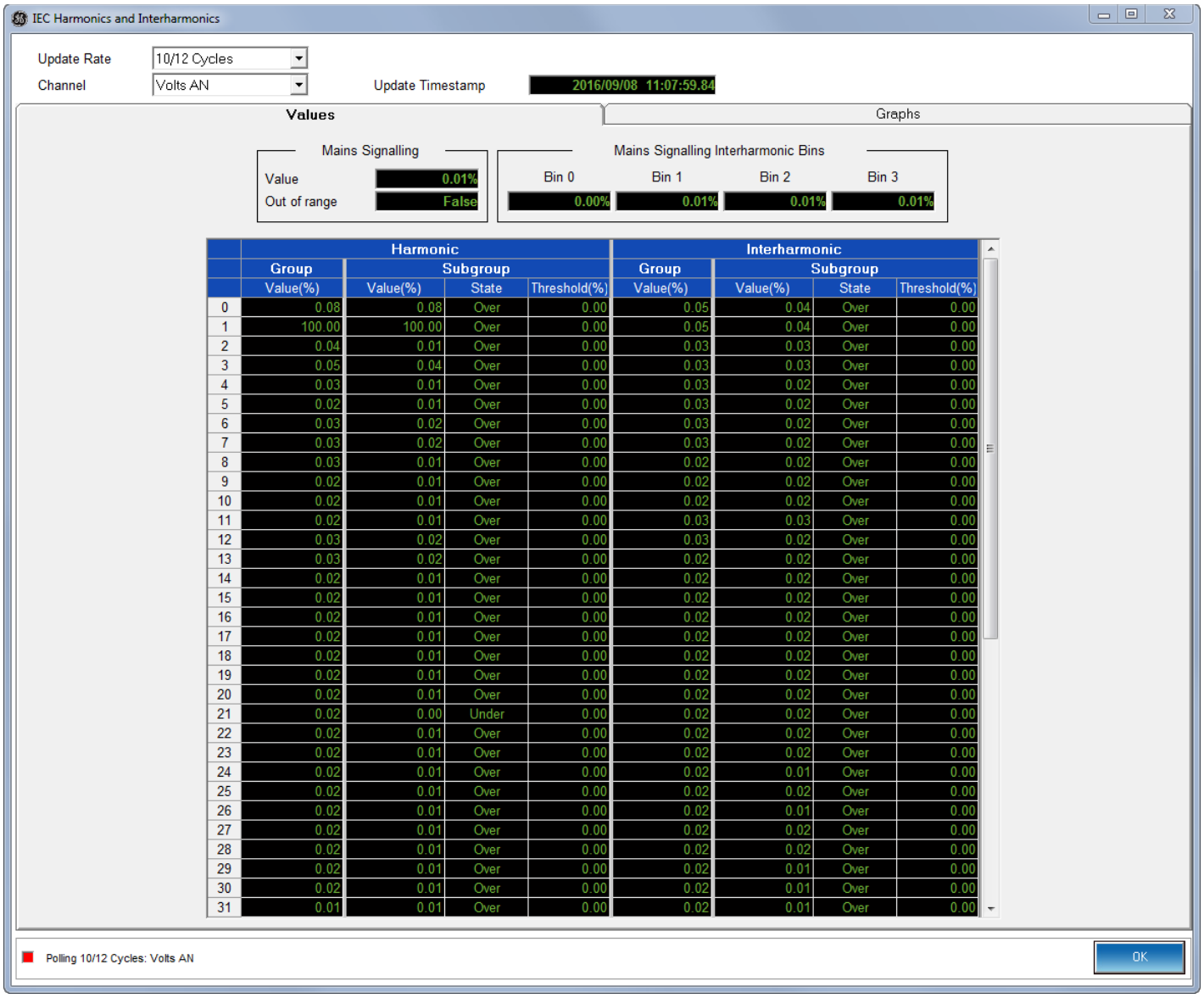
If you are connected to an EPM 7000/7000P meter, you will see a slightly different screen, which also displays Current unbalance and zero sequence and negative sequence Voltage unbalance. See the screen below.



- The drop-down menus allow you to select Scaling and the direction of the displayed angles.

5.4.6 Poll IEC Harmonics and Interharmonics (EPM 9900P Meter)

To view harmonic and interharmonic IEC 61000-4-30 data for the EPM 9900P meter, select **IEC Harmonics and Interharmonics** from the **Real-Time Poll > Power Quality and Alarms** menu. You will see the screen shown below.



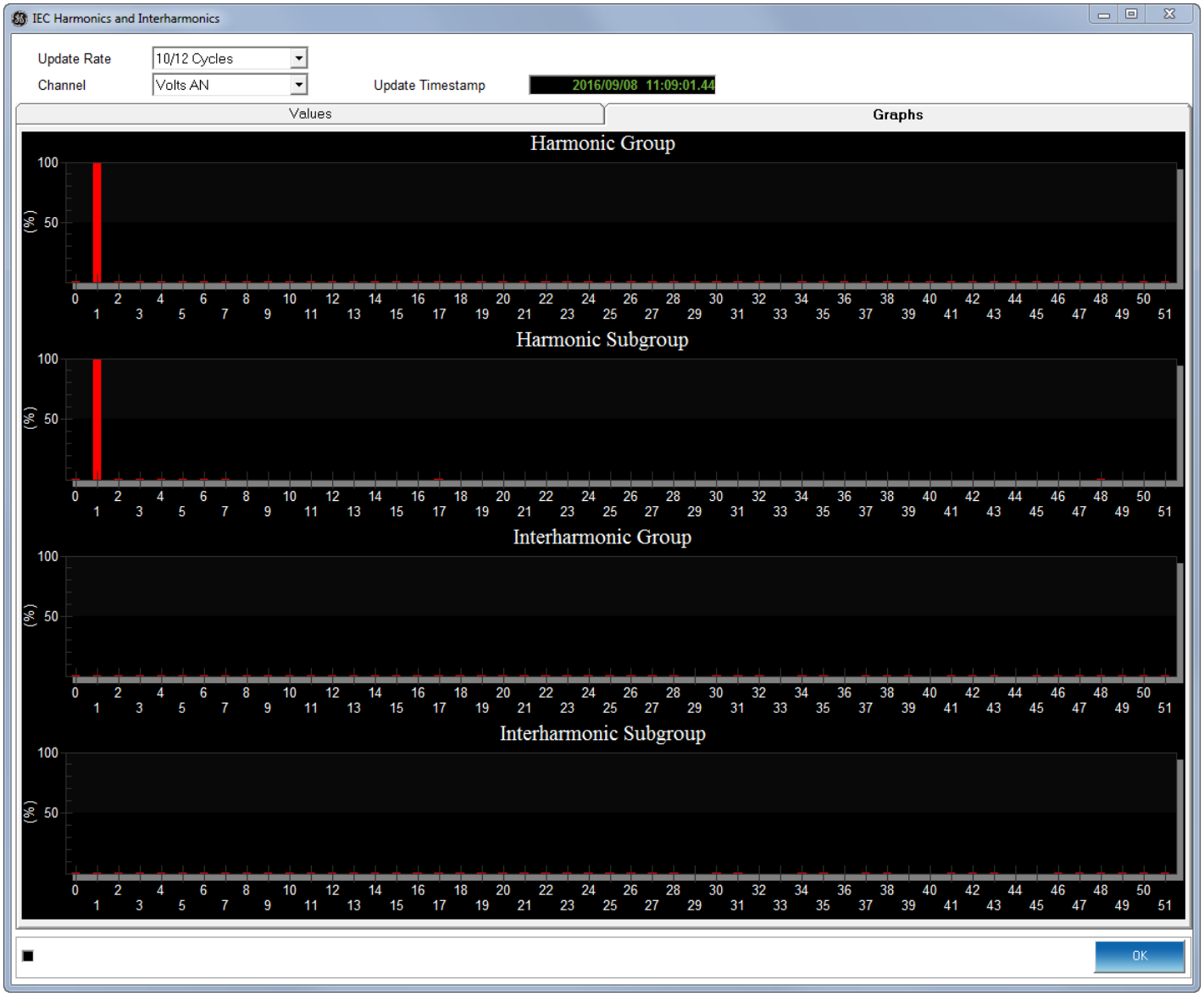
	Harmonic				Interharmonic			
	Group	Subgroup			Group	Subgroup		
	Value(%)	Value(%)	State	Threshold(%)	Value(%)	Value(%)	State	Threshold(%)
0	0.08	0.08	Over	0.00	0.05	0.04	Over	0.00
1	100.00	100.00	Over	0.00	0.05	0.04	Over	0.00
2	0.04	0.01	Over	0.00	0.03	0.03	Over	0.00
3	0.05	0.04	Over	0.00	0.03	0.03	Over	0.00
4	0.03	0.01	Over	0.00	0.03	0.02	Over	0.00
5	0.02	0.01	Over	0.00	0.03	0.02	Over	0.00
6	0.03	0.02	Over	0.00	0.03	0.02	Over	0.00
7	0.03	0.02	Over	0.00	0.03	0.02	Over	0.00
8	0.03	0.01	Over	0.00	0.02	0.02	Over	0.00
9	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
10	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
11	0.02	0.01	Over	0.00	0.03	0.03	Over	0.00
12	0.03	0.02	Over	0.00	0.03	0.02	Over	0.00
13	0.03	0.02	Over	0.00	0.02	0.02	Over	0.00
14	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
15	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
16	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
17	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
18	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
19	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
20	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
21	0.02	0.00	Under	0.00	0.02	0.02	Over	0.00
22	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
23	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
24	0.02	0.01	Over	0.00	0.02	0.01	Over	0.00
25	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
26	0.02	0.01	Over	0.00	0.02	0.01	Over	0.00
27	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
28	0.02	0.01	Over	0.00	0.02	0.02	Over	0.00
29	0.02	0.01	Over	0.00	0.02	0.01	Over	0.00
30	0.02	0.01	Over	0.00	0.02	0.01	Over	0.00
31	0.01	0.01	Over	0.00	0.02	0.01	Over	0.00

This screen has two tabs. The first, shown above, shows the values for Mains Signaling and the Harmonic and Interharmonic groups and subgroups depending on the search criteria you enter:

- Update Rate - choose from the pull-down menu:
  - 10/12 cycles
  - 150/180 cycles
  - 10 minutes
  - 2 hours
- Channel - choose from the pull-down menu:

- Volts AN, BN, CN, or Aux
- Amps IA, IB, IC, or IN

Click Graph to see the data in graphic format. See the example screen below.



5.4.7 Poll Alarm/Limits Status

To view Alarm (Limits) Status data for the currently connected device, select **Alarm Status** (EPM 9000 series meters) or **Limits** (other EPM meters) from the **Real-Time Poll > Power Quality and Alarms** menu. You will see the screen shown below.

Limit Status

Limit ID	Item	Value	Status		Limit 1		Limit 2		Combination	
			Limit 1	Limit 2	Setting	Setpoint	Setting	Setpoint	Type	Status
1	High Speed Volts AN	120.44	Out	Out	Below	456.00	Below	361.00	OR	Out
2	High Speed Volts BN	118.91	Out	Out	Below	456.00	Below	361.00	OR	Out
3	High Speed Volts CN	119.71	Out	Out	Below	456.00	Below	361.00	OR	Out
4	High Speed I A	1.02	Out	In	Below	6.50	Below	0.00	OR	Out
5	High Speed I B	1.02	Out	In	Below	6.50	Below	0.00	OR	Out
6	High Speed I C	0.96	Out	In	Below	6.50	Below	0.00	OR	Out
7	High Speed Frequency	60.08	In	Out	Below	50.25	Above	51.00	OR	Out
8		60.08	In	Out	Below	49.75	Above	49.00	OR	Out
9	Flicker Readings Inst V A	0.000	Out	In	Below	0.010	Above	0.010	OR	Out
10	Flicker Readings Inst V B	0.000	Out	In	Below	0.010	Above	0.010	OR	Out
11	Flicker Readings Inst V C	0.000	Out	In	Below	0.010	Above	0.010	OR	Out
12	Flicker Readings PST V A	0.009	In	In	Below	0.000	Above	0.500	OR	In
13	Flicker Readings PST V B	0.008	In	In	Below	0.000	Above	0.500	OR	In
14	Flicker Readings PST V C	0.008	In	Out	Below	0.000	Above	0.000	AND	In
15	Flicker Readings PLT V A	0.010	In	In	Below	0.000	Below	0.000	AND	In
16	Flicker Readings PLT V B	0.008	In	In	Below	0.000	Below	0.000	AND	In
17	Flicker Readings PLT V C	0.008	Out	Out	Above	0.000	Above	0.000	AND	Out
18			In	In						In
19			In	In						In
20			In	In						In
21			In	In						In
22			In	In						In
23			In	In						In
24			In	In						In
25			In	In						In
26			In	In						In
27			In	In						In

Polling

OK Print Help

This screen displays the status of the Limits set in the connected meter's Device Profile. Refer to the Limits programming section in the individual chapter for your meter type.

- **Item** - the readings that were programmed with limits in the Limits setting screen; e.g. from the screen above, High Speed Volts AN.
- **Value** - the current reading of the item; e.g. from the example screen, 120.44.
- **Status**
  - Status for Limits 1 and 2: "In" means that the current reading is within the limit range; "Out" means that the current reading is out-of-limits.
  - **Settings and Setpoint for Limits 1 and 2** - "Above" or "Below" the setpoint reading, also directly from the Limits that were programmed.

- **Combination Type and Status** - taken from the Limits setting, the programmed combination field; e.g., OR and the Status "Out" for the first reading in the example screen. A combination type of OR means that if either Limit 1 or Limit 2 is out-of-limit based on the current value of the reading, the combined Status is OUT. If the combination type is AND, unless **both** Limit 1 and Limit 2 are out-of-limit based on the current value of the reading, the combination status in "In." Refer to the programming section for your meter type, given above, for the possible combination settings.

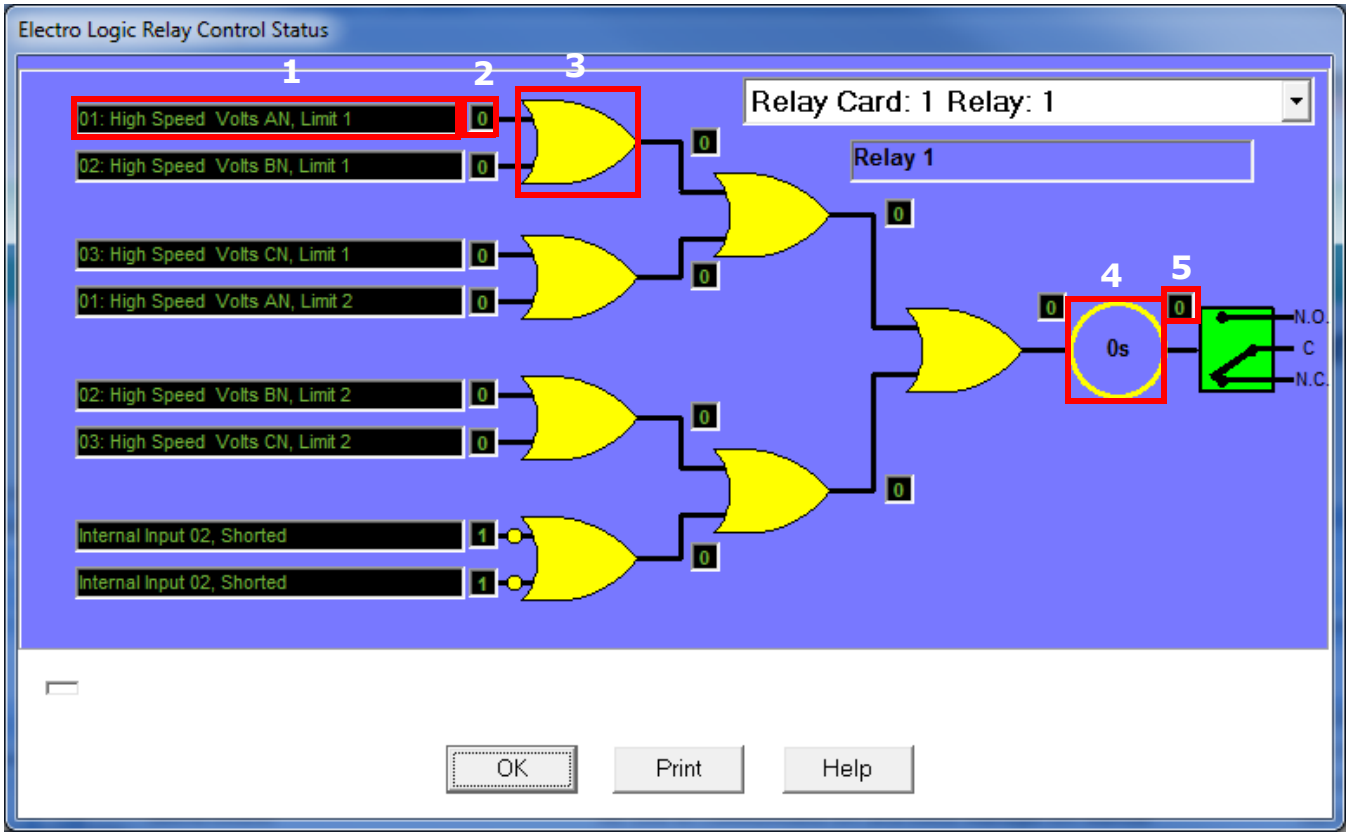
The screen above is for an EPM 9000 series meter, which has up to 32 limits. If you are connected to an EPM 7000/7000P meter or an EPM 4600 metering system, you can have up to eight limits, and do not have the Combination Type and Status fields.

- Use the scroll bar to view all of the data.
- The EPM 9000 series meter screen lets you adjust the column width. To do so:
    1. Position the cursor on a line between columns at the top of the screen.
    2. When the cursor changes to a left/right arrow, hold down the left mouse button and drag the column border left or right.
    3. Release the button when the column is at the desired width.

5.4.8 Poll EPM 9000 series Electrologic™ Status

EPM 9000 series meters allow users to set limits and trigger outputs under many desired conditions. These outputs can have logic associated with them that work to provide intelligence in the triggering designs.

To view the status of Relay control for the currently connected EPM 9000 series meter, select **ElectroLogic Status** from the **Real-Time Poll > Power Quality and Alarms** menu. You will see the screen shown below.



This screen shows the status of the relay control scheme that was set up through ElectroLogic Relay Control. See the individual meter chapters for detailed instructions for setting up ElectroLogic Relay Control.

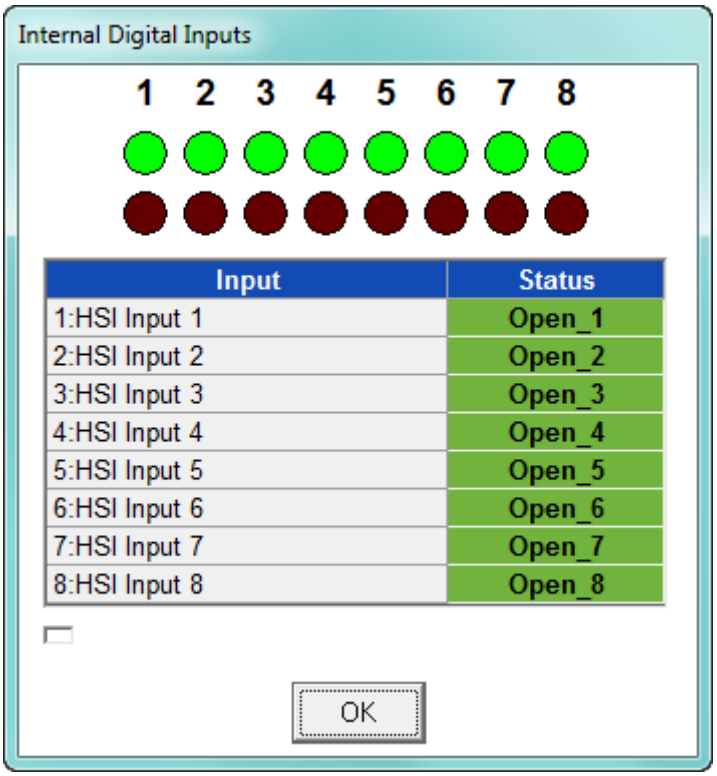
Click the drop-down menu to choose the Relay you want to view information for.

The fields shown are in the screen are:

- Assigned Limit or Digital Input
- Open (0) or Closed/Shorted (1) state of the Input or within Limit (0) or out-of-limit (1) condition for the Limit
- Logic Gate, in this instance for the first two Limits/Digital Inputs: this determines how the logic tree handles the 0 or 1 result of the Limit/Digital Input; e.g., if the gate is AND, the results must both be 1 for the result of the logic gate to be 1; if the gate is OR, either result of 1 will make the logic gate result become 1. Refer to the section for your meter for all of the gate options.
- The delay in seconds, programmed in the ElectroLogic Relay Logic setting screen.
- The result of the entire logic tree - 0 or 1 - which will ultimately control the relay; depending on whether the relay is normally open, or normally closed/shorted. 0 will leave the relay as is, and 1 will impose the opposite condition.

5.4.9 Poll Internal Digital Inputs

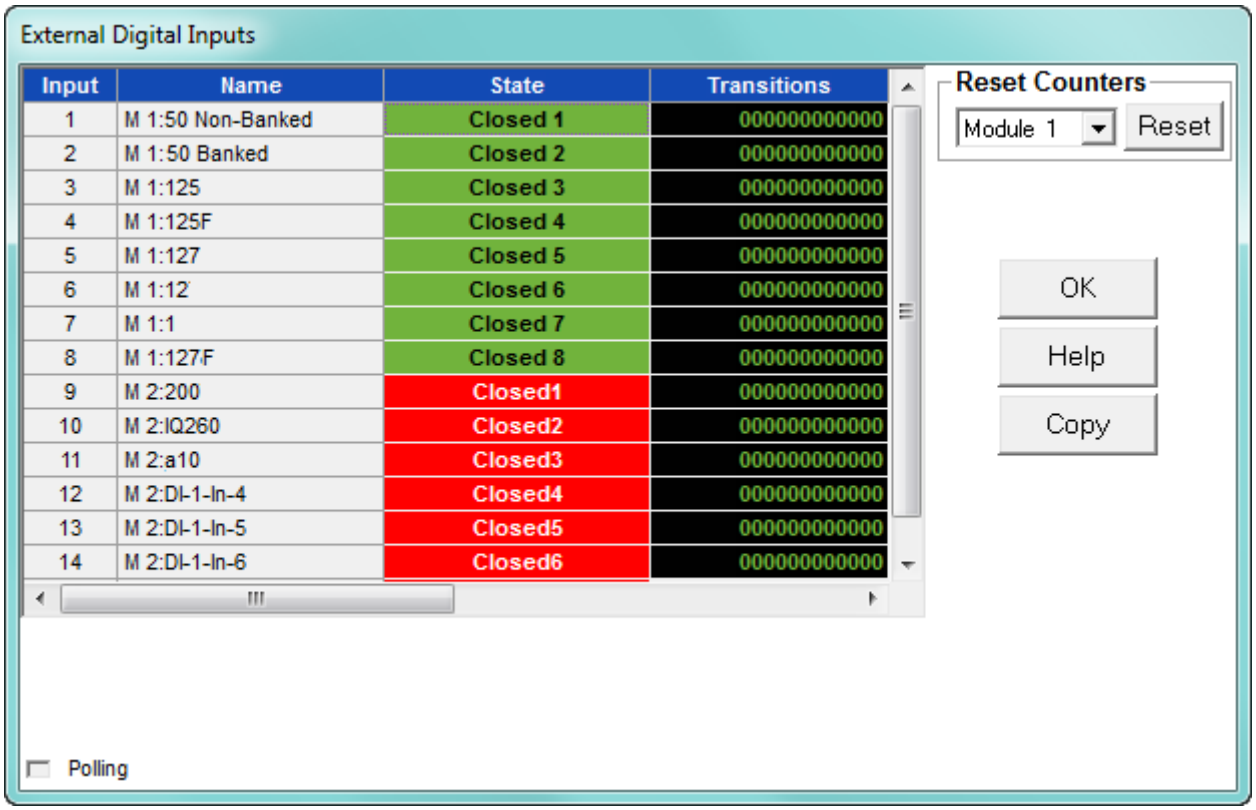
To view data for the internal High Speed inputs of the currently connected EPM 9000 series meter, select **Poll Internal Inputs** from the **Real-Time Poll > Power Quality and Alarms** Menu. You will see the screen shown below.



See the programming section for your meter type for details on the internal Digital Inputs.

5.4.10 Poll External Digital Inputs

To see the status of the external digital inputs for the connected EPM 9000 series meter, the Option card digital inputs for the EPM 7000 meter, or the embedded digital inputs for the EPM 4600 metering system, select **Poll External Digital Inputs** from the **Real-Time Poll > Poll Power Quality and Alarms** menu. You will see the screen shown below if you are connected to an EPM 9000 series meter.

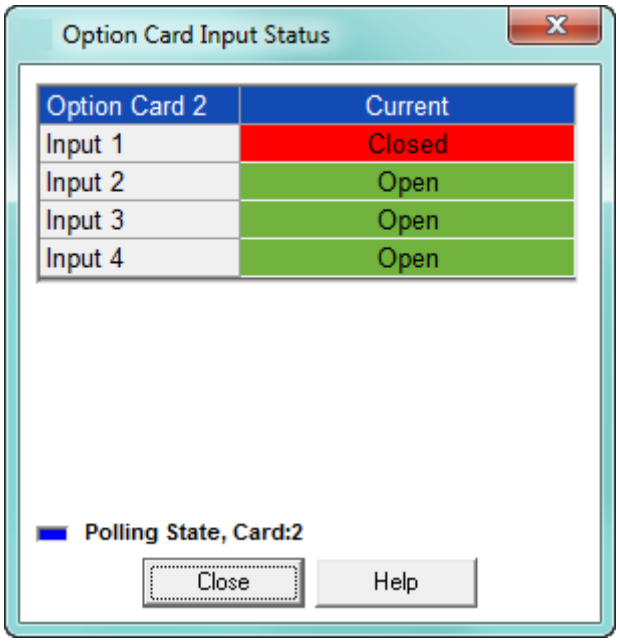


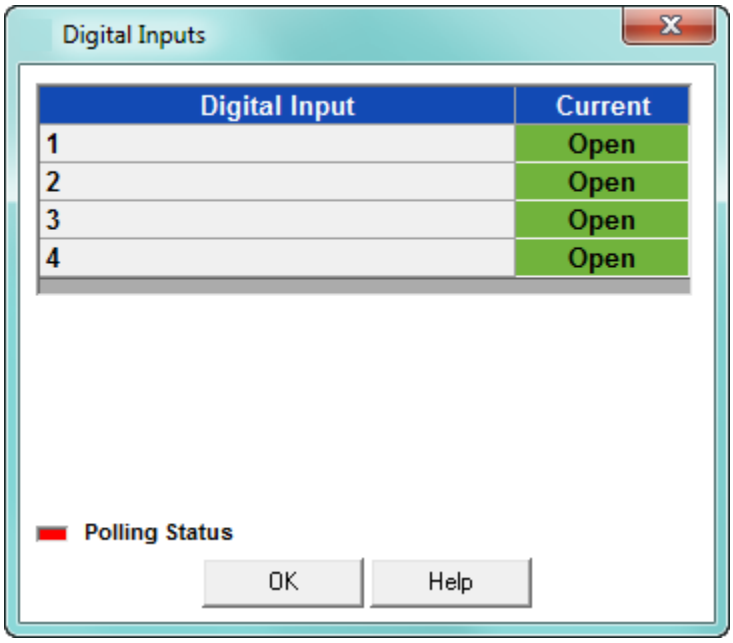
Input	Name	State	Transitions
1	M 1:50 Non-Banked	Closed 1	000000000000
2	M 1:50 Banked	Closed 2	000000000000
3	M 1:125	Closed 3	000000000000
4	M 1:125F	Closed 4	000000000000
5	M 1:127	Closed 5	000000000000
6	M 1:12	Closed 6	000000000000
7	M 1:1	Closed 7	000000000000
8	M 1:127F	Closed 8	000000000000
9	M 2:200	Closed1	000000000000
10	M 2:IQ260	Closed2	000000000000
11	M 2:a10	Closed3	000000000000
12	M 2:DI-1-In-4	Closed4	000000000000
13	M 2:DI-1-In-5	Closed5	000000000000
14	M 2:DI-1-In-6	Closed6	000000000000

This screen allows you to view State and Transition Counters data for the external digital inputs. These settings are programmed in the External Digital Inputs setting of the meter's Device Profile; see the programming section for your meter type for details.

- To reset the counters, select the counters you want to reset from the pull-down menu and click Reset.
- Use the scroll bars to view all of the data on the screen.

If you are connected to an EPM 7000 meter or an EPM 4600 metering system, you will the screens shown below. The screen on the left is for an EPM 7000 meter, and the screen on the right is for an EPM 4600 metering system.





This screens display the status (Open or Closed) of the Digital Inputs of:

- Any Relay Output/Digital Input or Pulse Output/Digital Input Option card installed in an EPM 7000 meter.
- The Digital Inputs of the EPM 4600 metering system's embedded Relay Output/ Digital Input card.

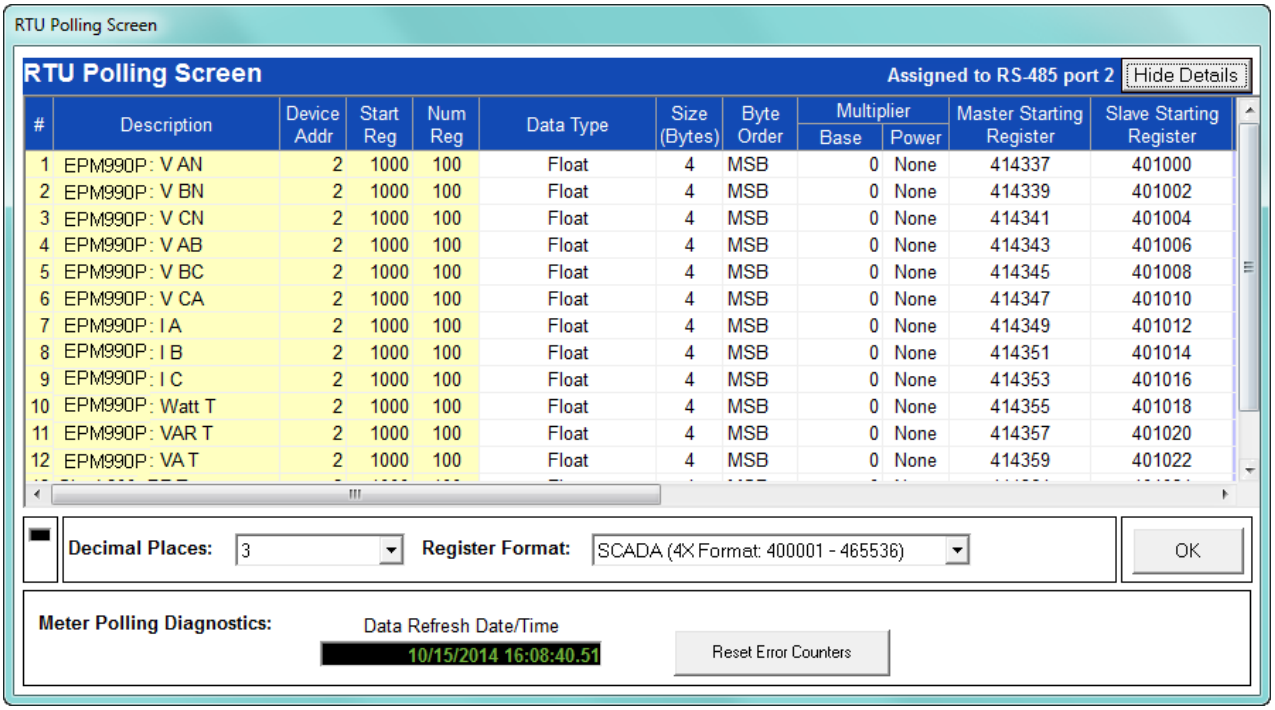
These settings are programmed in the Digital Inputs setting of the meter's Device Profile; see the programming section for your meter type for details.

5.5 RTU Polling (EPM 9900/9900P Meter)

The EPM 9900/9900P meter has the ability to function as an RTU. As such, it can poll Modbus readings from slave devices and take those readings into its memory for users to conduct actions with them. For the meter to act as an RTU, Port 2 must be set as an RTU Master (see 11.5.2 *RTU Settings* for instructions).

The RTU Polling screen helps the user verify that their application is working correctly, by checking that the information they see on this screen is as expected/needed.

Select **RTU Polling Screen** from the **Real Time Poll** menu. You will see the screen shown below.



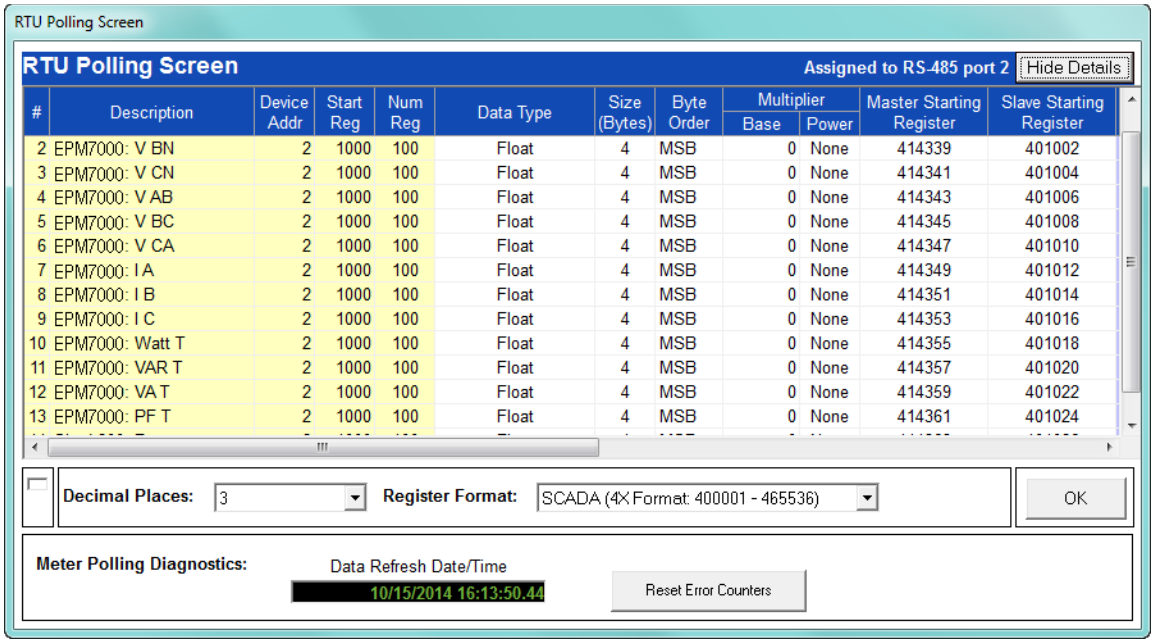
#	Description	Device Addr	Start Reg	Num Reg	Data Type	Size (Bytes)	Byte Order	Multiplier Base	Multiplier Power	Master Starting Register	Slave Starting Register
1	EPM990P: V AN	2	1000	100	Float	4	MSB	0	None	414337	401000
2	EPM990P: V BN	2	1000	100	Float	4	MSB	0	None	414339	401002
3	EPM990P: V CN	2	1000	100	Float	4	MSB	0	None	414341	401004
4	EPM990P: V AB	2	1000	100	Float	4	MSB	0	None	414343	401006
5	EPM990P: V BC	2	1000	100	Float	4	MSB	0	None	414345	401008
6	EPM990P: V CA	2	1000	100	Float	4	MSB	0	None	414347	401010
7	EPM990P: I A	2	1000	100	Float	4	MSB	0	None	414349	401012
8	EPM990P: I B	2	1000	100	Float	4	MSB	0	None	414351	401014
9	EPM990P: I C	2	1000	100	Float	4	MSB	0	None	414353	401016
10	EPM990P: Watt T	2	1000	100	Float	4	MSB	0	None	414355	401018
11	EPM990P: VAR T	2	1000	100	Float	4	MSB	0	None	414357	401020
12	EPM990P: VA T	2	1000	100	Float	4	MSB	0	None	414359	401022

The information shown on the screen is as follows:

- Description of the reading
- EPM 9900/9900P meter's Modbus starting register of the reading
- The slave device's Modbus starting register of the reading
- The raw value of the reading in hexadecimal
- The translated value of the reading for the user application
- The number of decimal places desired to set the degree of resolution needed
- The format the data is needed in; dependent on whether this is for a SCADA or customized application
- The Date and Time stamp of the data shown

Click **Show Details** to see more information (see the screen below):

- Device address
- Starting register and number of registers
- Data type, size in bytes, byte order
- any Multipliers to scale the data
- Group ID
- Error code
- Data Valid field - either True (a connection was made and data was obtained) or False (no connection was made; no data was received).

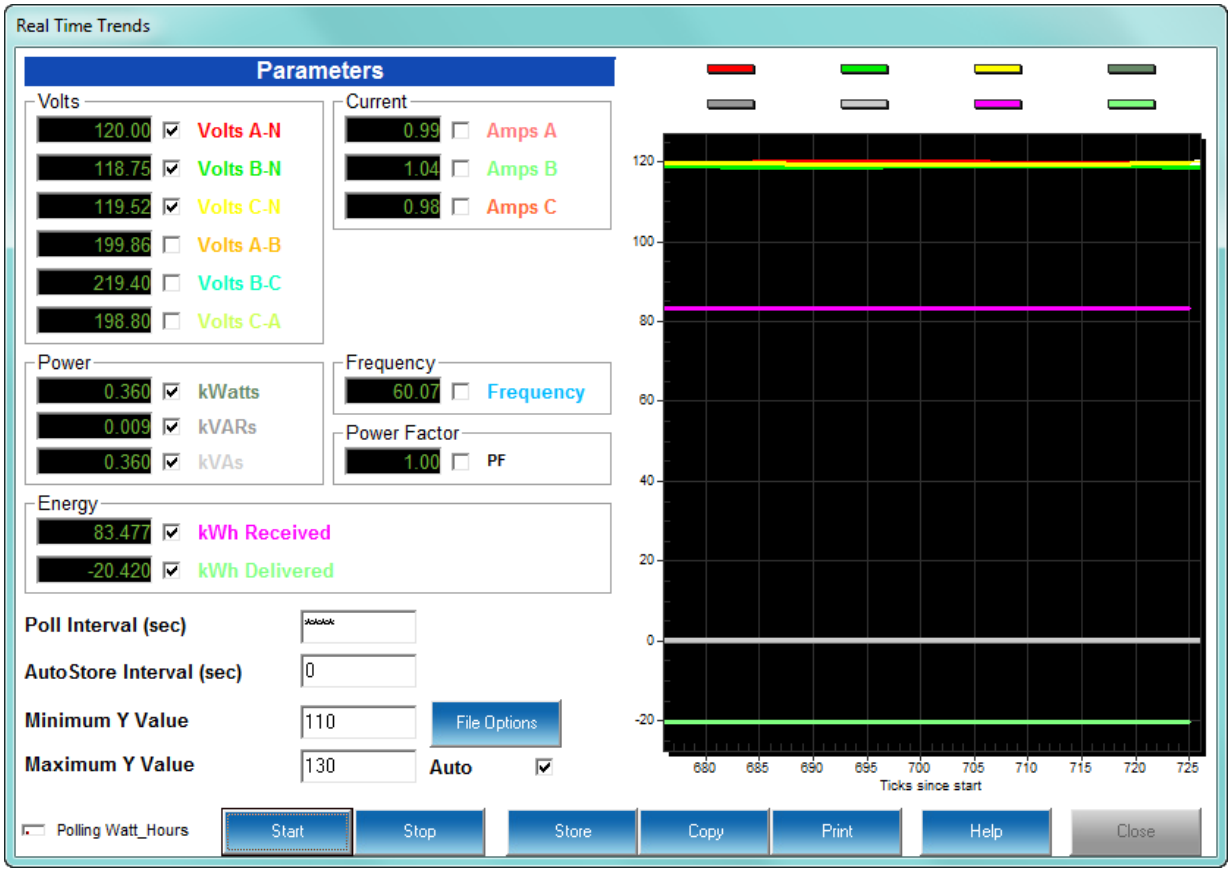


#	Description	Device Addr	Start Reg	Num Reg	Data Type	Size (Bytes)	Byte Order	Multiplier Base	Multiplier Power	Master Starting Register	Slave Starting Register
2	EPM7000: V BN	2	1000	100	Float	4	MSB	0	None	414339	401002
3	EPM7000: V CN	2	1000	100	Float	4	MSB	0	None	414341	401004
4	EPM7000: V AB	2	1000	100	Float	4	MSB	0	None	414343	401006
5	EPM7000: V BC	2	1000	100	Float	4	MSB	0	None	414345	401008
6	EPM7000: V CA	2	1000	100	Float	4	MSB	0	None	414347	401010
7	EPM7000: I A	2	1000	100	Float	4	MSB	0	None	414349	401012
8	EPM7000: I B	2	1000	100	Float	4	MSB	0	None	414351	401014
9	EPM7000: I C	2	1000	100	Float	4	MSB	0	None	414353	401016
10	EPM7000: Watt T	2	1000	100	Float	4	MSB	0	None	414355	401018
11	EPM7000: VAR T	2	1000	100	Float	4	MSB	0	None	414357	401020
12	EPM7000: VA T	2	1000	100	Float	4	MSB	0	None	414359	401022
13	EPM7000: PF T	2	1000	100	Float	4	MSB	0	None	414361	401024

Click **Reset Error Counters i**f you had errors that you have now addressed.

5.6 Poll Real Time Trends (EPM 6000 and 7000 Meters)

The EPM 6000 and 7000 series meters (excluding the EPM 7000P) have an additional polling screen. Select **Real Time Trends** from the **Real Time Poll** menu. You will see the screen shown below.



This screen lets you view trending for the selected parameters.

To view parameters on the graph:

1. Click the check box(es) next to the value(s) you want to display.
2. The Poll Interval can be changed. Set this value to 0 to poll as quickly as possible. (When '0' has been entered, the field displays '****.')
3. To create a .csv (Comma Separated Value Excel file) containing a log of the polling values, enter a value greater than 0 in the AutoStore Interval field. The software will store in its directory all polling values (regardless of the selections on the screen) in the .csv file on the interval (in seconds) entered in the AutoStore Interval field.

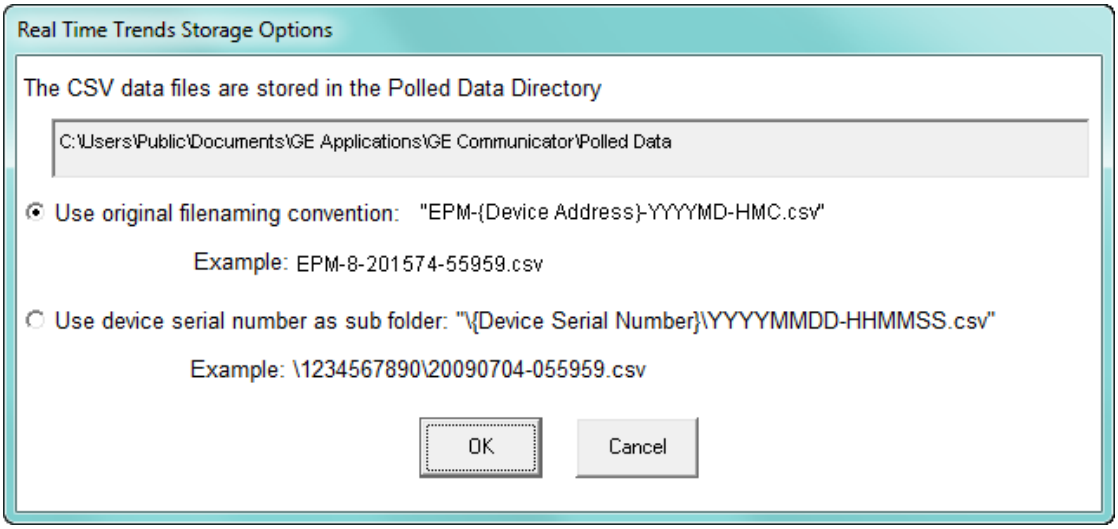
NOTE

To perform manual storage, click the Store button at the bottom of the screen.

4. Either:
   - Use the Min and Max Y Values fields to specify the Y Range for the graph.

- Check the Auto Scale box to let the software calculate the best Y Range values for the graph.

Click **File Options** to open the window shown below.



- The field at the top shows where the file of this screen's data will be stored. You can double-click in the field to open that directory.
- The selections let you choose how you want the file to be named:
- Leave the default selection (first radio button) to save the file in the directory with the original file naming convention:
  EPM-Device Address-year, month, day-hour, minutes, seconds

NOTE

The original file naming convention should no longer be used since multiple EPM meters on the same network will have the same device address and they could overwrite each other's files.

- Click the second radio button to use the device's serial number as a sub-folder in the directory, with the date and time as the file name:
  Device Serial Number\year, month, day-hour, minutes, 2 seconds
- Click **OK** to save your selections. When you click Store the file will be saved as you chose.
- If your desktop is very small, the screen will be divided in half. Click View Graph to see the Graph portion of the screen; click View Settings to see the Settings portion of the screen.
- Click **Start** to begin polling; click **Stop** to stop polling.

GE Communicator

Chapter 6: Meter Security

6.1 Overview

There are three aspects to the security offered by EPM meters through the GE Communicator software:

- Password protection
- Sealing switch
- Security lock

All EPM 9000 series meters offer the first two options: see 6.2.1 *EPM 9000 Series Meter Password Options* through 6.10 *View Sealing Switch Status (EPM 9000 series)*.

The EPM 9700 meter offers all three features, including a security lock. See 6.12 *EPM 9700 Security Features* on page 6–26.

The EPM 7000P meter offers password protection and a physical sealing switch on the meter: see ?? 7000P security.

Note that the EPM 4600 metering system and other EPM meters also offer password protection - see their individual programming chapters for instructions.

6.2 Password Overview

(For EPM 9700 see section 6.12.1 *Username and Password* on page 6–26.)

Password security is designed to protect the meter from unauthorized use. Since the meters are used for primary revenue and/or control functions, the password functionality is very secure. The use of the Password feature is recommended if there are security issues and if you have a secure place in which to save the password. If you have forgotten your meter's password, you cannot call the factory for help. There is no "back door." If you lose or forget your password, you must send the unit back to the factory to have the meter reset. It is very important to store password information carefully - make sure you archive the meter location and associated passwords prudently.

The GE Communicator application's password feature protects the following activities from unauthorized use:

- Changes to an EPM meter's Device profile
- Setting device date and time
- Resetting Device information (Max/Min/Demand, Hour Counters, Logs and Time of Use (TOU))
- Test Mode entry from software
- Flash upgrades
- Flicker start and stop
- Pulse test
- CT and PT Compensation
- Relay control and I/O Utilities
- TOU accumulations and changes to the TOU calendar settings
- Retrieval of trending and Power Quality logs (for the EPM 9000 series meters, with Extended Passwords only)

6.2.1 EPM 9000 Series Meter Password Options

Depending on the meter model and firmware level, the EPM 9000 series meters (other than the EPM 9700) password control consists of either Bi-level only or Bi-level **and** Extended password protection. Each of these methods is explained below.

Bi-level passwords:

- Level 1 accesses Time-of-Use Accumulations only - these are Billing functions.
- Level 2 accesses all password-protected functions. The Level 2 Password also allows a user to enable or disable the password function.

NOTE

When the password feature is enabled, the GE Communicator software asks for the appropriate password each time a user attempts to perform a protected operation.

NOTE

The Bi-level password feature is on a two-minute timer: after exiting from a password-protected area, the user has two minutes to access another protected area without re-entering the password. If more than two-minutes elapse, the software asks for the appropriate password.

Extended passwords:

- This feature allows you to set up to eight different profiles controlled by passwords. This allows you to set up specific password profiles so that users can have limited access to certain meter features. Once you have enabled the Level 2 password, you can then configure the Extended passwords for the meter.
- Specify which features are allowed or disallowed for each of the eight profiles, choosing from the following functions (as long as they are supported by the meter):
  - **Read TOU Calendars/Data** – allows the user to view the time of Use Calendars and Registers.
  - **External Device Access** – allows the user to access and program external devices.
  - **Modify Preset Energy** – allows the user to access the preset energy capability.
  - **Modify CT/PT Compensation** – allows the user to change the CT/PT compensation tables.
  - **Modify Date/Time** – allows the user to set a new date and or time.
  - **Modify TOU Calendars** – allows the user to modify existing calendars and upload new calendars.
  - **Update Firmware** – allows the user to change the existing firmware in the meter.
  - **Modify Programmable Settings** – allows the user to change existing programmable settings and program them to the meter.
  - **Retrieve PQ Logs** – allows the user to retrieve the Power Quality logs: PQ, Waveform, Alarm, and Flicker.
  - **Retrieve Historical Logs** – allows the user to retrieve non-PQ logs: Historical and Digital.
  - **Reset Demand** – allows the user to reset the Demand Registers.
  - **Reset PQ Logs** – allows the user to reset the Power Quality logs: PQ, Waveform, Alarm, and Flicker.
  - **Reset Logs** – allows the user to reset the non-PQ logs: Historical and Digital.
  - **Reset Energy** – allows the user to reset the Energy Accumulators.
  - **External Relay Control** – allows the user to manually fire the External Relays.
  - **Manual Waveform Capture** – allows the user to send the Manual Waveform Capture command, if supported by the meter.
  - **Other** – allows the user to use the Flicker function and any other Level 2 function that is not defined above.

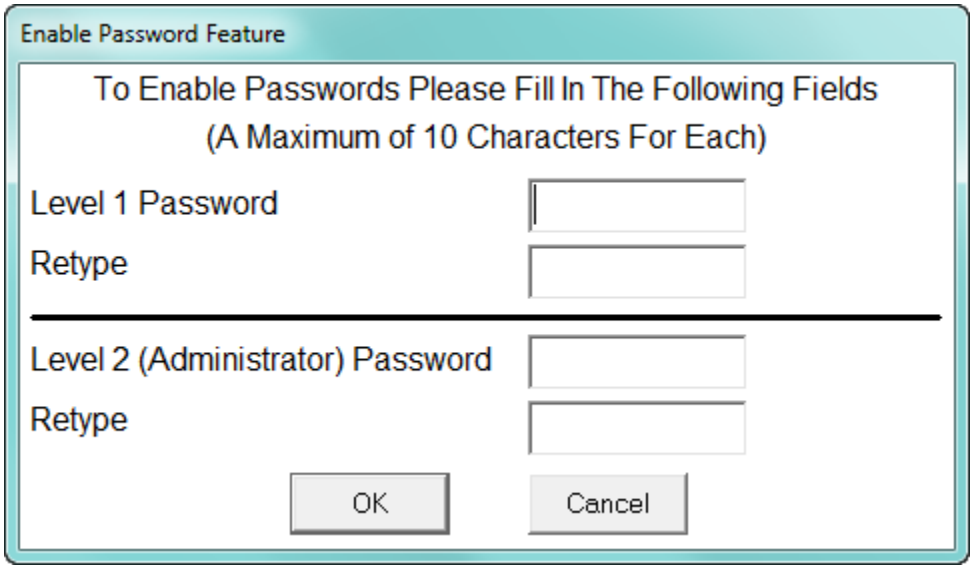
6.3 Enable Passwords (EPM 9000 series)

(For EPM 9700 see section 6.12 *EPM 9700 Security Features* on page 6–26.)

1. From the Main screen's Menu Bar, select **Tools > Passwords > Enable/Disable**.

NOTE

Passwords may contain up to 10 characters and may include the digits 0–9 and/or the letters A–Z. Passwords are not case-sensitive.

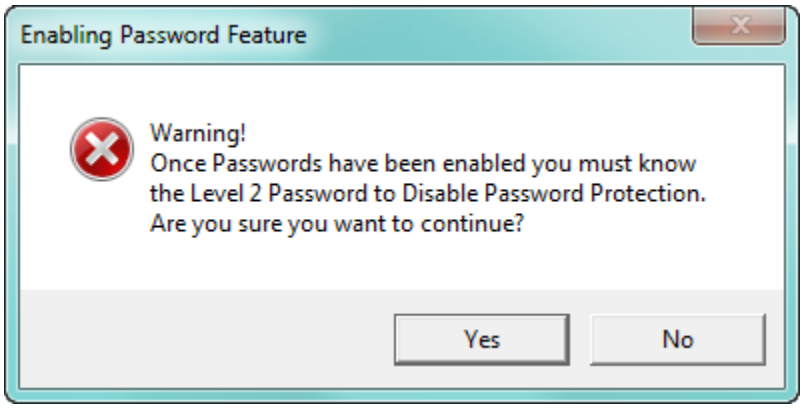


2. Enter the following:
   - Password for Level 1 in Level 1 Password and Retype entry fields. The Level 1 password allows viewing of Time of Use (TOU) data.
   - Password for Level 2 in Level 2 Password and Retype Entry fields. The Level 2 password restricts user access to all password protected functions listed in 6.2 *Password Overview*. Only by logging in with the Level 2 password can you disable the bi-level password feature.

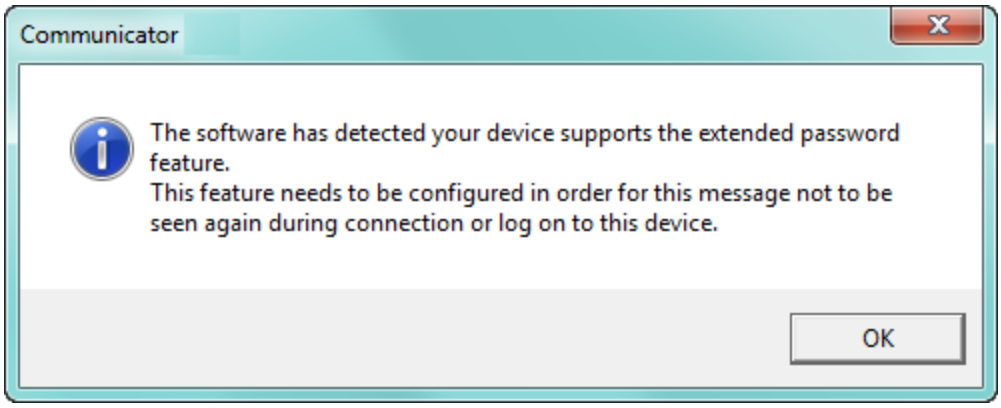
NOTE

You must enter both passwords. If you enter and retype only a Level 1 Password or a Level 2 Password and click **OK**, you will see an error message.

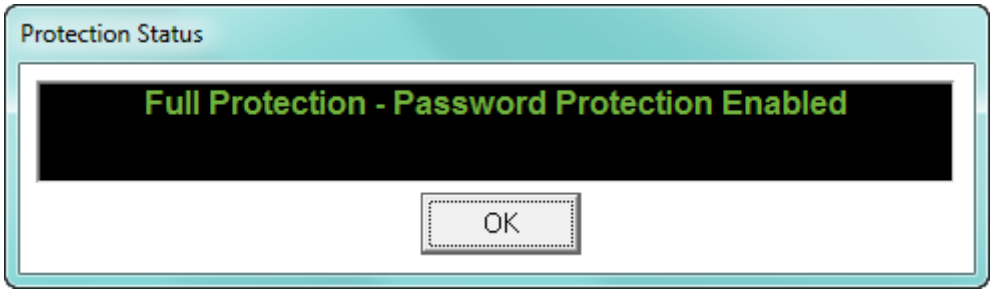
3. Click **OK**. You will see the message shown below.



4. Click **Yes** to save the passwords; click No to exit without saving. You will see the following message.



5. Click **OK**. The Bi-level Password function is now enabled. The computer status bar at the bottom of the screen now displays "Password: Enabled" and the following message screen is displayed (click OK to close the screen).



NOTE

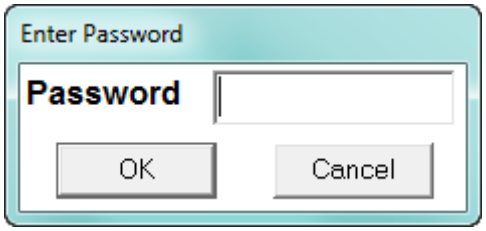
You can also check Password Status from the Tools menu:
click **Tools > Passwords > Status** to display the Protection Status screen shown above.

6. Now that you have enabled the Level 2 Password, click **Tools > Passwords > Extended Passwords** to configure the Extended passwords for a meter that supports Extended passwords.

NOTE

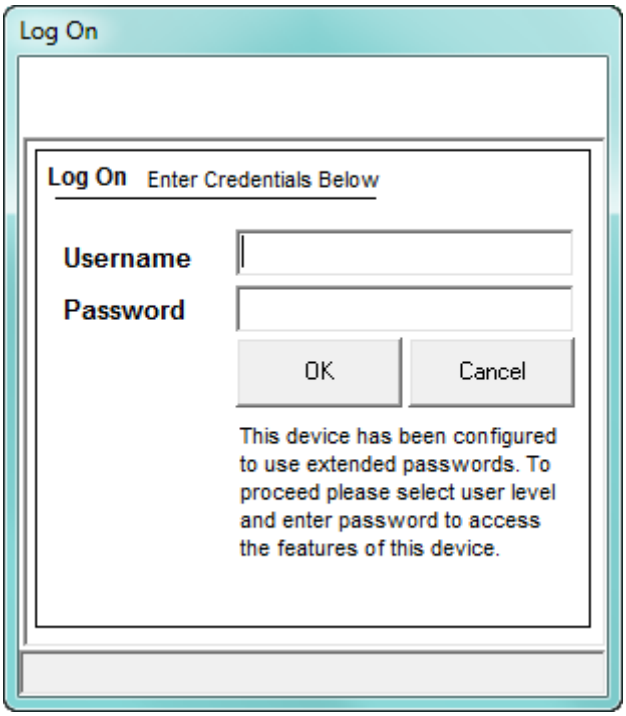
Only a user signed on with a Level 2 Password will be able to access this function.

- You will see the following screen if you are connected to an EPM 9650/9800 meter.

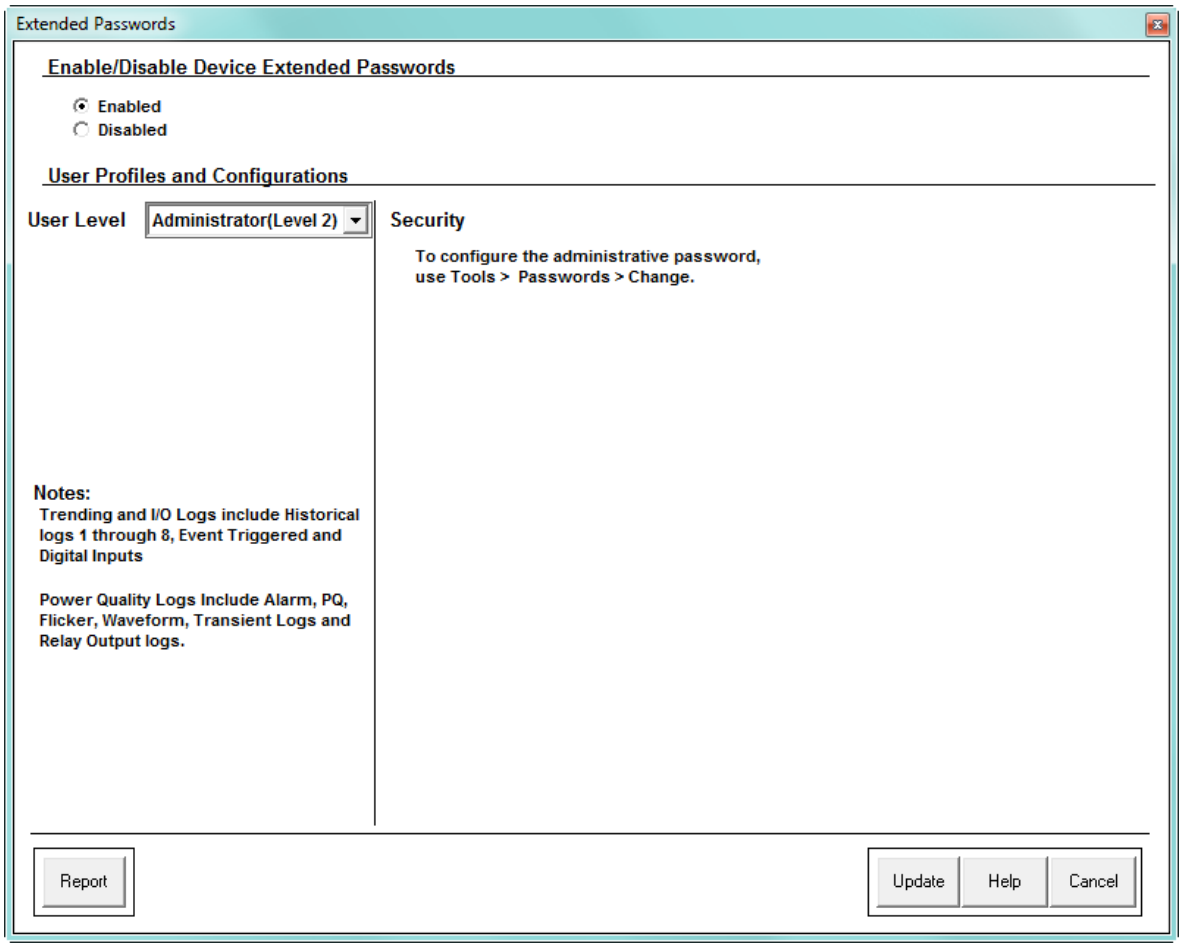


Enter the Level 2 password and click **OK**.

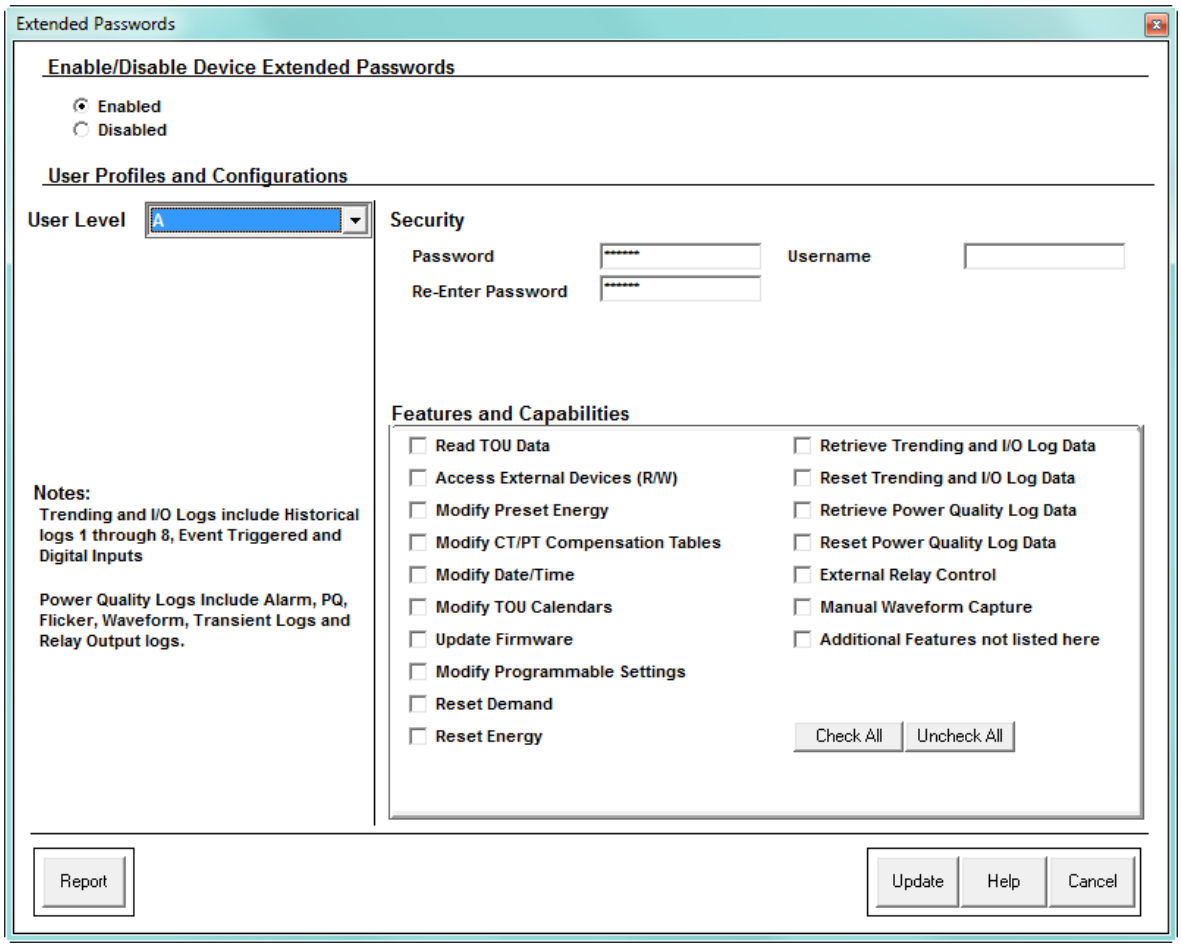
- If you are connected to EPM 9900/9900P meter, you will see the following screen.



Enter the username Admin and the Level 2 password; (the Level 2 password is the Admin password); then click **OK**.



7. The top portion of the screen lets you enable or disable the Extended password function: select the Enabled button to enable it.
8. Select the password profile you want to set up from the pull-down menu next to User Level. You can set up to 7 additional profiles (the first profile is the Level 2 Administrator password you already set up): each profile can have a different selection of features and capabilities.



9. In the security section enter the Username and password for this profile. Re-enter the password.

NOTE

Username is only displayed and used for the EPM 9900/9900P meter.

10. Click any of the features in the Features and Capabilities section of the screen to enable them for the profile.
    - Click **Check All** to select all of the features.
    - Click **Uncheck All** to de-select all of the features.

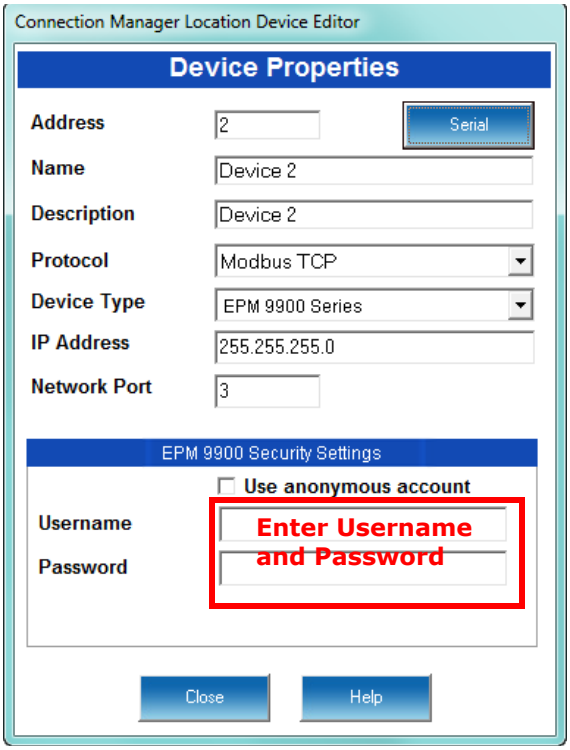
NOTE

The Administrator user level (Level 2 password) is non-configurable. It has all of the features enabled for it. It is the only profile that can set up the other profile levels.

11. Click:
    - **Update** to save your changes
    - **Cancel** to exit the screen without saving any changes.
    - **Report** to create a .csv file listing the password profiles and their enabled features (passwords are not printed in the report). You can open the report in a spreadsheet application.

NOTE

- When the Extended passwords feature has been enabled for an EPM 9900/9900P meter, in order to retrieve logs over the Network you must use Connection Manager to connect to the meter with your Username and password. See the screen on the right. Refer to Chapter 3 "Connecting to a GE Meter" for instructions on using Connection Manager.
- You must also enter the Username and password to update firmware, for an EPM 9900/9900P meter using Extended passwords.



6.4 Change Passwords (EPM 9000 series)

(For EPM 9700 see section 6.12 *EPM 9700 Security Features* on page 6–26.)

If you are going to use Passwords, it is a good idea to change them from time to time.

If you have set up Extended password protection, you can use a Level 2/Admin password profile to change the password profiles by opening the Extended Passwords setting screen; selecting the profile you want to change; and following the instructions already given for adding a new profile (steps 9-12 in the previous section). When you click Update you will be asked to confirm that you want to update the profile and then prompted to enter your Level 2/Admin password.

If you want to change the Level 1 password, you must first disable the Extended password protection by opening the Extended Passwords screen (using a Level 2/Admin password profile) and clicking the Disabled button. When you click Update you will be asked to confirm that you want to disable the Extended password protection and then will be prompted to enter your Level 2/Admin password. After the Extended password protection has been disabled, select **Tools > Passwords > Change** and enter the current password you want to change (either Level 1 or Level 2) and the new password. You are asked to confirm that you want to change the password and then are told the password has been changed.

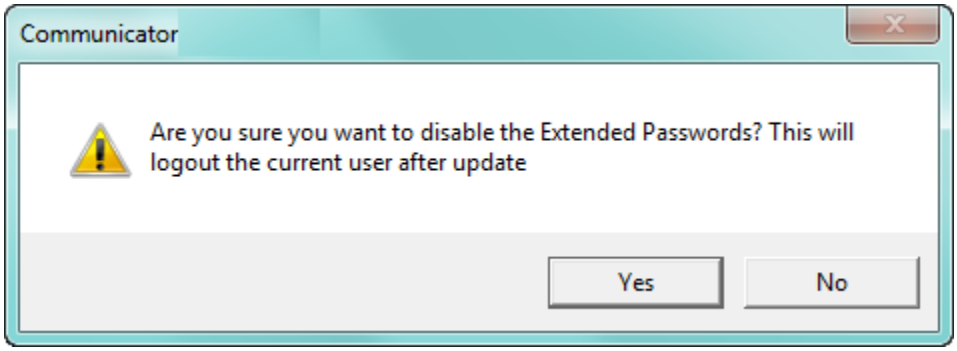
6.5 Disable Passwords (EPM 9000 series)

(For EPM 9700 see section 6.12 *EPM 9700 Security Features* on page 6–26.)

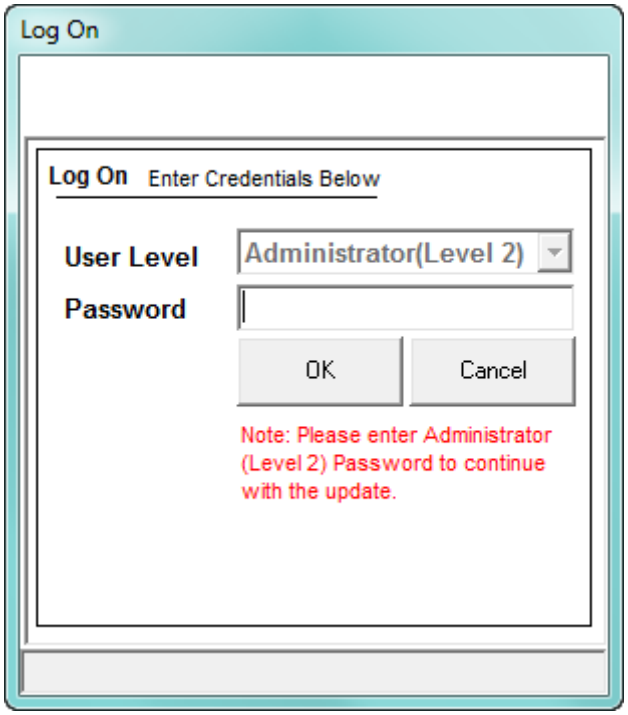
NOTE

You must use the Level 2 Password to disable password protection.

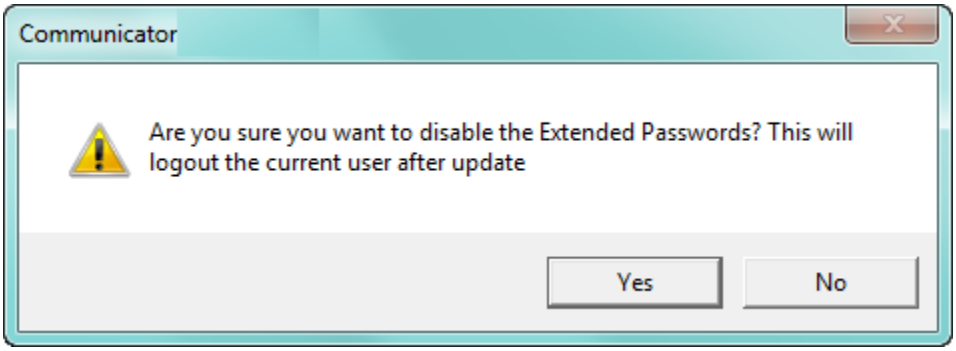
1. If you have enabled the Extended password feature, you need to first disable it. Click **Tools > Passwords > Enable/Disabled**. The Extended Passwords screen opens - click the **Disable** button and click **Update**. You will see the following message.



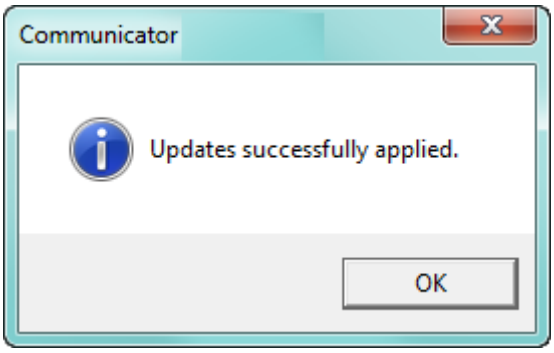
2. Click **Yes**. You will be prompted to enter your Level 2 password.



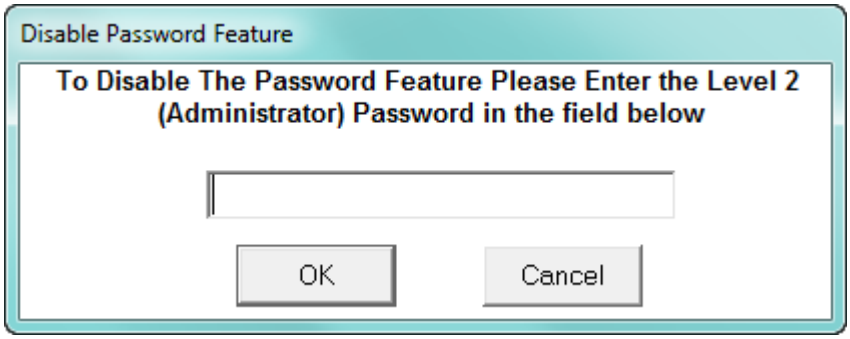
3. Click **OK**. You will see the message shown below.



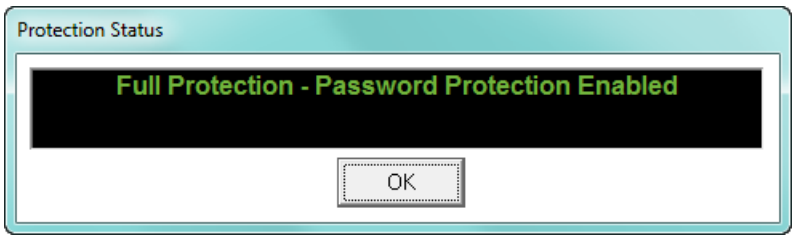
4. Click **Yes**. The Log On screen (above) will show a message that the profile is being updated and then you will see the following screen. Click **OK** to close it.



5. Disable the Bi-level password feature, click **Tools > Passwords > Enable/Disable**. You will now see the screen shown below.



6. Enter the Level 2 Password and click **OK**. You will see the message shown below.



7. Click **OK**. The Bi-level Password function is now disabled. The status bar at the bottom of your screen now displays: "Password: Disabled".

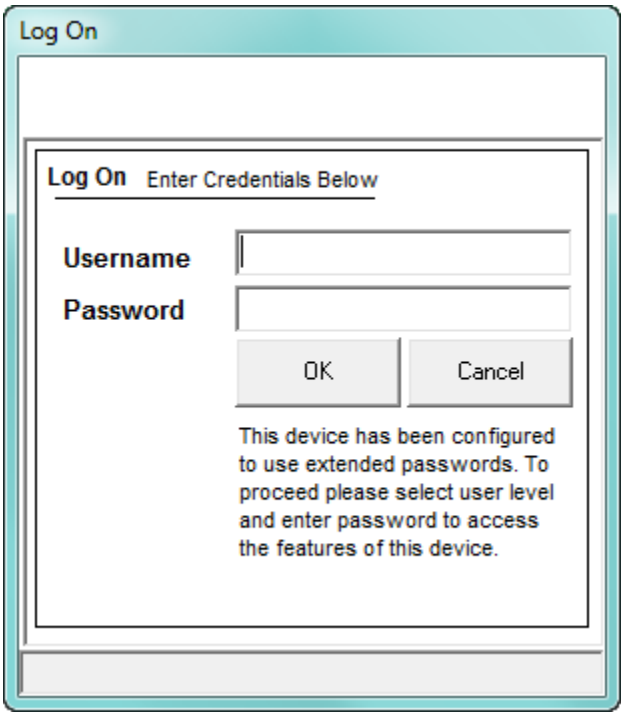
6.6 Log On and Off with Passwords (EPM 9000 series)

(For EPM 9700 see section 6.12 *EPM 9700 Security Features* on page 6–26.)

You can log on with a specific password, or log off from a specific password.

6.6.1 Log On/Off with Extended Passwords

When the Extended Passwords feature has been enabled for a meter, you will be prompted to log on with a password when you connect to the meter. See the screen shown below, from an EPM 9900/9900P meter.



1. Enter the Username and password for the profile for which you want to log on.

NOTE

For the other EPM 9000 series meters, you will enter the user level and password, since they do not have the Username field.

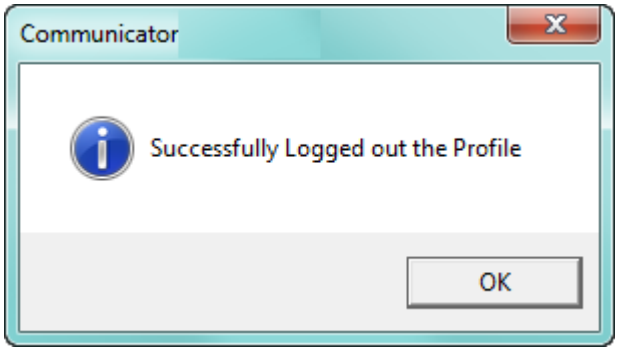
2. Click **OK**. You will have access to the functions enabled by this password profile.

NOTE

- Click **Cancel** to exit the Log On screen without logging on. You will be connected to the meter, but at the lowest access level.
- After three failed attempts to log on, the Log On window disappears and you are connected at the lowest access level.

3. To log off, click **Tools > Passwords > Log Off**. You will a confirmation screen - click **Yes** to log off or click **No** to stay logged on.

4. If you click **Yes**, you will see the message shown below. Click **OK** to close the message window.

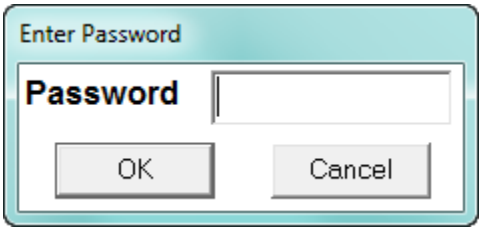


6.6.2 Log On/Off with Bi-level Passwords

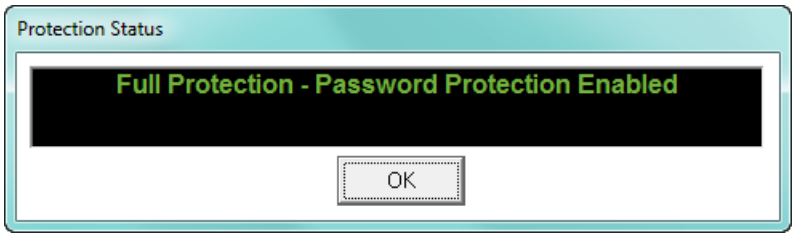
NOTE

You will only be able to log on/off the Bi-level password if the Extended password feature is not enabled.

1. To log on, select **Tools > Passwords > Log On**.



2. Enter a Level 1 or 2 Password and click **OK**.
3. To log off, select **Tools > Passwords > Log Off**. You will see the following message.



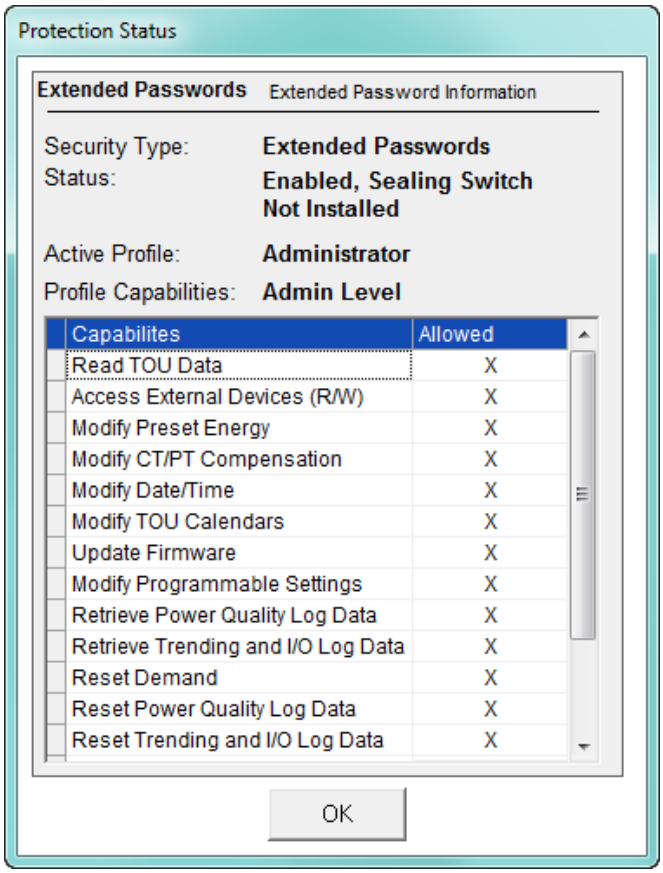
4. Click **OK**.

6.7 View Protection Status (EPM 9000 series)

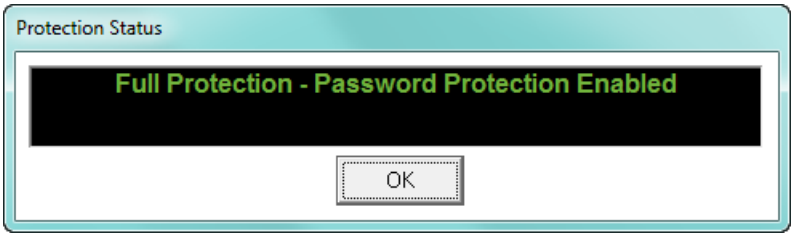
(For EPM 9700 see section 6.12.9 *Viewing Security Status* on page 6–38.)

Click **Tools > Passwords > Status**. The screen you see depends on the protection status that is active. It displays the currently logged in profile, the security status of the meter, and the profile's access permissions.

You will see the following screen if the Extended password protection is enabled. This is an example of the screen you would see if the Admin password is logged on.



You will see the following screen if only Bi-level password protection is enabled.



6.8 Sealing Switch Overview (EPM 9000 series)

(For EPM 9700 see section 6.12 *EPM 9700 Security Features* on page 6–26.)

The Sealing Switch lets you set additional restriction to functions of the meter. The Sealing Switch acts as a physical barrier, requiring a button to be pressed to allow a user to enter a password and configure the meter. This is an added level of security, since the button is located under an area that can be secured with a physical seal, which would indicate tampering if removed. The Sealing Switch is enabled through the Tools menu. Once enabled, the switch must be activated at the meter. You activate the switch by breaking the physical seal and then:

- Pressing and holding the button (EPM 9650/9900/9900P meter)
- Pressing both the Reset Switch and Test Button at the same time (EPM 9800 meter)

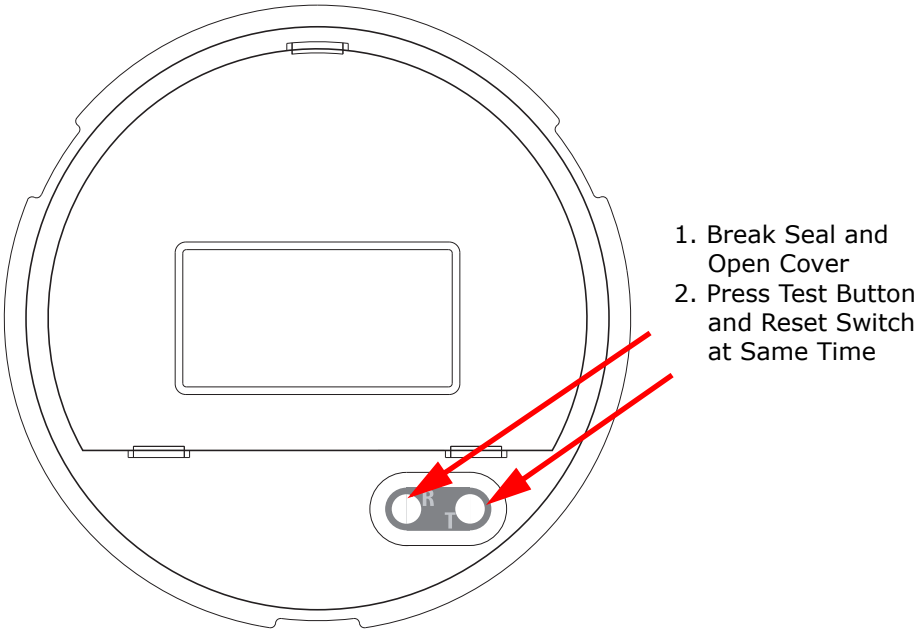
You will then be able to perform the restricted function. The restricted functions are as follows:

- EPM 9650/9800 meters:
  - Reset Logs, Max/Min, Energy, TOU, and related features
  - Enable/Disable Passwords
- EPM 9900/9900P meter:
  - Reset Logs, Energy, TOU, Flicker, and related features
  - Modify TOU Calendars
  - Modify Programmable Settings
  - Calibrate DSP1
  - Calibrate DPS2 Waveform Capture
  - Modify Level 1 Password
  - Modify Level 2 Password
  - Enable/Disable Passwords

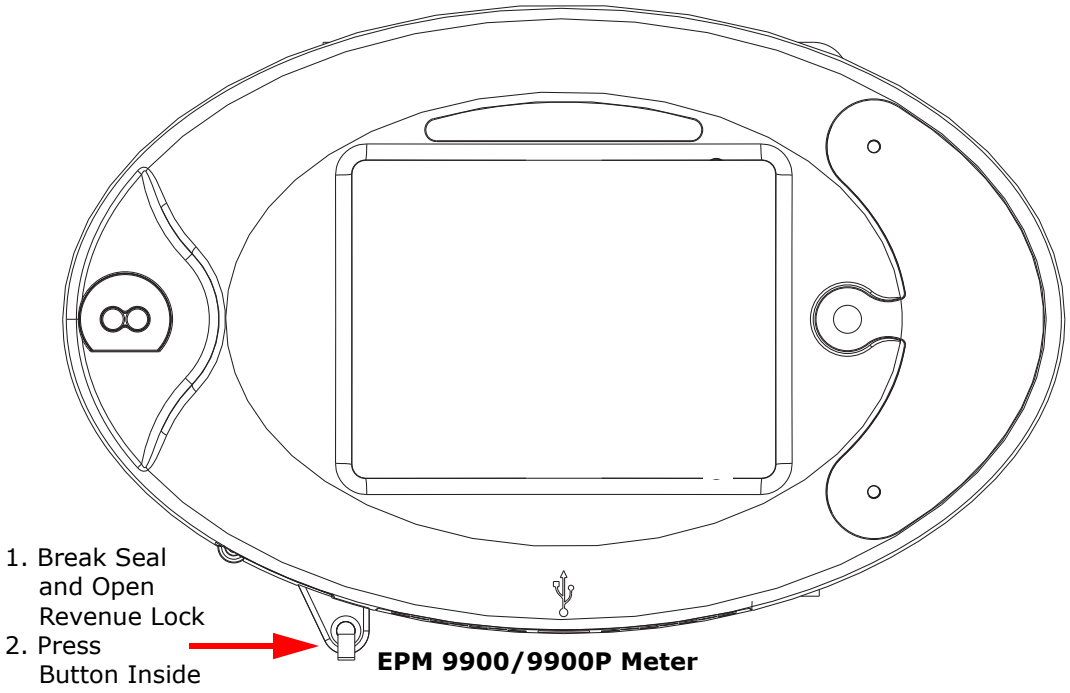
NOTE

- For the EPM 9900/9900P meter, you must break the seal and open the revenue lock on the bottom of the meter, and then press the Sealing Switch button located behind the revenue lock door. You have 30 minutes in which to perform the function once the sealing switch is enabled. You can press the button again to extend the time another 30 minutes.
- For the EPM 9800 meter, you must remove the front cover to access the Test button. Once you have pressed the two buttons for a few seconds, a message appears on the display telling you that the Sealing Switch is enabled. You have 30 minutes to implement changes. If you want to re-set the Sealing Switch before the 30 minutes is up, press the two buttons again.
- For the EPM 9650 meter, you must hold down the button while performing the restricted functions.

- Refer to the diagrams below for hardware location.



EPM 9800 Meter Without Cover



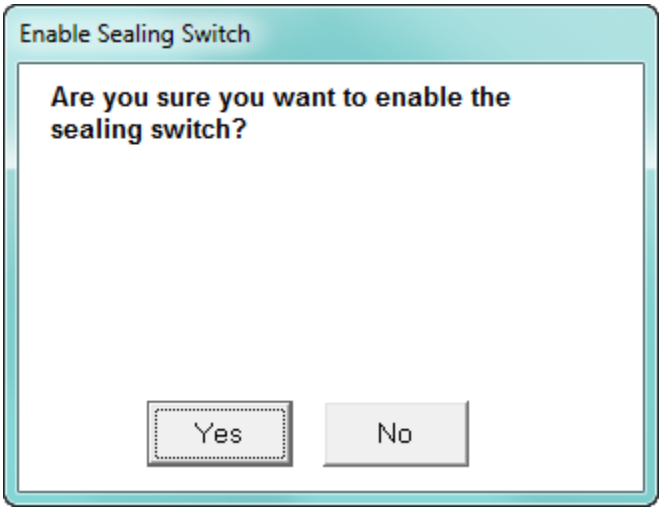
EPM 9900/9900P Meter

Figure 6-1: Figure 6.1: Location of Sealing Switch Buttons

6.8.1 Enable Sealing Switch

(For EPM 9700 see section 6.12.7 *Security Actions* on page 6–34.)

1. From the Tools Menu, select **Sealing Switch > Enable/Disable**. You will see the Enable Sealing Switch confirmation screen.



2. Click **Yes** to enable the Sealing Switch.
3. The Protection Status screen appears, showing Password and Sealing Switch status. Click **OK**.
4. The status bar at the bottom of your screen now displays: "Sealing Switch: Enabled".

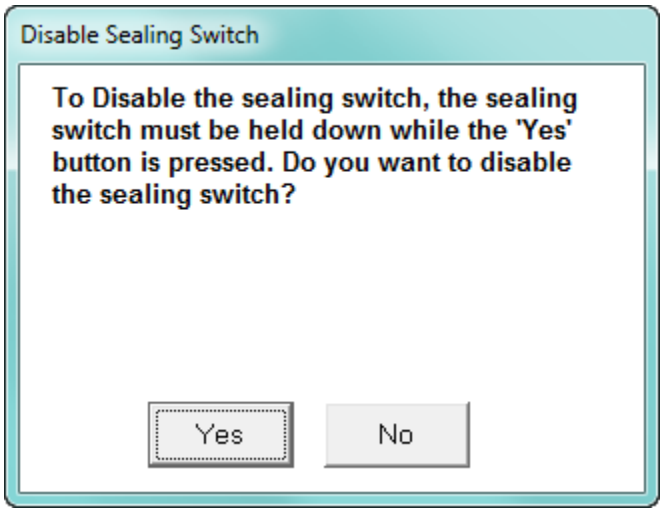
NOTE

The screen you see depends on the current status of the Sealing Switch. If the Switch is already enabled, you will see the screen shown in 6.9 *Disable Sealing Switch (EPM 9000 series)*: in that case, click **No** to keep the Sealing Switch enabled.

6.9 Disable Sealing Switch (EPM 9000 series)

(For EPM 9700 see section 6.12.7 *Security Actions* on page 6–34.)

1. From the Tools Menu, select Sealing Switch>Enable/Disable. You will see the Disable Sealing Switch confirmation screen.



2. Click **Yes** to Disable the Sealing Switch, at the same time pressing the Sealing Switch button on the EPM 9900/9900P meter.
3. The Protection Status screen appears, showing Password and Sealing Switch status. Click **OK**.
4. The status bar at the bottom of your screen now displays: "Sealing Switch: Disabled".

NOTE

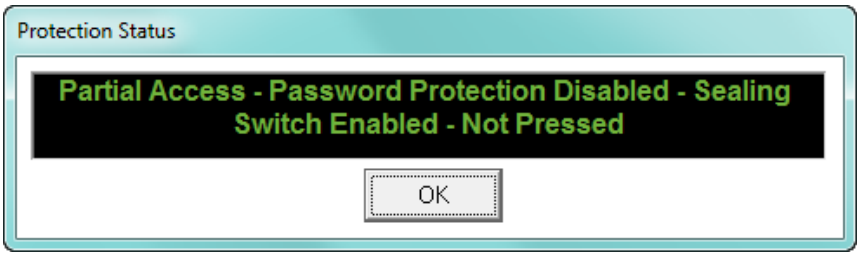
The screen you see depends on the current status of the Sealing Switch. If the Switch is already disabled, you will see the screen shown in 6.8 *Sealing Switch Overview (EPM 9000 series)*: in that case, click **No** to keep the Sealing Switch disabled.

6.10 View Sealing Switch Status (EPM 9000 series)

(For EPM 9700 see section 6.12.7 *Security Actions* on page 6–34.)

The Status Bar at the bottom of your screen displays Sealing Switch status. You can also view the status in the following way:

1. From the Tools Menu, select Sealing **Switch > Status**.
2. You will see the Protection Status screen (example screen shown below), telling you if the Sealing Switch is enabled or disabled.



3. Click **OK** to close the Protection Status screen.

6.11 EPM 7000P Meter Security

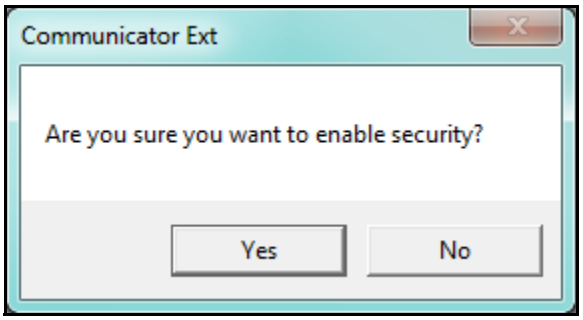
The EPM 7000P meter has enhanced security features to protect the meter's data.

- The meter's password protection offers one Admin level password that has access to all meter functions, and up to 8 user passwords that can be customized for their access to meter features; for example, resetting logs or accumulators or reading TOU data. Both the username and password are encrypted when they are sent to the meter, to further enhance security. In addition, there is a lockout period of five seconds after an unsuccessful password entry, to prevent brute force hacking.
    - Note that if an EPM 7000P meter is password protected, you won't be able to log onto the meter unless you enter a correct password.

6.11.1 Enable Passwords

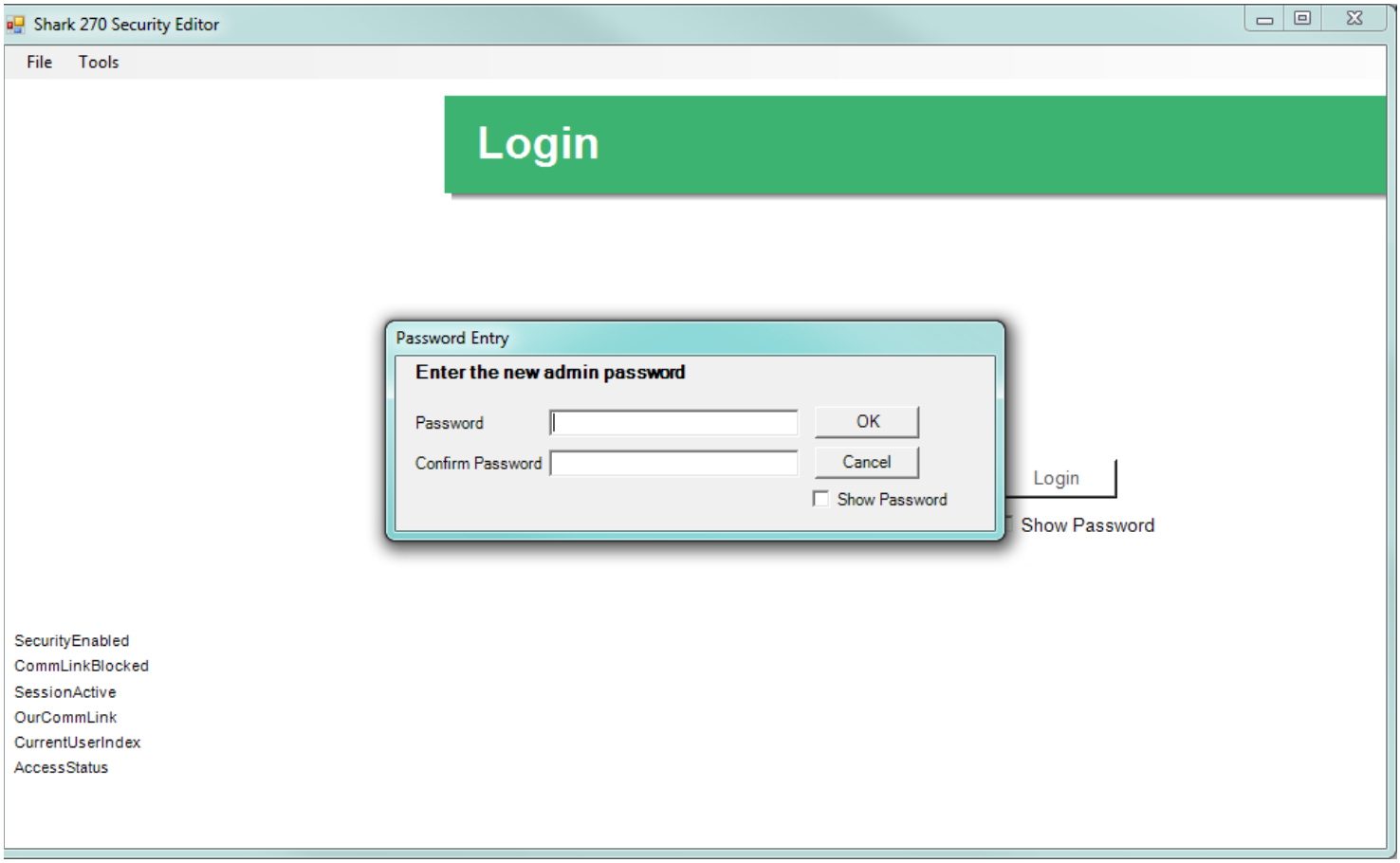
To enable the password feature for the meter, follow these instructions.

1. From the Tools Menu, select **Passwords > Enable**.



2. The password protection is currently disabled. To enable it, click the Yes button.

   Note that if password protection is enabled and you want to disable it, you select **Tools > Passwords > Disable** and click **Yes**. You need to be signed on with the Admin password in order to disable security.

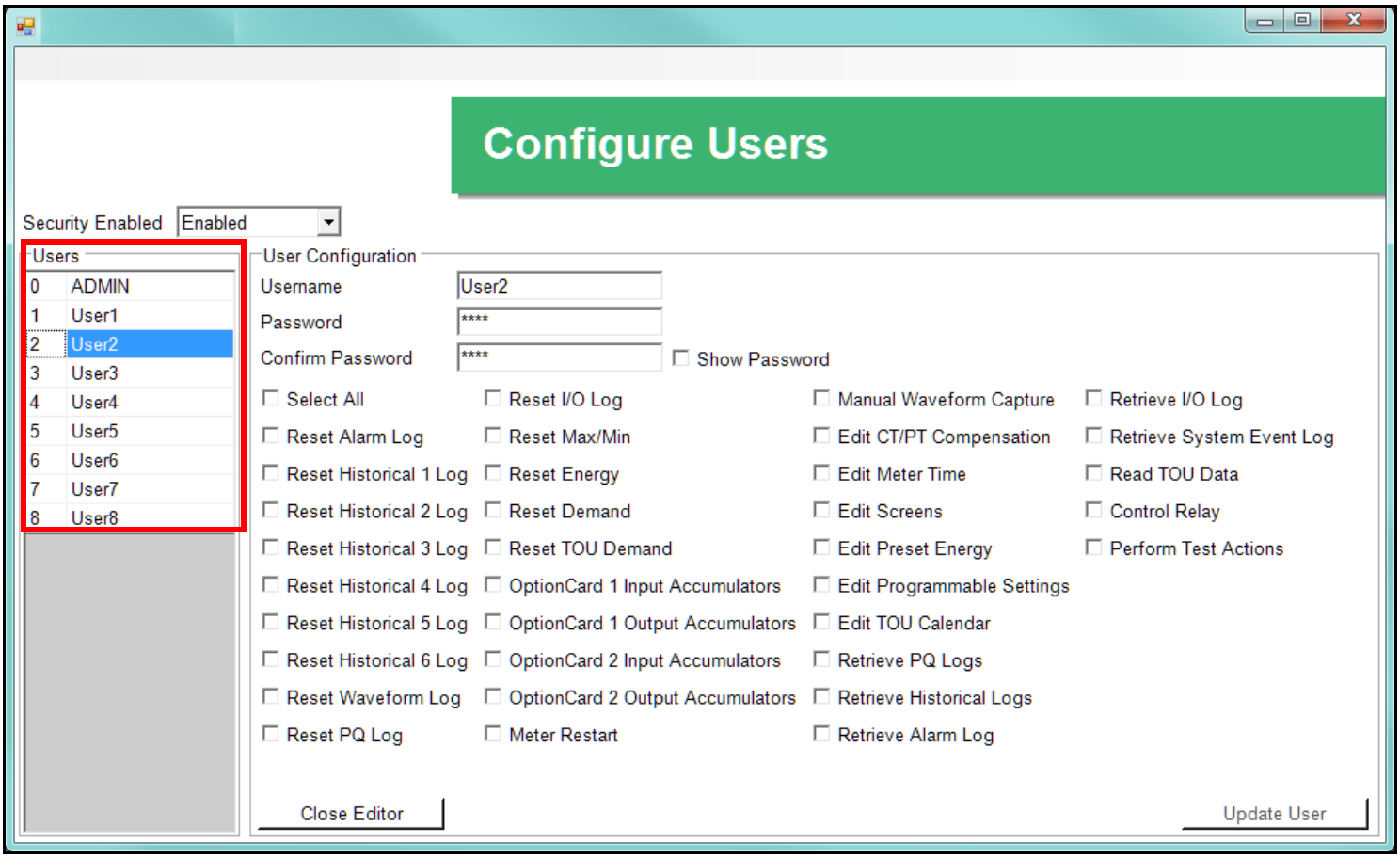


3. You will see the Security Editor screen with a window in front of it. This window prompts you to enter a password for the admin user, and to retype the password to confirm it. Once you have done so, click OK to continue. Note that you can click the Show Password box if you want the actual password to be displayed as it is entered, rather than shown as a series of asterisks; for example, if you want to be sure you are typing it correctly.

NOTE

Admin is the only security user that cannot not have a customized username. The username is always Admin, though you customize the password for the admin user. Admin is the highest level of password security and is the only level that can create other password users and change or disable, password protection. It is important to keep the admin password secure, since it enables all password protected functions. It is also recommended that you change the admin password and other passwords from time to time.

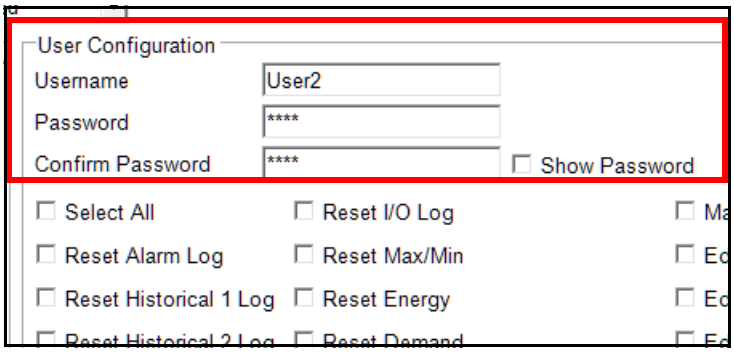
4. You will see messages, and then you will see the screen shown below. The Users field lists the Admin level (0) and Users 1-8.



5. To set up a user:

   a. Click on one of the Users (1-8.)

   b. You can change the username if you wish.



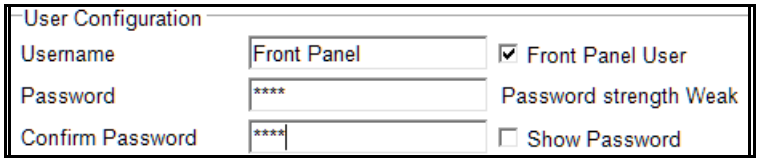
   c. Enter and confirm a password for the user. The password can be up to 30 alphanumeric characters. You can click the checkbox to display the password if you wish.

d. Select the functions this user is allowed to perform by clicking in the box next to the function. The functions include: resetting individual logs, retrieving individual logs, resetting max/min, resetting accumulators, restarting the meter, uploading firmware, etc. There is also a Select All checkbox, which when selected gives the user permission to perform all of the listed functions. Once this user is saved, the user is able to perform any allowed functions, e.g., resetting the Alarm log; but if the user attempts to perform a function not allowed for them, such as changing the software option, an error message window will be shown and they will not be allowed to perform that function.

e. Click Update User to save your changes.

f. Repeat steps a-e to create another user.

NOTE

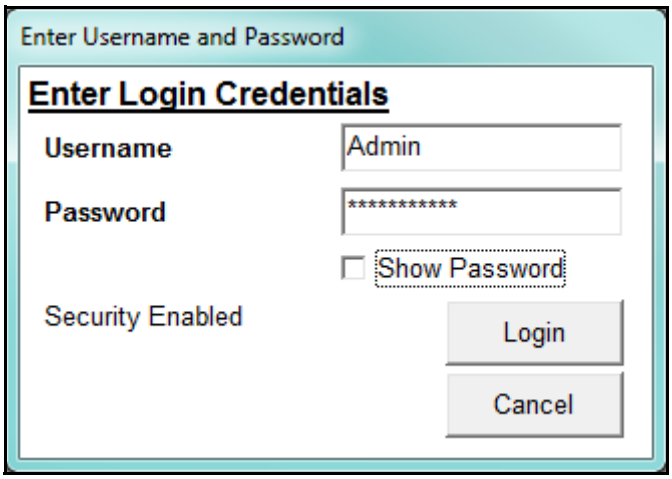


The EPM 7000P meter has an additional setting - Front Panel User. This setting is used to create security for the meter's front panel functions. You can set up one Front Panel user and password. To do so, check the Font Panel box and enter a username and a four digit password. Note that you will only be able to enter four numbers for the password.

6. When you are done, either click **File > Exit** or click the **X** in the upper, right corner of the screen.

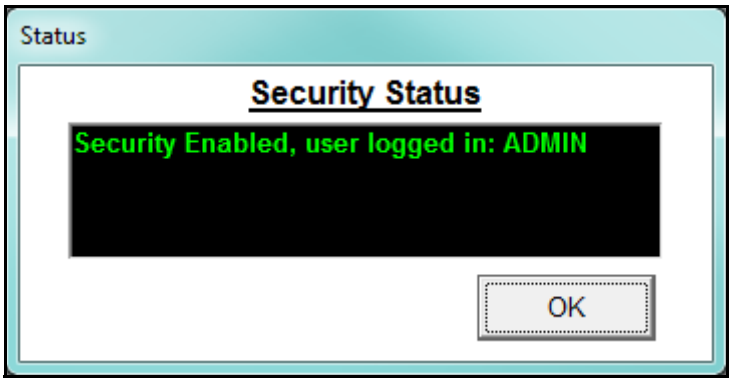
6.11.2 Log On

When password protection is enabled, a login window is presented whenever anyone tries to connect to the meter through software, and also when certain restricted functions are attempted.

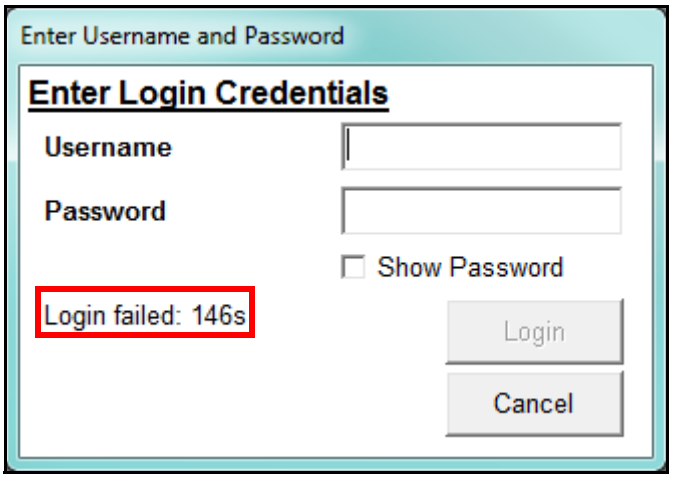


Enter username and password and click Login.

- If the username and password are allowed access to the function, e.g., connecting to a meter, you will be able to continue. You will see the window shown below.



- If the username and/or password are incorrect, there will be a message that login failed and a 60 second timer will start counting down until you can attempt login in again. (Note that for a second and subsequent failures, the timer runs for five minutes.)

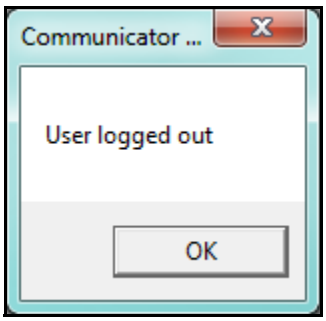


You can also login when the GE Communicator application is connected to the meter, for example, if you previously logged out. To do that, click **Tools > Passwords > Log On**.

6.11.3 Log Off

You may want to log off if you want to sign on as a different user, or if you don't want your username and password sent to the meter automatically (though they are encrypted) whenever you perform a secure action.

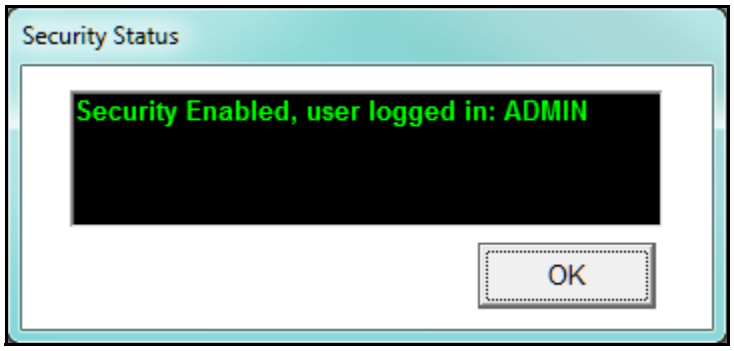
To log off, click **Tools > Passwords > Log Off**. You will see the message window below.



Note that you will be prompted to log back on before performing a secure action.

6.11.4 View Password Status

Click **Tools > Passwords > Status** to see if password protection is enabled, and who is logged in. See the example screen below.



6.12 EPM 9700 Security Features

The EPM9700 security features include a physical sealing switch, a physical sealing lock and a Security feature that provides password control of meter capabilities as well as the physical sealing switch and lock.

The meter's Security allows setup of up to 12 users:

- The Admin user has access to all of the meter's features. This user is the only one that can enable/disable security and create other users.
- The Legacy user provides backward compatible support. The Legacy user is equivalent to a level 2 user in the older EPM meter security system (see the instructions for bi-level passwords in 6.3 *Enable Passwords (EPM 9000 series)* on page 6–4). The Legacy user is not allowed to perform any web actions, including retrieving any logs other than historical logs 1 and 2 and the System Events log.
- Ten configurable users.

In addition to setting up users, the meter's Security allows setup of Roles, which are a collection of permissions that can be configured and then assigned to one or more of the ten configurable users.

Another important feature of the meter's Security is that usernames and passwords are encrypted when sent to the meter, both at login time and configuration time. For information on the meter's Web server security, see 21.1 *Overview* on page 21–1.

6.12.1 Username and Password

Following are the EPM 9700 meter's Username and Password rules:

- Admin user:
  - Has a fixed username of "admin."
  - Has the following password rules:
    - Password is configurable and can be up to 32 characters.
    - Password can contain any printable ASCII character.
    - Password may not contain the username.
- Legacy user:
  - Has a fixed username of "legacy."
  - Password is up to 10 characters.
  - Password enables Level 2 access (see 6.3 *Enable Passwords (EPM 9000 series)* on page 6–4, for information on Level 2 passwords).
  - Access is restricted to backwards compatible Modbus features, e.g., such as reseting energy, reading TOU, and retrieving logs, and cannot be used to log in via the GE Communicator application as it does not support newer features.
- Ten configurable users:
  - Username is configurable and can be up to 32 characters.
  - Username must be unique and can contain any printable ASCII character.
  - Password rules are the same as for the Admin password.
  - May have one of four roles assigned, to control user permissions.

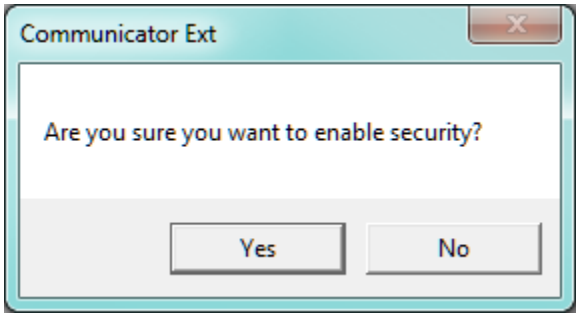
6.12.2 Roles

Roles are sets of permissions that can be configured by the Admin user and assigned (one each) to the ten configurable users. A role can be assigned to multiple users, but each user can have only one role. All of the available permissions are shown in the roles setup screen - see 6.12.6 *Setting up Roles* on page 6–32.

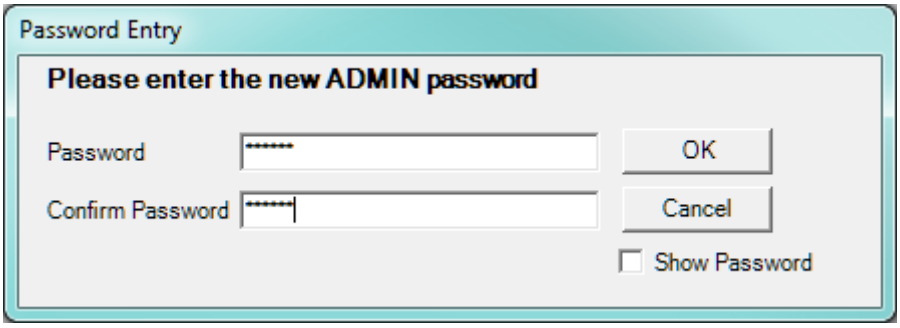
6.12.3 Enabling Security

To enable security:

1. From the Tools Menu, click **Security > Enable**. You will see this message.



2. Click Yes. You will be prompted to enter the Admin password.



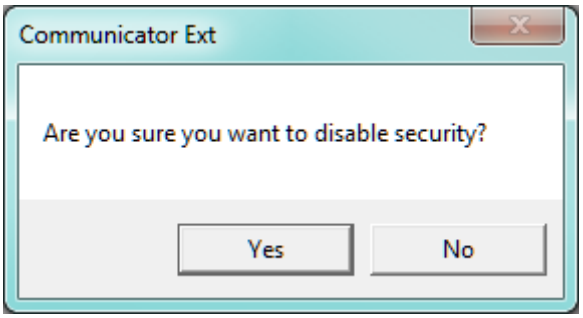
3. Enter and confirm a password for the Admin user (see 6.12.1 *Username and Password* on page 6–26, for password requirements). Note that you can click Show Password if you want to see the actual password rather than the placeholder asterisks.
4. Click **OK**.

   You will see the Security Editor screen, which is explained in 6.12.5 *Setting up Users* on page 6–29 and "Setting up Roles" on page 6-32.

6.12.4 Disabling Security

As mentioned earlier, only the Admin user can disable security for the meter.

1. From the Tools Menu, click **Security > Disable**. You will see this message.



2. Click **Yes**. You will see status messages as security is being disabled, and then this message once the security has been disabled.

3. Click **OK**.

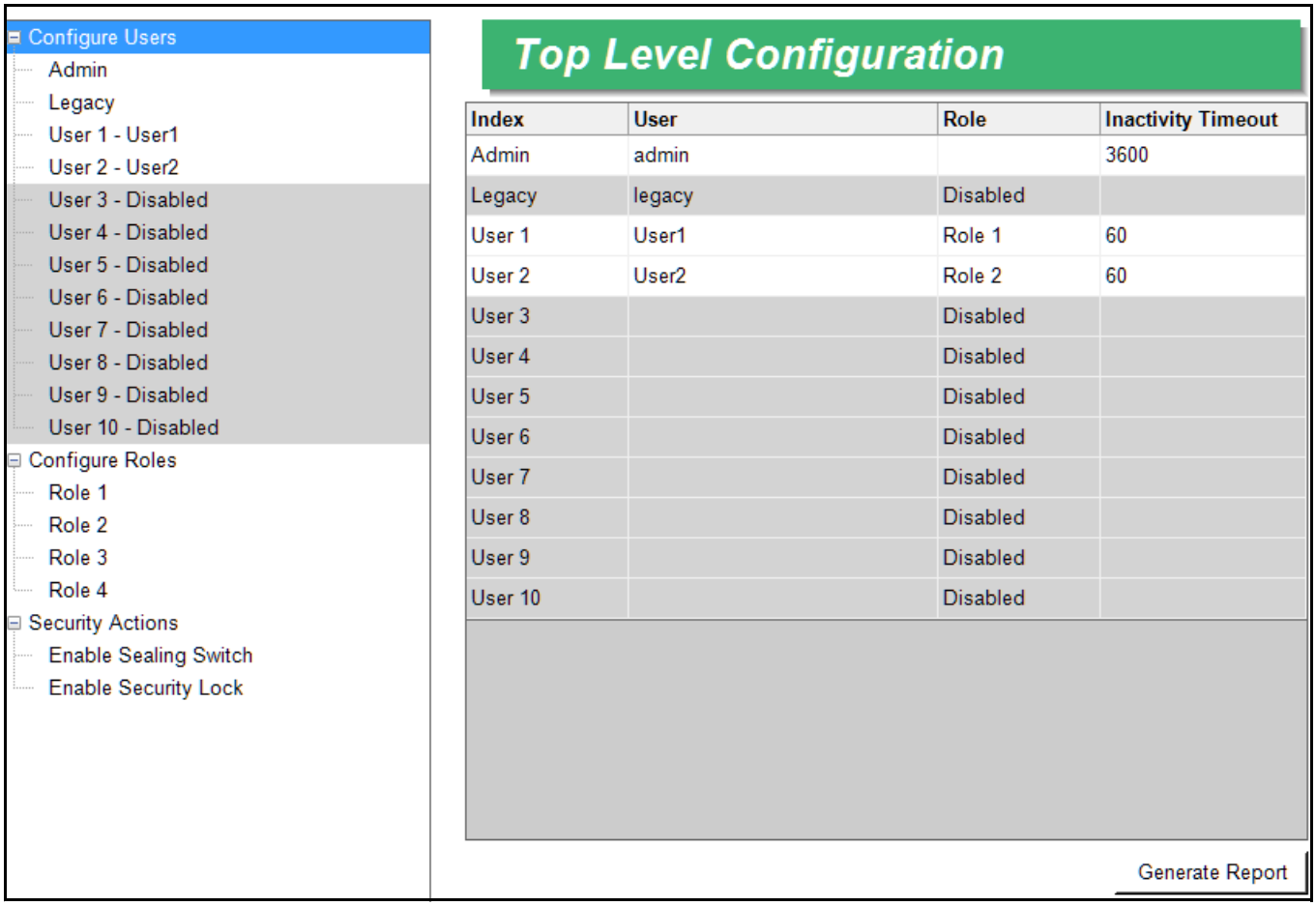
6.12.5 Setting up Users

As mentioned earlier, only the Admin user can configure the other users.

1. When you first Enable security, after entering the Admin password, the Security Editor opens automatically.

NOTE

To set up or edit users at another time, click **Tools > Security > Configure**.

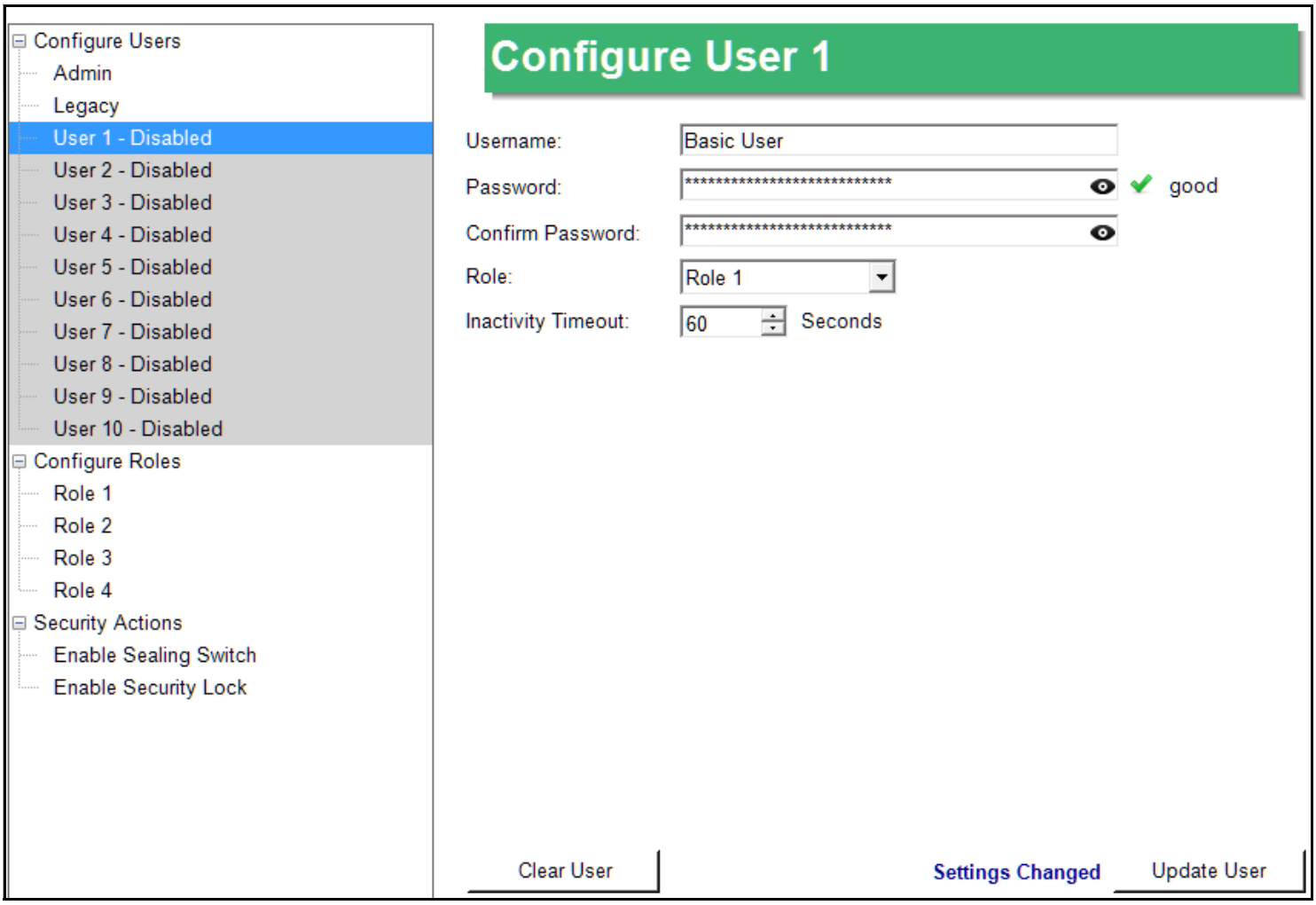


Index	User	Role	Inactivity Timeout
Admin	admin		3600
Legacy	legacy	Disabled	
User 1	User1	Role 1	60
User 2	User2	Role 2	60
User 3		Disabled	
User 4		Disabled	
User 5		Disabled	
User 6		Disabled	
User 7		Disabled	
User 8		Disabled	
User 9		Disabled	
User 10		Disabled	

2. If this is the first time you are setting up security for the meter, the only enabled user will be Admin; if users have already been configured, they will be listed on the right side of the screen. For each configured user, the username, assigned (configured) role, and timeout setting are displayed.

   From this screen you can set up a legacy user, if needed, and ten additional users. You can also configure roles for the users and enable the sealing switch and security lock.

3. To set up a user, click on a user in the list on the left side of the screen.



4. You configure settings for the user on the right side of the screen. Enter:
   - Username
   - Password

   See 6.12.1 *Username and Password* on page 6–26 for details of password requirements.

     - If the password meets the minimum requirements, you will see a red check mark and the text "weak" to the right of the field; if it meets the recommended strength length of at least 16 characters, you will see a green check mark and the word "good" to the right of the field.
     - If you want to see the password you are entering (rather than asterisk placeholders), click the eye icon to the right of the Password or Confirm Password fields.

5. Enter the password again in the Confirm Password field.

6. Select the Role for this user from the Role pull-down menu. You also set up roles; i.e., a collection of permissions, from the Security Editor screen - see 6.12.6 *Setting up Roles* on page 6–32, for instructions.

7. Select an inactivity timeout from the pull-down menu. This is the number of seconds without security activity that the system will wait before automatically signing out the user.
8. Note that there is a message at the bottom of the screen that says "Settings changed." Click Update User to save your settings and create the user, or Clear User to delete the user from the security setup. You will see a screen with update messages as your settings are being saved and then the Security Editor is redisplayed. When the user is saved successfully, there is a message at the bottom of the screen that says "Update Successful."

NOTE

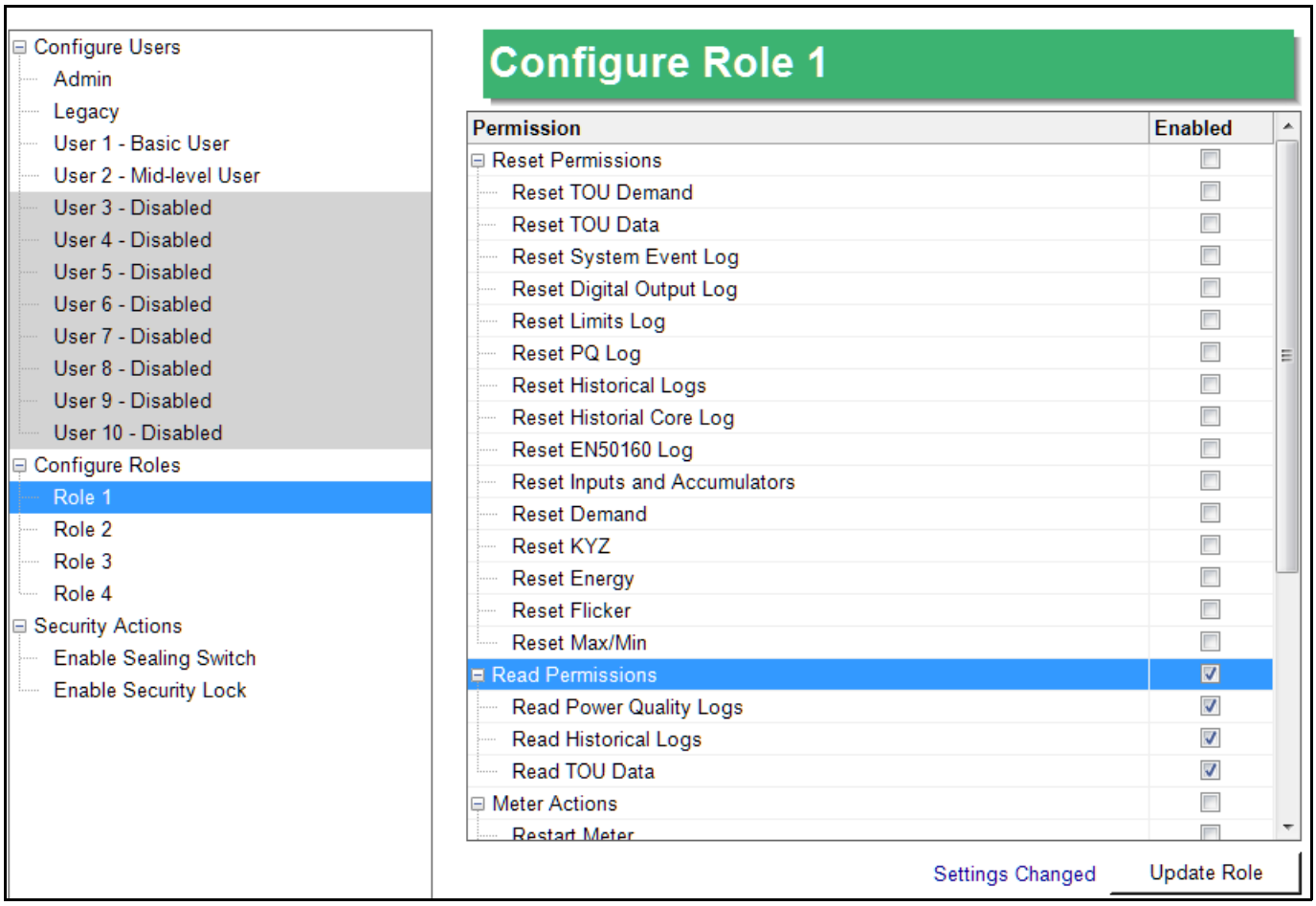
If the Update button isn't selectable, make sure that the password and confirmation passwords match, and that the password doesn't contain the username.

9. Continue to set up as many users as you need. Remember that the Legacy user is a special case that has unique password requirements - see 6.12.1 *Username and Password* on page 6–26, for details.

6.12.6 Setting up Roles

The Security Editor screen is also used to set up the roles, i.e., the set of permissions that will be assigned to users. You can only assign one role to a user, but multiple users can have the same role. Up to four roles can be configured.

1. Click on one of the roles on the left, under the **Configure Roles** heading.



2. The right side of the screen lists permissions. Use the scroll bar to view all of the available permissions. To assign a permission to a role, click in the Enabled checkbox next to the action, e.g., Read TOU data.

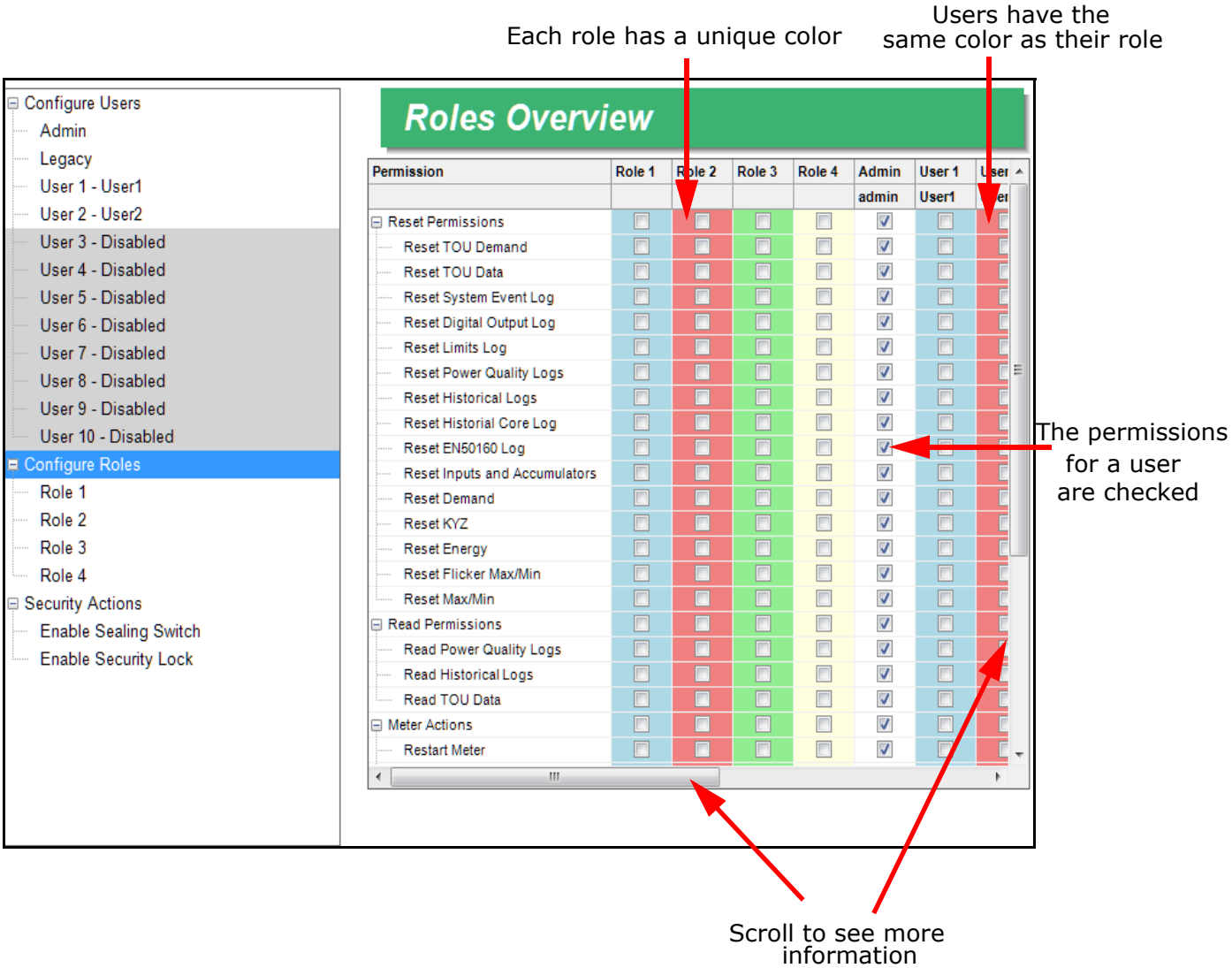
NOTE

You can click on the group checkbox, e.g., Read Permissions, to select all of the items in that group - see the example above. You can also right-click in the screen and choose Select All or Select None.

3. When you have finished assigning permissions to the roles, click Update Role. You will see a screen with update messages as the role is being saved and then the Security Editor is displayed once again. You can then assign that role to one or more users.

6.12.6.1 Viewing the Role and User Configuration

You can view all of the roles with their permissions, and the users to whom they are assigned by clicking on Configure Roles on the left side of the screen. You will see the Roles Overview screen, shown below.



You can also create a text file with the configured users and their permissions. Click **Configure Users** on the left side of the Security Editor and then click **Generate Report** on the bottom right. You will be prompted to enter a name and select a destination for the text file. An example text file is shown on the next page.

Report1 - Notepad

File Edit Format View Help

```
Connection:                     mn://172.20.167.218:502
Meter Designation:              Serial Number
Meter Serial:                   0000000000001234
Meter Type:                     0171
Generated:                      10/30/2017 1:45:57 PM


---- Security ----
    Security :                  Enabled
    Sealing Switch:             Disabled
    Security Lock:              Disabled


---- Users ----
- Admin -
    Username:                   admin
    Role:                       admin
    Inactivity Timer:           3600 Seconds

- Legacy -
    Disabled

- User 1 -
    Username:                   User1
    Role:                       Role 1
    Inactivity Timer:           60 Seconds

- User 2 -
    Username:                   User2
    Role:                       Role 2
    Inactivity Timer:           60 Seconds

- User 3 -
    Disabled

- User 4 -
    Disabled

- User 5 -
    Disabled

- User 6 -
    Disabled

- User 7 -
    Disabled

- User 8 -
    Disabled


---- Roles ----
- Role 1 -
    Edit Programmable Settings

- Role 2 -
    Edit Date

- Role 3 -

- Role 4 -
```

6.12.7 Security Actions

The Security Editor also lets you enable the meter's sealing switch and security lock.

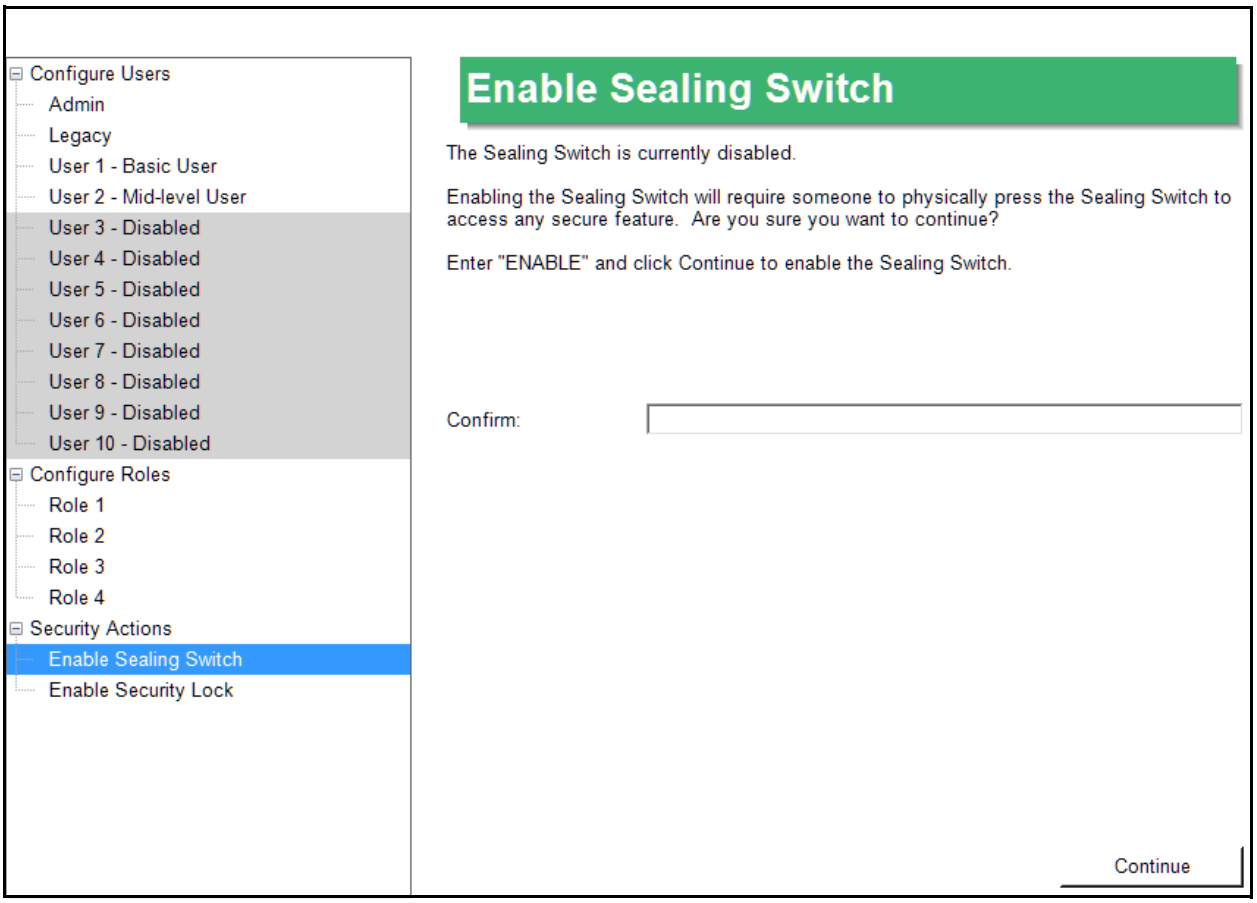
- When the sealing switch is enabled, a user must physically break the meter seal and press the switch to perform any password protected meter actions.
- When security lock is enabled, passwords must be used to access any password protected features.

CAUTION! Once security lock is enabled, it **cannot be turned off**.

6.12.7.1 Enabling the Sealing Switch

To enable the sealing switch:

1. Under Security Actions on the left side of the screen, click **Enable Sealing Switch**.



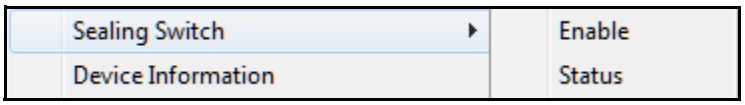
NOTICE

IMPORTANT! Once you enable the sealing switch, the sealing switch on the meter must be pressed, in order to access any secure features.

2. Enter the word **ENABLE** in the Confirm field.
3. Click **Continue**.

NOTE

- The Admin user can also disable the sealing switch if it has been enabled. The instructions are the same as for enabling the sealing switch, except that the text under Security Actions will say Disable Sealing Switch and you will type the word **DISABLE** in the Confirm field.
- You can also enable the sealing switch from the Tools menu. Once you have enabled security, click **Tools > Enable** to enable the sealing switch. Note that you will not see this menu item if security is not already enabled.



6.12.7.2 Enabling Security Lock

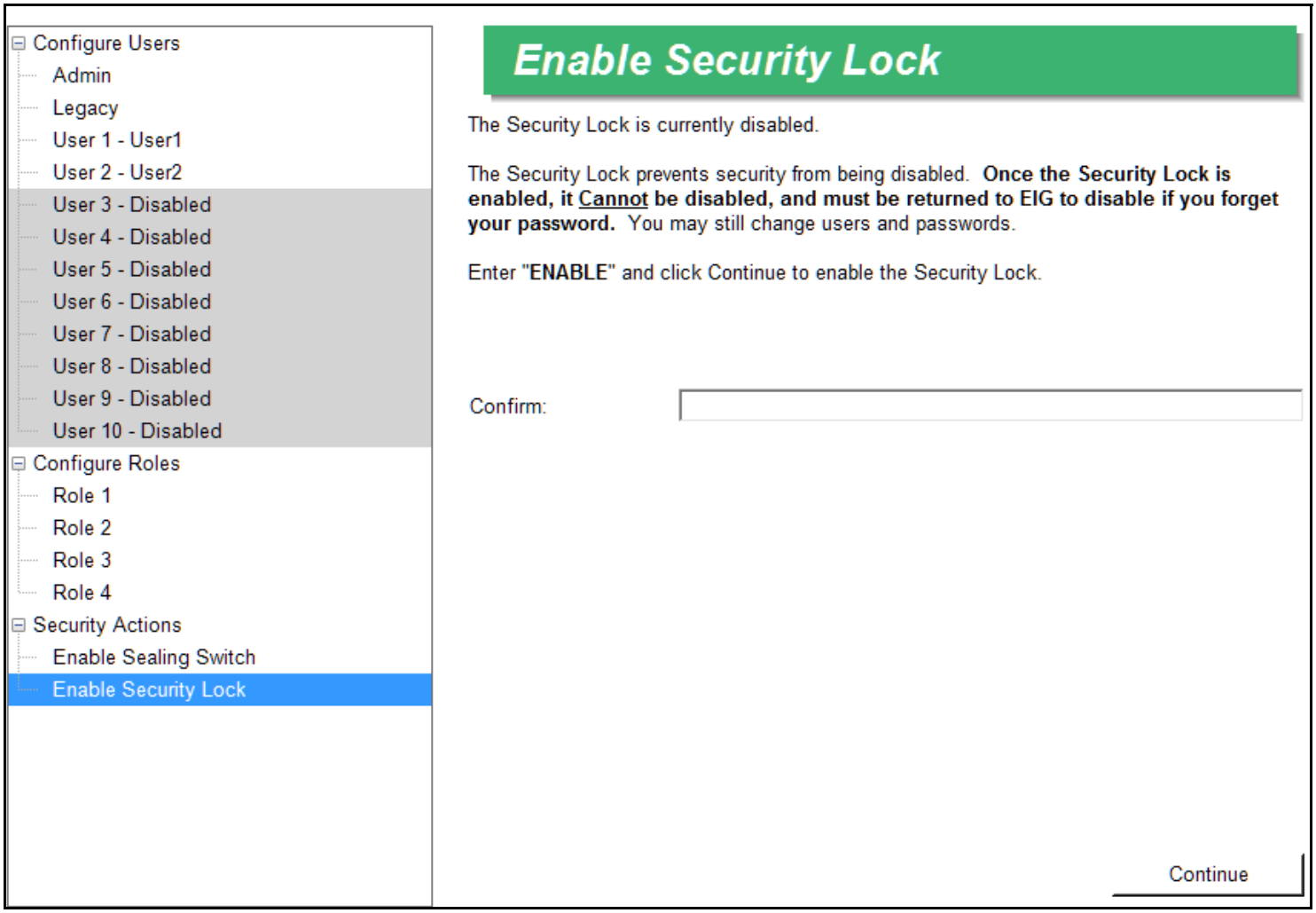
The security lock feature prevents meter security from being disabled.

CAUTION

IMPORTANT! Make sure you want to implement this setting: Once you enable the security lock, you **CANNOT DISABLE Security**, though you can still change users and passwords.

To enable the security lock:

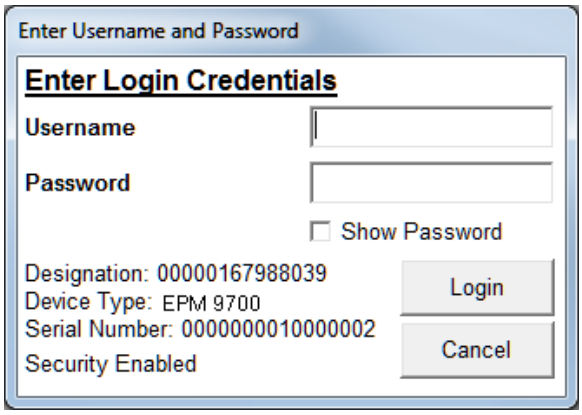
1. Under **Security Actions** on the left side of the screen, click **Enable Security Lock**. The right side of the screen displays the settings for the security lock.



2. If you are sure you want to enable security lock, enter the word **ENABLE** in the Confirm field.
3. Click **Continue**.

6.12.8 Logging On and Off

When security is enabled, you will be prompted to enter a password (or press the sealing switch and then enter your password, if sealing switch is enabled) when you connect to the meter.



Enter your username and password and then press Login. Note that you can click the box next to Show Password if you want to see the characters you are entering, rather than the place holding asterisks. If the username and password are correct, you will be able to perform the action. If they are not correct, you will be prompted to enter a new username and password.

You are logged out of the meter when you disconnect.

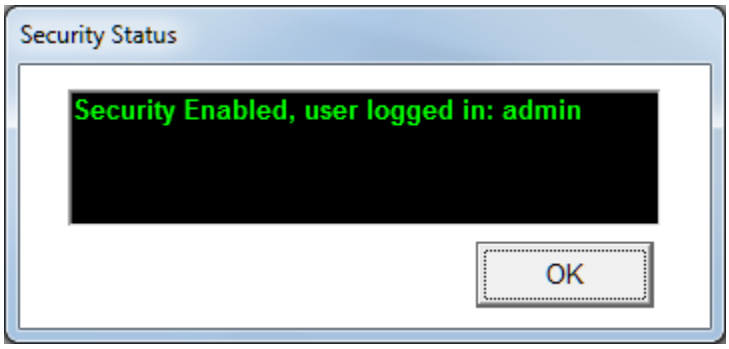
Note that if click Cancel you will be disconnected from the meter.

NOTE

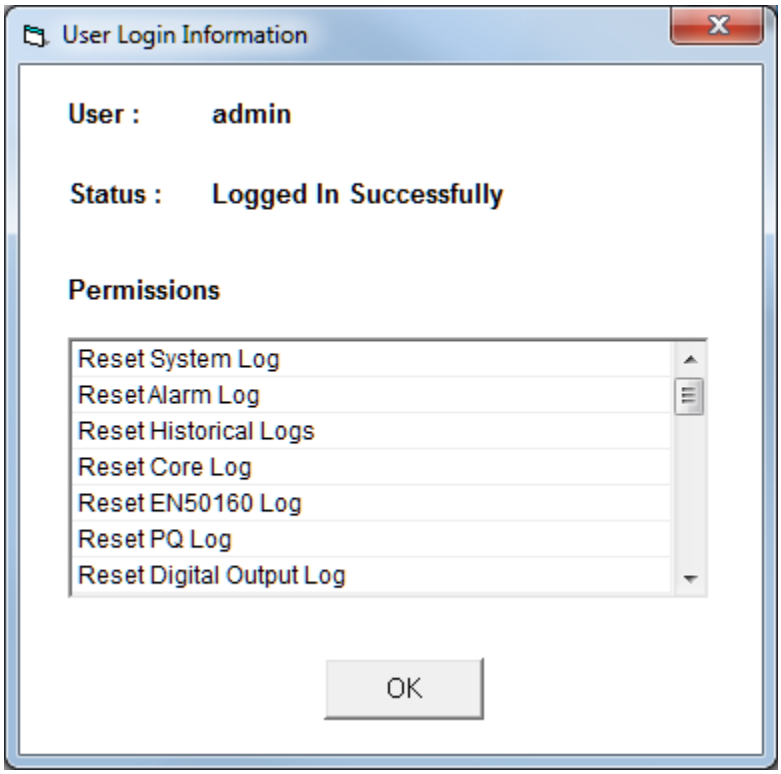
When the Device Profile of an EPM 9700 meter is updated, the meter reboots. If security was enabled when the meter rebooted, users may need to login again by disconnecting from the meter, reconnecting to it, and logging in again. This is true both for the user that updated the Device Profile and for any other users connected to the meter when it is updated.

6.12.9 Viewing Security Status

When you sign on with a password, you will see a security status screen like the one shown below.



You can also check Security status by clicking **Tools > Security > Status**. You will see a screen like the one shown below, showing details of the users that are logged in.



GE Communicator

Chapter 7: Device Profile

Once you have connected to your meter and closed the Device Status screen, you use the Device Profile screen to configure settings for your meter.

7.1 Device Profile Screen

The Device Profile screen is the place where most of the meter configuration takes place. You open the meter's Device Profile screen in one of the following ways:

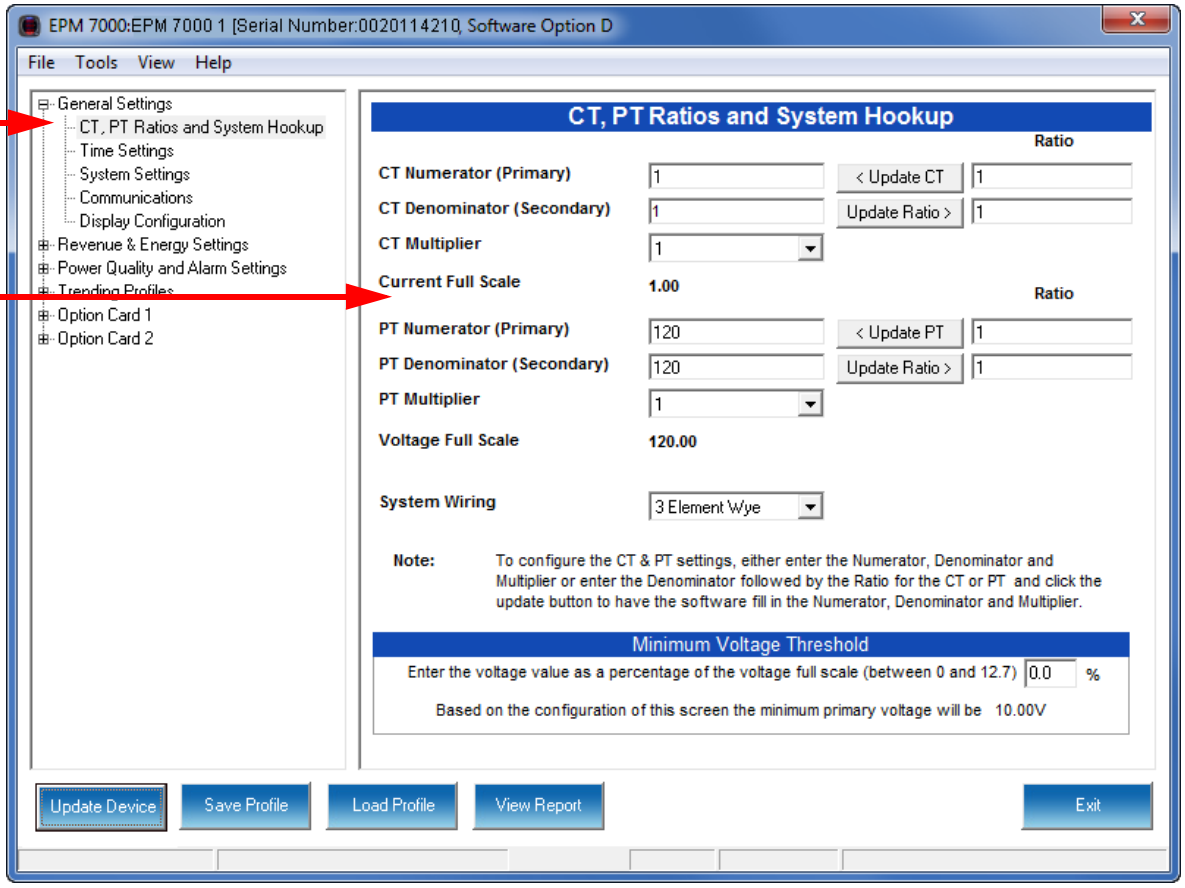
- Click the **Profile** icon in the Icon Bar when you are connected to a meter
- Click **Tools > Edit Device Profile** from the Menu Bar when you are connected to a meter
- Click **File > Open > Device Profile** from the Menu Bar and then choose one of the listed Device Profiles, to configure a stored Device Profile when you are offline (not connected to a meter)

This chapter explains the Device Profile screen and its features. The following chapters explain the Device Profile settings for specific GE meters:

- Chapter 8 "EPM 7000/7100 Meter"
- Chapter 9 "EPM 2200/6000/6010/6100 Meter"
- Chapter 10 "EPM 4600 Metering System"
- Chapter 11 "EPM 9900/9900P Meter"
- Chapter 12 "EPM 9800 Meter"
- Chapter 13 "EPM 9450/9650 Meter"
- Chapter 26 "EPM 9700 Meter"
- Chapter 27 "EPM 7000P Meter"

The appearance of the Device Profile screen depends on the meter type you are connected to. Refer to the following example.

Click in the Tree Menu to Display the Settings Screen on the Right Side



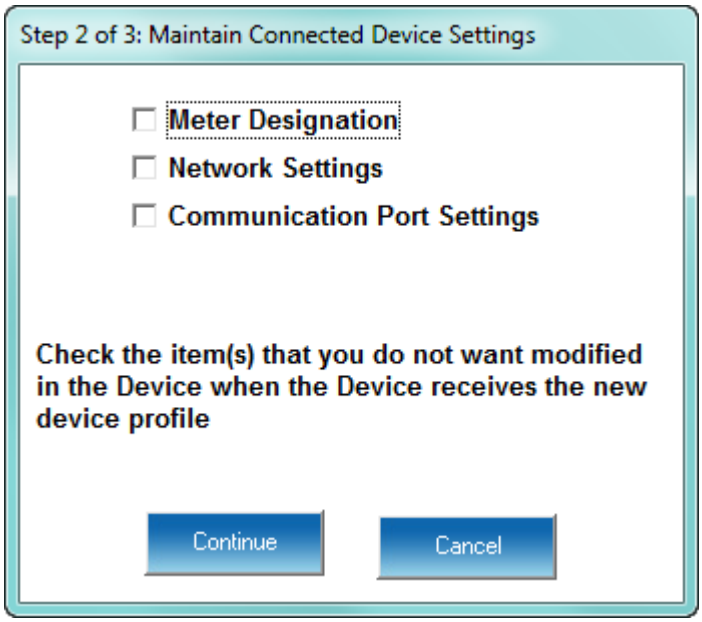
EPM 7000/7100 Meter Device Profile Screen

- All Device Profiles function basically in the same way. They each have a Tree Menu structure that expands to the specific setting desired.
- The Device Profile is organized by subject matter, so that navigating to a particular setting is intuitive.
- All meters manufactured by GE can be programmed with GE Communicator software through their Device Profile.
- GE Communicator software also provides the ability to store Device Profiles and Load Profiles so that users can keep generic profiles that only need to be slightly modified for a particular use.
- After you finish configuring any or all of the programmable settings (refer to the individual meter chapters for detailed configuration instructions for your meter type), use the buttons at the bottom of the screen to execute the tasks described in the following section.
- The Device Profiles can be configured offline, allowing you to configure a meter when it is not connected, and then update it with the programmed settings at a later time.

7.2 Device Profile Screen Buttons

All of the meters' Device Profile screens have the following buttons (though the appearance of the icons and the order in which they appear may vary):

Update Device - this sends the new Device Profile to the connected meter. **You must update the meter's Device Profile for any changes to the programmable settings to take effect.** When you click **Update Device**, the meter retrieves the programmable settings and then, for all EPM 9000 series meters displays the following screen.



1. Click on any item you do not want to change when the new Device Profile is sent. The purpose of this is if you wish to use a generic Device Profile to update the meter, these device-specific settings will not be over-written when the other programmable parameters are added.
2. Click Continue to update send the profile to the meter. You will see a progress screen while settings are updated.

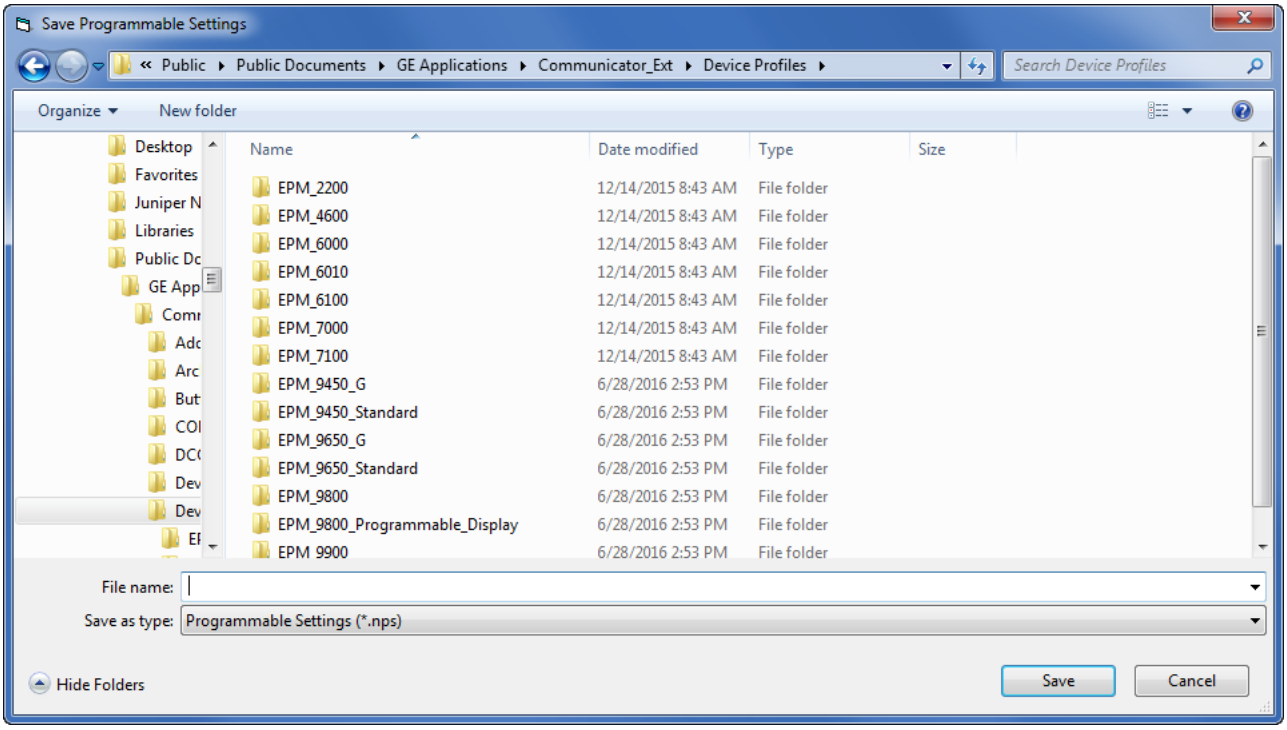
NOTE

IMPORTANT! If you change the Communication settings for the meter, you will no longer be able to communicate with it. You will have to sign off and sign on again with the new settings.

NOTE

When the Device Profile of an EPM 9700 meter is updated, the meter reboots. If security was enabled when the meter rebooted, users may need to login again by disconnecting from the meter, reconnecting to it, and logging in again. This is true both for the user that updated the Device Profile and for any other users connected to the meter when it is updated.

Save/Save Profile - Click to save the Device Profile settings to a file. You will see the Save Programmable Settings window, shown below. Give a name to the Device Profile and click **Save**.

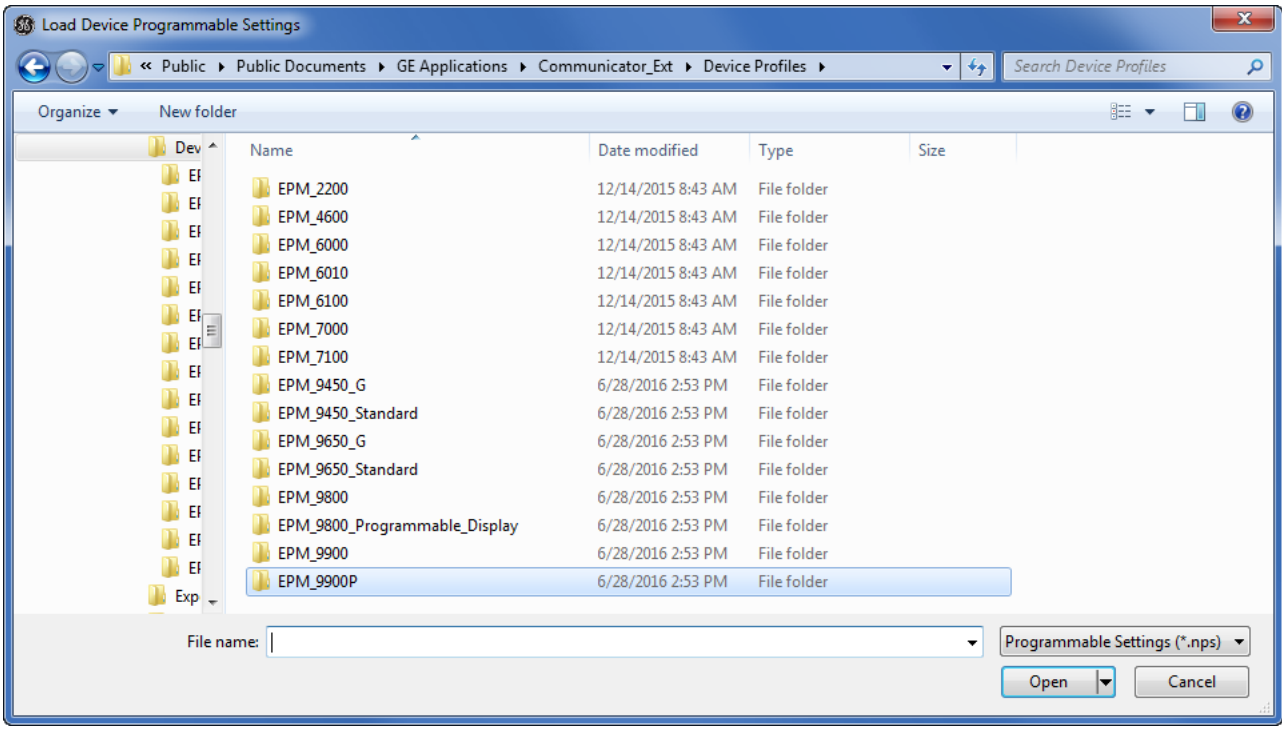


NOTE

Saving the profile does not update the meter.

Load/Load Profile/Open: Click to load a previously saved Device Profile Settings file. You will see the Load Programmable Settings window, shown below. Select the saved Device Profile you want and click Open. The settings from that file will now appear in the Settings Screens; for example, the CT and PT Ratios will be those from the saved Device Profile, rather than from the currently connected meter.

This feature is useful if you want to copy some or all of another meter's settings to the currently connected meter. **Be sure to give the meter a unique identification - see the programming chapter for your meter.**



Exit/Exit Editor: Click to leave the Device Profile Editor. You will be asked to confirm that you want to exit - click **Yes** to exit.

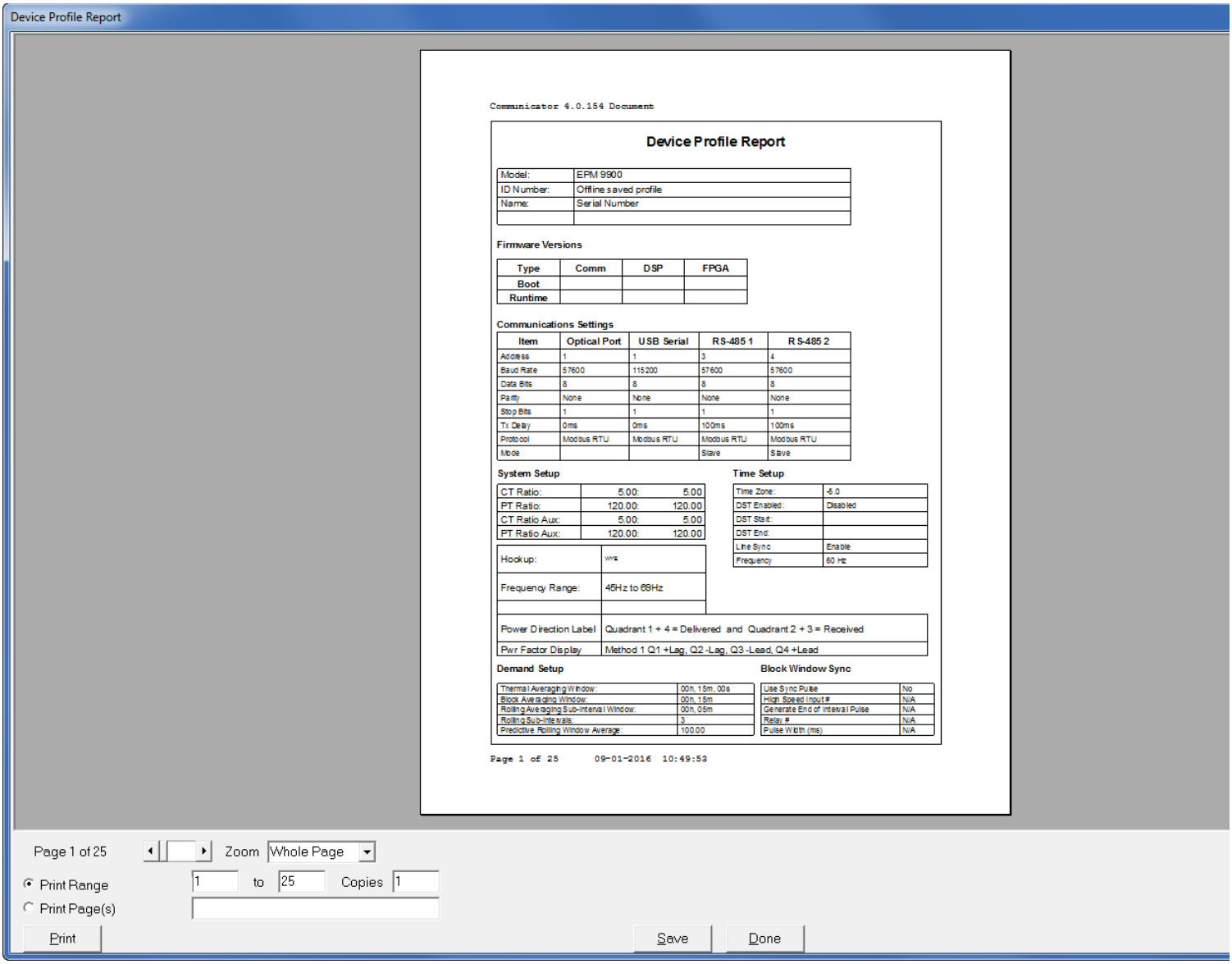
NOTE

The EPM 7000P does not have an **Exit** button. Click **X** in the upper right corner to close the screen.

7.2.1 Device Profile Report

Click **Report/View Report** to view the Device Profile or print a copy of it.

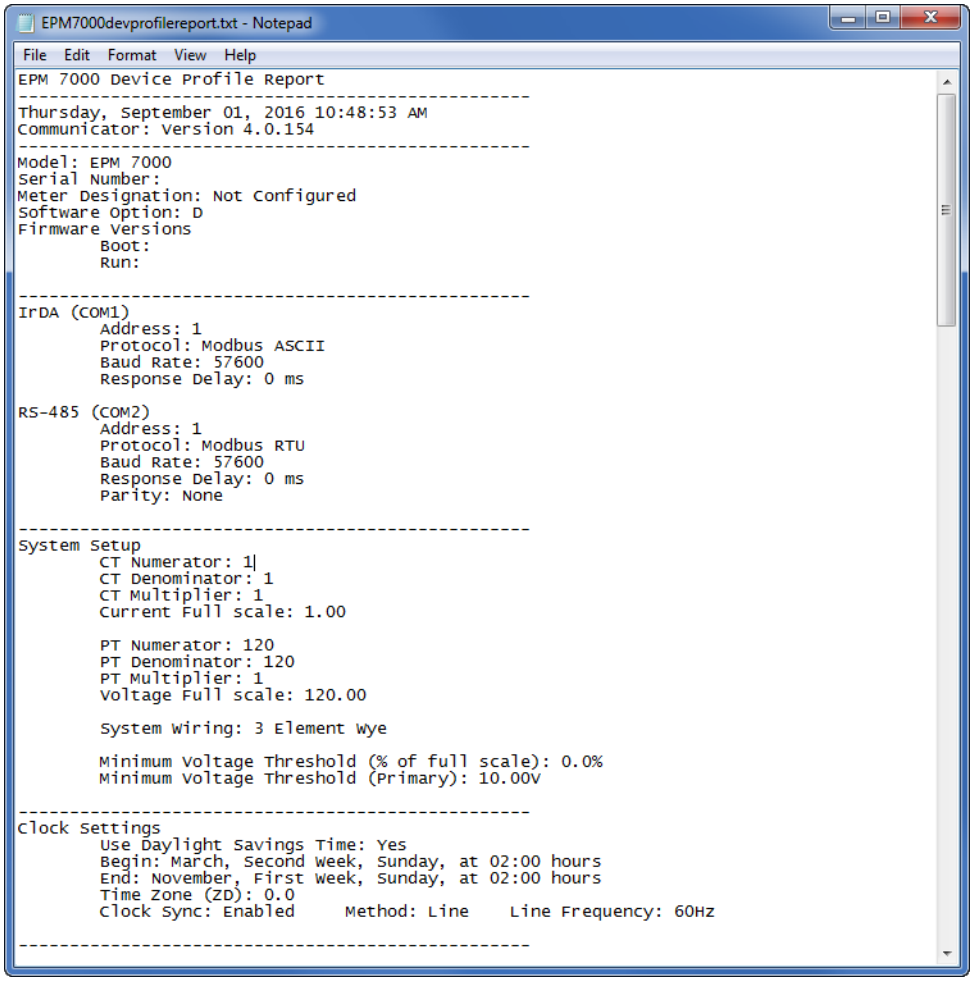
For the EPM 9000 series meters, message windows open while the report is being compiled and then you see the following screen.



- Use the Page arrows to select a page to view.
- Use the Zoom field to adjust the viewing magnification.
- Use the Print Range and Print Pages fields to specify the pages you want printed.
- Use the Copies field to specify number of reports.
- Use the **Print** button to print the report. You will see a Print Setup screen where you can select printer, properties, paper, and orientation.
- Use the **Save** button to save the Device Profile report. A window opens, allowing you to specify a location for the saved report.

- Use the **Done** button to exit the screen and return to the Device Profile screen.

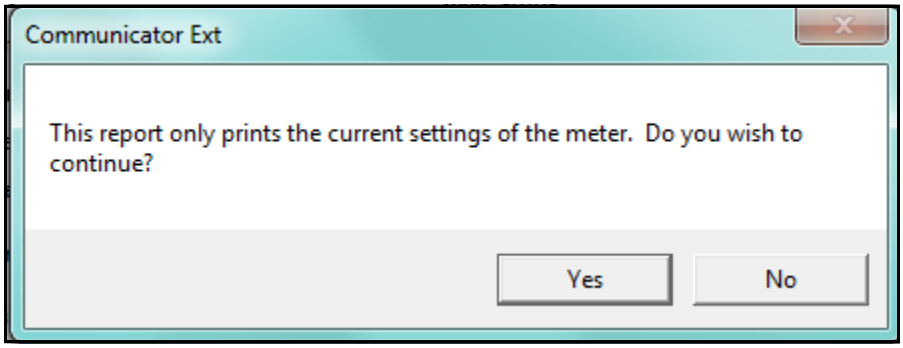
For the other EPM meters (EPM 6000 series, 7000 series, 2200, or EPM 4600 metering system), the **View Report** button opens a Notepad window containing the meter's Device Profile settings in a text file. See the example window, shown below.



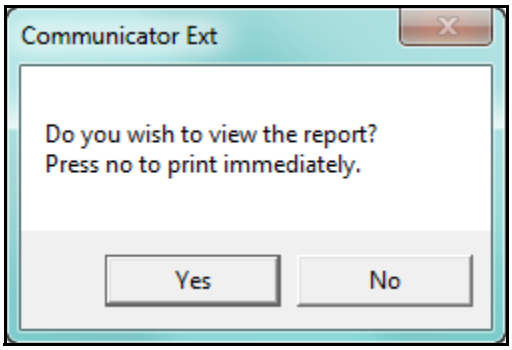
```
EPM7000devprofilereport.txt - Notepad
File  Edit  Format  View  Help
EPM 7000 Device Profile Report
--------------------------------------------------
Thursday, September 01, 2016 10:48:53 AM
Communicator: Version 4.0.154
--------------------------------------------------
Model: EPM 7000
Serial Number:
Meter Designation: Not Configured
Software Option: D
Firmware Versions
        Boot:
        Run:

--------------------------------------------------
IrDA (COM1)
        Address: 1
        Protocol: Modbus ASCII
        Baud Rate: 57600
        Response Delay: 0 ms

RS-485 (COM2)
        Address: 1
        Protocol: Modbus RTU
        Baud Rate: 57600
        Response Delay: 0 ms
        Parity: None

--------------------------------------------------
System Setup
        CT Numerator: 1
        CT Denominator: 1
        CT Multiplier: 1
        Current Full scale: 1.00

        PT Numerator: 120
        PT Denominator: 120
        PT Multiplier: 1
        Voltage Full scale: 120.00

        System Wiring: 3 Element Wye

        Minimum Voltage Threshold (% of full scale): 0.0%
        Minimum Voltage Threshold (Primary): 10.00V

--------------------------------------------------
Clock Settings
        Use Daylight Savings Time: Yes
        Begin: March, Second Week, Sunday, at 02:00 hours
        End: November, First Week, Sunday, at 02:00 hours
        Time Zone (ZD): 0.0
        Clock Sync: Enabled     Method: Line    Line Frequency: 60Hz

--------------------------------------------------
```

- Print the text file by selecting **File > Print** from the Notepad Menu Bar.
- Save the text file by selecting **File > Save** from the Notepad Menu Bar.

For the EPM 6000 meters, the View Report button opens the following window.



1. Click **Yes**. You will see the following window.



2. You have two choices:
   - To view the report on the PC, click **Yes**. Notepad will open with the report as a text file (see the example on the previous page).
     - Print the text file by selecting File>Print from the Notepad Menu Bar.
     - Save the text file by selecting File>Save from the Notepad Menu Bar.
   - To print the report without first viewing it, click **No**. A screen opens that lets you select the printer you want to use.

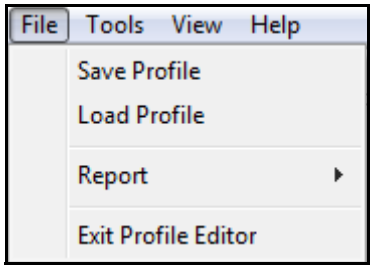
7.2.2 EPM 7000/4600 Device Profile Additional Features

The Device Profile screens for the EPM 7000 and EPM 4600 metering system have some additional features. Three items in the Menu Bar - File, Tools, View - open menus that let you perform functions. These menus and functions are described below.

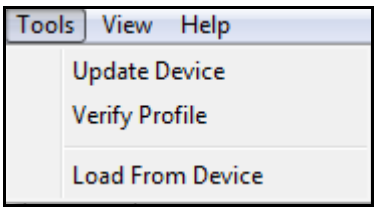
NOTE

When you click **Help** from the Menu bar a PDF file of this manual opens, with instructions for the Device Profile Setting that is active at the current time. For example, if you are on the Display Configuration screen and you click User Manual, the instructions for setting Display Configuration are shown.

- Click **File** from the Menu Bar to see the menu shown below. The File menu lets you perform functions that can also be performed using the screen Buttons, described on the previous page: Save Profile, Load Profile, Report, and Exit Profile Editor.

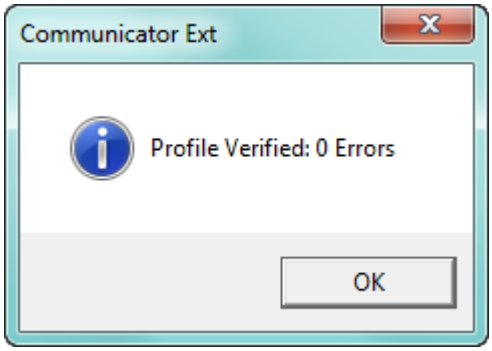


- Click **Tools** from the Menu bar to see the menu shown below.



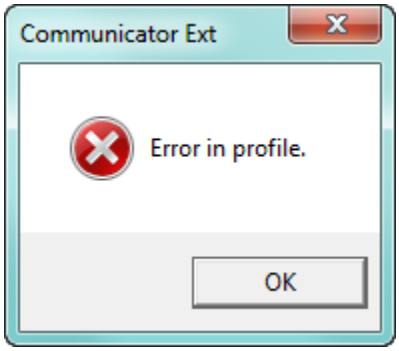
The Tools menu gives you the following options:

- **Update Device** - performs the same function as the Update Device button at the bottom of the screen: it send the Device Profile settings to the currently connected meter.
- **Verify Profile** - click to perform a verification of the current Device Profile settings. You will see a window like the one shown below if there are no errors.

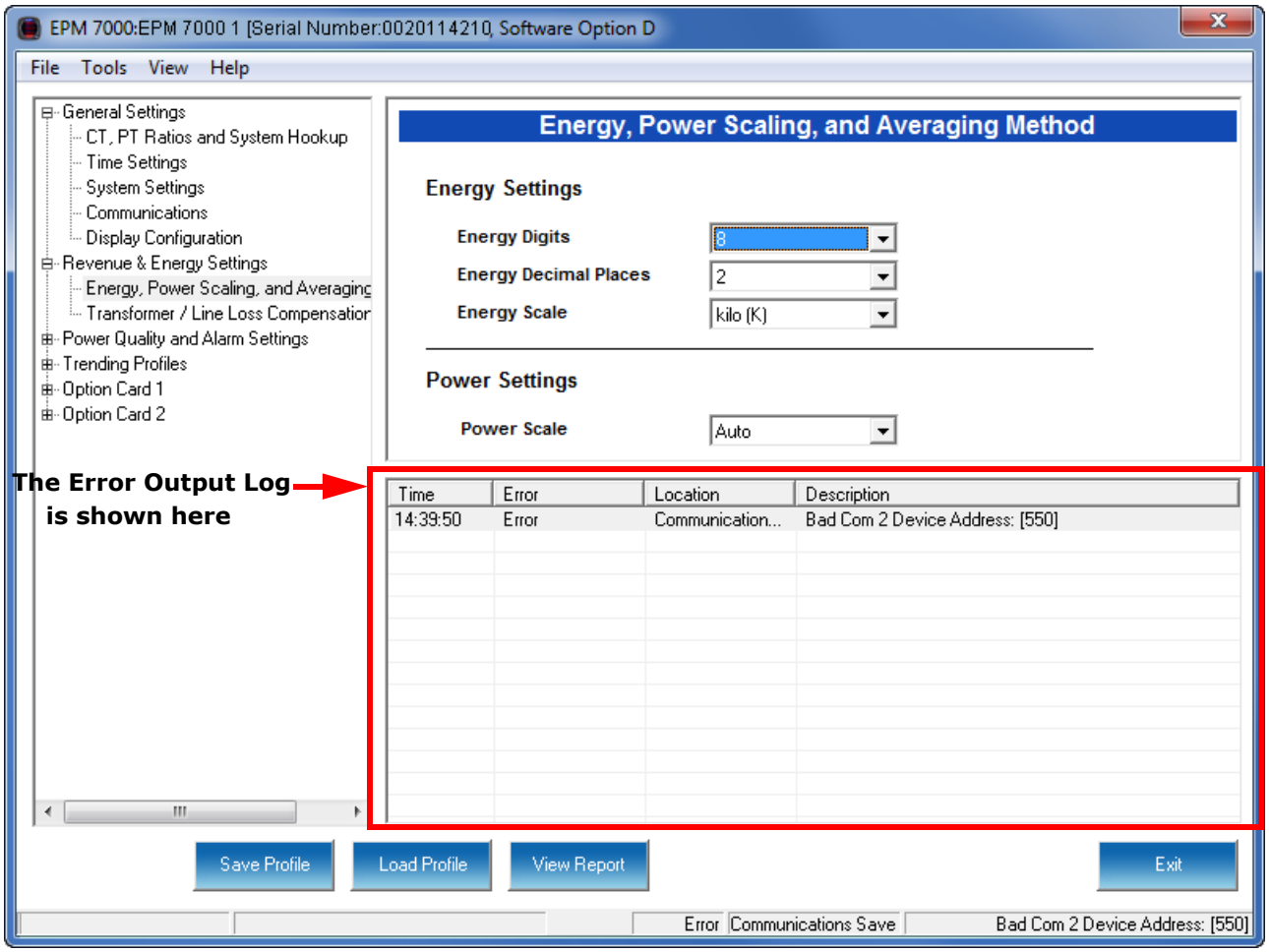


NOTE

If there are any errors as you program the profile, the error message shown below will display.



When you click **OK**, the Error Output Log will open under whatever settings screen you are currently viewing. See the example screen, shown below.

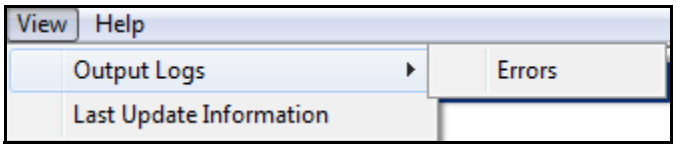


- The Error Output log lists the Time the setting error was made, the Location - the setting the error is in, and the description of the error. You will not be able to save the Device Profile with the error.
- The bottom of the Device Profile screen also displays information about the error: the location and description of the error.
- You can resize the display by clicking and dragging on the line above the Errors display.
- Click View Output Log>Errors to remove the Errors Output Log display from the screen.
- Load from Device - click to load the Settings fields with values from the currently connected meter. This will override any changes you've made locally.

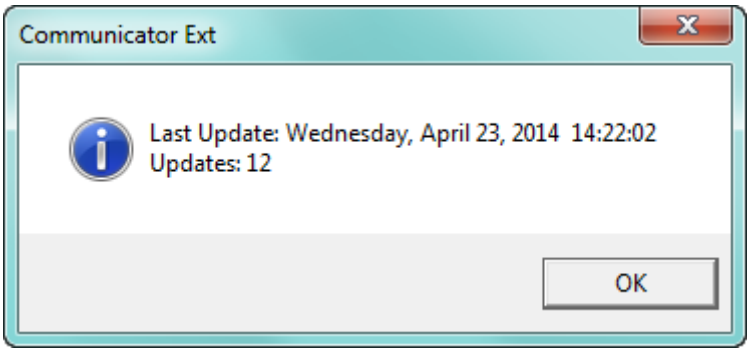
NOTE

CAUTION! If you have made changes to the settings and have not saved them to a file or updated the device, the changes will be lost.

- Click **View** from the Menu bar to see the menu shown below.



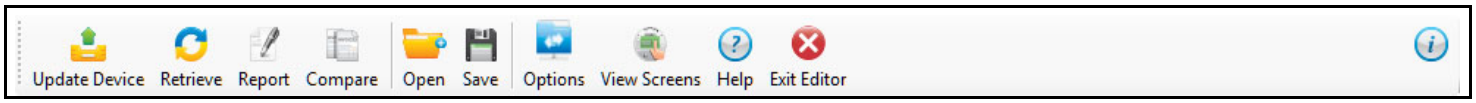
- View Last Update Information - click to view update information for this Device Profile. See the example screen below.



- This window displays the time and date of the last update, and the total number of updates, for this Device Profile.
- Click **OK** to close the window.

7.2.3 EPM 7000P Meter Device Profile Additional Features

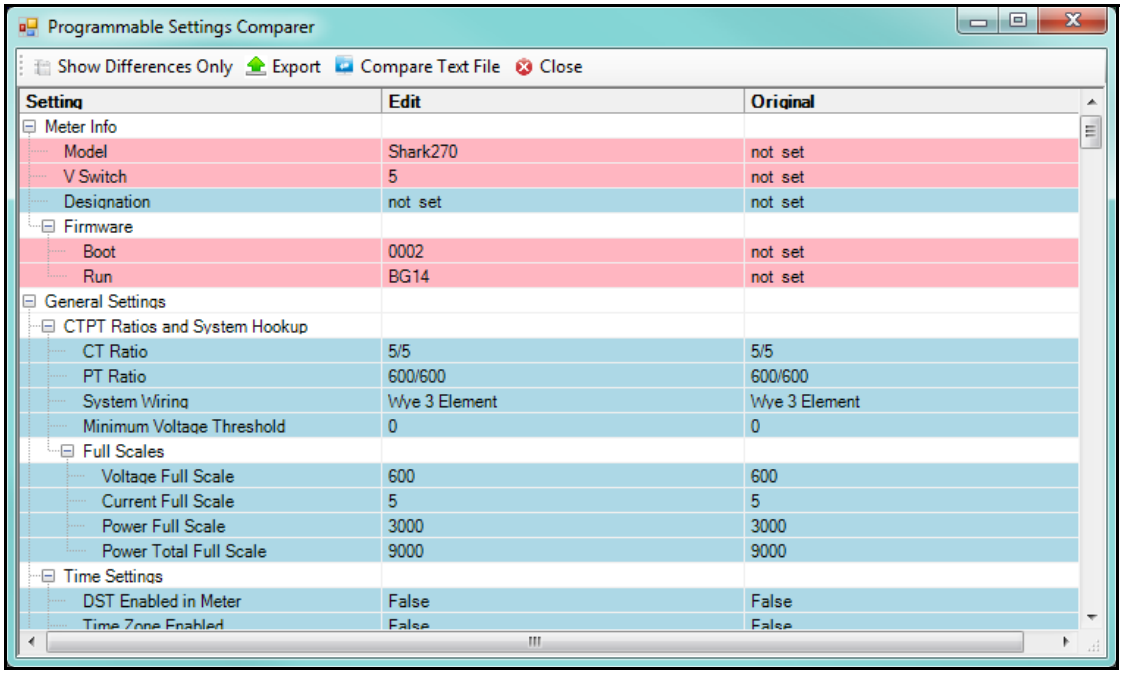
The EPM 7000P meter has Device Profile icons that look different from those of the other EPM meters. Most of the icons perform the same function as with the other device profile screens, e.g., the Update Device icon does the same thing as the Update Device button - it sends the new device profile settings to the connected meter.



Following are the unique device profile features for this meter:

- Click the **Help** icon to open instructions for the currently active setting.
- Click the **i** icon to view version information for the device profile software.
- Click the **Retrieve** icon to load the settings from the currently connected meter.

- Click the **Compare** icon to display the original settings and any new settings for the device profile.



Setting	Edit	Original
Meter Info		
Model	Shark270	not set
V Switch	5	not set
Designation	not set	not set
Firmware		
Boot	0002	not set
Run	BG14	not set
General Settings		
CTPT Ratios and System Hookup		
CT Ratio	5/5	5/5
PT Ratio	600/600	600/600
System Wiring	Wye 3 Element	Wye 3 Element
Minimum Voltage Threshold	0	0
Full Scales		
Voltage Full Scale	600	600
Current Full Scale	5	5
Power Full Scale	3000	3000
Power Total Full Scale	9000	9000
Time Settings		
DST Enabled in Meter	False	False
Time Zone Enabled	False	False

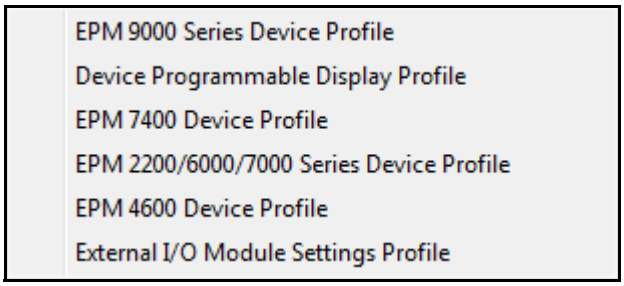
The settings in red/pink have been changed from the original settings, and the settings in blue have not been changed.

- Click the **Show Differences Only** checkbox to display just the changed settings.
- Click the **Export** setting to save the information in the screen as an Excel file. You will be prompted to give the file a name.
- Click **Compare Text File** to open a text file containing the information.

7.3 Device Profile Offline Settings

You can configure a device profile without being connected to a meter. Follow these steps,

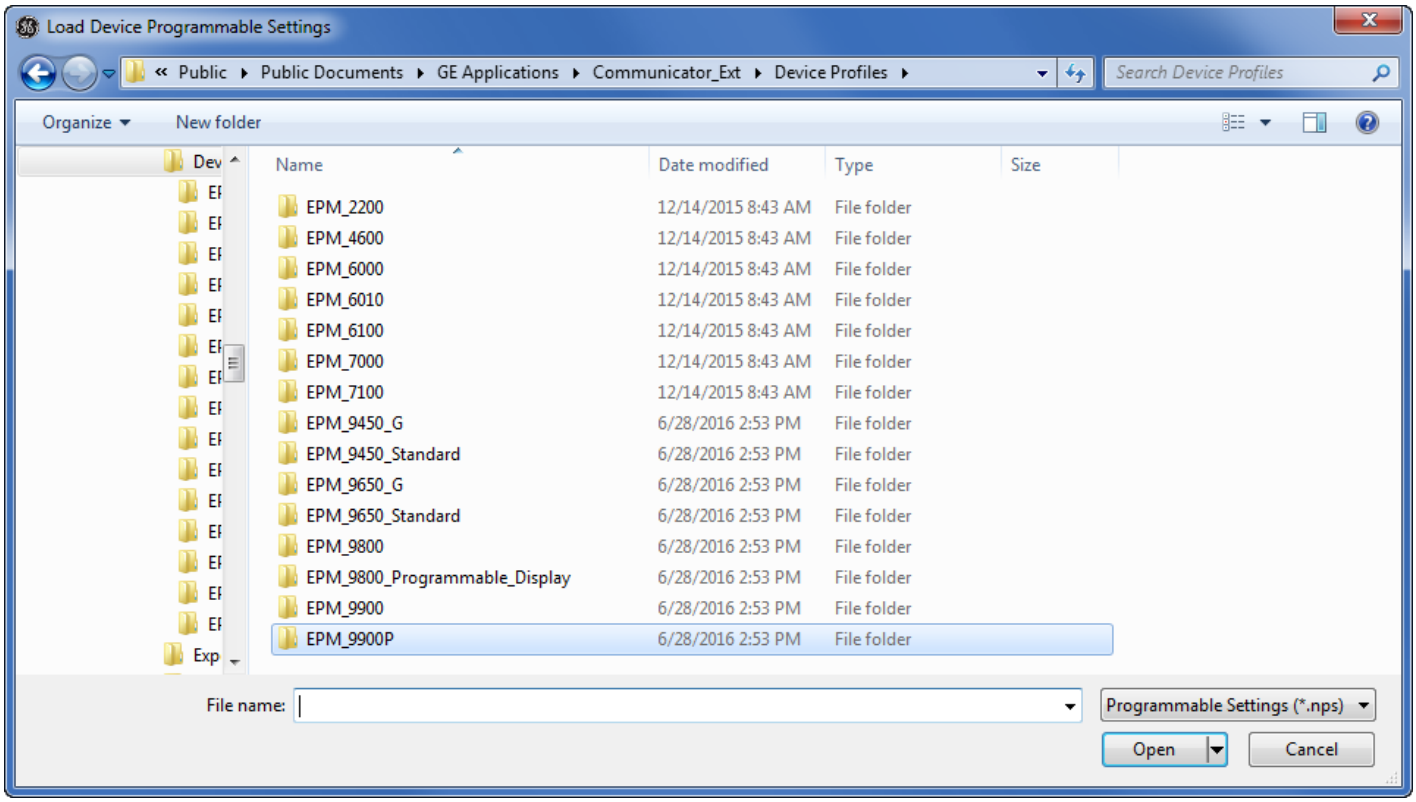
1. Open the GE Communicator application, and from the Main screen's Menu Bar, click **File > Open > Device Profile**. You will see this menu:



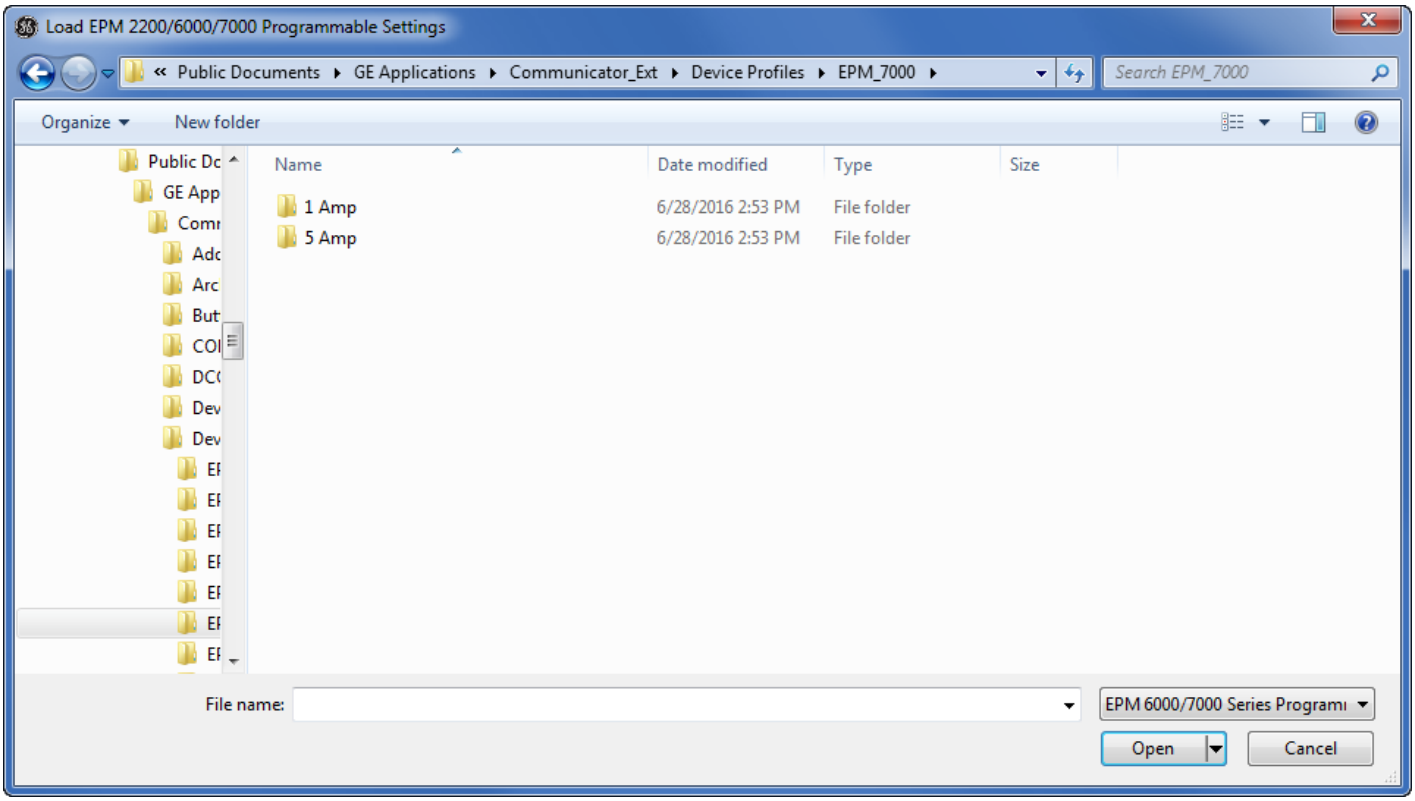
2. Click on the type of Device Profile you want to configure:
   - EPM 9000 Series Device Profile for the EPM 9450/9650/9700/9800/9900/9900P meters
   - Device Programmable Display Profile for the EPM 9450/9650 meter when you also want to modify the LCD display's programmable settings (see Chapter 13 "EPM 9450/9650 Meter" for details)
   - EPM 7400 Device Profile for legacy products
   - EPM 2200/6000/7000 Series Device Profile for the EPM 2200/6000/6010/6100/6000/7000/7000P/7100 meters
   - EPM 4600 Device Profile for the EPM 4600-T or EPM 4600-S metering system

   The External I/O Module Settings Profile is for the External I/O Modules (see Chapter 14 "External I/O Modules" for details on configuring the external I/O modules).

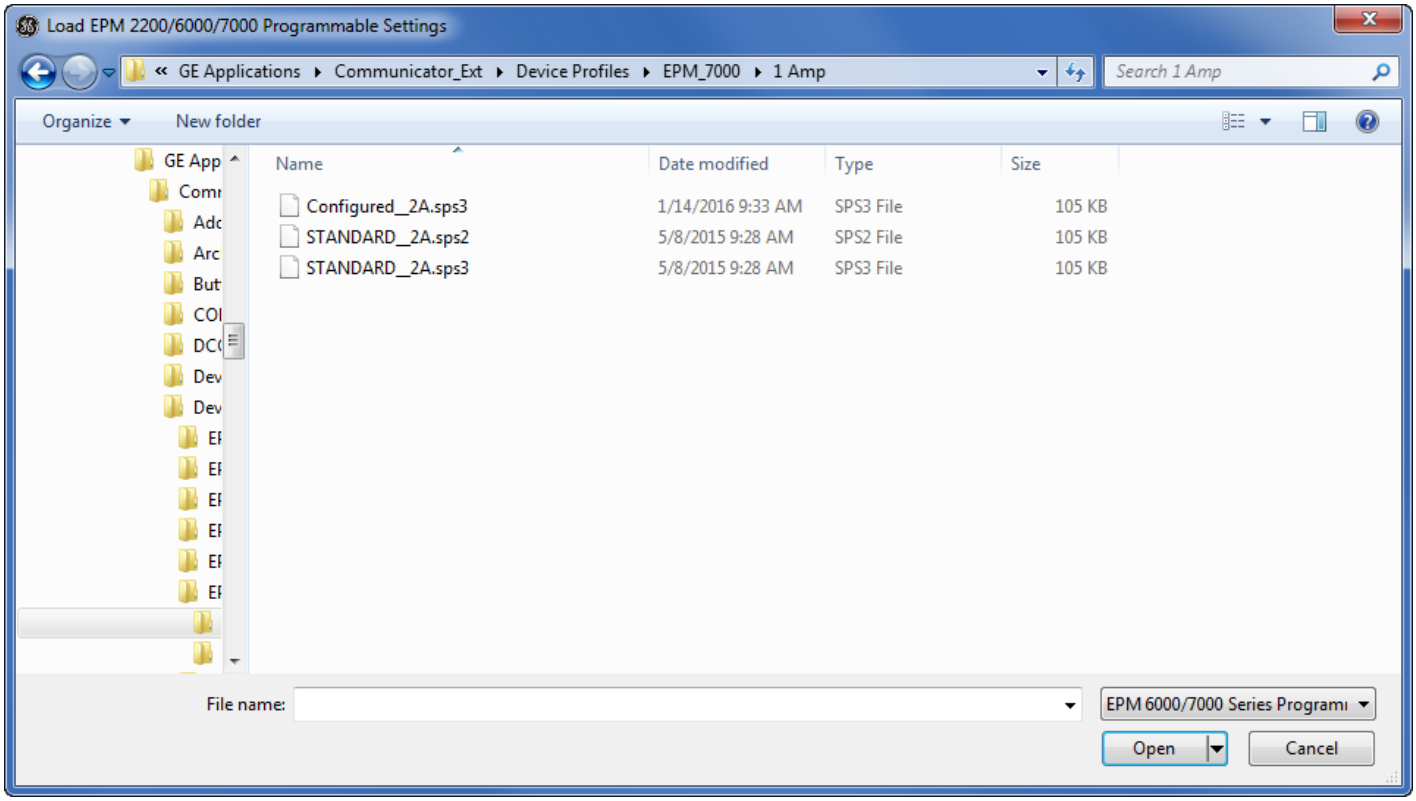
3. A window opens that lets you browse for the Device Profile you want to configure. You can open an existing Device Profile, or one of the default device profiles that come with the software. See the example below.



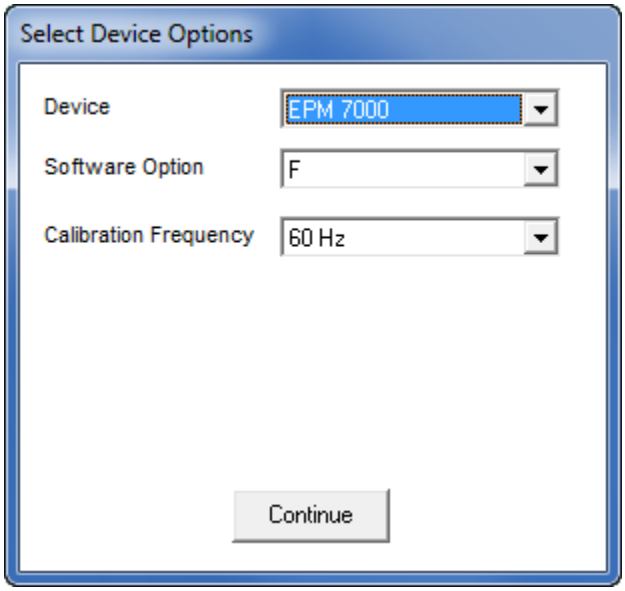
4. Click on the type of the folder with the Device Profile you want to configure, for example EPM 7000. A window will open that lets you narrow down your choice - see the example below.



5. Click on whichever Device Profile you want: 1 Amp or 5 Amp. You will see a screen like the one shown below.



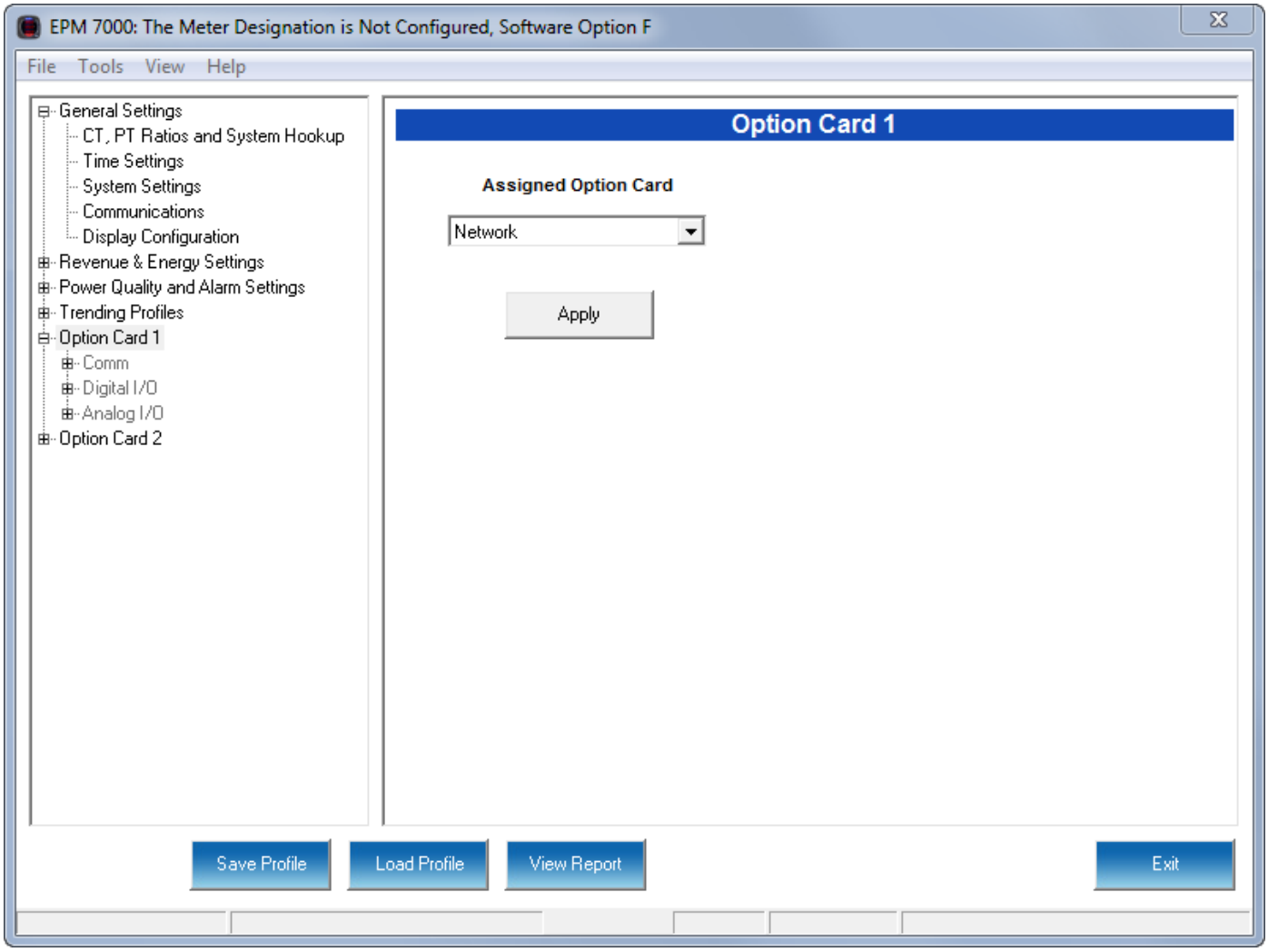
6. Either click on the file name and click Open, or double-click on the file name. You will see a screen like the one shown below.



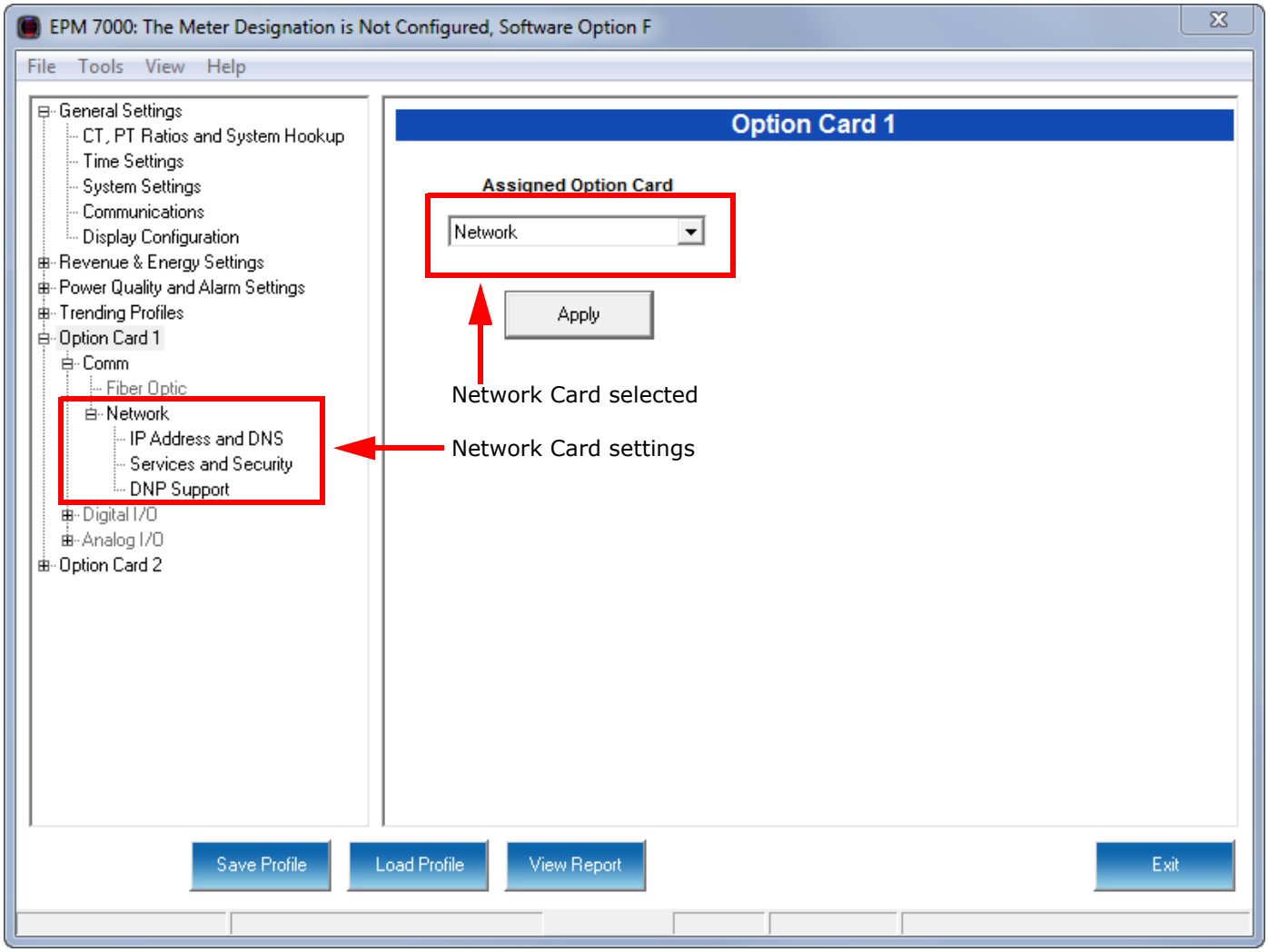
- Depending on the meter type, you may have choices in the Device field. In this example, you can choose either EPM 7000 or EPM 7100.

- Use the Software Option field to choose the software option. Depending on the meter type, the software option enables specific settings. In this example, software option E or F will enable PQ/Waveform setting for an EPM 7000 meter Device Profile.
- Use the Calibration Frequency field to select 50 Hz or 60 Hz.

7. Click Continue to open a Device Profile screen that matches your selections. Follow the instructions in the meter type programming chapters.
8. Note that for an EPM 7000 meter, you can edit the I/O Option cards as well as the other settings, when offline. To do so, double-click on Option Card 1 or Option Card 2 in the Device Profile screen Tree menu to see this display:



9. Select the Option card you want from the pull-down menu. The Option card's settings will now be listed in the Tree menu, for you to configure. See the example screen, below.



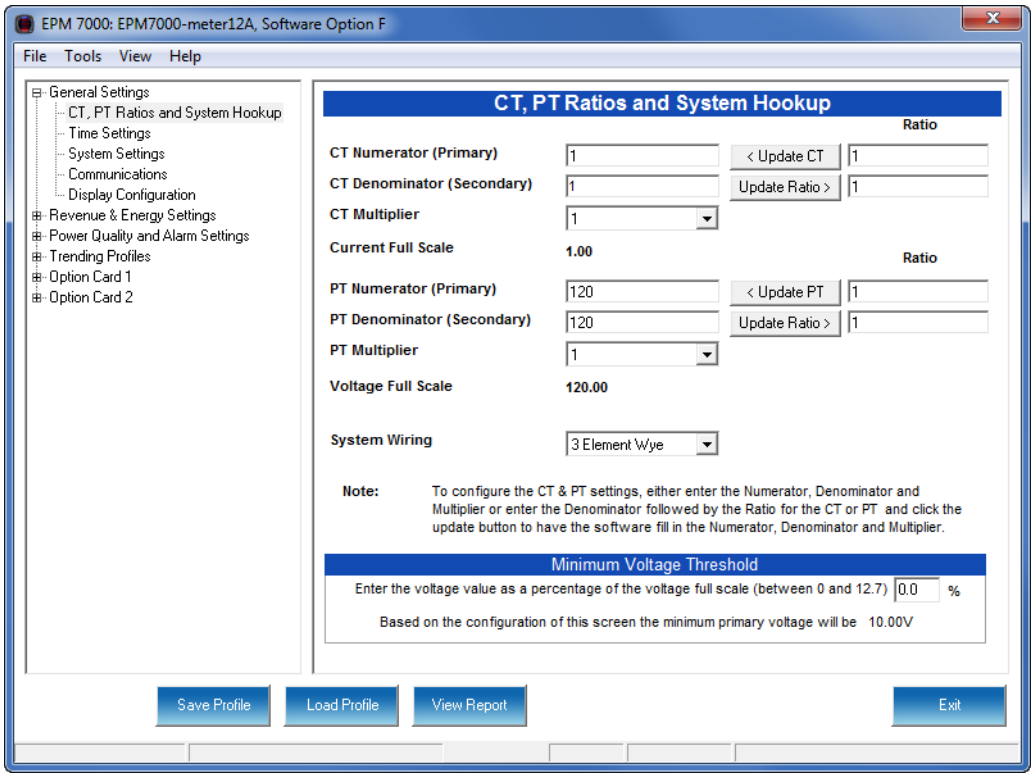
GE Communicator

Chapter 8: EPM 7000/7100 Meter

This chapter explains how to configure an EPM 7000/7100 meter's programmable settings, which are stored in the unit's Device Profile. Chapter 8 “EPM 7000/7100 Meter” contains detailed information on how to use the Device Profile.

8.1 Device Profile General Settings

1. From the Tree Menu on the left side of the EPM 7000/7100 meter Device Profile screen, double-click on the **General Settings** line or click on the **+** button next to it. All of the settings in the General Settings group are listed.



8.1.1 Configuring CT, PT Ratios and System Hookup

The first screen you see is the CT, PT Ratios and System Hookup screen, shown on the previous page (to return to this screen from another screen, click **General Settings > CT, PT Ratios and Hookup**). Use this setting to configure Current Transformer and Potential Transformer ratios and to select the System Hookup.

Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

NOTICE

You have two options for entering the CT and PT settings. You can either enter CT/PT Numerator, Denominator, and Multiplier manually (see instructions below), or you can enter the Ratios for CT/PT Numerator and Denominator and click the Update CT/Update PT

buttons to let the software calculate the Numerator, Denominator, and Multiplier for you. You can then empty the Ratio fields and click the Update Ratio buttons to confirm the calculated settings: you will see the same ratios you initially entered.

NOTE

Some ratios cannot be represented in the EPM 7000 meter. The software will try to find the closest value, in that case.

1. For manual entry, make these settings:

   CT Ratios

   - CT Numerator (Primary): 1 - 9999
   - CT Denominator (Secondary): 5 or 1 Amp

     NOTE

     This field is display only. The meter is ordered as a 5 Amp or 1 Amp Current Secondary.
   - EITHER CT Multiplier (Scaling): 1, 10 or 100
     Multiplies the CT Numerator by this scale. The display can only read 4 digits, or 9999. Above that range the number must be multiplied to have it read K or M values.
   - OR Ratio: the ratio to be applied, and click Update CT
   - Current Full Scale: Display only

   PT Ratios

   - PT Numerator (Primary): 1 - 9999
   - PT Denominator (Secondary): 1 - 9999
   - PT Multiplier (Scaling): 1, 10, 100, or 1000
   - Voltage Full Scale: Display only

   System Wiring

   - 3 Element Wye; 2.5 Element Wye; 2 CT Delta
     This value must be set properly for the meter to calculate readings correctly.

Example Settings:

For a CT of 2000/5A, set the following CT Ratios in the entry fields:

CT Numerator (Primary) 2000

CT Denominator (Secondary) 5

CT Multiplier 1

The Current Full Scale field will read 2000.

For a system that has 14400V primary with a 120V secondary line to neutral (PT Ratio of 120:1), set the following PT Ratios in the entry fields:

PT Numerator (Primary) 1440

PT Denominator (Secondary) 120

PT Multiplier 10

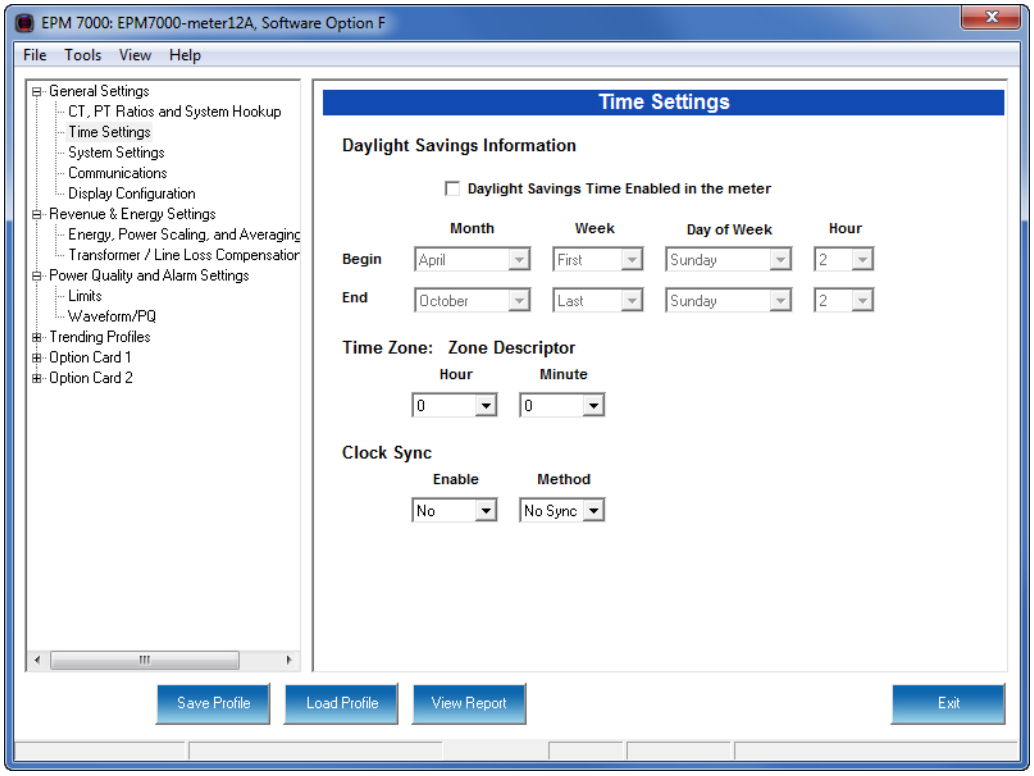
The Voltage Full Scale field will read 14.4k.

2. Use the box at the bottom of the screen to enter the minimum voltage threshold, which is a percentage of the voltage full scale. This setting adjusts the pick up threshold for the voltage. You set a percentage of the PT primary (PT numerator X PT multiplier) up to 12.7 in the entry field. This allows a user to configure when the meter will start readings values above 0 voltage. The minimum primary voltage based on the percentage you entered is displayed at the bottom of the screen.
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

8.1.2 Configuring Time Settings

Use this setting to enable or disable Daylight Savings Time for the meter, to set the beginning and ending times for Daylight Savings Time, and to set up Time Zone information and clock synchronization information.

1. From the Tree Menu, click **General Settings > Time Settings**.



2. Check the box to Enable Daylight Savings time, or un-check it to Disable Daylight Savings Time.
3. Use the entry fields to set the start and end times for the Daylight Savings Time feature, if enabled. Select the values you want from the Month, Week, Day of the Week, and Hour fields.

NOTE

The Hour field uses a 24-Hour clock.

4. You can choose clock synchronization for the meter. If your meter has a Network Option card, you can use it to access a Network Time Protocol (NTP) Server** for time synchronization. You can also select Line Sync for clock synchronization. Use these fields to set up clock synchronization:
   - Time Zone: Zone Descriptor - Select the hour and minute of your time zone in relation to Greenwich Mean Time. For example, if your time zone is Eastern Standard time, you would select -5 from the pull-down Hour menu and leave the Minutes field at 0.
   - Clock Sync - To enable clock synchronization, select:
     - Yes from the Enable pull-down menu
     - Line (line synchronization) or NTP** from the Method pull-down menu
     - For line synchronization, select 50Hz or 60Hz from the Line Frequency pull-down menu; for NTP select either Option Card in Slot 1 or Option Card in Slot 2 from the Interface pull-down menu.

       Line synchronization uses the frequency zero crossings to provide a time reference for the meter. This is the most common method to synchronize a meter's clock. GE recommends that you always select this method unless there is a specific reason not to select it. If the meter is not synchronized to line frequency or NTP, it will default to internal crystal. Different meters differ in terms of drift, but typically meters with 20 ppm crystals will drift 30 seconds per month when set to internal crystal.

NOTE

**IMPORTANT!

You also need to set up the NTP server information for the Network card. See "Configuring a Network Card" on page 8-43 for instructions.

5. To implement any changes, click the **Update Device** button to send the new profile to the meter.

8.1.3 Configuring System Settings

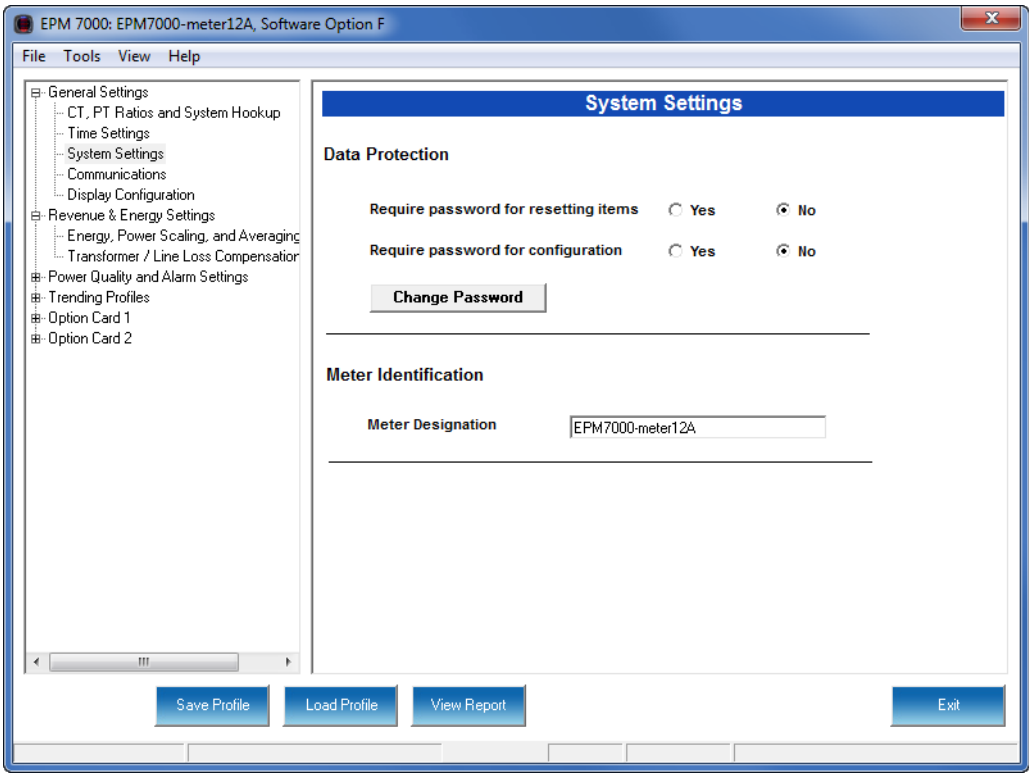
Use the system settings to set password protection and a meter ID. You can enable or disable a Password for Resetting (Reset Max/Min Energy Settings, Energy Accumulators, and the Individual Logs) and Configuration (Device Profile) in the Systems Settings screen.

Once password protection is enabled for the meter and the Device Profile is updated, anyone who attempts to make a change that is under password protection is prompted to enter the password. If the correct Password is not entered, the change doesn't take place.

NOTE

If you enable a Password for Resetting, you must also enable it for Configuration.

1. From the Tree Menu, click **General Settings > System Settings**.



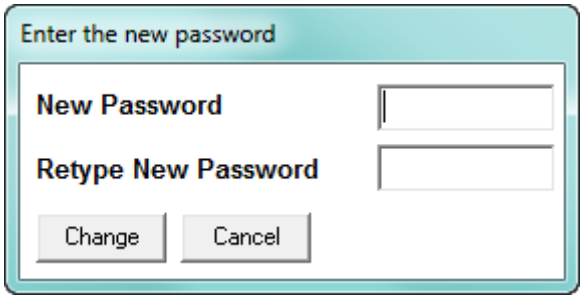
2. From this screen, you can do the following:
   - Enable or Disable Password for Resetting and/or Configuration: click the radio button next to Yes or No. Enabling Password protection prevents unauthorized tampering with devices.

NOTE

You must set up a password before enabling Password Protection. Click the Change button next to Change Password if you have not already set up a password.

   - Change the Password: click the Change button.
   - Change the Device Designation: input a new designation into this field.

3. When you click the Change button next to Change Password in the Settings screen, you will see the Enter the New Password screen.



   - Type in the new password (0 -9999).
   - Retype the password.

- Click **Change**. The new password is saved and you see the following message window.

NOTE

If Password Protection has already been enabled for configuration and you attempt to change the password, you will see the Enter Password screen after you click Change. Enter the old password and click OK to proceed with the password change.

4. To implement any changes, click the **Update Device** button to send the new profile to the meter.

8.1.4 Configuring Communication Settings

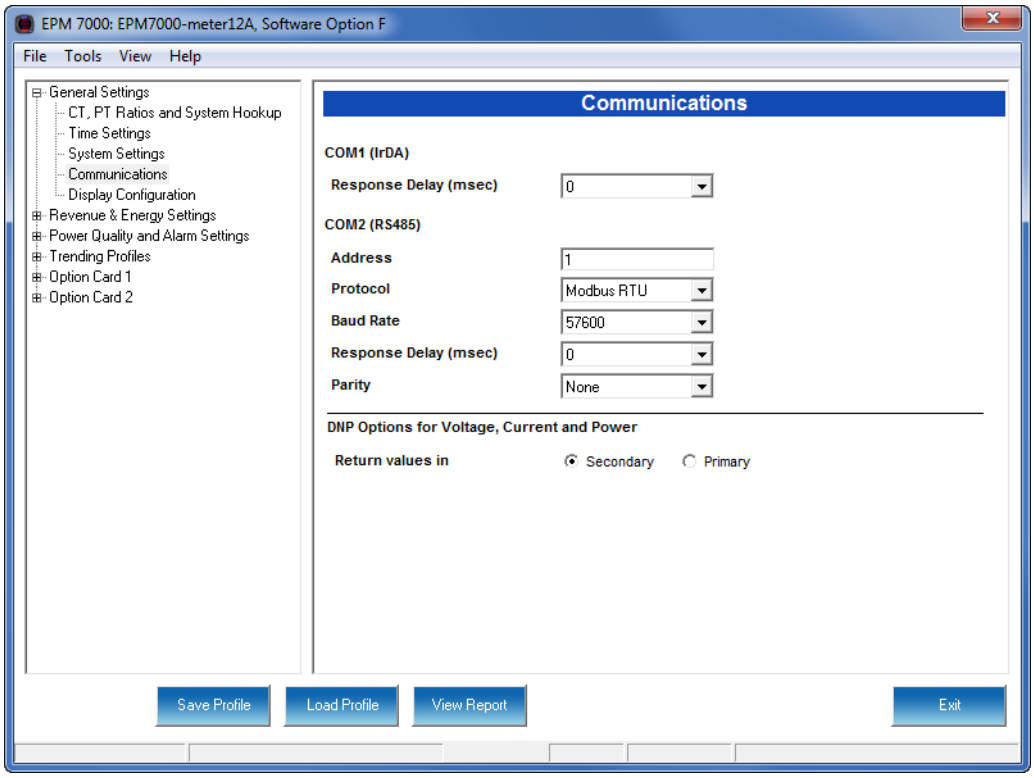
Use this screen to enter communication settings for the meter's two on-board ports: the IrDA Port (COM 1) and RS485 Port (COM 2).

NOTE

IMPORTANT!

The settings on this screen are the current settings for communication. Any changes you make may affect communication between the EPM meter and your PC.

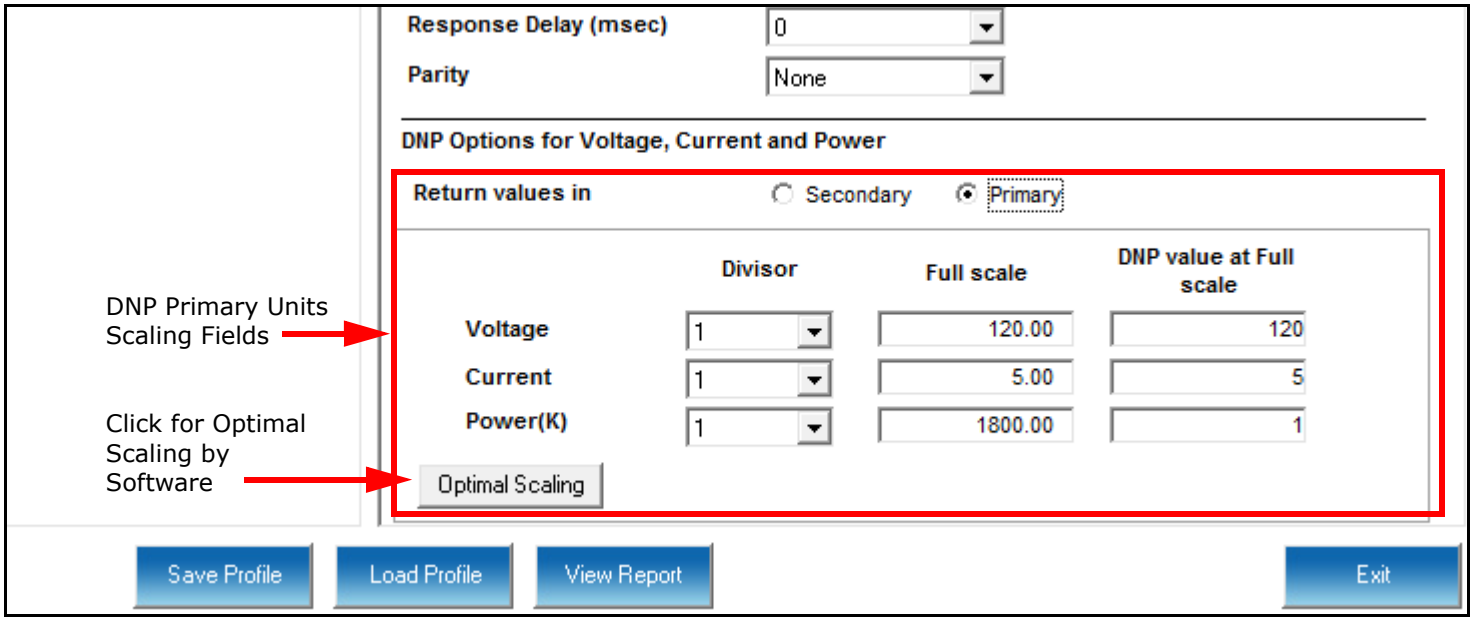
1. From the Tree Menu, click **General Settings > Communications**.



2. The screen fields and acceptable entries are as follows:
   - COM 1 (IrDA)
     - Response Delay: 0 - 750 (50msec increments)
   - COM 2 (RS-485)
     - Address:1 - 247 (Modbus); 1-65520 (DNP)
     - Protocol:Modbus RTU, Modbus ASCII or DNP 3.0

- Baud Rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600 (For the Baud Rates below 9600 your meter must have Runtime Firmware version 26 or higher.)
- Response Delay: 0 - 750 (50 msec increments)
  Response Delay is the delay the meter should use before responding to queries. If your connecting device requires a delay before receiving information, use response delay to program the time to wait before the meter starts responding to queries.
- Parity: Odd, Even, or None (For Parity setting your meter must have Runtime Firmware version 26 or higher.)

- DNP Options for Voltage, Current, and Power:
  These fields allow you to choose Primary or Secondary units for DNP, and to set custom scaling if you choose Primary. The Scaling fields appear after you click the Primary radio button (see partial screen capture, below).



Scaling is used with Primary readings so that you can ensure that your readings will not go beyond the DNP range before they reach Full Scale. The valid range for DNP Object 30 is -32768 to +32767. If the scaling you enter will cause the values to fall outside the DNP range, the values will be shown in bold or red in the DNP Value at Full Scale fields.
Click the Optimal Scaling button to have the software choose a divisor for voltage, current, and power, that will not result in an over/under-range.

NOTE

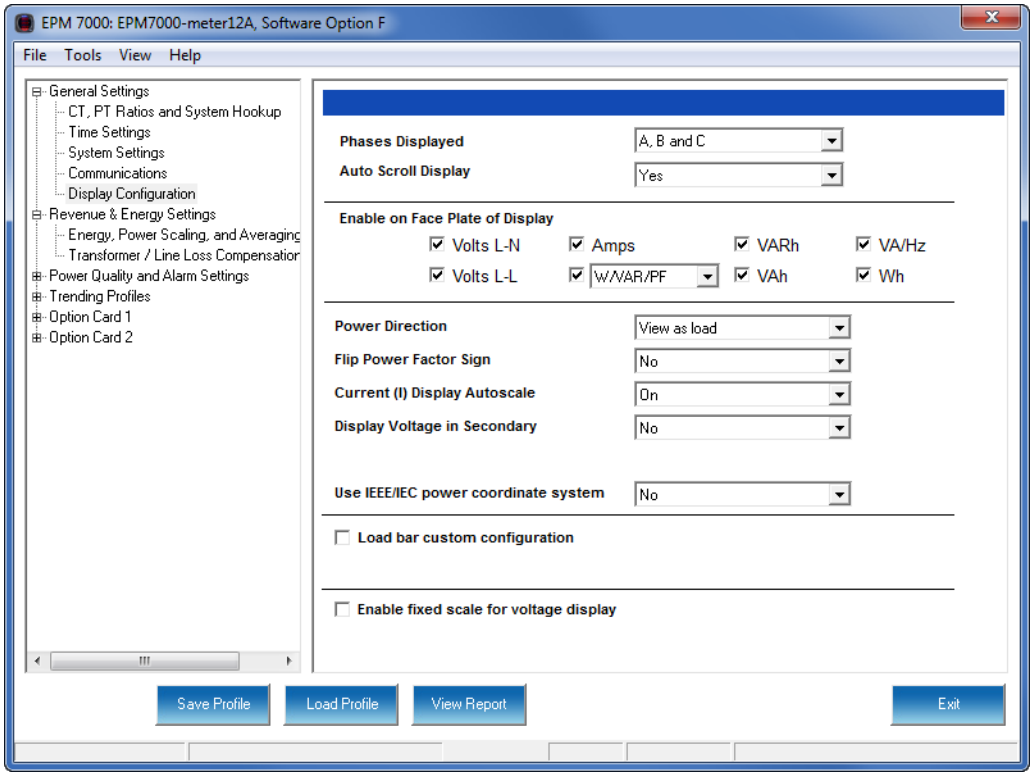
You must set the DNP polling software to multiply by the divisor amount before showing the final value.

3. To implement any changes, click the Update Device button to send the new profile to the meter.

8.1.5 Setting Display Configuration

Some users may want to lock the meter to a particular faceplate display or series of displays. For example, if you would like the meter to act only as a Volt meter, or only as an ammeter, the meter can be configured to display only the relevant screen. Use this setting to lock the display of the EPM 7000/7100 meter's faceplate to the specific combination you want. Refer to the meter's Installation and Operation Manual for additional information on the faceplate.

1. From the Tree Menu, click **General Settings > Display Configuration**.



2. The screen fields and acceptable entries are as follows:

   Phases Displayed: A; A and B; A, B, and C. This field determines which phases display on the faceplate. For example, if you select A and B, only those two phases will be displayed on the faceplate.

   Auto Scroll Display: Yes or No. This field enables/disables the scrolling of selected readings on the faceplate. If enabled, the readings scroll every 5 seconds.

   Enable on Face Plate of Display: Check the boxes of the Readings you want displayed on the faceplate of the meter. You must select at least one reading.

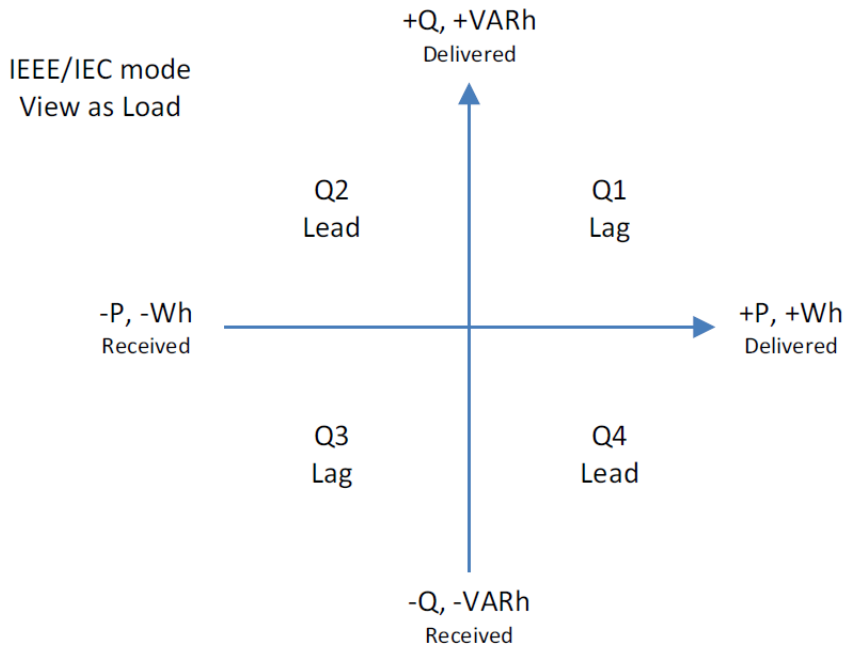
   Power Direction: View as Load or View as Generator; this controls how energy is accumulated in the EPM meter. View as Load means the energy readings are accumulated as Whrs Received, View as Generator means the energy readings are accumulated as Whrs Delivered.

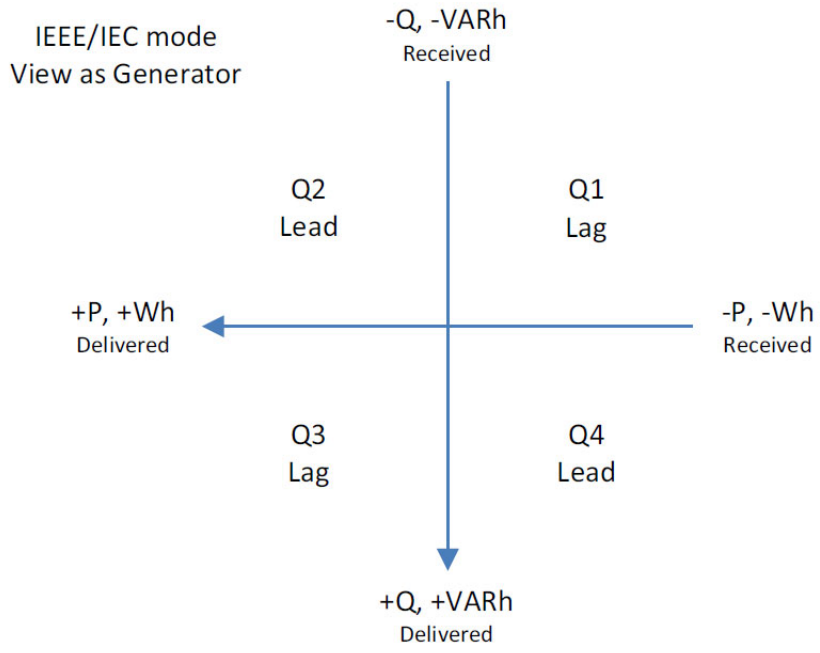
   Flip Power Factor Sign: Yes or No.

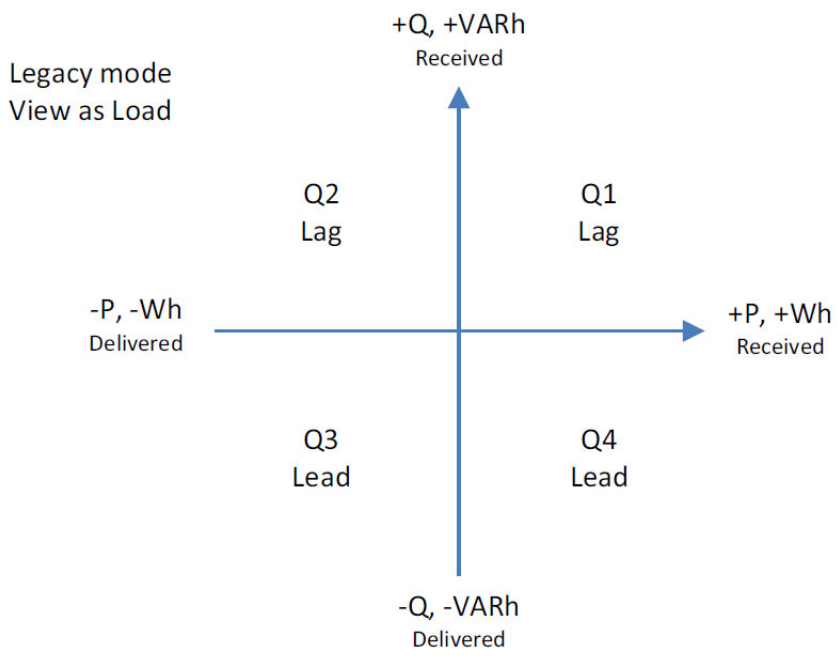
Current (I) Display Autoscale: On to apply scaling to the current display or Off (No decimal places).

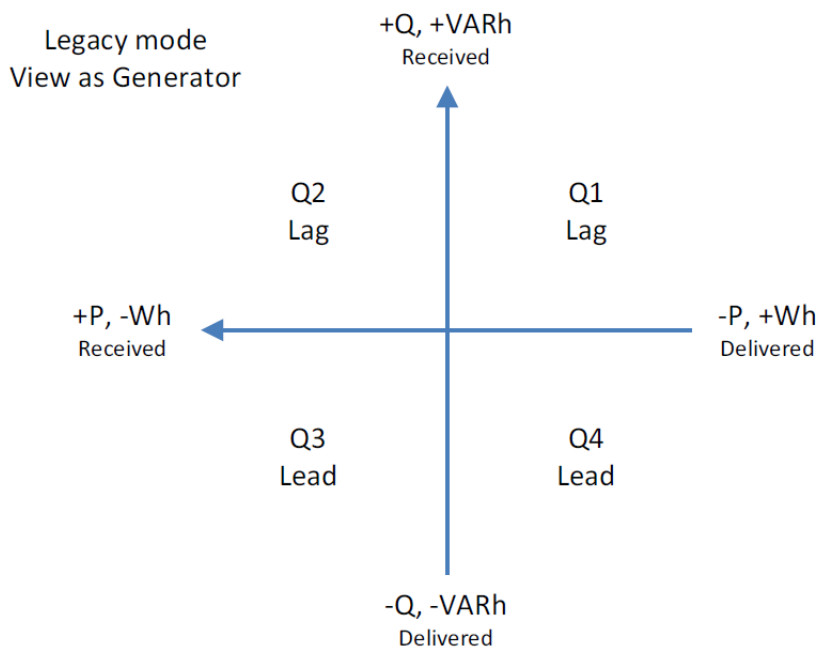
Display Voltage in Secondary: Yes or No.

Use IEEE/IEC Power Coordinate System: Yes or No. Select Yes to use the IEEE/ IEC system shown in the charts below. Select No if you want to use the legacy system shown in the charts below and on the next page.



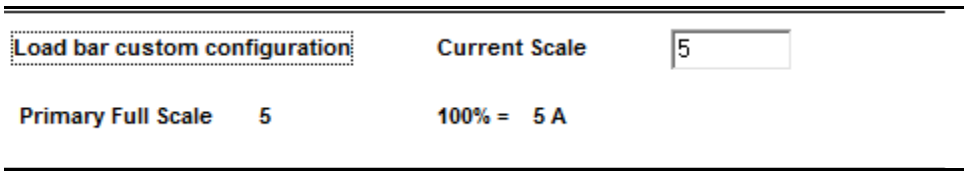



Legacy mode
View as Load
+Q, +VARh
Received
Q2
Lag
Q1
Lag
-P, -Wh
Delivered
+P, +Wh
Received
Q3
Lead
Q4
Lead
-Q, -VARh
Delivered


Legacy mode
View as Generator
+Q, +VARh
Received
Q2
Lag
Q1
Lag
+P, -Wh
Received
-P, +Wh
Delivered
Q3
Lead
Q4
Lead
-Q, -VARh
Delivered

Load Bar Custom Configuration: This allows the meter to display load with an analog representation. This way the user can get a visual presentation of the loading of the circuit. To enter scaling for the Load Bar:

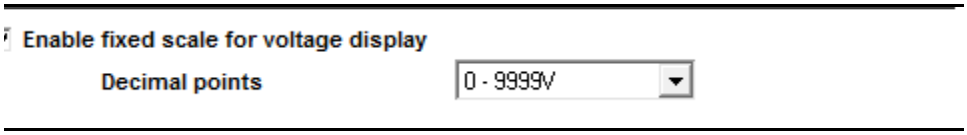
- Click the Load Bar Custom Configuration checkbox. Fields display on the screen that allow you to enter a Scaling factor for the display. See the
figure below



- Enter the scaling factor you want in the Current Scale field. This field is multiplied by the CT Multiplier set in the CT, PT Ratios, and System Hookup screen (see "Configuring CT, PT Ratios and System Hookup" on page 8-2) to arrive at the Primary Full Scale. Make sure you set the CT multiplier correctly.

Enable Fixed Scale for Voltage Display: To enter a scaling factor for the Voltage display:

- Click the checkbox next to Enable Fixed Scale for Voltage Display. The screen changes - see the figure below.

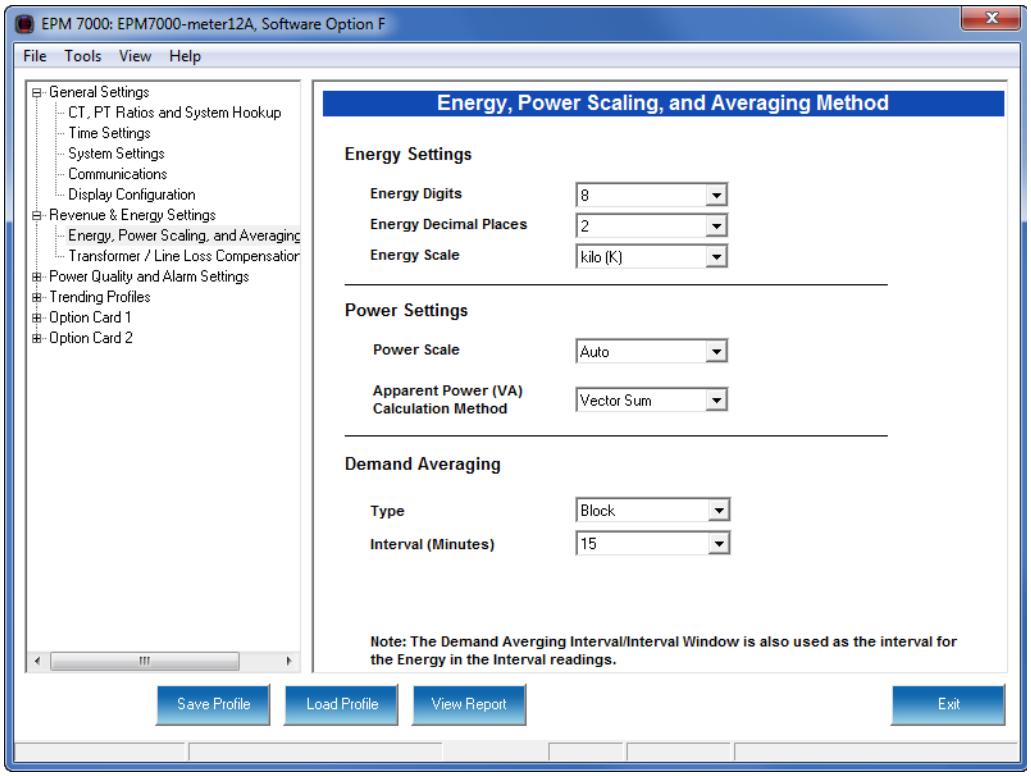


- Select the scaling you want to use from the pull-down menu. The options are: 0-9999V, 100.0kV-999.9kV, 10.00kV-99.99kV, or 0kV-9.999kV.

3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

8.2 Revenue and Energy Settings

From the Tree Menu on the left side of the EPM 7000/7100 meter's Device Profile screen, double-click on the **Revenue and Energy Settings** line or click on the **+** button next to it. The settings in the Revenue and Energy Settings group are listed.



8.2.1 Configuring Energy, Power Scaling, and Averaging

From the Tree Menu, click **Revenue & Energy Settings > Energy, Power Scaling, and Averaging** (see the screen on the previous page). Use this setting to configure:

- The display and storage of Energy registers in the meter
- The display of Power data in the meter
- The method of VA computation
- The interval over which Average values are computed, as well as the Interval Energy

Functional Overview of Energy Settings, VA Computation, and Averaging:

- **Energy Scaling**
  Energy Setting includes:
  Digits (the number of digits in the reading)
  Decimals (the number of decimal places in the reading)
  Energy Scale: the scale of the reading - unit; kilo (number times 1000); Mega (number times 1 million)

Energy settings allow you to balance the resolution (or accuracy) of the energy stored, with the interval over which energy rollover occurs. For example, the maximum resolution for a k scale reading is: 99999.999k.

To calculate the speed at which the energy will rollover, you must know the Power Full Scale, which is computed from the CT and PT Full Scale values (see "Configuring CT, PT Ratios and System Hookup" on page 8-2). The formula for calculating Power Full Scale is:
Wye system: CT Full Scale x PT Full Scale x 3
Delta system: CT Full Scale x PT Full Scale x 3 x $\sqrt{3}$

For example, for a CT Full Scale of 2000, PT Full Scale of 14400, Wye system:
2000 x 14400 x 3=86400000
In this example, the energy will increment at 86400000 Watts per hour, or 24000 Watts per second.
This value allows you to determine the number of digits, decimal places, and energy scale you want to configure for the Energy settings, when you take into account the rollover time.

To determine the number of hours before rollover, use this formula:
[Max Resolution]/[Full Scale] = #Hours, where Max Resolution = maximum digits and decimals for the Energy scale in use.

Using the example from above, with an energy scale of Mega, the formula would be:
99999.999 M/86.4 M = 1157.4074 hours or about 48 days until rollover.

NOTE

To increase the number of days until rollover, you can increase the number of digits (to 8), decrease the number of decimal places (to 0), or increase the Energy Scale (to M).

- **Apparent Power (VA) Computation**:

  There are two optional methods of VA Computation:

  Arithmetic Sum - the formula for this calculation is:

$$VA_T = VA_a + VA_b + VA_c$$

  Vector Sum - the formula for this calculation is:

$$VA_T = \sqrt{W_T^2 + VAR_T^2}$$

  Generally, the superior method for calculating VA is to use the Vectoral method; however, both methods are provided.

- **Demand Averaging**
  Demand is the average rate of energy use over time. The EPM 7000 meter supports two types of demand averaging: Block demand and Rolling demand.

  Block demand records the average demand for time intervals that you define (usually 5, 15 or 30 minutes).

  Rolling demand functions like multiple, overlapping Block demands. You define the subintervals at which an average of demand is calculated. An example of Rolling

demand would be a 15-minute Demand block using 5-minute subintervals, thus providing a new demand reading every 5 minutes, based on the last 15 minutes.

1. The screen fields and acceptable entries are as follows:
   - Energy Settings
     - Energy Digits: 5; 6; 7; 8
     - Energy Decimal Places: 0 - 6
     - Energy Scale: unit; kilo (K); Mega (M)

       For example: a reading for Digits: 8; Decimals: 3; Scale: K would be formatted: 00123.456k

NOTE

Your selection in the Energy Settings fields determines the precision of energy stored for display and polling. Refer to the Functional Overview at the beginning of this section for more information.

If you are changing the energy settings, we recommend you first reset the Energy Accumulators, in order to prevent erroneous counts. See "Reset Device Information" on page 20-8, for instructions on resetting the EPM 7000/7100 meter's Energy Accumulators.

   - Power Settings
     - Power Scale: Auto; unit; kilo (K); Mega (M)
     - Apparent Power (VA) Calculation Method: Arithmetic Sum; Vector Sum (See explanation on the previous page.)
   - Demand Averaging
     - Type: Block or Rolling
     - Interval (Block demand) or Sub-Interval (Rolling demand): 5; 15; 30; 60
     - Number of Subintervals: 1; 2; 3; 4
     - Interval Window: This field is display only. It is the product of the values entered in the Sub-Interval and Number of Subintervals fields.

NOTE

- You will only see the Number of Subintervals and Interval Window fields if you select Rolling demand.
- If you have set an Input to trigger EOI demand averaging (using either a Relay Output/ Digital Input or Pulse Output/Digital Input Option card) any entry you make in the Demand Averaging field will be ignored. A message to that effect appears on the screen. See "Configuring a Relay Output/Digital Input Card" on page 8-31 and "Configuring a Pulse Output/Digital Input Card" on page 8-35, for instructions on setting EOI pulse for demand averaging.

2. To implement any changes, click the Update Device button to send the new profile to the meter.

8.2.2 Transformer/Line Loss Compensation

Transformer losses are power used by the transformer while working. The more load on the transformer, the higher the transformer losses. There are two types of transformer losses:

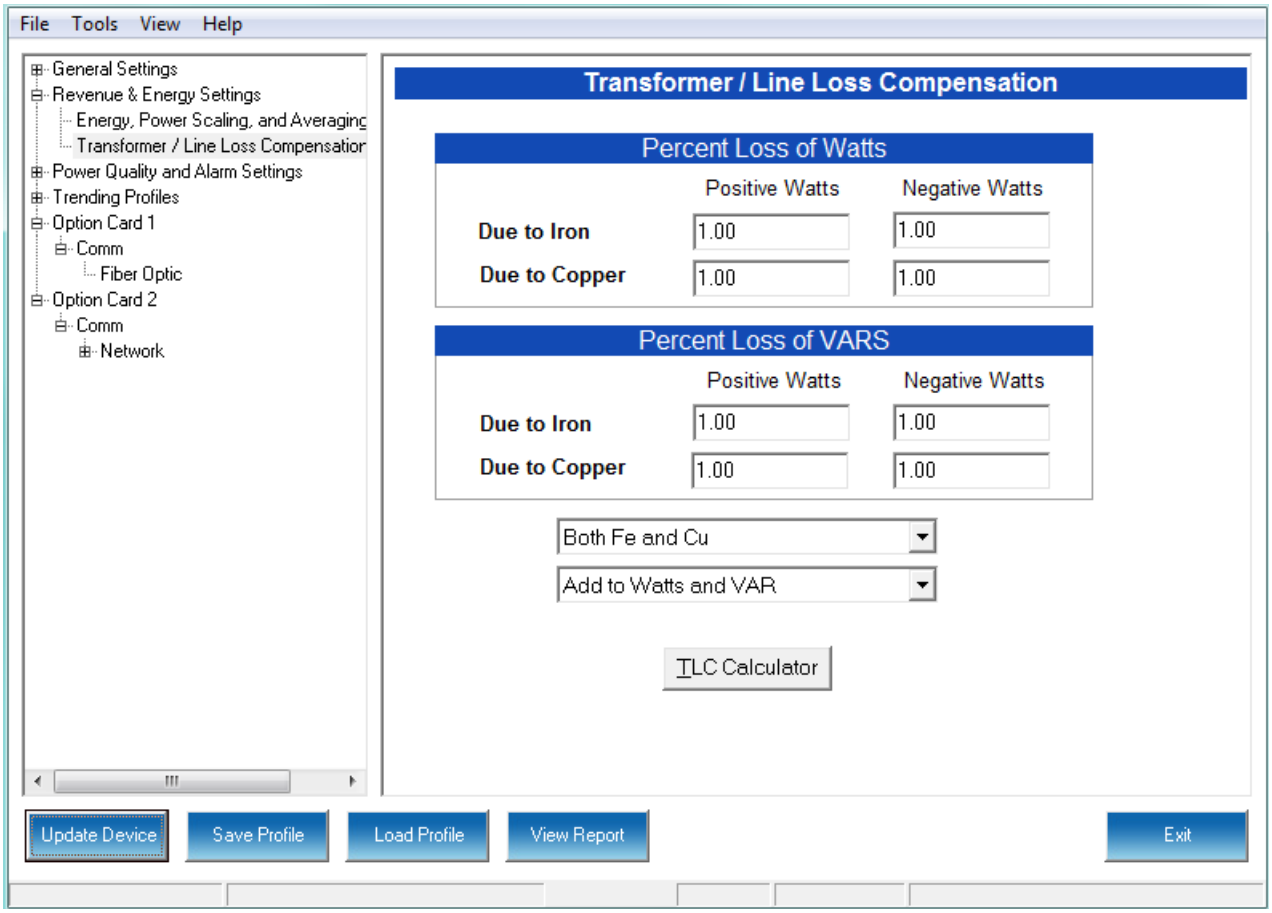
- No load losses - these are the fixed losses that keep the transformer up and running.
- Load losses - these vary with changes in the load.

When the meter is located on the secondary side of a customer's transformer, a utility will want to add the transformer losses into the energy usage calculation. However, this practice is regulated by local jurisdiction and regulations. The meter has the capability to add in or subtract out these transformer losses, depending on the user's specific needs.

Line losses are similar to transformer losses, except that they are used to compensate for loss incurred on wires, such as transmission lines.

Transformer/Line Loss Compensation allows you to add or subtract transformer and/or line losses to meter registration.

1. From the Tree Menu, click **Revenue & Energy Settings > Transformer/Line Loss Compensation.**



2. This screen displays the current values for the meter's Transformer Loss Compensation. The screen fields and acceptable entries are as follows
   - Percent Loss of Watts due to Iron and Copper/Positive Watts and Negative Watts

- Percent Loss of VARS due to Iron and Copper/Positive and Negative Watts
- Drop-down menu #1. Choose from: Disabled, Fe Only, Cu Only, Both Fe and Cu.
- Drop-down menu #2. Choose from: Add to Watts and VAR; Add to Watts and Subtract from VAR; Subtract from Watts and Add to VAR; Add to Watts and VAR; Subtract from Watts and VAR.

3. Click **TLC Calculator** to find the values to enter into the Percent Loss fields. The TLC Calculator button launches the TLC Calculator that makes the calculations for you once you enter the required data.

NOTE

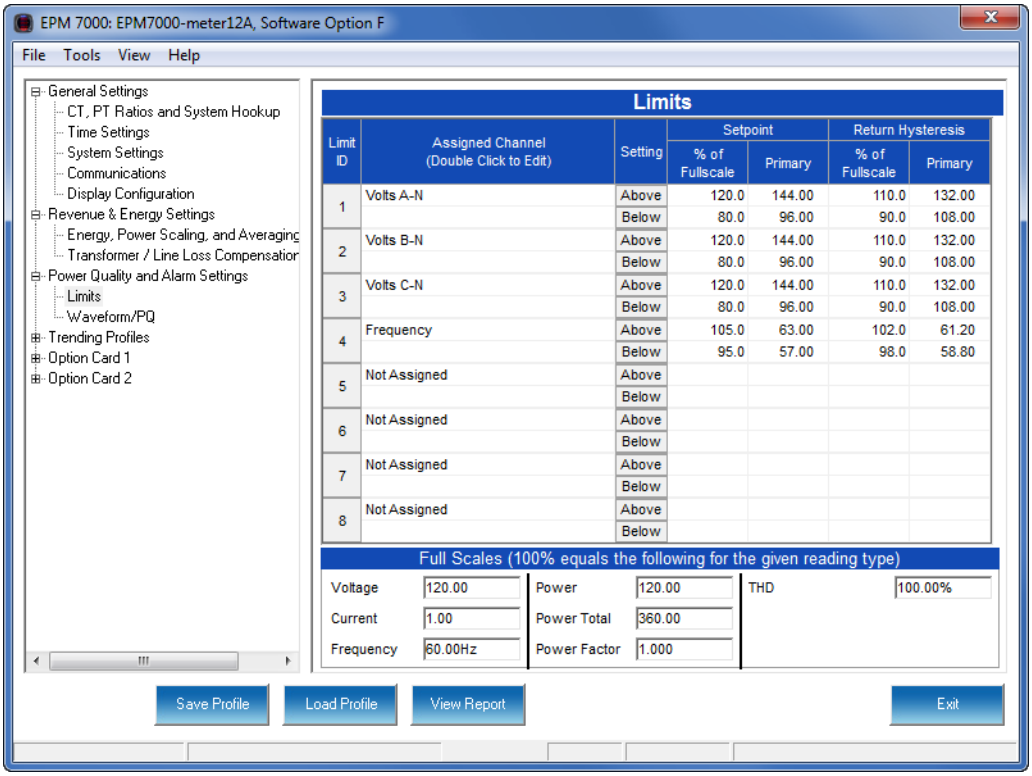
IMPORTANT! See Appendix A, which contains a screen capture of the TLC Calculator with example numbers, and an explanation of Loss Compensation considerations.

4. Enter the percent Loss of Watts and VARS for copper and iron in the appropriate fields.
5. To implement any changes, click the Update Device button to send the new profile to the meter.

8.3 Power Quality and Alarms Settings (EPM 7000 Meter Only)

Note that in this area you will find a difference between the EPM 7000 meter and the EPM 7100 meter. Even though they share Device Profiles, the EPM 7100 meter is a submeter, and does not have the option to have Waveform/PQ functions. These features are only for the EPM 7000 meter.

From the Tree Menu on the left side of the EPM 7000/7100 meter Device Profile screen, double-click on the **Power Quality and Alarms Settings** line or click on the **+** button next to it. All of the settings in the Power Quality and Alarms Settings group are listed.



8.3.1 Configuring Limits (EPM 7000 Meter Only)

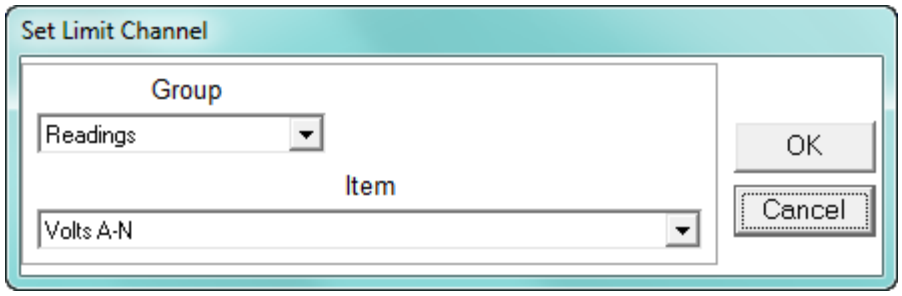
1. From the Tree Menu, click **Power Quality and Alarm Settings > Limits**. The current settings for Limits are shown in the screen. Use this screen to assign Limits for the EPM 7000 meter.

Functional Overview for Limits:
Limits are transition points used to divide acceptable and unacceptable measurements. When a value goes above or below the limit, an out-of-limit condition occurs. You can set and configure up to eight Limits for the EPM 7000 meter.

Once they are configured, you can view the out-of-Limits (or Alarm) conditions in the Limits Log (see Chapter 19 “Viewing Logs”) or Limits Polling screen (see Chapter 5 “Polling Your Meter”). You can also use Limits to trigger relays.
You can assign the eight limits to readings from three groups of parameters:

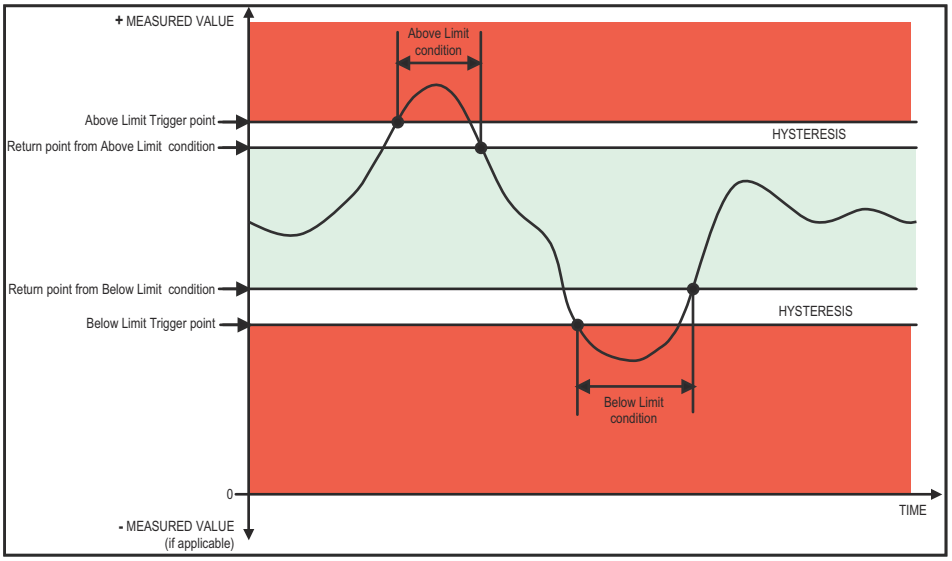
- Readings (Instantaneous Voltage; Instantaneous Current; Total and Per Phase Power and Power Factor; Frequency; Neutral Current; Symmetrical Components and Voltage Imbalances)
- Demand (Current; Per Phase, Total Power and Power Factor)
- THD (For Voltage and Current)

2. The bottom of the screen shows the Full Scale values for:
   - Voltage
   - Current
   - Frequency
   - Power
   - Power Total
   - Power Factor
   - THD
3. To set or change a Limit:
   - Select a limit by double-clicking on the Assigned Channel field.
   - You will see the screen shown below.



   - Select a Group and an Item for the Limit.
   - Click OK. The Limit you selected will now appear in the Limits screen.
4. To configure a Limit, double-click on the following fields to set their values:
   - **Above and Below Set Point:** of Full Scale (the point at which the reading goes out of limit: see figure on the next page)
     For example:
     100 of 120V Full Scale = 120V
     90 of 120V Full Scale = 108V
   - **Above and Below Return Hysteresis** (the point at which the limit's status changes from out of limit to within limit: see figure below)
     For example:
     Above Set Point = 110Below Set Point = 90
     (Out of Limit above 132V)(Out of Limit below 108V)

Above Return Hysteresis = 105Below Return Hysteresis = 95
(Stay Out of Limit until below 126V) (Stay Out of Limit until above 114V)



NOTE

- The Primary fields are display only. They show what the set point and return Hysteresis value are for each limit.
- If the Above Return Hysteresis is greater than the Above Set Point, the Above Limit is Disabled; if the Below Return Hysteresis is less than the Below Set Point, the Below Limit is Disabled. You may want to use this feature to disable either the Above Limit or Below Limit condition for a reading.
- If you are entering negative limits, be aware that the negative value affects the way the above and below limits function, since negative numbers are processed as signed values.

5. To implement any changes, click the Update Device button to send the new profile to the meter.

8.3.2 Configuring Waveform/PQ (EPM 7000 Meter, with Software Option E and Higher)

The EPM 7000 meter is Software Option upgradeable. If you have purchased Software Option E or F, the waveform recording feature will be available with your meter. The Waveform/PQ capability allows the meter to act as a high-speed waveform recorder to record any anomaly that occurs within a cycle of duration. This provides a user with advanced waveform analysis including pre- and post- waveform recording.

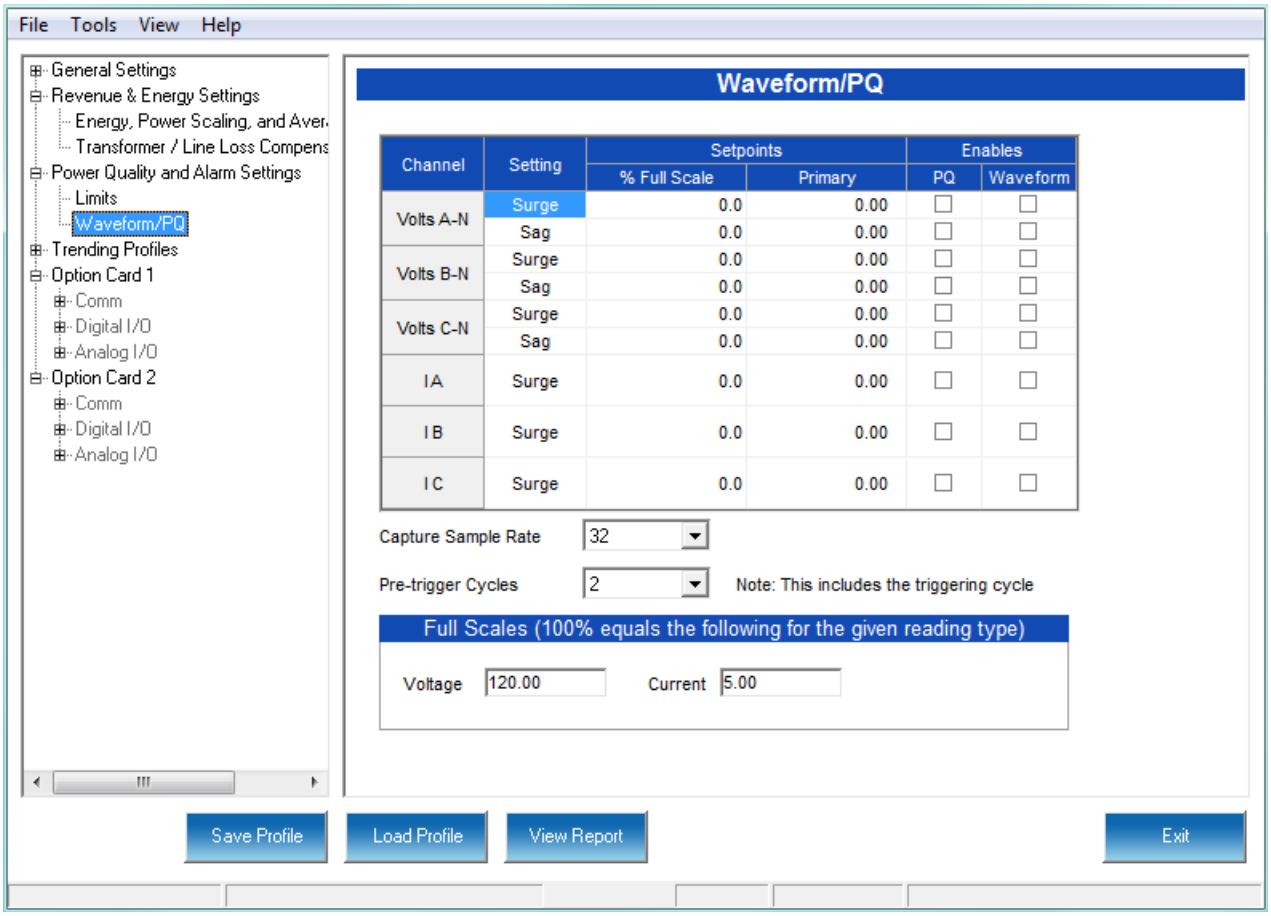
The meter has the capability to record both surges and sags of the measured signals. A voltage surge is any event that increases the RMS voltage for one cycle, calculated every half cycle. A voltage sag is a dip in the RMS of one cycle of voltage, calculated every half cycle. A current fault (or surge) is also calculated in the same manner. When the RMS value of any of these triggers exceeds the threshold settings, the meter will trigger a waveform capture.

This setting determines at what point the meter executes a waveform capture and/or records a power quality event. See Chapter 19 "Viewing Logs" for instructions on viewing Waveform and PQ logs. See 8.4.2 *Configuring Historical Log Sectors* for instructions on configuring the log sectors for the EPM 7000 meter.

NOTE

PQ and Waveform Thresholds are given as a percentage of the Full Scales (Full Scale fields). Full Scales are based on the CT and PT Ratios set in the CT, PT Ratios and System Hookup setting. Before programming the Waveform/PQ Thresholds, set the CT and PT ratios. See 8.1.1 *Configuring CT, PT Ratios and System Hookup*, for instructions.

1. From the Tree Menu, click **Power Quality and Alarm Settings > Waveform/PQ**. The current settings, if any, are shown in the screen.



2. Set the Surge and Sag Setpoints (in percent of Full Scale), for Voltage, and the Surge Setpoint for Current. When you enter the percentage for a reading, the primary value is displayed in the Primary field. The bottom of the screen displays the Full Scales for Voltage and Current.

3. Click the checkbox under PQ to enable PQ recording when the programmed threshold is exceeded.

4. Click the checkbox under Waveform to enable Waveform recording when the programmed threshold is exceeded.

5. Select the sampling rate from the Capture Sample Rate pull-down menu. The options are:
   - For Software Options E: 32, 64
   - For Software Options F: 32, 64, 128, 256, 512.
6. From the Pre-trigger pull-down menu, select the number of cycles of waveform data prior to the triggering event, that you want to be included in the waveform capture. The options are 2 to 63.

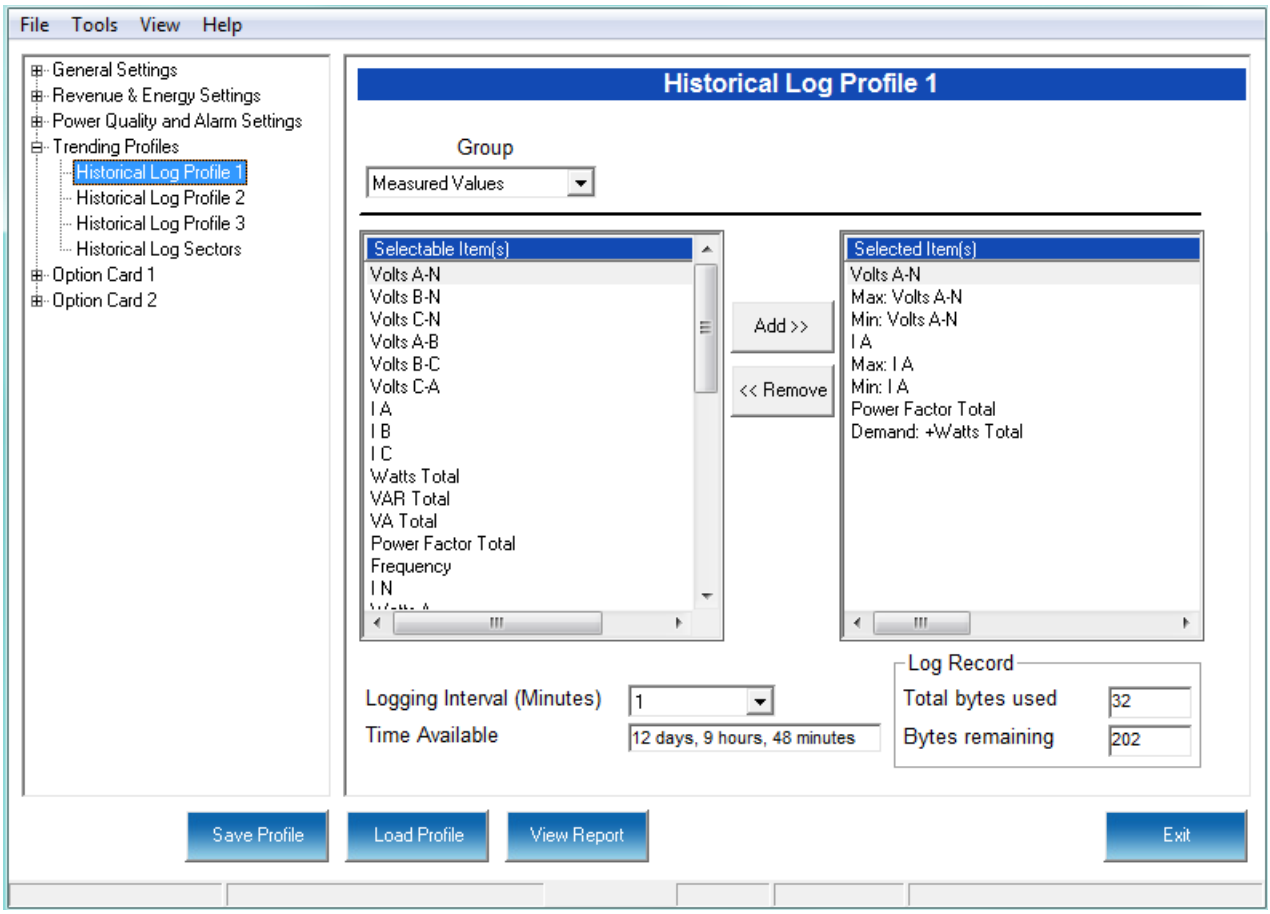
NOTE

Increasing the number of pre-cycles will decrease the number of cycles of data recorded after the event.

7. To implement any changes, click the **Update Device** button to send the new profile to the meter.

8.4 Trending Profiles Settings

From the Tree Menu on the left side of the EPM 7000/7100 meter Device Profile screen, double-click on the **Trending Profiles Settings** line or click on the **+** button next to it. All of the settings in the Trending Profiles Settings group are listed.



8.4.1 Configuring Historical Logs

Use this setting to select the parameters to be stored in each of the EPM 7000/7100 meter's three Historical Logs. For additional information on logs, including using the HHF Converter, see Chapter 16 “Databases and Log Data” and Chapter 19 “Viewing Logs”.

Functional Overview of Historical Logs:

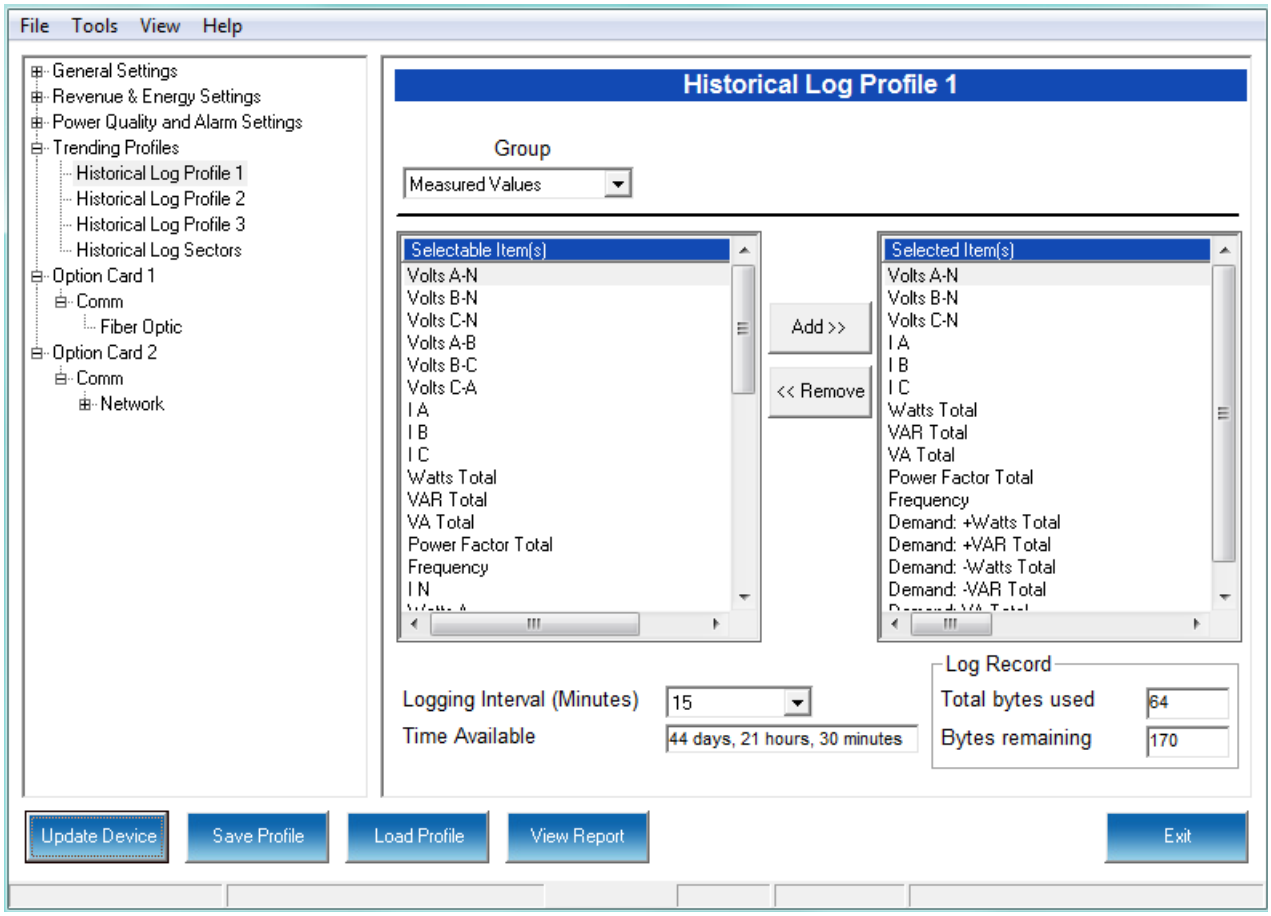
The EPM 7000/7100 meter allows a user to set up 3 separate historical profile logs that can log up to 64 parameters. Each of these logs can log at different time frames. For example, one log can be set for one minute intervals to record voltage; while another log can be set for 15 minute intervals for energy consumption logging.

Having three historical logs additionally affords you the flexibility of programming each log with unique parameters. For example, you might program Historical Log 1 to record Power Quality parameters (for example, THD - EPM 7000 meter only), Log 2 to record Demand parameters, and Log 3 to record Energy parameters.

Historical Log parameters can be selected from eleven groups:

- Measured Values (Instantaneous Voltage; Instantaneous Current; Total and Per Phase Power and Power Factor; Frequency; Neutral Current; Symmetrical Components and Voltage Unbalances)
- Demand (Current; Per Phase, Total Power and Power Factor)
- Maximums (Maximum values for all of the readings listed above, including THD voltage and currents)
- Minimums (Minimum values for all of the readings listed above, including THD voltage and currents)
- Energy (Watt-hours, VA-hours, VAR-hours, Energy in the Interval)
- Accumulators (Input and Output Accumulator values)
- Short Term Min (Min value within the Demand Interval)
- Short Term Max (Max value within the Demand Interval)
- Uncompensated ((Watt-hours, VA-hours, VAR-hours)
- THD (For voltage and current) - EPM 7000 meter only
- Harmonic Magnitudes (For voltage and current up to the 40th order) - EPM 7000 meter only

1. From the Tree Menu, click T**rending Profiles > Historical Log Profile (1-3)**.



This screen allows you to select items to be stored in the historical log you selected. The Group field determines the items that are available for selection.

2. Select a Group. The possible selections are: Measured Values, Demand, Maximums, Minimums, Energy, Energy in the Interval, Accumulators, Short Term Min, Short Term Max, Uncompensated, THD (EPM 7000 meter only), Harmonic Magnitudes (EPM 7000 meter only), and Rollover Counters. (See "Configuring a Relay Output/Digital Input Card" on page 8-31 and "Configuring a Pulse Output/Digital Input Card" on page 8-35, for information on Accumulators).

NOTE

If you select Harmonic Magnitudes, another field opens on the screen allowing you to select one of the following for Harmonic Magnitude: Volts A; Volts B; Volts C; I A; I B; I C.

3. Select items for your log:
   - Highlight the item(s) you want in the Selectable Items box.
   - Click Add. The item(s) are added to the Selected Items box.
   - To remove item(s), highlight them in the Selected Items box and click Remove.
4. Set the Logging Interval (Minutes). The available choices are: 1, 3, 5, 10, 15, 30, 60, EOI (End of Interval) Pulse (EPM 7000 meter only). The Logging Interval determines when the meter takes a snapshot.

NOTE

IMPORTANT! If you are trending Energy in the Interval, the Logging interval must be the same as the Demand interval.

NOTE

- Only **one** of the following can be set for the EOI pulse feature:
  - EITHER **1** Option card input can be set to receive an EOI pulse from another device
  - OR **1** Option card output can be set to trigger an EOI pulse
- The maximum rate for EOI Pulse used to trigger a log is once per minute.
- When you choose EOI Pulse, the meter takes a snapshot when the pulse is either received or generated (depending on whether the EOI pulse is assigned to an input or output), rather than on a time interval.

NOTE

There are two display fields at the bottom of the Historical Log Profile screen. They show the Total Bytes Used and the Bytes Remaining for this historical log. These fields are updated as you make selections on the screen. The total number of bytes available per log record is approximately 234.

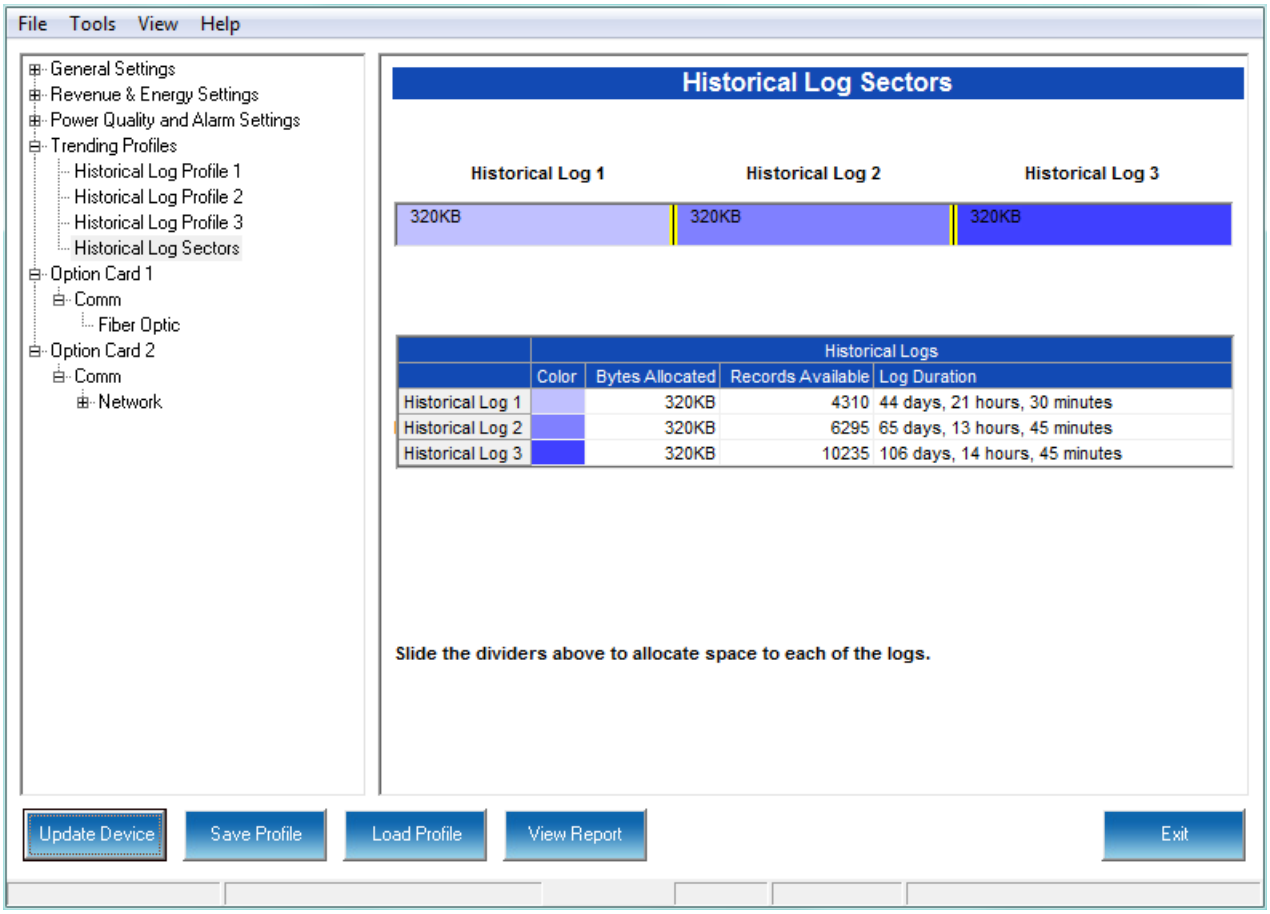
5. To implement any changes, click the Update Device button to send the new profile to the meter.

8.4.2 Configuring Historical Log Sectors

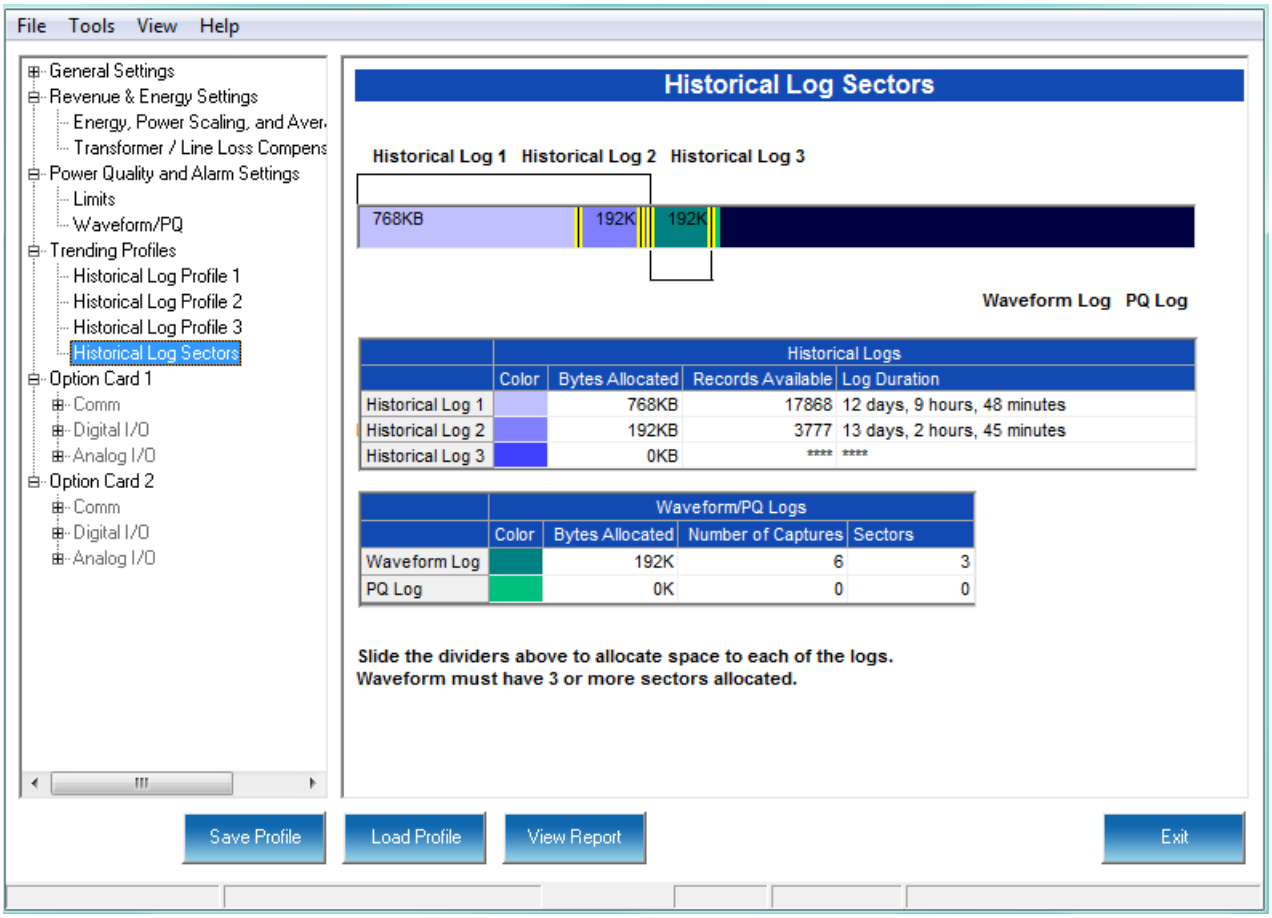
The EPM 7000/7100 meter allows a user to configure the amount of memory allocated for each log, so you can optimize the number of records stored for each log.

- For Software Options B and above, use this setting to increase or decrease the amount of records each of the EPM 7000/7100 meter's three Historical logs can store, and the duration each log can run, before becoming filled. This allows a user to set the amount of memory allocated per log for the amount of recording days desired before the memory fills and gets rolled over.
- For Software Options E and F (EPM 7000 meter only), use this setting to set the allocation for the Waveform and Power Quality (PQ) logs, as well as for the Historical logs.

1. From the Tree Menu, click **Trending Profiles > Historical Log Sectors**.



If your EPM 7000 meter is equipped with Software Option B-D, or the standard EPM 7100 Software Option, you will see the screen shown on the previous page. If it is a EPM 7000 meter equipped with Software Option E or F, you will see the screen shown on this page. Both screens are color-coded for ease of use. The color key is shown in the box(es) labeled Historical Logs and Waveform/PQ Logs.



- The first screen shows the current space allocation for the EPM 7000/7100 meter's three Historical logs, including:
    - The number of bytes allocated to each log
    - The number of records available for each log
    - The duration of each log.
- The second screen shows the same information, along with the current space allocation for the Waveform/PQ Logs, including:
    - The number of bytes allocated to each log
    - The number of captures that can be made before the log rolls over and data is rewritten
    - The number of sectors allocated to the log.

2. To change the current allocation for a log:
   - Click on one of the double yellow lines dividing the individual logs.
   - You will see a line with arrows on each side. Drag the line in either direction to increase or decrease the log allocation. The display fields for the logs will reflect any changes you make to the allocation.

NOTE

- The Waveform log must have at least 3 sectors allocated to it.
- When EOI Pulse is set as the Logging Interval for a Historical log (see "Configuring Historical Logs" on page 8-23), the Log Duration field for that log will be blank.

3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

8.5 Configuring Option Cards (EPM 7000 Meter Only)

The EPM 7000 meter automatically detects the presence of any Option cards installed in it. You will see the installed card(s) listed in the Tree Menu (see the figure below). Up to two Option cards can be installed in the EPM 7000 meter. Refer to the meter's Installation and Operation Manual for additional information concerning Option cards, including installation procedures. The EPM 7100 form does not accommodate these Option cards.

You must configure an Option card before using it. The following sections give instructions for configuring each of the Option cards.

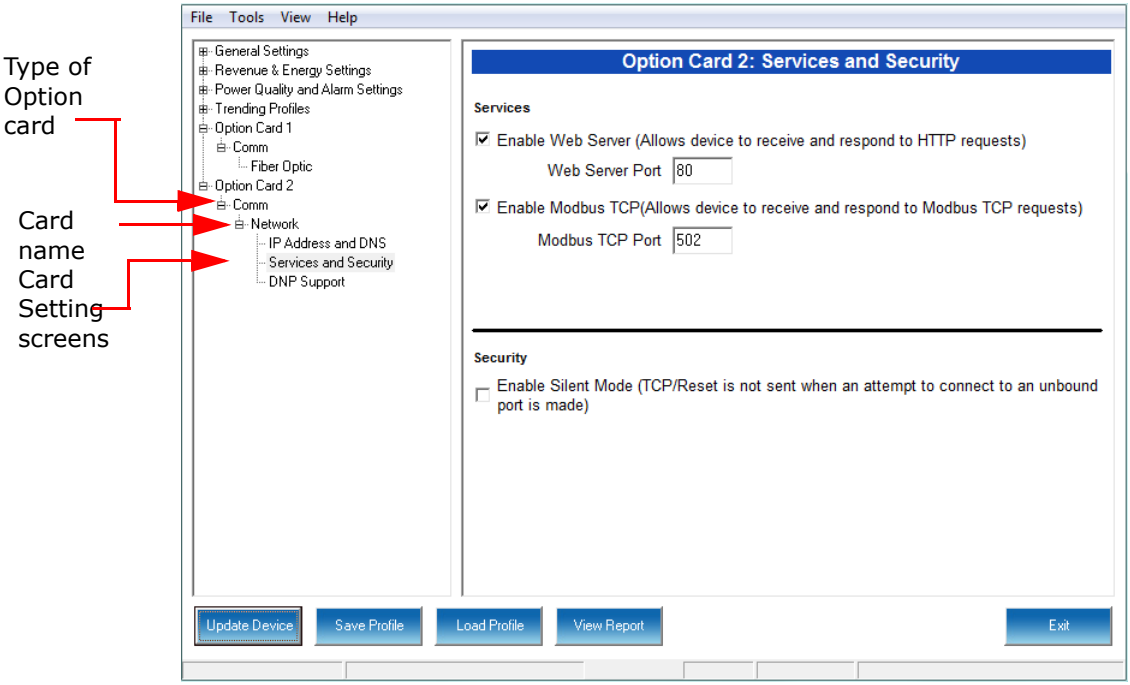
NOTE

You can configure settings for an Option card when you are not connected to a meter. Click Option Card 1 or 2 from the EPM 7000 meter's Device Profile screen. The drop-down menu on the displayed screen allows you to select your Option card. The available selections are: Fiber Optic, Network, Digital Relay, Pulse Output, Analog Output (0-1mA), Analog Output (4-20mA), None. Click Apply. The Option card you chose is now listed in the menu. Refer to the instructions for configuring the card.

From the Tree Menu on the left side of the EPM 7000 meter's Device Profile screen, double-click on the Option Card 1 or Option Card 2 line or click on the + button next to it. The settings for the option card(s) installed in your meter are shown.

Option Card Screens:

The type of Option card installed in the meter determines the settings you need to configure, and so, the screens you see. Click on the selectable lines under your Option card in the EPM meter's Device Profile menu. See the example below.



NOTE

The Option card settings for your meter will only show the option cards currently installed in your meter.

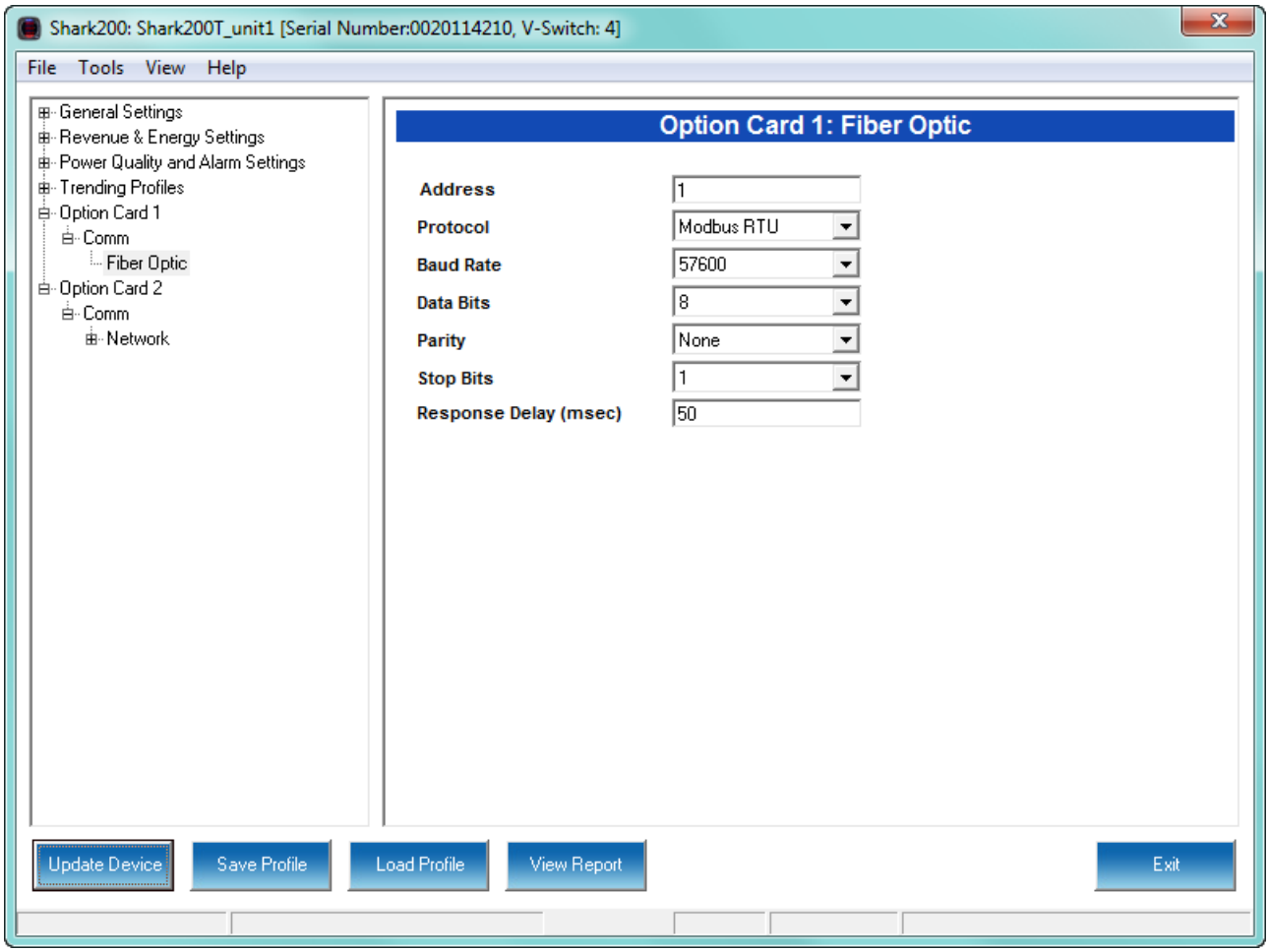
8.5.1 Configuring a Fiber Optic Card

The Fiber Optic Option Card is a Communication card that provides a standard, serial communication port over a fiber optic application. For technical specifications and hardware installation, refer to the meter's Installation and Operation Manual.

Example:

An example use of the optional Fiber Optic card is in a daisy chain topology, using the Echo switch on the Fiber Optic Card to allow messages to bypass the unit.

1. From the **Option Card** menu, click **Comm > Fiber Optic**.



1. The screen fields and acceptable entries are as follows:
   - Address: 1 - 247 (Modbus); 1-65520 (DNP)
   - Protocol: Modbus RTU; Modbus ASCII; DNP subset 2; DNP subset 3
   - Baud Rate: 9600; 19200; 38400; 57600
   - Data Bits: 5; 6; 7; 8
   - Parity: None, Odd, Even
   - Stop Bits: 1 or 2
   - Response Delay (msec): the suggested delay is 50 msec, but you can increase the delay, if necessary.

2. To implement any changes, click the **Update Device** button to send the new profile to the meter.

8.5.2 Configuring a Relay Output/Digital Input Card

The Relay Output/Digital Input card is used for a few purposes. The relay portion is used to send a control output when a limit is exceeded. The input portion can be used to either count KYZ pulse or detect the status of a circuit.

The Relay Output/Digital Input Option Card has:

- Two relay contact outputs for load switching
- Two wet/dry contact sensing digital inputs.

Accumulators in the GE Communicator software count the transitions of the Inputs and Outputs. For technical specifications and hardware installation, refer to the meter's Installation and Operation Manual.

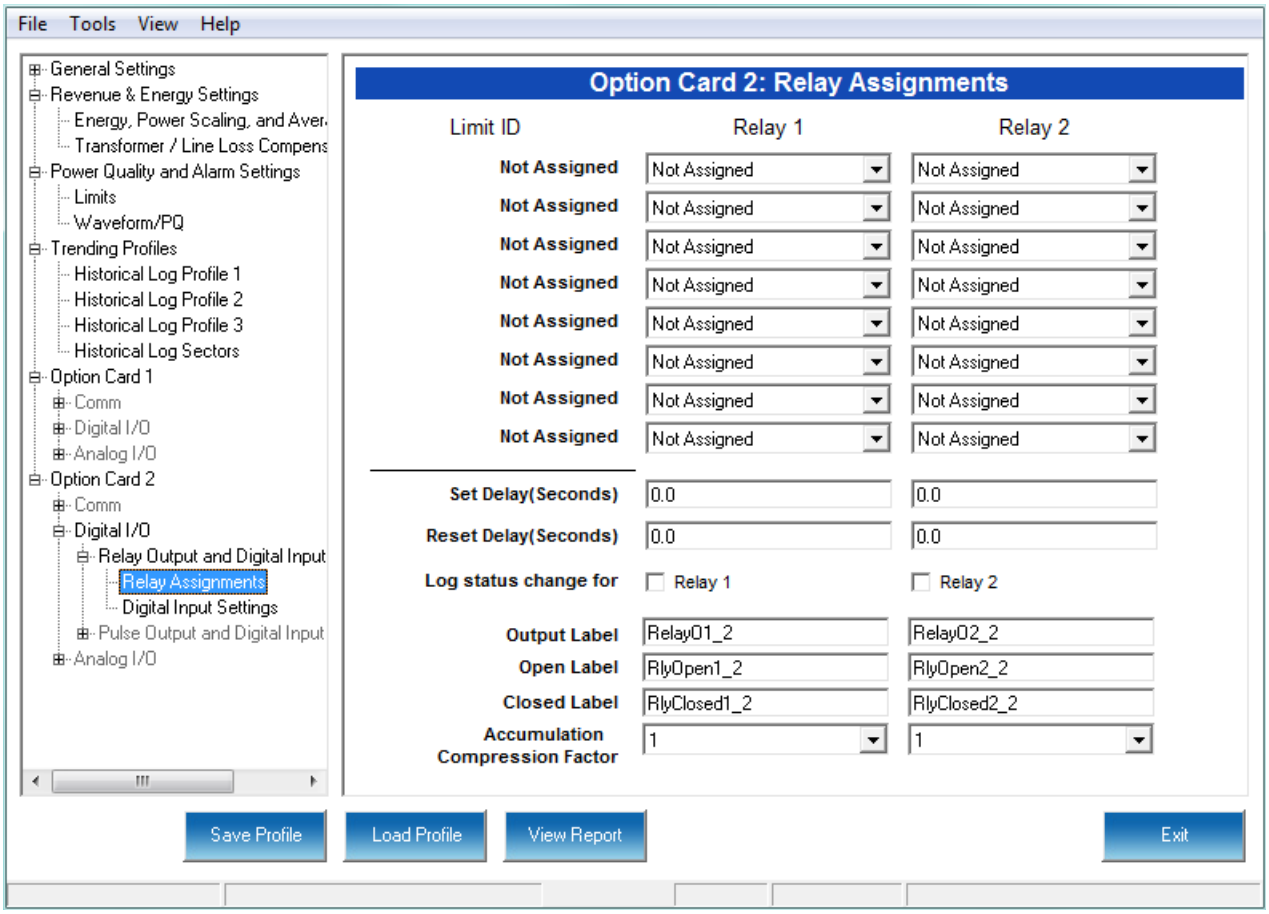
NOTE

NOTE: When installing a Relay Output/Digital Input card, we recommend you reset the accumulators for the card, in order to prevent erroneous counts. See Chapter 20 "Other Functions and Screens" for instructions on using the Reset Meter Information screen to reset card accumulators.

Example:

An example use of the optional Relay Card is in monitoring the status of circuit breakers or relays in your electrical system. The two status inputs could be used to monitor two circuit breakers, and the two relay outputs could be used to sound an alarm upon the occurrence of a programmed out of limit condition.

1. From the Option Card menu, click **Relay Output and Digital Input > Relay Assignments** to set the limits/alarm conditions and logging options for the card's Relay Outputs.



2. From the Relay Assignments screen, you can:
   - Configure up to 8 output conditions for the two Relay Outputs. Note that the Limits used are configured in **Power Quality and Alarm Settings > Limits**.
   - Set a Delay and Reset Delay for the Outputs.
   - Choose to log Status Changes for each Relay Output.
   - Assign each Output an Output Label, Open Label, and Closed Label, which are used when viewing the Relay Status Log.
   - Assign an Accumulation Compression Factor for each output.

NOTE

IMPORTANT! First use the Limits screen to set up the limits you want to assign to an Output. See "Configuring Limits (EPM 7000 Meter Only)" on page 8-18 for instructions.

3. The available Limits appear in the Limit ID column. To assign a limit to an Output relay:
   - Select the output condition from the pull-down menu next to the Limit ID. The options are: Above Limit (the Output is triggered when the Above Limit condition occurs) and Below Limit (the Output is triggered when the Below Limit condition occurs).

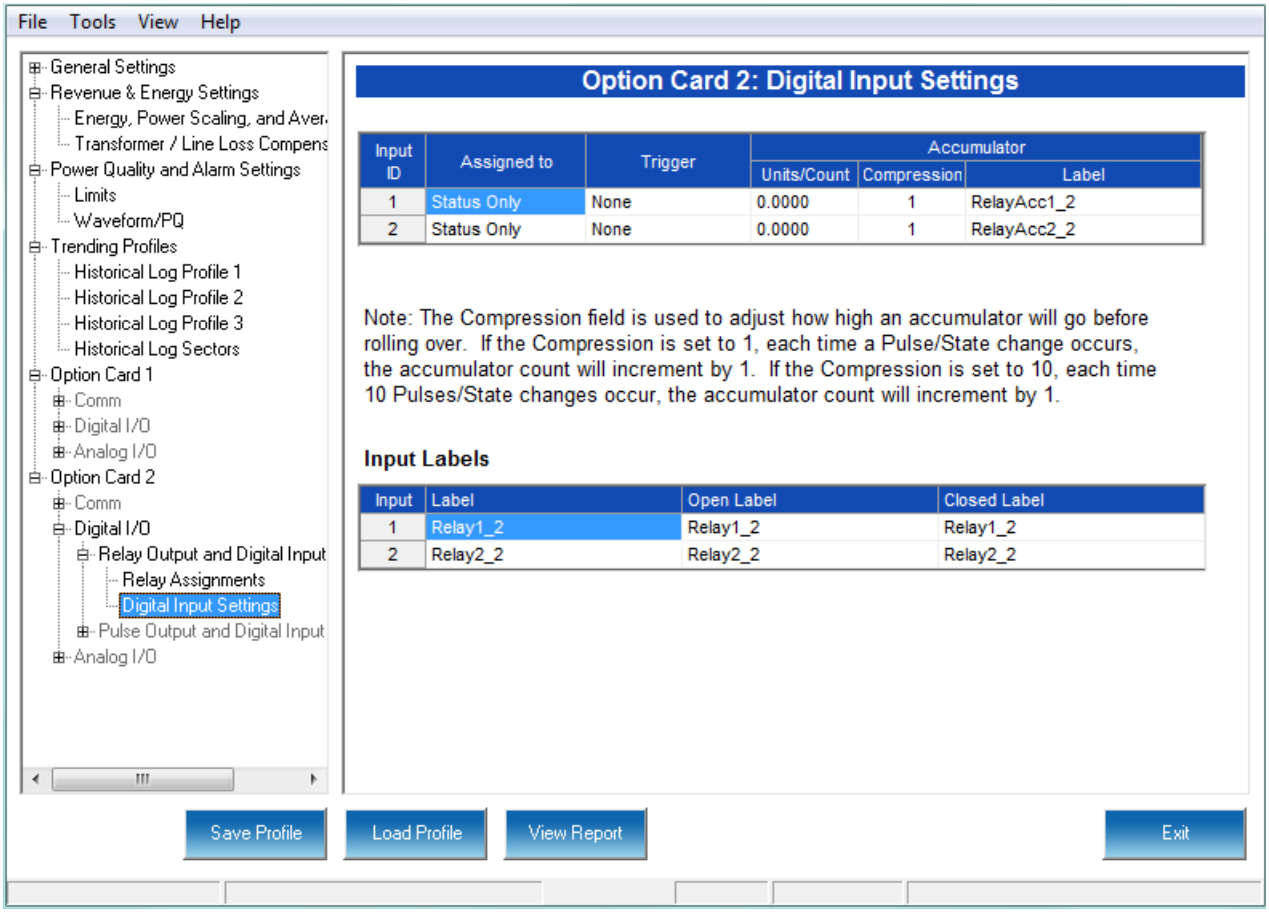
- You can assign the limit to one or both (or neither) of the Relay Outputs.

NOTE

A Relay operates when any one assigned Limit is tripped, and stays in the Set condition as long as one Limit is in the Alarm state.

4. You can enter Set Delay and/or Reset Delay. These values are the delay before the Output is changed: Set is when the common is shorted to Normal Open (this is the Set Condition), Reset is when the Output is shorted (closed).
5. Check the box next to Log Status Change for if you want to log output status changes for either or both Relay. See Chapter 19 "Viewing Logs" for information on the I/O Change Log.
6. The current Output Labels are displayed in the screen. These labels are used for Logging. To change the Output labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
   - Output Label - Label ID
   - Open Label - Open state ID
   - Closed Label - Closed state ID
7. You can specify an Accumulation Compression Factor. The Compression Factor is used to adjust how high an accumulator will go before rolling over. Because of this, it is useful in delaying rollover. For example, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count increments by 1. The available Compression Factors are: 1, 10, 100, 1000, 10000, and 100000. The default Compression Factor is 1.
8. To configure the Digital Inputs:

- From the Option Card menu, click **Relay Output and Digital Input > Digital Input Settings**. Use this screen to assign labels and functions to the Inputs.



- Make a selection in the Assigned to field. The available selections are:
  - Status Only - select this to use the digital inputs just to indicate if the state is open or closed.
  - Accumulator - select this to use the digital input as a pulse counter.
  - Digital Input Log - select this to use the digital input to trigger an entry in the I/O change log.
  - EOI Pulse - only one Input can be set to receive an EOI pulse.

    NOTES on End of Interval (EOI):
    - EOI is triggered in a device when the programmed condition is met. Only one Option Card input can be set to receive an EOI pulse. EOI is used for the following:
    - As a trigger for demand averaging: the received EOI pulse delineates an interval that results in demand averaging being performed. The minimum interval between received EOI Pulses used to trigger demand averaging should be 5 minutes. An EOI pulse allows the meter to be synchronized with an installed revenue meter, so that both meters are calculating Demand at the same time. When an Input is assigned to EOI, the demand interval is now the time between two received pulses.

- For historical logging: when the EOI pulse is received, it causes any log that has been configured for EOI Pulse interval to capture a record. Refer to "Configuring Historical Logs" on page 8-23, for additional information on EOI Pulse and logging.

- Select Trigger from the pull-down menu. The Trigger you select depends on your Assigned to selection:
  - For Status Only, select None.
  - For Accumulator, select from Closing, Opening, High Speed Closing or High Speed Opening.

NOTE

NOTE: Only one accumulator can be assigned to a High Speed Trigger.

  - For Digital Input Log, select Change.
  - For EOI Pulse, select from Closing, Opening, or Change.
- Enter Units/Count. The Units/Count is the output ratio from the device that is being input into the EPM 7000 meter. For example, if you have a KYZ module that is outputting a pulse every 1.8 kWh, with the input set to Accumulator, Increment on Contact Opening, you would set the Units/Count to be the value of the KYZ; in this case either 1.8 or a ratio of that number.
- Enter Compression. The Compression Factor is used to adjust how high an accumulator will go before rolling over. For example, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count increments by 1. The available Compression Factors are: 1, 10, 100, 1000, 10000, and 100000. The default Compression Factor is 1.
- Enter a Label for the Accumulator.
- The current Input Labels are displayed in the screen. To change the Input Labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
  - Input Label - Input ID
  - Open Label - Open state ID
  - Closed Label - Closed state ID

9. To implement any changes to the Relay Output/Digital Input card settings, click the Update Device button to send the new profile to the meter.

8.5.3 Configuring a Pulse Output/Digital Input Card

The Pulse Output/Digital Input card is similar to the Relay Output/Digital Input card except that the card contains 4 KYZ pulse output contacts instead of relay control outputs. These solid state output contacts can be configured to have the meter pulse out for user-assigned energy values. The Pulse Output/Digital Input Option Card has:

- Four Pulse Outputs via solid state contacts
- Four wet/dry contact sensing digital inputs.

Accumulators in the GE Communicator software count the pulses of Inputs and Outputs. For technical specifications and hardware installation, refer to the meter's Installation and Operation Manual.

NOTE

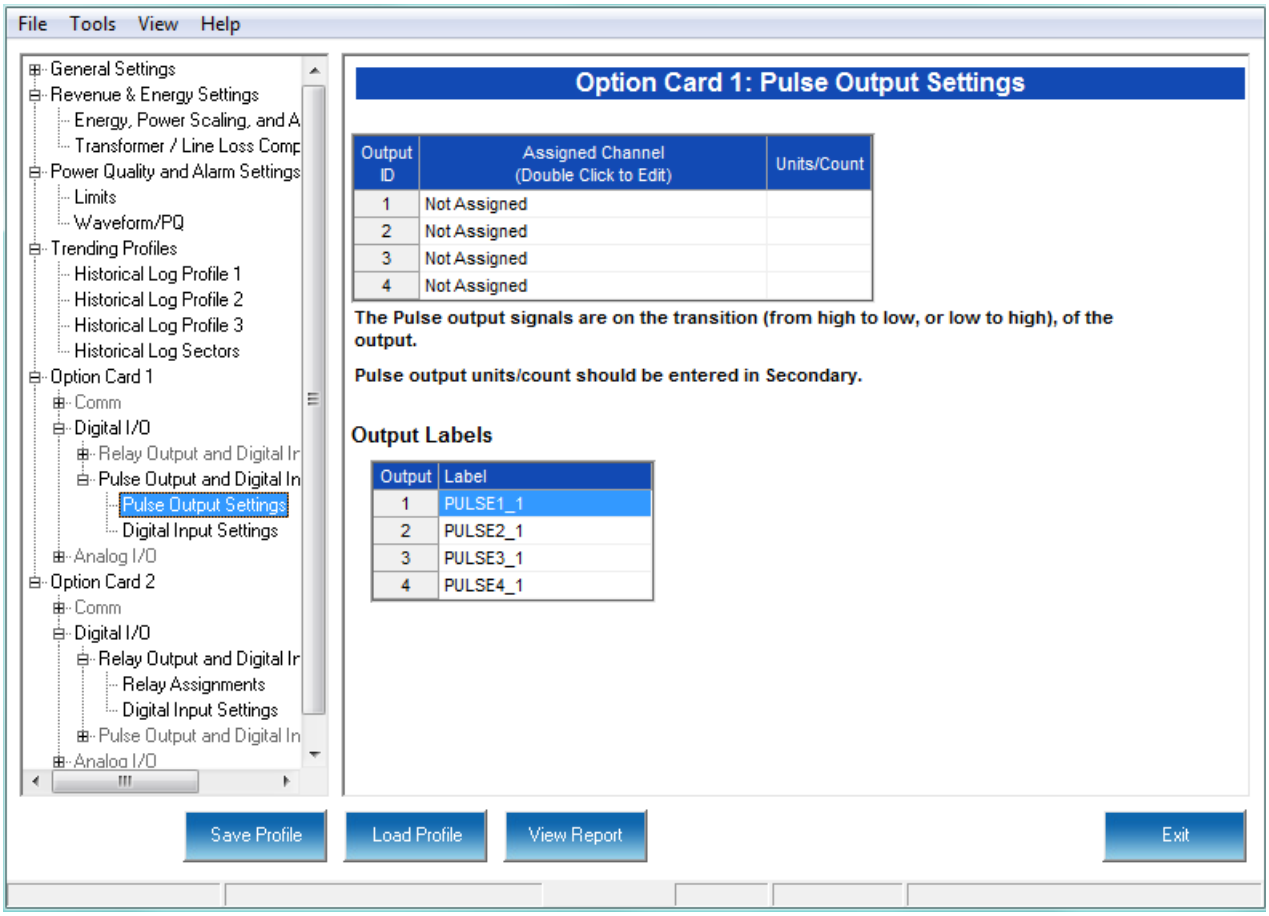
When installing a Pulse Output/Digital Input card, we recommend you reset the accumulators for the card, in order to prevent erroneous counts. See Chapter 20 "Other Functions and Screens" for instructions on using the Reset Meter Information screen to reset card accumulators.

Example:

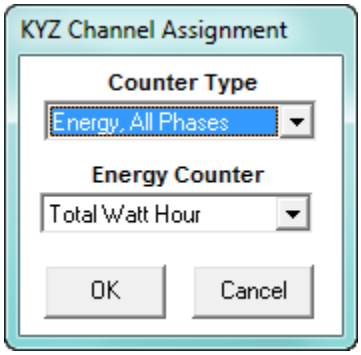
An example use of the Pulse Output/Digital Input Card is in a sub-metering application where a pulse output is needed. The Input Accumulator allows you to count the pulses from another device, for example, a KYZ module or another meter. The Output Accumulators allow you to count the pulses being output by the card.

The Pulse Output and Digital Input Card has two screens for configuration: the Pulse Output Settings screen and the Digital Input Settings screen.

1. From the Option card menu, click **Pulse Output and Digital Input > Pulse Output** Settings.



2. You can set up to four Output IDs for your Card. Each Output has a Label, an Assigned Channel, and a Unit/Count. Double-click an Assigned Channel field to add or edit an Output ID. You will see the window shown below.



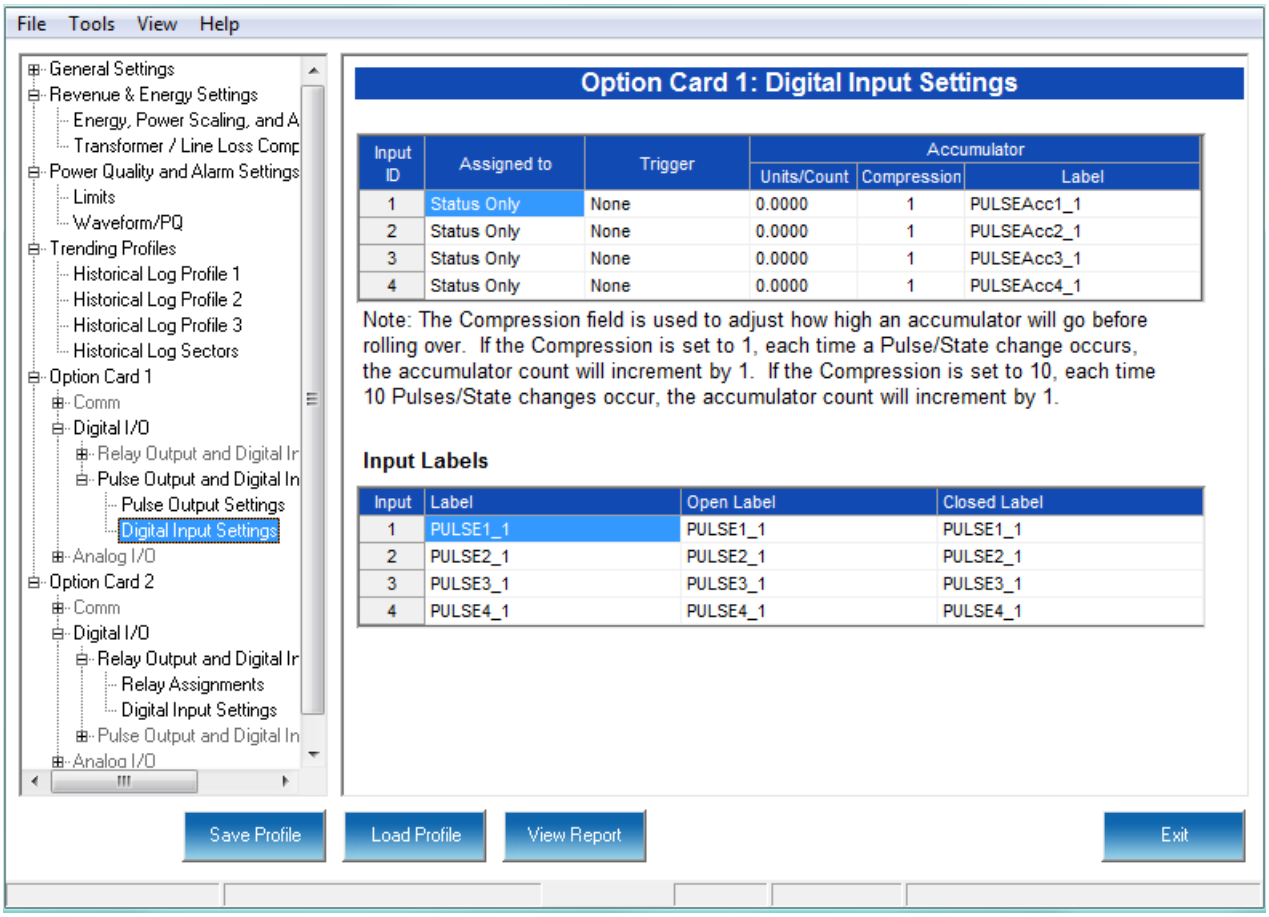
3. Select the Counter Type. The available selections are:
   - Energy, All Phases
   - End of Interval Event - this counter is triggered by a Demand Averaging Interval
   - Energy, Phase A
   - Energy, Phase B
   - Energy, Phase C
   - None.

NOTE

If you select one of the Energy Counter Types, you will see the Energy Counter field. The available selections are: Total Watt Hour; Positive Watt Hour; Negative Watt Hour; Total VAR Hour; Positive VAR Hour; Negative VAR Hour; VA Hour; Received Watt Hour; Delivered Watt Hour; Inductive VAR Hour; Capacitive VAR Hour.

4. Click **OK**. The Counter Type you selected displays in the Assigned Channel field of the Pulse Output Settings screen.
5. When you select the Assigned Channel, a value is entered for it in the Units/Count field. You can edit this field by double-clicking in it. The Units/Count is determined by the Secondary (the readings in the meter). For example, if you have a three-phase meter with 600 Watts per element, for a total of 1800 Watts, the Units/Count field will be 1.8. That means that every 1.8 Watt-hours, the count will accumulate by 1, and each count will represent 1.8 Watt-hours. If you are using CTs that have a ratio of 1000 to 1, for example, the count will still increment every 1.8 Watt-hours, but the count in that case will represent 1.8 Watt-hours times 1000, or 1800 Watt-hours.
6. The current Output Labels are displayed on the screen. To change the Output labels, click in the Labels field you want to change, and enter a new label.

7. From the Option card menu, click **Pulse Output and Digital Input > Digital Input Settings**. Use this screen to assign labels and functions to the Inputs



8. Make a selection in the Assigned to field. The available selections are:
   - Status Only - select this to use the digital inputs just to indicate if the state is open or closed.
   - Accumulator - select this to use the digital input as a pulse counter.
   - Digital Input Log - select this to use the digital input to trigger an entry in the I/O change log.
   - EOI Pulse - only one Input can be set to receive an EOI pulse.
     NOTES on End of Interval (EOI):
     - EOI is triggered in a device when the programmed condition is met. Only one Option Card input can be set to receive an EOI pulse. EOI is used for the following:
       - As a trigger for demand averaging: the received EOI pulse delineates an interval that results in demand averaging being performed. The minimum interval between received EOI Pulses used to trigger demand averaging should be 5 minutes. An EOI pulse allows the meter to be synchronized with an installed revenue meter, so that both meters are calculating Demand at the same time.

- For historical logging: when the EOI pulse is received, it causes any log that has been configured for EOI Pulse interval to capture a record. Refer to "Configuring Historical Logs" on page 8-23, for additional information on EOI Pulse and logging.

9. Select Trigger from the pull-down menu. The Trigger you select depends on your Assigned to selection:
   - For Status Only, select None.
   - For Accumulator, select from Closing, Opening, High Speed Closing or High Speed Opening.

NOTE

Only one accumulator can be assigned to a High Speed Trigger.

NOTE

High speed opening and closing would be used when monitoring pulses from water meters that can be pulsing very quickly.

   - For Digital Input Log, select Change.
   - For EOI Pulse, select from Closing, Opening, or Change.

10. Enter Units/Count. The Units/Count is the output ratio from the device that is being input into the EPM 7000 meter. For example, if you have a KYZ module that is outputting a pulse every 1.8 kWh, with the input set to Accumulator, Increment on Contact Opening, you would set the Units/Count to be the value of the KYZ; in this case either 1.8 or a ratio of that number.
11. Enter Compression. The Compression Factor is a divider used to adjust how high an accumulator will go before rolling over. For example, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count increments by 1. The available Compression Factors are: 1, 10, 100,1000, 10000, and 100000. The default Compression Factor is 1.
12. Enter a Label for the Accumulator.
13. The current Input Labels are displayed in the screen. To change the Input Labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
    - Input Label - Input ID
    - Open Label - Open state ID
    - Closed Label - Closed state ID
14. To implement any changes to the Pulse Output/Digital Input card settings, click the Update Device button to send the new profile to the meter.

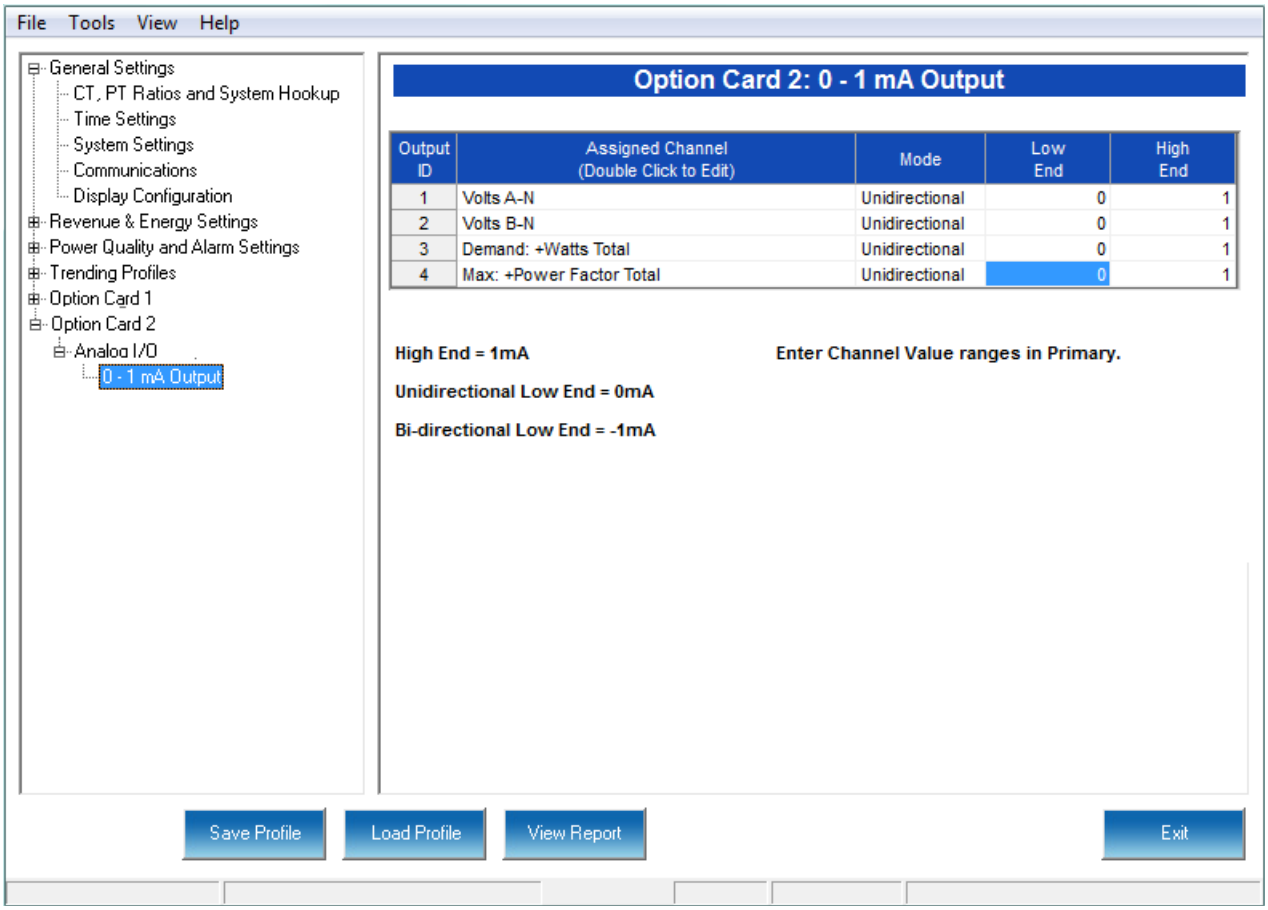
8.5.4 Configuring a 0-1 mA Output Card

The 0-1mA Output Option Card is an analog output card, which transmits a standard, bidirectional 0-1 milliamp signal proportional to the value selected. This card mimics an analog transducer. With the EPM design, the user can select any measured parameter to output on an analog transducer signal. For technical specifications and hardware installation, refer to the meter's Installation and Operation Manual.

Example:

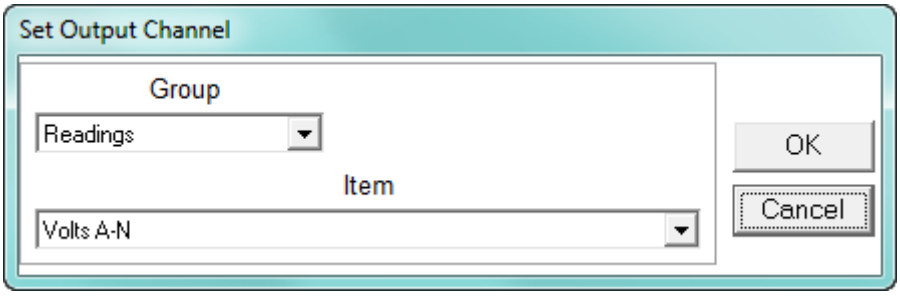
An example use of the optional 0-1mA Output Card is in enabling the EPM 7000 meter to communicate with an RTU.

1. From the Option card menu, click **Analog I/O > 0-1 mA Output**.



You can set up to four Output IDs for your Output Card.

2. Double-click an Assigned Channel field to add or edit an Output ID. You will see the window shown below.



3. Select Group for your Output Channel. The available selections are as follows:
   - Readings
   - Demand
   - Phase Angles
   - THD
   - Not Assigned.
4. Select Item for your Output Channel. The items are the available readings for the group you selected. For example, as shown in the window above, Volts A-N is an item you can select when you have selected Readings as the Group.
5. Click **OK**. The Output Channel you selected is displayed in the Assigned Channel field.
6. Enter Low End and High End for the channel.

NOTE

For the Item selected for the Assigned Channel, the Output Card takes the value in the meter and outputs a DC current within its range. The Low End is the lowest value, and the High End is the highest value. For example, for VOLTS A-N and Bidirectional Mode, at Nominal of 120V, the Low End is set to 115V and the High End is set to 125V. The Analog Output Card will output -1 mA when the reading is 115V, 0 mA when the reading is 120V, and 1 mA when the reading is 125V. The analog card can output below -1mA and above +1mA, proportionally to VOLTS A-N. For limiting values refer to the meter's Installation and Operation Manual's applicable section.

7. You can select either **Unidirectional** or **Bidirectional** for Mode. Unidirectional mode is used for unsigned data, e.g., voltage; and bi-directional mode is used with signed data, e.g., Watts.
8. To implement any changes to the 0-1mA Output card settings, click the **Update Device** button to send the new profile to the meter.

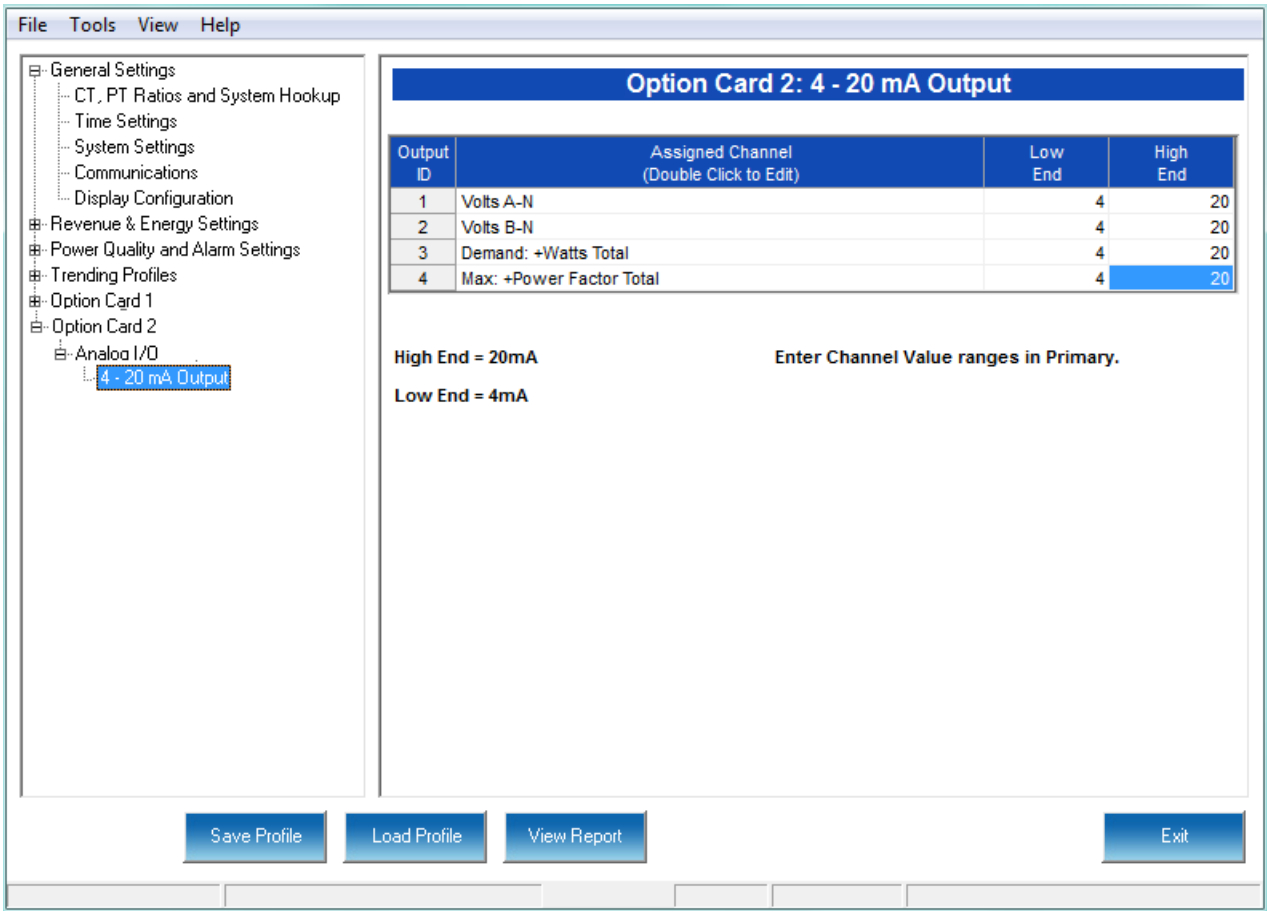
8.5.5 Configuring a 4-20 mA Output Card

The 4-20mA Output Option Card is an analog communication card, which transmits a standard, unidirectional 4-20 milliamp signal. For technical specifications and hardware installation, refer to the meter's Installation and Operation Manual.

Example:

An example use of the optional 4-20mA Output Card is in enabling the EPM 7000/7100 meter to communicate with an RTU.

1. From the Option card menu, click **Analog I/O > 4-20mA Output**.



2. Follow the instructions for configuring the 0-1 mA Card. The configuration of a 4-20 mA Card is the same as a 0-1 mA Card, except that this card can only be unidirectional, so there is no Mode setting.

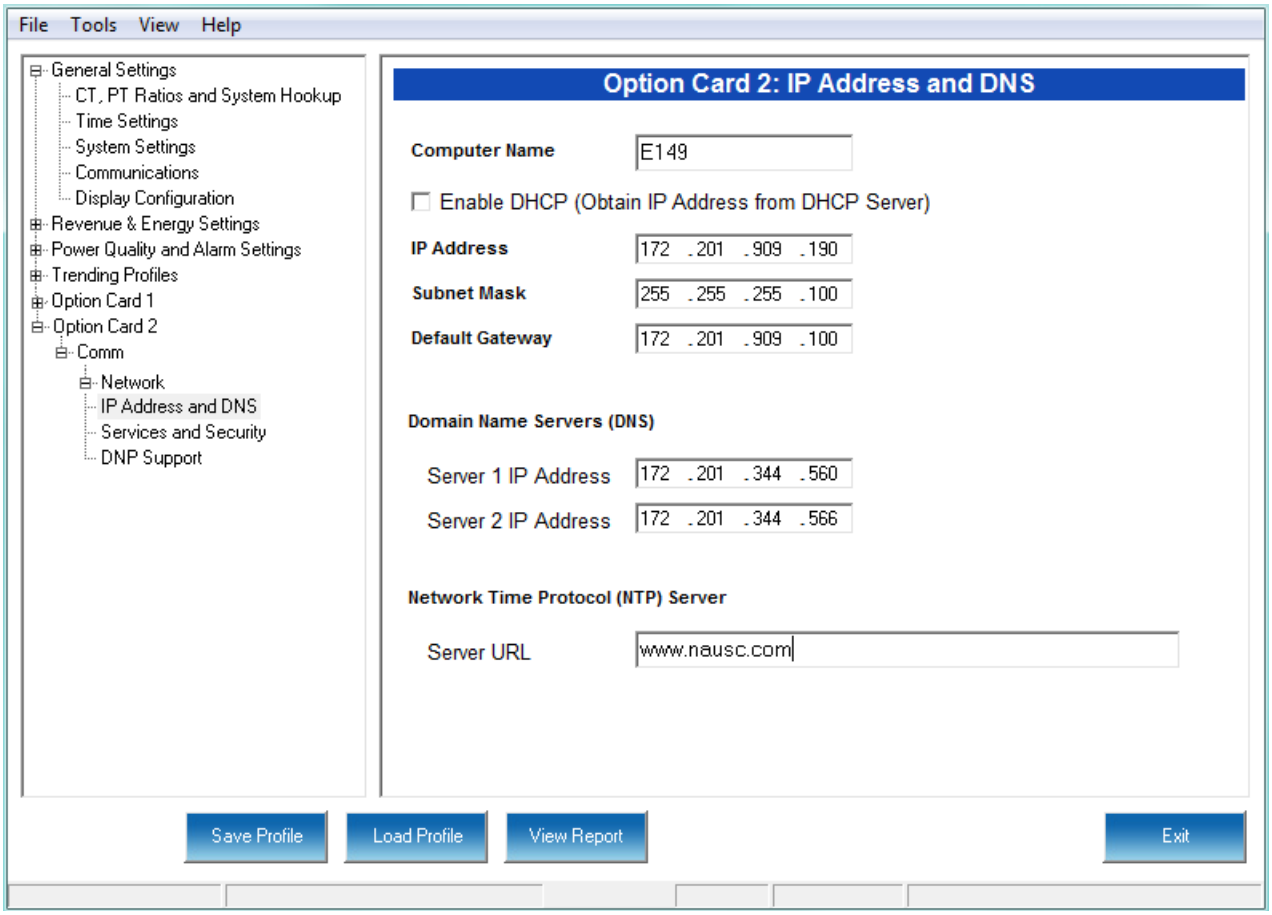
8.5.6 Configuring a Network Card

The optional Network Card enables 10/100BaseT Ethernet communications. It also acts as a Web server, allowing the meter's data to be viewed on a standard web browser. For technical specifications, hardware installation, and additional information on the Web server, refer to the meter's Installation and Operation Manual.

NOTE

For information on configuring the EPM 7100 meter's WiFi settings, see the *EPM 7100 Meter Installation and Operation Manual*.

1. From the Option Card menu, click **Comm > Network > IP Address and DNS**. You will see the screen shown below. It allows you to configure the IP Address, DNS, and Network Time Protocol Server for the card.



2. Enter the following information:
   - Computer Name: Either click the DHCP box to enable a DHCP server to assign the IP address for your network card or enter the following for the network card:
     - IP Address
     - Subnet Mask
     - Default Gateway

NOTE

If no mask is entered (blank) or 0.0.0.0 is used, the network card will use an automatic mask based on the network address class, or will not apply a mask, according to the following table:

Network Class	Address range	Mask used
Class A	1.0.0.0-127.x.x.x	255.0.0.0
Class B	128.0.0.0-191.x.x.x	255.255.0.0
Class C	192.0.0.0-223.x.x.x	255.255.255.0
Other classes		No masking will be applied

- Domain Name Server Address(es)
- URL address of a Network Time Protocol server if you are using one.

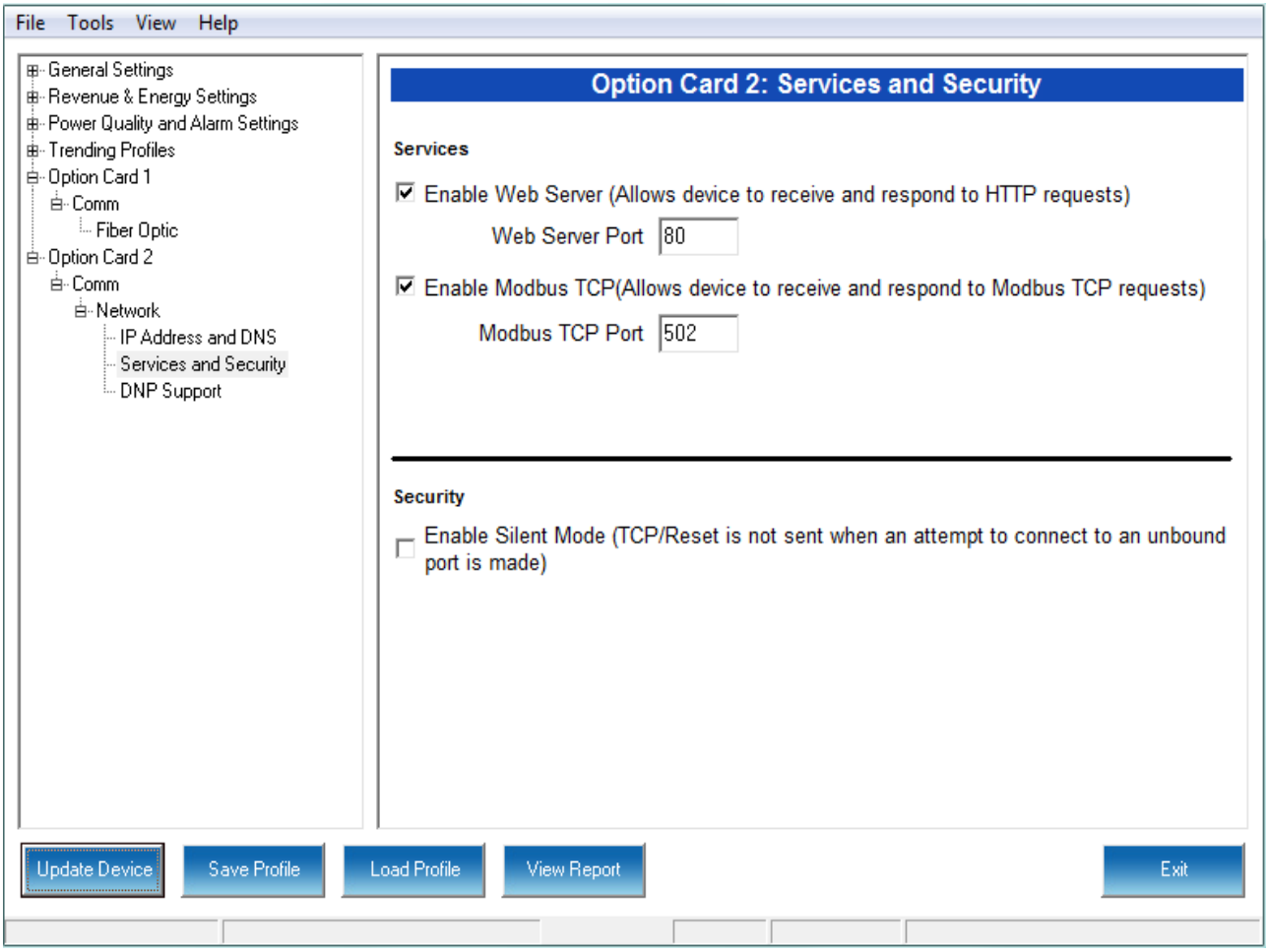
NOTE

The Network Time Protocol server is used for clock synchronization. It can be either a device with a real-time clock that is networked with your meter, or an NTP server on the Internet.

NOTE

IMPORTANT! You must also enable Clock Synchronization in the Time Settings screen (see “Configuring Time Settings” on page 8-4).

3. From the **Option Card** menu, click **Comm > Network > Services & Security**. You will see the screen shown below.



4. This screen allows you to disable certain features of the meter's Ethernet connection, for security purposes:
   - The HTTP Web Server can be disabled, or its default port can be changed.
   - The Modbus TCP server can be shut down, or its default port can be changed.
   - The Alarm Email and Notification feature of the Network card can be disabled.

NOTE

Note that the network card's firmware must support alarm and notification email for this feature to be available. The settings for the alarm/notification email feature are made using the card's Web server. See the *EPM 7000 Instruction Manual* for instructions.

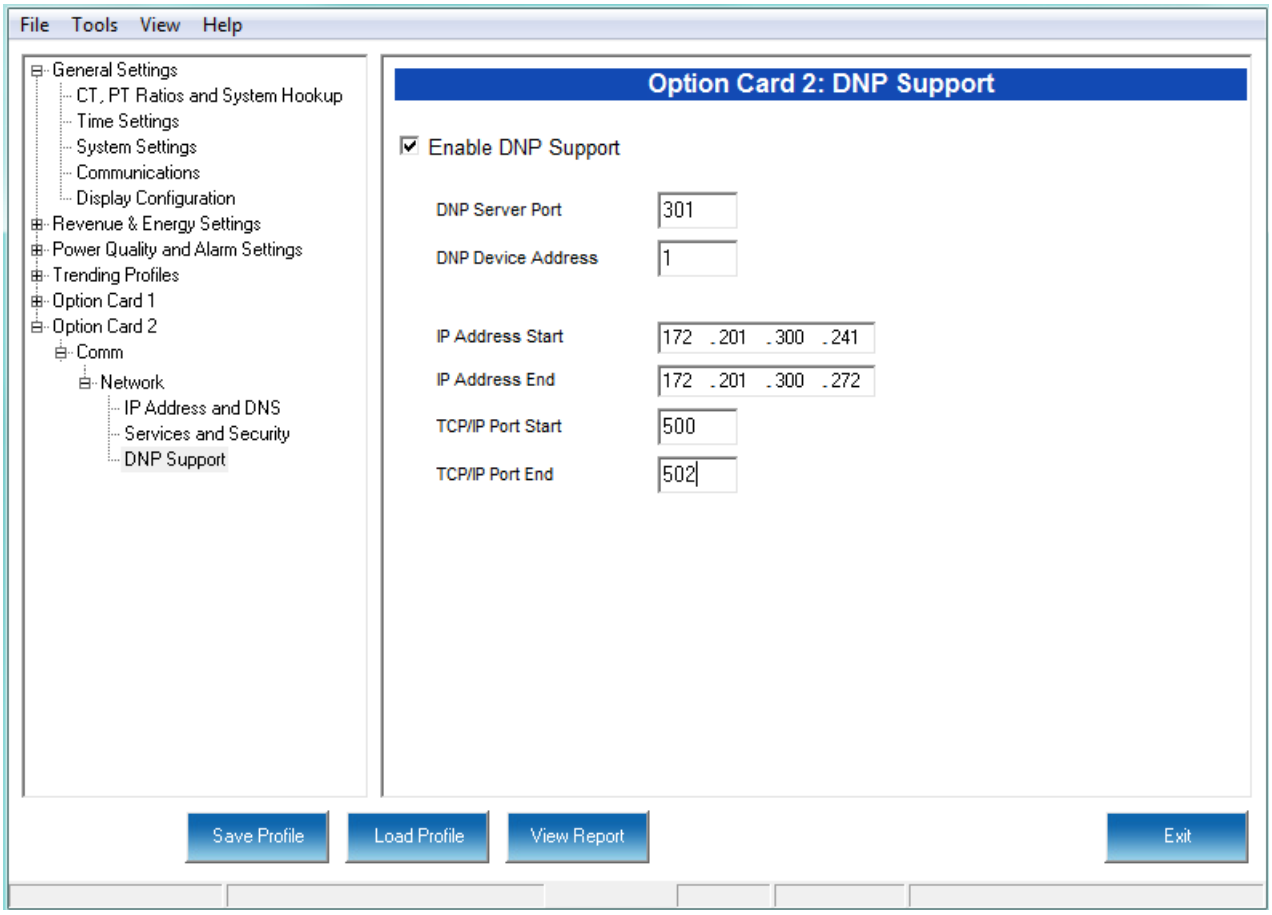
- If the port entered is less than "10," the standard port is used: 80 for Web Server and 502 for Modbus TCP Server.
- To disable one of the servers, uncheck the box next to it.

- When the Security feature "Silent Mode" is enabled, the meter will totally ignore incoming connections, in such a way that not even TCP/IP Reset packets will be sent. When "Silent Mode" is disabled, the meter follows standard TCP/IP procedures for incoming connections to unused ports. This feature is useful in preventing hacking (attempted security intrusions).

NOTE

- If you do not know this information, contact your Systems Administrator.
- See Chapter 25 "Flash Updating" for instructions on updating the Network card's firmware.

1. From the Option Card menu, click **Comm > Network > DNP Support** if you want to set up DNP over Ethernet for the Network Card. You will see the screen shown below.



This screen lets you set up a DNP Server gateway for the Network Option card. This gateway enables DNP 3.0 protocol communication over Ethernet, for the meter.

2. Make the following settings:
   - Enable DNP Support: by default the DNP server support is disabled. Check the box to enable it. Once it is enabled, the other parameters can be entered.
   - DNP Server Port: this is the TCP/IP port where the meter's Network card unit will be listening for incoming connections via the DNP protocol. Valid numbers are from 1 to 65535. We recommend that you set a value over 1024, because most of the lower numbers are reserved, or are already allocated to other popular services. If you set a port number of less than 10, the network card will set the port to its default, which is 20000.
   - DNP Device Address: this is the meter's configured address; currently, this setting should be 1.
   - IP Address Start/End: this setting implements Internet security by letting you specify a range of IP addresses that are authorized to connect to the DNP port. Any requester with an IP address outside of this range will be rejected. Enter the

range in the start and end fields. To disable the IP range restriction, write 0.0.0.0 in the start field and 255.255.255.255 in the end field.
An example of a range is 172.20.167.100 in the start field and 172.20.167.150 in the end field. That would authorize connection to the DNP port for any IP address from 172.20.167.100 up to and including 172.20.167.150.

- IP Port Start/End: you can also use this setting to implement Internet security by through specifying a range of authorized port addresses. Any requester originating the connection from a port outside of this range will be rejected. Enter the range in the start and end fields (valid port ranges are from 1 to 65535). To disable the port range restriction, use 0 in either the start or the end field.

3. To implement any changes to the Network card settings, click the Update Device button to send the new profile to the meter.

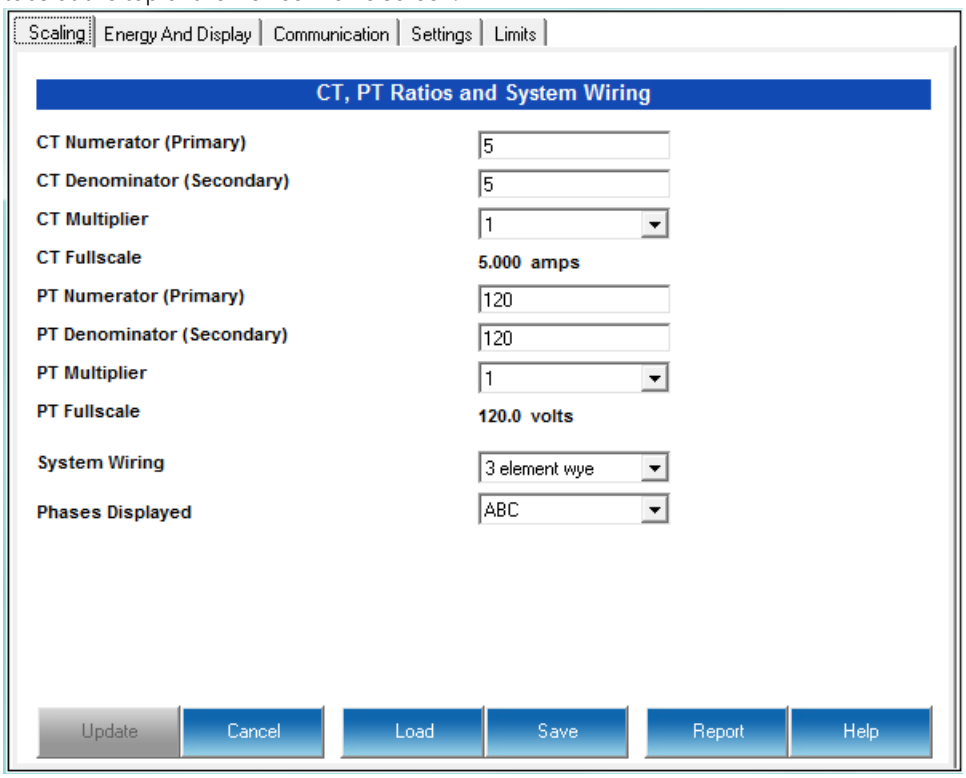
GE Communicator

Chapter 9: EPM 2200/6000/6010/6100 Meter

This chapter explains how to configure an EPM 2200/6000/6010/6100 meter's programmable settings, which are stored in the unit's Device Profile. Chapter 7 “Device Profile” contains detailed information on how to use the Device Profile.

9.1 Device Profile Settings

All of the EPM 2200/6000/6010/6100 meter's Device Profile settings are accessed from the tabs at the top of the Device Profile screen.



9.1.1 Configuring Scaling Settings

The first screen you see is the CT, PT Ratios and System Wiring screen, shown on the previous page (to return to this screen from another screen, click the Scaling tab). Use this setting to configure Current Transformer and Potential Transformer ratios and to select the System Hookup.

Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

1. Make your settings in the following fields:
   - CT Ratios
     - CT Numerator (Primary): 1 - 9999

- CT Denominator (Secondary): 5 or 1 Amp

NOTE

This field is display only. The meter is ordered as a 5 Amp or 1 Amp Current Secondary.

- CT Multiplier (Scaling): 1, 10 or 100
  This multiplier is for the display. The display can only read 4 digits, or 9999. Above that range the number must be multiplied to have it read K or M values.
- Current Full Scale: Display only

- PT Ratios
  - PT Numerator (Primary): 1 - 9999
  - PT Denominator (Secondary): 40 - 600
  - PT Multiplier (Scaling): 1, 10, 100, or 1000
  - Voltage Full Scale: shows how the voltage will appear on the display, as well as the limit full scales for voltage.
- System Wiring
  - 3 Element Wye; 2.5 Element Wye; 2 CT Delta
    This value must be set properly for the meter to calculate readings correctly.
- Phases Displayed - this field determines which phases display on the faceplate. For example, if you select AB, only those two phases will be displayed on the faceplate.
  - ABC; A; AB

Example Settings:

For a CT of 2000/5A, set the following CT Ratios in the entry fields:

CT Numerator (Primary) 2000

CT Denominator (Secondary) 5

CT Multiplier 1

The Current Full Scale field will read 2000.

For a system that has 14400V primary with a 120V secondary line to neutral (PT Ratio of 120:1), set the following PT Ratios in the entry fields:

PT Numerator (Primary) 1440

PT Denominator (Secondary) 120

PT Multiplier 10

The Voltage Full Scale field will read 14.4k.

2. To implement any changes, click the Update button to send the new profile to the meter.

9.1.2 Configuring Energy and Display Settings

Use this setting to configure:

- The display and storage of Energy registers in the meter
- The display of Power data in the meter
- The interval over which Average values are computed, as well as the Interval Energy
- Auto Scrolling and Display Configuration

Functional Overview of Energy Settings and Averaging:

- **Energy Scaling**
  Energy Setting includes:
  Digits (the number of digits in the reading)
  Decimals (the number of decimal places in the reading)
  Energy Scale: the scale of the reading - unit; kilo (number times 1000); Mega (number times 1 million)

  Energy settings allow you to balance the resolution (or accuracy) of the energy stored, with the interval over which energy rollover occurs. For example, the maximum resolution for a k scale reading is: 99999.999k.

  To calculate the speed at which the energy will rollover, you must know the Power Full Scale, which is computed from the CT and PT Full Scale values (see 5.3.1.1 *Poll Power and Energy (EPM Meters)*). The formula for calculating Power Full Scale is:
  Wye system: CT Full Scale x PT Full Scale x 3
  Delta system: CT Full Scale x PT Full Scale x 3 x $\sqrt{3}$

  For example, for a CT Full Scale of 2000, PT Full Scale of 14400, Wye system:
  2000 x 14400 x 3=86400000
  In this example, the energy will increment at 86400000 Watts per hour, or 24000 Watts per second.

  This value allows you to determine the number of digits, decimal places, and energy scale you want to configure for the Energy settings, when you take into account the rollover time.

  To determine the number of hours before rollover, use this formula:
  [Max Resolution]/[Full Scale] = #Hours, where Max Resolution = maximum digits and decimals for the Energy scale in use.

  Using the example from above, with an energy scale of Mega, the formula would be:
  99999.999 M/86.4 M = 1157.4074 hours or about 48 days until rollover.

  NOTE

  To increase the number of days until rollover, you can increase the number of digits (to 8), decrease the number of decimal places (to 0), or increase the Energy Scale (to M).

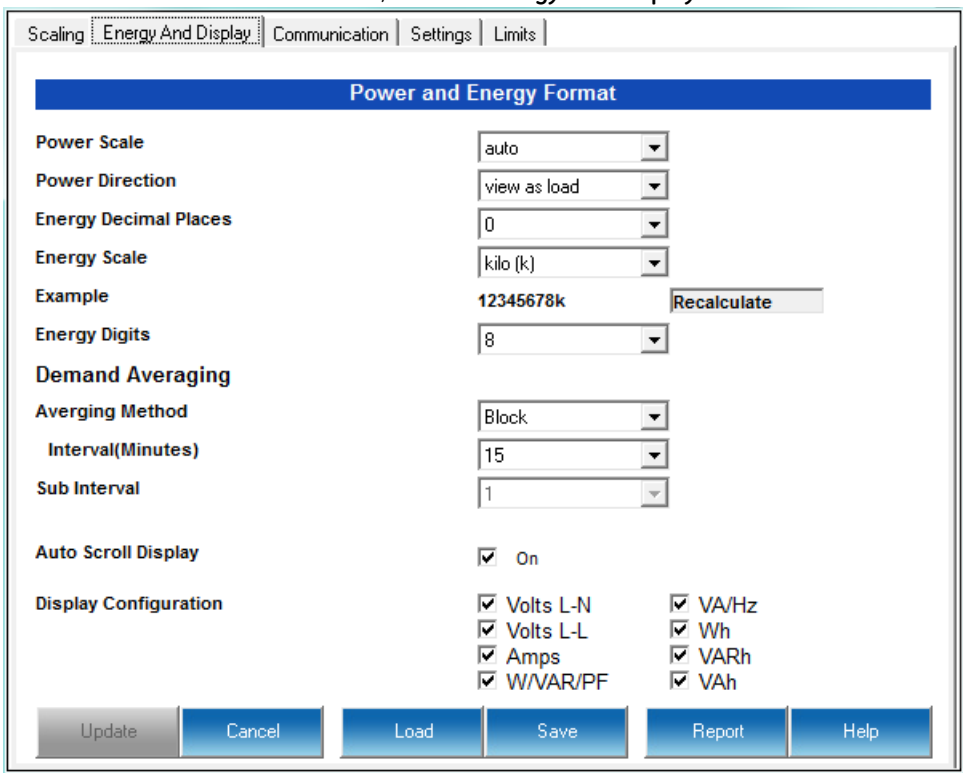
- **Demand Averaging**
  Demand is the average rate of energy use over time. The EPM meter supports two

types of demand averaging: Block demand and Rolling demand.

Block demand records the average demand for time intervals that you define (usually 5, 15 or 30 minutes).

Rolling demand functions like multiple, overlapping Block demands. You define the subintervals at which an average of demand is calculated. An example of Rolling demand would be a 15-minute Demand block using 5-minute subintervals, thus providing a new demand reading every 5 minutes, based on the last 15 minutes.

1. From the Device Profile screen, click the **Energy and Display** tab.



2. This screen displays the current settings for Power and Energy Format, Demand Averaging, Auto Scrolling and Display Configuration. The screen fields and acceptable entries are as follows:
   - Power and Energy Format
     - Power Scale: Unit, kilo (k), Mega (M), Auto
     - Power Direction: View as Load or View as Generator; this controls how energy is accumulated in the EPM meter. View as Load means the energy readings are accumulated as Whrs Received, View as Generator means the energy readings are accumulated as Whrs Delivered.
     - Energy Decimal Places: 0 - 6
     - Energy Scale: Unit, kilo (k), Mega (M)
     - Example: Shows an example with the selected settings applied. Click the Recalculate button if you make changes and want to see an example.

- Energy Digits: 5, 6, 7, 8

NOTE

- The Energy Digits, Scale and Decimal Places settings determine how energy values are displayed. Refer to the Functional Overview at the beginning of this section for more information.
- If invalid values are entered, you will see the following warning message: "Warning: Current CT, PT and Energy Settings may cause invalid energy accumulator values." Once you correct the values and click the **Recalculate** button, this message goes away.

NOTE

Typically, this means that the energy rollover point is too low. Try increasing the number of energy digits, or changing to a higher scale.

- If you are changing the energy digits, decimal places, or energy scale, we recommend you first reset the Energy Accumulators, in order to prevent erroneous counts. See Chapter 20 "Other Functions and Screens" for instructions on resetting the EPM meter's Energy Accumulators.
  - Demand Averaging (Refer to the Functional Overview at the beginning of this section for more information.)
    - Average Method: Block or Rolling;
    - Interval: 5, 15, 30 or 60 Minutes
    - Subinterval: 1, 2, 3 or 4

NOTE

Block Average cannot have a Subinterval.

  - Auto Scroll Display
    - Click the checkbox to turn auto-scrolling On and Off. Auto-scrolling controls the display of selected parameters on the meter's faceplate. Refer to the meter's Meter Installation and Operations Manual for more information.
  - Display Configuration
    - Some users may want to lock the meter to a particular faceplate display or series of displays. For example, if you would like the meter to act only as a Volt meter, or only as an ammeter, the meter can be configured to display only the relevant screen. Use this setting to lock the display of the meter's faceplate to the specific combination you want. Refer to the meter's Installation and Operation Manual for additional information on the faceplate.
    - Check the boxes of the Readings you want displayed on the faceplate of the meter. You must select at least one reading.

NOTE

The Auto Scroll Display and Display Configuration settings can be ignored for the EPM 6000T/6010T transducer, since it doesn't have a display.

3. To implement any changes, click the Update button to send the new profile to the meter.

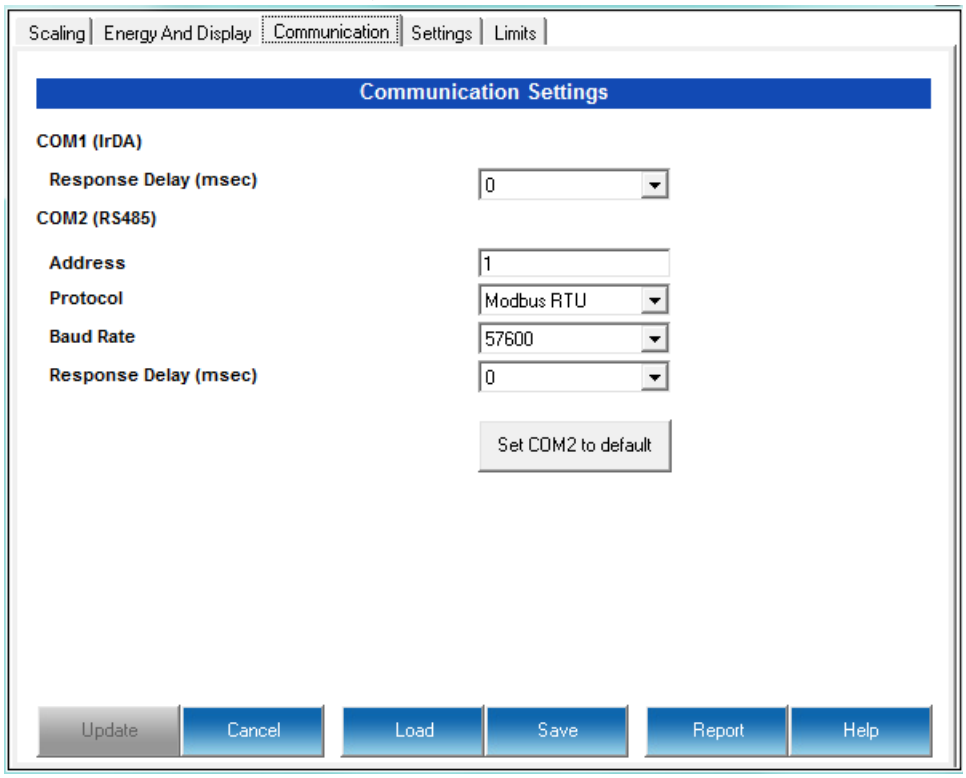
9.1.3 Configuring Communications Settings

Use this screen to enter communication settings for the meter's two on-board ports: the IrDA Port (COM 1) and RS485 Port (COM 2). Note that the EPM 2200 meter has an RS485 port, but no IrDA port, and the EPM 6010 meter has an IrDA port, but no RS485 port. The EPM 6000/6100 meters have both the IrDA port and the RS485 port.

NOTE

The settings on this screen are the current settings for communication. Any changes you make may affect communication between the EPM meter and your PC.

1. From the Device Profile menu, click the **Communications** tab.



2. The screen fields and acceptable entries are as follows:
   - COM 1 (IrDA)
     - Response Delay: 0 - 750 (50msec increments)
   - COM 2 (RS-485)
     - Address:1 - 247 (Modbus); 1-65520 (DNP)
     - Protocol:Modbus RTU, Modbus ASCII or DNP 3.0 (DNP 3.0 protocol is only available with the EPM 6000 meter's Software Option C or D)
     - Baud Rate: 9600, 19200, 38400, 57600
     - Response Delay: 0 - 750 (50 msec increments)

NOTE

Response Delay is the delay the meter should use before responding to queries. If your connecting device requires a delay before receiving information, use response delay to program the time to wait before the meter starts responding to queries.

   - The Set Com2 to Default button is used to restore the RS485 settings to their default values if necessary. The default settings are:

- Baud Rate: 57600
- Address: 001
- Protocol: Modbus RTU

3. To implement any changes, click the Update button to send the new profile to the meter.

NOTE

For information on configuring the EPM 6100 meter's WiFi settings, see the *EPM 6100 Instruction Manual*; for information on configuring the EPM 6000 meter's optional Ethernet settings, see the individual EPM 2200/6000/6010/6100 Instruction Manuals.

9.1.4 Configuring Settings

Use the Settings tab to set password protection, set up a meter ID, and change the meter's Software Option.

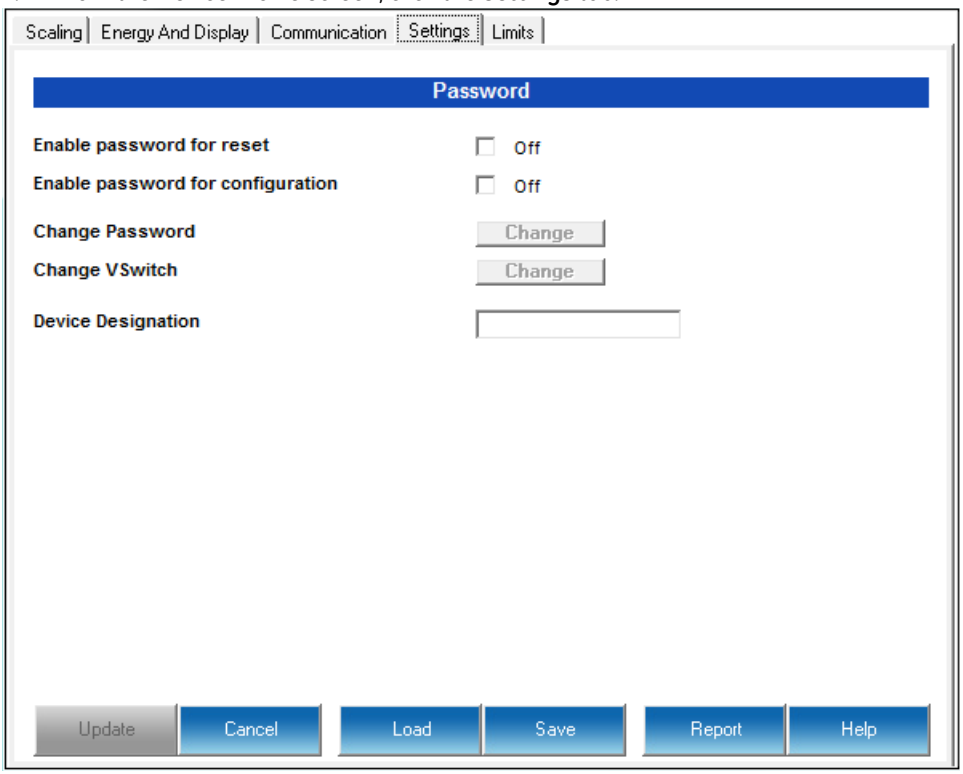
You can enable or disable a Password for Resetting (Reset Max/Min Energy Settings, Energy Accumulators, and the Individual Logs) and Configuration (Device Profile) in the Systems Settings screen.

Once password protection is enabled for the meter and the Device Profile is updated, anyone who attempts to make a change that is under password protection is prompted to enter the password. If the correct Password is not entered, the change doesn't take place.

NOTE

If you enable a Password for Resetting, you must also enable it for Configuration.

1. From the Device Profile screen, click the **Settings** tab.



2. From this screen, you can do the following:
   - Enable or Disable Password for Reset and/or Configuration: click the checkbox next to the option. The Off changes to On and the box is checked. Enabling Password protection prevents unauthorized tampering with devices.

     IMPORTANT! You must set up a password before enabling Password Protection. Click the Change button next to Change Password if you have not already set up a password.
     - Change the Password: click the Change button.
     - Change the Software Option - see Chapter 20 "Other Functions and Screens" for instructions.
     - Enter/change the Device Designation: input a new designation into this field.

3. When you click the Change button next to Change Password in the Settings screen, you will see the Enter the New Password screen.

- Type in the new password (0 -9999).
- Retype the password.
- Click **Change**. The new password is saved and you see the following message window.

NOTE

If Password Protection has already been enabled for configuration and you attempt to change the password, you will see the Enter Password screen after you click Change. Enter the old password and click OK to proceed with the password change.

4. To implement any changes, click the Update button to send the new profile to the meter.

9.1.5 Configuring Limit Settings (EPM 6000/6100, Software Option D)

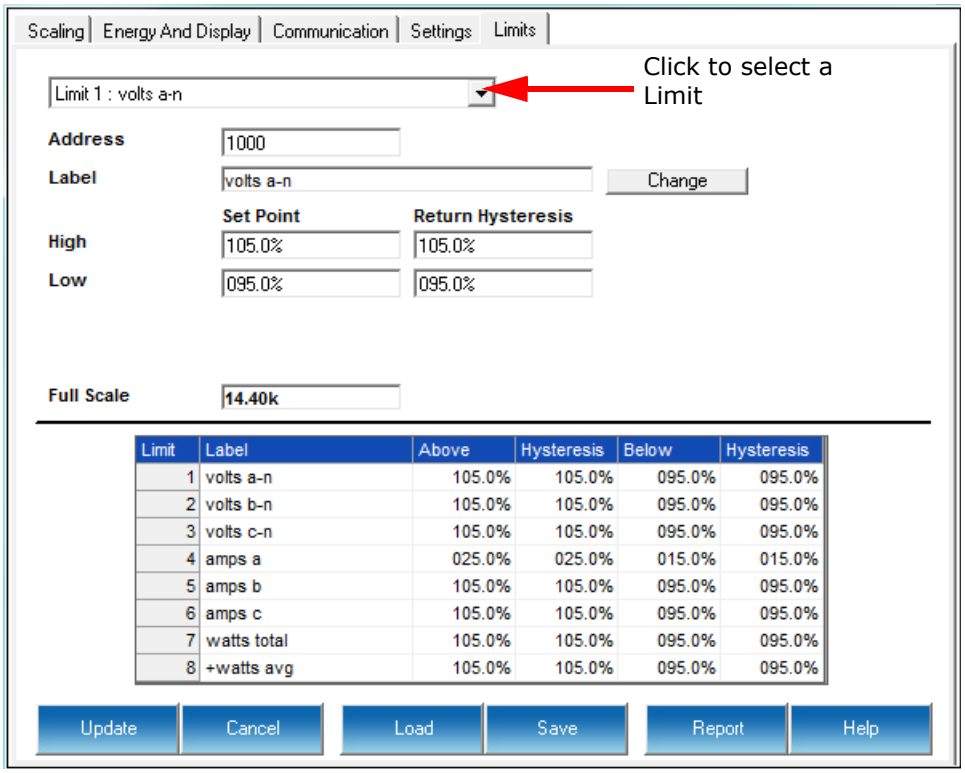
Use this screen to assign Limits for the EPM 6000/6100 meter with Software Option D.

Functional Overview for Limits:

Limits are transition points used to divide acceptable and unacceptable measurements. When a value goes above or below the limit, an out-of-limit condition occurs. You can set and configure up to eight Limits for the meter.

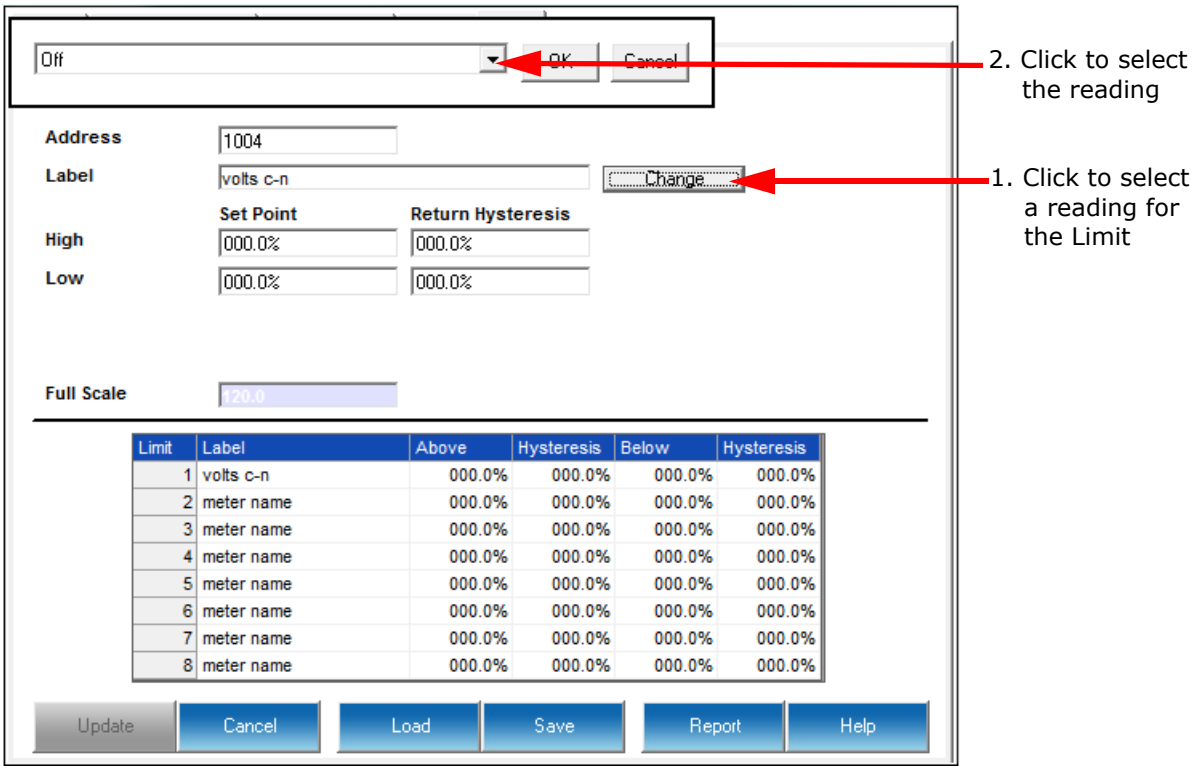
Once they are configured, you can view the out-of-Limits (or Alarm) conditions in the Limits Log (see Chapter 19 "Viewing Logs") or Limits Polling screen (see Chapter 5 "Polling Your Meter").

1. From the Device Profile screen, click the **Limits** tab.



Limit	Label	Above	Hysteresis	Below	Hysteresis
1	volts a-n	105.0%	105.0%	095.0%	095.0%
2	volts b-n	105.0%	105.0%	095.0%	095.0%
3	volts c-n	105.0%	105.0%	095.0%	095.0%
4	amps a	025.0%	025.0%	015.0%	015.0%
5	amps b	105.0%	105.0%	095.0%	095.0%
6	amps c	105.0%	105.0%	095.0%	095.0%
7	watts total	105.0%	105.0%	095.0%	095.0%
8	+watts avg	105.0%	105.0%	095.0%	095.0%

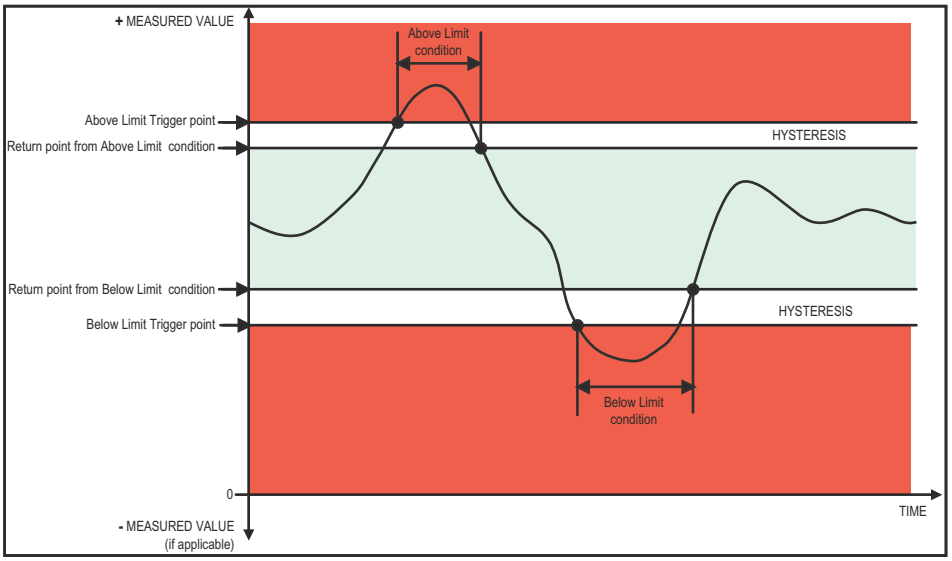
2. Select the Limit you want to set from the pull-down menu. You can set up to eight limits.
3. Click the **Change** button to select a reading value for the limit.



4. A small window opens at the top of the screen. Click on the pull-down menu to select the reading you want to set the limit for - e.g., voltage a-n. The address field changes to contain the Modbus address of the reading you select, and the Full Scale field changes to contain the full scale value for the reading. (When you first display this screen, all of the limits have "meter name" as their default; the address field displays 1, which is the Modbus address of the meter name field; and the Full Scale field displays 0.)
   - The available readings are:
     - Off (no limit is set)
     - Volts phase to phase and phase to reference
     - Amps A, B, C
     - Total Watts, VAR, and VA
     - Power Factor total
     - Frequency
     - Whrs Received, Delivered, Net, and Total
     - VARhrs Positive, Negative, Net, and Total
     - VAhrs Total
     - Amps per Phase Average/Minimum Average/
     - + and - Watts and VARs Average
     - VA Average

- + and - Power Factor Average
- Volts Phase to Phase and Phase to Reference Minimum/Maximum
- Amps per Phase Minimum Average/Maximum Average
- + and - Watts and VARs Minimum Average/Maximum Average
- VA Minimum Average/Maximum Average
- + and - Power Factor Minimum Average/Maximum Average
- Frequency Minimum/Maximum
- Current per Phase A, B, C
- Voltage Angles a-b, b-c, c-a
- Neutral Current

5. To configure the Limit, double-click in the following fields to set their values:
   - Above and Below Set Point: of Full Scale (the point at which the reading goes out of limit: see figure on the next page)
     For example:
     100 of 120V Full Scale = 120V
     90 of 120V Full Scale = 108V
   - Above and Below Return Hysteresis (the point at which the limit's status changes from out of limit to within limit: see figure below)
     For example:
     Above Set Point = 110Below Set Point = 90
     (Out of Limit above 132V)(Out of Limit below 108V)
     Above Return Hysteresis = 105Below Return Hysteresis = 95
     (Stay Out of Limit until below 126V) (Stay Out of Limit until above 114V)



NOTE

- If the Above Return Hysteresis is greater than the Above Set Point, the Above Limit is Disabled; if the Below Return Hysteresis is less than the Below Set Point, the Below Limit is Disabled. You may want to use this feature to disable either the Above Limit or Below Limit condition for a reading.

- If you are entering negative limits, be aware that the negative value affects the way the above and below limits function, since negative numbers are processed as signed values.

6. To implement any changes, click the **Update Device** button to send the new profile to the meter.

GE Communicator

Chapter 10: EPM 4600 Metering System

This chapter explains how to configure an EPM 4600 metering system's programmable settings, which are stored in the unit's Device Profile. Chapter 7 “Device Profile” contains detailed information on the Device Profile.

10.1 Device Profile General Settings

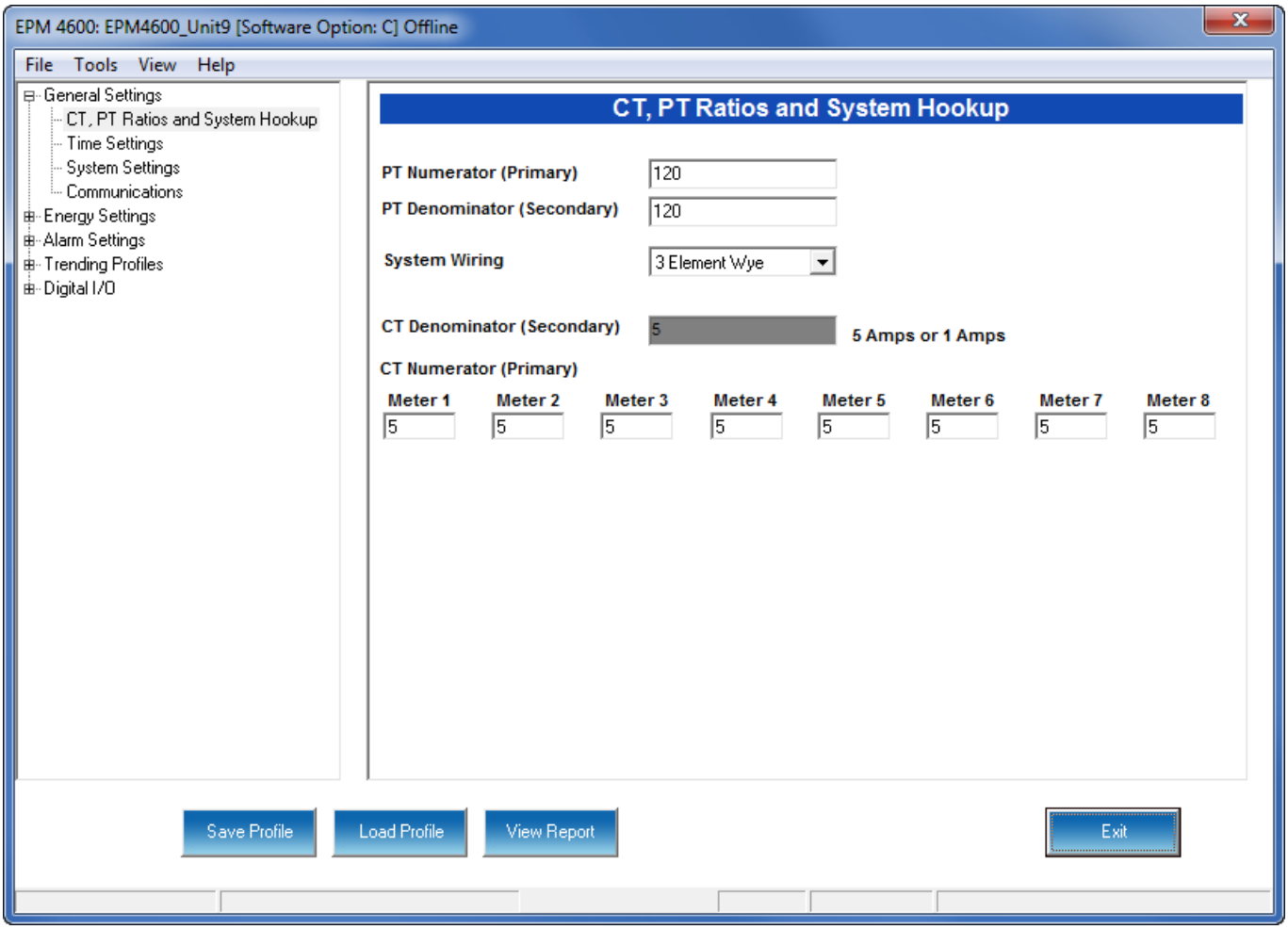
1. From the Tree Menu on the left side of theEPM 4600 metering system’s Device Profile screen, double-click on the General Settings line or click on the + button next to it. All of the settings in the General Settings group are listed.

   The EPM 4600 metering system comes in two types:

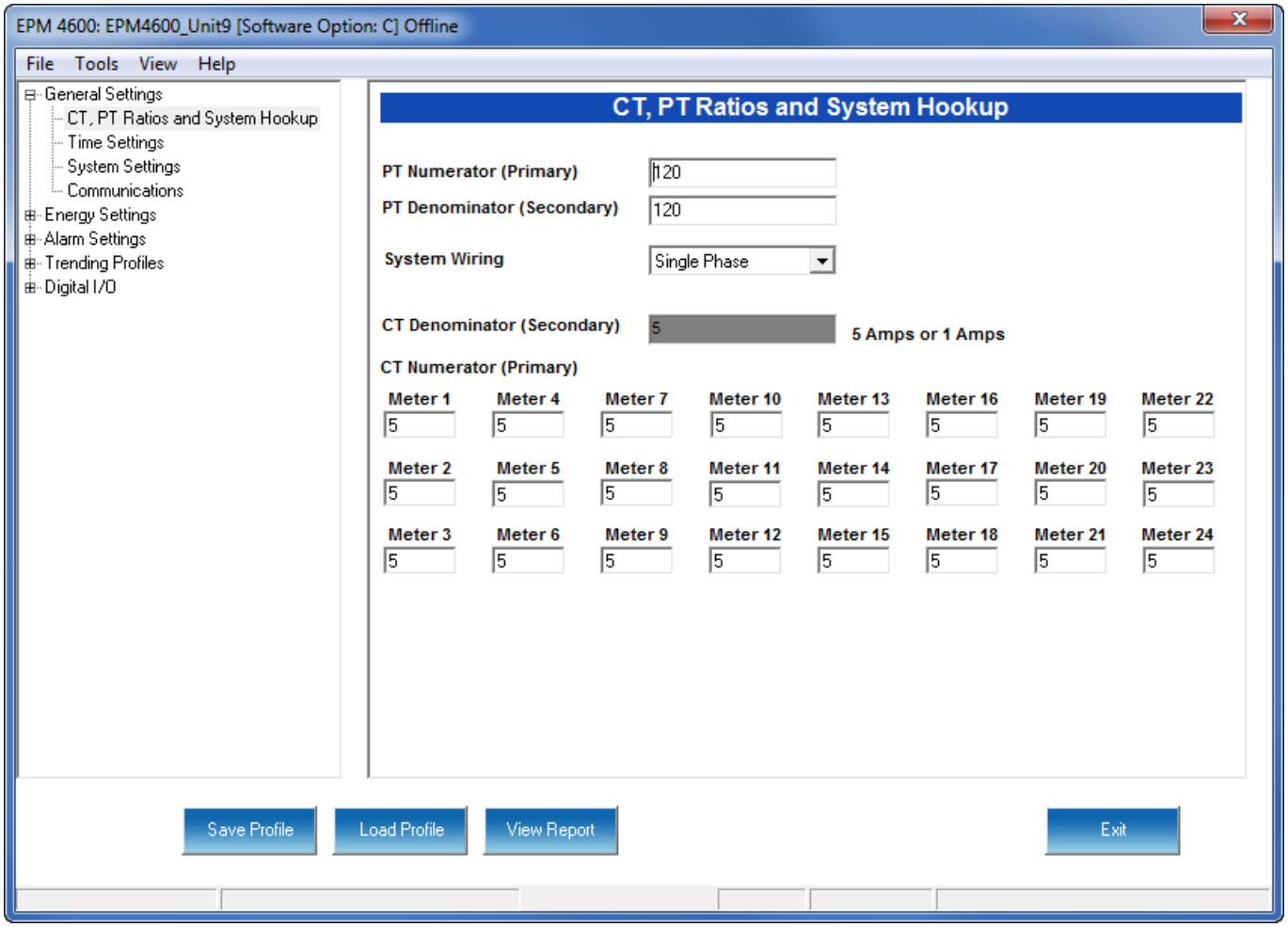
   - The EPM 4600-T - this version has eight three phase connections and provides an output for eight three phase meters.
   - The EPM 4600-S - this version acts as a single phase meter providing an output for all 24 single phase circuits.

NOTE

Many of the settings differ between the EPM 4600-T three phase configuration and the EPM 4600-S single phase configuration. Instructions for both configurations are given when there are differences.



Since the EPM 4600-T is a three phase meter, there are only eight sets of CT settings: one for each of the CTs needed for a single three phase circuit.



With the EPM 4600-S there are 24 individual circuits being measured, and since the CTs can be different on all of them, each of the 24 CTs can be configured individually.

10.1.1 Configuring CT, PT Ratios and System Hookup

The first screen you see is the CT, PT Ratios and System Hookup screen, shown on the previous two pages (to return to this screen from another screen, click General Settings>CT, PT Ratios and System Hookup). Use this setting to configure Current Transformer and Potential Transformer ratios and to select the System Hookup.

Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

1. Make your settings in the following fields:
   - PT Ratios
     - PT Numerator (Primary): 1 - 9999
     - PT Denominator (Secondary): 40 - 600
     - PT Multiplier (Scaling): 1, 10, 100, or 1000
     - Voltage Full Scale: Display only.
   - System Wiring
     - 3 Element Wye; 2.5 Element Wye; 2 CT Delta
       This value must be set properly for the meter to calculate readings correctly.
   - CT Ratios
     - CT Numerator (Primary): 1 - 9999

NOTE

This field is different for the EPM 4600-T and EPM 4600-S: there are 8 CT Numerator fields for the EPM 4600-T and 24 CT numerator fields for the EPM 4600-S; in each case, one for each circuit.

     - CT Denominator (Secondary): 5 or 1 Amp

NOTE

This field is display only. The meter is ordered as a 5 Amp or 1 Amp Current Secondary.

     - CT Multiplier (Scaling): 1, 10 or 100
       This multiplier is for the display. The display can only read 4 digits, or 9999. Above that range the number must be multiplied to have it read K or M values.
     - Current Full Scale: Display only.

Example Settings:

For a CT of 2000/5A, set the following CT Ratios in the entry fields:

CT Numerator (Primary) 2000

CT Denominator (Secondary) 5

CT Multiplier 1

The Current Full Scale field will read 2000.

For a system that has 14400V primary with a 120V secondary line to neutral (PT Ratio of 120:1), set the following PT Ratios in the entry fields:

PT Numerator (Primary) 1440

PT Denominator (Secondary) 120

PT Multiplier 10

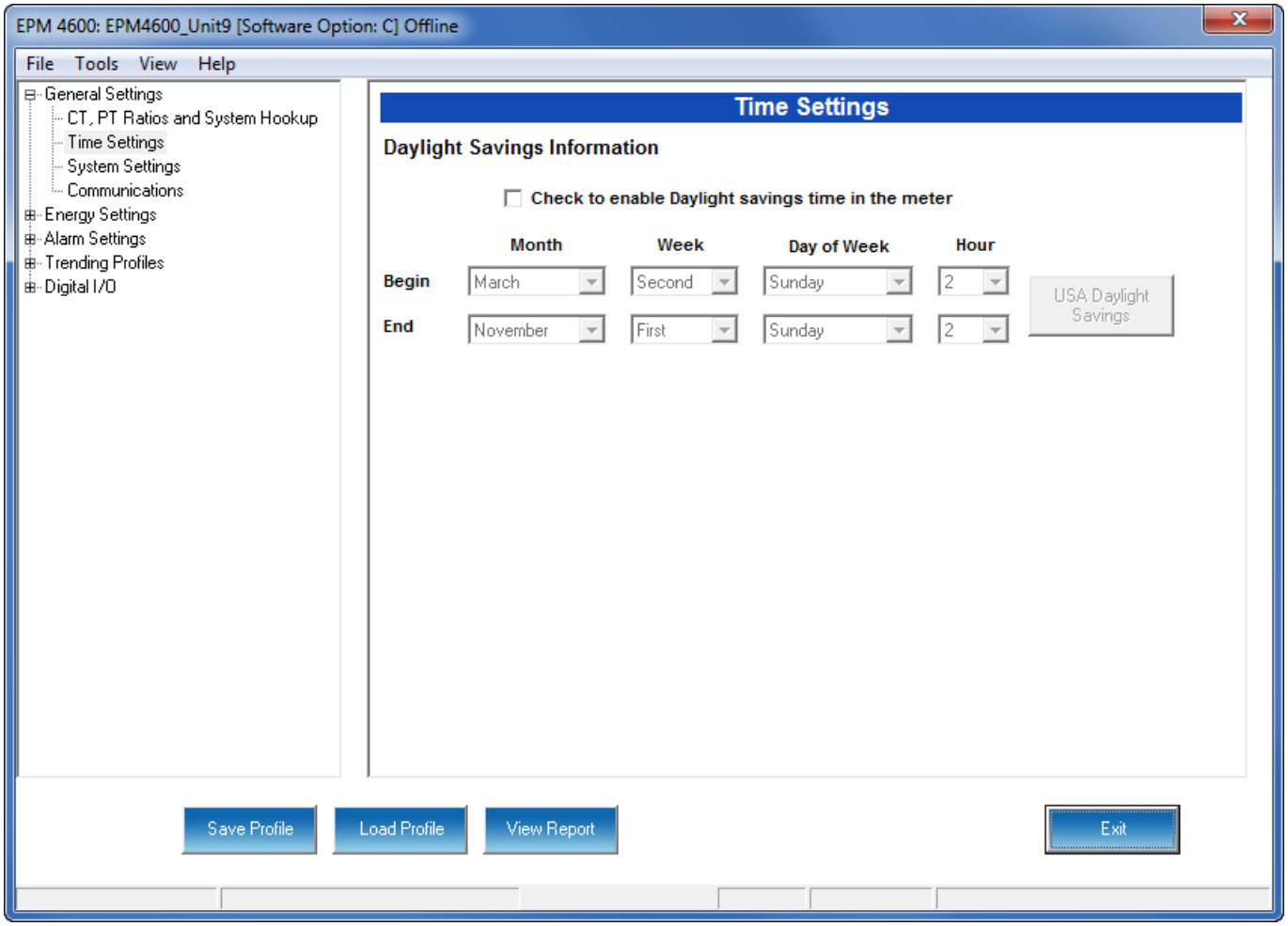
The Voltage Full Scale field will read 14.4k.

2. To implement any changes, click the Update Device button to send the new profile to the meter.

10.1.2 Configuring Time Settings

Use this setting to enable or disable Daylight Savings Time for the meter, to set the beginning and ending times for Daylight Savings Time, and to set up Time Zone information and clock synchronization information. This screen is the same whether you are connected to an EPM 4600-T or an EPM 4600-S.

1. From the Tree Menu, click **General Settings > Time Settings**.



2. Check the box to Enable Daylight Savings time, or un-check it to Disable Daylight Savings Time.

3. Use the entry fields to set the start and end times for the Daylight Savings Time feature, if enabled. Select the values you want from the Month, Week, Day of the Week, and Hour fields.

NOTE

The Hour field uses a 24-Hour clock.

4. To implement any changes, click the Update Device button to send the new profile to the meter.

10.1.3 Configuring System Settings

Use the system settings to set password protection and a meter ID. You can enable or disable a Password for Resetting (Reset Max/Min Energy Settings, Energy Accumulators (three phase configuration only), and the Individual Logs) and Configuration (Device Profile) in the Systems Settings screen. This screen differs between the EPM 4600-T and EPM 4600-S: the number of meter name fields is different (see the screens on the next two pages).

Once password protection is enabled for the meter and the Device Profile is updated, anyone who attempts to make a change that is under password protection is prompted to enter the password. If the correct Password is not entered, the change doesn't take place.

NOTE

If you enable a Password for Resetting, you must also enable it for Configuration.

1. From the Tree Menu, click **General Settings > System Settings**.

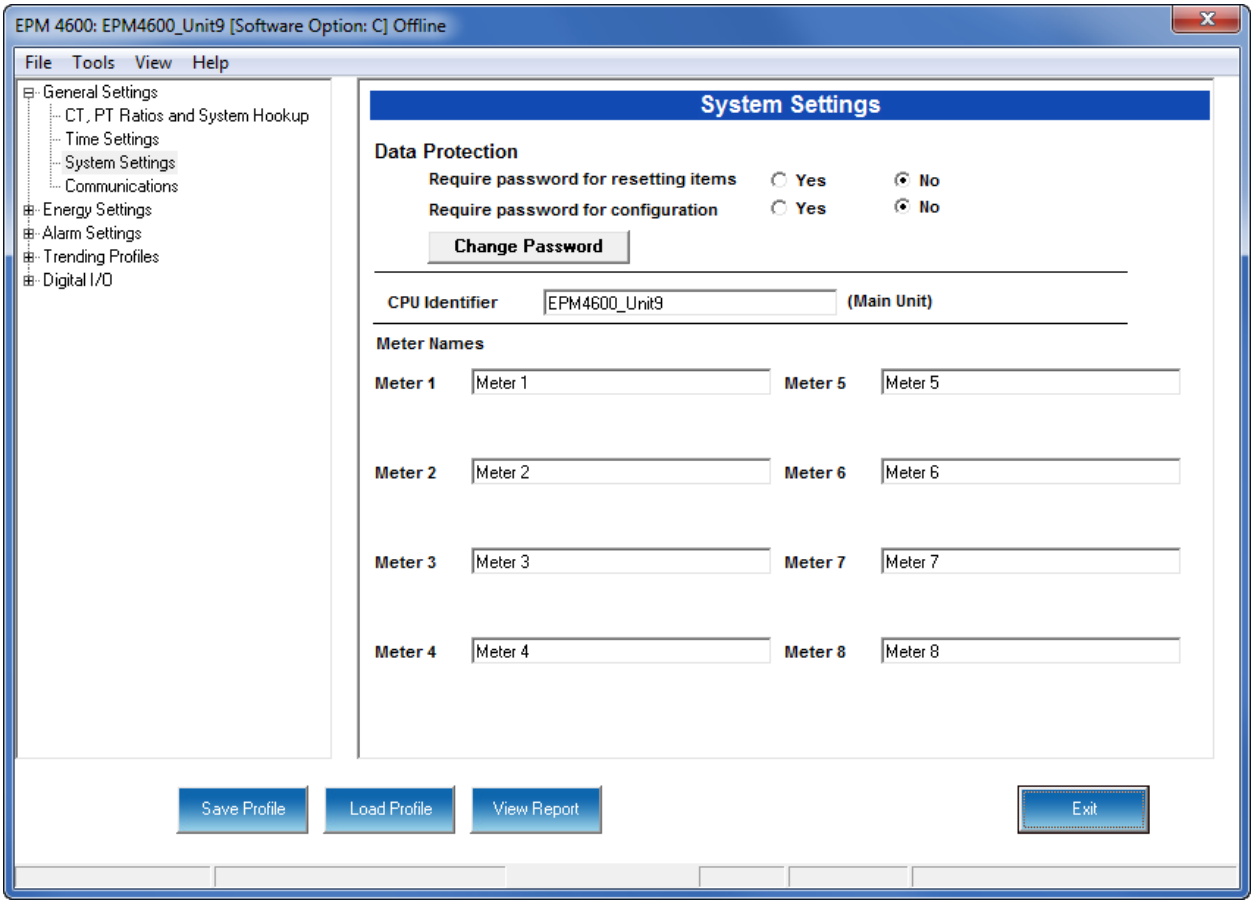


Figure 10-1: EPM 4600-T System Settings Screen

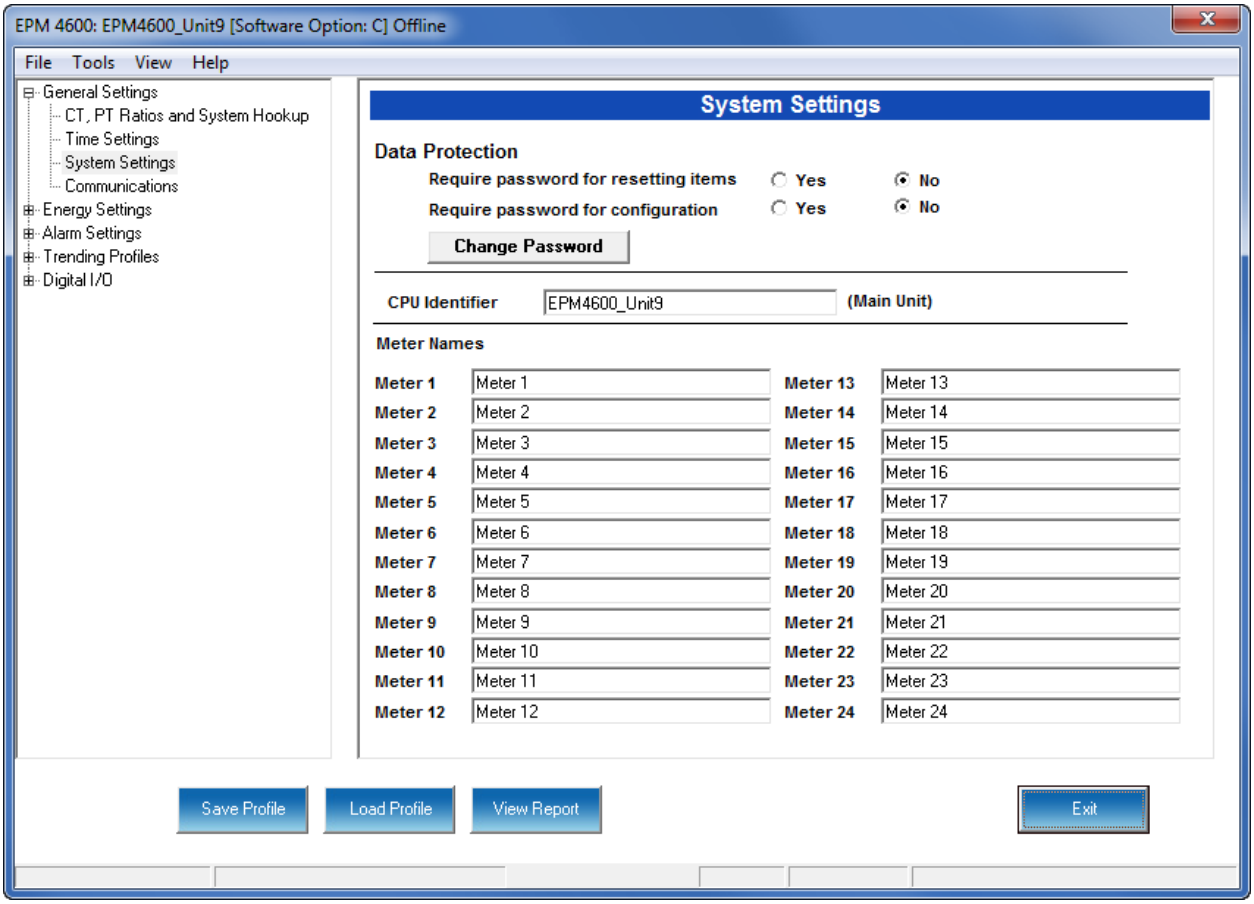


Figure 10-2: EPM 4600-S System Settings Screen

2. From this screen, you can do the following:
   - Enable or Disable Password for Resetting and/or Configuration: click the radio button next to Yes or No. Enabling Password protection prevents unauthorized tampering with devices.

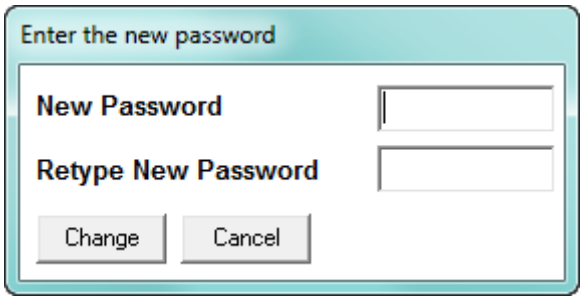
NOTE

You must set up a password before enabling Password Protection. Click the Change button next to Change Password if you have not already set up a password.

- Change the Password: click the **Change** button.
- Enter or change the CPU Identifier: input a new designation into this field. This identification is the name given to the main metering module - it is not the name of the metering locations.
- Enter a name for each of the meters: 8 for the EPM 4600-T and 24 for the EPM 4600-S. These names are used to identify the meters in logging and polling screens and are also used in the naming of the log files.

For example, if you have a shopping mall with 8 stores, each having a three phase system that is attached to the EPM 4600-T, you can name the meters Store 1 - Store 8, to identify each meter with its store. Then when you look at the polling screens or logging screens, you can easily identify each store's data, without needing to check the circuit configuration.

3. When you click the **Change** button next to Change Password in the Settings screen, you will see the Enter the New Password screen.



- Type in the new password (0 -9999).
- Retype the password.
- Click **Change**. The new password is saved and you see the following message window.

NOTES: If Password Protection has already been enabled for configuration and you attempt to change the password, you will see the Enter Password screen after you click Change. Enter the old password and click OK to proceed with the password change.

4. To implement any changes, click the Update Device button to send the new profile to the meter.

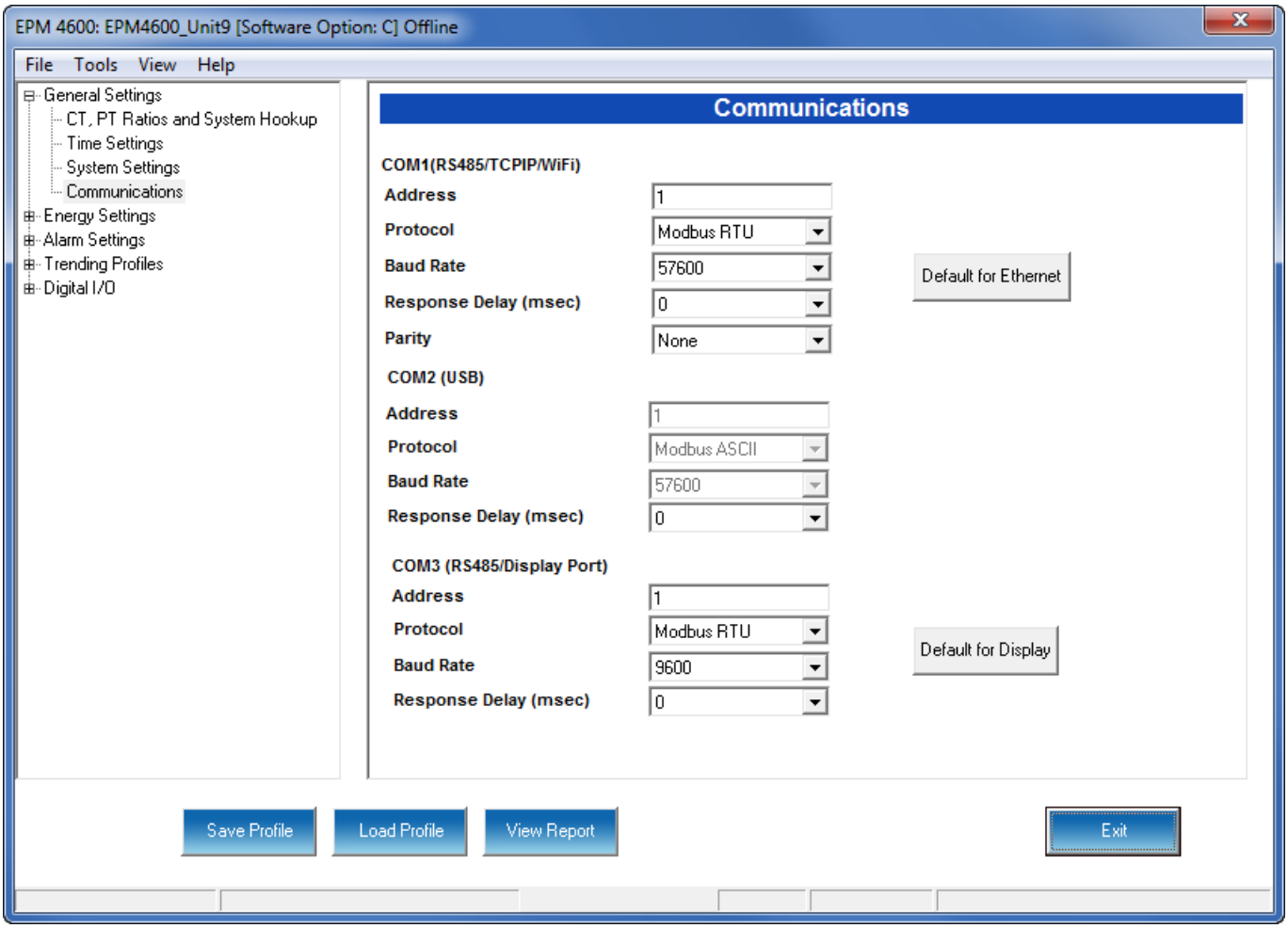
10.1.4 Configuring Communication Settings

Use this screen to enter communication settings for the EPM 4600 unit's Communication ports. This screen is the same for the EPM 4600-T and EPM 4600-S.

NOTE

IMPORTANT! The settings on this screen are the current settings for communication. Any changes you make may affect communication between the EPM 4600 and your PC.

1. From the Tree Menu, click **General Settings > Communications.**



2. Valid Communication Settings are as follows:
   - COM 1: RS485/ Ethernet/WIFI (optional)
     - Address: 1-247
     - Baud Rate: 9600, 19200, 38400, 57600 (For WiFi/Ethernet, only 57600)
     - Protocol: Modbus RTU/ASCII (For WiFi/Ethernet, only Modbus RTU)
     - Response Delay: 0-750ms

NOTE

Response Delay is the delay the meter should use before responding to queries. If your connecting device requires a delay before receiving information, use response delay to program the time to wait before the meter starts responding to queries.

     - Parity: Odd, Even or None
   - COM 2: USB port: The USB port settings are fixed, i.e., they cannot be changed.
     - Protocol: MODBUS ASCII
     - Baud Rate: 57600
     - Address: 1
   - COM 3: RS485

- Address: 1-247
- Protocol: Modbus RTU/ASCII
- Baud Rate: 9600, 19200, 38400, 57600
- Response Delay: 0-750ms: see the note on response delay, above.

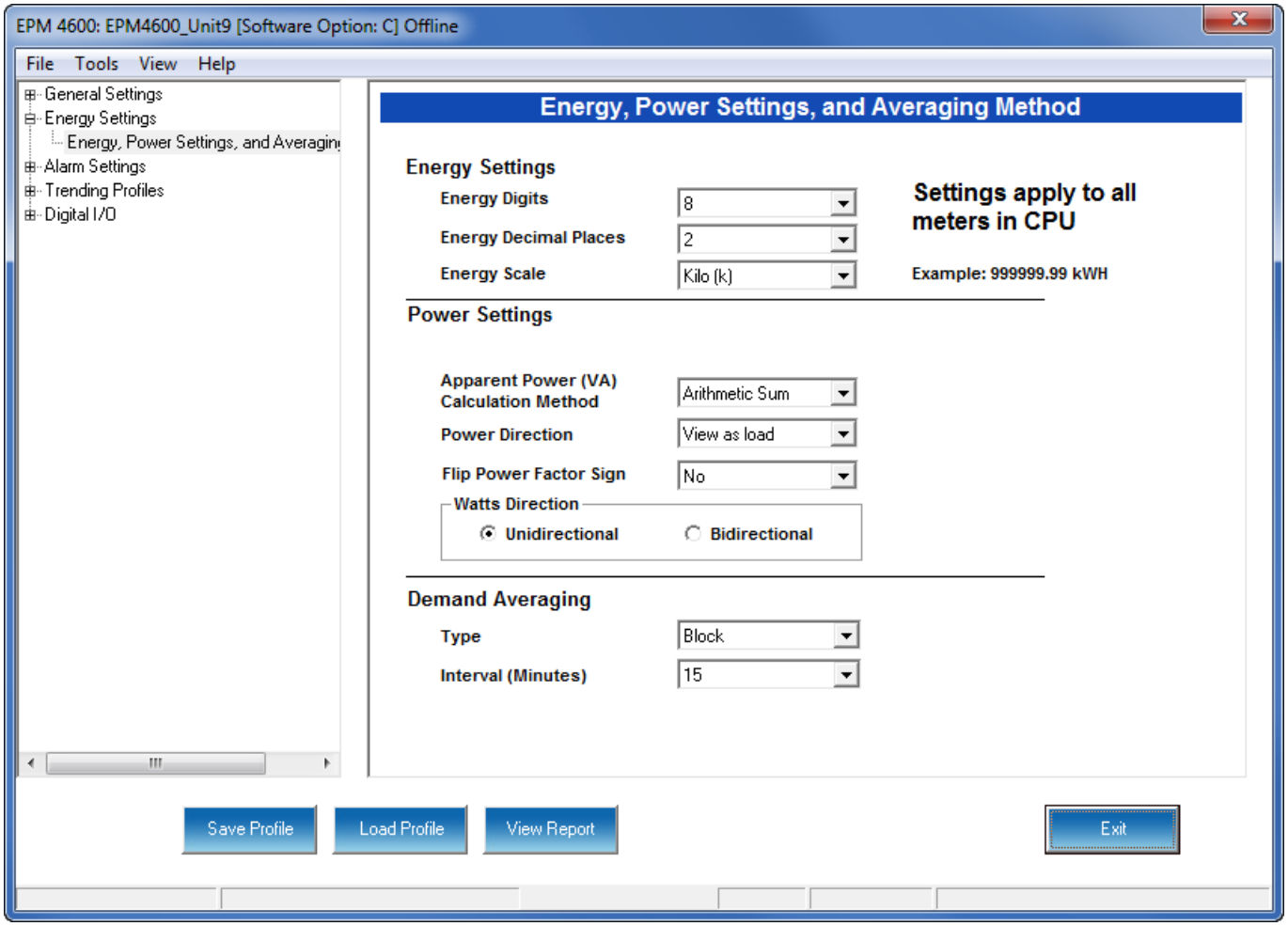
3. You can click the (1)Default to Ethernet or (2)Default to Display button to return either the (1)Ethernet settings for COM1 or (2)Display settings for COM3, to their default values.
4. To implement any changes, click the Update Device button to send the new profile to the meter.

NOTE

For information on configuring the EPM 4600 metering system's optional WiFi and Ethernet settings, see the *EPM 4600 Instruction Manual*.

10.2 Energy Settings

From the Tree Menu on the left side of the EPM 4600 metering system's Device Profile screen, double-click on the **Energy Settings** line or click on the **+** button next to it. The setting in the Energy Settings group is listed.



10.2.1 Configuring Energy, Power Scaling, and Averaging

Use this setting to configure:

- The display and storage of Energy data in the metering module (CPU)
- The display of Power data in the metering module (CPU) and the method of VA computation
- The interval over which Average values are computed

This screen is the same for the EPM 4600-T and EPM 4600-S units. Note that these settings are consistent for all of the metering points.

Functional Overview of Energy Settings, VA Computation, and Averaging:

- **Energy Scaling**
  Energy Setting includes:
  Digits (the number of digits in the reading)
  Decimals (the number of decimal places in the reading)
  Energy Scale: the scale of the reading - unit; kilo (number times 1000); Mega (number times 1 million)

  Energy settings allow you to balance the resolution (or accuracy) of the energy stored, with the interval over which energy rollover occurs. For example, the maximum resolution for a k scale reading is: 99999.999k.

  To calculate the speed at which the energy will rollover, you must know the Energy Full Scale, which is computed from the CT and PT Full Scale values (see 5.3.1.1 *Poll Power and Energy (EPM Meters)*). The formula for calculating Energy Full Scale is:
  Wye system: CT Full Scale x PT Full Scale x 3
  Delta system: CT Full Scale x PT Full Scale x 3 x $\sqrt{3}$

  For example, for a CT Full Scale of 2000, PT Full Scale of 14400, Wye system:
  2000 x 14400 x 3=86400000
  In this example, the energy will increment at 86400000 Watts per hour, or 24000 Watts per second.

  This value allows you to determine the number of digits, decimal places, and energy scale you want to configure for the Energy settings, when you take into account the rollover time.

  To determine the number of hours before rollover, use this formula:
  [Max Resolution]/[Full Scale] = #Hours, where Max Resolution = maximum digits and decimals for the Energy scale in use.

  Using the example from above, with an energy scale of Mega, the formula would be:
  99999.999 M/86.4 M = 1157.4074 hours or about 48 days until rollover.

  NOTE

  To increase the number of days until rollover, you can increase the number of digits (to 8), decrease the number of decimal places (to 0), or increase the Energy Scale (to M).

- **Apparent Power (VA) Computation**:

  There are two optional methods of VA Computation:

  Arithmetic Sum - the formula for this calculation is:

$$VA_T = VA_a + VA_b + VA_c$$

Vector Sum - the formula for this calculation is:

$$VA_T = \sqrt{W_T^2 + VAR_T^2}$$

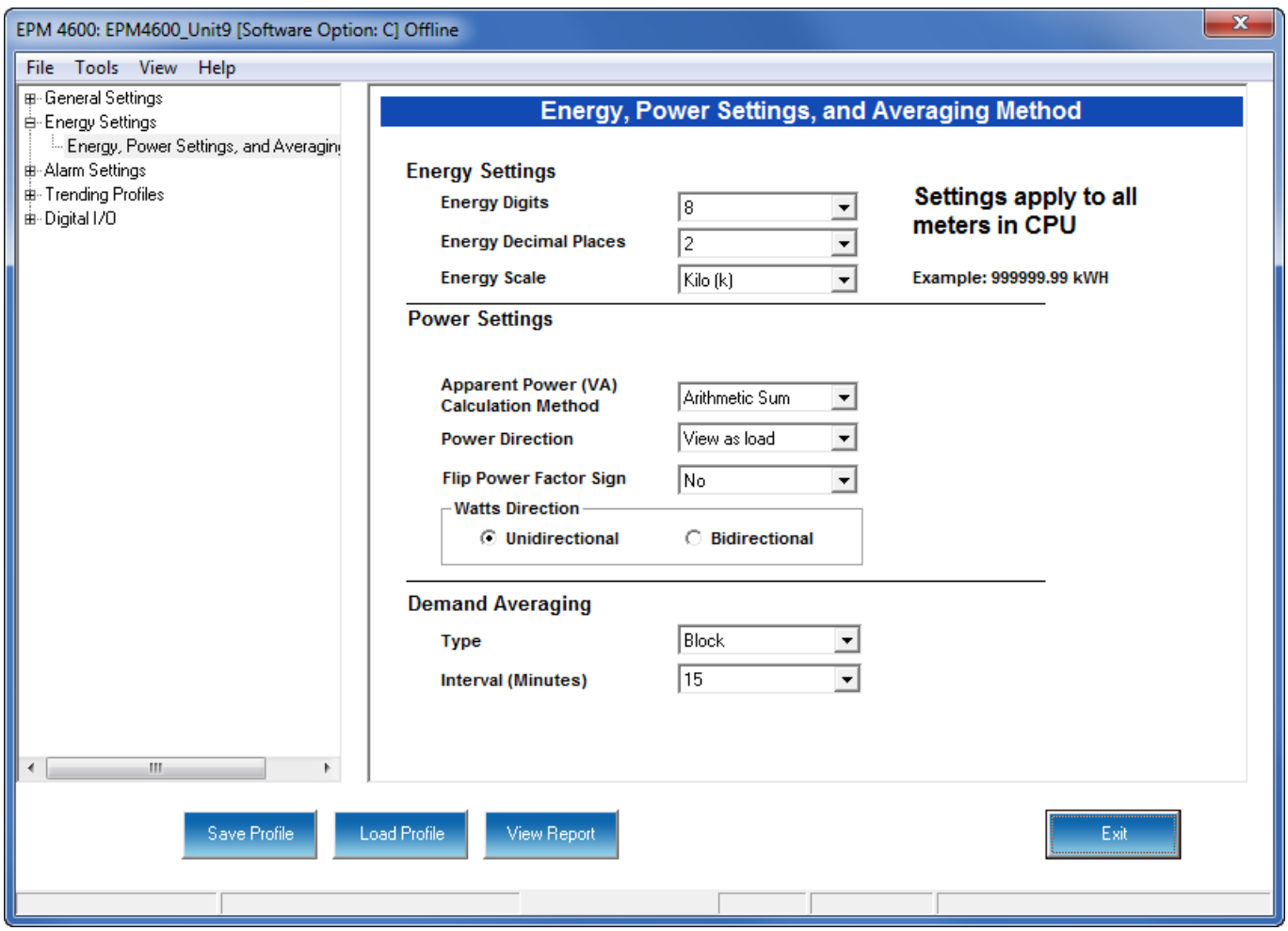
Generally, the superior method for calculating VA is to use the Vectoral method; however, both methods are provided.

- **Demand Averaging**
  Demand is the average rate of energy use over time. The EPM 4600 metering system
  supports two types of demand averaging: Block demand and Rolling demand.

  Block demand records the average demand for time intervals that you define (usually 5, 15 or 30 minutes).

  Rolling demand functions like multiple, overlapping Block demands. You define the subintervals at which an average of demand is calculated. An example of Rolling demand would be a 15-minute Demand block using 5-minute subintervals, thus providing a new demand reading every 5 minutes, based on the last 15 minutes.

1. From the Tree Menu, click **Energy Settings > Energy, Power Scaling, and Averaging**.



2. The screen fields and acceptable entries are as follows:
   - Energy Settings
     - Energy Digits: 5; 6; 7; 8
     - Energy Decimal Places: 0 - 6
     - Energy Scale: unit; kilo (K); Mega (M)

       For example: a reading for Digits: 8; Decimals: 3; Scale: K would be formatted: 00123.456k

NOTE

- Your selection in the Energy Settings fields determines the precision of energy stored for display and polling. Refer to the Functional Overview at the beginning of this section for more information.
- If you are changing the energy settings, we recommend you first reset the Energy Accumulators, in order to prevent erroneous counts. See Chapter 20 "Other Functions and Screens" for instructions on resetting the EPM 4600 metering system's Energy Accumulators.
   - Power Settings
     - Power Scale: Auto; unit; kilo (K); Mega (M)
     - Apparent Power (VA) Calculation Method: Arithmetic Sum; Vector Sum (See explanation on the previous page.)
   - Demand Averaging
     - Type: Block or Rolling
     - Interval (Block demand) or Sub-Interval (Rolling demand): 5; 15; 30; 60
     - Number of Subintervals: 1; 2; 3; 4
     - Interval Window: This field is display only. It is the product of the values entered in the Sub-Interval and Number of Subintervals fields.

NOTE

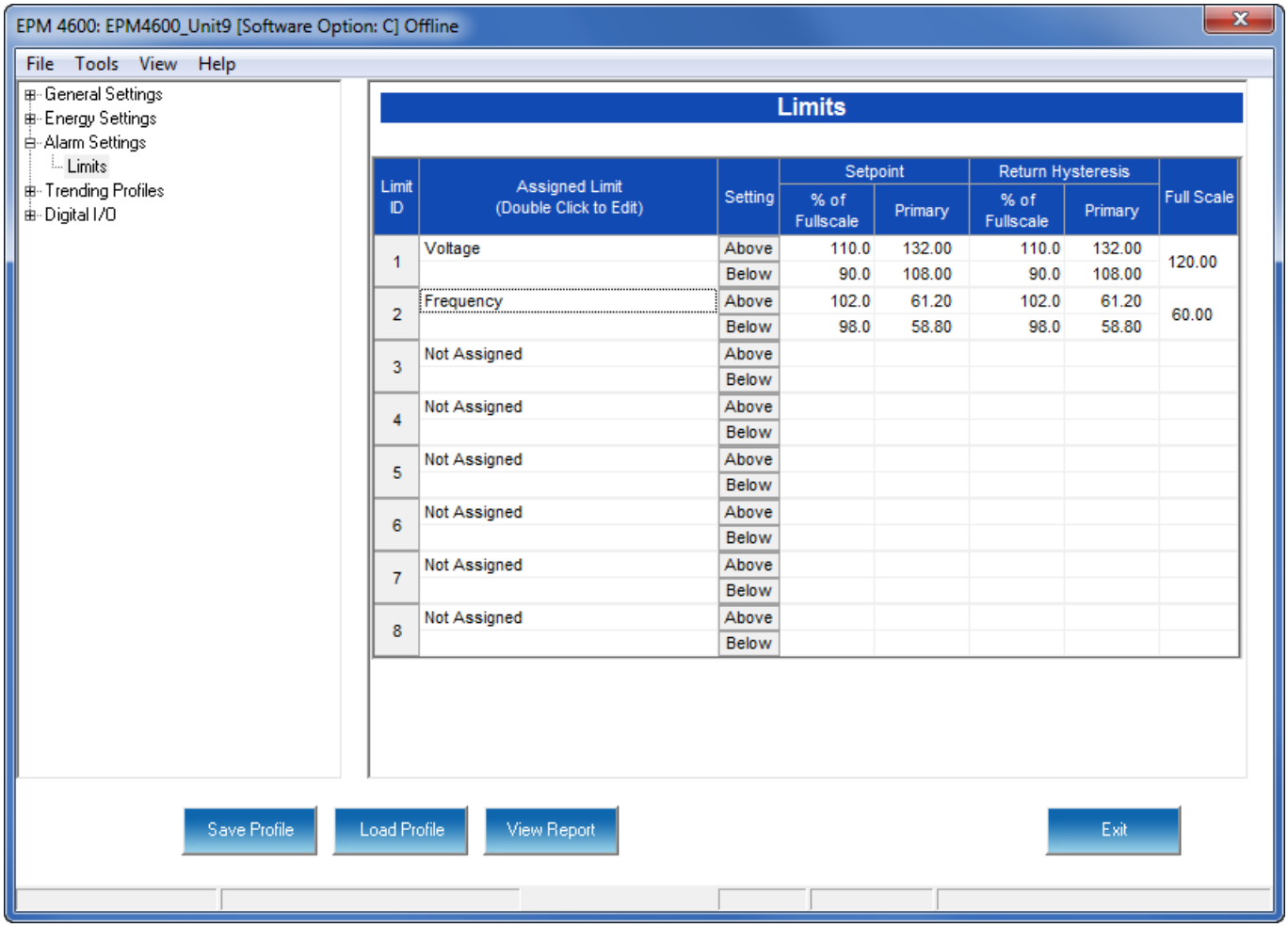
You will only see the Number of Subintervals and Interval Window fields if you select Rolling demand.

As the message on the screen states, the energy settings you make apply to all of the meters in the CPU (8 for the EPM 4600-T and 24 for the EPM 4600-S).

3. To implement any changes, click the Update Device button to send the new profile to the meter.

10.3 Alarm Settings

From the Tree Menu on the left side of the EPM 4600 metering system's Device Profile screen, double-click on the Alarm Settings line or click on the + button next to it. The setting in the Alarm Settings group is listed.



Limit ID	Assigned Limit (Double Click to Edit)	Setting	Setpoint % of Fullscale	Setpoint Primary	Return Hysteresis % of Fullscale	Return Hysteresis Primary	Full Scale
1	Voltage	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
2	Frequency	Above	102.0	61.20	102.0	61.20	60.00
		Below	98.0	58.80	98.0	58.80	
3	Not Assigned	Above					
		Below					
4	Not Assigned	Above					
		Below					
5	Not Assigned	Above					
		Below					
6	Not Assigned	Above					
		Below					
7	Not Assigned	Above					
		Below					
8	Not Assigned	Above					
		Below					

10.3.1 Configuring Limits

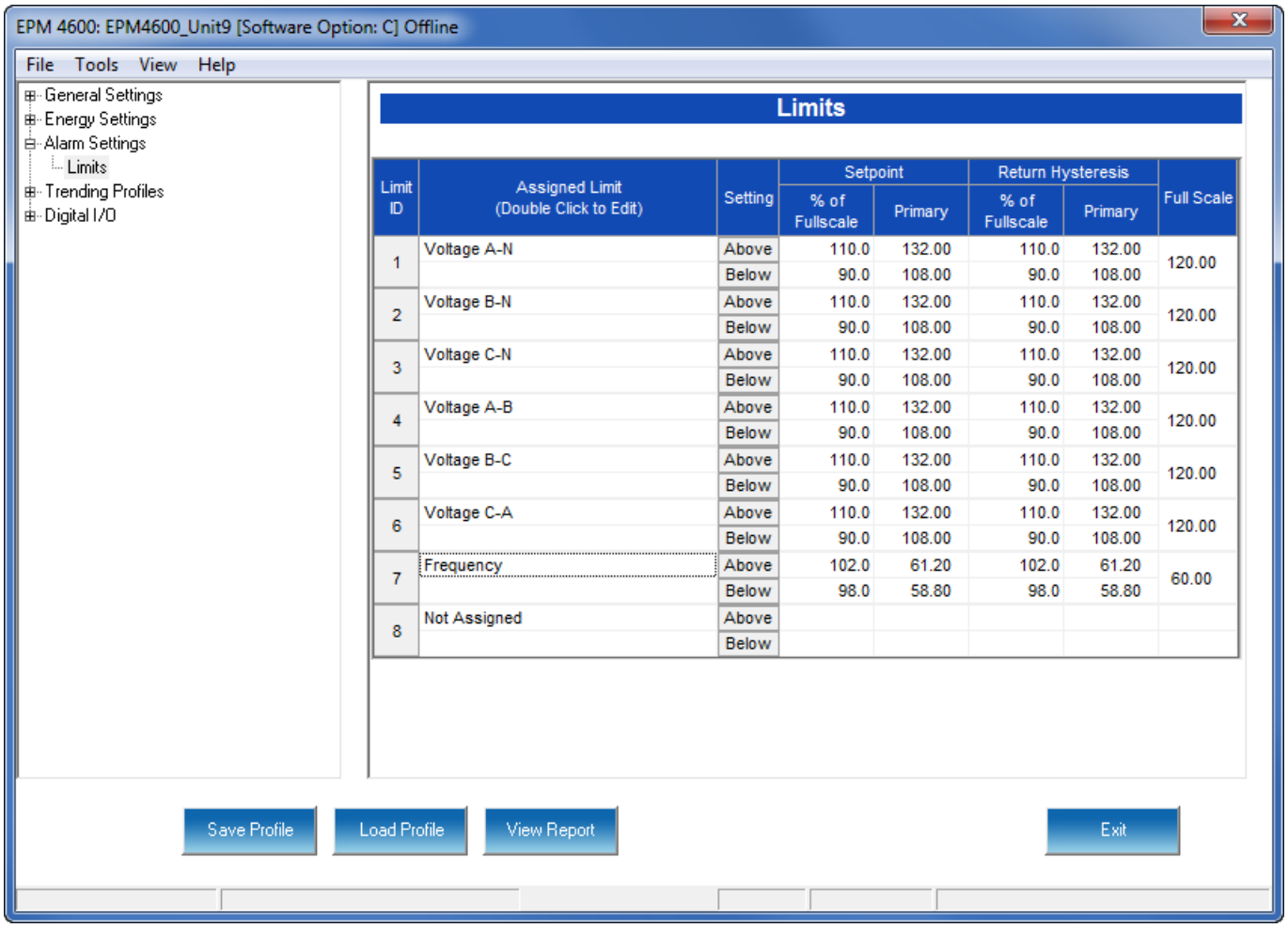
Use this screen to assign Limits for the EPM 4600 metering system. This screen differs for the EPM 4600-T and EPM 4600-S units.

Functional Overview for Limits:

Limits are transition points used to divide acceptable and unacceptable measurements. When a value goes above or below the limit, an out-of-limit condition occurs. You can set and configure up to eight Limits for the EPM 4600 metering system.

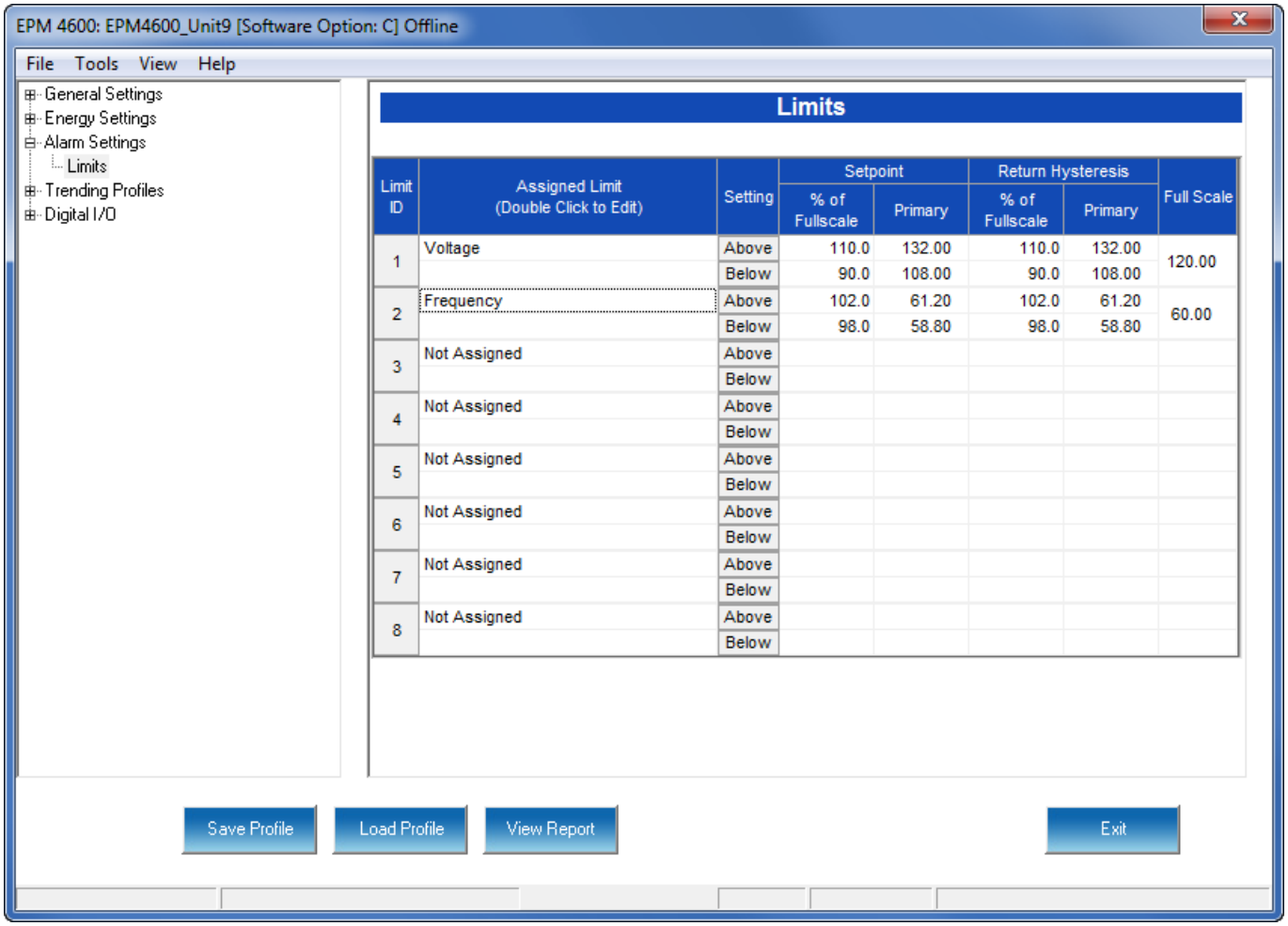
Once they are configured, you can view the out-of-Limits (or Alarm) conditions in the Limits Log (see Chapter 19 "Viewing Logs") or Limits Polling screen (see Chapter 5 "Polling Your Meter"). You can also use Limits to trigger relays.

1. From the Tree Menu, click **Alarm Settings > Limits**. The current settings for Limits are shown in the screen.



Limit ID	Assigned Limit (Double Click to Edit)	Setting	Setpoint % of Fullscale	Setpoint Primary	Return Hysteresis % of Fullscale	Return Hysteresis Primary	Full Scale
1	Voltage A-N	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
2	Voltage B-N	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
3	Voltage C-N	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
4	Voltage A-B	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
5	Voltage B-C	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
6	Voltage C-A	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
7	Frequency	Above	102.0	61.20	102.0	61.20	60.00
		Below	98.0	58.80	98.0	58.80	
8	Not Assigned	Above					
		Below					

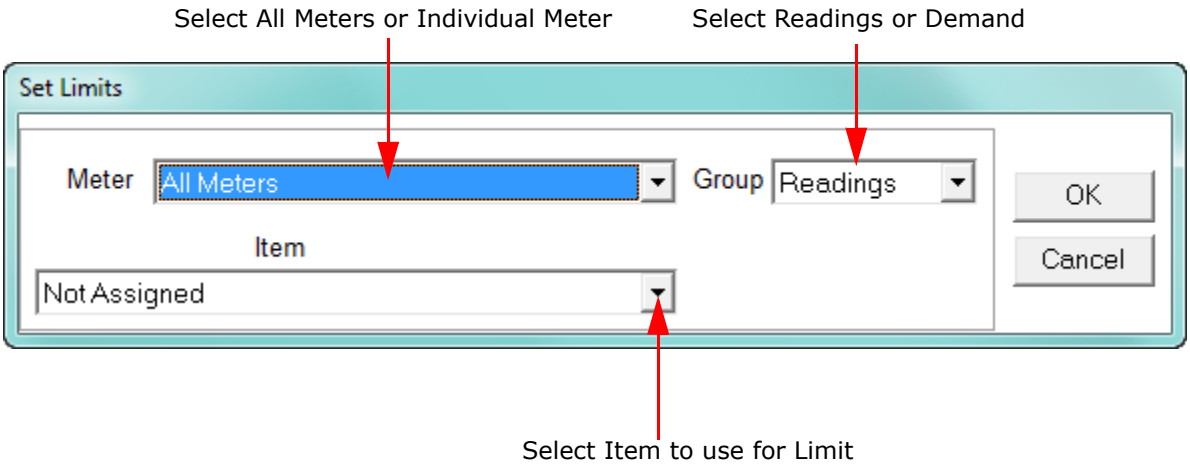
Figure 10-3: EPM 4600-T Limits Screen



Limit ID	Assigned Limit (Double Click to Edit)	Setting	Setpoint % of Fullscale	Setpoint Primary	Return Hysteresis % of Fullscale	Return Hysteresis Primary	Full Scale
1	Voltage	Above	110.0	132.00	110.0	132.00	120.00
		Below	90.0	108.00	90.0	108.00	
2	Frequency	Above	102.0	61.20	102.0	61.20	60.00
		Below	98.0	58.80	98.0	58.80	
3	Not Assigned	Above					
		Below					
4	Not Assigned	Above					
		Below					
5	Not Assigned	Above					
		Below					
6	Not Assigned	Above					
		Below					
7	Not Assigned	Above					
		Below					
8	Not Assigned	Above					
		Below					

Figure 10-4: EPM 4600-S Limits Screen

2. To set or change a Limit:
   - Select a limit by double-clicking on the Assigned Limit field.
   - You will see the screen shown below.

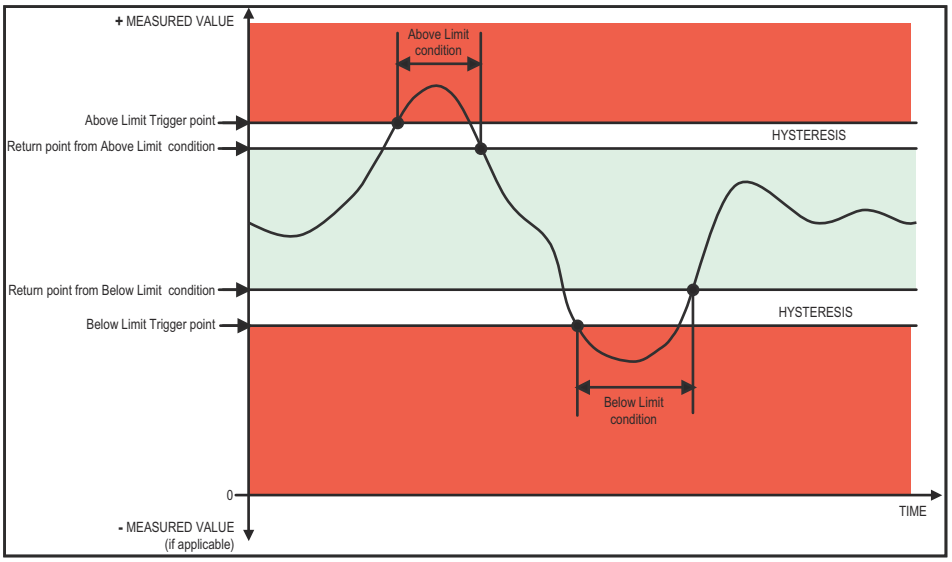


- This screen lets you configure the limits. The settings you can make depend on your EPM 4600 unit's configuration:
  - For an EPM 4600-T three phase configuration, you can set up limits from the Readings group's items for all meters or any individual meter (select from the Meter pull-down menu).
    The items you can select for Readings limits for All Meters are: Phase to Neutral voltage, Phase to Phase Voltage, and Frequency.
    The items you can select for Reading limits for individual meters are: Current phases A, B, and C, Total Watts, Total VAR, Total VA, Total PF, Current Neutral, Watts per Phase, VAR per Phase, VA per Phase, and PF per Phase.

    The Demand group (select from the Group pull-down menu) can only have limits set for individual meters (not All Meters).
    The items you can select for Demand limits are: Current phases A, B, and C, Total +Watts, Total +VAR, Total -Watts, Total -VAR, Total VA, Total +PF, Total -PF, +Watts per Phase, -Watts per Phase, +VAR per Phase, -VAR per Phase, VA per Phase, + PF per Phase, and -PF per Phase.
  - For an EPM 4600-S single phase configuration, you can set up limits from the Readings group's items for All meters or any individual meter (select from the Meter pull-down menu).
    The Items you can select for Readings limits for All Meters are: Voltage and Frequency.
    The items you can select for Reading limits for individual meters are: Current, Watts, VAR, VA, and PF.

    The Demand group (select from the Group pull-down menu) can only have limits set for individual meters (not All Meters).
    The items you can select for Demand limits are: Current, +Watts, +VAR, -Watts, -VAR, VA, +PF, and -PF.
- Click **OK**. The Limit you selected will now appear in the Limits screen.

3. To configure a Limit, double-click on the following fields to set their values:
   - Above and Below Set Point: of Full Scale (the point at which the reading goes out of limit: see figure on the next page)
     For example:
     100 of 120V Full Scale = 120V
     90 of 120V Full Scale = 108V
   - Above and Below Return Hysteresis (the point at which the limit's status changes from out of limit to within limit: see figure on the next page)
     For example:
     Above Set Point = 110Below Set Point = 90
     (Out of Limit above 132V)(Out of Limit below 108V)
     Above Return Hysteresis = 105Below Return Hysteresis = 95
     (Stay Out of Limit until below 126V) (Stay Out of Limit until above 114V)



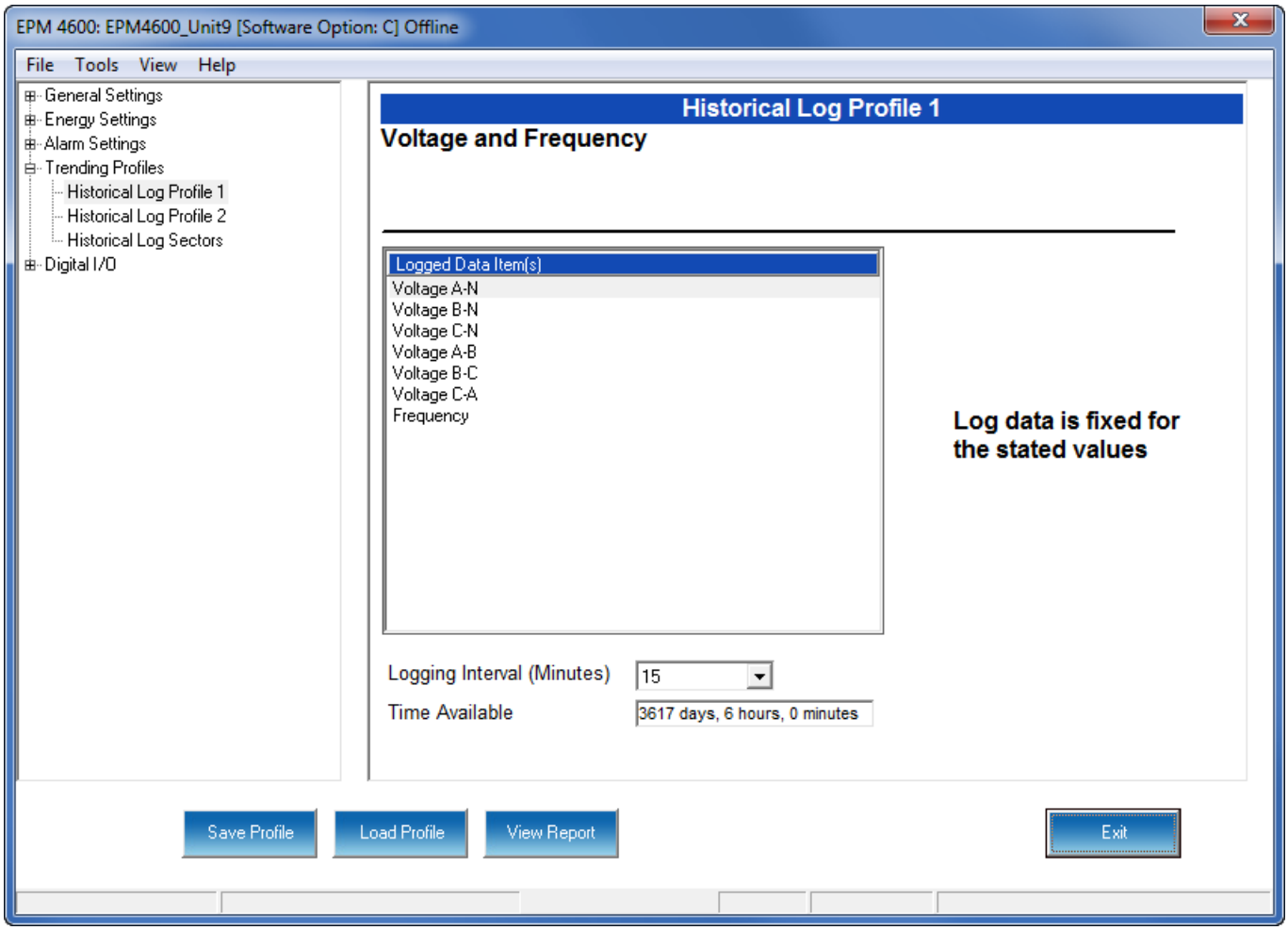
NOTE

- If the Above Return Hysteresis is greater than the Above Set Point, the Above Limit is Disabled; if the Below Return Hysteresis is less than the Below Set Point, the Below Limit is Disabled. You may want to use this feature to disable either the Above Limit or Below Limit condition for a reading.
- If you are entering negative limits, be aware that the negative value affects the way the above and below limits function, since negative numbers are processed as signed values.

4. To implement any changes, click the Update Device button to send the new profile to the meter.

10.4 Trending Profiles Settings

An EPM 4600 unit with Software Option B or C has memory for logging. From the Tree Menu on the left side of the EPM 4600 metering system's Device Profile screen, double-click on the Trending Profiles line or click on the + button next to it. All of the settings in the Trending Profiles settings group are listed.



10.4.1 Configuring Historical Logs

1. From the Tree Menu, click Trending Profiles>Historical Log Profile 1-3, depending on your EPM 4600 unit's circuit configuration, to display a screen that lets you select the logging interval for the historical log you selected. Historical logs 1 and 2 are used for the EPM 4600-T three phase configuration; Historical logs 1 and 3 are used for the EPM 4600-S single phase configuration.

NOTE

All of the EPM 4600 unit's Historical logs are pre-configured to log specific readings. Historical Log 1 logs Voltage and Frequency readings, Historical log 2 logs Energy in the Interval for the 8 three phase circuit, and Historical log 3 logs Energy in the Interval for each phase of the 24 single phase circuits.

Sample screens for the three Historical logs follow.

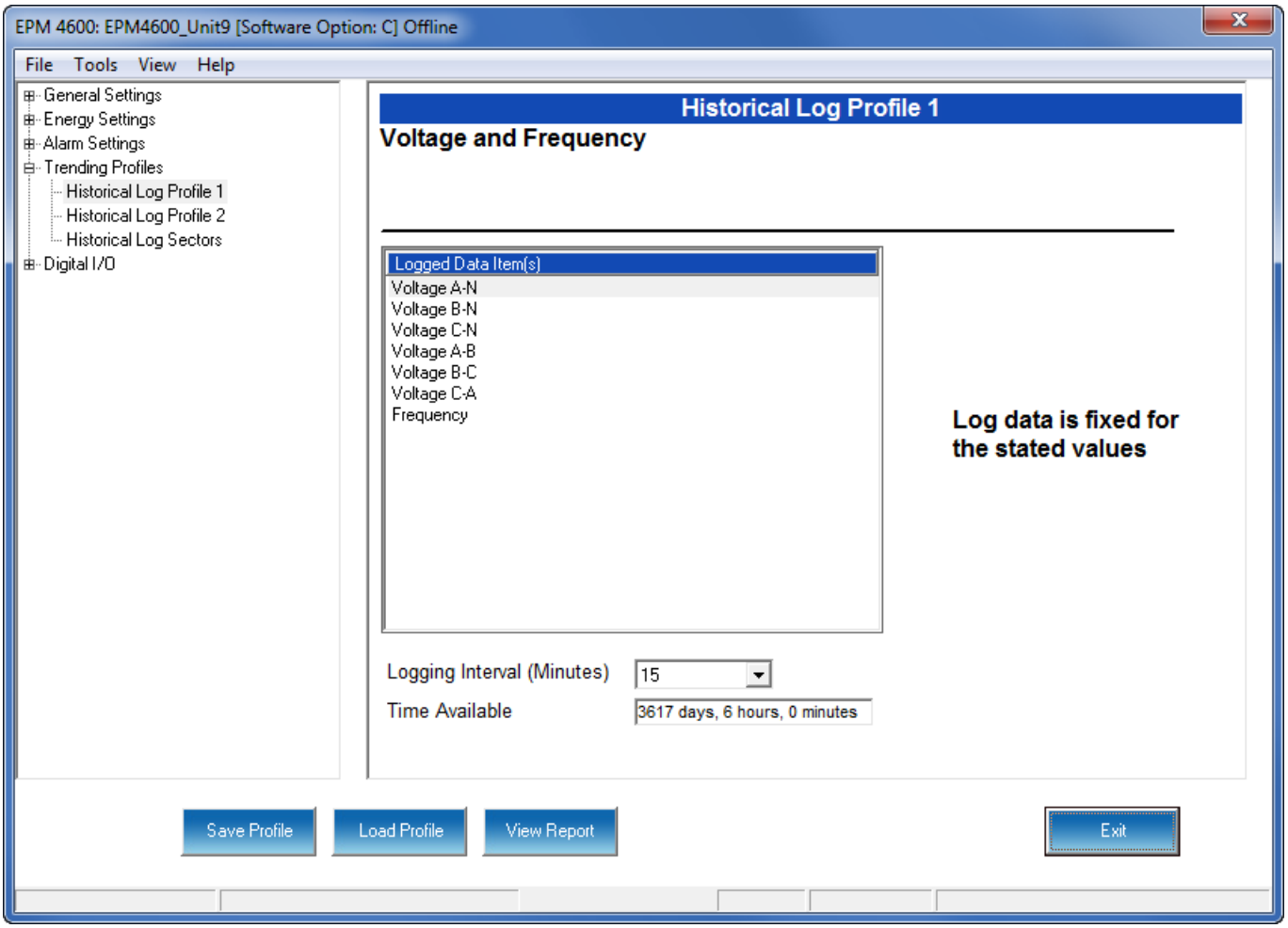


Figure 10-5: EPM 4600-T Historical Log 1 Screen

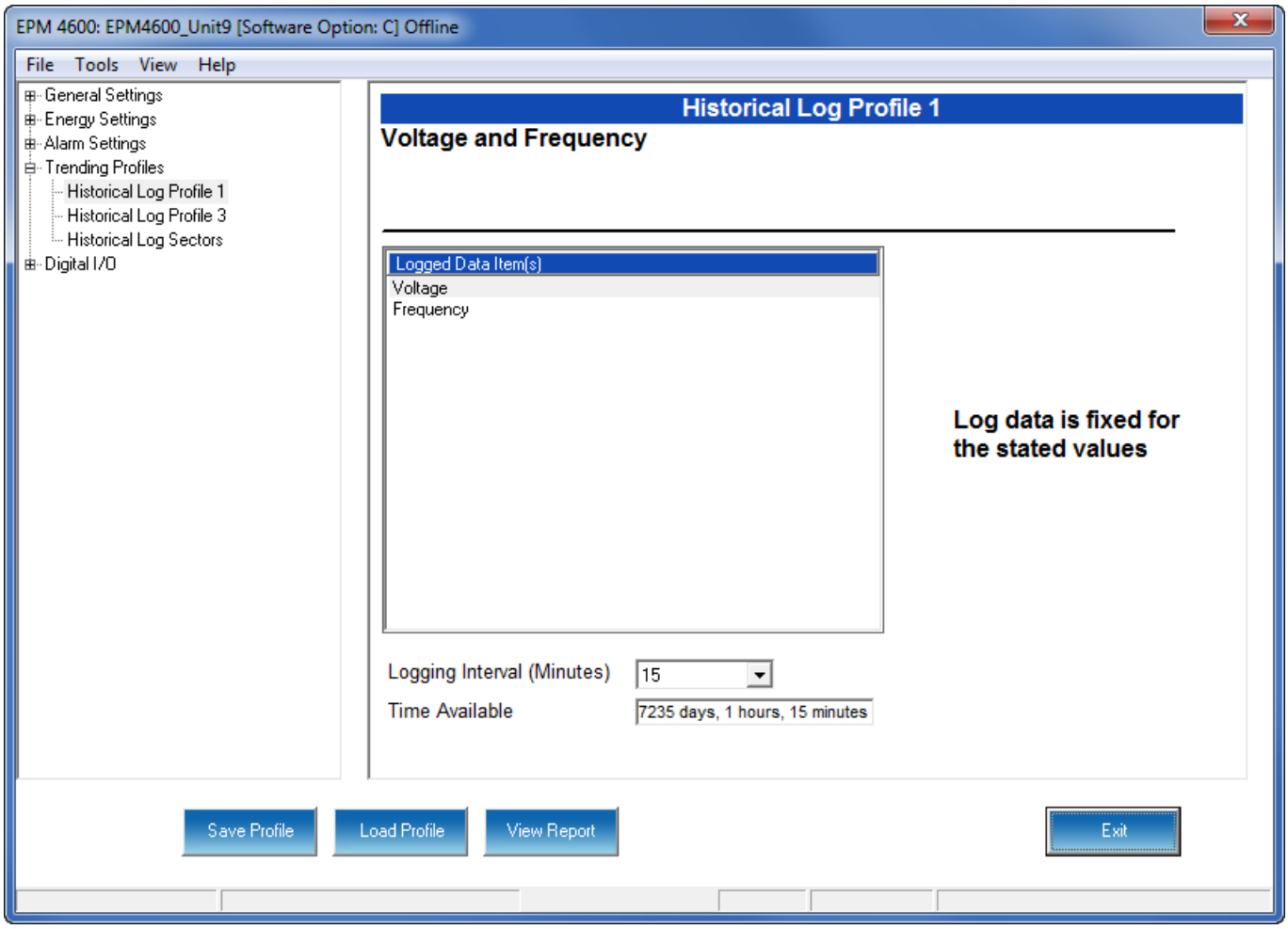


Figure 10-6: EPM 4600-S Historical Log 1 Screen

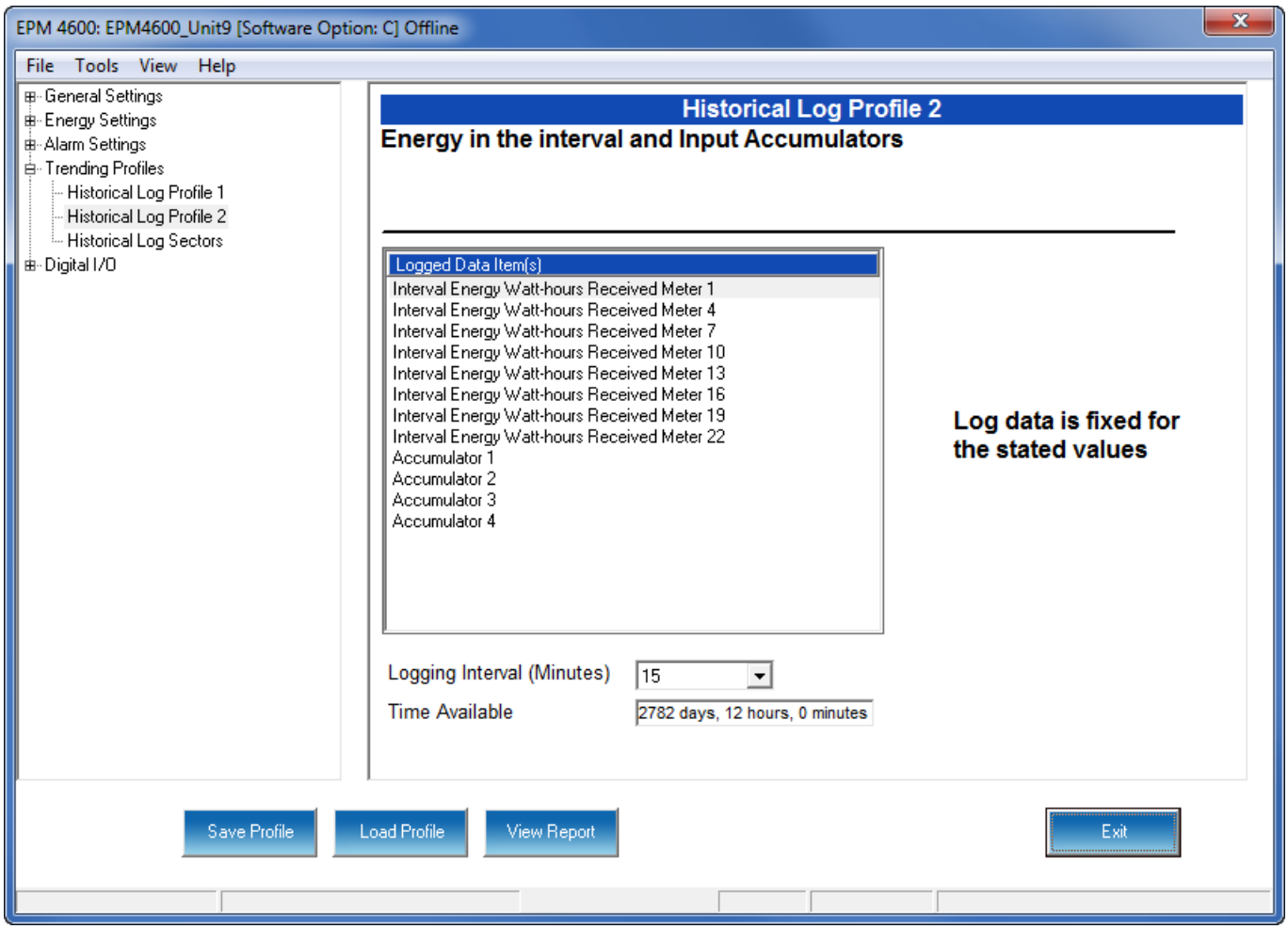


Figure 10-7: EPM 4600-T Historical Log 2 Screen

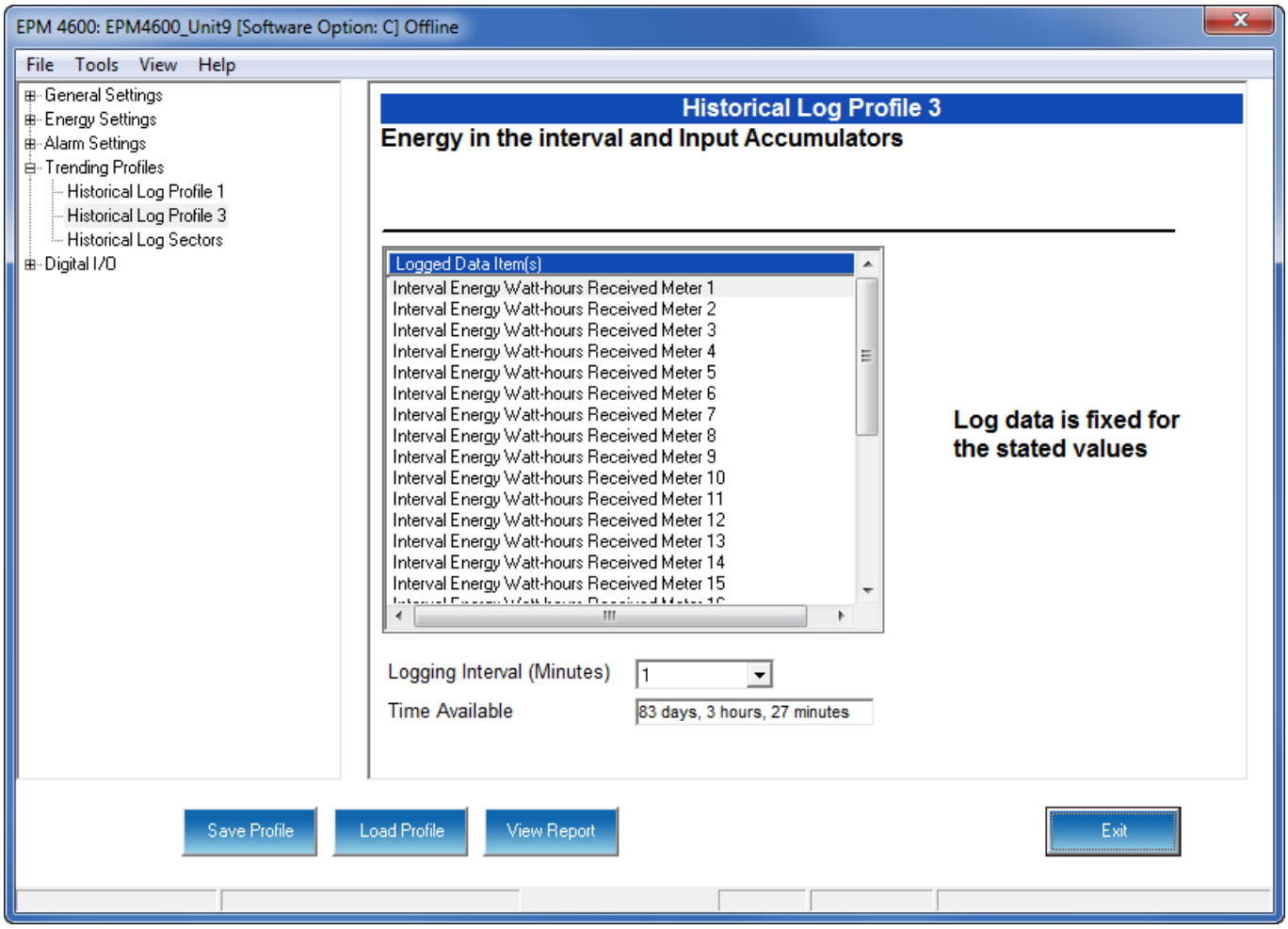


Figure 10-8: EPM 4600-S Historical Log 3 Screen

- The only change you can make in any of the Historical Log Profile screens is to set the Logging Interval. The available choices are: 1, 3, 5, 10, 15, 30, or 60 minutes, or EOI (End of Interval) Pulse. The Logging Interval determines when the EPM 4600 unit takes a snapshot of the data values being trended.

NOTE

IMPORTANT! If you are trending Energy in the Interval (Historical logs 2 and 3), the Logging interval must be the same as the Demand interval.

NOTE

- Only one Relay Output/Digital Input card input or output can be set to trigger an EOI pulse.
- The maximum rate for EOI Pulse used to trigger a log is once per minute.
- When you choose EOI Pulse, the EPM 4600 unit takes a snapshot on the End of Interval Pulse condition, rather than on a time interval. Following are two examples of using EOI Pulse for log recording.

Examples of EOI Pulse Recording:

The Relay Output/Digital Input card installed in your EPM 4600 unit is set to trigger on a state change. You can use EOI pulse to take a snapshot upon that state change.

An EPM 4600 unit is connected on each side of a load. You want to take a snapshot of both sides of the load at the same time. You can do this by connecting the Relay Output/Digital Input card in each of the EPM 4600 units to a device that will trigger them. Then set the EOI pulse to take a snapshot when the devices are triggered.

For more information see 10.5.1 *Configuring Relay Assignments*.

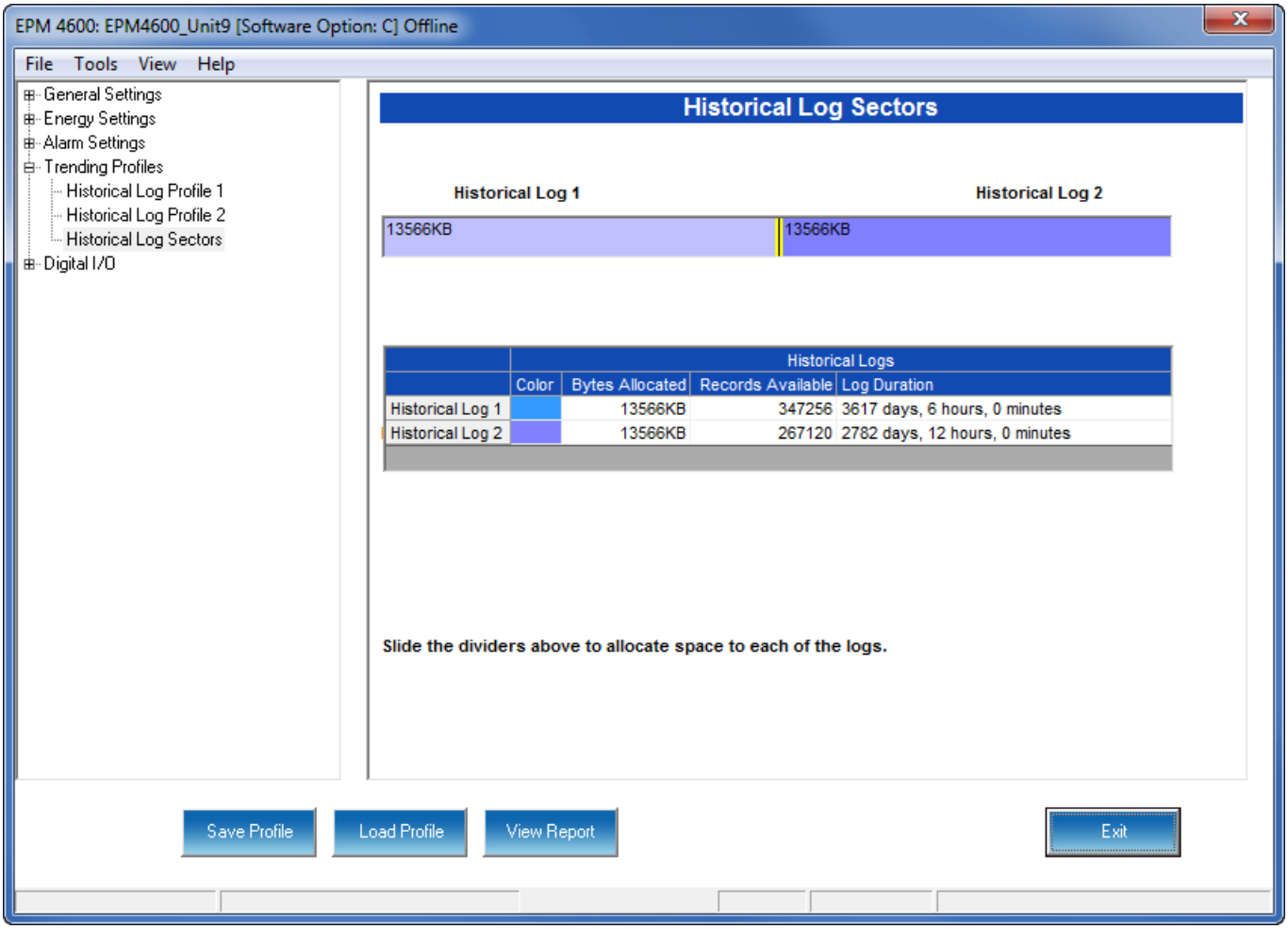
- The Time Available field lets you know how much time is left before the log is full.

2. To implement any changes, click the Update Device button to send the new profile to the meter.

10.4.2 Configuring Historical Log Sectors

The EPM 4600 metering system with Software Options B and above allows a user to configure the amount of memory allocated for each log, so you can optimize the number of records stored for each log. Use this setting to increase or decrease the amount of records each of the EPM 4600 unit's Historical logs can store, and the duration each log can run, before becoming filled.

1. From the Tree Menu, click T**rending Profiles > Historical Log Sectors** to display the screen shown below.

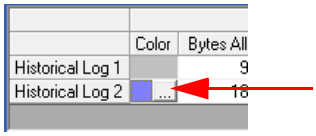


NOTE

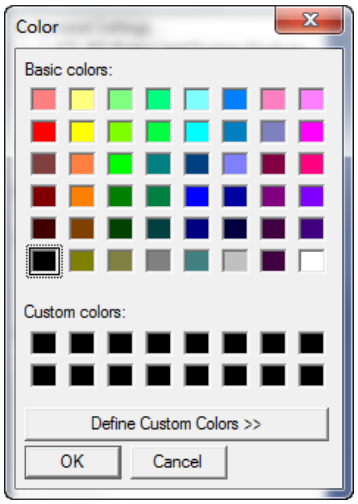
The screen above is for a three phase circuit configuration; if you are connected to an EPM 4600 with a single phase circuit configuration you will see Historical Logs 1 and 3.

2. The Historical logs are color-coded for ease of use. The color key is shown in the box(es) labeled Historical Log 1 and Historical Log 2 or 3. To change the color assigned to each log:

- Click in the Color field. A small box with three dots will appear.



- Click in the box to open a screen that lets you choose an alternate color.



- Click on the color you want and then click OK to select the new color and close the color selection screen. The new color will now be used for the Historical log.

3. The screen shows the current space allocation for the EPM 4600 unit's Historical logs, including:
   - The number of bytes allocated to each log
   - The number of records available for each log
   - The duration of each log
4. To change the current allocation for a log:
   - Click on the double yellow line dividing the logs.
   - You will see a line with arrows on each side. Drag the line in either direction to increase or decrease the log allocation. The display fields for the logs will reflect any changes you make to the allocation.
5. To implement any changes, click the Update Device button to send the new profile to the meter.

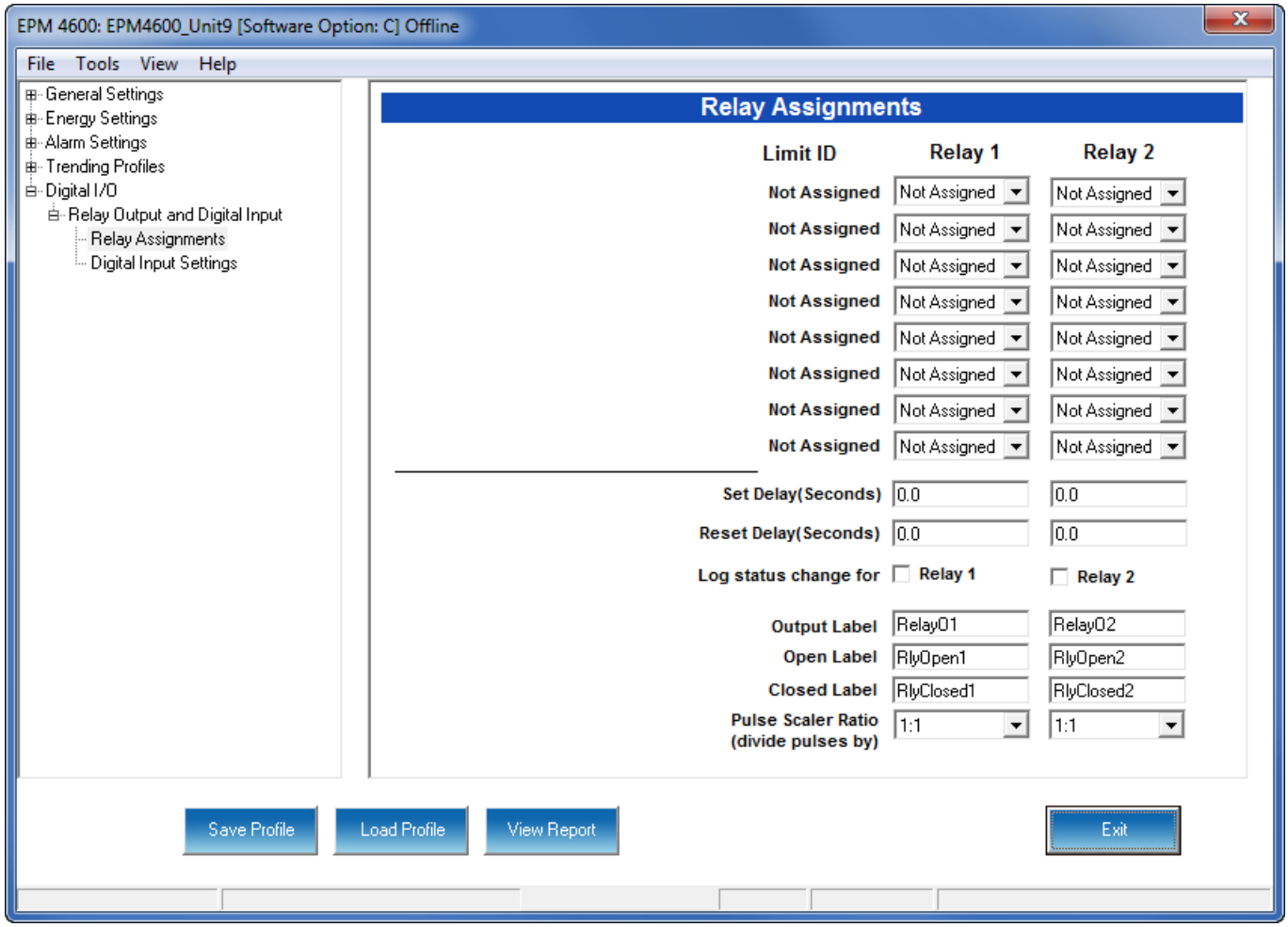
NOTE

When EOI Pulse is set as the Logging Interval for a Historical log (see previous section, 10.4.1 *Configuring Historical Logs*), the Log Duration field for that log will be blank.

10.5 Digital I/O Settings

From the Tree Menu on the left side of the EPM 4600 metering system's Device Profile screen, double-click on the Digital I/O line or click on the + button next to it. The settings in the Digital I/O settings group are listed.

The EPM 4600 unit has an embedded Relay Output/Digital Input card. This card is used for a few purposes. The relay portion is used to send a control output when a limit is exceeded. The input portion can be used to either count KYZ pulse or detect the status of a circuit. Accumulators in the GE Communicator software count the transitions of the Inputs and Outputs. For technical specifications and hardware installation, refer to the *EPM 4600 Instruction Manual*.



10.5.1 Configuring Relay Assignments

An example use of the Relay Card is in monitoring the status of circuit breakers or relays in your electrical system. The two status inputs could be used to monitor two circuit breakers, and the two relay outputs could be used to sound an alarm upon the occurrence of a programmed out of limit condition.

1. From the Tree menu, click **Option Card > Digital I/O > Relay Output and Digital Input > Relay Assignments** to open the screen shown above. This screen is the same for the EPM 4600-T and EPM 4600-S units.
2. From the Relay Assignments screen, you can:
   - Configure up to 8 limits for each of the two Relay Outputs
   - Set a Delay and Reset Delay for the Outputs
   - Choose to log Status Changes for each Relay Output
   - Assign each Output an Output Label, Open Label, and Closed Label, which are used when viewing the Relay Status Log
   - Select the Pulse Scaler Ratio

NOTE

First use the Limits screen to set up the limits you want to assign to an Output. See 10.3.1 *Configuring Limits* for instructions.

3. The available Limits appear in the Limit ID column. To Assign a Limit to an Output Relay:
   - Select the Alarm trigger from the pull-down menu next to the Limit ID. The options are: Above Limit (the Output is triggered when the Above Limit condition occurs) and Below Limit (the Output is triggered when the Below Limit condition occurs). You can assign the limit to one or both (or neither) of the Relay Outputs.

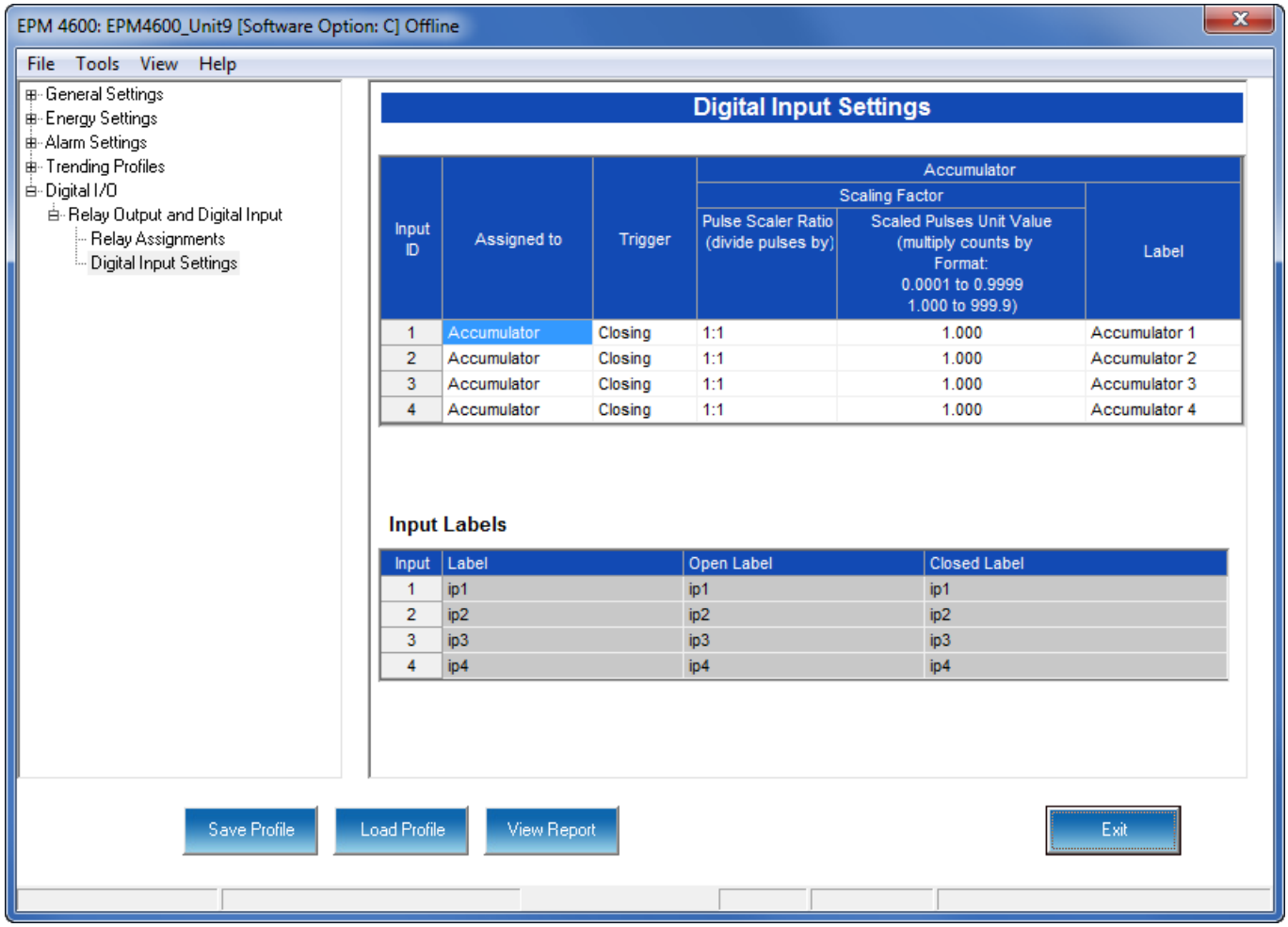
NOTE

A Relay operates when any one assigned Limit is tripped, and stays in the Set condition as long as one Limit is in the Alarm state.

   - You can enter Set Delay and/or Reset Delay. These values are the delay before the Output is changed: Set is when the common is shorted to Normal Open (this is the Set Condition).
   - Check the box next to Log Status Change for if you want to log output status changes for either or both Relay. See Chapter 19 “Viewing Logs” for information on the I/O Change Log.
4. The current Output Labels are displayed in the screen. These labels are used for Logging. To change the Output labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
   - Output Label - Label ID
   - Open Label - Open state ID
   - Closed Label - Closed state ID
5. Select the Pulse Scaler Ratio. The available ratios are from 1:1 to 10000000:1 (the default setting is 1:1). The ratio is used to adjust how high an accumulator will go before rolling over. Because of this, it is useful in delaying rollover. For example, if you select a ratio of 10:1, each time 10 Pulse/State changes occur, the accumulator count increments by 1.
6. To implement any changes, click the Update Device button to send the new profile to the meter.

10.5.2 Configuring Digital Input Settings

1. From the Tree menu, click **Digital I/O > Relay Output and Digital Input > Digital Input Settings**. Use this screen to assign labels and functions to the Relay Output/ Digital Input card's Inputs. This screen is the same for the EPM 4600-T and EPM 4600-S units.



2. Make a selection in the Assigned to field. The available selections are:
   - Status Only
   - Accumulator
   - Digital Input Log
   - EOI Pulse - only one Input can be set as EOI pulse.

     NOTES on End of Interval (EOI):
     - An EOI pulse allows the meter to be synchronized with an installed revenue meter so that both meters are calculating Demand at the same time.
     - EOI is triggered when the selected condition is met. Only one Option Card input or output can be set to trigger an EOI pulse. EOI is used for the following:

- As a trigger for demand averaging: when the selected condition is met, the EOI delineates an interval that results in demand averaging being performed. The minimum interval between EOI Pulses used to trigger demand averaging should be 5 minutes.
- For historical logging: when the selected condition is met, EOI causes any log that has been configured for EOI Pulse interval to capture a record. Refer to 10.4.1 *Configuring Historical Logs* for additional information on EOI Pulse and logging.

3. Select Trigger from the pull-down menu. The Trigger options depend on your Assigned to selection:
   - For Status Only, select None.
   - For Accumulator, select from Closing or Opening.
   - For Digital Input Log, select Change.
   - For EOI Pulse, select from Closing, Opening, or Change.
4. Use the Scaling Factor fields as follows (you can only set these fields if the input is set as accumulator; otherwise these fields are not used):
   - The Pulse Scaler Ratio sets the number of pulses needed before the accumulator count increments by 1. The available ratios are from 1:1 to 10000000:1 (the default setting is 1:1). The ratio is used to adjust how high an accumulator will go before rolling over. Because of this, it is useful in delaying rollover. For example, if you select a ratio of 10:1, each time 10 Pulse/State changes occur, the accumulator count increments by 1.
   - The Scaled Pulses Unit Value is used to adjust the accumulator count to a value you need. The Scaled Pulses Unit Value is multiplied by the accumulator count, so you enter the value that you want the accumulator count multiplied by.

     For example, if you have a KYZ module that is outputting a pulse every 1.8 kWh, with the input set to Accumulator, Increment on Contact Opening, and you have set the Pulse Scaler Ratio to be 10:1, you would set this field to 18.
5. Enter a Label for the Accumulator (only used if the input is set as Accumulator).
6. The current Input Labels are displayed in the screen. To change the Input Labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
   - Input Label - Input ID
   - Open Label - Open state ID
   - Closed Label - Closed state ID
7. To implement any changes, click the Update Device button to send the new profile to the meter.

GE Communicator

Chapter 11: EPM 9900/9900P Meter

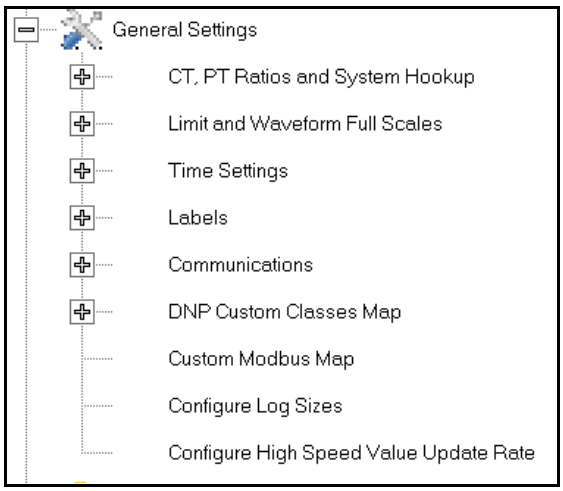
This chapter explains how to configure a EPM 9900/9900P meter's programmable settings, which are stored in the unit's Device Profile. Chapter 7 “Device Profile” contains detailed information on how to use the Device Profile.

NOTE

Some of the EPM 9900P settings are not available for the EPM 9900 meter.

11.1 Device Profile General Settings

1. From the Device Profile screen, double-click on the **General Settings** line or click on the **+** button next to it. All of the settings in the General Settings group are listed.



2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the General Settings menu.

11.1.1 CT and PT Ratios and System Hookup

Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

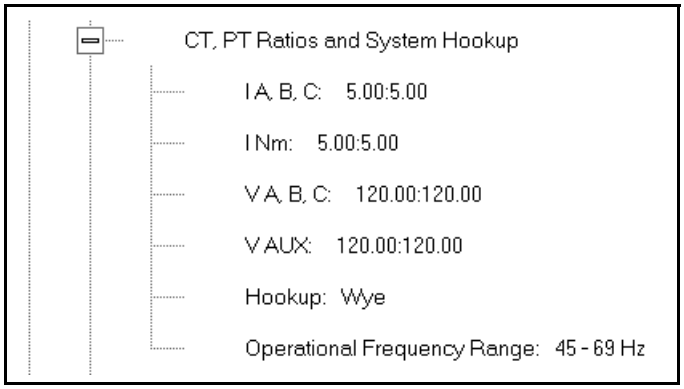
- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

NOTE

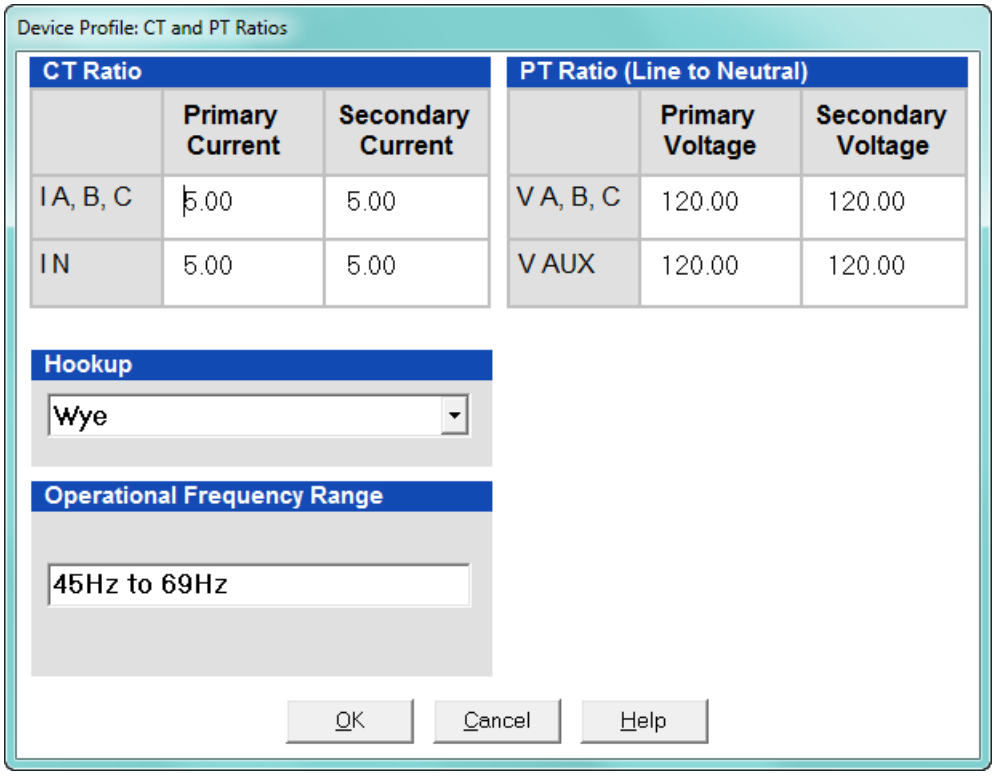
For the EPM 9900P meter, be sure to make these settings **before** configuring EN 50160 reporting.

1. From the General Settings menu, click the + button next to CT, PT Ratios and System Hookup. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for CT, PT ratios, connection type, and Operational Frequency range. The values shown here are the default meter settings.

2. Double-click on any of the settings. You will see the CT and PT Ratios screen.



3. Make changes to this screen according to your application requirements.

When you change a PT or CT Ratio, GE Communicator software updates the corresponding Full Scale value entered in the Limit and Waveform Full Scales setting. When you click OK on this screen, GE Communicator software opens the Limit & Waveform Full Scales screen so that you can verify the settings (see 11.1.2 "Limit and Waveform Full Scales").

- Enter Primary and Secondary Current, Voltage, and VAux.
- Using the pull-down menu, choose the Hookup mode that matches the connection you have to the EPM 9900/9900P meter. Choose from the following:
    - Wye
    - Delta 3 CTs
    - Delta 2 CTs
    - 2.5 Element Wye
    - 4 Wire Delta

      This value must be set properly for the meter to calculate readings correctly.

      See the *EPM 9900 or EPM 9900P Instruction Manual* for connection diagrams.
- The Operational Frequency Range for the meter is 45Hz to 69Hz: this field is display only.

4. Click OK. If changes have been made, a message window opens asking you to verify that the Limit Full Scales are correct.
5. Click OK. The Limit and Waveform Full Scales screen opens (see 11.1.2 "Limit and Waveform Full Scales").
6. To implement any changes, click the Update Device button to send the new profile to the meter.

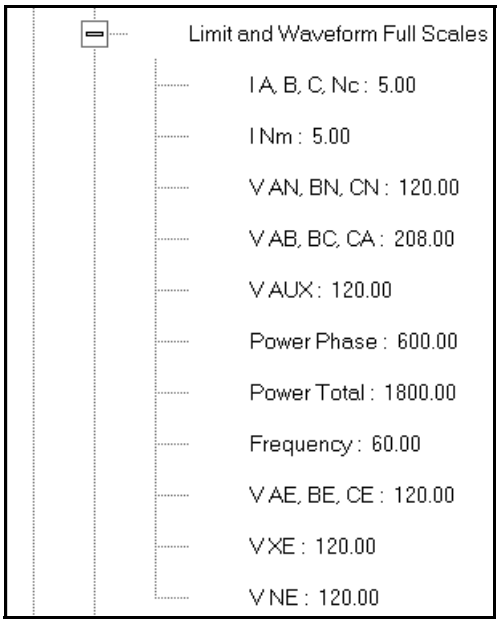
   You will see a warning message that logs will be reset, and you will be given the opportunity to retrieve the logs before they are cleared. Resetting the logs prepares the meter for placement in a new installation or change of the meter Transformers.

11.1.2 Limit and Waveform Full Scales

All Limit and Waveform settings (see 11.1.1 "CT and PT Ratios and System Hookup" and 11.3.5 "IEC 61000-4-30 Harmonic & Interharmonic Thresholds (EPM 9900P Meter)", respectively) are based on a percentage of the Full Scale. Full Scales are based on the CT and PT ratios (see 11.1.1 "CT and PT Ratios and System Hookup"). The % of Full Scale is defaulted based on the CT and PT ratio. If the user wants, the Full Scales can be adjusted to the actual power system condition, to optimize the triggering conditions.

Set the CT and PT ratios first; GE Communicator software automatically recalculates the Full Scales every time the CT and PT ratios change and presents them for your verification.

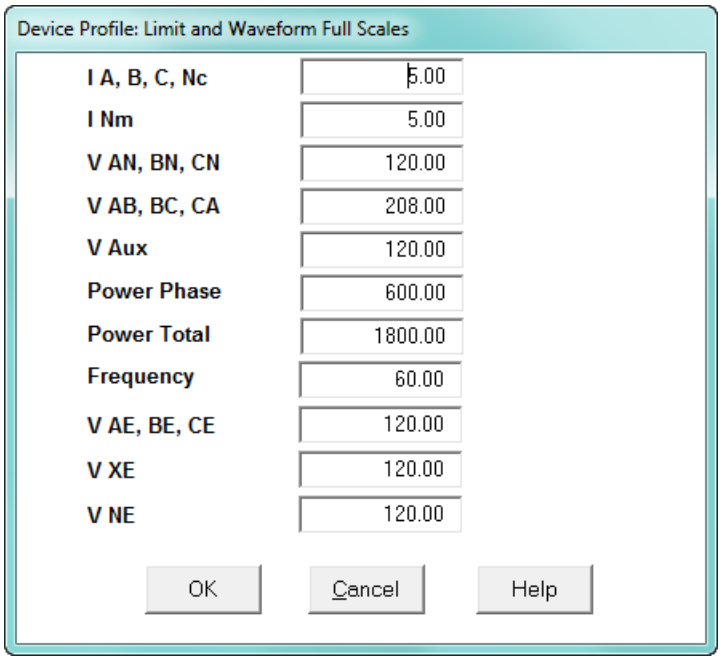
1. From the General Settings menu, click on the + button beside Limit and Waveform Full Scales or double-click on the Limit and Waveform Full Scales line. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for the Limit and Waveform Full Scales. The values shown here are the default meter settings.

- Frequency and Voltage values are nominal values. The Power Phase is computed using nominal Voltage and rated maximum current. In most cases the software automatically computes the proper value - you will not need to change it.
- Also note that in almost all cases VAE is the same Full Scale setting as VAN. VAE is voltage to earth ground, while VAN is voltage to the neutral connection.

2. Double-click any of the settings. You will see the Limit and Waveform Full Scales screen.



3. Enter the Full Scale for each parameter.

NOTE

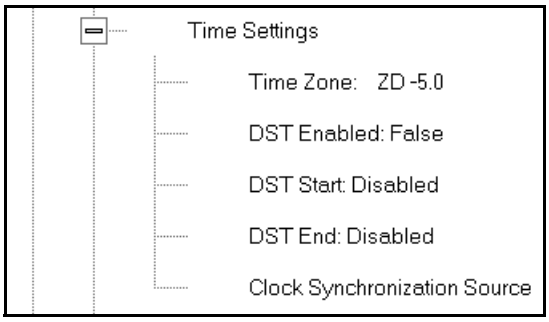
- The Limits and Waveform settings (Sections 11.1.1 "CT and PT Ratios and System Hookup" and 11.3.5 "IEC 61000-4-30 Harmonic & Interharmonic Thresholds (EPM 9900P Meter)", respectively) are based on a percentage of the Full Scales entered here.
- The software and meter use secondary readings internally, and set Limits on a percentage of Full Scale. The purpose of this is to allow the units to be programmed using standard profiles, so that meters can be managed on a large group basis.
- GE Communicator software automatically recalculates the Full Scale Voltages, currents and power every time the CT and PT ratios change. However, frequency is not changed, even if the operational frequency range is changed. **Frequency can only be changed on this screen**.
- Power Phase is the amount of power per each phase; Power Total is the power of all phases combined.

4. When all changes are entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

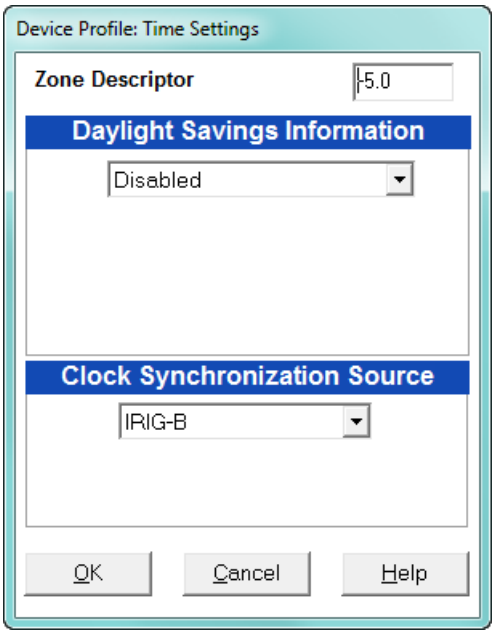
11.1.3 Time Settings

To edit the Device Profile's Time settings:

1. From the General Settings menu, double-click on the Time Settings line. You will see the submenu shown below. DST stands for Daylight Savings Time.



2. Double-click on any of the programmable settings; you will see the Time Settings screen.



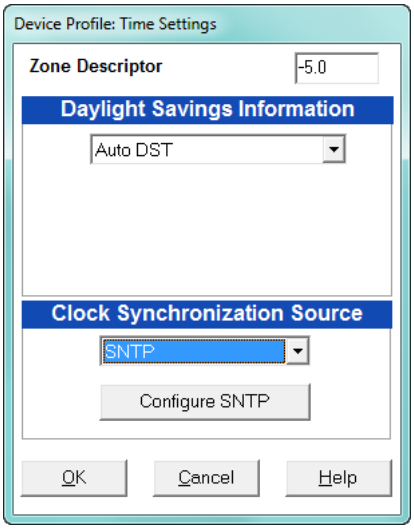
3. Make changes to this screen according to your application requirements.
   - Zone Descriptor: A Zone Descriptor sets the time zone for the meter. 0 = Greenwich Mean Time. Consult the following chart to find the Zone Descriptor for your time zone.

GMT Greenwich Mean Time Table (Dublin, London)	
-1.00 Azores	+1.00 Brussels, Paris, Warsaw
-2.00 Mid-Atlantic	+2.00 Athens, Cairo, Helsinki
-3.00 Buenos Aires, Georgetown	+3.00 Baghdad, Kuwait, Moscow, Tehran
-4.00 Atlantic Time (Canada), Santiago	+4.00 Kabul, Baku

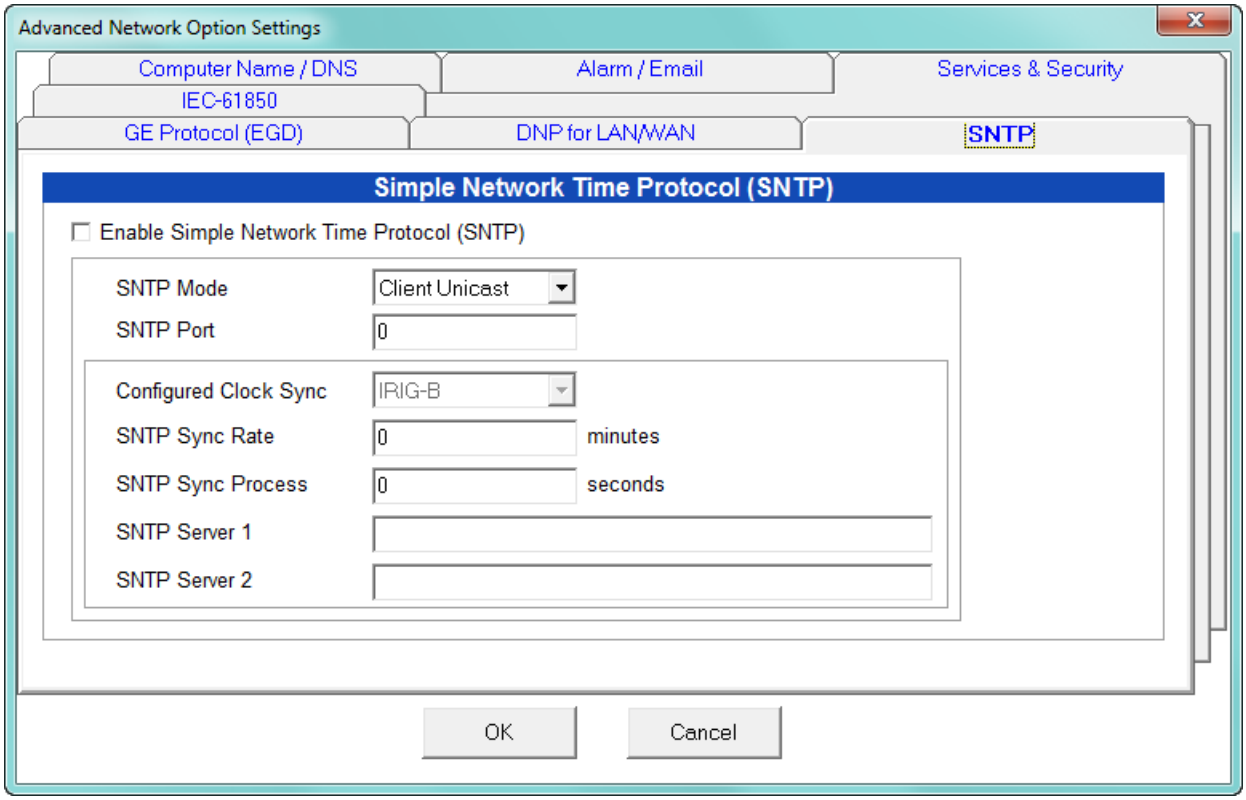
GMT Greenwich Mean Time Table (Dublin, London)	
-5.00 Eastern Time (USA and Canada), Lima	+5.00 Karachi
-6.00 Central Time (USA and Canada), Mexico City	+6.00 Dhaka
-7.00 Mountain Time (USA and Canada)	+7.00 Bangkok, Hanoi, Jakarta
-8.00 Pacific Time (USA and Canada), Tijuana	+8.00 Beijing, Hong Kong, Singapore
-9.00 Alaska	+9.00 Osaka, Sapporo, Seoul
-10.00 Hawaii	+10.00 Brisbane, Melbourne, Guam, Hobart
-11.00 Midway Island	+11.00 Magadan, Solomon Islands
-12.00 Eniwetok	+12.00 Auckland, Fiji

- Daylight Savings Information:
  - Disabled: Disables an automatic adjustment for Daylight Savings Time.
  - Auto DST: Sets Daylight Savings Time automatically to the pre-2007 standard for the United States: the time changes automatically occur at 2:00 AM (your local time), on the first Sunday in April and the last Sunday in October.
  - Auto DST U.S. EPA 2005: Sets Daylight Savings Time automatically to the 2007 standard for the United States: the time changes automatically occur at 2:00 AM (your local time), on the second Sunday in March and the first Sunday in November.
  - User Defined: Allows you to set the Daylight Savings Time start and end times manually. Fields open that let you set the beginning and ending dates for Daylight Savings Time.
- Select the Clock Synchronization Source from the pull-down menu: IRIG-B, SNTP (Simple Network time Protocol), IEEE 1588 PTP, or Line Sync (Line Frequency Synchronization).
  - If you are using IRIG-B as your time synchronization source, select it from the pull-down menu. IRIG-B is one of two clock synchronization sources you can choose if you use the EPM 9900P meter's Synchrophasors feature.
    See Appendix E and Appendix F in the EPM 9900P Instruction Manual for detailed information on the Synchrophasors feature.
  - With SNTP you access a Network Time Protocol (NTP) Server for time synchronization. The NTP server can be either a device with a real-time clock that

is networked with your meter, or an NTP server on the Internet. To use SNTP, select it from the pull-down menu.



- The screen changes to include a Configure SNTP button: click this button to set up SNTP.
- The Advanced Network Options screen opens. Click the SNTP tab.

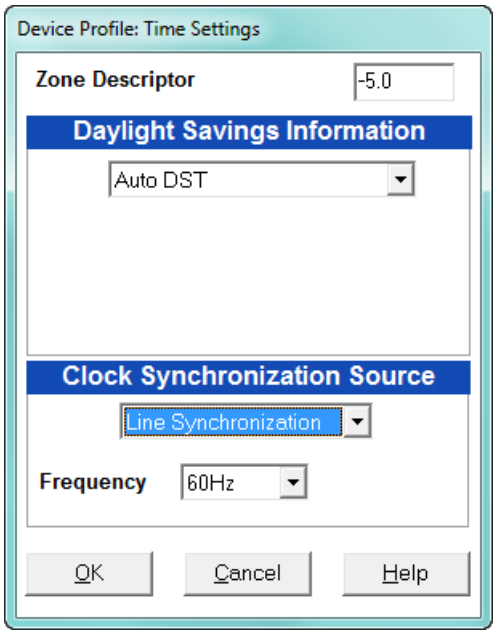


- Click the checkbox next to Enable Simple Network Time Protocol (SNTP).
- Enter:

- SNTP Mode: select Client Unicast or Client Broadcast:
  - In Client Unicast mode, the meter connects to the specified SNTP server using the configured SNTP IP address(es). First, the meter synchronizes with the SNTP server. After that, the meter periodically sends time requests to the SNTP server.
  - In Client Broadcast mode, the meter listens for broadcast messages sent by the SNTP server. After receiving the first broadcast message, the meter synchronizes its clock using the unicast mode, and afterwards does not send any packets to the SNTP server. Instead, it uses received broadcast messages from the SNTP server to adjust its clock.
- SNTP Port: enter the port that will be used to connect to the SNTP server.
- The Sync Rate in minutes: this is how often the meter checks the SNTP server for time updates. GE recommends that the sync rate be set to other than the logging interval, if possible; for example, if the logging interval is every 15 minutes, set the sync rate to every seven minutes. This is done to prevent erroneous time stamps in the log.
- The Sync Process Timeout in seconds: this is how long to wait for the server to respond. Typical timeout should be set for 30 seconds.
- At least one NTP server url address (you can enter a second NTP server url address if you want if you are using Client Unicast mode.)

- Click **OK**.
- If you want to use the IEEE 1588 PTP (Precision time Protocol) as the time synchronization method for the meter's PMU Synchrophasors feature, see the instructions for setting up the PMU in Appendix F of the EPM 9900P Instruction Manual.

- If you want to use Line Sync, you must also select the Line Frequency from the Frequency pull-down menu: 50Hz or 60Hz. The selection should be based on the nominal frequency in the jurisdiction where the meter is located.



- Line synchronization uses the frequency zero crossings to provide a time reference for the meter. The basic function of Line Frequency Clock Synchronization is to adjust the real time clock to track the time based on the power line frequency. For this purpose, Phase A voltage only is used.
- This is the most common method to synchronize a meter's clock. GE recommends that you always select this method unless there is a specific reason not to select it. If the meter is not synchronized to line frequency, SNTP, or IRIG-B, it will default to internal crystal. Meters differ in terms of drift, but typically meters with 20 ppm crystals will drift 30 seconds per month when set to internal crystal. The EPM 9900P meter has a clock accuracy of 3.5 ppm, which gives it a drift of less than 10 seconds per month.
- Line Sync is disabled if an IRIG-B signal is present. If the signal is lost, the unit defaults to its internal crystal for a time synchronizing reference.
- **How Time is Adjusted**
  After the clock is synced to the line, the meter periodically checks the cumulative difference between the real time clock in seconds and the line cycle count. If the absolute difference between the two accumulations is more than 1 second or 60 (50) cycles, the clock is adjusted + / - 1 second accordingly.

4. To set the meter's on-board clock manually, use Set Device Time from the Tools Menu (see 20.1 "Tools Menu").

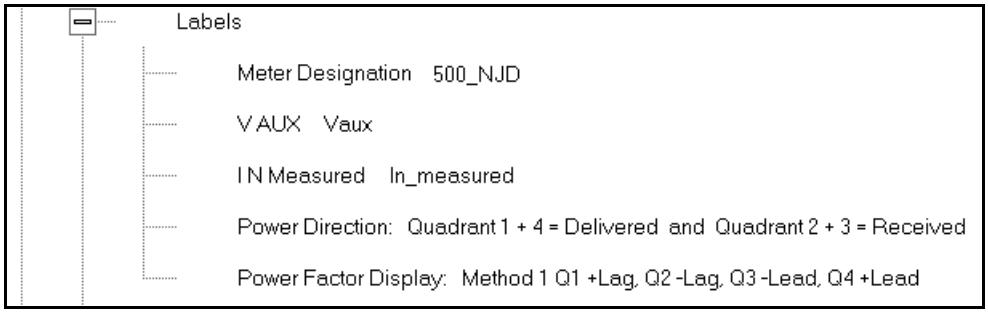
5. When all changes are entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.1.4 Labels

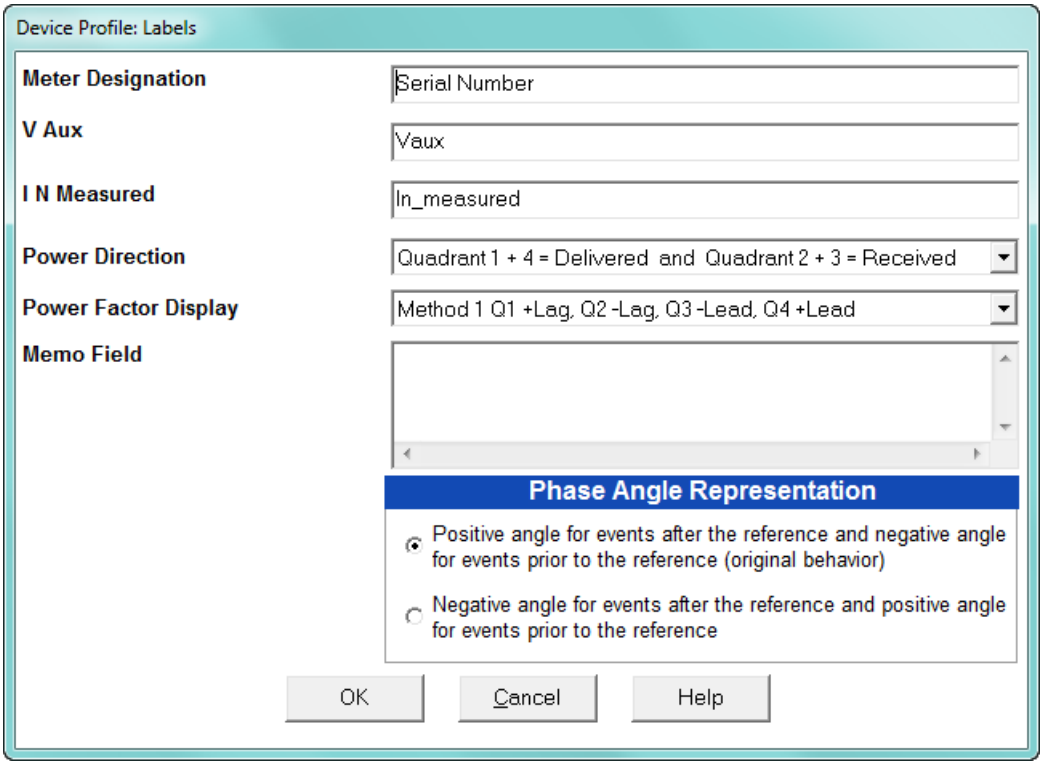
Labels are user-defined names for the EPM 9900/9900P meter, the Auxiliary Voltage terminal, and the I N Measured terminal. You also use the Labels screen to select the power direction, and the power factor display.

It is important to label the meter (under "Meter Designation") with a unique name because that label becomes the file name of any logs retrieved from that meter. See Chapter 19 "Viewing Logs" for more details on logs.

1. From the General Settings menu, double-click on the Labels line. You will see the submenu shown below.



2. Double-click on any of the parameters; you will see the Labels screen.



3. Enter labels in the appropriate fields.
   - Meter Designation must be set for log retrieval. You can use any character allowed by the Windows® operating system.

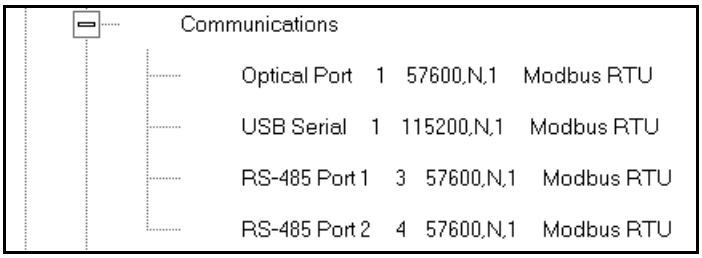
- In English versions the following characters don't work: \ / : * ? " < > |
- For meters used internationally by multilingual users, we recommend you use only alphanumeric characters allowed by your operating system.

- Your selection in Power Direction determines which quadrants of Watt-hours are considered Received and Delivered.
- Your selection in Power Factor Display determines the display of Quadrants in the Power Factor screen.
- The Memo field is used to enter notes about the meter, such as the location, or other relevant details.
- The Phase Angle representation determines how the voltage phase angles are represented. 90 of users will use the default, which is the first radio button: "Positive angle for events after the reference and negative angle for events prior to the reference"; however, you can choose the opposite display by selecting the second radio button, if you wish.

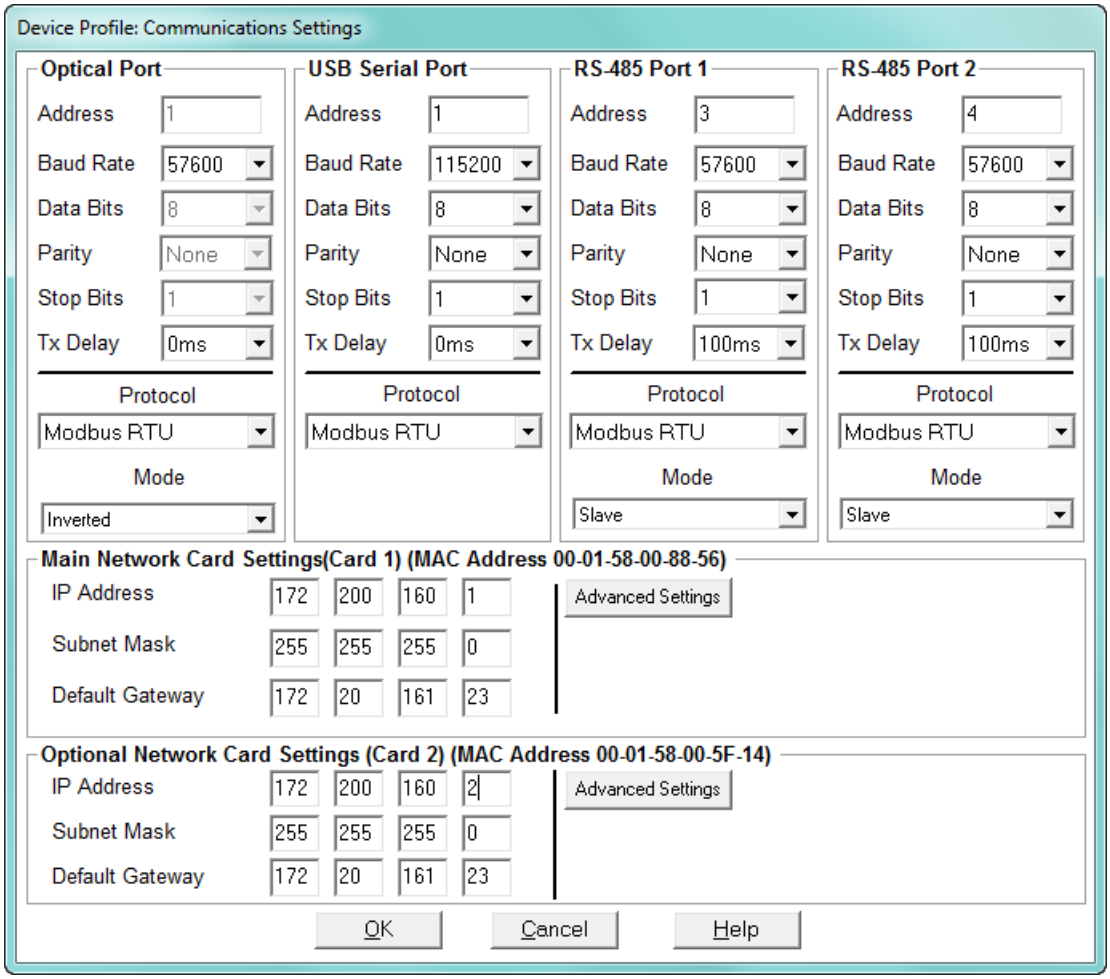
4. When all changes are entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.1.5 Communications

1. From the General Settings menu, double-click on the Communications line. You will see the submenu shown below.



2. Double-click on any of the settings (e.g., "Optical Port 1"); you will see the Communications Settings screen.



This screen displays the current Device Profile settings for the EPM 9900/9900P meter's Communications ports: address, baud rate, data bits, parity, stop bits, Tx (Transmit) delay, (communication) protocol, and mode. You can also use the meter's touch screen display to see the current baud rate, address and communication protocol of each of the EPM 9900/9900P meter's ports. See the *EPM 9900 or EPM 9900P Instruction Manual* for details.

NOTE

- Only some of the Optical port settings can be changed. Those that can't be changed appear grayed out and are not selectable.
- RS485 ports 1 and 2 are the meter's optional RS485 ports. The appropriate card must be ordered for the physical ports to be available. This card can be installed at a later time so that the meter can be upgraded.
- If the meter does not have the optional Network card 2, you will only see settings for the standard Network card 1.

3. Make changes to this screen according to your application requirements by clicking on the box or pull-down menu of any of the following settings:

- Address: assign the address that each port will respond to. Multiple EPM meters on an RS485 bus must each have a unique address set for the port that is connected to the bus - if they share the RS485 bus with the same address, the communication will not work.
- Baud Rate: from the pull-down menu, select 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. The baud rate entered in this field must match the baud rate of the device connected to the EPM 9900/9900P meter at this port. Use 9600 for modem connections.
- Data Bits: use the pull-down menu to select from: 5, 6, 7 or 8. For Modbus RTU and ASCII, leave the data bits at 8.
- Parity: use the pull-down menu to select from: None, Even, Odd, Mark or Space. For Modbus RTU and ASCII, leave the parity at None.
- Stop Bits: use the pull-down menu to select from: 1, 1.5 or 2. For Modbus RTU and ASCII, leave the stop bits at 1.
- TxDelay (Transmit Delay): use the pull-down menu to select from: 0ms, 10ms, 20ms, 30ms, 40ms, 50ms, 60ms, or 70ms. Leave the Tx delay at 50ms for RS485 communication.
- Protocol: use the pull-down menu to select from Modbus RTU and Modbus ASCII. Direct connections made through GE Communicator software must use either Modbus RTU or Modbus ASCII protocol (we recommend Modbus RTU). Modem connections made through GE Communicator software must use Modbus ASCII only. See Chapter 3 "Connecting to a GE Meter" for details.
- Mode field selections depend on the port:
- Optical port - select the Receiving mode, either Inverted (for use with the Smart Coupler or A7Z Optical Probes) or Non-inverted.
- Port 2 - depending on how you will be using this RS485 port select either Slave, Master (I/O Modules), RTU Master, or Ethernet Gateway.
    - Slave: This mode is used when the port will be polled by a Master device.
    - Master (I/O Modules): This mode is used when the port will be polling I/O modules.
    - RTU Master: This mode is used when the port will be used to poll other (slave) devices.
    - Ethernet Gateway: This mode is used when the port will be used by other devices to access an Ethernet network.
- For Network Card Settings, enter:
    - IP Address - the IP address that should be used to connect to this port.
    - Subnet Mask - the subnet mask controls the IP addresses this card will respond to.
    - Default Gateway - A default gateway is the node on the computer network that the network software uses when an IP address does not match any other routes in the routing table. You can enter a default gateway for the port to use in this field, if you wish.

NOTE

Click the Advanced Settings button to open a screen that lets you set Network card features, including enabling the IEC 61850 Protocol server. See Chapter 21 "Total Web Solutions" for details.

NOTE

See your Network Administrator for the correct settings.

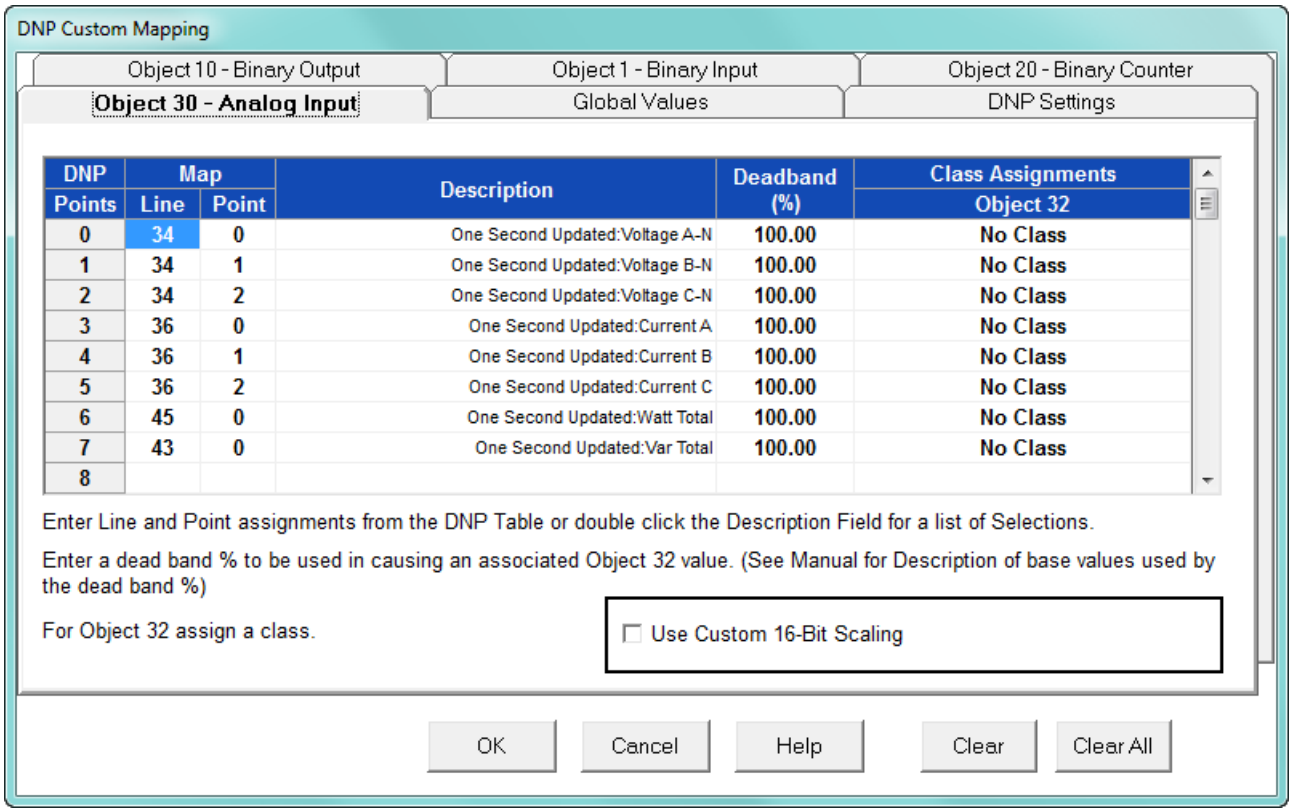
4. When all communication settings are entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

NOTE

IMPORTANT! In order to prevent communications problems, be careful when making changes in the Communications Settings screen. For example, if you change the baud rate of the port connected to a computer, be sure to make the same change to the computer port's baud rate.

11.1.6 DNP Custom Class Map

The DNP Custom Class Map lets you set up DNP communication for the meter. From the **General Settings** menu, double-click on the **DNP Custom Classes Map** line and on the **DNP Level 2** line. You will see the screen shown below.



DNP Points	Map Line	Map Point	Description	Deadband (%)	Class Assignments Object 32
0	34	0	One Second Updated:Voltage A-N	100.00	No Class
1	34	1	One Second Updated:Voltage B-N	100.00	No Class
2	34	2	One Second Updated:Voltage C-N	100.00	No Class
3	36	0	One Second Updated:Current A	100.00	No Class
4	36	1	One Second Updated:Current B	100.00	No Class
5	36	2	One Second Updated:Current C	100.00	No Class
6	45	0	One Second Updated:Watt Total	100.00	No Class
7	43	0	One Second Updated:Var Total	100.00	No Class
8					

For details on programming the DNP settings, see Chapter 22 “DNP 3.0 Configuration”.

11.1.7 Custom Modbus Map

The custom Modbus map for the EPM 9900/9900P meter can position up to 256 Registers (or the equivalent of 2K, whichever is lower) to readily provide the functionality you want from your meter. In addition, you can customize selected values for format type, Scaling, byte order, data size, etc. This allows a user to optimize Modbus registers by putting them in a particular order and/or format to make the SCADA poll more quickly and efficiently.

1. From the **General Settings** menu, double-click on the **Custom Modbus Map** line. You will see the screen shown below.

Custom Modbus Map

Item	Modbus Map Line	Modbus Map Point	Number of Registers	Start Register	Group	Channel	Format	Data Size	Unit	Primary / Secondary	Absolute Value	Byte Order	Display/ Modulo/Offset
1	18	0	2	412289	Tenth Second Phase to Neutral Volts	Volts AN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
2	18	1	2	412291	Tenth Second Phase to Neutral Volts	Volts BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
3	18	2	2	412293	Tenth Second Phase to Neutral Volts	Volts CN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
4	54	0	2	412295	Thermal Avg Measured N Current	I Nm	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
5	55	0	2	412297	Thermal Avg Calculated N Current	I Nc	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
6	537	0	2	412299	Scaled +/- Wh, Q 1 - 4 VAh and VARh	Quad(1+4) Watt Hour	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	
7	411	0	2	412301	Analog Input 1 - 8, Module 1	Input # 1	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
8	584	0	2	412303	Int Scaled +/- Wh, Q 1 - 4 VAh and VARh	Quad(1+4) Watt Hour	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
9	134	1	2	412305	Harmonics Volts A Mag # 0-7	#1	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
10	134	2	2	412307	Harmonics Volts A Mag # 0-7	#2	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
11	233	0	1	412309	Internal Inputs States	Inputs 1-8	Normal	2				MSB, MSb	
12	212	0	2	412310	Phase Angle Volts(AB,BC,CA)	Volts AB	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
13	212	1	2	412312	Phase Angle Volts(AB,BC,CA)	Volts BC	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
14	212	2	2	412314	Phase Angle Volts(AB,BC,CA)	Volts CA	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
15	455	0	2	412316	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V AN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
16	455	1	2	412318	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
17	455	2	2	412320	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V CN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
18	464	1	2	412322	Long Term Flicker V AN,BN,CN	Long Term Flicker V BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A

OK Clear all Clear Cancel Help Registers 35 of 2048

Data entry is straightforward. Each entry field is described below. Note that not all selections appear on the screen at the same time. Use the scroll buttons to view additional data/entry fields on the screen. Certain entries (such as Format, Data Size, etc.) have different allowable selections depending on the data point used. The pull-down menu adjusts to provide the appropriate selections for each data point.

- **Data Point Selection**: there are two different ways to select a data point:
  - Refer to the EPM 9900/9900P meter's Modbus map and find the associated line and point for the value you want. When you enter those values into the screen table, the software displays the associated group and channel.
  - Double-click the Group field. From the pull-down menus, select a group and its associated channel value. The software displays the map and line values.
- **Number of Registers**: this field is display only. The software computes the number in this field based on the data size selected in the Data Size column.
- **Start Register**: this field is display only. The software assigns and adjusts Start register numbers to take into account previous entries and data sizes. The Start register is the number of the first register used in polling. The Start registers are shown as 4x to describe them as holding registers, for SCADA applications.
- **Format**: from the pull-down menu, select a format type for a value, such as Signed Integer, Unsigned Integer, and 4 Byte IEEE Float.
- **Data Size**: from the pull-down menu, select the number of bytes you want to represent the data point: 2 or 4.
- **Unit**: if the polled value is viewed as an integer, the Unit field tells the software where to place the decimal point.
  Examples

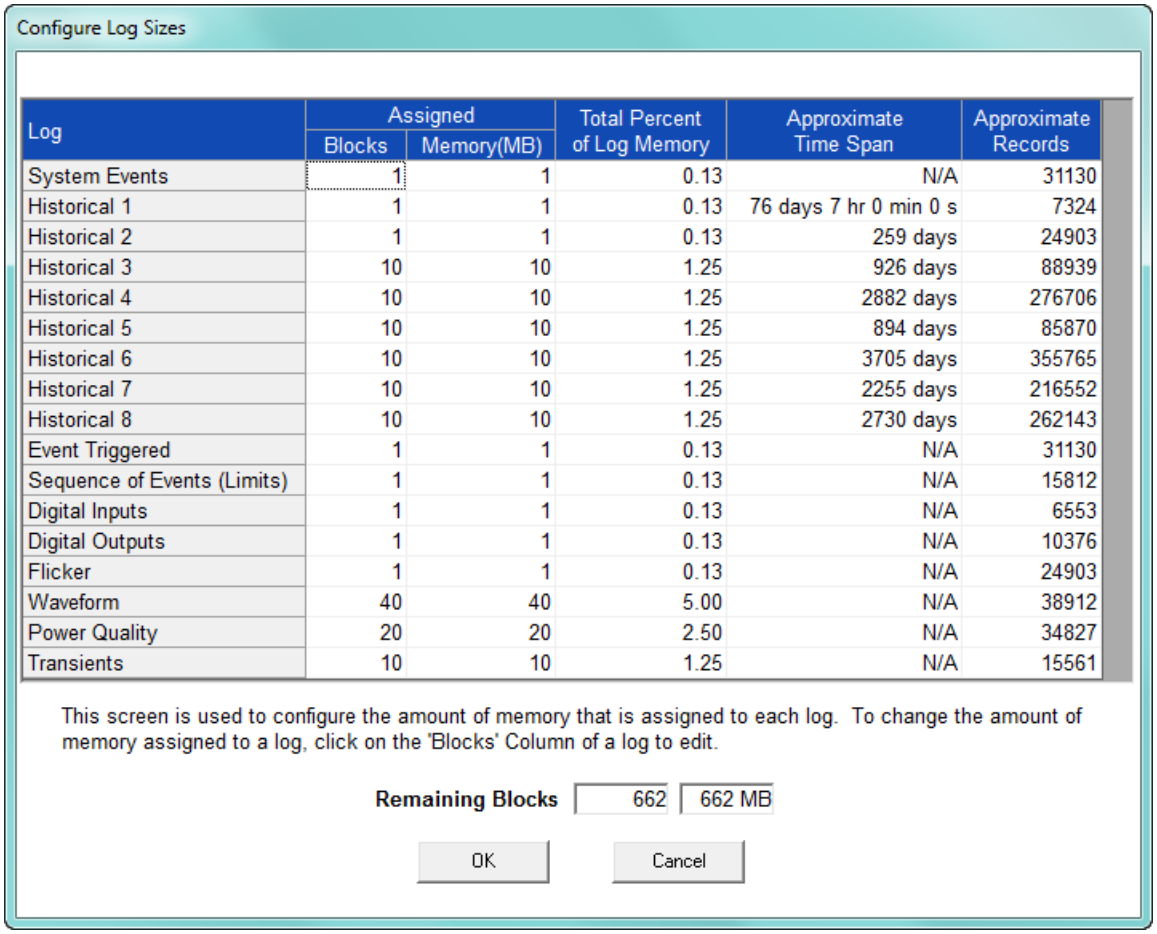
    - If you select .01, a polling value 1234 is interpreted as 12.34.
    - If you select 100, a polling value 1234 is interpreted as 123400.
- Primary/Secondary: the meter normally computes values in secondary units. Where applicable, you may select primary or secondary. If Primary is selected, the value is multiplied by the appropriate CT and/or PT values.
- Absolute Value: where appropriate, you may have the option of having the data point computed as a signed or absolute value. Select either:
    - No: to have the data point computed as a signed value.
    - Yes: to have the data point computed as an absolute value.
- Byte Order: for most of the data points, you can select the polling order of the registers/bytes to match what the SCADA system needs. The choices are: MSR, MSB (most significant register, most significant byte); MSR, LSB (most significant register, least significant byte); LSR, MSB (least significant register, most significant byte); and LSR, LSB (least significant register, least significant byte). EPM meters store data as MSR, MSB, whereas most SCADA systems use LSR, LSB. You can either select an alternate order here, for example, LSR, LSB, or you can leave the data as is and then have your SCADA system change the order after the data is polled.
- Display/Modulo/Offset: depending on the data point, select one or more additional options with appropriate sub-selections.
    - Display: for certain data points, interpretation and display options are offered.
      Example: For "AN Angle" values, you can represent and display as 0 to 360 degrees or -180 to +180 degrees, etc. Selections appear in a pull-down menu for the associated point. You may want to select -180 to +180 degrees if you ant to know if a phase angle is positive or negative in relation to the reference.
    - Modulo: Certain values are cumulative and can roll over and start recounting from zero. For those values, where required, you can enter a point at which the rollover will occur.
    - Offset: Where allowed, you can enter a value (offset) that will be added to the data point when it is computed.

2. When all changes are entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.1.8 Configure Log Sizes

The Configure Log Sizes setting allows you to set the size (amount of memory) allocated for each log, so you can optimize the number of records stored for each log.

1. From the General Settings menu, double-click on the Configure Log Sizes line. You will see the screen shown below.



Log	Assigned		Total Percent of Log Memory	Approximate Time Span	Approximate Records
	Blocks	Memory(MB)			
System Events	1	1	0.13	N/A	31130
Historical 1	1	1	0.13	76 days 7 hr 0 min 0 s	7324
Historical 2	1	1	0.13	259 days	24903
Historical 3	10	10	1.25	926 days	88939
Historical 4	10	10	1.25	2882 days	276706
Historical 5	10	10	1.25	894 days	85870
Historical 6	10	10	1.25	3705 days	355765
Historical 7	10	10	1.25	2255 days	216552
Historical 8	10	10	1.25	2730 days	262143
Event Triggered	1	1	0.13	N/A	31130
Sequence of Events (Limits)	1	1	0.13	N/A	15812
Digital Inputs	1	1	0.13	N/A	6553
Digital Outputs	1	1	0.13	N/A	10376
Flicker	1	1	0.13	N/A	24903
Waveform	40	40	5.00	N/A	38912
Power Quality	20	20	2.50	N/A	34827
Transients	10	10	1.25	N/A	15561

This screen lists the logs and the assigned blocks/memory/total percent of log memory/ for each, along with the approximate time span and approximate number of records based on the log's size; the bottom of the screen lists the remaining blocks/ memory.

2. Click in the Blocks field of any log that you want to configure and enter the amount of blocks you want that log to use: 1 Block = 1 MegaByte of memory.

   The software limitation of the log sizes is shown in the table below. However, the Software Option of your meter may restrict these sizes - see the NOTES below.

Log	Min Size	Max Size
System Events	1	1
Historical Log 1	0	8
Historical Log 2	0	8
Historical Log 3-8	0	60
All other logs	0	All remaining unused log memory at current Software Option level

3. Click **OK** to save your changes and exit the screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

NOTE

The amount of memory available for logging depends on the meter's model and Software Option:

Option A:

- 128 MB memory for logging for the EPM 9900 meter
- 512 MB memory for logging for the EPM 9900P meter

Option B: 1 GB memory for logging for both the EPM 9900 meter and the EPM 9900P meter

Option C:

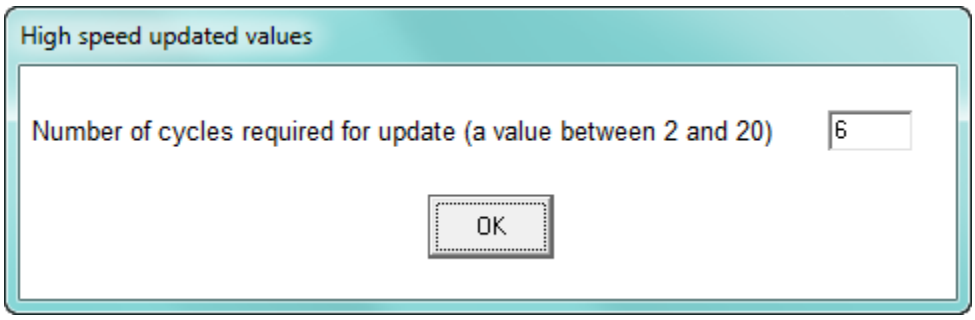
- 1 GB memory for logging for the EPM 9900 meter
- 4 GB memory for logging for the EPM 9900P meter

Memory size allocations can change. See the *EPM 9900 or EPM 9900P Manual* for specific memory sizes.

11.1.9 Configure High Speed Value Update Rate - EPM 9900P Meter

The Configure High Speed Value Update Rate setting lets you configure the update rate for the meter's High Speed Inputs. You can set between two and 20 cycles. This number determines how often any values assigned to the High Speed Inputs are updated.

1. From the General Settings menu, double-click on the Configure High Speed Value Update Rate line. You will see the screen shown below.

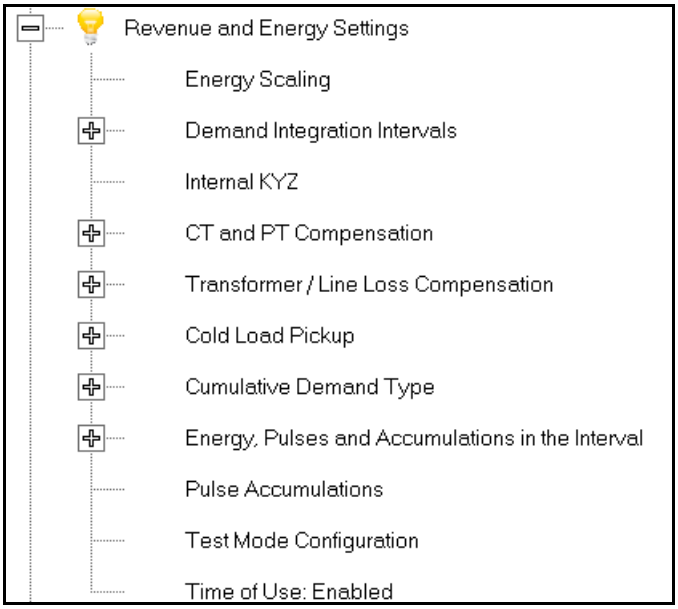


2. Enter the number of cycles you want before an update is performed: enter a number between 2 and 20.
3. Click OK to save your changes and exit the screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.2 Revenue and Energy Settings

Revenue and Energy Settings are the second group of settings in the Device Profile. They are used to configure the meter settings for parameters that are useful in energy measurement applications.

1. From the Device Profile screen, click on the + button next to Revenue and Energy Settings or double-click on the Revenue and Energy Settings line. All of the settings in the Revenue and Energy Settings group are listed. Not that you will only see the last two settings: Test Mode Configuration and Time of Use:Enabled/Disabled, if you are connected to an EPM 9900P meter.



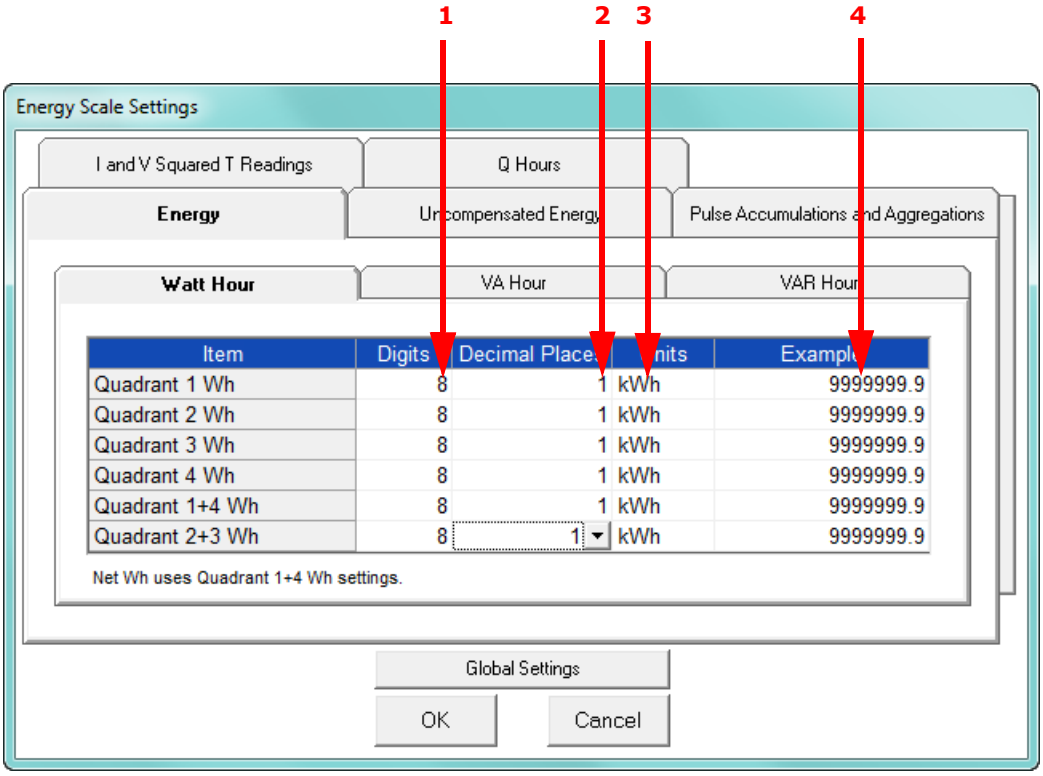
2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the Revenue and Energy Settings menu.

11.2.1 Energy Scaling

Energy scaling is the amount of digits and the decimal point position that will be seen on the meter display. Each energy parameter can be specifically set up for its desired scaling.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Energy Scaling or double-click on the **Energy Scaling** line. You will see the Energy Scale Settings screen.

To configure scaling for a reading, enter:
1. Number of Digits, 2. Number of Decimal Places,
3.Unit of Measurement; 4. Example of the resultant scaling is shown here



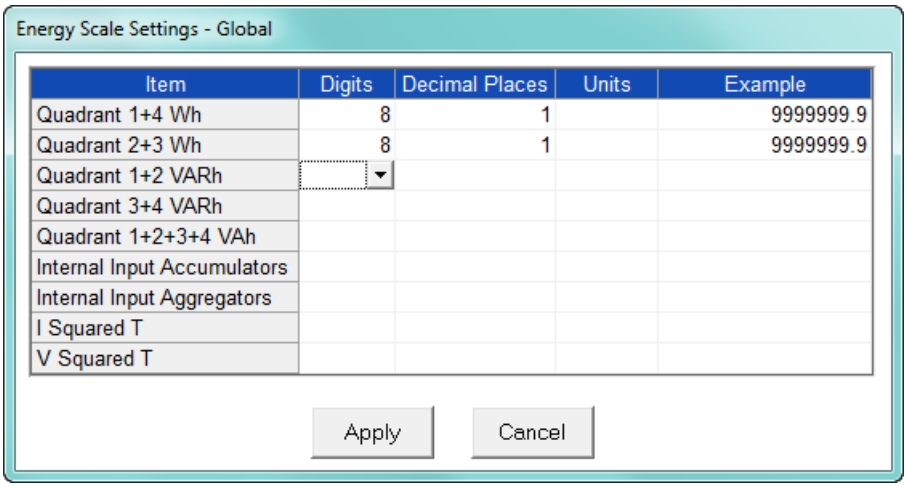
- This screen has multiple tabs that allow you to access all of the Energy Scaling options. Using the Energy Scale Settings screens you can select the number of digits, decimal point placement and Energy unit for displayed readings.

  This also affects the resolution of logged energy values and affects the rollover.

NOTE

- The Example field shows you the scaling choices you made applied to an example reading.
- You click on the tabs to navigate between screens, except for Global settings - you click on the Global Settings button to access that screen.

Global Settings



NOTE

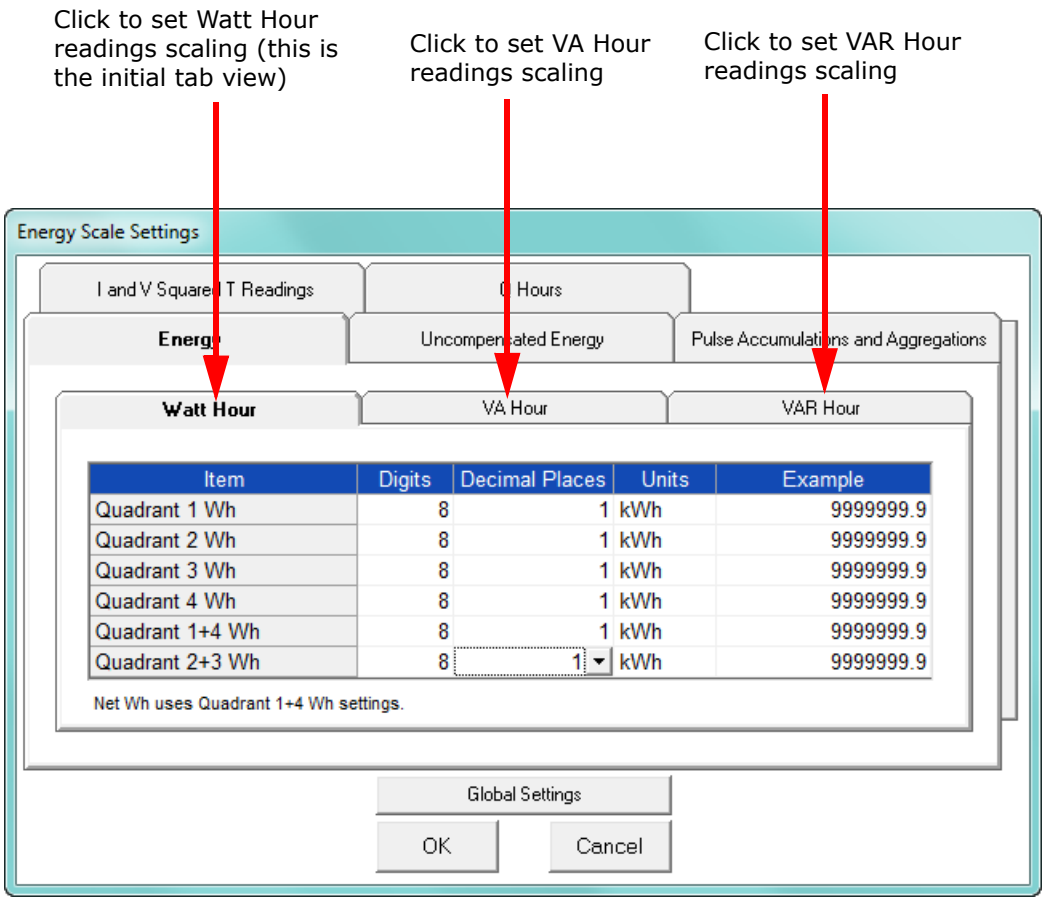
Because there are many energy settings, Global Settings conveniently allows you to set these similar energy reading settings all at once.

2. Click the Global Settings button to see the screen shown above. This screen lets you set the scale for all of the Energy Readings.
   - Click in the Digits field and select the number of digits for the value from the pull-down menu. You can choose between 2 and 9 digits.
   - Click in the Decimal Places field and select the number of decimal places for the value from the pull-down menu. You can choose between 0 and 7 decimal places, depending on the number of digits you selected. For example, if you chose 3 digits, you can only choose up to 2 decimal places.
   - Click in the Units field to select the unit of measurement for the value. You can select k or M.

     The example field changes as you make selections, to show you how the value would appear with the settings you made.
3. When all changes are entered, click Apply to return to the main Energy Scale Settings screen. You can now use the tabs to modify the scale for specific readings. For example, you might have set the scale for the Internal Input Accumulators as 5 digits, 2 decimal places, and M unit, but you may want one of the accumulators to have a different scale. You would click the Pulse Accumulations and Aggregations tab and change the scale for that accumulator. The following sections show the tab screens where you can make individual scaling changes. You set the Digits, Decimals, and Units fields in the same way as in the Global Settings screen.

Energy Tab

This is the initial screen view. Click on the Watt Hour, VA Hour, and VAR Hour tabs to configure scaling for those readings.

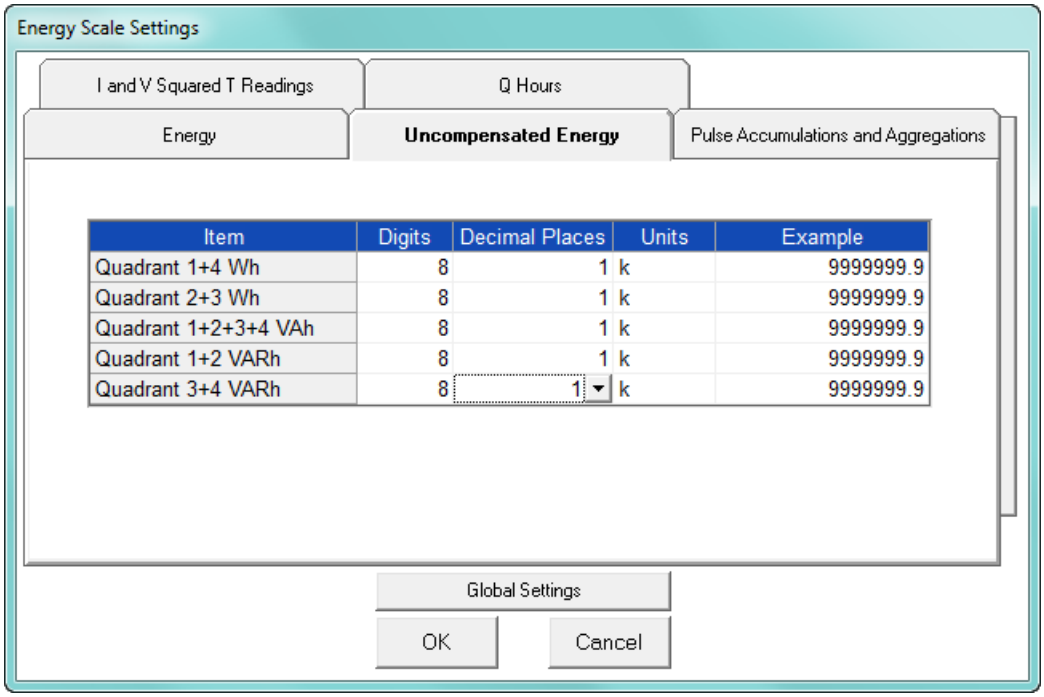


The meter has the ability to measure and display energy readings for many different purposes. These readings can each be scaled separately.

Uncompensated Energy Tab

Uncompensated energy is the energy log that does not have the transformer/line loss compensation attached to it.

Click on the Uncompensated Energy tab to configure specific VA, Watt and VAR readings not adjusted by Transformer Loss Compensation.



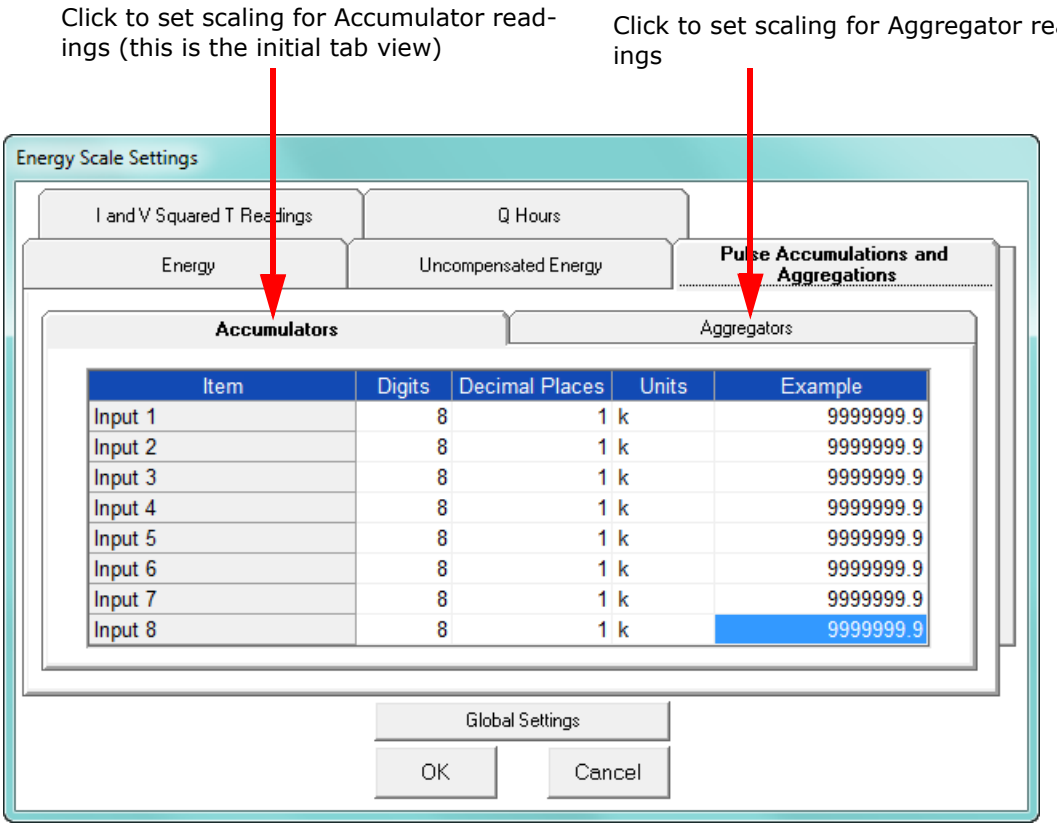
Item	Digits	Decimal Places	Units	Example
Quadrant 1+4 Wh	8	1	k	9999999.9
Quadrant 2+3 Wh	8	1	k	9999999.9
Quadrant 1+2+3+4 VAh	8	1	k	9999999.9
Quadrant 1+2 VARh	8	1	k	9999999.9
Quadrant 3+4 VARh	8	1	k	9999999.9

This meter has the ability to collect both compensated and uncompensated energy data, simultaneously. This is useful in jurisdictions in which multiple entities need to receive data, if some of the entities require compensated data, and others require uncompensated data.

Pulse Accumulations and Aggregation Tab

Pulse accumulations allow the meter to be used as a pulse counter and pulse totalizer. This is useful when you want to add additional metered parameters, such as water, condensate (steam), gas, or any other desired energy commodity.

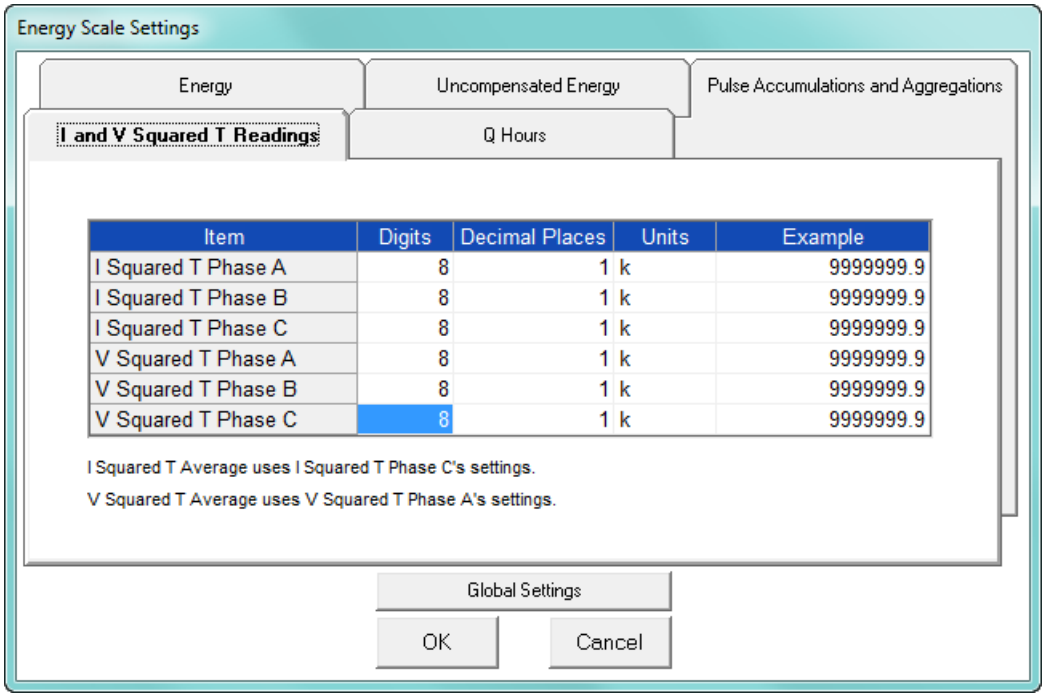
Click on the Pulse and Aggregations tab and then click on the Accumulators and Aggregators tabs to configure scaling for those readings.



Item	Digits	Decimal Places	Units	Example
Input 1	8	1	k	9999999.9
Input 2	8	1	k	9999999.9
Input 3	8	1	k	9999999.9
Input 4	8	1	k	9999999.9
Input 5	8	1	k	9999999.9
Input 6	8	1	k	9999999.9
Input 7	8	1	k	9999999.9
Input 8	8	1	k	9999999.9

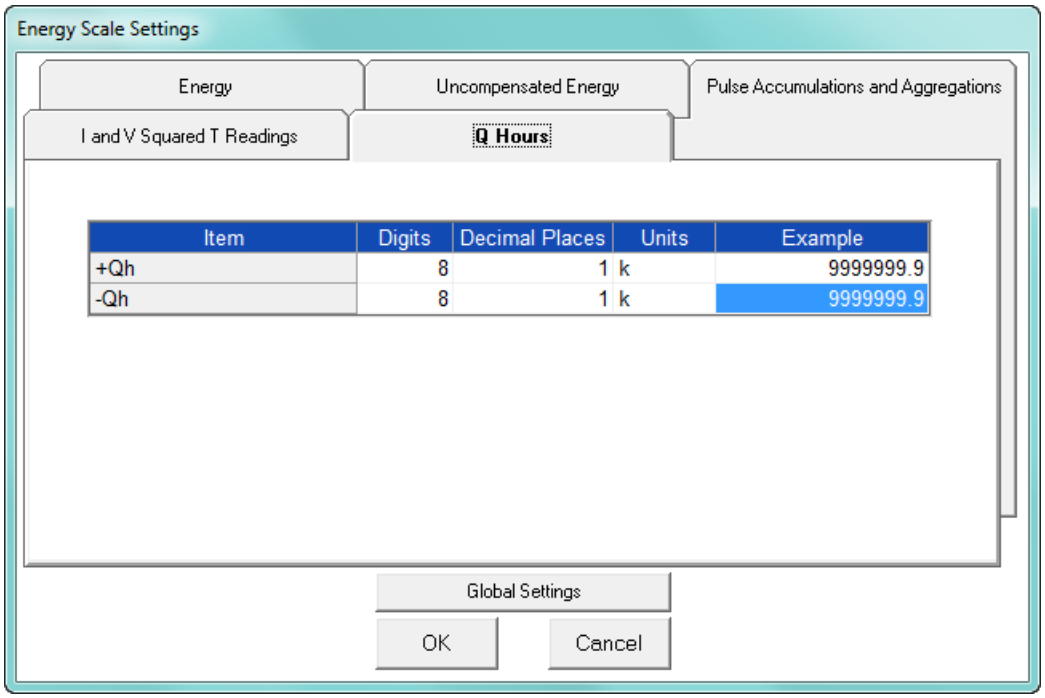
I and V Squared T Readings Tab

Click on the I and V Squared Readings tab to configure scaling for specific I^2T readings (data will not accumulate until current reaches the programmed level) and V^2T readings (data stops accumulating when Voltage falls below the programmed level).



Q Hours Tab

Click on the Q Hours tab to configure scaling for +QH and -QH readings.

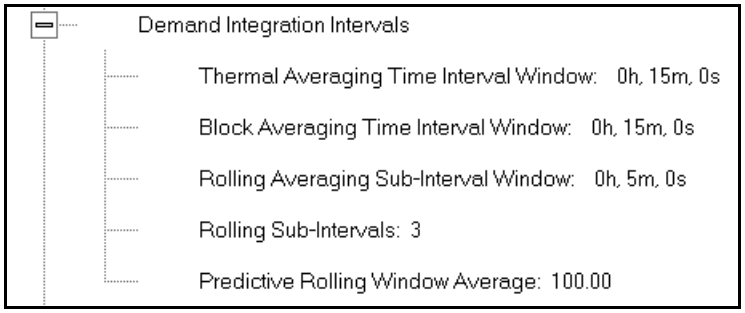


4. When you are done, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the Update Device button to send the new profile to the meter.

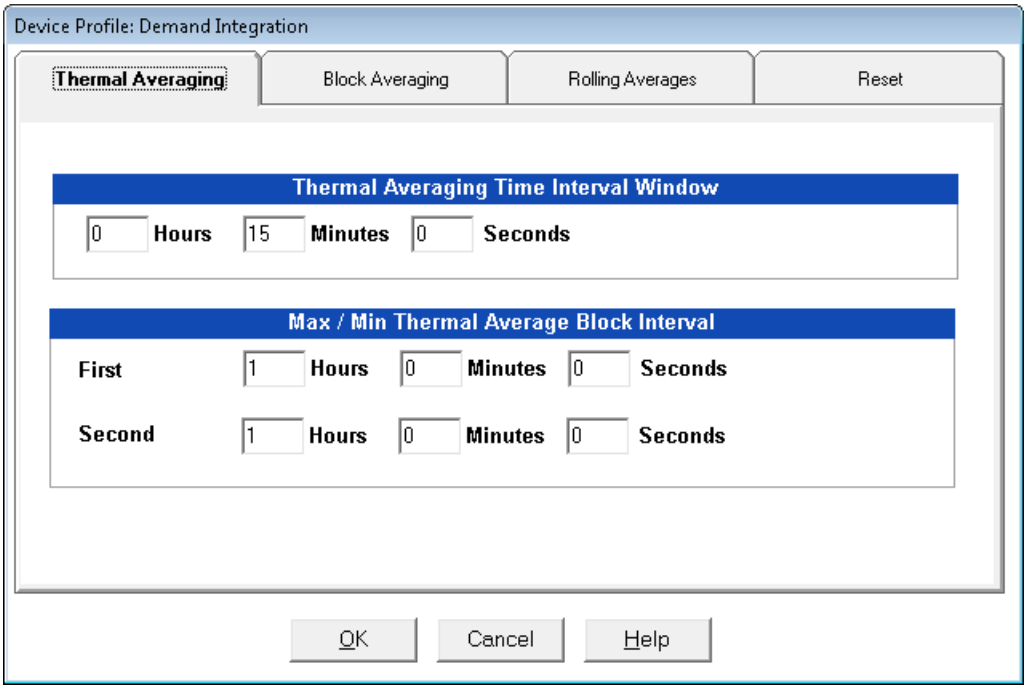
11.2.2 Demand Integration Intervals

See the *EPM 9900 or EPM 9900P Instruction Manual* for details on Demand intervals.

1. From the Revenue and Energy Settings menu, click on the + button next to Demand Integration Intervals or double-click on the Demand Integration Intervals line. You will see the submenu shown below.



2. Double-click on any of the settings. You will see the screen shown below.

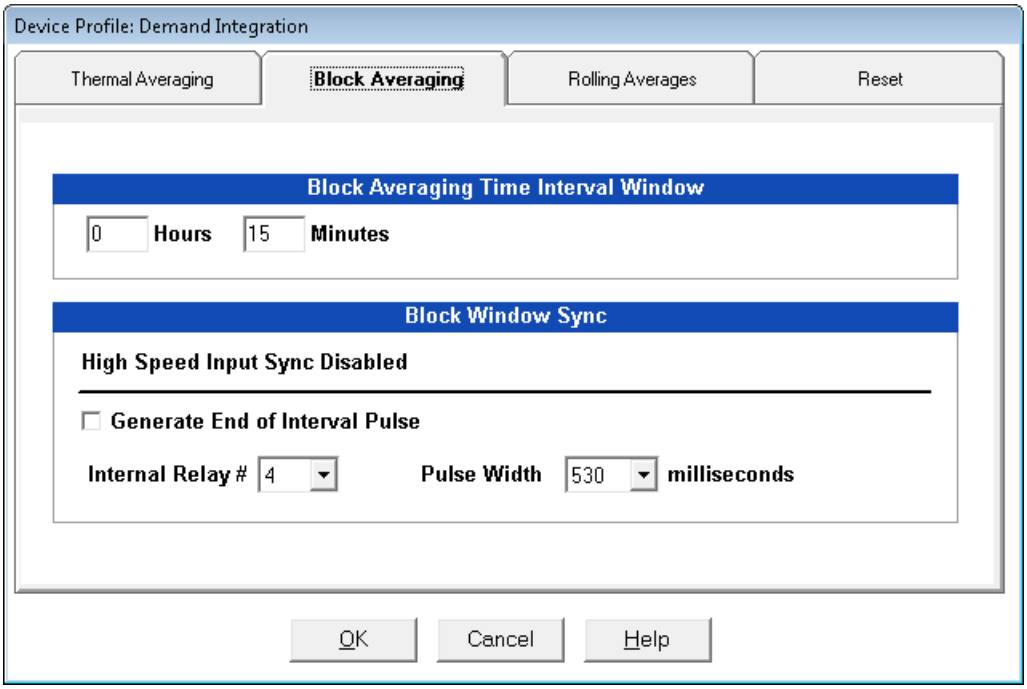


3. Click on the tabs at the top of the screen to navigate from one setting to another. Make changes to the settings according to your application requirements. Following is a brief description of each setting and its function:

- **Thermal Averaging** (tab shown on previous page): use to set hours and minutes for a precise thermal window of demand data.
    - Traditional analog Watt-hour meters use heat-sensitive elements to measure temperature rises produced by an increase in current flowing through the meter. A pointer moves in proportion to the temperature change, providing a record of demand. The pointer remains at peak level until a subsequent increase in demand moves it again, or until it is manually reset.

      The EPM 9900/9900P meter mimics traditional meters to provide Thermal Demand readings. Electronic thermal demand emulation is the logarithmic average of the power used, with a more recent load being weighted more heavily than a less recent load, (approximated exponentially). Each second, as a new power level is computed, a recurrence relation formula is applied. This formula recomputes the thermal demand by averaging a small portion of the new power value with a large portion of the previous thermal demand value. The occurrence of the proportioning of new to previous is programmable, set by the averaging interval. The averaging interval represents a 90 change in thermal demand to a step change in power. So, for example, with a 15 minute set interval, the meter will record 90 of a change in load in 15 minutes, 99 in 30 minutes, and 99.9 in 45 minutes.

      Because thermal demand emulation is the logarithmic average, the demand is not set to zero on a demand reset. On a demand reset, present demand becomes the new maximum demand.
    - The Max/Min Thermal Average Block Interval fields are used if you want to track the maximum and minimum Demand in more than one interval, e.g., the Max and Min Demand in a 10 minute (First Interval) and a 15 minute interval (Second Interval).
- **Block Averaging Time**: use to set the length of the block interval used for Demand calculations and other interval-based functions; also used to set End of Interval pulse. Block averaging is also known as fixed window averaging. A window is the user set time range, e.g., 15 minutes. Computation is performed on that 15 minute interval, and after that, a new set of computations will be started. For example, Window 1 will be from 0 to 15 minutes, Window 2 will be from 16 to 30 minutes, and so on.

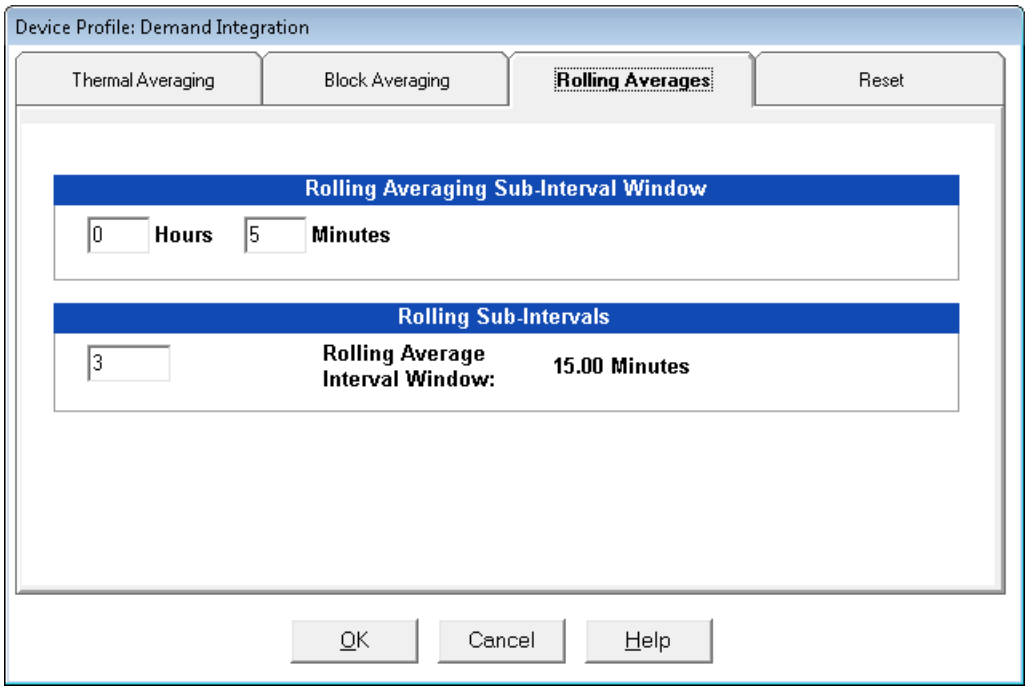


- Use the Hours and Minutes fields to set the length of the Block Interval.
- If you want to generate a pulse at the end of the set interval, click the box next to the Generate End of Interval Pulse field and select the number of the internal relay (1-4) you want to use and the pulse width (600 - 635 milliseconds).

NOTE

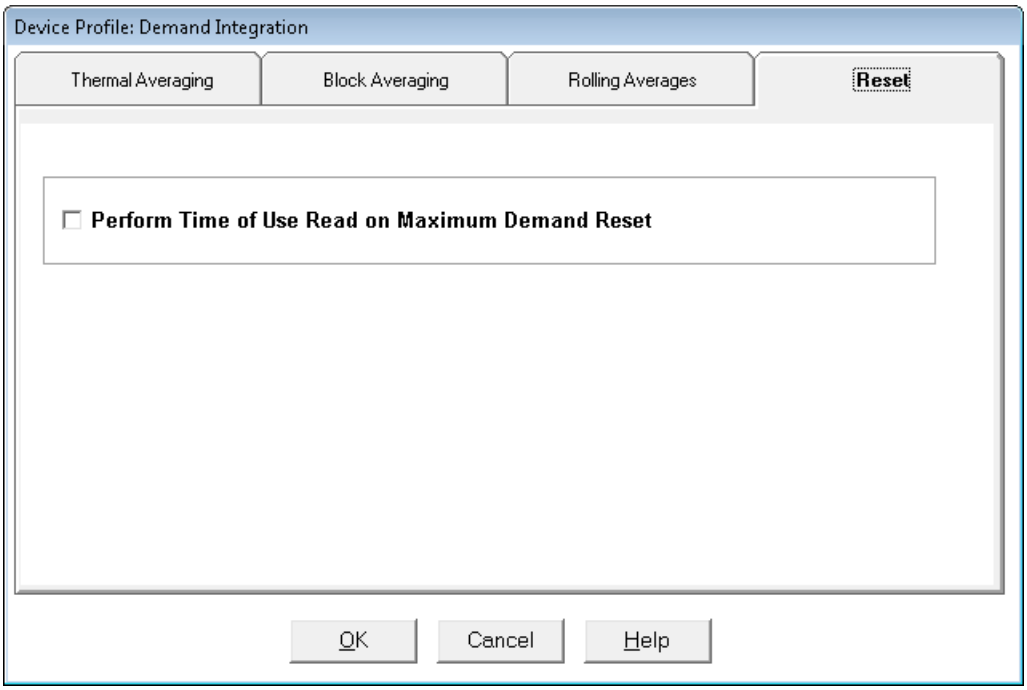
The Block Window Sync field indicates whether the meter is being synchronized with pulses from a High Speed input. This option is set in the Input Type field of the High Speed Inputs screen (see 11.3.8 "High Speed Inputs").

- **Rolling Averages**: also known as a sliding window, functions like multiple, overlapping Block averages. You define the subintervals at which an average of Demand is calculated. A window duration is the user set time, such as 15 minutes, but it moves, so that, for example, Window 1 is 0 to 15, Window 2 is 1 to 16, Window 3 is 2 to 17, and so on.



- Set the **Hours** and **Minutes** fields under **Rolling Averaging Sub-Interval Window**.
- **Rolling Sub-Intervals**: set the number of rolling windows you want to "string together."
- **Predictive Rolling Window Average**: the meter gives you the programmed (field) prediction of your demands. If you are using Demand as a Limit, such that you will perform certain actions when you hit a certain Demand level, e.g., turning off motors, you may want to give yourself a “buffer.” This field accomplishes that by letting you choose to over-predict the Rolling Window Demand - e.g., if you enter 110, the meter will predict Demand at a 10 higher rate than the actual Demand, so that you will trigger a Limit alarm earlier than if you were using 100 Predictive Demand.

- **Reset**: Allows you to specify a Time of Use read whenever Maximum Demand is reset.



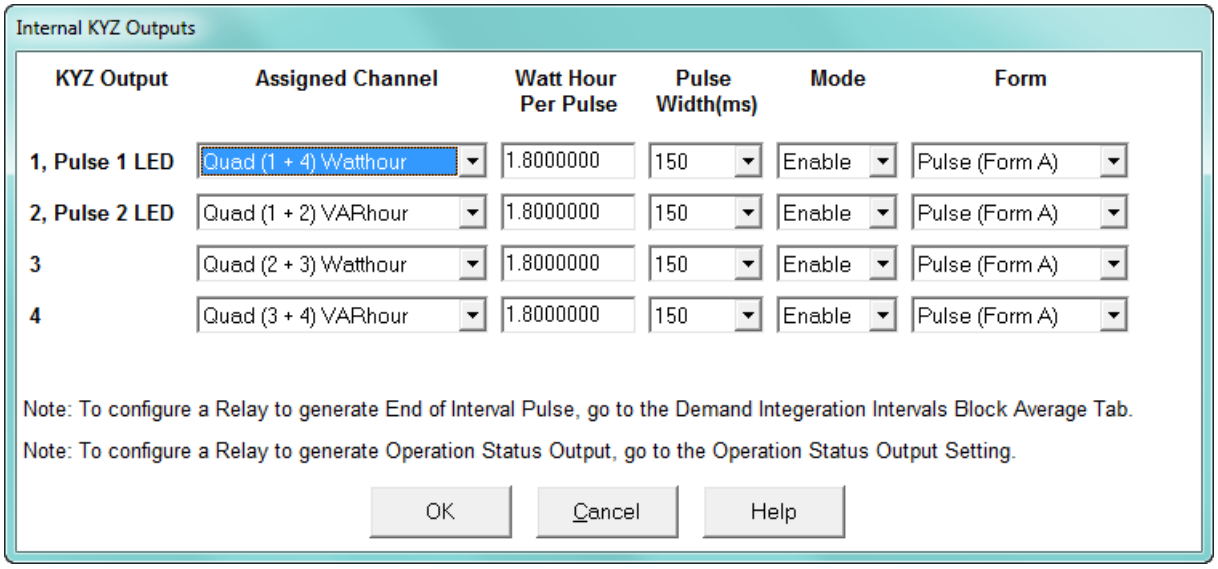
- Check the box to perform the TOU read. By selecting this, the meter will place all of the TOU values in the previous month's registers. Otherwise, the meter will default to self read based on a date set in the meter.
- Leave the box unchecked if you don't want to perform a TOU read.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.2.3 Internal KYZ Outputs

The Internal KYZ Outputs setting lets you assign channels to the KYZ outputs and to the test LEDs. The channel selection sets the type of pulse that will be generated. For example, the Pulse 1 LED can generate Energy Pulses for conventional testing or Reactive (VARh) Pulses for complex testing and approvals. This setting also allows you to determine the frequency and duration of the pulse for each output and LED.

1. From the Revenue and Energy Settings menu, click on the + button next to Internal KYZ Settings or double-click on the Internal KYZ Settings line. You will see the screen shown below.



2. To make selections on this screen:
   - Select the assigned channel for the pulse/output. This is the demand that will be output as a pulse.
   - Enter Watt hour per pulse, pulse width, mode and form for each pulse/output.

NOTE

- Form A = Pulse; Form C = Transition
- No more than one Pulse Output can be assigned as an Operation Status Output.

3. When all changes are entered, click OK to return to the main Device Profile screen. For these changes to take effect, you must click the Update Device button to send the new profile to the meter.

Considerations on Setting KYZ Outputs

KYZ Pulses are produced at a rate proportional to the rate of energy accumulation, a feature that makes them useful for accuracy testing. Decreasing the value of the Watt Hour per Pulse field increases the pulse rate, improving the moment-to-moment precision of the output. The increased pulse rate means that the pulses are of shorter duration. Most equipment for detecting and counting pulses has a minimum detection time, so pulses that occur too rapidly might not be detected and counted.

The value in the Pulse Width field is used to force the meter to generate minimum width pulses in situations where proportional width pulses would occur too quickly to be measured. A pulse width setting that does not match appropriately with the input level and Watt hour per pulse setting will result in output that, in the short term, will not verify correctly.

For proper operation of this feature, the pulse width should be set to a value that is longer than the detection time required by the monitoring equipment, and shorter than the pulse period that the inputs and Watt hour per pulse setting would produce. The formula for the second quantity is:

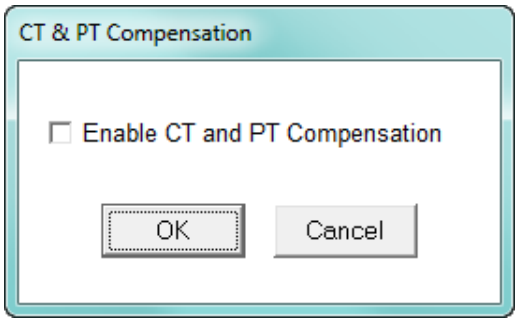
$$\frac{3600 \text{ x } \textit{Watt-hr per pulse}}{\textit{Total Power}}$$

Some example cases are shown in the table below. For proper operation the pulse width should be set to a value that is less than the computed value of seconds per pulse.

Voltage Phase to Neutral/Phase		Current		Total Power Wh/Pulse	Pulses/Hour	Seconds/Pulse
Volts	Volts	Amps	Watts	Wh	Pulses	Seconds
69.28	120.00	1	207.85	1.8000000	115.47	31.18
69.28	120.00	1	207.85	0.2078461	1000.00	3.60
69.28	120.00	5	1039.23	1.8000000	577.35	6.24
69.28	120.00	5	1039.23	1.0392305	1000.00	3.60
120.00	207.85	1	360.00	1.8000000	200.00	18.00
120.00	207.85	1	360.00	0.3600000	1000.00	3.60
120.00	207.85	5	1800.00	1.8000000	1000.00	3.60
277.13	480.00	1	831.38	1.8000000	461.88	7.79
277.13	480.00	1	831.38	0.8313844	1000.00	3.60
277.13	480.00	5	4156.92	1.8000000	2309.40	1.56
277.13	480.00	5	4156.92	4.15629219	1000.00	3.60

11.2.4 CT and PT Compensation

1. From the Revenue and Energy Settings menu, click on the + button next to CT and PT Compensation or double-click on the CT and PT Compensation line.



2. Check the Enable box to enable CT and PT Compensation; leave the box unchecked to keep it disabled.

3. Click OK to close the screen and return to the main Device Profile screen. For these changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.2.5 Transformer / Line Loss Compensation

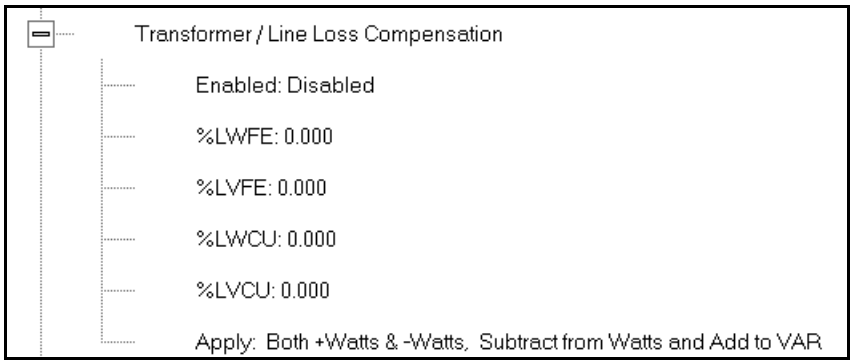
Transformer losses are power used by the transformer while working. The more load on the transformer, the higher the transformer losses. There are two types of transformer losses:

- No load losses - these are the fixed losses that keep the transformer up and running.
- Load losses - these vary with changes in the load.

When the meter is located on the secondary side of a customer's transformer, a utility will want to add the transformer losses into the energy usage calculation. However, this practice is regulated by local jurisdiction and regulations. The meter has the capability to add in or subtract out these transformer losses, depending on the user's specific needs.

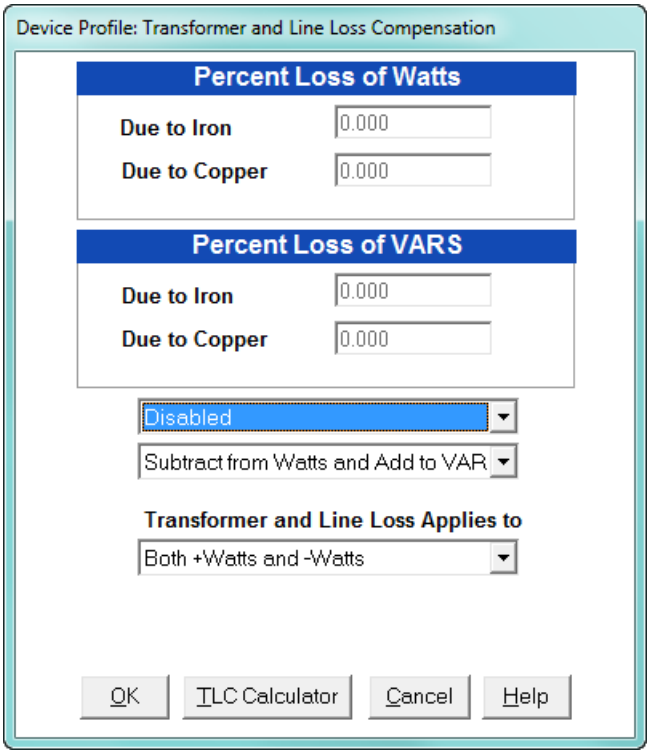
Line losses are similar to transformer losses, except that they are used to compensate for loss incurred on wires, such as transmission lines.

1. From the Revenue and Energy Settings menu, click on the + button next to Transformer/Line Loss Compensation or double-click on the Transformer/Line Loss Compensation line. You will see the submenu shown below.



2. The menu displays the current values for the meter's Transformer Loss Compensation.
   - LWFE = percent loss of Watts due to iron
   - LVFE = percent loss of Vars due to iron
   - LWCU = percent loss of Watts due to copper
   - LVCU = percent loss of Vars due to copper

3. Double-click on any of the loss values. You will see the screen shown below.



4. Click on **TLC Calculator** to find the values to enter into the Percent Loss fields. The TLC Calculator button launches the TLC Calculator that performs the calculations for you once the required data is entered.

NOTE

IMPORTANT! See Appendix A, which contains screen captures of the TLC Calculator with example numbers, and an explanation of Loss Compensation considerations.

5. Enter the percent loss of Watts and VARS for copper and iron in the appropriate fields.
6. Enable or Disable Transformer Loss Compensation with the first pull-down menu at the bottom of the screen. The optional selections are:
   - Disabled
   - Iron (Fe) Only
   - Copper (Cu) Only
   - Both Iron and Copper (Fe and Cu)
7. With the second pull-down menu, select from the following options:
   - Add to Watts and Subtract from VAR
   - Subtract from Watts and Add to VAR
   - Add to Watts and VAR
   - Subtract from Watts and VAR
8. With the third pull-down menu, apply the loss based on the power flow direction by selecting one of the following options:
   - Both +Watts and -Watts
   - -Watts only

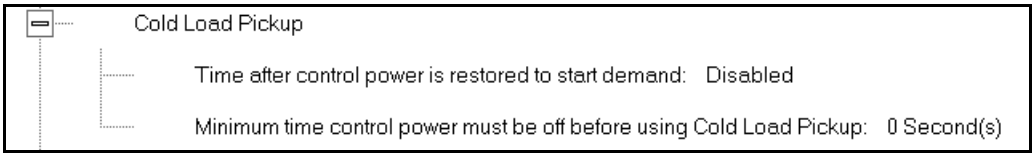
- +Watts only

9. When all settings are complete, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

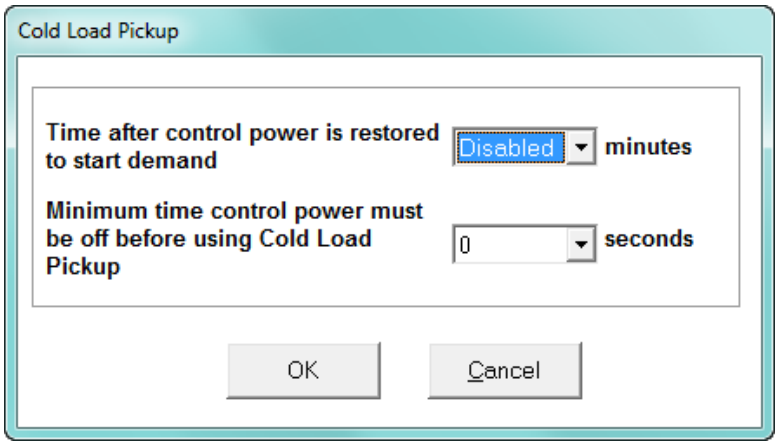
11.2.6 Cold Load Pickup

Cold Load Pickup is used to manage Demand in the event of a power outage. You set the amount of time (in seconds) power is off to identify a power outage that is the responsibility of the utility (as opposed to a very short term loss of power that is not their responsibility); then you set the amount of time (in minutes) you want to wait before Demand starts again. This time should correspond to the "grace" period the utility applies to avoid charging for motor startup, etc. after a power outage.

1. From the Revenue and Energy menu, click on the + button next to Cold Load Pickup or double-click on the Cold Load Pickup line. You will see the submenu shown below.



2. Double-click on one of the parameters to open the screen shown below.



3. Make the following selections in accordance with your application needs:
   - Time after control power is restored to start demand - can be 1 to 60 minutes, or Disabled.
   - Minimum time control power must be off before using Cold Load Pickup - can be from 0 to 255 seconds.

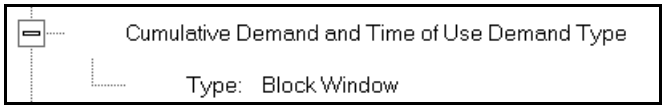
4. When all changes are entered, click OK to return to the main Device Profile screen. For these changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.2.7 Cumulative Demand Type and Time of Use Demand Type

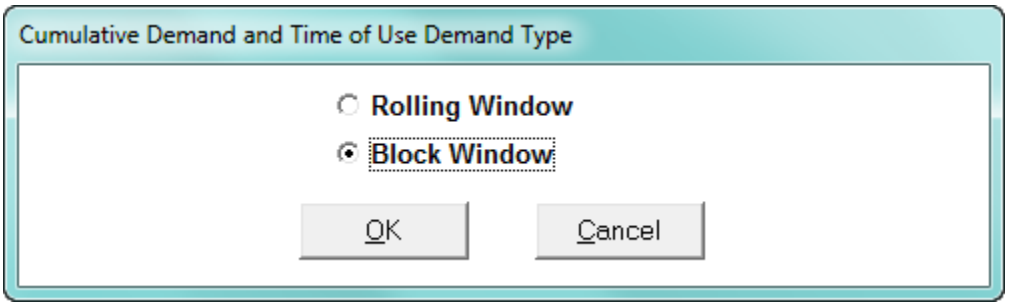
The EPM 9900 meter lets you set the Cumulative Demand Type; the EPM 9900P also lets you set the Time of Use Demand Type (both cumulative and TOU must be the same demand type).

- Cumulative demand is a counter of max demand that the meter keeps. It can help you determine if there has been tampering with the meter, i.e., unauthorized resetting of demand. Whenever demand is reset, the current max demand is added to the cumulative demand. By analyzing the data in the counter you can see if the demand is being reset more often than intended. You can choose to use **either** Block Window Demand or Rolling Window Demand for the cumulative demand.
- Time of Use demand type can also be set for the EPM 9900P meter. Either Block Window or Rolling Window demand averaging can be chosen. This setting is used to accumulate time of use energy readings. See Chapter 15 "Time-of-Use" for detailed information on time of use for the EPM 9900P meter. Note that the same demand type must be used for both cumulative demand and Time of Use demand.

1. From the Revenue and Energy Settings menu, click on the + button next to Cumulative Demand Type and Time of Use Demand Type or double-click on the Cumulative Demand Type and Time of Use Demand Type line. You will see the submenu shown below. It tells you the type of demand currently selected.



2. Click the **Type** line to open the screen shown below.

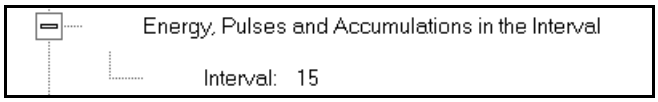


3. Click the radio button in front of Rolling Window (sliding) or Block Window (fixed) to select cumulative Demand and TOU Demand type.
4. Click **OK** to exit the screen and return to the main Device Profile screen. For a change to take effect, you must click the Update Device button to send the new profile to the meter.

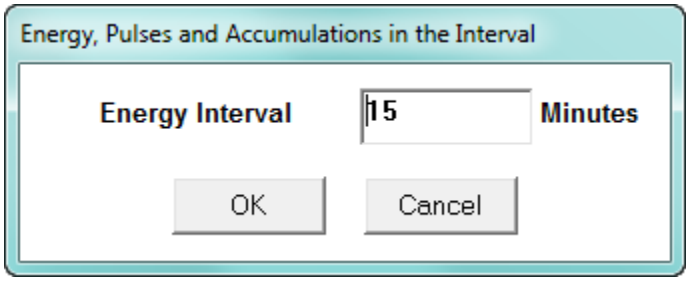
11.2.8 Energy, Pulses and Accumulations in the Interval

Energy in the interval is the energy that is accumulated within a load profiling interval. This is often the preferred method for logging because it is a summation of only that particular period of energy. The Interval setting you make creates the sub-accumulation field within the general Energy accumulation. An advantage of this setting is that the sub-accumulation takes up less space and is processed more quickly then the larger accumulation.

1. From the Revenue and Energy Settings menu, click on the + button next to Energy, Pulses and Accumulations in the Interval or double-click on the Energy, Pulses and Accumulations in the Interval line. You will see the submenu shown below.



2. The current Interval setting is displayed. Click on the **Interval** setting to open the screen shown below.



3. Set the number of minutes for the Energy interval. Note that Energy in the Interval should always match the Demand Interval timing.
4. Click **OK** to close the window and return to the main Device Profile screen. For any change to take effect, you must click the Update Device button to send the new profile to the meter.

11.2.9 Pulse Accumulations

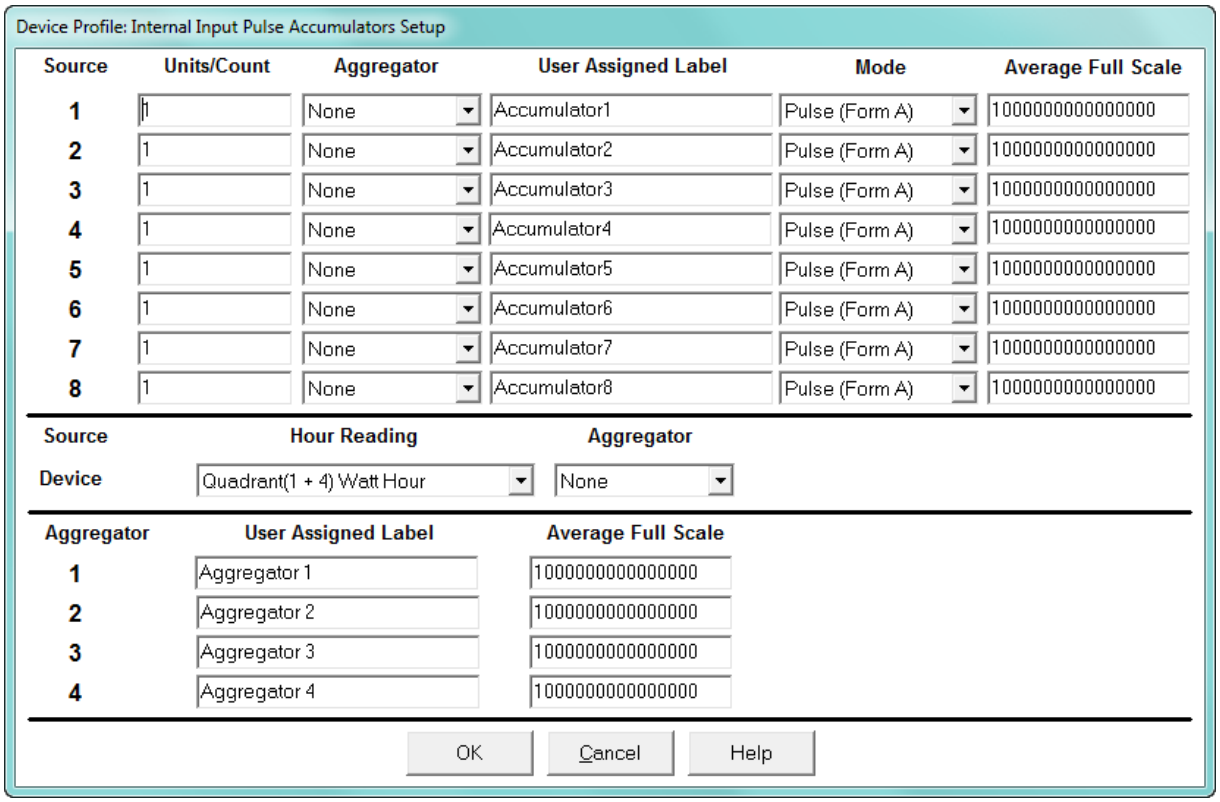
Pulse accumulators are used to count and/or aggregate pulse information from external devices, using the digital high speed inputs. These devices may be gas, water, or electricity meters; energy management systems; SCADA devices; or any pulse-generating device.

This section of the Device Profile displays a series of eight running totals available on the EPM 9900/9900P meter. Each total can be added to (or subtracted from) other totals. This allows you to set the High Speed inputs located directly on the meter to accumulate pulses.

NOTE

If you use these inputs for pulse accumulations, do not set them to record waveforms - if you do, you will record endless waveforms.

1. From the Revenue and Energy Settings menu, click on the + button next to Pulse Accumulations or double-click on the Pulse Accumulations line. You will see the screen shown below.



2. High Speed inputs 1-8 are listed in order under Source. Enter the following information or use the pull-down menus to select:
   - **Units/Count** - this is the scale factor that normalizes the pulses so that they can be aggregated. Pulses are stored in primary values.
   - **Aggregator** - this allows you to place the pulse register into a separate accumulation register that can aggregate (add) or net (subtract) values.
   - **User Assigned Label** - this window allows you to enter a label designation for the source.
   - **Mode** - you can set Pulse or Transition. A transition means from open to shorted/closed or from shorted/closed to open; a pulse contains 2 transitions, open to shorted/closed, followed by shorted/closed to open.
   - **Average Full Scale** - for EPM meters, in order to set a limit on a reading it needs a Full Scale value as the 100 reference. You can set a limit on the average number of pulses per interval.
   - **Device Hour Reading and Aggregator** - source device is the meter you are connected to. The Hour reading is either Quadrant 1 and 4 Watt-hour or Quadrant 2 and 3 Watt-hour. The Aggregators indicate whether the count should be added to, or subtracted from, Aggregators 1-4. You can choose None if you don't want the count to affect any of the Aggregators.

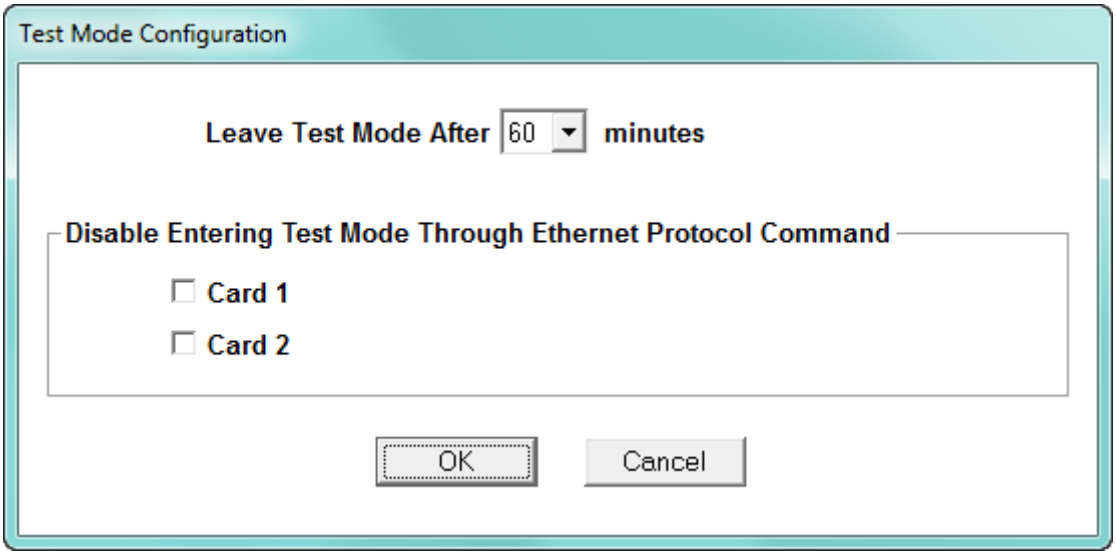
- **Aggregators:** The "buckets," or Totalizer fields where pulse counts from the High Speed inputs and from the Watt-Hour counters can be totaled. The user can assign a label to each of the Aggregators. See the Average Full Scale description above for an explanation of this field - it has the same use here, except for the Aggregators.

3. When all data has been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.2.10 Test Mode Configuration (EPM 9900P Meter)

The EPM 9900P meter offers a Test Mode that is used to verify the meter's accuracy. This setting lets you configure a time for the Test Mode to time out and for the meter to return to Normal Mode, if there is no testing activity. It also lets you restrict Test Mode access for either or both of the Ethernet ports. See Chapter 20 "Other Functions and Screens" for additional Test Mode settings, and the *EPM 9900P Instruction Manual* for more information on the meter's Test Mode function.

1. From the Revenue and Energy Settings menu, double-click on **Test Mode Configuration**. You will see the screen shown below.



2. Select the timeout period from the pull-down menu. The options are 0-60 minutes. This will be the time the meter waits before returning to Normal Mode from Test Mode, once there is no more testing activity.

3. If you want to restrict Test Mode from being entered through either or both of the Ethernet ports, click the appropriate buttons. Card 1 refers to Network card port #1, and Card 2 refers to the optional Network card port #2.

4. Click OK to save your changes and return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

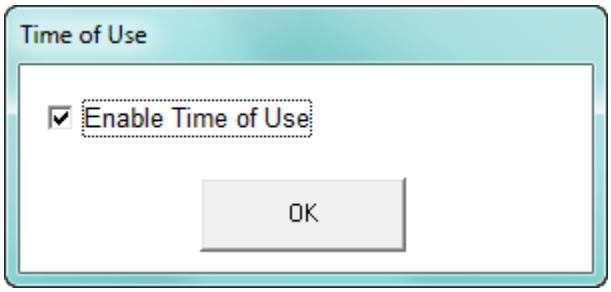
11.2.11 Time of Use Enable/Disable (EPM 9900P Meter)

The EPM 9900P meter has a setting that lets you enable or disable the meter's Time of Use (TOU) (see Chapter 15 "Time-of-Use" for detailed information on the EPM 9900P meter's TOU). This is useful if you need to reset TOU, since TOU can only be reset if it is not active, i.e., disabled. Once TOU has been reset, use this screen to enable TOU, again.

NOTE

You will also use this screen to enable TOU for the first time, once you have set up the TOU Profile, since the meter's default is TOU disabled.

1. From the **Revenue and Energy Settings** menu, double-click on **Time of Use**. You will see the screen shown below.

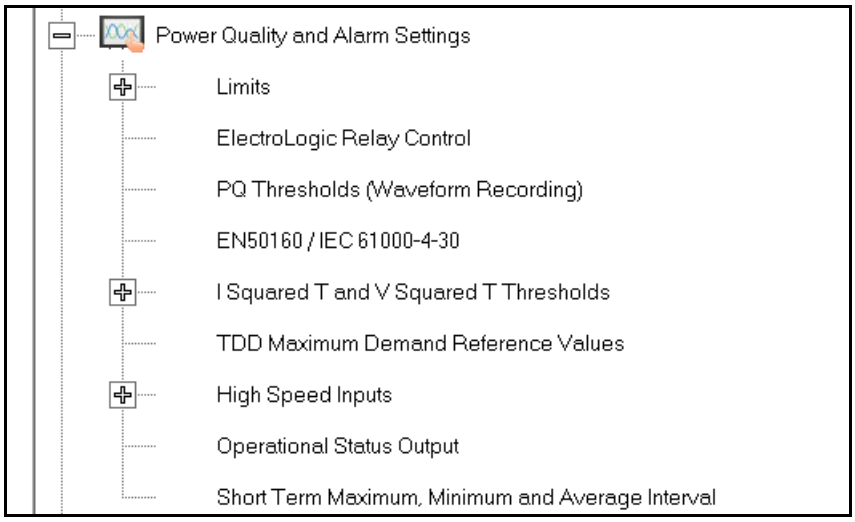


2. When there is a check in the box, TOU is enabled; if the box is blank, TOU is disabled. Clicking in the box toggles it between being checked and being unchecked.
3. Click **OK** to save your changes and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

11.3 Power Quality and Alarm Settings

Power Quality and Alarm Settings are the third group of settings in the Device Profile.

1. From the Device Profile screen, click on the **+** button next to Power Quality and Alarm Settings or double-click on the **Power Quality and Alarm Settings** line. All of the settings in this group are listed.



2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the Power Quality and Alarm Settings menu.

11.3.1 Limits

Limits are threshold settings that can be set by a user to trigger a record in a log when an alarm condition is met. Utilizing the limits, the user can then control a relay or send a warning email on that alarm.

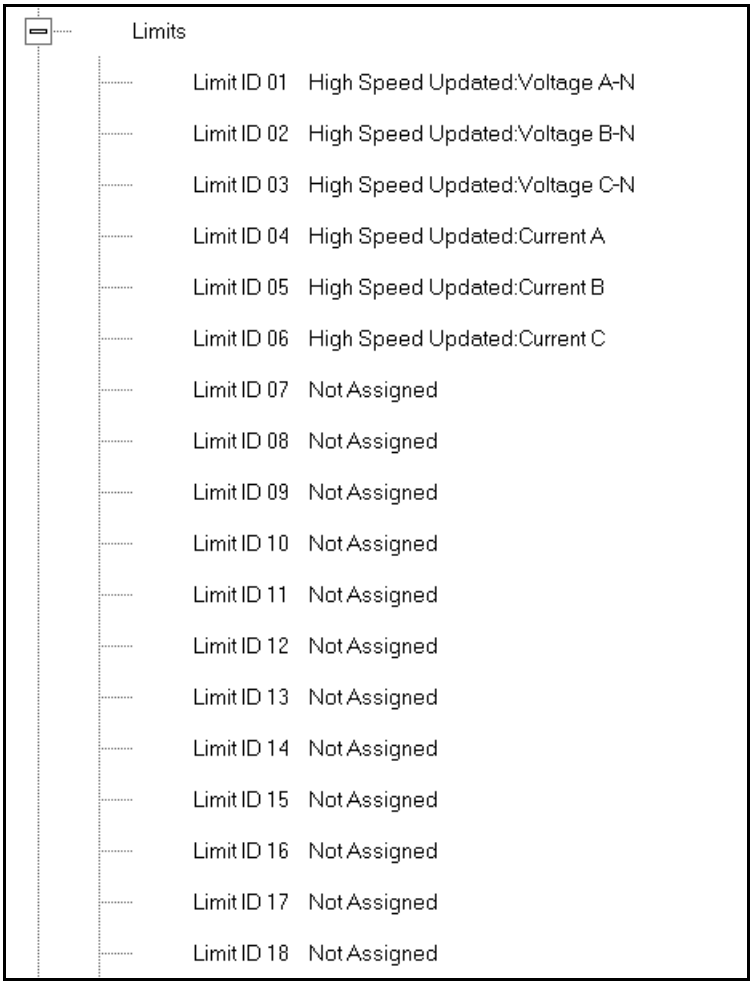
Limit settings are based on a percentage of the Full Scale (% of FS), which is set in the Limit and Waveform Full Scales setting (11.4.2 "Programming the Trending Setup"). Full Scale is based on CT and PT ratios set in the CT, PT Ratios and System Hookup setting (19.4.1 "Viewing Historical Trends and Snapshots"). Limits are based on a percent of Full Scale settings so that the same settings can be used no matter what the CT and PT Ratio needed.

Before programming limits, set the CT and PT ratios. Then, set the Limit and Waveform Full Scales if you want to change to automatic configuration. In most cases the software will configure the Full Scale optimally.

NOTE

The software automatically updates the Full Scale; however, you can set it separately from the CT and PT Ratios.

1. From the Power Quality and Alarm Settings menu, click on the + button next to Limits or double-click on the Limits line. You will see the submenu shown below.



This submenu displays the current Device Profile Limit settings. Not all limits are shown in the figure above: there are 32 Limit ID fields.

2. Double-click on any of the settings (Limit ID 01, for example). You will see the Limits screen, shown below.

Device Profile: Limits

Limit ID	Assigned Item	Limit 1			Limit 2			Combination Limit 3
		Setting	Setpoint		Setting	Setpoint		
			% of FS	Primary		% of FS	Primary	
1	High Speed Updated:Voltage A-N	Above	120.00	144.00	Below	80.00	96.00	OR
2	High Speed Updated:Voltage B-N	Above	120.00	144.00	Below	80.00	96.00	OR
3	High Speed Updated:Voltage C-N	Above	120.00	144.00	Below	80.00	96.00	OR
4	High Speed Updated:Current A	Above	150.00	7.50	Below	0.00	0.00	OR
5	High Speed Updated:Current B	Above	150.00	7.50	Below	0.00	0.00	OR
6	High Speed Updated:Current C	Above	150.00	7.50	Below	0.00	0.00	OR
7	Not Assigned	Above	98.00	98.00	Above	0.00	0.00	OR
8	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
9	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
10	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
11	Not Assigned	Below	-0.01	-0.01	Above	0.00	0.00	OR
12	Not Assigned	Below	-0.01	-0.01	Above	0.00	0.00	OR

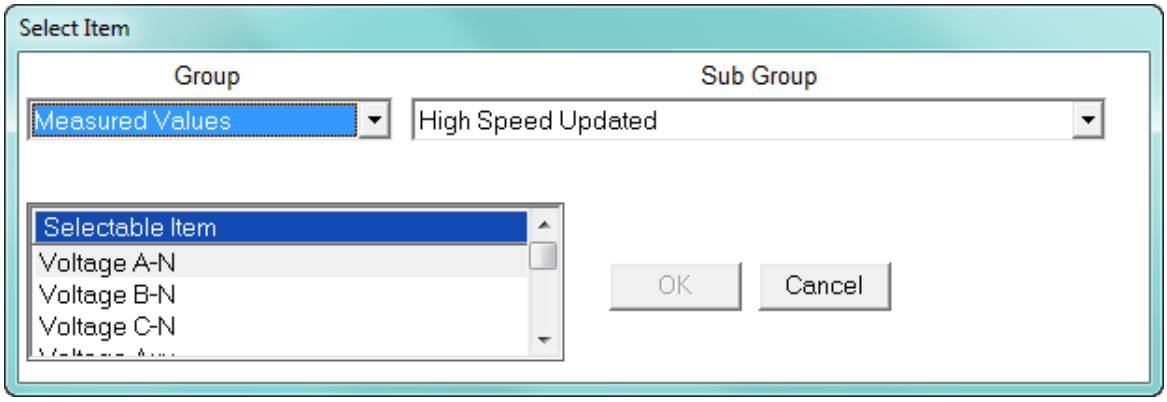
Channels	Primary Values at 100%
I A, B, C, Nc	5.00
I Nm	5.00
V Phase to Neutral	120.00
V Phase to Phase	208.00
Power Phase	600.00
Power Total	1800.00
Frequency	60.00

OK Cancel Help

- This screen can be expanded to show all of the limits. Click on the top or bottom of the screen to display sizing arrows you can click on and drag to expand the screen.
- Percentage of Full Scale settings (of FS): The limits are set in % of Full Scale so that when you create a profile, you can keep your settings. This is true, even though the CT and PT ratios change when the meter (or a new meter) is placed in a different location. Changing the CT and PT ratios does not affect the % of Full Scale limits previously set. This is useful when you are using large numbers of meters because one profile can be used with a common set of limit settings no matter what the CT and PT ratio. Full Scale reference information is available in the lower left box.

3. Make changes to this screen according to your application requirements.
   - To set the type of limit and the channel assigned to it:

- Double-click in either the Limit ID or Assigned Item column. You will see the screen shown below.



- From the pop-up menus, choose the desired settings and click OK. Following is a list of the available Groups, Sub Groups, and Items.
  Group: Measured Values
  Sub Group: High Speed Updated
  Item: Voltage A-N
  Voltage B-N
  Voltage C-N
  Voltage Aux
  Current A
  Current B
  Current C
  Current N Measured
  Voltage A-B
  Voltage B-C
  Voltage C-A
  VA A
  VA B
  VA C
  VA Total
  VAR A
  VAR B
  VAR C
  VAR Total
  Watt A
  Watt B
  Watt C
  Watt Total
  Frequency
  Power Factor A
  Power Factor B
  Power Factor C
  Power Factor Total
  Volts A-Aux Phase Angle
  Sub Group: One second updated

Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A
VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Uncompensated VA A
Uncompensated VA B
Uncompensated VA C
Uncompensated VA Total
Uncompensated VAR A
Uncompensated VAR B
Uncompensated VAR C
Uncompensated VAR Total
Uncompensated Watt A
Uncompensated Watt B
Uncompensated Watt C
Uncompensated Watt Total
THD Volts A
THD Volts B
THD Volts C
THD Current A
THD Current B
THD Current C
K Factor Current A

K Factor Current B
K Factor Current C
Internal Temperature
TDD Volts A
TDD Volts B
TDD Volts C
TDD Current A
TDD Current B
TDD Current C
Sub Group: Harmonic Values
Item: 0 - 127th Harmonic on selectable Harmonic Magnitude
(Voltage Phases A, B, and C; Current Phases A, B, and C)
Sub Group: Internal Inputs, States
Item: Internal Inputs 1-8
Sub Group: Phase Angles
Item: Phase A-N Voltage
Phase B-N Voltage
Phase C-N Voltage
Phase A Current
Phase B Current
Phase C Current
Phase A-B Voltage
Phase B-C Voltage
Phase C-A Voltage
Volts A-Aux Phase Angle
Voltage Phase Sequence
Sub Group: Flicker
Item: Flicker: PInst Volts A
Flicker: PInst Volts B
Flicker: PInst Volts C
Flicker: PST Volts A
Flicker: PST Volts B
Flicker: PST Volts C
Flicker: PLT Volts A
Flicker: PLT Volts B
Flicker: PLT Volts C
Group: Averages
Sub Group: Thermal Average
Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A

VA A
VA B
VA C
VA Total
VAR A
VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Sub Group: Block Window Average
Item: VA
VAR
Watt
Sub Group: Pulse Accumulation/Aggregation Block Window Average
Item: Internal Inputs #1 - #8
Aggregators #1 - #4
Sub Group: Rolling Window Average
Item: Predictive VA
Predictive VAR
Predictive Watt
VA
VAR
Watt
Sub Group: Voltage and Current Means
Item: Volts PN
Current P
Volts PP
Group: External I/O Devices
Sub Group: Analog Input Modules
Item: Module 1: Analog Input 1 - Analog Input 8
Module 2: Analog Input 1 - Analog Input 8
Module 3: Analog Input 1 - Analog Input 8
Module 4: Analog Input 1 - Analog Input 8

- To designate the limit as either above or below a percentage of the Full Scale, click once in each Settings column and select the desired setting from the pull-down menu.
- To set the percentage of the Full Scale that will trip the limit, enter the value in the % of FS column. GE Communicator software automatically calculates the Primary value.

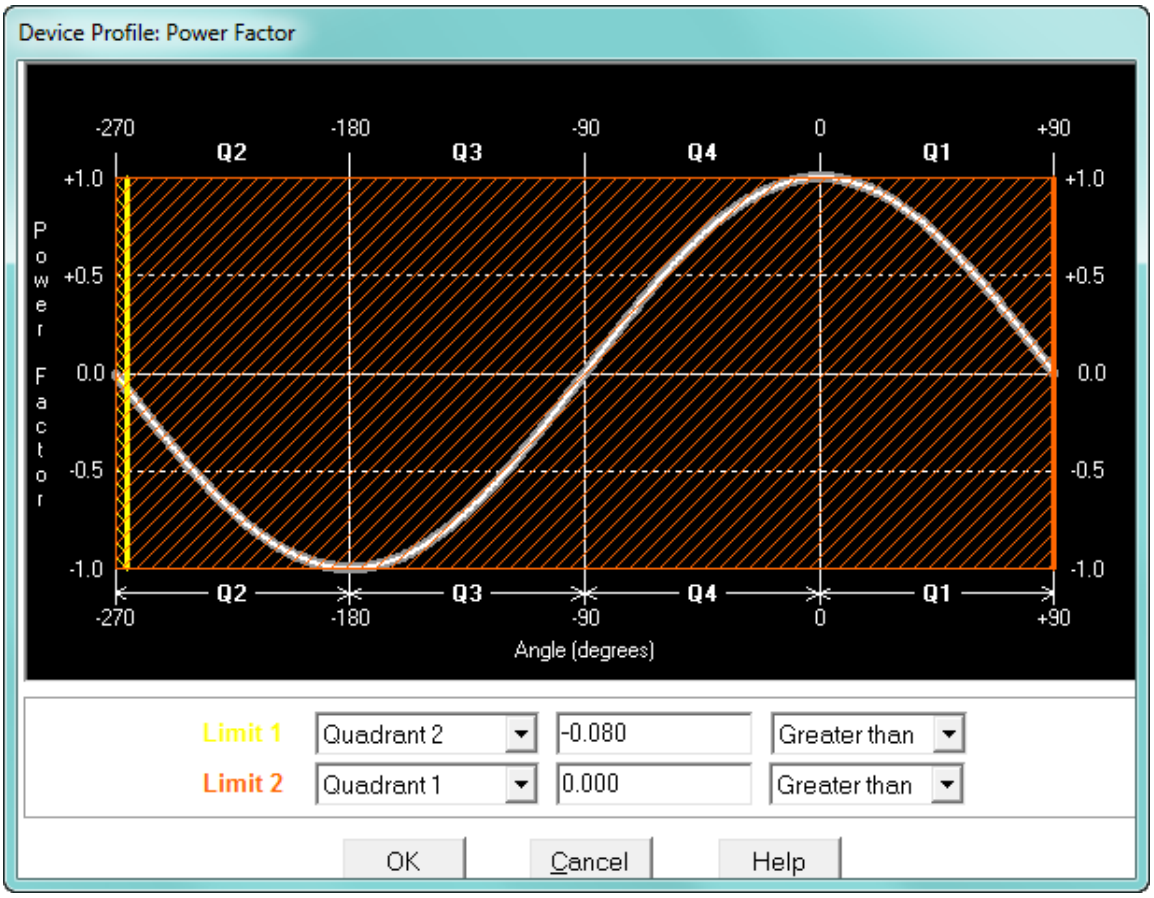
- Combination Limit 3 is the logical combination of Limit 1's state and Limit 2's state.

  Example 1
  Limit I D
  Type: 1 Second Readings
  Channel: Volts AN
  Limit 1 Setting: Limit exceeded if Volts AN is below 120 F.S.
  Limit 2 Setting: Limit exceeded if Volts AN is above 80 F.S.
  Combination Limit 3 Setting: AND
  If Limit 1 AND Limit 2 are tripped (e.g., the reading is 100 F.S.), then Limit 3 is tripped.

  Example 2
  Limit I D
  Type: 1 Second Readings
  Channel: Volts AN
  Limit 1 Setting: Limit exceeded if Volts AN is above 120 F.S.
  Limit 2 Setting: Limit exceeded if Volts AN is below 80 F.S.
  Combination Limit 3 Setting: OR
  If either Limit 1 OR Limit 2 is tripped (e.g., the reading is 75), then Limit 3 is tripped.
- Full Scales settings are shown in the lower left of the screen. These values are set in the Limits and Waveform Full Scales section of the Device Profile (11.1.2 "Limit and Waveform Full Scales").

4. Power Factor is broken into four quadrants. Selecting the Full Scale value brings up a screen that lets you set a limit in two of the four quadrants.

- To set the power factor limits, double click on any of the power factor settings in the Limit 1 or Limit 2 columns. You will see the Power Factor screen.



- To set a limit: from the pull-down menus, select a quadrant and Less Than or Greater Than (Full Scales). Enter the power factor number. The graph will illustrate your selections by shading the out of limit bands. The area of the graph not covered by shading is within normal operational range.

NOTE

Whether you see method 1 Quadrants (Q1 +Lag, Q2 -Lag, Q3 -Lead, Q4 +Lead) or method 2 Quadrants (Q1 +Lag, Q2 -Lead, Q3 +Lag, Q4 -Lead) depends on the setting in the Power Factor Display field of the Labels setting (see 11.1.4 "Labels").

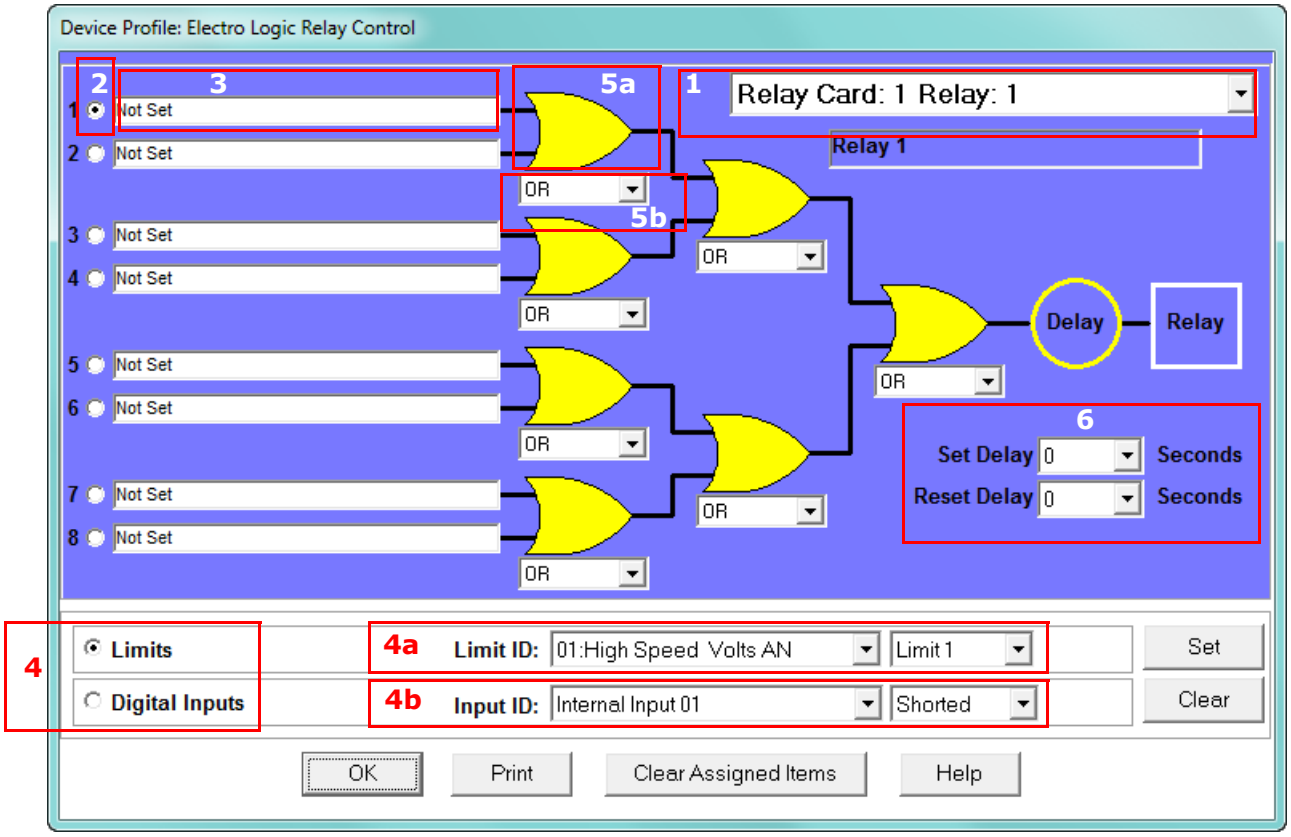
NOTE

The EPM 9900/9900P device is a four-quadrant meter. Therefore, limits can be set for capacitive and inductive PF when generating or consuming power.

5. When all settings are complete, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.3.2 Electrologic™ Relay Control

1. From the Power Quality and Alarm Settings menu, double-click on the ElectroLogic Relay Control line. You will see the screen shown below.



ElectroLogic Relay Control lets you set up a logic tree to control the meter's optional relays. Each relay can be programmed individually. The end result of the logic tree is to set, or not set, a relay, with an optional programmed Set Delay and/or Reset Delay. The initial inputs to the logic tree are chosen from among the 32 Limits and 40 Digital Inputs (both internal and external inputs). The gates, in several stages, perform logical combinations (AND, OR, etc) on pairs of inputs (either initial inputs or the outputs of earlier gates), and in combination produce an ultimate "true" or "false" state to drive the relay open or closed.

For example, one of the gates is AND. For data to pass an AND gate, both pieces of data must be "true." For a Limit to be true, the data must be in the Out-of-Limit condition on either Limit 1, Limit 2, or both (you decide which). For a Digital Input to be true, it must be in the condition you specify - either Open or Shorted.

The gates used in ElectroLogic Relay Control are used as follows:
OR: If either or both of the two conditions are true, the gate is passed
AND: If both of the conditions are true, the gate is passed
Hysteresis: For Limits only, the if the Limit is within the programmed hysteresis value, the gate is passed
XOR: If either of the two conditions are true, but not both, the gate is passed

NOR: If either of the two conditions are true, the gate is not passed
NAND: If both of the two conditions are true, the gate is not passed
NHysteresis: For limits only, if the Limit is within the programmed hysteresis value, the gate is not passed
NXOR: If either of the two conditions are true, but not both, the gate is not passed

NOTE

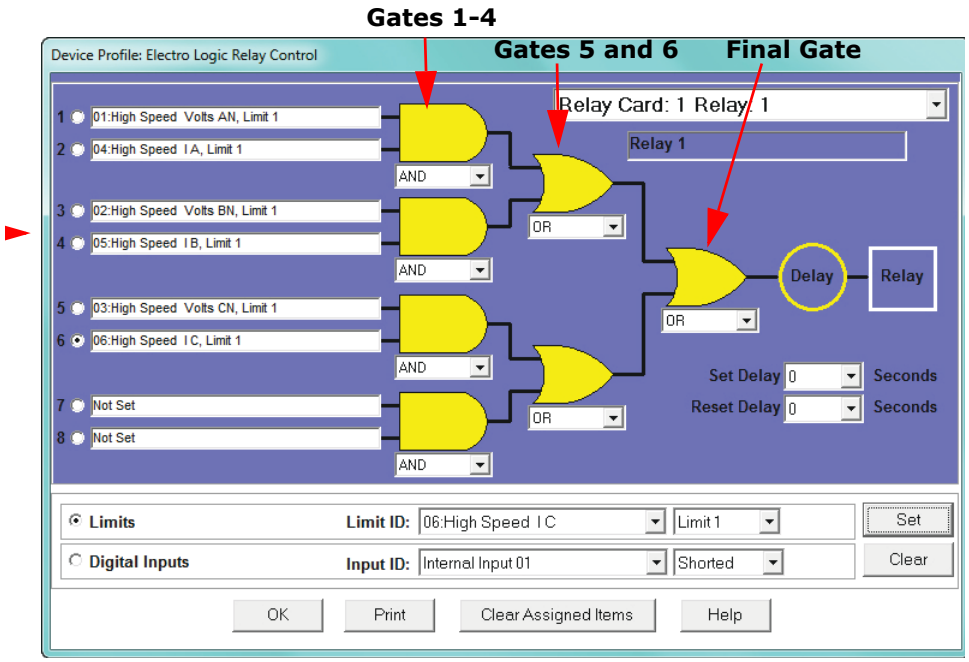
See *Example of an ElectroLogic Relay Logic Tree:* on page 11–53.

2. To assign an item to the Relay Logic tree:
   - Select the relay card/module from the pull-down menu - see number 1 in the screen in step 1.
   - Select an input for the tree by clicking on a radio button next to numbers 1 through 8 - see number 2 in the screen in step 1.
   - Choose **Limits** or **Digital Inputs** by clicking on the radio button in front of the word - see number 3 in the screen on the previous page.
   - From the pull-down menus, select the limit (Limit ID) or input (Input ID) you want to assign to this Relay Logic tree input (step b) - see number 4 in the screen in step 1.
     - For a limit, use the second pull-down menu to select Limit 1, Limit 2, or Combination - see number 4a in the screen in step 1.
     - For an input, use the second pull-down menu to select Shorted or Open - see number 4b in the screen in step 1.
   - Press **Set** to confirm your selection. The software places the selection in the appropriate field in the screen.
3. After you assign all the Relay Logic inputs, select the gates that will be used to combine the logic to trigger the relay. To select a gate type, either:
   - Click on the gate (yellow fields) - see number 5a in the screen in step 1.
   - Choose a gate type from the pull-down menu below the gate - see number 5b in the screen in step 1.
4. If you want, select Set Delay and Reset Delay from the pull-down menus. You can choose between 0 and 255 seconds. Use these fields if you want to program a delay before the relay is set, or before it is reset - see number 6 in the screen in step 1.
5. To change items on the Relay Logic tree, follow the previous steps.
   - To clear an item from the Relay tree, click on that item and click the **Clear** button.
   - To clear all items from the Relay Tree, click the Clear Assigned Items button.
6. When all settings are complete, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

NOTE

In order to use this screen, you must have purchased at least one Relay Option card or one External Relay Output module. For more details on external Output modules, see Chapter 14 “External I/O Modules”.

Example of an ElectroLogic Relay Logic Tree:



Inputs 1 through 8 are set to High Speed Volts AN Limit 1, High Speed Amps A Limit 1, High Speed Volts BN Limit 1, High Speed Amps B Limit 1, High Speed Volts CN Limit 1, High Speed Amps C Limit 1, Not Set and Not Set. The four first gates are AND gates, and the remaining three gates are OR gates.

Each first level gate looks at the state of the two limits, and the result is "true" if and only if both the inputs (Voltage Limit and Current Limit) are "true" (Out-of-Limit Condition). The second and third level gates look at the state of the earlier gates, and their results are "true" if either one (or both) of the previous gates are "true". The end result is a relay that is energized if one or more of the three phases (A, B, and/or C) is currently Out-of-Limit on both its voltage and current Limit 1 tests.

11.3.3 PQ Thresholds (Waveform Recording)

The PQ Thresholds/Waveform Recording capability allows the meter to act as a high-speed waveform recorder to record any anomaly that occurs within a cycle of duration. This provides a user with advanced waveform analysis including pre- and post- waveform recording.

The meter has the capability to record both surges and sags of the measured signals. A voltage surge is any event that increases the RMS voltage for one cycle, calculated every half cycle. A voltage sag is a dip in the RMS of one cycle of voltage, calculated every half cycle. A current fault (or surge) is also calculated in the same manner. The EPM 9900/9900P meter can also be set to record a waveform when voltage transients are found. When the RMS value of any of these triggers exceeds the threshold settings, the meter will trigger a waveform capture. In addition, you can set a voltage interruption to trigger IEC 61000-4-30 Class A reporting. The EPM 9900P meter can also capture a waveform is response to an IEC 61850 Protocol GOOSE message.

The Power Quality (PQ) and Waveform Thresholds setting determines at what point the EPM 9900/9900P meter executes a waveform capture and/or records a power quality event.

See Chapter 19 “Viewing Logs” for instructions on viewing Waveform and PQ logs.

PQ and Waveform Thresholds are given as a percentage of the Full Scales (% of FS) or a sliding reference voltage if the load voltage is known to be fluctuating (using the U_{SR} setting, explained in the following instructions). Set the Full Scales in the Limits and Waveform Full Scales setting of the Device Profile (see 11.1.2 "Limit and Waveform Full Scales"). Full Scales are based on the CT and PT ratios set in the CT, PT Ratios and System Hookup setting of the Device Profile (see 11.1.1 "CT and PT Ratios and System Hookup").

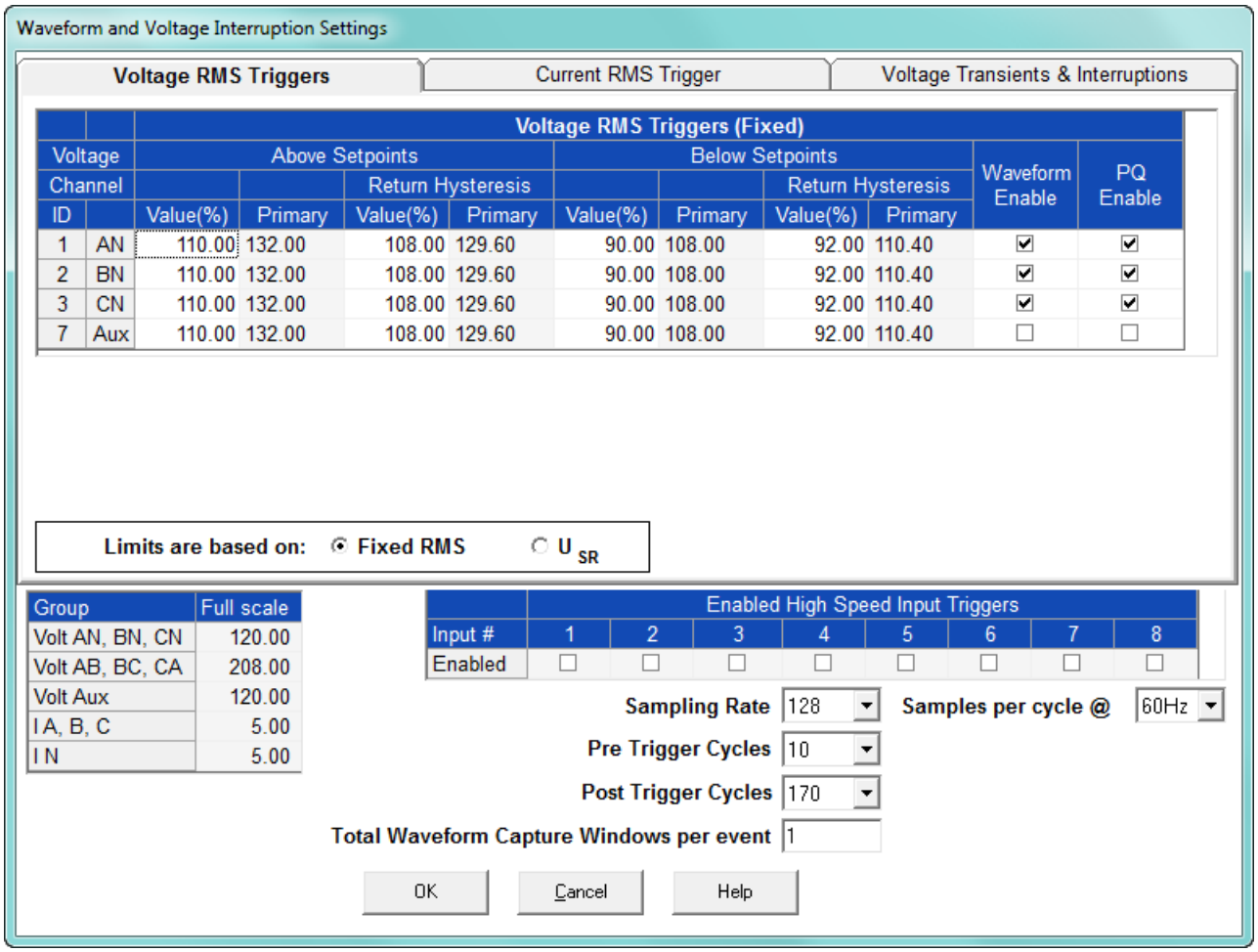
Before programming the PQ and Waveform Thresholds, set the CT and PT ratios and the Limits and Waveform Full Scales.

NOTE

Note on Sampling Rate: A higher sampling rate allows for transients to be monitored. Generally, the meter is set to take 1024 samples per cycle for this purpose. Lower sampling rates have advantages, however, because they allow you to record more cycles of information per event screen. Therefore, low sampling rates are better for long duration events, like motor starts or distribution faults. The meter enables you to tailor its recording for both these applications. For more information on sampling rate, see the table on page 11-76.

The EPM 9900/9900P meter has a transient feature which combines high speed and low speed sampling. The high sampling records the Mega Hertz speed and the low speed can be recorded at any desired sampling rate. When a high speed transient is found, the meter converts the low speed sample closest to the magnitude of the high speed capture. Additionally, the instrument provides the exact time of the high speed event. This provides the benefit of high speed data acquisition with a captured event that comprises only the data that is needed for analysis.

1. From the Power Quality and Alarm Settings menu, double-click on the **PQ Thresholds** (Waveform Recording) line. You will see the screen shown below.



2. This screen allows you to set the voltage RMS triggers, the current RMS triggers, and the voltage transients triggers for waveform recording. It also allows you to set the voltage interruption settings for IEC61000-4-30 Class A recording. Use the tabs at the top of the screen to navigate between the voltage, current, and voltage transient and interruption settings.

NOTE

- The Waveform clipping threshold for the EPM 9900/9900P meter is 66.7A RMS and 1140V RMS on the secondary side of all channels.
- The High Speed Inputs field allows you to see which High Speed input is enabled for Waveform recording. You assign the High Speed input to its trigger in the High Speed Inputs screen (see 11.3.9 "Operational Status Output").
- Voltage and current Full Scale values are shown in the lower left corner of the screen.

3. The Voltage setpoints are used to record voltage type events, such as voltage surges and sags. To set the Voltage RMS triggers for a PQ event and waveform capture (Voltage RMS Triggers tab):
   - Select either Fixed RMS or U_{SR} (radio buttons).

NOTE

NOTE on U_{SR} Setting: The U_{SR} setting lets you configure waveform capture thresholds based on sliding reference voltage rather than Full Scale (see instructions on the next page). This is useful if you know your line voltage will be varying and you want the voltage reference to be adjusted accordingly.

The formula used is as follows:

$U_{sr}n = 0.9967 \times U_{sr\,(n-1)} + 0.0033 \times U_{(10/12)rms}$

where

$U_{sr}n$ is the present value of the sliding reference voltage;

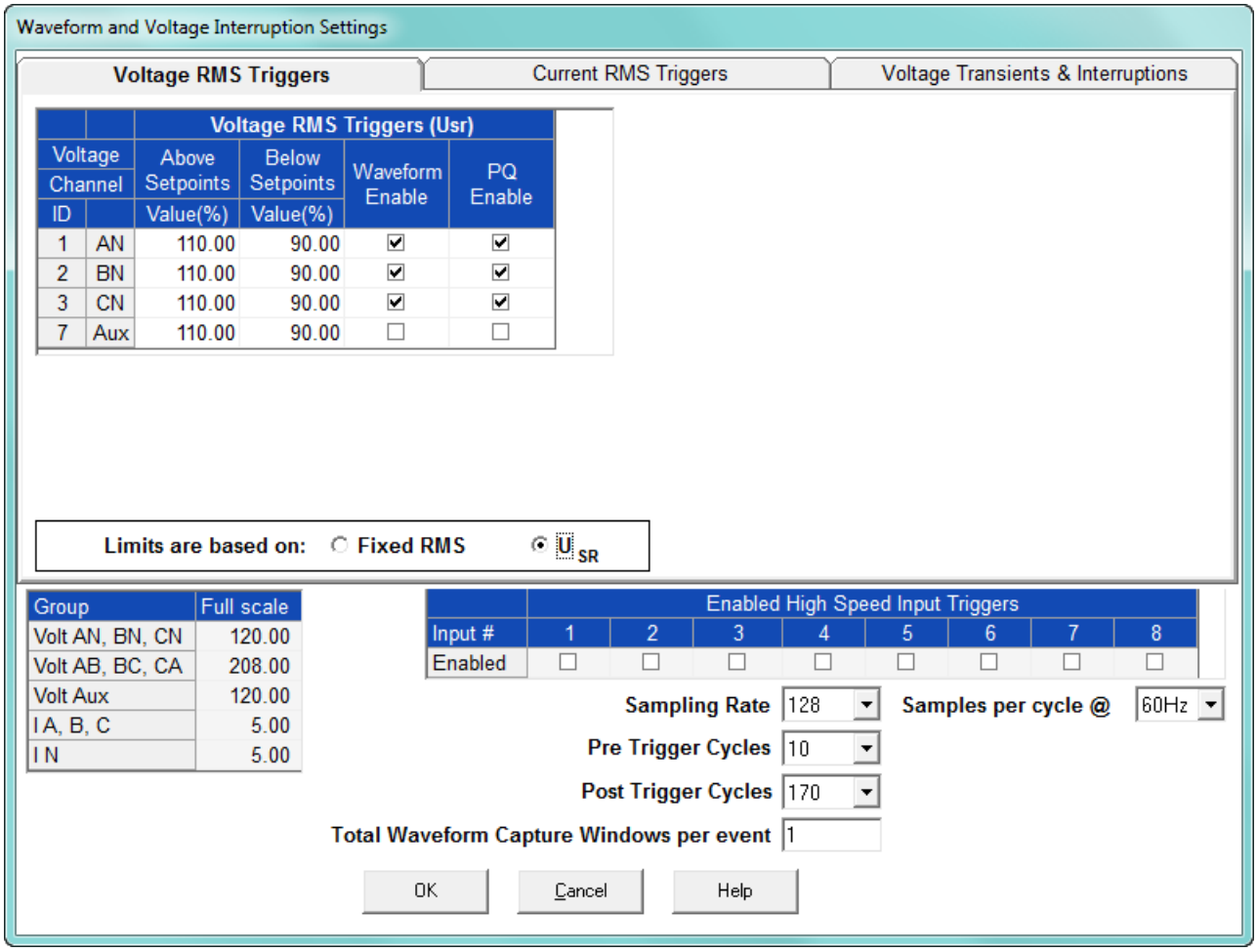
$U_{sr\,(n-1)}$ is the previous value of the sliding reference voltage; and

$U_{(10/12)rms}$ is the most recent 10/12-cycle RMS value.

When the measurement is started, the initial value of the sliding reference voltage is set to the programmed input voltage. The sliding reference voltage is computed every 10/12-cycles. If a 10/12-cycle is flagged as being out-of-limits, that voltage is not used - the previous sliding reference voltage is used instead.

- If you select Fixed RMS:
    - . Enter the desired percentage of Full Scale in the Value() column of the Above setpoints and Below setpoints sections. After you make an entry, the Primary field (display only) adjusts accordingly. When the RMS value crosses the setpoint, a capture is taken.
    - .Enter the desired percentage for Return Hysteresis for the Above and Below setpoints. After you make an entry, the Primary field (display only) adjusts accordingly. Hysteresis is the value that must be met for the out of limit condition to be considered ended. Hysteresis is useful in preventing excessive out of limit conditions when the readings are hovering around a setpoint, since it dictates that the readings must recover to a certain level before dropping again in order for them to be considered out of limit.
    - .Click the box(es) to enable Waveform Recording (Waveform Enable box) and/or PQ Recording (PQ Enable box).
- If you have a load with slowly changing voltage, you probably do not want to use Full Scale as your reference point. In that case, you can use the U_{SR} function to set up a sliding reference voltage rather than a Full Scale voltage reference.
  Follow these instructions:
    - . If you don't see the U_{SR} button on the screen next to the RMS button, then EN 50160/IEC 61000-4-30 logging is enabled, and you will need to disable it. From the Device Profile screen, double-click on the EN 50160/IEC 61000-4-30 line, click the Enable PQ/Waveform, Logs 7 and 8 button, and click OK (see following 11.3.6 "I Squared T and V Squared T Thresholds" for detailed instructions).

- .Go back to the PQ Waveform Recording screen and click the U_{SR} button. The top of the screen changes as seen in the example below.



- . Enter the desired percentage of the sliding reference voltage in the Value() column of the Above setpoints and Below setpoints sections.
- .Click the box(es) to enable Waveform Recording (Waveform Enable box) and/or PQ Recording (PQ Enable box) when the setpoints are crossed.

4. To set the current RMS triggers for a PQ event and waveform capture (Current RMS Triggers tab - see the example screen below):

Waveform and Voltage Interruption Settings

Voltage RMS Triggers | **Current RMS Triggers** | Voltage Transients & Interruptions

		Current RMS Triggers									
Current		Above Setpoints				Below Setpoints				Waveform Enable	PQ Enable
Channel				Return Hysteresis				Return Hysteresis			
ID		Value(%)	Primary	Value(%)	Primary	Value(%)	Primary	Value(%)	Primary		
1	A	200.00	10.00	108.00	5.40	0.00	0.00	92.00	4.60	☑	☐
2	B	200.00	10.00	108.00	5.40	0.00	0.00	92.00	4.60	☑	☐
3	C	200.00	10.00	108.00	5.40	0.00	0.00	92.00	4.60	☑	☐
4	N	200.00	10.00	108.00	5.40	0.00	0.00	92.00	4.60	☑	☐

Group	Full scale
Volt AN, BN, CN	120.00
Volt AB, BC, CA	208.00
Volt Aux	120.00
I A, B, C	5.00
I N	5.00

	Enabled High Speed Input Triggers							
Input #	1	2	3	4	5	6	7	8
Enabled	☐	☐	☐	☐	☐	☐	☐	☐

Sampling Rate 128 **Samples per cycle @** 60Hz

Pre Trigger Cycles 10

Post Trigger Cycles 170

Total Waveform Capture Windows per event 1

OK Cancel Help

- Enter the desired percentage of Full Scale in the Value() column of the Above setpoints and Below setpoints sections. After you make an entry, the Primary field (display only) adjusts accordingly.
- Enter the desired percentage for Return Hysteresis for the Above and Below setpoints. After you make an entry, the Primary field (display only) adjusts accordingly. Hysteresis is the value that must be met for the out of limit condition to be considered ended. Hysteresis is useful in preventing excessive out of limit conditions when the readings are hovering around a setpoint, since it dictates that the readings must recover to a certain level before dropping again in order for them to be considered out of limit.
    - Click the box(es) to enable Waveform Recording (Enable box) and/or PQ Recording (PQ Enable box).

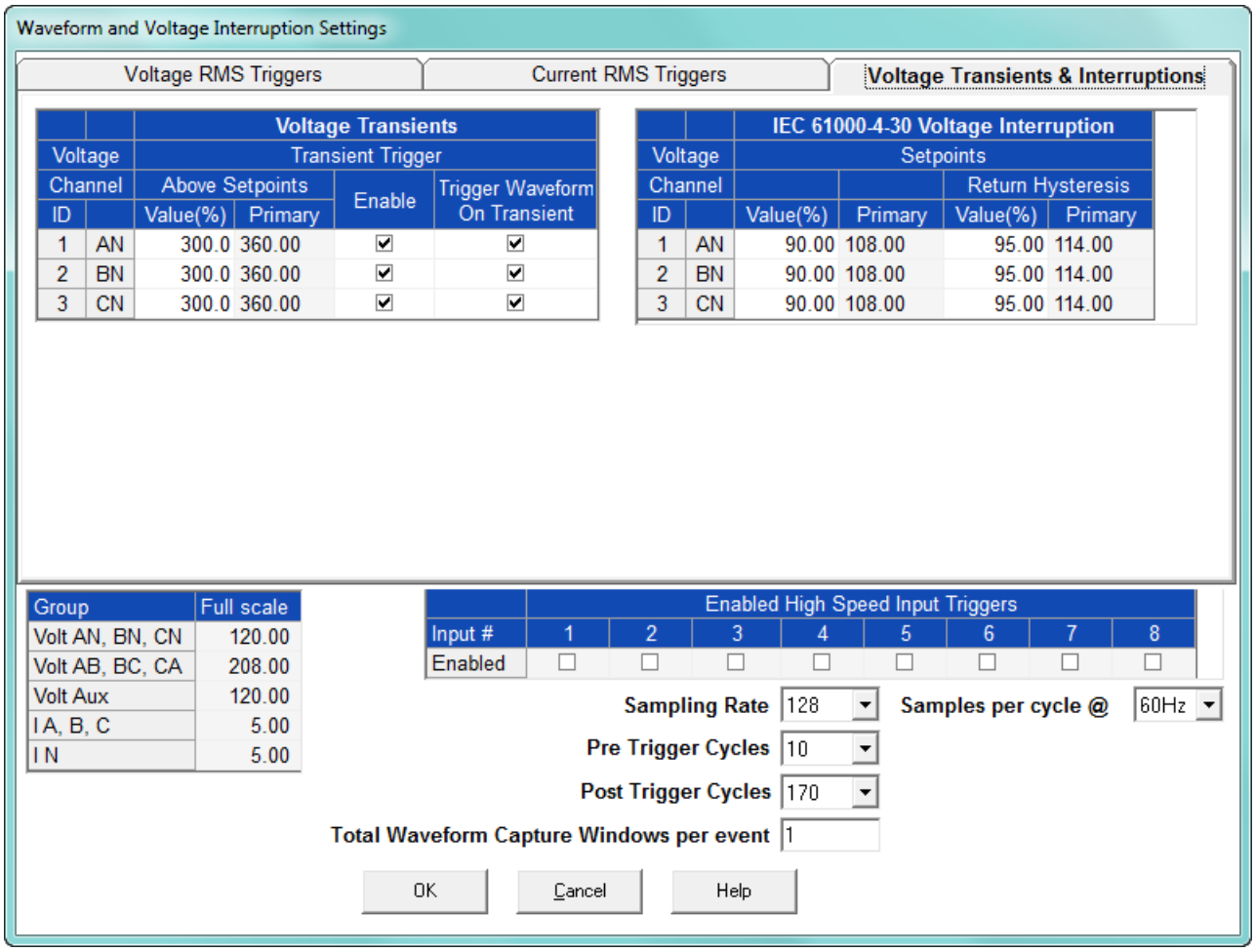
NOTE

The current setpoints are used to record faults on the line or in-rush currents from devices such as motors. Typically, to catch these events, set the limit to above 200 of Full Scale. As a general rule you do not want to set either:

- Any below current thresholds because that will trigger waveforms when the current drops
- Any above current thresholds within possible current load

Either of these settings will constantly trigger waveforms.

5. To set the Voltage transients trigger for a waveform capture and Voltage interruptions trigger for IEC61000-4-30 recording (Voltage Transients and Interruptions tab - see the example screen below):



- Enter the desired percentage of the Voltage Peak Full Scales (shown in the center of the screen) in the Value() column of the Voltage Transients Above Setpoints section (there are no Below setpoints for Voltage transients). After you make an entry, the Primary field (display only) adjusts accordingly.
- Click the box(es) to enable transient capture (Enable box) and/or Waveform (Trigger Waveform on Transient box). You might want to record a waveform at the time of transient capture in order to obtain more information about the transient event.
- Enter the desired percentage of Full Scale in the Value () field and in the Return Hysteresis field in the IEC 61000-4-30 Voltage Interruptions section. After you make an entry, the Primary field (display only) adjusts accordingly. This setting

relates only to the reporting of voltage interruptions: it sets an internal flag for IEC 61000-4-30 reporting.

6. Select the number of samples per cycle to be recorded from the Sampling Rate field's pull- down menu. Choose from 16, 32, 64, 128, 256, 512 or 1024 samples per cycle. The number of samples per cycle you choose above 128 samples per cycle affects the number of cycles per capture.
   - The following table shows the effects of sampling rate on the number of cycles captured. Increasing the sampling rate increases waveform resolution; but for higher sampling rates, reduces the length of the observed window. The approximate length of the observed window is shown in the last column.

NOTE

The table shows sampling data for 60 Hz systems.

The table shows values for one waveform capture window. If you have more than one waveform capture window, the maximum time per capture increases.

EPM 9900/9900P Sampling Rate Chart (at 60Hz)					
Samples per Cycle	**Channels**		**Samples per Channel**	**Cycles per Channel per Window***	**Time (approx.)**
	Analog pts	**Digital Inputs**			
16	6	8	2880	180	3 sec
32	6	8	5760	180	3 sec
64	6	8	11520	180	3 sec
128	6	8	23040	180	3 sec
256	6	8	30720	120	2 sec
512	6	8	30720	60	1 sec
1024	6	8	40960	40	0.6 sec

* Each Window contains the number of cycles listed but multiple windows are supported so that the total number of cycles captured is only limited by the memory allocated.

7. You can select Frequency - either 60Hz or 50Hz - from the pull-down menu. This is only to help you decide what options to select - it does not affect the meter.

8. From the Pre-Trigger Cycles and Post-Trigger Cycles fields' pull-down menus, select the number of cycles you want to record before and/or after the triggered recording. The maximum total number of pre and post-trigger cycles is one less than the maximum number of cycles per capture. See the table above for the maximum cycles per capture for each sampling rate.

9. You can select total waveform capture windows per event. You can set between 1 and 65536 windows per event. You may want more than 1 window to get data for a longer time period. Also, selecting multiple windows allows you to make full use of the pre-trigger cycles to have extended recording of events. You always need 1 post-trigger cycle, but can choose multiple pre-trigger cycles. As the sampling rate is reduced, the number of possible pre-trigger windows increases. In this way, you may choose less resolution, but more information about the conditions before a waveform capture.

NOTE

When you select more than one window per event, the Post-Trigger Cycles field cannot be changed. It will be fixed as the maximum number of cycles per capture minus the number of pre-trigger cycles. See the table on the previous page for the maximum cycles per capture for each sampling rate.

NOTE

Note on CBEMA (PQ Recording): CBEMA plotting is a power quality standard known worldwide for recording the amount of damage Voltage transient conditions have done to the equipment being monitored. The meter automatically records this information. For CBEMA purposes, program internal set points for Voltage below 90 and above 110 of Full Scale (+/- 10 from the nominal Voltage). These set points are defined by the ITI (CBEMA) specification. The ITI (CBEMA) Curve is published by Information Technology Industry Council (ITI) and is available online. You can set a recording with tighter Voltage limits to trigger a waveform recording. However, CBEMA plotting is based only on the limits internally set.

10. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.3.4 EN 50160/IEC 61000-4-30 Class A Reporting

The EPM 9900/9900P meter can record power quality reporting values in two independent logs. When EN 50160/IEC 61000-4-30 reporting is enabled, entries are made into the logs when the associated values occur. All values can be downloaded to the Log Viewer where they are available for graphing or export to another program, such as a spreadsheet. Refer to Chapter 19 “Viewing Logs” for additional information on viewing logs.

NOTE

The meter is calculating its Flicker based upon the EN 61000-4-15 standard which is referenced in the EN 61000-4-30 standard. The accuracy requirements for this instrument are within the Class A standards for Flicker measurements. Refer to Chapter 23 “EN 50160 / IEC 61000-4-30 Power Quality Analysis” for additional information on Flicker standards.

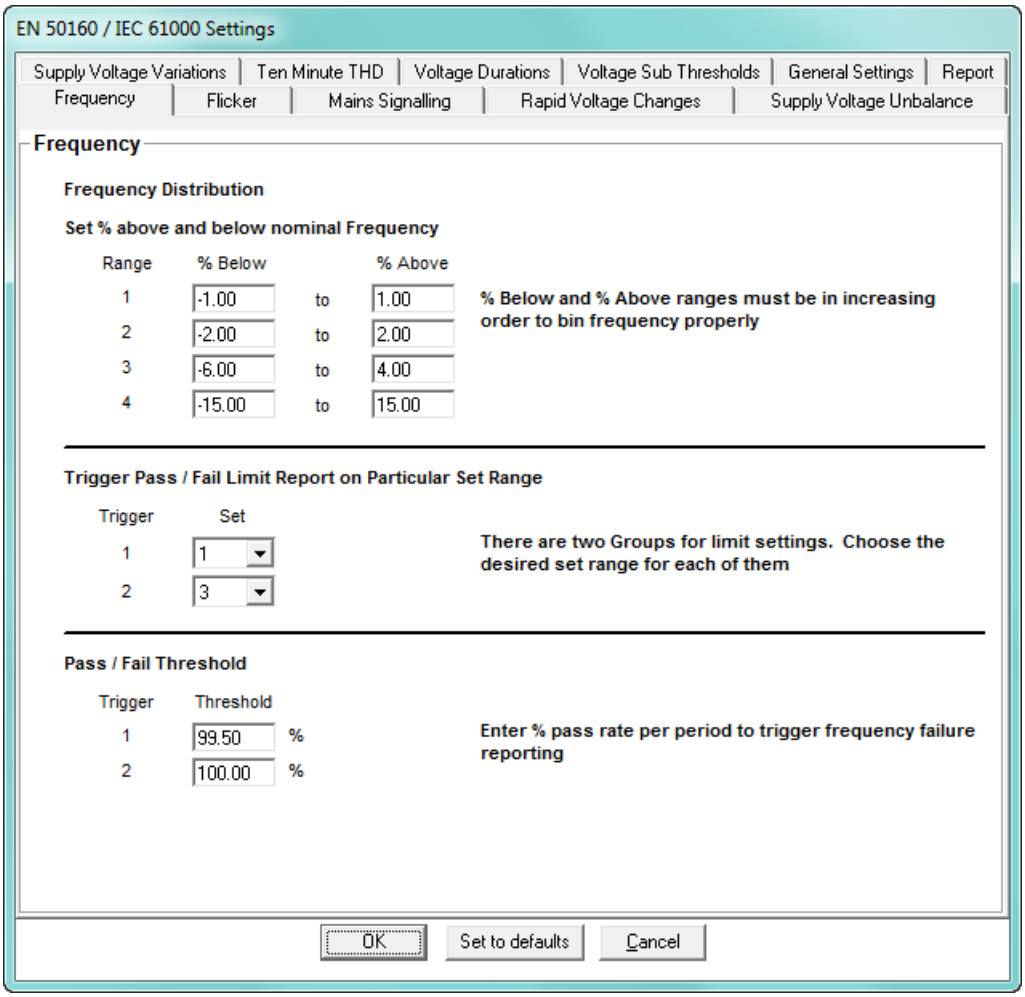
The EPM 9900P meter offers customization of EN 50160/IEC 61000-4-30 reporting so that the user can meet specific jurisdictional or regional requirements. 11.3.4.1 "EN 50160/IEC 61000-4-30 Setting for the EPM 9900P Meter" details the EPM 9900P meter’s settings; see 11.3.4.2 "EN 51060/IEC 61000-4-30 Setting for the EPM 9900 Meter" for the EPM 9900 meter’s settings. Note that you should program the CT/PT Ratio and System Hookup settings for the EPM 9900P meter **before** programming the EN 50160 reporting - see 11.1.1 "CT and PT Ratios and System Hookup", for instructions.

NOTE

IMPORTANT! Since the EN 50160/IEC 61000-4-30 reporting has specific requirements for programming, GE recommends that you refer to the IEC 61000-4-30 2008 standard before making changes to the default settings of the meter.

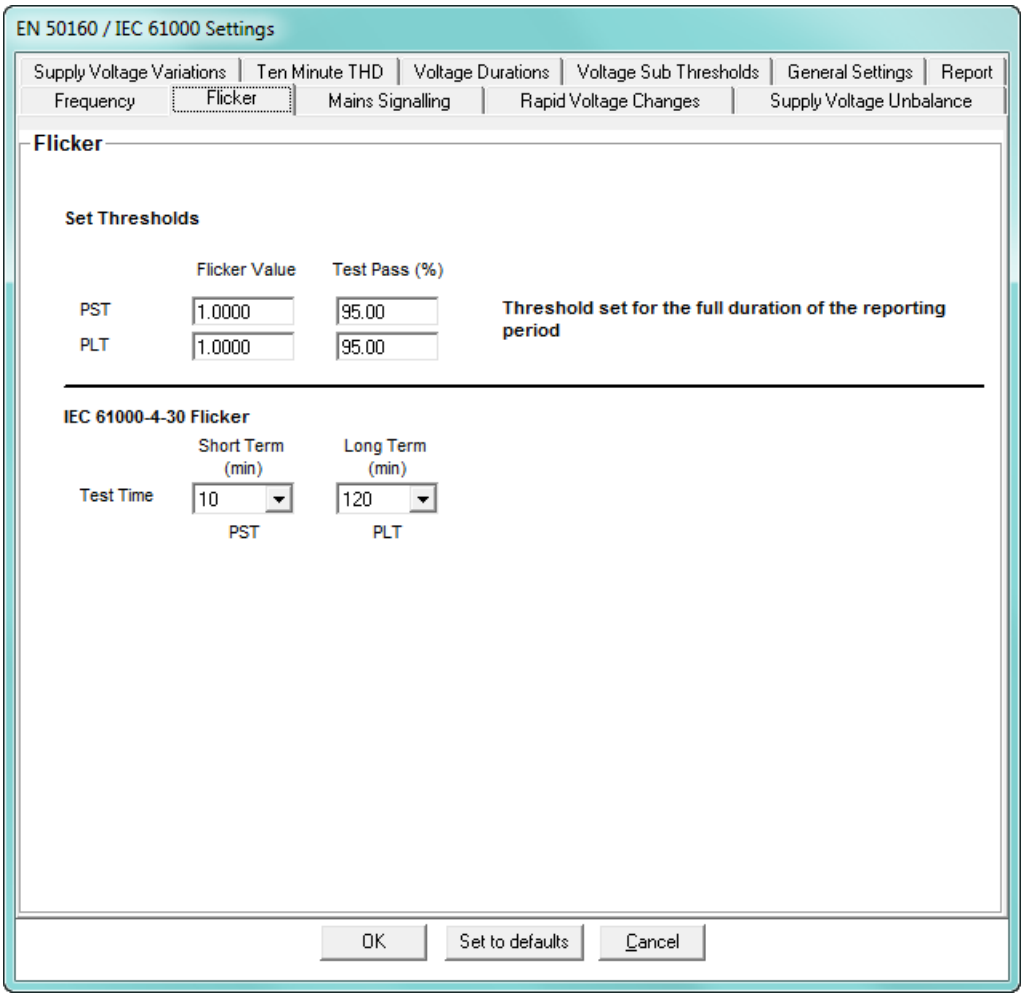
11.3.4.1 EN 50160/IEC 61000-4-30 Setting for the EPM 9900P Meter

1. From the Power Quality and Alarm Settings menu, double-click on the EN 50160/IEC 61000-4-30 line. You will see the screen shown below. It has multiple tabs that let you make all the settings for the meter's EN 50160/IEC 61000-4-30 implementation.



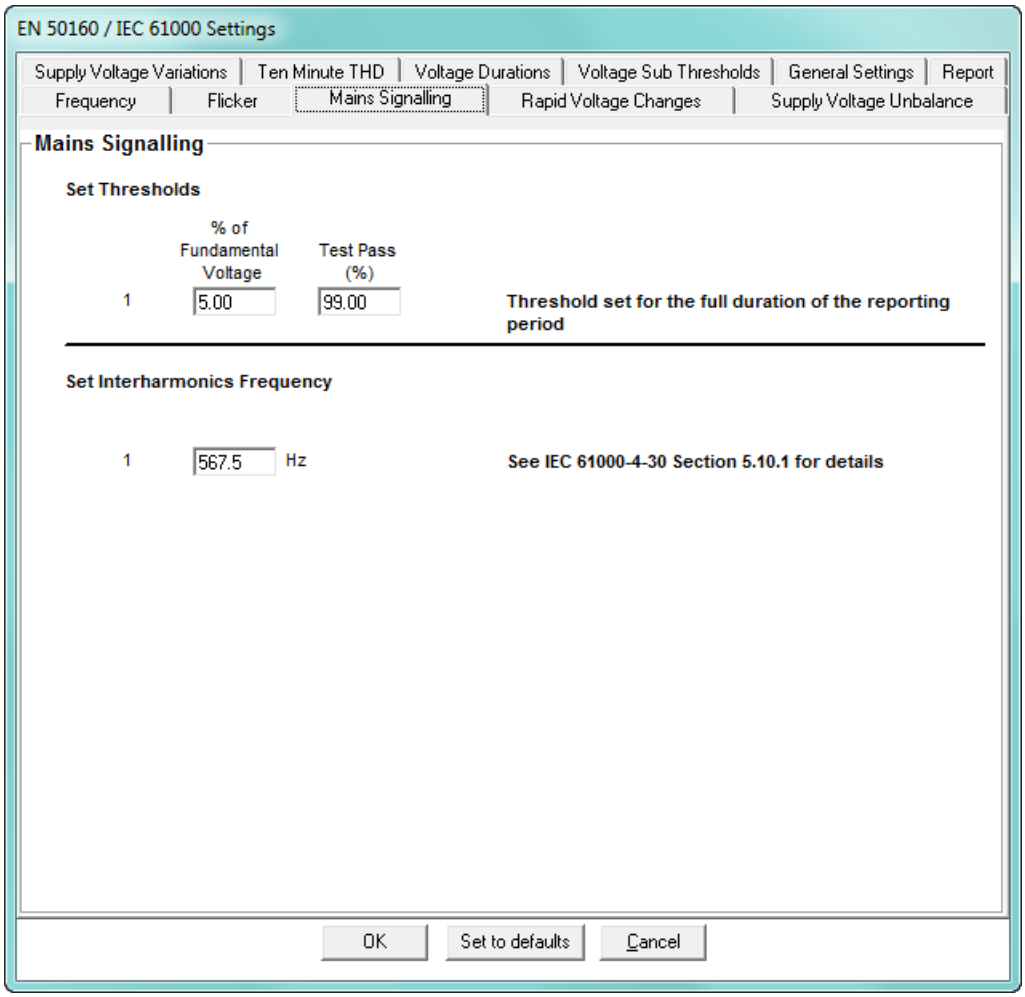
2. The first tab is the **Frequency** tab, which lets you set acceptable frequency ranges and pass/fail thresholds:
   - Frequency Distribution: enter below and above percentages for four frequency ranges, increasing from 1-4; e.g., range 1: -1 below to 1 above; range 2: -2 below to 2 above, etc.
   - Trigger Pass/Fail Limit Report on Particular Set Range: for each of the two available triggers, select the set range (1-4).
   - Pass/Fail Threshold: enter the percentage pass rate per period to that will trigger frequency failure reporting.

3. Click the **Flicker** tab. The flicker settings let you set passing value and percent thresholds and times for the short-term (PST) and longterm (PLT) flicker tests.



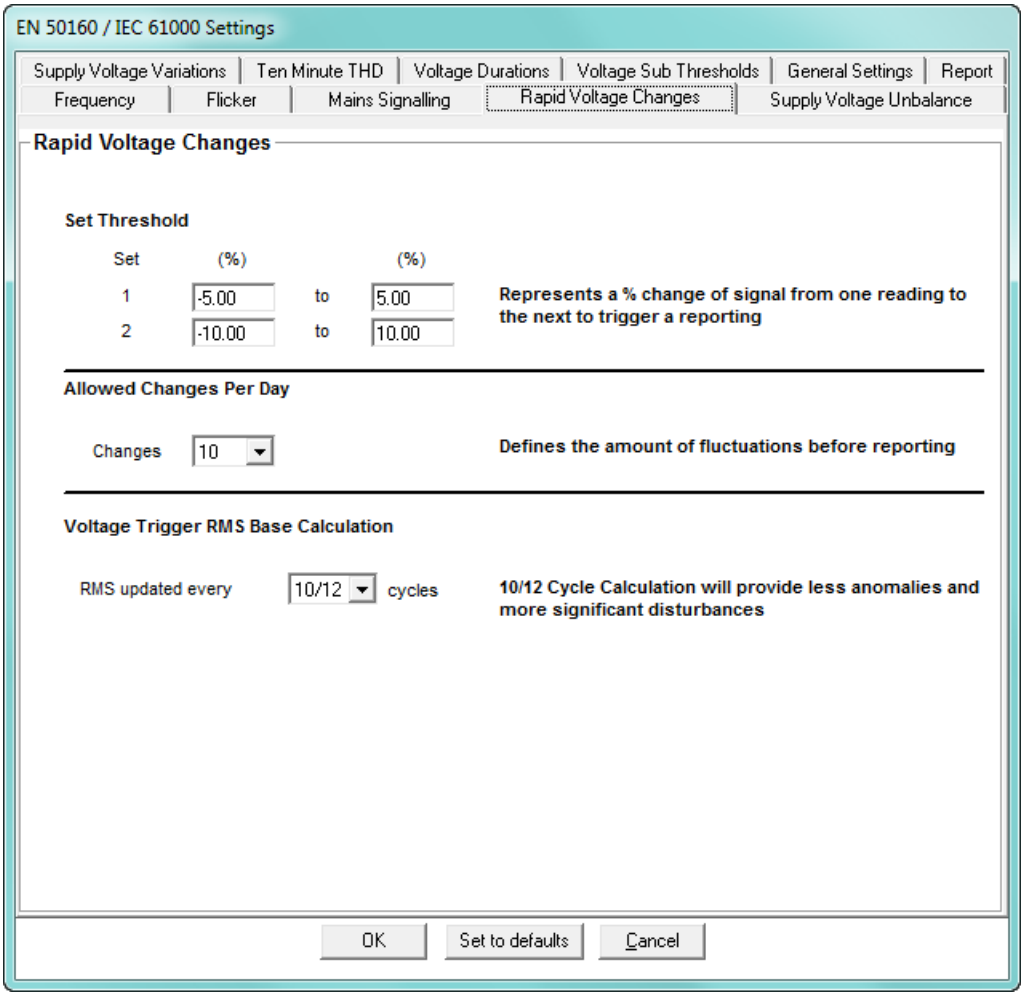
- Set Thresholds: enter flicker value and test pass for both PST and PLT.
- IEC 61000-4-30 Flicker: select time for the short term and long term tests from the pull-down menus.

4. Click the **Mains Signaling** tab. This screen lets you make settings for the Mains Signaling voltage, which is a burst of signals (often at a non-harmonic frequency) that remotely control industrial equipment, revenue meters, and other devices. In this tab you will set the acceptable thresholds for the Mains signaling voltage.



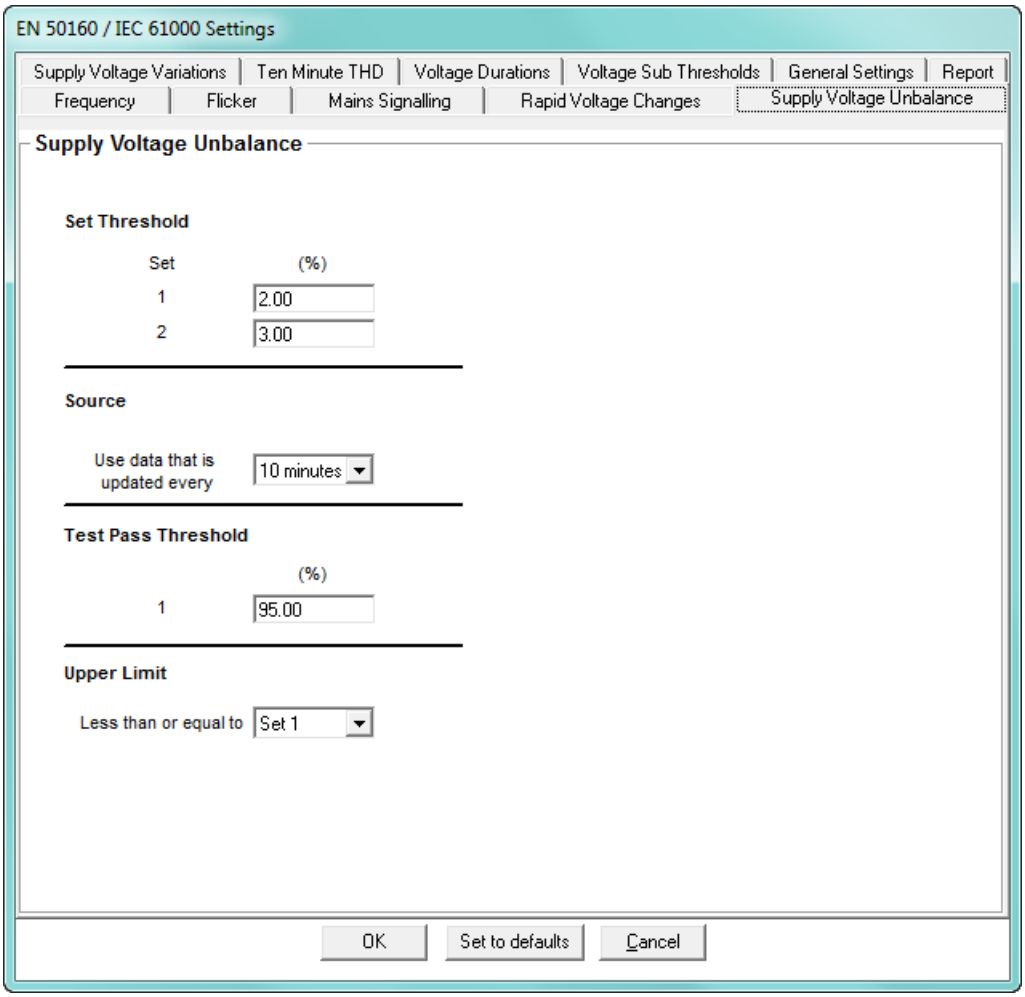
- Set Thresholds: set the thresholds for percentage of the fundamental voltage and for test passing.
- Set Interharmonic Frequency: enter the interharmonic frequency for the test when this interharmonic exceeds the detection threshold reporting is made. See Chapter 23 “EN 50160 / IEC 61000-4-30 Power Quality Analysis” for more details on this setting.

5. Click the **Rapid Voltage Changes** tab. Rapid voltage changes consist of a series of sudden variations or cyclic variations of the nominal value of the voltage between two consecutive levels. Usually rapid voltage changes are caused by load changes or system switching. In this tab, you will set thresholds for the voltage changes, and the acceptable number of changes, for your reporting.



- Set Threshold 1 and 2: enter the percentage change in signal from one reading to the next that will trigger reporting.
- Allowed Changes per Day: defines the amount of fluctuations per day before reporting a fail, e.g., if you enter 5, then only the 6th change and later will be reported as failed.
- Voltage Trigger RMS Base Calculation: 10/12 cycle update is the recommended setting.

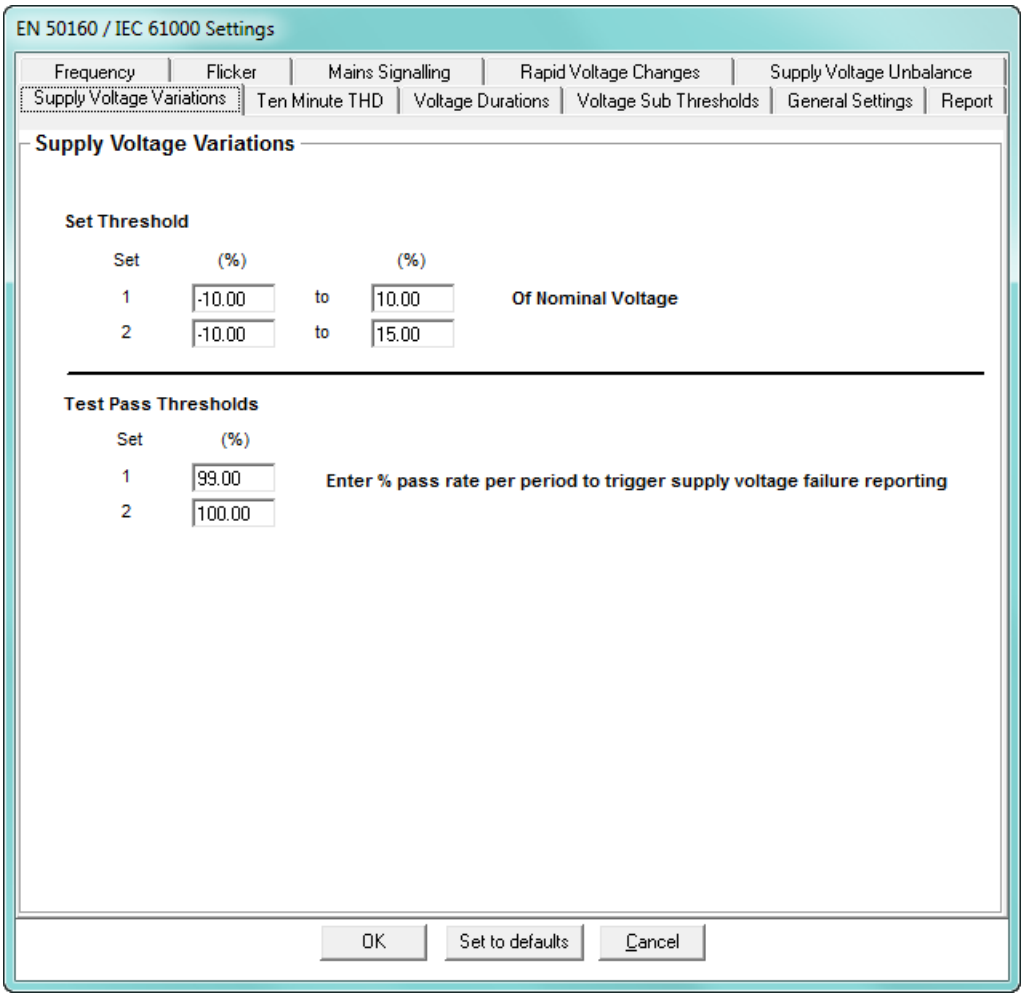
6. Click the **Supply Voltage Unbalance** tab. Voltage unbalance occurs when the phase angles between consecutive line voltages are not equal. The degree of the inequality is usually expressed as the ratios of the negative- and zero-sequence components to the positive-sequence component.



In this tab, enter:

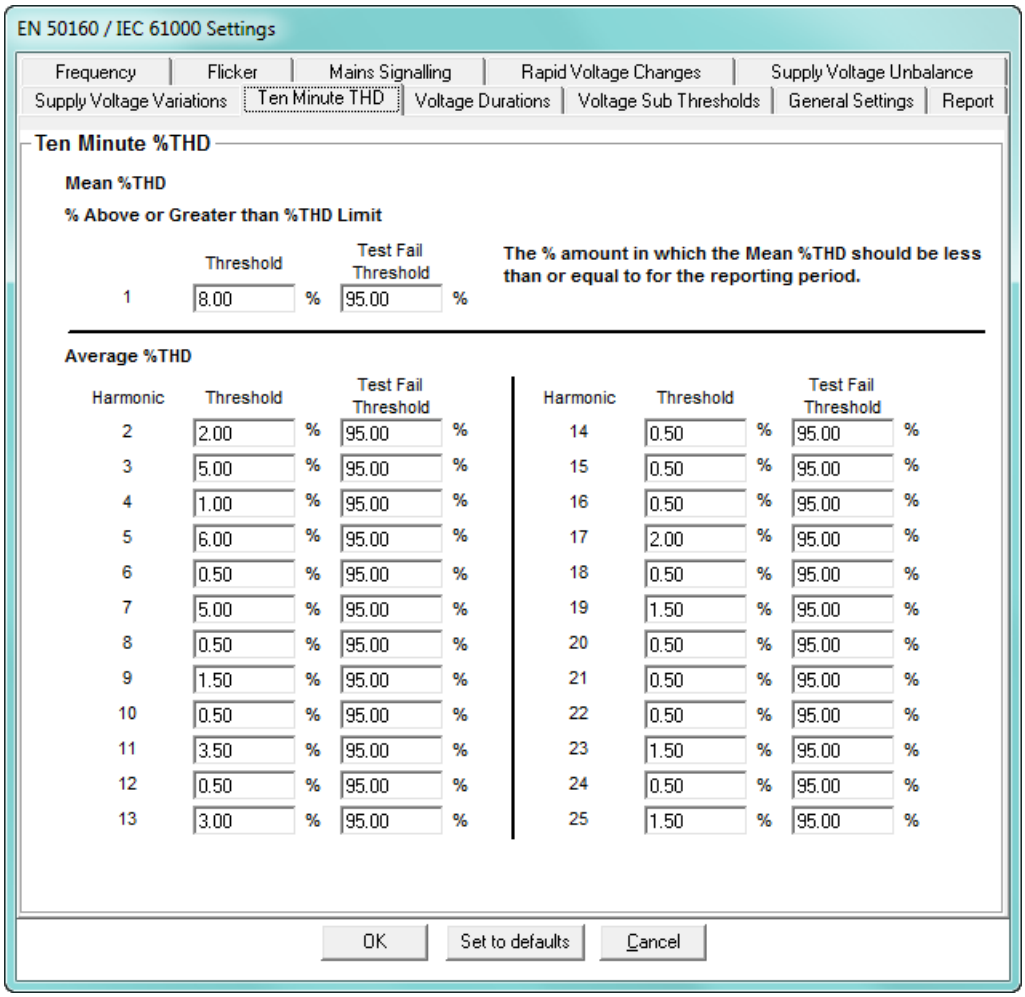
- Set Threshold 1 and 2: enter the percentage change that will trigger reporting.
- Source: select the update time for the data used - the choices are 10 minutes and 2 hours.
- Test Pass Threshold: enter the percentage of the threshold that will cause the data to be considered passing, i.e., acceptable.
- Upper Limit: select Set 1 or Set 2 as the upper limit for reporting.

7. Click the **Supply Voltage Variations** tab. In this tab, you set up acceptable variations for the supply voltage.



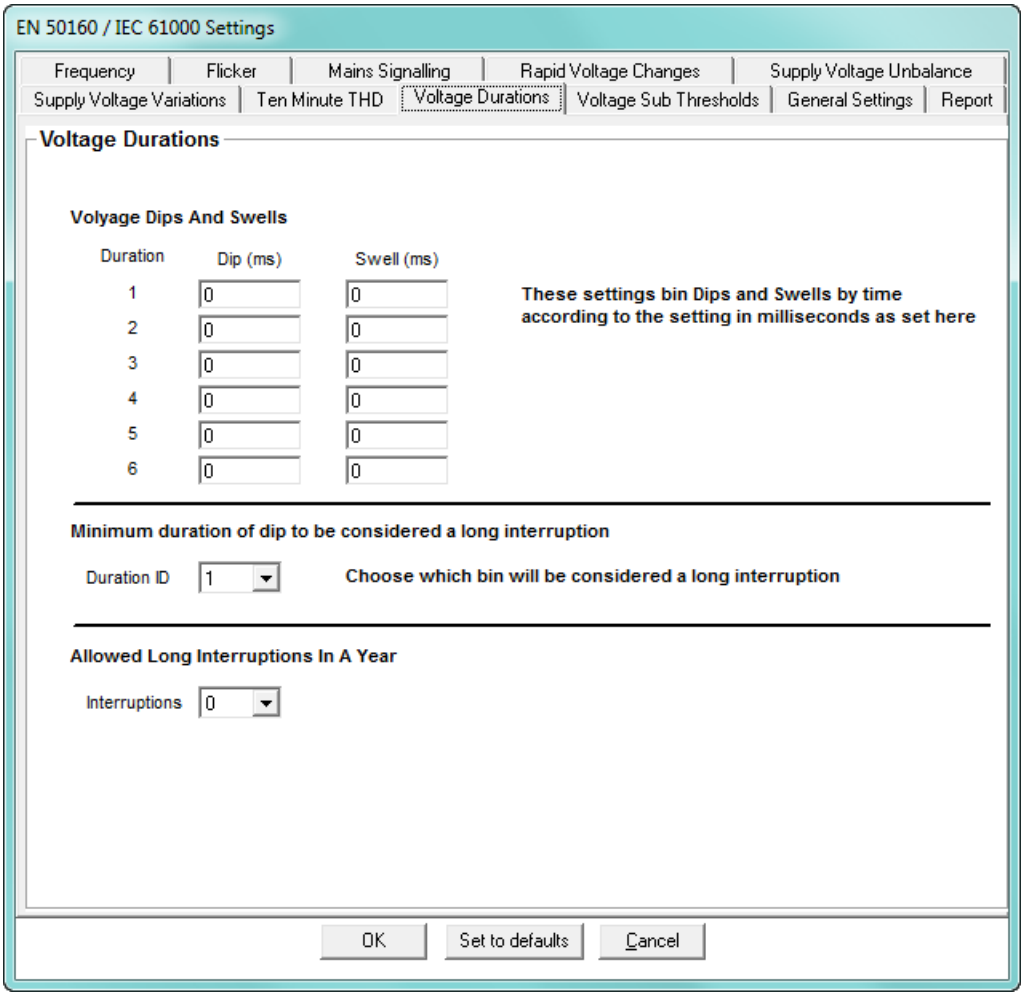
- Set Threshold 1 and 2: enter the percentage range of the nominal voltage that will trigger reporting.
- Test Pass Thresholds: enter the percentage of the threshold for sets 1 and 2 that will cause the data to be considered passing, i.e., acceptable.

8. Click the **Ten Minute THD** tab. In this tab, you set thresholds for the mean supply voltage THD and the average supply voltage THD. You also set the percentage for test failure for the mean and average THD.



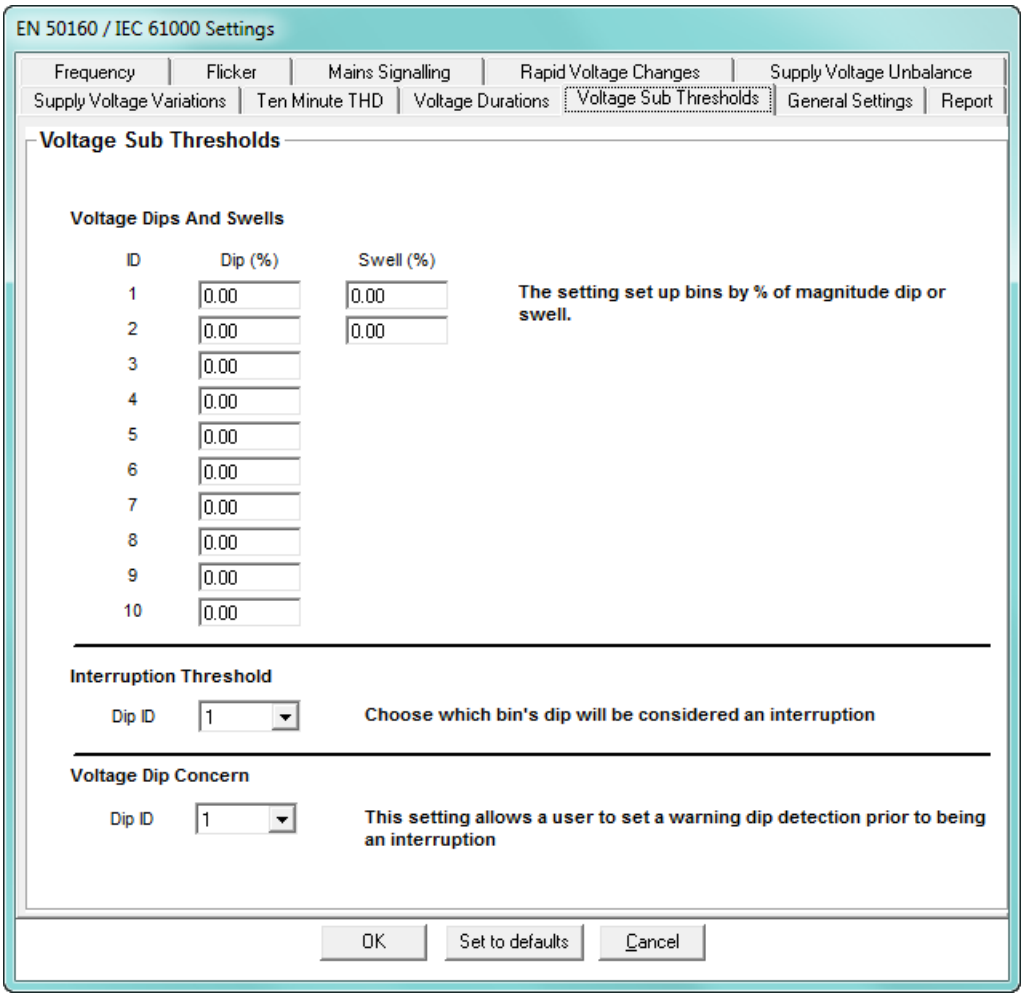
- Mean THD: enter the threshold percentage for acceptable THD (Threshold field) and the percentage of the mean THD that will be considered a fail (Test Fail Threshold field). For example, the default Threshold is 8, and the default Test Fail Threshold is 95. This means that a mean THD reading of over 8 will be considered as a fail, and when more than 95 of the mean THD readings are failed, the mean THD is reported as a fail.
- Average THD: for each harmonic magnitude from 1-25, enter the threshold percentage (Threshold field) and the test fail percentage (Test Fail Threshold) based on the average THD readings. For example, if the default average THD Threshold for harmonic magnitude 2 is 2, and the Test Fail Threshold is 95, then the average THD for magnitude 2 is considered failed if over 2, and if over 95 of the average THD readings are failed, then the average THD for harmonic magnitude 2 will be reported as failed.

9. Click the **Voltage Durations** tab. In this tab, you make settings for the duration of dips and swell in voltages.



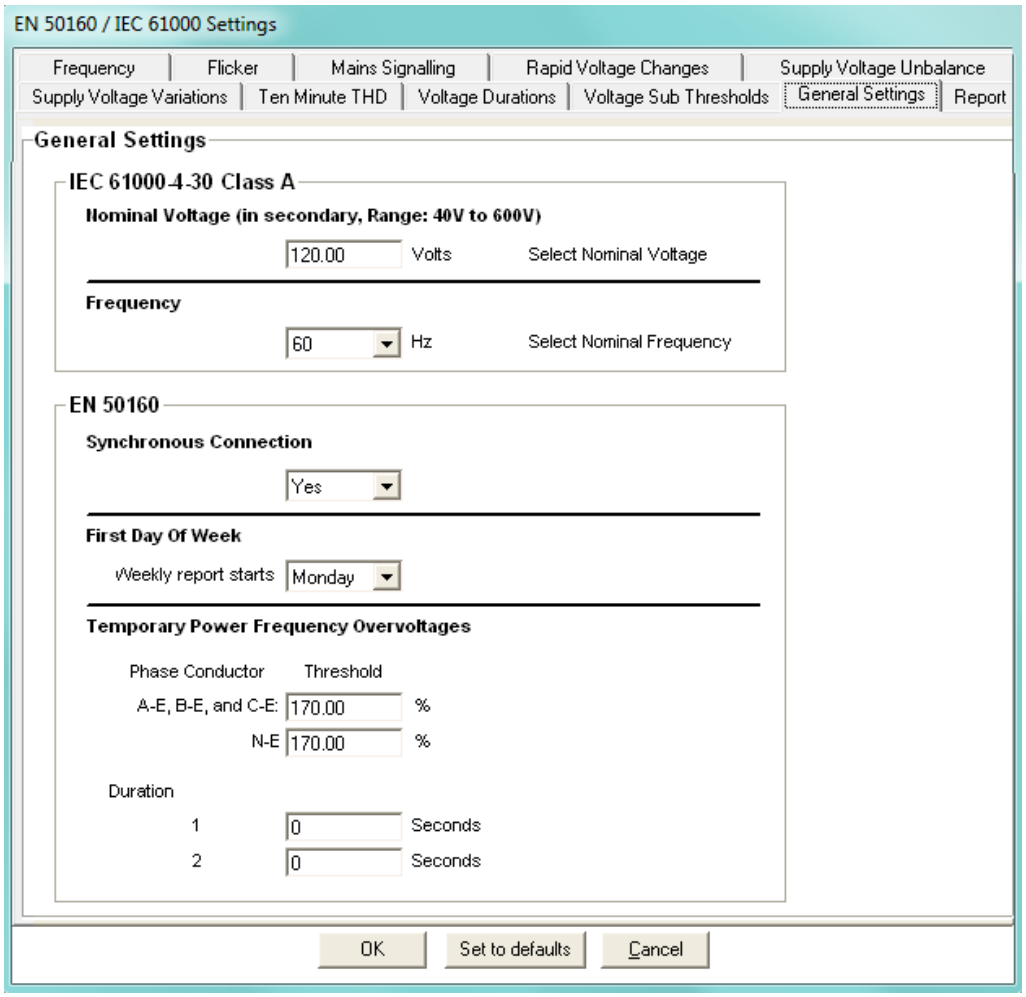
- Voltage Dips and Swells: enter the duration in milliseconds for dips and swells for 6 levels of voltage interruptions.
- Short Interruption Duration: select the level that will be considered a short interruption.
- Long Interruption Duration: select the level that will be considered a long interruption.
- Allowed Long Interruptions in a Year: select the number of long interruptions that are acceptable per year.

10. Click the **Voltage Sub Thresholds** Tab. In this tab, you set up levels for the magnitude of voltage dips and swells.



- Voltage Dips and Swells: enter 10 levels of magnitude for voltage dips and 2 levels of magnitude for voltage swell.
- Interruption Threshold: select the voltage dip level that will be considered an interruption.
- Voltage Dip Concern: select the level that will prompt a warning before a dip interruption occurs.

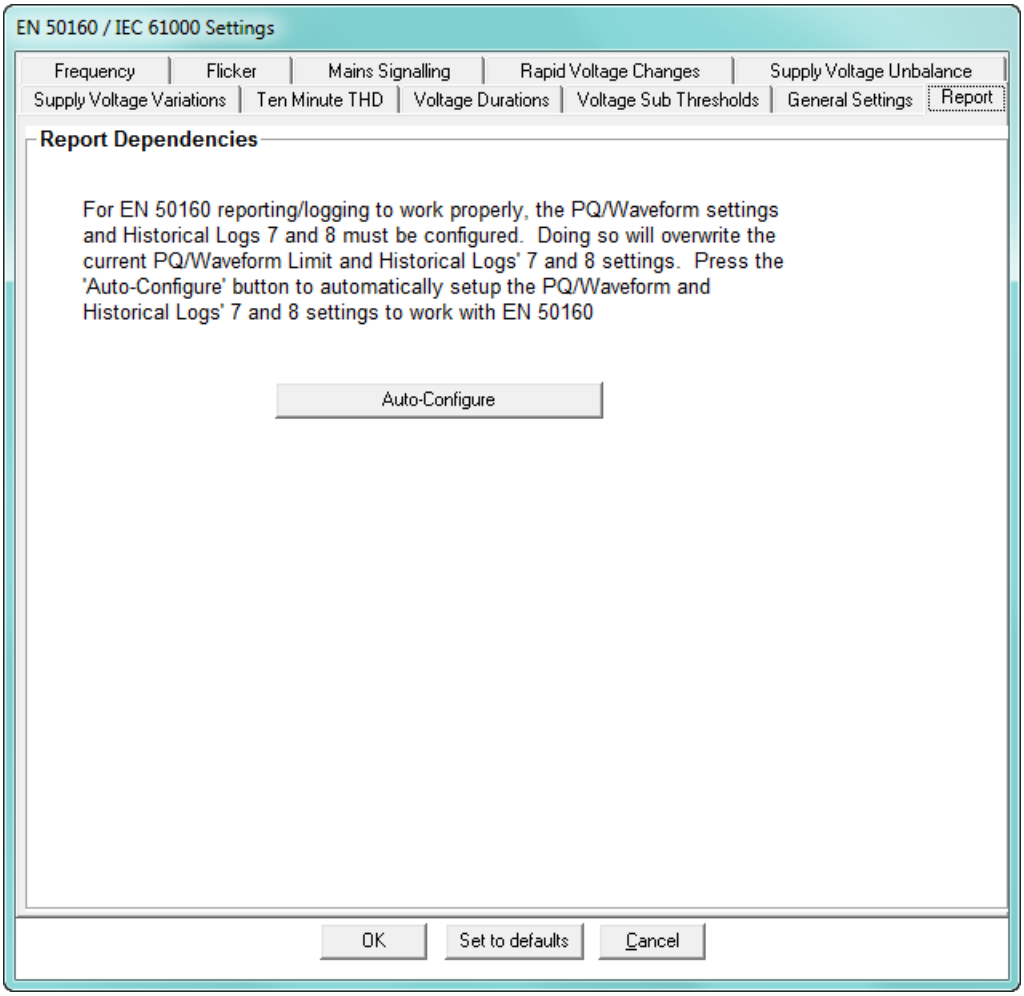
11. Click the **General Settings** tab. In this tab, you set general information for the report.



- IEC 61000-4-30 Class A:
  - Nominal Voltage in Secondary - enter the value for your system.
  - Frequency - select the nominal frequency of your system.
- EN 50160:
  - Synchronous Connection - select Yes or No, depending on whether or not the system is Synchronous. This setting is only used for information purposes, and appears on the power quality report. Consult the IEC 61000-4-30 2008 standard for information on how the synchronous/ non-synchronous affects how the frequency test should be conducted.
  - First Day of Week - select the day you want the report to start.
  - Temporary Power Frequency Overvoltages:
    - Phase Conductor and Threshold - enter the threshold for the temporary power frequency overvoltage for Phase to Earth, and for Neutral to Earth. This number is a percentage; e.g., 170.00% over normal voltage level. Note that since systems can require different thresholds, the EN 50160:2010 specification should be consulted for information on determining this setting.

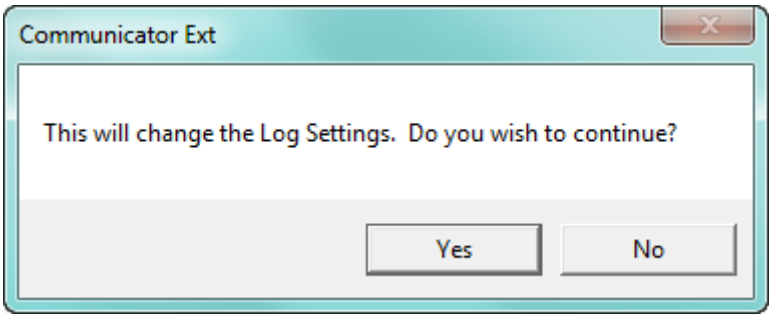
- Duration - enter 2 levels of temporary power frequency overvoltages, in seconds; e.g., level 1: 5 seconds; level 2: 10 seconds.

12. Click the **Report** tab. In this tab, you can enable PQ/Waveform settings, and EN 50160/IEC 61000-4-30 related information being trended in historical logs 7 and 8.

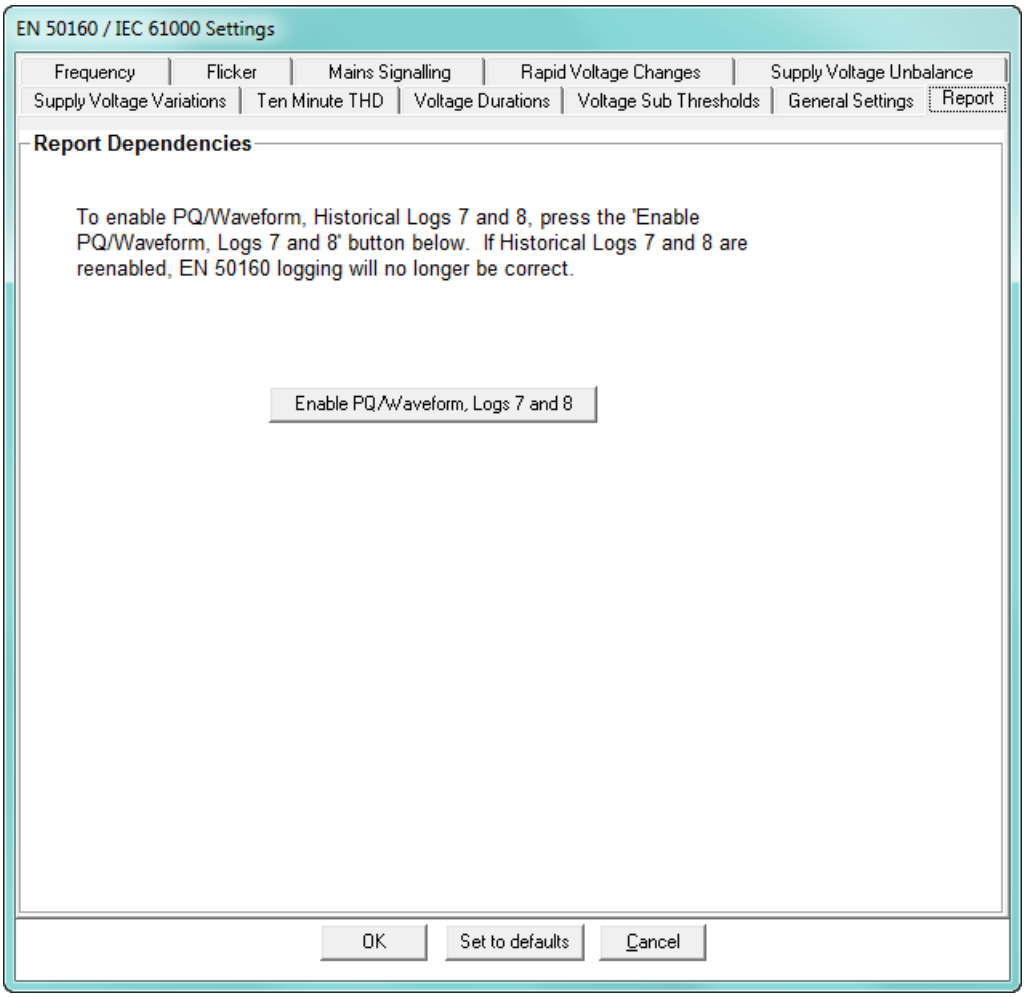


- Click **Auto-Configure** to set up PQ/Waveform settings, and EN 50160/IEC 61000-4-30 related information being recorded in historical logs 7 and 8. The two logs will have historical trending information related to the EN 50160 report. Note that the EN 50160 report itself is a separate report. See Chapter 23 "EN 50160 / IEC

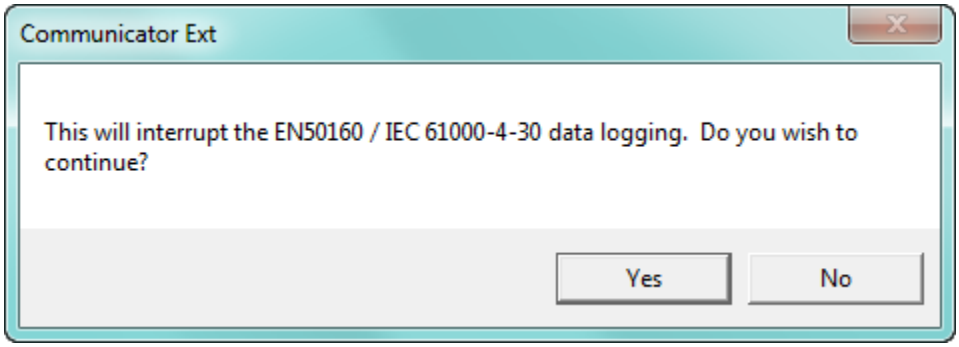
61000-4-30 Power Quality Analysis" for information on it. You will see the following confirmation screen.



13. Click **Yes** to enable the PQ/Waveform set up and recording in historical logs 7 and 8. The screen changes as shown below.



14. To disable EN 50160/IEC 61000-4-30 related information being recorded in historical logs 7 and 8 and the PQ/Waveform override setup, click **Enable PQ/ Waveform**, Logs 7 and 8. You will see this confirmation screen.



15. Click **Yes** - this will disable the EN 50160/IEC 61000-4-30 related information being recorded in historical logs 7 and 8.

NOTE

IMPORTANT! The EN 50160/IEC 61000-4-30 logs will no longer be correct, and the reports will be invalid.

16. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

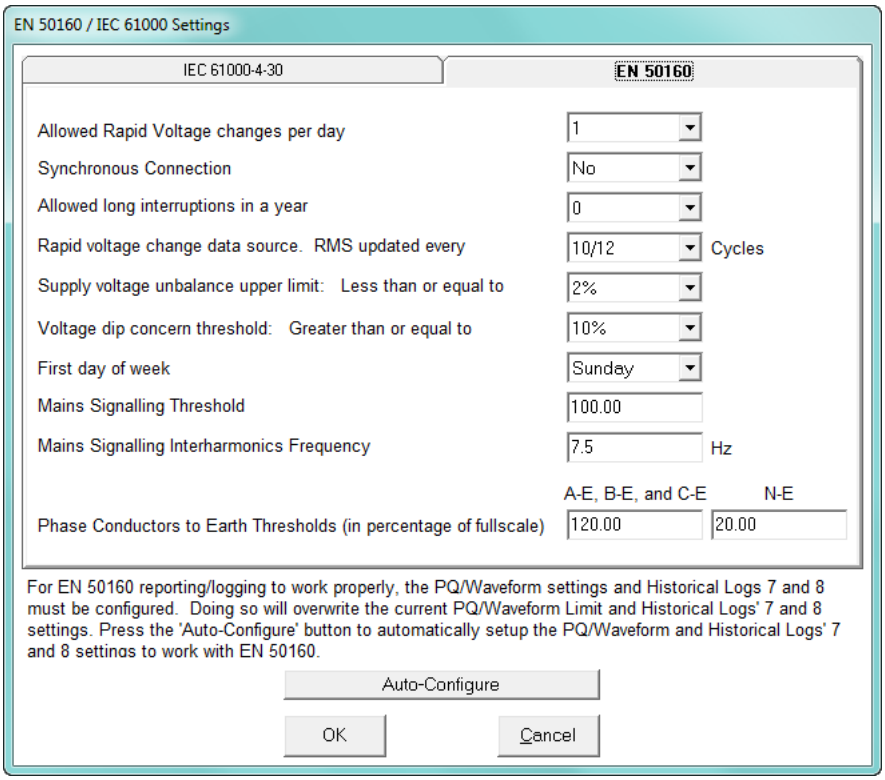
NOTE

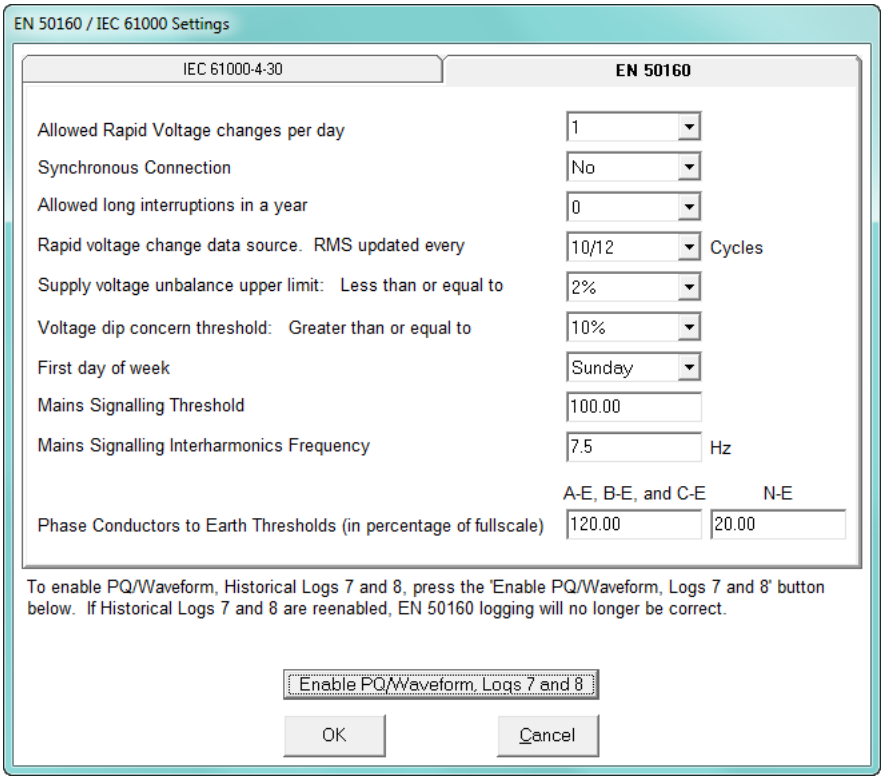
You can return all of the EN 50160/ IEC 61000-4-30 settings to their default values by clicking the Set to Defaults button.

11.3.4.2 EN 51060/IEC 61000-4-30 Setting for the EPM 9900 Meter

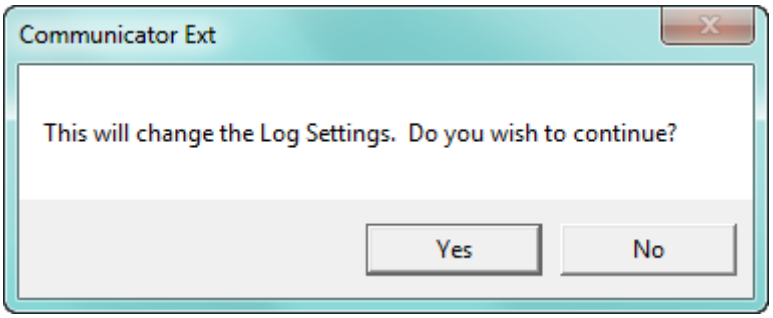
You must set up several parameters to properly configure flicker logging.

1. From the Power Quality and Alarm Settings menu, double-click on the EN 50160/IEC 61000-4-30 line. Depending on your current setting, you will see one of the following screens.


EN 50160 / IEC 61000 Settings
IEC 61000-4-30
EN 50160
Allowed Rapid Voltage changes per day
1
Synchronous Connection
No
Allowed long interruptions in a year
0
Rapid voltage change data source. RMS updated every
10/12
Cycles
Supply voltage unbalance upper limit: Less than or equal to
2%
Voltage dip concern threshold: Greater than or equal to
10%
First day of week
Sunday
Mains Signalling Threshold
100.00
Mains Signalling Interharmonics Frequency
7.5
Hz
A-E, B-E, and C-E
N-E
Phase Conductors to Earth Thresholds (in percentage of fullscale)
120.00
20.00
For EN 50160 reporting/logging to work properly, the PQ/Waveform settings and Historical Logs 7 and 8 must be configured. Doing so will overwrite the current PQ/Waveform Limit and Historical Logs' 7 and 8 settings. Press the 'Auto-Configure' button to automatically setup the PQ/Waveform and Historical Logs' 7 and 8 settings to work with EN 50160.
Auto-Configure
OK
Cancel


EN 50160 / IEC 61000 Settings
IEC 61000-4-30
EN 50160
Allowed Rapid Voltage changes per day
1
Synchronous Connection
No
Allowed long interruptions in a year
0
Rapid voltage change data source. RMS updated every
10/12
Cycles
Supply voltage unbalance upper limit: Less than or equal to
2%
Voltage dip concern threshold: Greater than or equal to
10%
First day of week
Sunday
Mains Signalling Threshold
100.00
Mains Signalling Interharmonics Frequency
7.5
Hz
A-E, B-E, and C-E
N-E
Phase Conductors to Earth Thresholds (in percentage of fullscale)
120.00
20.00
To enable PQ/Waveform, Historical Logs 7 and 8, press the 'Enable PQ/Waveform, Logs 7 and 8' button below. If Historical Logs 7 and 8 are reenabled, EN 50160 logging will no longer be correct.
Enable PQ/Waveform, Logs 7 and 8
OK
Cancel

2. The EPM 9900 meter can use Historical logs 7 and 8 to record the results of flicker testing: you will see the first screen if EN 50160/IEC 61000-4-30 logging has not been selected for the meter; you will see the second screen if it has already been selected.
   - If you see the first screen, click **Auto-Configure**. You will see this confirmation screen.

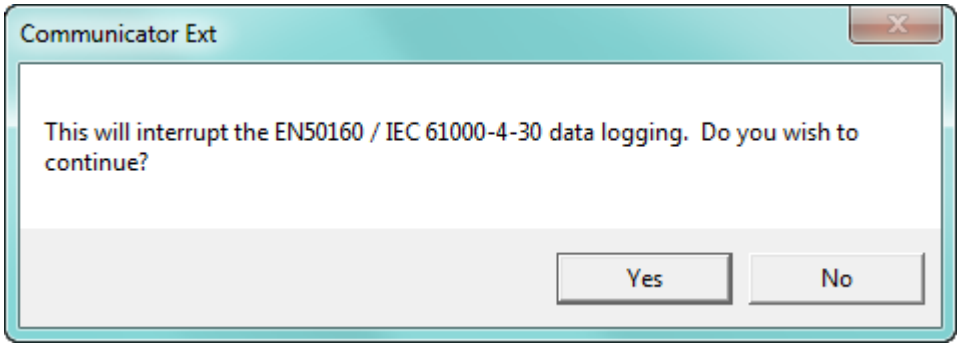


Click **Yes** - Historical logs 7 and 8 will now be used for EN 50160/IEC 61000-4-30 logging, only. Additionally, PQ and Waveform will be configured for the report.

NOTE

It takes a week for the meter to collect all the necessary data for the analysis.

   - If EN 50160/IEC 61000-4-30 recording is already active and you want to disable it, click Enable PQ/Waveform Logs 7 and 8. You will see this confirmation screen.



Click Yes - this will disable the EN 50160/IEC 61000-4-30 logging in Historical logs 7 and 8.

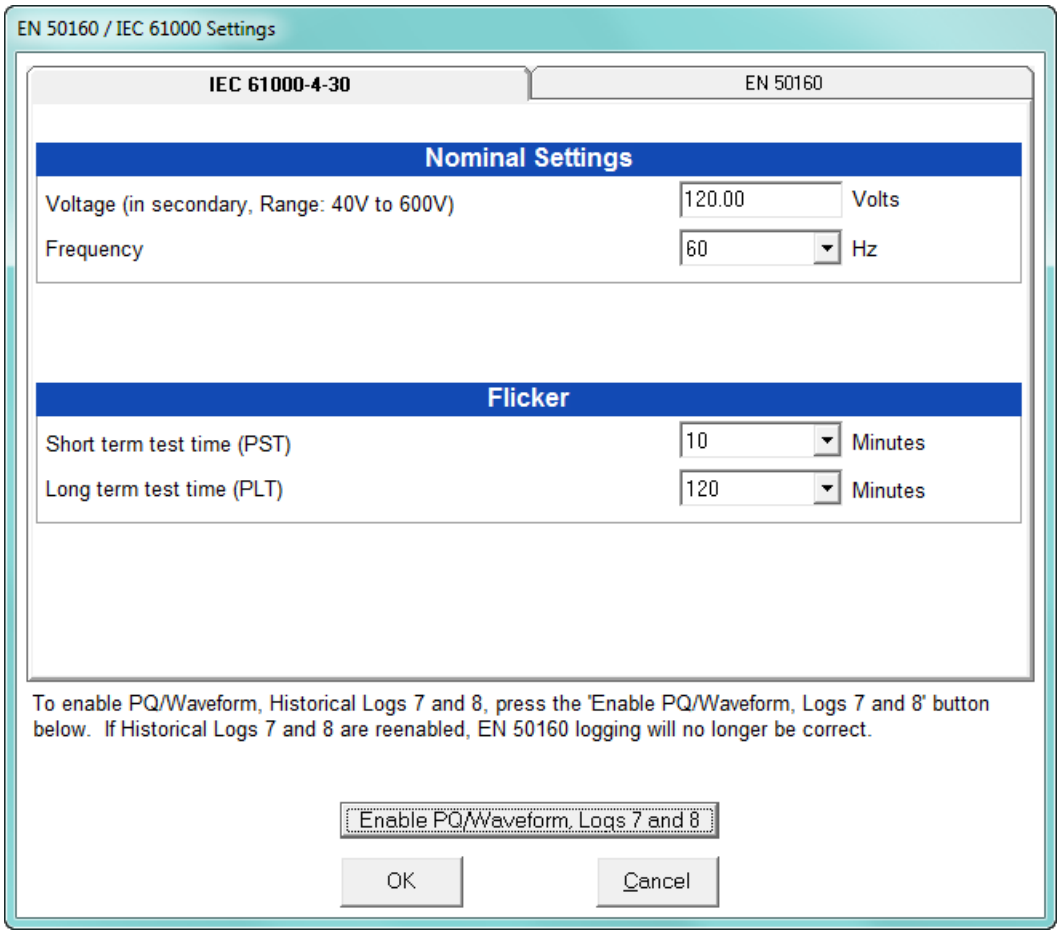
NOTE

IMPORTANT! The EN 50160/IEC 61000-4-30 log will no longer be correct, and the Dip/Interruption reports will be invalid.

3. To make settings for EN 50160, configure the following fields (see Chapter 23 "EN 50160 / IEC 61000-4-30 Power Quality Analysis" for a description of the EN 51060 settings):
   - Select the number of allowed rapid Voltage changes per day (1- 50).
   - Select the synchronous connection status (Yes or No: yes for a system with a synchronous connection to another system, no if there is no such synchronous connection).
   - Select the number of allowed long interruptions (0-100).

- Select how often RMS is updated for rapid Voltage data source (1 cycle or 10/12 cycles).
- Select the upper limit for the supply Voltage unbalance (less than or equal to 2 or 3).
- Select the Voltage dip concern threshold (greater than or equal to 10-85).
- Select the first day of the week (Sunday or Monday).
- Enter the Mains signaling threshold.
- Enter the Mains signaling Interharmonic frequency.
- Enter the Phase Conductors to Earth Thresholds in percentage of Full Scale:
    - Enter the value for A-E, B-E, and C-E.
    - Enter the value for N-E.

4. To change settings for IEC 61000-4-30, first click the IEC 61000-4-30 tab.



5. Configure the following fields:
    - Enter the nominal Voltage in secondary (range from 40V to 600V). By supplying the nominal voltage, this field is used to calculate under and over deviations.
    - Select the frequency (50 or 60Hz). This field is used to calculate the harmonics and interharmonics associated with the set fundamental frequency.

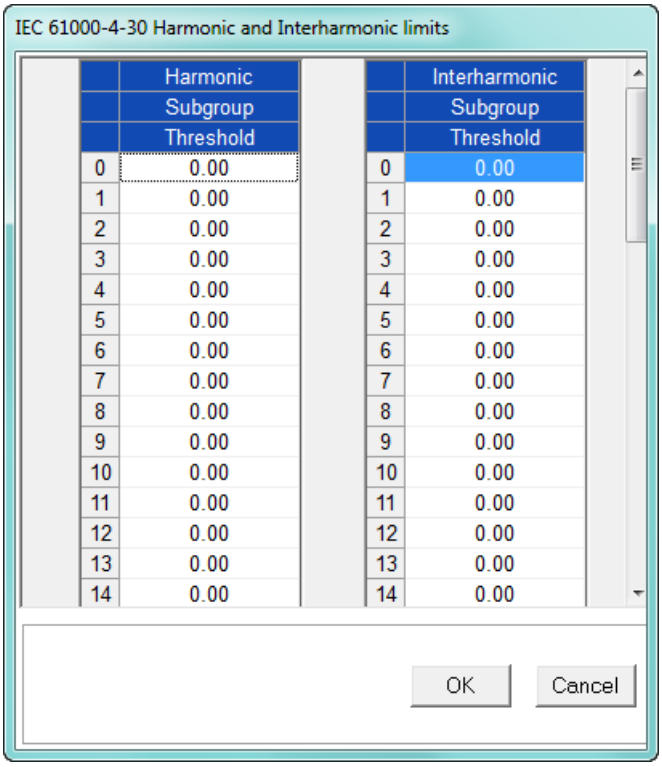
- Select the short term test time (1-10 minutes, in minute increments). PST is defined over a ten minute interval. Standard IEC 61000-4-15 requires 10 minutes for PST.
- Select the long term test time (10-240 minutes, in ten minute increments). The standard requires 120 minutes, and is calculated from the PLT values.

6. When all changes are entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.3.5 IEC 61000-4-30 Harmonic & Interharmonic Thresholds (EPM 9900P Meter)

Use this setting to set the group and subgroup harmonic and interharmonic thresholds that will be applied to the IEC 61000-4-30 reporting for the meter.

1. From the Power Quality and Alarm Settings menu, double-click on the IEC 61000-4-30 Harmonic & Interharmonic line. You will see the screen shown below.

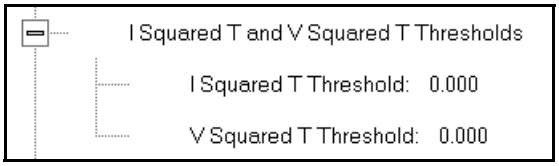


2. For each of the Harmonic and Interharmonic subgroup levels 0-51, you can enter a threshold percentage value. Use the scroll bars to view all of the levels.
3. When all changes are entered, click **OK** to return to the Main Device Profile screen.
4. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

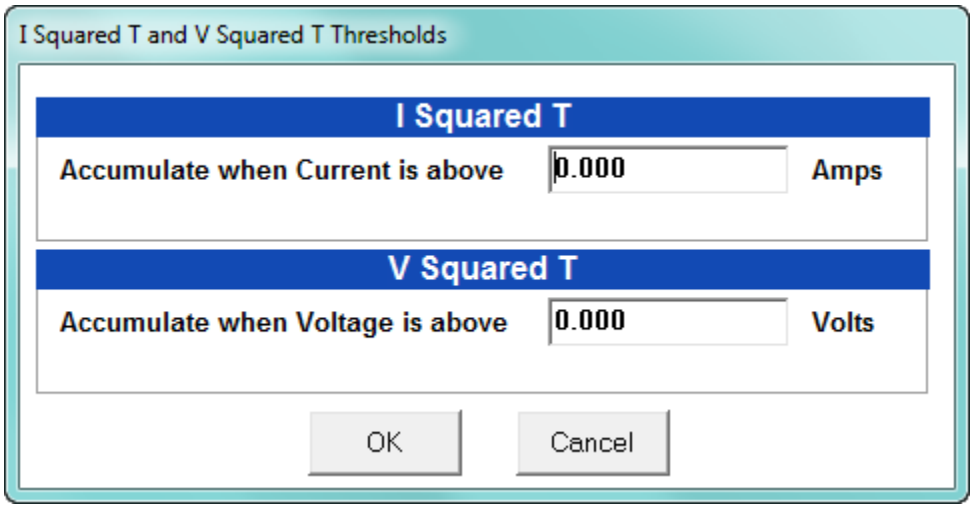
11.3.6 I Squared T and V Squared T Thresholds

With the I Squared T and V Squared T Thresholds screen, you can set the point at which the meter accumulates current and Voltage. This feature is used to calculate wear on circuit breaker contacts.

1. From the Power Quality and Alarm Settings menu, click on the + button next to I Squared T and V Squared T Thresholds or double-click on that line. You will see the submenu shown below, which shows the current settings for the meter.



2. Double-click one of the settings to open the I Squared T and V Squared T Thresholds screen, shown below.

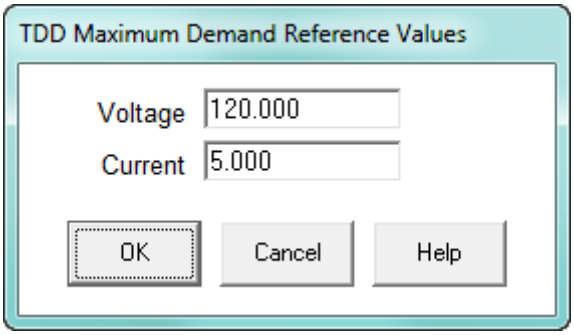


3. Enter the thresholds in the I Squared T and V Squared T fields.
4. Click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

11.3.7 TDD Maximum Demand Reference Values

This setting of the Device Profile allows you to set the maximum value for voltage and current, which is used for the TDD (Total Demand Distortion) calculation. TDD and THD (Total Harmonic Distortion) are both indices used to measure harmonics. TDD is defined in the IEEE 519 Standard, "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems" as "the total root-sum-square harmonic current distortion in percent of the maximum load current." It gives a better indication of the impact of distortion on Demand than THD which analyzes the harmonic distortion relative to the fundamental, without consideration of load.

1. From the Power Quality and Alarm Settings menu, double-click on the TDD Maximum Demand Reference Values. You will see the screen below.



2. Enter the maximum values for voltage and current.
   - You can find these values in the Poll Max and Min Readings polling screen (see 5.2.2 "Poll Max and Min Readings" for details).
   - You can view the TDD values in the Harmonics polling screen (see 5.4.2 "Poll Harmonics" for details).
3. Click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

11.3.8 High Speed Inputs

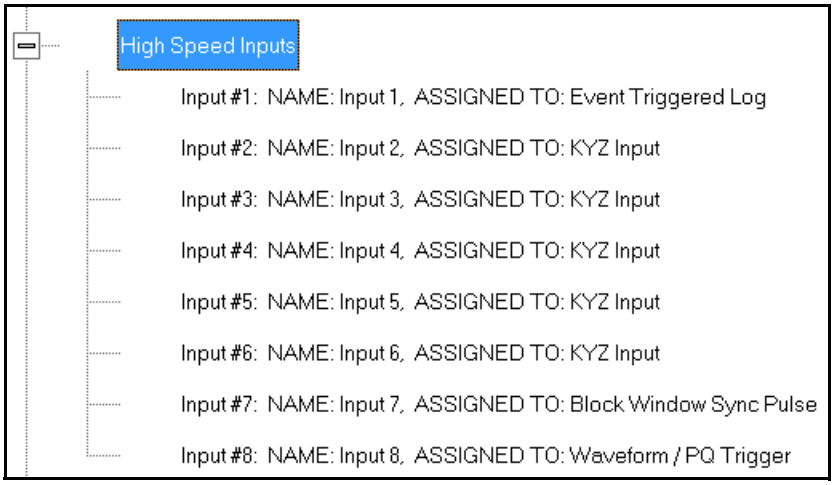
The EPM 9900/9900P meter's built-in High Speed Inputs can be used in two ways:

- Attaching status contacts from relays, breakers or other devices for status or waveform initiation
- Attaching the KYZ pulse outputs from other meters for pulse counting and totalizing

Even though these inputs are capable of being used as high speed digital fault recording inputs, they serve a dual purpose as KYZ counters and totalizers. The function in use is programmable in this setting of the Device Profile, which lets you label the eight High Speed inputs and to specify their status.

- Labeling the inputs allows you to determine the source of status change when data is later analyzed.
- This feature lets you set the High Speed Inputs' status as a KYZ input, a trigger for waveform capture or PQ recording, a trigger for logging, or a means of synchronizing the meter.
- In the Pulse Accumulations setting (11.2.9 "Pulse Accumulations"), you can assign the High Speed Inputs' counts to be accumulated in one of four internal Aggregators of the meter.

1. From the Power Quality and Alarm Settings menu, double-click on the High Speed Inputs line or click on the + button next to it. You will see the submenu shown below.



2. Double-click any of the Input lines. You will see the screen below.

Device Profile: High Speed Digital Input Assignments

Input ID	Name	Open Label	Shorted Label	Normal Condition	Input Type
1	Input 1	Open	Closed	Open	Event Triggered Log
2	Input 2	Open	Closed	Open	KYZ Input
3	Input 3	Open	Closed	Open	KYZ Input
4	Input 4	Open	Closed	Open	KYZ Input
5	Input 5	Open	Closed	Open	KYZ Input
6	Input 6	Open	Closed	Open	KYZ Input
7	Input 7	Open	Closed	Open	Block Window Sync Pulse
8	Input 8	Open	Closed	Open	Waveform / PQ Trigger

OK Cancel Help

3. Double-click a field to enter the following:
   - Name
   - Open Label
   - Shorted Label
   - Normal Condition
4. Click on the Input Type field to select an option from the pull-down menu. The available selections are:
   - KYZ Input - select this option to designate the input as a pulse (KYZ) input.
   - Waveform/PQ Trigger - select this option if you want the input to trigger a waveform/PQ recording (see 11.3.3 "PQ Thresholds (Waveform Recording)").
   - Block Window Sync Pulse - select this option if you want to synchronize the meter with pulses from the input (see "See the EPM 9900 or EPM 9900P Instruction Manual for details on Demand intervals.").

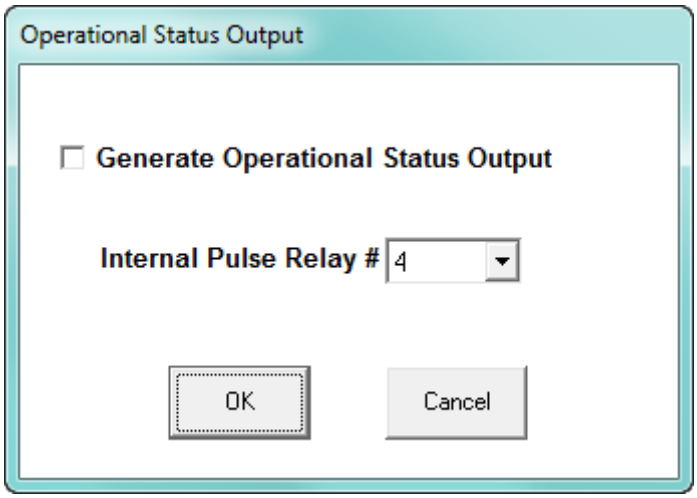
- Event Triggered Log - select this option if you want the input to trigger logging. Logging occurs when the input's state changes from Open to Closed. Only one High Speed input at a time can be set for Event Triggered logging. You must also set the length of logging and the parameters to be logged (see 19.4.1 "Viewing Historical Trends and Snapshots" and 19.4.2 "Viewing the Limits Log").

5. When you have finished making your selections, click OK to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.3.9 Operational Status Output

This setting of the Device Profile lets you assign a relay to indicate that the meter is operational, i.e., when it enters Runtime. When the meter is first started up, the indicator will be off, and once the meter is ready for operation, the indicator will be on. The relay can be monitored either by another connected device, or, if the operational status is assigned to one of the two LED relays, operational status will be indicated on the front of the meter - the LED will light up once the meter is operational.

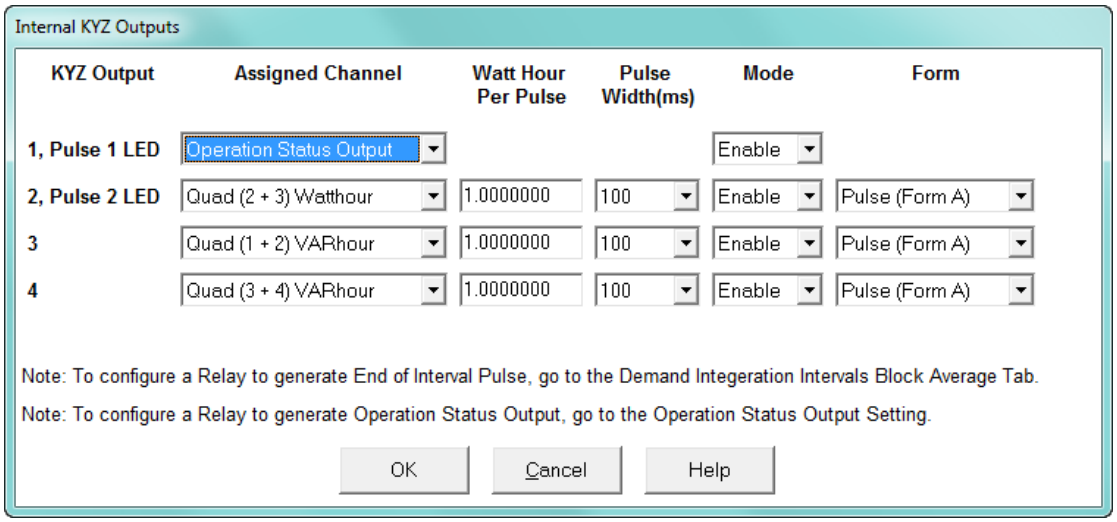
1. From the Power Quality and Alarm Settings menu, double-click on the Operational Status Output line. You will see the screen shown below.



2. Click the checkbox to enable this feature and select the relay you want to assign from the pull-down menu.

3. When you finish making your selections, click OK to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

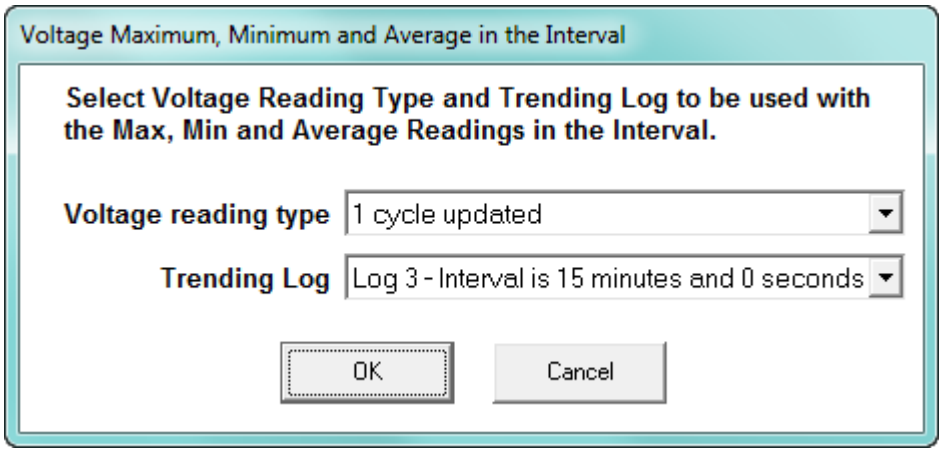
Note that your selection will now be reflected in the Internal KYZ screen; see the example screen below and refer to “Internal KYZ Outputs” on page 11-31.



11.3.10 Voltage Short Term Maximum, Minimum and Average Interval

This feature allows a user to capture short term high and low readings on voltage that would normally be missed by a 15 minute voltage snapshot log. With this feature the user can see the highest and lowest anomaly on the line to be able to trend voltage quality over a long period of time. This setting of the Device Profile lets you assign a voltage reading type and Historical log (Trending log) for the maximum, minimum, and average readings in the interval.

1. From the Power Quality and Alarm Settings menu, double-click on the Short Term Maximum, Minimum and Average Interval line. You will see the screen shown below.



2. From the pull-down menus, select:
   - Voltage reading type - can be 1 cycle updated, 10/12 cycle updated, 3 second updated or 10 minute updated. The voltage reading type defines which reading to compare for the max/min/average values.
   - Trending log - can be Historical logs 3 - 8. The interval programmed for each log (see 11.4.1 "Programming the Trending Log Time Intervals") is also displayed. The

Trending log setting defines which log to synchronize Averaging interval to. You must still manually enter these items into the logs if you wish to use them for that purpose.

3. When you finish making your selections, click OK to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

11.4 Trending Profile Settings

Trending profiles allow you to set up which parameters you wish to trend in the meter's historical memory. Virtually any reading that the meter measures can be stored in the meter's memory to be logged for later download to the host software. This section of the Device Profile enables you to configure parameters for the EPM 9900/9900P meter's eight historical logs and the Event Triggered log.

1. From the Device Profile screen, click on the + button next to Trending Profile Settings or double-click on the Trending Profile Settings line. You will see the menu shown below.

2. Double-click on one of the Trending lines to access the programming screens.

NOTE

NOTE on Load Profile Recording: Load Profile recording is a subset of the EPM meter's more general logging and trending capability. The same screens are used for setup, but Load Profile recording only deals with accumulated values; Energy (Wh), reactive Energy (VARh) and apparent power (VAh).
Historically, Load Profile recording referred to recording of quadrant 1 Energy (Wh) because electromechanical meters only measured energy and were designed to prevent reverse rotation outside of quadrant 1.

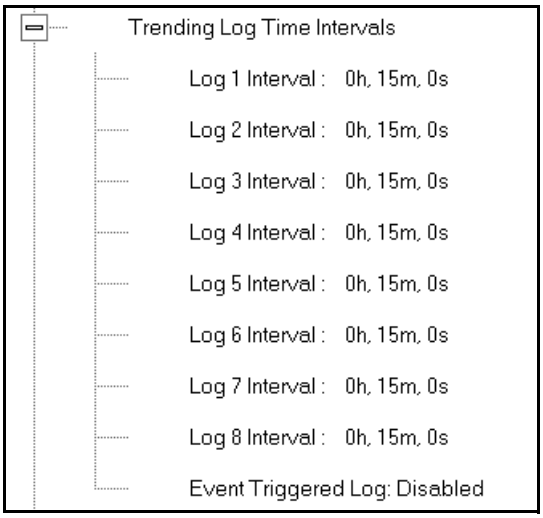
NOTE

When using MV90, you must set up your load profile in Log 1 and Log 2. The MV90 TIM will only read from the first two logs. The additional logs can be used to bring additional data down via the GE Communicator application.

11.4.1 Programming the Trending Log Time Intervals

The Trending Log Time Intervals setting determines the interval at which the Historical logs take a "snapshot" of data, and the length of time logging continues for the Event Triggered log (see 11.3.8 "High Speed Inputs" for information on setting the Event Triggered log). To set the parameters for the logs, see 11.4.2 "Programming the Trending Setup". See Chapter 16 "Databases and Log Data" for information on retrieving logs and Chapter 19 "Viewing Logs" for information on viewing logs.

1. From the Trending Profile Settings menu, double-click Trending Log Time Intervals or click the + button next to it. You will see the submenu shown below. The submenu shows both the intervals set for logs 1 through 8, and the length of logging for any Event Triggered log. It will also show if Logs 7 and 8 are enabled for EN 50160/IEC 61000-4-30 logging.



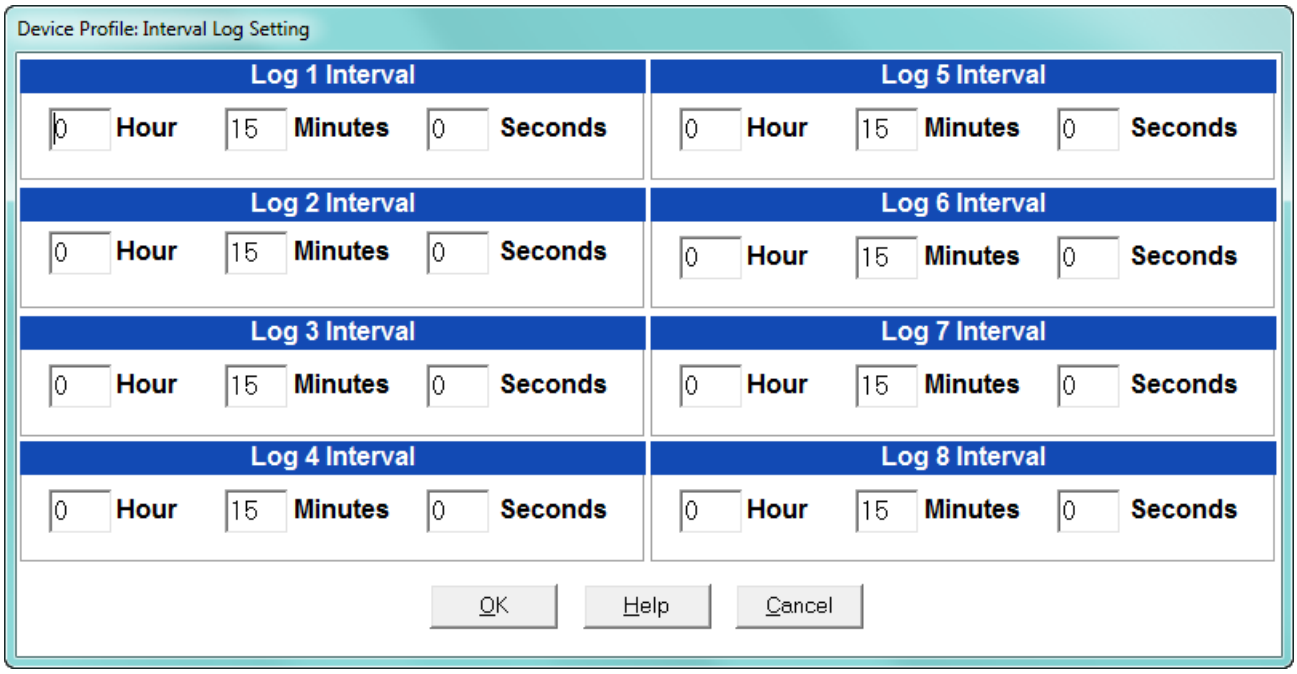
- To change the interval for a Historical log, double-click on one of the log numbers.
- To change logging time for an Event Triggered log, double-click on the Event Triggered log.

NOTE

NOTE: You can also access the Interval setting screens from the Trending Setup screens (see 11.4.2 "Programming the Trending Setup").

2. Depending on your selection, follow instructions in step a or b.

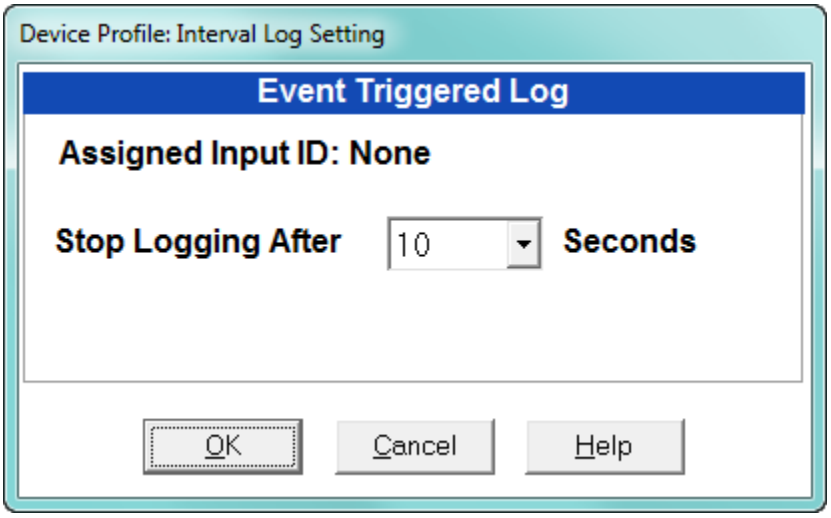
- If you click on Logs 1-8, you will see the screen shown below.



- This screen lets you set the interval for the Historical (Trending) logs. The interval cannot be greater than one hour. Enter either:
  - 1 Hour

  or either or both of the following:
  - Minutes
  - Seconds
- If you click on Event Triggered Log, you will see the screen shown below. It displays the High Speed input that is assigned to the Event Triggered log (see 11.3.8 "High Speed Inputs") and the amount of time (in seconds) that logging continues after the trigger, i.e., when the High Speed input assigned to the log goes

from an open state to a closed state.



Select the amount of time for logging from the pull-down menu. You can select from 1 to 60 seconds.

NOTE

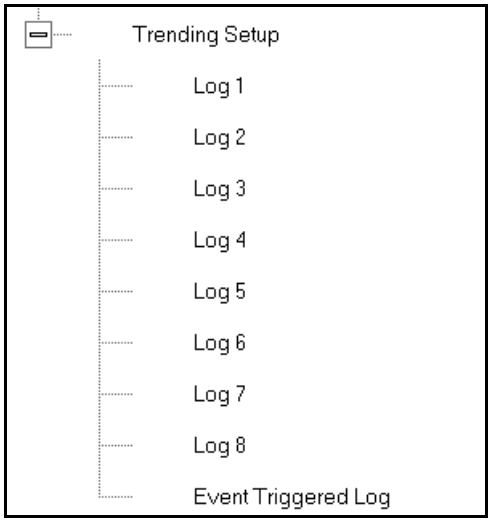
You enable the Event Triggered log in the High Speed Inputs setting (see 11.3.8 "High Speed Inputs").

3. Click OK to save your changes. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

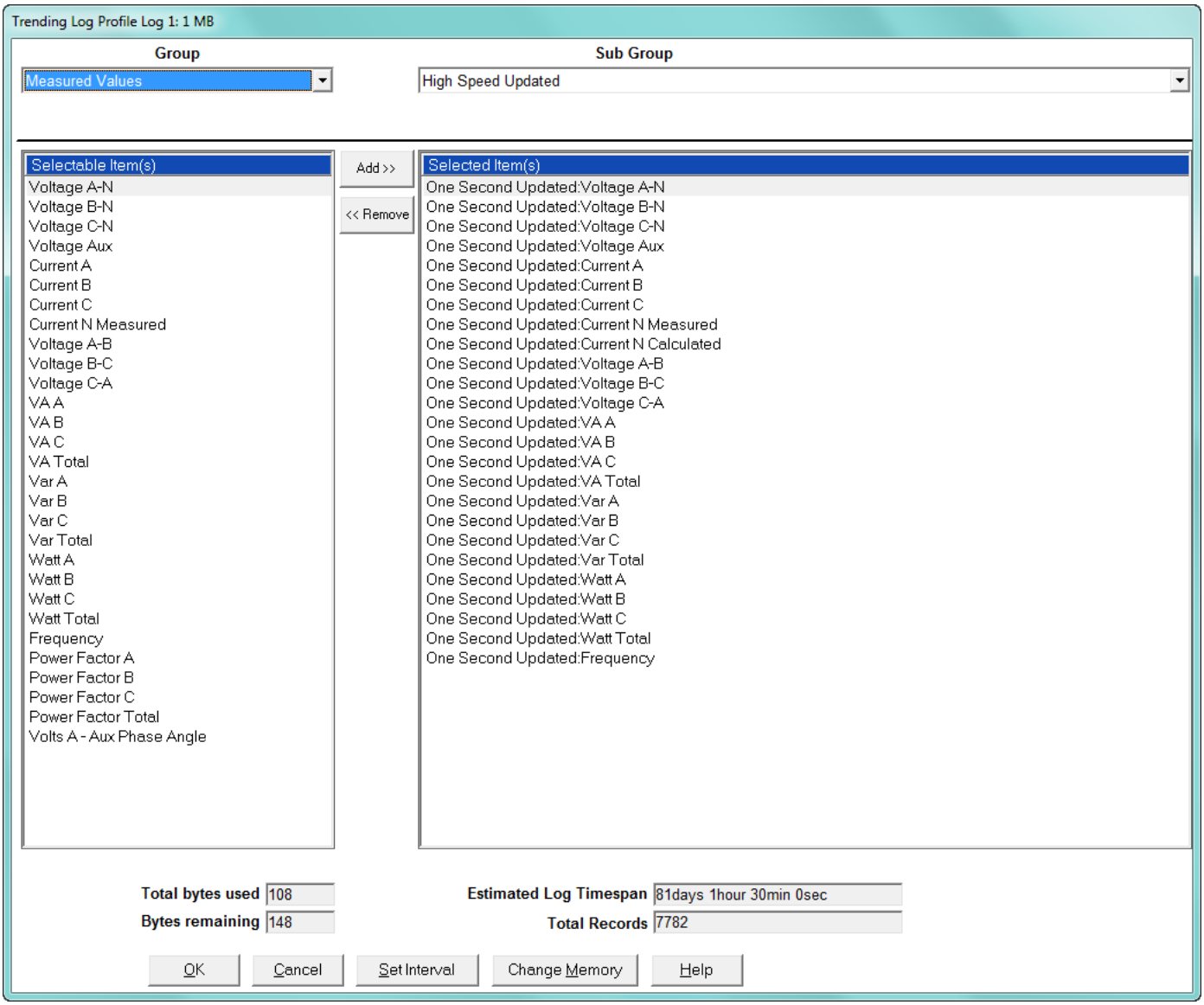
11.4.2 Programming the Trending Setup

The Trending Setup controls the channel assignments for Historical logs 1 - 8 and the Event Triggered log. See Chapter 16 “Databases and Log Data” for instructions on retrieving logs, including using the HHF Converter.

1. From the Trending Profile Settings menu, click on the + button next to Trending Setup or double-click on the Trending Setup line. You will see the submenu shown below.



2. Double-click on the log whose settings you want to configure. You will see the Trending Log Profile screen for the log you selected. An example screen is shown on the next page.



3. Make changes to this screen according to your application requirements. The screen fields are:
   - Group - using the pull-down menu, select the type of snapshot. The options are: Measured Values, Averages, Accumulators, Interval Accumulators, Option Cards, RTU Master Items, and TOU Cumulative Dmd.
   - Sub-Group - using the pull-down menu, select a channel for the snapshot. The options you see depend on the Group you selected.
   - Sub-Group 2 - with some selections, a second sub-group field will be shown underneath the first one.

- Highlight items in the Selectable Items(s) box and click Add to include the selections in the Log. The items are copied to the Selected Item(s) box. To remove an item from the log, highlight the item in the Selected Item(s) box and click Remove or double-click the item. The item is removed from the Selected Item(s) box.

NOTE

- To select multiple items, hold Ctrl while highlighting the items.
- To select a range of items, click the first item, hold Shift, and click the last item
- Move the cursor to the lower left corner of an item, or group of items, to view its size in bytes.
  - The Total Bytes Used and Bytes Remaining fields display the amount of memory used for each record of the log. The meter assumes 256 bytes of memory for each record. Total memory is determined by Software Option and configured log size (see 11.1.8 "Configure Log Sizes").
  - Click Set Interval to open the Interval Log Setting screen (see Section 11.4.1 "Programming the Trending Log Time Intervals").

4. When all changes have been entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

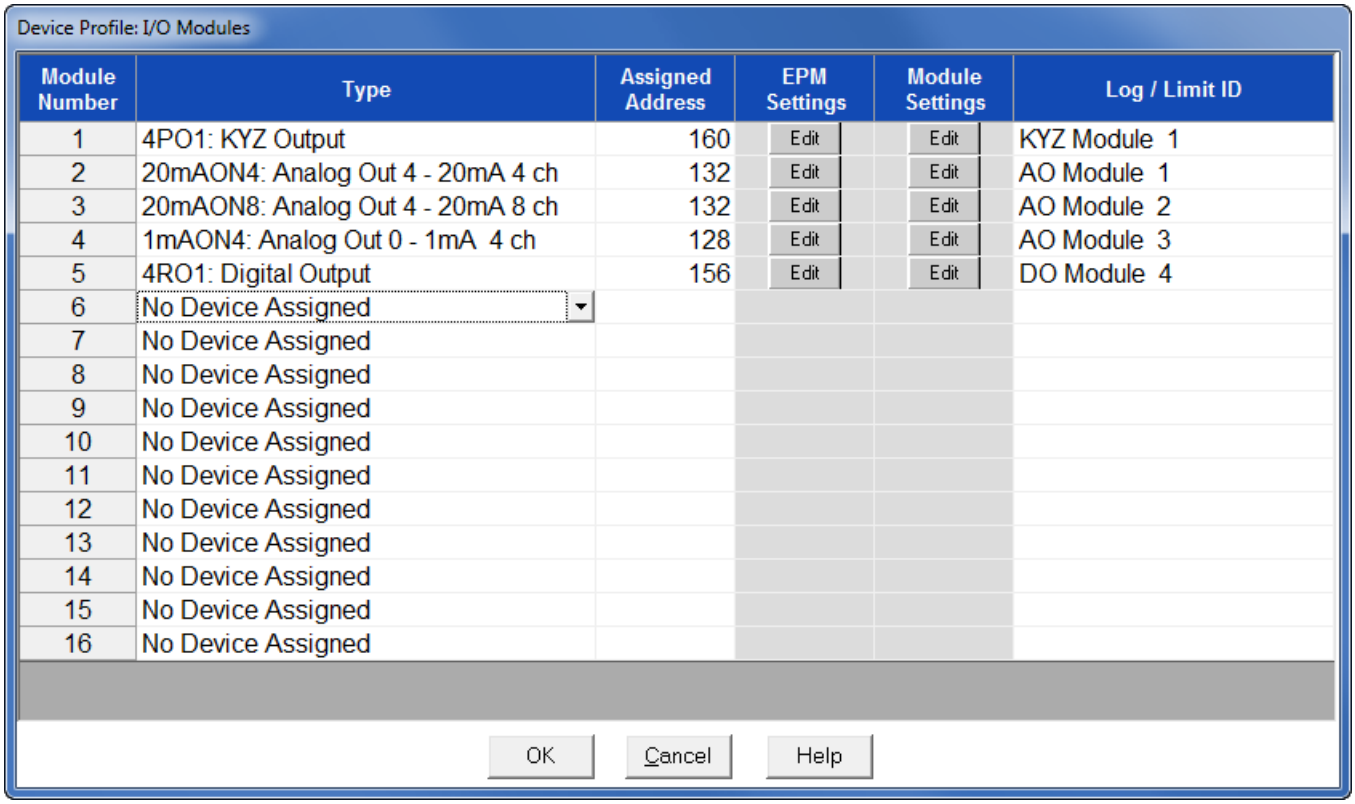
11.5 External I/O Modules

The EPM 9900/9900P meter has the ability to have its I/O expanded using external I/O modules. These modules add both analog and digital inputs and outputs to the meter to greatly expand the capability of the instrument. The meter also has two internal slots to mount expansion digital I/O, including 6 relay outputs and 16 digital inputs - see 11.6 "Internally Mounted Option Cards (EPM 9900P Meter)" for information on the internal I/O options.

This setting of the Device Profile allows you to set up the meter's optional external Input/Output modules (see Chapter 14 "External I/O Modules" for more information on the I/O modules) and RTU Master settings. I/O modules work as Modbus slave devices. The meter polls these modules to get the data from them. I/O modules generally have default RS485 Modbus addresses. So, they don't have to be configured. Once you set up which module you want, put in the default address and start with the basic configuration of readings you desire to gather.

11.5.1 Configuring the Input/Output Modules

1. From the Device Profile screen, double-click on the External I/O Modules icon. You will see the screen shown below.



2. Click in the Type column and use the pull-down menu to select the specific module you want to add. The Assigned Address, EPM settings, and Module settings you can make depend on the module you are configuring. The modules and settings are as follows:

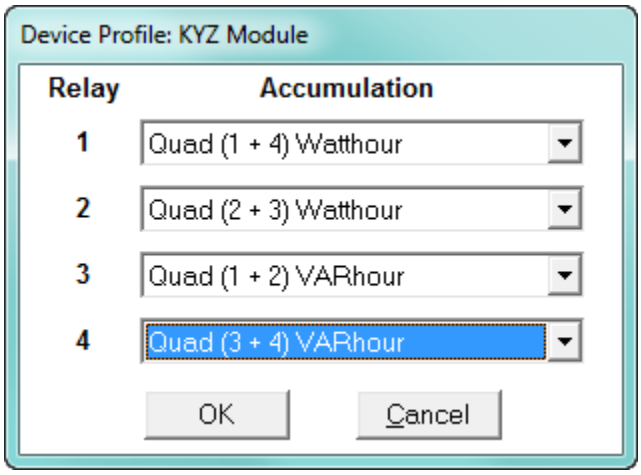
Module	Assigned Address*	EPM Setting**	Module Setting
4PO1 - KYZ Output	160*	Click to Edit Relay Accumulations	Click to enter Transmit Delay and configure KYZ outputs' Watt/pulse, rollover and minimum pulse width.
20mAON4 - Analog Transducer Signal Outputs, 4 channels, 4-20 mA	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
20mAON8- Analog Transducer Signal Outputs, 8 channels, 4-20 mA	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
1mAON4 - Analog Transducer Signal Outputs, 4 channels, 0-1 mA	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
1mAON8 - Analog Transducer Signal Outputs, 8 channels, 0-1 mA	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings

Module	Assigned Address*	EPM Setting**	Module Setting
4RO1 - Digital Output	156*	Click to configure Relays	Click to enter Transmit Delay
8AI1 - Analog Input Module, 0-1 mA	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI2- Analog Input Module, 0-20 mA	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI3 - Analog Input Module, 0-5 VDC	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI4 - Analog Input Module, 0-10 VDC	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8DI1 - Digital Status Input Module	164*	Click to configure Digital Inputs	Click to enter Transmit Delay and configure Channel settings

* The Assigned address on this screen is the address the meter uses to identify the I/O module. The default is the factory set address, which you can change by clicking in the field and choosing a new address from the pull-down menu. This address is not the actual I/O module address. You set that from the I/O Devices menu; see Chapter 14 "External I/O Modules" for instructions.

**When you click in this field you see an Edit button. Click the button to open a screen that lets you edit that module. See the following example screens.

Figure 11-1: 4PO1 Screen - Pulse Output module

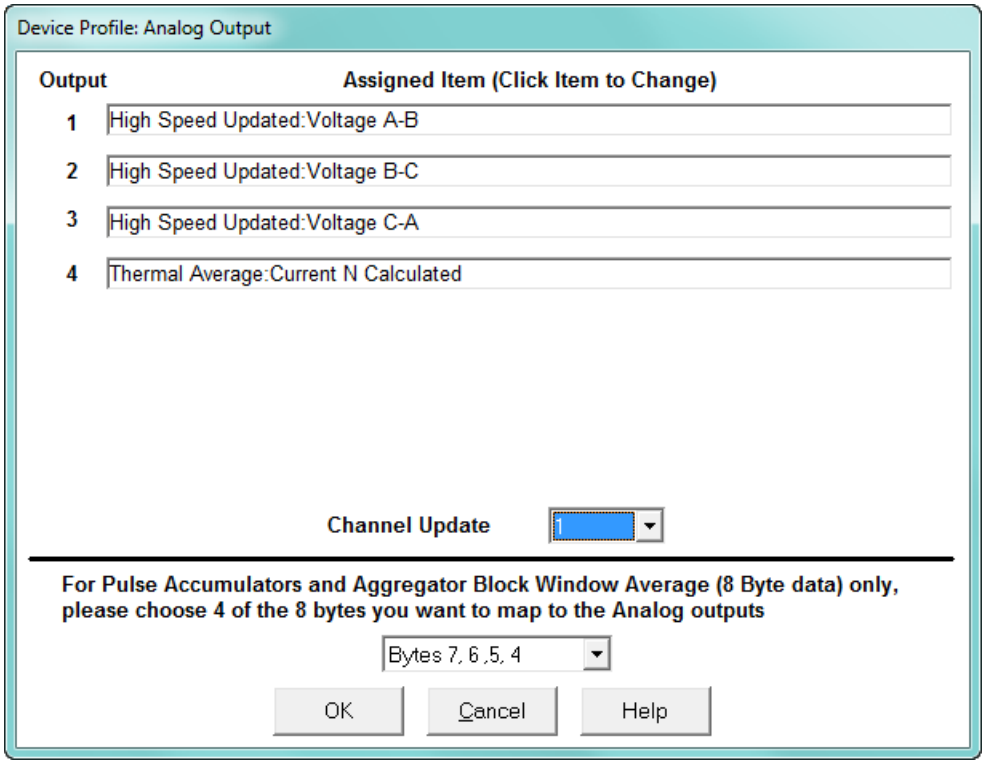


This screen allows you to assign a KYZ output to an accumulator. Click on the pull-down menu to select accumulation configuration for each of the 4 relays. The options are:

- Disabled
- Quad (1+4) Watthr
- Quad (2+3) Watthr
- Quad (1+2) VARhr
- Quad (3+4) VARhr
- Quad (1+2+3+4) VAhr

- Quad 1 Watthr
- Quad 2 Watthr
- Quad 3 Watthr
- Quad4 Watthr
- Quad 1 VARhr
- Quad 2 VARhr
- Quad 3 VARhr
- Quad 4 VARhr
- Quad 1 VAhr
- Quad 2 VAhr
- Quad 3 VAhr
- Quad 4 VAhr
- +Qh Total
- -Qh Total
- Internal Input (#1-8) Totals
- Accumulation (#1-4) Totals
- External Digital Input Modules (1-4) Inputs (#1-8)
- I Squared T (A, B, C)
- V Squared T (A,B,C)

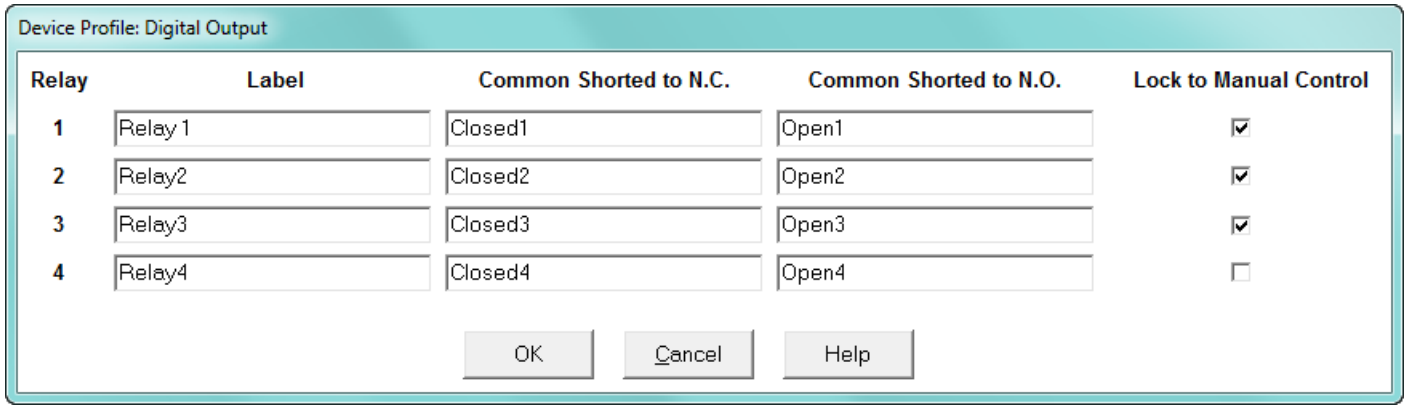
Figure 11-2: 20mAON4 Screen: 4 channel Analog Output module, 4-20 mA



Click in Output channels 1-4 to assign them to a parameter. The other Analog Output Modules - 20mAON8, 1mAON4, and 1mAON8 have similar setting screens, except for the number of channels you can program.

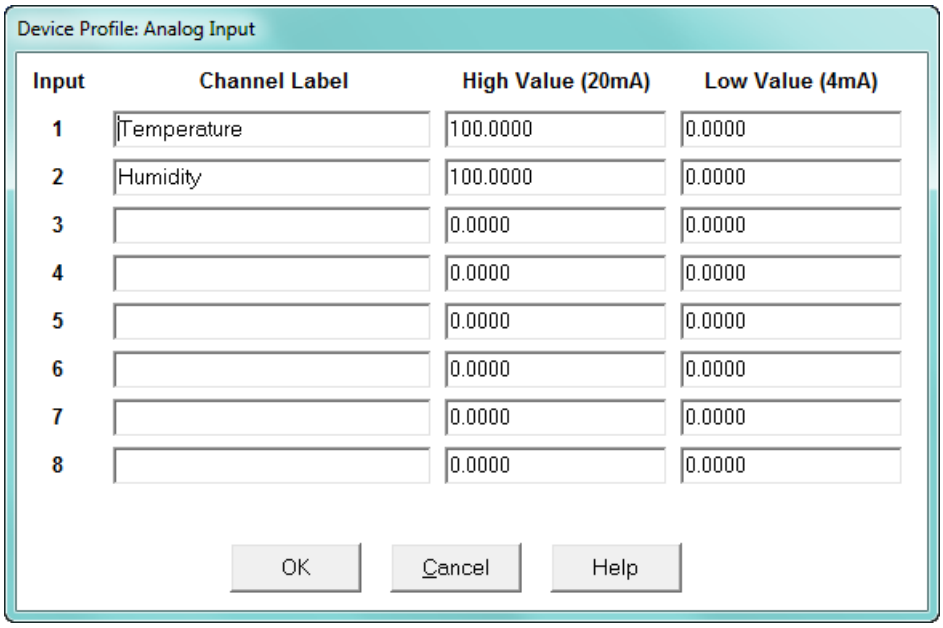
- The analog outputs are used to send a variable current dependent on the programmed reading. This screen lets you select the readings to output.

Figure 11-3: 4RO1 Screen- Relay Output module



Click in the Relay fields 1-4 to enter relay label, common shorted to N.C., common shorted to N.O., and check the box to lock the relay to manual control. When a relay is locked to manual control, it cannot be used in ElectroLogic Relay Control (see 11.3.2 "Electrologic™ Relay Control" for information on ElectroLogic Relay Control).

Figure 11-4: 8AI2- Analog Input Module, 4-20 mA



Click in Input Channels 1-8 to assign a label and a High and Low Value for each of the analog inputs.

- The two analog input module's settings are the same, except for the Inputs' high and low range.

- The High and Low Value fields let you map the inputs' high and low range to values that are appropriate for the parameters you are measuring. For example, in the screen above, the first input is measuring temperature. The high value for the input is set to 100, and the low value is set to 0. An input reading of 12mA will translate to 50 for the temperature.
  The Analog Input modules can be trended in the historical logs, and the data can be viewed and graphed in Log Viewer (see Chapter 19 "Viewing Logs" for details). The readings shown in the logs and graphs will use the setting range programmed in the screen above, i.e., the results will be reported as 0 through 100.

Figure 11-5: 8DI1 - Digital Status Input module

Device Profile: Digital Input Option Card in Slot 3

Input	Channel Label	Open Label	Closed Label	Normal State	Rollover
1	Input 1	Opened	Closed	Open	999999999
2	Input 2	Opened	Closed	Open	999999999
3	Input 3	Opened	Closed	Open	999999999
4	Input 4	Opened	Closed	Open	999999999
5	Input 5	Opened	Closed	Open	999999999
6	Input 6	Opened	Closed	Open	999999999
7	Input 7	Opened	Closed	Open	999999999
8	Input 8	Opened	Closed	Open	999999999
9	Input 9	Opened	Closed	Open	999999999
10	Input 10	Opened	Closed	Open	999999999
11	Input 11	Opened	Closed	Open	999999999
12	Input 12	Opened	Closed	Open	999999999
13	Input 13	Opened	Closed	Open	999999999
14	Input 14	Opened	Closed	Open	999999999
15	Input 15	Opened	Closed	Open	999999999
16	Input 16	Opened	Closed	Open	999999999

Initialize OK Cancel

Click in Channel Label's 1-8 to assign a Channel label, Open and Closed label, and Normal State (Open or Shorted) for each of the digital inputs.

NOTE

Log/Limit ID is a display only field. It shows the ID that GE Communicator software generates to identify this module in the Log Viewer and Limits functions.

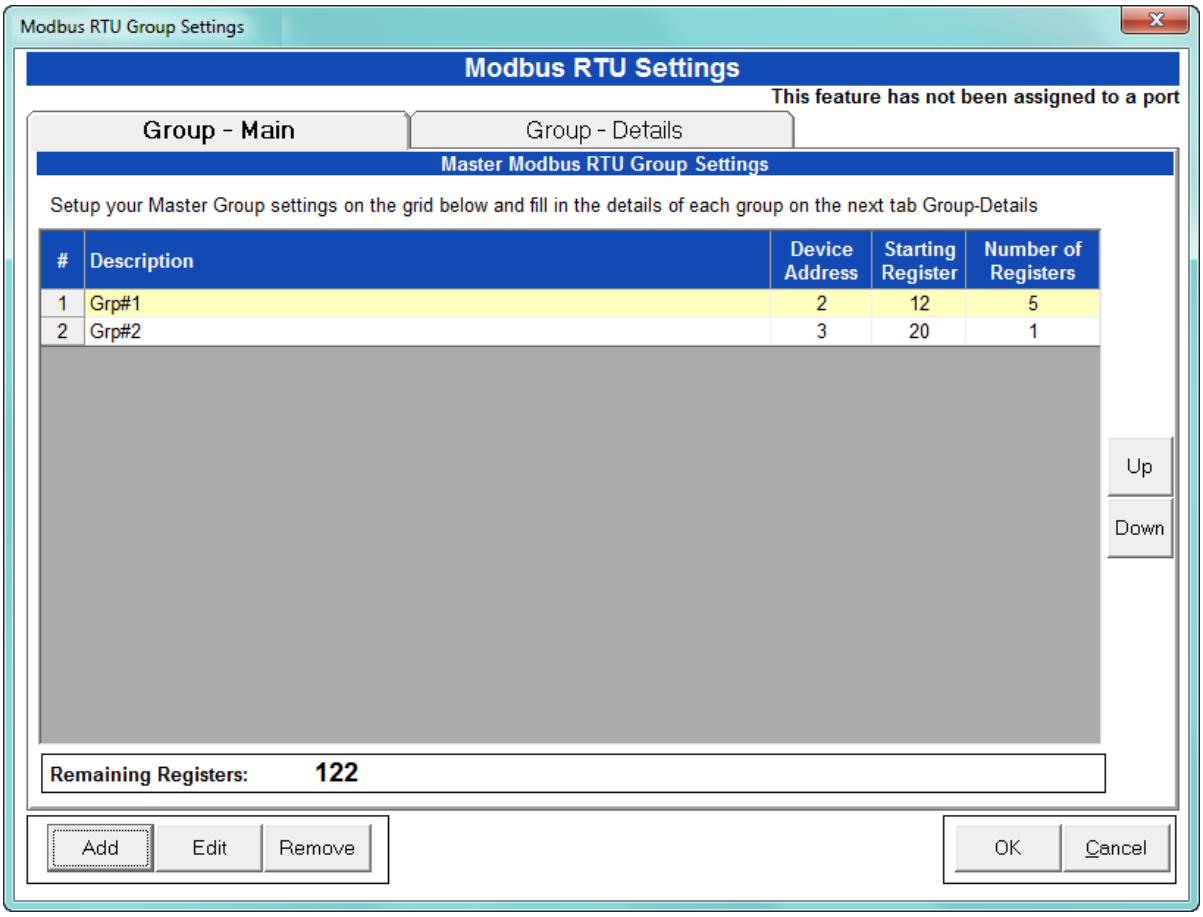
3. Click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

11.5.2 RTU Settings

The EPM 9900/9900P meter provides a feature that allows it to act as a simple Remote Terminal Unit (RTU). It can poll Modbus registers from downstream devices and bring that data into its memory for logging. This is very useful when trying to integrate data from existing, simpler, legacy Modbus devices. This section of the Device Profile enables you to configure RTU Master settings. This feature is used when you want to have the meter act as an RTU, polling data from other Modbus-based devices, such as lower end meters.

1. From the Device Profile screen, click on the **+** button next to the **External I/O Modules** line. You will see the menu option shown below.

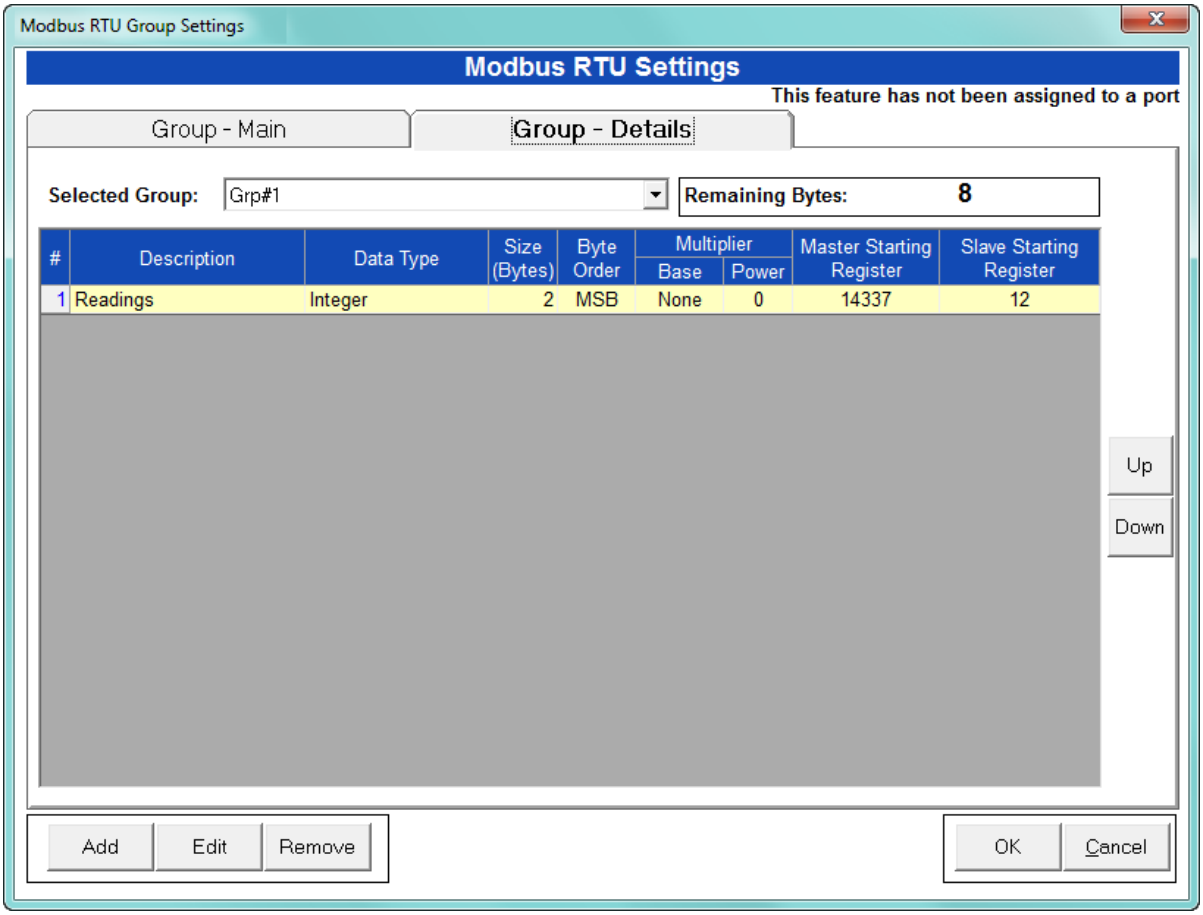
2. Double-click on **RTU Settings**. You will see the screen shown below.



Use this screen to configure the settings when Port 2 is set as an RTU Master (see 11.1.5 "Communications").

3. The first view you see is the Group Main tab (shown on the previous page). This screen lets you set up the RTU Master groups, i.e. the devices the EPM 9900/9900P meter is polling. You can enter up to 16 groups. You have the following options:
   - Click **Add** to add a Master group. Fill in the Description, Device Address, Starting Register, and Number of Registers; click **Save** to save your entries.
   - Click on a group and click **Edit** to change data for the group; click Save to save your changes.
   - Click on a group and click **Remove** to delete the group.
   - Click on a group and click **Up** or **Down** to change the position of the group.

4. Click the Group Details tab to set up the readings for the devices. See the example screen shown below.



You have the following options:

- Click Add to add a reading to the group. Fill in the Data Type, Size in Bytes, Byte Order, Multiplier Information, and Slave Starting Register (the Master Starting Register is read-only); click Save to save your entries.

  The readings in the group must have consecutive register numbers. If necessary you can break the readings into two or more groups.

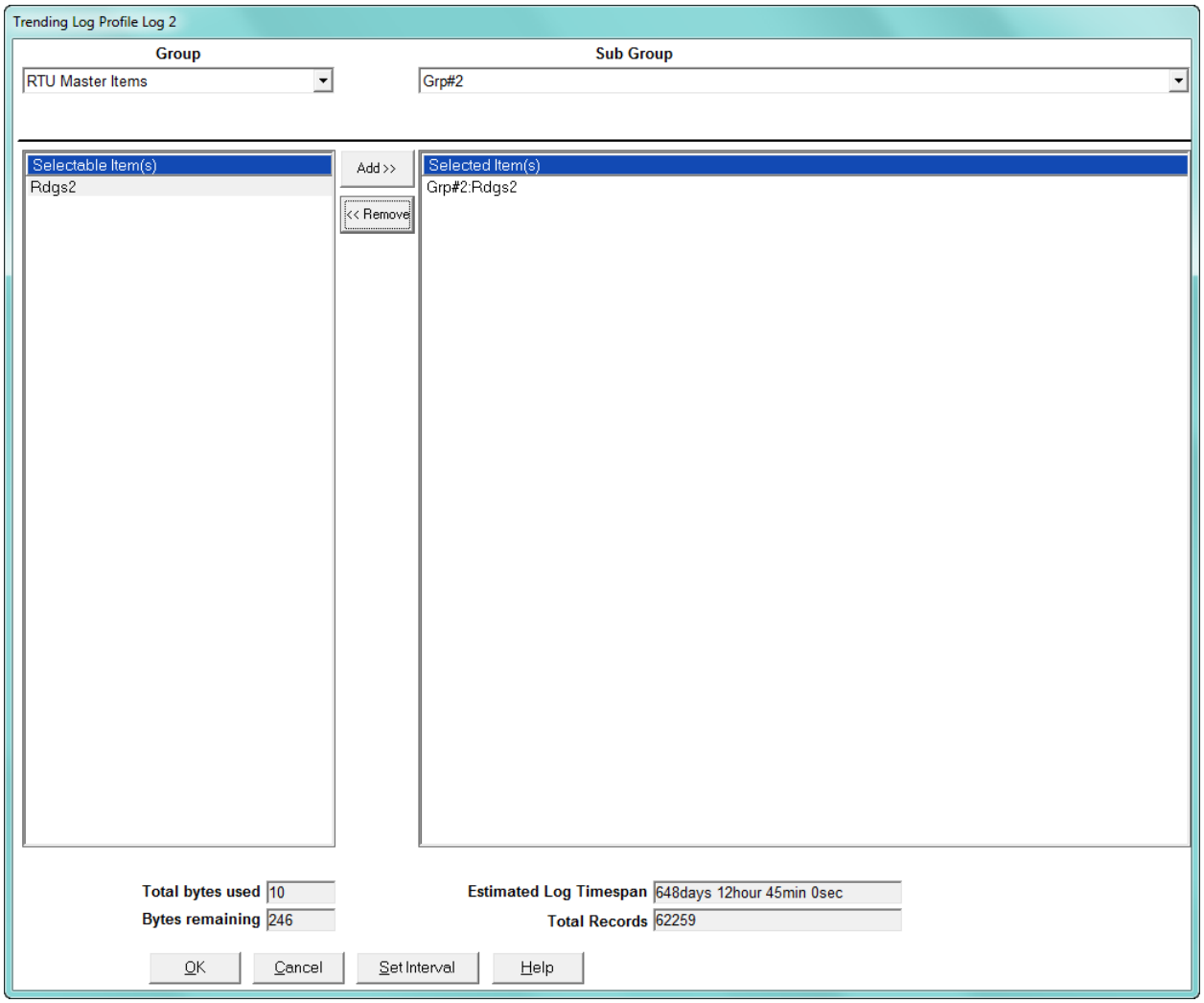
- Click on a reading and click Edit to change data for the reading; click Save to save your changes.
- Click on a reading and click Remove to delete the reading from the group.
- Click on the Selected Group pull-down menu to select and display details for another group.

5. Click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

For more details on I/O Modules, see Chapter 14 “External I/O Modules”.

You can then use the polled data in the following ways:

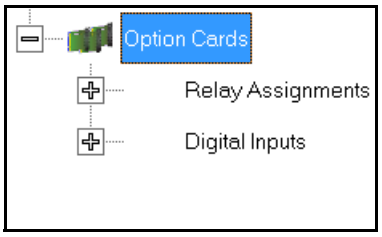
- Access the data using Modbus protocol: Modbus registers.
  You can see the EPM 9900/9900P meter's full Modbus map in the EPM 9900 or EPM 9900P Modbus User Manual.
- Log the data by selecting Master RTU Items for the group in the Trending Profiles screen: see the example screen, below.



11.6 Internally Mounted Option Cards (EPM 9900P Meter)

The EPM 9900P meter has two internal slots to mount expansion digital I/O. The options include 6 relay outputs and 16 digital inputs. In addition to the internal I/O, there are also a large variety of externally mounted I/O modules that can also be added (see 11.5 "External I/O Modules"). The last EPM 9900P meter's Device Profile settings let you program the Relay Output and Digital Input Option cards. You can install up to two of these internally mounted Option cards in a meter. Refer to the meter's Installation and Operation Manual for additional information on these and other EPM 9900P meter Option cards.

1. From the Device Profile screen, click on the + button next to the Option Cards line. You will see the menu option shown below.

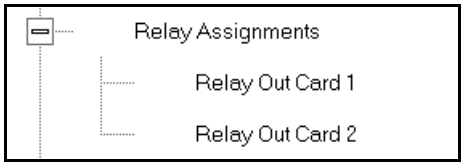


2. To set relay assignments for the Relay Output Option card, continue to 11.6.1 "Relay Assignments (Relay Output Option Card)"; to set digital inputs for the Digital Input Option card, go to 11.6.2 "Digital Inputs (Digital Inputs Option Card)".

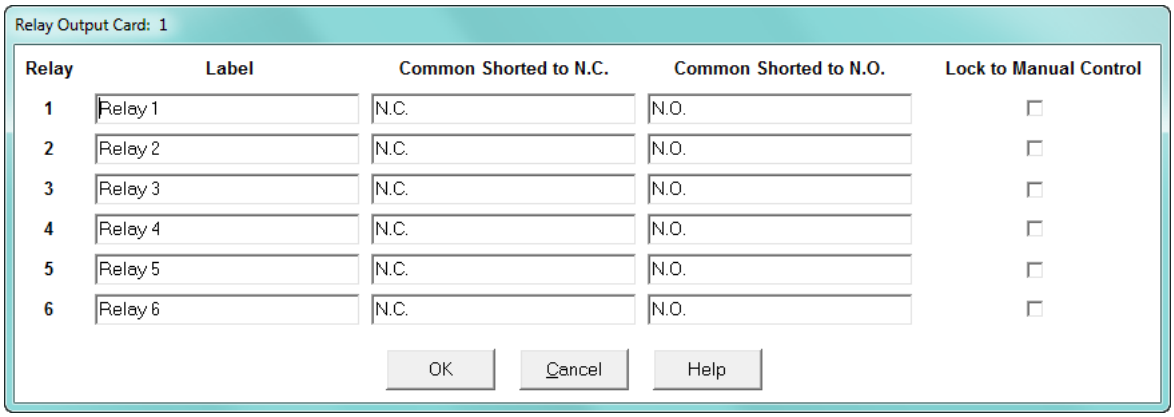
11.6.1 Relay Assignments (Relay Output Option Card)

This setting allows you to label relays and their states and to set manual control of relays.

1. From the Power Quality and Alarm Settings menu, click on the + button next to Relay Assignments or double-click on the Relay Assignments line. You will see the submenu shown below (the number of Relay Out cards you see depends on your meter's configuration).



2. Click the Relay card you want to configure. You will see the screen shown below.

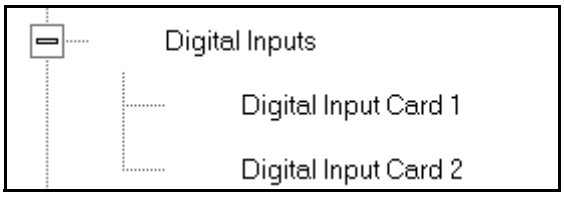


3. You can enter a label for the:
   - Relay, which can be used to describe what the relay is used for, attached to, its function, or its purpose
   - Common shorted to N.C condition, which can be used to describe the condition or state when the relay's common connection is shorted to the N.C. connection
   - Common shorted to N.O. condition, which can be used to describe the condition or state when the relay's common connection is shorted to the N.O. connection
4. If you want to set any of the relays so that they can only be controlled manually, click the Lock to Manual Control checkbox. Then use the Relay Control feature (see Tools menu information in 20.1 "Tools Menu" for instructions) to manually change the state of the relay.
5. When all settings are complete, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

11.6.2 Digital Inputs (Digital Inputs Option Card)

The Digital Inputs Option card can be used to either count pulses, for example, from a KYZ module or another meter, or to monitor the status of a circuit or equipment, e.g., breakers or transformers. Up to two cards can be entered into a meter. This setting allows you to configure the Digital Inputs Option card(s).

1. From the Power Quality and Alarm Settings menu, click on the + button next to Digital Inputs or double-click on the Digital Inputs line. You will see the submenu shown below (the number of Digital Input cards you see depends on your meter's configuration).



2. Click the Digital Input card you want to configure. You will see the screen shown below.

Device Profile: Digital Input Option Card in Slot 3

Input	Channel Label	Open Label	Closed Label	Normal State	Rollover
1	Input 1	Opened	Closed	Open	999999999
2	Input 2	Opened	Closed	Open	999999999
3	Input 3	Opened	Closed	Open	999999999
4	Input 4	Opened	Closed	Open	999999999
5	Input 5	Opened	Closed	Open	999999999
6	Input 6	Opened	Closed	Open	999999999
7	Input 7	Opened	Closed	Open	999999999
8	Input 8	Opened	Closed	Open	999999999
9	Input 9	Opened	Closed	Open	999999999
10	Input 10	Opened	Closed	Open	999999999
11	Input 11	Opened	Closed	Open	999999999
12	Input 12	Opened	Closed	Open	999999999
13	Input 13	Opened	Closed	Open	999999999
14	Input 14	Opened	Closed	Open	999999999
15	Input 15	Opened	Closed	Open	999999999
16	Input 16	Opened	Closed	Open	999999999

Initialize OK Cancel

3. For each of the 16 inputs, you can enter a label for the:
   - Channel, which can be used to describe its function or its purpose
   - Open condition
   - Closed condition
4. For each of the inputs, select the Normal state from the pull-down menu.
5. The rollover value tells when each of the state counters will roll over. Enter a number between one and 4294967295.

NOTE

You can click Initialize to have the software automatically set up the card's settings to the values shown in the screen above.

6. When all settings are complete, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

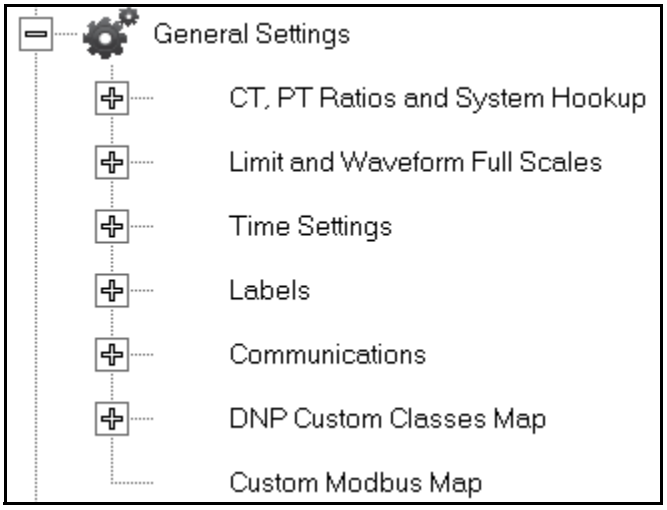
GE Communicator

Chapter 12: EPM 9800 Meter

This chapter explains how to configure an EPM 9800 meter's programmable settings, which are stored in the unit's Device Profile. Chapter 7 “Device Profile” contains detailed information on the Device Profile.

12.1 Device Profile General Settings

1. From the Device Profile screen, double-click on the **General Settings** line or click on the **+** button next to it. All of the settings in the General Settings group are listed.



2. Click the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the General Settings menu.

12.1.1 CT and PT Ratios and System Hookup

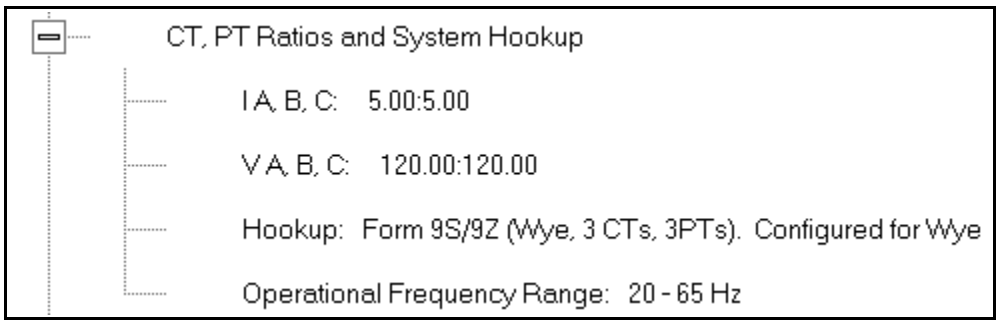
Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

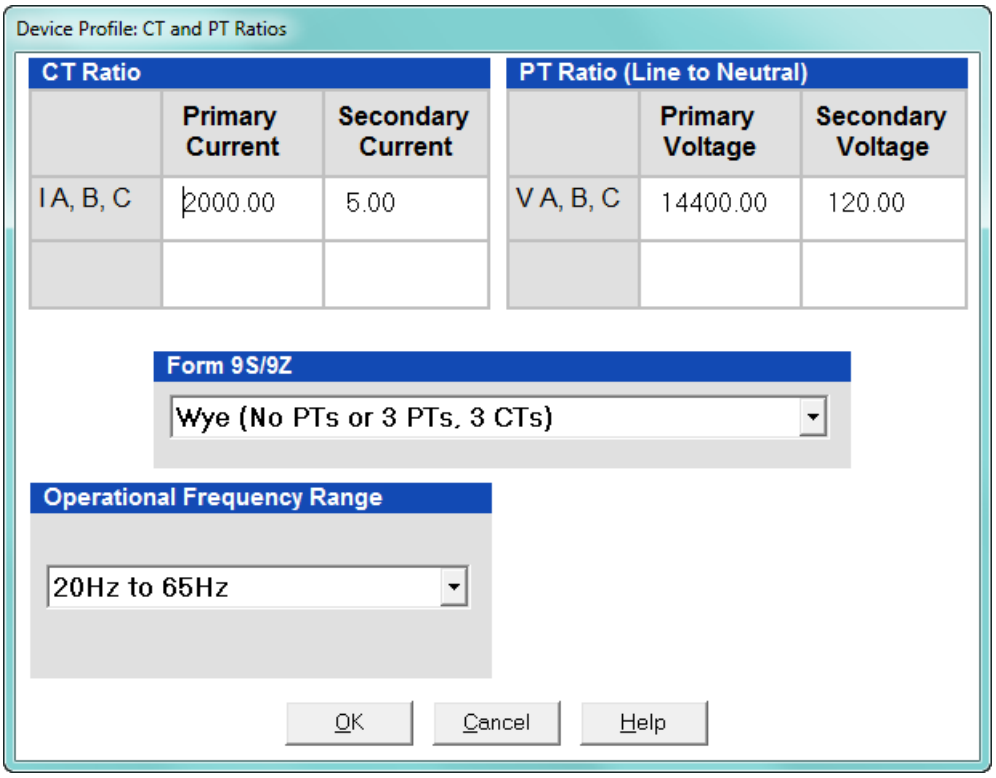
The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

1. From the **General Settings** menu, click the **+** button next to **CT, PT Ratios and System Hookup**. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for CT, PT ratios, connection type, and Operational Frequency range.

2. Double-click on any of the settings. You will see the CT and PT Ratios screen.



3. Make changes to this screen according to your application requirements.

When you change a PT or CT Ratio, GE Communicator software updates the corresponding Full Scale value entered in the Limit and Waveform Full Scales setting. When you click **OK** on this screen, GE Communicator software opens the Limit & Waveform Full Scales screen so that you can verify the settings (see "Limit and Waveform Full Scales" on page 12-4).

- Enter Primary and Secondary Current and Voltage.
- Using the pull-down menu, choose the Hookup mode that matches the connection you have to the EPM 9800 meter. Choose from the following:
    - Wye
    - Delta 3 CTs
    - Delta 2 CTs
    - 2.5 Element Wye
    - 4 Wire Delta
      This value must be set properly for the meter to calculate readings correctly.
      See the *EPM 9800 Instruction Manual* for connection diagrams.
- Using the pull-down menu, select Operational Frequency Range:
    - 20Hz to 65Hz
    - 350Hz to 500Hz
    - 20Hz to 500Hz

4. Click **OK**. If changes have been made, a message window opens asking you to verify that the Limit Full Scales are correct.
5. Click **OK**. The Limit and Waveform Full Scales screen opens (see "Limit and Waveform Full Scales" on page 12-4).
6. To implement any changes, click the **Update Device** button to send the new profile to the meter.

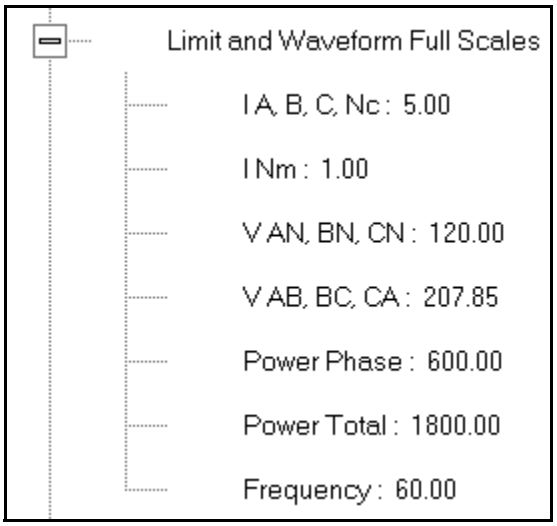
   You will see a warning message that logs will be reset, and you will be given the opportunity to retrieve the logs before they are cleared. Resetting the logs prepares the meter for placement in a new installation or change of the meter Transformers.

12.1.2 Limit and Waveform Full Scales

All Limit and Waveform settings (see "Limits" on page 12-50 and "PQ Thresholds (Waveform Recording)" on page 12-61) are based on a percentage of the Full Scale. Full Scales are based on the CT and PT ratios (see "CT and PT Ratios and System Hookup" on page 12-2). The % of Full Scale is defaulted based on the CT and PT ratio. If the user wants, the Full Scales can be adjusted to the actual power system condition, to optimize the triggering conditions.

Set the CT and PT ratios first; GE Communicator software automatically recalculates the Full Scales every time the CT and PT ratios change and presents them for your verification.

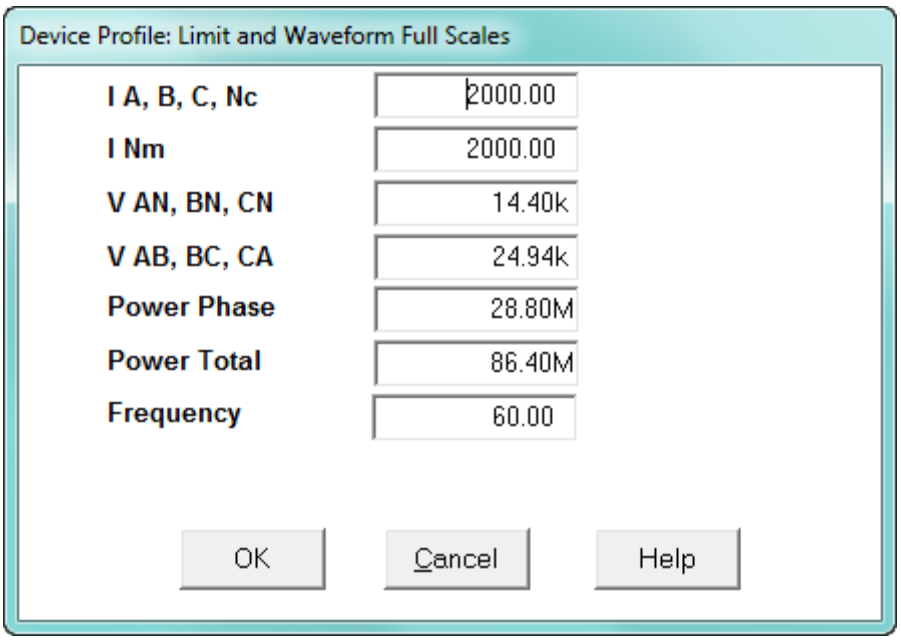
1. From the **General Settings** menu, click on the **+** button beside **Limit and Waveform Full Scales** or double-click on the **Limit and Waveform Full Scales** line. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for the Limit and Waveform Full Scales. The values shown here are the default meter settings.

Frequency and Voltage values are nominal values. The Power Phase is computed using nominal Voltage and rated maximum current. In most cases the software automatically computes the proper value - you will not need to change it.

2. Double-click any of the settings. You will see the Limit and Waveform Full Scales screen.



3. Enter the Full Scale for each parameter.

NOTE

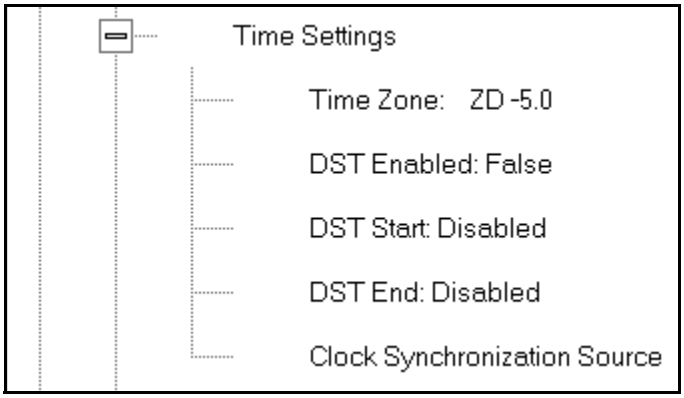
- The Limits and Waveform settings (Sections 12.1.1 *CT and PT Ratios and System Hookup* and 12.3.5 *I Squared T and V Squared T Thresholds*, respectively) are based on a percentage of the Full Scales entered here.
- GE Communicator software automatically recalculates the Full Scale Voltages, currents and power every time the CT and PT ratios change. However, frequency is not changed, even if the operational frequency range is changed. **Frequency can only be changed on this screen**.
- Power Phase is the amount of power per each phase; Power Total is the power of all phases combined.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

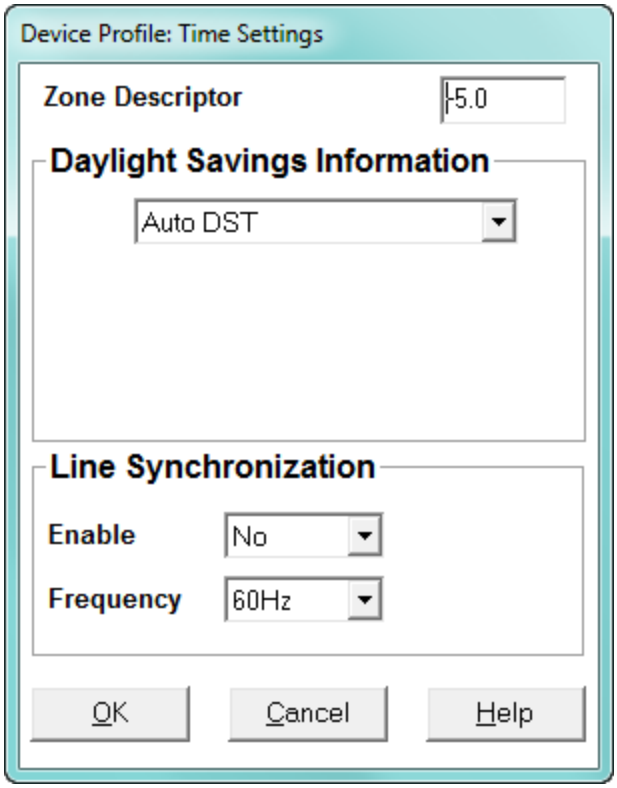
12.1.3 Time Settings

To edit a Device Profile's Time settings:

1. From the **General Settings** menu, double-click on the **Time Settings** line. You will see the submenu shown below. DST stands for Daylight Savings Time.



2. Double-click on any of the programmable settings; you will see the Time Settings screen.



3. Make changes to this screen according to your application requirements.
   - Zone Descriptor: A Zone Descriptor sets the time zone for the meter. 0 = Greenwich Mean Time. Consult the chart below to find the Zone Descriptor for your time zone.

GMT Greenwich Mean Time Table (Dublin, London)	
-1.00 Azores	+1.00 Brussels, Paris, Warsaw
-2.00 Mid-Atlantic	+2.00 Athens, Cairo, Helsinki

GMT Greenwich Mean Time Table (Dublin, London)	
-3.00 Buenos Aires, Georgetown	+3.00 Baghdad, Kuwait, Moscow, Tehran
-4.00 Atlantic Time (Canada), Santiago	+4.00 Kabul, Baku
-5.00 Eastern Time (USA and Canada), Lima	+5.00 Karachi
-6.00 Central Time (USA and Canada), Mexico City	+6.00 Dhaka
-7.00 Mountain Time (USA and Canada)	+7.00 Bangkok, Hanoi, Jakarta
-8.00 Pacific Time (USA and Canada), Tijuana	+8.00 Beijing, Hong Kong, Singapore
-9.00 Alaska	+9.00 Osaka, Sapporo, Seoul
-10.00 Hawaii	+10.00 Brisbane, Melbourne, Guam, Hobart
-11.00 Midway Island	+11.00 Magadan, Solomon Islands
-12.00 Eniwetok	+12.00 Auckland, Fiji

- Daylight Savings Information:
  - Disabled: Disables an automatic adjustment for Daylight Savings Time.
  - Auto DST: Sets Daylight Savings Time automatically to the pre-2007 standard for the United States: the time changes automatically occur at 2:00 AM (your local time), on the first Sunday in April and the last Sunday in October.
  - Auto DST U.S. EPA 2005: Sets Daylight Savings Time automatically to the 2007 standard for the United States: the time changes automatically occur at 2:00 AM (your local time), on the second Sunday in March and the first Sunday in November.
  - User Defined: Allows you to set the Daylight Savings Time start and end times manually. Fields open that let you set the beginning and ending dates for Daylight Savings Time.
- Line Synchronization: set Enable or Disable and Frequency.
  - Line synchronization uses the frequency zero crossings to provide a time reference for the meter. The basic function of Line Frequency Clock Synchronization is to adjust the real time clock to track the time based on the power line frequency. For this purpose, Phase A voltage only is used.
  - This is the most common method to synchronize a meter's clock. GE recommends that you always select this method unless there is a specific reason not to select it. If the meter is not synchronized to line frequency or IRIG-B, it will default to internal crystal. Different meters differ in terms of drift, but typically meters with 20 ppm crystals will drift 30 seconds per month when set to internal crystal.
  - Line Sync is disabled if an IRIG-B signal is and the unit synchronizes to the IRIG-B signal and doesn't rely on the internal signal unless the IRIG-B signal is lost.
  - **How Time is Adjusted**
    After the clock is synced to the line, the meter periodically checks the cumulative difference between the real time clock in seconds and the

line cycle count. If the absolute difference between the two accumulations is more than 1 second or 60 (50) cycles, the clock is adjusted + / - 1 second accordingly.

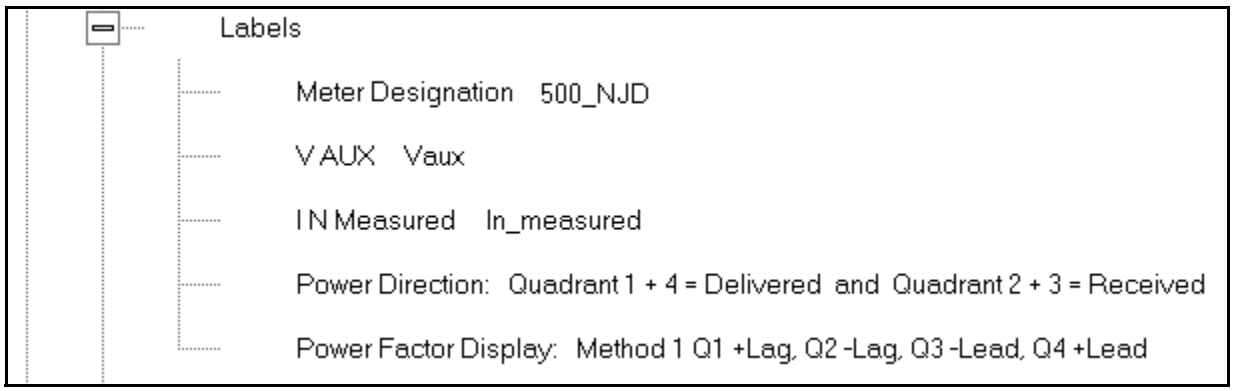
4. To set the meter's on-board clock, use Set Device Time from the Tools Menu (see "Tools Menu" on page 20-1).
5. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.1.4 Labels

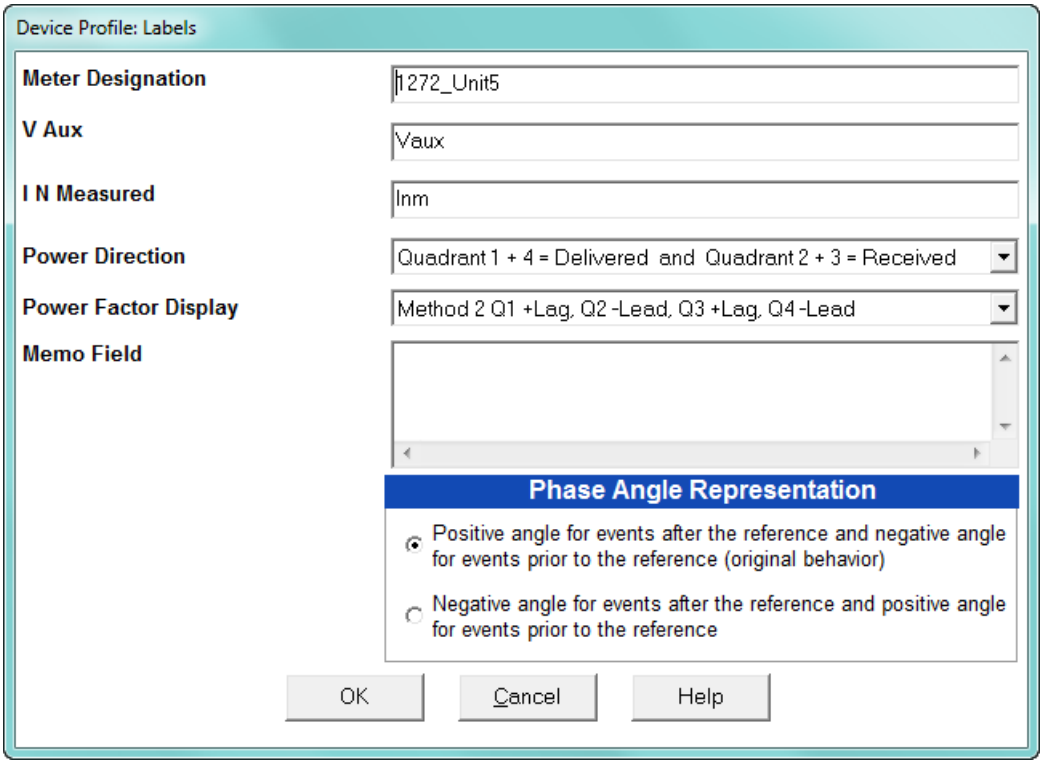
Labels are user-defined names for the EPM 9800 meter and the I N Measured terminal. You also use the Labels screen to select the power direction, and the power factor display.

It is important to label the meter (under "Meter Designation") with a unique name because that label becomes the file name of any logs retrieved from that meter. Duplicate meter designations interfere with retrieved log databases. See Chapter 19 "Viewing Logs" for more details on logs.

1. From the **General Settings** menu, double-click on the **Labels** line. You will see the submenu shown below.



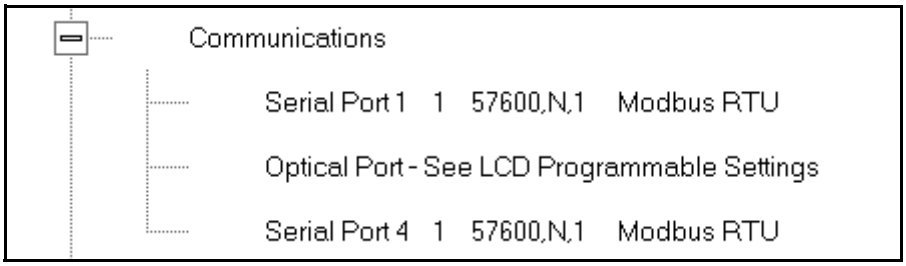
2. Double-click on any of the parameters; you will see the Labels screen.

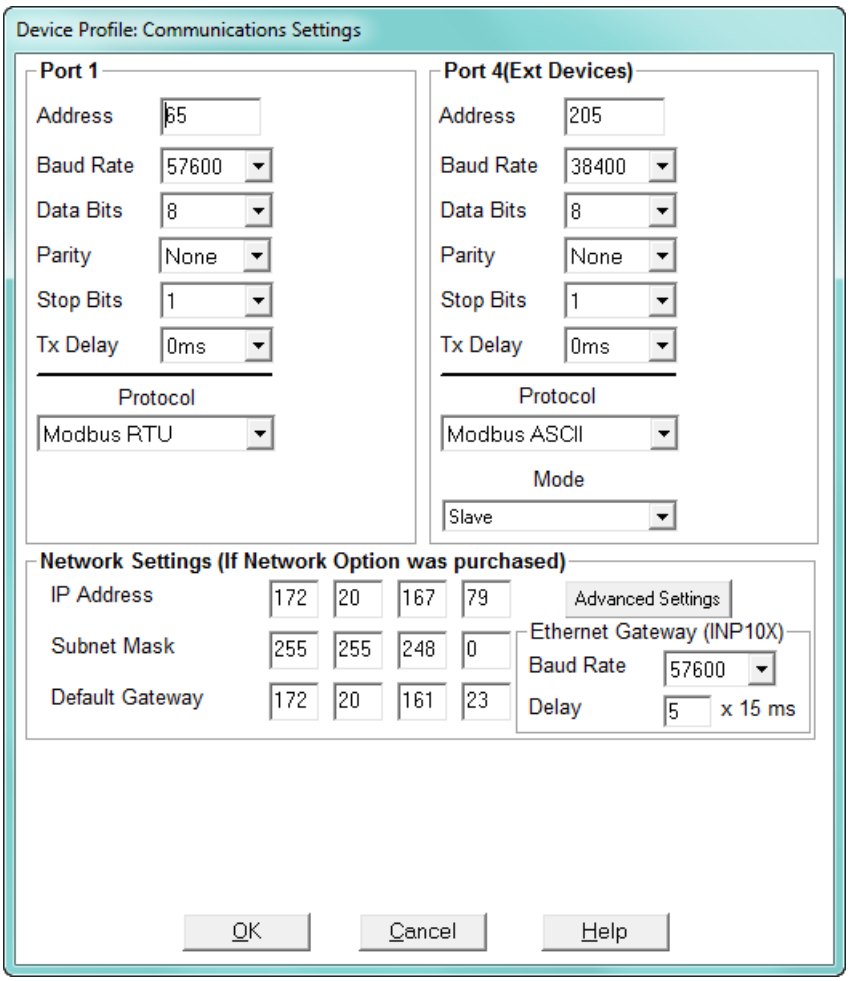


3. Enter labels in the appropriate fields.
   - Meter Designation must be set for partial log retrieval. You can use any character allowed by the Windows® operating system.
     - In English versions the following characters don't work: \ / : * ? " < > |
     - For meters used internationally by multilingual users, we recommend you use only alphanumeric characters allowed by your operating system.
   - Your selection in Power Direction determines which quadrants of Watt-hours are considered Received and Delivered.
   - Your selection in Power Factor Display determines the display of Quadrants in the Power Factor screen.
   - The Memo field is used to enter notes about the meter, such as the location, or other relevant details.
   - The Phase Angle representation determines how the voltage phase angles are represented. 90 of users will use the default, which is the first radio button: "Positive angle for events after the reference and negative angle for events prior to the reference'; however, you can choose the opposite display by selecting the second radio button, if you wish.
4. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.1.5 Communications

1. From the **General Settings** menu, double-click on the **Communications** line. You will see the submenu shown below.





NOTE

You may use the onboard display or one of the EPM External Displays to learn the current baud rate, address and communication protocol of each meter port. *See the EPM 9800 Instruction Manual* for details.

2. Make changes to this screen according to your application requirements by clicking on the box or pull-down menu of any of the following settings:

- Address: assign an address to each port to communicate with other devices. Multiple EPM meters on an RS485 bus must each have a unique address set for the port that is connected to the bus.
- Baud Rate: from the pull-down menu, select 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. The baud rate entered in this field must match the baud rate of the device connected to the EPM 9800 meter at this port. Use 9600 for modem connections.
- Data Bits: use the pull-down menu to select from: 5, 6, 7 or 8. For Modbus RTU and ASCII, leave the data bits at 8.
- Parity: use the pull-down menu to select from: None, Even, Odd, Mark or Space. For Modbus RTU and ASCII, leave the parity at None.
- Stop Bits: use the pull-down menu to select from: 1, 1.5 or 2. For Modbus RTU and ASCII, leave the stop bits at 1.
- TxDelay (Transmit Delay): use the pull-down menu to select from: 0ms, 10ms, 20ms, 30ms, 40ms, 50ms, 60ms, or 70ms. Leave the Tx delay at 0ms unless you are using equipment that requires a delay in the response time, such as a radio modem.
- Protocol: use the pull-down menu to select from Modbus RTU and Modbus ASCII. Direct connections made through GE Communicator must use either Modbus RTU or Modbus ASCII protocol (we recommend Modbus RTU). Modem connections made through GE Communicator must use Modbus ASCII only. See Chapter 3 “Connecting to a GE Meter” for details.
- Mode (Port 4 only): If you are using Output modules, set this port to Master (I/O modules) mode. Set the port to operate at 57600 baud.
- Internal Network Option: If your meter has the Internal Network Option (Communications Option W), see your Network Administrator for the correct settings to enter into the Network Settings fields. Settings will vary from network to network.
- If your meter has Communications Option W or C (10/100BaseT and Combo Card), you will see the **Advanced Settings** button: click it to open a screen that lets you set Network card features; see Chapter 21 “Total Web Solutions” for details.
- Internal Modem Settings: If your meter has this option:
    - Set the number of Rings to Answer from the pull-down menu.
    - Set the Baud Rate to 57600, or to match your system's baud rate.
    - Click **Dial-Out Profile** to access the Modem Programming screen: see Chapter 24 “Configuring Dial-In/Dial-Out” for instructions on using the Modem Dial In/Dial Out Function.

3. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button. This sends the new profile to the meter.

NOTE

IMPORTANT!

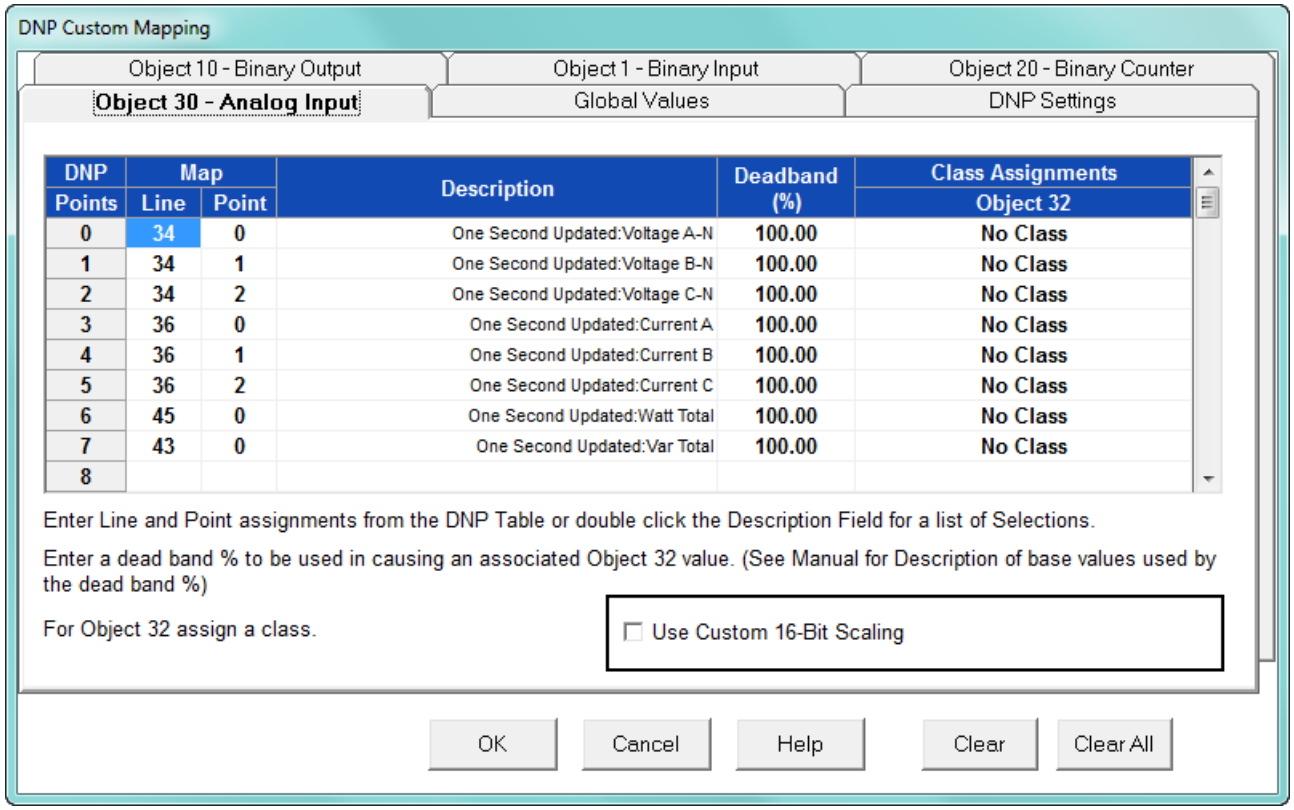
- In order to prevent communications problems, be careful when making changes in the Communications Settings screen. For example, if you change the baud rate of the port connected to a computer, be sure to make the same change to the computer port's

baud rate. If you change a port's address, be sure to update the address settings of any device that communicates with the port.

- The baud rate of the port used by the EPM 9800 External Display should always be set to 9600 and the address set to 1.

12.1.6 DNP Custom Class Map

The DNP Custom Class Map lets you set up DNP communication for the meter. From the **General Settings** menu, double-click on the **DNP Custom Classes Map** line and on the **DNP Level 2** line. You will see the screen shown below.



DNP Points	Map Line	Map Point	Description	Deadband (%)	Class Assignments Object 32
0	34	0	One Second Updated:Voltage A-N	100.00	No Class
1	34	1	One Second Updated:Voltage B-N	100.00	No Class
2	34	2	One Second Updated:Voltage C-N	100.00	No Class
3	36	0	One Second Updated:Current A	100.00	No Class
4	36	1	One Second Updated:Current B	100.00	No Class
5	36	2	One Second Updated:Current C	100.00	No Class
6	45	0	One Second Updated:Watt Total	100.00	No Class
7	43	0	One Second Updated:Var Total	100.00	No Class
8					

For details on programming the DNP settings, see Chapter 22 “DNP 3.0 Configuration”.

12.1.7 Custom Modbus Map

The custom Modbus map for the EPM 9800 meter can position up to 256 Registers (or the equivalent of 2K, whichever is lower) to readily provide the functionality you want from your meter. In addition, you can customize selected values for format type, Scaling, byte order, data size, etc. This allows a user to optimize Modbus registers by putting them in a particular order and/or format to make the SCADA poll more quickly and efficiently.

1. From the **General Settings** menu, double-click on the **Custom Modbus Map** line. You will see the screen shown below.

Custom Modbus Map

Item	Modbus Map Line	Modbus Map Point	Number of Registers	Start Register	Group	Channel	Format	Data Size	Unit	Primary / Secondary	Absolute Value	Byte Order	Display/ Modulo/Offset
1	18	0	2	412289	Tenth Second Phase to Neutral Volts	Volts AN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
2	18	1	2	412291	Tenth Second Phase to Neutral Volts	Volts BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
3	18	2	2	412293	Tenth Second Phase to Neutral Volts	Volts CN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
4	54	0	2	412295	Thermal Avg Measured N Current	I Nm	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
5	55	0	2	412297	Thermal Avg Calculated N Current	I Nc	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
6	537	0	2	412299	Scaled +/- Wh, Q 1 - 4 VAh and VARh	Quad(1+4) Watt Hour	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	
7	411	0	2	412301	Analog Input 1 - 8, Module 1	Input # 1	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
8	584	0	2	412303	Int Scaled +/- Wh, Q 1 - 4 VAh and VARI	Quad(1+4) Watt Hour	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
9	134	1	2	412305	Harmonics Volts A Mag # 0-7	#1	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
10	134	2	2	412307	Harmonics Volts A Mag # 0-7	#2	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
11	233	0	1	412309	Internal Inputs States	Inputs 1-8	Normal	2				MSB, MSb	
12	212	0	2	412310	Phase Angle Volts(AB,BC,CA)	Volts AB	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
13	212	1	2	412312	Phase Angle Volts(AB,BC,CA)	Volts BC	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
14	212	2	2	412314	Phase Angle Volts(AB,BC,CA)	Volts CA	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
15	455	0	2	412316	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V AN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
16	455	1	2	412318	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
17	455	2	2	412320	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V CN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
18	464	1	2	412322	Long Term Flicker V AN,BN,CN	Long Term Flicker V BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A

OK Clear all Clear Cancel Help Registers 35 of 2048

Data entry is straightforward. Each entry field is described below. Note that not all selections appear on the screen at the same time. Use the scroll buttons to view additional data/entry fields on the screen. Certain entries (such as Format, Data Size, etc.) have different allowable selections depending on the data point used. The pull-down menu adjusts to provide the appropriate selections for each data point.

- Data Point Selection: there are two different ways to select a data point:
    - Refer to the EPM 9800 meter's Modbus map and find the associated line and point for the value you want. When you enter those values into the screen table, the software displays the associated group and channel.
    - Double-click the **Group** field. From the pull-down menus, select a group and its associated channel value. The software displays the map and line values.
- Number of Registers: this field is display only. The software computes the number in this field based on the data size selected in the Data Size column.
- Start Register: this field is display only. The software assigns and adjusts Start register numbers to take into account previous entries and data sizes. The Start register is the number of the first register used in polling. The Start registers are shown as 4x to describe them as holding registers, for SCADA applications.
- Format: from the pull-down menu, select a format type for a value, such as Signed Integer, Unsigned Integer, and 4 Byte IEEE Float.
- Data Size: from the pull-down menu, select the number of bytes you want to represent the data point: 2 or 4.
- Unit: if the polled value is viewed as an integer, the Unit field tells the software where to place the decimal point.

  Examples
    - If you select .01, a polling value 1234 is interpreted as 12.34.
    - If you select 100, a polling value 1234 is interpreted as 123400.
- Primary/Secondary: the meter normally computes values in secondary units. Where applicable, you may select primary or secondary. If Primary is selected, the value is multiplied by the appropriate CT and/or PT values.
- Absolute Value: where appropriate, you may have the option of having the data point computed as a signed or absolute value. Select either:

- No: to have the data point computed as a signed value.
- Yes: to have the data point computed as an absolute value.

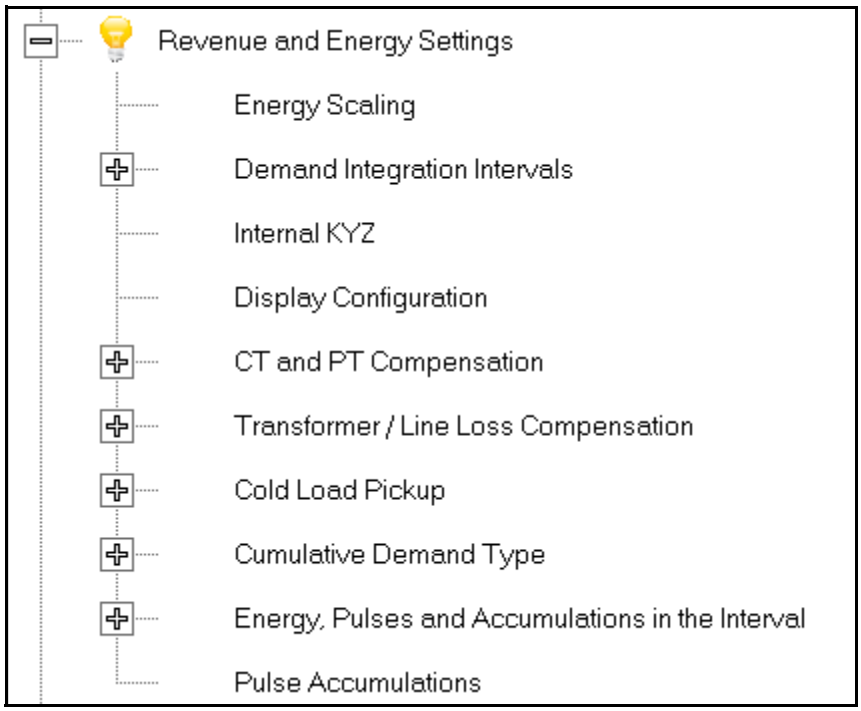
- Byte Order: for most of the data points, you can select the polling order of the registers/bytes to match what the SCADA system needs. The choices are: MSR, MSB (most significant register, most significant byte); MSR, LSB (most significant register, least significant byte); LSR, MSB (least significant register, most significant byte); and LSR, LSB (least significant register, least significant byte). EPM meters store data as MSR, MSB, whereas most SCADA systems use LSR, LSB. You can either select an alternate order here, for example, LSR, LSB, or you can leave the data as is and then have your SCADA system change the order after the data is polled.
- Display/Modulo/Offset: depending on the data point, select one or more additional options with appropriate sub-selections.
    - Display: This setting supplies a modifier for phase angles and power factor that translates the value into something usable by the SCADA system.
      Example: For Volts AN phase angle values, you can represent the value as 0 to 360 degrees or -180 to +180 degrees, etc. Selections appear in a pull-down menu for the associated point.You may want to select -180 to +180 degrees if you ant to know if a phase angle is positive or negative in relation to the reference.
    - Modulo: Certain values are cumulative and can roll over and start recounting from zero. For those values, where required, you can enter a point at which the rollover will occur.
    - Offset: Where allowed, you can enter a value (offset) that will be added to the data point when it is computed.

2. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.2 Revenue and Energy Settings

Revenue and Energy Settings are the second group of settings in the Device Profile.

1. From the Device Profile screen, click on the **+** button next to **Revenue and Energy Settings** or double-click on the **Revenue and Energy Settings** line. All of the settings in the Revenue and Energy Settings group are listed.

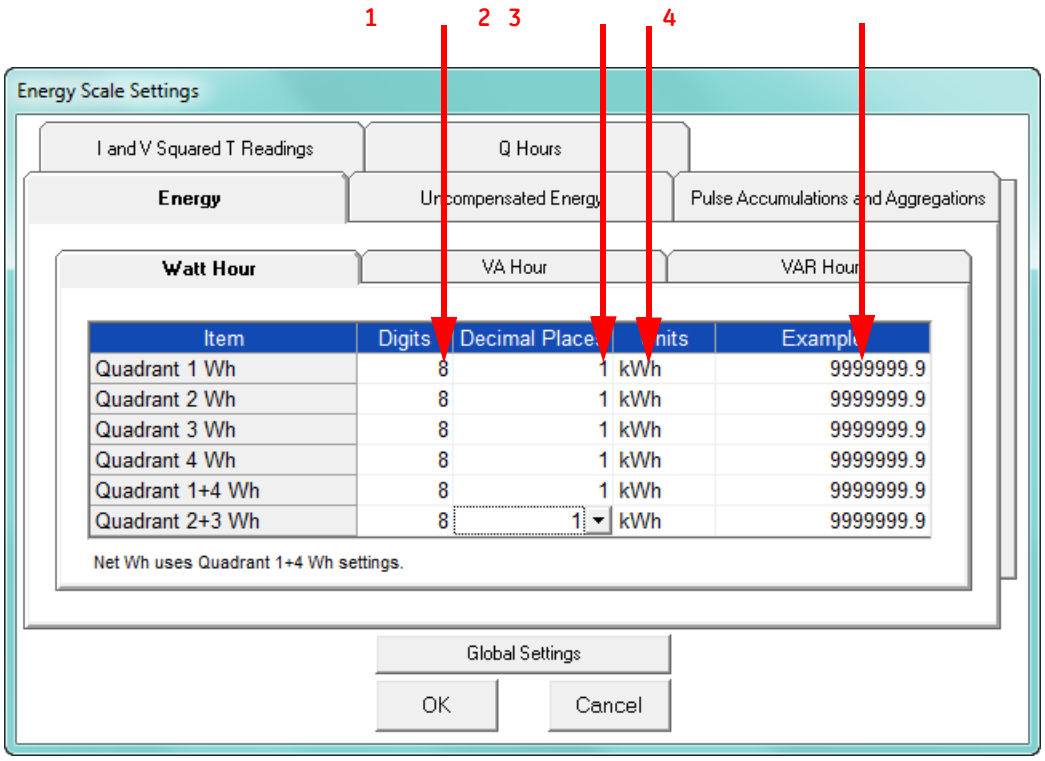


2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the Revenue and Energy Settings menu.

12.2.1 Energy Scaling

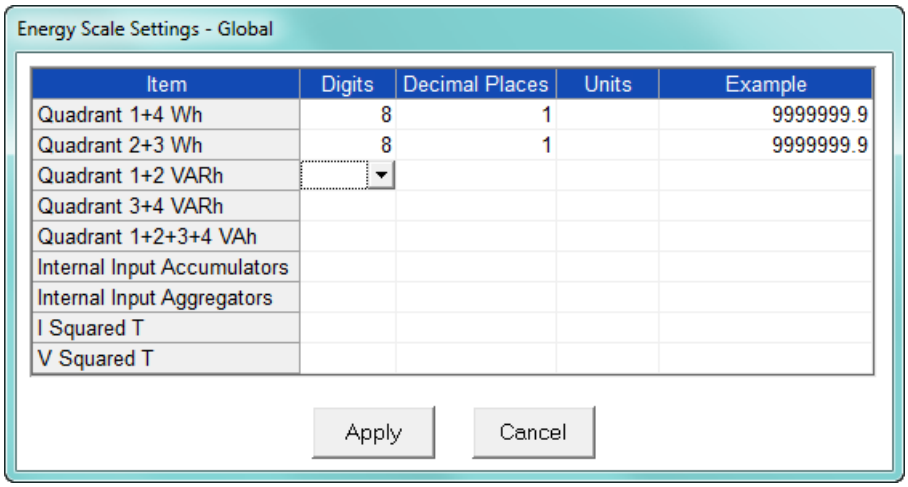
1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Energy Scaling or double-click on the **Energy Scaling** line. You will see the Energy Scale Settings screen.

To configure scaling for a reading, enter:
1. Number of Digits, 2. Number of Decimal Places,
3.Unit of Measurement; 4. Example of the resultant scaling is shown here



- This screen has multiple tabs that allow you to access all of the Energy Scaling options. Using the Energy Scale Settings screens you can select the number of digits, decimal point placement and Energy unit for displayed readings.
- The Example field shows you the scaling choices you made applied to an example reading.
- You click on the tabs to navigate between screens, except for Global settings - you click on the **Global Settings** button to access that screen.

Global Settings



NOTE

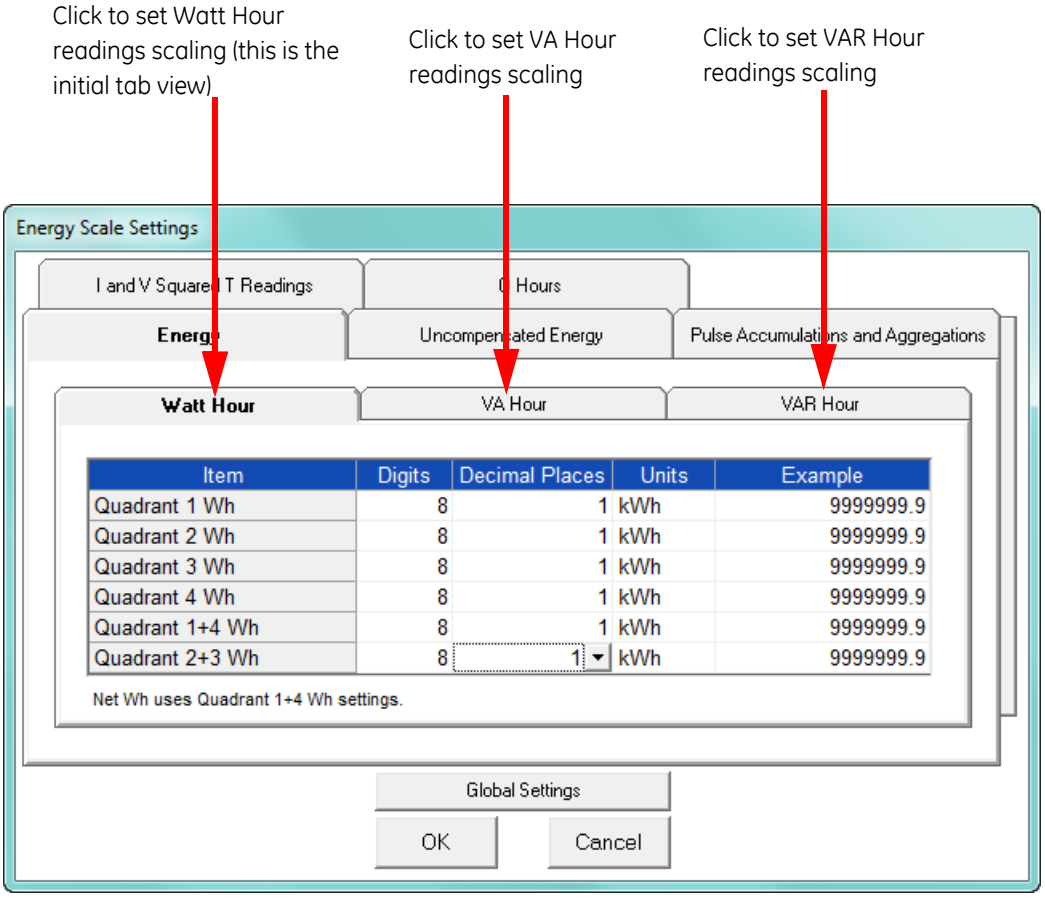
Because there are many energy settings, Global Settings conveniently allows you to set these similar energy reading settings all at once.

2. Click the **Global Settings** button to see the screen shown above. This screen lets you set the scale for all of the Energy Readings.
   - Click in the **Digits** field and select the number of digits for the value from the pull-down menu. You can choose between 2 and 9 digits.
   - Click in the **Decimal Places** field and select the number of decimal places for the value from the pull-down menu. You can choose between 0 and 7 decimal places, depending on the number of digits you selected. For example, if you chose 3 digits, you can only choose up to 2 decimal places.
   - Click in the **Units** field to select the unit of measurement for the value. You can select k or M.

     The example field changes as you make selections, to show you how the value would appear with the settings you made.
3. When all changes are entered, click **Apply** to return to the main Energy Scale Settings screen. You can now use the tabs to modify the scale for specific readings. For example, you might have set the scale for the Internal Input Accumulators as 5 digits, 2 decimal places, and M unit, but you may want one of the accumulators to have a different scale. You would click the **Pulse Accumulations and Aggregations** tab and change the scale for that accumulator. The following sections show the tab screens where you can make individual scaling changes. You set the Digits, Decimals, and Units fields in the same way as in the Global Settings screen.

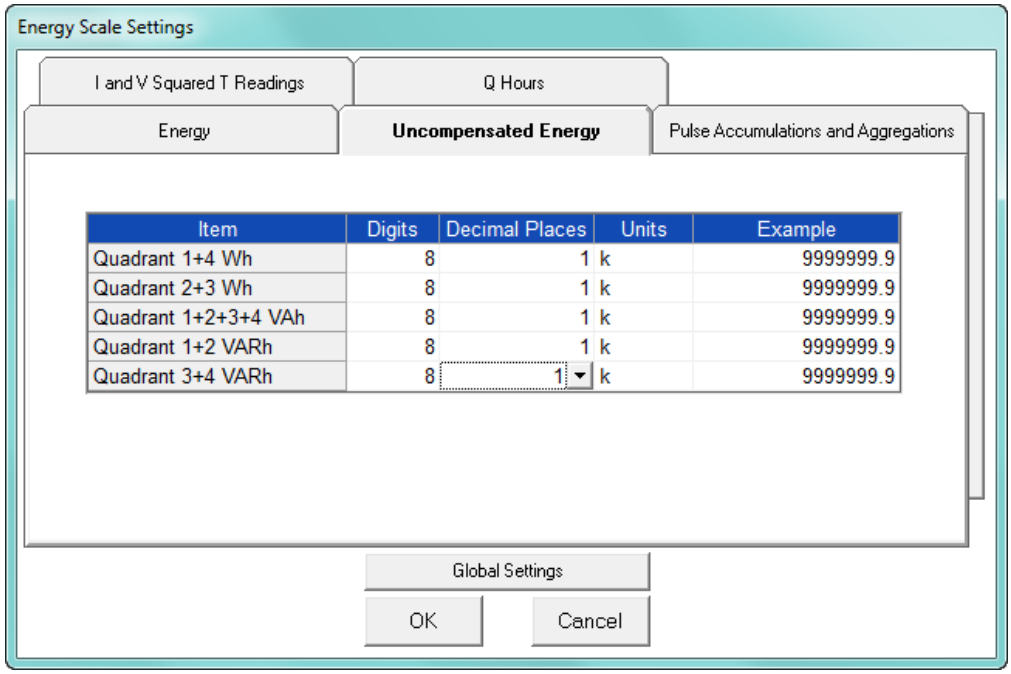
Energy Tab

This is the initial screen view. Click on the **Watt Hour, VA Hour, and VAR Hour** tabs to configure scaling for those readings.



Uncompensated Energy Tab

Click on the **Uncompensated Energy** tab to configure specific VA, Watt and VAR readings not adjusted by Transformer Loss Compensation.



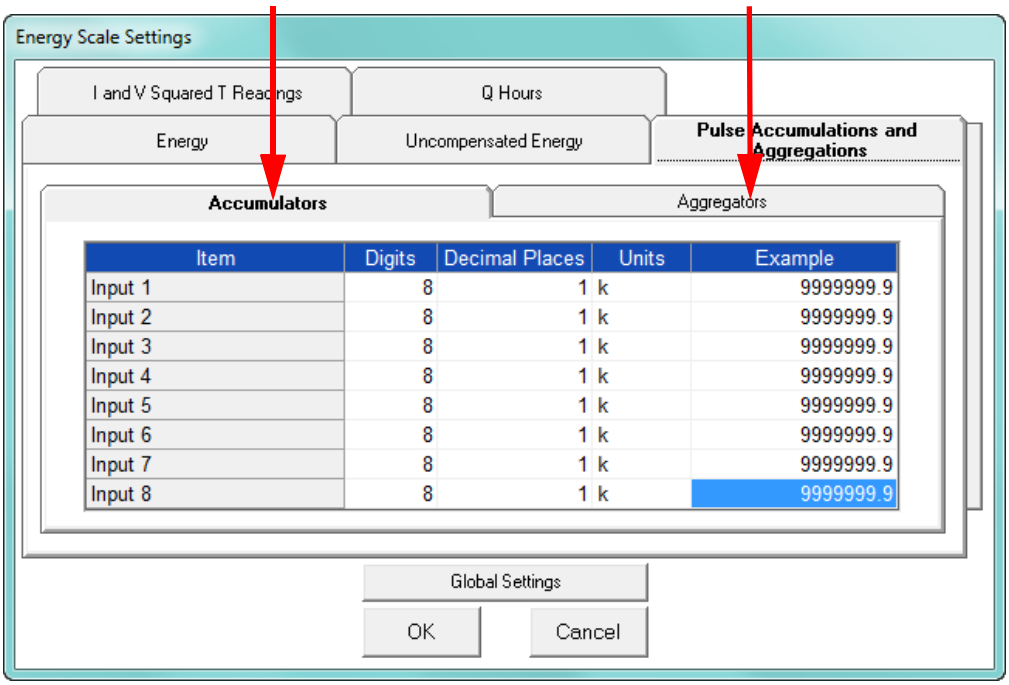
Item	Digits	Decimal Places	Units	Example
Quadrant 1+4 Wh	8	1	k	9999999.9
Quadrant 2+3 Wh	8	1	k	9999999.9
Quadrant 1+2+3+4 VAh	8	1	k	9999999.9
Quadrant 1+2 VARh	8	1	k	9999999.9
Quadrant 3+4 VARh	8	1	k	9999999.9

Pulse Accumulations and Aggregation Tab

Click on the **Pulse and Aggregations** tab and then click on the **Accumulators and Aggregators** tabs to configure scaling for those readings.

Click to set scaling for Accumulator readings (this is the initial tab view)

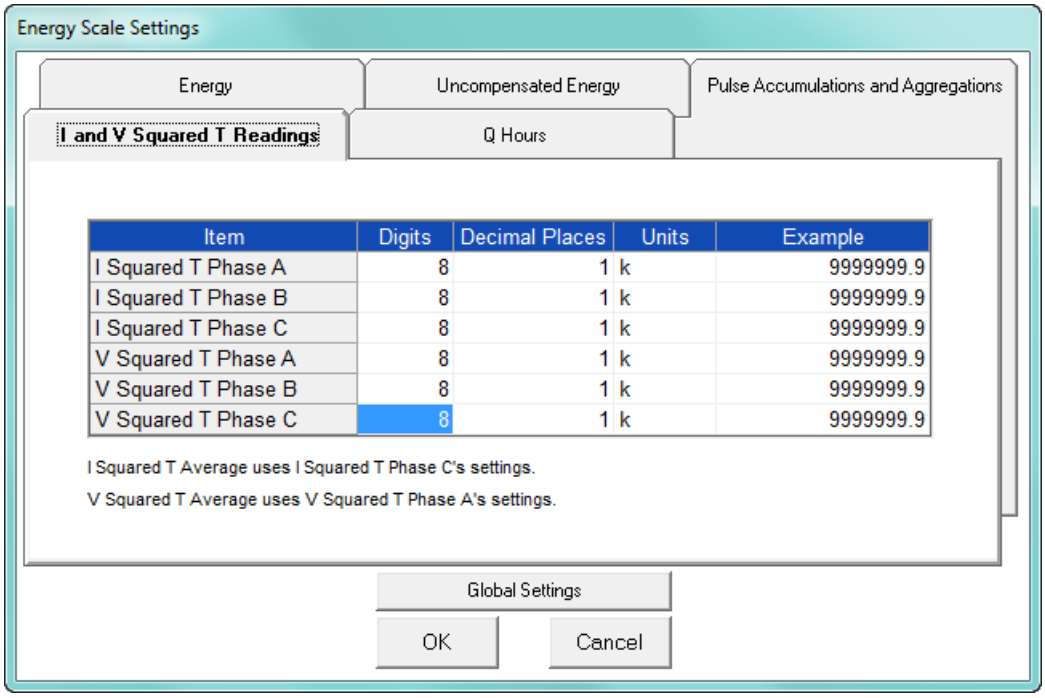
Click to set scaling for Aggregator readings



Item	Digits	Decimal Places	Units	Example
Input 1	8	1	k	9999999.9
Input 2	8	1	k	9999999.9
Input 3	8	1	k	9999999.9
Input 4	8	1	k	9999999.9
Input 5	8	1	k	9999999.9
Input 6	8	1	k	9999999.9
Input 7	8	1	k	9999999.9
Input 8	8	1	k	9999999.9

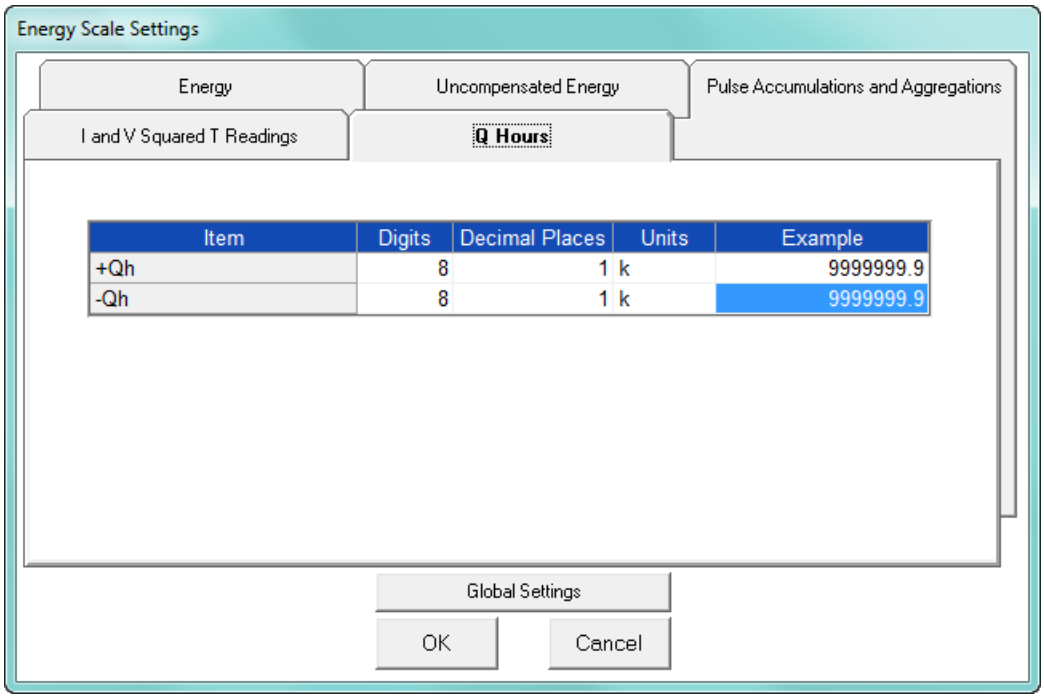
I and V Squared T Readings Tab

Click on the I and V Squared Readings tab to configure scaling for specific I^2T readings (data will not accumulate until current reaches the programmed level) and V^2T readings (data stops accumulating when Voltage falls below the programmed level).



Q Hours Tab

Click on the **Q Hours** tab to configure scaling for +QH and -QH readings.

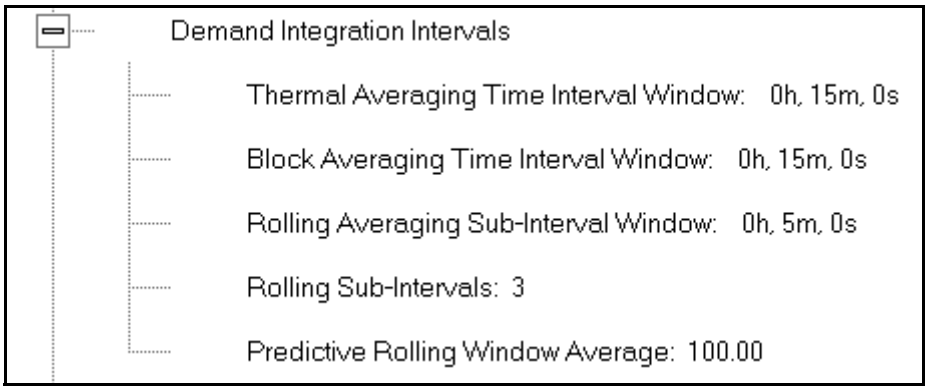


4. When you are done, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

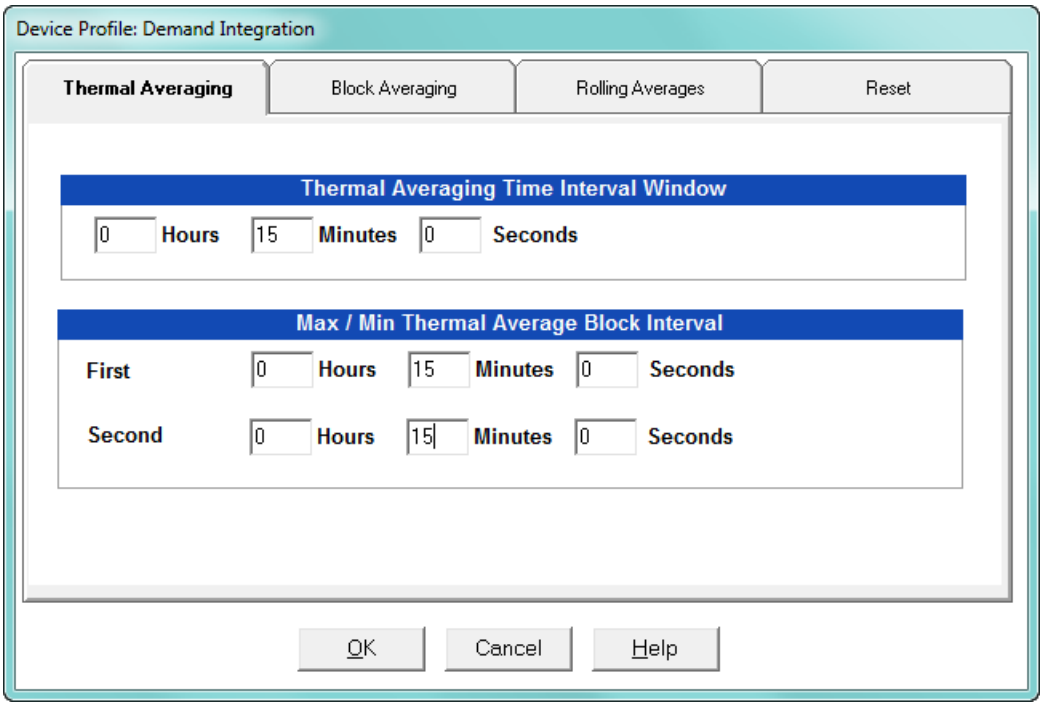
12.2.2 Demand Integration Intervals

See the *EPM 9800 Meter Installation and Operation Manual* for details on Demand intervals.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Demand Integration Intervals or double-click on the **Demand Integration Intervals** line. You will see the submenu shown below.



2. Double-click on any of the settings. You will see the screen shown below.

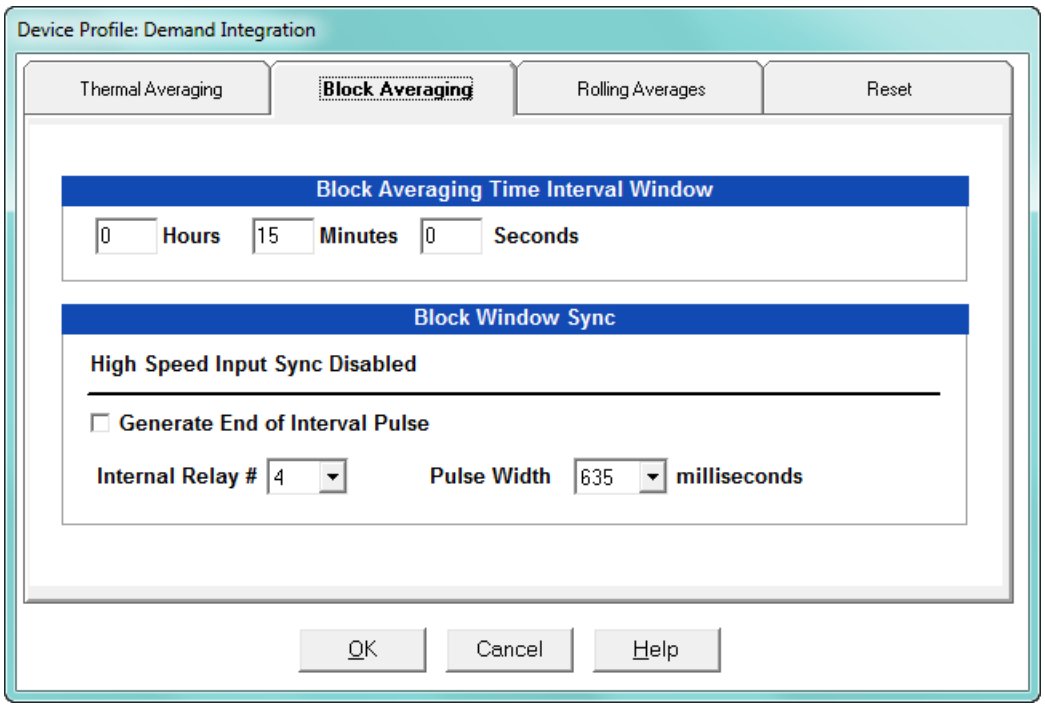


3. Click on the tabs at the top of the screen to navigate from one setting to another. Make changes to the settings according to your application requirements. Following is a brief description of each setting and its function:
   - Thermal Averaging (tab shown on previous page): use to set hours, minutes and seconds for a precise thermal window of demand data.
     Thermal Averaging (tab shown on previous page): use to set hours, minutes and seconds for a precise thermal window of demand data.
     - Traditional analog Watt-hour meters use heat-sensitive elements to measure temperature rises produced by an increase in current flowing through the meter. A pointer moves in proportion to the temperature change, providing a record of demand. The pointer remains at peak level until a subsequent increase in demand moves it again, or until it is manually reset.

       The EPM 9800 meter mimics traditional meters to provide Thermal Demand readings. Electronic thermal demand emulation is the logarithmic average of the power used, with a more recent load being weighted more heavily than a less recent load, (approximated exponentially). Each second, as a new power level is computed, a recurrence relation formula is applied. This formula recomputes the thermal demand by averaging a small portion of the new power value with a large portion of the previous thermal demand value. The occurrence of the proportioning of new to previous is programmable, set by the averaging interval. The averaging interval represents a 90 change in thermal demand to a step change in power. So, for example, with a 15 minute set interval, the meter will record 90 of a change in load in 15 minutes, 99 in 30 minutes, and 99.9 in 45 minutes.

       Because thermal demand emulation is the logarithmic average, the demand is not set to zero on a demand reset. On a demand reset, present demand becomes the new maximum demand.
     - The Max/Min Thermal Average Block Interval fields are used if you want to track the maximum and minimum Demand in more than one interval, e.g., the Max and Min Demand in a 10 minute (First Interval) and a 15 minute interval (Second Interval).
   - Block Averaging Time: use to set the length of the block interval used for Demand calculations and other interval-based functions; also used to set End of Interval pulse. Block averaging is also known as fixed window averaging. A window is the user set time range, e.g., 15 minutes. Computation is performed on that 15 minute interval, and after that, a new set of computations will be started.

For example, Window 1 will be from 0 to 15 minutes, Window 2 will be from 16 to 30 minutes, and so on.



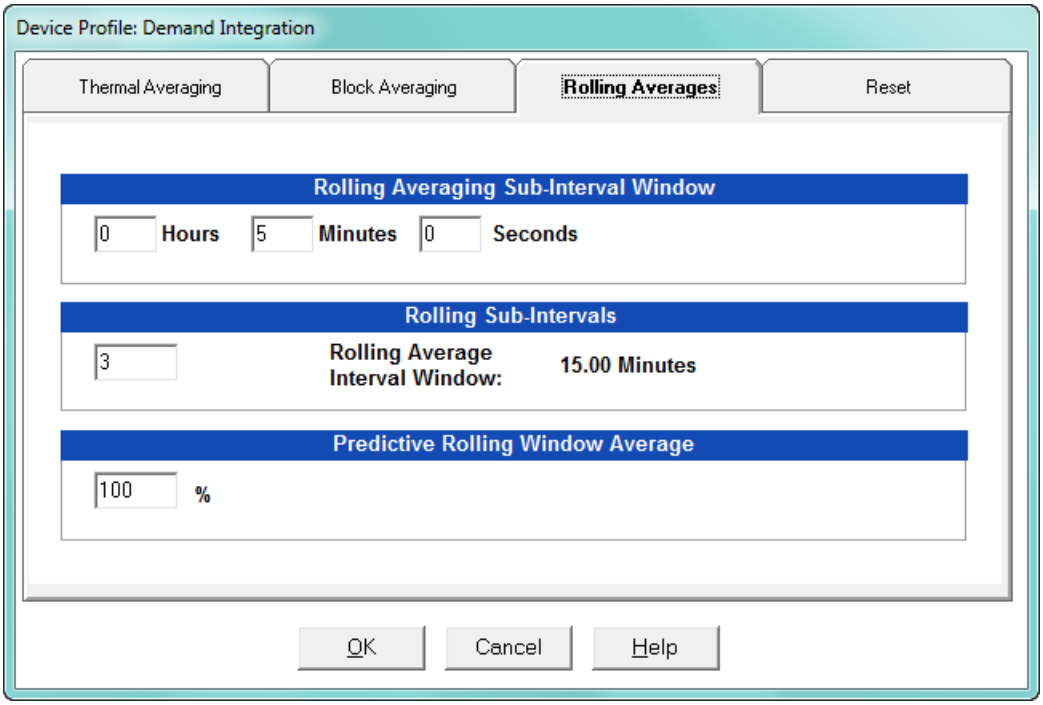
- Use the Hours, Minutes, and Seconds fields to set the length of the Block Interval.
- If you want to generate a pulse at the end of the set interval, click the box next to the **Generate End of Interval Pulse** field and select the number of the internal relay (1-4) you want to use and the pulse width (600 - 635 milliseconds).

NOTE

NOTE: The Block Window Sync field indicates whether the meter is being synchronized with pulses from a High Speed input. This option is set in the Input Type field of the High Speed Inputs screen (see "High Speed Inputs" on page 12-65).

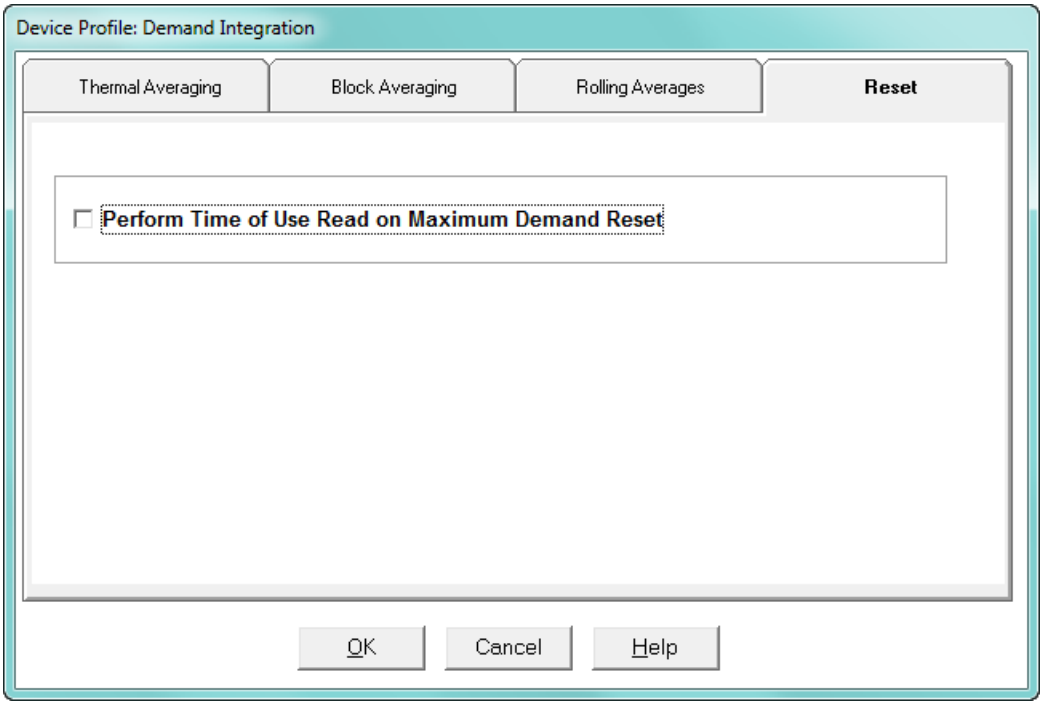
- Rolling Averages: also known as a sliding window, functions like multiple, overlapping Block averages. You define the subintervals at which an average of Demand is calculated. A window duration is the user set time, such as 15 minutes,

but it moves, so that, for example, Window 1 is 0 to 15, Window 2 is 1 to 16, Window 3 is 2 to 17, and so on.



- Set the Hours, Minutes, and Seconds fields under Rolling Averaging Sub-Interval Window.
- Rolling Sub-Intervals: set the number of rolling windows you want to "string together."
- Predictive Rolling Window Average: the meter gives you the programmed (field) prediction of your demands. If you are using Demand as a Limit, such that you will perform certain actions when you hit a certain Demand level, e.g., turning off motors, you may want to give yourself a “buffer.” This field accomplishes that by letting you choose to over-predict the Rolling Window Demand - e.g., if you enter 110, the meter will predict Demand at a 10 higher rate than the actual Demand, so that you will trigger a Limit alarm earlier than if you were using 100 Predictive Demand.

- Reset: Allows you to specify a Time of Use read whenever Maximum Demand is reset.



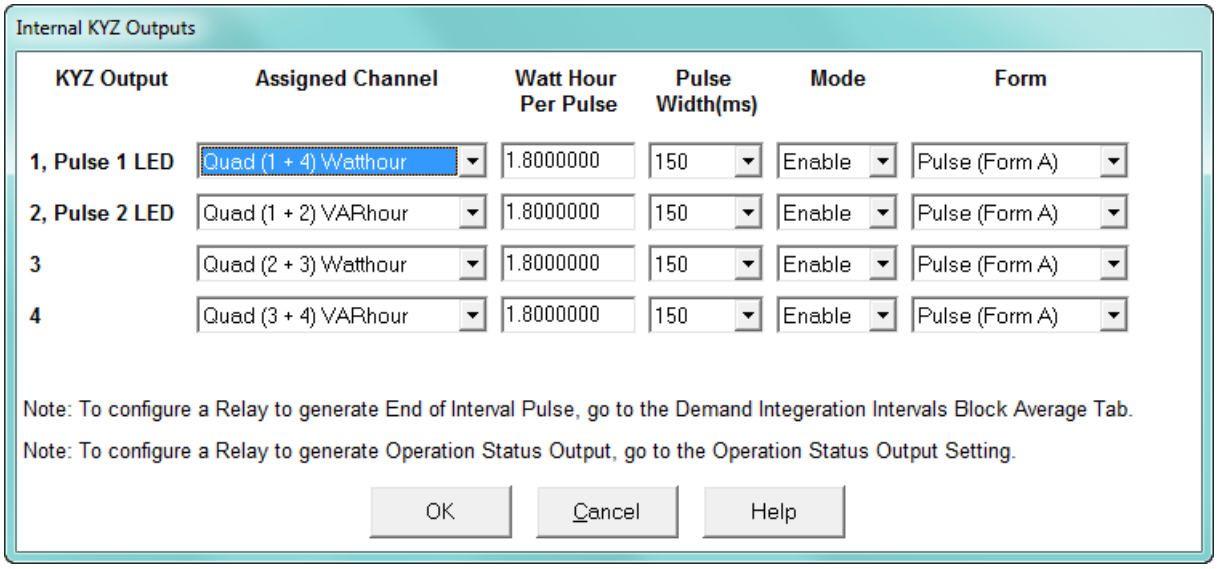
- Check the box to perform the TOU read. By selecting this, the meter will place all of the TOU values in the previous month's registers. Otherwise, the meter will default to self read based on a date set in the meter.
- Leave the box unchecked if you don't want to perform a TOU read.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.2.3 Internal KYZ Outputs

The Internal KYZ Outputs setting lets you assign channels to the KYZ outputs and to the test LEDs. The channel selection sets the type of pulse that will be generated. For example, the Pulse 1 LED can generate Energy Pulses for conventional testing or Reactive (VARh) Pulses for complex testing and approvals. This setting also allows you to determine the frequency and duration of the pulse for each output and LED.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Internal KYZ Settings or double-click on the **Internal KYZ Settings** line. You will see the screen shown below.



2. To make selections on this screen:
   - Select the assigned channel for the pulse/output. This is the demand that will be output as a pulse.
   - Enter Watt hour per pulse, pulse width, mode and form for each pulse/output.

NOTE

- Form A = Pulse; Form C = Transition
- No more than one Pulse Output can be assigned as an Operation Status Output.

3. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

Considerations on Setting KYZ Outputs

KYZ Pulses are produced at a rate proportional to the rate of energy accumulation, a feature that makes them useful for accuracy testing. Decreasing the value of the Watt Hour per Pulse field increases the pulse rate, improving the moment-to-moment precision of the output. The increased pulse rate means that the pulses are of shorter duration. Most equipment for detecting and counting pulses has a minimum detection time, so pulses that occur too rapidly might not be detected and counted.

The value in the Pulse Width field is used to force the meter to generate minimum width pulses in situations where proportional width pulses would occur too quickly to be measured. A pulse width setting that does not match appropriately with the input level and Watt hour per pulse setting will result in output that, in the short term, will not verify correctly.

For proper operation of this feature, the pulse width should be set to a value that is longer than the detection time required by the monitoring equipment, and shorter than the pulse period that the inputs and Watt hour per pulse setting would produce. The formula for the second quantity is:

$$\frac{3600 \text{ x } \textit{Watt-hr per pulse}}{\textit{Total Power}}$$

Some example cases are shown in the table below. For proper operation the pulse width should be set to a value that is less than the computed value of seconds per pulse.

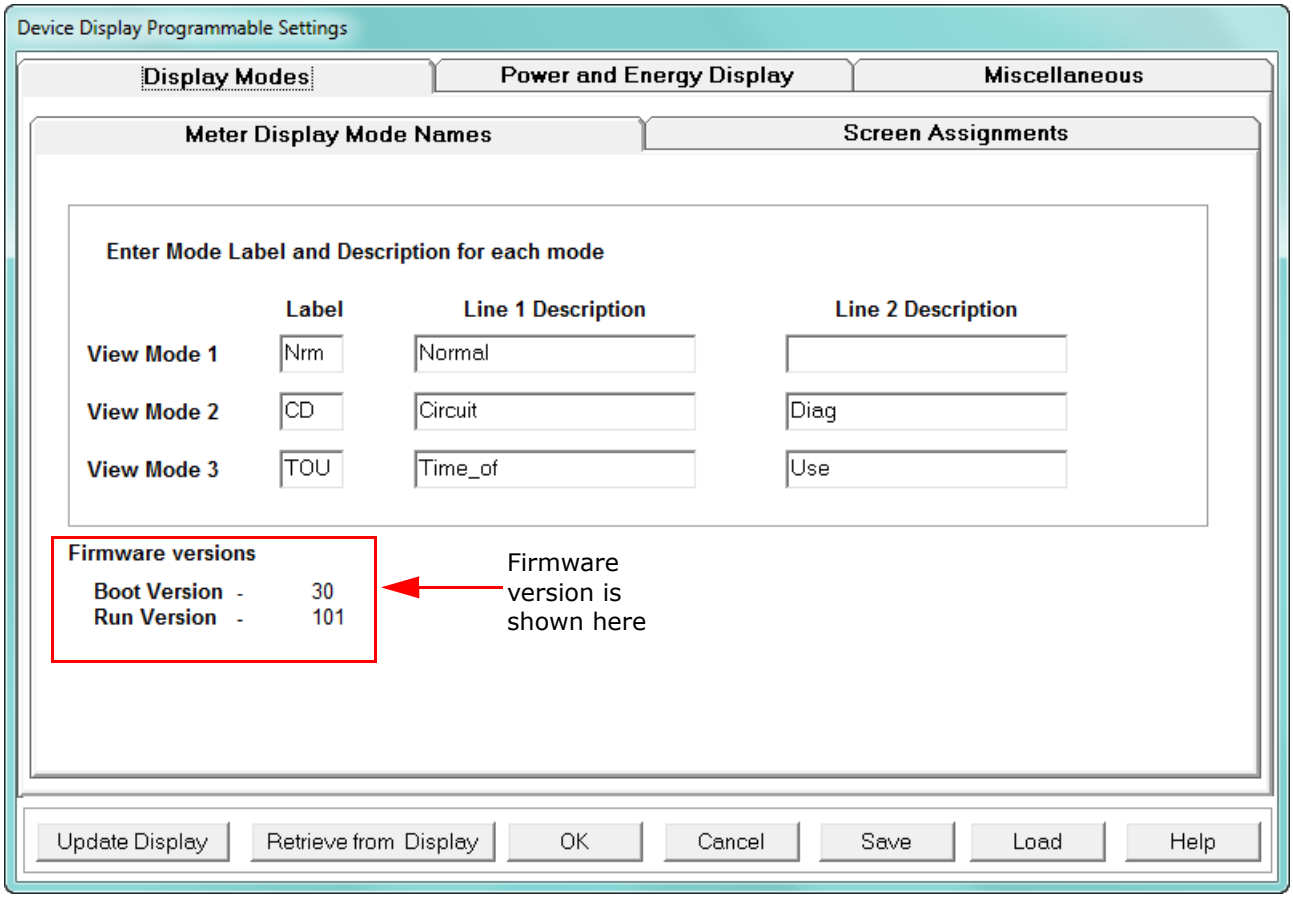
VoltagePhase to Neutral/Phase		Current		Total Power Wh/Pulse	Pulses/Hour	Seconds/Pulse
Volts	Volts	Amps	Watts	Wh	Pulses	Seconds
69.28	120.00	1	207.85	1.8000000	115.47	31.18
69.28	120.00	1	207.85	0.2078461	1000.00	3.60
69.28	120.00	5	1039.23	1.8000000	577.35	6.24
69.28	120.00	5	1039.23	1.0392305	1000.00	3.60
120.00	207.85	1	360.00	1.8000000	200.00	18.00
120.00	207.85	1	360.00	0.3600000	1000.00	3.60
120.00	207.85	5	1800.00	1.8000000	1000.00	3.60
277.13	480.00	1	831.38	1.8000000	461.88	7.79
277.13	480.00	1	831.38	0.8313844	1000.00	3.60
277.13	480.00	5	4156.92	1.8000000	2309.40	1.56
277.13	480.00	5	4156.92	4.15629219	1000.00	3.60

12.2.4 Display Configuration

The EPM 9800 meter with appropriate firmware (User Programmable LCD Display Run Time Firmware version 100, LCD Display Boot version 30, Base meter's COM run Time 624; or higher) gives you the Display Configurator. This feature lets you customize the meter's LCD screens to display any measured readings. The
Display Configurator features the same three View Modes as the base programmable display but has memory for up to 75 screens, distributed however you want among the three View Modes.

The settings shown in this section are for an EPM 9800 meter with the Display Configurator. If you have an earlier version of firmware that does not support the Display Configurator (Runtime Firmware version less than 100 and LCD Display Boot version less than 30), you will see a different Screen Assignments tab: see 12.2.4.1 *Using the Screen Assignments Tab (Earlier Firmware Version Only)* for instructions on using that tab. The other Display Configuration settings are the same, irrespective of hardware version. The Firmware versions are shown on the bottom portion of the Device Display Programmable Settings screen - see the screen on the next page.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Display Configuration or double-click on the **Display Configuration** line. You will see the screen shown below.

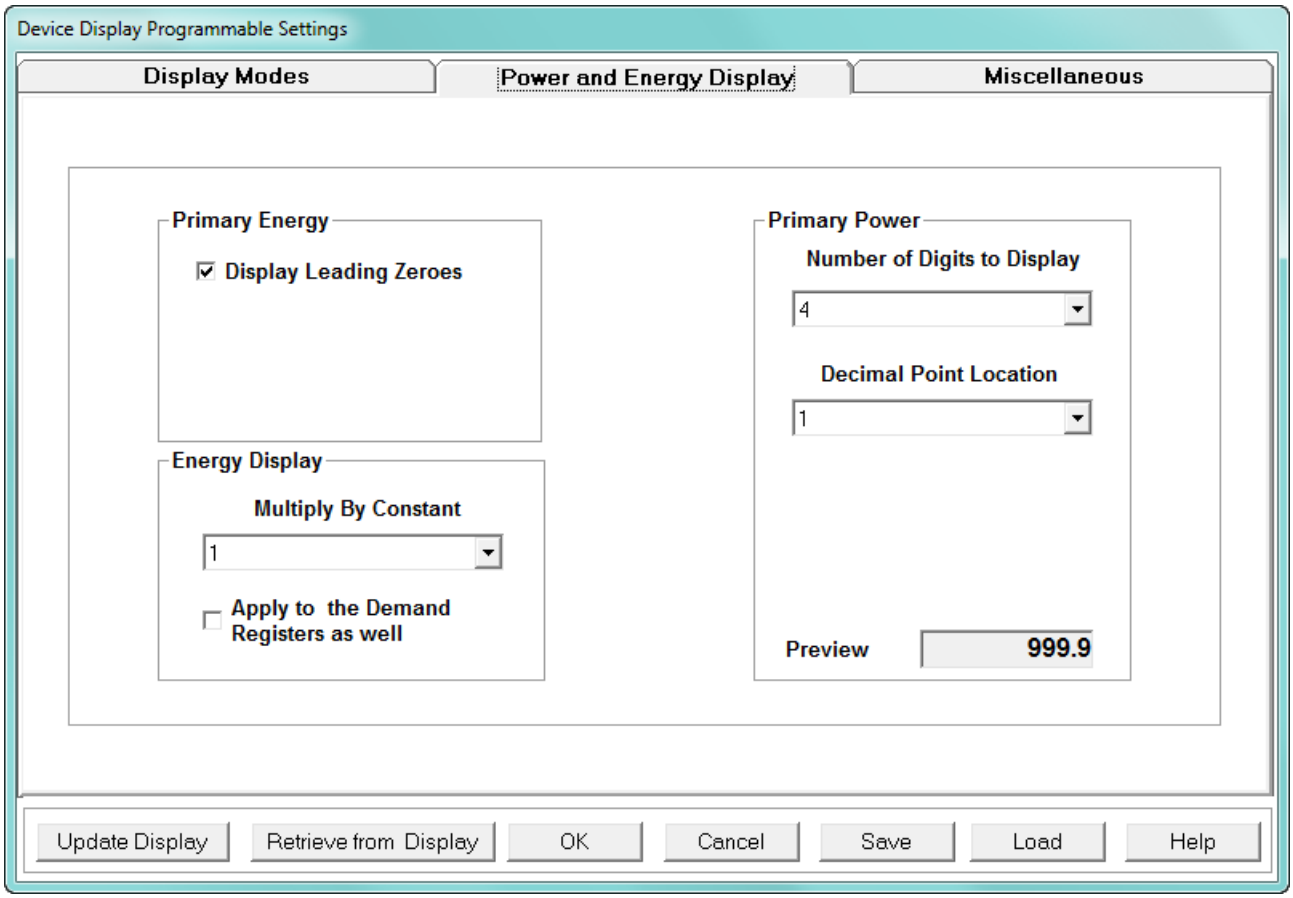


2. Click the tabs at the top of the screens to access the different settings.

   Meter Display Mode Names Tab (screen shown above; this screen is used by all firmware versions, and is the initial tab view):

   - Enter a Label for each of the three View Modes.
   - Enter a Description for each View Mode using the Line 1 and 2 Description windows.

Power and Energy Display Tab: (this screen is used by all firmware versions)



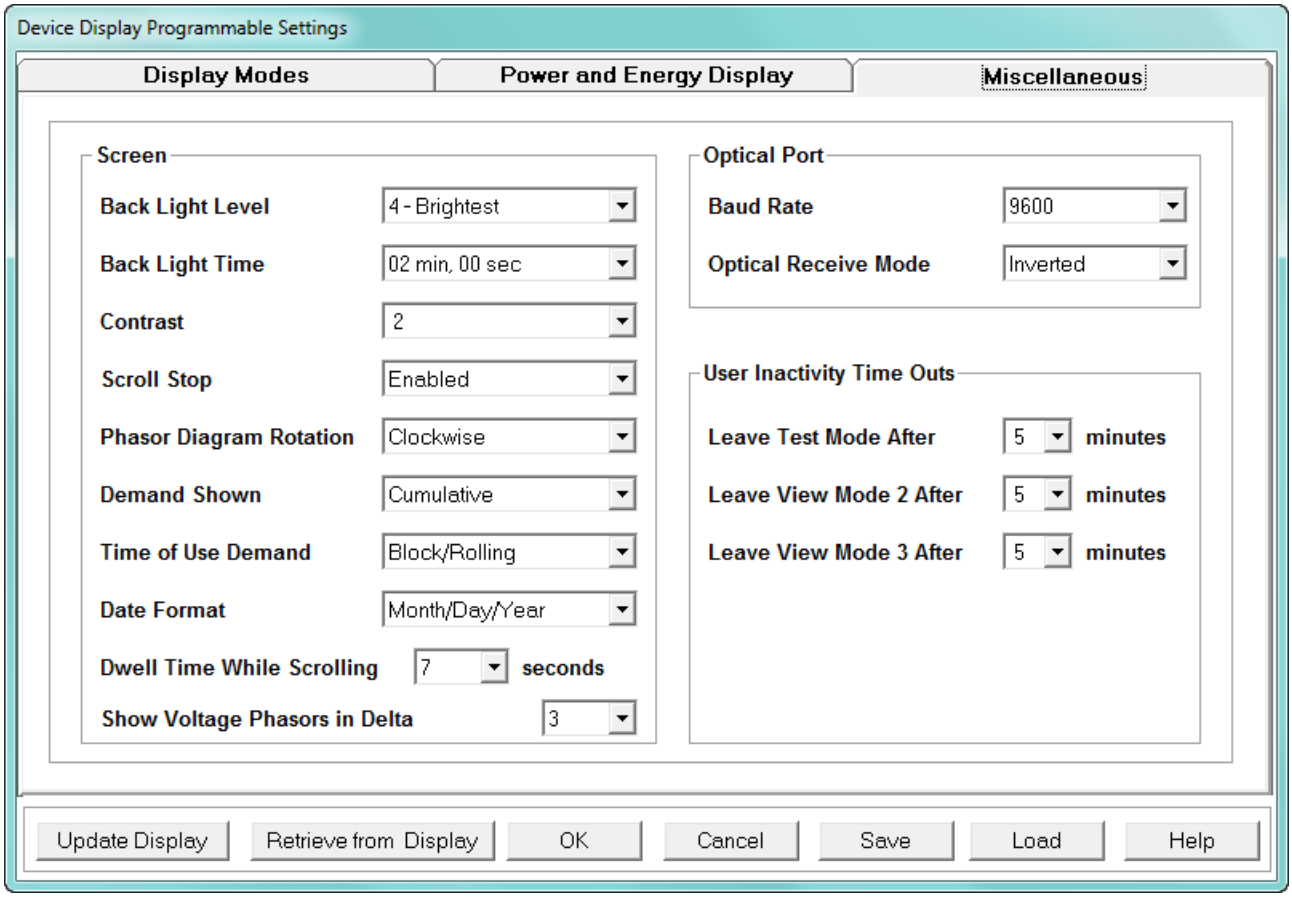
- For Primary Power (right side of screen), set Digits and Decimal Point. These settings apply to VA-hours, Watt-hours (+/-), VAR-hours (+/-) and VAR-hours (quadrants) in the meter. Previews appear at the bottom of the screen.

NOTE

NOTE: Care should be taken to match the Primary Power values on the display with those in the historical logs, since these values are stored in the meter.

- The Primary Energy fields are used to modify the display, only. They are not stored in the meter. Select a value for the Multiply by Constant field, located in the Energy Display box, from the pull-down menu. This value is used to modify the display.
  For example: if the multiple you select is 100 and the value is 7835, 78.35 will be displayed.
- If you want the Multiply by Constant to be applied to Demand as well as energy, click the checkbox next to the Apply to the Demand Registers as Well field.

Miscellaneous Tab: (this screen is used by all firmware versions)

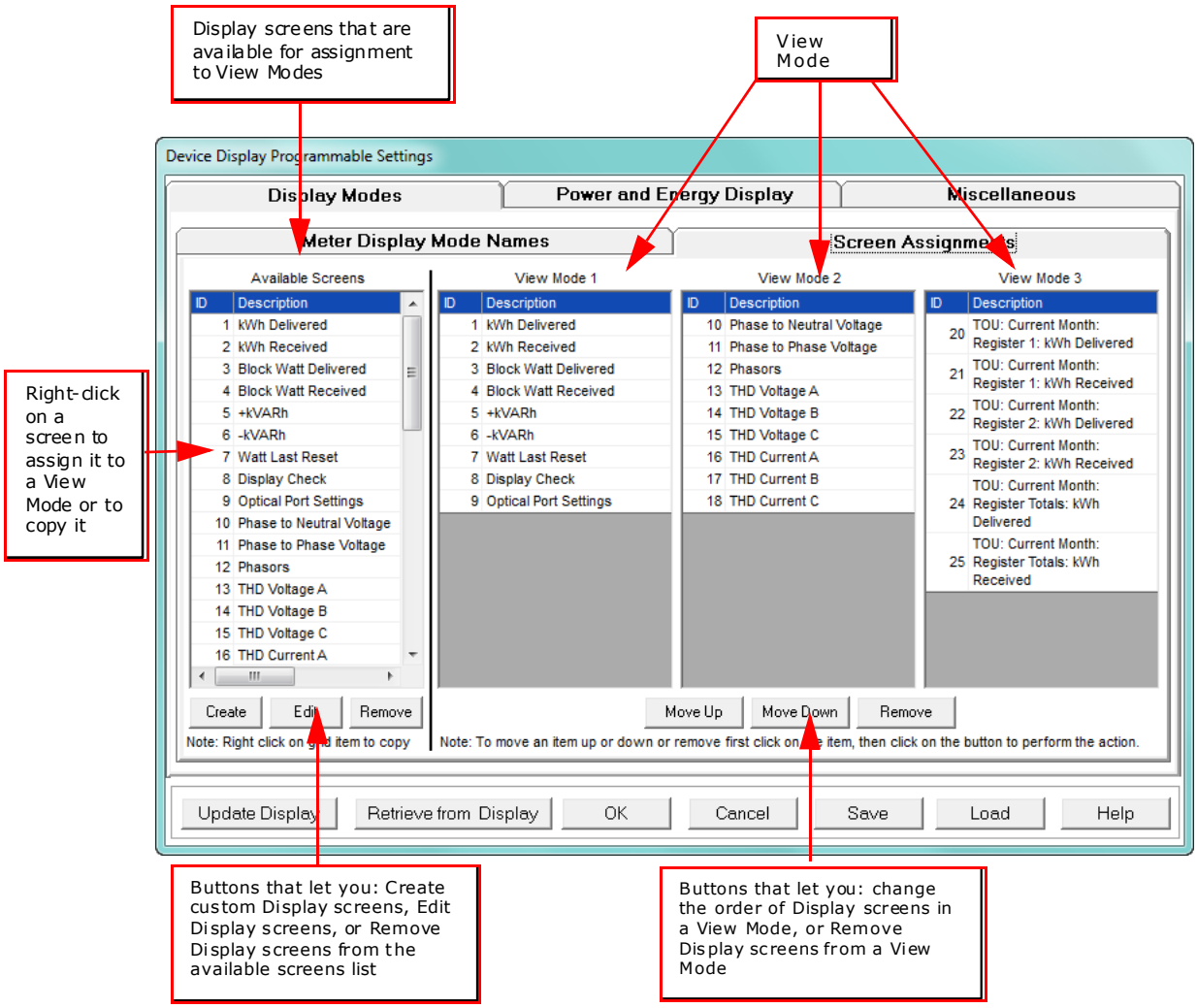


Use this screen to Set Screen Settings, Optical Port and User Inactivity Time Outs. The Screen Settings replace Adjustments Mode in the default profile.

- Screen Settings: set Back Light Level (brightness), Back Light Time (when Back Light shuts off), Contrast level, Scroll Stop (Enabled or Disabled), Phasor Diagram Rotation (Clockwise or Counter Clockwise), Demand Shown (Cumulative - running total or Continuous - running total + current max/min), Time of Use Demand (Block/Rolling or Cumulative) Date Format (Month-Day-Year or Day-Month-Year), Dwell Time While Scrolling (the amount of time each screen is displayed when Scroll mode is selected), and how many Voltage Phasors to show in Delta (2 or 3).
- Optical Port: Set Baud Rate and Optical Receive (Non-Inverted or Inverted) Inverted Operation is used with the Smart Coupler or A7Z optical readers.
- User Inactivity Time Outs: (number of minutes since last user action when Mode reverts to View Mode 1). Settings are from 5 - 60 minutes.
    - Leave Test Mode After _ Minutes: Reverts with or without energy accumulation.
    - Leave View Mode 2 or 3 After _ Minutes: Reverts automatically.

Screen Assignments Tab (for Runtime Firmware Version 100 or higher and LCD Display Boot version 30 or higher: see 12.2.4.1 *Using the Screen Assignments Tab (Earlier Firmware Version Only)* for earlier firmware)

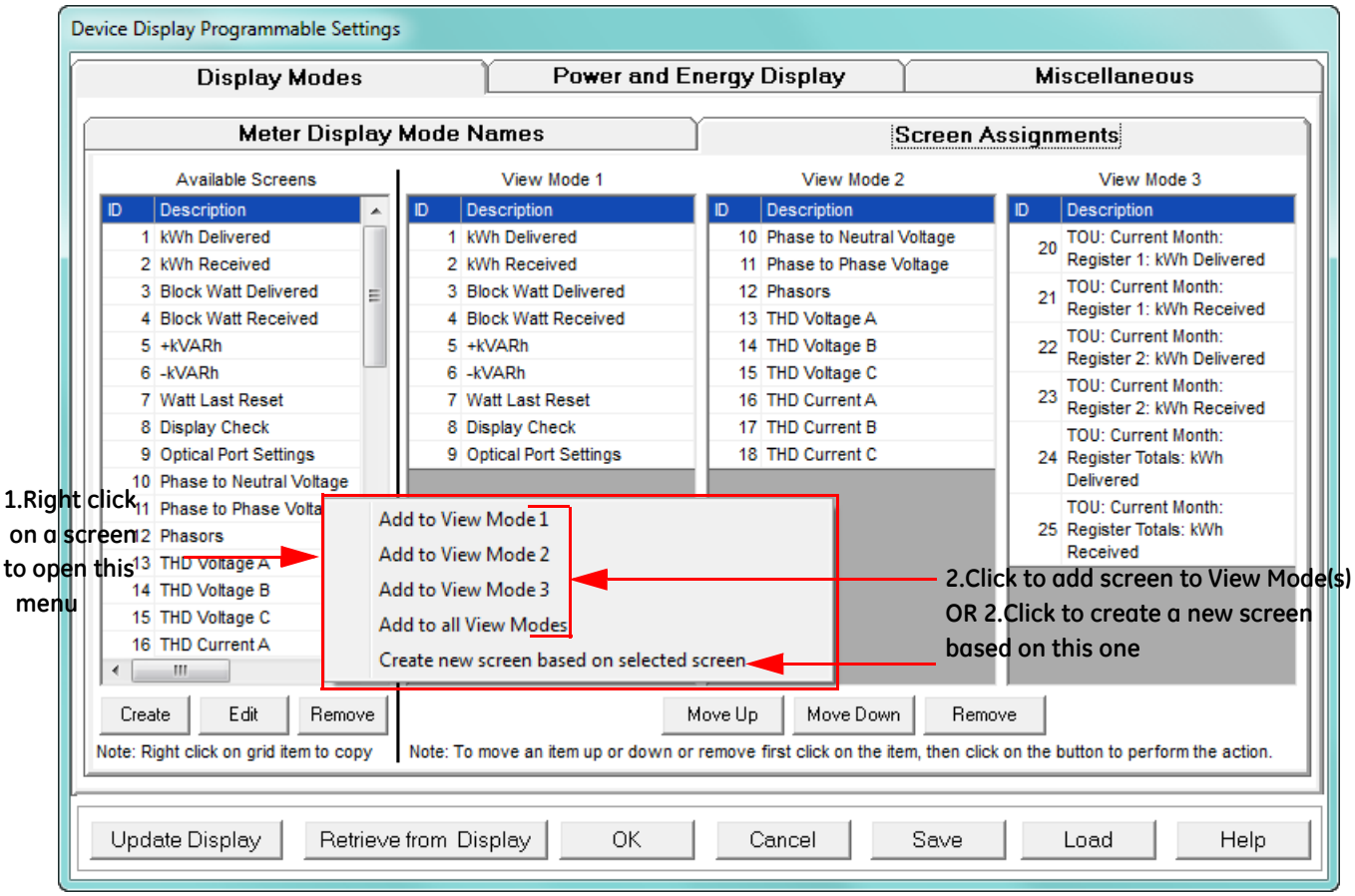
- Click the **Screen Assignments** tab. You will see the screen shown below.



- Use the buttons on the bottom of the screen to:
  - Retrieve display settings from the connected meter by clicking **Retrieve from Display**.
  - Update the connected EPM meter's display settings by clicking **Update Display**. The meter will reboot, and you will get a message on the PC screen: Device LCD Display Programmable Settings Updated.
  - Save any changes you have made to display settings by clicking **Save**.
  - Load a previously saved LCD Display file by clicking **Load** and select the file you want to load into this screen (it is a .nds2 file).
  - Return to the previous screen without saving any changes by clicking **Cancel**.
  - View online instructions for using this screen by clicking **Help**.

3. The leftmost column lists all of the Available display screens. Before you've used the Display Configurator, you will only see the pre-programmed display screens in the list. Once you have created customized screens, you will see those in the list as well. The other three columns list the display screens that are assigned to each of the three View Modes. Use the scroll bars to display all of the items in the columns.

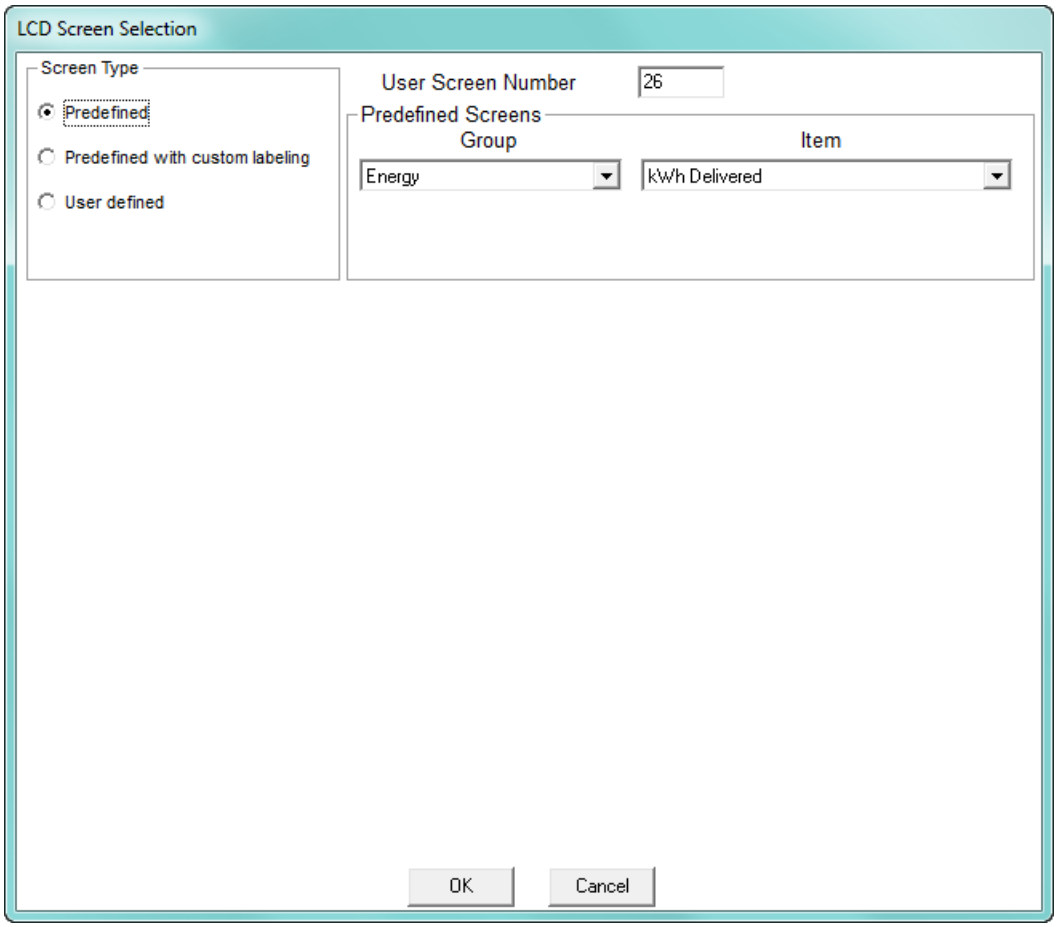
4. To assign one of the screens to a View Mode or to create a new screen based on it:
   - Click on the screen in the list and right-click. You will see the pop-up menu shown below.



   - To add the screen to one of the modes, or to all modes, click on that item in the menu.
   - To create a new screen based on the screen, click on the last item in the menu.

5. To change the position of screens in one of the View modes, or to remove the screen from the mode:
   - Click on the screen in the View Mode column and then either:
     - Click on a screen and then click **Move Up** or **Move Down** to change the position of the screen within that View Mode. The position of the screens determines the scrolling order in the LCD Display.
     - Click on a screen and then click **Remove** to remove the screen from that View Mode.

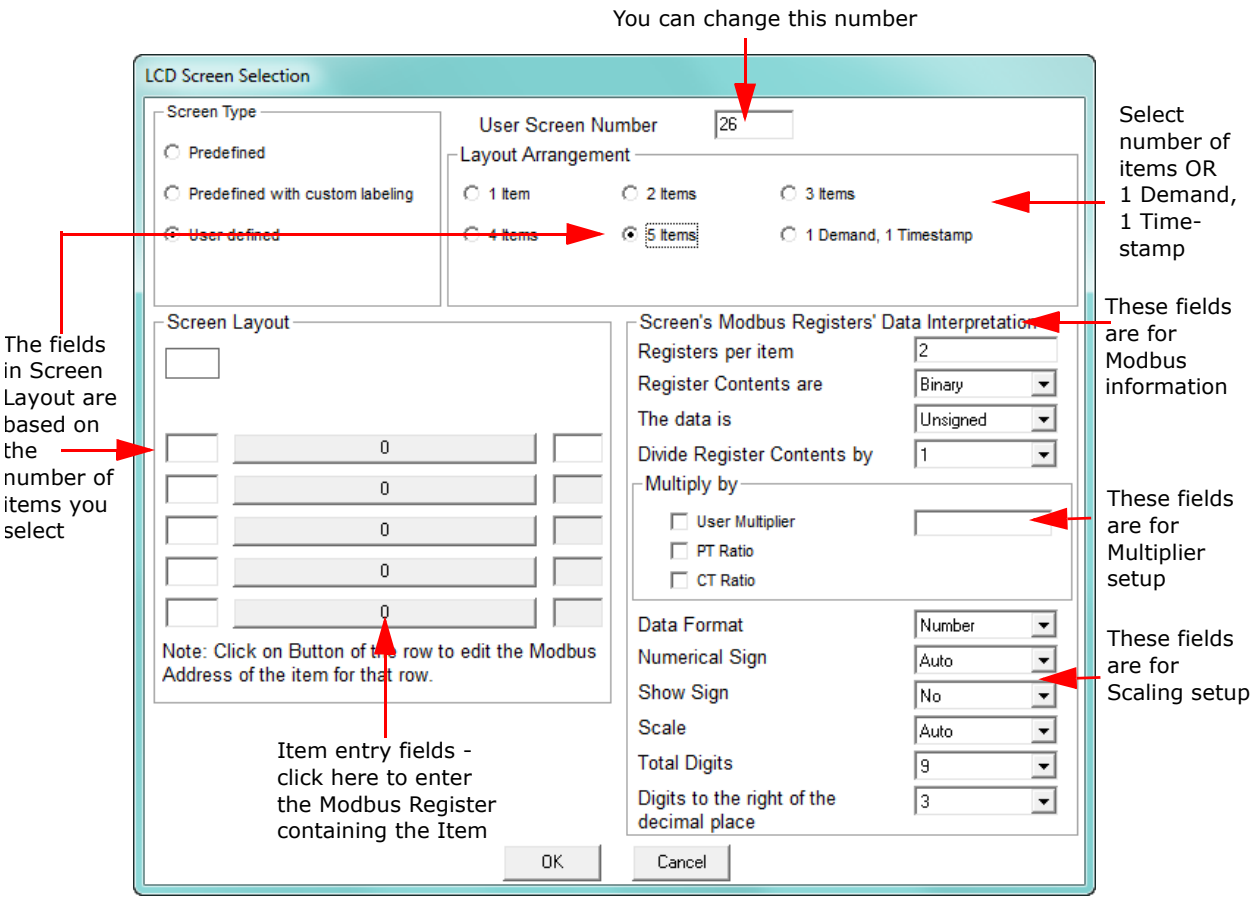
6. To remove a screen from the list of available screens, click on the screen in the Available Screens column list and then click **Remove**. The screen will no longer be displayed in the list of available screens, and cannot be assigned to any View Mode. It will also be removed from any View Modes it has already been assigned to.
7. To edit a screen, click on the screen in the Available Screens column list and then click **Edit**.
8. To create a new screen based on an existing screen, right-click on the screen in the Available Screens column list and select Create New Screen Based on Selected Screen from the pop-up menu.
9. To create a new custom Display screen, click **Create** in the Available Screens column.



10. The screen above is displayed if you are creating a new screen or editing an existing screen.
    - When you are creating a new screen, the User Screen Number field displays the next screen number in sequence (e.g., if there are already 25 screens, the number will be 26).
    - When you are editing an existing screen, or creating a new screen based on an existing screen, the screen number and data will be shown for the screen you selected.

      a. There are three types of screens:

- Predefined - the default screens for the meter; you can edit some of these screens - go to step 10-l for instructions
- Predefined with Custom Labeling - a new screen based on a predefined screen; you can change some fields to make the screen unique - go to step 10-l for instructions
- User Defined - a new custom designed screen - the instructions follow



NOTE

NOTE: The instructions for editing a custom screen are the same as for creating a new custom screen, except that since the screen is already be in the Available Screens list, you click on it and then click **Edit**. You will see the screen shown above.

c. The number you see in the User Screen Number field can be changed. The Screen number field accepts any number up to three digits in length. Use numbers between 1 and 999 if you want the number to display on the LCD Display screen; use numbers between 1000 and 1999 if you don't want the number to display.

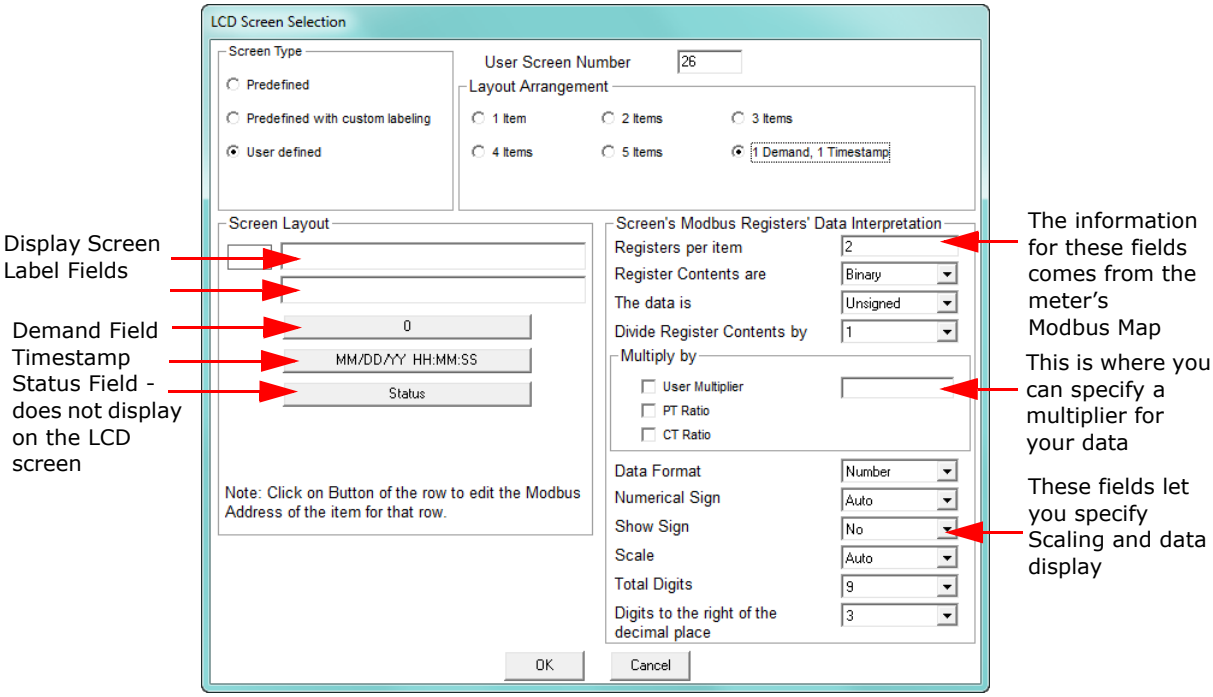
NOTE

NOTE: The Harmonics, Phasors, and Line Segment screens never display their number on the LCD Display screen.

d. Use the Layout Arrangement field to choose what fields you want the LCD screen to display. Choose either:

- The number of items you want the LCD screen to display: click one of the Item buttons.
- Display Demand and Timestamp fields: click the 1 Demand, 1 Timestamp button.

e. After you make your selection, the left side of the screen will change to display entry fields for the Item(s) (see the screen on the previous page) or Demand and Time Stamp information: see the example screen below.



f. The top field in the Screen Layout section is for the Display screen label (Title). Depending on the number of items you've selected, you will have between 0 to 2 lines for a screen label:

- If you have selected 1-3 items or 1 Demand, 1 Timestamp, you will have two entry lines.
- If you have selected 4 items you will have one entry line.
- If you have selected 5 items, you will not have any entry fields for a Display screen label (there won't be room on the screen for a label).

g. The Item entry fields allow you to specify the data you want to display on the LCD screen. You can also enter a prefix (optional) for each line item and a suffix (optional) for all of the items on the display screen.

Example: a screen containing phase to phase voltages might have a single title (Volts P-P), 3 lines of data with prefixes (Vab, Vbc, Vca), and the same suffix (MV) on all 3 lines.

h. The 1 Demand, 1 Timestamp entry fields allow you to specify the demand, the timestamp, and an optional status register. The status register is not displayed on the LCD screen.

i. To enter an item:

- Click on the **Item label** box.
- Fields open underneath the item, which allow you to enter the starting value of the Modbus Register containing the data for the item. Use the Decimal value of the register. See the screen on the next page. Refer to the *EPM 9800 Modbus Manual* for the EPM 9800 meter's Modbus Register Map.

NOTE

IMPORTANT! All of the data items you select must be the same Modbus type, for example F3. The Modbus type is listed in the Modbus map. See the following example.

Example:

To select 1 Cycle Phase A-N voltage, find the starting register for the field in the Modbus manual. See the figure below:

1 Cycle Block								
00090-00093	9	0	50	1 cycle Block Time Stamp	12/31/9999 23:59:59.99	10 msec	F3	R
00094-00095	10	0		1 cycle Phase A-N Voltage	+65536 V^2 / 0 V^2	1/65536 V^2 sec	F5	R

Decimal Starting Register is 01521 Item you are selecting F Type

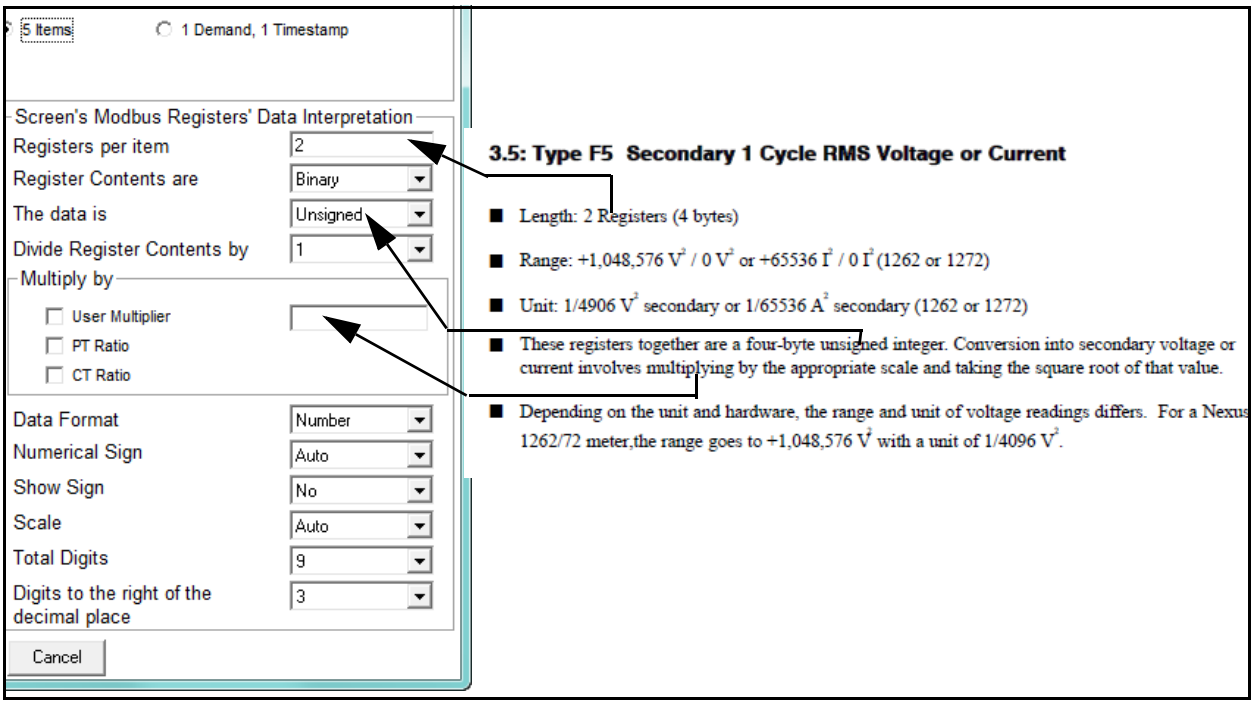
- Click **Update** to save the item's starting register address.
- Enter any additional items in the same way.

j. When you have finished entering items, use the entry fields in the right portion of the screen to enter details for the items' Modbus type, and to enter scaling, multiplier, and data display settings.

The Modbus type information is found in EPM 9800 *Modbus Manual*. See the example below.

Example:

The item in the example above was Modbus type F5. Any additional items must be the same Modbus type. Type F5 is described in the EPM 9800 meter's Modbus manual, as shown on the next page. Use the Modbus type information as shown.



In the example here, you would find the number of registers per item, the fact that the data is unsigned, and scaling information from the Modbus type information.

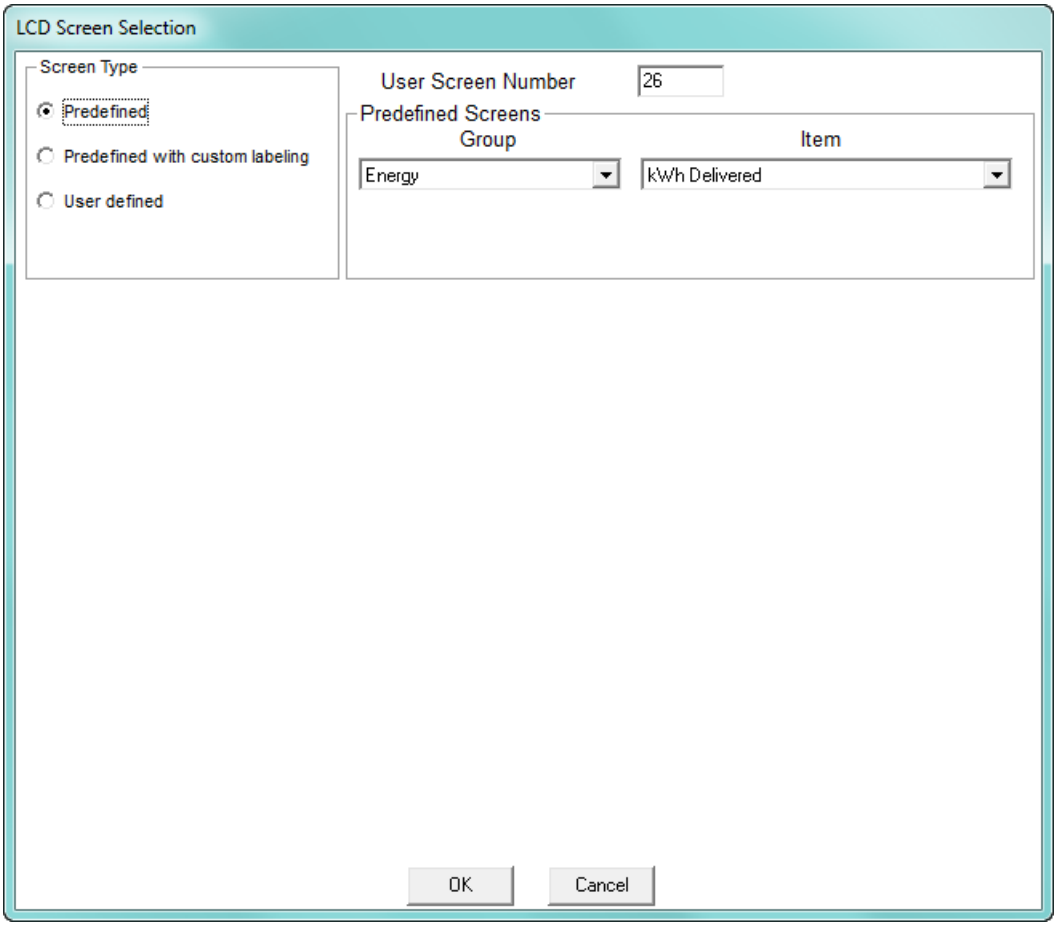
The fields underneath the Multiply by fields, let you set up how the data will be displayed, for example, specifying if the data is a number or some other value; whether you want the sign to display for signed data; whether you want the data scaled, the number of digits and decimal places in the field.

Click the drop-down menus to see alternate choices for the fields. The entries you make affect **all of the items** on the screen. The table on the next page shows the fields and the valid entries for them.

Entry fields	Possible entries
Registers per item	1 - 8
Register contents	Binary, BCD, Text, Scaled Energy
Data	Signed, Unsigned
Divide contents by	1, 100, 65536
Multiply by	User multiplier (enter in blank field), PT Ratio, CT Ratio
Data format	Number, Text, Power factor, Time, Date, Time & Date, Status indicator
Numerical sign	Auto, Forced negative, Forced positive
Show sign	No, Yes
Scale	Auto, None, kilo (k), Mega (M), Giga (G)
Total digits	1-10
Digits to the right of the decimal place	1-8

k. Once you have finished your entries, click **OK** to return to the Screen Assignments tab. The new screen will be listed in the leftmost column. Click on it and then right-click to assign it to one or all of the View Modes.

l. To edit a predefined screen or create a new screen from a predefined screen: either click **Edit** after selecting a predefined screen in the Available Screens list, or right-click on a predefined screen and select Create a new screen based on selected screen from the pop-up menu.



You have the following options for editing predefined screens:

- You can edit the screen number.
- You can create a new screen based on the predefined screen, but you will only be able to change the screen number and/or screen label (title).

NOTE

Some of the predefined screens cannot be customized as described above. The following table below lists those predefined screens and tells what can be changed on them.

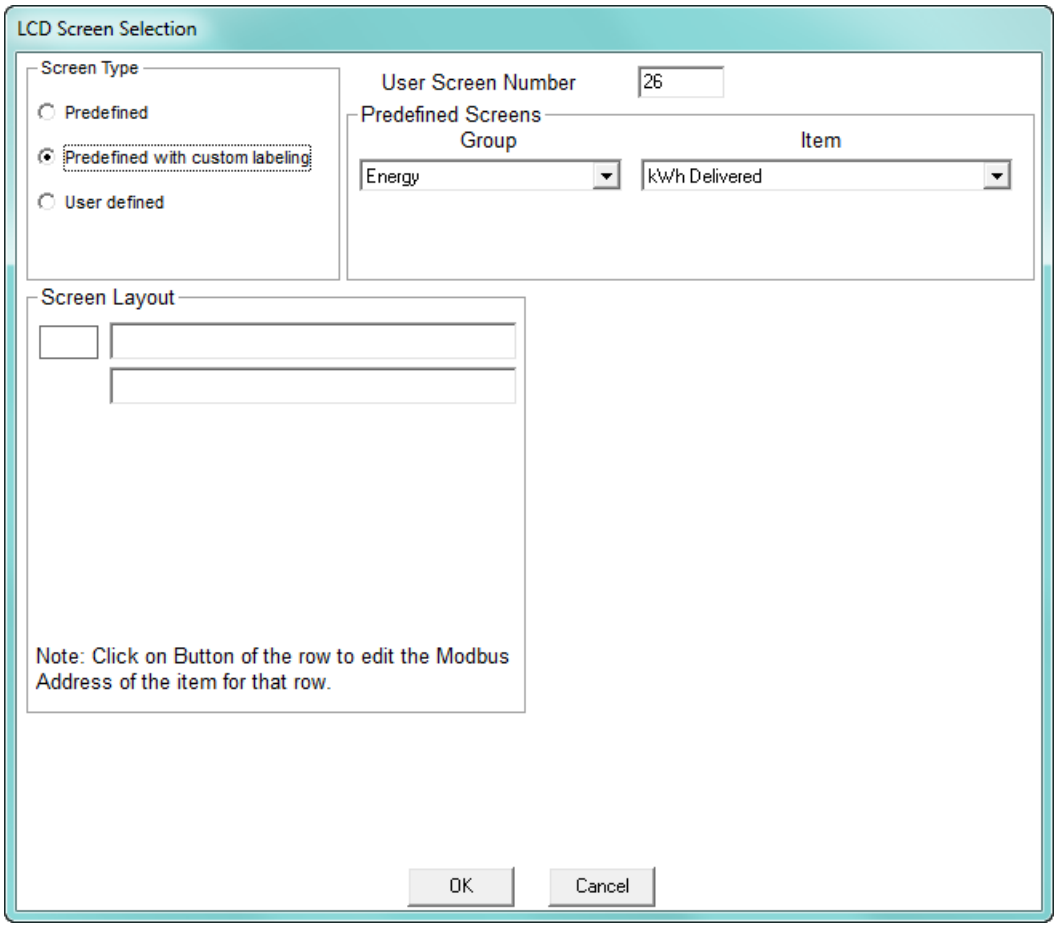
Predefined LCD Screen Number (Default Value)	Description	Editing Options
18	Phasors	None
20	VAR, PF, & Frequency	Title
21 - 26	Harmonics	Title
60	Segment check	None
64	Optical Port Settings	Title
65	Comm Ports	Title
66	EPM Status	Title
67	Firmware Versions	Title
68	EPM Info	Title
76 - 77	Rolling/Block Demand	Title
80 - 89	TOU Energy	Title
90 - 93	TOU Demand	Title
94 - 95	TOU +/- VARh	Title

- Click the button for one of these screen types:
  - **Predefined** - you can only change the screen number.
  - **Predefined with custom labeling** - you can change the title as well as the number of the screen. Refer to the table above for editing limitations.

NOTE

- The Screen number field is a three digit numeric field. Use numbers between 1 and 999 to display the number on the LCD Display screen; use numbers between 1000 and 1999 to not display the number on the LCD display screen.
- The Harmonics, Phasors, and Line Segment screens never display their number on the LCD Display screen.
- Depending on the predefined screen, you will have between 0 - 3 lines for screen label (title) entry. Screen labels can be up to 16 characters per line.

- Below is the LCD Screen Selection screen with the Predefined with custom labeling option selected. You can enter a new screen title in the Screen Layout fields.



- After you have made your entries, click **OK**. You will return to the previous screen (Screen Assignments tab).

11. When you have finished programming the LCD Display, click:
    - **Save** to save the LCD Programmable Settings to a .nds2 file.
    - **Upload** to upload the LCD Programmable Settings to the connected EPM meter.
    - **Cancel** to exit the screen WITHOUT SAVING ANY CHANGES.
12. Click **Update Display** to save any changes and return to the main GE Communicator screen.

NOTE

See the *EPM 9800 Instruction Manual* for further details.

12.2.4.1 Using the Screen Assignments Tab (Earlier Firmware Version Only)

NOTE

The screen shown here is only seen if your meter's Display Run Time firmware version is earlier than 100: see 12.2.4 *Display Configuration*, for instructions on using the Screen Assignments tab for later Firmware versions.

Device Display Programmable Settings

Display Modes | Power and Energy Display | Miscellaneous

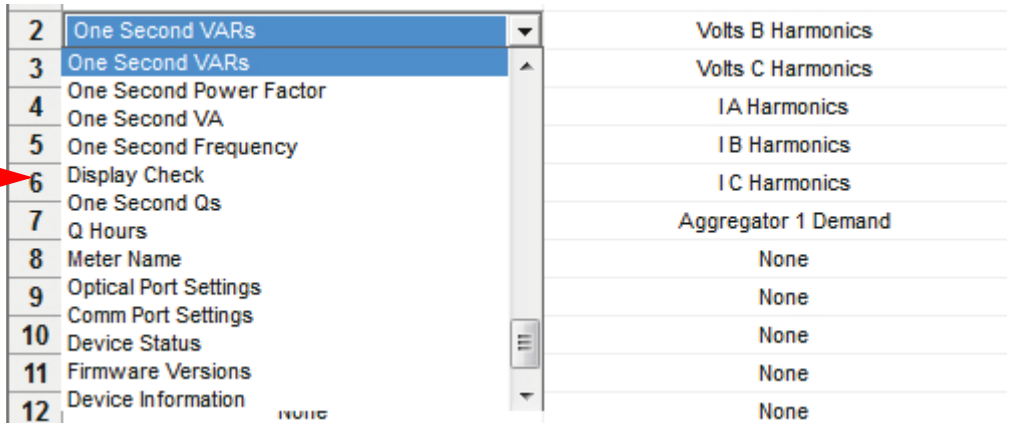
Meter Display Mode Names | Screen Assignments

	111 Mode Screens	222 Mode Screens	333 Mode Screens
1	One Second Watts	Volts A Harmonics	Meter Name
2	One Second VARs	Volts B Harmonics	Optical Port Settings
3	One Second VA	Volts C Harmonics	Device Status
4	One Second Frequency	I A Harmonics	Firmware Versions
5	Phase to Neutral Voltage	I B Harmonics	Device Information
6	Phase Current	I C Harmonics	None
7	Block W Demand Delivered	Aggregator 1 Demand	None
8	Block W Demand Received	None	None
9	kW Demand Last Reset	None	None
10	kWh Delivered	None	None
11	kWh Received	None	None
12	None	None	None
13	None	None	None
14	None	None	None
15	None	None	None
16	None	None	None

Update Display | Retrieve from Display | OK | Cancel | Save | Load | Help

1. Your Label for each View Mode appears at the top of each column.
2. Enter up to 16 screens for each View Mode clicking in one of the 48 entry fields on the screen and selecting the screen you want to assign, from the pull-down menu. Use the scroll bars to display all of the screen selections.

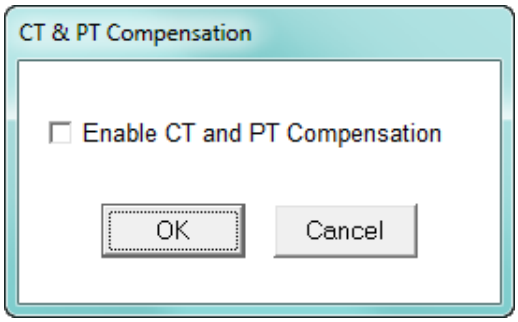
Select Screen to Assign to Mode from the pull-down menu



3. When you have finished your settings, click:
   - **Save** to save the LCD Programmable Settings to a .nds2 file.
   - **Upload** to upload the LCD Programmable Settings to the connected EPM meter.
   - **Cancel** to exit the screen WITHOUT SAVING ANY CHANGES.
4. Click **Update Display** to save any changes and return to the main GE Communicator screen.

12.2.5 CT and PT Compensation

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to CT and PT Compensation or double-click on the **CT and PT Compensation** line.



2. Check the Enable box to enable CT and PT Compensation; leave the box unchecked to keep it disabled.
3. Click **OK** to close the screen and return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.2.6 Transformer / Line Loss Compensation

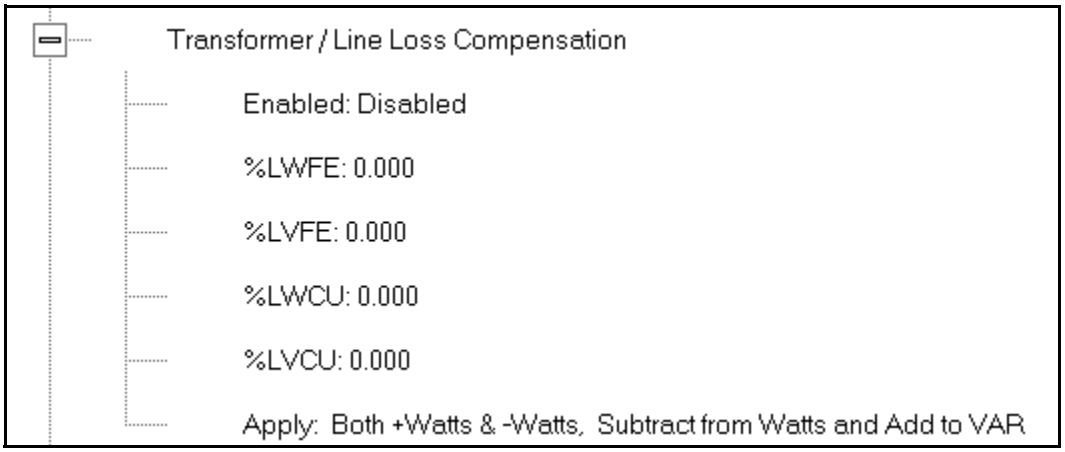
Transformer losses are power used by the transformer while working. The more load on the transformer, the higher the transformer losses. There are two types of transformer losses:

- No load losses - these are the fixed losses that keep the transformer up and running.
- Load losses - these vary with changes in the load.

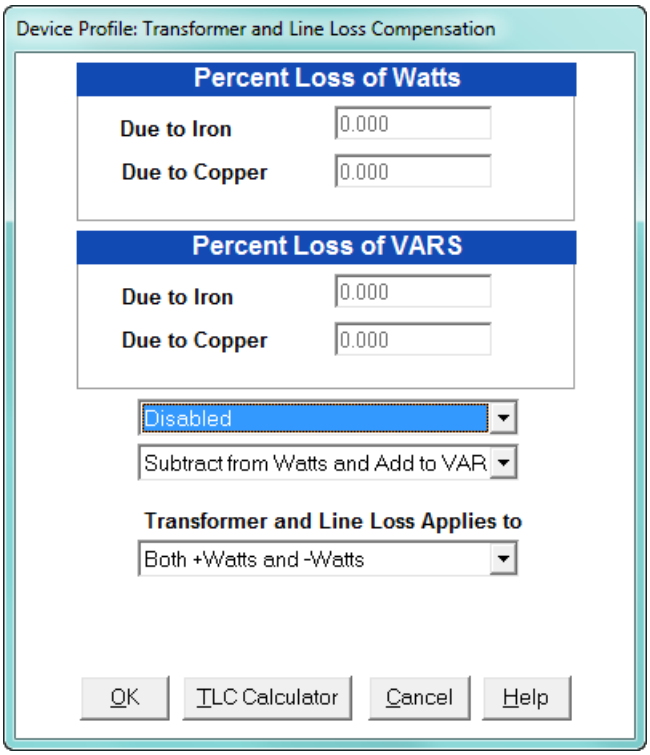
When the meter is located on the secondary side of a customer's transformer, a utility will want to add the transformer losses into the energy usage calculation. However, this practice is regulated by local jurisdiction and regulations. The meter has the capability to add in or subtract out these transformer losses, depending on the user's specific needs.

Line losses are similar to transformer losses, except that they are used to compensate for loss incurred on wires, such as transmission lines.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Transformer/Line Loss Compensation or double-click on the **Transformer/Line Loss Compensation** line. You will see the submenu shown below.



2. The menu displays the current values for the meter's Transformer Loss Compensation.
   - LWFE = percent loss of Watts due to iron
   - LVFE = percent loss of Vars due to iron
   - LWCU = percent loss of Watts due to copper
   - LVCU = percent loss of Vars due to copper
3. Double-click on any of the loss values. You will see the screen shown below.



4. Click on **TLC Calculator** to find the values to enter into the Percent Loss fields. The TLC Calculator button launches the TLC Calculator that performs the calculations for you once the required data is entered.

NOTE

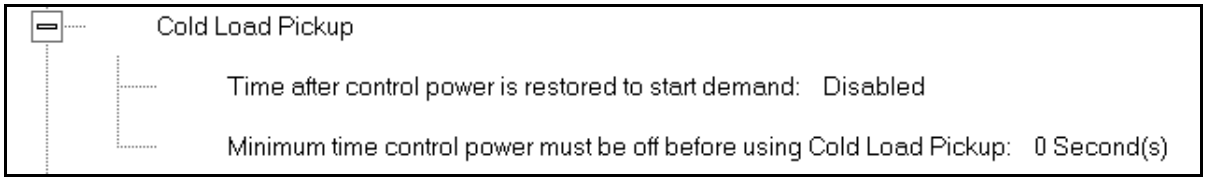
IMPORTANT! See Appendix A, which contains screen captures of the TLC Calculator with example numbers, and an explanation of Loss Compensation considerations.

5. Enter the percent loss of Watts and VARS for copper and iron in the appropriate fields.
6. Enable or Disable Transformer Loss Compensation with the first pull-down menu at the bottom of the screen. The optional selections are:
   - Disabled
   - Iron (Fe) Only
   - Copper (Cu) Only
   - Both Iron and Copper (Fe and Cu)
   - With the second pull-down menu, select from the following options:
   - Add to Watts and Subtract from VAR
   - Subtract from Watts and Add to VAR
   - Add to Watts and VAR
   - Subtract from Watts and VAR
7. With the third pull-down menu, apply the loss based on the power flow direction by selecting one of the following options:
   - Both +Watts and -Watts
   - -Watts only
   - +Watts only
8. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

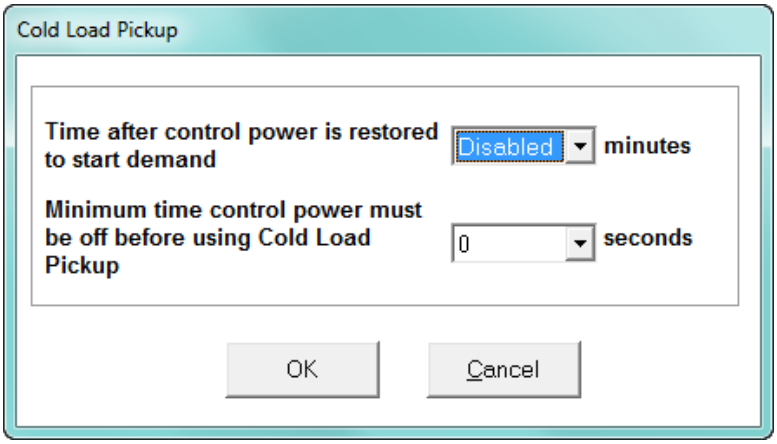
12.2.7 Cold Load Pickup

Cold Load Pickup is used to manage Demand in the event of a power outage. You set the amount of time (in seconds) power is off to identify a power outage that is the responsibility of the utility (as opposed to a very short term loss of power that is not their responsibility); then you set the amount of time (in minutes) you want to wait before Demand starts again. This time should correspond to the "grace" period the utility applies to avoid charging for motor startup, etc. after a power outage.

1. From the **Revenue and Energy** menu, click on the **+** button next to Cold Load Pickup or double-click on the **Cold Load Pickup** line. You will see the submenu shown below.



2. Double-click on one of the parameters to open the screen shown below.

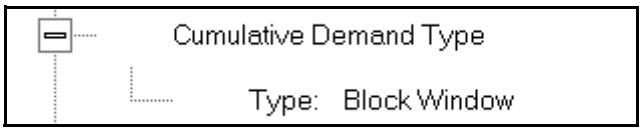


3. Make the following selections in accordance with your application needs:
   - Time after control power is restored to start demand - can be 1 to 60 minutes, or Disabled.
   - Minimum time control power must be off before using Cold Load Pickup - can be from 0 to 255 seconds.
4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

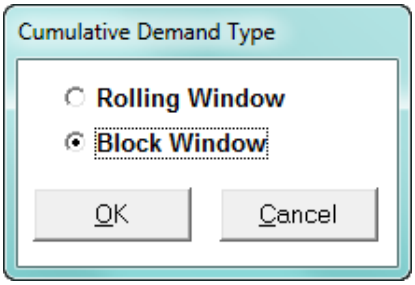
12.2.8 Cumulative Demand Type

Cumulative Demand is a counter of Max Demand that the meter keeps. It can help you determine if there has been tampering with the meter, i.e., unauthorized resetting of Demand. Whenever Demand is reset, the current Max Demand is added to the Cumulative Demand. By analyzing the data in the counter you can see if the Demand is being reset more often than intended. You can choose to use **either** Block Window Demand or Rolling Window Demand for the Cumulative Demand.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Cumulative Demand Type or double-click on the **Cumulative Demand Type** line. You will see the submenu shown below. It tells you the type of Demand currently selected.



2. Click the **Type** line to open the screen shown below.

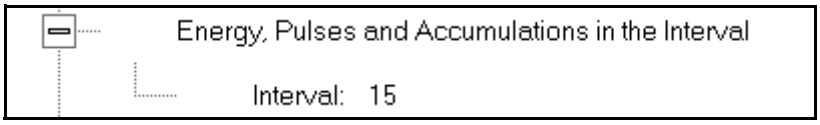


3. Click the radio button in front of Rolling Window (sliding) or Block Window (fixed) to select cumulative Demand type.
4. Click **OK** to exit the screen and return to the main Device Profile screen. For a change to take effect, you must click the **Update Device** button to send the new profile to the meter.

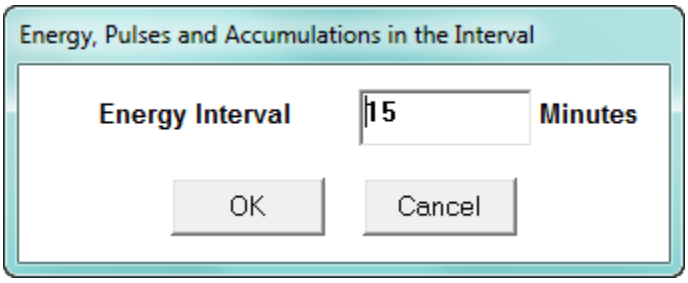
12.2.9 Energy, Pulses and Accumulations in the Interval

Energy in the interval is the energy that is accumulated within a load profiling interval. This is often the preferred method for logging because it is a summation of only that particular period of energy. The Interval setting you make creates the sub-accumulation field within the general Energy accumulation. An advantage of this setting is that the sub-accumulation takes up less space and is processed more quickly then the larger accumulation.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Energy, Pulses and Accumulations in the Interval or double-click on the **Energy, Pulses and Accumulations** in the Interval line. You will see the submenu shown below.



2. The current Interval setting is displayed. Click on the Interval setting to open the screen shown below.



3. Set the number of minutes for the Energy interval.
4. Click **OK** to close the window and return to the main Device Profile screen. For any change to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.2.10 Pulse Accumulations

Pulse accumulators are used to count and/or aggregate pulse information from external devices, using the High Speed inputs. These devices may be gas, water, or electricity meters; energy management systems; SCADA devices; or any pulse-generating device.

This section of the Device Profile displays a series of eight running totals available on the EPM 9800 meter. Each total can be added to (or subtracted from) other totals. This allows you to set the High Speed inputs located directly on the meter to accumulate pulses.

NOTE

NOTE: If you use these inputs for pulse accumulations, do not set them to record waveforms - if you do, you will record endless waveforms.

1. From the **Revenue and Energy Settings** menu, click on the **+** button next to Pulse Accumulations or double-click on the **Pulse Accumulations** line. You will see the screen shown below.

Device Profile: Internal Input Pulse Accumulators Setup

Source	Units/Count	Aggregator	User Assigned Label	Mode	Average Full Scale
1	1	None	Accumulator1	Pulse (Form A)	1000000000000000
2	1	None	Accumulator2	Pulse (Form A)	1000000000000000
3	1	None	Accumulator3	Pulse (Form A)	1000000000000000
4	1	None	Accumulator4	Pulse (Form A)	1000000000000000
5	1	None	Accumulator5	Pulse (Form A)	1000000000000000
6	1	None	Accumulator6	Pulse (Form A)	1000000000000000
7	1	None	Accumulator7	Pulse (Form A)	1000000000000000
8	1	None	Accumulator8	Pulse (Form A)	1000000000000000

Source	Hour Reading	Aggregator
Device	Quadrant(1 + 4) Watt Hour	None

Aggregator	User Assigned Label	Average Full Scale
1	Aggregator 1	1000000000000000
2	Aggregator 2	1000000000000000
3	Aggregator 3	1000000000000000
4	Aggregator 4	1000000000000000

OK Cancel Help

2. High Speed inputs 1-8 are listed in order under Source. Enter the following information or use the pull-down menus to select:
   - **Units/Count** - this is the scale factor that normalizes the pulses so that they can be aggregated. Pulses are stored in primary values.
   - **Aggregator** - this allows you to place the pulse register into a separate accumulation register that can aggregate (add) or net (subtract) values.
   - **User Assigned Label** - this window allows you to enter a label designation for the source.

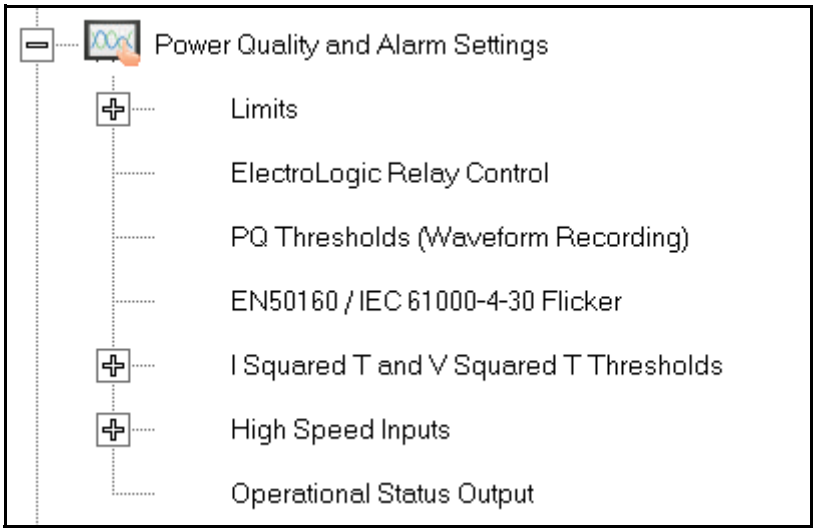
- **Mode** - you can set Pulse or Transition. A transition means from open to shorted/closed or from shorted/closed to open; a pulse contains 2 transitions, open to shorted/closed, followed by shorted/closed to open.
- **Average Full Scale** - for EPM meters, in order to set a limit on a reading it needs a Full Scale value as the 100 reference. You can set a limit on the average number of pulses per interval.
- **Device Hour Reading and Aggregator** - source device is the meter you are connected to. The Hour reading is either Quadrant 1 and 4 Watt-hour or Quadrant 2 and 3 Watt-hour. The Aggregators indicate whether the count should be added to, or subtracted from, Aggregators 1-4. You can choose None if you don't want the count to affect any of the Aggregators.
- **Aggregators**: The "buckets," or Totalizer fields where pulse counts from the High Speed inputs and from the Watt-Hour counters can be totaled. The user can assign a label to each of the Aggregators. See the Average Full Scale description above for an explanation of this field - it has the same use here, except for the Aggregators.

3. When all data has been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.3 Power Quality and Alarm Settings

Power Quality and Alarm Settings are the third group of settings in the Device Profile.

1. From the Device Profile screen, click on the **+** button next to Power Quality and Alarm Settings or double-click on the **Power Quality and Alarm Settings** line. All of the settings in this group are listed.



2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the Power Quality and Alarm Settings menu.

12.3.1 Limits

Limits are threshold settings that can be set by a user to trigger a record in a log when an alarm condition is met. Utilizing the limits, the user can then control a relay or send a warning email on that alarm.

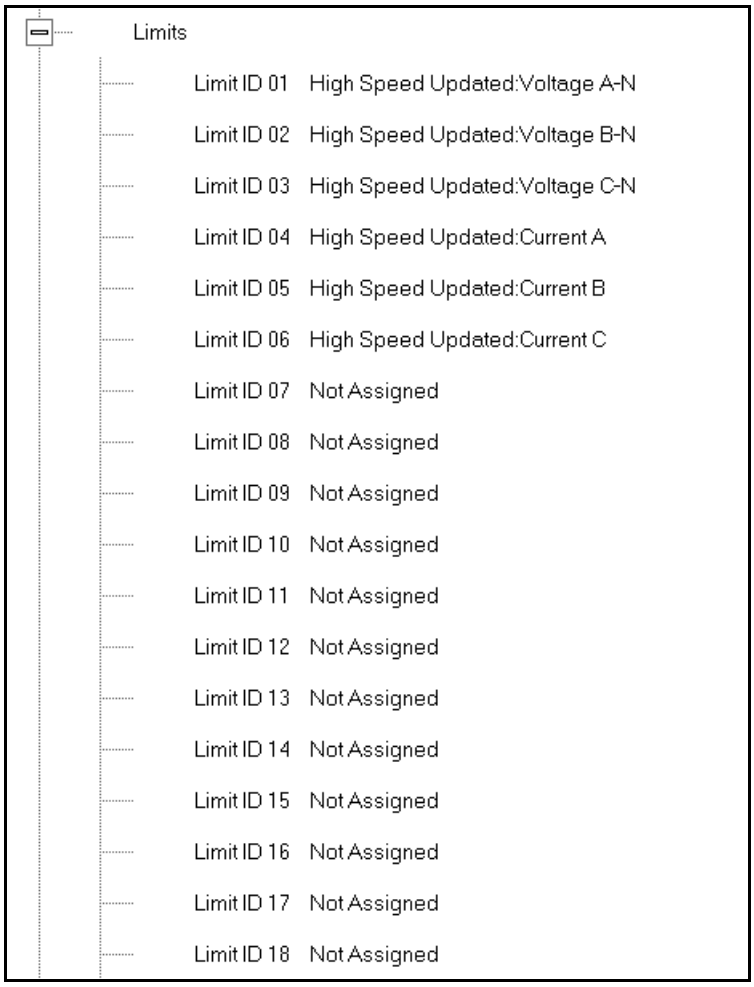
Limit settings are based on a percentage of the Full Scale (% of FS), which is set in the Limit and Waveform Full Scales setting (12.1.2 *Limit and Waveform Full Scales*). Full Scale is based on CT and PT ratios set in the CT, PT Ratios and System Hookup setting (12.1.1 *CT and PT Ratios and System Hookup*).
Limits are based on a percent of Full Scale settings so that the same settings can be used no matter what the CT and PT Ratio needed.

Before programming limits, set the CT and PT ratios. Then, set the Limit and Waveform Full Scales if you want to change to automatic configuration. In most cases the software will configure the Full Scale optimally.

NOTE

The software automatically updates the Full Scale; however, you can set it separately from the CT and PT Ratios.

1. From the **Power Quality and Alarm Settings** menu, click on the **+** button next to Limits or double-click on the **Limits** line. You will see the submenu shown below.



This submenu displays the current Device Profile Limit settings. Not all limits are shown in the figure above: there are 32 Limit ID fields.

2. Double-click on any of the settings (Limit ID 01, for example). You will see the Limits screen, shown below.

Device Profile: Limits

Limit ID	Assigned Item	Limit 1			Limit 2			Combination Limit 3
		Setting	Setpoint		Setting	Setpoint		
			% of FS	Primary		% of FS	Primary	
1	High Speed Updated:Voltage A-N	Above	120.00	144.00	Below	80.00	96.00	OR
2	High Speed Updated:Voltage B-N	Above	120.00	144.00	Below	80.00	96.00	OR
3	High Speed Updated:Voltage C-N	Above	120.00	144.00	Below	80.00	96.00	OR
4	High Speed Updated:Current A	Above	150.00	7.50	Below	0.00	0.00	OR
5	High Speed Updated:Current B	Above	150.00	7.50	Below	0.00	0.00	OR
6	High Speed Updated:Current C	Above	150.00	7.50	Below	0.00	0.00	OR
7	Not Assigned	Above	98.00	98.00	Above	0.00	0.00	OR
8	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
9	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
10	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
11	Not Assigned	Below	-0.01	-0.01	Above	0.00	0.00	OR
12	Not Assigned	Below	-0.01	-0.01	Above	0.00	0.00	OR

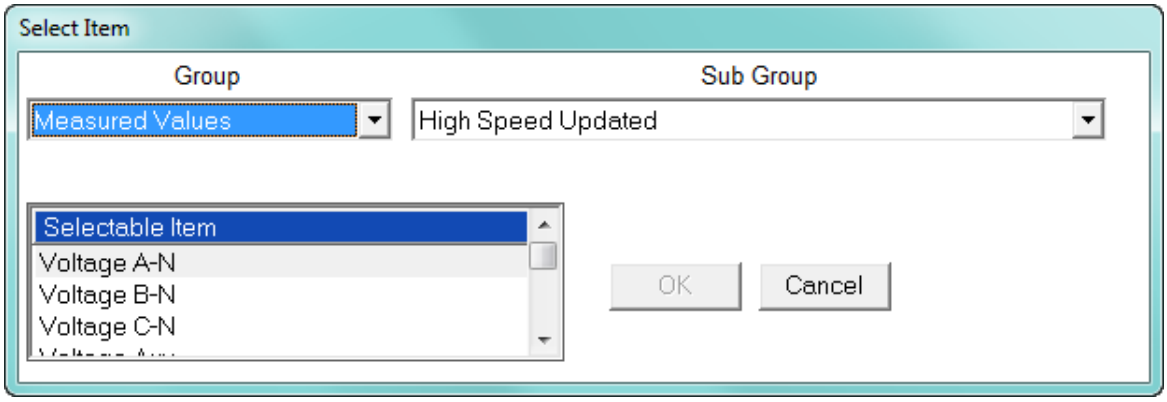
Channels	Primary Values at 100%
I A, B, C, Nc	5.00
I Nm	5.00
V Phase to Neutral	120.00
V Phase to Phase	208.00
Power Phase	600.00
Power Total	1800.00
Frequency	60.00

OK Cancel Help

- This screen can be expanded to show all of the limits. Click on the top or bottom of the screen to display sizing arrows you can click on and drag to expand the screen.
- Percentage of Full Scale settings (% of FS): The limits are set in % of Full Scale so that when you create a profile, you can keep your settings. This is true, even though the CT and PT ratios change when the meter (or a new meter) is placed in a different location. Changing the CT and PT ratios does not affect the % of Full Scale limits previously set. This is useful when you are using large numbers of meters because one profile can be used with a common set of limit settings no matter what the CT and PT ratio. Full Scale reference information is available in the lower left box.

3. Make changes to this screen according to your application requirements.
   - To set the type of limit and the channel assigned to it:

- Double-click in either the **Limit ID** or **Assigned Item** column. You will see the screen shown below.



- From the pop-up menus, choose the desired settings and click **OK**.
  Following is a list of the available Groups, Sub Groups, and Items.
  Group: Measured Values
  Sub Group: High Speed Updated
  Item:
  Voltage A-N
  Voltage B-N
  Voltage C-N
  Voltage Aux
  Current A
  Current B
  Current C
  Current N Measured
  Voltage A-B
  Voltage B-C
  Voltage C-A
  VA A
  VA B
  VA C
  VA Total
  VAR A
  VAR B
  VAR C
  VAR Total
  Watt A
  Watt B
  Watt C
  Watt Total
  Frequency
  Power Factor A
  Power Factor B
  Power Factor C
  Power Factor Total
  Volts A-Aux Phase Angle

Sub Group: One second updated
Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A
VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Uncompensated VA A
Uncompensated VA B
Uncompensated VA C
Uncompensated VA Total
Uncompensated VAR A
Uncompensated VAR B
Uncompensated VAR C
Uncompensated VAR Total
Uncompensated Watt A
Uncompensated Watt B
Uncompensated Watt C
Uncompensated Watt Total
THD Volts A
THD Volts B
THD Volts C
THD Current A
THD Current B
THD Current C

K Factor Current A
K Factor Current B
K Factor Current C
Internal Temperature
Sub Group: Harmonic Values
Item: 0 - 127th Harmonic on selectable Harmonic Magnitude
(Voltage Phases A, B, and C; Current Phases A, B, and C)
Sub Group: Internal Inputs, States
Item: Internal Inputs 1-8
Sub Group: Phase Angles
Item: Phase A-N Voltage
Phase B-N Voltage
Phase C-N Voltage
Phase A Current
Phase B Current
Phase C Current
Phase A-B Voltage
Phase B-C Voltage
Phase C-A Voltage
Volts A-Aux Phase Angle
Voltage Phase Sequence
Sub Group: Flicker
Item: Flicker: PInst Volts A
Flicker: PInst Volts B
Flicker: PInst Volts C
Flicker: PST Volts A
Flicker: PST Volts B
Flicker: PST Volts C
Flicker: PLT Volts A
Flicker: PLT Volts B
Flicker: PLT Volts C
Group: Averages
Sub Group: Thermal Average
Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A

VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Sub Group: Block Window Average
Item: VA
VAR
Watt
Sub Group: Pulse Accumulation/Aggregation Block Window Average
Item: Internal Inputs #1 - #8
Aggregators #1 - #4
Sub Group: Rolling Window Average
Item: Predictive VA
Predictive VAR
Predictive Watt
VA
VAR
Watt
Sub Group: Voltage and Current Means
Item: Volts PN
Current P
Volts PP
Group: External I/O Devices
Sub Group: Analog Input Modules
Item: Module 1: Analog Input 1 - Analog Input 8
Module 2: Analog Input 1 - Analog Input 8
Module 3: Analog Input 1 - Analog Input 8
Module 4: Analog Input 1 - Analog Input 8

- To designate the limit as either above or below a percentage of the Full Scale, click once in each Settings column and select the desired setting from the pull-down menu.
- To set the percentage of the Full Scale that will trip the limit, enter the value in the % of FS column. GE Communicator software automatically calculates the Primary value.
- Combination Limit 3 is the logical combination of Limit 1's state and Limit 2's state.

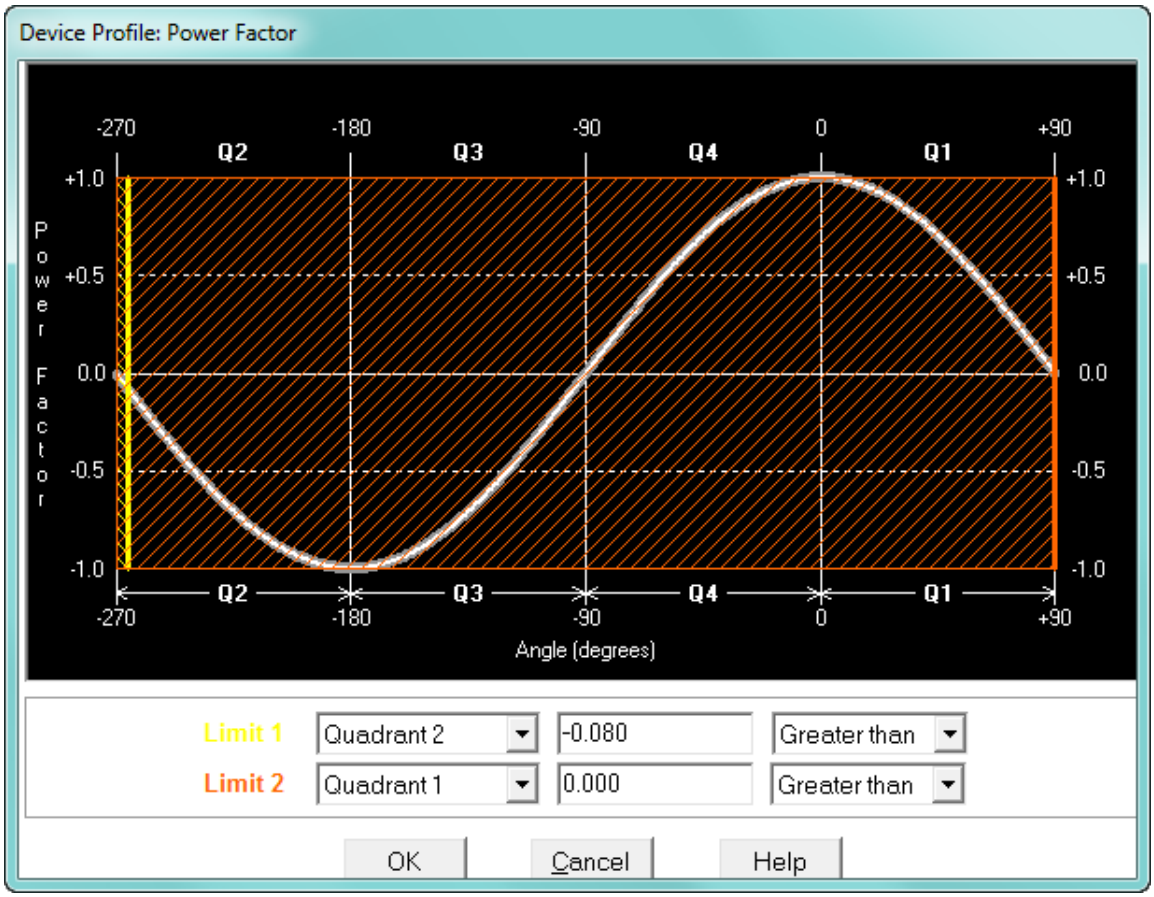
Example 1
Limit I D
Type: 1 Second Readings

Channel: Volts AN
Limit 1 Setting: Limit exceeded if Volts AN is below 120 F.S.
Limit 2 Setting: Limit exceeded if Volts AN is above 80 F.S.
Combination Limit 3 Setting: AND
If Limit 1 AND Limit 2 are tripped (e.g., the reading is 100F.S.), then Limit 3 is tripped.

Example 2
Limit I D
Type: 1 Second Readings
Channel: Volts AN
Limit 1 Setting: Limit exceeded if Volts AN is above 120 F.S.
Limit 2 Setting: Limit exceeded if Volts AN is below 80 F.S.
Combination Limit 3 Setting: OR
If either Limit 1 OR Limit 2 is tripped (e.g., the reading is 75), then Limit 3 is tripped.

- Full Scales settings are shown in the lower left of the screen. These values are set in the Limits and Waveform Full Scales section of the Device Profile (12.1.2 *Limit and Waveform Full Scales*).

4. Power Factor is broken into four quadrants. Selecting the Full Scale value brings up a screen that lets you set a limit in two of the four quadrants.
   - To set the power factor limits, double click on any of the power factor settings in the Limit 1 or Limit 2 columns. You will see the Power Factor screen.



- To set a limit: from the pull-down menus, select a quadrant and Less Than or Greater Than (Full Scales). Enter the power factor number. The graph will illustrate your selections by shading the out of limit bands. The area of the graph not covered by shading is within normal operational range.

NOTE

Whether you see method 1 Quadrants (Q1 +Lag, Q2 -Lag, Q3 -Lead, Q4 +Lead) or method 2 Quadrants (Q1 +Lag, Q2 -Lead, Q3 +Lag, Q4 -Lead) depends on the setting in the Power Factor Display field of the Labels setting (see "Labels" on page 12-8).

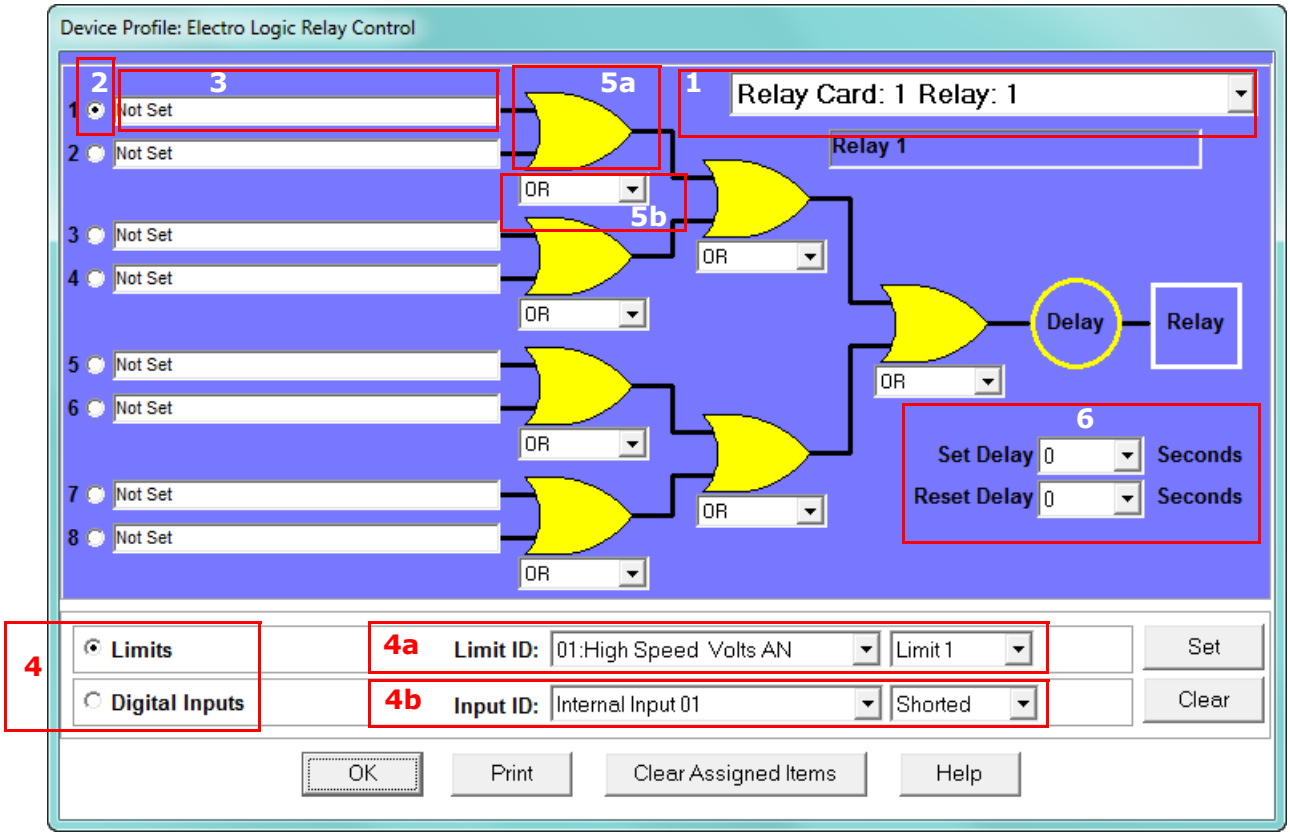
NOTE

The EPM 9800 device is a four-quadrant meter. Therefore, limits can be set for capacitive and inductive PF when generating or consuming power.

5. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.3.2 Electrologic™ Relay Control

1. From the **Power Quality and Alarm Settings** menu, double-click on the **ElectroLogic Relay Control** line. You will see the screen shown below.



ElectroLogic Relay Control lets you set up a logic tree to control the meter's optional relays. Each relay can be programmed individually. The end result of the logic tree is to set, or not set, a relay, with an optional programmed Set Delay and/or Reset Delay.

The initial inputs to the logic tree are chosen from among the 32 Limits and 40 Digital Inputs (both internal and external inputs). The gates, in several stages, perform logical combinations (AND, OR, etc) on pairs of inputs (either initial inputs or the outputs of earlier gates), and in combination produce an ultimate "true" or "false" state to drive the relay open or closed.

For example, one of the gates is AND. For data to pass an AND gate, both pieces of data must be “true.” For a Limit to be true, the data must be in the Out-of-Limit condition on either Limit 1, Limit 2, or both (you decide which). For a Digital Input to be true, it must be in the condition you specify - either Open or Shorted.

The gates used in ElectroLogic Relay Control are used as follows:

OR: If either or both of the two conditions are true, the gate is passed

AND: If both of the conditions are true, the gate is passed

Hysteresis: For Limits only, the if the Limit is within the programmed hysteresis value, the gate is passed

XOR: If either of the two conditions are true, but not both, the gate is passed

NOR: If either of the two conditions are true, the gate is not passed

NAND: If both of the two conditions are true, the gate is not passed

NHysteresis: For limits only, if the Limit is within the programmed hysteresis value, the gate is not passed

NXOR: If either of the two conditions are true, but not both, the gate is not passed

NOTE

See Example settings after step 6.

2. To assign an item to the Relay Logic tree:
   - Select the relay card/module from the pull-down menu - see number 1 in the screen on the previous page.
   - Select an input for the tree by clicking on a radio button next to numbers 1 through 8 - see number 2 in the screen on the previous page.
   - Choose Limits or Digital Inputs by clicking on the radio button in front of the word - see number 3 in the screen on the previous page.
   - From the pull-down menus, select the limit (Limit ID) or input (Input ID) you want to assign to this Relay Logic tree input (step b) - see number 4 in the screen on the previous page.
     - For a limit, use the second pull-down menu to select Limit 1, Limit 2, or Combination - see number 4a in the screen on the previous page.
     - For an input, use the second pull-down menu to select Shorted or Open - see number 4b in the screen on the previous page.
   - Press Set to confirm your selection. The software places the selection in the appropriate field in the screen.
3. After you assign all the Relay Logic inputs, select the gates that will be used to combine the logic to trigger the relay. To select a gate type, either:
   - Click on the gate (yellow fields) - see number 5a in the screen on page 12-77.

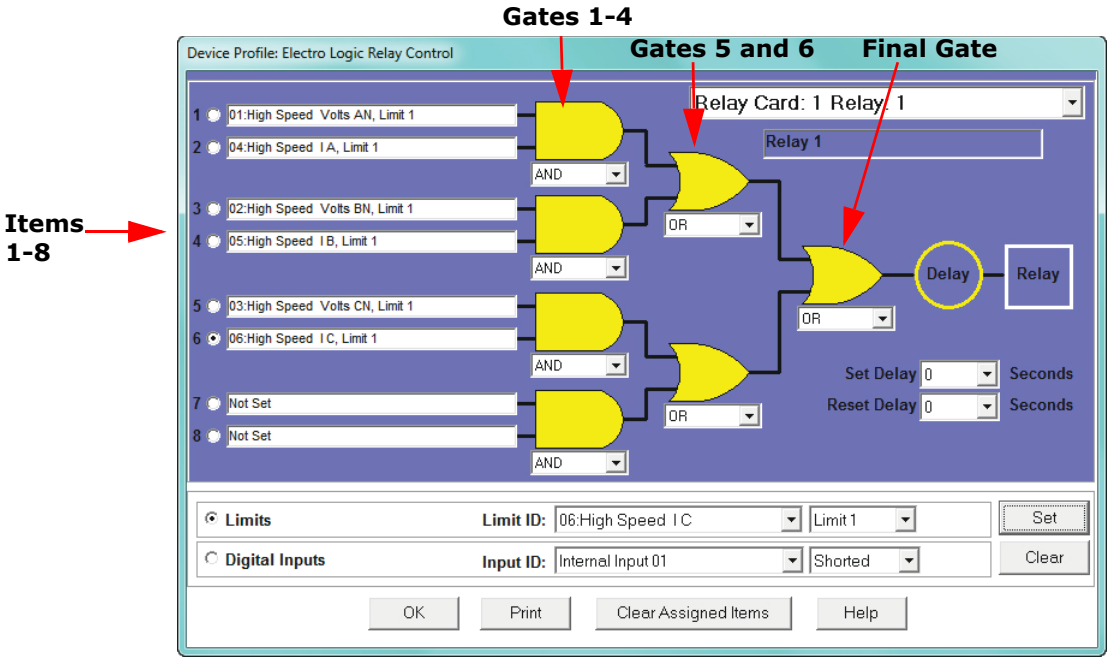
- Choose a gate type from the pull-down menu below the gate - see number 5b in the screen on page 12-77.

4. If you want, select Set Delay and Reset Delay from the pull-down menus. You can choose between 0 and 255 seconds. Use these fields if you want to program a delay before the relay is set, or before it is reset - see number 6 in the screen on page 12-77.
5. To change items on the Relay Logic tree, follow the previous steps.
   - To clear an item from the Relay tree, click on that item and click the **Clear** button.
   - To clear all items from the Relay Tree, click the **Clear Assigned Items** button.
6. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

NOTE

In order to use this screen, you must have purchased at least one External Relay Output module. For more details on external Output modules, see Chapter 14 "External I/O Modules".

Example of an ElectroLogic Relay Logic Tree:



Inputs 1 through 8 are set to High Speed Volts AN Limit 1, High Speed Amps A Limit 1, High Speed Volts BN Limit 1, High Speed Amps B Limit 1, High Speed Volts CN Limit 1, High Speed Amps C Limit 1, Not Set and Not Set. The four first gates are AND gates, and the remaining three gates are OR gates.

Each first level gate looks at the state of the two limits, and the result is "true" if and only if both the inputs (Voltage Limit and Current Limit) are "true" (Out-of-Limit Condition). The second and third level gates look at the state of the earlier gates, and their results are "true" if either one (or both) of the previous gates are "true". The end result is a relay that is energized if one or more of the three phases (A, B, and/or C) is currently Out-of-Limit on both its voltage and current Limit 1 tests.

12.3.3 PQ Thresholds (Waveform Recording)

The PQ Thresholds/Waveform Recording capability allows the meter to act as a high-speed waveform recorder to record any anomaly that occurs within a cycle of duration. This provides a user with advanced waveform analysis including pre- and post- waveform recording.

The meter has the capability to record both surges and sags of the measured signals. A voltage surge is any event that increases the RMS voltage for one cycle, calculated every half cycle. A voltage sag is a dip in the RMS of one cycle of voltage, calculated every half cycle. A current fault (or surge) is also calculated in the same manner. When the RMS value of any of these triggers exceeds the threshold settings, the meter will trigger a waveform capture.

The Power Quality (PQ) and Waveform Thresholds setting determines at what point the EPM 9800 meter executes a waveform capture and/or records a power quality event.

See Chapter 19 "Viewing Logs" for instructions on viewing Waveform and PQ logs.

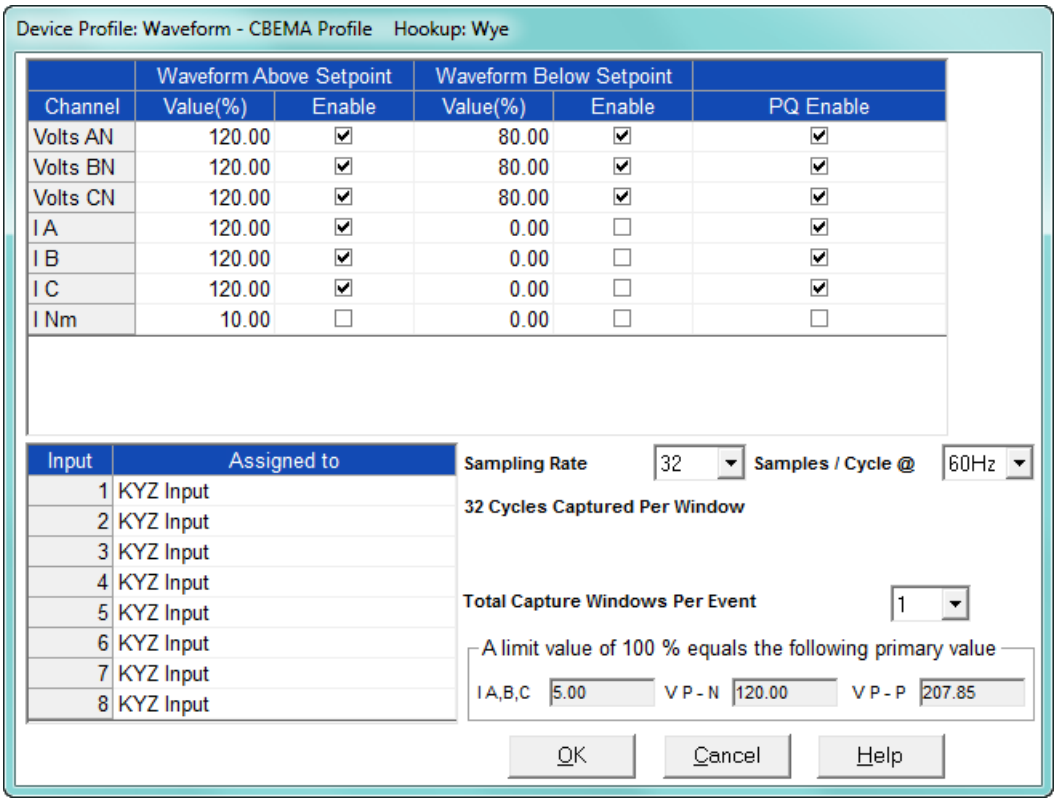
PQ and Waveform Thresholds are given as a percentage of the Full Scales (% of FS). Set the Full Scales in the Limits and Waveform Full Scales setting of the Device Profile (see "Limit and Waveform Full Scales" on page 12-4). Full Scales are based on the CT and PT ratios set in the CT, PT Ratios and System Hookup setting of the Device Profile (see "CT and PT Ratios and System Hookup" on page 12-2).

Before programming the PQ and Waveform Thresholds, set the CT and PT ratios and the Limits and Waveform Full Scales.

NOTE

Note on Sampling Rate: A higher sampling rate allows for transients to be monitored. Generally, the meter is set to take 1024 samples per cycle for this purpose. Lower sampling rates have advantages, however, because they allow you to record more cycles of information per event screen. Therefore, low sampling rates are better for long duration events, like motor starts or distribution faults. The meter enables you to tailor its recording for both these applications. For more information on sampling rate, see the table on page 12-84.

1. From the **Power Quality and Alarm Settings** menu, double-click on the **PQ Thresholds (Waveform Recording)** line. You will see the screen shown below



2. To set the threshold for a PQ event and waveform capture, enter the desired percentage of Full Scale in the Value() column of the Above Setpoint and Below Setpoint sections. Full Scales are shown in the lower right corner of the screen.

NOTE

NOTE ON CBEMA: The CBEMA plotting is a power quality standard known worldwide for recording the amount of damage voltage transient conditions have done to the equipment being monitored. The meter automatically records this information. For CBEMA purposes, program internal setpoints for voltage below 90 and above 110 of full scale (+/- 10 from the nominal voltage). These setpoints are defined by the ITI (CBEMA) specification. The ITI (CBEMA) Curve is published by Information Technology Industry Council (ITI). You can set a recording with tighter voltage limits to trigger a waveform recording. However, CBEMA plotting will be based only on the
limits internally set.

NOTE

NOTE ON SETTING THE METER TO RECORD CURRENT FAULTS: The voltage setpoints are used to record voltage type events, such as voltage surges, sags and transients. The current settings are used to record faults on the line or in-rush currents from devices such as motors. Typically, to catch these events, set the limit to above 200 of full scale.

- Current Waveform Clipping Thresholds: EPM 9800 Meter; Class 20A - ±90A Peak before clipping; Class 2A - ±18A Peak before clipping
- Voltage Waveform Clipping Thresholds: EPM 9800 Meter SE, S, DE Hardware - ±800V Peak before clipping; LV Hardware - ±200V Peak before clipping

- High Speed Inputs: The High Speed Inputs field allows you to see which High Speed Inputs are enabled for Waveform recording.

NOTE

IMPORTANT! You assign the High Speed Input to its trigger in the High Speed Inputs screen (see "High Speed Inputs" on page 12-65).

- Samples per Cycle: To choose the Samples per Cycle to be recorded at 60 Hz, click on the **Sampling Rate** pull-down menu. Choose from 16, 32, 64, 128, 256 and 512 samples per cycle. The number of samples per cycle you choose will inversely affect the number of cycles per capture.
    - If you select 256, a Capture Only pop-up screen will ask you to select Volts A, B, C or I A, B, C.
    - If you select 512, a Capture Only pop-up screen will ask you to select one of the individual channels.

The following table illustrates the effects of sampling rate on the number of cycles captured. Increasing the Sampling Rate increases Waveform definition, but reduces the length of the observed window. The approximate length of the observed window is shown in the last column.

Effects of Sampling Rate					
Samples Per Cycle	**Channels**		**Samples Per Channel**	**Cycles Per Capture**	**Time (Approx)**
	Analog	HSI			
16	7	8	1024	64	1 Second
32	7	8	1024	32	½ Second
64	7	8	1024	16	¼ Second
128	7	8	1024	8	1/8 Second
256	3	8	2048	8	1/8 Second
512	1	8	4096	8	1/8 Second

For example, for observed events of approximately ½ second, a sampling rate of 32 samples per Cycle, or less, should be used.

NOTE

NOTE ON WAVEFORM EVENT CAPTURES: A screen of data is one capture. If you set Total Captures to 3 and you are recording at 16 samples per cycle, you will record:

16 Samples3 x 64 = 192 cycles of recorded waveforms
128 Samples3 x 8 = 24 cycles of recorded waveforms

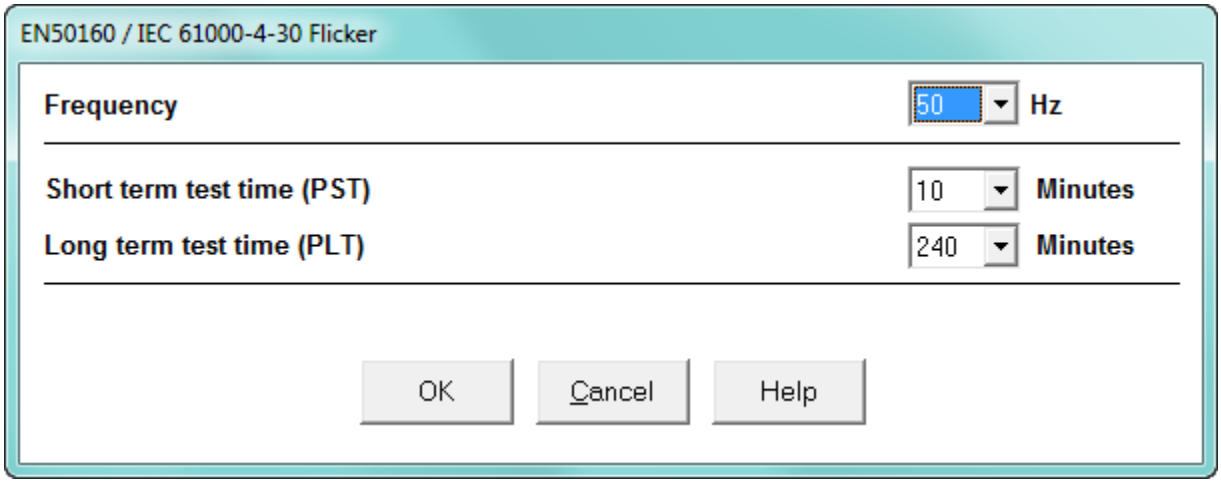
With the 2 Megabyte module, you have a total of 64 captures; with the 4 Megabyte module, you have a total of 96 captures. You can partition the memory in any fashion required by your application. There is no limitation on the amount of cycles that can be recorded per event.

3. To choose the total amount of captures, click on the **Total Captures** pull-down menu. Select from 0 to 96 captures. The higher the number, the more information you will be "stringing together."
4. When all changes are entered, click **OK** to return to the main Device Profile screen. For changes to take effect, you must click the **Update Device** button. This sends the new profile to the meter.

12.3.4 EN 50160/IEC 61000-4-30 Flicker

With the EN 50160/IEC 61000-4-30 Flicker screen, you can set the test times for the Flicker function.

1. From the Device Profile screen double-click on the EN50160/IEC61000-4-30 Flicker line. You will see the screen shown below.



2. From the pull-down menus, select:

- Frequency (50 or 60Hz) - this field is used to calculate the harmonics and interharmonics associated with the set fundamental frequency.
- Short Term Test Time (1-10 minutes, in minute increments) - PST is defined over a ten minute interval. Standard IEC 61000-4-15 requires 10 minutes for PST.
- Long Term Test Time (10-240 minutes, in ten minute increments) - the standard requires 120 minutes, and is calculated from the PLT values.

3. When all changes have been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

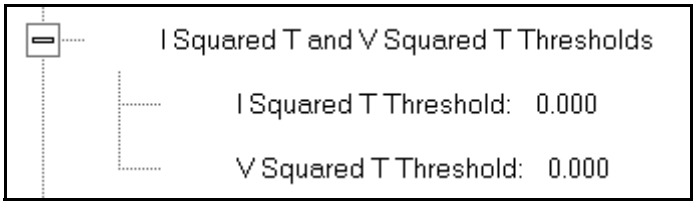
NOTE

Flicker is discussed in detail in Chapter 23 “EN 50160 / IEC 61000-4-30 Power Quality Analysis”.

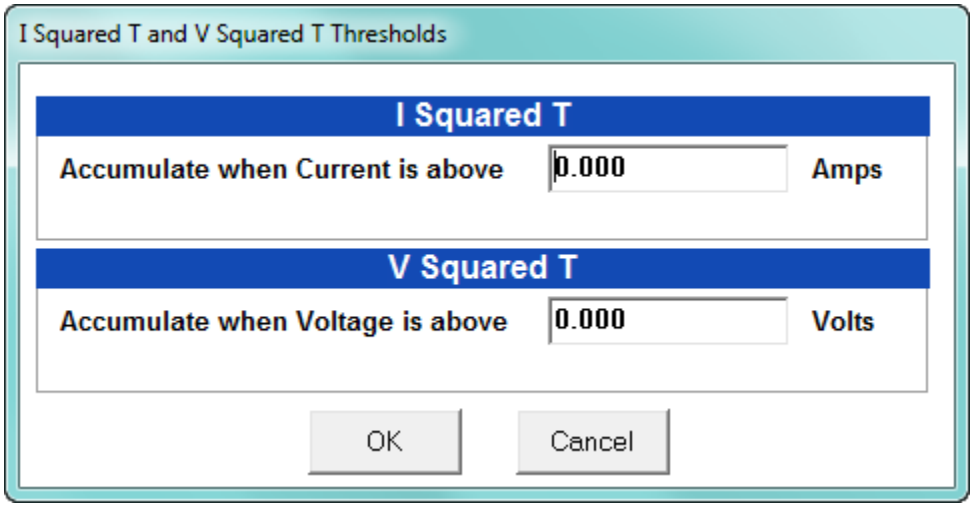
12.3.5 I Squared T and V Squared T Thresholds

With the I Squared T and V Squared T Thresholds screen, you can set the point at which the meter accumulates current and Voltage. This feature is used to calculate wear on circuit breaker contacts.

1. From the **Power Quality and Alarm Settings** menu, click on the **+** button next to I Squared T and V Squared T Thresholds or double-click on that line. You will see the submenu shown below, which shows the current settings for the meter.



2. Double-click one of the settings to open the I Squared T and V Squared T Thresholds screen, shown below.



3. Enter the thresholds in the I Squared T and V Squared T fields.
4. Click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.3.6 High Speed Inputs

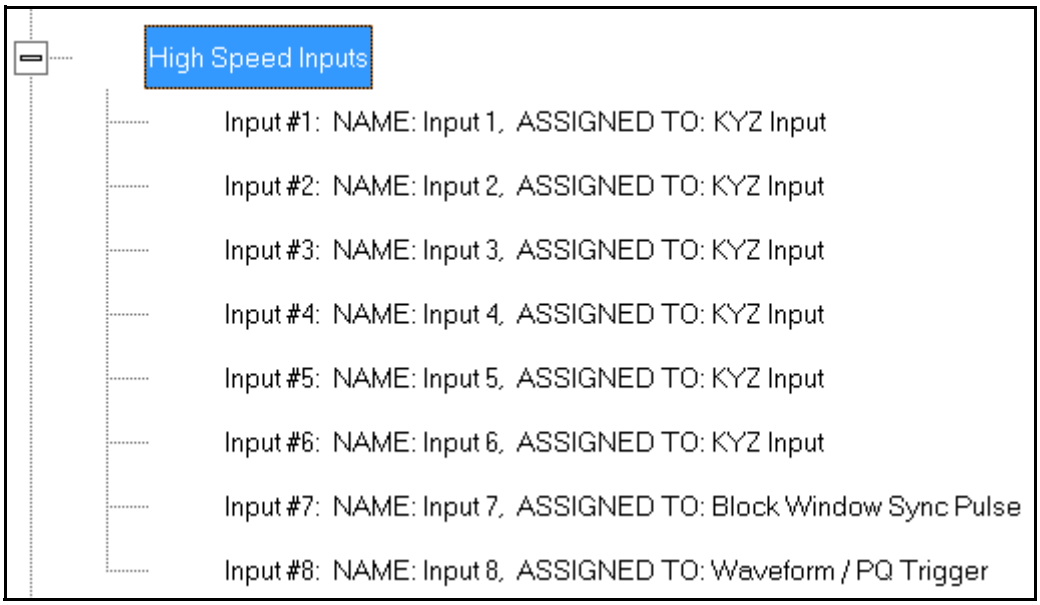
The EPM 9800 meter's built-in High Speed Inputs can be used in two ways:

- Attaching status contacts from relays, breakers or other devices for status or waveform initiation
- Attaching the KYZ pulse outputs from other meters for pulse counting and totalizing

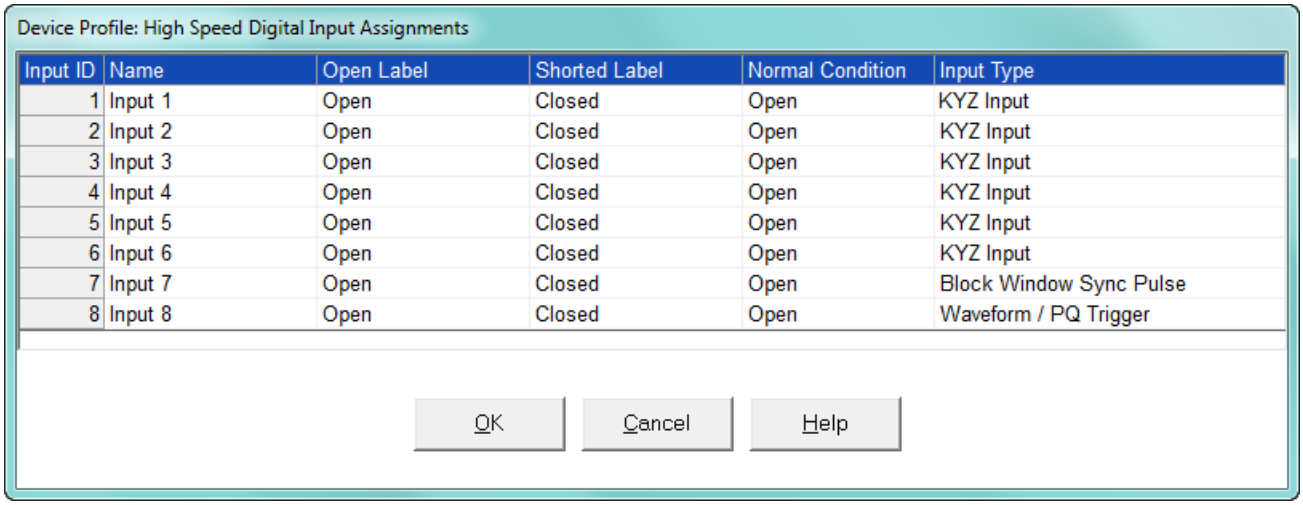
Even though these inputs are capable of being used as high speed digital fault recording inputs, they serve a dual purpose as KYZ counters and totalizers. The function in use is programmable in this setting of the Device Profile, which lets you label the eight High Speed inputs and to specify their status.

- Labeling the inputs allows you to determine the source of status change when data is later analyzed.
- This feature lets you set the High Speed Inputs' status as a KYZ input, a trigger for waveform capture or PQ recording, or as a means of synchronizing the meter.
- In the Pulse Accumulations setting (12.2.10 *Pulse Accumulations*), you can assign the High Speed Inputs' counts to be accumulated in one of four internal Aggregators of the meter.

1. From the **Power Quality and Alarm Settings** menu, double-click on the High Speed Inputs line or click on the **+** button next to it. You will see the submenu shown below.



2. Double-click any of the Input lines. You will see the screen below.



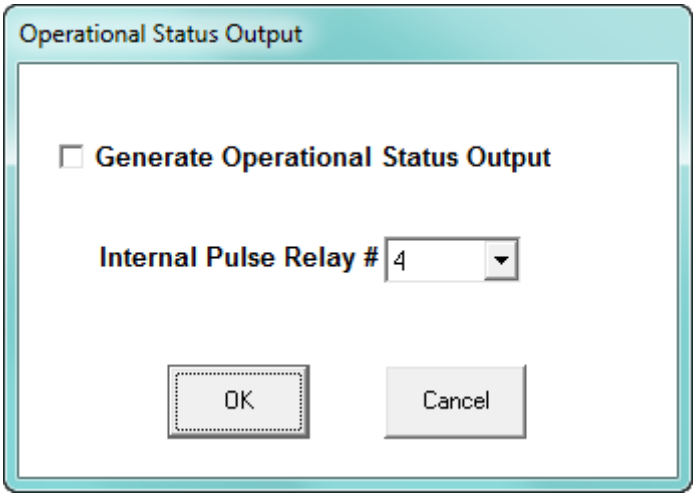
Input ID	Name	Open Label	Shorted Label	Normal Condition	Input Type
1	Input 1	Open	Closed	Open	KYZ Input
2	Input 2	Open	Closed	Open	KYZ Input
3	Input 3	Open	Closed	Open	KYZ Input
4	Input 4	Open	Closed	Open	KYZ Input
5	Input 5	Open	Closed	Open	KYZ Input
6	Input 6	Open	Closed	Open	KYZ Input
7	Input 7	Open	Closed	Open	Block Window Sync Pulse
8	Input 8	Open	Closed	Open	Waveform / PQ Trigger

3. Double-click a field to enter the following:
   - Name
   - Open Label
   - Shorted Label
   - Normal Condition
4. Click on the **Input Type** field to select an option from the pull-down menu. The available selections are:
   - KYZ Input - select this option to designate the input as a pulse (KYZ) input.
   - Waveform/PQ Trigger - select this option if you want the input to trigger a waveform/PQ recording (see "PQ Thresholds (Waveform Recording)" on page 12-61).
   - Block Window Sync Pulse - select this option if you want to synchronize the meter with pulses from the input (see "Demand Integration Intervals" on page 12-21).
5. When you have finished making your selections, click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.3.7 Operational Status Output

This setting of the Device Profile lets you assign a relay to the operational status of the meter. The relay can then be monitored by another connected device.

1. From the **Power Quality and Alarm Settings** menu, double-click on the **Operational Status Output** line. You will see the screen shown below.



2. Select the relay you want to assign from the pull-down menu and click the checkbox.
3. When you finish making your selections, click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.4 Trending Profile Settings

This section of the Device Profile enables you to configure parameters for the EPM 9800 meter's two historical logs.

1. From the Device Profile screen, click on the **+** button next to Trending Profile Settings or double-click on the **Trending Profile Settings** line. You will see the menu shown below.

2. Double-click on one of the Trending lines to access the programming screens.

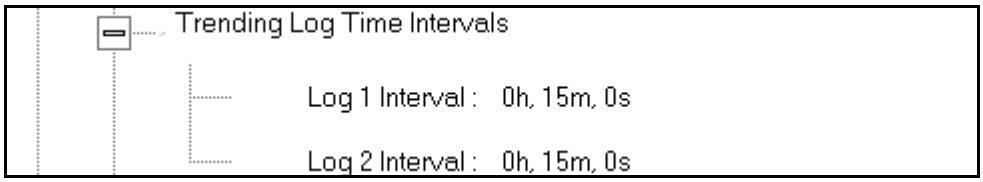
NOTE

NOTE on Load Profile Recording: Load Profile recording is a subset of the EPM meter's more general logging and trending capability. The same screens are used for setup, but Load Profile recording only deals with accumulated values; Energy (Wh), reactive Energy (VARh) and apparent power (VAh).
Historically, Load Profile recording referred to recording of quadrant 1 Energy (Wh) because electromechanical meters only measured energy and were designed to prevent reverse rotation outside of quadrant 1.

12.4.1 Programming the Trending Log Time Intervals

The Trending Log Time Intervals setting determines the interval at which the Historical logs take a "snapshot" of data. To set the parameters for the logs, see 12.4.2 *Programming the Trending Setup*. See Chapter 16 "Databases and Log Data" for information on retrieving logs and Chapter 19 "Viewing Logs" for information on viewing logs.

1. From the Trending Profile Settings menu, double-click Trending Log Time Intervals or click the + button next to it. You will see the submenu shown below. The submenu shows the interval set for both Historical logs.

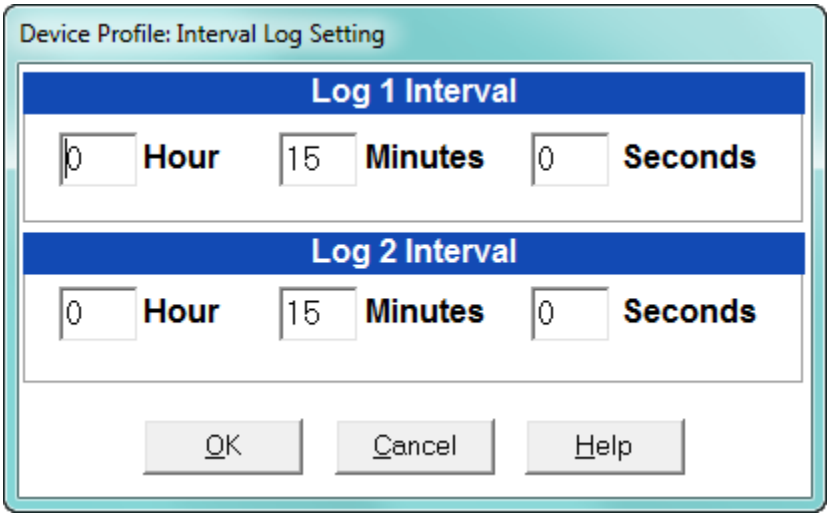


2. To change the interval for a Historical log, double-click on one of the logs.

NOTE

NOTE: You can also access the Interval setting screens from the Trending Setup screens (see "Programming the Trending Setup" on page 12-69).

3. You will see the screen shown below. Enter the interval you want.

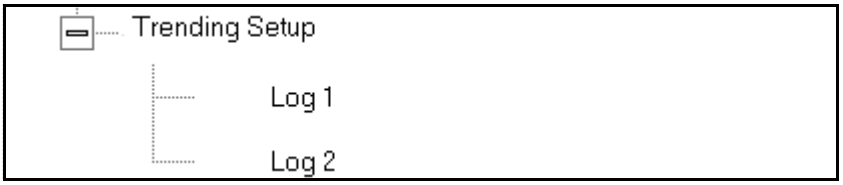


4. Click **OK** to save your changes. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

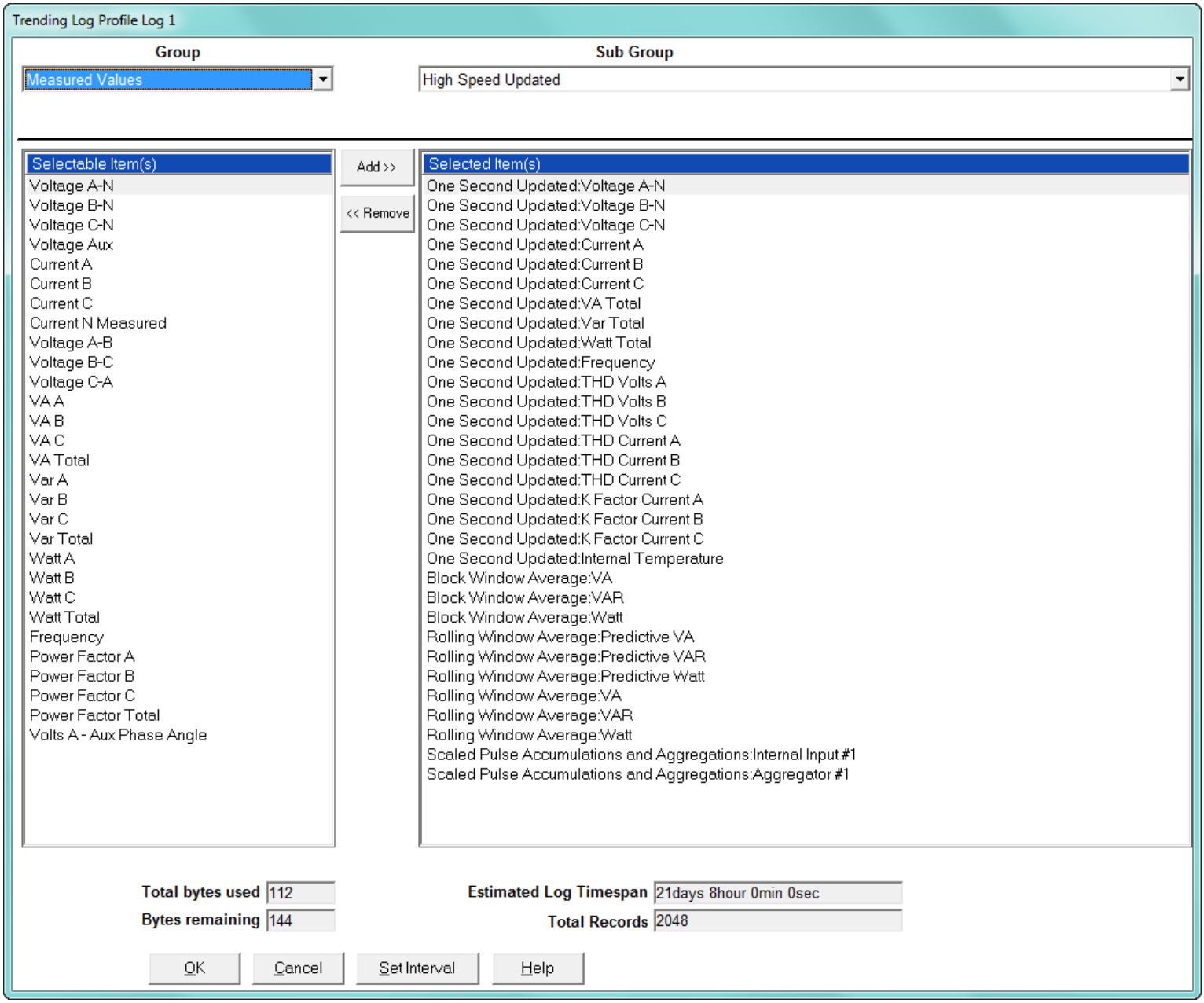
12.4.2 Programming the Trending Setup

The Trending Setup controls the channel assignments for the Historical logs. See Chapter 16 "Databases and Log Data" for instructions on retrieving logs.

1. From the Trending Profile Settings menu, click on the + button next to Trending Setup or double-click on the Trending Setup line. You will see the submenu shown below.



1. Double-click on the log whose settings you want to configure. You will see the Trending Log Profile screen for the log you selected. An example screen is shown below.



2. Make changes to this screen according to your application requirements.

   a. Group: Using the pull-down menu, select the type of snapshot. The options are: Measured Values, Averages, Accumulators, Interval Accumulators, External Output Devices, TOU Cumulative Dmd.

   b. Sub-Group: Using the pull-down menu, select a channel for the snapshot. The options are: Fifty Millisecond Updated; One Second Updated; Harmonic Values; Internal Inputs, States; Phase Angles; Flicker.

c. Sub-Group 2: With some selections, a second sub-group field will be shown underneath the first one. Select a value for this field from the pull-down menu.

d. Highlight items in the Selectable Items(s) box and click Add to include the selections in the Log. The items will be copied to the Selected Item(s) box. To remove an item from the log, highlight the item in the Selected Item(s) box and click Remove or double-click the item. The item will be removed from the Selected Item(s) box.

NOTE

- To select multiple items, hold Control while highlighting the items.
- To select a range of items, click the first item, hold Shift, and click the last item.
- Move the cursor to the lower left corner of an item, or group of items, to view its size in bytes.

e. Click HHF if you want to convert files to HHF format for use with MV-90.
See Chapter 16 “Databases and Log Data” for details.

f. Click Check HHF if you want to check if current settings are compatible with the HHF Converter.

NOTE

- You will not see the HHF options unless you have enabled the HHF converter using the Options menu. See Chapter 20 “Other Functions and Screens” for instructions.

g. The Total bytes used and Bytes remaining fields display the amount of memory used for each record of the log. The meter assumes 256 bytes of memory for each record. Total memory is determined at time of purchase.

h. The Estimated Log Timespan field displays the length of the time between the first and last records in the log when it is full.

i. The Total Records field displays the total number of records that will be in the log when it is full.

j. Click Set Interval to open the Interval Log Setting screen (see “Programming the Trending Log Time Intervals” on page 12-68).

3. When all changes have been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

12.5 External I/O Modules

This setting of the Device Profile allows you to set up the meter's optional external Input/Output modules (see Chapter 14 "External I/O Modules" for more information on the I/O modules). I/O modules work as Modbus slave devices. The meter polls these modules to get the data from them. I/O modules generally have default RS485 Modbus addresses. So, they don't have to be configured. Once you set up which module you want, put in the default address and start with the basic configuration of readings you desire to gather.

12.5.1 Configuring the Input/Output Modules

1. From the Device Profile screen, double-click on the External I/O Modules icon. You will see the screen shown below.

Device Profile: I/O Modules

Module Number	Type	Assigned Address	EPM Settings	Module Settings	Log / Limit ID
1	20mAON8: Analog Out 4 - 20mA 8 ch	132	Edit	Edit	AO Module 1
2	4PO1: KYZ Output	160	Edit	Edit	KYZ Module 1
3	4RO1: Digital Output	156	Edit	Edit	DO Module 4
4	8AI1: Analog In 0 - 1mA 8 ch	136	Edit	Edit	AI Module 1
5	No Device Assigned				
6	No Device Assigned				
7	No Device Assigned				
8	No Device Assigned				
9	No Device Assigned				
10	No Device Assigned				
11	No Device Assigned				
12	No Device Assigned				
13	No Device Assigned				
14	No Device Assigned				
15	No Device Assigned				
16	No Device Assigned				

OK Cancel Help

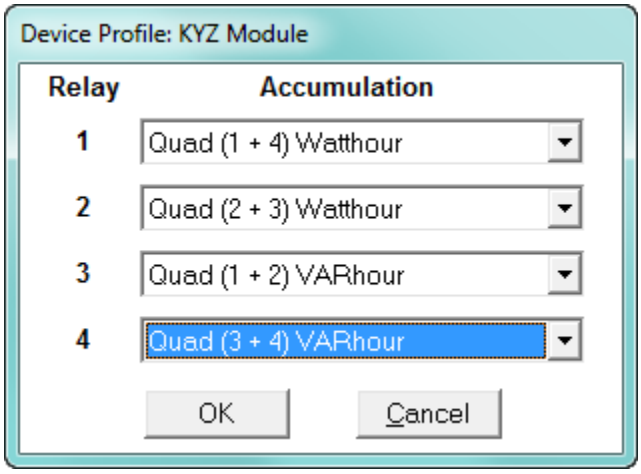
2. Click in the Type column and use the pull-down menu to select the specific module you want to add. The Assigned Address, EPM settings, and Module settings you can make depend on the module you are configuring. The modules and settings are as follows:

Module	Assigned Address*	EPM Setting**	Module Setting
4PO1 - KYZ Output	160*	Click to Edit Relay Accumulations	Click to enter Transmit Delay and configure KYZ outputs' Watt/pulse, rollover and minimum pulse width.
20mAON4	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
20mAON8	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
1mAON4	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
1mAON8	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
4RO1 - Digital Output	156*	Click to configure Relays	Click to enter Transmit Delay
8AI1 - Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI2- Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI3 - Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI4 - Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8DI1 - Digital Status Input Module	164*	Click to configure Digital Inputs	Click to enter Transmit Delay and configure Channel settings

* The Assigned address on this screen is the address the meter uses to identify the I/O module. The default is the factory set address, which you can change by clicking in the field and choosing a new address from the pull-down menu. This address is not the actual I/O module address. You set that from the I/O Devices menu; see Chapter 14 "External I/O Modules" for instructions.

**When you click in this field you see an Edit button. Click the button to open a screen that lets you edit that module. See the following example screens.

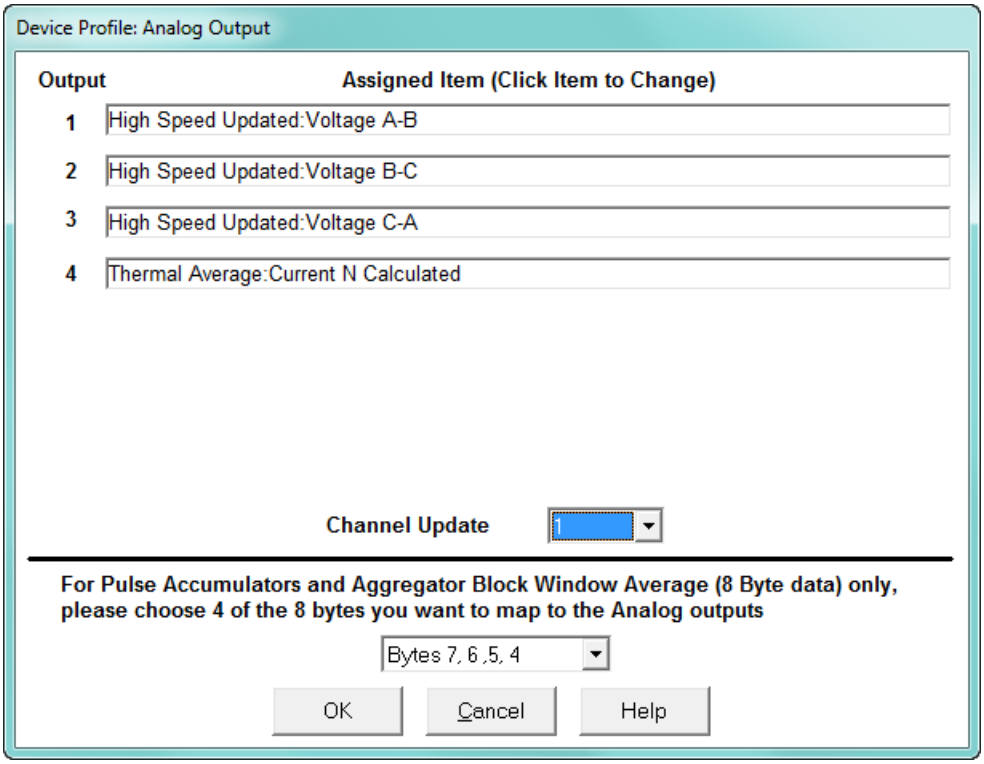
Figure 12-1: 4PO1 Screen



This screen allows you to assign a KYZ output to an accumulator. Click on the pull-down menu to select accumulation configuration for each of the 4 relays. The options are:

- Disabled
- Quad (1+4) Watthr
- Quad (2+3) Watthr
- Quad (1+2) VARhr
- Quad (3+4) VARhr
- Quad (1+2+3+4) VAhr
- Quad 1 Watthr
- Quad 2 Watthr
- Quad 3 Watthr
- Quad4 Watthr
- Quad 1 VARhr
- Quad 2 VARhr
- Quad 3 VARhr
- Quad 4 VARhr
- Quad 1 VAhr
- Quad 2 VAhr
- Quad 3 VAhr
- Quad 4 VAhr
- +Qh Total
- -Qh Total
- Internal Input (#1-8) Totals
- Accumulation (#1-4) Totals
- External Digital Input Modules (1-4) Inputs (#1-8)
- I Squared T (A, B, C)
- V Squared T (A,B,C)

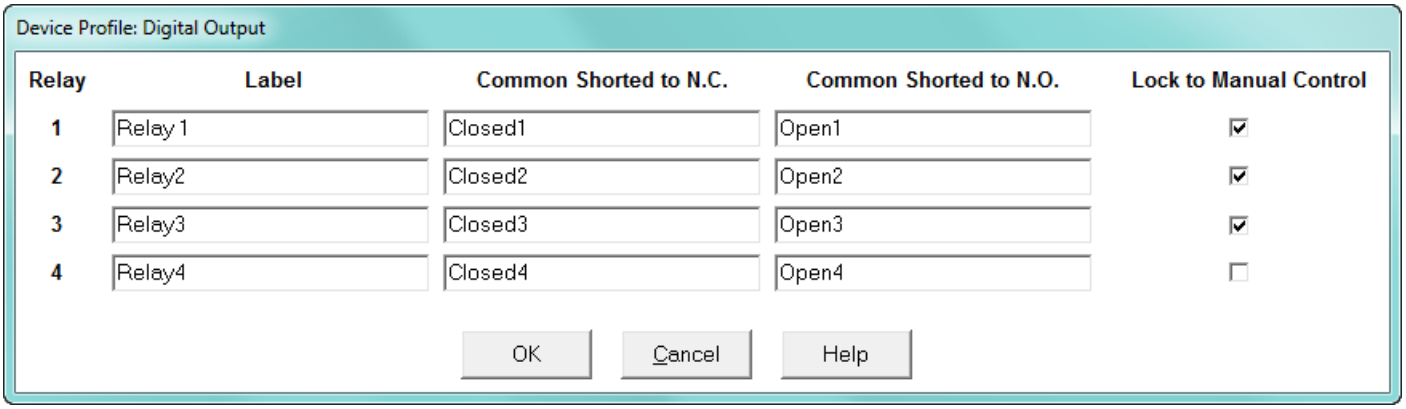
Figure 12-2: 20mAON4 Screen



Click in Output channels 1-4 to assign them to a parameter. The other Analog Output Modules - 20mAON8, 1mAON4, and 1mAON8 have similar setting screens, except for the number of channels you can program.

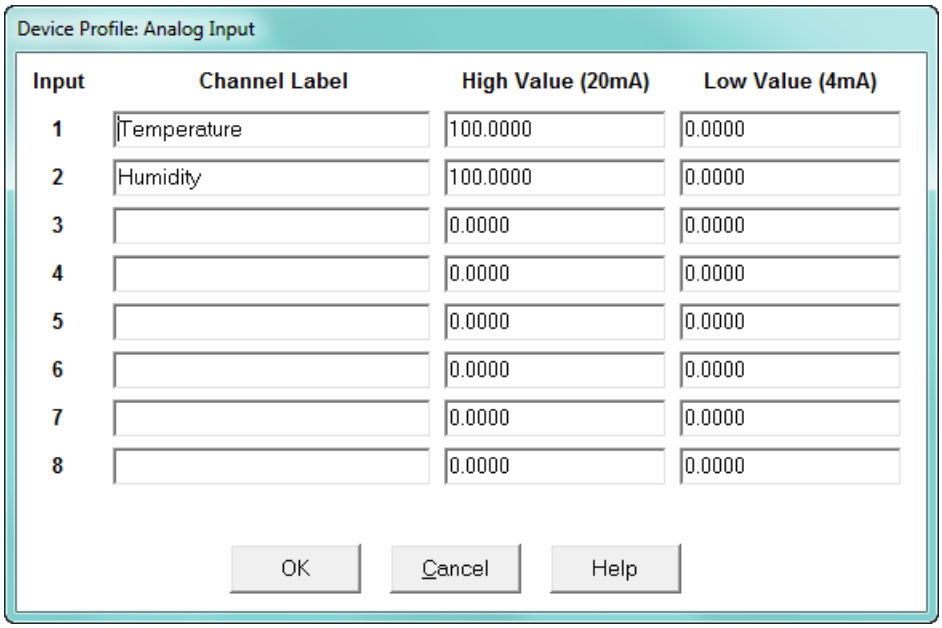
- The analog outputs are used to send a variable current dependent on the programmed reading. This screen lets you select the readings to output.

Figure 12-3: 4RO1 Screen



Click in the Relay fields 1-4 to enter relay label, common shorted to N.C., common shorted to N.O., and check the box to lock the relay to manual control. When a relay is locked to manual control, it cannot be used in ElectroLogic Relay Control (see 12.3.2 *Electrologic™ Relay Control* for information on ElectroLogic Relay Control).

Figure 12-4: Analog Input Screen



Click in Input Channels 1-8 to assign a label and a High and Low Value.

- The two analog input module's settings are the same, except for the Inputs' high and low range.
- The High and Low Value fields let you map the inputs' high and low range to values that are appropriate for the parameters you are measuring. For example, in the screen above, the first input is measuring temperature. The high value for the input is set to 100, and the low value is set to 0. An input reading of 12mA will translate to 50 for the temperature.
  The Analog Input modules can be trended in the historical logs, and the data can be viewed and graphed in Log Viewer (see Chapter 19 "Viewing Logs" for details).

The readings shown in the logs and graphs will use the setting range programmed in the screen above, i.e., the results will be reported as 0 through 100.

Figure 12-5: Digital Input Screen

Device Profile: Digital Input Option Card in Slot 3

Input	Channel Label	Open Label	Closed Label	Normal State	Rollover
1	Input 1	Opened	Closed	Open	999999999
2	Input 2	Opened	Closed	Open	999999999
3	Input 3	Opened	Closed	Open	999999999
4	Input 4	Opened	Closed	Open	999999999
5	Input 5	Opened	Closed	Open	999999999
6	Input 6	Opened	Closed	Open	999999999
7	Input 7	Opened	Closed	Open	999999999
8	Input 8	Opened	Closed	Open	999999999
9	Input 9	Opened	Closed	Open	999999999
10	Input 10	Opened	Closed	Open	999999999
11	Input 11	Opened	Closed	Open	999999999
12	Input 12	Opened	Closed	Open	999999999
13	Input 13	Opened	Closed	Open	999999999
14	Input 14	Opened	Closed	Open	999999999
15	Input 15	Opened	Closed	Open	999999999
16	Input 16	Opened	Closed	Open	999999999

Initialize OK Cancel

Click in Channel Label's 1-8 to assign a Channel label, Open and Closed label, and Normal State (Open or Shorted) for each of the digital inputs.

NOTE

- The Assigned Address, EPM settings, and Module settings you can make depend on the module you are configuring. The modules and settings are explained fully in the *EPM 9800 Instruction Manual*.
- Port 4 is the only available port for the modules.
- Log/Limit ID is a display only field. It shows the ID GE Communicator software generates to identify this module in the Log Viewer and Limits functions.

3. Click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

GE Communicator

Chapter 13: EPM 9450/9650 Meter

This chapter explains how to configure an EPM 9450/9650 meter's programmable settings, which are stored in the unit's Device Profile. Chapter 7 "Device Profile" contains detailed information on the Device Profile.

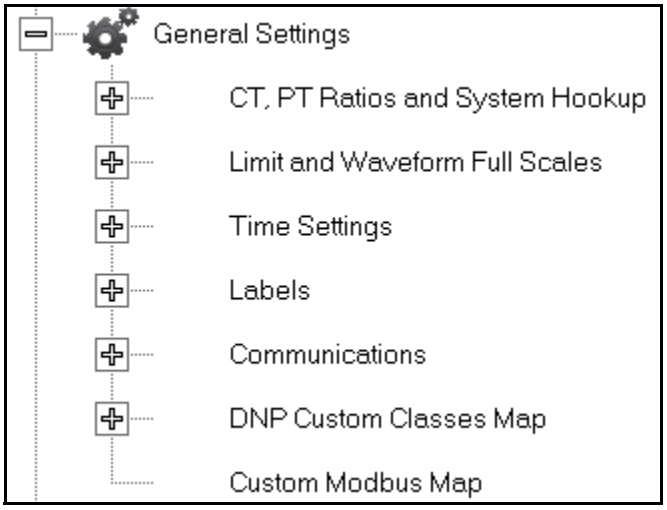
NOTE

The settings shown are Initial Settings for the EPM 9650 meter, unless otherwise noted. Most 9450 Meter settings are similar to the 9650 meter settings.

The EPM 9650 Meter supports DNP Level 2. For details on DNP, see Chapter 22 "DNP 3.0 Configuration", and the *EPM 9650 DNP Guide (GEK-113504)*.

13.1 Device Profile General Settings

1. From the Device Profile screen, double-click on the General Settings line or click on the + button next to it. All of the settings in the General Settings group are listed.



2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the General Settings menu.

13.1.1 CT and PT Ratios and System Hookup

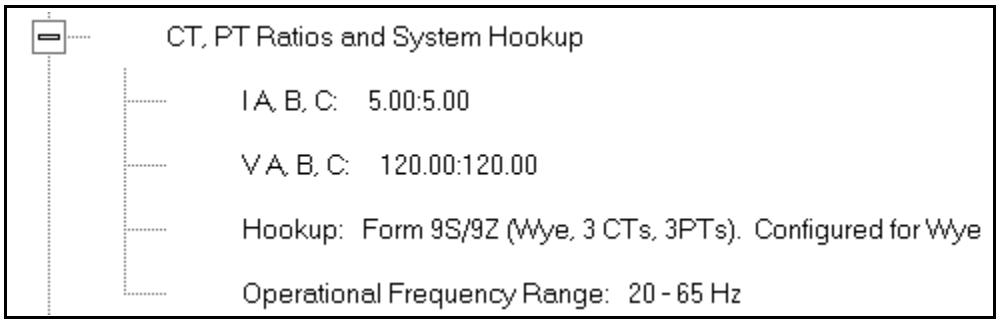
Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

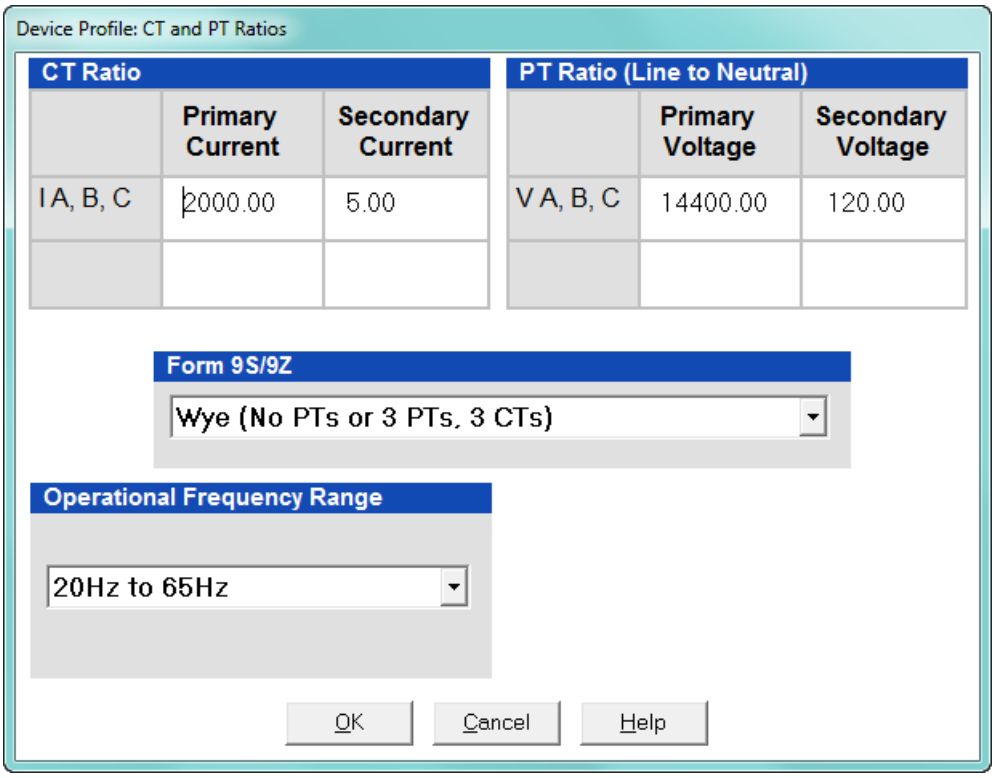
The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

1. From the General Settings menu, click the + button next to CT, PT Ratios and System Hookup. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for CT, PT ratios, connection type, and Operational Frequency range.

2. Double-click on any of the settings. You will see the CT and PT Ratios screen.



3. Make changes to this screen according to your application requirements.

When you change a PT or CT Ratio, GE Communicator software updates the corresponding Full Scale value entered in the Limit and Waveform Full Scales setting. When you click **OK** on this screen, GE Communicator software opens the Limit & Waveform Full Scales screen so that you can verify the settings (see 13.1.3 *Limit and Waveform Full Scales*).

- Enter Primary and Secondary Current and Voltage.
- Using the pull-down menu, choose the Hookup mode that matches the connection you have to the EPM 9450/9650 meter. Choose from the following:
    - Wye
    - Delta 3 CTs
    - Delta 2 CTs
    - 2.5 Element Wye
    - 4 Wire Delta

      This value must be set properly for the meter to calculate readings correctly.

      See the *EPM 9450/9650 Instruction Manual* for connection diagrams.
- Using the pull-down menu, select Operational Frequency Range:
    - 20Hz to 65Hz
    - 350Hz to 500Hz
    - 20Hz to 500Hz

- Select the “300 Volt Secondary” option ONLY if you have a meter with the “B” Option.

NOTE

Warning: Only Select The 300 Volt Secondary Option If You Ordered The Meter With The “B” Option.

If you connect 300 volts to a meter that does not have the “B” option for system voltage, you will damage the meter. Please check the label on your meter and your invoice to make sure you have the “B” Option, for example: PL9650-0-**B**-1-A-2-0-0-0-0.

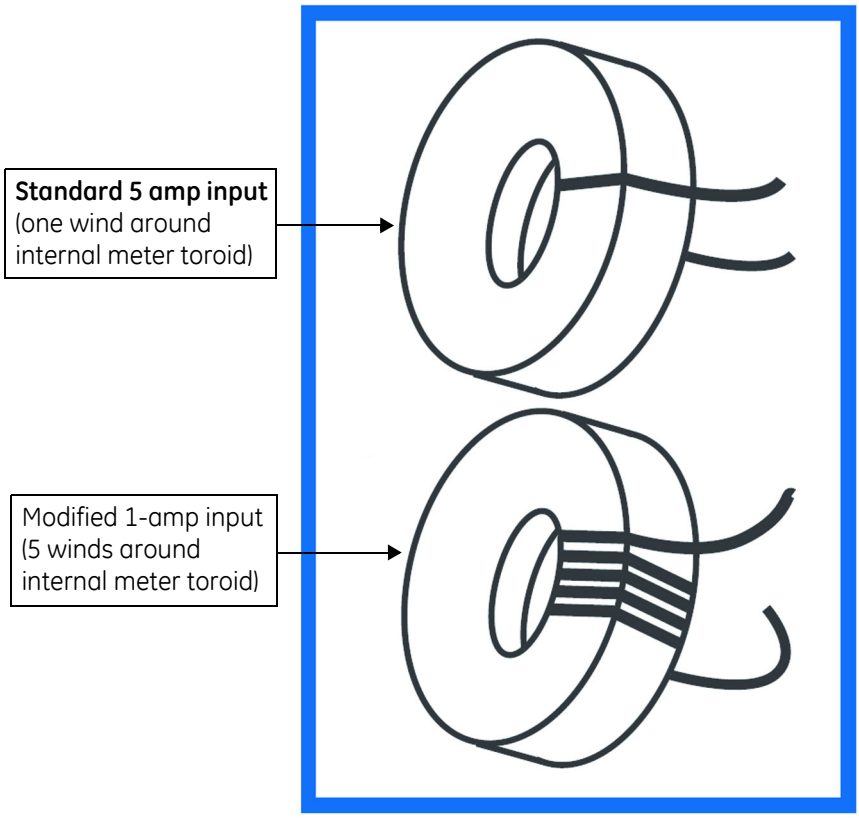
4. Click **OK**. If changes have been made, a message window opens asking you to verify that the Limit Full Scales are correct.
5. Click **OK**. The Limit and Waveform Full Scales screen opens (see 13.1.3 *Limit and Waveform Full Scales*).
6. To implement any changes, click the **Update Device** button to send the new profile to the meter.

   You will see a warning message that logs will be reset, and you will be given the opportunity to retrieve the logs before they are cleared. Resetting the logs prepares the meter for placement in a new installation or change of the meter Transformers.

13.1.2 One Amp Current Input Addendum (Modification Number M10.0)

For special circumstances, the meter can be ordered with one amp current transformers.

This will give the meter a range of 0 - 1 amps with an additional over-range of 1 amp. This option is used where 1A IEC meters are required or extended low current performance is needed and higher current performance is not needed. This option is not used for most 1A installations. The standard Meter has the capability of very accurately monitoring 1A loads and providing extended current overload. This section shows how to change the CT Ratios in the Meter (ONLY EPM 9450 Hardware Rev. A) to reflect the hardware change:



In order to maintain maximum accuracy with one (1) amp current inputs, the wire is wound around the internal toroids five (5) times, instead of the usual one time. This effectively multiplies the current input by five (5) times, to maintain maximum resolution.

Configuring CT Ratios with Modification Number M10.0 (EPM 9450 Hardware Rev. A):

EPM 9650 (and other Hardware Revs) adjust internally for the hardware change.

Because the GE Communicator "sees" the one (1) amp input as five (5) amps, it is necessary to configure the CT secondary to five (5) amps.

Example:

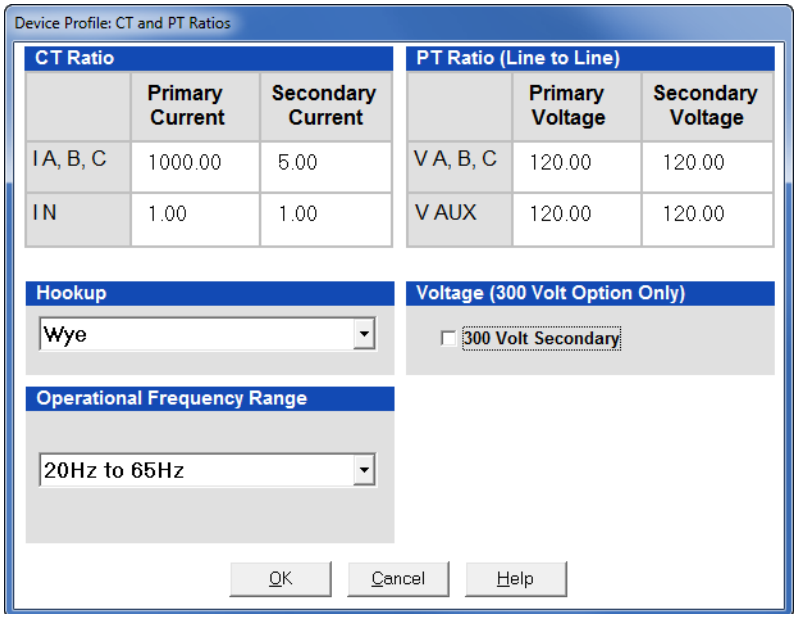
Normal One Amp CT Ratio - 1000:1

Meter M10.0 One Amp CT Ratio - 1000:5

The CT Ratio screen shows the correct input for the typical one amp user:

NOTE

NOTE: This adjustment is for EPM 9450 Hardware Rev. A ONLY.



NOTE

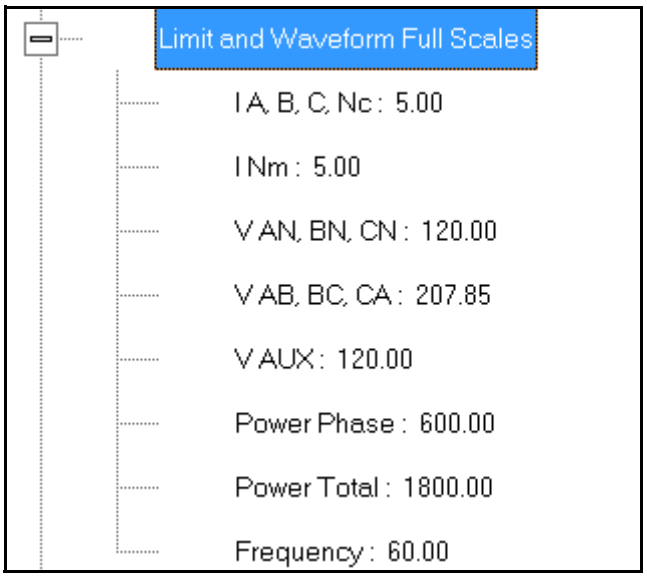
Even though the software is configured from 1000:5, it is actually displaying current from 1000:1 amps. If you are not concerned with maximum accuracy, you can use the standard Meter (without specially ordering the M10.0 option) to display readings from a 0 to 1 amp CT.

13.1.3 Limit and Waveform Full Scales

All Limit and Waveform settings (see 13.1.1 *CT and PT Ratios and System Hookup* and 13.3.5 *I Squared T and V Squared T Thresholds*, respectively) are based on a percentage of the Full Scale. Full Scales are based on the CT and PT ratios (see 13.1.1 *CT and PT Ratios and System Hookup*). The % of Full Scale is defaulted based on the CT and PT ratio. If the user wants, the Full Scales can be adjusted to the actual power system condition, to optimize the triggering conditions.

Set the CT and PT ratios first; GE Communicator software automatically recalculates the Full Scales every time the CT and PT ratios change and presents them for your verification.

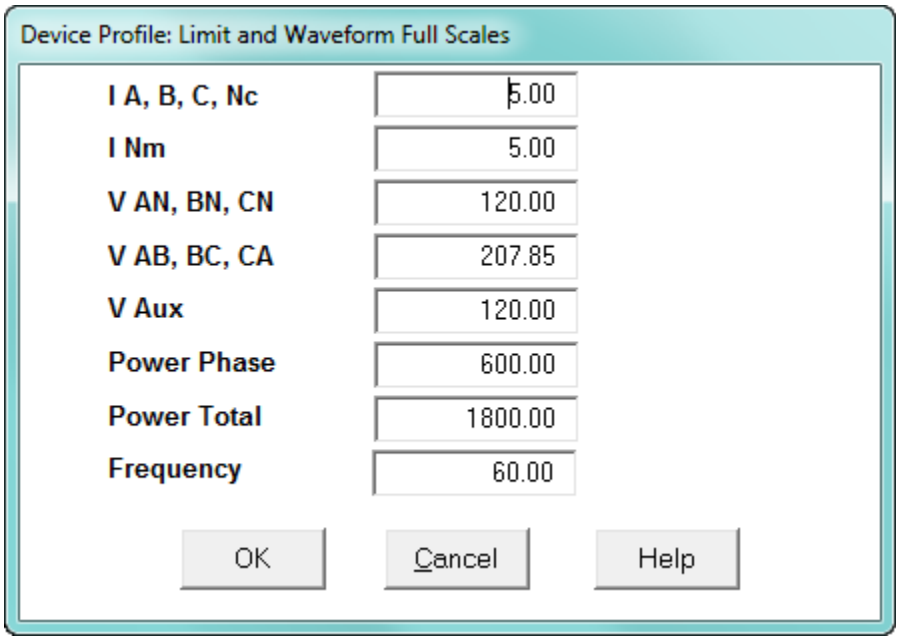
1. From the General Settings menu, click on the + button beside Limit and Waveform Full Scales or double-click on the Limit and Waveform Full Scales line. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for the Limit and Waveform Full Scales. The values shown here are the default meter settings.

Frequency and Voltage values are nominal values. The Power Phase is computed using nominal Voltage and rated maximum current. In most cases the software automatically computes the proper value - you will not need to change it.

2. Double-click any of the settings. You will see the Limit and Waveform Full Scales screen.



3. Enter the Full Scale for each parameter.

NOTE

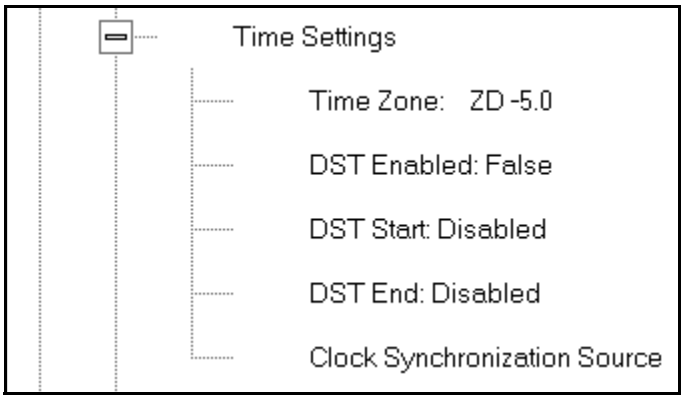
- The Limits and Waveform settings (13.1.1 *CT and PT Ratios and System Hookup* and 13.3.5 *I Squared T and V Squared T Thresholds*, respectively) are based on a percentage of the Full Scales entered here.
- GE Communicator software automatically recalculates the Full Scale Voltages, currents and power every time the CT and PT ratios change. However, frequency is not changed, even if the operational frequency range is changed. **Frequency can only be changed on this screen**.
- Power Phase is the amount of power per each phase; Power Total is the power of all phases combined.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

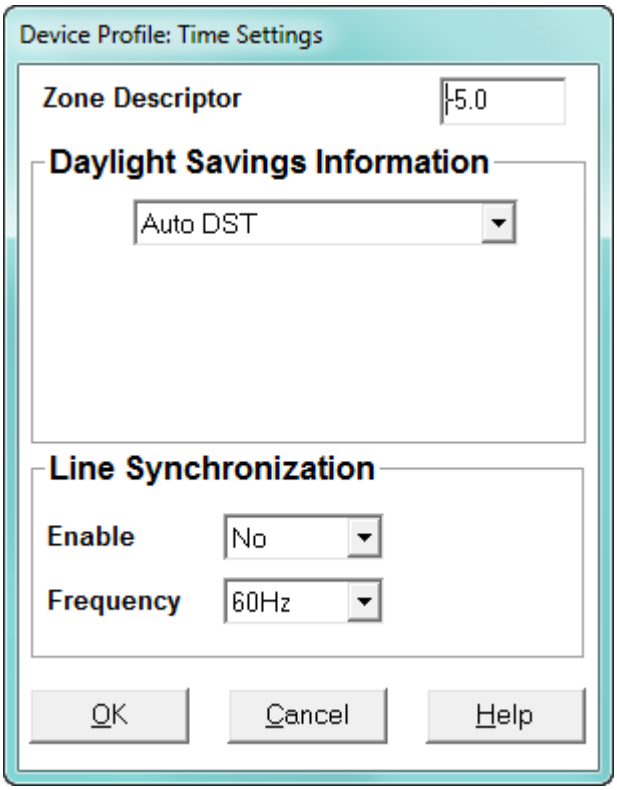
13.1.4 Time Settings

To edit a Device Profile's Time settings:

1. From the General Settings menu, double-click on the Time Settings line. You will see the submenu shown below. DST stands for Daylight Savings Time.



2. Double-click on any of the programmable settings; you will see the Time Settings screen.



3. Make changes to this screen according to your application requirements.
   - Zone Descriptor: A Zone Descriptor sets the time zone for the meter. 0 = Greenwich Mean Time. Consult the chart below to find the Zone Descriptor for your time zone.

GMT Greenwich Mean Time Table (Dublin, London)	
-1.00 Azores	+1.00 Brussels, Paris, Warsaw
-2.00 Mid-Atlantic	+2.00 Athens, Cairo, Helsinki
-3.00 Buenos Aires, Georgetown	+3.00 Baghdad, Kuwait, Moscow, Tehran
-4.00 Atlantic Time (Canada), Santiago	+4.00 Kabul, Baku
-5.00 Eastern Time (USA and Canada), Lima	+5.00 Karachi
-6.00 Central Time (USA and Canada), Mexico City	+6.00 Dhaka
-7.00 Mountain Time (USA and Canada)	+7.00 Bangkok, Hanoi, Jakarta
-8.00 Pacific Time (USA and Canada), Tijuana	+8.00 Beijing, Hong Kong, Singapore
-9.00 Alaska	+9.00 Osaka, Sapporo, Seoul
-10.00 Hawaii	+10.00 Brisbane, Melbourne, Guam, Hobart
-11.00 Midway Island	+11.00 Magadan, Solomon Islands
-12.00 Eniwetok	+12.00 Auckland, Fiji

- Daylight Savings Information:
    - Disabled: Disables an automatic adjustment for Daylight Savings Time.
    - Auto DST: Sets Daylight Savings Time automatically to the pre-2007 standard for the United States: the time changes automatically occur at 2:00 AM (your local time), on the first Sunday in April and the last Sunday in October.
    - Auto DST U.S. EPA 2005: Sets Daylight Savings Time automatically to the 2007 standard for the United States: the time changes automatically occur at 2:00 AM (your local time), on the second Sunday in March and the first Sunday in November.
    - User Defined: Allows you to set the Daylight Savings Time start and end times manually. Fields open that let you set the beginning and ending dates for Daylight Savings Time.
- Line Synchronization: set Enable or Disable and Frequency.
    - Line synchronization uses the frequency zero crossings to provide a time reference for the meter. The basic function of Line Frequency Clock Synchronization is to adjust the real time clock to track the time based on the power line frequency. For this purpose, Phase A voltage only is used.
    - This is the most common method to synchronize a meter's clock. GE recommends that you always select this method unless there is a specific reason not to select it. If the meter is not synchronized to line frequency or IRIG-B, it will default to internal crystal. Different meters differ in terms of drift, but typically meters with 20 ppm crystals will drift 30 seconds per month when set to internal crystal.
    - Line Sync is disabled if an IRIG-B signal is and the unit synchronizes to the IRIG-B signal and doesn't rely on the internal signal unless the IRIG-B signal is lost.
    - **How Time is Adjusted**
      After the clock is synced to the line, the meter periodically checks the cumulative difference between the real time clock in seconds and the line cycle count. If the absolute difference between the two accumulations is more than 1 second or 60 (50) cycles, the clock is adjusted + / - 1 second accordingly.

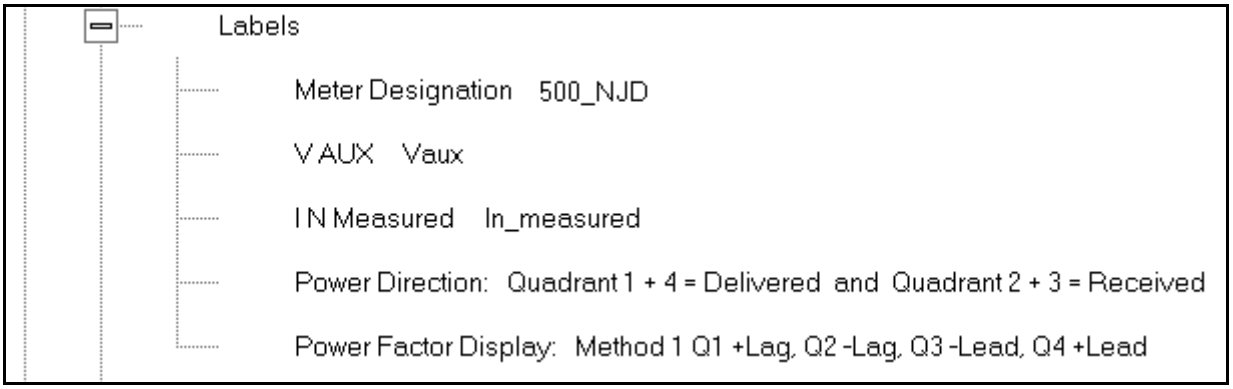
4. To set the meter's on-board clock, use Set Device Time from the Tools Menu (see 20.1 *Tools Menu*).
5. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.1.5 Labels

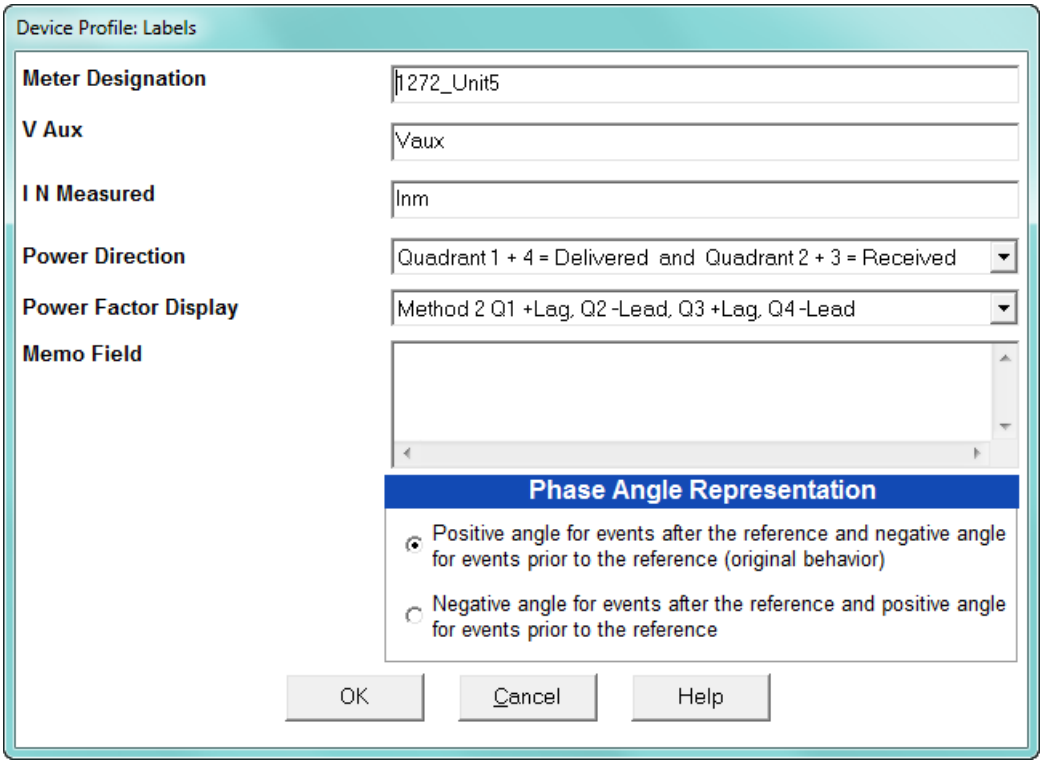
Labels are user-defined names for the EPM 9450/9650 meter and the I N Measured terminal. You also use the Labels screen to select the power direction, and the power factor display.

It is important to label the meter (under "Meter Designation") with a unique name because that label becomes the file name of any logs retrieved from that meter. Duplicate meter designations interfere with retrieved log databases. See Chapter 16 “Databases and Log Data” and Chapter 19 “Viewing Logs” for more details on logs.

1. From the General Settings menu, double-click on the Labels line. You will see the submenu shown below.



2. Double-click on any of the parameters; you will see the Labels screen.



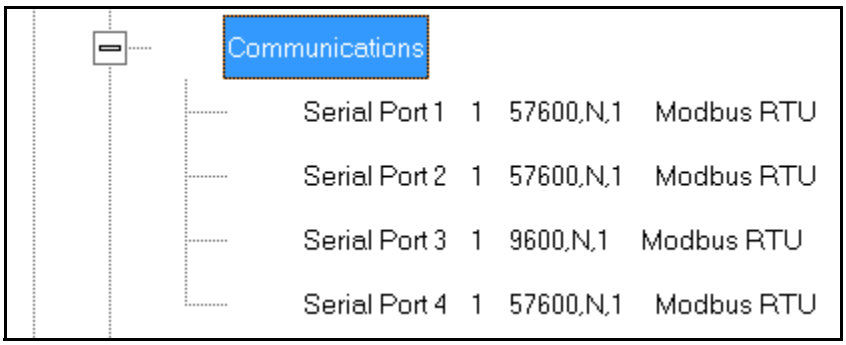
3. Enter labels in the appropriate fields.
   - Meter Designation must be set for partial log retrieval. You can use any character allowed by the Windows® operating system.
     - In English versions the following characters don’t work: \ / : * ? " < > |

- For meters used internationally by multilingual users, we recommend you use only alphanumeric characters allowed by your operating system.
- Your selection in Power Direction determines which quadrants of Watt-hours are considered Received and Delivered.
- Your selection in Power Factor Display determines the display of Quadrants in the Power Factor screen.
- The Memo field is used to enter notes about the meter, such as the location, or other relevant details.
- The Phase Angle representation determines how the voltage phase angles are represented. 90 of users will use the default, which is the first radio button: "Positive angle for events after the reference and negative angle for events prior to the reference'; however, you can choose the opposite display by selecting the second radio button, if you wish.

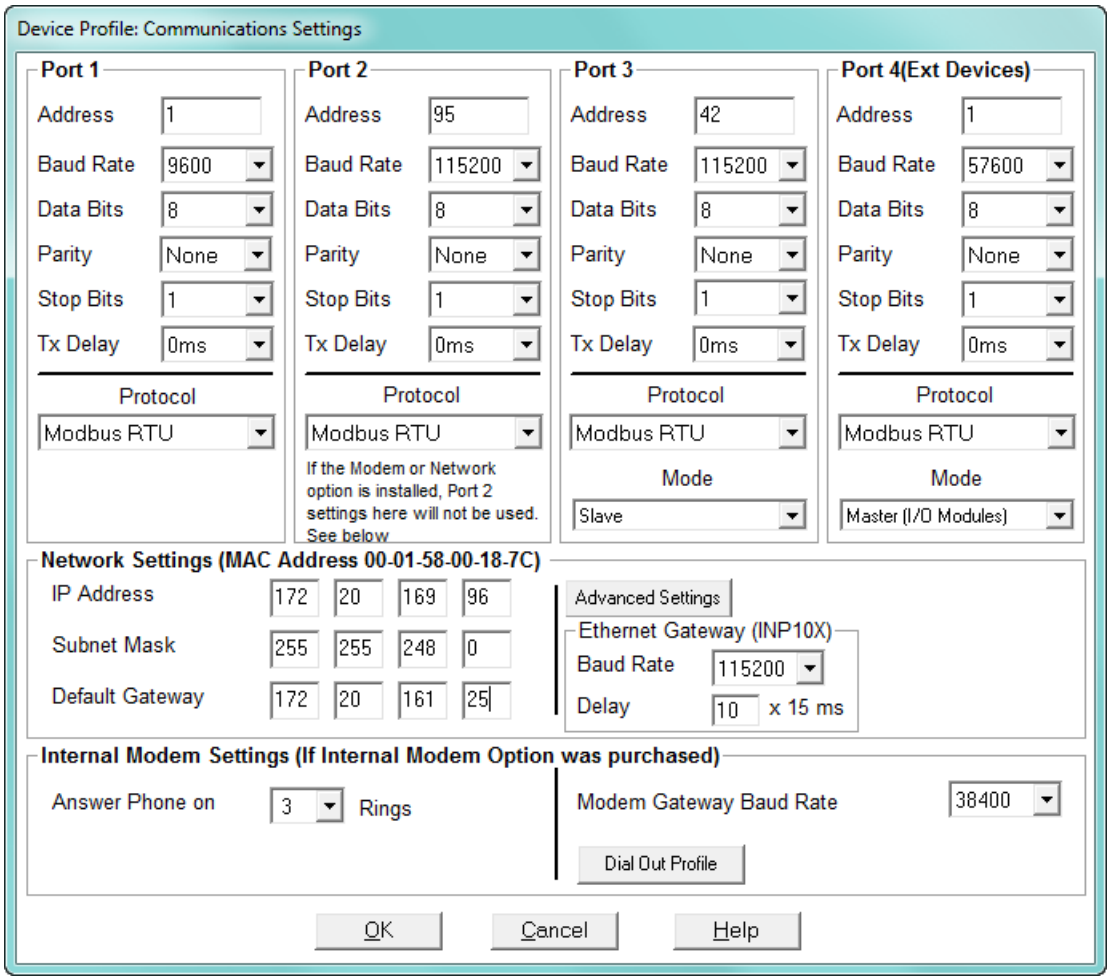
4. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.1.6 Communications

1. From the General Settings menu, double-click on the Communications line. You will see the submenu shown below.



2. Double-click on any of the settings (e.g., "Serial Port 1"): you will see the Communications Settings screen.



This screen displays the current Device Profile settings for the EPM 9450/9650 meter's 4 Communications ports: address, baud rate, data bits, parity, stop bits, Tx (Transmit) delay, (communication) protocol, and mode. You may use the one of the EPM External Displays to learn the current baud rate, address and communication protocol of each meter port. *See the EPM 9450/9650 Instruction Manual* for details.

NOTE

- When an EPM 9450/9650 meter has the Internal Network option (Communication Option 1) Port 2 is unavailable and any settings in the Port 2 fields are ignored.
- Port 2 settings are ignored when the Internal Modem option (Communication Option 2) is installed and the address is set to 1.
- Port 3 is factory set to the EPM External Display's baud rate of 9600. The External Display only communicates at Address 1. You must use Port 3 or Port 4 to connect any external devices, such as a EPM External I/O module.
- Port 3 and Port 4 are Master (I/O modules)/Slave selectable. If you use Port 3 as an I/O Module port, you can use one of the other ports for the display (change the baud rate

to 9600 and set address to 1). For all External I/O Devices, set the Communication Protocol to Modbus RTU.

3. Make changes to this screen according to your application requirements by clicking on the box or pull-down menu of any of the following settings:
   - **Address**: assign an address to each port to communicate with other devices. Multiple EPM meters on an RS485 bus must each have a unique address set for the port that is connected to the bus.
   - **Baud Rate**: from the pull-down menu, select 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. The baud rate entered in this field must match the baud rate of the device connected to the EPM 9450/9650 meter at this port. Use 9600 for modem connections.
   - **Data Bits**: use the pull-down menu to select from: 5, 6, 7 or 8. For Modbus RTU and ASCII, leave the data bits at 8.
   - **Parity**: use the pull-down menu to select from: None, Even, Odd, Mark or Space. For Modbus RTU and ASCII, leave the parity at None.
   - **Stop Bits**: use the pull-down menu to select from: 1, 1.5 or 2. For Modbus RTU and ASCII, leave the stop bits at 1.
   - **TxDelay (Transmit Delay)**: use the pull-down menu to select from: 0ms, 10ms, 20ms, 30ms, 40ms, 50ms, 60ms, or 70ms. Leave the Tx delay at 0ms unless you are using equipment that requires a delay in the response time, such as a radio modem.
   - **Protocol**: use the pull-down menu to select from Modbus RTU and Modbus ASCII. Direct connections made through GE Communicator software must use either Modbus RTU or Modbus ASCII protocol (we recommend Modbus RTU). Modem connections made through GE Communicator software must use Modbus ASCII only. See Chapter 3 “Connecting to a GE Meter” for details.
   - Mode (Port 4 only): If you are using Output modules, set this port to Master (I/O modules) mode. Set the port to operate at 57600 baud.
   - Internal Network Option: If your meter has the Internal Network Option (Communication Option 1), see your Network Administrator for the correct settings to enter into the Network Settings fields. Settings will vary from network to network.
   - If your meter has Communication Option 1(10/100BaseT and Combo Card), you will see the Advanced Settings button: click it to open a screen that lets you set Network card features; see Chapter 21 “Total Web Solutions” for details.
   - Internal Modem Settings: If your meter has this option:
     - Set the number of Rings to Answer from the pull-down menu.
     - Set the Baud Rate to 57600, or to match your system's baud rate.
     - Click Dial-Out Profile to access the Modem Programming screen: see Chapter 24 “Configuring Dial-In/Dial-Out” for instructions on using the Modem Dial In/Dial Out Function.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button. This sends the new profile to the meter.

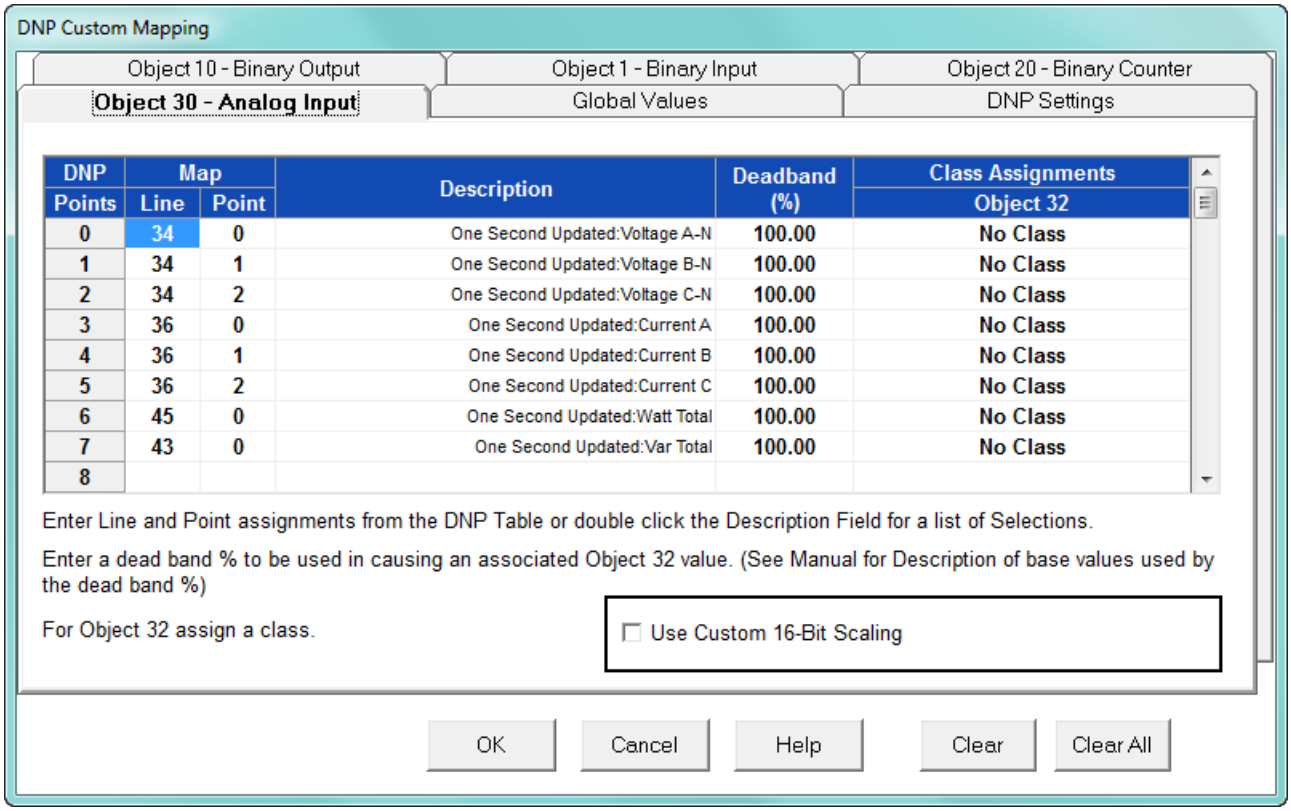
NOTE

IMPORTANT!

- In order to prevent communications problems, be careful when making changes in the Communications Settings screen. For example, if you change the baud rate of the port connected to a computer, be sure to make the same change to the computer port's baud rate. If you change a port's address, be sure to update the address settings of any device that communicates with the port.
- The baud rate of the port used by the EPM External Display should always be set to 9600 and the address set to 1.

13.1.7 DNP Custom Class Map

The DNP Custom Class Map lets you set up DNP communication for the meter. From the General Settings menu, double-click on the DNP Custom Classes Map line and on the DNP Level 2 line. You will see the screen shown below.



DNP Points	Map Line	Map Point	Description	Deadband (%)	Class Assignments Object 32
0	34	0	One Second Updated:Voltage A-N	100.00	No Class
1	34	1	One Second Updated:Voltage B-N	100.00	No Class
2	34	2	One Second Updated:Voltage C-N	100.00	No Class
3	36	0	One Second Updated:Current A	100.00	No Class
4	36	1	One Second Updated:Current B	100.00	No Class
5	36	2	One Second Updated:Current C	100.00	No Class
6	45	0	One Second Updated:Watt Total	100.00	No Class
7	43	0	One Second Updated:Var Total	100.00	No Class
8					

For details on programming the DNP settings, see Chapter 22 “DNP 3.0 Configuration”.

13.1.8 Custom Modbus Map

The custom Modbus map for the EPM 9450/9650 meter can position up to 256 unique items (or the equivalent of 2048 registers, whichever you reach first) to readily provide the functionality you want from your meter. In addition, you can customize selected values for

format type, Scaling, byte order, data size, etc. This allows a user to optimize Modbus registers by putting them in a particular order and/or format to make the SCADA poll more quickly and efficiently.

1. From the General Settings menu, double-click on the Custom Modbus Map line. You will see the screen shown below.

Custom Modbus Map

Item	Modbus Map Line	Modbus Map Point	Number of Registers	Start Register	Group	Channel	Format	Data Size	Unit	Primary / Secondary	Absolute Value	Byte Order	Display/ Modulo/Offset
1	18	0	2	412289	Tenth Second Phase to Neutral Volts	Volts AN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
2	18	1	2	412291	Tenth Second Phase to Neutral Volts	Volts BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
3	18	2	2	412293	Tenth Second Phase to Neutral Volts	Volts CN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
4	54	0	2	412295	Thermal Avg Measured N Current	I Nm	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
5	55	0	2	412297	Thermal Avg Calculated N Current	I Nc	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
6	537	0	2	412299	Scaled +/- Wh, Q 1 - 4 VAh and VARh	Quad(1+4) Watt Hour	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	
7	411	0	2	412301	Analog Input 1 - 8, Module 1	Input # 1	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
8	584	0	2	412303	Int Scaled +/- Wh, Q 1 - 4 VAh and VARI	Quad(1+4) Watt Hour	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
9	134	1	2	412305	Harmonics Volts A Mag # 0-7	#1	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
10	134	2	2	412307	Harmonics Volts A Mag # 0-7	#2	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
11	233	0	1	412309	Internal Inputs States	Inputs 1-8	Normal	2				MSB, MSb	
12	212	0	2	412310	Phase Angle Volts(AB,BC,CA)	Volts AB	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
13	212	1	2	412312	Phase Angle Volts(AB,BC,CA)	Volts BC	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
14	212	2	2	412314	Phase Angle Volts(AB,BC,CA)	Volts CA	Unsigned Integer	4 Byte	1		No	MSR, MSB	0 to +360
15	455	0	2	412316	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V AN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
16	455	1	2	412318	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
17	455	2	2	412320	Instantaneous Flicker V AN,BN,CN	Instantaneous Flicker V CN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A
18	464	1	2	412322	Long Term Flicker V AN,BN,CN	Long Term Flicker V BN	Unsigned Integer	4 Byte	1	Secondary	No	MSR, MSB	N/A

OK Clear all Clear Cancel Help Registers 35 of 2048

Data entry is straightforward. Each entry field is described below. Note that not all selections appear on the screen at the same time. Use the scroll buttons to view additional data/entry fields on the screen. Certain entries (such as Format, Data Size, etc.) have different allowable selections depending on the data point used. The pull-down menu adjusts to provide the appropriate selections for each data point.

- Data Point Selection: there are two different ways to select a data point:
    - Refer to the EPM 9450/9650 meter's Modbus map and find the associated line and point for the value you want. When you enter those values into the screen table, the software displays the associated group and channel.
    - Double-click the Group field. From the pull-down menus, select a group and its associated channel value. The software displays the map and line values.
- Number of Registers: this field is display only. The software computes the number in this field based on the data size selected in the Data Size column.
- Start Register: this field is display only. The software assigns and adjusts Start register numbers to take into account previous entries and data sizes. The Start register is the number of the first register used in polling. The Start registers are shown as 4x to describe them as holding registers, for SCADA applications.
- Format: from the pull-down menu, select a format type for a value, such as Signed Integer, Unsigned Integer, and 4 Byte IEEE Float.
- Data Size: from the pull-down menu, select the number of bytes you want to represent the data point: 2 or 4.
- Unit: if the polled value is viewed as an integer, the Unit field tells the software where to place the decimal point.

  Examples
    - If you select .01, a polling value 1234 is interpreted as 12.34.
    - If you select 100, a polling value 1234 is interpreted as 123400.

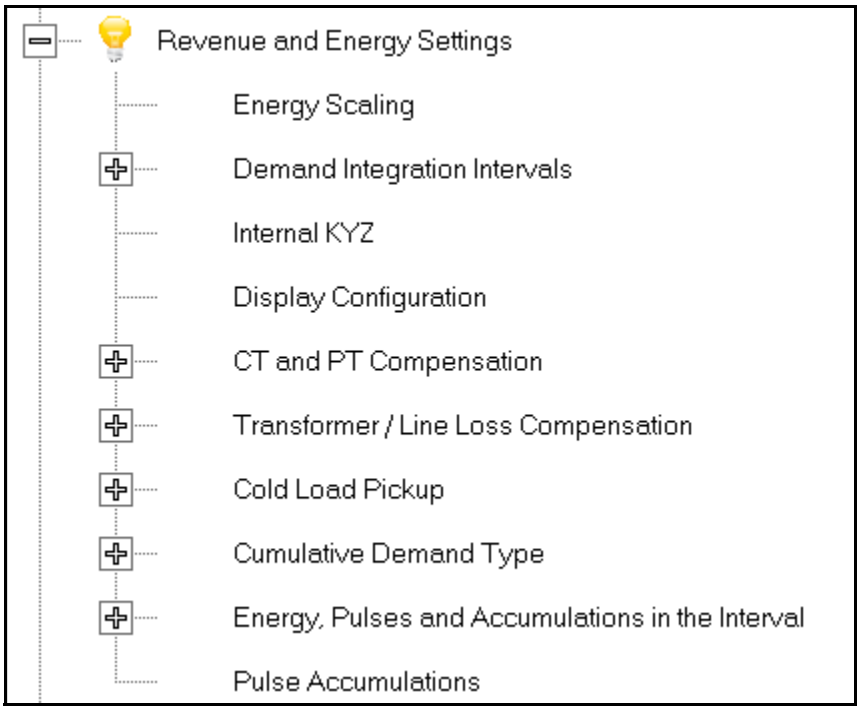
- Primary/Secondary: the meter normally computes values in secondary units. Where applicable, you may select primary or secondary. If Primary is selected, the value is multiplied by the appropriate CT and/or PT values.
- Absolute Value: where appropriate, you may have the option of having the data point computed as a signed or absolute value. Select either:
    - No: to have the data point computed as a signed value.
    - Yes: to have the data point computed as an absolute value.
- Byte Order: for most of the data points, you can select the polling order of the registers/bytes to match what the SCADA system needs. The choices are: MSR, MSB (most significant register, most significant byte); MSR, LSB (most significant register, least significant byte); LSR, MSB (least significant register, most significant byte); and LSR, LSB (least significant register, least significant byte). EPM meters store data as MSR, MSB, whereas most SCADA systems use LSR, LSB. You can either select an alternate order here, for example, LSR, LSB, or you can leave the data as is and then have your SCADA system change the order after the data is polled.
- Display/Modulo/Offset: depending on the data point, select one or more additional options with appropriate sub-selections.
    - Display: for certain data points, interpretation and display options are offered.
      Example:
      For Volts AN phase angle values, you can represent and display as 0 to 360 degrees or -180 to +180 degrees, etc. Selections appear in a pull-down menu for the associated point. You may want to select -180 to +180 degrees if you ant to know if a phase angle is positive or negative in relation to the reference.
    - Modulo: Certain values are cumulative and can roll over and start recounting from zero. For those values, where required, you can enter a point at which the rollover will occur.
    - Offset: Where allowed, you can enter a value (offset) that will be added to the data point when it is computed.

2. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.2 Revenue and Energy Settings

Revenue and Energy Settings are the second group of settings in the Device Profile.

1. From the Device Profile screen, click on the + button next to Revenue and Energy Settings or double-click on the Revenue and Energy Settings line. All of the settings in the Revenue and Energy Settings group are listed.

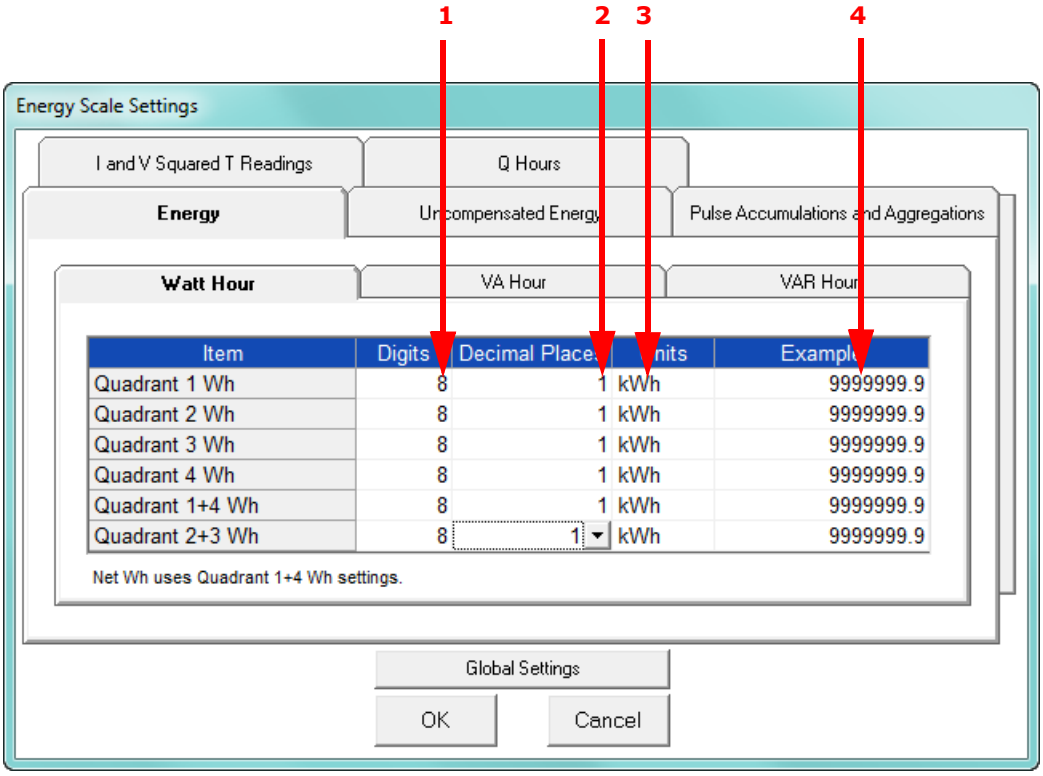


2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the Revenue and Energy Settings menu.

13.2.1 Energy Scaling

1. From the Revenue and Energy Settings menu, click on the + button next to Energy Scaling or double-click on the Energy Scaling line. You will see the Energy Scale Settings screen.

To configure scaling for a reading, enter:
1. Number of Digits, 2. Number of Decimal Places,
3.Unit of Measurement; 4. Example of the resultant scaling is shown here



- This screen has multiple tabs that allow you to access all of the Energy Scaling options. Using the Energy Scale Settings screens you can select the number of digits, decimal point placement and Energy unit for displayed readings.
- The Example field shows you the scaling choices you made applied to an example reading.
- You click on the tabs to navigate between screens, except for Global settings - you click on the Global Settings button to access that screen.

Global Settings

Energy Scale Settings - Global

Item	Digits	Decimal Places	Units	Example
Quadrant 1+4 Wh	8	1		9999999.9
Quadrant 2+3 Wh	8	1		9999999.9
Quadrant 1+2 VARh				
Quadrant 3+4 VARh				
Quadrant 1+2+3+4 VAh				
Internal Input Accumulators				
Internal Input Aggregators				
I Squared T				
V Squared T				

Apply Cancel

NOTE

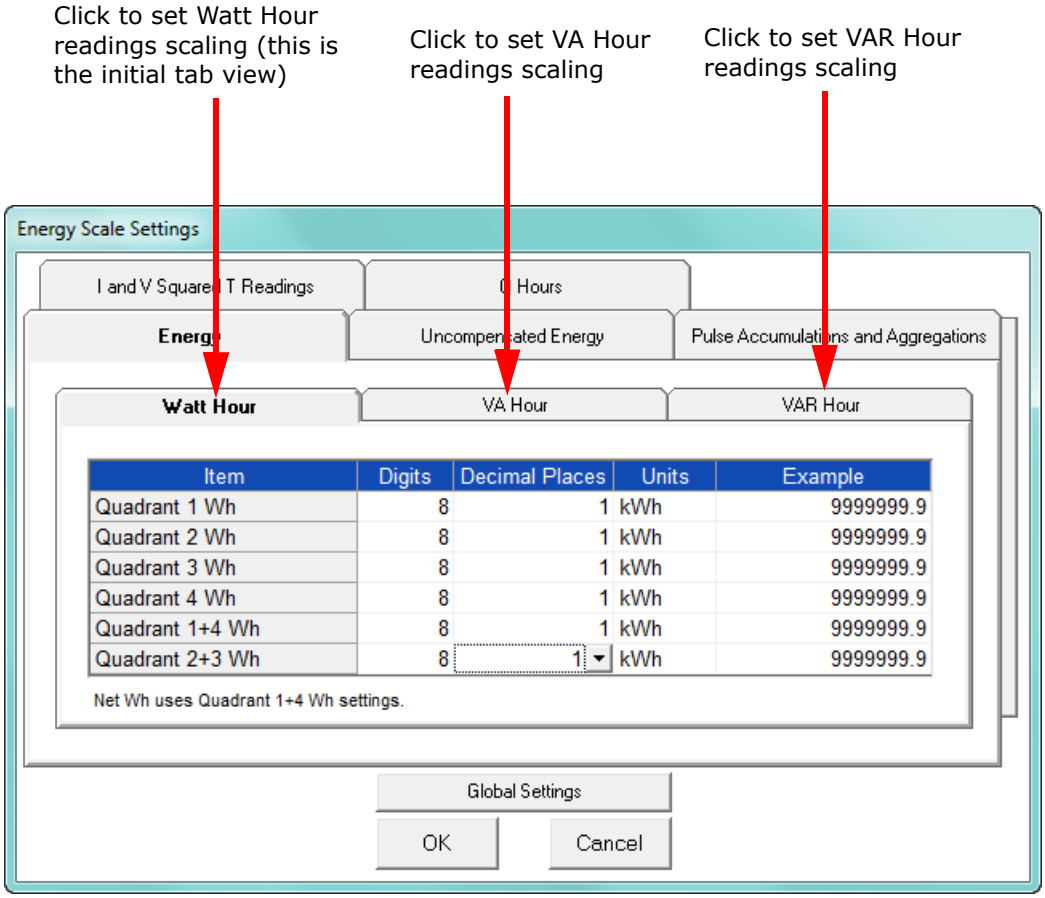
Because there are many energy settings, Global Settings conveniently allows you to set these similar energy reading settings all at once.

2. Click the Global Settings button to see the screen shown above. This screen lets you set the scale for all of the Energy Readings.
   - Click in the Digits field and select the number of digits for the value from the pull-down menu. You can choose between 2 and 9 digits.
   - Click in the Decimal Places field and select the number of decimal places for the value from the pull-down menu. You can choose between 0 and 7 decimal places, depending on the number of digits you selected. For example, if you chose 3 digits, you can only choose up to 2 decimal places.
   - Click in the Units field to select the unit of measurement for the value. You can select k or M.

     The example field changes as you make selections, to show you how the value would appear with the settings you made.
3. When all changes are entered, click Apply to return to the main Energy Scale Settings screen. You can now use the tabs to modify the scale for specific readings. For example, you might have set the scale for the Internal Input Accumulators as 5 digits, 2 decimal places, and M unit, but you may want one of the accumulators to have a different scale. You would click the Pulse Accumulations and Aggregations tab and change the scale for that accumulator. The following sections show the tab screens where you can make individual scaling changes. You set the Digits, Decimals, and Units fields in the same way as in the Global Settings screen.

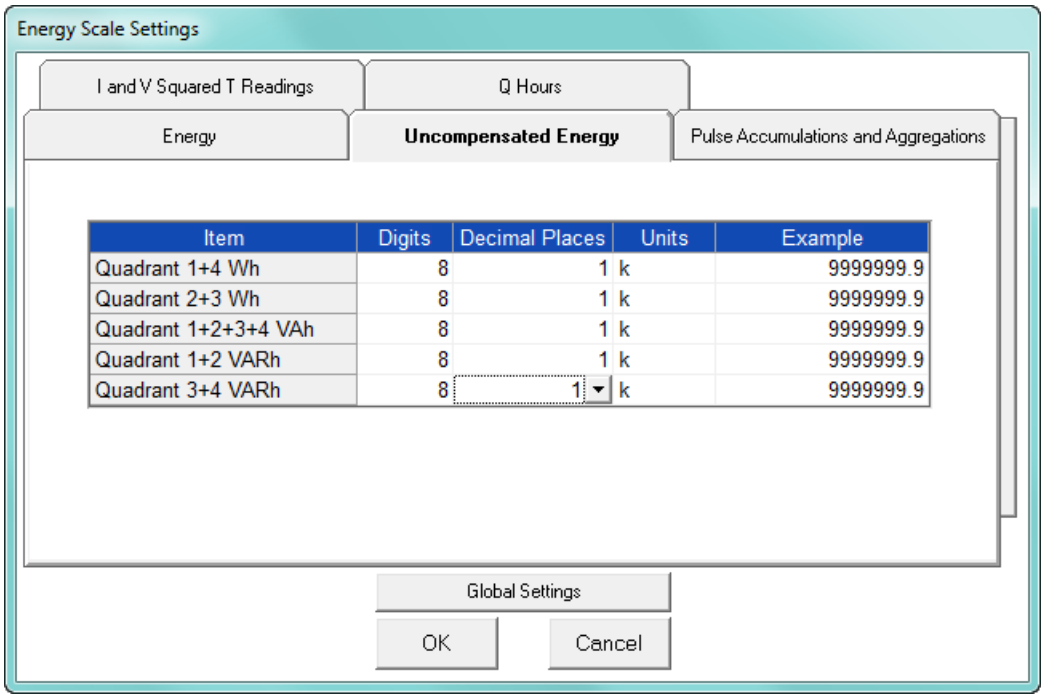
Energy Tab

This is the initial screen view. Click on the Watt Hour, VA Hour, and VAR Hour tabs to configure scaling for those readings.



Uncompensated Energy Tab

Click on the Uncompensated Energy tab to configure specific VA, Watt and VAR readings not adjusted by Transformer Loss Compensation.



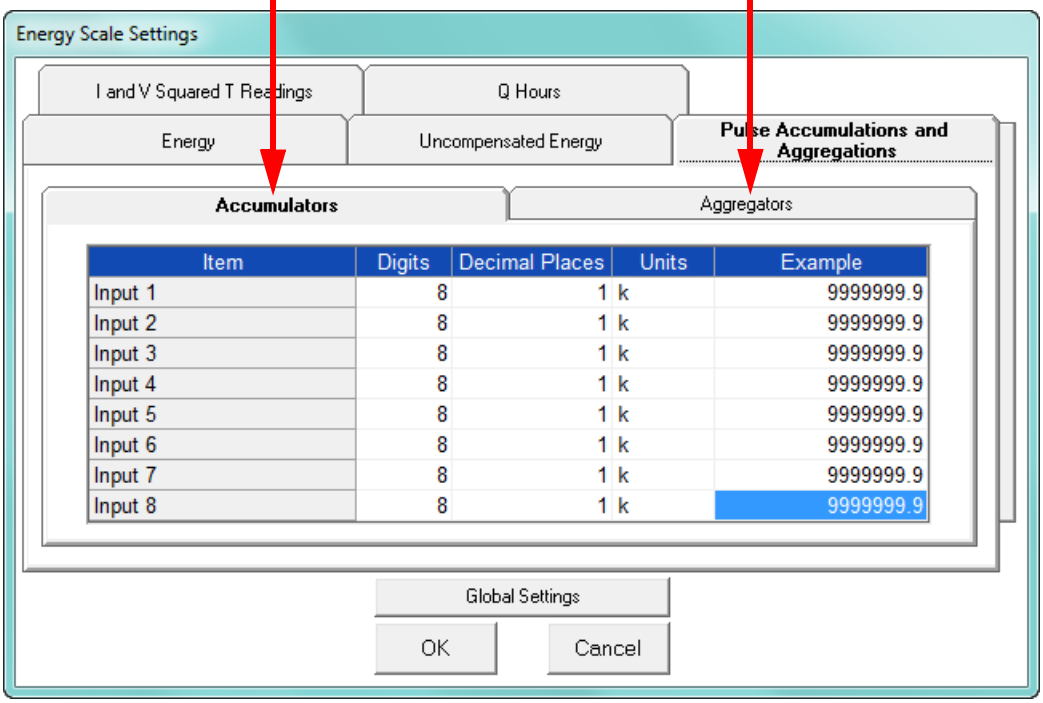
Item	Digits	Decimal Places	Units	Example
Quadrant 1+4 Wh	8	1	k	9999999.9
Quadrant 2+3 Wh	8	1	k	9999999.9
Quadrant 1+2+3+4 VAh	8	1	k	9999999.9
Quadrant 1+2 VARh	8	1	k	9999999.9
Quadrant 3+4 VARh	8	1	k	9999999.9

Pulse Accumulations and Aggregation Tab

Click on the Pulse and Aggregations tab and then click on the Accumulators and Aggregators tabs to configure scaling for those readings.

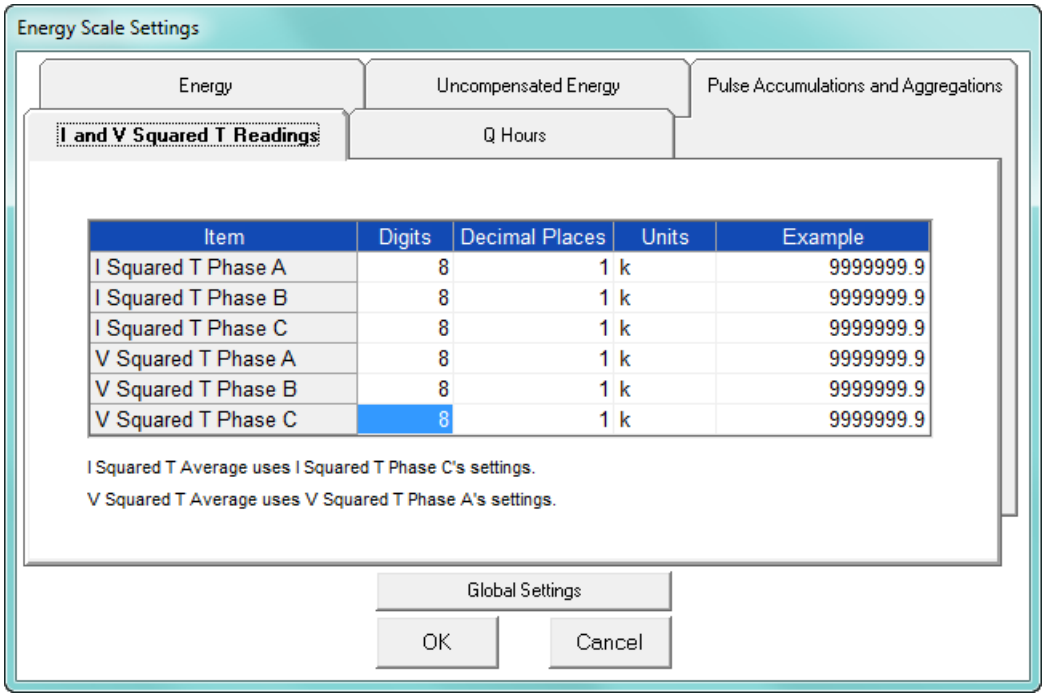
Click to set scaling for Accumulator readings (this is the initial tab view)

Click to set scaling for Aggregator readings



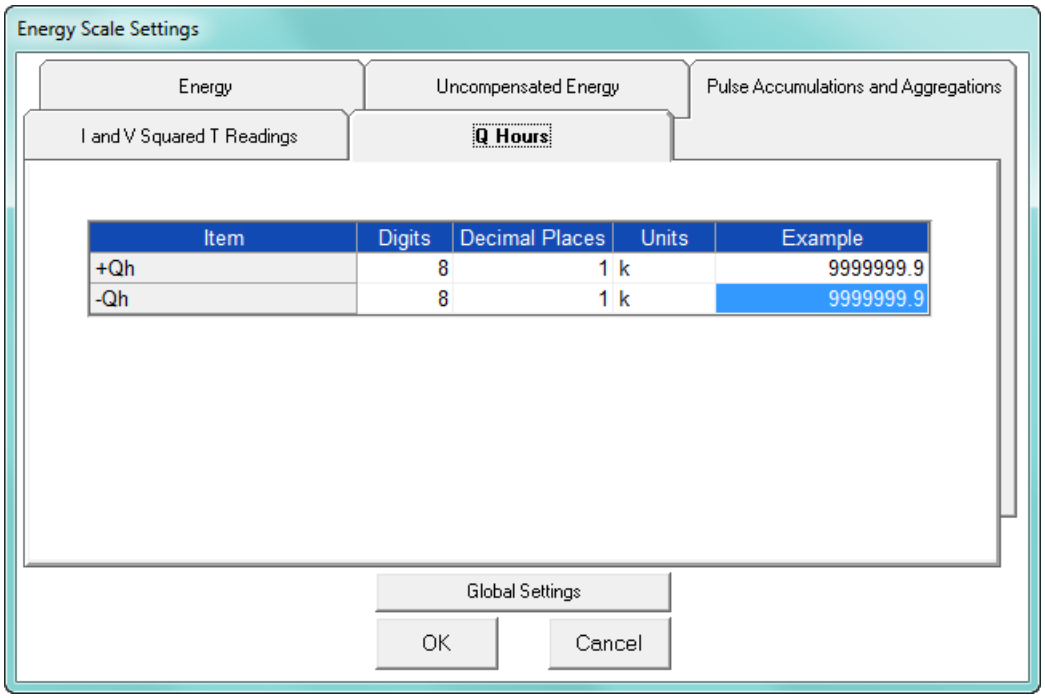
I and V Squared T Readings Tab

Click on the I and V Squared Readings tab to configure scaling for specific I^2T readings (data will not accumulate until current reaches the programmed level) and V^2T readings (data stops accumulating when Voltage falls below the programmed level).



Q Hours Tab

Click on the Q Hours tab to configure scaling for +QH and -QH readings.

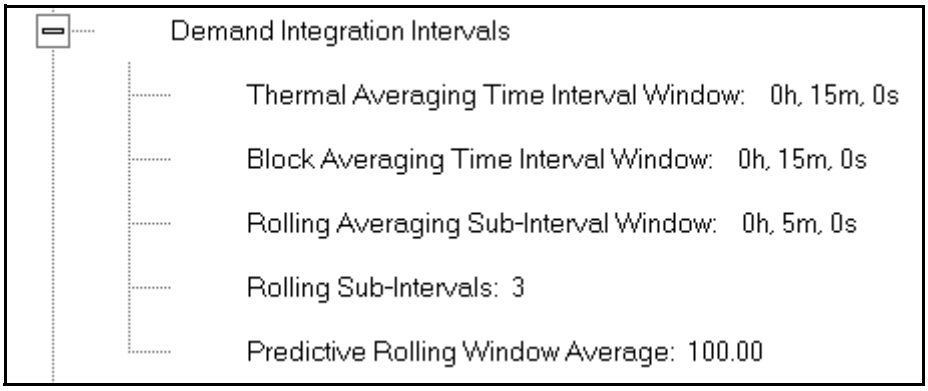


4. When you are done, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

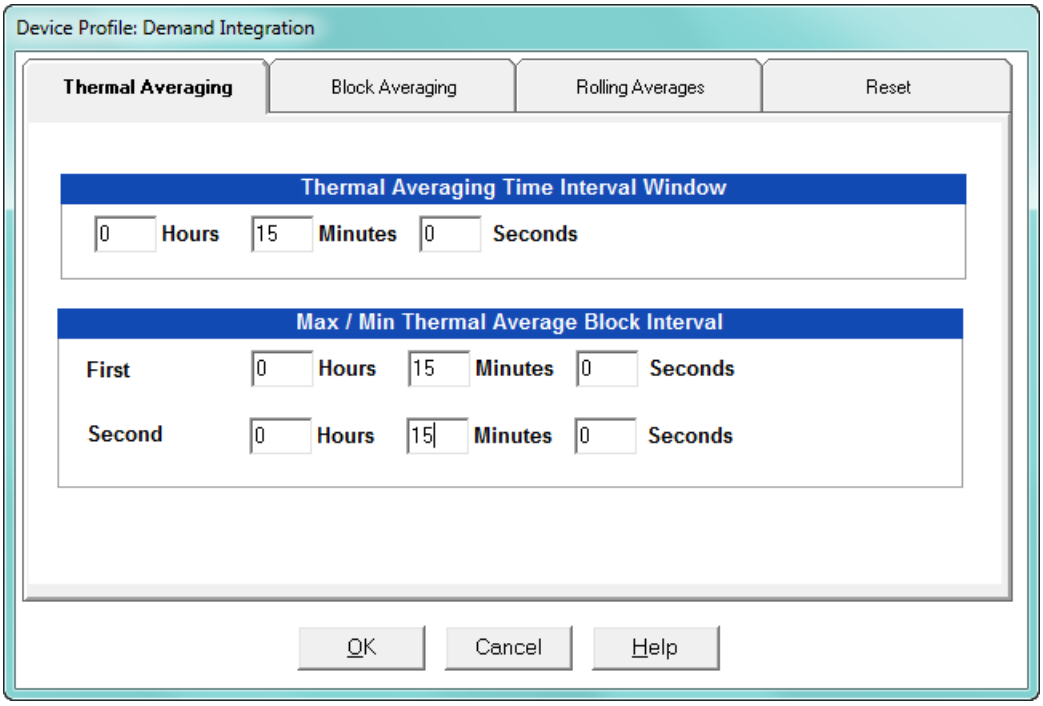
13.2.2 Demand Integration Intervals

See the *EPM 9450/9650 Instruction Manual* for details on Demand intervals.

1. From the Revenue and Energy Settings menu, click on the + button next to Demand Integration Intervals or double-click on the Demand Integration Intervals line. You will see the submenu shown below.



2. Double-click on any of the settings. You will see the screen shown below.

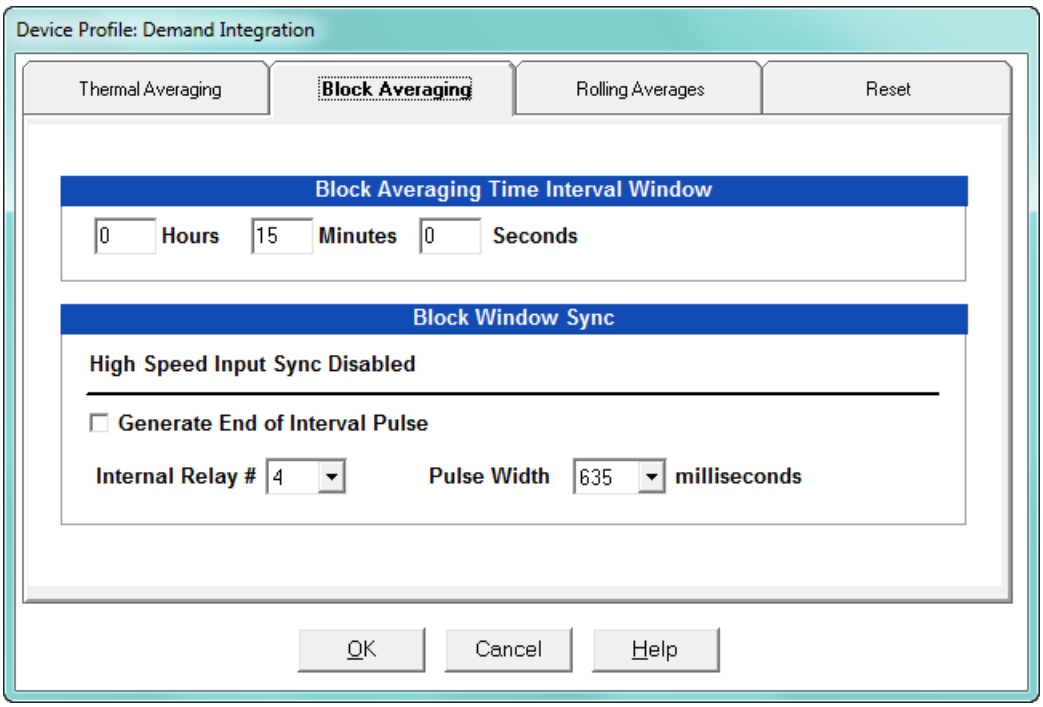


3. Click on the tabs at the top of the screen to navigate from one setting to another. Make changes to the settings according to your application requirements. Following is a brief description of each setting and its function:
   - Thermal Averaging (tab shown on previous page): use to set hours, minutes and seconds for a precise thermal window of demand data.
     Thermal Averaging (tab shown on previous page): use to set hours, minutes and seconds for a precise thermal window of demand data.
     - Traditional analog Watt-hour meters use heat-sensitive elements to measure temperature rises produced by an increase in current flowing through the meter. A pointer moves in proportion to the temperature change, providing a record of demand. The pointer remains at peak level until a subsequent increase in demand moves it again, or until it is manually reset.

       The EPM 9450/9650 meter mimics traditional meters to provide Thermal Demand readings. Electronic thermal demand emulation is the logarithmic average of the power used, with a more recent load being weighted more heavily than a less recent load, (approximated exponentially). Each second, as a new power level is computed, a recurrence relation formula is applied. This formula recomputes the thermal demand by averaging a small portion of the new power value with a large portion of the previous thermal demand value. The occurrence of the proportioning of new to previous is programmable, set by the averaging interval. The averaging interval represents a 90 change in thermal demand to a step change in power. So, for example, with a 15 minute set interval, the meter will record 90 of a change in load in 15 minutes, 99 in 30 minutes, and 99.9 in 45 minutes.

       Because thermal demand emulation is the logarithmic average, the demand is not set to zero on a demand reset. On a demand reset, present demand becomes the new maximum demand.
     - The Max/Min Thermal Average Block Interval fields are used if you want to track the maximum and minimum Demand in more than one interval, e.g., the Max and Min Demand in a 10 minute (First Interval) and a 15 minute interval (Second Interval).
   - Block Averaging Time: use to set the length of the block interval used for Demand calculations and other interval-based functions; also used to set End of Interval pulse. Block averaging is also known as fixed window averaging. A window is the user set time range, e.g., 15 minutes. Computation is performed on that 15 minute interval, and after that, a new set of computations will be started.

For example, Window 1 will be from 0 to 15 minutes, Window 2 will be from 16 to 30 minutes, and so on.



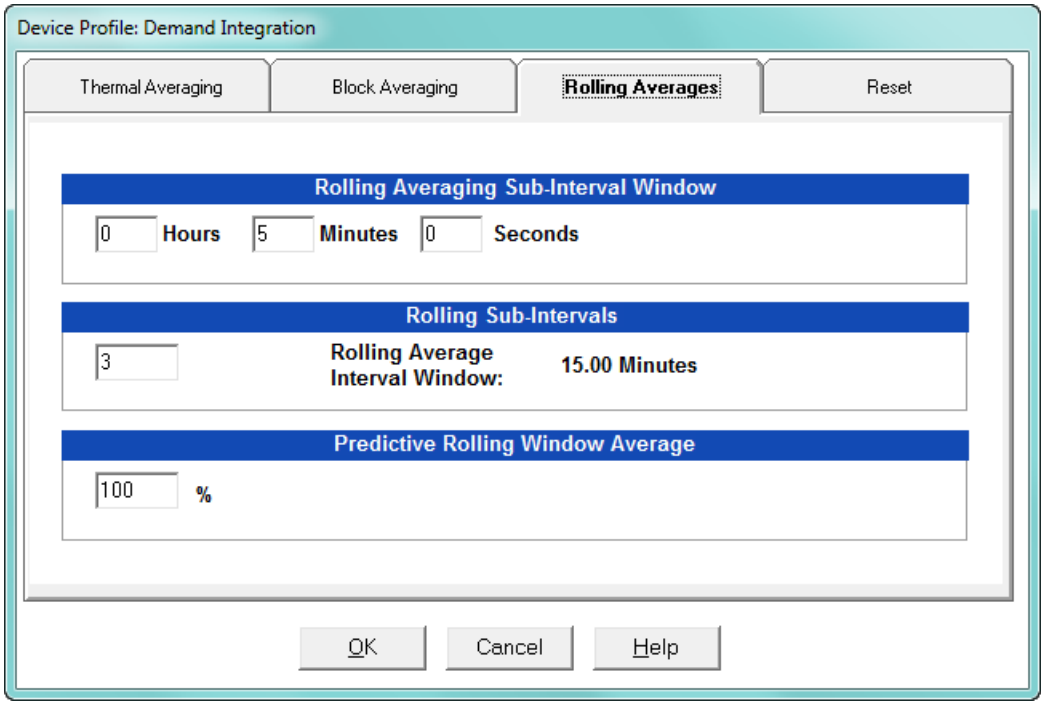
- Use the Hours, Minutes, and Seconds fields to set the length of the Block Interval.
- If you want to generate a pulse at the end of the set interval, click the box next to the Generate End of Interval Pulse field and select the number of the internal relay (1-4) you want to use and the pulse width (600 - 635 milliseconds).

NOTE

The Block Window Sync field indicates whether the meter is being synchronized with pulses from a High Speed input. This option is set in the Input Type field of the High Speed Inputs screen (see 13.3.7 *High Speed Inputs*).

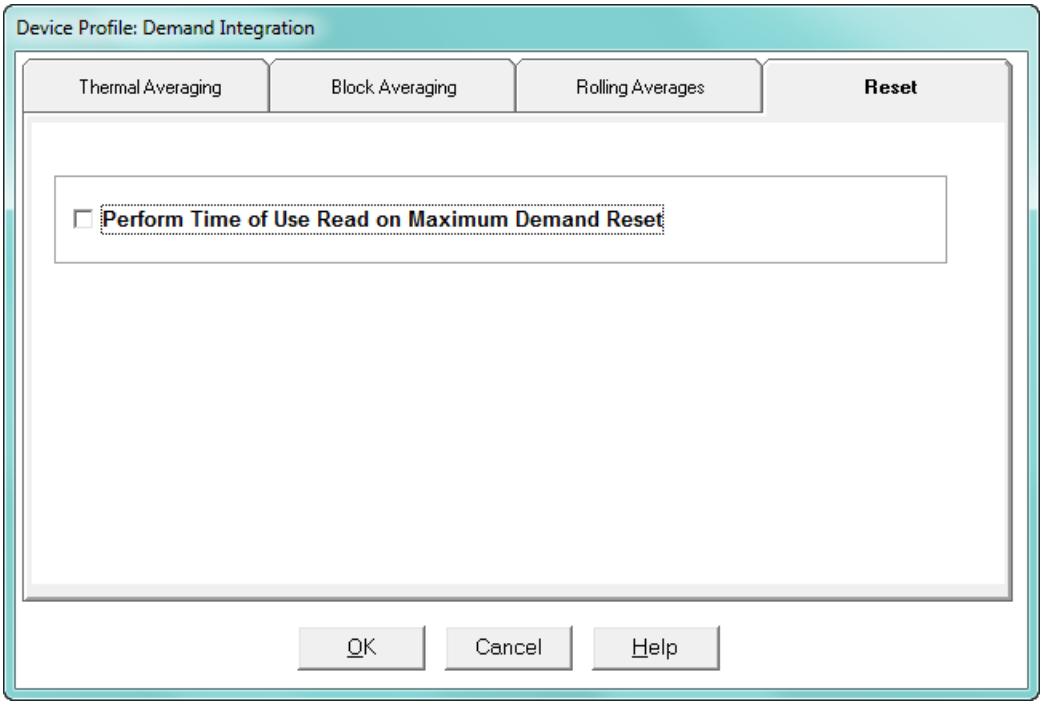
- Rolling Averages: also known as a sliding window, functions like multiple, overlapping Block averages. You define the subintervals at which an average of Demand is calculated. A window duration is the user set time, such as 15 minutes,

but it moves, so that, for example, Window 1 is 0 to 15, Window 2 is 1 to 16, Window 3 is 2 to 17, and so on.



- Set the Hours, Minutes, and Seconds fields under Rolling Averaging Sub-Interval Window.
- Rolling Sub-Intervals: set the number of rolling windows you want to "string together."
- Predictive Rolling Window Average: the meter gives you the programmed (field) prediction of your demands. If you are using Demand as a Limit, such that you will perform certain actions when you hit a certain Demand level, e.g., turning off motors, you may want to give yourself a “buffer.” This field accomplishes that by letting you choose to over-predict the Rolling Window Demand - e.g., if you enter 110, the meter will predict Demand at a 10 higher rate than the actual Demand, so that you will trigger a Limit alarm earlier than if you were using 100 Predictive Demand.

- Reset: Allows you to specify a Time of Use read whenever Maximum Demand is reset.



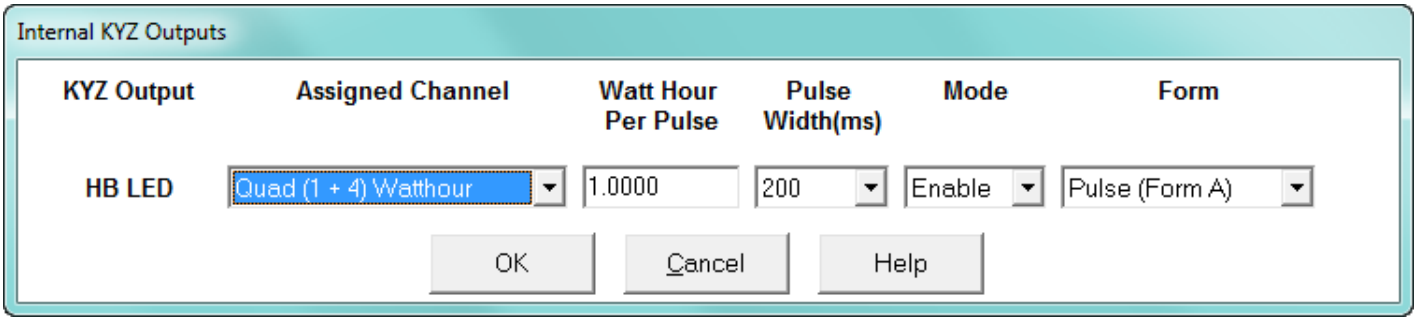
- Check the box to perform the TOU read. By selecting this, the meter will place all of the TOU values in the previous month's registers. Otherwise, the meter will default to self read based on a date set in the meter.
- Leave the box unchecked if you don't want to perform a TOU read.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.2.3 Internal KYZ Outputs

The EPM 9450/9650 meter has no internal KYZ outputs. The Internal KYZ Outputs setting allows you to assign a channel and determine other settings for the Heartbeat LED which the meter does have.

1. From the Revenue and Energy Settings menu, click on the + button next to Internal KYZ Settings or double-click on the Internal KYZ Settings line. You will see the screen shown below.



2. Using the pull-down menu next to HB LED (Heartbeat LED):
   - Assign a channel to the LED.
   - Enter Watt Hour per Pulse, Pulse Width, Mode and Form for the HB LED.

NOTE

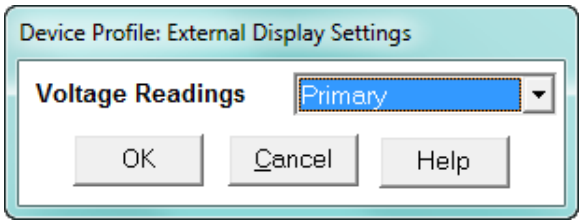
NOTE ON FORM: Form A = Pulse; Form C = Transition.

3. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.2.4 External Display Options

Many utility companies want to read secondary Volts and primary power readings. This setting configures a P40N/P40N+ external display to read either primary or secondary Volts. All other readings will be in the primary, regardless of this setting.

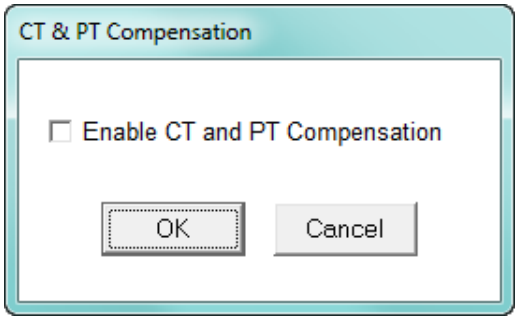
1. From the Revenue and Energy Settings menu, double-click on the External Display Options line. You will see the screen below.



2. Use the pull-down menu to select either primary or secondary units for Voltage.
3. Click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.2.5 CT and PT Compensation

1. From the Revenue and Energy Settings menu, click on the + button next to CT and PT Compensation or double-click on the CT and PT Compensation line.



2. Check the Enable box to enable CT and PT Compensation; leave the box unchecked to keep it disabled.
3. Click **OK** to close the screen and return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.2.6 Transformer / Line Loss Compensation

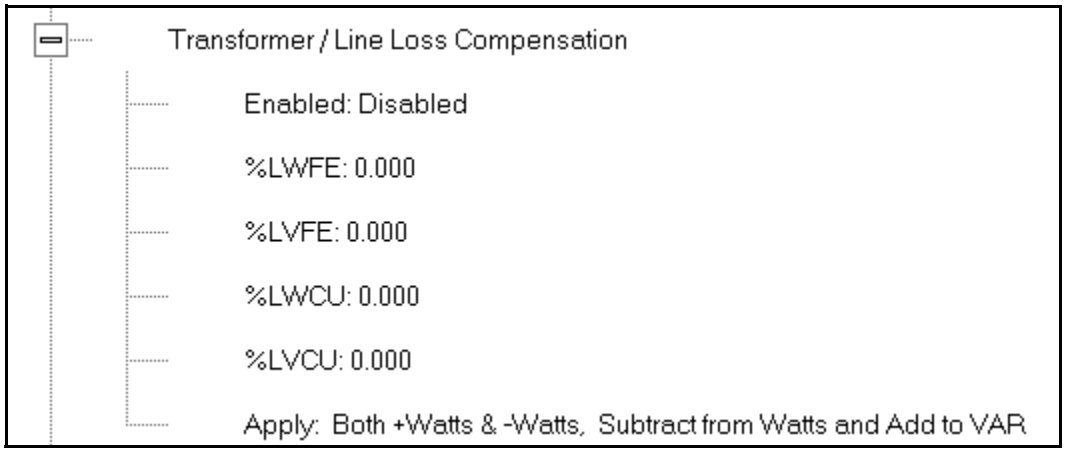
Transformer losses are power used by the transformer while working. The more load on the transformer, the higher the transformer losses. There are two types of transformer losses:

- No load losses - these are the fixed losses that keep the transformer up and running.
- Load losses - these vary with changes in the load.

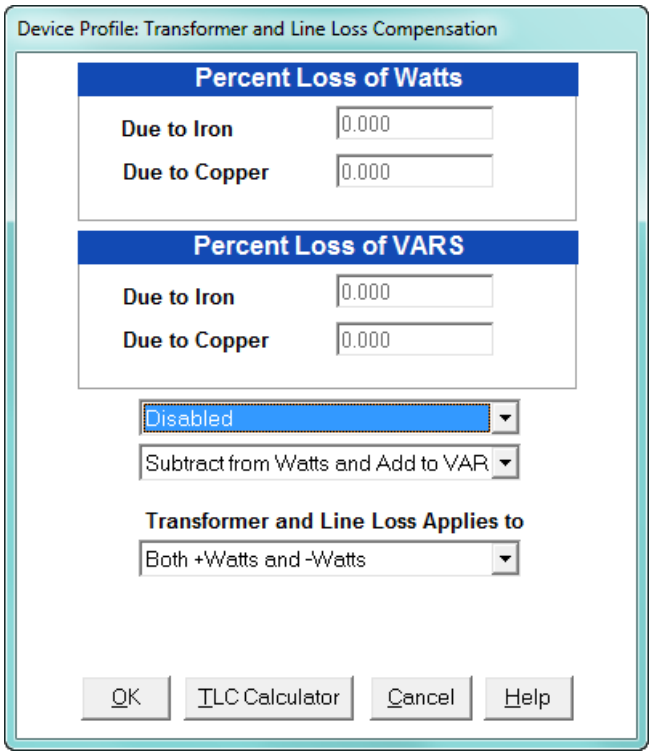
When the meter is located on the secondary side of a customer's transformer, a utility will want to add the transformer losses into the energy usage calculation. However, this practice is regulated by local jurisdiction and regulations. The meter has the capability to add in or subtract out these transformer losses, depending on the user's specific needs.

Line losses are similar to transformer losses, except that they are used to compensate for loss incurred on wires, such as transmission lines.

1. From the Revenue and Energy Settings menu, click on the + button next to Transformer/Line Loss Compensation or double-click on the Transformer/Line Loss Compensation line. You will see the submenu shown below.



2. The menu displays the current values for the meter's Transformer Loss Compensation.
   - LWFE = percent loss of Watts due to iron
   - LVFE = percent loss of Vars due to iron
   - LWCU = percent loss of Watts due to copper
   - LVCU = percent loss of Vars due to copper
3. Double-click on any of the loss values. You will see the screen shown below.



4. Click on **TLC Calculator** to find the values to enter into the Percent Loss fields. The TLC Calculator button launches the TLC Calculator that performs the calculations for you once the required data is entered.

NOTE

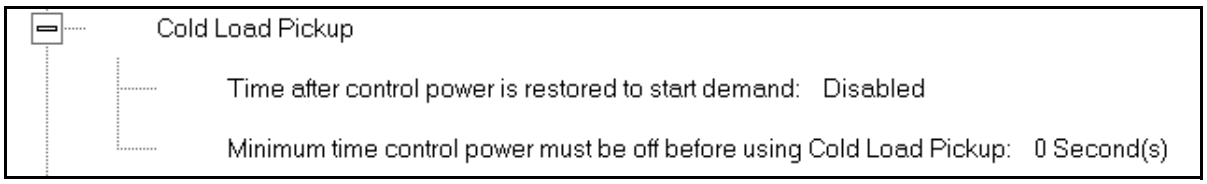
IMPORTANT! See Appendix A, which contains scree captures of the TLC Calculator with example numbers, and an explanation of Loss Compensation considerations.

5. Enter the percent loss of Watts and VARS for copper and iron in the appropriate fields.
6. Enable or Disable Transformer Loss Compensation with the first pull-down menu at the bottom of the screen. The optional selections are:
   - Disabled
   - Iron (Fe) Only
   - Copper (Cu) Only
   - Both Iron and Copper (Fe and Cu)
7. With the second pull-down menu, select from the following options:
   - Add to Watts and Subtract from VAR
   - Subtract from Watts and Add to VAR
   - Add to Watts and VAR
   - Subtract from Watts and VAR
8. With the third pull-down menu, apply the loss based on the power flow direction by selecting one of the following options:
   - Both +Watts and -Watts
   - -Watts only
   - +Watts only
9. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

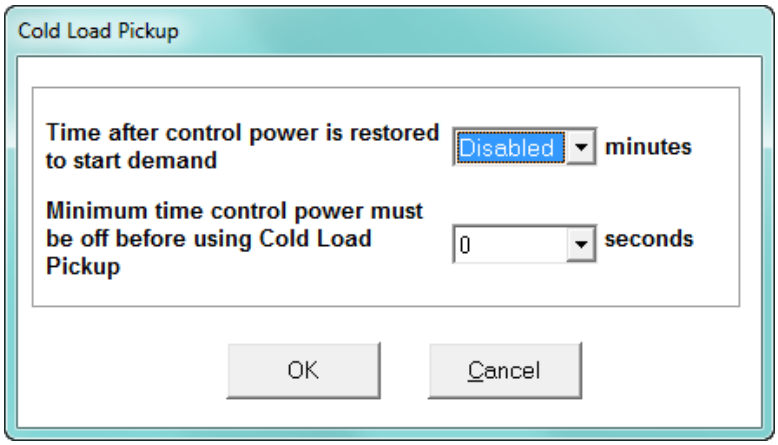
13.2.7 Cold Load Pickup

Cold Load Pickup is used to manage Demand in the event of a power outage. You set the amount of time (in seconds) power is off to identify a power outage that is the responsibility of the utility (as opposed to a very short term loss of power that is not their responsibility); then you set the amount of time (in minutes) you want to wait before Demand starts again. This time should correspond to the "grace" period the utility applies to avoid charging for motor startup, etc. after a power outage.

1. From the Revenue and Energy menu, click on the + button next to Cold Load Pickup or double-click on the Cold Load Pickup line. You will see the submenu shown below.



2. Double-click on one of the parameters to open the screen shown below.

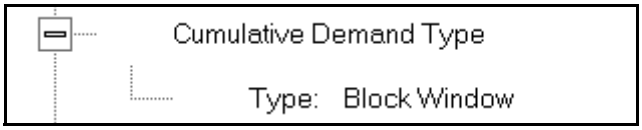


3. Make the following selections in accordance with your application needs:
   - Time after control power is restored to start demand - can be 1 to 60 minutes, or Disabled.
   - Minimum time control power must be off before using Cold Load Pickup - can be from 0 to 255 seconds.
4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

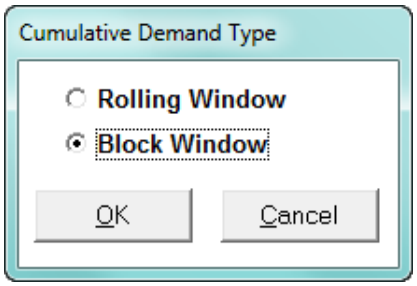
13.2.8 Cumulative Demand Type

Cumulative Demand is a counter of Max Demand that the meter keeps. It can help you determine if there has been tampering with the meter, i.e., unauthorized resetting of Demand. Whenever Demand is reset, the current Max Demand is added to the Cumulative Demand. By analyzing the data in the counter you can see if the Demand is being reset more often than intended. You can choose to use **either** Block Window Demand or Rolling Window Demand for the Cumulative Demand.

1. From the Revenue and Energy Settings menu, click on the + button next to Cumulative Demand Type or double-click on the Cumulative Demand Type line. You will see the submenu shown below. It tells you the type of Demand currently selected.



2. Click the Type line to open the screen shown below.

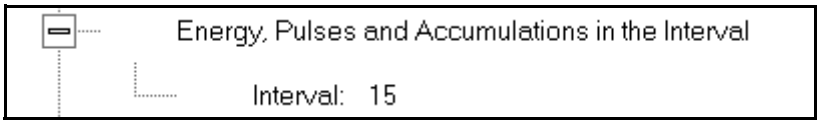


3. Click the radio button in front of Rolling Window (sliding) or Block Window (fixed) to select cumulative Demand type.
4. Click **OK** to exit the screen and return to the main Device Profile screen. For a change to take effect, you must click the **Update Device** button to send the new profile to the meter.

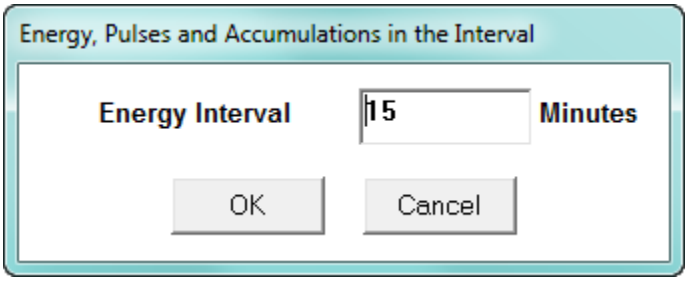
13.2.9 Energy, Pulses and Accumulations in the Interval

Energy in the interval is the energy that is accumulated within a load profiling interval. This is often the preferred method for logging because it is a summation of only that particular period of energy. The Interval setting you make creates the sub-accumulation field within the general Energy accumulation. An advantage of this setting is that the sub-accumulation takes up less space and is processed more quickly then the larger accumulation.

1. From the Revenue and Energy Settings menu, click on the + button next to Energy, Pulses and Accumulations in the Interval or double-click on the Energy, Pulses and Accumulations in the Interval line. You will see the submenu shown below.



2. The current Interval setting is displayed. Click on the Interval setting to open the screen shown below.



3. Set the number of minutes for the Energy interval.
4. Click **OK** to close the window and return to the main Device Profile screen. For any change to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.2.10 Pulse Accumulations

Pulse accumulators are used to count and/or aggregate pulse information from external devices, using the High Speed inputs. These devices may be gas, water, or electricity meters; energy management systems; SCADA devices; or any pulse-generating device.

This section of the Device Profile displays a series of eight running totals available on the EPM 9450/9650 meter. Each total can be added to (or subtracted from) other totals. This allows you to set the High Speed inputs located directly on the meter to accumulate pulses.

NOTE

If you use these inputs for pulse accumulations, do not set them to record waveforms - if you do, you will record endless waveforms.

1. From the Revenue and Energy Settings menu, click on the + button next to Pulse Accumulations or double-click on the Pulse Accumulations line. You will see the screen shown below.

Device Profile: Internal Input Pulse Accumulators Setup

Source	Units/Count	Aggregator	User Assigned Label	Mode	Average Full Scale
1	1	None	Accumulator1	Pulse (Form A)	1000000000000000
2	1	None	Accumulator2	Pulse (Form A)	1000000000000000
3	1	None	Accumulator3	Pulse (Form A)	1000000000000000
4	1	None	Accumulator4	Pulse (Form A)	1000000000000000
5	1	None	Accumulator5	Pulse (Form A)	1000000000000000
6	1	None	Accumulator6	Pulse (Form A)	1000000000000000
7	1	None	Accumulator7	Pulse (Form A)	1000000000000000
8	1	None	Accumulator8	Pulse (Form A)	1000000000000000

Source	Hour Reading	Aggregator
Device	Quadrant(1 + 4) Watt Hour	None

Aggregator	User Assigned Label	Average Full Scale
1	Aggregator 1	1000000000000000
2	Aggregator 2	1000000000000000
3	Aggregator 3	1000000000000000
4	Aggregator 4	1000000000000000

OK Cancel Help

2. High Speed inputs 1-8 are listed in order under Source. Enter the following information or use the pull-down menus to select:
   - Units/Count - this is the scale factor that normalizes the pulses so that they can be aggregated. Pulses are stored in primary values.
   - Aggregator - this allows you to place the pulse register into a separate accumulation register that can aggregate (add) or net (subtract) values.
   - User Assigned Label - this window allows you to enter a label designation for the source.

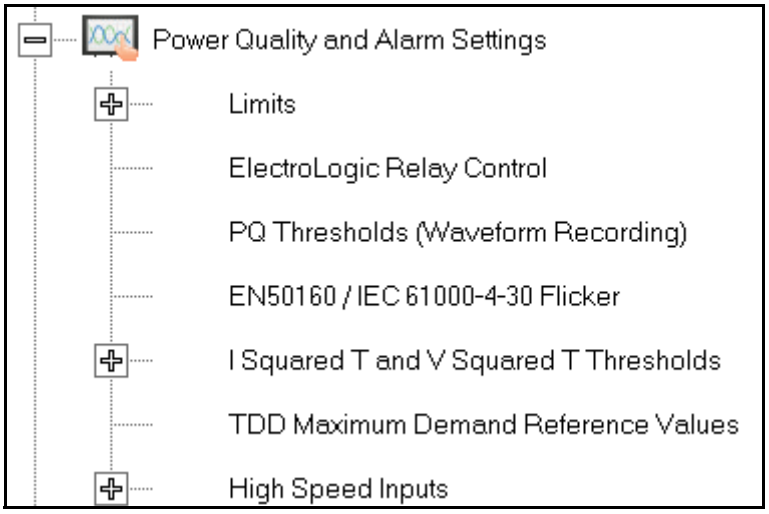
- Mode - you can set Pulse or Transition. A transition means from open to shorted/closed or from shorted/closed to open; a pulse contains 2 transitions, open to shorted/closed, followed by shorted/closed to open.
- Average Full Scale - for EPM meters, in order to set a limit on a reading it needs a Full Scale value as the 100 reference. You can set a limit on the average number of pulses per interval.
- Device Hour Reading and Aggregator - source device is the meter you are connected to. The Hour reading is either Quadrant 1 and 4 Watt-hour or Quadrant 2 and 3 Watt-hour. The Aggregators indicate whether the count should be added to, or subtracted from, Aggregators 1-4. You can choose None if you don't want the count to affect any of the Aggregators.
- Aggregators: The "buckets," or Totalizer fields where pulse counts from the High Speed inputs and from the Watt-Hour counters can be totaled. The user can assign a label to each of the Aggregators. See the Average Full Scale description above for an explanation of this field - it has the same use here, except for the Aggregators.

3. When all data has been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.3 Power Quality and Alarm Settings

Power Quality and Alarm Settings are the third group of settings in the Device Profile.

1. From the Device Profile screen, click on the + button next to Power Quality and Alarm Settings or double-click on the Power Quality and Alarm Settings line. All of the settings in this group are listed.



2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the Power Quality and Alarm Settings menu.

13.3.1 Limits

Limits are threshold settings that can be set by a user to trigger a record in a log when an alarm condition is met. Utilizing the limits, the user can then control a relay or send a warning email on that alarm.

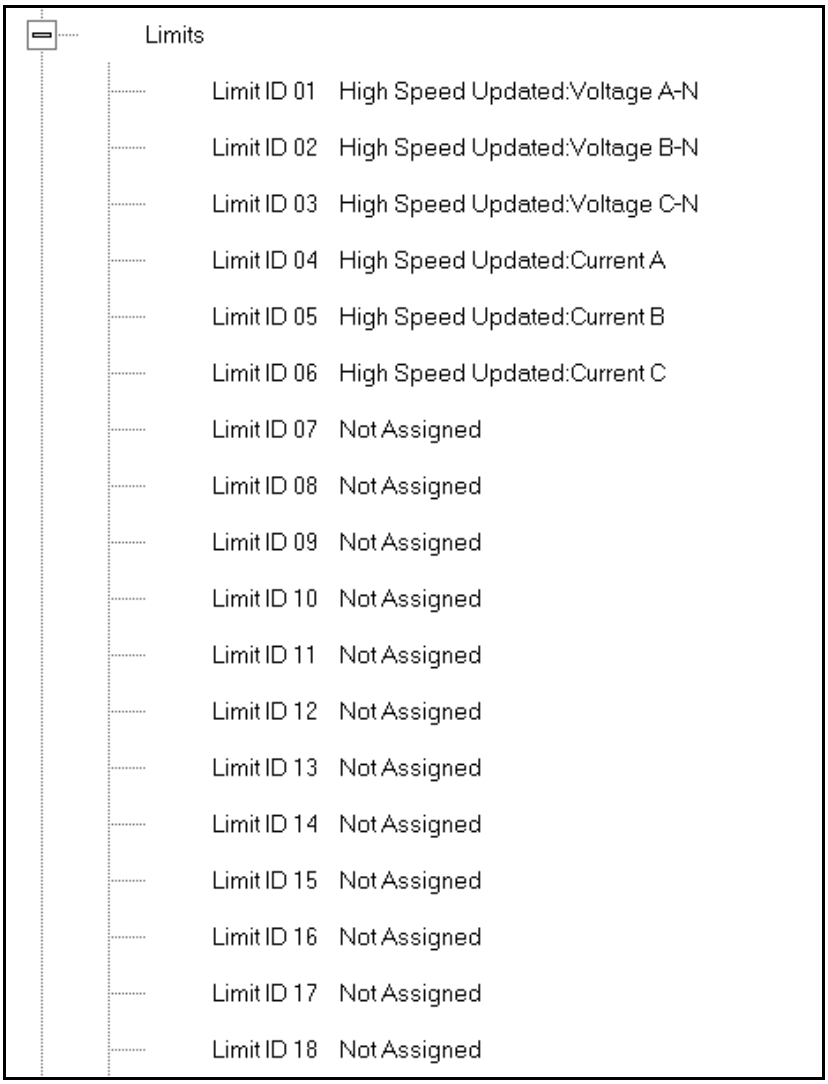
Limit settings are based on a percentage of the Full Scale (% of FS), which is set in the Limit and Waveform Full Scales setting (13.1.3 *Limit and Waveform Full Scales*). Full Scale is based on CT and PT ratios set in the CT, PT Ratios and System Hookup setting (13.1.1 *CT and PT Ratios and System Hookup*). Limits are based on a percent of Full Scale settings so that the same settings can be used no matter what the CT and PT Ratio needed.

Before programming limits, set the CT and PT ratios. Then, set the Limit and Waveform Full Scales if you want to change to automatic configuration. In most cases the software will configure the Full Scale optimally.

NOTE

The software automatically updates the Full Scale; however, you can set it separately from the CT and PT Ratios.

1. From the Power Quality and Alarm Settings menu, click on the + button next to Limits or double-click on the Limits line. You will see the submenu shown below.



This submenu displays the current Device Profile Limit settings. Not all limits are shown in the figure above: there are 32 Limit ID fields.

2. Double-click on any of the settings (Limit ID 01, for example). You will see the Limits screen, shown below.

Device Profile: Limits

Limit ID	Assigned Item	Limit 1			Limit 2			Combination Limit 3
		Setting	Setpoint		Setting	Setpoint		
			% of FS	Primary		% of FS	Primary	
1	High Speed Updated:Voltage A-N	Above	120.00	144.00	Below	80.00	96.00	OR
2	High Speed Updated:Voltage B-N	Above	120.00	144.00	Below	80.00	96.00	OR
3	High Speed Updated:Voltage C-N	Above	120.00	144.00	Below	80.00	96.00	OR
4	High Speed Updated:Current A	Above	150.00	7.50	Below	0.00	0.00	OR
5	High Speed Updated:Current B	Above	150.00	7.50	Below	0.00	0.00	OR
6	High Speed Updated:Current C	Above	150.00	7.50	Below	0.00	0.00	OR
7	Not Assigned	Above	98.00	98.00	Above	0.00	0.00	OR
8	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
9	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
10	Not Assigned	Below	80.00	80.00	Above	0.00	0.00	OR
11	Not Assigned	Below	-0.01	-0.01	Above	0.00	0.00	OR
12	Not Assigned	Below	-0.01	-0.01	Above	0.00	0.00	OR

Channels	Primary Values at 100%
I A, B, C, Nc	5.00
I Nm	5.00
V Phase to Neutral	120.00
V Phase to Phase	208.00
Power Phase	600.00
Power Total	1800.00
Frequency	60.00

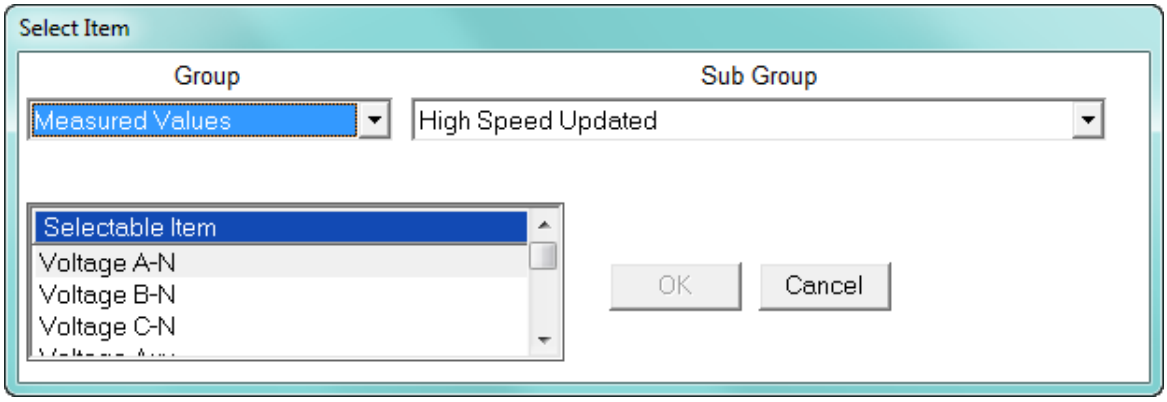
OK Cancel Help

This screen can be expanded to show all of the limits. Click on the top or bottom of the screen to display sizing arrows you can click on and drag to expand the screen.

Percentage of Full Scale settings (% of FS): The limits are set in % of Full Scale so that when you create a profile, you can keep your settings. This is true, even though the CT and PT ratios change when the meter (or a new meter) is placed in a different location. Changing the CT and PT ratios does not affect the % of Full Scale limits previously set. This is useful when you are using large numbers of meters because one profile can be used with a common set of limit settings no matter what the CT and PT ratio. Full Scale reference information is available in the lower left box.

3. Make changes to this screen according to your application requirements.
   - To set the type of limit and the channel assigned to it:

- Double-click in either the Limit ID or Assigned Item column. You will see the screen shown below.



- From the pop-up menus, choose the desired settings and click **OK**. Following is a list of the available Groups, Sub Groups, and Items.

  Group: Measured Values
  Sub Group: High Speed Updated
  Item: Voltage A-N
  - Voltage B-N
  - Voltage C-N
  - Voltage Aux
  - Current A
  - Current B
  - Current C
  - Current N Measured
  - Voltage A-B
  - Voltage B-C
  - Voltage C-A
  - VA A
  - VA B
  - VA C
  - VA Total
  - VAR A
  - VAR B
  - VAR C
  - VAR Total
  - Watt A
  - Watt B
  - Watt C
  - Watt Total
  - Frequency
  - Power Factor A
  - Power Factor B
  - Power Factor C
  - Power Factor Total
  - Volts A-Aux Phase Angle

  Sub Group: One second updated

Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A
VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Uncompensated VA A
Uncompensated VA B
Uncompensated VA C
Uncompensated VA Total
Uncompensated VAR A
Uncompensated VAR B
Uncompensated VAR C
Uncompensated VAR Total
Uncompensated Watt A
Uncompensated Watt B
Uncompensated Watt C
Uncompensated Watt Total
THD Volts A
THD Volts B
THD Volts C
THD Current A
THD Current B
THD Current C
K Factor Current A

K Factor Current B
K Factor Current C
Internal Temperature
Sub Group: Harmonic Values
Item: 0 - 127th Harmonic on selectable Harmonic Magnitude
(Voltage Phases A, B, and C; Current Phases A, B, and C)
Sub Group: Internal Inputs, States
Item: Internal Inputs 1-8
Sub Group: Phase Angles
Item: Phase A-N Voltage
Phase B-N Voltage
Phase C-N Voltage
Phase A Current
Phase B Current
Phase C Current
Phase A-B Voltage
Phase B-C Voltage
Phase C-A Voltage
Volts A-Aux Phase Angle
Voltage Phase Sequence
Sub Group: Flicker
Item: Flicker: PInst Volts A
Flicker: PInst Volts B
Flicker: PInst Volts C
Flicker: PST Volts A
Flicker: PST Volts B
Flicker: PST Volts C
Flicker: PLT Volts A
Flicker: PLT Volts B
Flicker: PLT Volts C
Group: Averages
Sub Group: Thermal Average
Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A
VAR B

VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Sub Group: Block Window Average
Item: VA
VAR
Watt
Sub Group: Pulse Accumulation/Aggregation Block Window Average
Item: Internal Inputs #1 - #8
Aggregators #1 - #4
Sub Group: Rolling Window Average
Item: Predictive VA
Predictive VAR
Predictive Watt
VA
VAR
Watt
Sub Group: Voltage and Current Means
Item: Volts PN
Current P
Volts PP
Group: External I/O Devices
Sub Group: Analog Input Modules
Item: Module 1: Analog Input 1 - Analog Input 8
Module 2: Analog Input 1 - Analog Input 8
Module 3: Analog Input 1 - Analog Input 8
Module 4: Analog Input 1 - Analog Input 8

- To designate the limit as either above or below a percentage of the Full Scale, click once in each Settings column and select the desired setting from the pull-down menu.
- To set the percentage of the Full Scale that will trip the limit, enter the value in the % of FS column. GE Communicator software automatically calculates the Primary value.
- Combination Limit 3 is the logical combination of Limit 1's state and Limit 2's state.

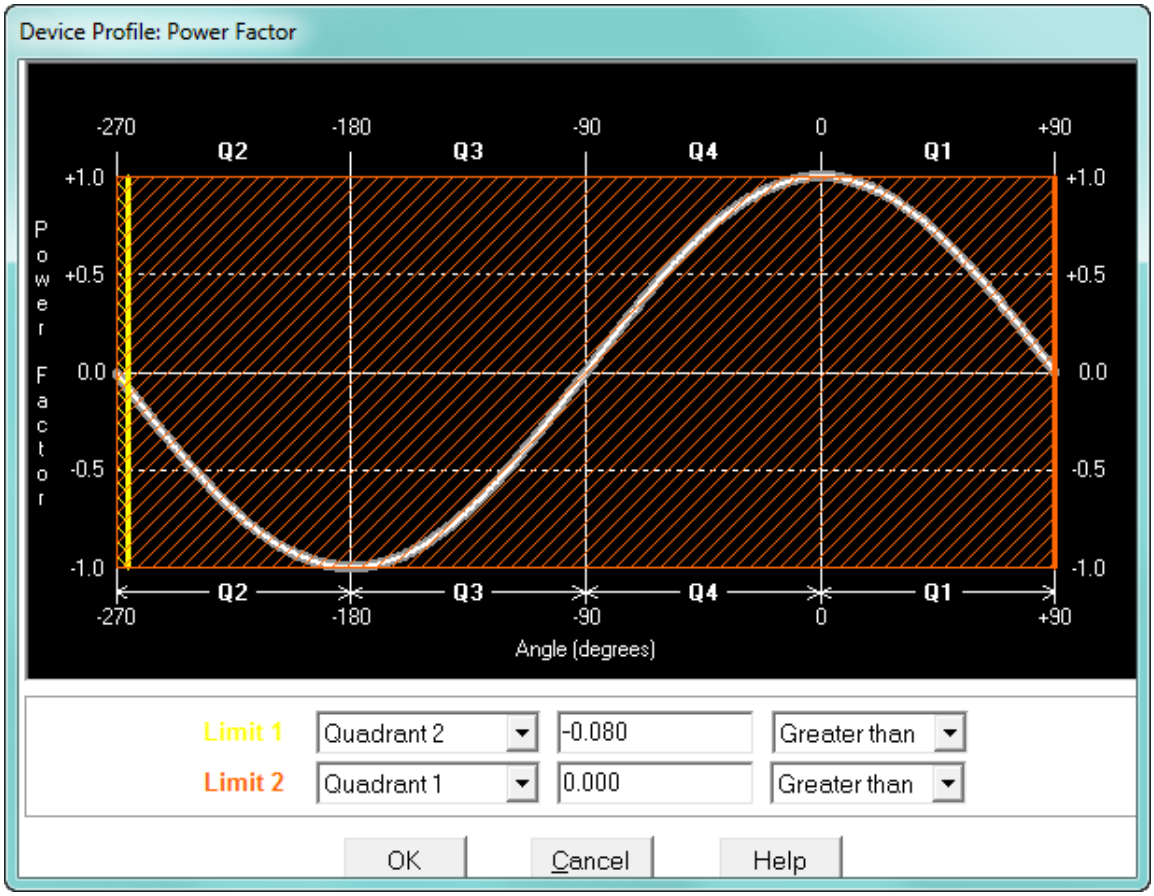
Example 1
Limit I D
Type: 1 Second Readings
Channel: Volts AN

Limit 1 Setting: Limit exceeded if Volts AN is below 120 F.S.
Limit 2 Setting: Limit exceeded if Volts AN is above 80 F.S.
Combination Limit 3 Setting: AND
If Limit 1 AND Limit 2 are tripped (e.g., the reading is 100F.S.), then Limit 3 is tripped.

Example 2
Limit I D
Type: 1 Second Readings
Channel: Volts AN
Limit 1 Setting: Limit exceeded if Volts AN is above 120 F.S.
Limit 2 Setting: Limit exceeded if Volts AN is below 80 F.S.
Combination Limit 3 Setting: OR
If either Limit 1 OR Limit 2 is tripped (e.g., the reading is 75), then Limit 3 is tripped.

- Full Scales settings are shown in the lower left of the screen. These values are set in the Limits and Waveform Full Scales section of the Device Profile (13.1.3 *Limit and Waveform Full Scales*).

4. Power Factor is broken into four quadrants. Selecting the Full Scale value brings up a screen that lets you set a limit in two of the four quadrants.
   - To set the power factor limits, double click on any of the power factor settings in the Limit 1 or Limit 2 columns. You will see the Power Factor screen.



- To set a limit: from the pull-down menus, select a quadrant and Less Than or Greater Than (Full Scales). Enter the power factor number. The graph will

illustrate your selections by shading the out of limit bands. The area of the graph not covered by shading is within normal operational range.

NOTE

Whether you see method 1 Quadrants (Q1 +Lag, Q2 -Lag, Q3 -Lead, Q4 +Lead) or method 2 Quadrants (Q1 +Lag, Q2 -Lead, Q3 +Lag, Q4 -Lead) depends on the setting in the Power Factor Display field of the Labels setting (see 13.1.5 *Labels*).

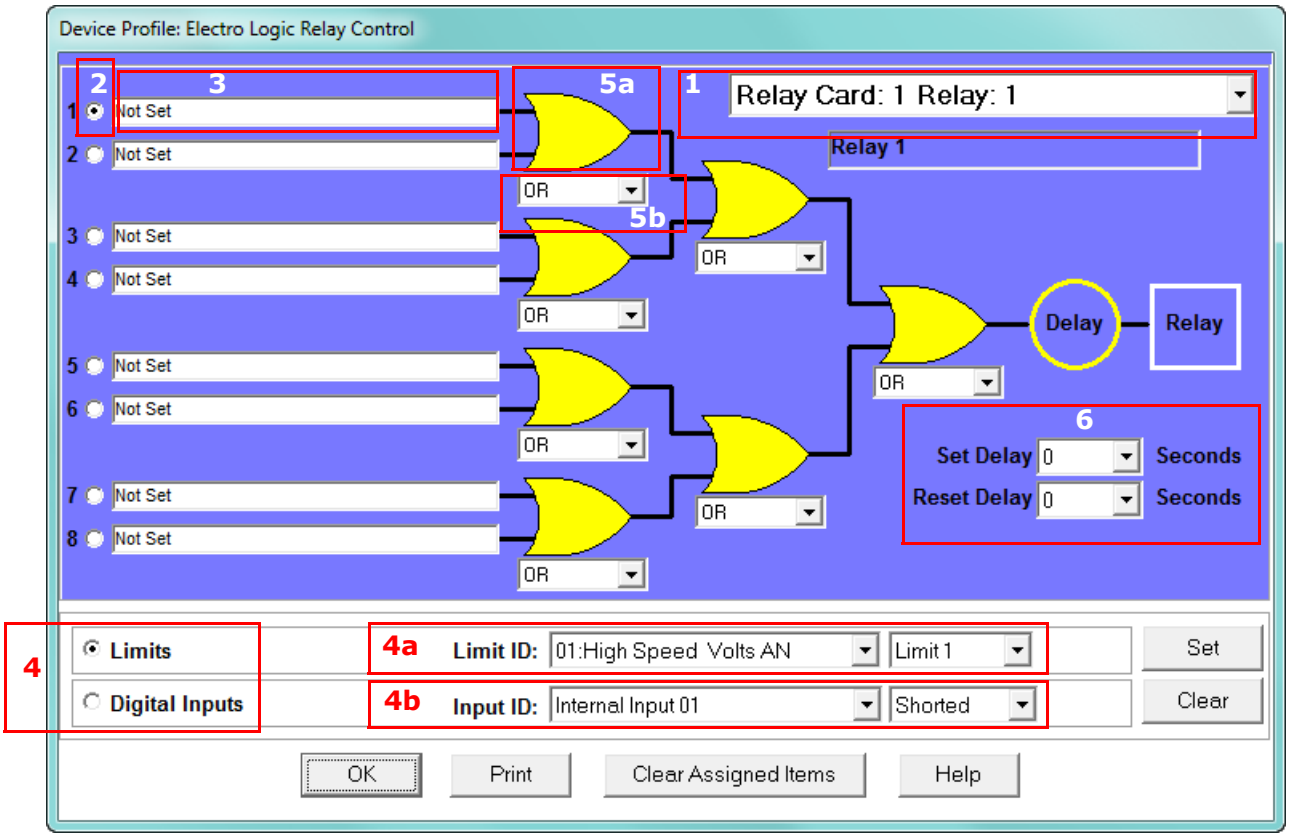
NOTE

The EPM 9450/9650 device is a four-quadrant meter. Therefore, limits can be set for capacitive and inductive PF when generating or consuming power.

5. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.3.2 Electrologic™ Relay Control

1. From the Power Quality and Alarm Settings menu, double-click on the ElectroLogic Relay Control line. You will see the screen shown below.



ElectroLogic Relay Control lets you set up a logic tree to control the meter's optional relays. Each relay can be programmed individually. The end result of the logic tree is to set, or not set, a relay, with an optional programmed Set Delay and/or Reset Delay. The initial inputs to the logic tree are chosen from among the 32 Limits and 40 Digital Inputs (both internal and external inputs). The gates, in several stages, perform logical combinations (AND, OR, etc) on pairs of inputs (either initial inputs or the outputs of

earlier gates), and in combination produce an ultimate "true" or "false" state to drive the relay open or closed.

For example, one of the gates is AND. For data to pass an AND gate, both pieces of data must be “true.” For a Limit to be true, the data must be in the Out-of-Limit condition on either Limit 1, Limit 2, or both (you decide which). For a Digital Input to be true, it must be in the condition you specify - either Open or Shorted.

The gates used in ElectroLogic™ Relay Control are used as follows:
OR: If either or both of the two conditions are true, the gate is passed
AND: If both of the conditions are true, the gate is passed
Hysteresis: For Limits only, the if the Limit is within the programmed hysteresis value, the gate is passed
XOR: If either of the two conditions are true, but not both, the gate is passed
NOR: If either of the two conditions are true, the gate is not passed
NAND: If both of the two conditions are true, the gate is not passed
NHysteresis: For limits only, if the Limit is within the programmed hysteresis value, the gate is not passed
NXOR: If either of the two conditions are true, but not both, the gate is not passed

NOTE

See Example settings on the next page.

2. To assign an item to the Relay Logic tree:
   - Select the relay card/module from the pull-down menu - see number 1 in the screen on the previous page.
   - Select an input for the tree by clicking on a radio button next to numbers 1 through 8 - see number 2 in the screen on the previous page.
   - Choose Limits or Digital Inputs by clicking on the radio button in front of the word - see number 3 in the screen on the previous page.
   - From the pull-down menus, select the limit (Limit ID) or input (Input ID) you want to assign to this Relay Logic tree input (step b) - see number 4 in the screen on the previous page.
     - For a limit, use the second pull-down menu to select Limit 1, Limit 2, or Combination - see number 4a in the screen on the previous page.
     - For an input, use the second pull-down menu to select Shorted or Open - see number 4b in the screen on the previous page.
   - Press Set to confirm your selection. The software places the selection in the appropriate field in the screen.
3. After you assign all the Relay Logic inputs, select the gates that will be used to combine the logic to trigger the relay. To select a gate type, either:
   - Click on the gate (yellow fields) - see number 5a in the screen on page 13-55.
   - Choose a gate type from the pull-down menu below the gate - see number 5b in the screen on page 13-55.
4. If you want, select Set Delay and Reset Delay from the pull-down menus. You can choose between 0 and 255 seconds. Use these fields if you want to program a delay before the relay is set, or before it is reset - see number 6 in the screen on page 13-55.
5. To change items on the Relay Logic tree, follow the previous steps.

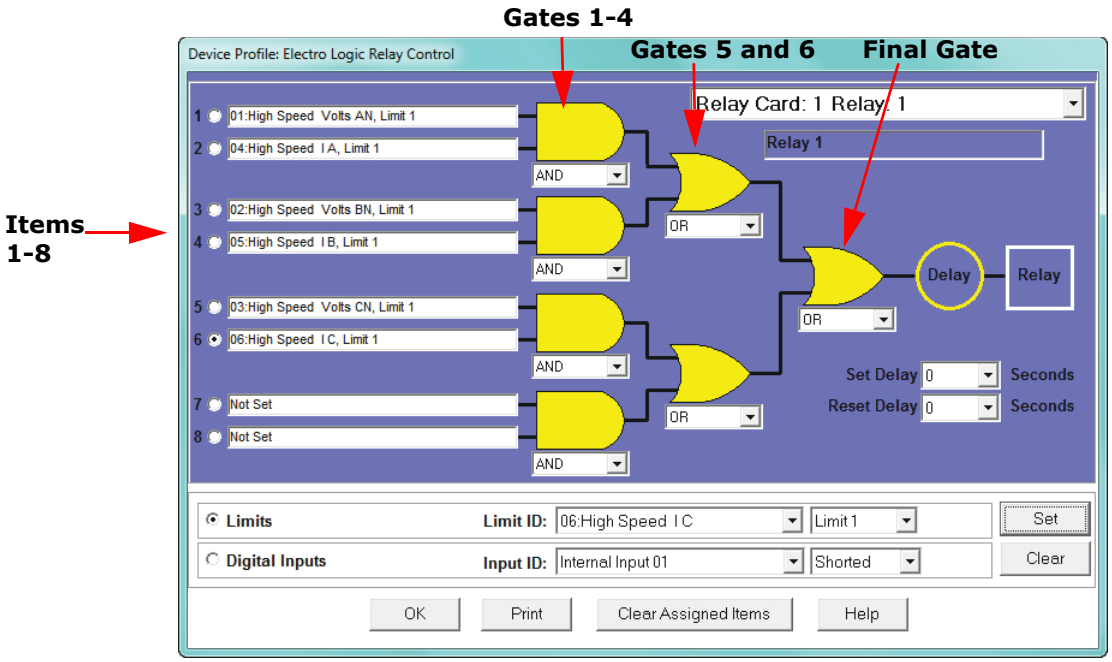
- To clear an item from the Relay tree, click on that item and click the Clear button.
- To clear all items from the Relay Tree, click the Clear Assigned Items button.

6. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

NOTE

In order to use this screen, you must have purchased at least one External Relay Output module. For more details on external Output modules, see Chapter 14 "External I/O Modules".

Example of an ElectroLogic™ Relay Logic Tree:



Inputs 1 through 8 are set to High Speed Volts AN Limit 1, High Speed Amps A Limit 1, High Speed Volts BN Limit 1, High Speed Amps B Limit 1, High Speed Volts CN Limit 1, High Speed Amps C Limit 1, Not Set and Not Set. The four first gates are AND gates, and the remaining three gates are OR gates.

Each first level gate looks at the state of the two limits, and the result is "true" if and only if both the inputs (Voltage Limit and Current Limit) are "true" (Out-of-Limit Condition). The second and third level gates look at the state of the earlier gates, and their results are "true" if either one (or both) of the previous gates are "true". The end result is a relay that is energized if one or more of the three phases (A, B, and/or C) is currently Out-of-Limit on both its voltage and current Limit 1 tests.

13.3.3 PQ Thresholds (Waveform Recording)

The PQ Thresholds/Waveform Recording capability allows the meter to act as a high-speed waveform recorder to record any anomaly that occurs within a cycle of duration. This provides a user with advanced waveform analysis including pre- and post- waveform recording.

The meter has the capability to record both surges and sags of the measured signals. A voltage surge is any event that increases the RMS voltage for one cycle, calculated every half cycle. A voltage sag is a dip in the RMS of one cycle of voltage, calculated every half cycle. A current fault (or surge) is also calculated in the same manner. When the RMS value of any of these triggers exceeds the threshold settings, the meter will trigger a waveform capture.

The Power Quality (PQ) and Waveform Thresholds setting determines at what point the EPM 9450/9650 meter executes a waveform capture and/or records a power quality event.

See Chapter 19 “Viewing Logs” for instructions on viewing Waveform and PQ logs.

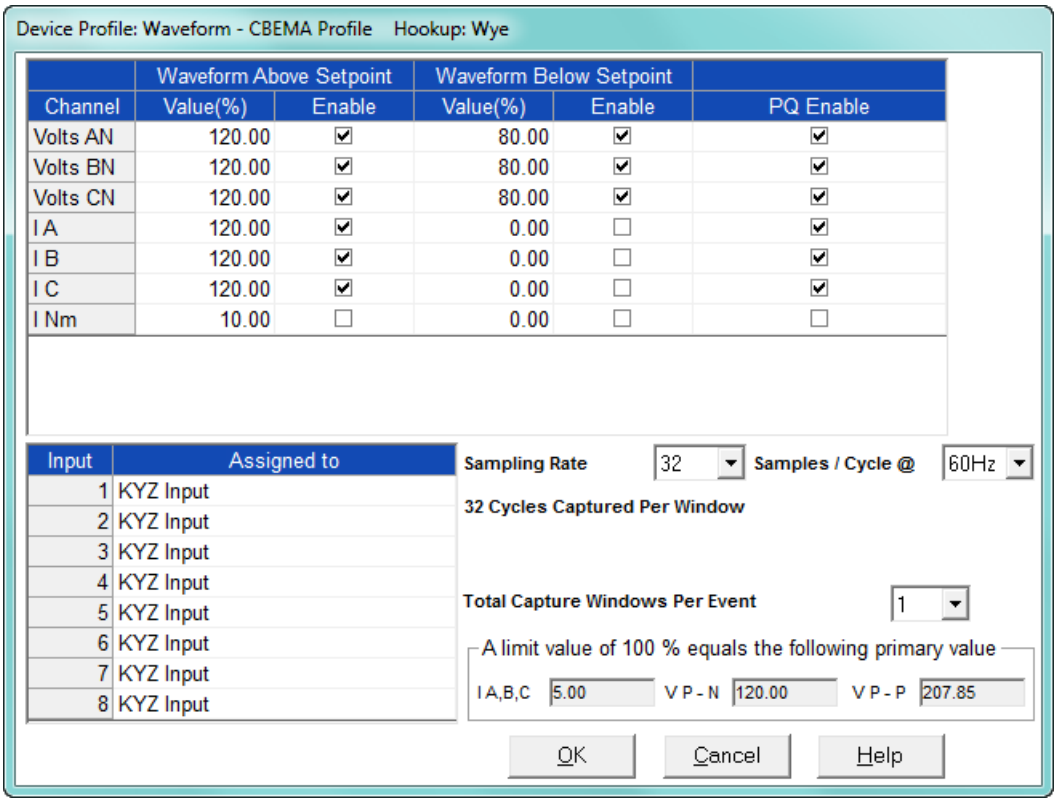
PQ and Waveform Thresholds are given as a percentage of the Full Scales (% of FS). Set the Full Scales in the Limits and Waveform Full Scales setting of the Device Profile (see 13.1.3 *Limit and Waveform Full Scales*). Full Scales are based on the CT and PT ratios set in the CT, PT Ratios and System Hookup setting of the Device Profile (see 13.1.1 *CT and PT Ratios and System Hookup*).

Before programming the PQ and Waveform Thresholds, set the CT and PT ratios and the Limits and Waveform Full Scales.

NOTE

Note on Sampling Rate: A higher sampling rate allows for transients to be monitored. Generally, the meter is set to take 1024 samples per cycle for this purpose. Lower sampling rates have advantages, however, because they allow you to record more cycles of information per event screen. Therefore, low sampling rates are better for long duration events, like motor starts or distribution faults. The meter enables you to tailor its recording for both these applications. For more information on sampling rate, see the table on page 13-62.

1. From the Power Quality and Alarm Settings menu, double-click on the PQ Thresholds (Waveform Recording) line. You will see the screen shown below



2. To set the threshold for a PQ event and waveform capture, enter the desired percentage of Full Scale in the Value() column of the Above Setpoint and Below Setpoint sections. Full Scales are shown in the lower right corner of the screen.

NOTE

NOTE ON CBEMA: The CBEMA plotting is a power quality standard known worldwide for recording the amount of damage voltage transient conditions have done to the equipment being monitored. The meter automatically records this information. For CBEMA purposes, program internal setpoints for voltage below 90 and above 110 of full scale (+/- 10 from the nominal voltage). These setpoints are defined by the ITI (CBEMA) specification. The ITI (CBEMA) Curve is published by Information Technology Industry Council (ITI). You can set a recording with tighter voltage limits to trigger a waveform recording. However, CBEMA plotting will be based only on the limits internally set.

NOTE

NOTE ON SETTING THE METER TO RECORD CURRENT FAULTS: The voltage setpoints are used to record voltage type events, such as voltage surges, sags and transients. The current settings are used to record faults on the line or in-rush currents from devices such as motors. Typically, to catch these events, set the limit to above 200 of full scale.

- Waveform Clipping Threshold: EPM 9450/9650 Meter 5 Amp Standard Hardware - ±60A Peak before clipping; EPM 9450/9650 Meter 1 Amp Hardware - ±12A Peak before clipping.

- Voltage Waveform Clipping Thresholds: EPM 9450/9650 Meter Standard Hardware - ±200V Peak before clipping; EPM 9450/9650 Meter -G Hardware - ±400V Peak before clipping.
- High Speed Inputs: The High Speed Inputs field allows you to see which High Speed Inputs are enabled for Waveform recording.

NOTE

IMPORTANT! You assign the High Speed Input to its trigger in the High Speed Inputs screen (see 13.3.7 *High Speed Inputs*).

- Samples per Cycle: To choose the Samples per Cycle to be recorded at 60 Hz, click on the Sampling Rate pull-down menu. Choose from 16, 32, 64, 128, 256 and 512 samples per cycle. The number of samples per cycle you choose will inversely affect the number of cycles per capture.
    - If you select 256, a Capture Only pop-up screen will ask you to select Volts A, B, C or I A, B, C.
    - If you select 512, a Capture Only pop-up screen will ask you to select one of the individual channels.

The following table illustrates the effects of sampling rate on the number of cycles captured. Increasing the Sampling Rate increases Waveform definition, but reduces the length of the observed window. The approximate length of the observed window is shown in the last column.

Effects of Sampling Rate					
Samples Per Cycle	**Channels**		**Samples Per Channel**	**Cycles Per Capture**	**Time (Approx)**
	Analog	HSI			
16	7	8	1024	64	1 Second
32	7	8	1024	32	½ Second
64	7	8	1024	16	¼ Second
128	7	8	1024	8	1/8 Second
256	3	8	2048	8	1/8 Second
512	1	8	4096	8	1/8 Second

For example, for observed events of approximately ½ second, a sampling rate of 32 samples per Cycle, or less, should be used.

NOTE

NOTE ON WAVEFORM EVENT CAPTURES: A screen of data is one capture. If you set Total Captures to 3 and you are recording at 16 samples per cycle, you will record:

16 Samples3 x 64 = 192 cycles of recorded waveforms
128 Samples3 x 8 = 24 cycles of recorded waveforms

With the 2 Megabyte module, you have a total of 64 captures; with the 4 Megabyte

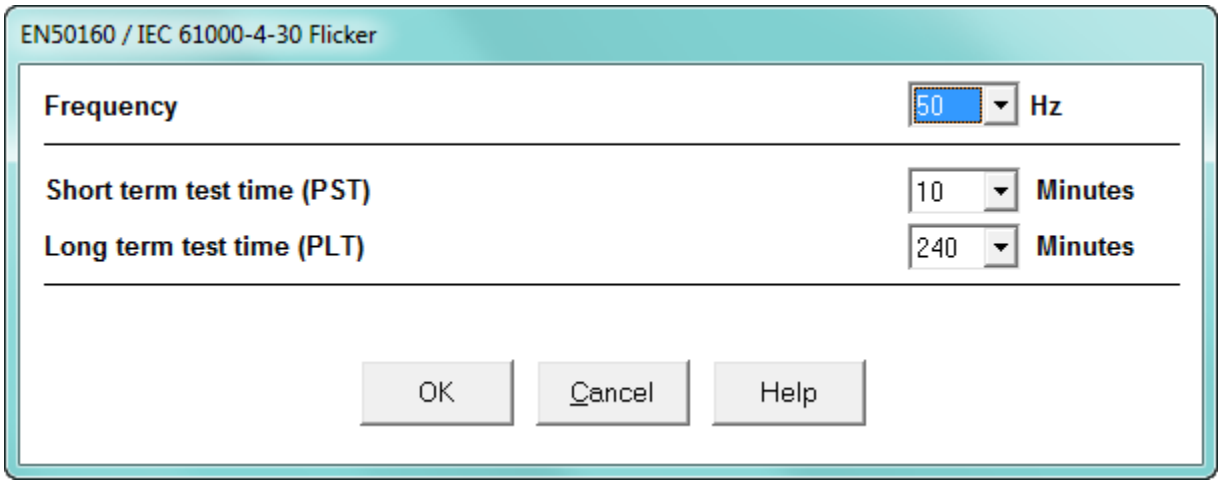
module, you have a total of 96 captures. You can partition the memory in any fashion required by your application. There is no limitation on the amount of cycles that can be recorded per event.

3. To choose the total amount of captures, click on the Total Captures pull-down menu. Select from 0 to 96 captures. The higher the number, the more information you will be "stringing together."
4. When all changes are entered, click **OK** to return to the main Device Profile screen. For changes to take effect, you must click the **Update Device** button. This sends the new profile to the meter.

13.3.4 EN 50160/IEC 61000-4-30 Flicker

With the EN 50160/IEC 61000-4-30 Flicker screen, you can set the test times for the Flicker function.

1. From the Device Profile screen double-click on the EN50160/IEC61000-4-30 Flicker line. You will see the screen shown below.



2. From the pull-down menus, select:
   - Frequency (50 or 60Hz) - this field is used to calculate the harmonics and interharmonics associated with the set fundamental frequency.
   - Short Term Test Time (1-10 minutes, in minute increments) - PST is defined over a ten minute interval. Standard IEC 61000-4-15 requires 10 minutes for PST.
   - Long Term Test Time (10-240 minutes, in ten minute increments) - the standard requires 120 minutes, and is calculated from the PLT values.
3. When all changes have been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

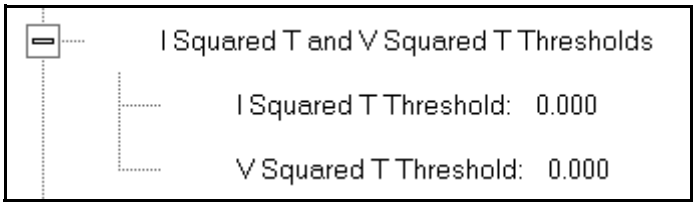
NOTE

Flicker is discussed in detail in Chapter 23 “EN 50160 / IEC 61000-4-30 Power Quality Analysis”.

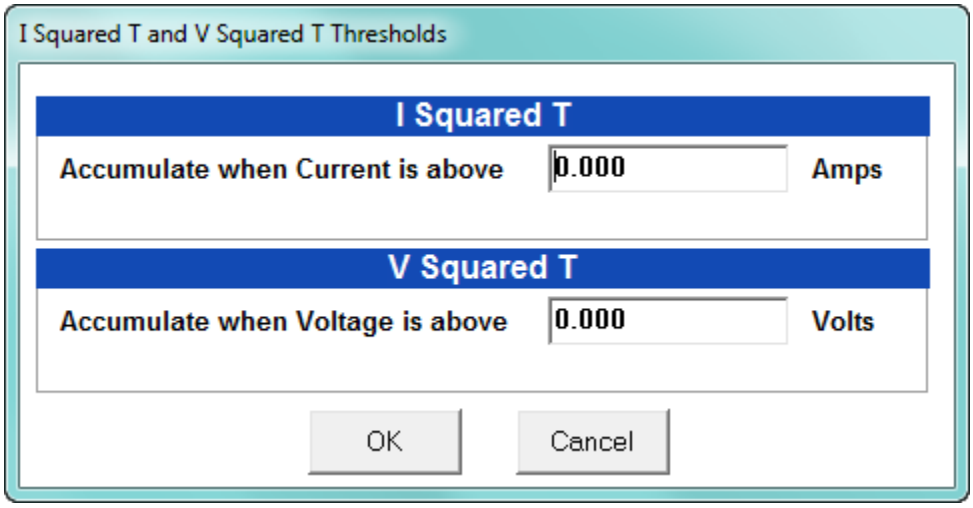
13.3.5 I Squared T and V Squared T Thresholds

With the I Squared T and V Squared T Thresholds screen, you can set the point at which the meter accumulates current and Voltage. This feature is used to calculate wear on circuit breaker contacts.

1. From the Power Quality and Alarm Settings menu, click on the + button next to I Squared T and V Squared T Thresholds or double-click on that line. You will see the submenu shown below, which shows the current settings for the meter.



2. Double-click one of the settings to open the I Squared T and V Squared T Thresholds screen, shown below.

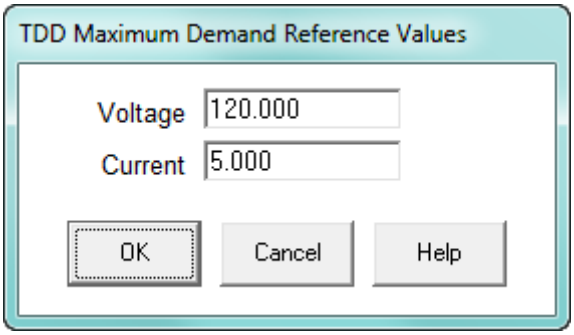


3. Enter the thresholds in the I Squared T and V Squared T fields.
4. Click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.3.6 TDD Maximum Demand Reference Values

This setting of the Device Profile allows you to set the maximum value for voltage and current, which is used when the meter calculates TDD (Total Demand Distortion). TDD and THD (Total Harmonic Distortion) are both indices used to measure harmonics.
TDD is defined in the IEEE 519 Standard, "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems" as "the total root-sum-square harmonic current distortion in percent of the maximum load current." It gives a better indication of the impact of distortion on Demand than THD which analyzes the harmonic distortion relative to the fundamental, without consideration of load.

1. From the Power Quality and Alarm Settings menu, double-click on the TDD Maximum Demand Reference Values. You will see the screen below.



2. Enter the maximum values for voltage and current.
   - You can find these values in the Poll Max and Min Readings polling screen (see 5.2.2 *Poll Max and Min Readings* for details).
   - You can view the TDD values in the Harmonics polling screen (see 5.4.2 *Poll Harmonics*for details).
3. Click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.3.7 High Speed Inputs

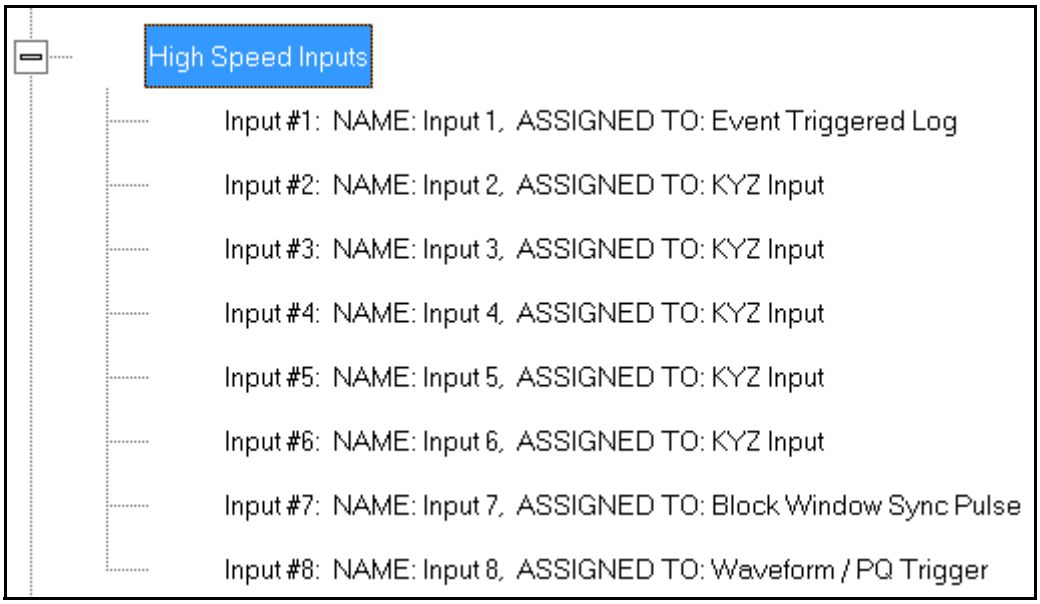
The EPM 9450/9650 meter's built-in High Speed Inputs can be used in two ways:

- Attaching status contacts from relays, breakers or other devices for status or waveform initiation
- Attaching the KYZ pulse outputs from other meters for pulse counting and totalizing

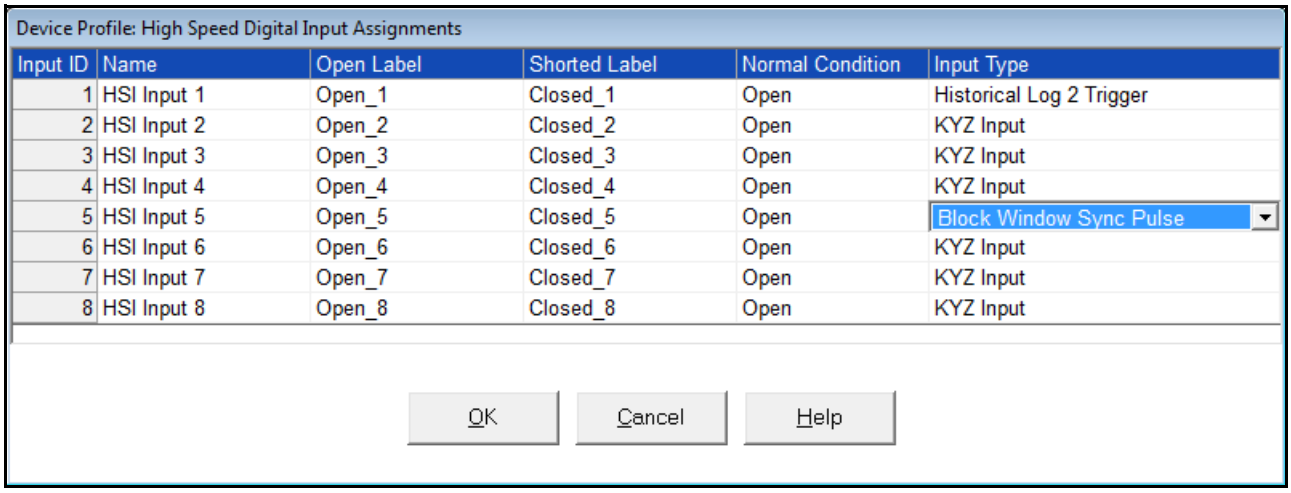
Even though these inputs are capable of being used as high speed digital fault recording inputs, they serve a dual purpose as KYZ counters and totalizers. The function in use is programmable in this setting of the Device Profile, which lets you label the eight High Speed inputs and to specify their status.

- Labeling the inputs allows you to determine the source of status change when data is later analyzed.
- This feature lets you set the High Speed Inputs' status as a KYZ input, a trigger for waveform capture or PQ recording, a trigger for logging, or a means of synchronizing the meter.
- In the Pulse Accumulations setting (13.2.10 *Pulse Accumulations*), you can assign the High Speed Inputs' counts to be accumulated in one of four internal Aggregators of the meter.

1. From the Power Quality and Alarm Settings menu, double-click on the High Speed Inputs line or click on the + button next to it. You will see the submenu shown below.



2. Double-click any of the Input lines. You will see the screen below.



Input ID	Name	Open Label	Shorted Label	Normal Condition	Input Type
1	HSI Input 1	Open_1	Closed_1	Open	Historical Log 2 Trigger
2	HSI Input 2	Open_2	Closed_2	Open	KYZ Input
3	HSI Input 3	Open_3	Closed_3	Open	KYZ Input
4	HSI Input 4	Open_4	Closed_4	Open	KYZ Input
5	HSI Input 5	Open_5	Closed_5	Open	Block Window Sync Pulse
6	HSI Input 6	Open_6	Closed_6	Open	KYZ Input
7	HSI Input 7	Open_7	Closed_7	Open	KYZ Input
8	HSI Input 8	Open_8	Closed_8	Open	KYZ Input

3. Double-click a field to enter the following:
   - Name
   - Open Label
   - Shorted Label
   - Normal Condition
4. Click on the Input Type field to select an option from the pull-down menu. The available selections are:

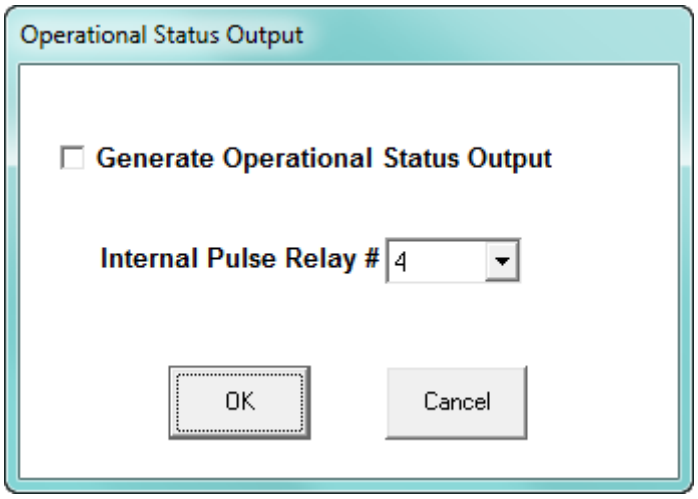
- KYZ Input - select this option to designate the input as a pulse (KYZ) input.
- Waveform/PQ Trigger - select this option if you want the input to trigger a waveform/PQ recording (see 13.3.3 *PQ Thresholds (Waveform Recording)*).
- Block Window Sync Pulse - select this option if you want to synchronize the meter with pulses from the input (see 13.2.2 *Demand Integration Intervals*).
- Historical Log 2 Trigger - select this option to use this input to trigger logging in Historical log 2 upon a change in its state (see "Programming the Trending Log Time Intervals" on page 13-57).

5. When you have finished making your selections, click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.3.8 Operational Status Output

This setting of the Device Profile lets you assign a relay to the operational status of the meter. The relay can then be monitored by another connected device.

1. From the Power Quality and Alarm Settings menu, double-click on the Operational Status Output line. You will see the screen shown below.



2. Select the relay you want to assign from the pull-down menu and click the checkbox.
3. When you finish making your selections, click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.4 Trending Profile Settings

This section of the Device Profile enables you to configure parameters for the EPM 9450/9650 meter's two historical logs.

1. From the Device Profile screen, click on the + button next to Trending Profile Settings or double-click on the Trending Profile Settings line. You will see the menu shown below.

2. Double-click on one of the Trending lines to access the programming screens.

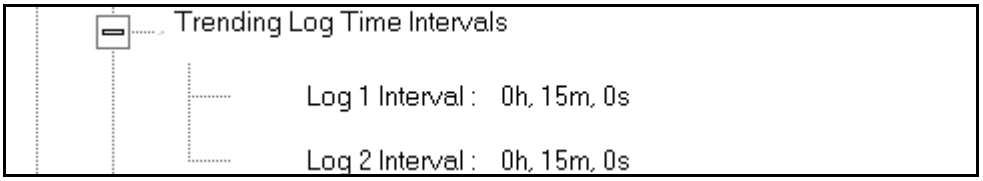
NOTE

NOTE on Load Profile Recording: Load Profile recording is a subset of the EPM meter's more general logging and trending capability. The same screens are used for setup, but Load Profile recording only deals with accumulated values; Energy (Wh), reactive Energy (VARh) and apparent power (VAh).
Historically, Load Profile recording referred to recording of quadrant 1 Energy (Wh) because electromechanical meters only measured energy and were designed to prevent reverse rotation outside of quadrant 1.

13.4.1 Programming the Trending Log Time Intervals

The Trending Log Time Intervals setting determines the interval at which the Historical logs take a "snapshot" of data, and the length of time logging continues when Historical log 2 recording is triggered by changes in the state of an input (see "High Speed Inputs" on page 13-54). To set the parameters for the logs, see 13.4.2 *Programming the Trending Setup*. See CChapter 16 "Databases and Log Data" for information on retrieving logs and Chapter 19 "Viewing Logs" for information on viewing logs.

1. From the Trending Profile Settings menu, double-click Trending Log Time Intervals or click the + button next to it. You will see the submenu shown below. The submenu shows the interval set for both Historical logs.



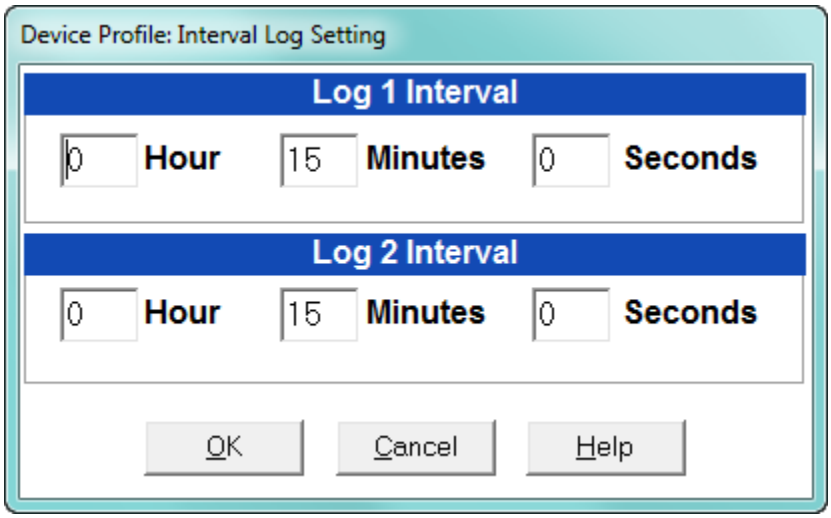
2. To change the interval for a Historical log, double-click on one of the logs.

NOTE

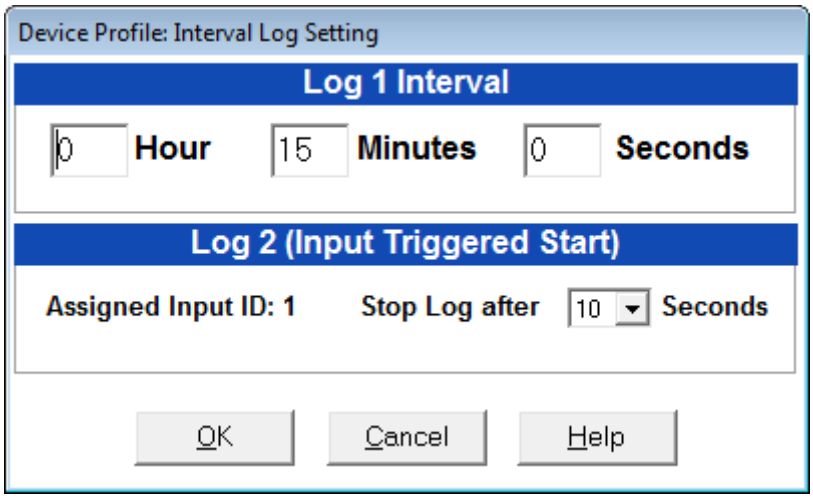
- You can also access the Interval setting screens from the Trending Setup screens (see 13.4.2 *Programming the Trending Setup*).

- If Historical log 2 has been configured to log the changes in state of an input, the menu shown above will indicate that.

3. You will see the screen shown below. Enter the interval you want.



Note that if Historical log 2 recording is being triggered by the change of state of an input, the Input number will be displayed and the selection for Log 2 will consist of the number of seconds after which logging should stop. See the example screen, below.



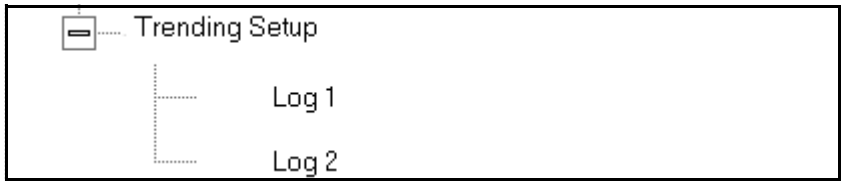
Select the number of seconds from the pull-down menu.

4. Click **OK** to save your changes. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

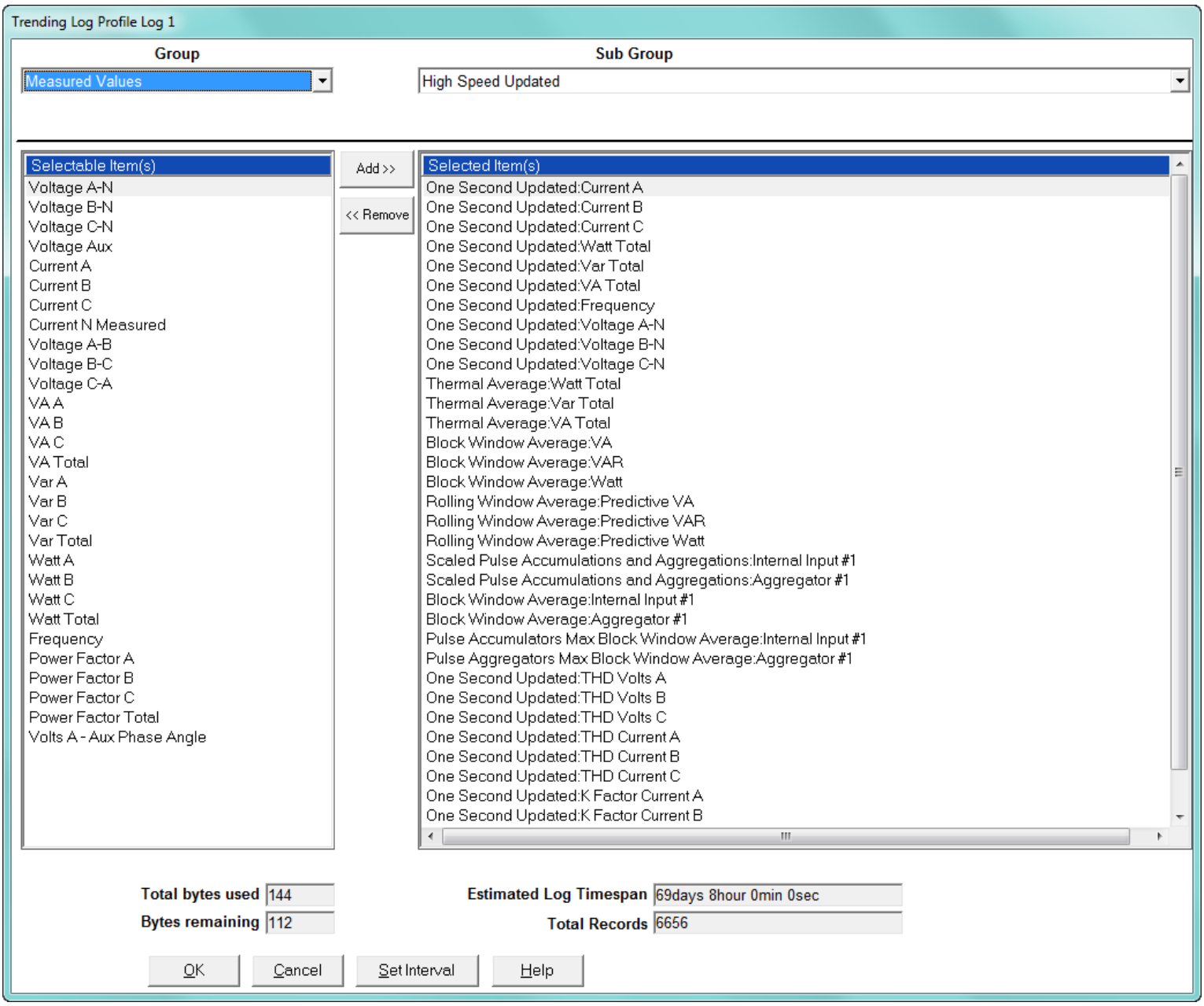
13.4.2 Programming the Trending Setup

The Trending Setup controls the channel assignments for the Historical logs. See Chapter 16 “Databases and Log Data” for instructions on retrieving logs.

1. From the Trending Profile Settings menu, click on the + button next to Trending Setup or double-click on the Trending Setup line. You will see the submenu shown below.



2. Double-click on the log whose settings you want to configure. You will see the Trending Log Profile screen for the log you selected. An example screen is shown below.



3. Make changes to this screen according to your application requirements.
   - Group: Using the pull-down menu, select the type of snapshot. The options are: Measured Values, Averages, Accumulators, Interval Accumulators, External Output Devices, TOU Cumulative Dmd.
   - Sub-Group: Using the pull-down menu, select a channel for the snapshot. The options are: Fifty Millisecond Updated; One Second Updated; Harmonic Values; Internal Inputs, States; Phase Angles; Flicker.
   - Sub-Group 2: With some selections, a second sub-group field will be shown underneath the first one. Select a value for this field from the pull-down menu.
   - Highlight items in the Selectable Items(s) box and click Add to include the selections in the Log. The items will be copied to the Selected Item(s) box. To remove an item from the log, highlight the item in the Selected Item(s) box and click Remove or double-click the item. The item will be removed from the Selected Item(s) box.

NOTE

- To select multiple items, hold Control while highlighting the items.
- To select a range of items, click the first item, hold Shift, and click the last item.
- Move the cursor to the lower left corner of an item, or group of items, to view its size in bytes.
   - Click HHF if you want to convert files to HHF format for use with MV-90. See Chapter 16 “Databases and Log Data” for details.
   - Click Check HHF if you want to check if current settings are compatible with the HHF Converter.

NOTE

NOTE: You will not see the HHF options unless you have enabled the HHF converter using the Options menu. See Chapter 20 “Other Functions and Screens” for instructions.

   - The Total bytes used and Bytes remaining fields display the amount of memory used for each record of the log. The meter assumes 256 bytes of memory for each record. Total memory is determined at time of purchase.
   - The Estimated Log Timespan field displays the length of the time between the first and last records in the log when it is full.
   - The Total Records field displays the total number of records that will be in the log when it is full.
   - Click Set Interval to open the Interval Log Setting screen (see 13.4.1 *Programming the Trending Log Time Intervals*).

4. When all changes have been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

13.5 External I/O Modules

This setting of the Device Profile allows you to set up the meter's optional external Input/Output modules (see Chapter 14 "External I/O Modules" for more information on the I/O modules). I/O modules work as Modbus slave devices. The meter polls these modules to get the data from them. I/O modules generally have default RS485 Modbus addresses. So, they don't have to be configured. Once you set up which module you want, put in the default address and start with the basic configuration of readings you desire to gather.

13.5.1 Configuring the Input/Output Modules

1. From the Device Profile screen, double-click on the External I/O Modules icon. You will see the screen shown below.

Device Profile: I/O Modules

Module Number	Type	Assigned Address	EPM Settings	Module Settings	Log / Limit ID
1	20mAON8: Analog Out 4 - 20mA 8 ch	132	Edit	Edit	AO Module 1
2	4PO1: KYZ Output	160	Edit	Edit	KYZ Module 1
3	4RO1: Digital Output	156	Edit	Edit	DO Module 4
4	8AI1: Analog In 0 - 1mA 8 ch	136	Edit	Edit	AI Module 1
5	No Device Assigned				
6	No Device Assigned				
7	No Device Assigned				
8	No Device Assigned				
9	No Device Assigned				
10	No Device Assigned				
11	No Device Assigned				
12	No Device Assigned				
13	No Device Assigned				
14	No Device Assigned				
15	No Device Assigned				
16	No Device Assigned				

OK Cancel Help

2. Click in the Type column and use the pull-down menu to select the specific module you want to add. The Assigned Address, EPM settings, and Module settings you can make depend on the module you are configuring. The modules and settings are as follows:

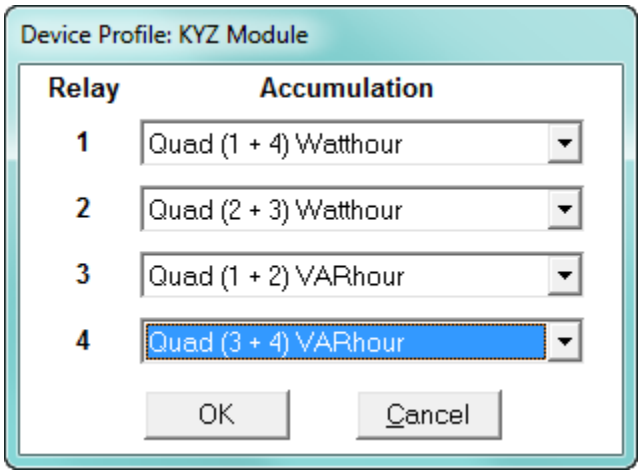
Module	Assigned Address*	EPM Setting**	Module Setting
4PO1 - KYZ Output	160*	Click to Edit Relay Accumulations	Click to enter Transmit Delay and configure KYZ outputs' Watt/pulse, rollover and minimum pulse width.

Module	Assigned Address*	EPM Setting**	Module Setting
20mAON4	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
20mAON8	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
1mAON4	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
1mAON8	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
4RO1 - Digital Output	156*	Click to configure Relays	Click to enter Transmit Delay
8AI1 - Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI2- Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI3 - Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI4 - Analog Input Module	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8DI1 - Digital Status Input Module	164*	Click to configure Digital Inputs	Click to enter Transmit Delay and configure Channel settings

* The Assigned address on this screen is the address the meter uses to identify the I/O module. The default is the factory set address, which you can change by clicking in the field and choosing a new address from the pull-down menu. This address is not the actual I/O module address. You set that from the I/O Devices menu; see Chapter 14 "External I/O Modules" for instructions.

**When you click in this field you see an Edit button. Click the button to open a screen that lets you edit that module. See the following example screens.

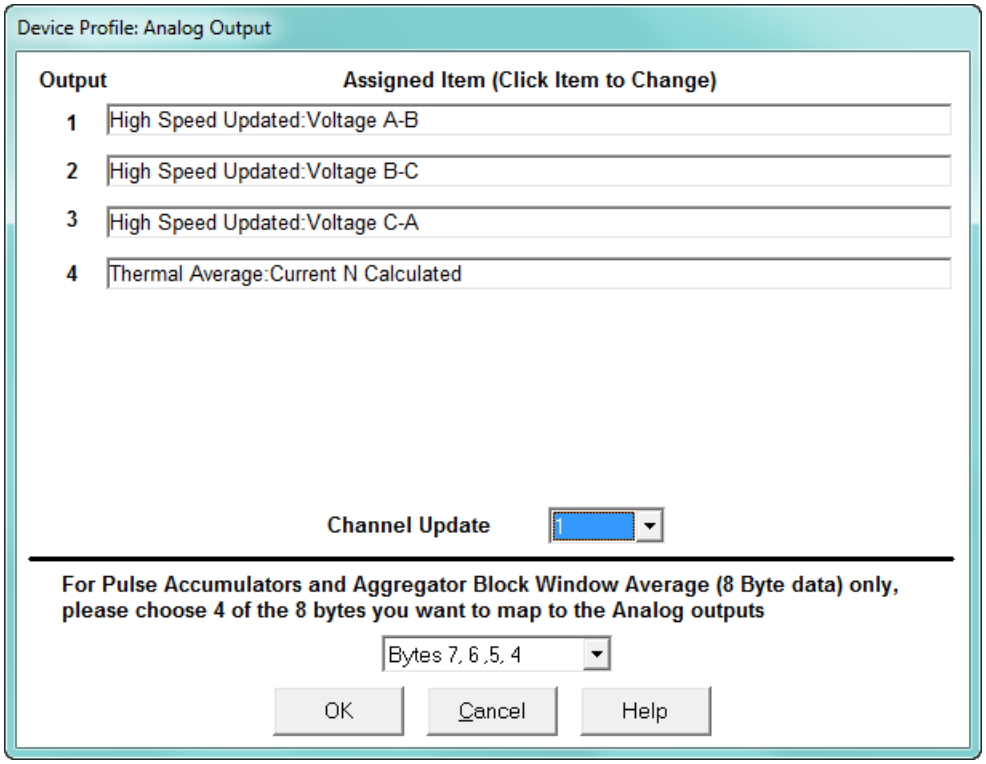
Figure 13-1: 4PO1 Screen



This screen allows you to assign a KYZ output to an accumulator. Click on the pull-down menu to select accumulation configuration for each of the 4 relays. The options are:

- Disabled
- Quad (1+4) Watthr
- Quad (2+3) Watthr
- Quad (1+2) VARhr
- Quad (3+4) VARhr
- Quad (1+2+3+4) VAhr
- Quad 1 Watthr
- Quad 2 Watthr
- Quad 3 Watthr
- Quad4 Watthr
- Quad 1 VARhr
- Quad 2 VARhr
- Quad 3 VARhr
- Quad 4 VARhr
- Quad 1 VAhr
- Quad 2 VAhr
- Quad 3 VAhr
- Quad 4 VAhr
- +Qh Total
- -Qh Total
- Internal Input (#1-8) Totals
- Accumulation (#1-4) Totals
- External Digital Input Modules (1-4) Inputs (#1-8)
- I Squared T (A, B, C)
- V Squared T (A,B,C)

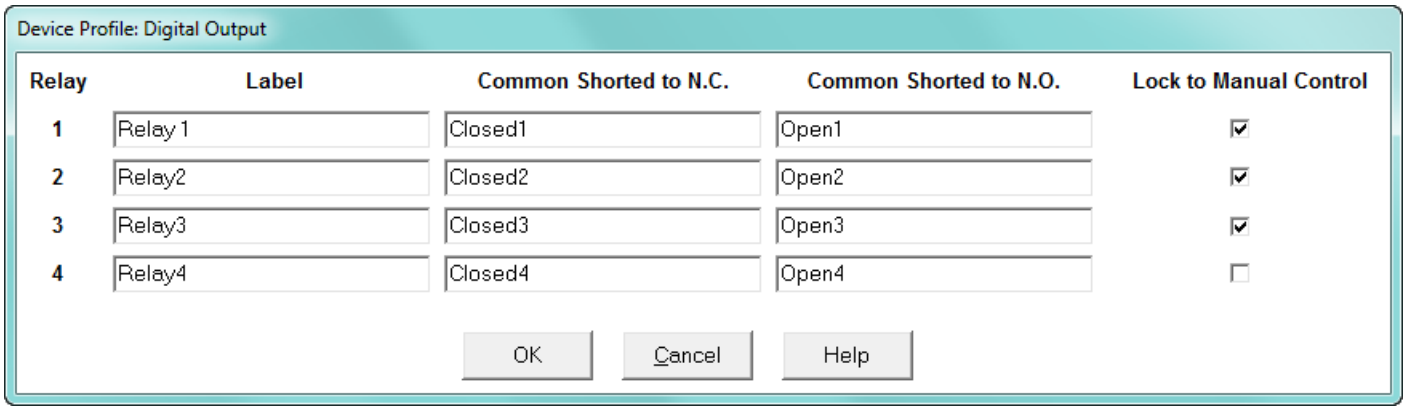
Figure 13-2: 20mAON4 Screen



Click in Output channels 1-4 to assign them to a parameter. The other Analog Output Modules - 20mAON8, 1mAON4, and 1mAON8 have similar setting screens, except for the number of channels you can program.

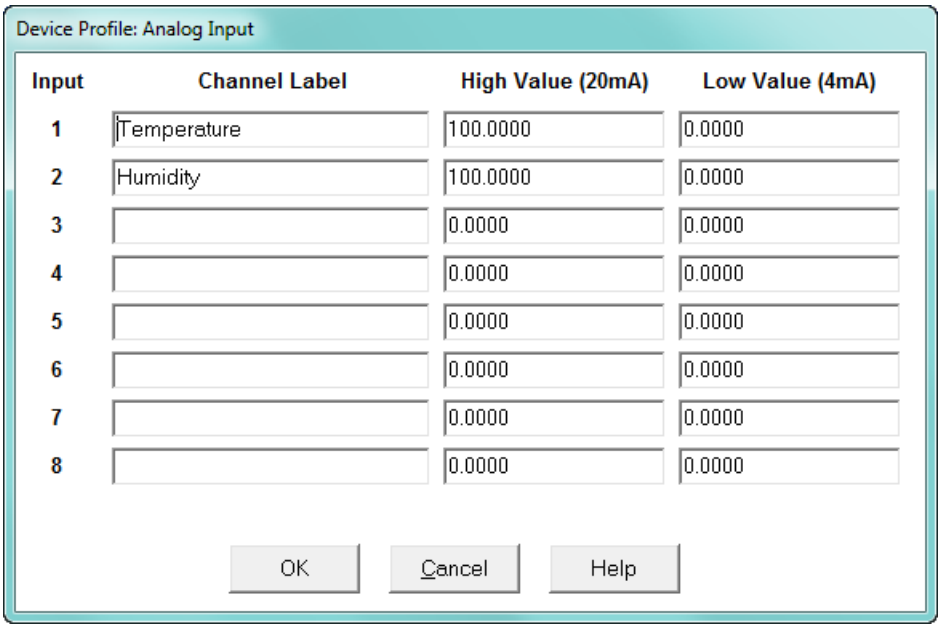
- The analog outputs are used to send a variable current dependent on the programmed reading. This screen lets you select the readings to output.

Figure 13-3: 4RO1 Screen



Click in the Relay fields 1-4 to enter relay label, common shorted to N.C., common shorted to N.O., and check the box to lock the relay to manual control. When a relay is locked to manual control, it cannot be used in ElectroLogic Relay Control (see 13.3.2 *Electrologic™ Relay Control* for information on ElectroLogic Relay Control).

Figure 13-4: Analog Input Screen



Click in Input Channels 1-8 to assign a label and a High and Low Value.

- The two analog input module's settings are the same, except for the Inputs' high and low range.
- The High and Low Value fields let you map the inputs' high and low range to values that are appropriate for the parameters you are measuring. For example, in the screen above, the first input is measuring temperature. The high value for the input is set to 100, and the low value is set to 0. An input reading of 12mA will translate to 50 for the temperature.
  The Analog Input modules can be trended in the historical logs, and the data can be viewed and graphed in Log Viewer (see Chapter 19 "Viewing Logs" for details).

The readings shown in the logs and graphs will use the setting range programmed in the screen above, i.e., the results will be reported as 0 through 100.

Figure 13-5: Digital Input Screen

Device Profile: Digital Input Option Card in Slot 3

Input	Channel Label	Open Label	Closed Label	Normal State	Rollover
1	Input 1	Opened	Closed	Open	999999999
2	Input 2	Opened	Closed	Open	999999999
3	Input 3	Opened	Closed	Open	999999999
4	Input 4	Opened	Closed	Open	999999999
5	Input 5	Opened	Closed	Open	999999999
6	Input 6	Opened	Closed	Open	999999999
7	Input 7	Opened	Closed	Open	999999999
8	Input 8	Opened	Closed	Open	999999999
9	Input 9	Opened	Closed	Open	999999999
10	Input 10	Opened	Closed	Open	999999999
11	Input 11	Opened	Closed	Open	999999999
12	Input 12	Opened	Closed	Open	999999999
13	Input 13	Opened	Closed	Open	999999999
14	Input 14	Opened	Closed	Open	999999999
15	Input 15	Opened	Closed	Open	999999999
16	Input 16	Opened	Closed	Open	999999999

Initialize OK Cancel

Click in Channel Label's 1-8 to assign a Channel label, Open and Closed label, and Normal State (Open or Shorted) for each of the digital inputs.

NOTE

- The Assigned Address, EPM settings, and Module settings you can make depend on the module you are configuring. The modules and settings are explained fully in the *EPM 9450/9650 Instruction Manual*.
- Port 4 is the only available port for the modules.
- Log/Limit ID is a display only field. It shows the ID GE Communicator software generates to identify this module in the Log Viewer and Limits functions.

3. Click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

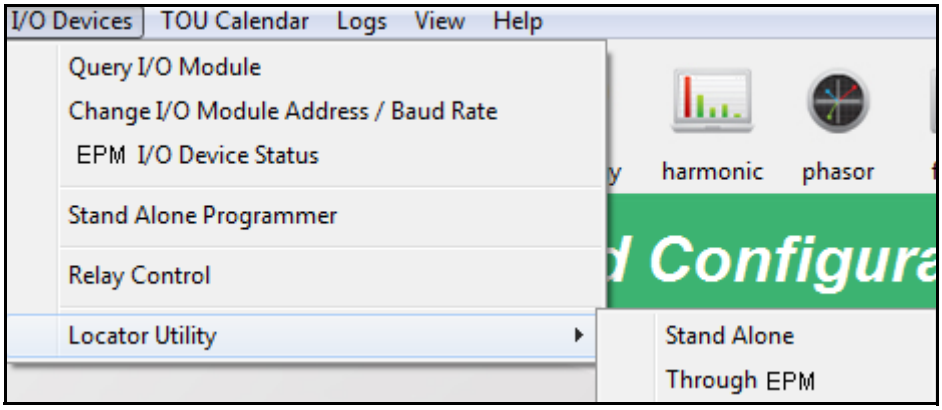
GE Communicator

Chapter 14: External I/O Modules

14.1 Overview

The EPM 9000 series meters have optional external I/O modules. Refer to your meter's Installation and Operation manual for the options offered and physical installation instructions, any necessary power supplies, and related hardware considerations.

The external I/O devices are programmed through the meter's Device Profile (refer to the Communications and External I/O Devices settings instructions for your meter). There are additional software options available through the I/O Devices menu, which is accessed from the Main screen's Menu Bar.



This chapter explains these software options.

14.1.1 Information About the External I/O Modules

Depending on the EPM meter you are configuring, the external I/O devices use the following RS485 Com ports:

- EPM 9900/9900P meter's optional Port 2

- EPM 9800 meter's Port 4
- EPM 9450/9650/9700 meter's Port 3 or 4

NOTE

IMPORTANT: You must use the correct port. Be sure ports are set to operate at the same baud rate as the I/O modules. The ports must also be configured as Output Modules. refer to the individual meter chapters for detailed port configuration instructions for your meter type.

The External I/O Modules setting of the meter Device Profile, tells the meter which I/O Modules are connected to it at which addresses. This profile must reflect what is physically attached to the meter.

Revise the Device Profile each time an I/O module is added, removed or configured.

Each type of I/O module is shipped with a factory-set address (see 11.5 *External I/O Modules* (EPM 9900/9900P), 12.5 *External I/O Modules* (EPM 9800), and 13.5 *External I/O Modules* (EPM 9450/9650) for details and the table of factory-set addresses for each of the I/O modules). If you plan to use more than one I/O module of the same type (such as three KYZ modules), you must change the address of each module individually before connecting the group to the EPM meter. See 14.3 *Assign Addresses and Baud Rates to an I/O Module* for instructions on changing a module's address and baud rate.

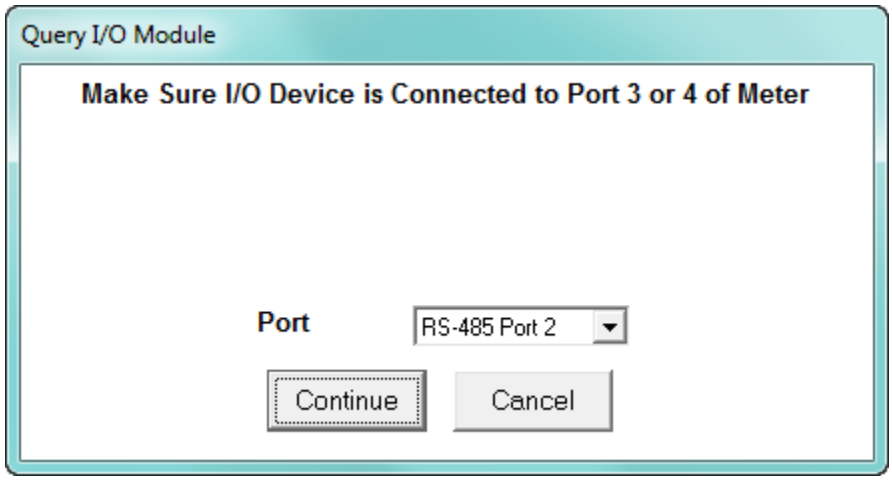
14.2 Query I/O Module

Though the I/O modules are shipped with default addresses (shown in the tables in sections 11.5 *External I/O Modules* for EPM9900/9900P, 12.5 *External I/O Modules* for EPM 9800, and 13.5 *External I/O Modules* EPM 9450/9650), in the case that you have changed the address and don't know it, you can use the Query I/O Module option to locate a module with an unknown address and baud rate.

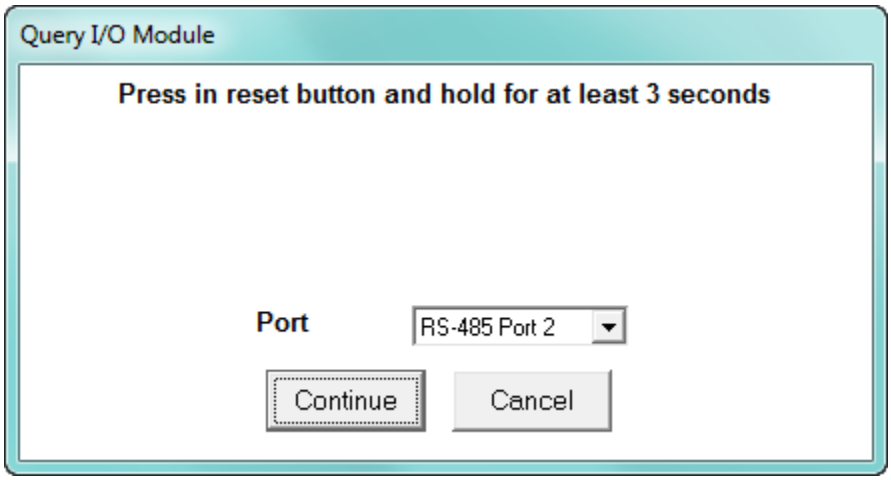
NOTE

This utility requires you to press the I/O module's Reset button. If you are off-site, or cannot access the Reset button, use the Locator Utility option described in 14.7 *Locator Utility*, instead.

1. From the Menu Bar, select **I/O Devices > Query I/O Module**. See the example screen, shown below.

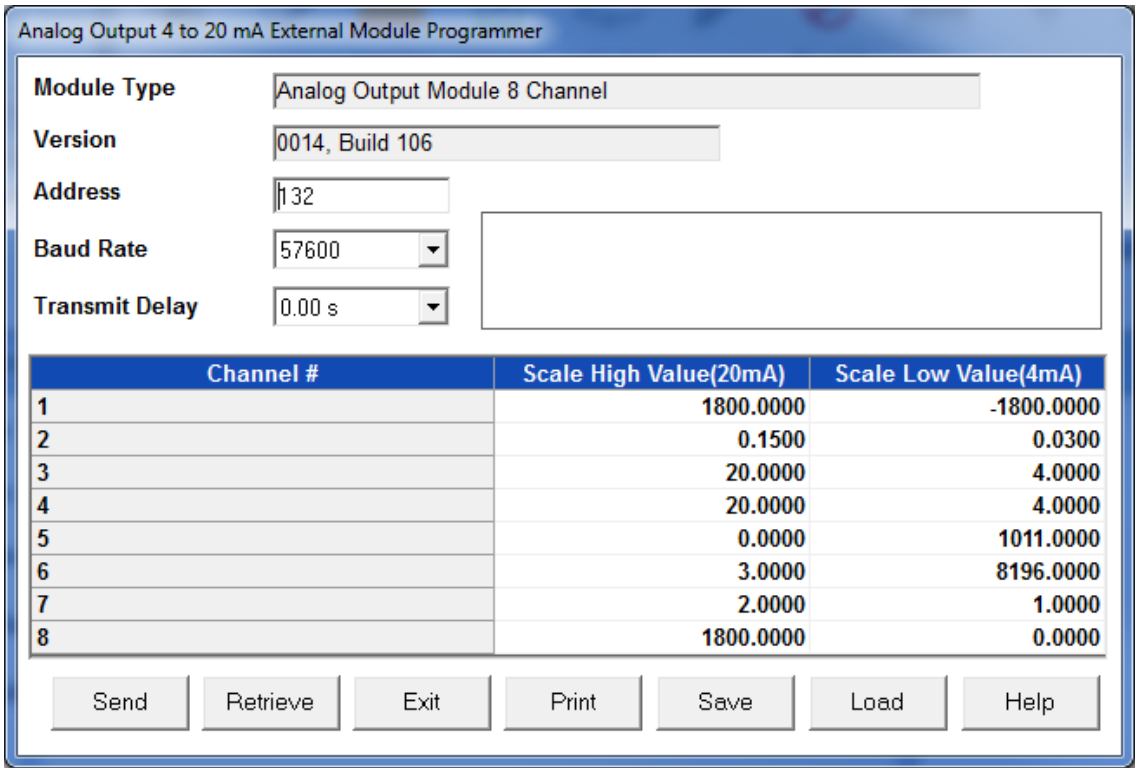


2. Select the port the module is connected to from the pull-down menu and click **Continue**. You will see the screen shown below.



3. Use an instrument with a fine point to depress the I/O module's Reset button. Hold it in for at least three seconds. This resets the I/O module to address 247 at 57600 baud for thirty seconds, allowing the GE Communicator application to retrieve the stored address and baud rate.

4. Click **Continue**. The software begins looking for the device at the temporary address of 247. When the I/O's programmable information is located, the following screen opens (the specific screen you see will be for the type of External I/O Module you are connected to).



5. Write down the address and baud rate.
6. Click **Exit** to close the screen.

14.3 Assign Addresses and Baud Rates to an I/O Module

As mentioned previously, the external I/O modules are shipped with a factory-set default address and baud rate. If you have more than one of a particular type of I/O module, you'll have to change the address of the additional module(s), since each I/O module must have a unique address. This feature lets you change the address of an I/O module. You can also change the baud rate of the module with this feature, if you wish.

NOTE

The utility described here requires the I/O module to be connected to the meter's I/O port - Port 2 of the EPM 9900/9900P meter, Port 4 of the EPM 9800 meter, or ports 3 or 4 of the EPM 9450/9650/9700 meter. To configure an I/O module by connecting it directly to your computer rather than to the meter, use the Stand Alone Programmer utility: see 14.5 *Stand Alone Programmer* for instructions.

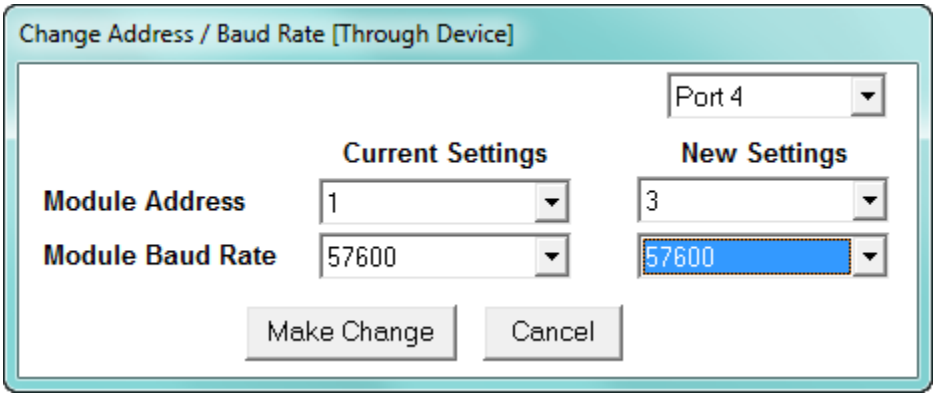
You must know the current address and baud rate of the I/O you want to change. See sections 14.2 *Query I/O Module* and 14.7 *Locator Utility* if the address and/or baud rate has been changed or is no longer known. When you have determined the current address and baud rate, proceed with the steps listed below.

1. Make sure the EPM meter's port is configured to communicate with the external I/O module. See the Communications setting instruction in your meter's programming chapter.
2. Connect the external I/O module to the meter's port.

NOTE

You may connect a group of I/O modules to the EPM meter to make address/baud rate changes only if each I/O already has a unique address. If the I/O modules have the same address - such as three new KYZ modules—you must connect and change their addresses individually.

3. Select **I/O Devices > Change I/O Module Address/Baud Rate.** You will see the screen shown below.



4. From the pull-down menus:
   - Select the port the I/O module is connected to.
   - Enter the module's current address and baud rate.
   - Enter the new address (1 - 247)and/or baud rate(4800, 9600, 19,200, 57600). Make sure that the address is not already assigned to an external I/O module you will be using.

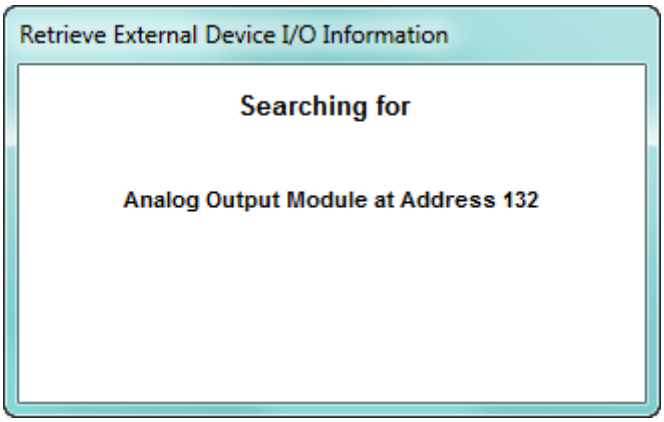
- Click Make Change. A confirmation screen appears after the module has been updated. If there are multiple I/O modules in this group, repeat the procedure for all of the I/O modules.

5. Write down the module's new address and baud rate.
6. Enter the information in the meter's External I/O settings screen. Refer to the programming chapter for your meter.

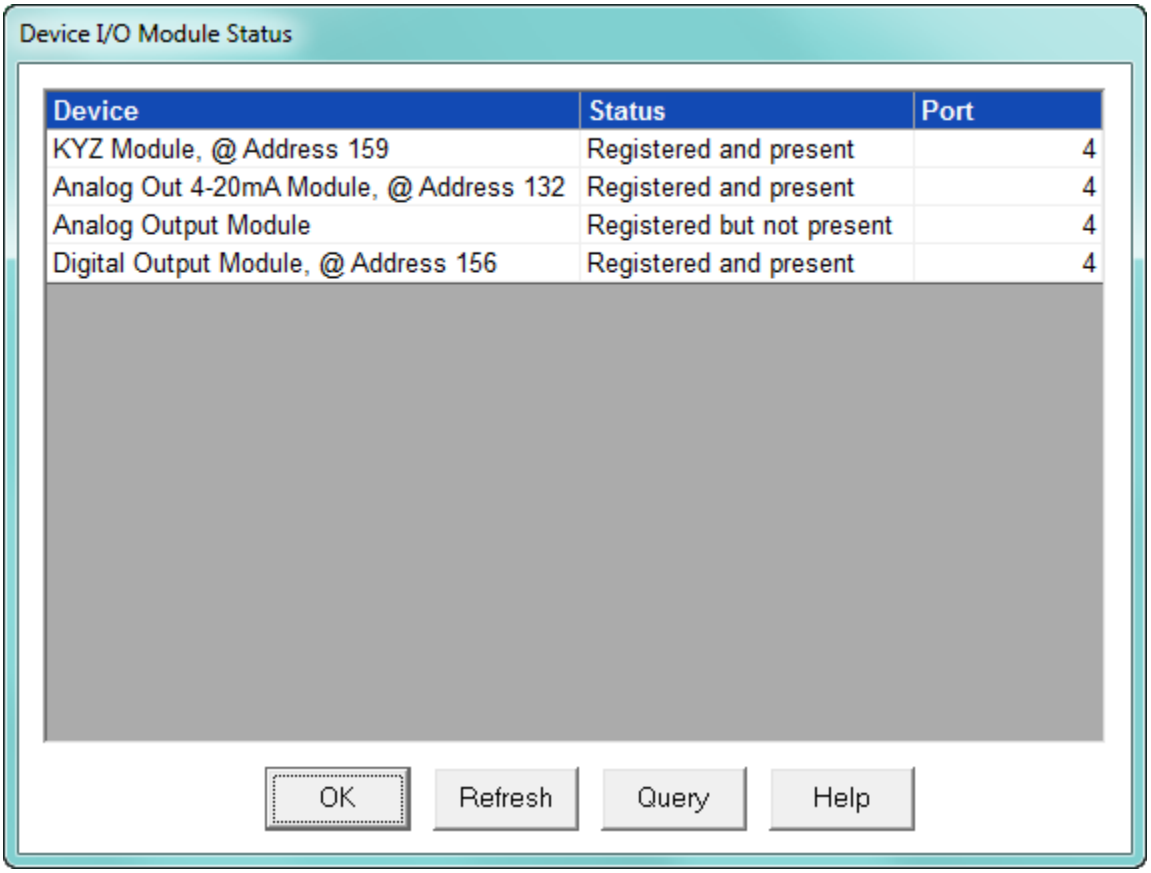
14.4 EPM I/O Device Status

This utility lets you view a list of all the modules that have been entered ("registered") in the EPM meter's Device Profile.

1. From the Menu Bar, select **I/O Devices > EPM I/O Device Status**. GE Communicator software searches for all entered I/O modules. You will see a status screen while the I/O modules are being located. See the example screen below.

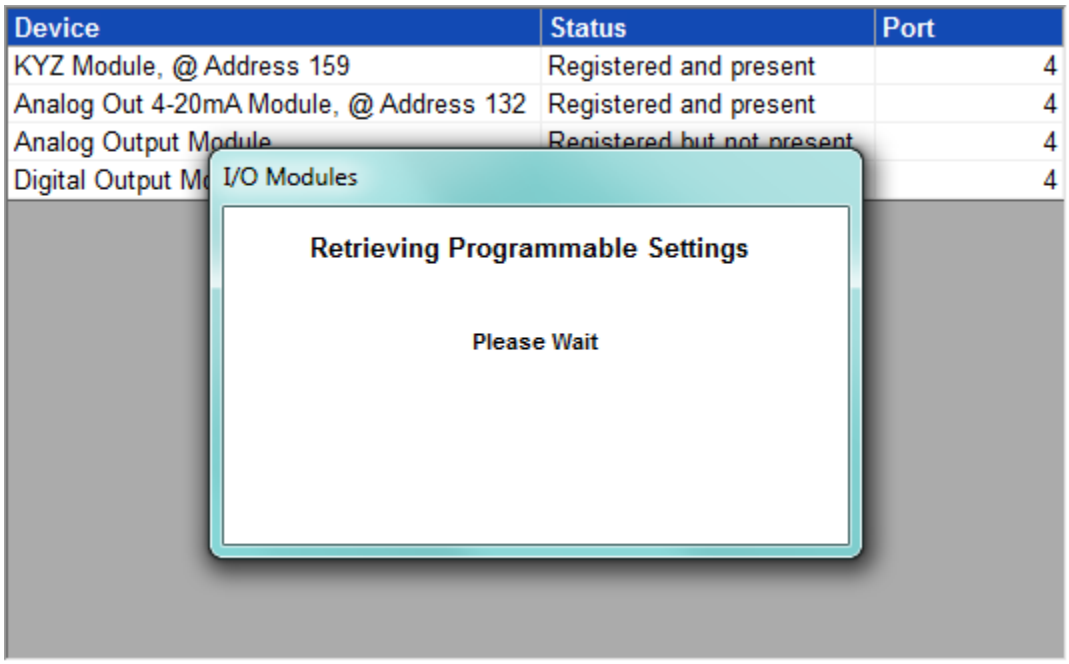


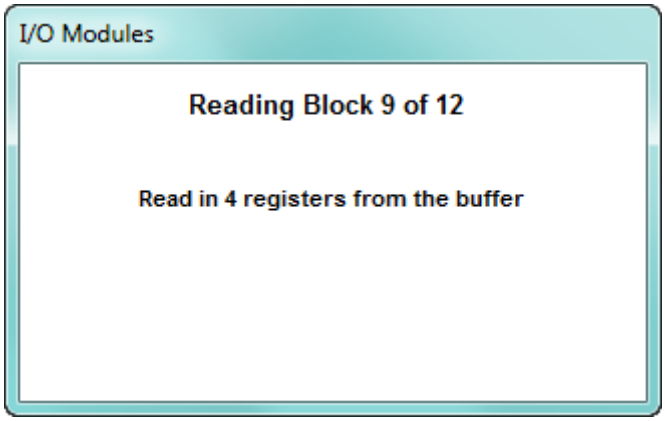
2. When the external I/O modules are all located you will see the following screen.



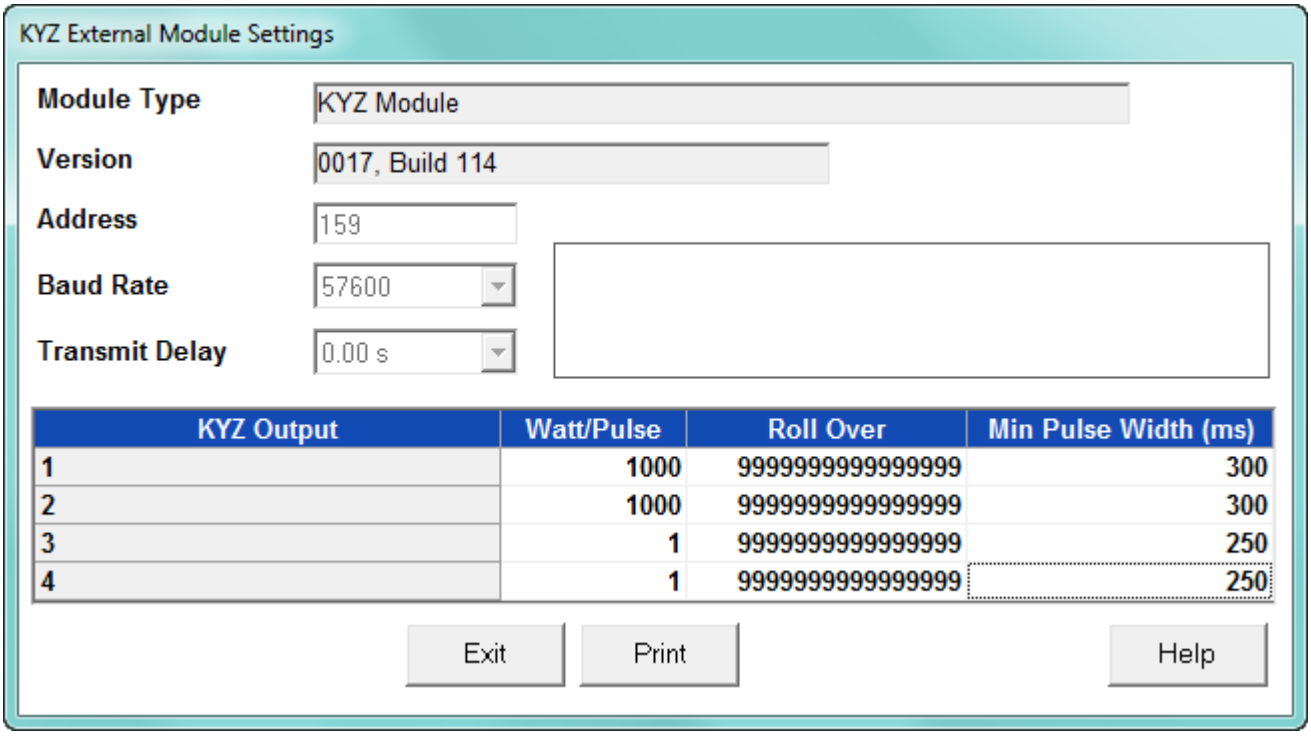
Device	Status	Port
KYZ Module, @ Address 159	Registered and present	4
Analog Out 4-20mA Module, @ Address 132	Registered and present	4
Analog Output Module	Registered but not present	4
Digital Output Module, @ Address 156	Registered and present	4

3. To view the current programmable settings of a particular module, select it and click Query. You will see the status screens shown below.





4. When the information is all found, you will see a screen like the one shown below.



5. Click Print to select a printer and then print a copy of this screen.
6. Click Exit to return to the I/O Module Status screen.
7. Click Refresh to initiate a new search and listing of connected I/O modules; click OK to close the screen.

14.5 Stand Alone Programmer

The Stand Alone programmer lets you configure all parameters of an I/O module or group of I/O modules by connecting the I/O modules directly to the computer.

NOTE

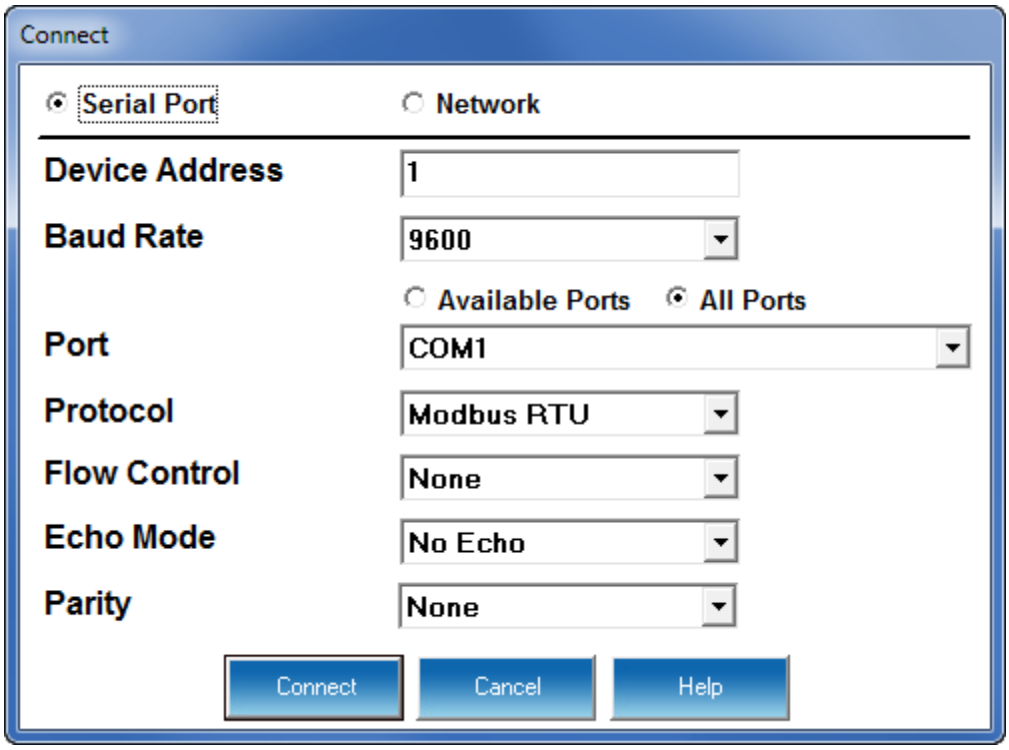
If you plan to connect the I/O module(s) to an EPM meter in the future, you must still enter it in the External I/O Devices setting of the EPM meter's Device Profile.

- To use the Stand Alone Programmer, you will need the following:
- RS232 Cable or USB Cable
- An RS232/RS485 converter or an USB to RS485 converter
- An RS485 cable with power wires separated from communication wires; see diagram below.
- A 15–20V DC at 50–200mA power source for the I/O module, such as model PSIO; you may also use any port on an EPM 9650 meter as a power source (12VA max combined).

1. Wire the converter, I/O module(s) and computer as shown:
2. Either connect a USB to RS485 cable into your computer, or use an RS232 cable to connect the converter 2500 and your computer:

- Set the converter to operate at 57600 baud rate.
- Set the converter to DCE and HD.

3. Click the **Connect** icon in the Main screen's Icon Bar, or select **Connect > Quick Connect** from the Menu Bar. You will see the screen shown below.

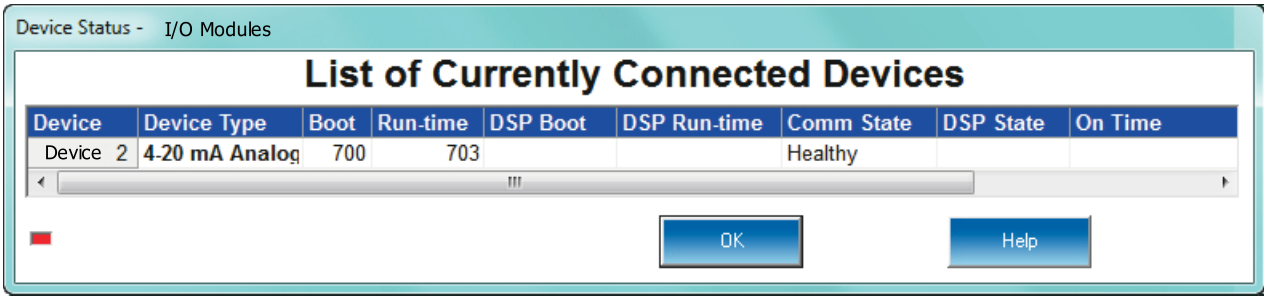


- In the Device Address field, enter the current address of one of the I/O modules in the group. If you do not know the address, use the Stand Alone Locator utility (see 14.7 *Locator Utility*).
- In the Baud Rate field, enter a baud rate that matches the baud rate of the I/O modules - 57600 is recommended. If you do not know the baud rate, use the Stand Alone Locator utility (see 14.7 *Locator Utility*).
- In the Serial Port field, enter the computer's communication port into which the RS232 cable is inserted.
- Leave the Protocol field set to Modbus RTU.

4. Click Connect. The software searches for a module at the specified baud rate and address.
5. When it has located the external I/O(s) modules, you will see the following screen.

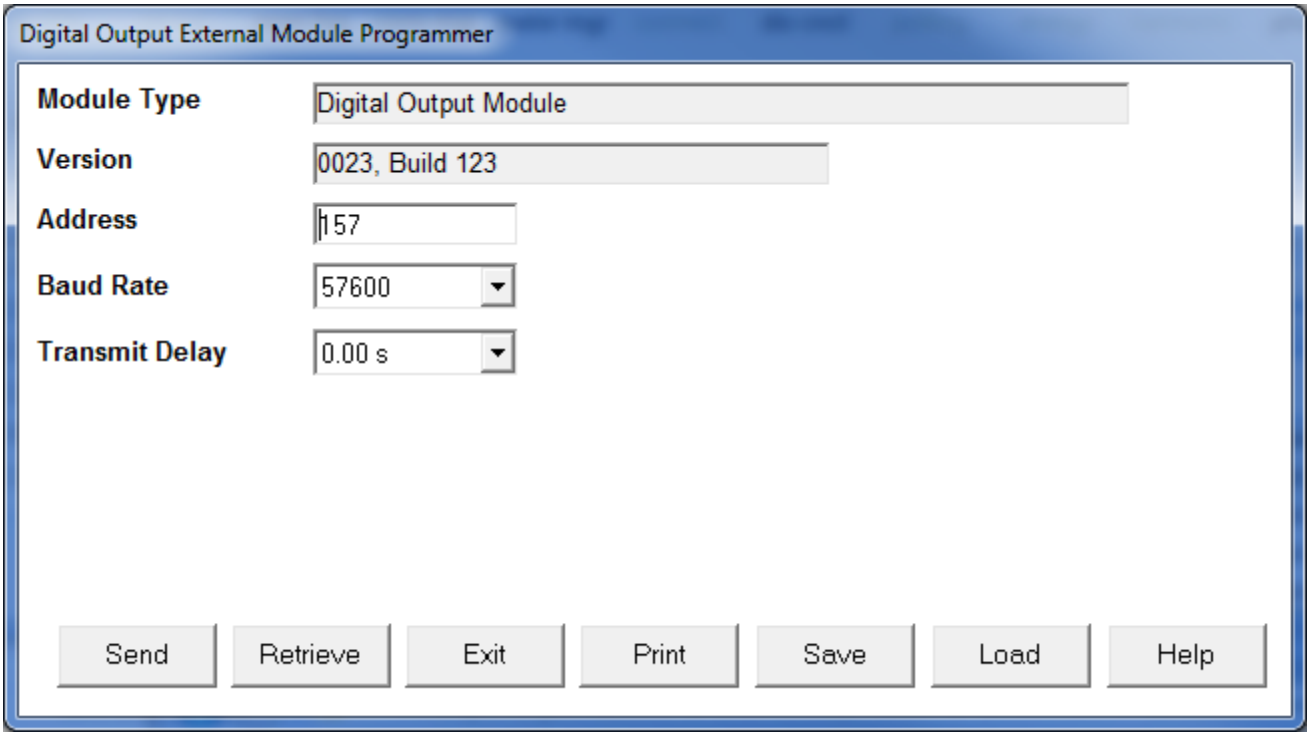
NOTE

The software will find a group of external I/O modules if they have been added together on the Connection Manager screen (see Chapter 3 "Connecting to a GE Meter").



6. Click OK to close the Status screen.
7. From the Menu Bar, select I/O Devices>Stand Alone Programmer. The GE Communicator software retrieves the current settings from the I/O module and displays them in the Module Programmer screen. The contents of this screen will vary, depending on the type of module in use. The example below shows the Digital Output

Module Programmer screen. See the instructions for programming the external I/O modules in the External I/O Devices settings section of your meters programming chapter.



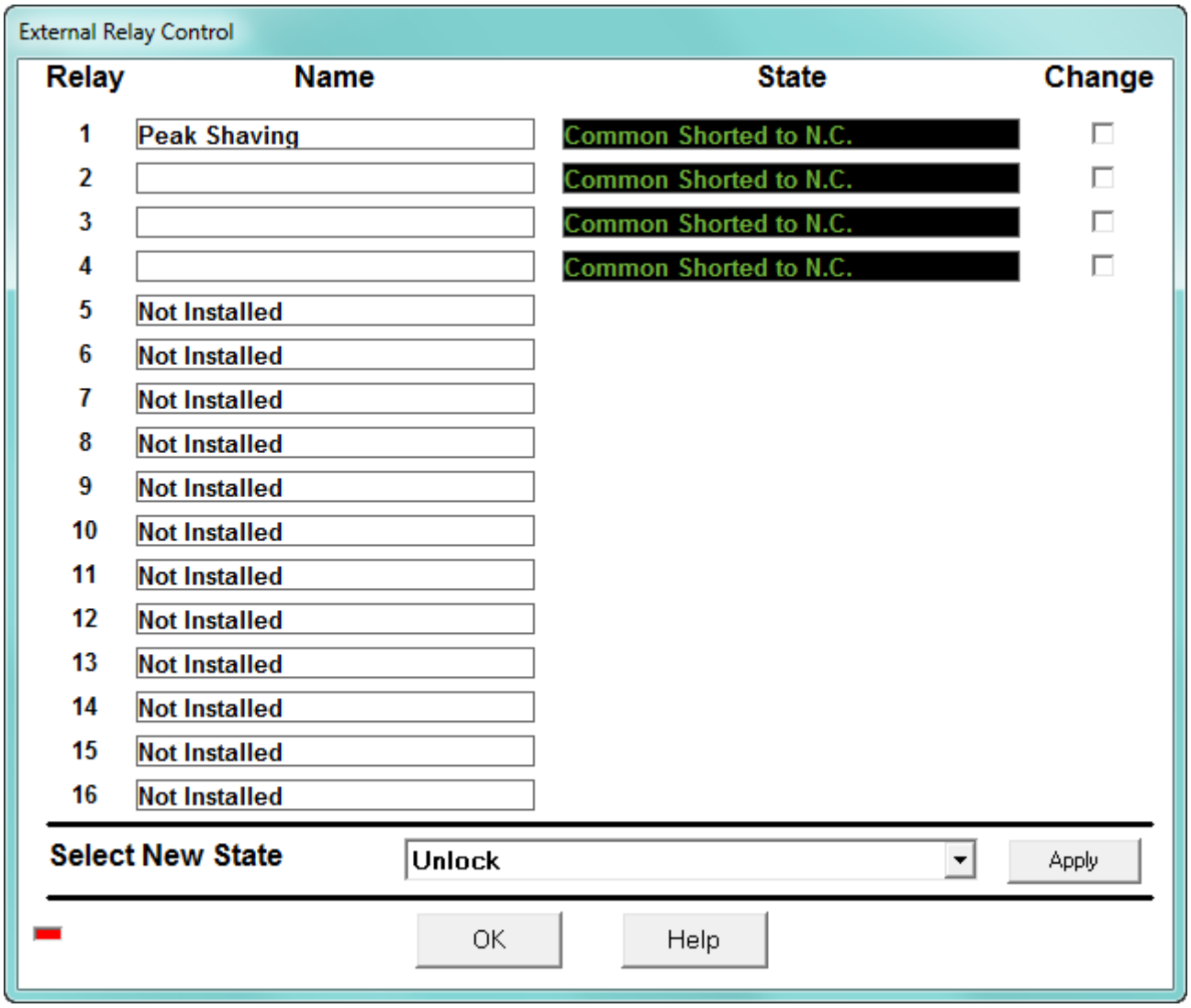
8. When you have finished configuring the address, baud rate and other programmable settings, click Send to send the new settings to the I/O module.
9. If you have connected a group of I/O modules to the computer, click Retrieve.
10. At the prompt, enter the address of the next module you wish to program. Click OK; the software will retrieve the programmable settings of that device.
11. When you have finished programming all of the external I/O modules, click Exit.

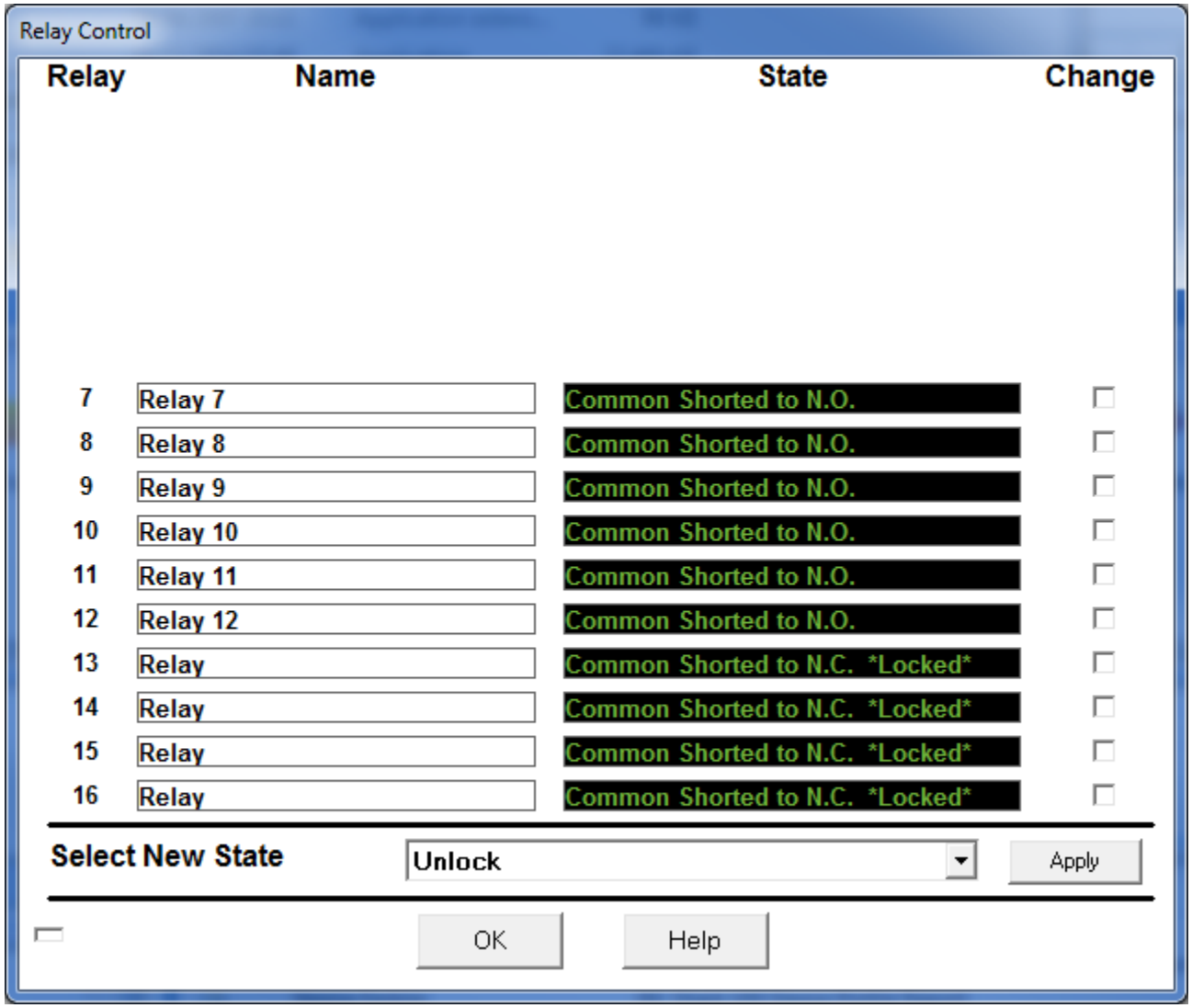
NOTE

IMPORTANT! Be sure to enter any external I/O modules in the External I/O Devices setting of your meter's Device Profile when you connect them to the meter. See the instructions for programming the external I/O modules in the External I/O Devices settings section of your meters programming chapter.

14.6 Relay Control

1. Be sure each module has a unique address, is entered in the EPM meter's Device Profile, and is connected to the meter's I/O port at the same baud rate.
2. From the Menu Bar, select I/O Devices>Relay Control. You will see the screen shown below if you are connected to EPM 9650/9700/9800 meter, and the screen on the next page you are connected to an EPM 9900/9900P meter.





3. The relays for each installed I/O module are shown in the screen. To change the state of one or more relays, click the box next to the relay(s) you want to change.

NOTE

The first 12 slots in the EPM 9900/9900P meter screen are for the two optional Relay Output Cards, and slots 13-16 are for the external Relay Output module. See Chapter 20 "Other Functions and Screens" for information on Relay Control for the optional Relay Output cards.

4. Use the pull down menu next to Select New State to assign a "Lock Common to N.C.", "Lock Common to N.O." or an "Unlock" state to the relay(s).
5. Click the **Apply** button to send the new setting to one or more relays of one or more modules.
6. Click **OK** to close the screen when you have finished configuring all Relay Outputs.

14.7 Locator Utility

Use the Locator Utility to find an external I/O module's address and baud rate if you do not have access to the module's Reset button; if you can press the Reset button, use the Query I/O function. The Locator Utility has two options:

- Stand Alone - this option allows you to search for an external I/O module's address and baud rate by connecting the I/O module directly to the computer.
- Through EPM - this option searches each address in succession only at the baud rate at which the computer and the EPM meter are connected.

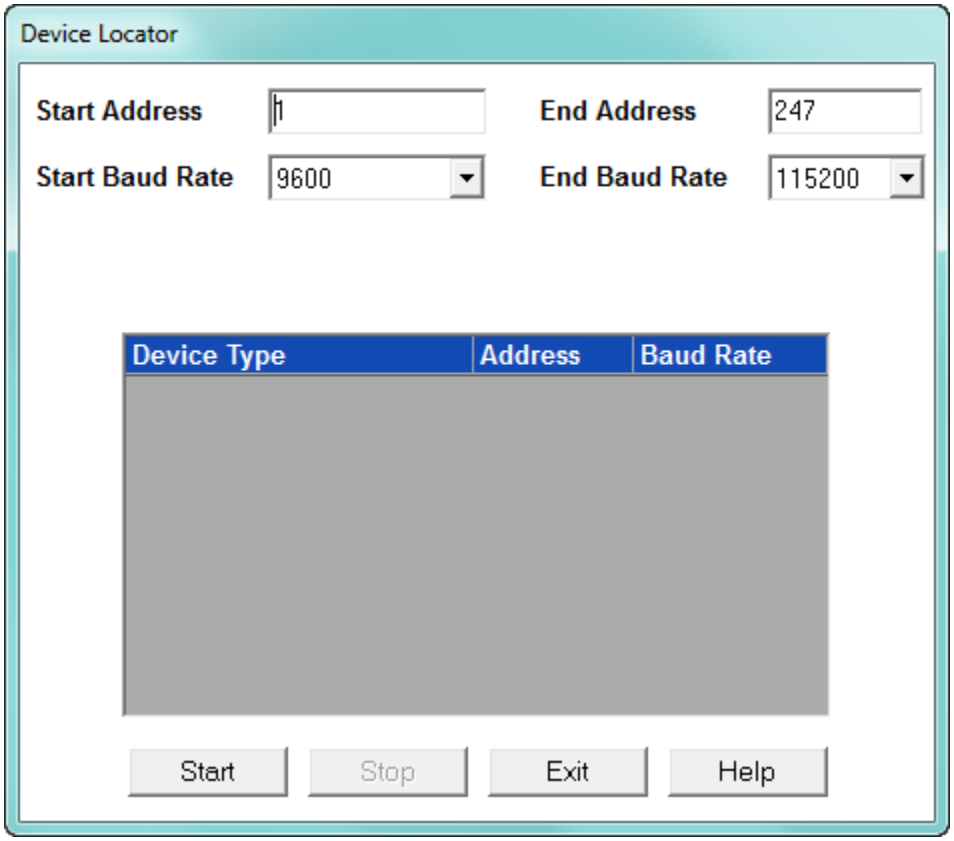
14.7.1 Locator through Stand Alone Mode

The Stand Alone Locator utility searches for any I/O device connected directly to your computer (it is not for use with remote connections). The search criteria is a programmable range of baud rates and addresses. When a device is found, Locator displays its name, baud rate and address.

To make a Stand Alone connection you will need the same connections as described in 14.5 *Stand Alone Programmer*. Follow the information given for connecting the meter and external I/O module and the software connection steps through step 4.

1. GE Communicator will be unable to locate the device - after a few seconds a No Device Found At This Location dialogue box will appear: click OK.

2. From the Menu Bar, select I/O Devices>Locator Utility>Stand Alone. You will see the screen shown below.



3. Set the address and baud rate ranges for the search. GE Communicator software will begin at the start address and baud rate, searching every address up to and including the End Address; then it will begin the same address search at the next baud rate in the range.

NOTE

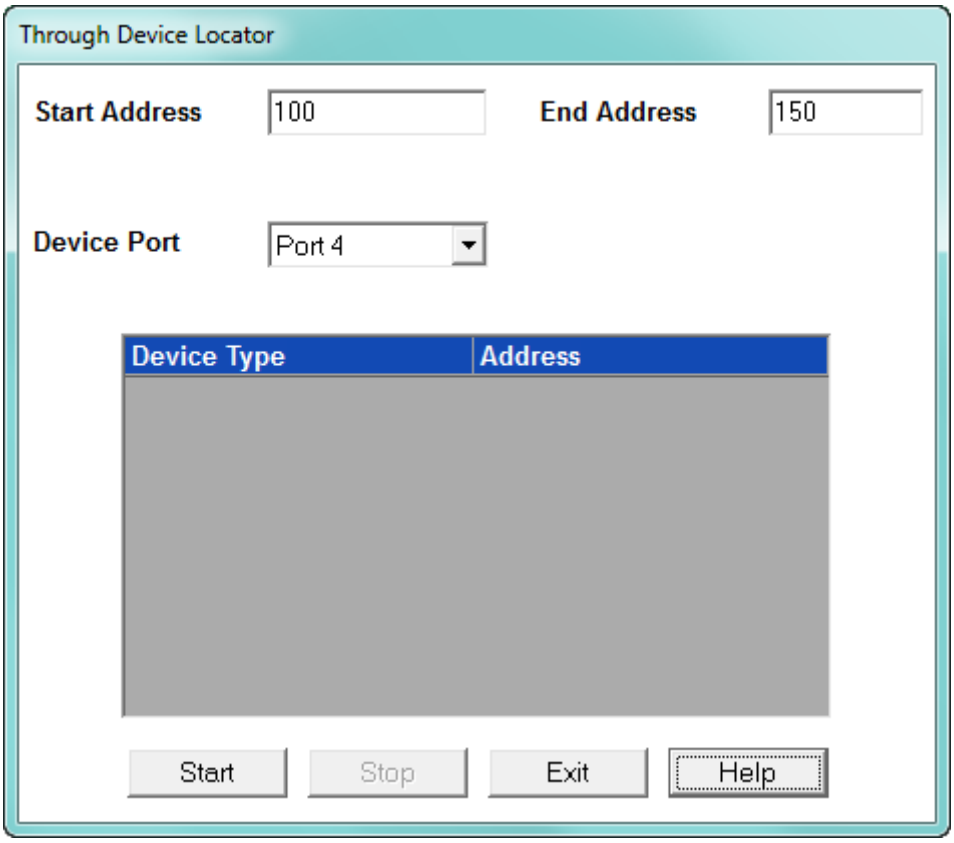
If you include all baud rates, the Device Locator will take about 12 hours to complete the search. If you know the baud rate of the device (external I/O module usually have a baud rate of 57600), just look for addresses in that baud rate - the search will take minutes instead of hours.

4. Click Start. The Device Locator begins searching for devices within the specified baud rate and address range.
5. The Device Locator will continue to search for devices until it reaches the end of the specified criteria or until you click Stop. Write down the address and baud rate.
6. Click Exit to close the Device Locator screen.

14.7.2 Locator through EPM Mode

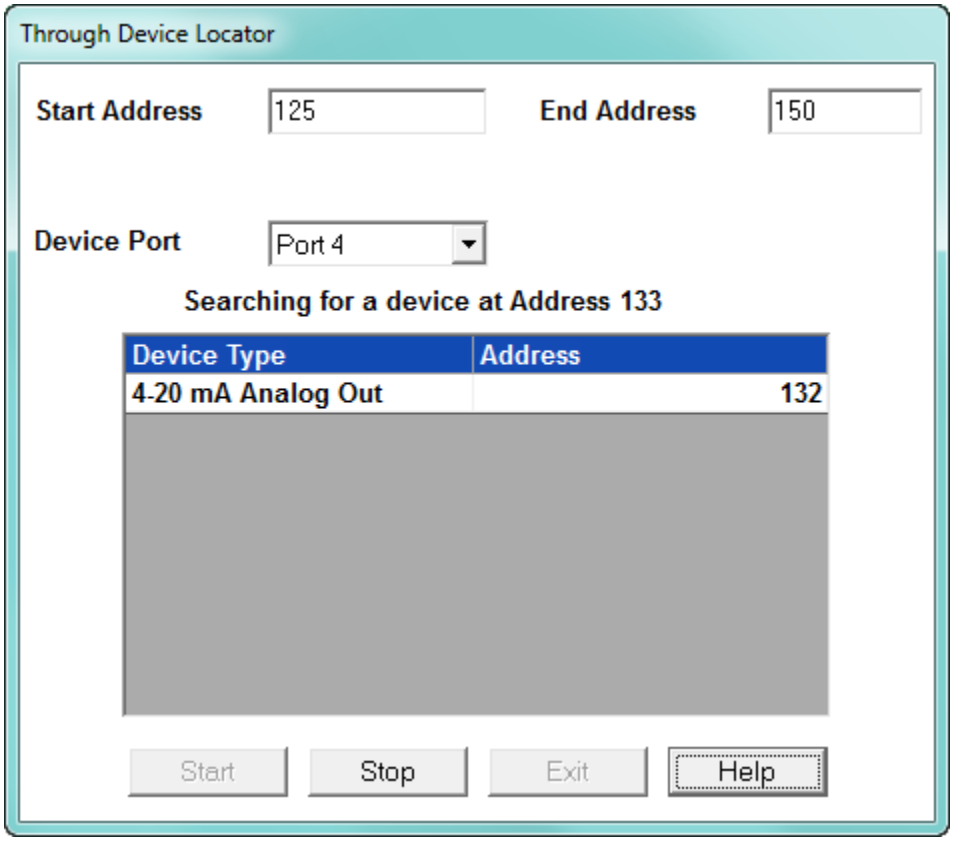
This option locates an external I/O module by searching each address in succession only at the baud rate at which the computer and the EPM meter are connected.

1. Connect the module to the EPM meter's I/O modules port.
2. Establish a connection between the computer and the EPM meter. The baud rate at which the computer and the EPM meter are connected is the baud rate Locator will use to search for the I/O module's address.
3. From the Menu bar, select **I/O Devices > Locator Utility > Through EPM**. You will see the following screen.



4. Select the port the external I/O Module is attached to
5. Set the address range for the search in the Start and End Address fields. Set the address range as small as possible to limit the time of the search.
6. Click Start. GE Communicator software will begin at the Start Address, searching every address up to and including the End Address.

7. The Through Device Locator screen opens, listing any devices found, as shown in the example screen below.



8. The software will continue to search for devices until it reaches the end of the address range for the port or until you click Stop.
9. Click Exit to close the Through Device Locator screen.

GE Communicator

Chapter 15: Time-of-Use

15.1 Overview

In Time of Use (TOU) metering, the meter is set up to automatically segment usage data based on the time it is used. The most common reason for this is to track On Peak and Off Peak energy consumption, so that customers can be charged more for On Peak times when energy is more expensive for the utility to produce. The TOU feature is important in rate jurisdictions that use the TOU method of billing.

When a user sets up TOU in a meter, the user is setting up the accumulation bins, for example, On Peak, and setting the rules for when energy usage is added to the bins, for example, from 9-5 on weekdays. For maximum flexibility, a TOU system lets the user set up multiple seasons, billing periods (these are usually months), types of days (weekday, weekend, holidays), and the time periods that are assigned to each bin. In advanced TOU systems, the user can also define which energy or other accumulators should be segmented.

The figure on the next page provides a graphical representation of TOU.

Time of Use

Energy use is binned according to the time it is used, so that it can be billed for appropriately.

To set up the bins (that is, the rates), you can use:

Seasons 1-4

Months 1-12

Type of Days (Weekend/Weekday/Holiday)

Time of Day Bins (Rates)

For Example: Off-Peak=Lowest Energy Usage Cost
On-Peak=Highest Energy Usage Cost
Shoulder Peak=Middle Energy Usage Cost

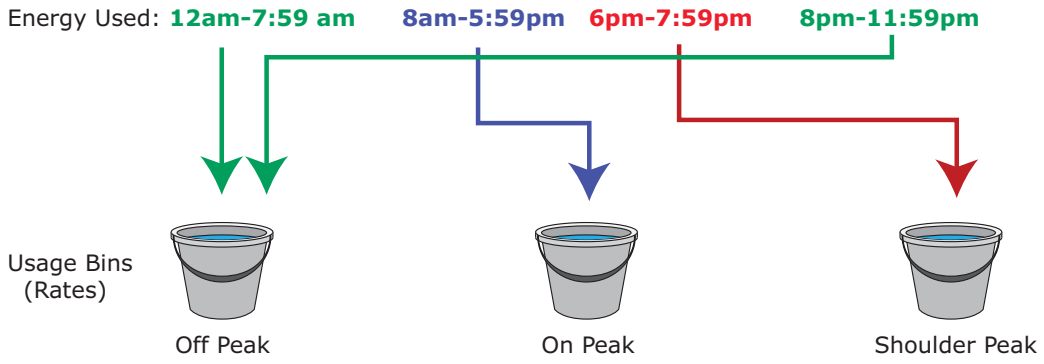
TOU example: Season One, Month 1

Weekdays
Off Peak 12 am-7:59am
On Peak 8 am - 5:59pm
Shoulder Peak 6 pm - 7:59 pm
Off Peak 8 pm-11:59pm

Weekends
Off Peak 12 am-11:59pm

Holidays
Off Peak 12 am-11:59pm

Monday: the day's usage is binned as shown below:



15.1.1 TOU in EPM Meters

TOU functions are found in many GE EPM meters. See the Instruction Manual for your meter for more information on your meter's TOU function.

The EPM 9450/9650, EPM 9800, and EPM9900 meters use a fixed 20 year calendar. With this implementation, each day must be configured. See 15.2 *TOU for the EPM 9450/9650, EPM 9800, and EPM 9900 Meter* on page 15–5.

The EPM 9700/9900P and EPM 7000P meters use an advanced perpetual calendar to automatically calculate days based on event algorithms, so the user does not have to program each year. Specifics of the settings are explained in 15.3 *EPM 9700/9900P/7000P TOU Settings* on page 15–37.

Following is a high-level summary of the TOU implementation:

- Feature Enable/Disable: TOU is enabled or disabled in the meter's Device profile
- Demand Type and Interval: set in the meter's Device profile
  - Block Window type
  - Rolling Window type
- TOU Read modes
  - Self Read - TOU is automatically read based on the user's programming
  - Manual Read - TOU is read manually by the user
- Months
  - Up to 12 billing month periods
  - Configurable time of day for self read
  - Seasons
  - Up to 4 season periods
  - Each season should be one billing month or longer
  - Configurable time of day for self read
- Weekly and Daily
  - Seasons can be set up for weekly self read or daily self read
  - Configurable starting day of the week for weekly self read
  - Configurable time of day for self read
- Calendar
  - Perpetual calendar
  - Flexible methods to specify dates for month, season and holiday
    - Recurring - month/day
    - Floating - nth day-of-week in month
    - Specific - month/day/year
    - Repeating - every n days beginning with month/day/year
    - Special - Easter and Good Friday
    - Configurable Date Occurs On
      - This day only
      - The following day only
      - The day and the following day

            - Only when this day falls on a weekday
            - This day only, unless this day falls on Saturday, then apply to the Friday before this day
            - This day only, unless this day falls on Sunday, then apply to the Monday after this day
    - Holidays
        - Up to 31 calendar entries for holiday dates
- Rates
    - Up to 5 rates - one fixed totalizer rate and up to 4 individual user configurable rates, such as On Peak, Off Peak, Shoulder Peak, etc.
- Day Types
    - Holiday type
    - Up to 3 additional user configurable types, such as Weekday, Saturday, and Sunday
- Schedules
    - Up to 16 daily schedules
    - Rate changes may occur on any demand interval boundary
    - Up to 50 rate changes are available for all schedules combined
- Monitored Data Sets
    - Up to 16 data sets are available
    - Choose from 38 accumulator demand values
    - Choose from 12 coincident demand values
    - Each set includes
        - Accumulator
        - Peak demand with time stamp
        - Cumulative demand with continuous option
        - Coincident demand

15.2 TOU for the EPM 9450/9650, EPM 9800, and EPM 9900 Meter

For the EPM 9450/9650, EPM 9800, and EPM 9900 meter (not the EPM 9900P meter) you have two options:

- Program an individual year calendar - allows a user to program a meter for just a particular year. The meters can store 20 individual years.
- Program a "perpetual" calendar - allows a user to program the meter for 20 years based on changing events that the meter automatically calculates.

In either of these cases, there are basic steps for programming the TOU calendar:

1. 1. From the Tool Bar, select either:
   - **TOU Calendar > Calendar Settings** to set up an individual year's calendar
   - **TOU > Perpetual Calendar** to create a perpetual calendar
2. Create the TOU calendar profile.
3. Send the TOU calendar profile to the connected meter. You can also send multiple TOU calendars to the meter at one time (**TOU Calendar > Multi Calendar Update**).
4. View, print or export the TOU calendar.
5. Reset the TOU accumulations at any time by selecting Reset Meter Information from the Tools Menu (see 20.1.7 *Reset Device Information*. Resetting clears all accumulations of the current month or season and causes the accumulations to use the present date as the start date and accumulate to the next new end date, which is taken from the new calendar.

NOTE

NOTES:

- To use Daylight Savings Time, you must enable it in the meter's Device Profile Time Settings screen (see the Time settings section of your meter's programming chapter).
- If GPS Time (IRIG-B) is connected, you must set the appropriate time zone. Date and time settings (except year) are overridden by GPS Time.

NOTE

An IRIG-B signal-generating device connected to the GPS satellite system will synchronize meters located at different geographic locations. See the Installation and Operation Manual for your meter, for installation instructions.

NOTE

If you are not using an external time sync method like NTP or IRIG-B, it is recommended that you enable line frequency sync for highest time accuracy.

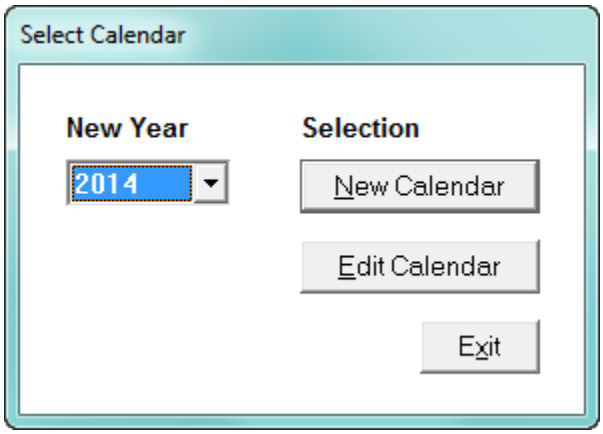
15.2.1 Creating a TOU Calendar Profile - Yearly Profile

The TOU calendar profile sets the parameters for TOU data accumulation. You may store up to twenty calendars in the meter and an unlimited amount on your computer.

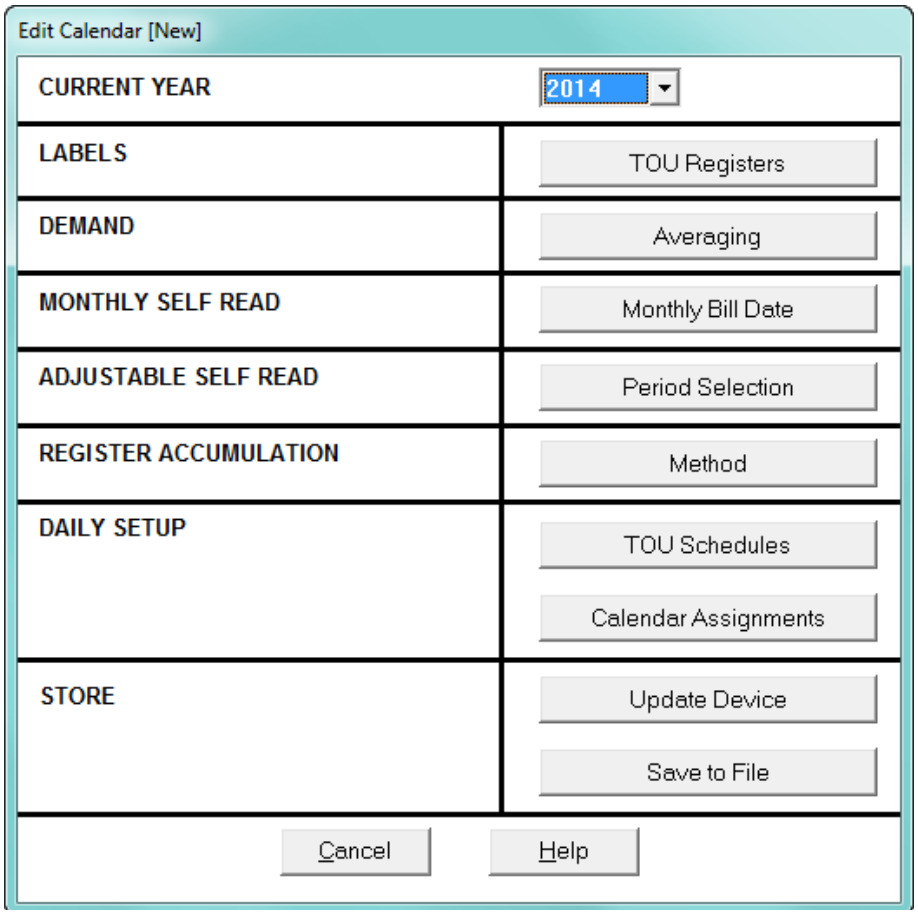
- To edit an existing calendar, see 15.2.2 *Edit a TOU Calendar Profile* on page 15–19.
- To create a new individual calendar, follow the steps listed below. To edit an existing individual calendar,
- To create or edit a perpetual calendar (all 20 years at one time), see

- To load multiple calendars to a meter, see
- To create a new calendar, follow the steps below.

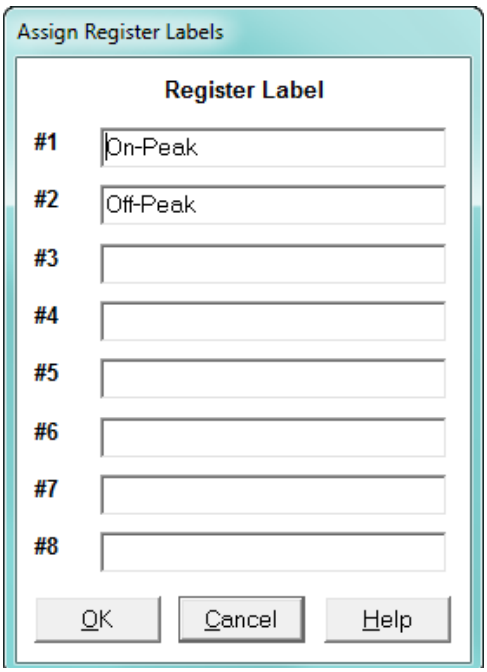
1. From the Time-of-Use menu, select **Calendar Settings**.
   The following screen appears:



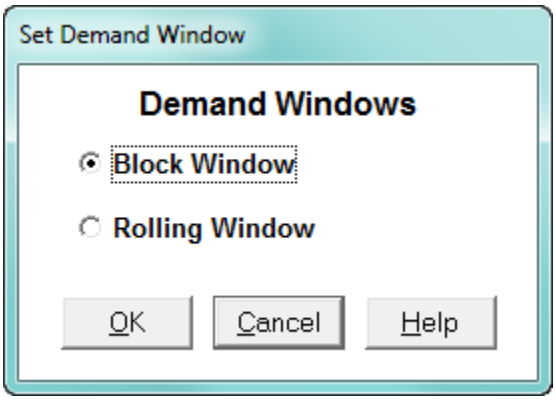
2. From the pull-down menu, choose the year for which you would like to create a TOU usage structure.
3. Click **New Calendar**. You will see the screen shown below.



4. Click **TOU Registers**. You will see the screen shown below.



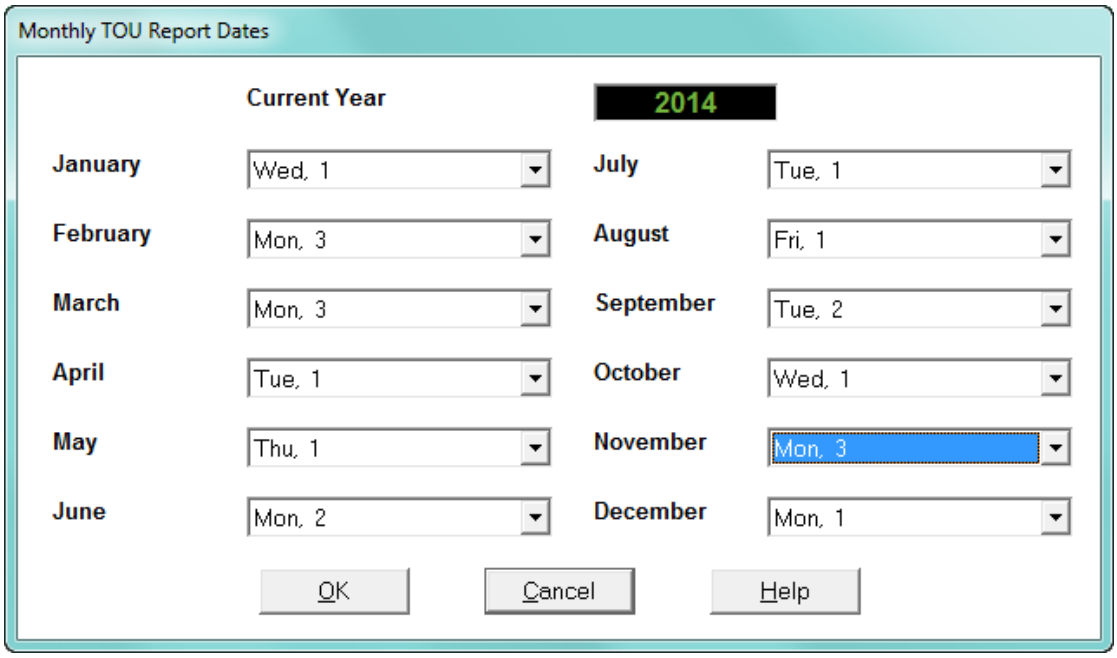
5. A register is a type of rate structure, for example "Peak", "Off-Peak" or "Shoulder Peak." You will assign one register to each fifteen-minute interval of the day when you set up the TOU schedule (instructions on page 15-11). In this setting you will assign a name to any new registers. The default registers are Peak and Off-Peak.
   - Enter a name for each different register (up to eight).
   - Click **OK** to return to the main Edit Calendar screen.
6. Click **Averaging**. You will see the screen shown below.



7. Demand is the average rate of energy used over time. Select the type of Demand Averaging to be applied to the TOU accumulations: Block Demand or Rolling
Window Demand. The Demand type you select should be the Demand needed for your specific jurisdiction. Most users rely on a Block Demand,

however, a Rolling Demand is also available. The Demand Integration interval is usually 15 minutes, but it is programmable, and is configured in the meter's Device Profile.

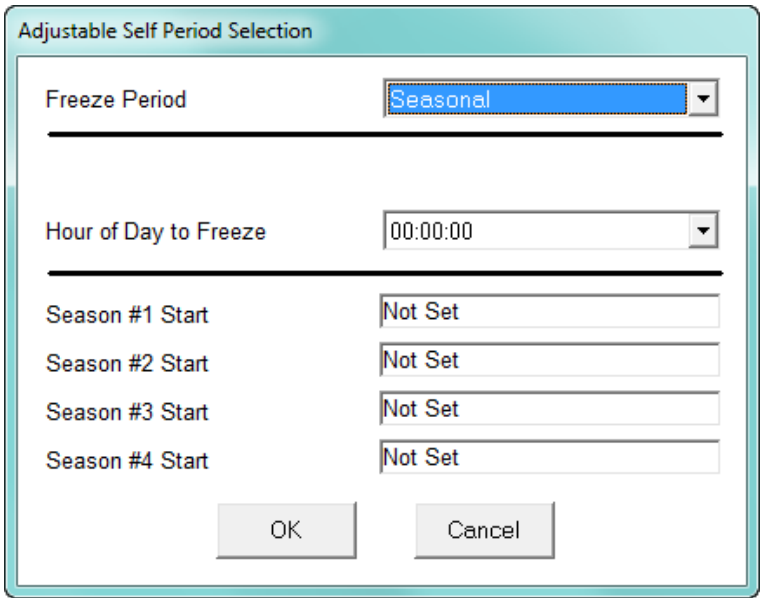
8. Click **OK** to return to the main Edit Calendar screen.
9. Click **Monthly Bill Date**. You will see the screen shown below.



The billing date delineates the self read. When the billing date is reached, the meter shifts the current month views to the previous month views. Since billing dates can differ, the user can program the day for each read.

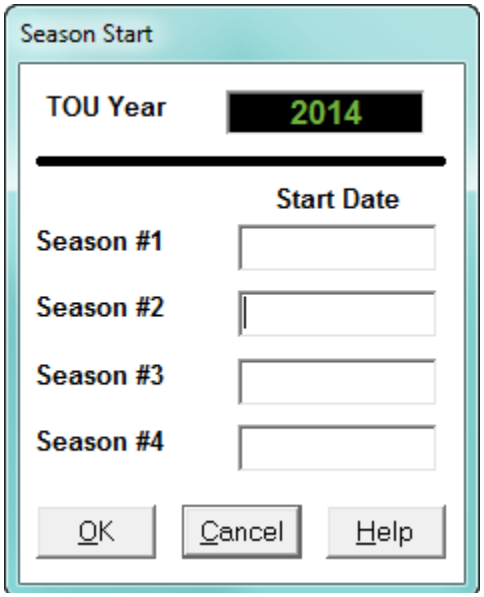
10. To program a specific Bill Date for each month, use the pull-down menus. If you do not select a specific billing date for a given month, accumulations will continue until the next monthly billing date is reached or December 31, if there is no next year spanning calendar.
11. When you have entered all Monthly Bill Dates, click **OK** to return to the main Edit Calendar screen.

12. To set the Freeze values for Time of Use Polling, click **Period Selection**. You will see the screen shown below.



13. The four Freeze Period options are Seasonal, Weekly, Daily, and Hourly. Click on the Freeze Period pull-down menu to select the option you want. The Freeze period specifies when TOU data will be copied to a Freeze register for later reading.
    - Seasonal Freeze Period lets you set up to four seasons (time periods), for which values are frozen (accumulations of data are stopped) for Time of Use Polling. Select Hour of Day to Freeze from the pull-down menu next to this option. The Hour of Day specifies the time on the season start date that the season changes and the values are frozen.
        - ▷ Double-click one of the Season Start windows to specify the start date for the season. You will see the screen shown below. Enter a start date for each season field or double-click to retrieve a calendar from which you can choose a Month and Day.

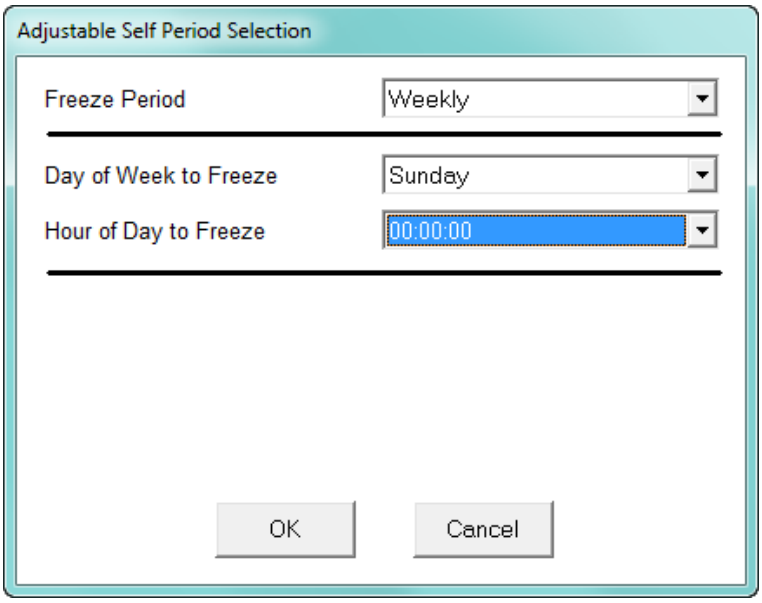
▷ Click **OK** to return to the Adjustable Self Period Selection screen.



NOTE

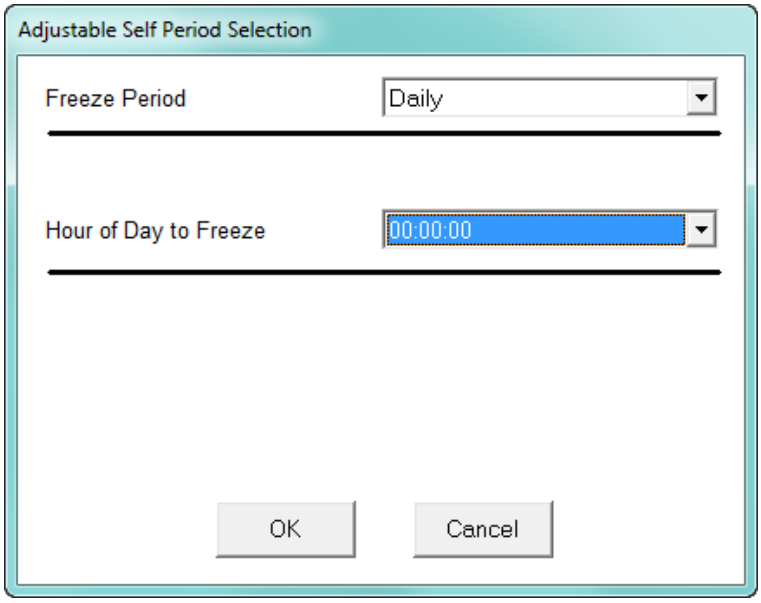
The date format you use here should be the same as the date format set for your computer. To change or view your computer's date settings: open the Control Panel and select **Clock, Language, and Region > Change the date, time, or number format**.

- Weekly Freeze Period lets you set the day and hour each week at which values are frozen for Time of Use Polling. Select the Day of Week to Freeze and Hour to Freeze from the pull-down menus next to these options, in the Adjustable Self Period Selection screen.

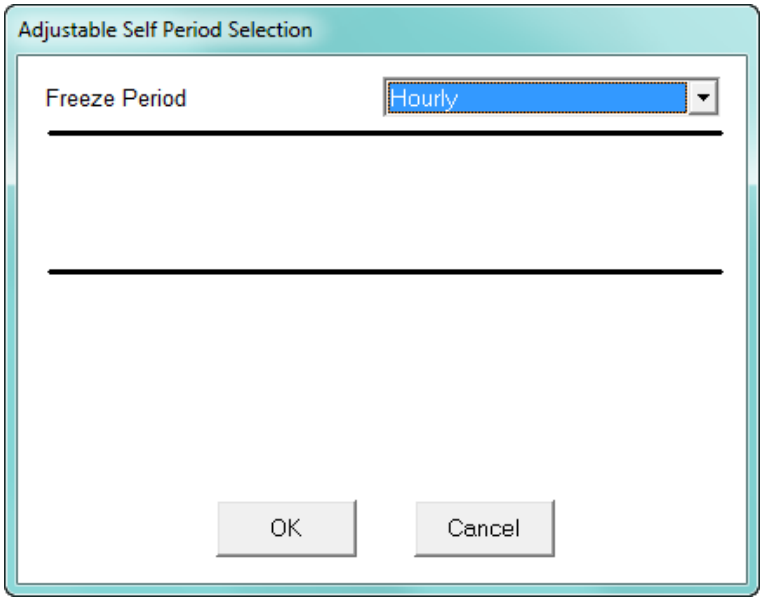


- Daily Freeze Period lets you set the hour each day at which values are frozen for Time of Use Polling. Select Hour of Day to Freeze from the pull-

down menu next to this option, in the Adjustable Self Period Selection screen.

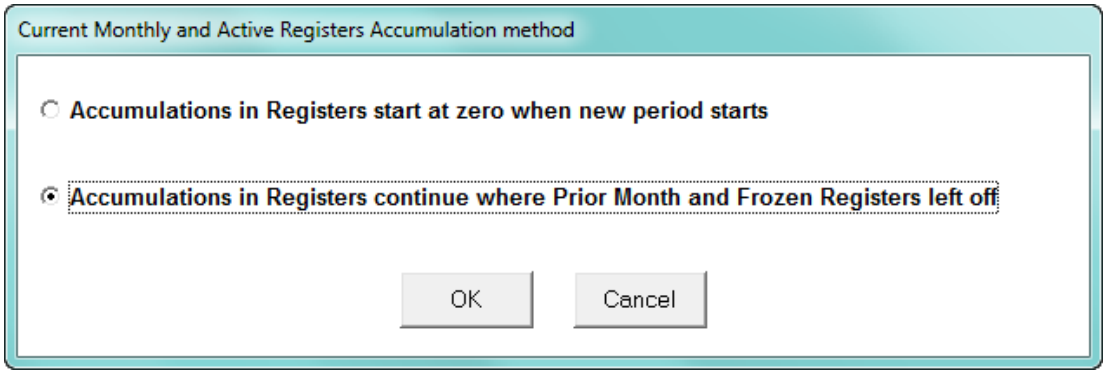


- Hourly Freeze Period freezes the values for Time of Use Polling each hour.



14. Click **OK** in the Adjustable Self Period Selection screen to save your selections and return to the main Edit Calendar screen; click **Cancel** to exit the screen without saving any changes.

15. Click **Method** in the **Register Accumulation** section of the Edit Calendar window. You will see the screen shown below.

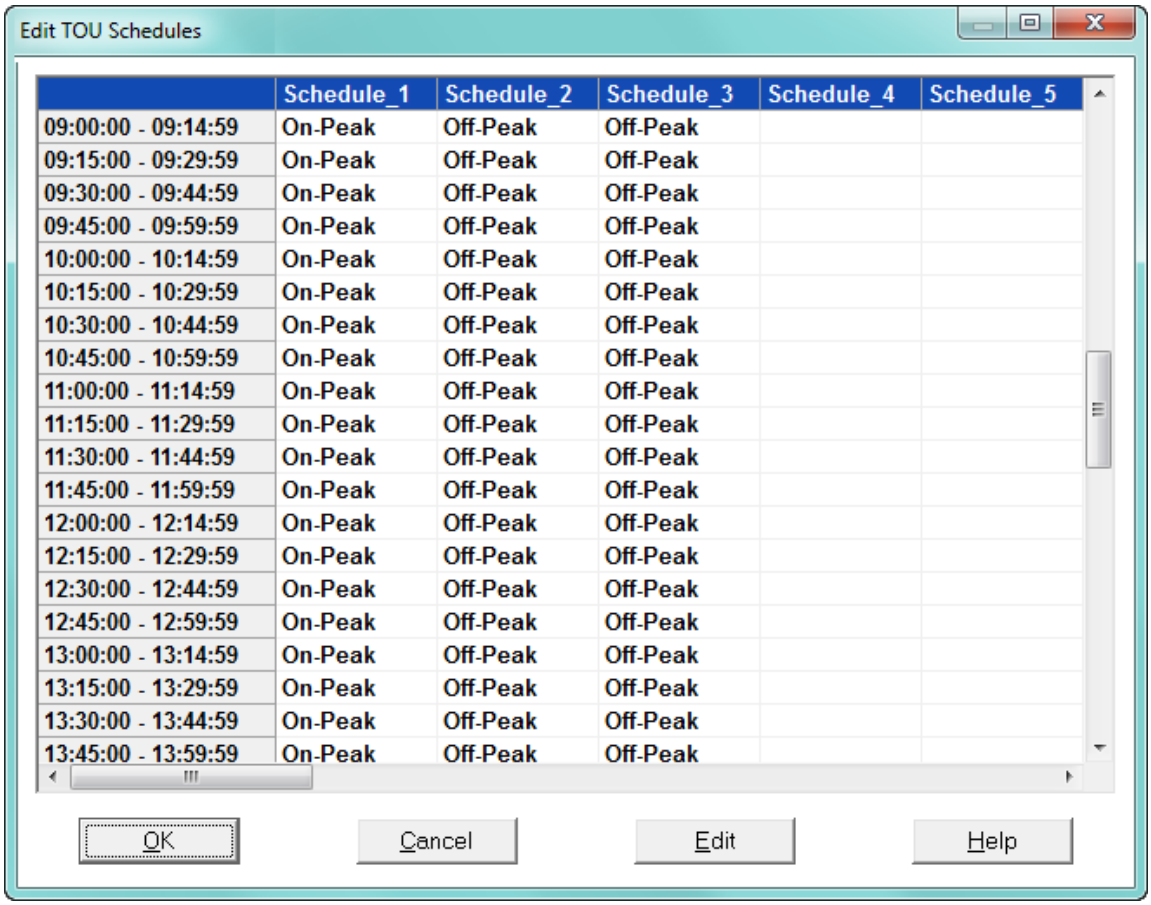


16. Click the radio button for the type of Accumulations you require and click **OK**:
    - Click **Accumulations in Registers start at zero when new period starts** if you want accumulations to begin anew once the last period's values are frozen.
    - Click **Accumulations in Registers continue where Prior Month and Frozen Registers left off** to add the new accumulations to the prior frozen ones.

NOTE

In almost all cases, this will be a user's selection, so that the TOU registers continue to accumulate.

17. Click **TOU Schedules**. You will see the screen shown below.



	Schedule_1	Schedule_2	Schedule_3	Schedule_4	Schedule_5
09:00:00 - 09:14:59	On-Peak	Off-Peak	Off-Peak		
09:15:00 - 09:29:59	On-Peak	Off-Peak	Off-Peak		
09:30:00 - 09:44:59	On-Peak	Off-Peak	Off-Peak		
09:45:00 - 09:59:59	On-Peak	Off-Peak	Off-Peak		
10:00:00 - 10:14:59	On-Peak	Off-Peak	Off-Peak		
10:15:00 - 10:29:59	On-Peak	Off-Peak	Off-Peak		
10:30:00 - 10:44:59	On-Peak	Off-Peak	Off-Peak		
10:45:00 - 10:59:59	On-Peak	Off-Peak	Off-Peak		
11:00:00 - 11:14:59	On-Peak	Off-Peak	Off-Peak		
11:15:00 - 11:29:59	On-Peak	Off-Peak	Off-Peak		
11:30:00 - 11:44:59	On-Peak	Off-Peak	Off-Peak		
11:45:00 - 11:59:59	On-Peak	Off-Peak	Off-Peak		
12:00:00 - 12:14:59	On-Peak	Off-Peak	Off-Peak		
12:15:00 - 12:29:59	On-Peak	Off-Peak	Off-Peak		
12:30:00 - 12:44:59	On-Peak	Off-Peak	Off-Peak		
12:45:00 - 12:59:59	On-Peak	Off-Peak	Off-Peak		
13:00:00 - 13:14:59	On-Peak	Off-Peak	Off-Peak		
13:15:00 - 13:29:59	On-Peak	Off-Peak	Off-Peak		
13:30:00 - 13:44:59	On-Peak	Off-Peak	Off-Peak		
13:45:00 - 13:59:59	On-Peak	Off-Peak	Off-Peak		

- The first column lists each fifteen-minute block of a 24-hour day.
- The individual Registers named in Step 5 will be applied to each fifteen-minute block.
- A schedule is the type of accumulation structure you will apply to individual days. You may program up to 16 different schedules (use the scroll bars to view all of the data in the screen).
- This screen sets up the bucketing so that TOU registers will be accumulated in different buckets at certain times of the day. See the example graphic on the next page.

Time of Use Example: Weekday

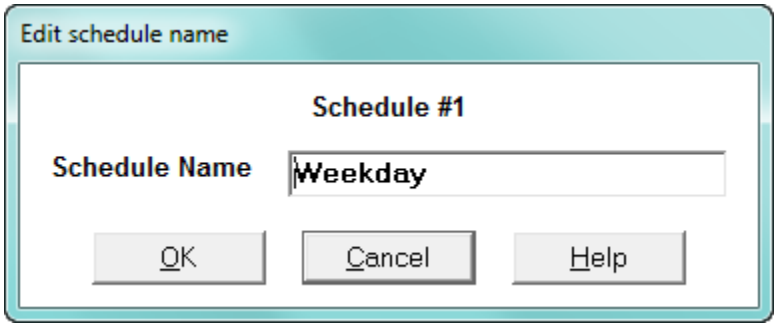
Off-Peak	On-Peak	Shoulder Peak	Off-Peak
00:00 am - 8:59 am	9:00 am - 4:59 pm	5:00 pm - 6:59 pm	7:00 pm - 11:59 pm

Off-Peak=Lowest Energy Usage Cost
On-Peak=Highest Energy Usage Cost
Shoulder Peak=Middle Energy Usage Cost

Figure 15-1: Figure 15.2: TOU Example

The EPM meter will switch accumulating to different registers based on thetime of day to capture energy usage at these different rate structures.

18. Double-click on one of the Schedule Headings—for example: "Schedule_1". You will see the following screen.

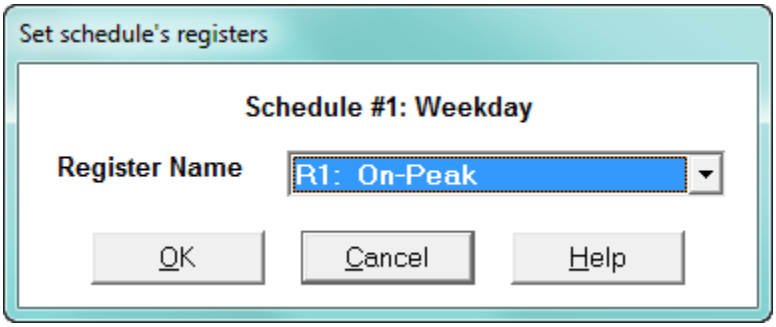


19. Enter a Name for the schedule, such as "Weekday," "Weekend" or "Holiday." Click **OK**.

NOTE

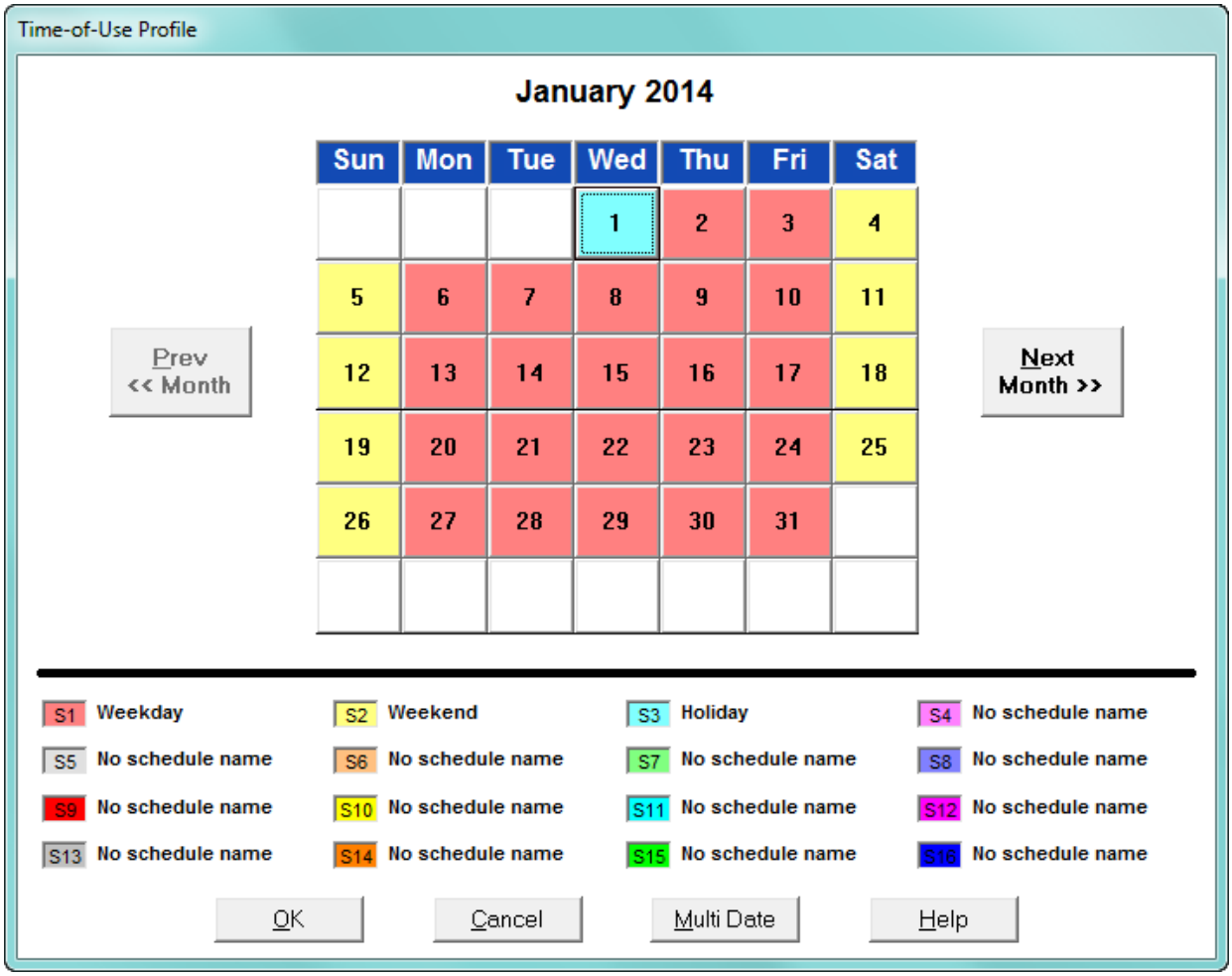
Note that all the names used here are just examples. They can be custom named to whatever you require.

20. Double-click on one of the fifteen-minute blocks in the schedule. You will see the following screen.



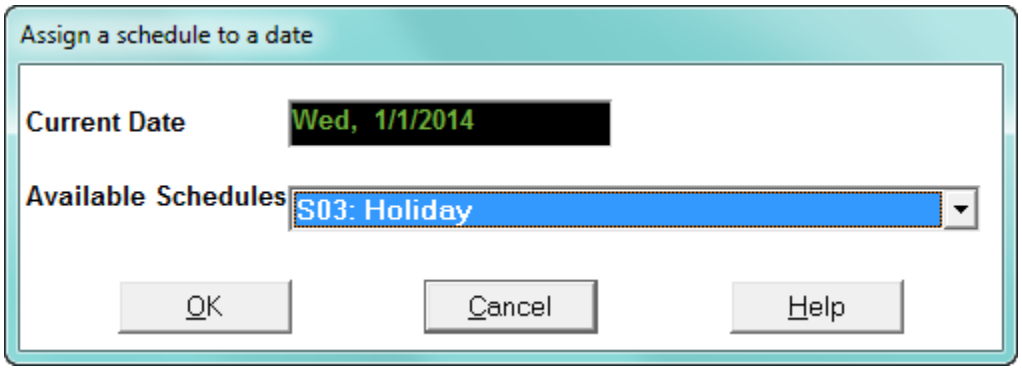
21. From the pull-down menu, select the Register Name you would like to apply to this fifteen-minute block. Click **OK**.
22. Repeat the above procedure until all fifteen-minute blocks in the schedule(s) are assigned registers.
23. When all schedules are formatted, click **OK** to return to the main Edit Calendar screen.

24. Click **Calendar Assignments**. You will see the screen shown below.



With the use of color, the screen delineates how the day is described as a rate structure.The user must enter each holiday individually.

25. The schedules created in steps 16–21 are shown beneath the calendar. Each schedule is color-coded. Assign a schedule to each day by clicking on the day. You will see the screen shown below.

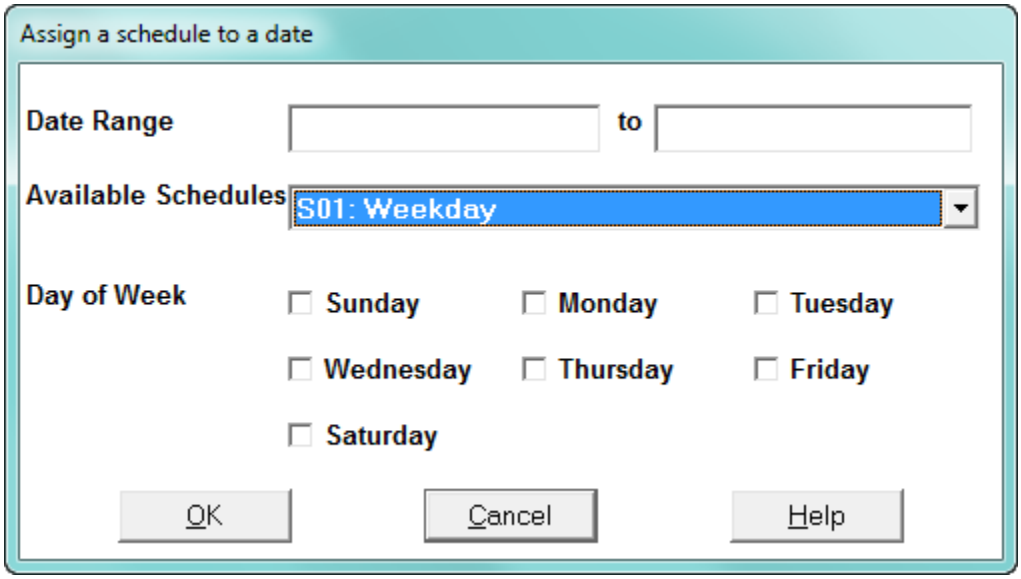


26. From the pull-down menu, select the Schedule you would like to apply to this day.

27. Click **OK** to return to the calendar.
28. To apply a Schedule to a Range of Dates or to selected days of the week, click **Multi Date**. You will see the screen shown below.

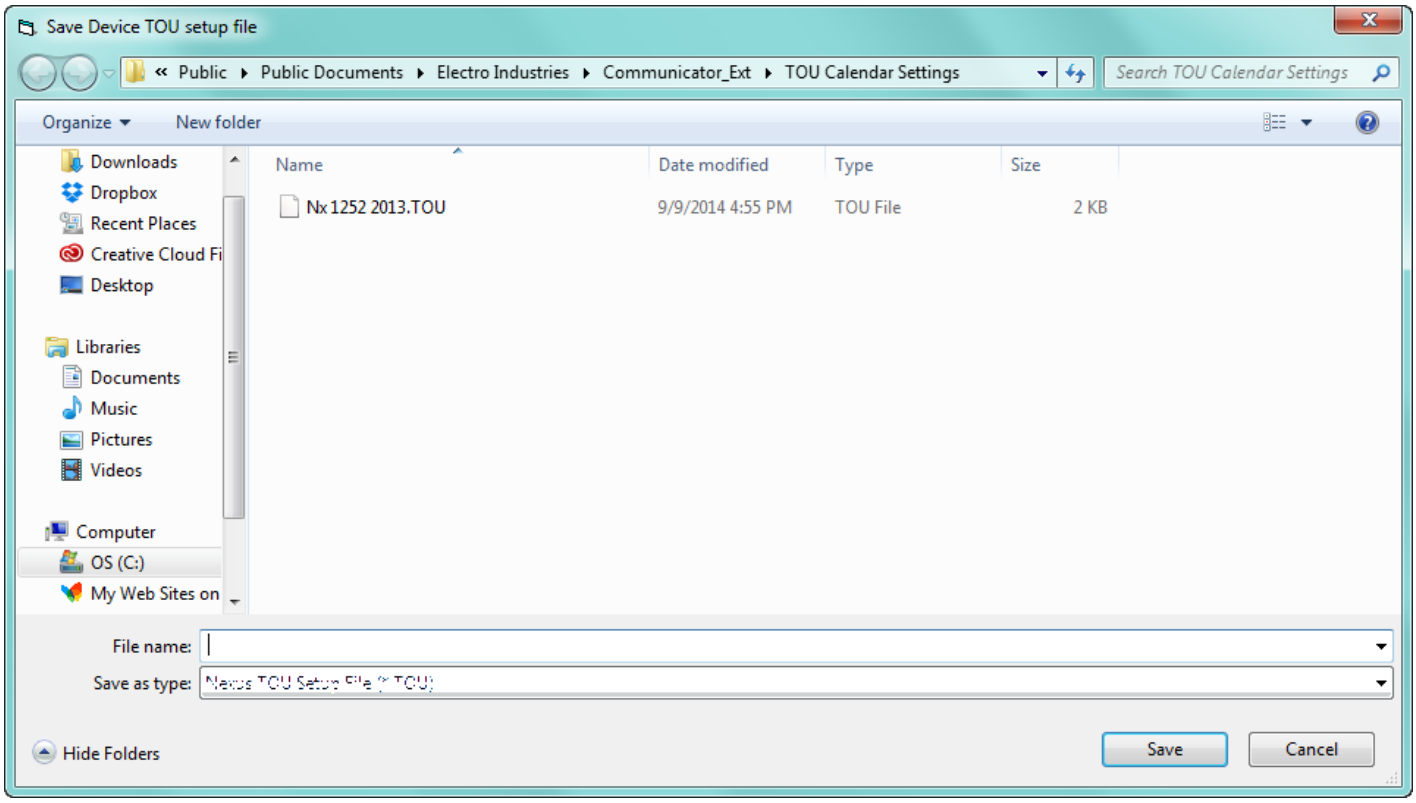
NOTE

With the **Multi Date** button, you can quickly program a whole year (For Example, 2014) by selecting, for instance, all the weekdays (Mon - Fri) and in the Date Range type 01/01/14 to 12/31/14. Do the same for the weekend days. Fill in holidays and vacations for each month.



- ▷ Enter a Date Range.
- ▷ Select the Schedule from the pull-down menu.
- ▷ If you want, choose a Day of the Week.
- ▷ Click **OK**.

29. Use the color-coded key below the calendar to review which Schedules have been applied to the month. Click **Next Month** and repeat the process for the year.
30. When the calendar settings are complete, click **OK** to return to the main Edit Calendar screen.
31. You may now:
    - Click **Save to File** to send the calendar to the computer for future use. See 15.2.2 *Edit a TOU Calendar Profile* on page 15–19 for instructions on editing a previously saved calendar. You will see a screen similar to the one shown below, which allows you to name and save the TOU file.



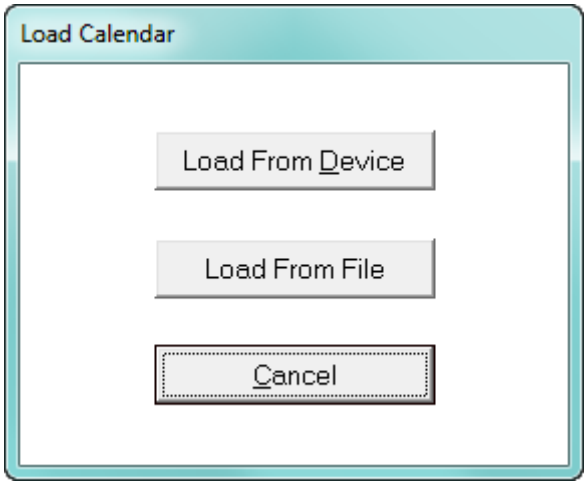
- Click **Update Device** to send the calendar to the meter. You will see a screen that prompts you to the year the calendar will be applied to. Select the radio button of the year you want to use and click **Send**. A message window will tell you that the calendar was received. Click **OK**. The meter will use the calendar for the designated year, based on the date settings of your computer.

NOTE

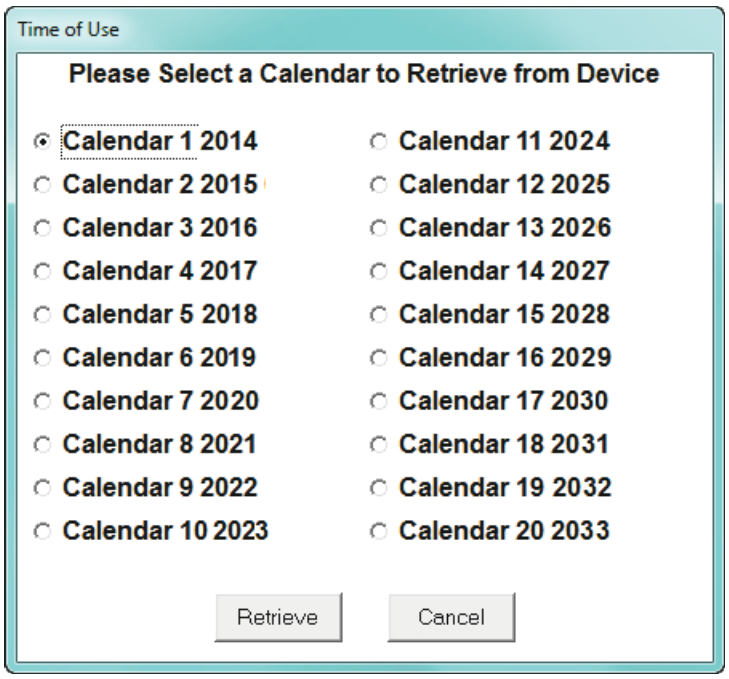
Do not enter more than one calendar for the same year (i.e., do not store two calendars for 2014). If you do, the meter uses the first calendar entered.

15.2.2 Edit a TOU Calendar Profile

1. From the Time of Use menu, select **Calendar Settings**. You will see the same screen as shown in 15.2.1 *Creating a TOU Calendar Profile - Yearly Profile* on page 15–5.
2. Click **Edit Calendar.** You will see the screen shown below.



- To edit a calendar saved on the computer's hard drive, click Load From File. A screen opens that lets you to locate the calendar. After the calendar has loaded, see 15.2.1 *Creating a TOU Calendar Profile - Yearly Profile* on page 15–5,for details on programming the calendar.
- To edit one of the calendars stored in the meter, click Load from Device. You will see the following screen.

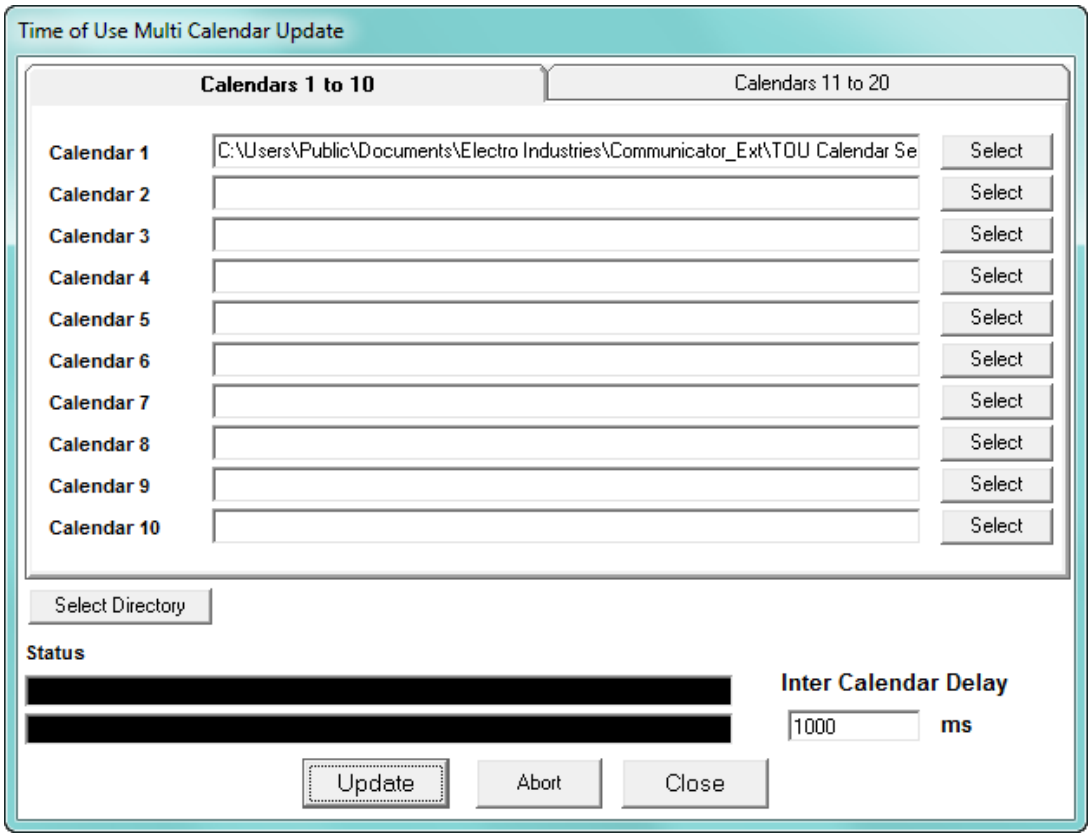


3. Select the calendar year you would like to edit and click Retrieve. After the calendar has been retrieved, see 15.2.1 *Creating a TOU Calendar Profile - Yearly Profile* on page 15–5, for details on programming the calendar.

15.2.3 Multiple Calendar Update

Use this feature to send multiple TOU calendars to the meter at one time.

1. From the TOU Calendar menu, select **Multi Calendar Update**. You will see the screen shown below.



2. You can select up to 20 calendars, using the tabs at the top of the screen.
   - To upload a calendar, click **Select** to select it from the Calendar Settings directory.
   - If your calendar(s) are saved in a different directory, click Select Directory and locate the files.
   - If a calendar is not loading correctly, you can increase the Inter Calendar Delay time to give the meter more time to process the data. If you are not having a problem, leave this field as it is.
3. Click **Update** to send the calendars to the meter; select **Abort** to cancel the update; select **Close** to close the window.

15.2.4 Using the TOU Perpetual Calendar Configurator

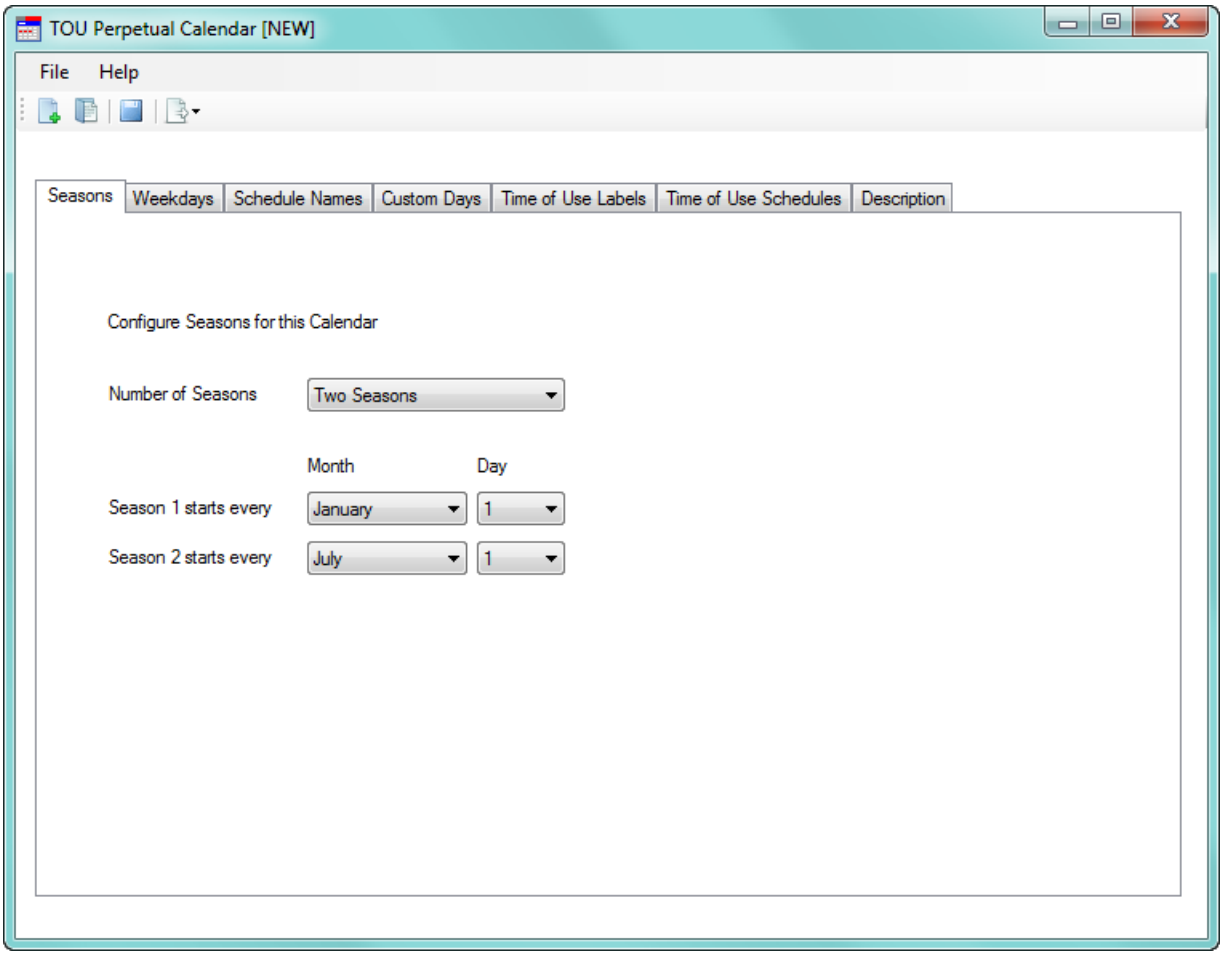
The TOU Perpetual Calendar configurator will automatically configure the meter for all 20 years. The structure of this feature is different, and rule-based. In an effort to simplify the TOU programming process, GE developed this utility that configures the EPM 9000 series 20 year calendars using a perpetual TOU calendar setup concept. This new form uses an event-based algorithm to configure all 20 years based on one setting from the user. It is much easier and faster and less prone to mistakes. However, if you wish to edit a specific year, you must use the individual edit calendar function discussed previously.

NOTE

Note that the EPM 9700/9900P meter uses a perpetual TOU calendar built into the meter's firmware (i.e., the software that runs the meter). The other EPM 9000 series meters rely on this software-based perpetual calendar.

There are benefits to having the meters calculate the perpetual calendars internally. One of the main benefits is that the algorithms can be retrieved by the meter, at a later time, for analysis. With the PC software-based TOU, the meter will only provide the individual days of the year it has stored.

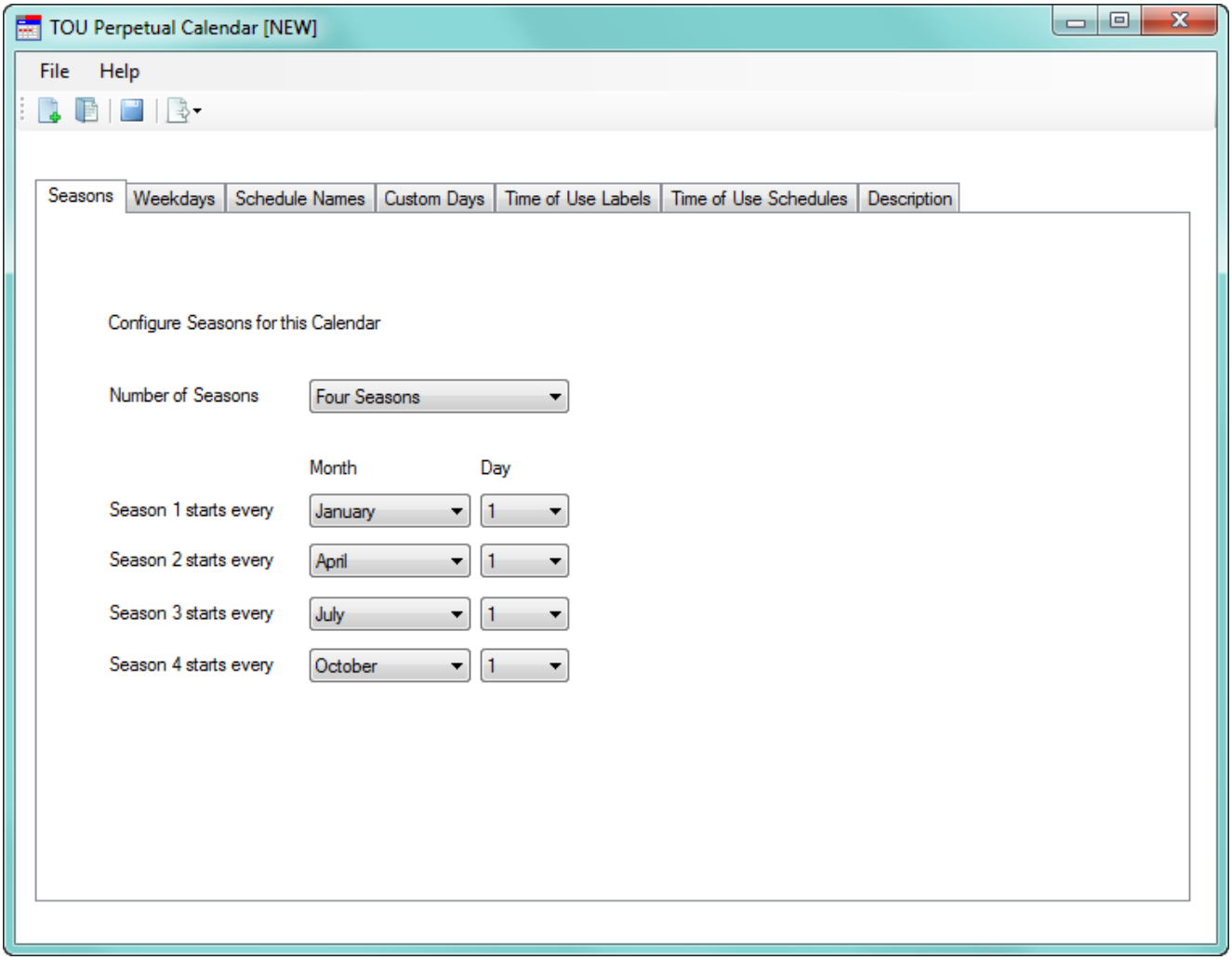
1. From the TOU Calendar menu, select Perpetual Calendar. You will see the screen shown below.



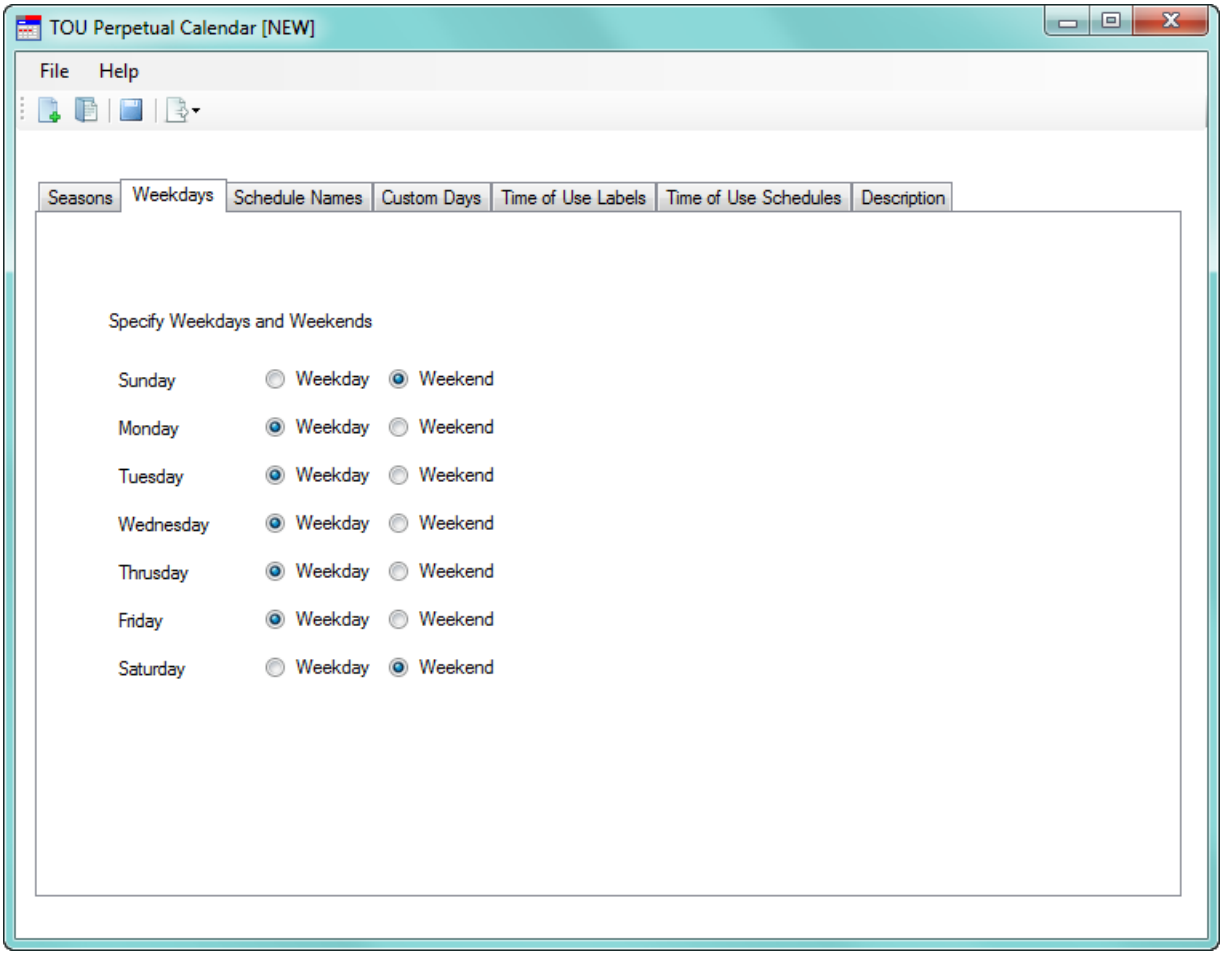
2. The TOU Perpetual Calendar screen has tabs that let you access all of its settings:

- Seasons - use this tab to set up to 4 seasons for the calendar.
- Weekdays - use this tab to set days as weekends or weekdays.
- Schedule Names - use this tab to label the TOU schedules you set up.
- Custom Days - use this tab to set up holidays, for example, Christmas.
- Time of Use Labels - use this tab to set up names for TOU that will be used in addition to the two Default labels: On Peak and Off Peak.
- Time of Use Schedules - use this tab to set the hourly time range for the TOU schedules.
- Description - use this tab to enter any descriptive information about the Perpetual Calendar.

3. The first tab is the Seasons tab (see previous page and screen below). The default setting is two seasons. Click in the pull-down menu to select between one and four seasons. Depending on what you select, you will see one to four fields that let you select the start date for the seasons. Select the month and day for the season start date from the pull-down menus.

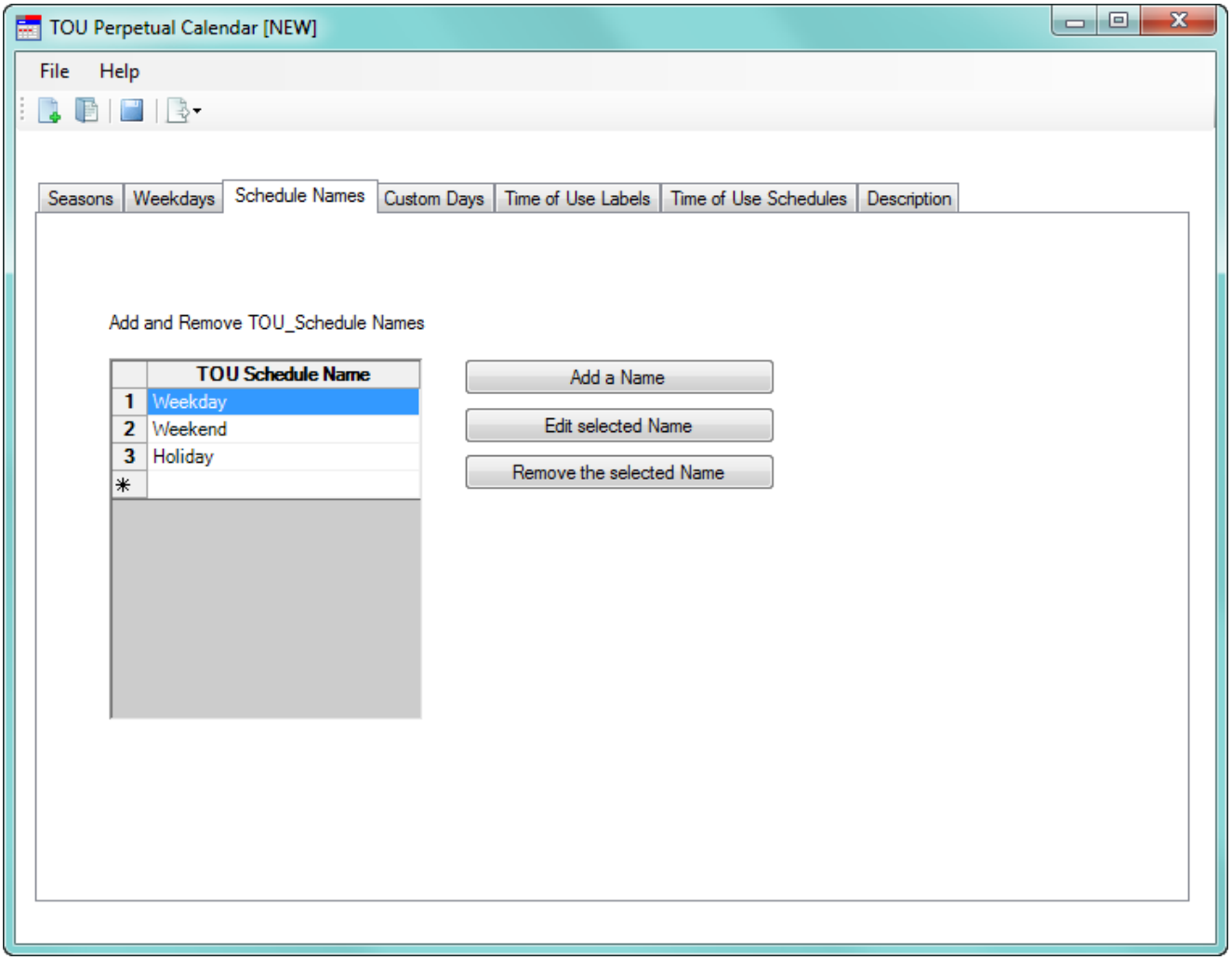


4. Click the Weekdays tab - you will see the screen shown below.



You can change a day of the week to a weekend or weekday by clicking on one of the radio buttons next to it. The default values are Monday - Friday as weekdays, and Saturday and Sunday as weekends.

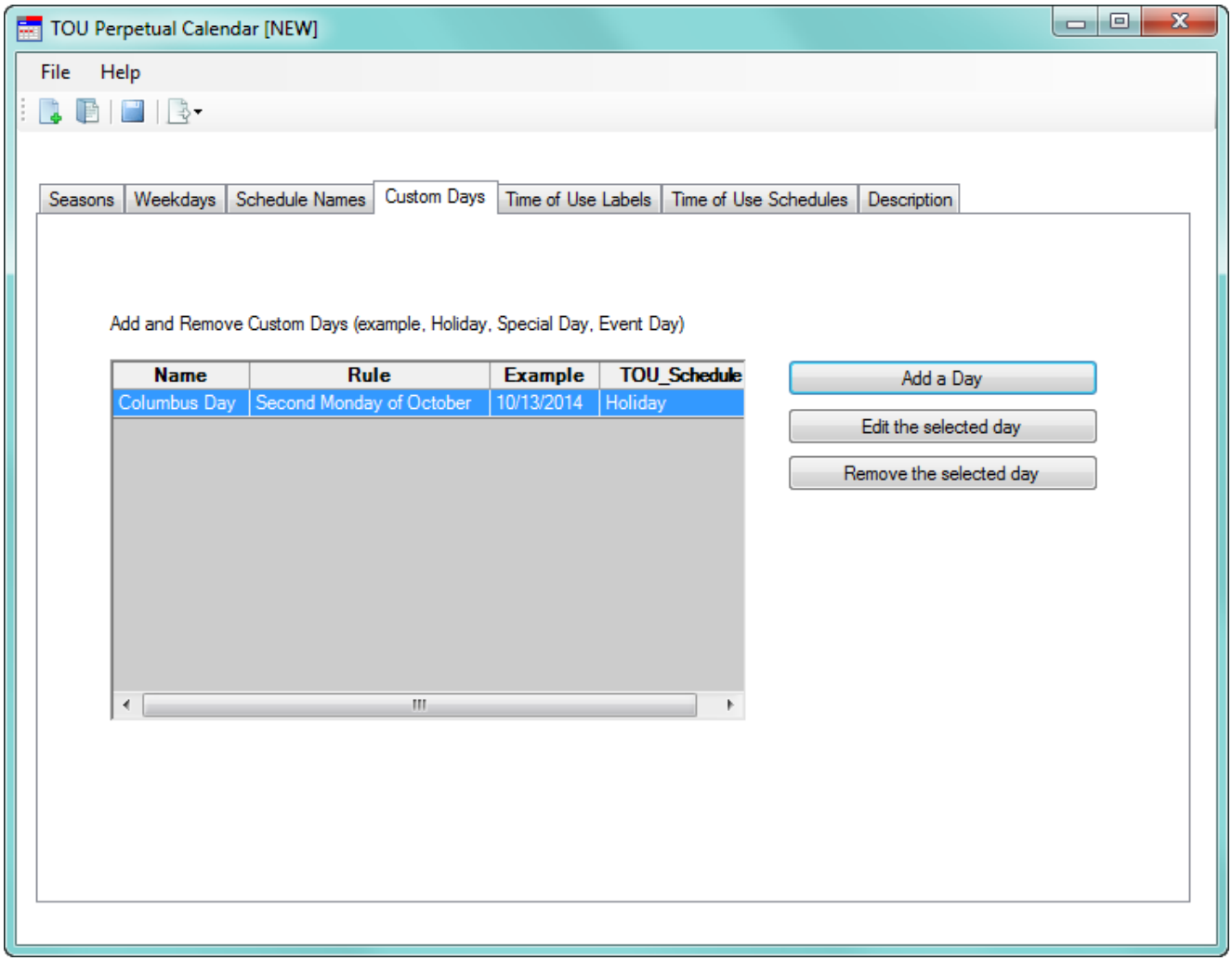
5. Click the Schedule Names tab - you will see the screen shown below.



The default Schedule names are Weekday, Weekend, and Holiday.

- To add a new schedule name, click the Add a Name button. You will see an empty line where you can add the new name. After you enter a name, press Enter or click anywhere in the screen. A number will appear next to the new Schedule name.
- To edit an existing name, click on the name and click the Edit Selected Name button. You can then change the name. After you change the name, press Enter or click anywhere in the screen.
- To remove a name you added, click on the name and click the Remove Selected Name button. Note that you won't be able to remove the default Schedule names (Weekday, Weekend, and Holiday).

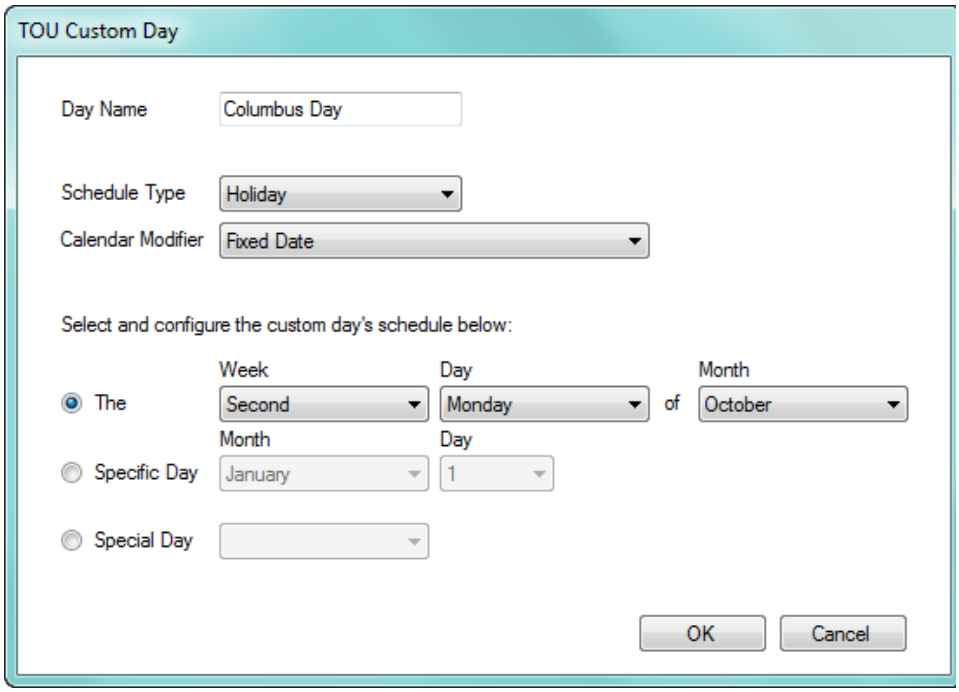
6. Click the Custom Days tab - you will see the screen shown below.



Use this screen to set up holidays. A holiday is a day that would normally be a regular "on peak" day but because of a special event, it is fully off peak. The best example is Christmas, since December 25th is almost always an off peak day.

People are not working that day and there are no peak charges. In this section, the user enters all these dates, as defined by the Utility rate structure.

- To add a Custom day, click the Add a New Day button. You will see the screen shown below.



▷ Enter a name for the holiday, e.g., Columbus Day.

▷ Select the Calendar Modifier from the pull-down menu. You can select:

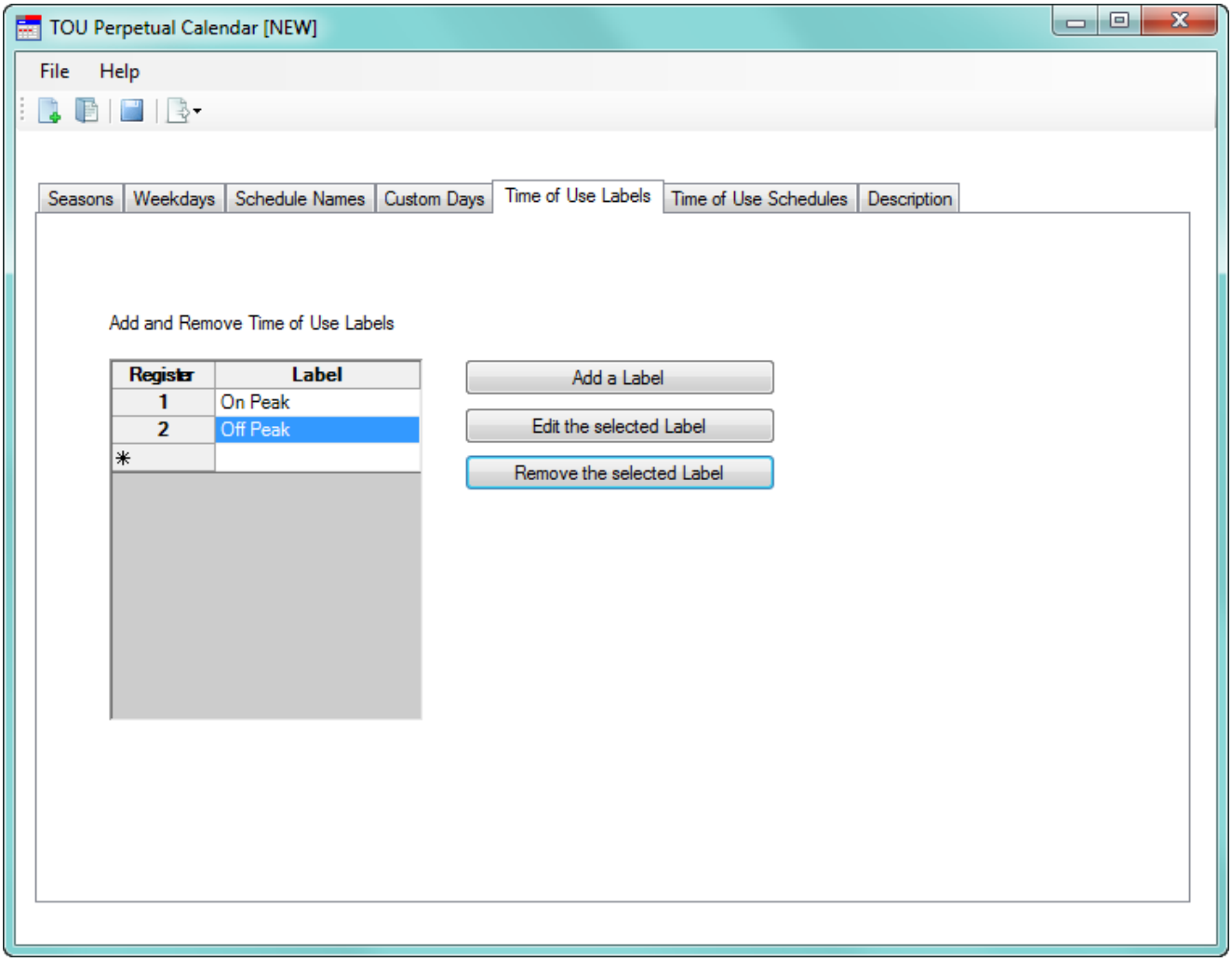
- Fixed Date - the holiday always falls on the same date each year, e.g., New Year's Day, which is always January 1st
- Occurs on the Next Day - the holiday always occurs on the day after, e.g., a holiday that begins at sundown of the previous day.
- Spans to the Next Day - it is a two-day holiday, e.g., Thanksgiving and the day after.
- Weekday Only - Nearest Weekday - if the date falls on a weekend, the holiday moves to the nearest weekday; e.g., if the holiday falls on Saturday, the holiday moves to Friday, but if the holiday falls on Sunday, it moves to Monday.
- Weekday Only - Nearest Weekday After - if the date falls on a weekend, the holiday moves to the nearest weekday after the set date; e.g., if the holiday falls on either a Saturday or Sunday, it moves to Monday.
- Weekday Only - Nearest Weekday Prior - if the date falls on a weekend, the holiday moves to the nearest weekday before the set date; e.g., if the holiday falls on either a Saturday or Sunday, it moves to Friday.

▷ Configure the custom day's date. You can select Week, Day, of Month (for example, the First Monday of September for U.S. Labor Day); a specific day (for example December 25th for Christmas), or Special Day (Easter).

▷ Click OK to save the custom day's settings. Once the holiday rules are set up, the software will apply them to all 20 years.

- To edit a Custom day, click on the date in the list and click the **Edit the Selected Day** button. You will see the screen shown above. Change the settings as you want and click **OK**.
- To remove a Custom day, click on the date in the list and click the **Remove the Selected Day** button.

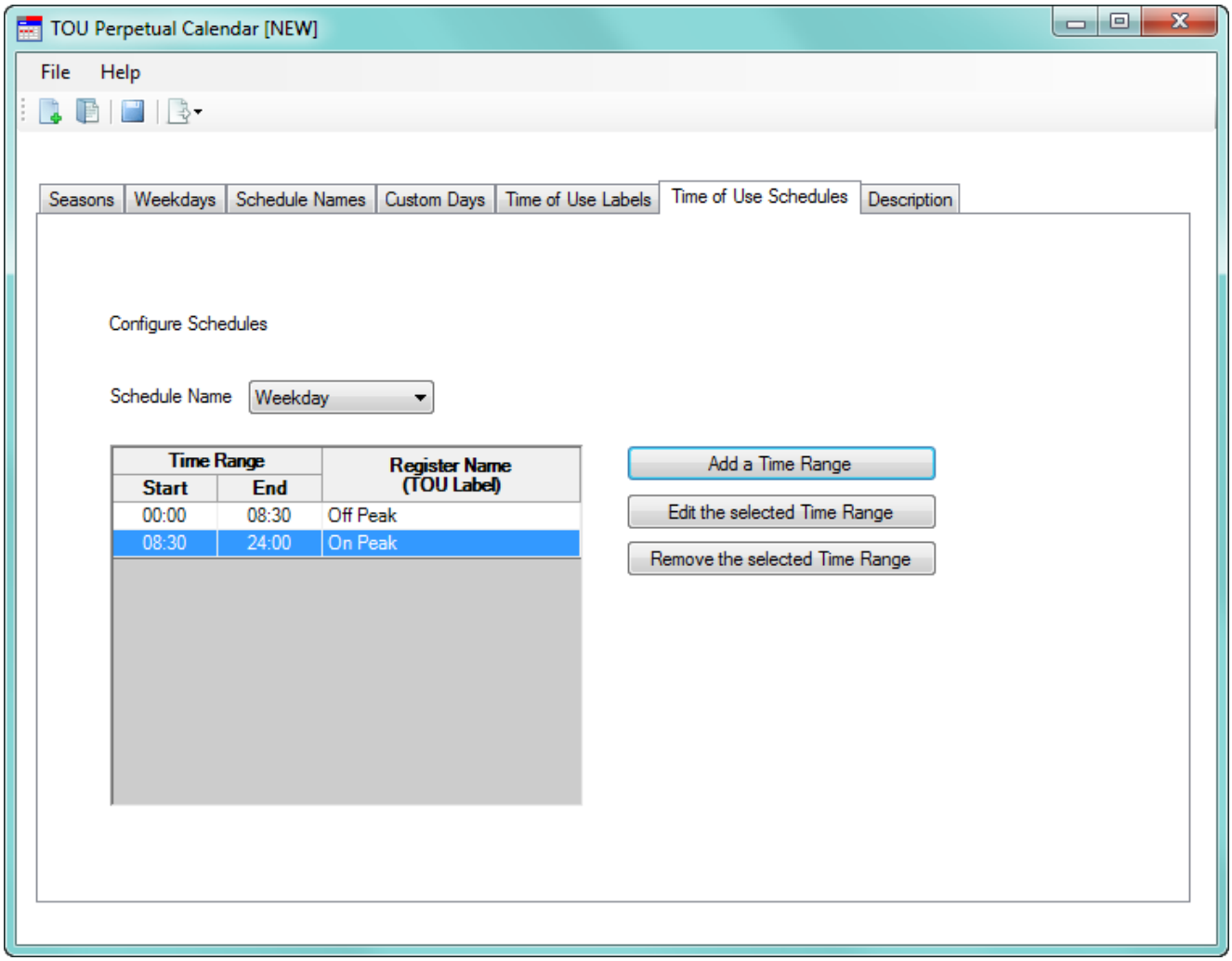
7. Click the **Time of Use Labels** tab - you will see the screen shown below.



The default TOU labels are On Peak and Off Peak.

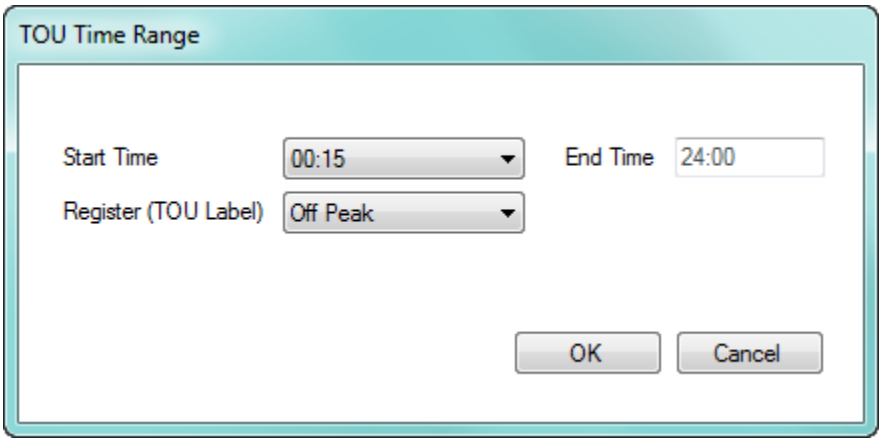
- To add a new Time of Use label, click the **Add a Label** button. You will see an empty line where you can add the new label. After you enter a label, press Enter or click anywhere in the screen. A number will appear next to the new Time of Use label.
- To edit an existing Time of Use label, click on the label and click the **Edit the Selected Label** button. You can then change the label. After you change the label, press Enter or click anywhere in the screen.
- To remove a Time of Use label you added, click on the label and click the **Remove the Selected Label** button. Note that you won't be able to remove the default TOU labels.

8. Click the **Time of Use Schedules** tab - you will see the screen shown below.



- Use this screen to set the time range for the existing Schedules. The Schedules consist of the default Schedules - Weekday, Weekend, and Holiday, and any Schedules you created using the Schedule Names tab. There is one default time range with a Start Time of 00:00 and an End time of 24:00 for the Off Peak TOU label. This feature uses a 24 hour clock, so that 12PM - 12AM is 13:00-24:00.
- This feature works like a timer. Use it to set up when the meter will switch to the next bucket of energy accumulation. The meter will run these rules in the order they appear.
- To add a time range to a schedule, select the Schedule from the pull-down menu and click the **Add a Time Range** button. You will see the

screen shown below.



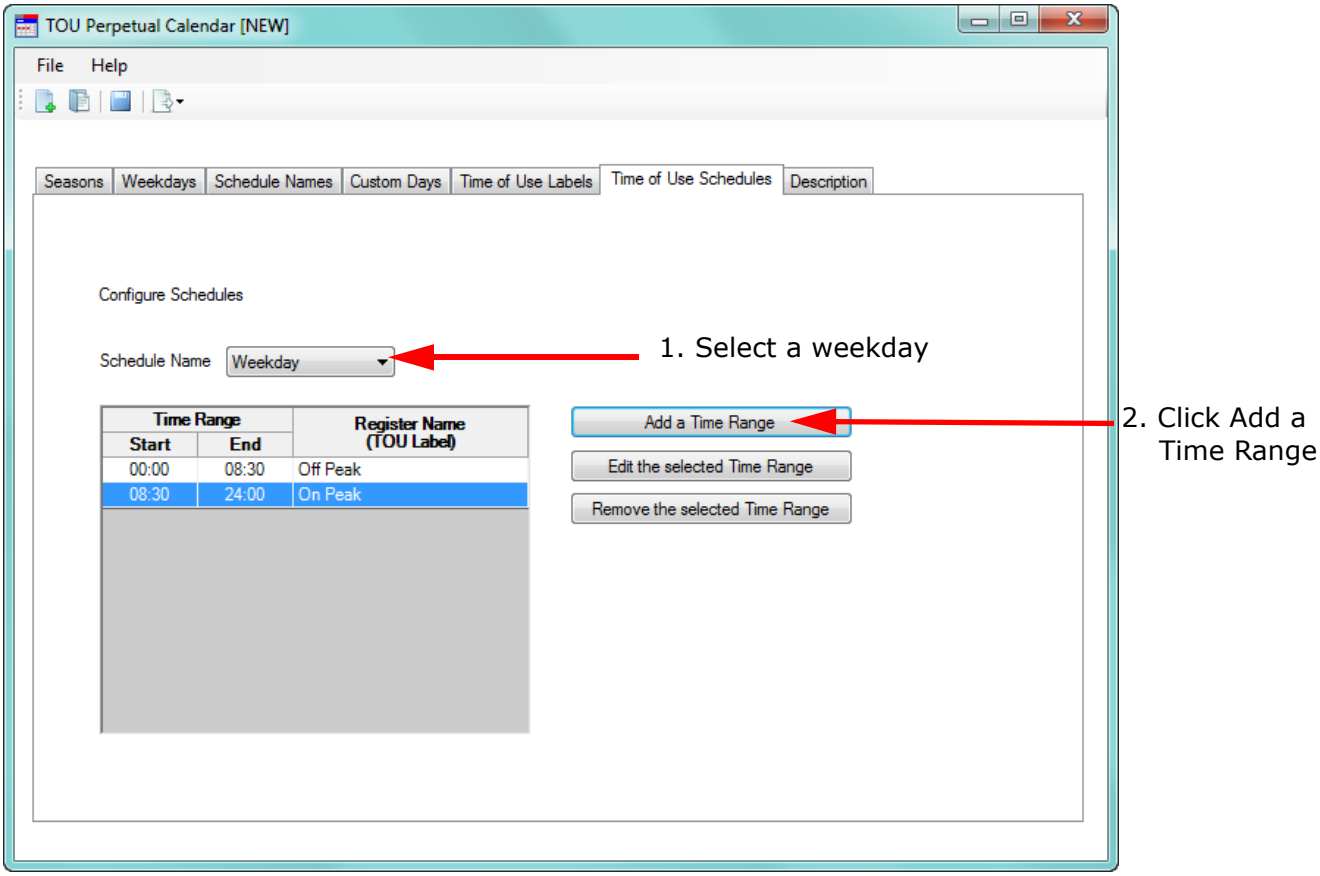
Select the start time and the TOU label from the pull-down menus and click **OK**. The End time will be updated automatically (see the following example).

- To edit a Schedule's time range, select the Schedule from the pull-down list, click on the Register name (TOU label) in the list and click the **Edit a Selected Time Range** button. You will see the TOU Time Range screen shown on the previous page. Change the settings as you want and click **OK**.
- To remove a Schedule's time range, select the Schedule from the pull-down list, click on the Register name (TOU label) in the list and click the **Remove a Selected Time Range** button.

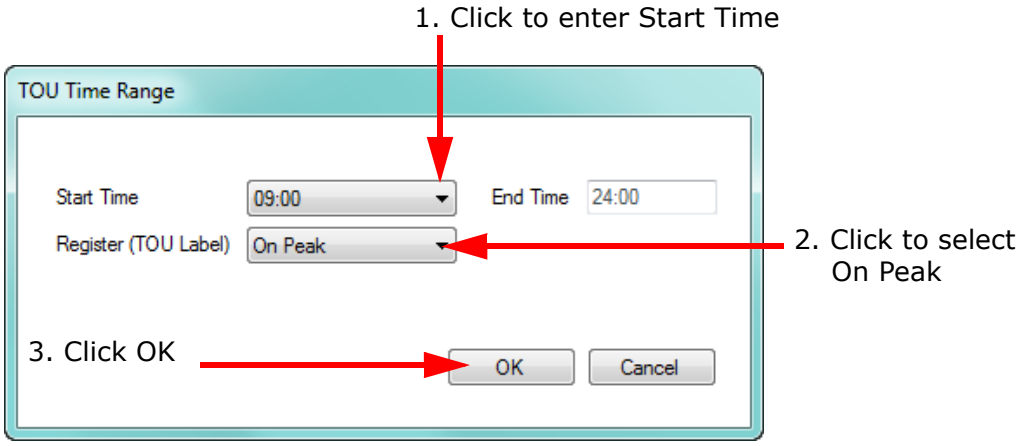
Example of Time Range Setting

Let's say you are setting up the Weekday Schedule's Off Peak and On Peak Time Range. The first Off Peak range is already set in the default setting. But it is set for the whole day - 00:00 Start Time and 24:00 End Time. So the first step is to set the beginning time for the On Peak range. Once you do that, the End Time for the first Off Peak period will be adjusted accordingly.

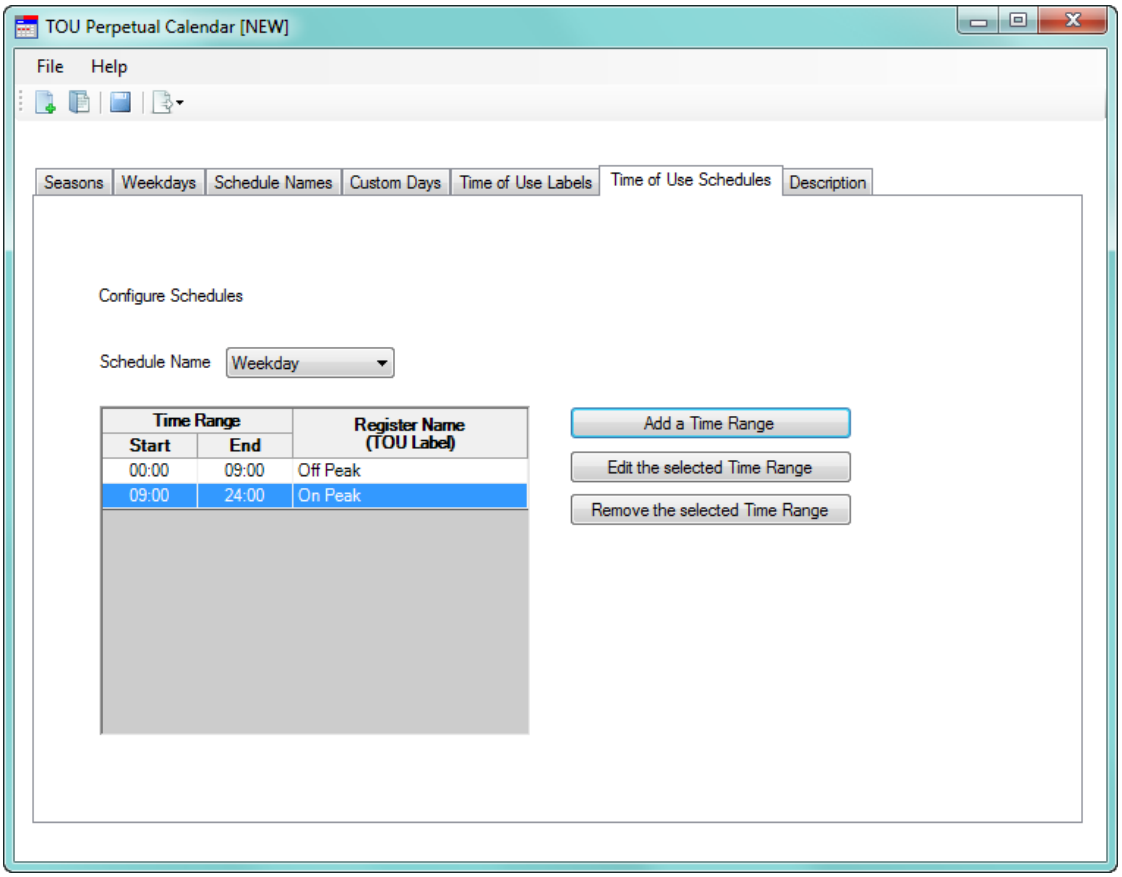
▷ From the TOU Schedules tab screen, select Weekday from the **Schedule Name** pull-down menu and click the **Add a Time Range** button.



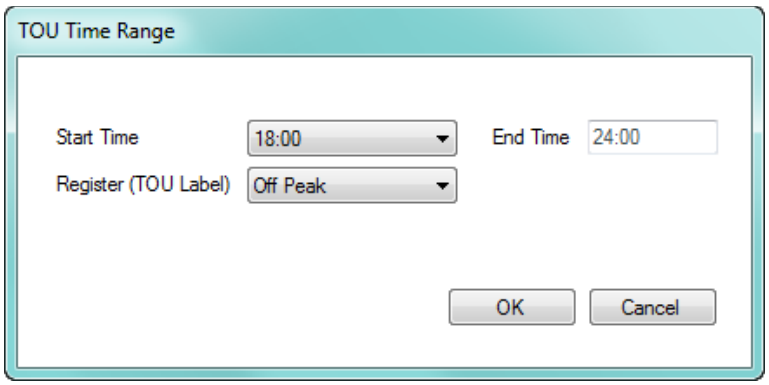
▷ Select the start time for the On Peak period for a Weekday schedule. The example below uses 9:00 AM. Make sure that the Register (TOU Label) is On Peak. Click **OK**.



The Time of Use Schedules screen redisplays, now listing the On Peak time range as well as the default Off Peak time range. Note that the Off Peak time range's end time is now the same as the start time of the On Peak time range, and that the On Peak time range's End time is 24:00 (end of the day).

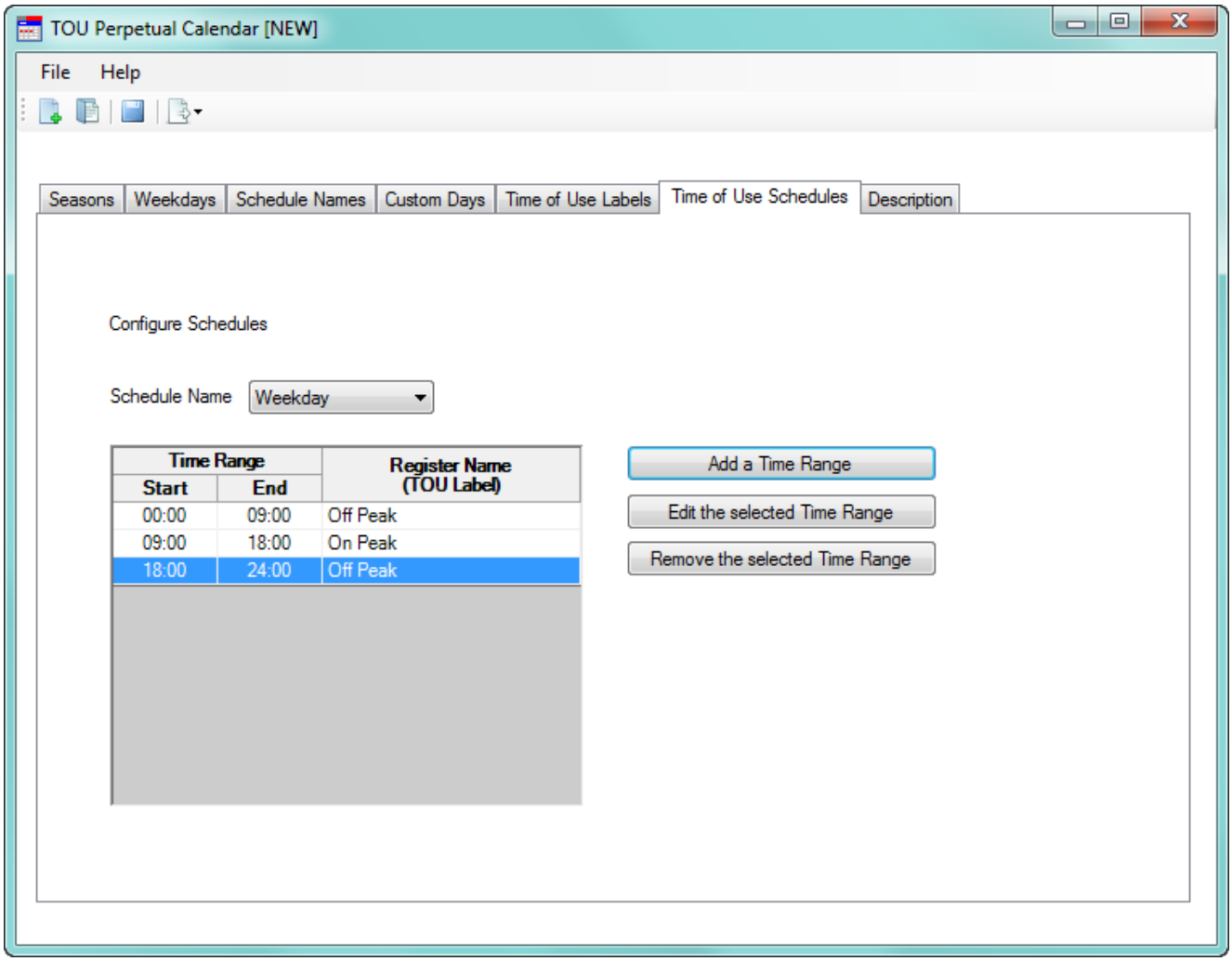


▷ To set up the second Off Peak period, click the Add a Time Range button. Enter the start time for the second Weekday's Off Peak period. The example below uses 6 PM (18:00). Make sure that the Register (TOU Label) is Off Peak. Click **OK**.

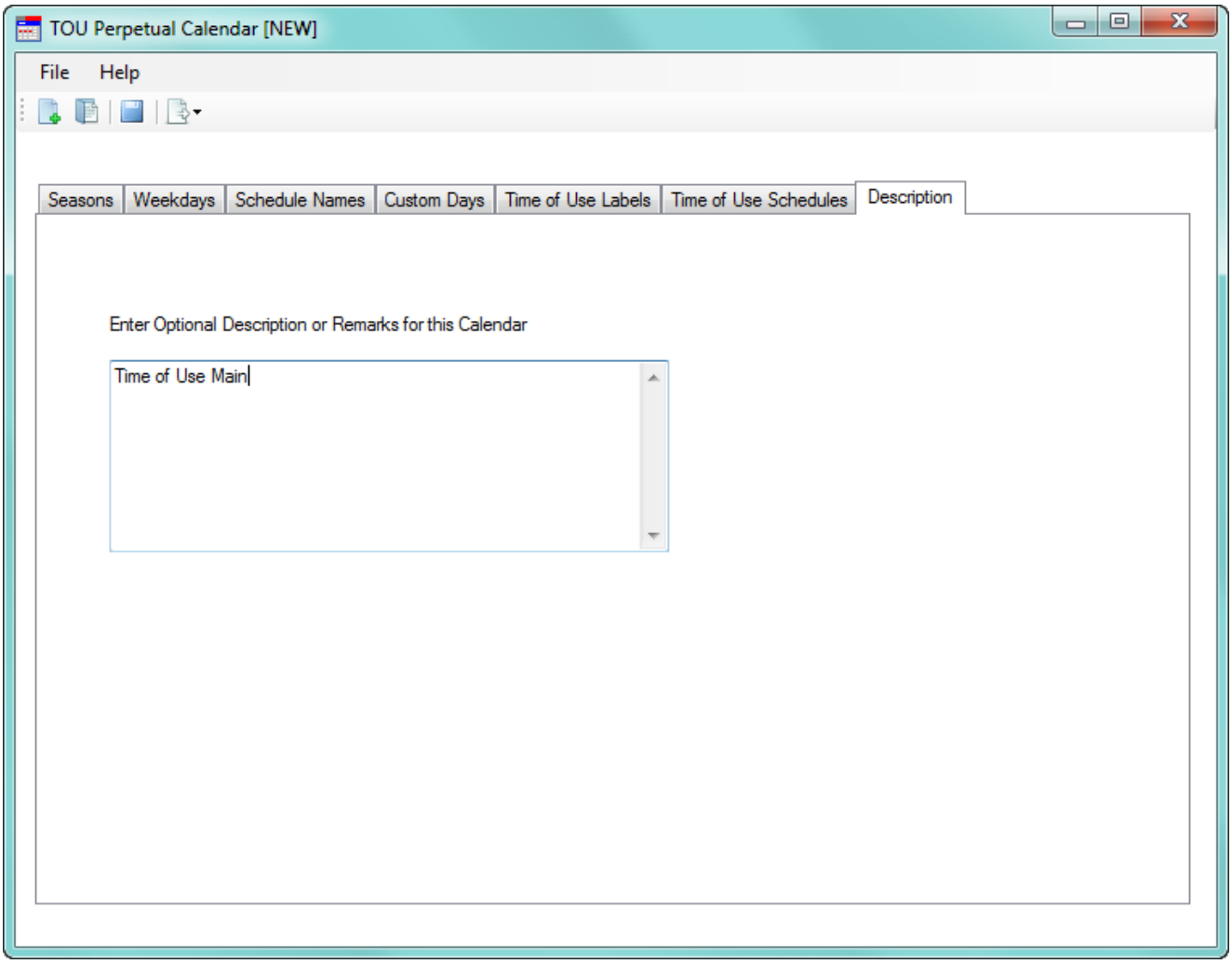


▷ The Time of Use Schedules screen redisplays, now listing the new Off Peak time range as well as the other two time ranges. Note that the On Peak time range's end time is now the same as the start time of the second Off Peak time range, and that the second Off Peak time

range's End time is 24:00 (end of the day). So now you have a Weekday schedule of Off Peak from 12 AM to 9 AM, On peak from 9 AM to 6 PM, and Off Peak from 6 PM to midnight.

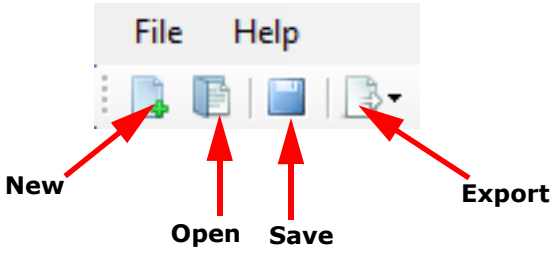


9. Click the Description tab. You will see the screen shown below.



You can use this tab to enter a description or notes for this perpetual calendar.

10. To save the Perpetual Calendar, click the Save icon at the top of the screen or click
File > Save Profile or **File > Save Profile As**.



11. You also have the following options:

- To create a new Perpetual Calendar, click the New icon or click **File > New Profile**.
- To open a previously saved Perpetual Calendar, click the Open icon or click **File > Open Profile**.
- To export the Perpetual Calendar (and create up to 20 years of calendars based on it), click the Export icon or click: **File > Export > EPM TOU Calendar File**. See the instructions in 15.2.3 *Multiple Calendar Update* on page 15–20.
  - To view a report, click **File > View a Report**. You will be prompted to save the perpetual calendar. Then the Calendar report will open in a text window. See the example report below.

tmp7BA4.tmp - Notepad

File Edit Format View Help

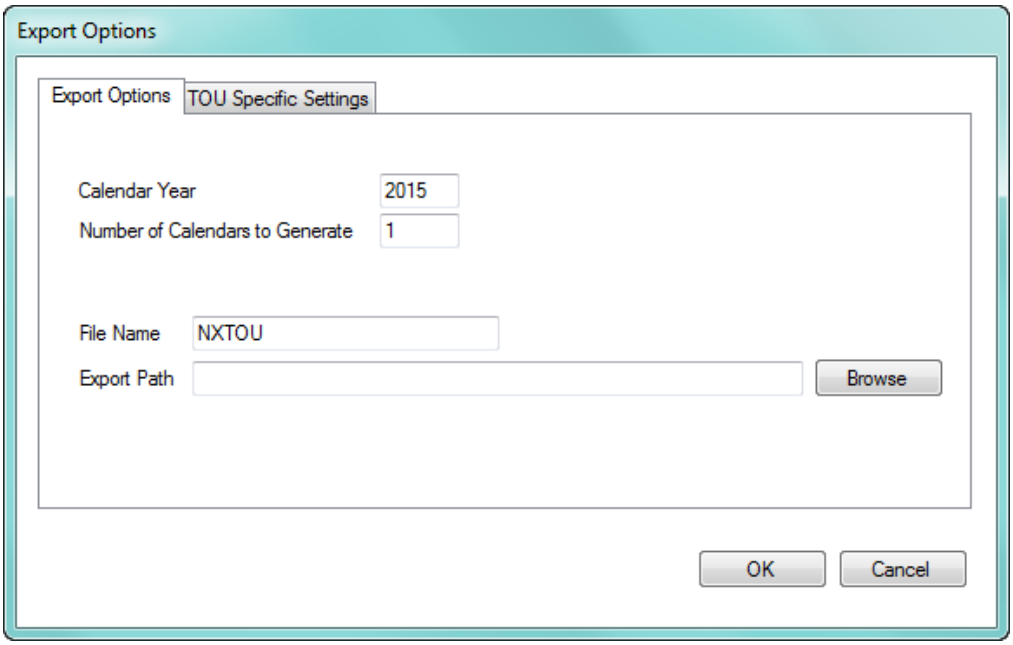
```
Profile Name: Time of Use Perpetual Calendar Profile
Version: 4
Profile Date: 9/10/2014 9:01:06 AM
Description :

Seasons :
        Season 1 : 1st of January
        Season 2 : 1st of July

Weekdays :
        -------------------------------
        | Weekday       | TOU_Schedule |
        -------------------------------
        | Sunday        | WeekEnd      |
        | Monday        | WeekDay      |
        | Tuesday       | WeekDay      |
        | Wednesday     | WeekDay      |
        | Thursday      | WeekDay      |
        | Friday        | WeekDay      |
        | Saturday      | WeekEnd      |
        -------------------------------

Custom Days :
        None

Time of Use Register Labels :
        On Peak,Off Peak

Schedules :
        Weekday
        ---------------------------------------
        | Start Time | End Time    | TOU Label  |
        ---------------------------------------
        | 00:00      | 09:00       | Off Peak   |
        | 09:00      | 18:00       | On Peak    |
        | 18:00      | 24:00       | Off Peak   |
        ---------------------------------------
        Weekend
        ---------------------------------------
        | Start Time | End Time    | TOU Label  |
        ---------------------------------------
        | 00:00      | 24:00       | Off Peak   |
        ---------------------------------------
        Holiday
        ---------------------------------------
        | Start Time | End Time    | TOU Label  |
        ---------------------------------------
        | 00:00      | 24:00       | Off Peak   |
        ---------------------------------------
```

12. To exit the Perpetual Calendar setup, click **File > Exit** or click the **X** in the screen's Menu Bar. You will be asked to confirm that you want to close the software - click **Yes** to exit the Perpetual Calendar setup screen.

15.2.5 Exporting a Perpetual Calendar to an EPM 9000 Series TOU Calendar File

Use this function to create an EPM 9000 series meter TOU Calendar file from a perpetual calendar configuration. You can use this feature to create calendars for multiple years from one perpetual calendar. You can then import the TOU files into the GE Communicator application when you configure TOU Calendars. See 15.2.3 *Multiple Calendar Update* on page 15–20, and 15.2.4 *Using the TOU Perpetual Calendar Configurator* on page 15–21.

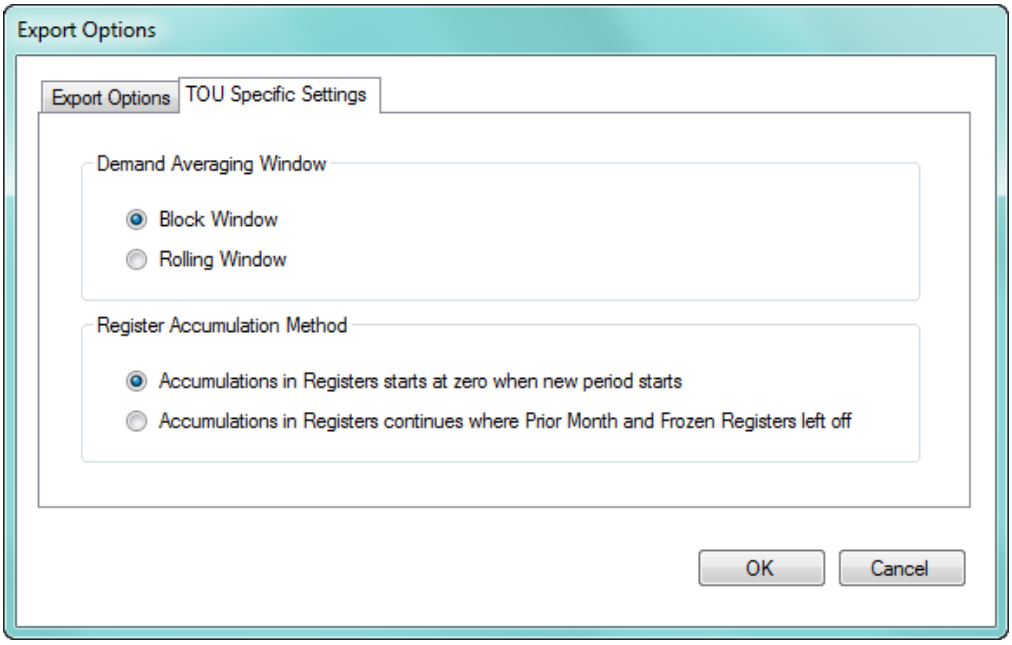
1. Save the perpetual calendar you want to export.
2. From the Perpetual Calendar screen, click the Export icon or click **File > Export > EPM TOU Calendar File**. (You will be prompted to save the perpetual calendar.)
3. You will see the Export Options screen, shown below.



4. Enter the following information:
   - The year for which the new, exported calendar will be used. If you are creating a calendar for more than one year, this should be the first year for which the calendar will be used.
   - The number of years that calendars should be created from the exported calendar. You can select up to 20 years. For example, if this field is set to 3 and the Calendar Year is set to 2014, 3 exported TOU Calendar files will be created: one for each of the years 2014, 2015 and 2016.
   - The File Name and Export Path. These fields are used to specify the base filename of the exported file and the location where the exported file(s) will be saved.
     - The calendar year is added to the end of the file name you enter. For example, if the filename is NXTOU, the exported file for year 2014 will be named "NXTOU2014.TOU."

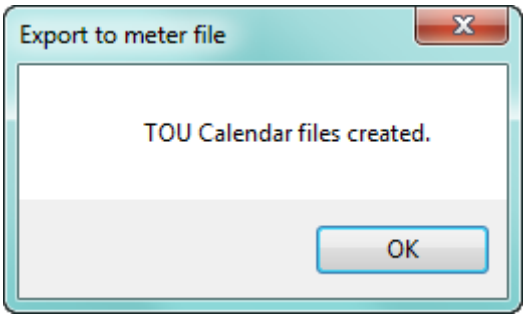
- You can click the **Browse** button to select another location to save the calendar file, other than the default location listed on the screen.

5. Use the EPM TOU Specific Settings tab to configure the Demand Averaging Window and/or the Register Accumulation Method for the exported file(s).



- Select the Demand Average Window method: Block Window or Rolling Window.
- Select the Register Accumulation method: "Accumulations in Registers starts at 0 when new period starts" or "Accumulations in Registers continues where Prior Month and Frozen Registers left off."

6. Click **OK** to save your Export settings.
7. Click **OK** on the Export screen. The software creates calendars for the number of years you selected, based on the Perpetual calendar, and exports them to the meter. You will see a message window when the files have been exported - see the example below.



15.3 EPM 9700/9900P/7000P TOU Settings

As explained earlier in this chapter, TOU bins energy use into time periods, so that utilities can bill customers correctly for Peak and Off Peak usage. The EPM 9700/9900P and EPM 7000P meters use a perpetual TOU schedule called the TOU Profile, configured and stored in the meter's firmware, that you only need to set up once.

To program the EPM 9700/9900P/7000P meter's TOU Profile, you:

- Set up the number of seasons per year - up to four seasons are allowed. You can also set up the seasons for weekly or daily TOU accumulations.
- Set up the billing periods, e.g., January 1st, February 1st, etc - up to 12 billing periods are allowed.
- Set up the days designated as holidays.
- Set up day types, e.g., weekday - up to four day types are allowed, including the default day type "holidays."
- Set up rates, which are accumulators for usage from different times, e.g., peak usage which is accumulated from times designated as peak - up to four rates plus a default total accumulations rate are allowed.
- Set up schedules that specify when rate changes occur during a day; e.g., Schedule 1 consists of Off-Peak at 12 AM, On-Peak at 7 AM, and Off-Peak again at 6 PM; the result of this is that the usage from 12 AM to 6:59 AM is applied to the Off-Peak Rate, the usage from 7 AM to 5:59 PM is applied to the On-Peak Rate, and the usage from 6 PM to 11:59 PM is applied to the Off-Peak Rate.
- Assign schedules to day type (weekday, weekend, holiday, etc.) for each of the configured seasons (or weekly/daily accumulations); e.g., assign Schedule 1 to Weekdays for Season 1.
- Set up the values that will be accumulated.

Usage data is automatically accumulated in the appropriate counters at the TOU demand interval set in the meter's Device Profile (see individual meter chapters for instructions); for example, every 15 minutes.

An exception to this interval accumulation occurs for the EPM 7000P meter, when an external digital input has been configured as end of interval (EOI). In that case, TOU will perform automatic data usage accumulation and calendar actions (rate change, day type change, season/billing month self reads) based on the EOI input trigger. This can result in shorter or longer interval periods, depending on the EOI input timing, so the rate/day type/calendar actions may differ from what is expected.

NOTE

When the meter is set up for automatic (self read) TOU, there are restrictions on resets. You cannot perform the following reset functions (you are still able to reset maximum and minimum values as permitted by the meter's security settings):

- Reset meter energy
- Reset meter pulse accumulations
- Reset meter cumulative demands
- Reset TOU current season

- Reset TOU current month
- Reset TOU current season/month demand, i.e., peak demand and coincident demand
- Reset TOU current season/month accumulators
- Initialize TOU cumulative demands
- Manual read TOU season
- Manual read TOU month

NOTE

NOTES:

- If you need to reset TOU, use the TOU Enable/Disable setting in the Device Profile. See the individual meter chapters for instructions.
- If you are manually reading TOU, you do not have these reset restrictions.
- Detailed instructions for programming a TOU profile begin in 15.3.1 *Creating a New EPM 9700/9900P Meter TOU Profile* on page 15–38. For an example of programming a TOU profile, see 15.3.6 *Example of Programming a TOU Profile* on page 15–61.

15.3.1 Creating a New EPM 9700/9900P Meter TOU Profile

When setting up TOU for the EPM 9700/9900P meter, these are the recommended steps:

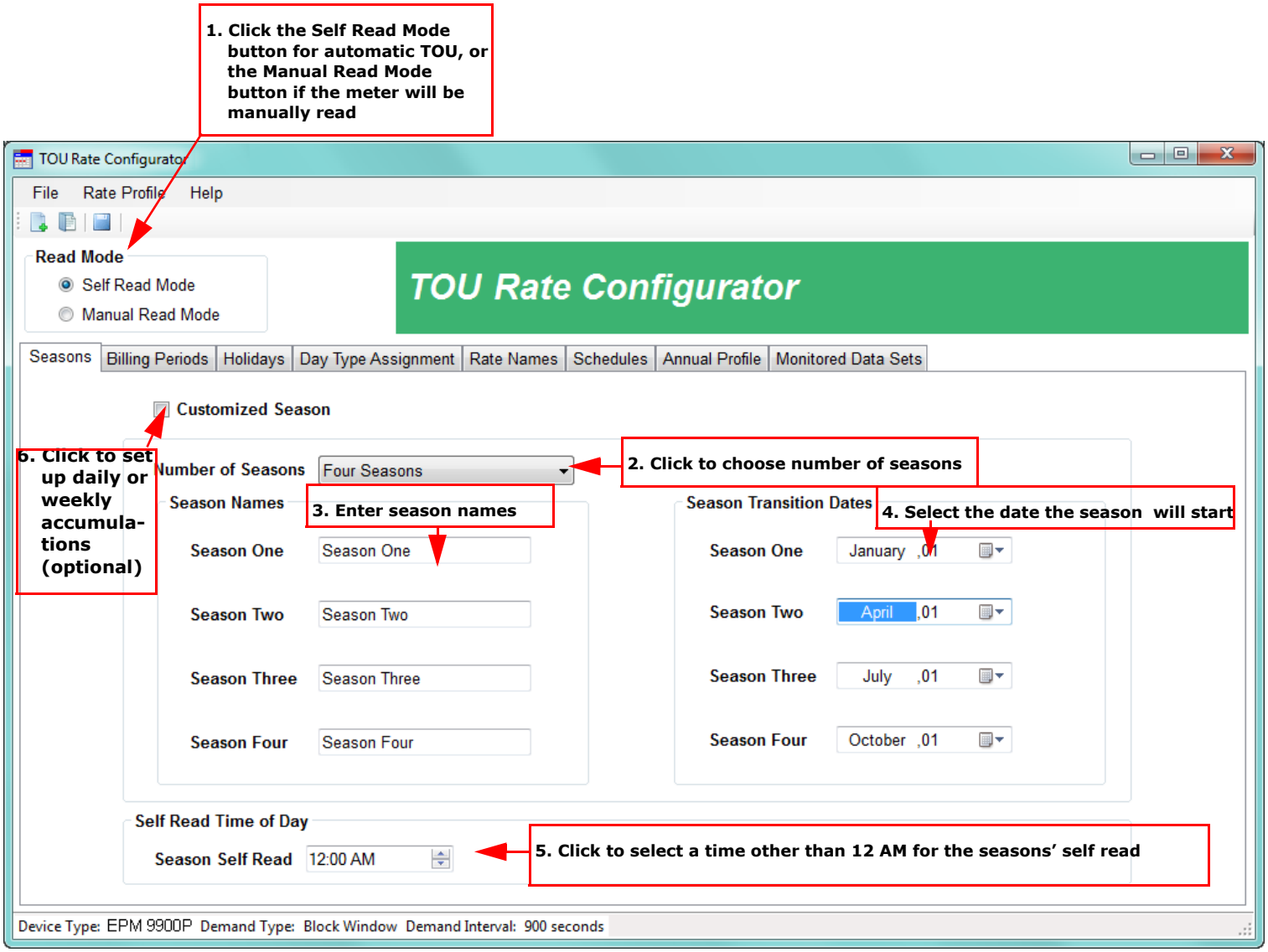
1. Program the meter's Device profile settings needed for TOU:
   - Enabling TOU
     - 11.2.11 *Time of Use Enable/Disable (EPM 9900P Meter)* on page 11–41
     - 27.2.6 *Time of Use Setting* on page 27–39 for the EPM 7000P meter).
   - Demand averaging type: block window or sliding window
     - 11.2.7 *Cumulative Demand Type and Time of Use Demand Type* on page 11–37) for the EPM 9900P
     - 26.2.2 *Demand Integration Intervals* on page 26–18 for the EPM 9700
     - 27.2.1 *Configuring Energy, Power Scaling, and Averaging* on page 27–26 for the EPM 7000P).
   - Demand intervals
     - 11.2.2 *Demand Integration Intervals* on page 11–27 for the EPM 9900P
     - 26.2.2 *Demand Integration Intervals* on page 26–18 for the EPM 9700
     - 27.4.2 *Trending Profiles - Configuring Historical Logs* on page 27–50 for the EPM 7000P).
   - Scaled energy formats
     - 11.2.1 *Energy Scaling* on page 11–20 for the EPM 9900P
     - 26.2.1 *Energy Scaling* on page 26–17 for the EPM 9700
     - 27.2.1 *Configuring Energy, Power Scaling, and Averaging* on page 27–26 for the EPM 7000P).

- Which scaled energy accumulators will be available in the meter
  - 11.2.9 *Pulse Accumulations* on page 11–38 for the EPM 9900P
  - 26.2.6 *Pulse Accumulations* on page 26–28 for the EPM 9700)

2. Program the TOU profile: instructions begin below.
3. Program additional meter profile settings: apply available TOU data-set items from the TOU profile to the DNP map. To get the TOU from either DNP or meter logs, see:
   - For the EPM 9900P see 11.1.6 *DNP Custom Class Map* on page 11–15) and to interval logs (11.4 *Trending Profile Settings* on page 11–84.
   - For EPM 9700 see 26.4 *Trending Profile Settings* on page 26–52.
   - For the EPM 7000P see 27.4.2 *Trending Profiles - Configuring Historical Logs* on page 27–50.

Instructions follow:

1. From the Main screen's File menu, click **TOU Calendar > TOU Rate Configurator**.

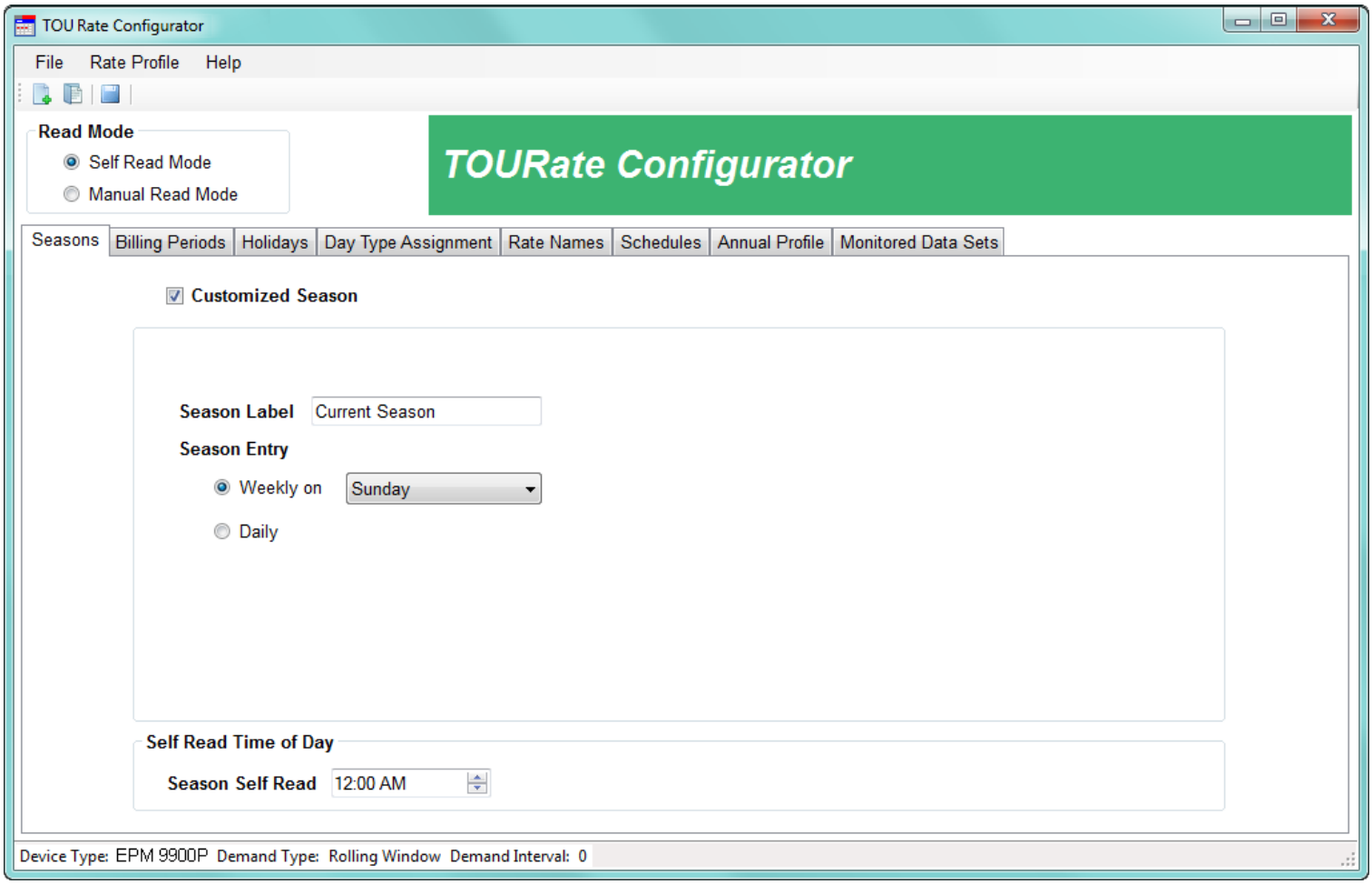


2. You will use the screen shown above to set up the information for the TOU Profile. The normal order of tasks is shown in the example screen. The tabs let you navigate between the different settings.
3. Click the Self Read Mode button if the meter will be performing TOU reads automatically, based on the TOU Profile settings.
   - If the meter will be read manually, click the Manual Read Mode. In the case of manual TOU reading of the meter, you will not set up Seasons or Billing Periods.

15.3.1.1 Seasons (or Weekly/Daily)

The first tab is used to set up the number of seasons you want for your TOU Profile. The Seasons setting lets you assign different rates to days, based on when in the year the day falls - for example, setting a higher On Peak rate in the summer than in the spring, since there the higher energy usage caused by air conditioning is more expensive for the utility to produce. You can set up to four seasons.

1. Select the number of seasons - 1 to 4 - from the pull-down menu.
2. Enter names for each of the seasons.
3. Enter the date that the season will begin.
4. The default for the seasons' self read is 12 AM (midnight) - if you want to use a different time of day, select it.
   - This tab also lets you set up weekly or daily TOU accumulations. To do so, click the Customized Season checkbox. The screen changes as shown on the next page.



▷ Enter a label for the season.

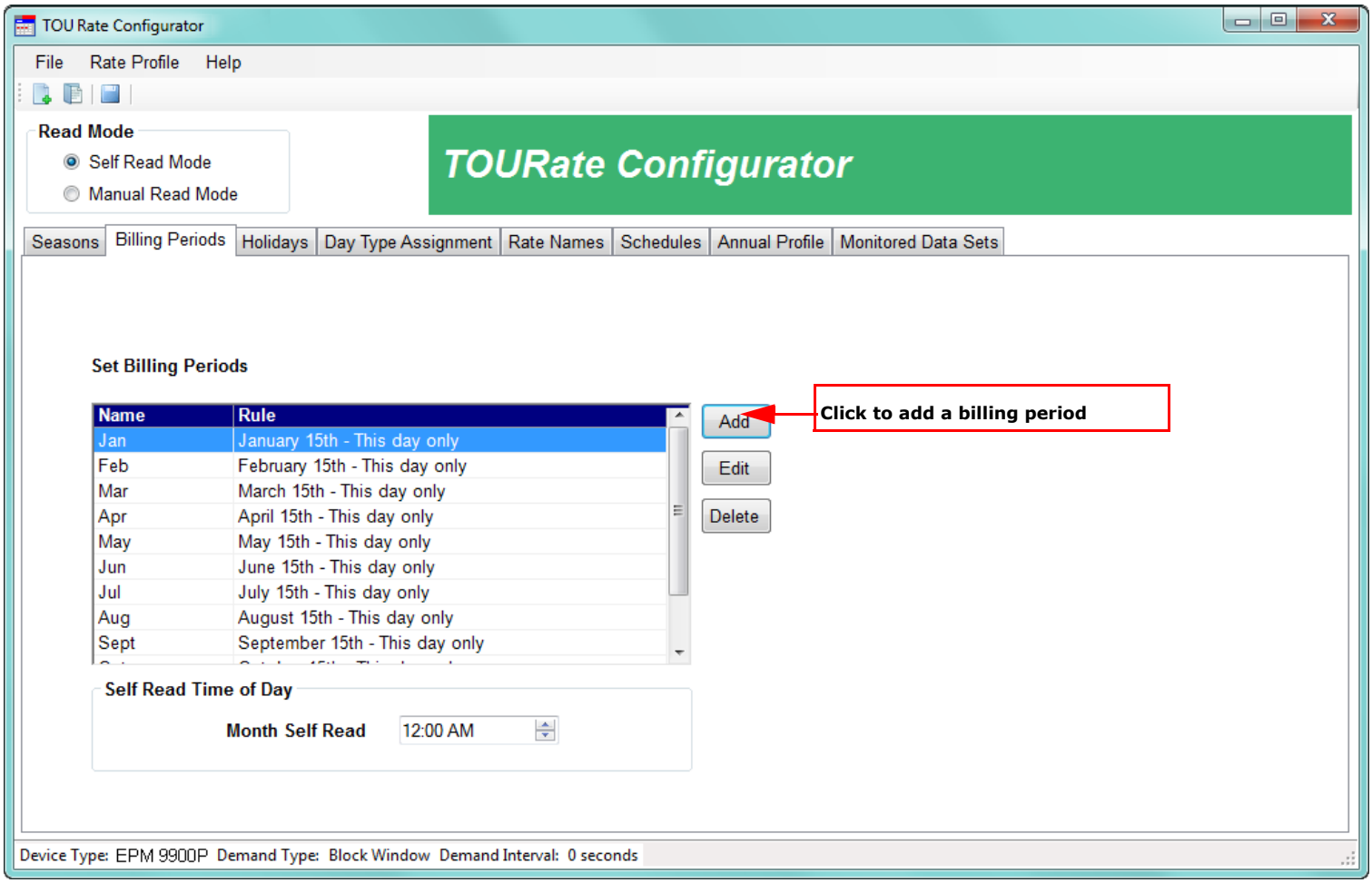
▷ Click one of the following to set when the TOU accumulations will be read:

- Weekly - select the day of the week that the TOU accumulations will be read.
- Daily - select if you want the TOU accumulations to be read daily.

▷ The Self Read Time of Day setting is the same as described in step 4 of the previous page.

15.3.1.2 Billing Periods

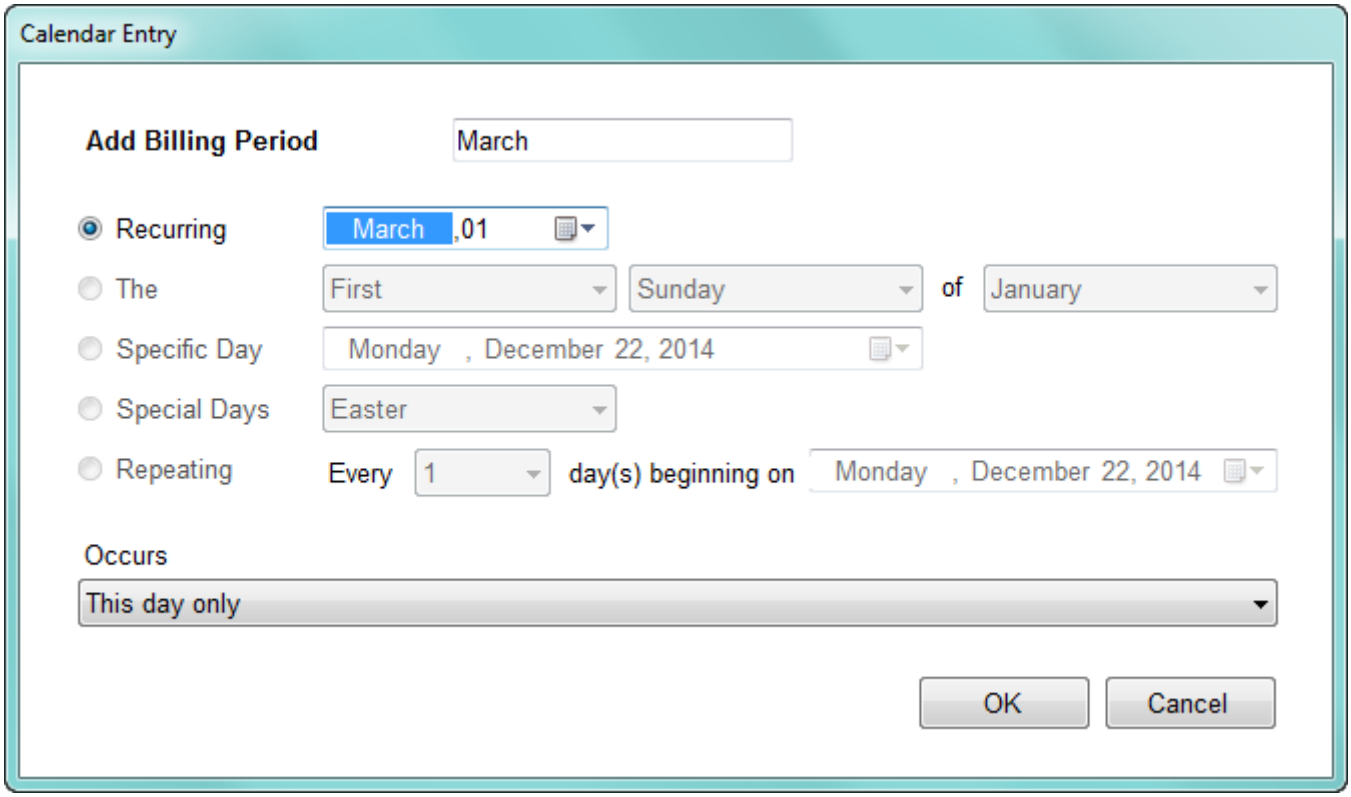
1. Click the **Billing Periods** tab.



2. Billing periods are the time periods in which the usage is stored, e.g., January 1, February 1, March 1,etc. You can set up to 12 billing periods. At the end of a billing period, the meter moves the accumulations into the Prior month and season bucket and resets Demand to 0.

   Billing periods can coincide with a month, be less than a month, or be multiple months, depending on what your application requires.

3. Click the **Add** button to add a new billing period. You will see the screen shown below.

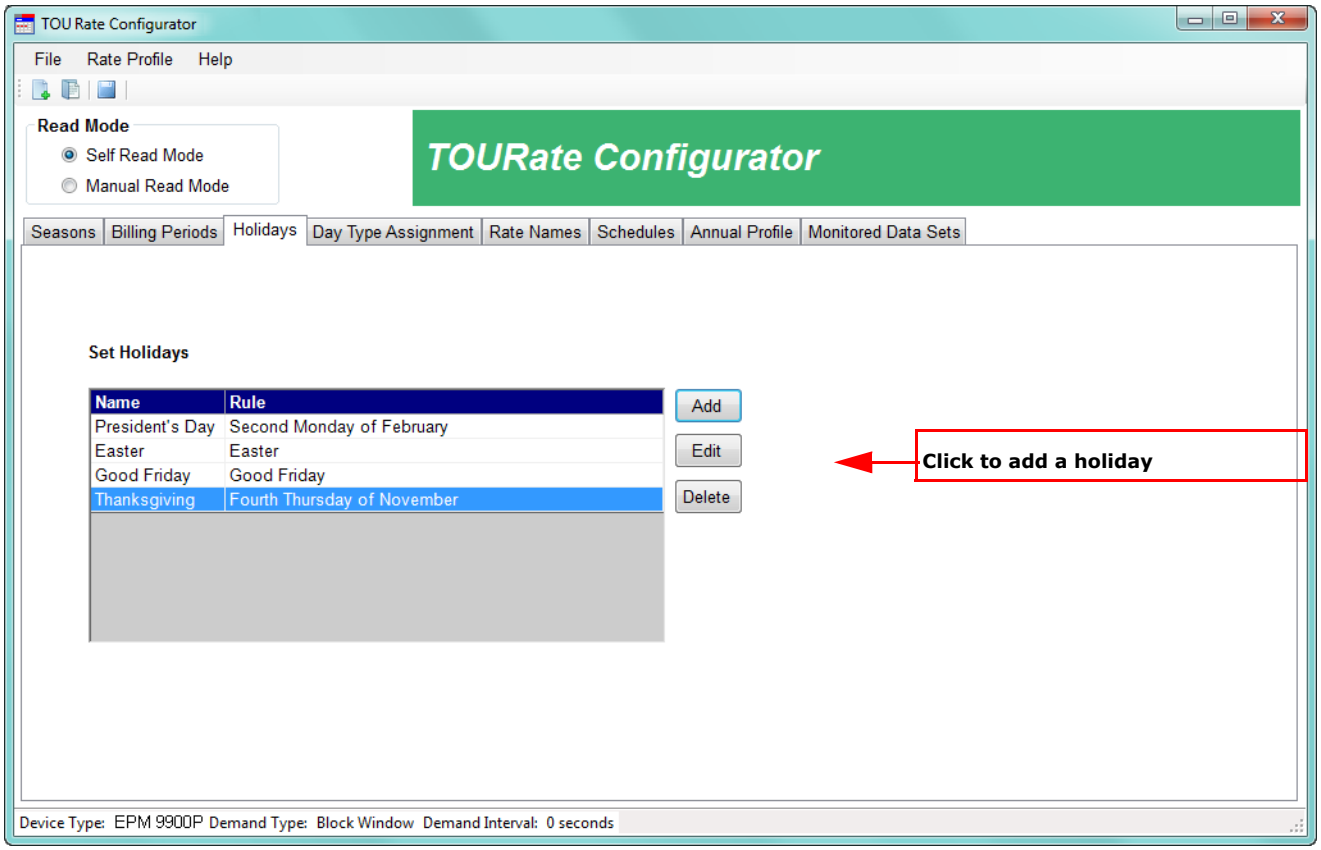


4. Enter a name for the billing period, e.g., March.
5. To set the start date for the billing period, click in the Recurring field and select the date from the pull-down menu.
6. Click **OK** to save your selection and return to the Billing Period tab.

   The default for the months' self read is 12 AM (midnight) - if you want to use a different time of day, select it.

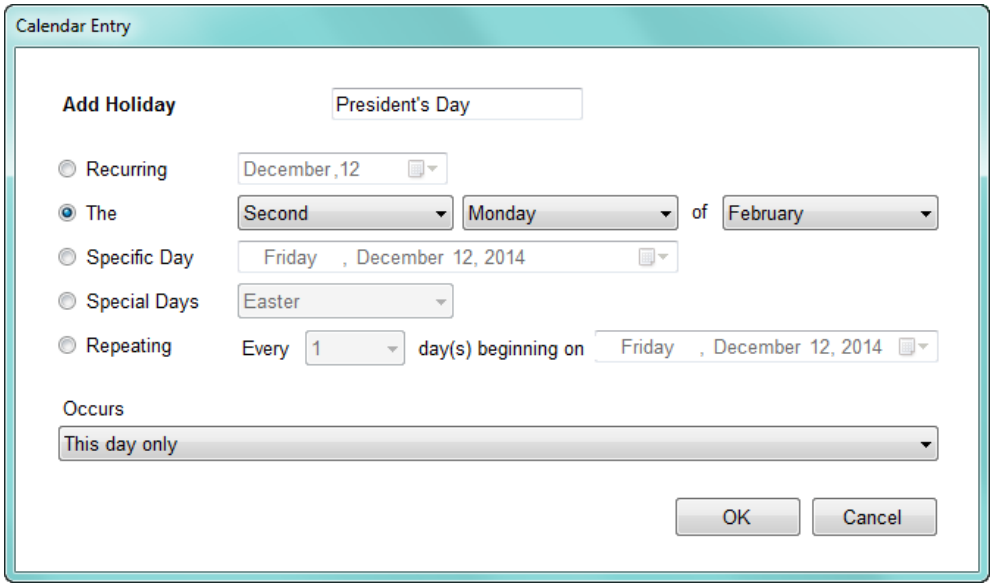
15.3.1.3 Holidays

1. Click the **Holidays** tab.



Holidays are days in which Off Peak billing is usually applied to the entire day. Use this screen to set up the days that are considered holidays in your TOU Profile.

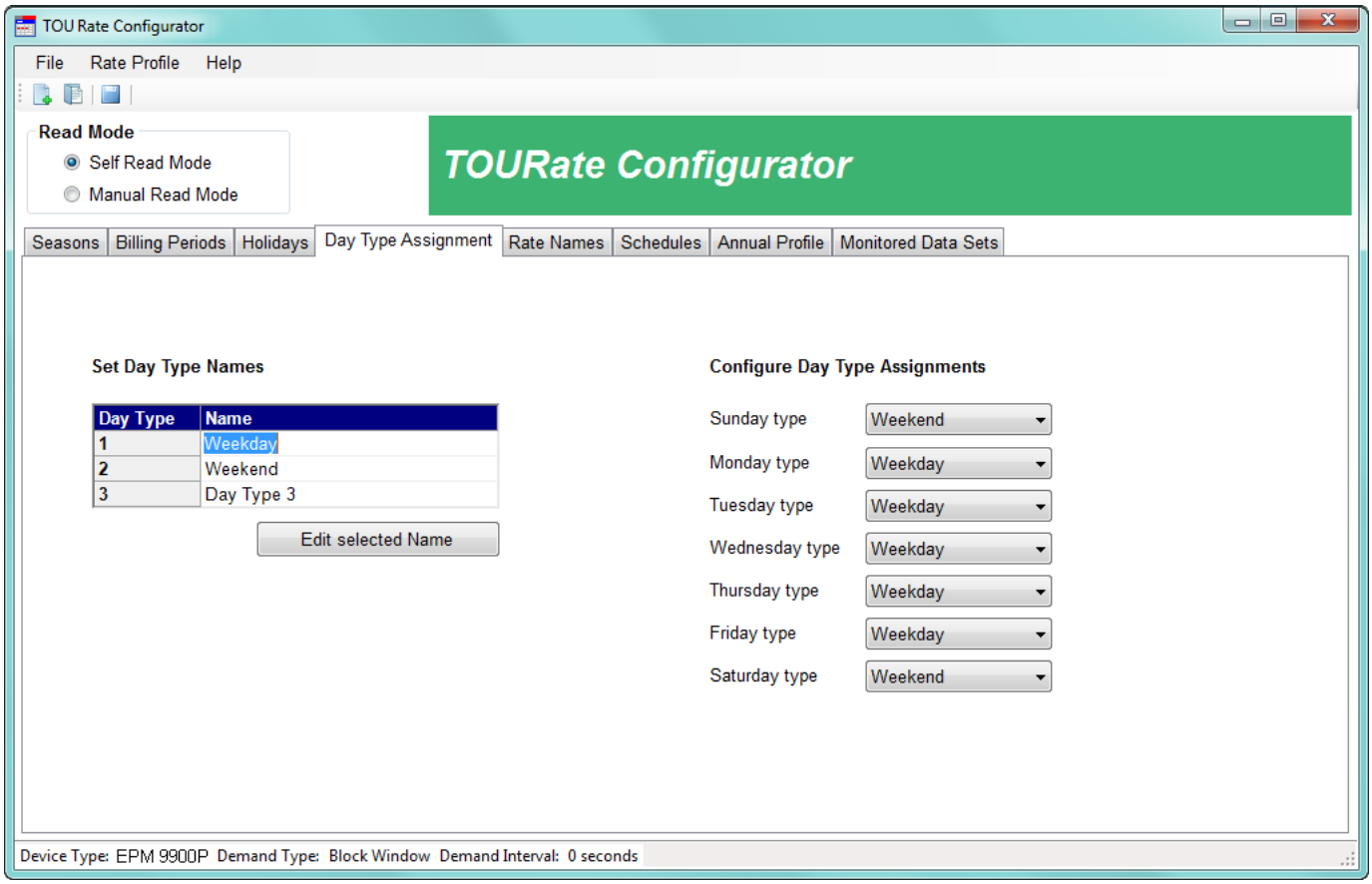
2. Click the **Add** button to add a new holiday. You will see the screen shown below.



3. Enter a name for the holiday, e.g., President's Day.
4. This screen gives you many options for setting up the holiday. To set up the holiday's date, select from the following:
   - Recurring - select the month and day for the holiday, e.g., December 25, if the holiday is always on the same date every year
   - The (Order), (Day of the Week) of (Month), e.g., Fourth Thursday in November, if the holiday always takes place on a specific day of the week in a specific month. You can also enter the order and day of the week and select Every Month, e.g., the first Monday of every month.
   - Specific Day - select the day, month, and year, e.g., Wednesday, March 4, 2015, to set the holiday for only that day, if the holiday only takes place on one specific day and is non-recurring
   - Special Days - to choose either Easter or Christmas for the holiday
   - Repeating Every (number of) day(s), beginning on a specific date, e.g., Repeating Every 22 days beginning on Wednesday, March 4, 2015 to set the holiday for every 22 days from March 4, 2015 onward
   - Occurs - this field gives you added flexibility for setting the date of the holiday. You can leave the default setting of "this day only"; but you can select one of the following options:
   - "The following day only" to designate the holiday as the day after the date you set up
   - "This day and the following day" to set the holiday to begin on this day and extend to the next day; for example to set a holiday for U.S. Thanksgiving and the day after
   - "Only when this day falls on a weekday" to only designate the day as a holiday if the set day is a weekday
   - "This day only, unless this day falls on Saturday, then apply to the Friday before this day" to designate the Friday before a Saturday as the holiday when the set day is a Saturday
   - "This day only, unless this day falls on Sunday, then apply to the Monday after this day" to designate the Monday after a Sunday as the holiday when the set day is a Sunday
5. Click **OK** to save your selection and return to the Holiday tab.

15.3.1.4 Day Type Assignments

1. Click the **Day Type Assignments** tab.



2. Use the screen above to set up to three day types and to assign one of the three day types to each day of the week, i.e, Sunday - Saturday. You do this in order to apply Off Peak and On Peak rates to a day.

   For example: you set up a Weekend day type that will be Off Peak for the entire day, and a Weekday day type that will be On Peak 9-5 and Off Peak the rest of the day. Then you apply the Weekend day type to Saturday and Sunday, and the Weekday day type to Monday - Friday.

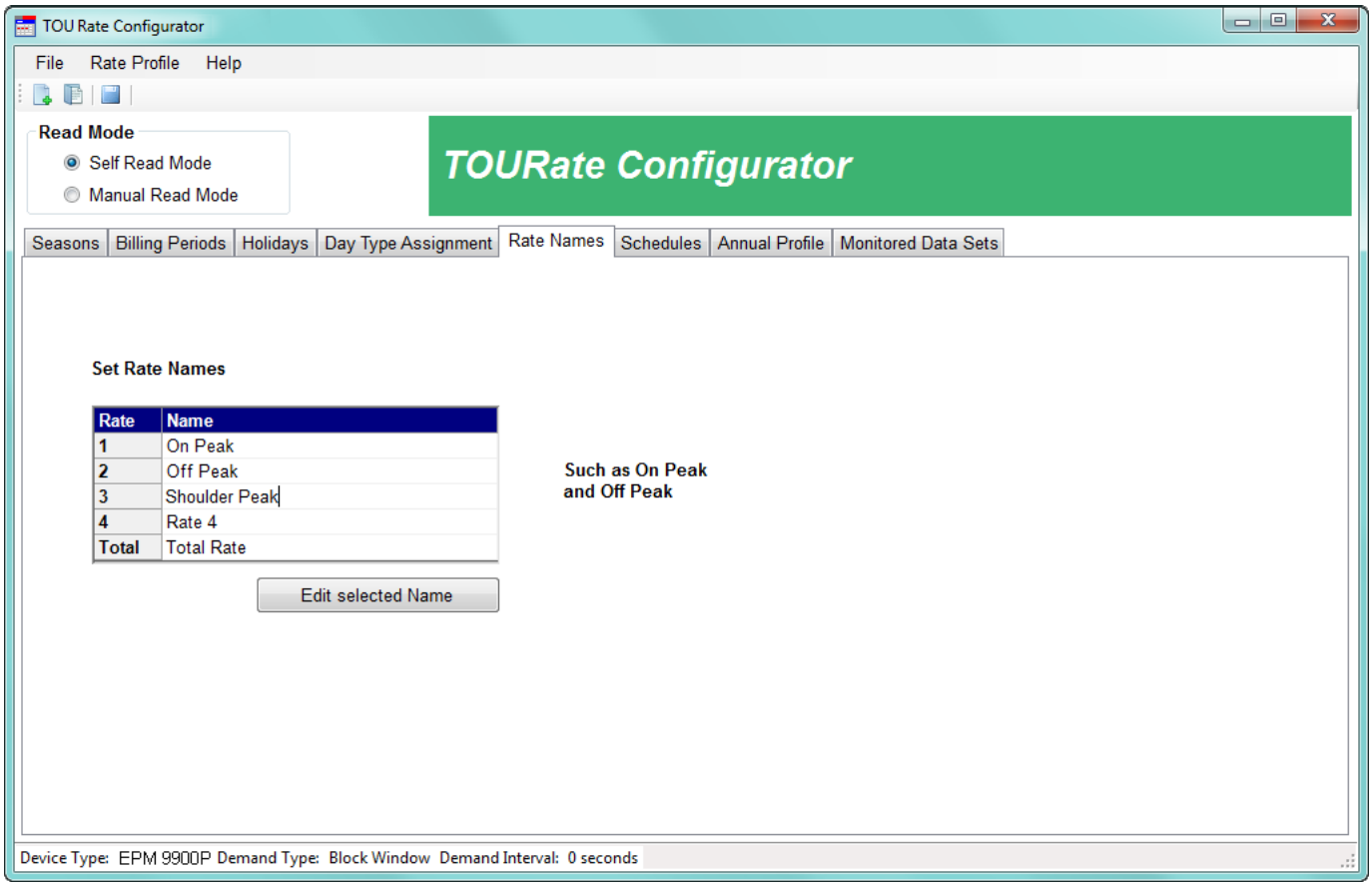
3. Enter a name for the day types.

   To change a day type name, click in the name field and click the Edit Selected Name button. You can then change the name.

4. For each of the days listed (Sunday type through Saturday type), select the day type for it from the pull-down menu. In the example screen on the previous page, the Weekend day type is assigned to Saturday and Sunday, and the Weekday day type is assigned to Monday - Friday. Make the proper settings for your jurisdiction.

15.3.1.5 Rate Names

1. Click the **Rate Names** tab.



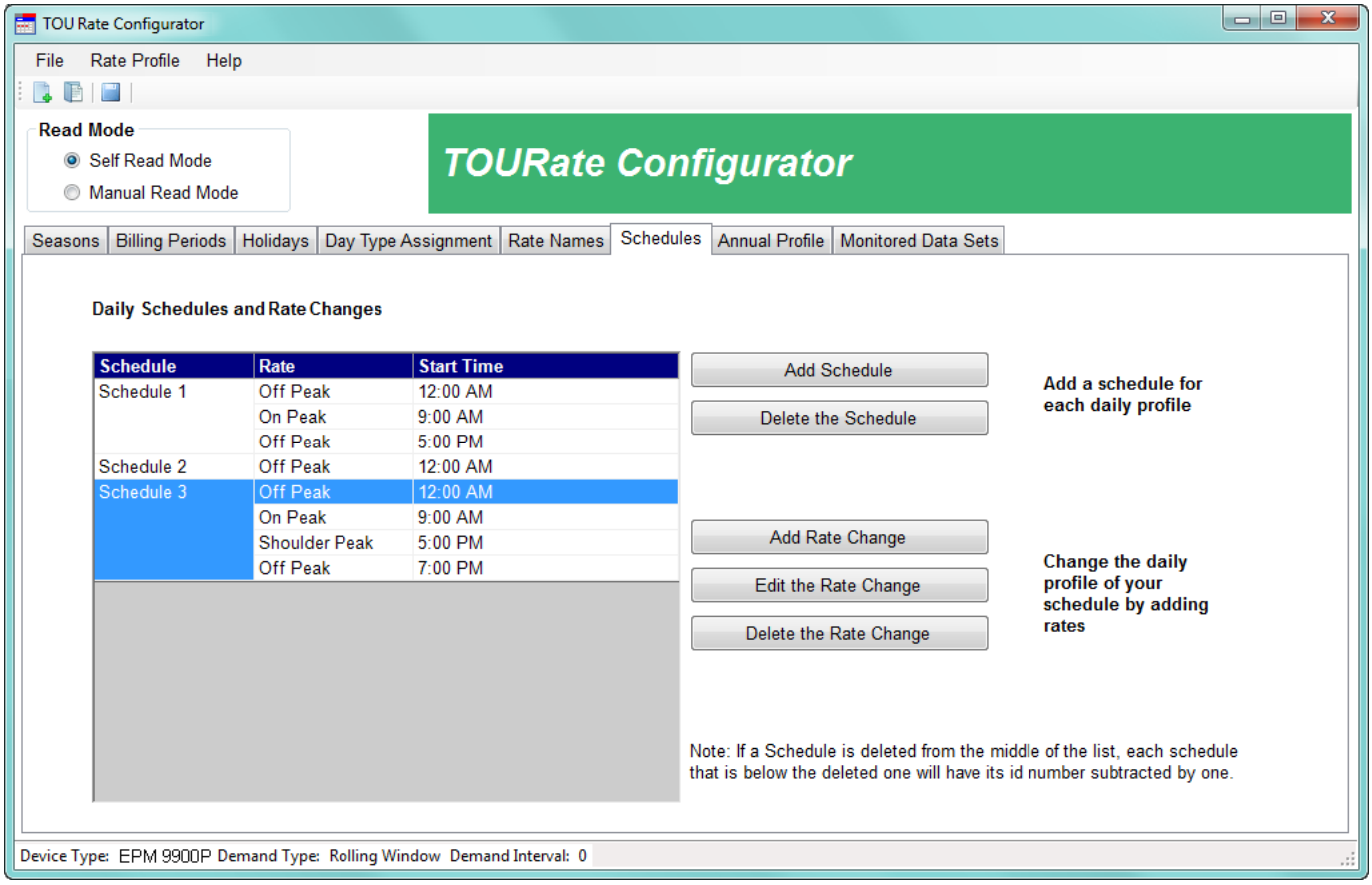
2. This screen is used to set up rates. A rate is the type of charge that is applied to a TOU time period - for example, On Peak, Off Peak, Shoulder Peak. The Total rate keeps a cumulative total of usage. Use the screen above to set up to four rates and the Total rate.

3. Enter a name for each rate, e.g., On Peak.

   To change a rate name, click in the name field and click the Edit Selected Name button. You can then change the name.

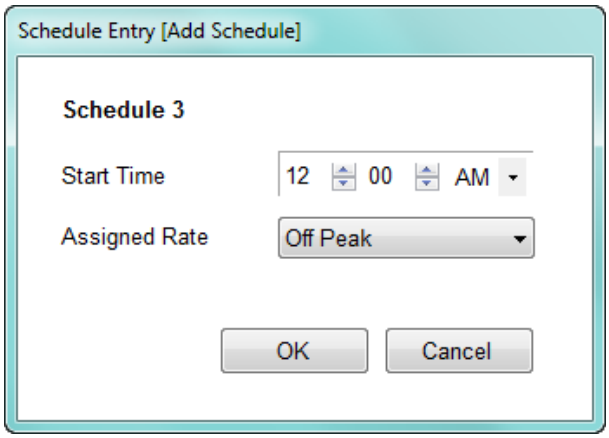
15.3.1.6 Schedules

1. Click the **Schedules** tab.

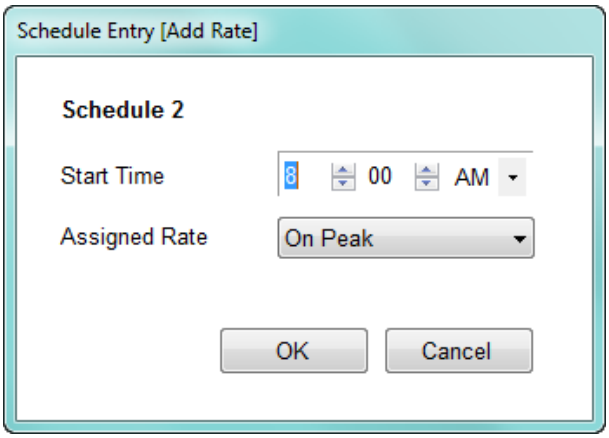


This screen lets you set up TOU schedules. The schedules define what time of the day the rates are applied, for example Off Peak from 9-5 and On Peak the rest of the day. The schedules you set up are then applied to the day types (Weekend, Weekday, Holiday, etc.) for each of the seasons (or weekly/daily TOU accumulations). You can set up to 16 schedules.

2. Click the **Add Schedule** button to add a new schedule.



3. The schedules are automatically numbered consecutively. Select the start time for the first rate and select the rate from the pull-down menus. For example, select 12:00 AM and Off Peak to set up the Off Peak rate for the beginning of the day for this schedule.
4. Click **OK**. You return to the Schedules tab.
5. Click **Add Rate Change** to add another Rate to the schedule. This lets you set up a different rate for part of the day



6. Select the start time and rate from the pull-down menus; then click OK. For example, to set up a schedule that can be applied to a Weekday, select 9:00 AM and On Peak. Repeat this step until all of the rate changes for the schedule are entered.

   For example: to make a schedule that you will apply to a weekday, in which 9 AM-5 PM is Peak usage and all other hours are Off Peak usage, you would create the schedule and 1. apply the Off Peak Rate to begin at 12 AM, 2. apply the On Peak Rate to begin at 9 AM, and 3. apply the Off Peak Rate to begin at 5 PM. This will ensure that the usage will be accumulated correctly.

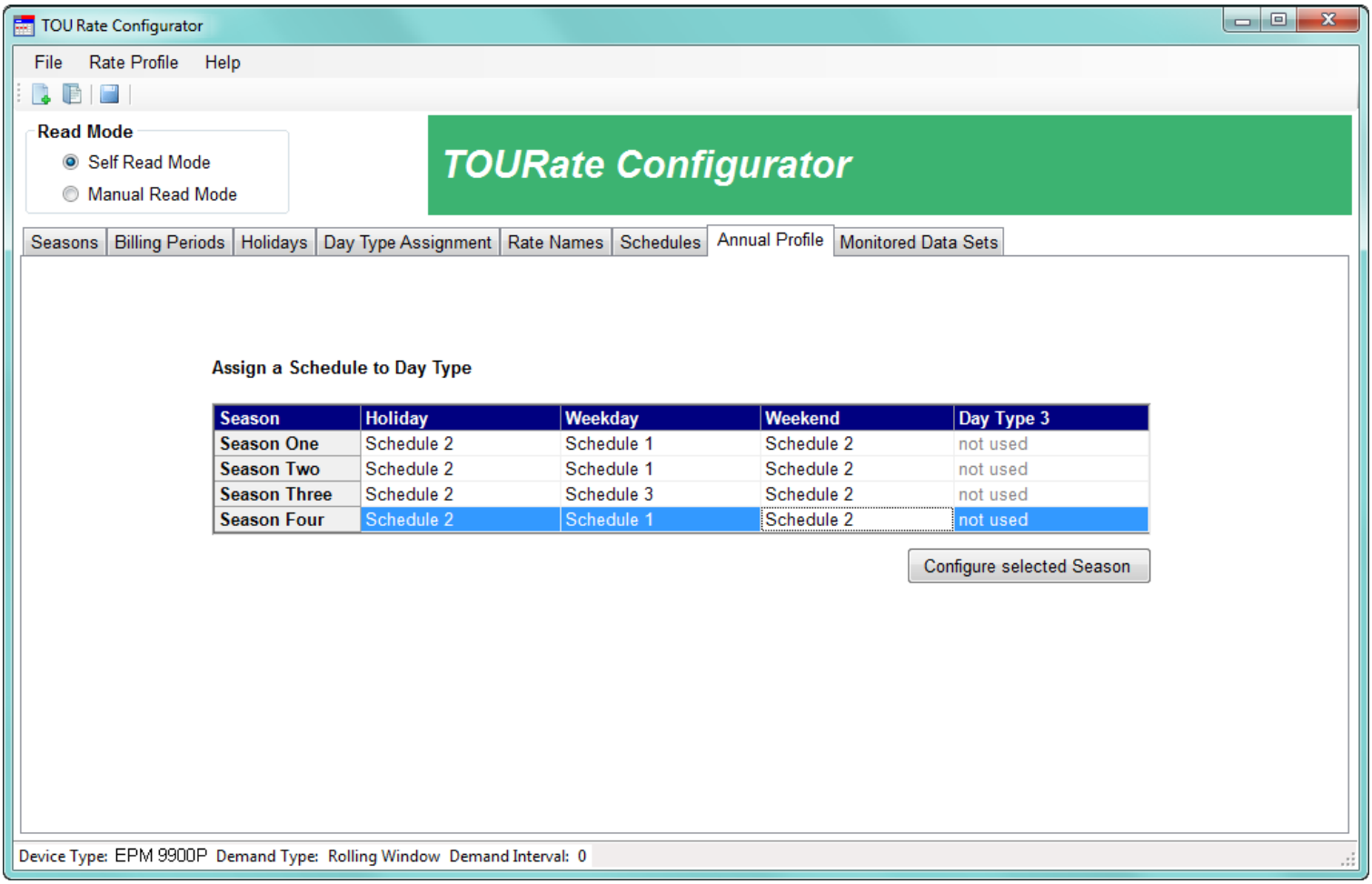
NOTE

NOTES:

- You can delete a schedule by highlighting it in the schedule list and clicking **Delete the Schedule**. Note that if you delete a schedule, the schedules after it are renumbered by subtracting 1, i.e., if you have schedules 1-4 and you delete schedule 2, the schedule that was schedule 3 will be renumbered schedule 2; and the schedule that was schedule 4 will be renumbered schedule 3. Be sure to readjust the Annual Profile tab, accordingly - see 15.3.1.7 *Annual Profile* on page 15–50.
- You can edit a Rate change by highlighting the Rate in the list and selecting **Edit the Rate Change**.
- You can delete a Rate change by highlighting the Rate in the list and selecting **Delete the Rate Change**.

15.3.1.7 Annual Profile

1. Click the **Annual Profile** tab.

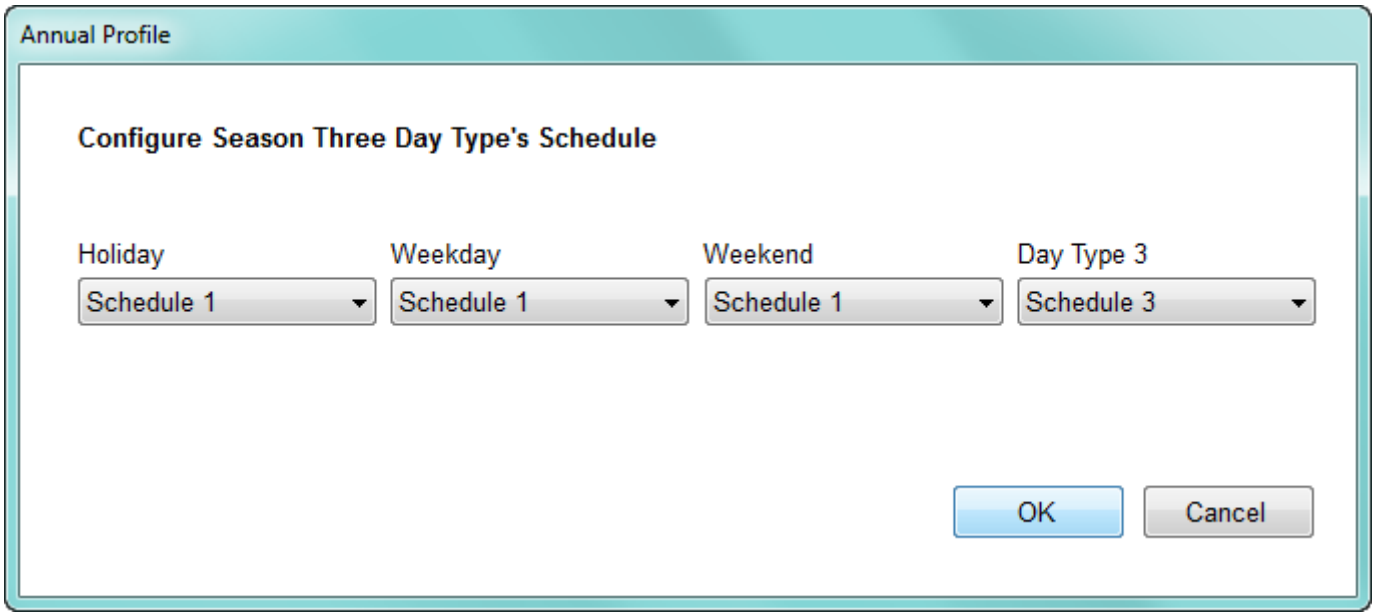


The Annual Profile is the assignment of the schedules you set up in the previous step to the day types you set up earlier. You can assign different schedules for each of the day types and for each of the seasons (or weekly/daily TOU accumulations).

For example: (as shown in the above example screen)

- You have set up Weekend and Weekday day types, in addition to the default Holiday day type.
- Then you set up Schedule 1 which has On Peak hours 9-5 and Off-Peak the rest of the day; Schedule 2 which is Off Peak all day, and Schedule 3 which is On-Peak 9-5, Shoulder Peak 5-7, and Off-Peak the rest of the day.
- Here in the Annual Profile setting, you could set Seasons 1, 2, and 4 with Schedule 1 for Weekday, and Schedule 2 for Weekend and Holiday; and Season 3 with Schedule 3 for Weekday, and Schedule 2 for Weekend and Holiday. (Day Type 3 is not used in this example Annual Profile.)
- This way the whole year is set up for the proper TOU accumulations and billing.

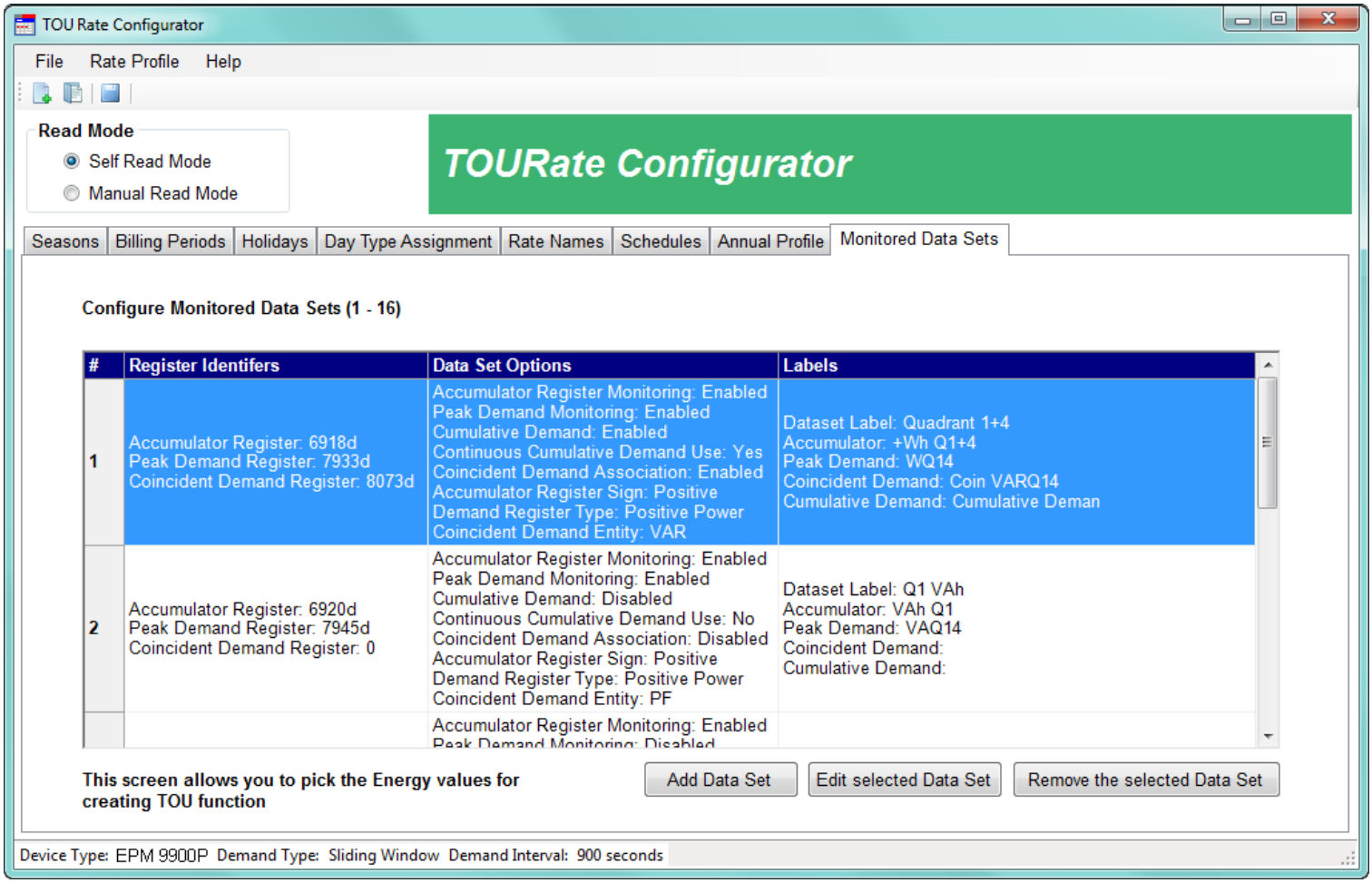
2. Click on a season and click **Configure Selected Season**.



3. For each of the day types, select the schedule to apply to it from the pull-down menu.
4. Click **OK**. You will return to the Annual Profile tab.
5. Repeat for each of the seasons.

15.3.1.8 Monitored Data Sets

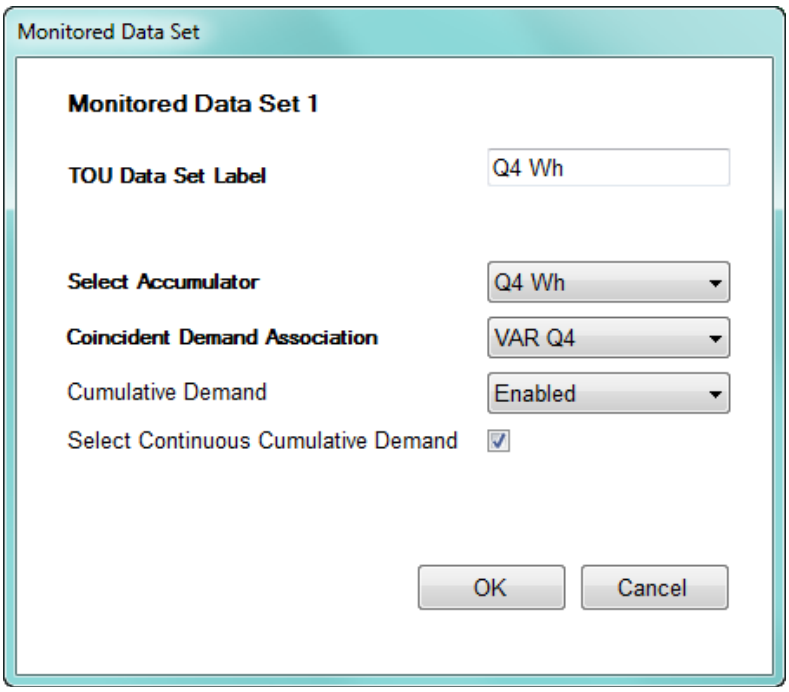
1. Click the Monitored Data Sets button.



2. The Monitored Data Sets setting lets you decide what accumulators, in addition to the Energy and Demand readings, that you want to save when TOU is performed. In many cases you will leave the default setup as it has been configured to be most useful for accumulating TOU data. However, the EPM 9700/9900P meter's TOU implementation gives you the flexibility to perform TOU on many different readings. There are 38 channels of data that can be accumulated for TOU, as follows:
   - Total VA (Quadrants 1+2+3+4)
   - Positive VARh (Quadrants 1+2)/Negative VARh (Quadrants 3+4)
   - Positive Wh (Quadrants 1+4)/Negative Wh (Quadrants 2+3)
   - Quadrant 1 VAh/Quadrant 1 VARh
   - Quadrant 2 VAh/Quadrant 2 VARh
   - Quadrant 3 VAh/Quadrant 3 VARh
   - Quadrant 4 VAh/Quadrant 4 VARh
   - I2t Phase A/I2t Phase B/I2t Phase C
   - V2t Phase A/V2t Phase B/V2t Phase C

- Quadrant 1 Wh/Quadrant 2 Wh/Quadrant 3 Wh/Quadrant 4 Wh
- Uncompensated Total VAh/Uncompensated +VARh/Uncompensated -VARh / Uncompensated +Wh/Uncompensated -Wh
- +Q/-Q
- Pulse Accumulation Inputs 1-8
- In addition, the following coincident demand values can be selected:
    - VAR Q12/VAR Q34
    - VAR Q1/Q2/Q3/Q4
    - VA Q1/Q2/Q3/Q4
    - PF
    - +PF/-PF
    - Uncompensated PF

3. Click Add Data Set to add new monitored data.



4. Select the reading you want to accumulate from the pull-down menu next to "Select Accumulator." The accumulator you select will also be listed in the TOU Data Set Label field. Note that the peak demand is based on the selected accumulator.

5. Coincident Demand Association lets you accumulate another reading at the time of peak demand accumulation. For example, you may want to track Power Factor (PF) or VARs at the time of peak demand, to identify the number of capacitors needed, peak inefficiencies, etc. To enable this, select the required coincident demand reading from the pull-down menu.

Cumulative demand is the sum of peak demand. There are two cumulative demand blocks: current and prior. At the start of a period, the TOU cumulative demand is carried forward to the current period data block from the prior period data block. At the end of a period, TOU cumulative demand is the sum of the cumulative demand value and the peak demand from the current period. Then the meter moves the current data into the prior data block, and carries forward the updated cumulative demand into the next period's current data block. Select Enabled from the pull-down menu to activate cumulative demand. Refer to Figure 15-2: *Cumulative Demand Processing* below

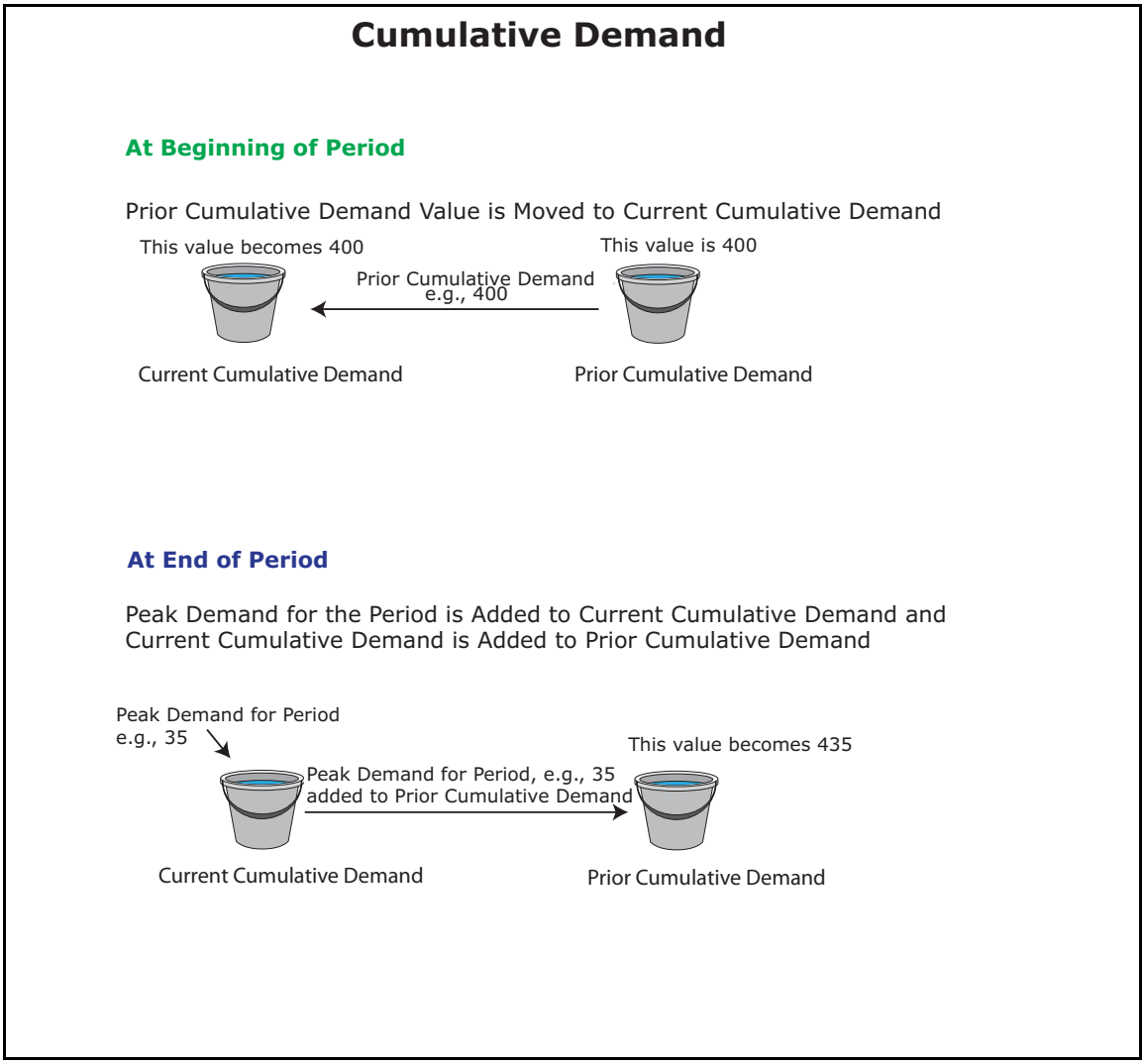


Figure 15-2: Cumulative Demand Processing

Continuous cumulative demand means that the current cumulative peak demand is updated continuously throughout the period. At the start of a period, the TOU cumulative demand is carried forward to the current period from the prior period. During the period, TOU current cumulative demand is the sum of the cumulative demand value and the current peak demand from the current period. At the end of the period, the meter moves the current cumulative demand data into the prior cumulative demand data block, and carries forward the updated cumulative demand into the next period. Click the checkbox to enable cumulative demand accumulation. Note that selecting continuous cumulative demand doesn't affect the prior cumulative demand field, which will still be added to at the end of the period. Refer to Figure 15-3: *Continuous Cumulative Demand Processing* on page 15–55 for a graphical representation of Continuous Cumulative Demand processing.

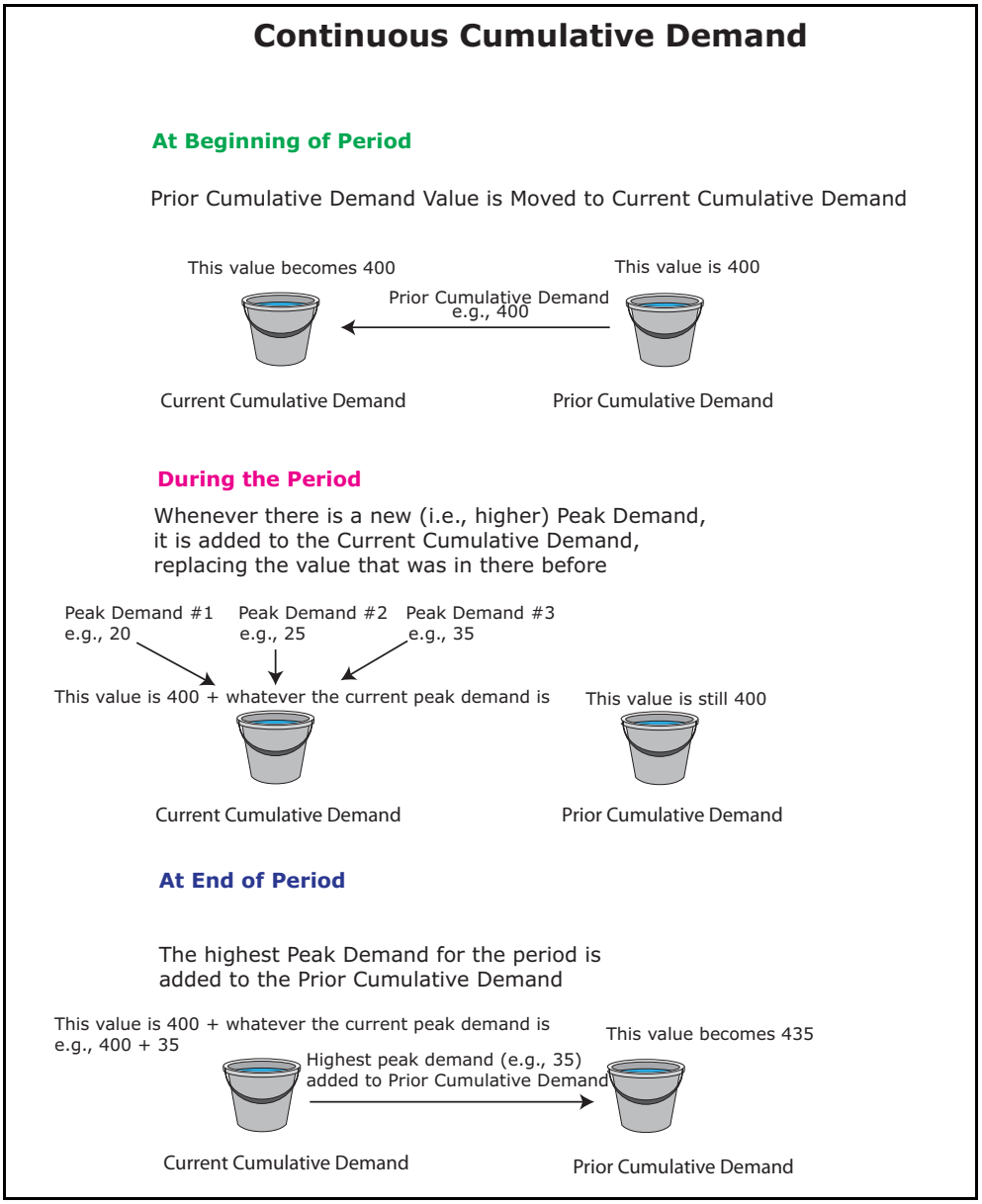
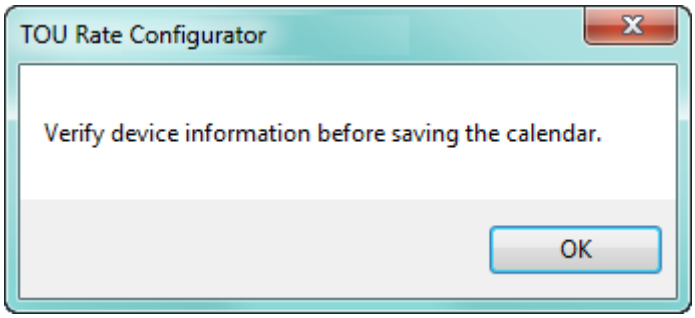
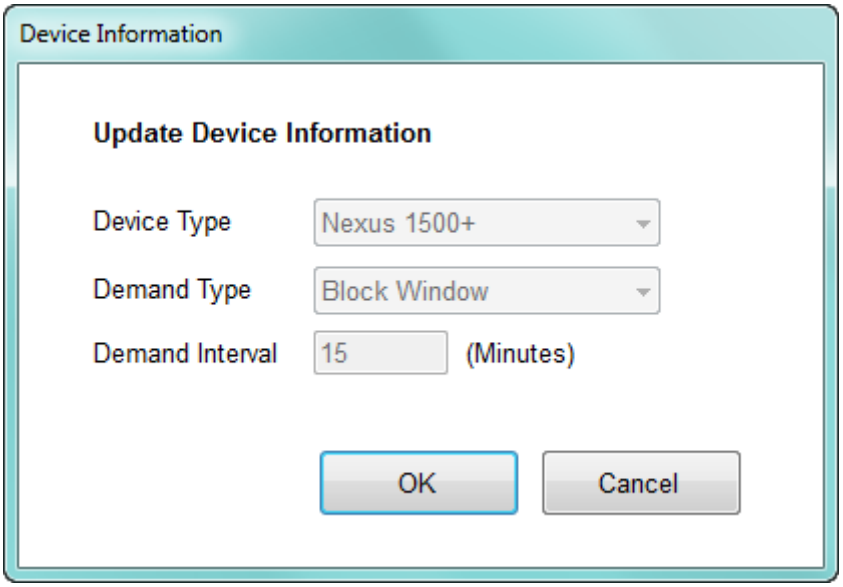


Figure 15-3: Continuous Cumulative Demand Processing

6. Click **OK** to save your monitored data set.
7. When you have made all the TOU settings:
   - Click **File > Save Rate Profile** to save the TOU Profile to a .cal file.
   - Click **File > Save Rate Profile As** to save the TOU Profile
   - Click **View As Report** to see a report of the TOU Profile settings.
8. For the EPM 9700/9900P meter, whichever option you choose, the following screen opens.



9. Click **OK**; you will see the following screen. This information is for reference only and is saved by the software as part of the TOU profile.



10. Click **OK** to proceed with the save or report options.

15.3.2 Editing an Existing TOU Profile

To edit an existing TOU Profile, you first need to import it either from the connected meter or from a saved calendar file.

For the EPM 9700/9900P meter:

- To edit the current device's TOU Profile, click **TOU Calendar > EPM 9700/9900P TOU Calendar Settings > Edit Current Device Rate Profile**. The application will load the meter's TOU Rate Profile and open it in the Rate Configurator. You can then follow the instructions given in 15.3.1 *Creating a New EPM 9700/9900P Meter TOU Profile* on page 15–38 to edit the profile and then save it. See 15.3.3 *Importing a TOU Profile to the Meter* on page 15–58 for instructions on importing it back into the meter.
- To edit a TOU Profile for other than the connected device, click **TOU Calendar > Open Rate Profile**. A screen opens letting you select the profile file, which is a Time of Use Configurator file - with the file extension .cal. The file will open in the Rate Configurator and you can follow the instructions in 15.3.1 *Creating a New EPM 9700/9900P Meter TOU Profile* on page 15–38 to edit and save it.

For the EPM 7000P meter, click T**OU Calendar > TOU Rate Configurator**. The connected meter's TOU Profile is loaded, if there is one.

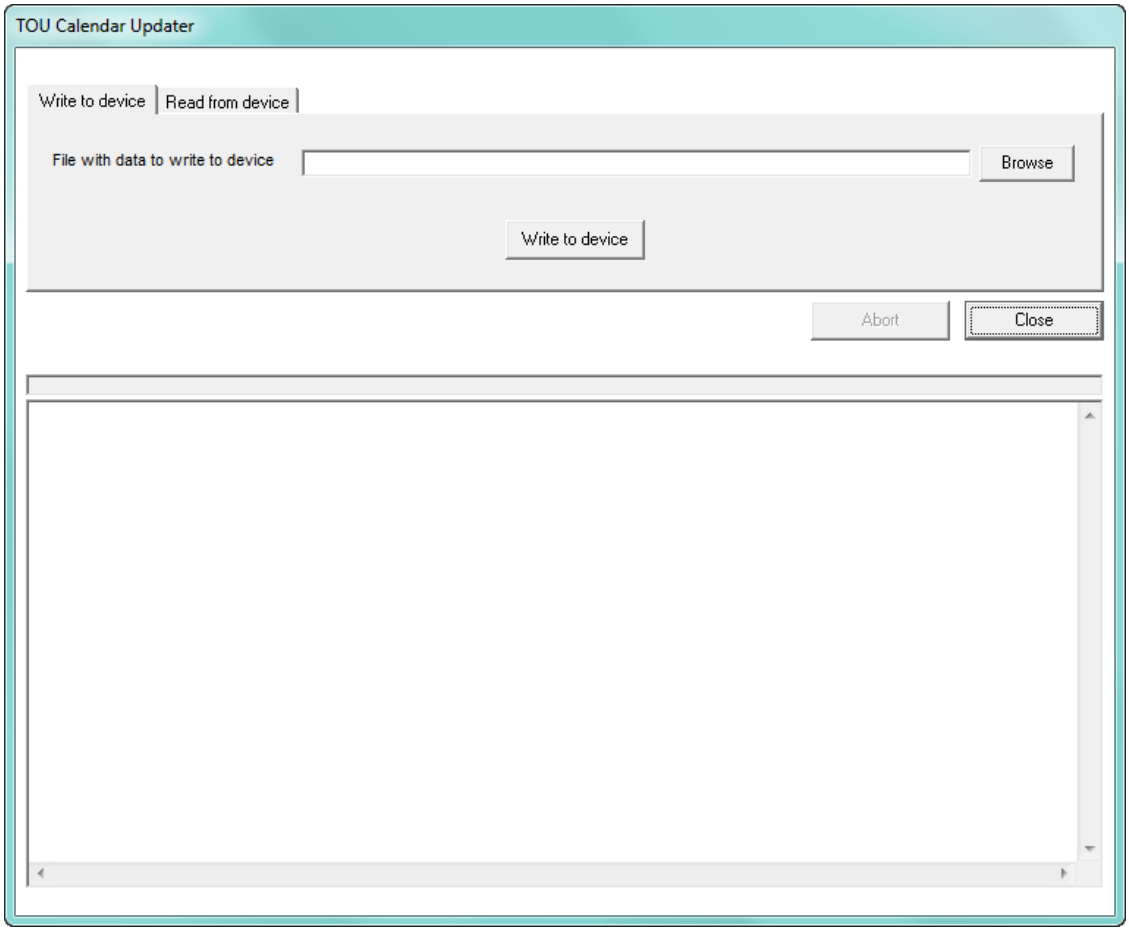
To edit another TOU Profile, click **File > Open Rate Profile**. A screen opens that shows all TOU Profile files. Select the one you want and click Open. The TOU Profile you selected will open in the TOU Rate Configurator screen.

15.3.3 Importing a TOU Profile to the Meter

When you have saved a TOU Profile as a Time of Use Configurator file, you can copy it to any other EPM 9700/9900P/7000P meter, for example, if you are replacing an existing meter or setting up another meter with the same TOU settings. This way you do not need to enter the settings again. The procedure is slightly different for the different meters.

15.3.3.1 Importing an EPM 9700/9900P Meter TOU Profile

1. To import a new or edited Time of Use Configurator file to the meter, click **TOU Calendar > EPM 9700/9900P TOU Calendar Settings > TOU Calendar Utility**.

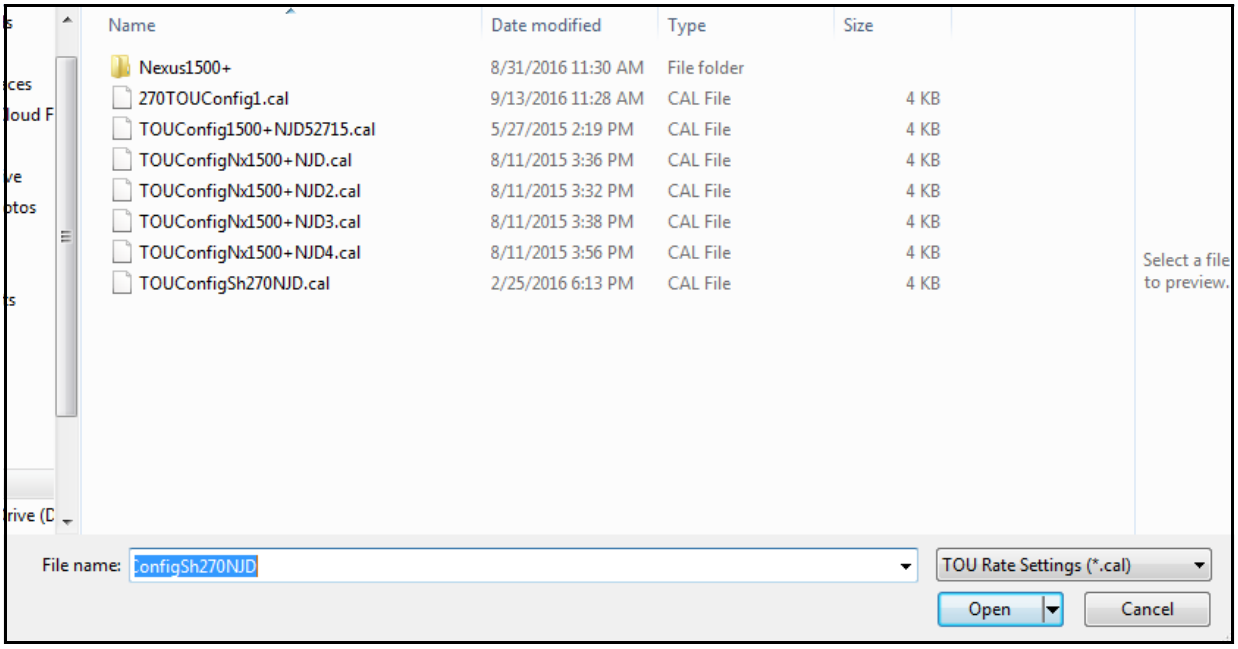


2. Using this screen, you can either read a TOU file from the meter or write a file to the meter using this screen. To write a file to the meter:
3. Click the **Browse** button to locate the file you want. It will be a file with the .cal extension.
4. Click the **Write to Device** button. You will see messages in the screen as the meter is being updated. Note that the TOU module will automatically perform a self read and then restart, after each TOU profile update.
5. Click **Close** when the update is complete.
6. Enable TOU in the meter's Device Profile - see 11.2.11 *Time of Use Enable/Disable (EPM 9900P Meter)* on page 11–41 for instructions.

15.3.3.2 Importing an EPM 7000P Meter TOU Profile

For the EPM 7000P meter you select the TOU Profile you want and then upload it to the meter:

1. Click **TOU Calendar > Upload TOU Rate Settings**.



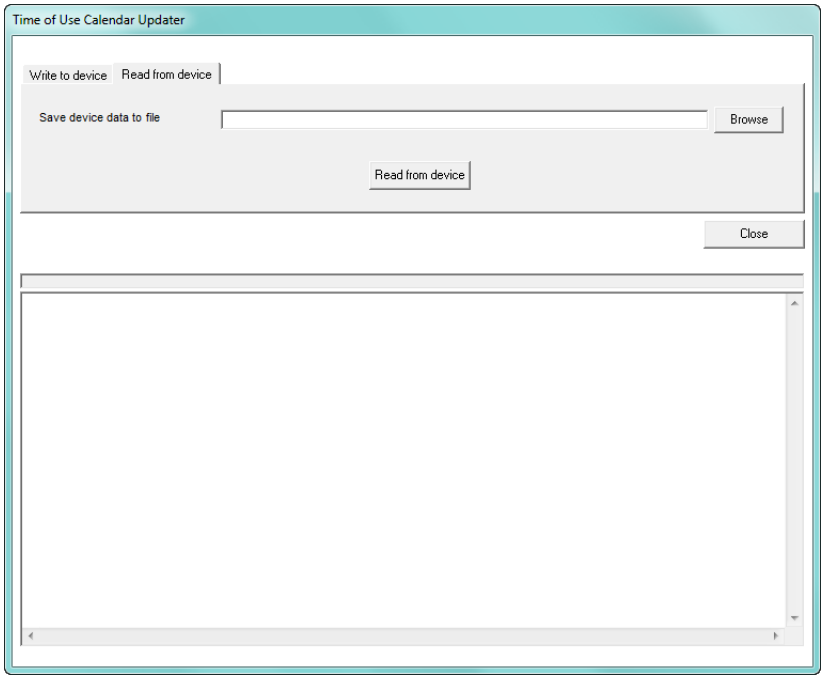
2. A screen opens that shows all TOU Profile files. Select the one you want and click Open.
3. You will see a message window as the TOU Profile is being uploaded to the meter, and another message window will tell you when the file has finished uploading.

15.3.4 Saving a Device's TOU Profile to a File (EPM 9700/9900P)

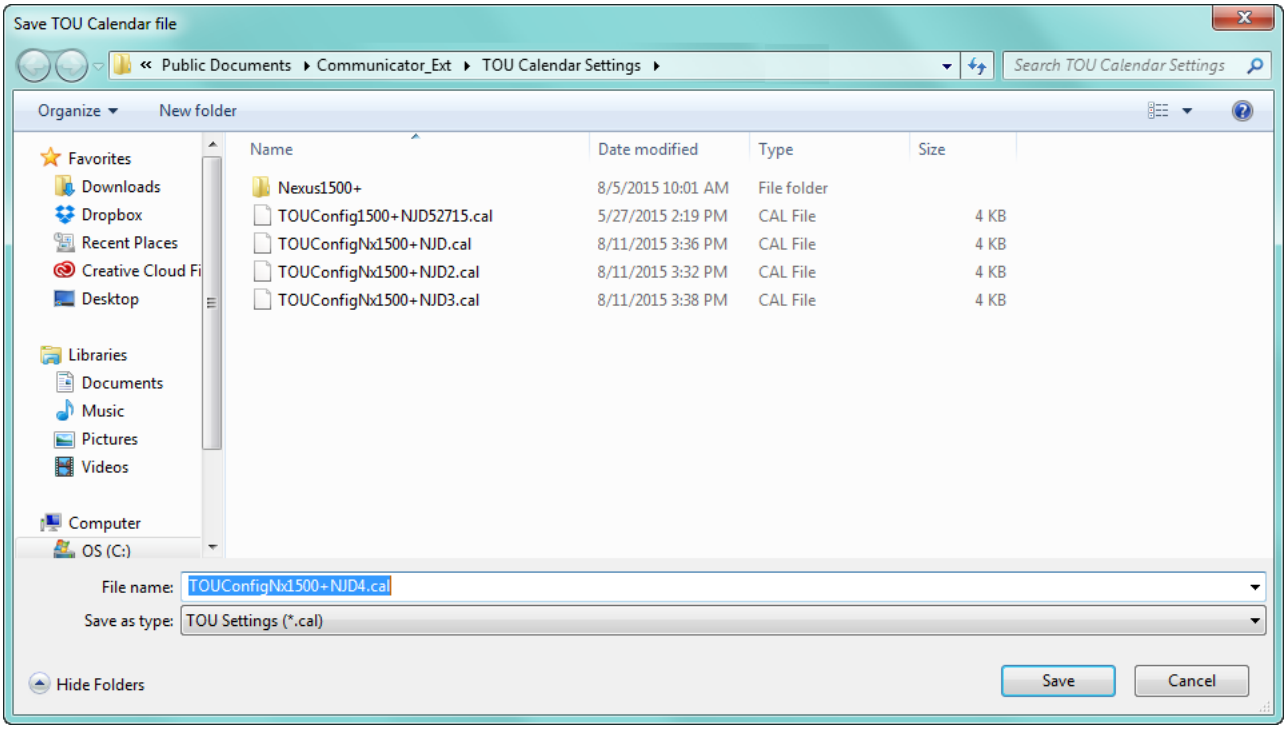
As explained in 15.3.2 *Editing an Existing TOU Profile*, you can use the Edit Current Device Rate Profile option to open the device's configuration file and then make changes to it and save it as a file. If you want to save the device's configuration file as a file, but do not want to make any changes to it, the simplest way is to use the TOU Calendar Utility screen shown in 15.3.3 *Importing a TOU Profile to the Meter*. Follow these instructions.

1. Click **TOU Calendar > EPM 9700/9900P TOU Calendar Settings > TOU Calendar Utility**.

2. Click the **Read From Device** tab.



3. Click **Browse**. You will see the screen shown below.



4. Give a name to the file and click **Save**.
5. Click the **Read From Device** button. You will see messages while the file is being saved.
6. Click **Close** once the messages stop (the file will be saved).

15.3.5 Performing a TOU Read through the Modbus Map

To perform a TOU read through the Modbus map, you need to poll the appropriate registers. The TOU data is located in Modbus input registers 0xD037H- 0xEF16H for the EPM 9900P meter and 41000-48918 for the EPM 7000P meter. Data includes current billing month/season and previous billing month/season.

NOTE

IMPORTANT!

- Refer to the *EPM 9700, EPM 9900P, or EPM 7000P Meter Modbus User Manual* for detailed Modbus Map information.
- For Manual Read mode, or for a TOU profile configured with weekly or daily self reads, the user should not read the initial and final parts of the current and prior month blocks. These are used for regular Self Read mode. The parts that should not be read are:
    - For all current month/season/weekly/daily blocks, energy scaling information is in the meter's Device Profile. Coincident demand data identifiers are in the
      Current TOU profile.
    - For all prior month/season/weekly/daily blocks, energy scaling and coincident demand data identifiers are in Modbus input registers EF1BH to EF6EH.
- The TOU registers contain scaled readings, based on the scaling set up in the meter's Device Profile (for EPM 9900P see 11.2.1 *Energy Scaling* on page 11–20 for EPM 9700 see 26.2.1 *Energy Scaling* on page 26–17, and for EPM 7000P see 27.2.1 *Configuring Energy, Power Scaling, and Averaging* on page 27–26). If you are making changes to the meter's scaling, follow these steps before doing so:
    1. Perform a read before applying the new meter profile.
    2. Update the meter's Device Profile. See the individual meter chapters for instructions.
    3. Perform a reset of all meter energy, accumulations and TOU readings (see 20.1.7 *Reset Device Information* on page 20–8, for reset instructions.

15.3.6 Example of Programming a TOU Profile

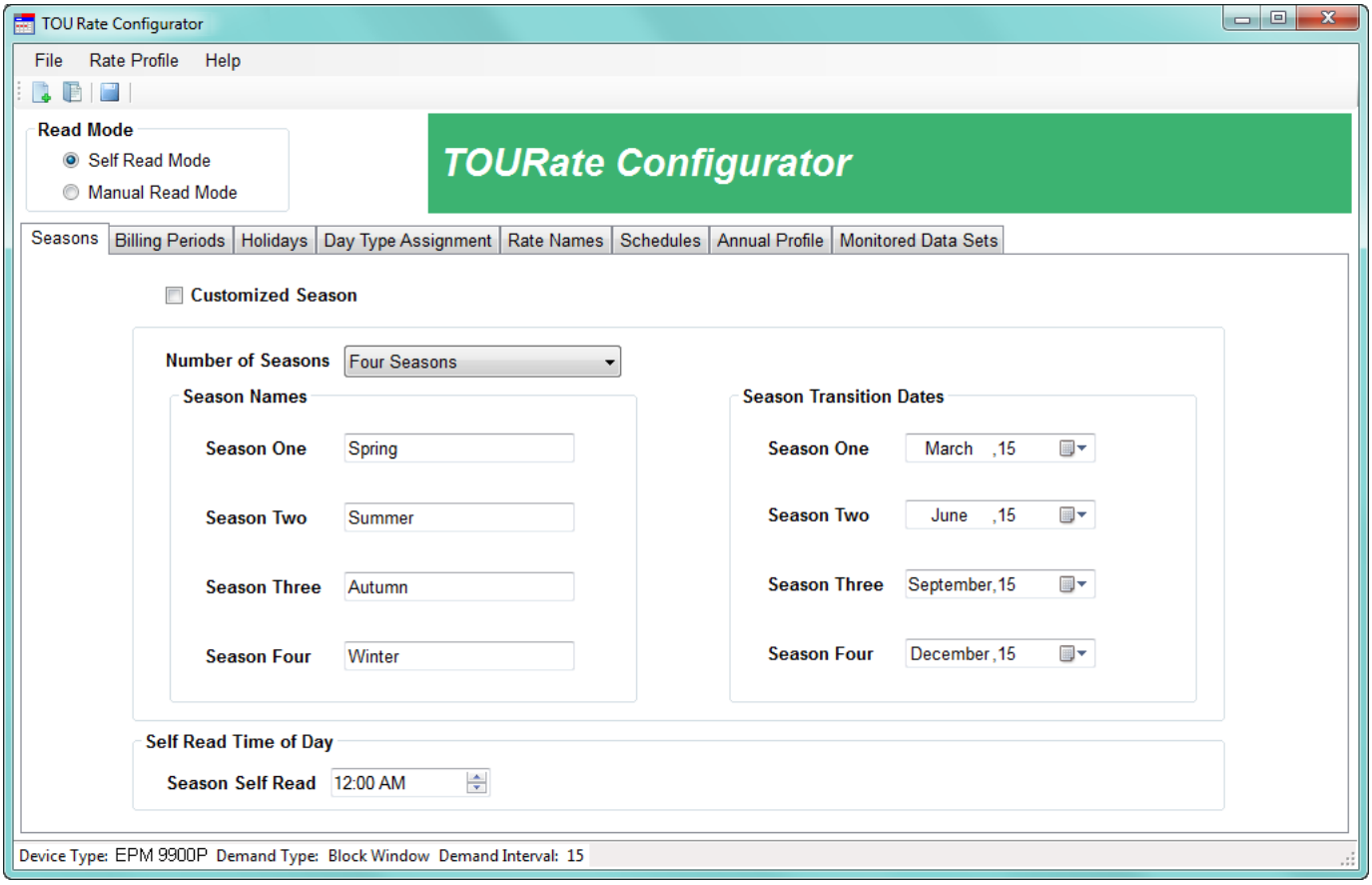
Following is an example of programming a TOU Profile, with these settings:

- Self Read mode
- 12 months: 1/15, 2/15, 3/15, 4/15, 5/15, 6/15, 7/15, 8/15, 9/15, 10/15, 11/15, 12/15
- Four seasons: 3/15(Spring), 6/15(Summer), 9/15(Autumn), 12/15 (Winter)
- Holiday: 1/1
- Day Types: Saturday, Sunday, and Weekday
- Rate Names: On Peak, Off Peak, Holiday
- Day Type Assignments: Weekday (Monday - Friday), Saturday, Sunday
- Schedules: Schedule 1 (8 am On Peak rate, 6 pm Off-Peak rate) Schedule 2 (12 am Off Peak rate), Schedule 3 (12 am Holiday rate)
- Annual Profile:

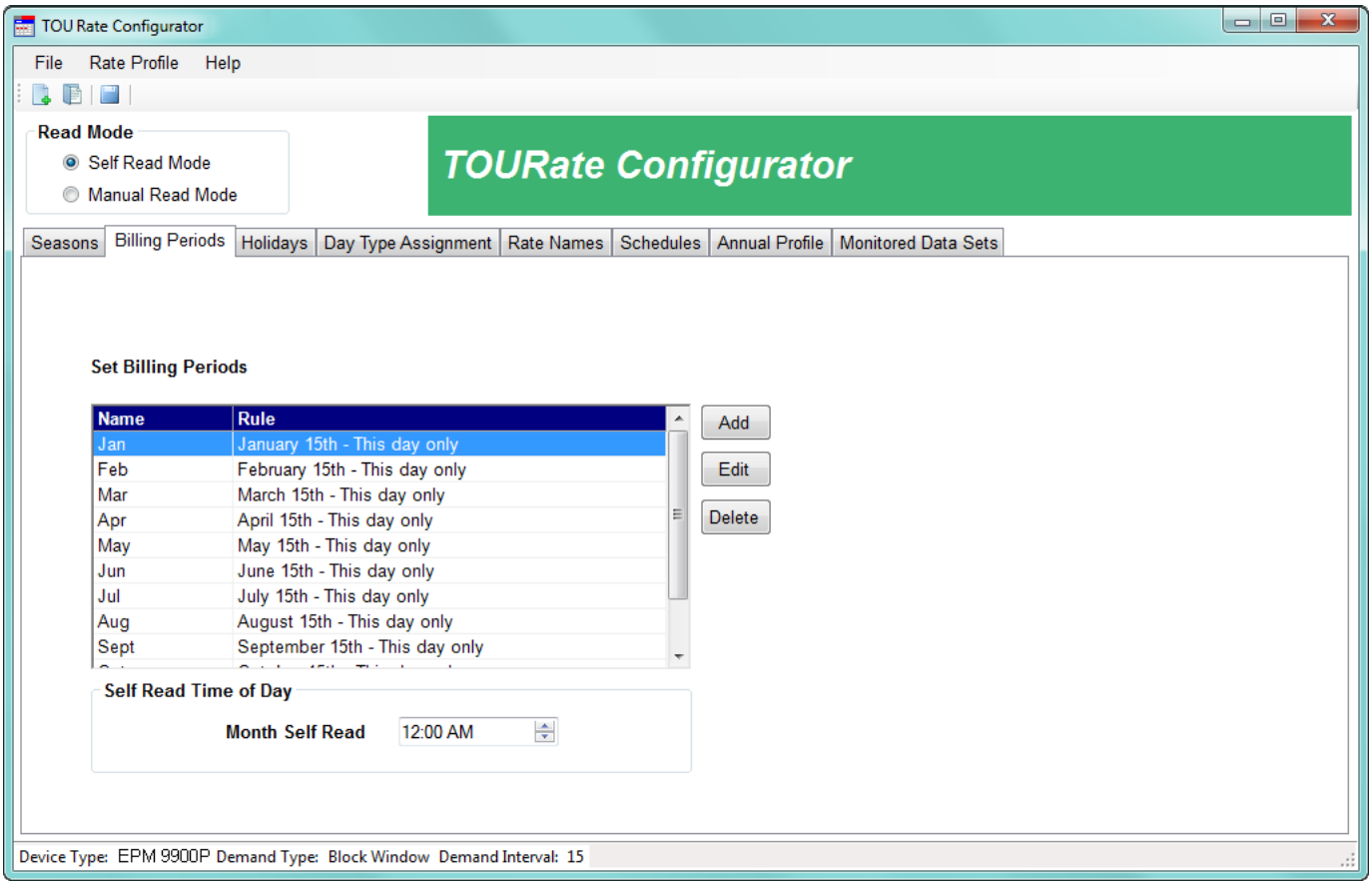
- Spring (Holidays - Schedule 3; Weekdays - Schedule 1; Saturdays - Schedule 2; Sundays - Schedule 2)
- Summer (Holidays - Schedule 3; Weekdays - Schedule 1; Saturdays - Schedule 2; Sundays - Schedule 2)
- Autumn (Holidays - Schedule 3; Weekdays - Schedule 1; Saturdays - Schedule 2; Sundays - Schedule 2)
- Winter (Holidays - Schedule 3; Weekdays - Schedule 1; Saturdays - Schedule 2; Sundays - Schedule 2)

- Monitored Data Sets: Wh Q1+4, Wh Q2+3, -Varh, + Varh

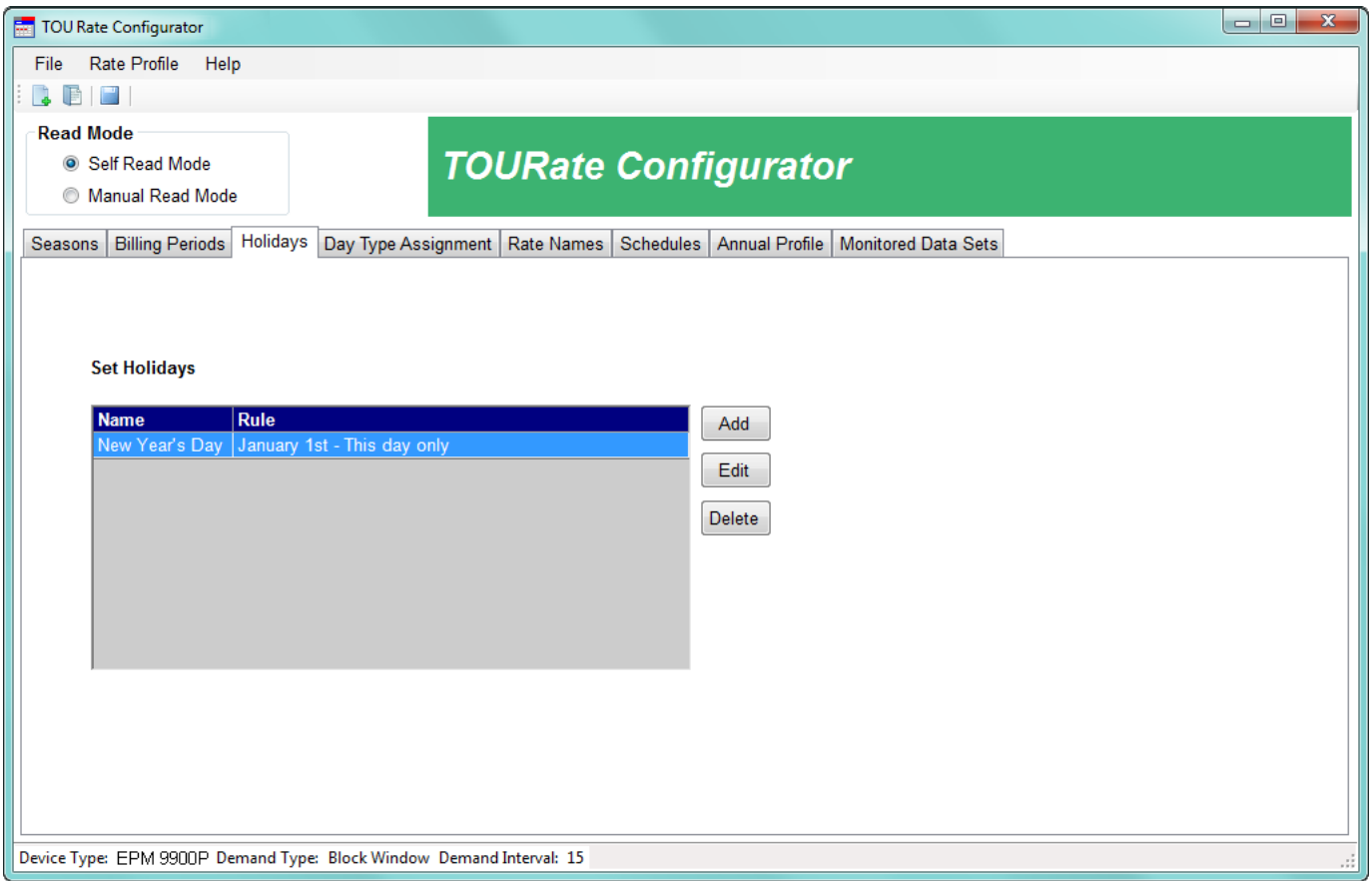
1. Seasons tab: Self Read Mode; Four Seasons set up, with programmed transition dates.



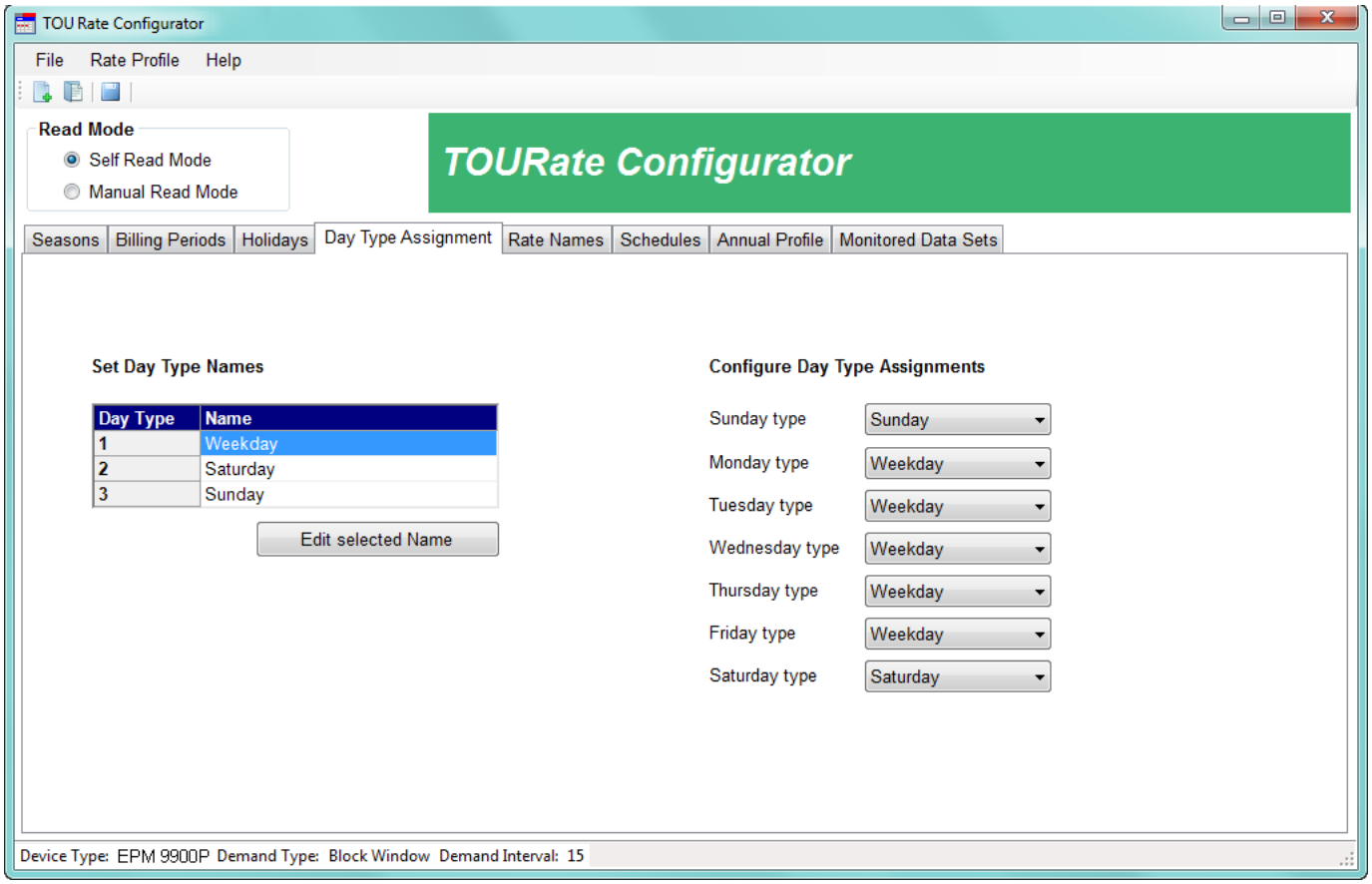
2. Monthly Billing Periods set to the 15th of every month.



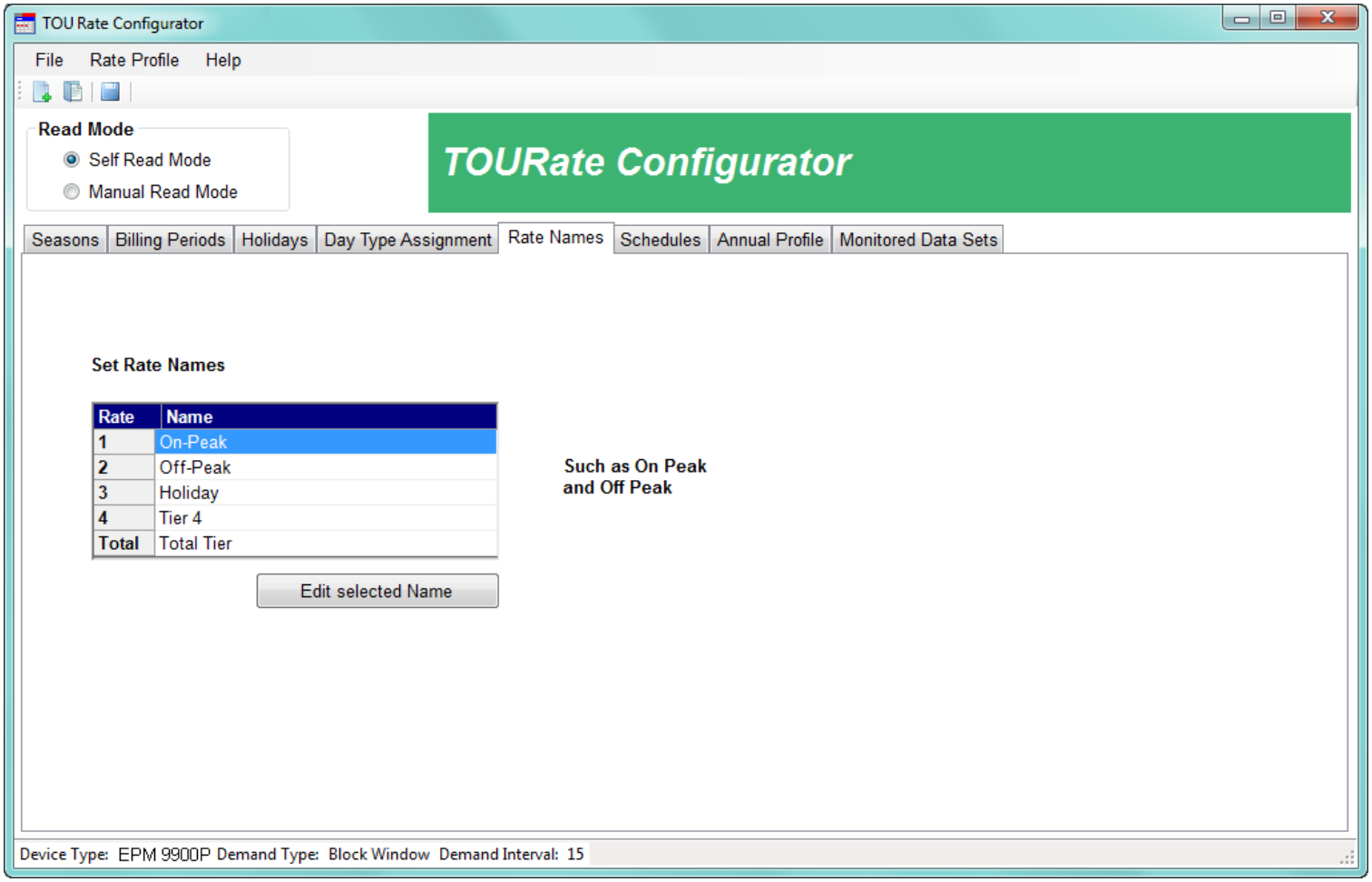
3. New Year's Day set as a holiday.



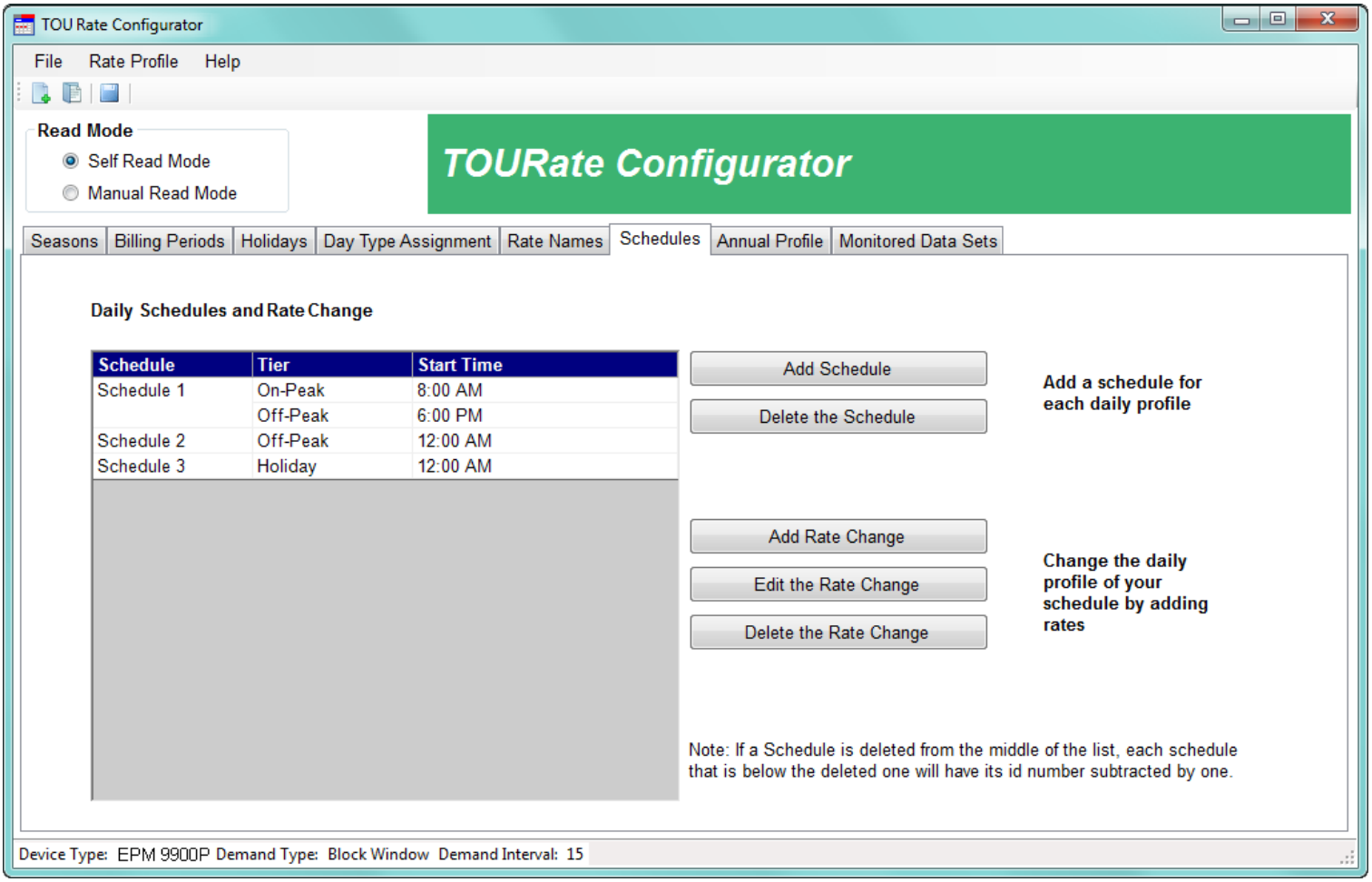
4. Day types set and all three assigned - as Saturday, Sunday, and Weekday (Mon-Fri).



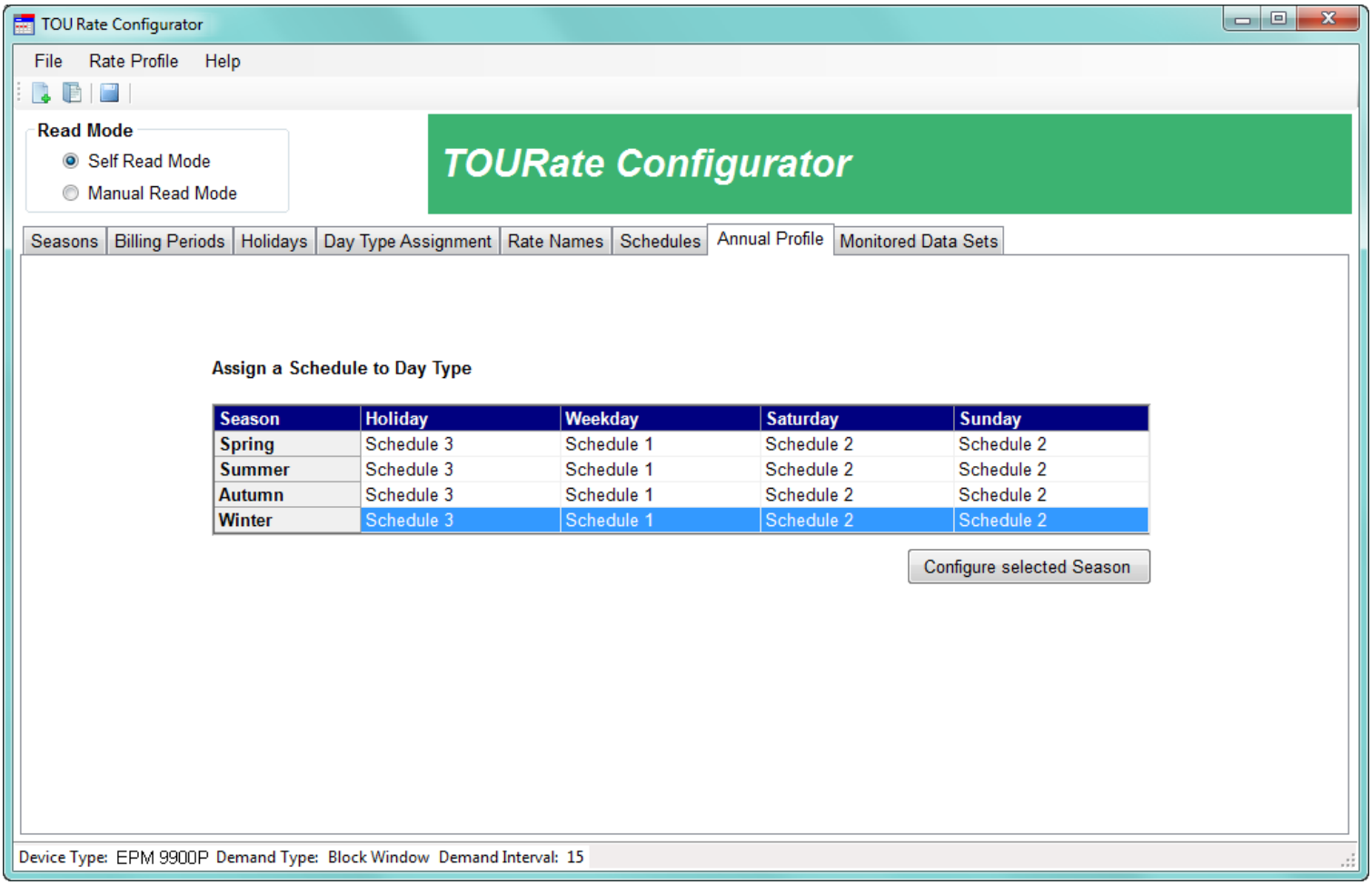
5. Rates set up (named) - On-Peak, Off-Peak, and Holiday.



6. Three schedules set up: Schedule 1 On-Peak at 8 am, Off-Peak at 6 pm; Schedule 2 Off-Peak at 12 am (and all day); Schedule 3 Holiday at 12 am (and all day).

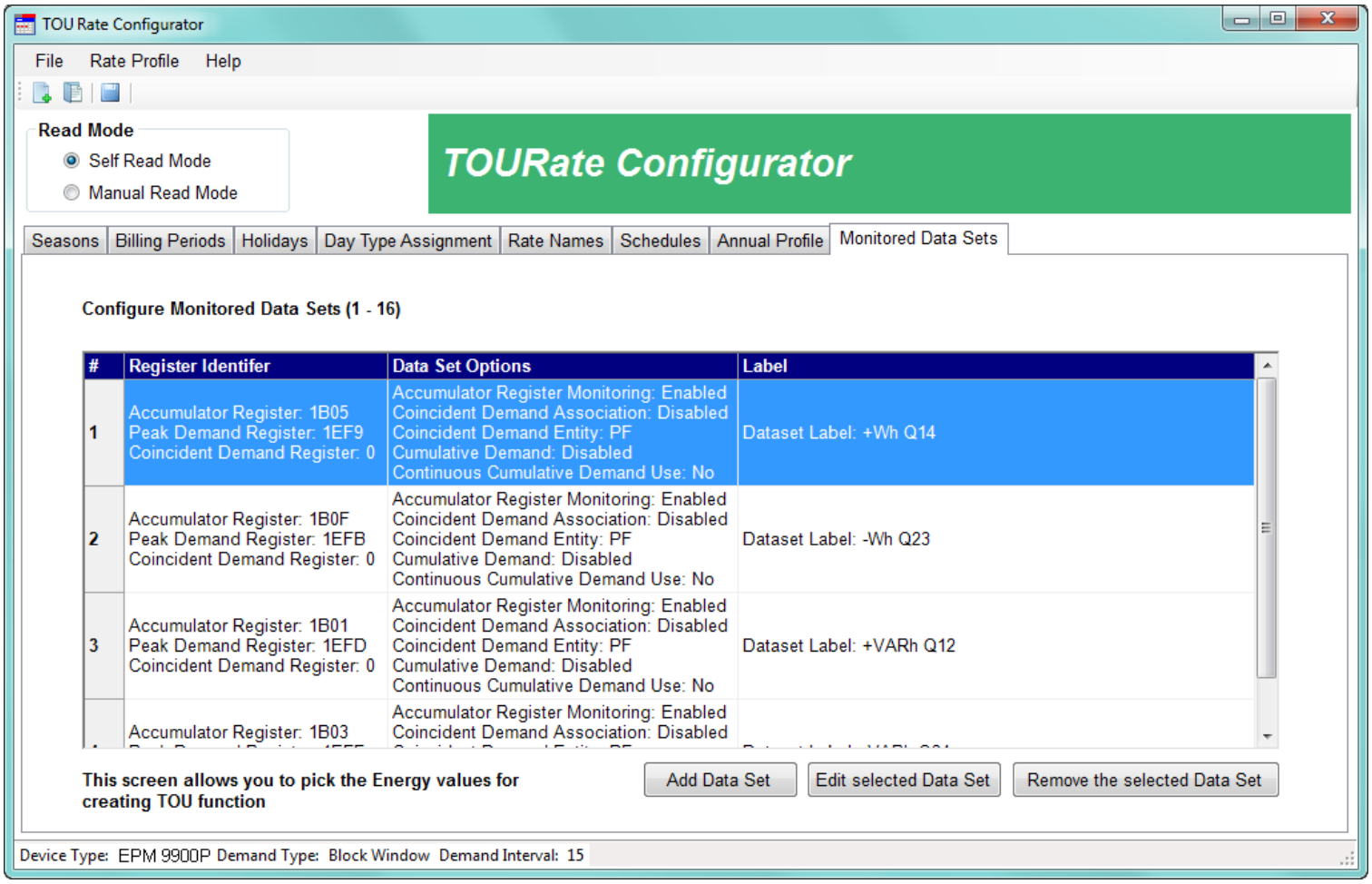


7. Annual Profile set up as: for Spring/Summer/Autumn/Winter seasons - Schedule 3 applied to holidays, Schedule 1 applied to weekdays, and Schedule 2 applied to Saturday and Sunday.



Season	Holiday	Weekday	Saturday	Sunday
Spring	Schedule 3	Schedule 1	Schedule 2	Schedule 2
Summer	Schedule 3	Schedule 1	Schedule 2	Schedule 2
Autumn	Schedule 3	Schedule 1	Schedule 2	Schedule 2
Winter	Schedule 3	Schedule 1	Schedule 2	Schedule 2

8. Monitored data sets of Wh in Quadrants 1 and 4 and 2 and 3; and + and - VARh accumulators, set up for TOU accumulations.



9. Accumulation Method set to continue from the previous billing period and start at zero for a new season.

GE Communicator

Chapter 16: Databases and Log Data

16.1 Overview

The GE Communicator application accesses meter readings and stores the information in databases. The Polling screens and the meter logs use these databases to display the meter data. The Polling screens are described in Chapter 5 “Polling Your Meter”, and the logs and Log Viewer are described in Chapter 19 “Viewing Logs”. This chapter explains the databases that the software uses, the retrieval of log data, and how to archive logs.

16.2 GE Communicator Application Databases

The following sections explain how meter reading data is stored, where it is stored, and the types of files it is stored in.

16.2.1 How Data is Organized

The GE Communicator application uses an Open Database Connectivity (ODBC) compliant database structure.

16.2.2 Where Data is Stored

Unless you specify otherwise using the Options screen (see Chapter 20 "Other Functions and Screens" for instructions), the application's data files are stored on your PC as shown in the table below.

Path For	Directory
Retrieved Logs	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs
Device Profiles	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Device Profiles
Scripts	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Scripts
Polled Data	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Polled Data
Exported Data	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Exported Data
Script Data	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Script Logs
Connection DB	C:\Users\Public\Documents\GE Applications\Communicator_Ext
COMTRADE Data	C:\Users\Public\Documents\GE Applications\Communicator_Ext\COMTRADE Files
Firmware Info	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Firmware Information
TOU Calendar Settings	C:\Users\Public\Documents\GE Applications\Communicator_Ext\TOU Calendar Settings
Device Profile Reports	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Device Profile Reports
Hardware Settings	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Hardware Settings
Archived Logs	C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved logs\log_archive

NOTE

These are the default locations of the meter data files. You can view these locations by clicking **View > Options** from the Main screen Menu Bar.

16.2.3 Types of Database Files

The meter log data is stored in one of two files, depending on the meter type:

- .nbl - Binary log file for all EPM 9000 series meters
- .sbl - Binary log file for all other EPM meters)

The Log Viewer application takes the .nbl and .sbl files and converts them into .db files that can then be viewed and printed by the Log Viewer application. See Chapter 19 "Viewing Logs" for details on the Log Viewer.

16.3 Retrieving Log Data

There are three methods for retrieving log data from the GE Communicator application database:

- Retrieve logs manually - you use the GE Communicator application to retrieve the log data; this process is described in this chapter.
- Retrieve logs using MeterManager - you set up MeterManager to automatically retrieve log data from your meters. See Chapter 18 "GE MeterManager" for complete instructions on using MeterManager to retrieve log data.
- Retrieve logs using Script & Scheduler - you use the Script & Scheduler application to set up automatic log retrieval. See Chapter 17 "Script & Scheduler Program" for complete instructions on using Script & Scheduler to retrieve log data.

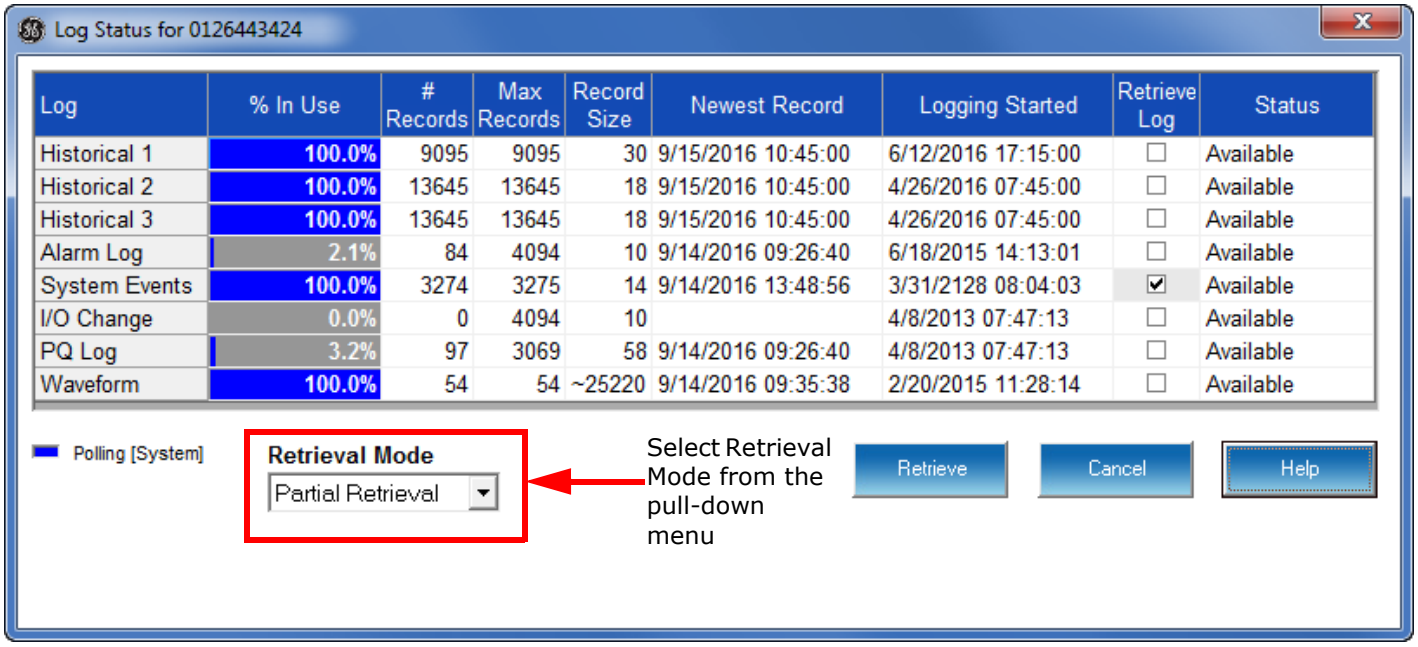
NOTE

EPM 9450/9650 meters allow only one Ethernet connection at a time to download logs.

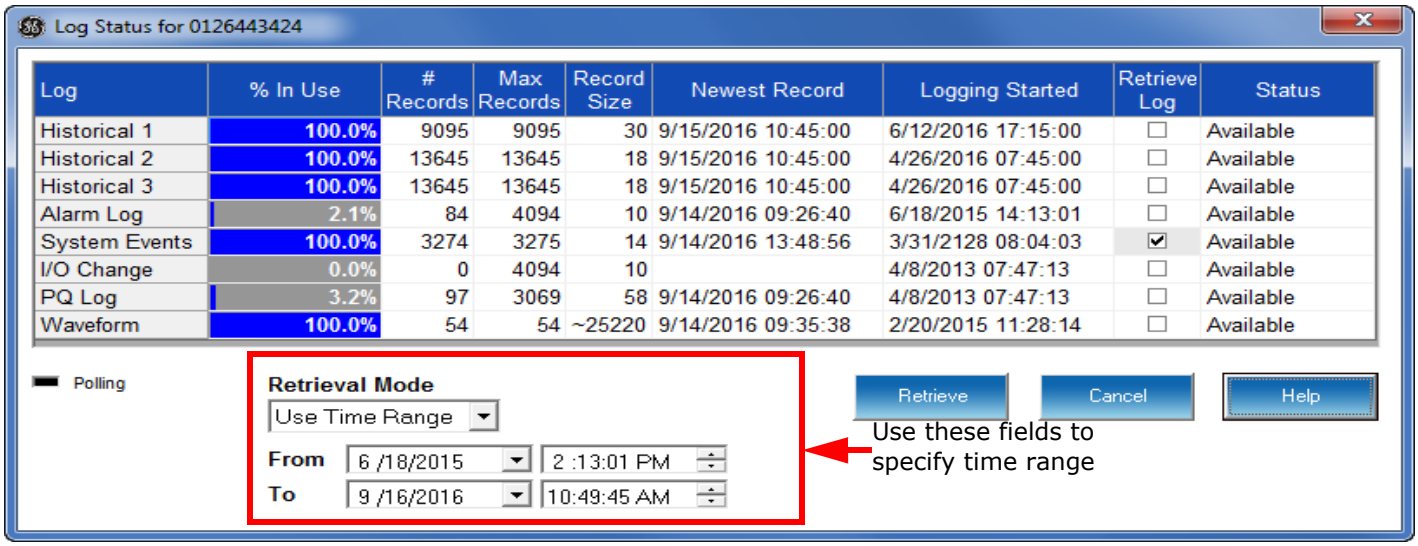
16.3.1 Manual Log Retrieval

If your meter has memory for logging, you can retrieve the logs manually in the following way:

1. Connect to your meter (see Chapter 3 "Connecting to a GE Meter" for instructions).
2. From the GE Communicator application's Main screen, click either the Ret Log (retrieve logs) icon or **Logs > Retrieve Log(s) from Device**. You will see the Log Status screen for the meter, which lists the available logs and information about them. The screen varies depending on the meter type and the logs available for it. See the example screen, below, from an EPM 7000 meter.



3. The pull-down menu for Retrieval Mode allows you to select one of two options:
   - Partial Retrieval - this is the default Retrieval Mode. In Partial Retrieval mode, only the newest records are retrieved for any logs you select. This increases retrieval speed, since records that have previously been retrieved are ignored. When the log is full, it will roll over. Partial Retrieval mode should be used for billing and continuous logging.
   - Time Range Retrieval (Use Time Range) - the Time Range Retrieval mode is useful if you want to retrieve specific events. If you select Use Time Range from the pull-down menu, date range fields will display, allowing you to select the time range for data retrieval. Only records (within the specified time range) that are newer than the latest records in the log database can be retrieved for any selected logs. For this reason, Time Range Retrieval should not be used for billing or continuous logging purposes. The only way to retrieve earlier records using Time Range Retrieval is to delete the existing log database(s) before retrieving the log(s). See the example screen, below.



NOTE

The EPM 9900/9900P meter does not have a time range option. It always performs a partial log retrieval when possible.

4. The Log Status screen tells you which logs are available for retrieval. Follow the instructions for your meter type.

NOTE

IMPORTANT! Only one person at a time can download a log. If someone else is downloading a log, it will be unavailable until the download is complete.

EPM 7000 meter, EPM 4600 metering system

To select a log or logs for retrieval, 1. click in the Retrieve Log box next to the log(s), 2. select your Retrieval Mode and 3. Click Retrieve (see following screens).

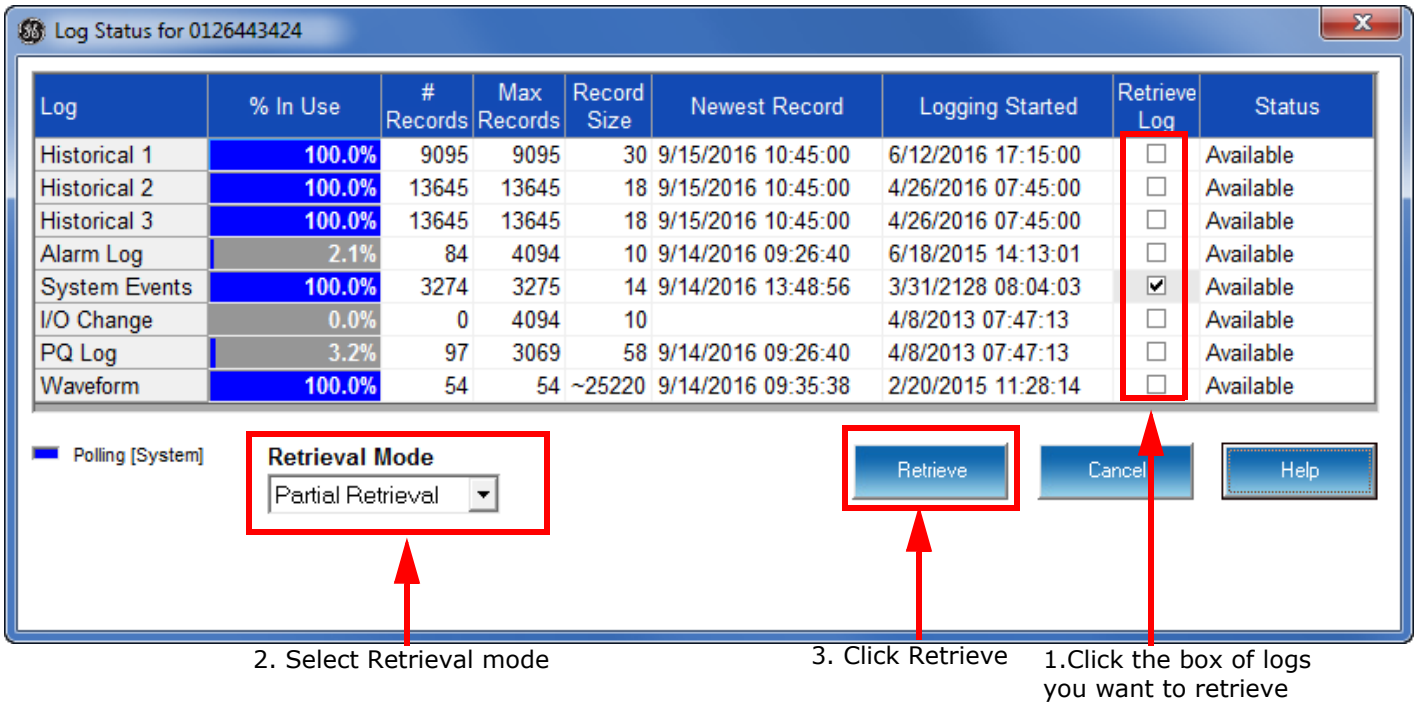


Figure 16-1: EPM 7000 Meter Log Status Screen

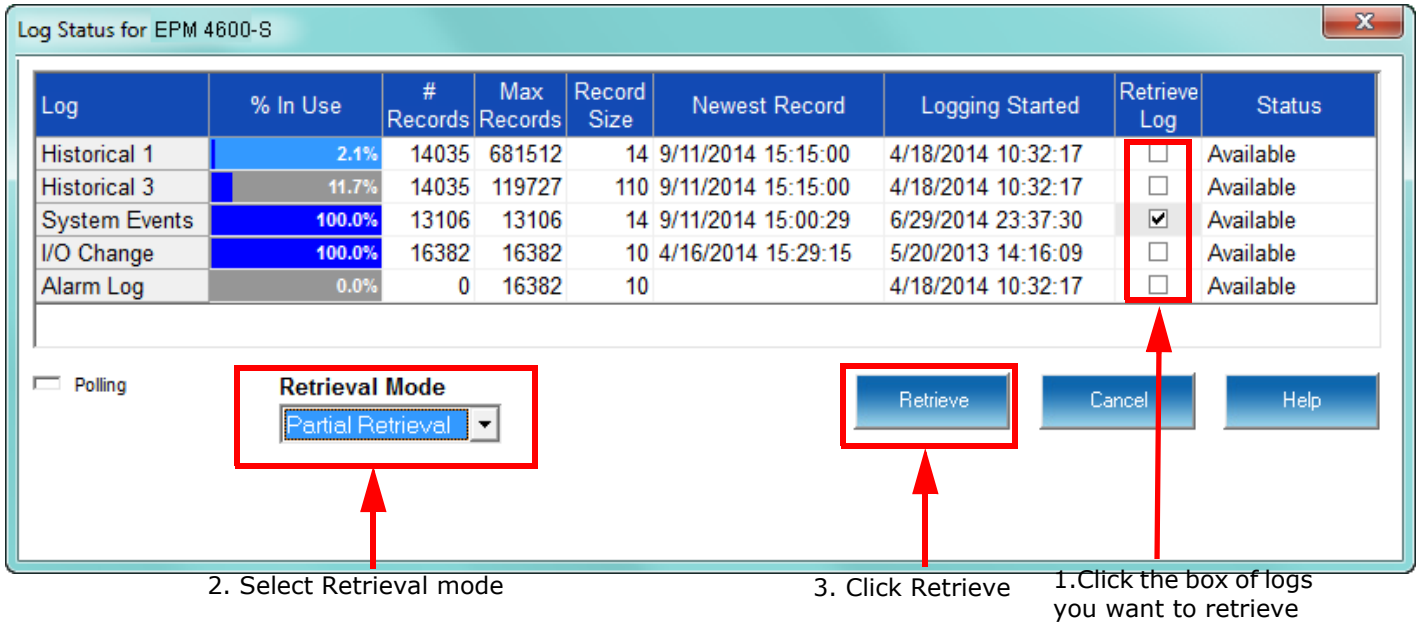
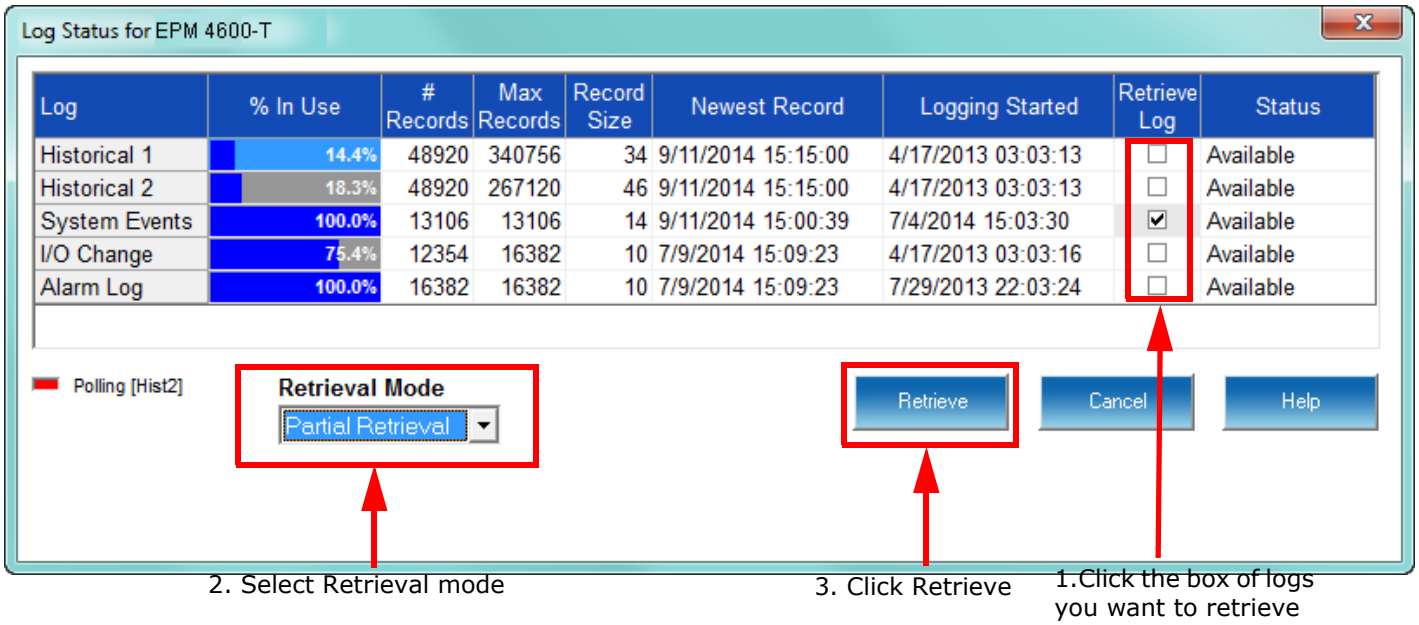


Figure 16-2: EPM 4600-S Metering System Log Status Screen



2. Select Retrieval mode

3. Click Retrieve

1.Click the box of logs you want to retrieve

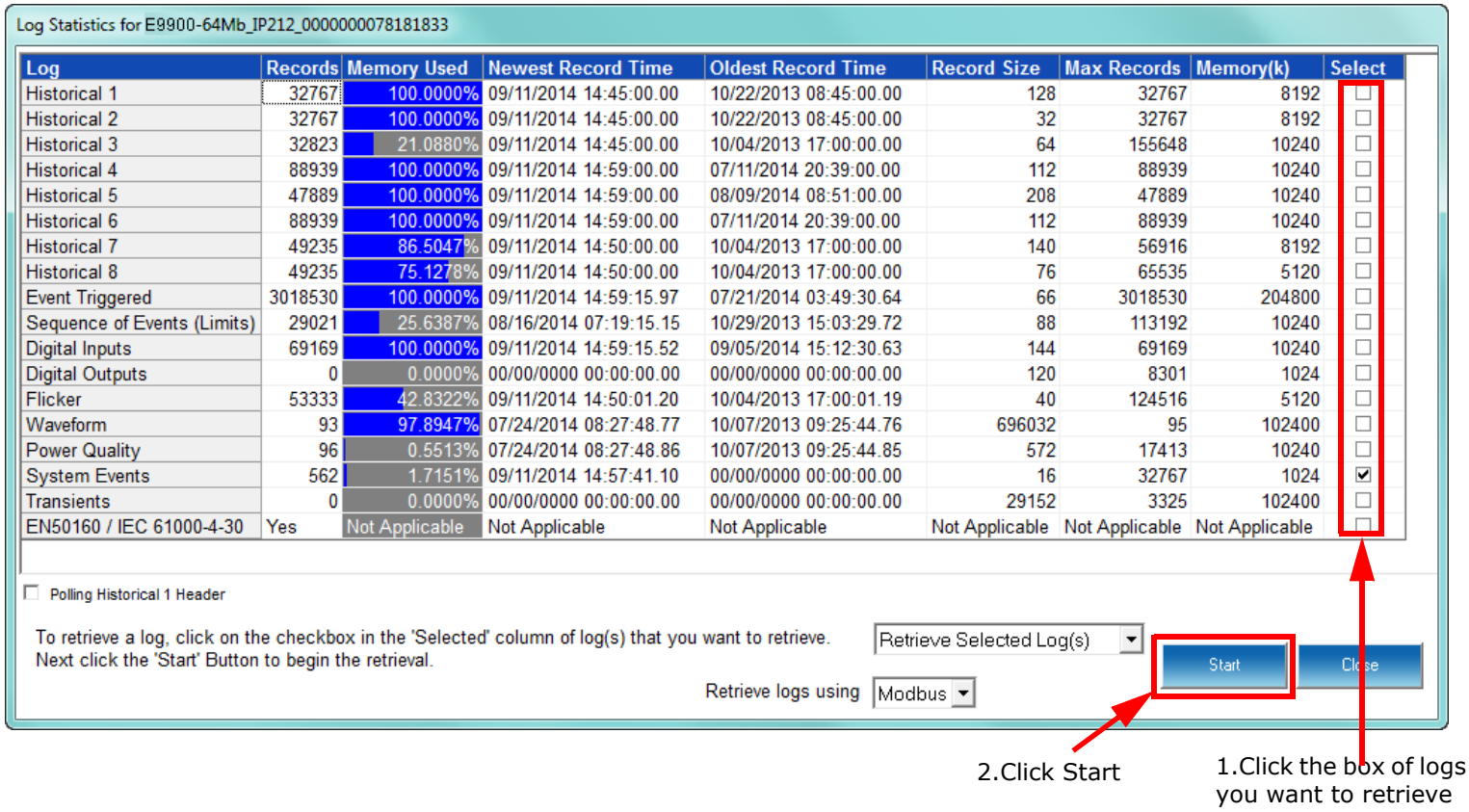
Figure 16-3: EPM 4600-T Metering System Log Status Screen

EPM 9900/9900P Meter

To select a log or logs for retrieval,

a. Click in the **Select** box next to the log(s)

b. Click **Start** (see screen below).

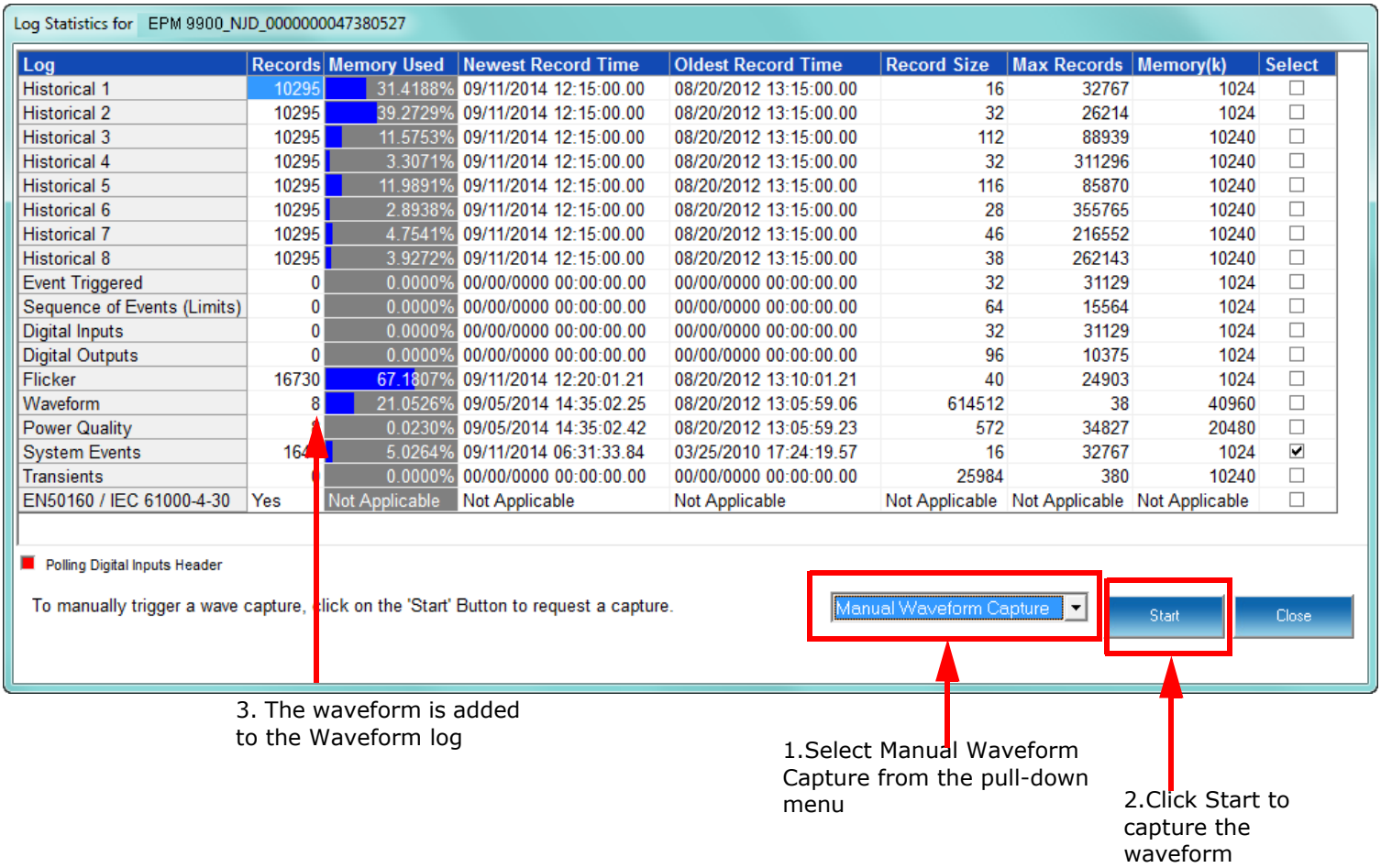


Log	Records	Memory Used	Newest Record Time	Oldest Record Time	Record Size	Max Records	Memory(k)	Select
Historical 1	32767	100.0000%	09/11/2014 14:45:00.00	10/22/2013 08:45:00.00	128	32767	8192	☐
Historical 2	32767	100.0000%	09/11/2014 14:45:00.00	10/22/2013 08:45:00.00	32	32767	8192	☐
Historical 3	32823	21.0880%	09/11/2014 14:45:00.00	10/04/2013 17:00:00.00	64	155648	10240	☐
Historical 4	88939	100.0000%	09/11/2014 14:59:00.00	07/11/2014 20:39:00.00	112	88939	10240	☐
Historical 5	47889	100.0000%	09/11/2014 14:59:00.00	08/09/2014 08:51:00.00	208	47889	10240	☐
Historical 6	88939	100.0000%	09/11/2014 14:59:00.00	07/11/2014 20:39:00.00	112	88939	10240	☐
Historical 7	49235	86.5047%	09/11/2014 14:50:00.00	10/04/2013 17:00:00.00	140	56916	8192	☐
Historical 8	49235	75.1278%	09/11/2014 14:50:00.00	10/04/2013 17:00:00.00	76	65535	5120	☐
Event Triggered	3018530	100.0000%	09/11/2014 14:59:15.97	07/21/2014 03:49:30.64	66	3018530	204800	☐
Sequence of Events (Limits)	29021	25.6387%	08/16/2014 07:19:15.15	10/29/2013 15:03:29.72	88	113192	10240	☐
Digital Inputs	69169	100.0000%	09/11/2014 14:59:15.52	09/05/2014 15:12:30.63	144	69169	10240	☐
Digital Outputs	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	120	8301	1024	☐
Flicker	53333	42.8322%	09/11/2014 14:50:01.20	10/04/2013 17:00:01.19	40	124516	5120	☐
Waveform	93	97.8947%	07/24/2014 08:27:48.77	10/07/2013 09:25:44.76	696032	95	102400	☐
Power Quality	96	0.5513%	07/24/2014 08:27:48.86	10/07/2013 09:25:44.85	572	17413	10240	☐
System Events	562	1.7151%	09/11/2014 14:57:41.10	00/00/0000 00:00:00.00	16	32767	1024	☑
Transients	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	29152	3325	102400	☐
EN50160 / IEC 61000-4-30	Yes	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	☐

Figure 16-4: EPM 9900 Meter Log Retrieval Screen

The EPM 9900/9900P meter does not have partial or time range log retrieval options, but it has another option. You can choose to perform a manual waveform capture to add a record (or records) to the Waveform log before you download it. This is useful if you want to analyze the current power quality.

Click in the pull-down menu to select Manual Waveform Capture. When you select Start, the application performs a Waveform capture, and the number of records in the Waveform log field increases by one.



Log	Records	Memory Used	Newest Record Time	Oldest Record Time	Record Size	Max Records	Memory(k)	Select
Historical 1	10295	31.4188%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	16	32767	1024	☐
Historical 2	10295	39.2729%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	32	26214	1024	☐
Historical 3	10295	11.5753%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	112	88939	10240	☐
Historical 4	10295	3.3071%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	32	311296	10240	☐
Historical 5	10295	11.9891%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	116	85870	10240	☐
Historical 6	10295	2.8938%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	28	355765	10240	☐
Historical 7	10295	4.7541%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	46	216552	10240	☐
Historical 8	10295	3.9272%	09/11/2014 12:15:00.00	08/20/2012 13:15:00.00	38	262143	10240	☐
Event Triggered	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	32	31129	1024	☐
Sequence of Events (Limits)	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	64	15564	1024	☐
Digital Inputs	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	32	31129	1024	☐
Digital Outputs	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	96	10375	1024	☐
Flicker	16730	67.1807%	09/11/2014 12:20:01.21	08/20/2012 13:10:01.21	40	24903	1024	☐
Waveform	8	21.0526%	09/05/2014 14:35:02.25	08/20/2012 13:05:59.06	614512	38	40960	☐
Power Quality	[illegible]	0.0230%	09/05/2014 14:35:02.42	08/20/2012 13:05:59.23	572	34827	20480	☐
System Events	164[illegible]	5.0264%	09/11/2014 06:31:33.84	03/25/2010 17:24:19.57	16	32767	1024	☑
Transients	[illegible]	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	25984	380	10240	☐
EN50160 / IEC 61000-4-30	Yes	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	☐

When you are ready to view the Waveform log,

a. Select **Retrieve Selected log(s)** from the pull-down menu,

b. Select the Waveform log

c. Click **Start** to retrieve it.

EPM 9450/9650/9800 Meter

To select a log or logs for retrieval:

a. Click in the Retrieve field next to the log(s) - the No will change to Yes;

b. Select your Retrieval Mode

c. Click **Start** (see following screens).

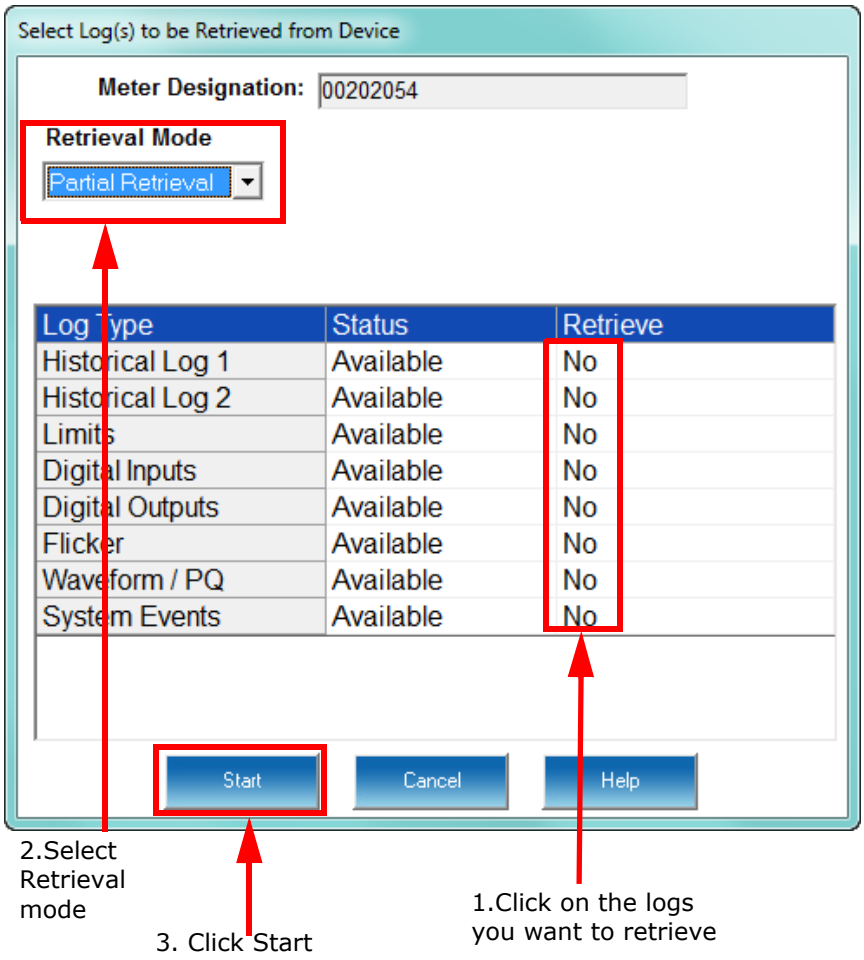


Figure 16-5: EPM 9800 Meter Log Retrieval Screen

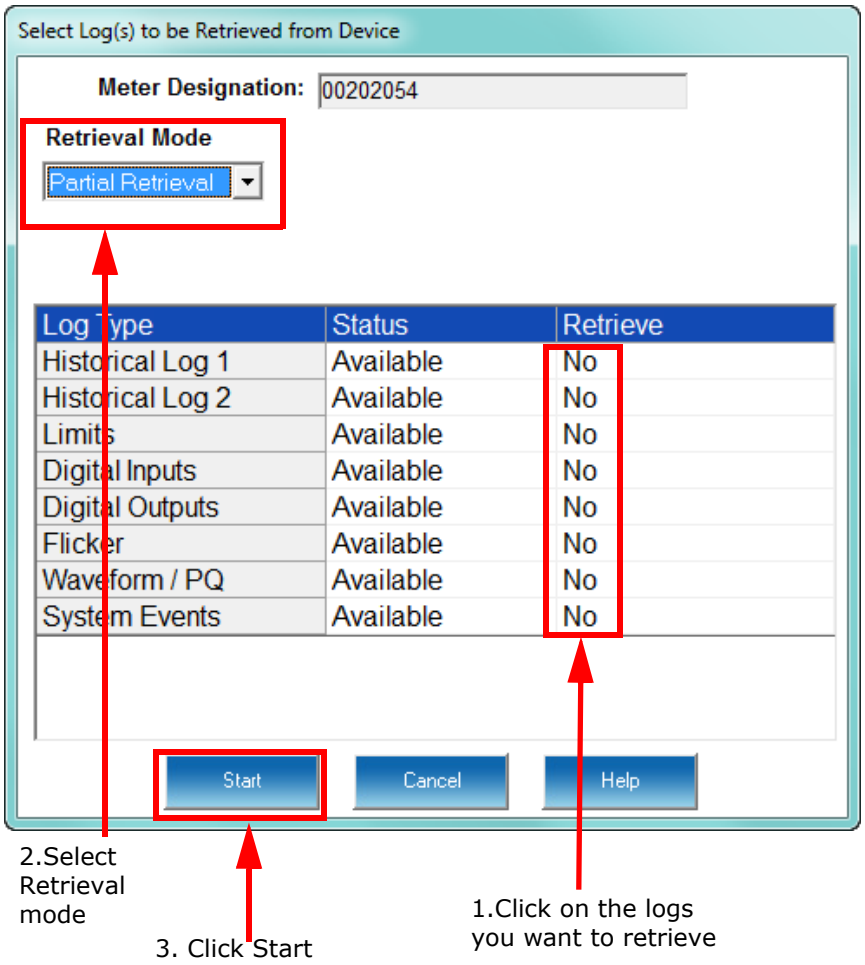


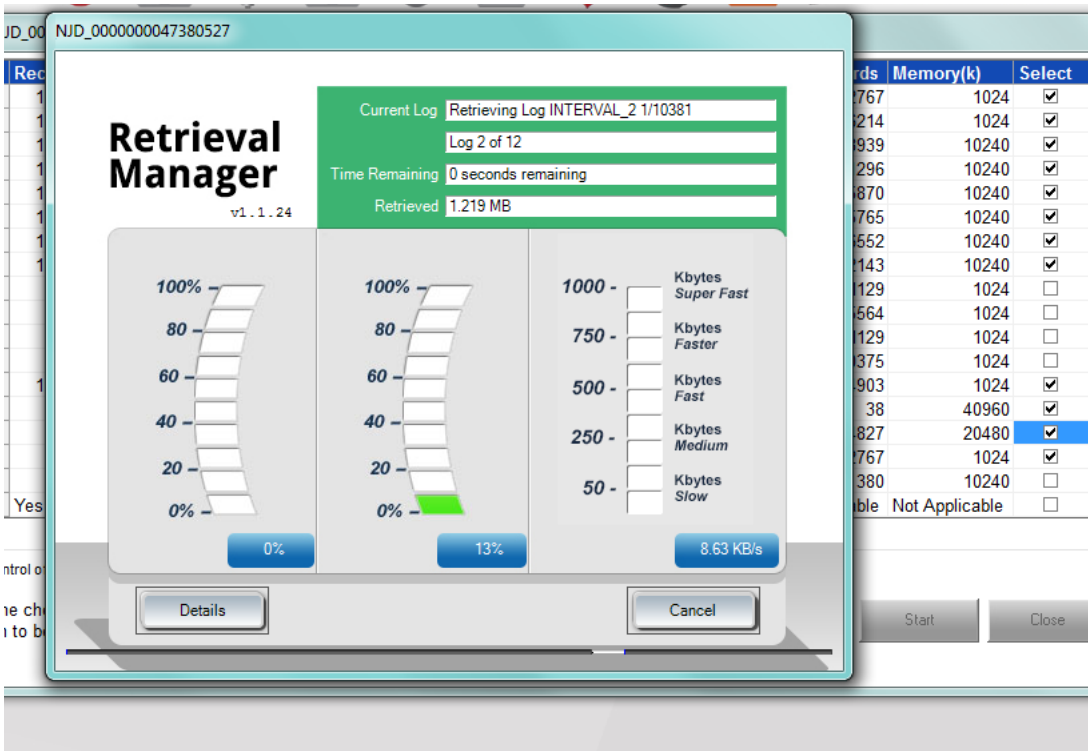
Figure 16-6: EPM 9650 Meter Log Retrieval Screen

NOTE

The EPM 9650 meter's Log Status screen doesn't list the System Events log, but it is retrieved every time you perform a log retrieval.

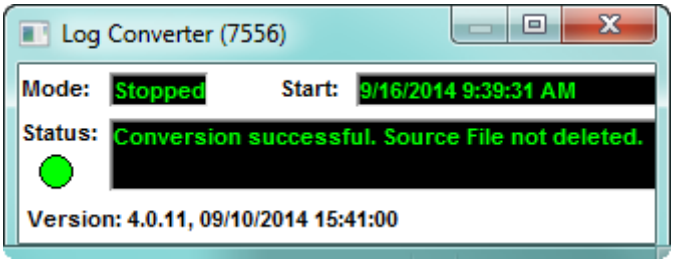
5. Click **Cancel** or **Close** (EPM 9900/9900P meter only) to close the Log Status screen.

6. You will see progress messages as the logs are being retrieved. See the example screen from an EPM 9900 meter, below.



The messages show you what logs are currently being retrieved.

7. The Log Converter application takes the binary file data and converts it into the Log database files that can be viewed through the Log Viewer application. The Log Converter runs automatically once the data is retrieved. While running, the Log Converter screen shows you the Mode, Start time, and Status of log conversion. See the example screen from an EPM 9900 meter, below.



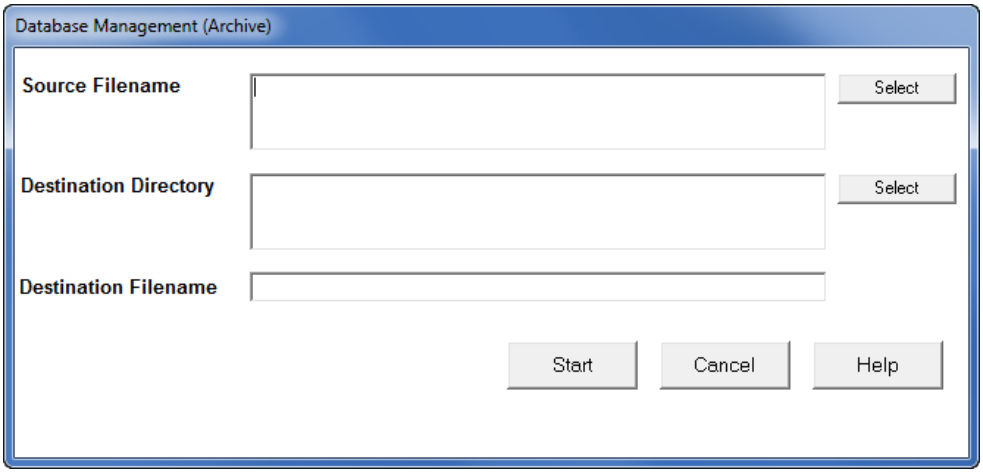
8. The Log Viewer will open next. Refer to Chapter 19 “Viewing Logs” for instructions for using the Log Viewer and details on the available logs.

16.4 Archiving Logs

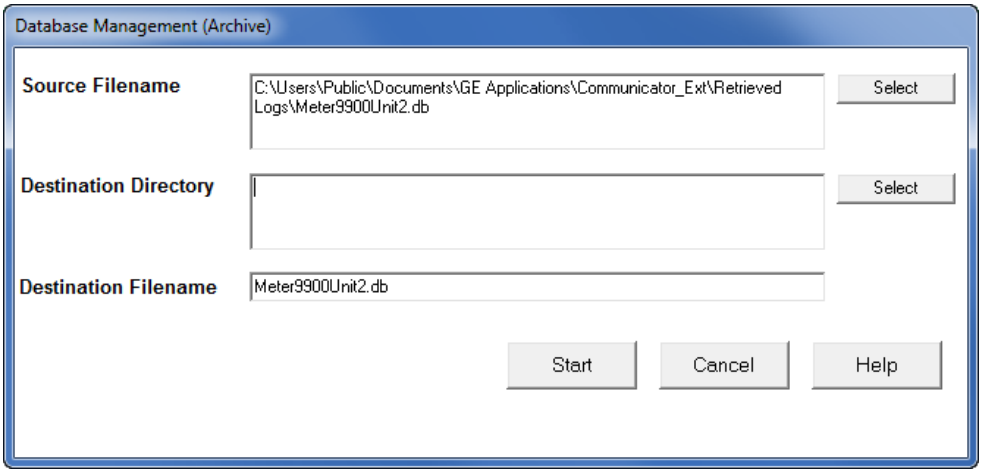
This feature lets you create an archived copy of a saved log database file. The smaller the log file, the quicker the processing of the data, so you may want to archive your files on a regular basis before they get unwieldy.

Use this feature to create an archived copy and delete the working file, so that you can have an empty database file for the next logging period. Note that you cannot select a time range for archiving files with this option - the whole file is archived. The Script & Scheduler application lets you select a time range for Log retrieval, if that is what you need. See Chapter 17 "Script & Scheduler Program" for information on using Script & Scheduler.

1. Click **Logs > Log Database > Archive**. You will see the screen shown below.



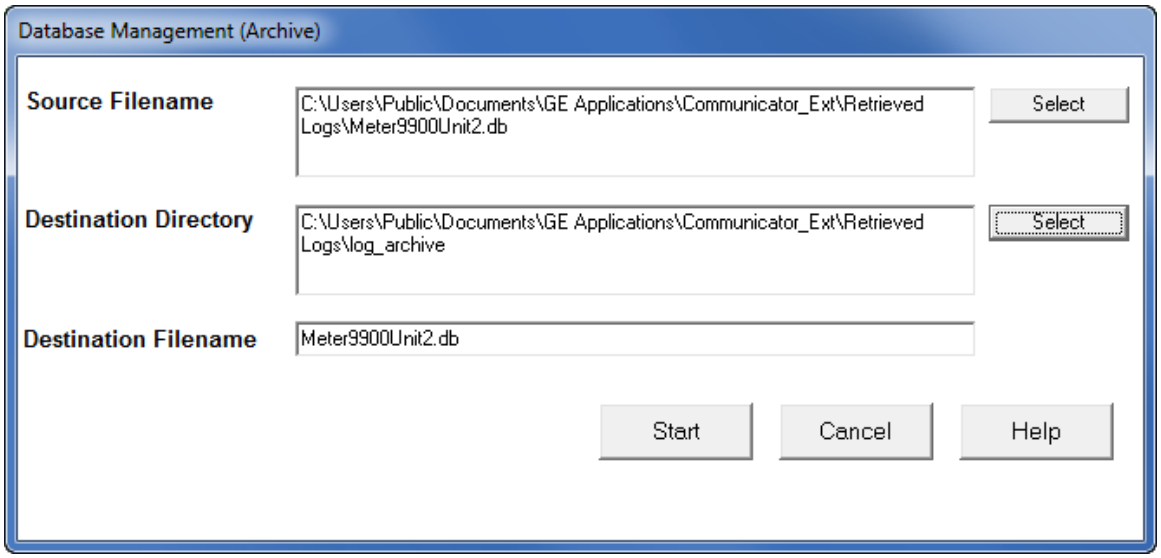
2. Click the top **Select** button. A window opens, allowing you to select a retrieved log for archiving. Once you select the log, the screen displays the selected log and its path in the Source Filename field and the log's file name in the Destination Filename field.



NOTE

The Destination filename can be changed.

3. Click the bottom **Select** button. A window opens, allowing you to select a location for the archived file. Once you select the location, the screen displays it in the Destination Directory field.



4. Click the **Start** button to start the archiving process; click Cancel to exit the screen without archiving.
5. You will be asked to confirm that you want to archive the log - click **Yes** to continue or click **No** to cancel the archiving.
6. You will see a message window when the file has been archived. Click **OK** to close the window, and then click **Cancel** to close the archiving screen, shown above.

GE Communicator

Chapter 17: Script & Scheduler Program

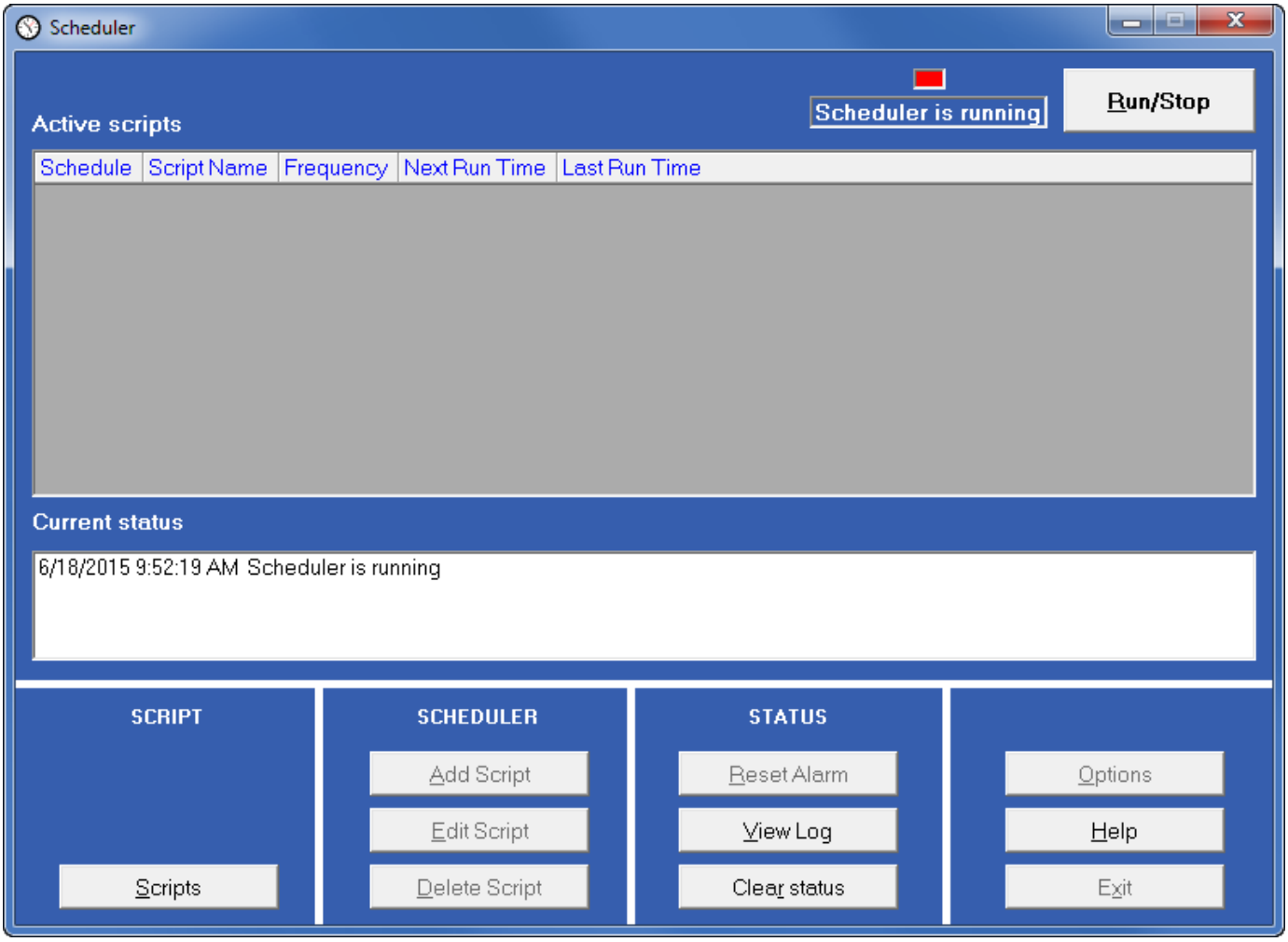
17.1 Overview

Chapter 19 “Viewing Logs” explains how to retrieve and view logs manually through GE Communicator. This chapter explains how to set up automatic log downloads with the GE Script & Scheduler application. Chapter 18 “GE MeterManager” explains how to set up automatic log downloads using GE MeterManager.

GE MeterManager and GE Script & Scheduler each have different features, but in general, if a user has a Network-based connection, GE MeterManager is the preferred method of collecting data from meters. It is easier to use and more automated. If the user is communicating with telephone modems or wants to support a feature not available with GE MeterManager, GE Script & Scheduler is the preferred option.

17.2 Using Script & Scheduler

1. Click Start > **All Programs > GE Applications > GE Script & Scheduler** to start the application.



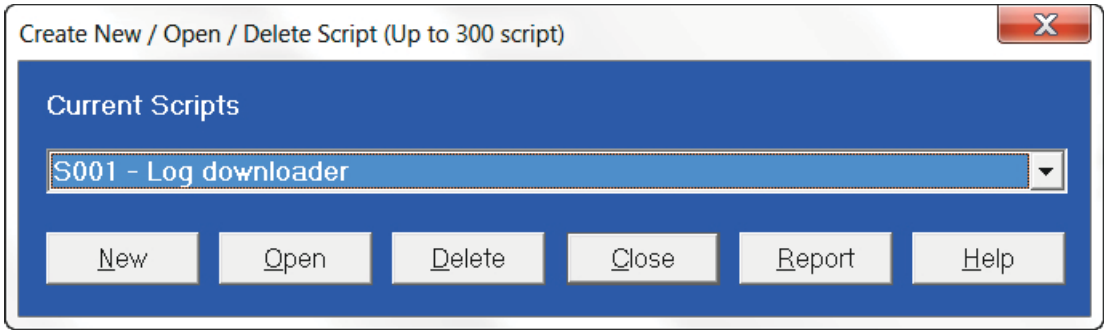
If the application is running (the box at the top has a red light blinking in it and the message "Scheduler is running" appears under the box), click **Run/Stop**.

The application will stop (the box will be empty and "Scheduler stopped" will appear under the box).

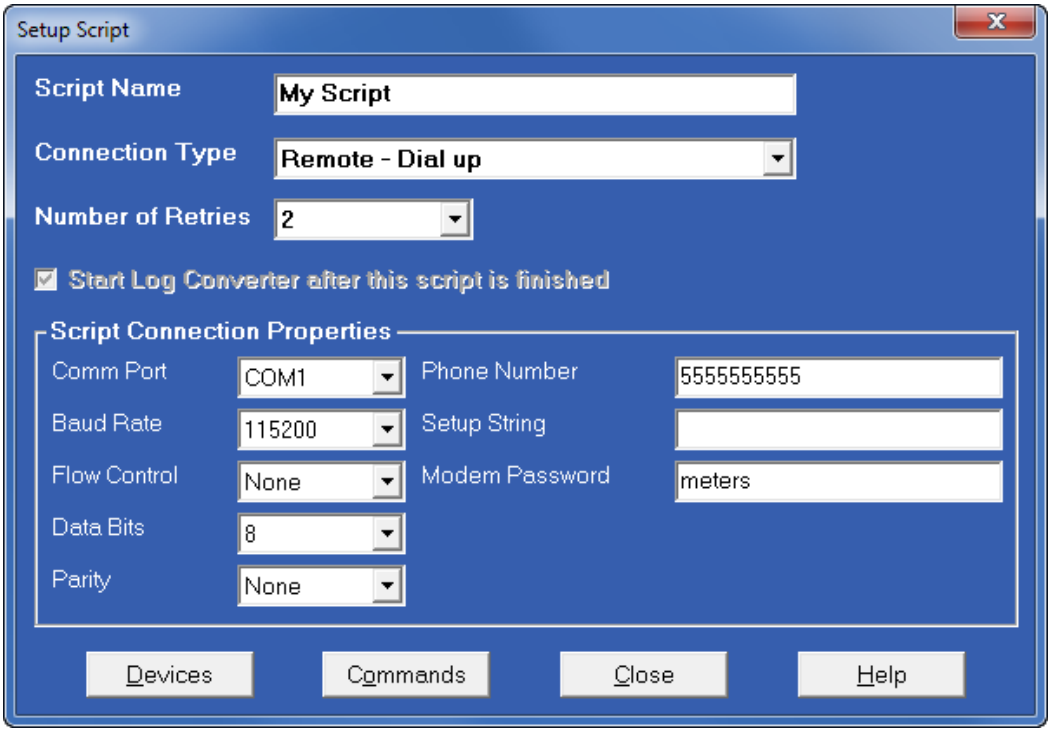
NOTE

To work on the Scheduler, the Scheduler must always be stopped, by pressing the **Run/Stop** button at the top right of the Scheduler window.

2. Click **Scripts**. You will see the screen shown below.



3. Click **New**. You will see the screen shown below.



4. Create a script for each meter whose data you are downloading (unless some of your meters are slaves to a Master meter, in which case they can be entered in the same script as the Master - instructions for this are given in step 8).

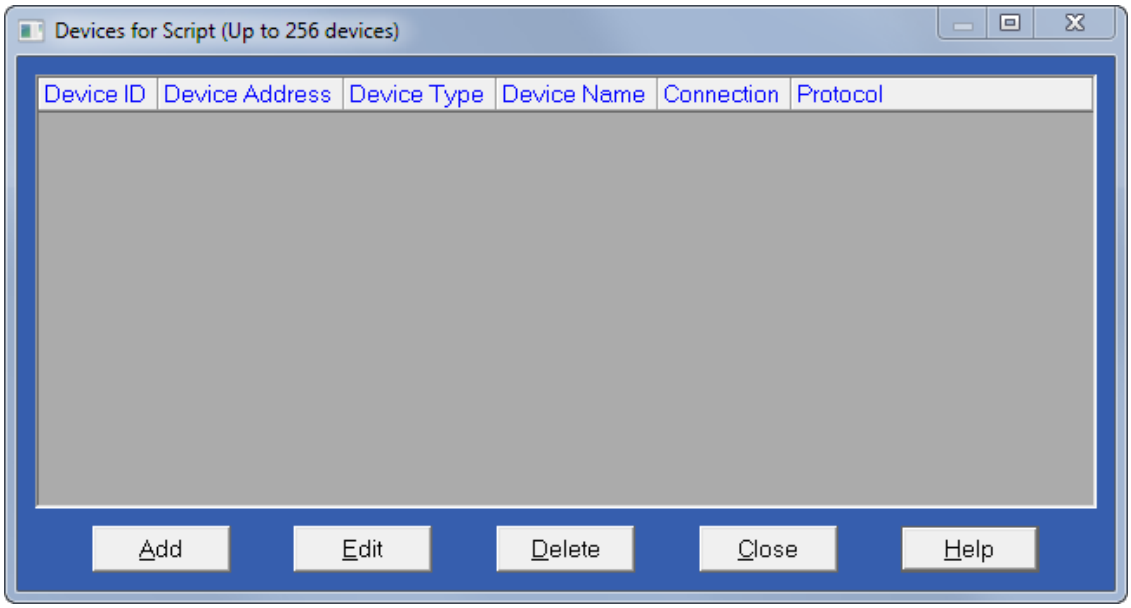
   Enter the following data:

   - **Script Name** - give this script a unique name. It is best to call it the name or location of the meter.
   - **Connection Type** - select Remote-Dial up from the pull-down menu.
   - **Number of Retries** - this field specifies whether you want the application to try connecting for the programmed number of times (between 0 and 5) if the first attempt was unsuccessful. Since this setting applies to Modem communication primarily, you should leave the default setting of 0.
   - **"Start Log Converter after this script is finished"** is the default and cannot be changed. Log Converter is a related application that takes the data downloaded

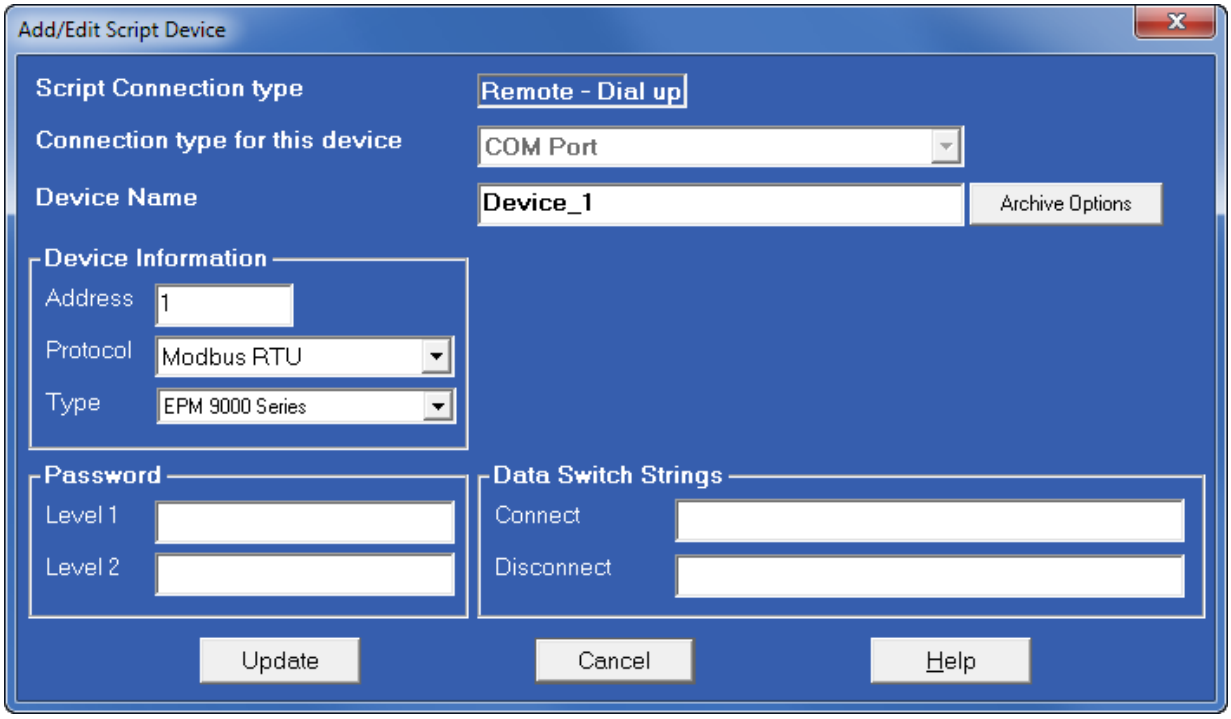
from the meter's log files and converts the data into the correct type of database for later retrieval. This is done automatically within the software - you do not need to do anything.

- **Script Connection properties** - enter the Com Port, Baud Rate, Flow Control, Data Bits, Parity, Phone Number, Setup String, and Modem Password, as applicable.

5. Click **Devices**. You will see the screen shown below.



6. Click **Add**. You will see the screen shown below.



7. This is where you add the information for the meter whose log you want to download.
   - **Device Name**: enter the name of the meter.

- **Archive Options** - click to view and/or change options for archiving the log database files.

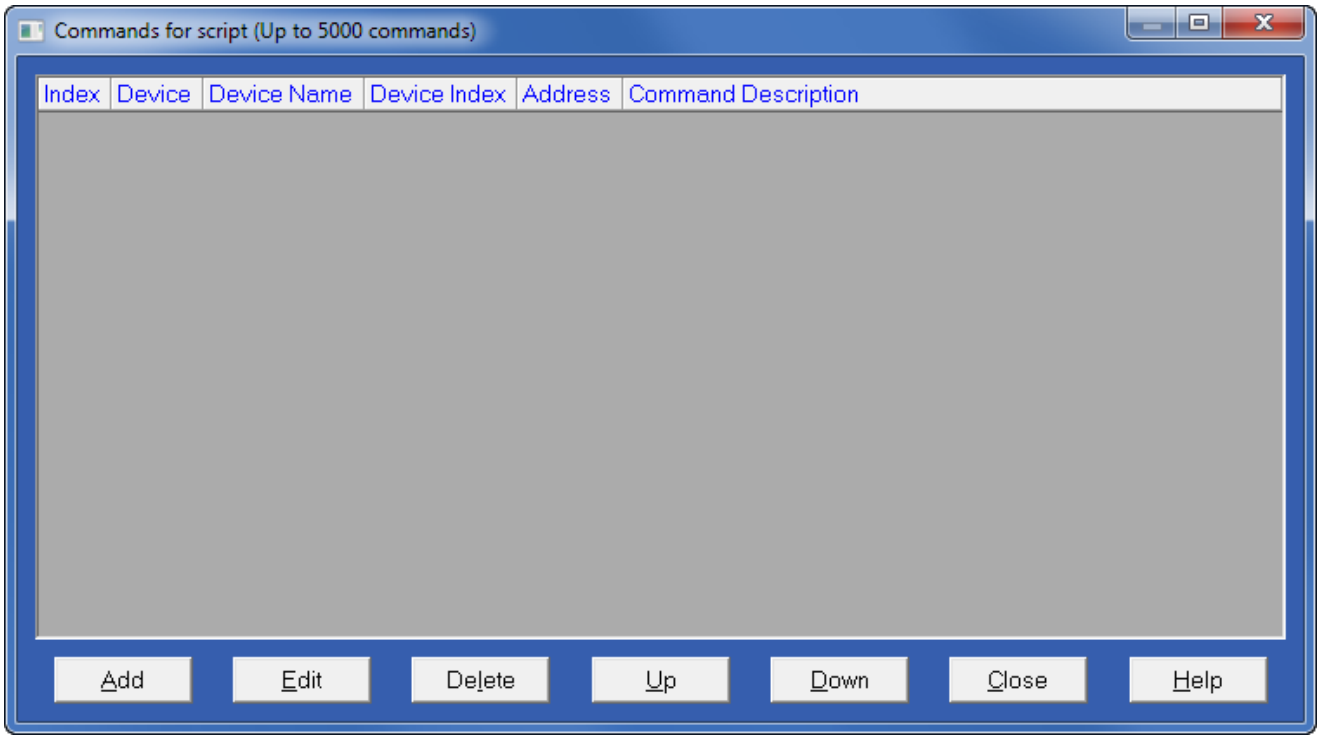
- **Device Information**: enter for your meter - device address, e.g., "1"; select Modbus RTU for communication protocol, and select your meter's type, e.g., EPM 9900.
- **Password**: if password protection is used for the meter, enter the Level 1 and Level 2 passwords in the appropriate fields.
- **Data switch strings** - only necessary if using the discontinued GE Substation Mutliplexor. Refer to the Substation Multiplexor User Manual.

8. Click **Update**. You will return to the Devices for Script screen.

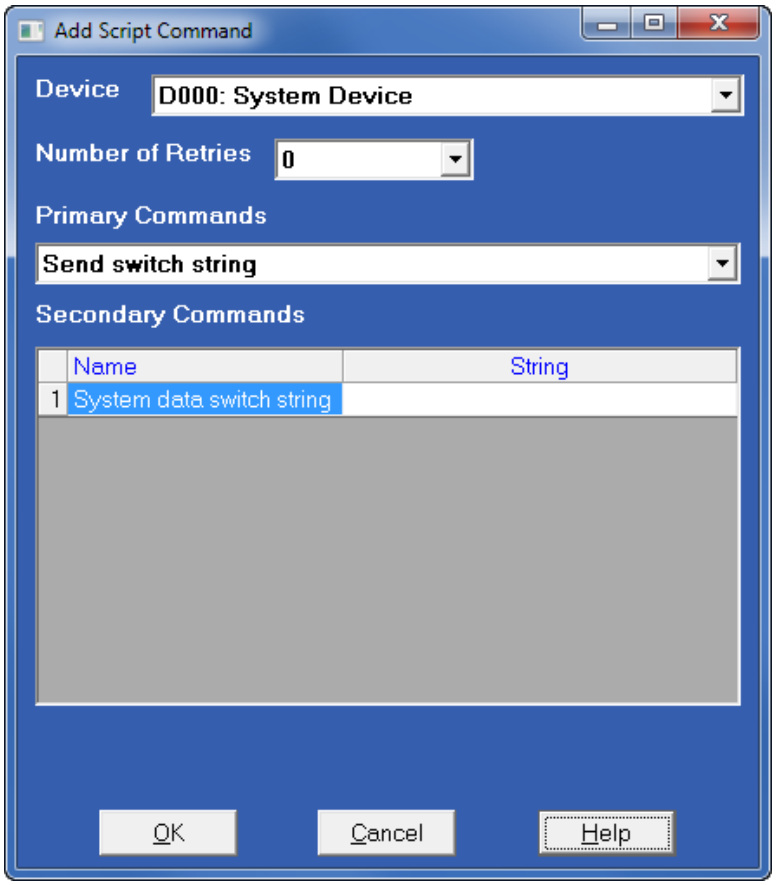
NOTE

You can repeat steps 6 and 7 to add more meters to the script if you are entering slave meters, i.e., meters connected to a Master device. Slave meters must have unique device addresses. You can add up 256 meters in total.

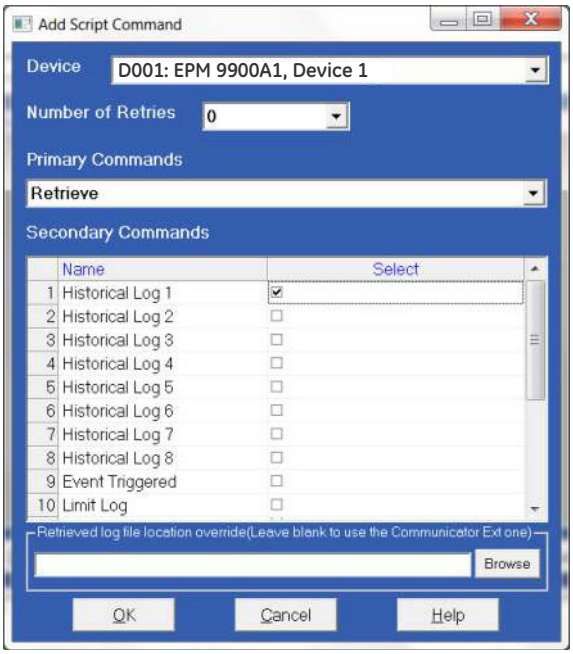
9. When you finish entering devices, click **Close**. You return to the Setup Script screen.
10. Click **Commands**. You will see the screen shown below.



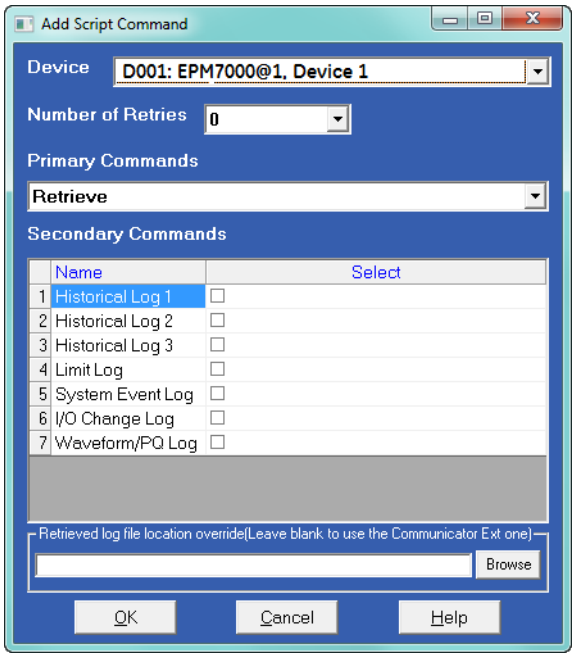
11. Click **Add**. You will see the screen shown below.



12. Select your meter from the Device pull-down menu. The screen changes, as shown in the examples shown on the next page.



EPM 9900 Add Script Command



EPM 7000 Add Script Command

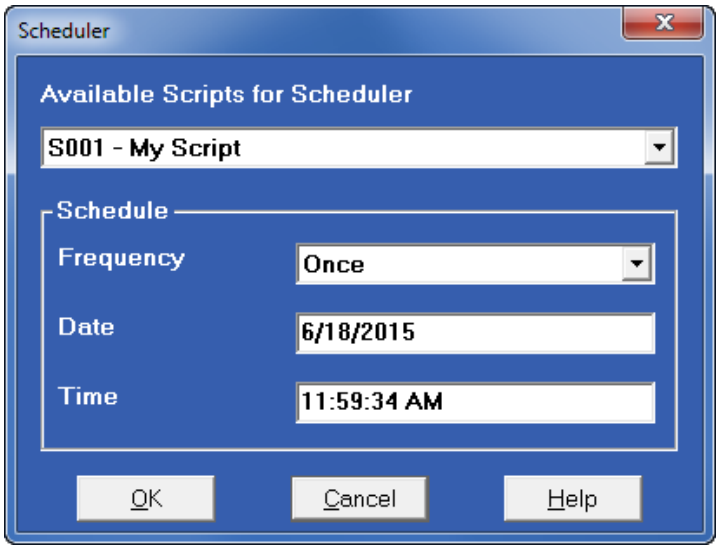
13. Note that the **Primary Command** is "Retrieve" and the **Secondary Commands** are a selection of logs.
    - Click the logs that you set want to set up automatic retrieval for.
    - The blank field at the bottom of the screen tells the GE Script & Scheduler application where to find the logs it needs to download. If you want to use the GE Communicator default location, keep this field blank. If you want to set a new location for the retrieved logs, click **Browse**.

      By default, the retrieved logs are stored in: C:\users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs.

      For the EPM 9900 meter only, the default path also includes \[meter name_meter serial number]\logs\[log_type]\logtype.db.
14. The **Number of Retries** field determines how many times the software will attempt to connect to the meter. You can set between 0 and 5 retries from the pull-down menu.
15. Click **OK**. You will return to the Commands for Script screen.

    The command you entered and the device it is for are displayed on the screen. If you entered slave meters, repeat the process for all of the meters in the Device pull-down menu.
16. Click **Close**. You will return to the Setup Script screen.
17. Click **Close**. You will return to the Create New/Open/Delete Script screen. Your script will be in the pull-down menu.

18. Click **Close**. You will return to the Script & Scheduler main screen. Under the Scheduler column at the bottom of the screen, click **Add Script**. You will see the screen shown below.



19. Select your new script from the pull-down menu. Select "Interval" for Frequency and specify hour and minutes, for example, 12 hours and 0 minutes. This will cause a download of the meter's logs every 12 hours.
20. Click OK. You will return to the Script & Scheduler main screen. Add additional scripts as needed, for downloading logs from additional meters.

NOTE

You can enter 300 scripts. If you have more than 300 meters, you will need to set up an additional server and run the Script & Scheduler application on it to add the additional meters.

21. When you are done, re-start the Script & Scheduler application by clicking the **Run/ Stop** button.

    Your log data will now be retrieved according to the interval you set and the Log Converter will prepare the data and send it to the log database.

GE Communicator

Chapter 18: GE MeterManager

18.1 Overview

GE MeterManager is the GE Communicator Professional version's automation and meter management module. It automatically locates and collects energy data from all installed meters within your power system. GE MeterManager performs its location and collection actions autonomously, so that even novice users can get the full benefits of the application.

When locating network meters, GE MeterManager puts them into groups for maximum control and efficiency. You can also easily launch other meter applications, such as polling meters' real time data, viewing stored data and meter logs, and launching GE's other Energy Management applications, from GE MeterManager. Because of GE MeterManager's extensive organizational capabilities, you may choose to use it as the Base application and access the other applications, such as GE Communicator software, through it.

In addition, GE MeterManager features an easy-to-use automatic report generator, Report Exporter, that lets you create custom spreadsheet reports on all aspects of electrical usage, such as energy consumption, voltage deviation, watt/VAR distribution and many other parameters. GE MeterManager enables you to email these reports, on a regular programmable interval, to the needed parties, upload them to an FTP location, and/or save them in various file formats for additional processing (see 18.2.3.14: Report Exporter, on page 18-47).

Additional important features of GE MeterManager are as follows:

- Set up scripts to automatically download meter logs, and export them to the Energy Aggregator application which uses the log data to generate usage and billing reports and analysis. Once activated, scripts run even if no one is signed onto the computer. In this way, GE MeterManager can retrieve logs from multiple meters automatically, according to the script's schedule, without your having to do anything once the script is set up. For more information on the GE Energy Aggregator application, see the *GE Energy Aggregator Instruction Manual*.

- Synchronize time for a group of meters or an individual meter. This is useful when a meter doesn't have other means of time synchronization, like NTP.
- Be alerted when a meter goes offline, to minimize meter downtime.
- Set up automatic log compression and backup for groups of meters or individual meters to manage data and improve processing. Archiving the log database before log retrieval allows you to have a database with only new data. See *18.3.2.1.2: Log Archiving for Meter* on page 18–25 and 18.3.1 *Configure Group Scripts* on page 18–76, for instructions on archiving log databases.

To open the GE MeterManager application, click **Start > All Programs > GE Applications > Meter Manager > Meter Manager Viewer** to open the GE MeterManager Monitor screen. The MeterManager Monitor screen has two main screen views: **Meter List** and **Scripts Status**. These are explained in the following sections.

18.1.1 Installation Requirements

This section explains the requirements for:

- System resources, for the full usage of the GE MeterManager and GE Energy Aggregator applications installed and run together, on a single computer - recommendations for optimum usage are given (see "System Requirements" on page 1-2, for supported operating system versions).
- The PostGreSQL database server version 9.5, which is the version of the database server used by GE MeterManager and GE Energy Aggregator software.

Optimum System Resource Requirements for GE MeterManager and GE Energy Aggregator Software (Concurrently, on One PC)

Storage: The storage requirements for running and storing meter data and reports depends on a number of factors. The majority of these factors are affected by the number of meters in the system. Items that are stored consist of:

- Reports
- Meter Log Databases
- Retrieval Logs
- GE Energy Aggregator Databases
- Internal Logs

Storage requirements are given in the following table.

		Years		
Meters	**Locations**	**1/12**	**1**	**5**
10	1	23 MB	273 MB	1,365 MB
10	10	24 MB	282 MB	1,412 MB
100	10	195 MB	2,345 MB	11,727 MB
100	50	199 MB	2,387 MB	11,934 MB
100	100	203 MB	2,439 MB	12,193 MB
500	10	960 MB	11,515 MB	57,574 MB
500	100	967 MB	11,608 MB	58,040 MB

		Years		
Meters	**Locations**	**1/12**	**1**	**5**
500	500	1,002 MB	12,023 MB	60,113 MB
1000	10	1,915 MB	22,977 MB	114,883 MB
1000	200	1,931 MB	23,173 MB	115,867 MB
1000	1000	2,000 MB	24,002 MB	120,012 MB
2000	50	3,828 MB	45,941 MB	229,707 MB
2000	200	3,841 MB	46,097 MB	230,484 MB
2000	2000	3,997 MB	47,962 MB	239,810 MB

System: The amount of system resources needed for running the various components of the system depends both on the specific configuration of the system and on how it is being used. The majority of system usage occurs during log retrieval, importing data into the Energy Aggregator application, and generating reports. The different usage loads are as follows:

- **Idle**
- **Viewing**: Each GE MeterManager Monitor, Energy Aggregator Settings Editor, and Energy Aggregator Dashboard Viewer that is open, puts a load on the system, due to the functions of reading data from the database and refreshing the UI. The primary system usage is by the CPU, and it is caused by refreshing the UI. These open components (monitor, editor, dashboard) also occur in parallel, so their usage can result in cumulative loads on the system.
- **Retrieval**: Retrieval of meter logs involves downloading the meter data and converting it to a local file database. This occurs at the retrieval interval specified by the user. These functions also occur in parallel, so they can result in cumulative loads on the system. A large amount of disk usage occurs while the log databases are converted and data is being written to the local database files.
- **Importing**: Meter logs are checked every hour for new data to be imported into the GE Energy Aggregator database. If there is no new data, only regular viewing usage occurs. When new data is found, the peak load of Importing occurs. While importing, a large amount of network and disk usage occurs while the new data is written to the database.
- **Reporting**: Reports are checked every 12 hours. While checking, only regular viewing usage occurs. Once a month, multiple reports are generated for the various GE Energy Aggregator locations. At this time, the peak load of Reporting occurs. While generating reports, a large amount of disk usage occurs while data that needs to go into the reports is read from the database.

System requirements are given in the following table. The usage requirements that are shown should be considered the Peak usage (the highest values seen on a normal basis).

		Peak					
	idle	**viewing (per user)**	**viewing (10 users)**	**retrieval (per meter)**	**retrieval (10 meters)**	**importing**	**reporting**
RAM	50 MB	140 MB	1000 MB	60 MB	600 MB	150 MB	500 MB
CPU (one thread)	0.24%	40%	400%	100%	1000%	150%	100%
Disk	2 kB/s	40 kB/s	400 kB/s	3,000 kB/s	30,000 kB/s	7,500 kB/s	3,000 kB/s

CPU: The CPU usage is given as a percent across the entire system, and can vary based on the number of threads (which determine how the CPU handles multiple software processes). For example, with 10 viewers, there are 11 softwares running, resulting in a cumulative usage of 400%. If there are 16 threading contexts, then each will only see a usage peak of 40% (with 5 contexts free for other tasks). However, if only 4 threading contexts are available, each will be loaded with 100% usage. See the Recommendations section, which follows.

Usage overflow: RAM, CPU, and Disk rely on each other, and overflowing one can lead to increased usage on the others. The numbers given above are dependent on enough free usage/space to accommodate the given tasks.

Other System Usage: If there are any other tasks running on the system at the same time (such as other applications), these can take system resources away from GE MeterManager and GE Energy Aggregator software, which will cause all tasks to run more slowly.

Computer Resources Recommendation:

Disk Space	1 TB
CPU	4 core, 3 G Hz: Preferably Intel® I7 or greater
RAM	16 GB
Disk Throughput	200 MB/s

CPU: As multi-threaded systems, GE MeterManager and GE Energy Aggregator software can benefit from multiple CPU cores and threading contexts. It is recommended that the CPU have at least 4 cores and 8 threading contexts (for example, the Intel I7 processor).

Disk Throughput: The greatest load on the system is reading from and writing to the databases on the disk. Because the entire system relies on reading from and writing to the disk, a slow disk will cause the entire system to run slowly. Under peak load, 50 MB/s can be read/written to the disk, so it is recommended that a High Performance Hard-Drive, such as a Solid State Drive, be used for database storage.

NOTE

- This system is complex and runs multiple, simultaneous tasks. It is important to NOT try to run the system on less than capable hardware.
- The Meter Log Retrieval and Report Generation components of the software have heavy usage requirements when running. For an optimal system, it is recommended that GE MeterManager be run on a dedicated server, reserved solely for that purpose.

PostGreSQL Version 9.5 Requirements

PostGreSQL server version 9.5 requires a 64-bit operating system. Chapter 1 contains details about the GE MeterManager installation, including the PostGreSQL server 9.5 installation/upgrade. Note that version 9.5 is not supported by most computers running the Windows® XP operating system. See "Instructions for Remote Desktop Host Server" on page 1-4, for information on how to handle this situation.

Storage Space - To upgrade the database from 8.4 to 9.5, enough space must exist on the hard drive for both databases to exist simultaneously, which is slightly more then double the size of the 8.4 database. Before upgrading, make sure this space is available on the destination drive. The installer will warn you if there might not be enough space.

18.2 Meter List

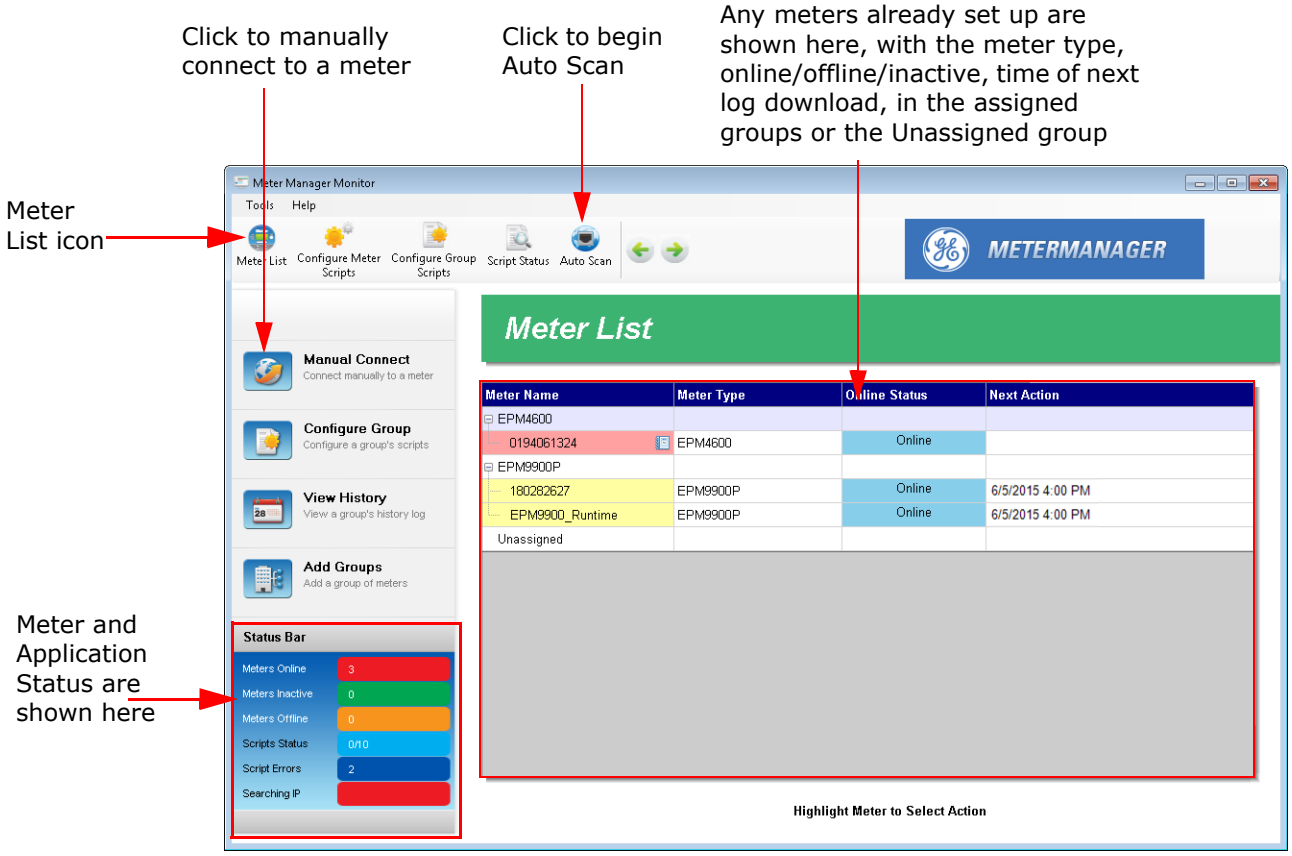
The Meter List is the main launchpad location and it gives you a central location where you can add and group your meters so that you do not need to connect to each meter individually to perform tasks, such as:

- Viewing meter status
- Configuring meters and groups of meters
- Connecting to a meter to view real time data
- Viewing meter logs, waveforms, or events
- Configuring automatic reporting
- View communication status/history for network and meters

NOTE

Note that GE MeterManager also has a feature that lets you perform actions on multiple meters at one time. See "Search Meters" on page 18-110 for an explanation of Meter Search and its features.

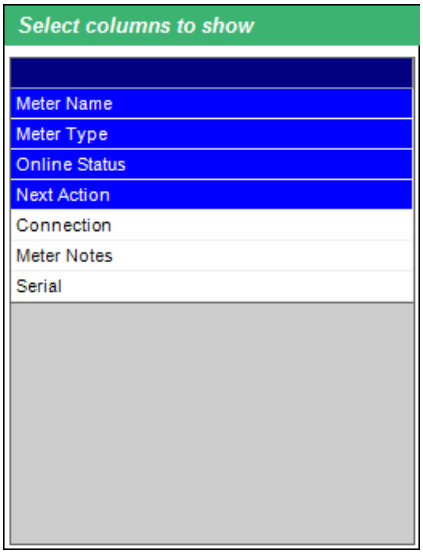
The first screen you see when you open the GE MeterManager application is the Meter List screen. (To return to the screen from another screen, click the Meter List icon.)



- If you have already added meters to the list, they are displayed in the middle of the screen, in the groups to which they have been assigned; or if they are not assigned to a group, then in the **Unassigned** group.

- You can move a group to the top of the meter list by right-clicking on the group name and selecting **Favorite Group** from the sub-menu. The group will move to the top of the list and display a star next to its name.
- You can remove a group by right-clicking on the group name and selecting **Remove Group** from the sub-menu.

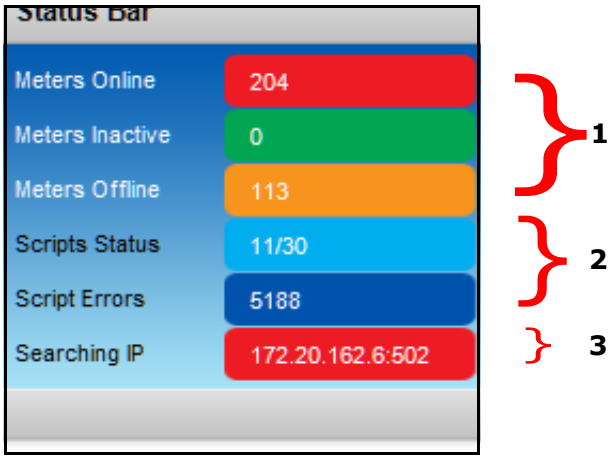
- For each meter in the screen, information is displayed in the screen columns. The columns that display when you first start the application are the default. You can change the fields that are displayed by right-clicking in the **Title** field where Meter Name, Meter Type, etc., are written and clicking "**Select Columns to Show**." You will see this menu.



- The fields already showing are highlighted in blue. Click on any fields that are white to display them in the Meter List screen. If you want to remove a field that is already showing, click on it. The line will change from blue to white.
- When you are done, click outside of the menu to close it.
- You can move the columns around by clicking on the title and moving them left or right.
- You can resize the columns by clicking on the lines dividing them and pulling out or in with your cursor.
- The available fields are:
    - **Meter Name** - the name assigned to the meter during Device Profile configuration.
    - **Meter Type** - the meter's type, such as EOM 9900P.
    - **Online Status** - whether the meter is Online or Offline.
    - **Next Action** - whether a script for the meter is running, or if not running, when the next script action for the meter is scheduled.
    - **Connection** - the IP address at which the application is connecting to the meter.
    - **Meter Notes** - any notes that have been entered for the meter (see "Add Meters to Meter List Manually" on page 18-18, for instructions on adding meter notes).

- **Serial** - the meter's serial number.
- **Software Option** - the meter's current Software Option (this can help you easily locate meters that need to be updated to a higher software option).
- **Firmware** - the current firmware version (this can help you easily locate meters that need to be updated to a later firmware).
  NOTE: This column shows the most important firmware for the meter, which is also more likely to have newer versions. There are other, specific firmware columns you can choose to view (e.g., Boot Firmware, DSP Run firmware) which can be chosen if those are more relevant to you.

- You can choose to sort a group of meters by one of the columns, by left-clicking the column header. This lets you sort through large groups of meters more quickly. For example, to find all meters within a group that are offline, left-click in the Online Status column to sort the meters by their status, and allow you to easily see which meters are offline.
- The Status Bar, located on the bottom left of the screen, tells you the number of meters offline/inactive/online (1), how many scripts are active and if there are any script errors (2), and if an Auto Scan is active, the IP Address that is being currently searched for a meter(3).



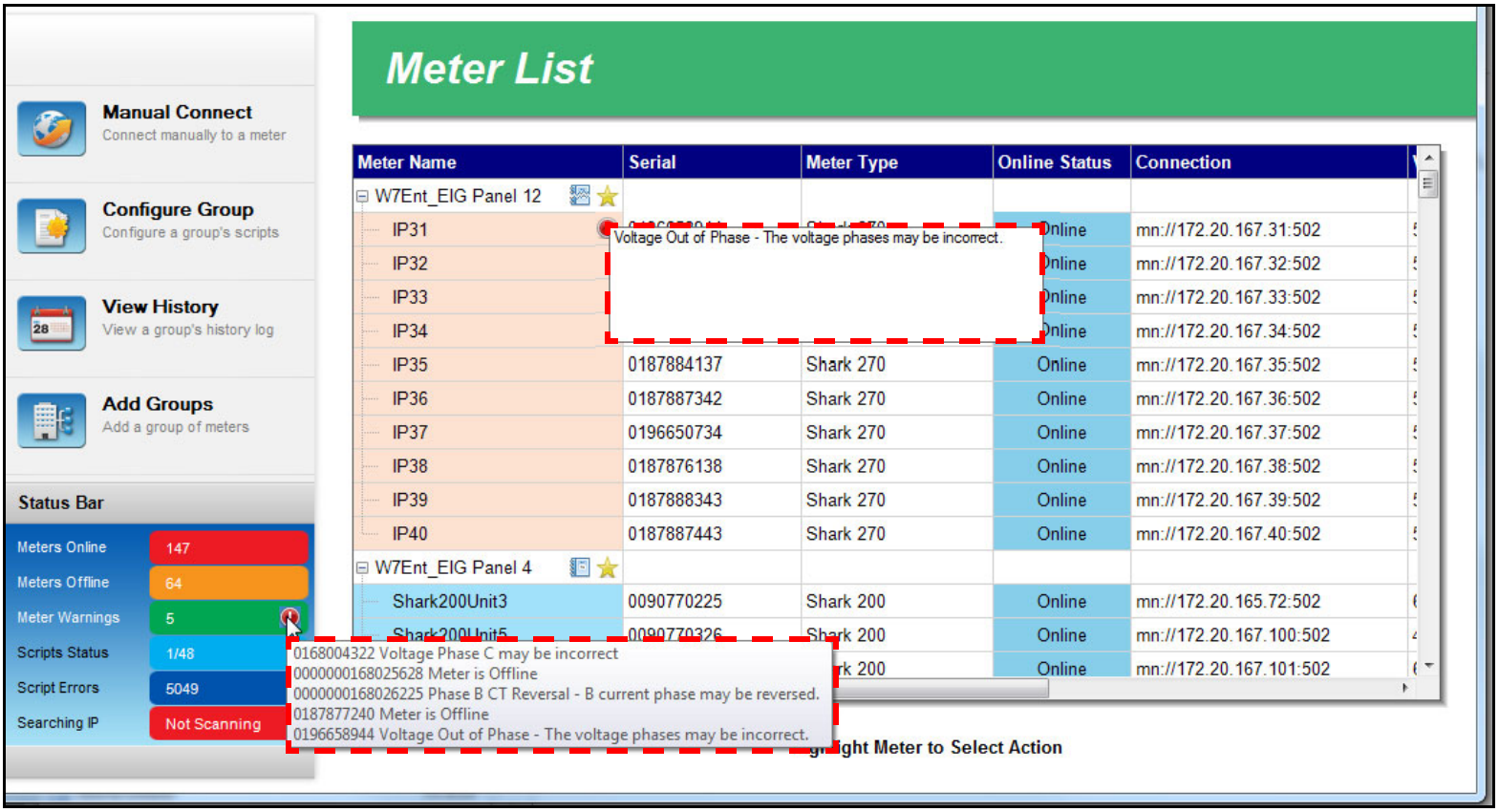
- A group or meter that has one or more report templates configured displays a "Report" icon next to the group or meter name. If a group or meter has a report template configured and the group or meter configuration was modified after the report template was created (for example, a group may have one or more meters added or removed), a "Broken Report" icon is displayed. See *Report Exporter* on page 18–39 for information on report templates.

Meter Name	Connection	Meter Typ
RetTest2		
128Mb_IP197	mn://172.20.166.197:502	Nexus 150
IP31	mn://172.20.167.31:502	Shark 270
Shark 270		
RK270	mn://172.20.166.5:502	Shark 270
Unassigned		
128Mb_IP199	mn://172.20.166.199:502	Nexus 150
N1500-32Mb_IP110	mn://172.20.167.110:502	Nexus 150

Broken Report Icon

Report Icon

- GE MeterManager software performs meter setup verification. If there is a possible problem with a meter, i.e., it is offline or there is a possibility of a wiring issue, an exclamation point is displayed next to the meter in the Meter List. As shown in the screen below, if you move the cursor over the exclamation point next to the meter, you will see a message about the possible problem, and if you move the cursor over the exclamation point in the Status Bar, you will see a display of all of the possible problems for the meters (note that the red, dashed lines are shown here for clarity - they won't appear on the screen).



NOTE

Meter setup verification doesn't provide a list of all problems that meters encounter. Specifically, it provides static issues, not transitory issues: if a meter is offline (a continuous problem) or there are wiring problems (which won't change until fixed) they can be reported, but bad timestamps detected in a meter's log (an issue with a specific record), for example, won't be reported.

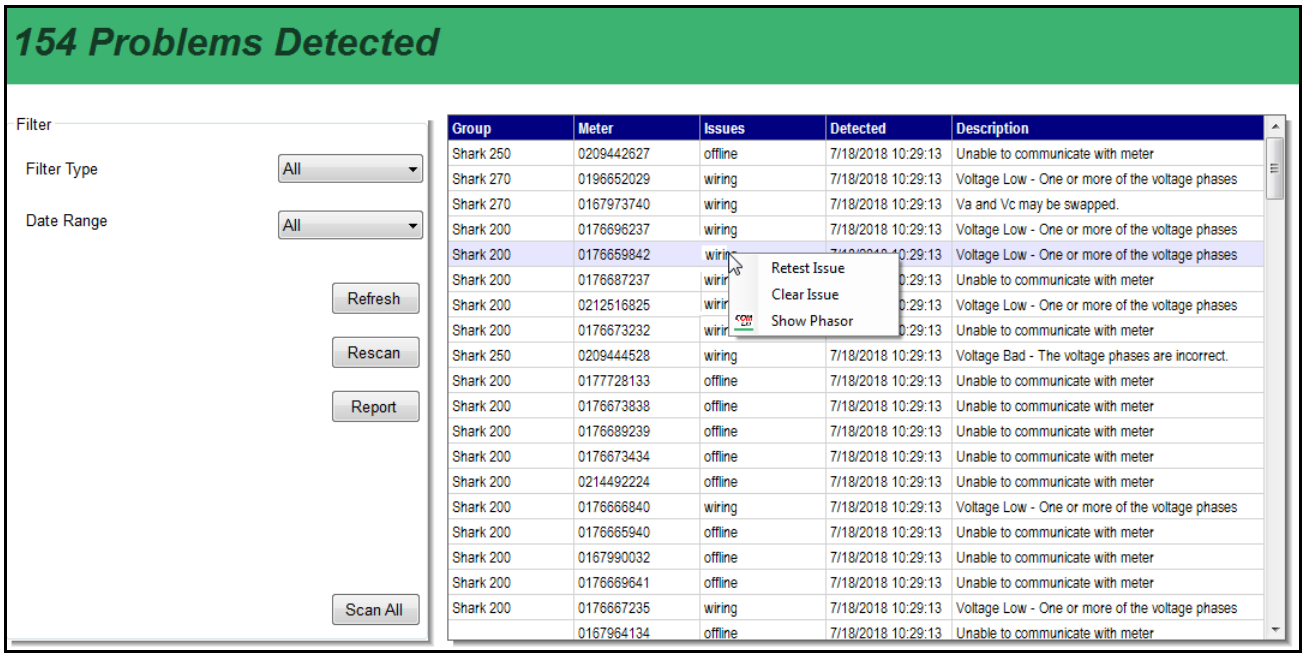
NOTE

Meters that are connected to a serial port are displayed as Offline.

- If you click on an exclamation point, a screen showing possible problems is displayed.

NOTE

You can also click the Meter Issues icon toward the top of the screen to display the possible problems screen.



Group	Meter	Issues	Detected	Description
Shark 250	0209442627	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 270	0196652029	wiring	7/18/2018 10:29:13	Voltage Low - One or more of the voltage phases
Shark 270	0167973740	wiring	7/18/2018 10:29:13	Va and Vc may be swapped.
Shark 200	0176696237	wiring	7/18/2018 10:29:13	Voltage Low - One or more of the voltage phases
Shark 200	0176659842	wiring	7/18/2018 10:29:13	Voltage Low - One or more of the voltage phases
Shark 200	0176687237	wiring	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0212516825	wiring	7/18/2018 10:29:13	Voltage Low - One or more of the voltage phases
Shark 200	0176673232	wiring	7/18/2018 10:29:13	Unable to communicate with meter
Shark 250	0209444528	wiring	7/18/2018 10:29:13	Voltage Bad - The voltage phases are incorrect.
Shark 200	0177728133	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0176673838	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0176689239	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0176673434	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0214492224	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0176666840	wiring	7/18/2018 10:29:13	Voltage Low - One or more of the voltage phases
Shark 200	0176665940	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0167990032	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0176669641	offline	7/18/2018 10:29:13	Unable to communicate with meter
Shark 200	0176667235	wiring	7/18/2018 10:29:13	Voltage Low - One or more of the voltage phases
	0167964134	offline	7/18/2018 10:29:13	Unable to communicate with meter

- The meters with possible problems are shown in the list on the right. For each meter, the Group, Serial Number, Issues (Offline or Wiring), the time the possible problem was detected, and the description of the possible problem are shown.
    - "Offline" means that the software is not able to communicate with the meter.
    - "Wiring" indicates that the voltage and current hookups may not be correct or the CTs may be reversed. The specific hookups that can be validated by GE MeterManager are 3 Element Wye and 2 CT Delta.
    - The meters that are supported for meter verification are: EPM 6000/6100/7000/7100/7000P/9700/9900/9900P meters.
- You can filter the possible problems you see by type (Filter Type - Wiring or Offline) and/or Date Range (Last Week, Last 2 Weeks, Last Month).
- If you right-click on a possible problem in the list, you can choose to retest the issue, clear the issue from the list (note that the issue will be shown again if the list

is recreated by a Refresh command or if GE MeterManager restarts), or show the Phasor diagram to analyze the issue. Note that the Phasor diagram is shown in GE Communicator software, and is only available if the meter is online.

- Click **Refresh** to reload the possible problems list.
- Click **Rescan** to rescan all of the possible problems in the list.
- Click **Report** to display the possible problems in a spreadsheet. The fields shown are Meter Name, Serial Number, Connection, Issue Type, and Description.
- Click **Scan** All to scan all of the meters in the system and generate a new possible problems list.
- The table below shows the possible warning messages.

Message	Meaning
General	
OK	Both voltage and current are correctly wired.
Not supported	Supports 3 Element Wye and 2 CT Delta, only.
Unable to communicate with meter	Meter is offline.
Voltage Low - One or more of the voltage phases has too low of an RMS value.	Below 5 V secondary
Current Low - One or more of the current phases has too low of an RMS value.	Below 0.05 A secondary
Phase A CT Reversal - A current phase may be reversed.	Current phase 180°± 45 of the voltage phase.
Phase B CT Reversal - B current phase may be reversed.	Current phase 180°± 45 of the voltage phase.
Phase C CT Reversal - C current phase may be reversed.	Current phase 180°± 45 of the voltage phase.
3 Element Wye	
Current Out of Phase - The current phases may be incorrect.	Current phase ±45° from corresponding voltage.
Voltage Out of Phase - The voltage phases may be incorrect.	Voltage phase 120°± 5 apart.
2 CT Delta	
Voltage Phases A-C Swapped - Two of the voltage phases may be swapped.	Vab 60°± 5 from Vcb
Voltage Phases B-C Swapped - Two of the voltage phases may be swapped.	Vcb 60°± 5 from Vab
Voltage Phase C may be incorrect.	Vcb 60°± 5 from Vab
Current Phase A Bad may be incorrect.	Ia must be -30°±45° from Vab.
Current Phase C Bad may be incorrect.	Ic phase must be +30°±45° from Vcb.

The next sections explain how to add meters to the Meter List and how to assign them to groups.

18.2.1 Set Up a Meter List

You add meters to the Meter List in one of two ways:

- Automatic Connect Using Auto Discovery - This is the simplest method. In this mode the software searches out and locates any meters on the network. Once the meters are found, they are automatically added to groups (based on the meter type), and the software automatically begins to download stored meter data.
- Manual Connect (Manually adding meters) - In this mode, you manually connect to the meter using its IP address. Once the address is entered, the software adds it to a group (based on the meter type), and automatically begins to collect stored meter data for that meter.

18.2.1.1 Add Meters to the Meter List Using Auto Discovery

There are four methods to configure Auto Discovery. Use whichever one best suits your needs.

- **Auto Scan** - searches an IP range you enter for network meters and adds them to the Meter List.
- **Meter Discovery Configuration** - gives you access to additional settings for customizing scanning for meters.
- **Network Scan** - use this feature to perform parallel network scans for meters - see "Manual Network Scan" on page 18-105, for instructions. This feature scans large groups of Network IP ranges for high-speed discovery of meters.
- **Manual Entry** - manually signing on to the meter automatically puts the meter on to the Meter List.

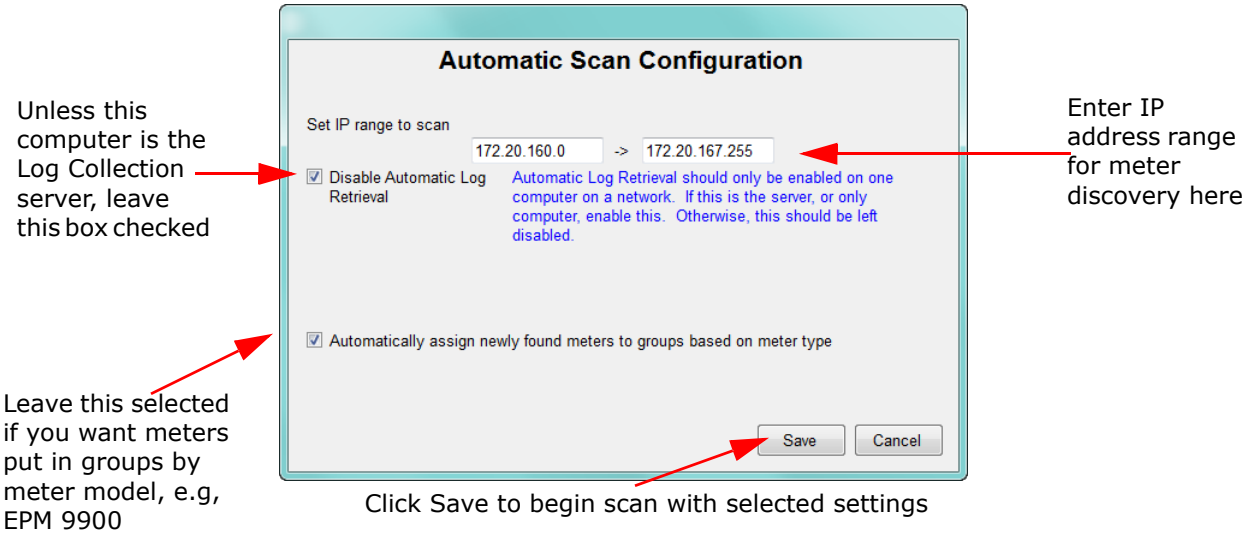
18.2.1.2 Add Meters Using Auto Scan

When you use Auto Scan, the application looks for and adds Network meters in the IP address range you enter. This is an intentionally slow process in order to not use up network resources. You have the option of putting the meters into groups based on meter type, e.g., EPM 4600, EPM 9900.

NOTE

The first time you start the GE MeterManager Monitor after installation, you are asked if you want to enable Auto Scan. Enabling Auto Scan is recommended.

1. Click the **Auto Scan** icon at the top of the screen.



2. In the **Automatic Scan Configuration** screen, you set:
   - The **IP range** in which you want the application to search for meters: the starting and ending IP addresses.

NOTE

EPM meters use Modbus for communication, which defaults to Port 502. However, if you have changed the Modbus port on the meter, or are using a network device that changes the port mapping, you can specify the port range to scan by adding ":[port]" after the IP address.

For example, range 192.168.0.1:503 to 192.168.0.255:505 will scan all IP addresses from 192.168.0.1 to 192.168.0.255, and attempt to connect to those IP addresses via ports 503, 504, and 505.

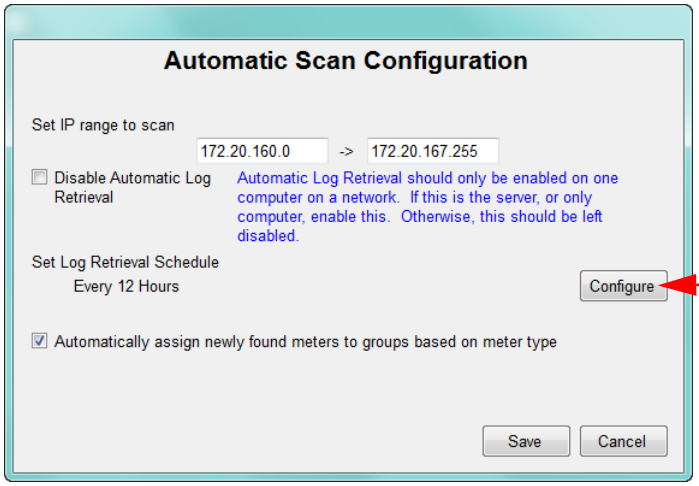
   - Whether or not meters are grouped by meter model. Leave the checkbox selected to group any discovered meters this way, for example, into EPM 4600 or EPM 9900 groups. Groups are used to perform tasks on multiple meters at one time. See 18.2.2 *Meter Groups* on page 18–20 for more information.

NOTE

Any combination of groups can be created, and the user can assign any of the meters to any group. Though the default grouping is by meter type, so that it is easier to locate meters within the meter list once they are found, the meters in a group do not need to be the same meter type.

   - Disable automatic log retrieval - the default of this screen is that automatic log retrieval is disabled for the computer (the box is checked). That is because only one computer in the network - the server, should be enabled for automatic log retrieval.
     - If this computer is not the Log Collection server, leave the box checked.

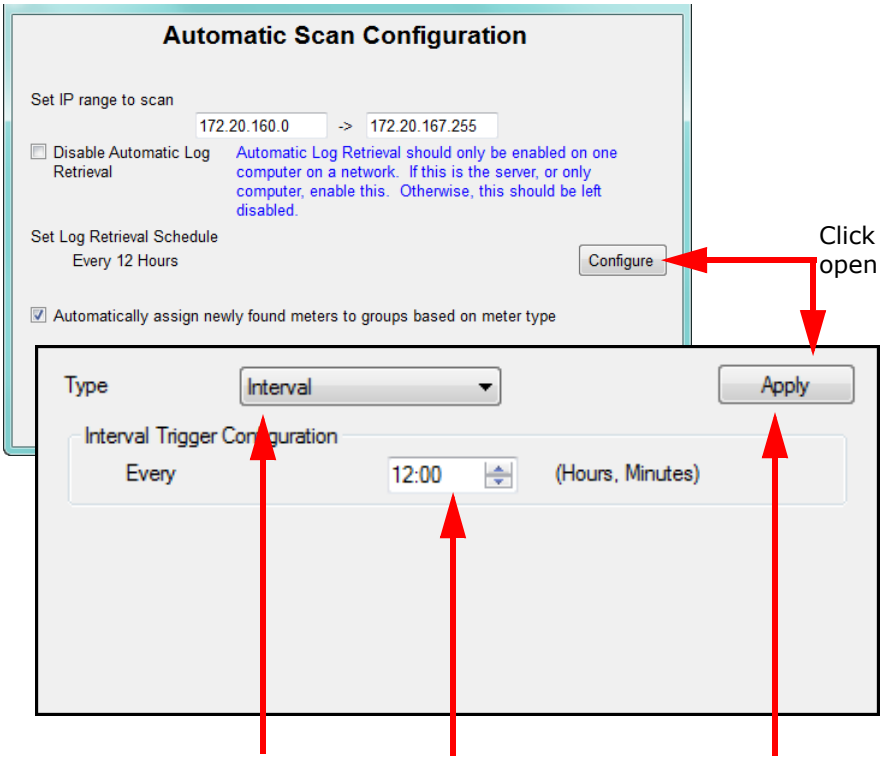
- If this computer is the Log Collection server, click on the box to uncheck it - the screen will change as shown below.



Click to set up a log retrieval interval of other than every 12 hours (not recommended)

- Now that you have enabled automatic log retrieval for the computer, you can set the log retrieval interval. The default is every 12 hours, which is the recommended setting. If you want to change the interval, click the Configure button and then enter the new interval. See the example screen on the next page.

Changing Log Retrieval Interval screen



Click Configure to open this screen

Click to select: Interval - to set up interval log retrieval; Time - to set a specific log retrieval time; or Manual - to perform a manual log retrieval, e.g., to test the system

Click to set interval for log retrieval

Click Apply to save the new interval

3. Click **Save** to begin the automatic scan for meters with these settings. In the **Searching IP Address** field of the **Status** section, the Meter List screen will show the IP addresses as the application searches for meters.

   When searching is complete, the discovered meters will be shown in the Meters List.

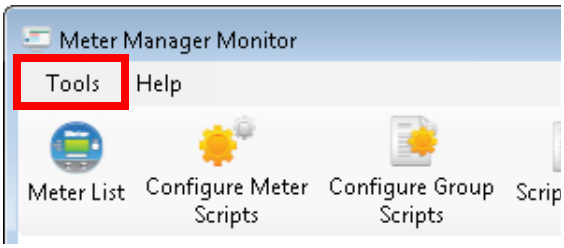
NOTE

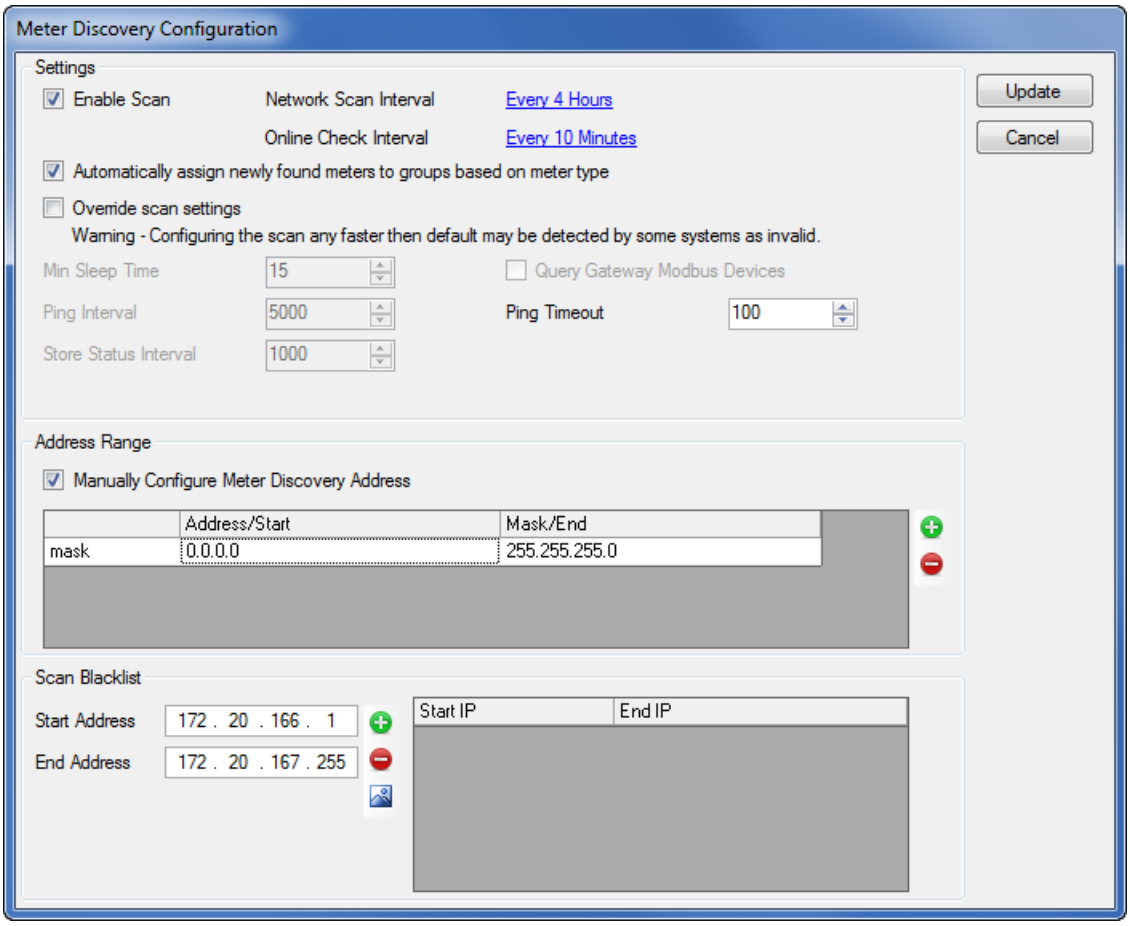
Any IP address that is on the Blacklist will not show up in the auto search (see the next section for information on the scan Blacklist).

18.2.1.3 Add Meters Using Meter Discovery Configuration

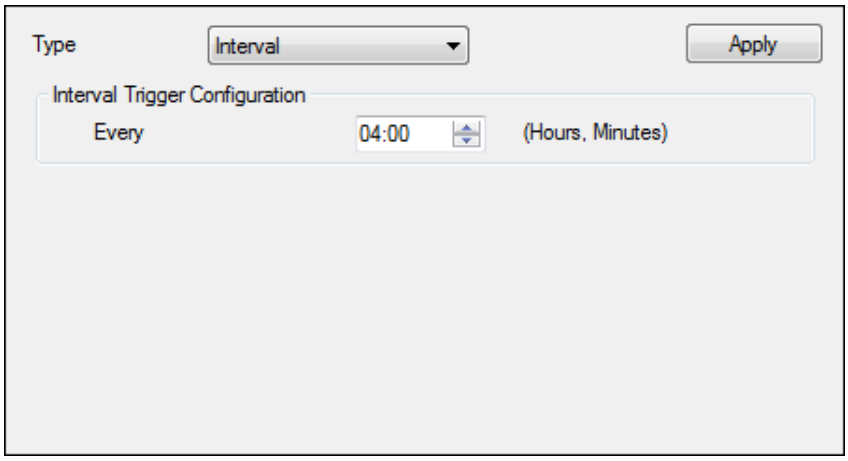
Meter Discovery is a more advanced method of finding meters. It allows the user to specify multiple IP ranges and to block ranges that should not be scanned. Meter Discovery configuration gives you added flexibility compared to Auto Scan, since you can specify this additional criteria for Auto Discovery.

1. From the GE MeterManager Monitor menu bar, click: **Tools > Configure > System > Meter Discovery**.



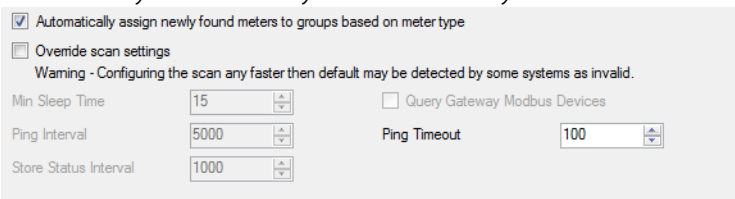


2. The entry fields are:
   - **Enable Scan** - click the checkbox to toggle between enabling and disabling Auto Discovery - when the box is checked Auto Discovery is enabled; when it is empty, Auto Discovery is disabled.
   - **Network Scan Interval** - this setting determines how often the network is scanned for new devices. Because new devices are not added frequently, and a scan can take time to complete, this interval should be kept at not less than 4 hours. Click on the underlined field (Every Four Hours) to open a screen that lets you adjust the time (see the screen beneath the Online Check Interval explanation, below).
   - **Online Check Interval** - this setting determines how often meters which have already been discovered are checked to see if they are still online. Click on the underlined field (**Every Ten Minutes**) to open a screen that lets you adjust the time.



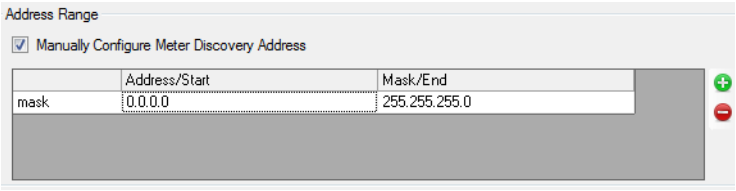
     - Choose type from the pull-down menu. The choices are:
       - **Interval** - this is the default. Use the up and down arrows in the time field to set the hours and minute values you want.
       - **Time** - select this if you want to set a specific time of the day, week, or month for the scan or online check. Fields open which let you specify the time you want the scan or online check to occur.
       - **Manual** - select this to force a scan or online check right away.
     - Click **Apply** to implement your settings.
   - **Automatically assign newly found meters to groups based on meter type** - only uncheck this box if you don't want meters assigned to meter type groups, when they are discovered. If that is the case, the software will assign all meters to one location, regardless of their type.
   - **Override scan settings** - The default of this setting is disabled (the setting checkbox is empty/unchecked). Disabled is the recommended setting since even

though changing the settings in this section may improve scan speed, if settings are too fast they can be seen by some anti-virus systems as a malicious attack.



- **Min Sleep Time** - this setting determines the minimum time between each action taken by the scanner, in milliseconds.
- **Ping Interval** - this setting determines the minimum time between each IP address to be tested, in milliseconds. Do not set this value to less than 5 seconds.
- **Store Status Interval** - this is an internal setting that updates the status of the meter search. There is no reason to edit this value.
- **Query Gateway Modbus Devices** - by default, the Discovery Scan only finds meters attached to the network. If you have meters behind a Modbus Gateway, enabling this setting can be used to find these meters. However, as this greatly slows down the scan, it is recommended that gateway devices be manually added through the GE Communicator application.
  When you connect to a meter via the GE Communicator application's Quick Connect (see Chapter 3 “Connecting to a GE Meter” for instructions), a successful connection will be added to the Meter List. If the meter is new, it will be listed under the "Unconfigured" group. Otherwise, the connection last active will be updated for the meter.

- **Address Range** - this setting specifies the range of IP addresses to scan.



- If the **Manually Configure** box is not checked (this is the default setting), the Discovery Scan automatically scans the entire Local Area Network (LAN) accessible from your computer, as specified by your Network Card's IP address and Network Mask.
- If you want to enable manual configuration of the Discovery Scan, click in the box so that it is checked. Now you can specify a list of IP addresses and ranges to scan in the table at the bottom of the screen.

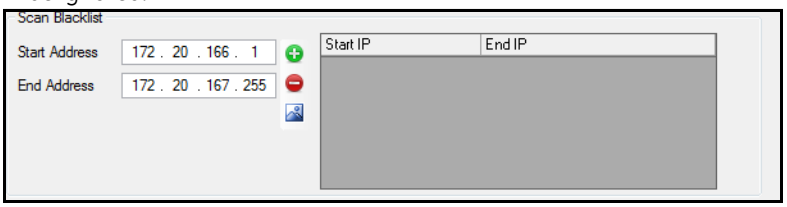
  ▷ To add a range to the table, press the green plus icon (+) on the right of the table; to remove a range from the table, press the red minus icon (-) on the right of the table.

  ▷ Click in the first field on the left to choose either range or mask.

  - Using a range is the simplest way to specify a scan address. You enter a start and end IP address for each range.
  - To use a mask for the scan, you specify a base IP address and a network mask, to specify the range of accessible IP addresses.

The scan will look for all meters within the network mask, beginning with the base IP address.

- **Scan Blacklist** - this setting lets you eliminate (blacklist) certain IP addresses from meter discovery. Once configured, the blacklist is used by both the Manual Network scan, and the Automatic Network Discovery. Each address in the Blacklist ranges will be ignored.



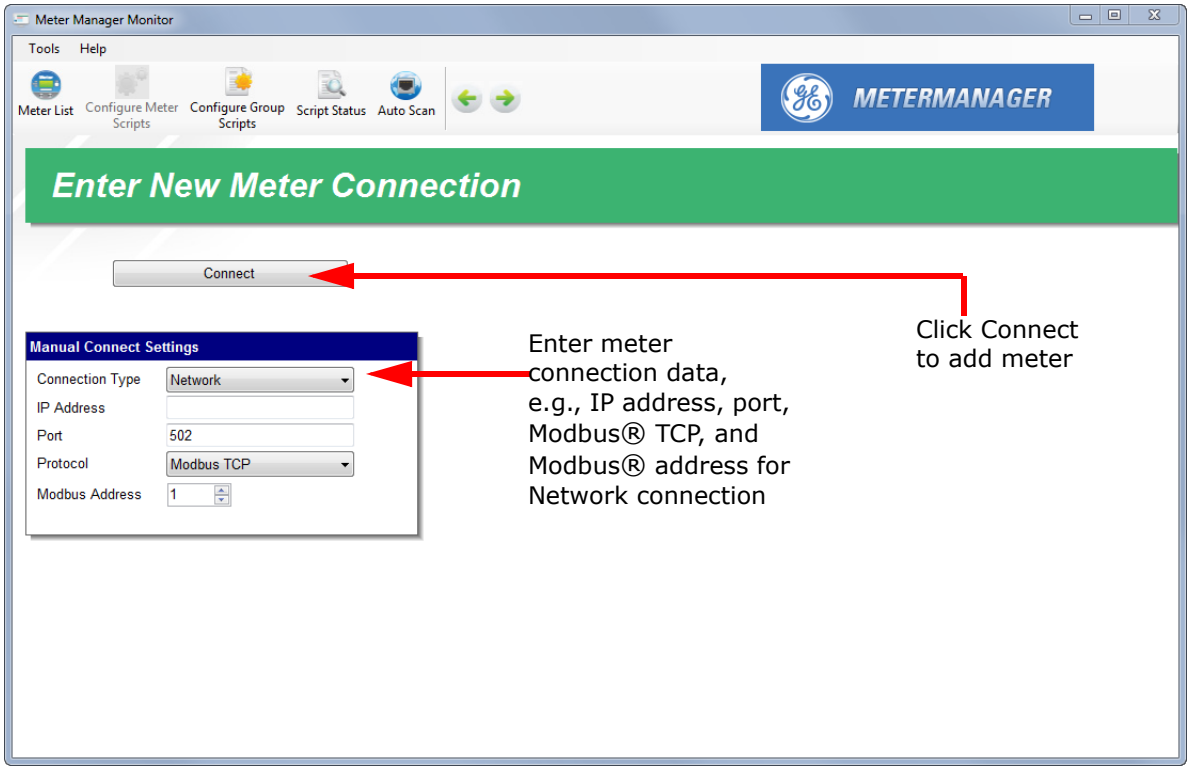
  - To add an IP address range to the blacklist, enter the start and end IP addresses, and click the plus button. The IP address range is added to the Blacklist box on the right.
  - To remove an IP address range from the blacklist, select the IP address range in the Blacklist box and click the minus button.
  - To clear the Blacklist box, click the clear blacklist button.

3. Click **Update** to save your settings. When the Discovery Scan is next run, any new meters will be added to the Meter List.

18.2.1.4 Add Meters to Meter List Manually

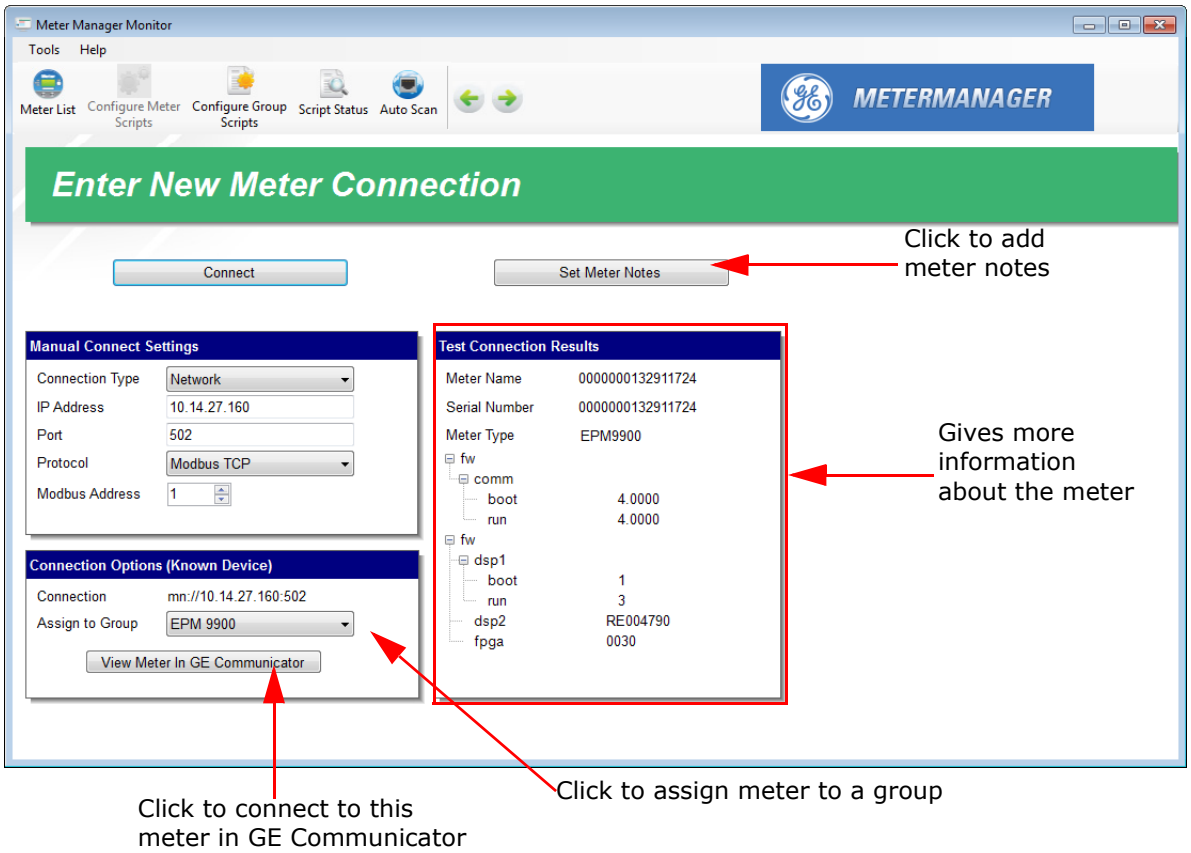
When you enter meters manually, you assign the meter to a group at the time you enter its data. Note that this method does not use the Blacklist, so you can use it to discover meters that are blacklisted from the auto scan.

1. From the Meter List screen, click Manual Connect on the left side of the screen. You will see the screen shown below.



2. Enter these settings:
   - Connection Type is Network
   - Enter the meter IP address
   - Enter the port, or leave the default port 502
   - Protocol is Modbus TCP
   - Enter the Modbus address using the Up and Down arrows: valid addresses are between 1 - 247

3. Click **Connect**.



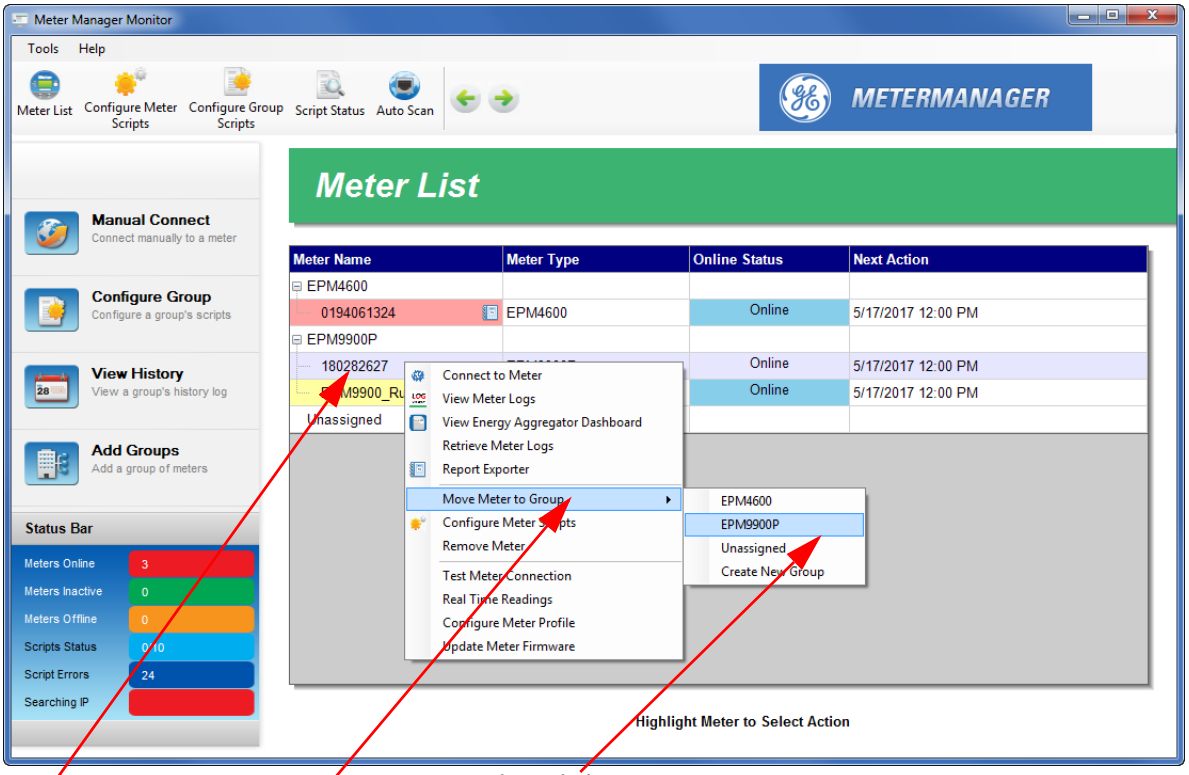
4. The screen now includes the following:
   - Information about the meter in the Test Connection Results box: meter name, serial number, type, and firmware versions.
   - The ability to assign the meter to a group in the Connection Options (New Device) box: click the pull-down menu and select from one of the already created groups, create a new group for the meter, or assign the meter to the Unassigned group if you are not ready to assign it to a group.
   - The option of opening the meter connection in GE Communicator, to configure meter settings, see polling screens, etc.
   - The options to add notes for the meter: click the **Set Meter Notes** button a screen where you can type notes for the meter. You can use this option to record information about the meter, e.g., location. The notes are saved with the meter and can be accessed later.
5. Click **Meter List** or use the green back button at the top of the screen to return to the Meter List screen.

18.2.2 Meter Groups

The GE MeterManager application groups meters together for ease of handling. Default groups are formed by meter type. Groups allow for performing tasks, such as log retrieval work on a selected group of meters all at once, allowing actions to be performed on a group basis. Groups may be customized to something more useful, for example, grouping by substation, location, or function.

To add an unassigned meter to a group or to re-assign a meter to another group, follow these instructions.

1. From the **Meter List** screen, right-click on the meter you want to assign.



Double-click or right-click on meter to assign it to a group

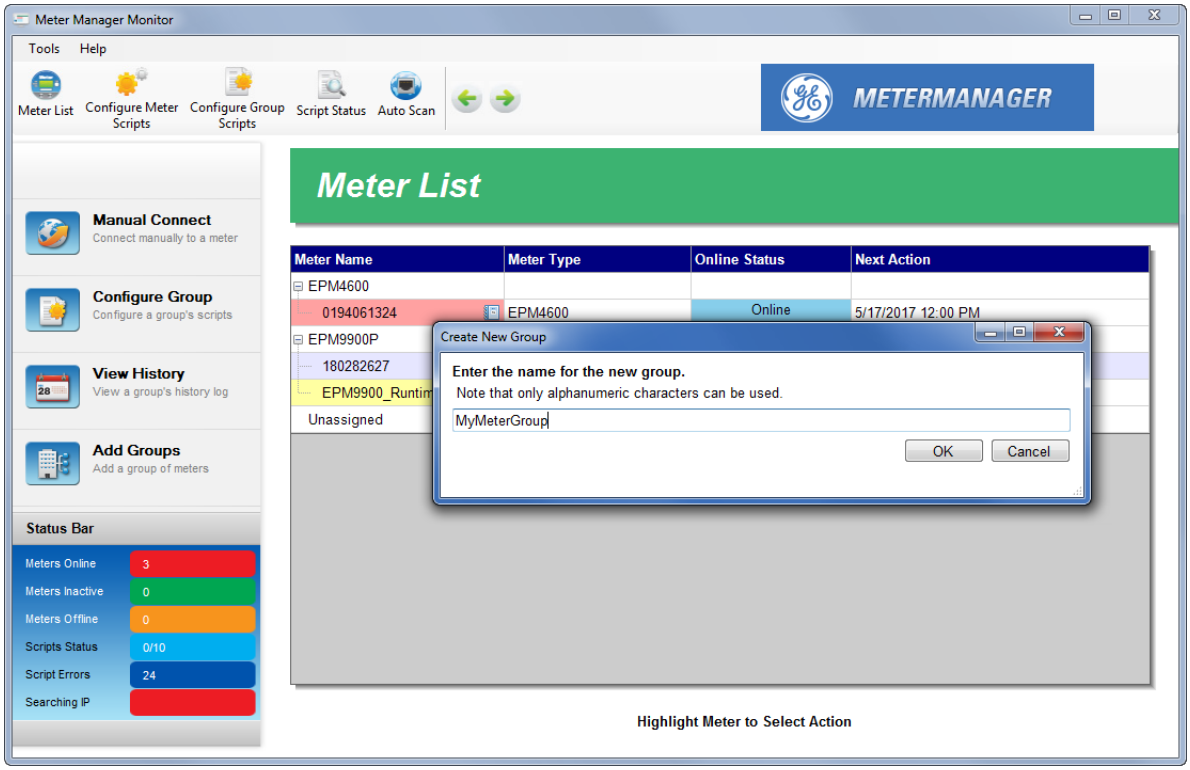
Click Move Meter to Group

Either click on a group in the list, or click Create New Group

You will see a sub-menu that lets you perform actions for the meter.

2. Move your cursor to the line **Move Meter to Group**.
3. Within the sub-menu, you can perform one of the following actions:
   - Click on a previously created group to move the meter to that group
   - Click **Create New Group** to create a new group.

4. If you choose to move the meter to an existing group, the screen will display the meter in its new assignment. If you choose to create a new group, you will see the following screen.



5. Enter a name for the group and click **OK**. You can then assign the meter to the new group.

18.2.3 Additional Meter Tasks

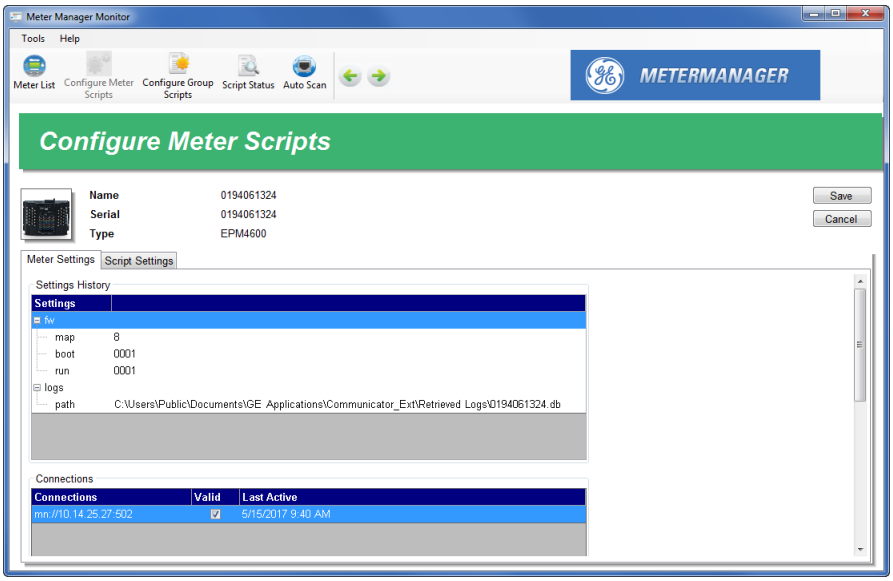
This section gives information about other tasks you can perform for the meters in the Meter List.

18.2.3.1 Configure Meter Scripts

Use the configure meter scripts feature to provide information about a specific meter, and to set security passwords for that meter so that GE MeterManager can successfully download data from the meter. Note that this feature is not used for general meter configuration (profile programming) - see the individual meter chapters for instructions on Device Profile configuration.You can view information about the meter settings and connections, see any problems with the meter, and set security and log retrieval options through the **Configure Meter Scripts** screen. You can also enable time synchronization for the meter, and you can override group log archiving settings for a specific meter.

1. Click on a meter in the Meter List and do one of the following:
   - Right -click and select **Configure Meter Scripts** from the menu

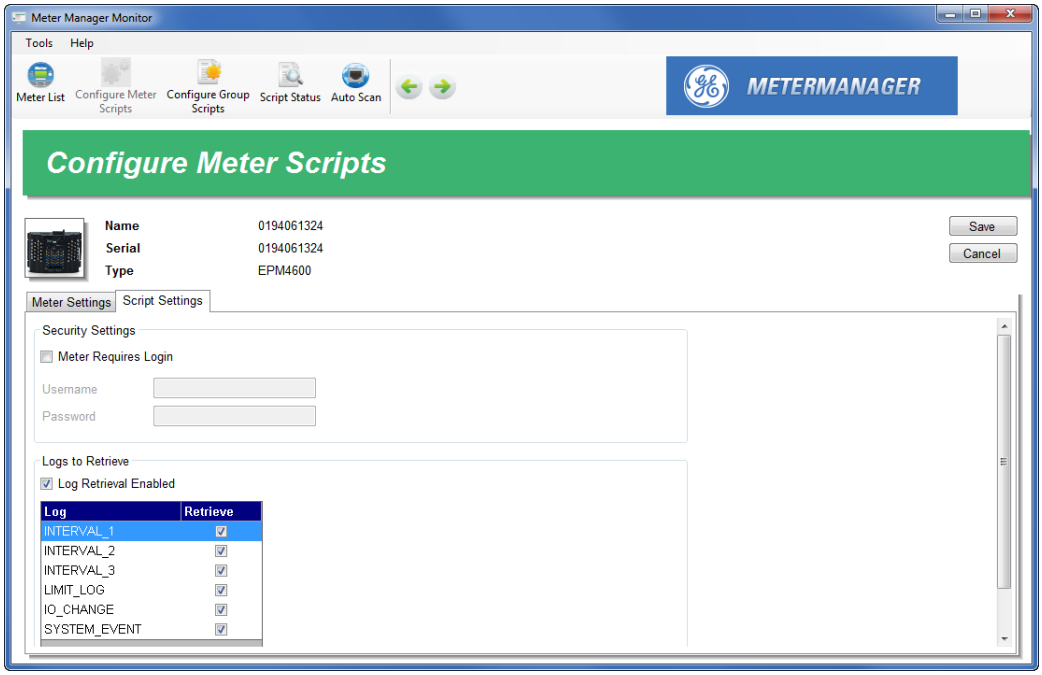
- Click the **Configure Meter Scripts** icon at the top of the screen



The top of the Configure Meter Scripts screen lists the meter name, serial number, and type, as well as an image of the meter type. The screen has three tab views:

- **Meter Settings** - this is the first tab you see when the screen opens. This screen gives you information on the settings history - firmware versions and log directory path, and connections for the meter, and the time each connection was last active, etc. You can only view information in this tab - you can't change anything.
- **Script Settings** (shown below)- this tab lets you set security settings and log retrieval.
    - If the meter requires the user to log in to retrieve logs, click the checkbox and enter the Username and Password. For meters which do not require user names, such as the EPM 9450/9650, you can enter anything in the Username field. Note that security is also used by the software time sync, and should be configured if software time sync is enabled.
    - You can uncheck the box next to any logs you don't want to retrieve, or uncheck the Log Retrieval Enabled box to disable all retrieving of the meter logs.
      The default GE MeterManager settings will download all data to the host server. This setting lets you limit that data. This is very important when collecting data from devices with large amounts of memory, such as the EPM 9900 meter, from which you may not want to archive all data on the host server. You can configure this for all meters in a group

- using the Configure Group Scripts screen - see 18.3.1 *Configure Group Scripts* on page 18–76, for instructions.

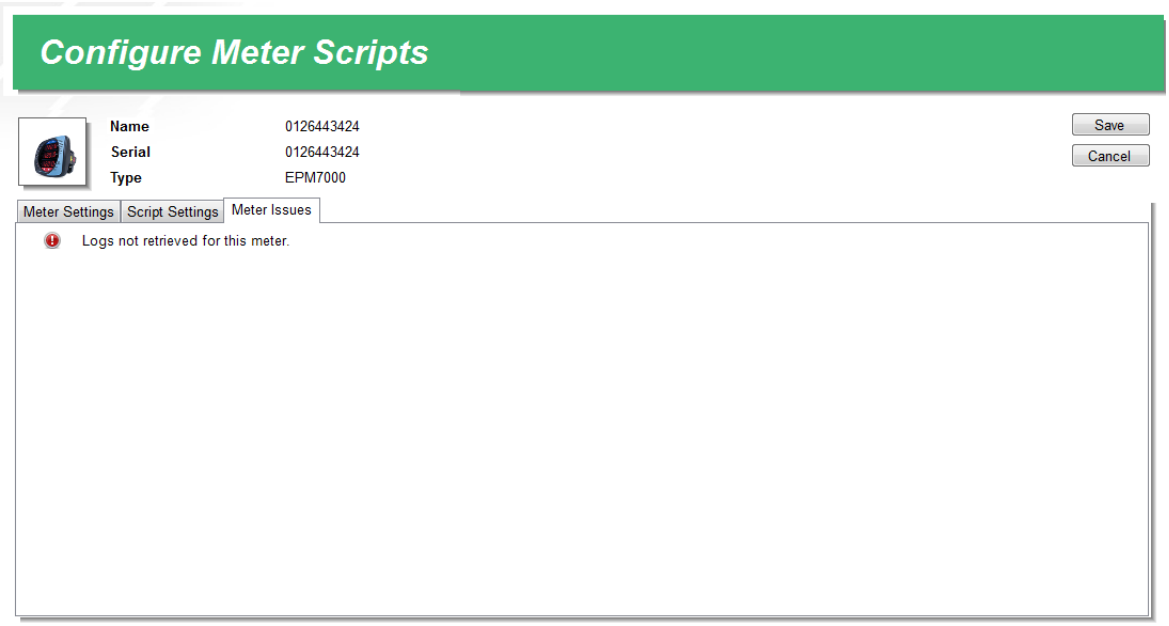


NOTE

If you make changes in this tab, be sure to click the **Save** button to save your changes.

- **Meter Issues** (shown below) - This tab lists any problems with the meter, for example the logs not retrieved as shown in the example screen.

  You can only view information in this tab - you can't change anything.



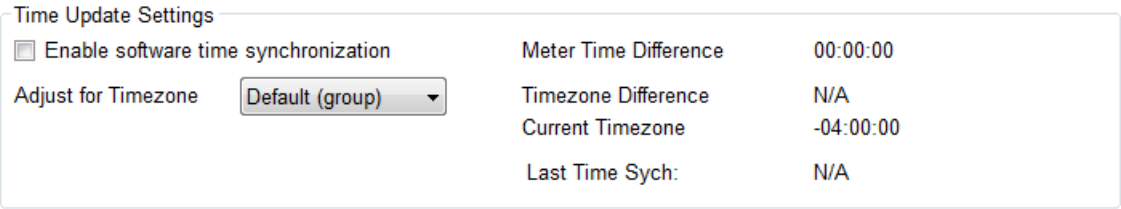
2. If you have changed anything in the **Script Settings** tab, click the **Save** button. Otherwise, click the **Cancel** button.

You will return to the Meters List screen.

18.2.3.1.1: Time Sync

As explained previously, Time Sync is available from the Meter Settings tab. The Time Sync feature allows for tracking the time difference of meters from the GE MeterManager server. When Time Sync is enabled, it also sets the meter's time when it drifts beyond a configured threshold. Meters which have software time sync enabled will be shown with a clock icon in the Meter List. Scanning the meter times is done automatically at one hour intervals - no configuration is required. To enable software time sync on a meter:

1. Scroll to the bottom of the Meter Settings tab.



2. In the **Time Update Settings** section, the most recently scanned meter time difference is displayed. It will be marked in red if this time is too far different.
3. Select E**nable software time synchronization**.
4. Select the Timezone offset from UTC, which is Coordinated Universal Time (UTC is the mean solar time at 0° longitude; and is the main time standard used worldwide to regulate clocks and time); or leave the Default, which is the same as the group setting (see "Configure Group Scripts" on page 18-76, for instructions on setting Time Sync for a group).

   The purpose of adding a UTC Zone descriptor is that the meter may not be located in the same timezone as the server. Thus, the server needs to know what the connect synchronizing time should be.

   The current timezone offset is listed, along with the adjustment factor (timezone difference), to assist in configuring the time. The Timezone Offset works by offsetting the PC time being compared against the meter.

PC Time	Meter Time	PC Timezone	Meter Timezone	Difference
2015/04/28 01:00	2015/04/28 01:01	-4	-4	00:01
2015/04/28 01:00	2015/04/27 23:01	-4	-6	00:01
2015/04/28 01:00	2015/04/27 23:01	-4	0	-05:59
2015/04/28 01:00	2015/04/28 05:01	-4	0	00:01
2015/04/28 01:00	2015/04/27 23:01	-4	disabled	-01:59

NOTE

- The UTC offset specified should be current daylight savings offset, if applicable. For example, for the eastern timezone of the United States, EST is -5:00, EDT is -4:00. If you are currently in Daylight Savings, specify -4, otherwise -5.
- The Allowed Time Drift is set in the System Options screen. See Section 18.4.2 for instructions.
- Only use Time Sync when other time synchronization options are not being used. For example, if you are using NTP or IRIG-B, do not allow time sync through this method.

- Time Sync is especially useful with EPM 7100 meters, which do not offer time sync through NTP. EPM 7100 meters equipped with an E1 card, on the other hand, offer NTP time sync.
- Time Sync will be disabled for 12 hours before and after the DST transition time for the PC's current regional settings, in order to prevent updating the meter's time while it is automatically updating for its own internal DST transition times.
- If security is enabled in the meter, you may need to enter login information - see step a on page 18-26.

18.3.2.1.2: Log Archiving for Meter

In order to manage the size of the databases created through log retrieval, GE MeterManager lets you set up automatic log archival for a group - see 18.3.1 *Configure Group Scripts* on page 18–76, for instructions. You can override the log archival group settings for a meter within a group. Once this option is enabled, the meter's log archiving limits set up here will automatically be checked before a log is retrieved for the meter. If one of the limits is exceeded, the log database(s) will be archived to a compressed file in the configured archived logs folder. The file will be named for the range of data it contains:

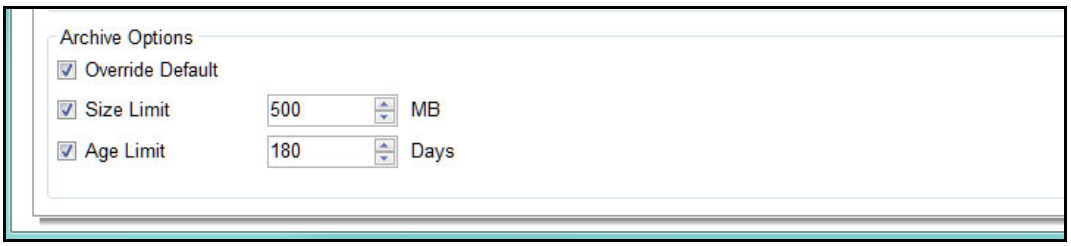
[metername]__[meterserial]\[metername]__[meterserial].[oldestdate]_[newestdate].zip

For example, if the MeterName was 1800ShamesDr, the Serial# was 0123995130, and the database contained log data from 2017/01/08 to 2017/08/25, the archive might be:

C:\Users\Public\Documents\Electro Industries\Communicator_Ext\Retrieved Logs\log_archive\1800ShamesDr__0123995130\1800ShamesDr__0123995130.20170108_20170825.zip

A record of the archive will be entered in the Retrieve Logs Script runlog for that group.

1. Scroll to the bottom of the Script Settings tab of the Configure Meter Scripts screen to see the Archive Options settings.



2. Click the Override Default checkbox to enable archiving for this meter which overrides the settings of the meter's group. Note that if you don't override the group settings for a meter, archiving for the meter will use the group's settings, which will be shown in the Size and/or Age Limits fields here.
3. Click the checkbox next to one of the limit options (Size Limit or Age Limit).
   - **Size Limit** - The log database will be archived if the file(s) size exceeds the limit entered here, for example 500 MB.

     For EPM 9900/9900P meters, this will be the largest database in the LOGS folder, not the sum of all of the databases.

NOTE

- **Age Limit** - The log database will be archived if the age since the first download of the log database exceeds the limit entered here, for example 180 days.

  For EPM 9900/9900P meters, this will be the oldest database in the LOGS folder.

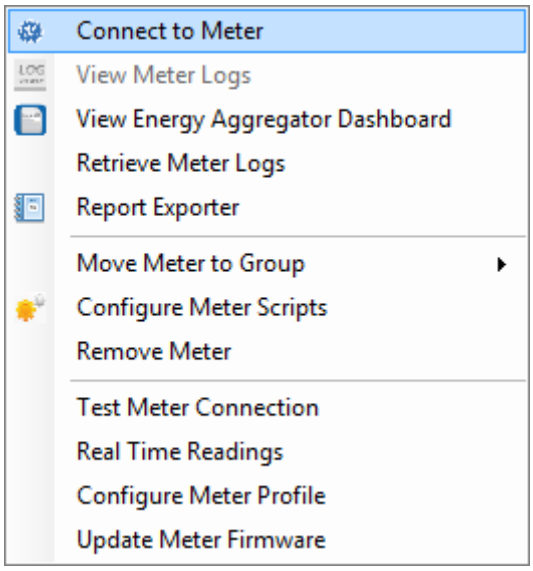
NOTE

- If you select both options, the first limit reached will trigger an archive. For example, if you select 500 MB Size Limit and 90 days Age Limit, and you reach the 90 days limit first, the log will be archived at that point.
- Note that if log archival is enabled for the group this meter belongs to, but you don't want archiving for this meter, click the checkbox to override the group settings and then leave the Size and Age Limits boxes unchecked. This will prevent the meter's logs from being archived.

18.2.3.2 Connect to a Meter

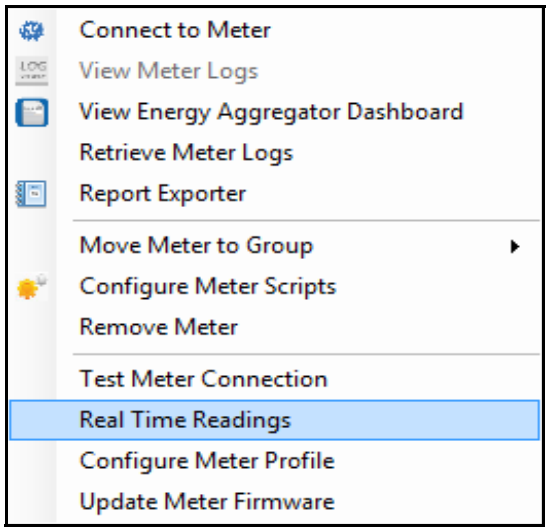
From the **Meter List**, you can connect directly to a meter in the GE Communicator application, to view real time data and/or configure the meter.

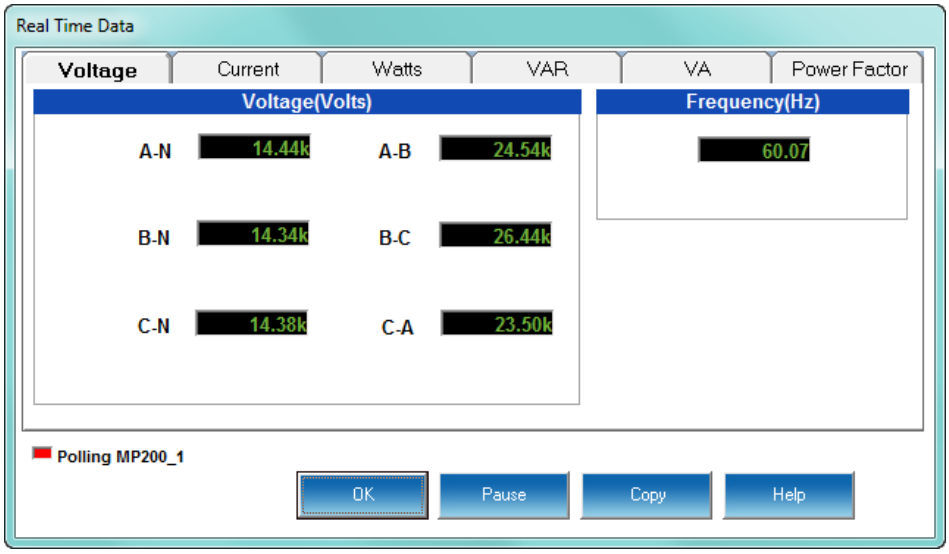
1. Double-click or right-click on the meter in the **Meter List** screen, and select **Connect to Meter**.



The GE Communicator application connects to the meter and opens at the Main screen. Refer to the other chapters in this manual for information on the tasks you can perform with the software. You can access the manual online by clicking **Help > Contents** from the GE Communicator Menu bar.

2. If you want to go directly to the poll real time readings screen to view power and energy readings, double-click **Real Time Readings** in the menu list. See the example screen below (from an MP200 metering system), and see 5.2.1 *Instantaneous Polling* on page 5–3, for a detailed explanation.

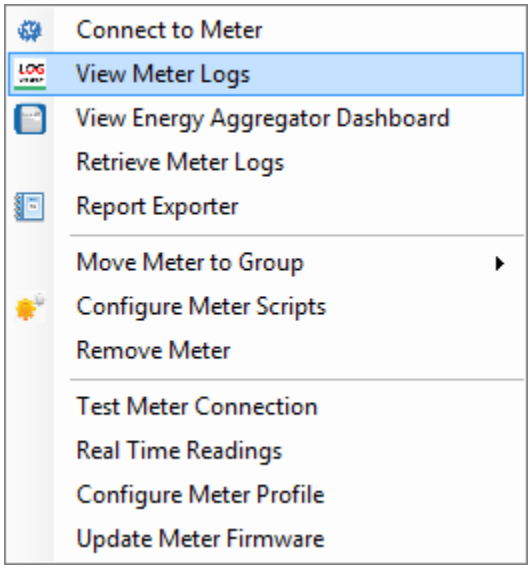




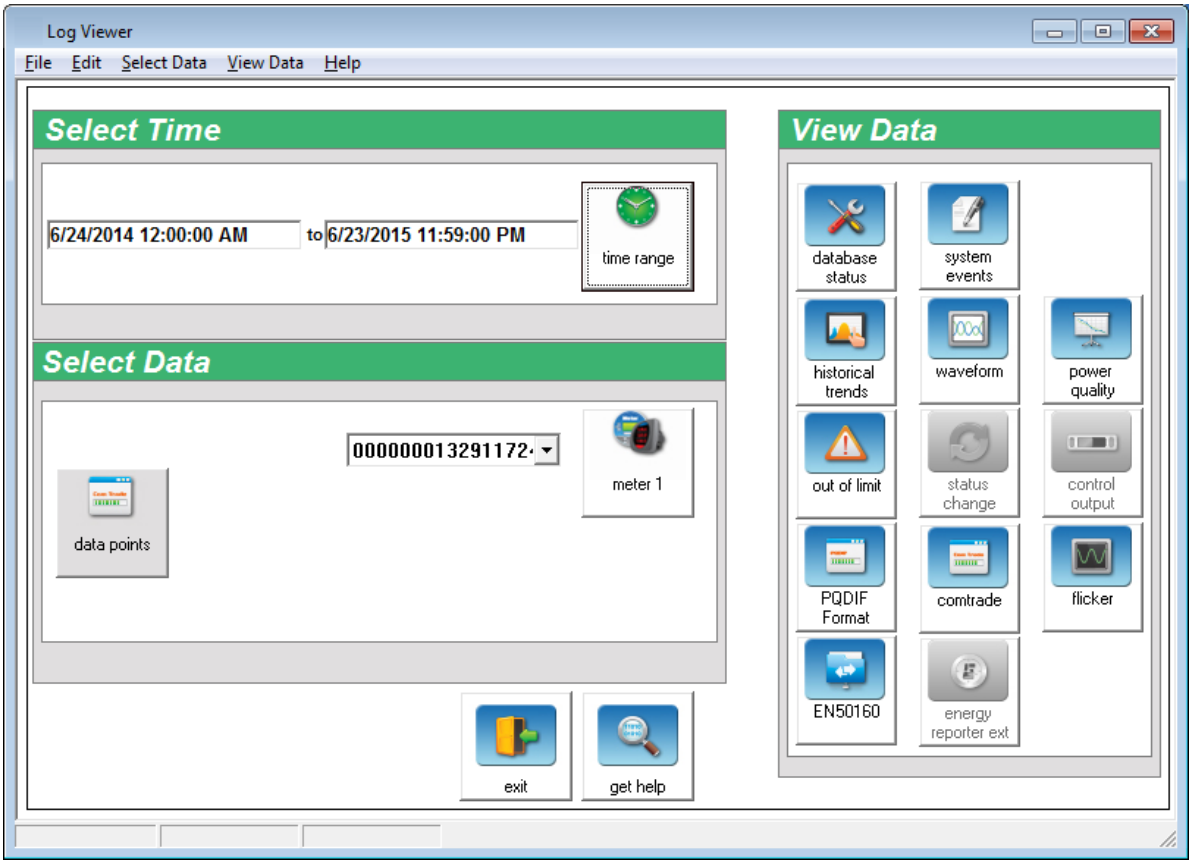
18.2.3.3 View Meter Logs

Meter logs are the log data stored in the meter that was automatically collected and brought into the software. They allow you to view historical log data, alarm data, and power quality fault and surge/sag waveform data.

To view, copy, or print retrieved logs for a meter directly from the Meter List, double-click or right-click on a meter in the Meter List screen and select View Meter Logs. The View Meter Logs button will be disabled if logs have not been retrieved, or if the meter does not support logs (such as the EPM 6000 meter).



The Log Viewer opens, letting you view any logs for the meter.



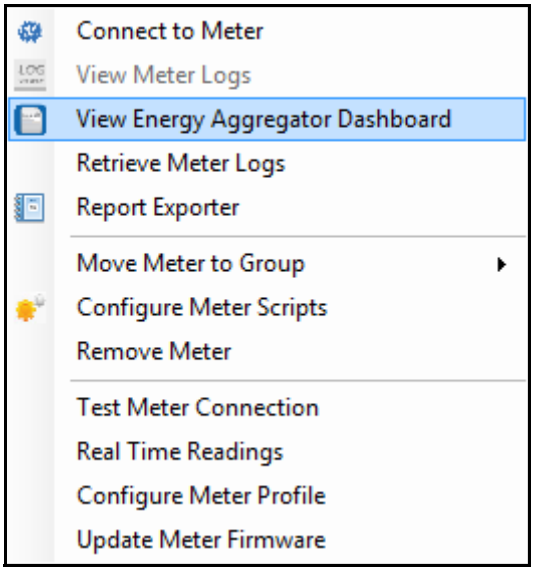
See Chapter 19 “Viewing Logs” for detailed information on using the Log Viewer.

NOTE

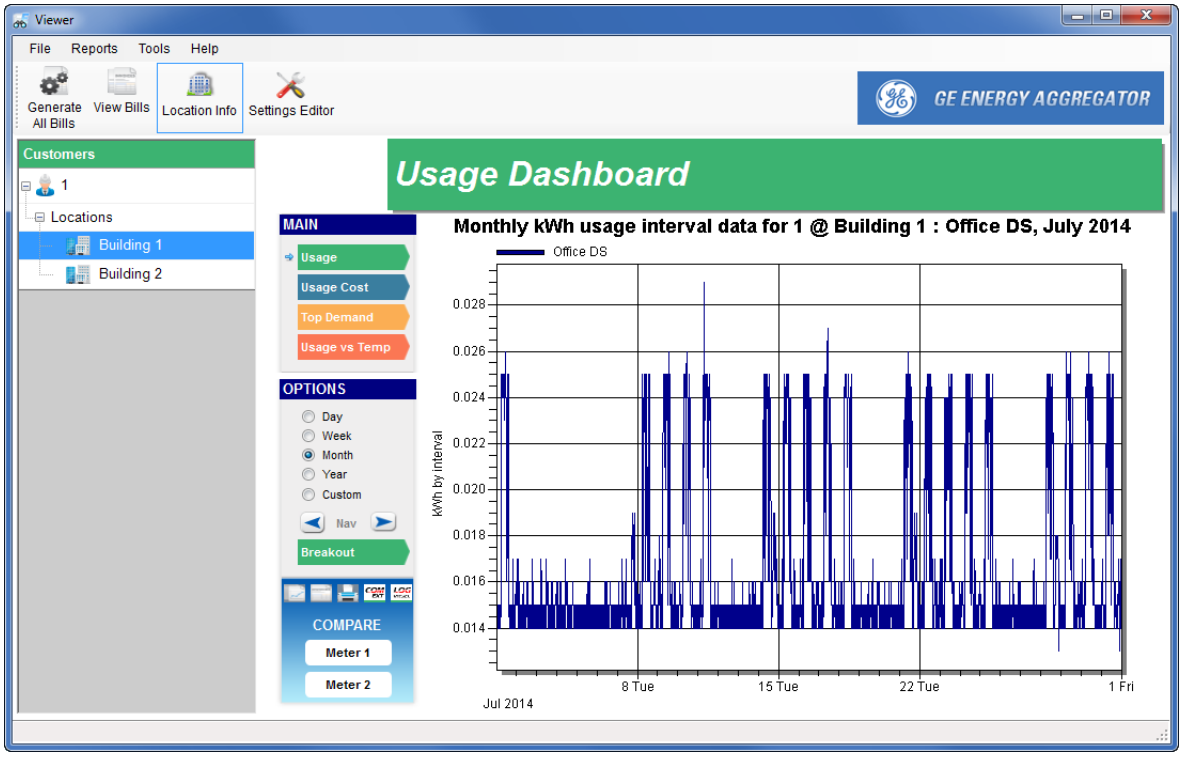
Log Viewer allows you to analyze, chart and graph, and view all data collected from stored memory in deployed GE metering systems. This is a very commonly used application module; it allows you to conduct deep engineering analysis on your power distribution system.

18.2.3.4 View GE Energy Aggregator Dashboard

- Double-click or right-click on a meter in the Meter List screen and select View Energy Aggregator Dashboard.



The GE Energy Aggregator Dashboard Viewer opens.

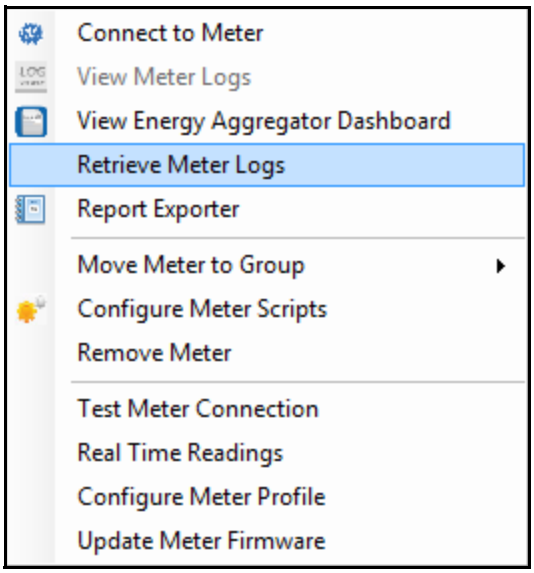


The Energy Aggregator Dashboard lets you view usage information for the meter. For more information on the Dashboard, see the *GE Energy Aggregator Instruction Guide*.

18.2.3.5 Retrieve Meter Logs

GE MeterManager is designed to retrieve automatically all stored data in a meter on a scheduled interval. However, if a user desires to view stored data at the current moment, that can be accomplished here, directly from the Meter List. This is useful if a user wishes to look at an event that just occurred, rather than waiting for the next log retrieval to capture the event, since the usual log retrieval interval is one hour.

Double-click or right-click on a meter in the **Meter List** screen and select **Retrieve Meter Logs** to start the script that will retrieve logs for the meter (see "Scripts" on page 18-76 for information on scripts).



NOTE

- The log retrieval history is not saved for individual meter log retrievals. If viewing this history is necessary, add the meter to a group and use the Group Retrieve Log Script (see 18.2.3.6 *Move Meter to Group* on page 18–32, and 18.2.3.13 *Groups Menu* on page 18–37).
- GE MeterManager provides logging capability for meters without logs, i.e., the EPM 2000/6000 meters. See 18.4.2 *System Options* on page 18–100, for instructions.

In the **Next Action** field of the **Meter List** screen you will see the log retrieval progress (see the example below).

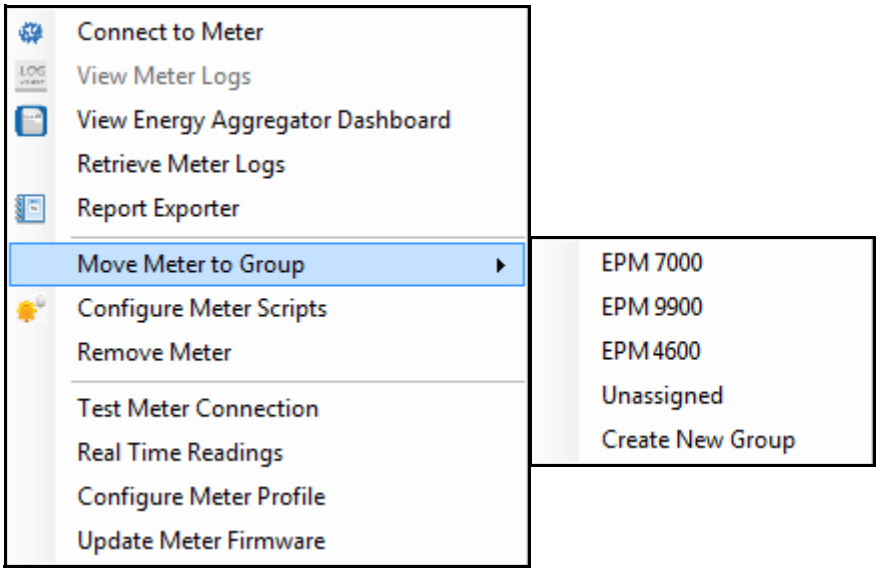
Meter List

Meter Name	Meter Type	Online Status	Next Action
EPM4600			
0194061324	EPM4600	Online	Retrieving Historical 1 [2325/4153]
EPM9900P			
180282627	EPM9900P	Online	Running
EPM9900_Runtime	EPM9900P	Online	Running
Unassigned			

The software provides feedback on the download status of each log being retrieved. Once the downloads have completed you can view any data you want.

18.2.3.6 Move Meter to Group

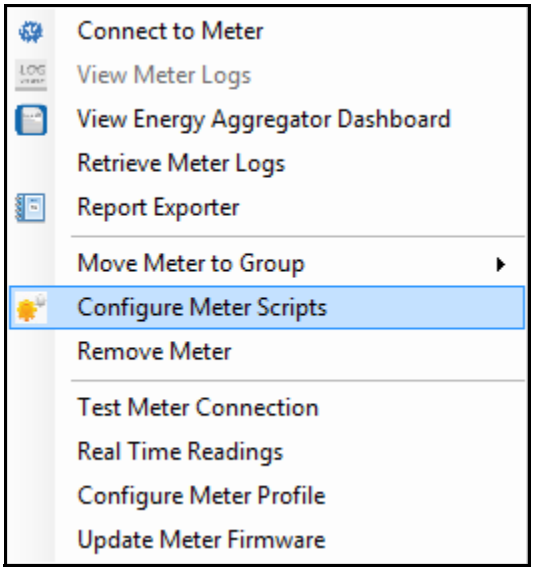
- Double-click or right-click on a meter in the **Meter List** screen and select **Move Meter to Group**.
  A submenu opens showing the existing groups.



- Click on a group to move the meter into that group; click **Create New Group** to create a new group for the meter.

18.2.3.7 Configure Meter Scripts

- Double-click or right-click on a meter in the Meter List screen and select **Configure Meter Scripts**.



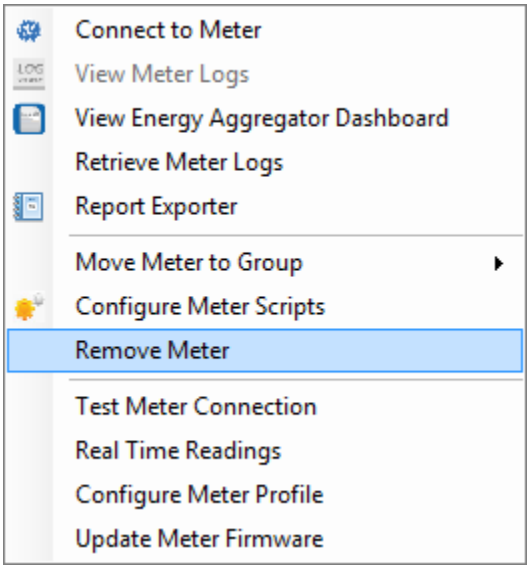
The **Configure Meter Scripts** screen opens - see "Configure Meter Scripts" on page 18-21 for instructions.

NOTE

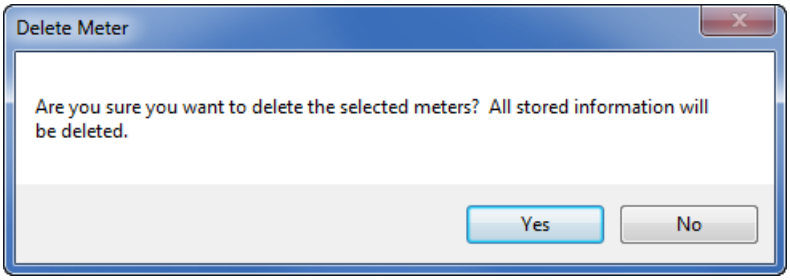
Configure Meter Scripts is used for setting up custom scripts. **Configure Meter Profile** is used to make a change to the meter's device profile configuration.

18.2.3.8 Remove Meter

- Double-click or right-click on a meter in the Meter List and select Remove Meter.



You will see the following message window.



- Click **Yes** to remove the meter from the list or click No to keep the meter on the list. You can use the Search Meters feature to remove multiple meters at one time. See "Search Meters" on page 18-110, for instructions.

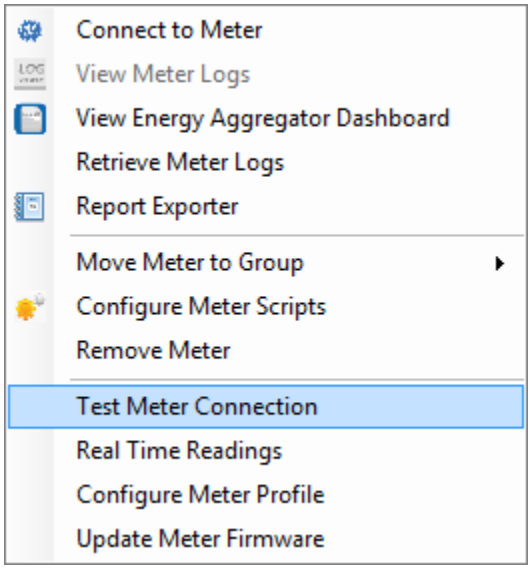
NOTE

Deleting the meters from the Meter List does not delete the meter's log data. If you add the meter back into the Meter List at a later date, the meter's log data will still be available.

18.2.3.9 Test Meter Connection

Test Meter Connection will verify that the system is able to communicate successfully with the installed remote meter.

Right-click a meter in the **Meter List** screen and select **Test Meter Connection** to make sure you are able to connect to the meter.



You will see an error message if you are not able to connect to the meter. If you get an error message, check to make sure that the meter's connection information - IP address, etc., is correct. You can test connections for multiple meters at one time using the Search Meters feature - see 18.4.4 *Search Meters* on page 18–110, for instructions.

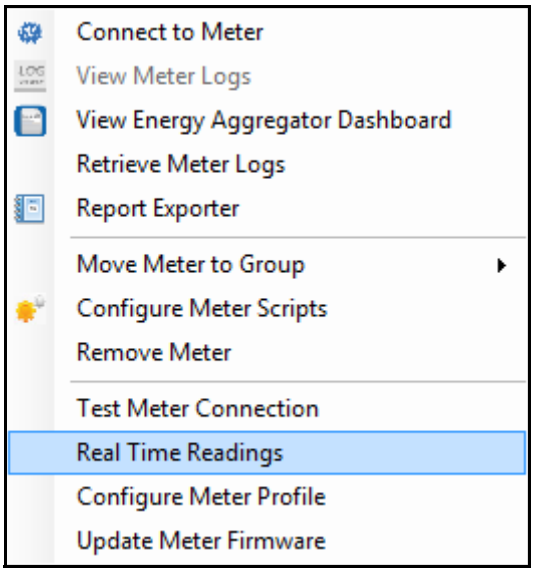
NOTE

The system periodically self-tests its connection to the meter. The Test Meter Connection option is used if a user wants to test the meter connection on demand.

18.2.3.10Real Time Readings

Real Time Readings allows a user to view electrical parameters as they are happening. For example, the user can view real time voltage, harmonics, power, and current flow.

Double-click or right-click on a meter in the **Meter List** screen and select **Real Time Readings**.

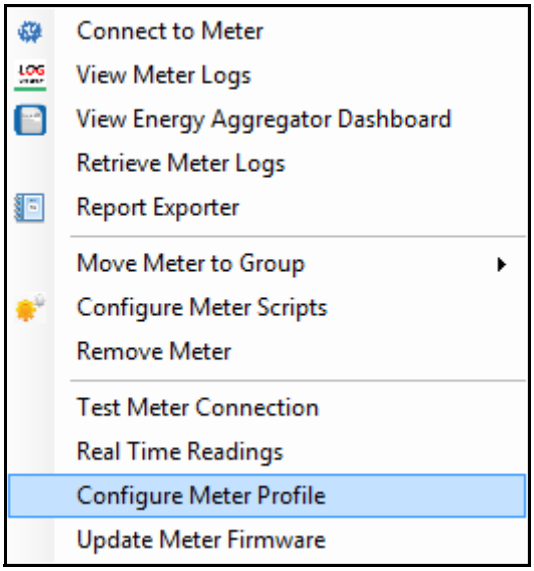


GE Communicator opens and displays the real time polling screen for the meter (see "Polling Your Meter" on page 5-1 for details on this polling screen). You can view Real Time readings for multiple meters using the Search Meters feature - see 18.4.4 *Search Meters* on page 18–110, for instructions.

18.2.3.11 Configure Meter Profile

Configure Meter Profile allows a user to edit the actual configuration settings stored in the meter.

Double-click or right-click on a meter in the **Meter List** screen and select **Configure Meter Profile**.

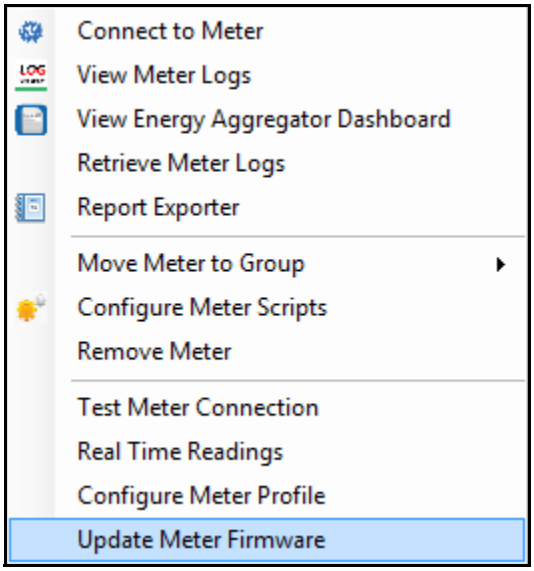


GE Communicator opens and displays the **Device Profile** screen for the meter. (see 7.1 *Device Profile Screen* on page 7–1, for details on this screen). You can program multiple meters, consecutively, using the Search Meters feature - see 18.4.4 *Search Meters* on page 18–110, for instructions.

18.2.3.12 Update Meter Firmware

This feature to used to update the meter firmware and activate the advanced features, directly from the Meter List.

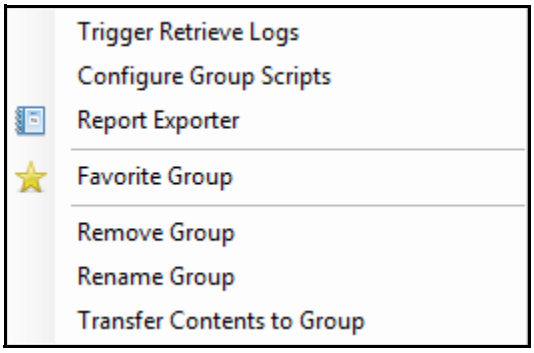
1. Double-click or right-click on a meter in the Meter List screen and select Update Meter Firmware.



GE Communicator opens and displays the Firmware Update screen for the meter (see Chapter 25 "Flash Updating", for details on this screen). You can update firmware for multiple meters, consecutively, using the Search Meters feature - see 18.4.4 *Search Meters* on page 18–110, for instructions.

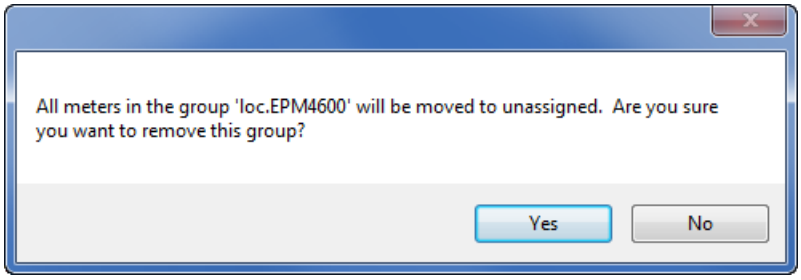
18.2.3.13Groups Menu

Double-click or right-click on a group name in the **Meter List** screen to see the sub menu shown below.



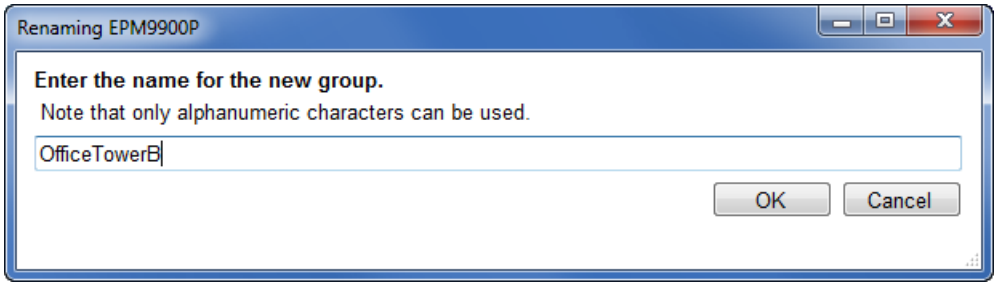
- Click **Trigger Retrieve Logs** to start log retrieval for all meters in the group automatically. Note that automatic log retrieval must be enabled in order to retrieve logs for a group. If automatic retrieval is disabled, and you still want to retrieve the logs, trigger retrieval for the meters individually. See "Configure Meter Scripts" on page 18-21, for instructions.

- Click **Configure Group Scripts** to open the screen that lets you set up scripts. See "Configure Group Scripts" on page 18-76, for instructions.
- Click **Report Exporter** to set up automatic reporting for the group meters. See "Report Exporter" on page 18-39, for instructions.
- Click **Favorite Group** to mark this group as a favorite. When a group is selected as a favorite, the software moves the group to the top of the Meter List. This lets a user move the most often viewed groups to the top of the list.
- Click **Remove Group** to remove this group. You will see the following confirmation message.

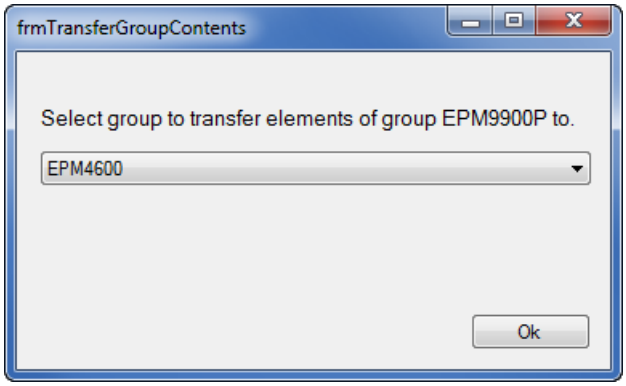


Click **Yes** to remove the group and move all of its meters to the Unassigned group or click **No** if you do not want to do that.

- Click **Rename Group** to give a new name to the group. In the screen shown below, enter the name and click OK.



- Click **Transfer Contents to Group** if you want to move the group meters into another group, e.g., if you want to combine groups. In the screen shown below, select from the pull-down menu, the group into which you want to move the meters.



18.2.3.14 Report Exporter

GE MeterManager's Report Exporter feature lets you easily create report templates and then automatically generate and distribute the reports on a configured schedule. Report Exporter is a software product that allows a user to set up custom reports that generate a spreadsheet-type tabular data format. This allows a user to customize a report for the specific fields of energy consumption they need.

The Report Exporter is designed to not only create the report, but also to send that data out to the user automatically. A user can select which report and the frequency of the report they wish to send. Features of Report Exporter include:

- Provide tabular format of differing values for one or more meters in a spreadsheet format report.
- Create formulas to automatically calculate derivative values on the data in the report.
- Report files are automatically sent to a selected folder, which is specified when the report template is created. This can be a folder on the local computer or on the network.
- Reports can be sent as email attachments.
- Reports can be uploaded to an FTP server for availability to multiple users.

There are five types of scheduled reports:

- Hourly Reports, which begin at HH:00:00 and end at HH:59:59 each hour.
- Multi-Hour Reports, of between 2 and 23 hours, can be configured.
- Daily Reports, which begin at 12:00:00 AM and end at 11:59:59 PM each day.
- Weekly Reports, which start on any day of the week at 12:00:00 AM and end at 11:59:59 PM on the 7th day (e.g., if a weekly report started on Monday at 12:00:00 AM, it would end the next Sunday at 11:59:59 PM).
- Monthly Reports, which begin at 12:00:00 AM on the selected day of the month (any day from 1 to 28) and end at 11:59:59 PM a month later (e.g., a monthly report beginning on June 6 at 12:00:00 AM will end July 5 at 11:59:59 PM).

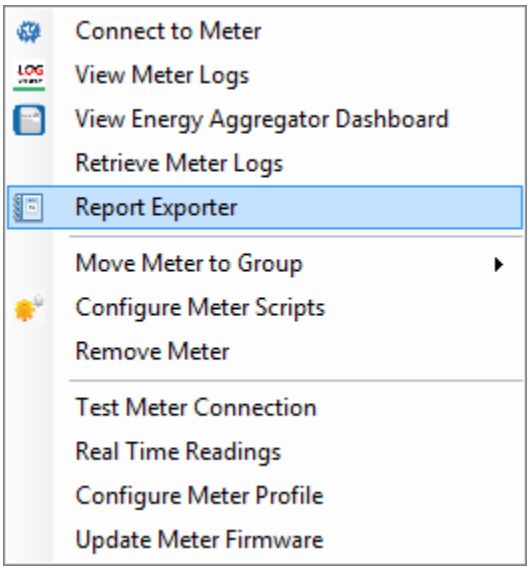
Note that scheduled reports need to have available historical log data in order to run:

- A report is exported only if there is data available for the next scheduled report period. If there is incomplete data for the report at the time the export is triggered, a message will be added to the system log to that effect, and the export will be attempted again on the next scheduled export cycle.
- If there is historical log data with a time stamp greater than the next scheduled period end time, but there is no data for the scheduled report period, an empty report is generated. The report period will then be incremented to the next report period. For example, if a Daily Report was configured and the power went down for a day and then resumed the next day, an empty report would be exported for the day the power was out.
- The scheduled report period will only advance to the next report period when there has been a successful export for the period. For example, if an hourly report has been scheduled but the Historical Logs have not been retrieved for a day or more, all hourly reports up to the latest data will be generated after the logs have been retrieved and the next export schedule is executed.

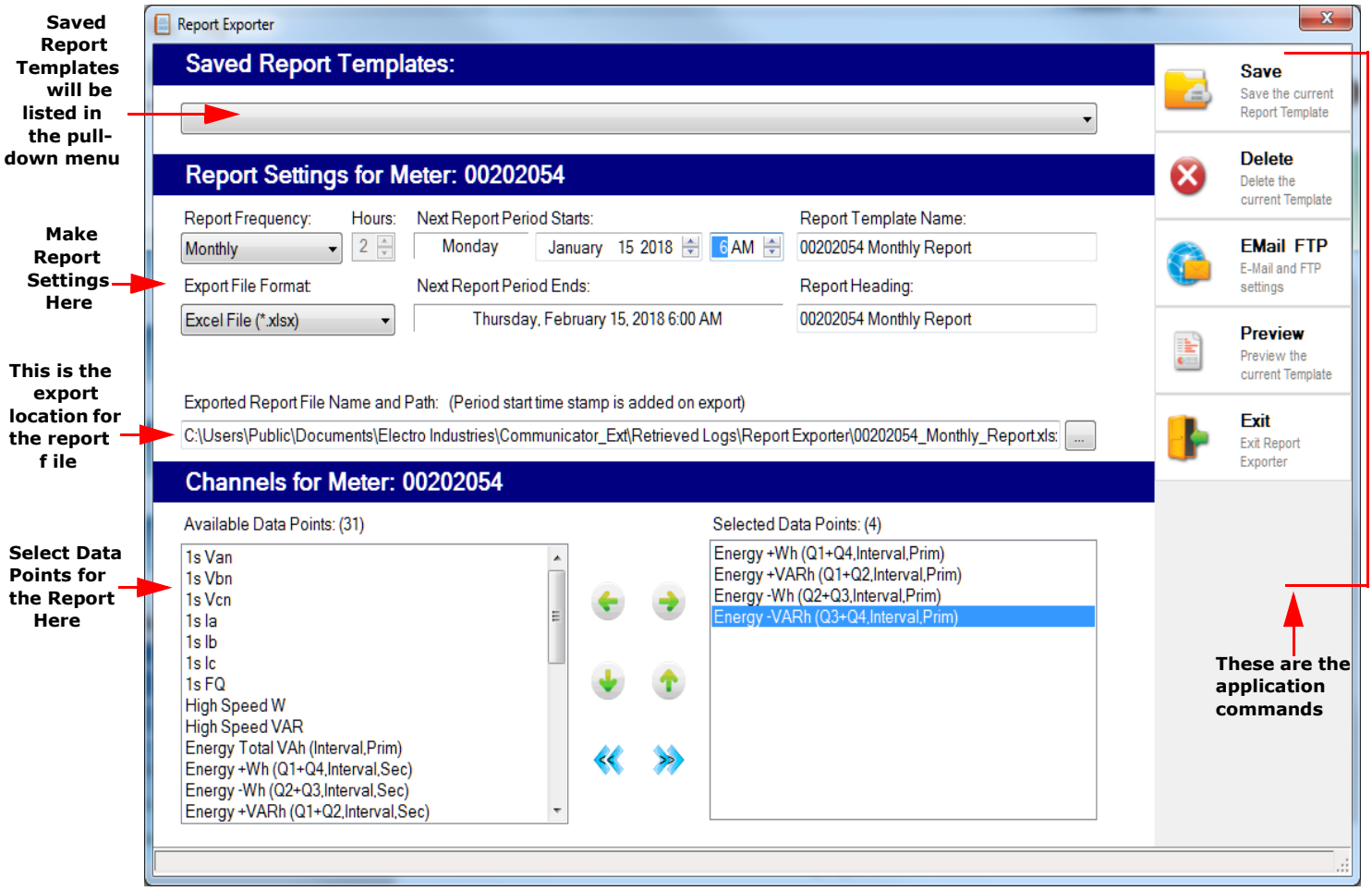
Additional information about Report Exporter is as follows:

- In addition to the scheduled reports, reports may be generated manually at any time. Manual reports offer a great deal of flexibility:
  - Report Exporter offers multiple styling options for manual reports.
  - User-defined date ranges and formulas may be added to manual reports.
  - You can create multiple manual reports for the same meter group or meter, which gives you flexibility in data analysis.
- Reports may be saved as one of two file types (.xlsx which can be opened by Microsoft® Excel or Open Office, which is an open source application, or. csv files, which can be imported into many applications) and/or printed.
- Report Exporter scheduled export activities are logged and can be reviewed in the GE MeterManager Script Status logs (see "View Script Logs" on page 18-86).
- Reports may not include multiple meter groups or individual meters from multiple meter groups, but if your data requirements need this capability, you can create a group containing the set of meters desired for a report. When a meter group is selected for a report, only the set of data points (channels) common to all of the meters in the group are displayed for selection for inclusion in a report.
- Reports will not be exported when scheduled for groups or meter whose configuration was modified after the report template was created - this includes adding or removing meters from a group, or changing the logged items configured in the meters. The report template must be edited or replaced for scheduled exports to resume for that group or meter. In this situation, a "Broken Report" icon is displayed in the Meter Manager Meter List, a warning message is displayed when opening the report template for editing, and a warning message is logged when a scheduled export cycle is run.
- Report Exporter can only be run from the computer that is the server, since that is the only computer that controls log retrieval. However, multiple users can have access to the report files through email, saving to shared locations, and/or FTP.
- Automatic log retrieval must be enabled for Report Exporter to be configured. See "Add Meters to the Meter List Using Auto Discovery" on page 18-11, for instructions on enabling automatic log retrieval. In addition, if you are creating a report template for a group of meters or a meter that belongs to a group, automatic log retrieval must be enabled for the group. See "Configure Group Scripts" on page 18-76, for instructions on enabling automatic log retrieval for groups of meters. Note that you will see a warning message when you try to select Report Exporter if automatic log retrieval is not enabled.
- See "18.2.3.14.4: Report Exporter Example" on page 18-63, for an example report creation.
- See "18.2.3.14.5: Report Exporter Troubleshooting" on page 18-67, for information on any possible Report Exporter errors and their resolutions.

1. Right-click on a meter and select Report Exporter. (You can also right-click on a group name and select Report Exporter).



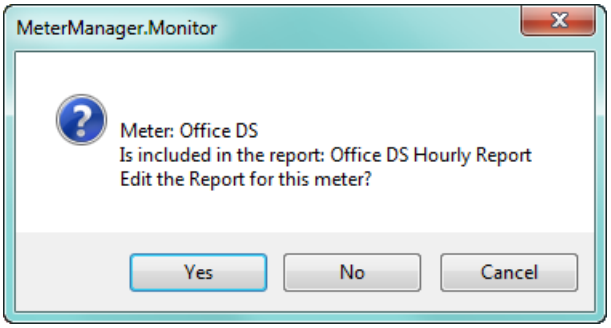
2. You will see the **Report Exporter** screen.



The example screen is for an individual meter. If you are using the Report Exporter for a group of meters, the screen and settings will be the same, except that the default report and header names will be based on the name of the group, and the Channels section will only contain data points common to all of the meters.

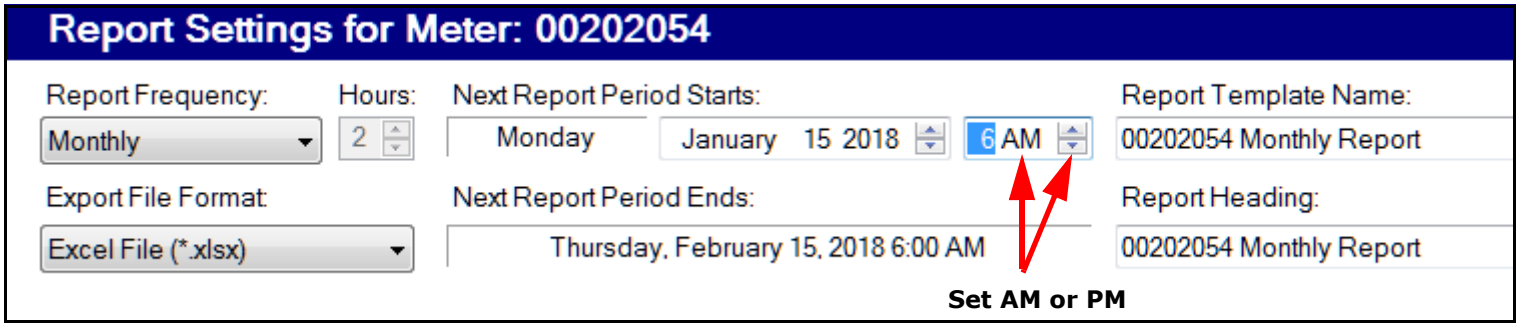
NOTE

If there is already a report template for this meter or group of meters, you will be asked to confirm that you want to edit the report.



- If you click **Yes**, the Report Exporter screen opens with the settings for the existing report template, which you can change if you wish. Once you have made changes you can **Save** the report template, which will write over the previous version.
- If you click **No**, the Report Exporter opens, letting you set up a new report template.
- If you click **Cancel**, the message window closes and the Report Exporter does not open.

Use the middle of the screen to set up information for the template:



NOTE

The date and time are determined by the report frequency, the start time, and in the case of the multi-hour report, but the number of hours in the Hours field.

- **Report Frequency** - your choices are Hourly, Multi-Hour, Daily, Weekly, or Monthly. Note that Report Exporter will suggest an appropriate starting date and time for the report, based on the stored data, but you can set the report to start at any date or time you want. To edit the date, click on the up/down arrows in the date field. To edit the hour, click on the number and use the up and down arrows; to set AM or PM, click on the AM/PM and click the up or down arrow.

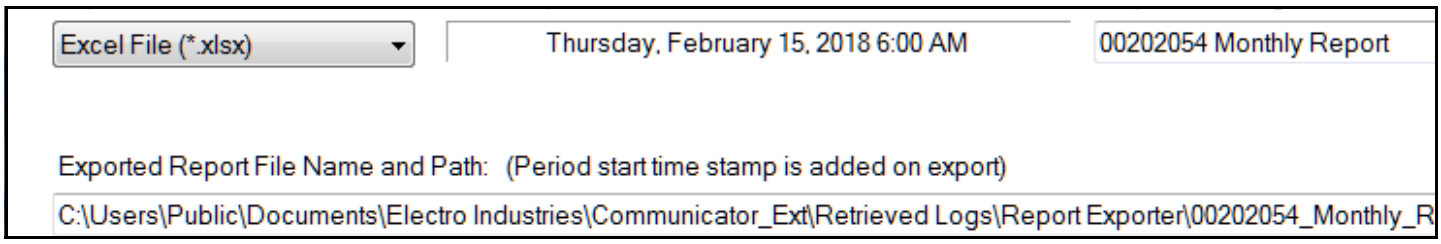
NOTE

The report data starts at the first interval after the start of the report period. Similarly, the last value in the report will include the end of the report period. For example, a daily report for 15 minute interval data, would contain values from 12:15 AM to 12:00

AM the next day. Since data is time stamped at the end of the logging interval, this is done to ensure the data reported is for the data within the day, month, or otherwise, included by the report period.

- **Hourly reports** - the report period starts at the top of the hour and goes to the last second, for example, from 8:00:00 to 8:59:59. Then the next hourly report would be from 9:00:00 to 9:59:59.
- **Multi-Hour reports** - the report period starts at the top of the hour and ends at NN:59:59, where N is the number of hours selected in the Hours field, minus 1. For example, if you select 6 Hours, a report starting at midnight will go from 12:00:00 AM to 5:59:59 AM; the next Multi-Hour report will go from 6:00:00 AM to 11:59:59 AM; the third for 12:00:00 PM to 5:59:59 PM, etc. You can select between 2 and 23 hours for the Multi-Hour report.
- **Daily** - the report period starts at the hour you select and goes for 24 hours. For example, if you choose to start the report at 6 AM, the daily report will begin at 6 A.M and go until 6 A.M the following day.
- **Weekly** - the report period starts on Sunday at the hour you set and goes until that same time a week later; e.g., Sunday at 5 AM until the next Sunday at 5 AM.
- **Monthly** - the report period starts at the hour you set on the selected day of the month (1 to 28) and goes until the hour you set a month later; e.g., from March 4 at 12 PM to April 4 at 12 PM).

- **Hours** - the number of hours to be included in a Multi-Hour report.
- **Date the next report period starts** - This is determined by the current date and type of report; e.g., Weekly reports start on Sunday, while an Hourly report would start on the current day.
- **Time the next report period starts** - Normally reports will start to be generated automatically after the report has been configured. If you want to generate reports starting at an earlier date, (or generate new reports for old data), set this field to when the report generation should start. All possible reports from that date will be generated.
- **Report Template name** - the default is the meter name followed by the type of report, i.e., Hourly, Daily, Weekly, or Monthly. You can change this name if you wish, but you should select the Report Frequency first so that your chosen name is not overwritten.

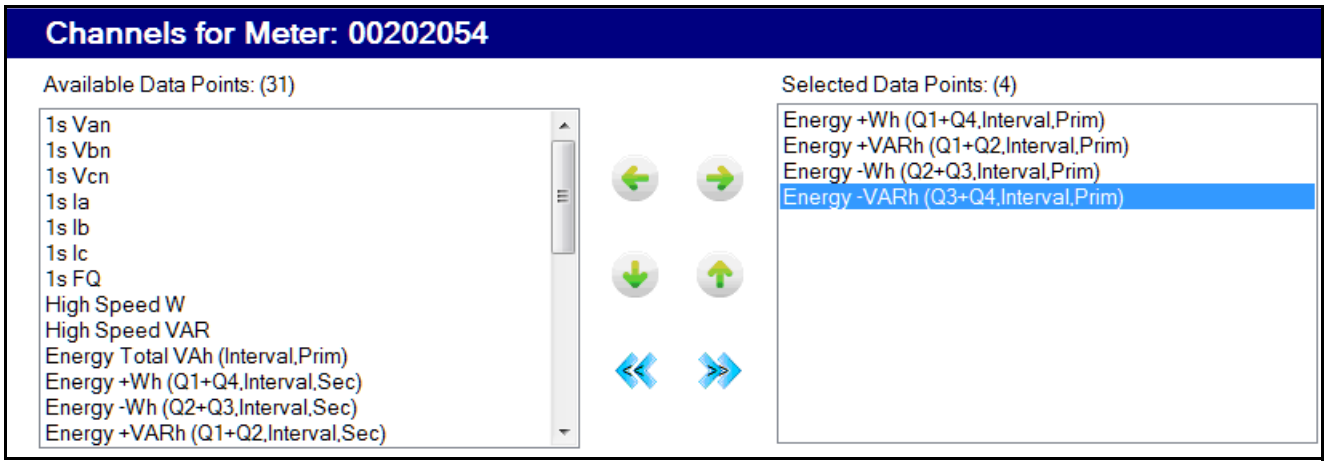


- Format for the exported report file - the choices are Excel file (*.xlsx), or CSV file (*.csv). What you choose depends on how you want to use the data, for example, if you will be using Microsoft® Excel or Open Office applications, choose .xlsx, if you are using another application, choose .csv, since .csv files are compatible with multiple applications.
- Date the next report period ends - this field is display only and is determined by the report frequency setting. For example if the report

frequency is daily, the date the next period ends is 11:59:59 of the current day, since the next report period starts at 12 A.M. of the next day. This lets you determine what data the next report generated will contain, given the configured settings and the data stored in the meters' logs.

- **Report Heading** - this heading displays on the first line of the report. The default is the same as the default report template name, but you can enter another heading if you wish. You should select the Report Frequency first, so that your chosen heading is not overwritten.
- **Exported Report File Name and Path** - the default path is shown. Click on the [...] button to choose another name and/or location if you wish. You should select the Report Frequency before changing the file name, so that your chosen name is not overwritten. When the file is exported a time stamp is added at the end of the file name. The time stamp is formatted YYYYMMDDHHMM (Year, Month, Day, Hour (0 - 23), Minute).

The bottom of the screen displays the available data points from the historical file (for a group report template, only the data points shared by all of the meters are displayed).



- To include a data point in the report, click on it in the left column and click the right arrow. (To remove a data point from the report, click on it in the right column and click the left arrow.)

NOTE

There is a maximum of 256 channels across all meters, per report.

- You can add a computed channel in this way: To include a data point that will be calculated across a time frame, click on the data point in the left column and click on the third button on the right (the circle with a smaller black circle intersected with a green horizontal line). (To remove that data point, click on the data point in the right column and then click on the matching button on the left.)

NOTE

The data point you selected will be copied to the column on the right, with "Computed_XX" next to its name XX.

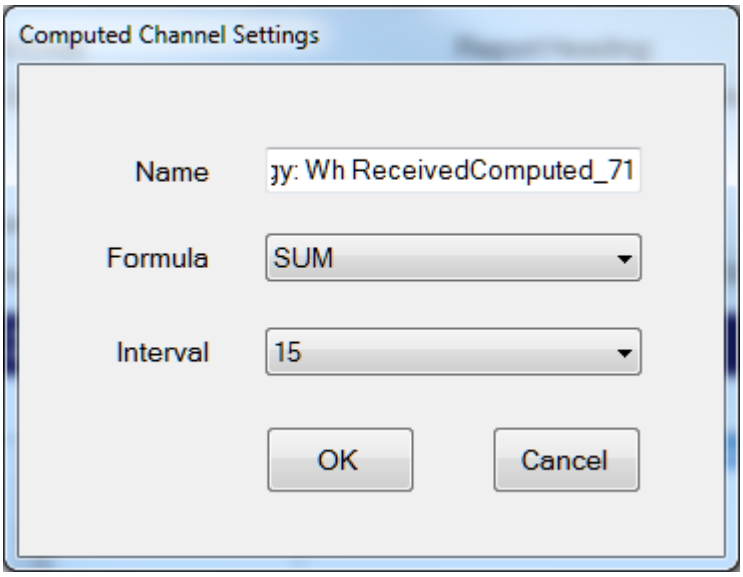
NOTE

Any computed data points are displayed in green in the column on the right, to distinguish them easily from "regular" data points.

NOTE

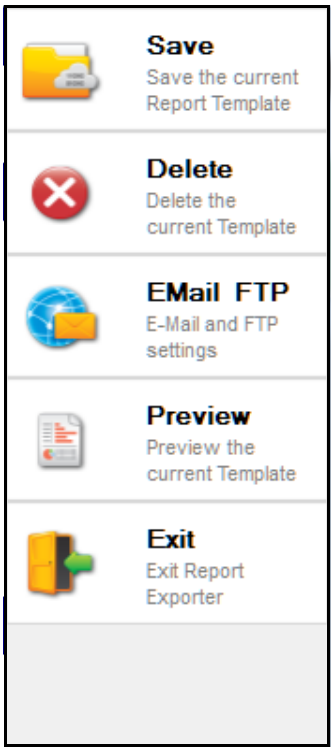
The data point you selected will still be listed in the column on the left and can be selected, so that you can have a data point and also a computation for that data point in the report.

- Once the data point for the computed channel is listed in the right column, right-click on it and select "Define Computed Settings for [the data point name]."



- Select the computation Formula: SUM, AVG, MAX, or MIN.
- Select the computation Interval: 15 (minutes), 30 (minutes), 60 (minutes), or Daily.
- Click **OK**. (See Figure 18.3 on page 18-83 for an example of a report using computed channels.)
- To move a data point higher or lower in the list, use the up/down arrows.
- To move all of the data points from one column to the other, use the double arrow symbols.

- The right side of the screen contains the Report Exporter commands:

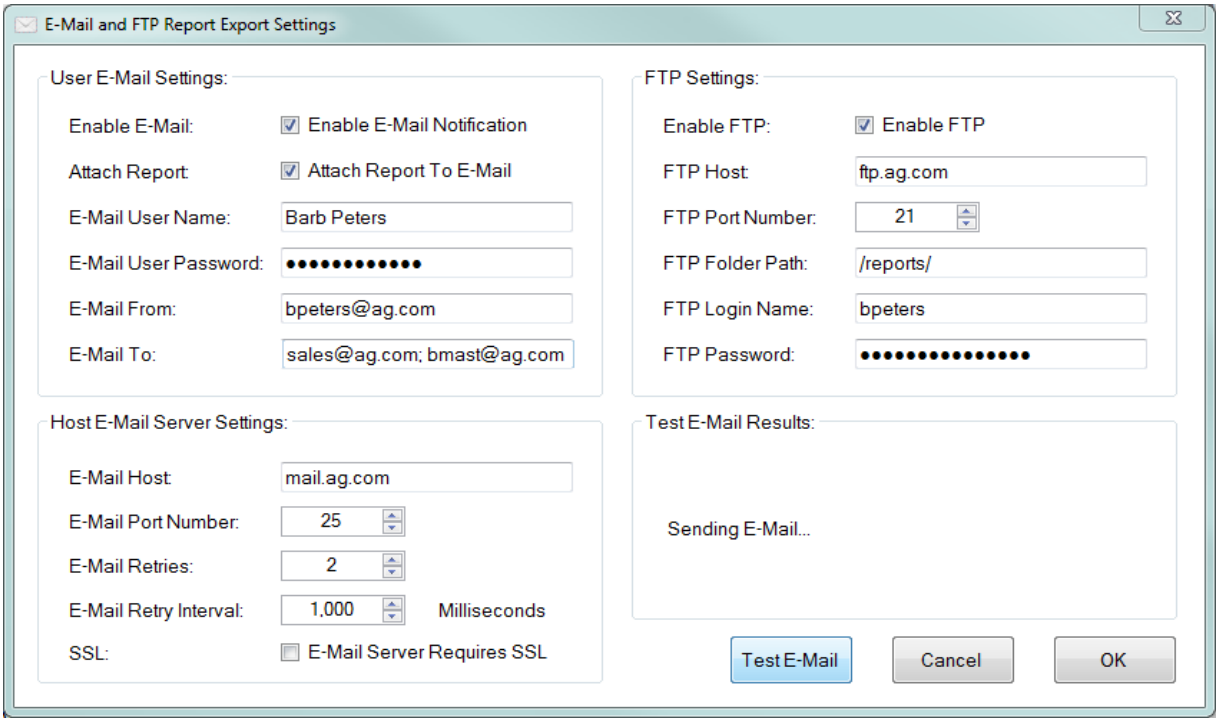


- **Save** - click to save the template - the name will be displayed in the Saved Templates field at the top of the screen.
- **Delete** - click to delete the currently selected template - you will see a confirmation message window - click Yes to delete or No/Cancel to not delete.
- **Exit** - click to close the Report Exporter screen once you have finished setting up and saving the report template.
- The other options: **Email/FTP Server**, **Advanced**, and **Preview**, are explained in the following sections.

18.2.3.14.1: Email/FTP Feature

Once automatic reports are generated, it is important to get the reports to the appropriate people, as they are needed. Use the Email/FTP feature to send all of the reports generated by the Report Exporter software to an email or file location on a regular schedule. This fully automates the process of getting reports to the proper person or entity, so they can make informed energy management and business decisions.

1. Click **Email FTP** from the right side of the screen.



2. To set up report email:
   - In the **User Email Settings** section:

     a. Click the **Enable Email Notification** checkbox.

     b. To send the report as an email attachment, click the **Attach Report to Email** checkbox.

     c. Enter the person sending the email's name in the **Email User Name field**.

     d. Enter the email password in the **Email User Password** field. The password will be stored in an encrypted method, for security.

     e. Enter the senders email address in the **Email From field**.

     f. Enter the recipient's email address in the **Email To field**; multiple recipients can be configured by separating the addresses with semi-colon, as shown in the example above.
   - In the **Host Email Settings** section:

     a. Enter the Email Host Server Fully Qualified Domain Name (FQDN) or IP Address name in the **Email Host** field.

     b. Select the Email port number from the pull-down menu. Most email servers use Port 25 for SMTP (Simple Mail Transfer Protocol).

     c. Select the number or retries for the email from the pull-down menu.

     d. Select the retry timeout (in milliseconds) from the pull-down menu.

     e. If the **Email Server requires SSL security**, click the checkbox next to the option.

     f. Click **OK** to save your changes or continue to the FTP instructions.

NOTE

You can send a test email to confirm that the setup is working:

a. Click Test E-Mail.

b. Any messages related to the test email will be shown in the Test E-Mail Results box.

3. An FTP server provides a centralized network file storage location. Setting up an FTP server for makes it easy for multiple users to access the reports over an internal company network or an Internet-facing FTP server. For security reasons, we recommend that you don't use an anonymous public FTP server. Access to an FTP Server and the proper credentials (i.e., username and password) for file upload and download are required to use this feature. The default FTP Port is Port 21. Please consult your IT department for the correct port and access credentials for your FTP server.

   - To set up an FTP server for report access, in the **FTP settings** section:

     a. Click the **Enable FTP** checkbox.

     b. Enter the host name in the **FTP Host** field.

     c. Select the FTP port number from the pull-down menu.

     d. Enter the FTP path in the **FTP Folder Path** field. Note that this field is case-sensitive and the FTP folder name must be entered exactly the same as used for the destination FTP server. In addition, don't use a forward slash at the beginning or ending of the path. See the following examples:
     CORRECT PATH: agftp/reports
     INCORRECT PATHS:
     /agftp/reports
     agftp/reports/
     /agftp/reports/

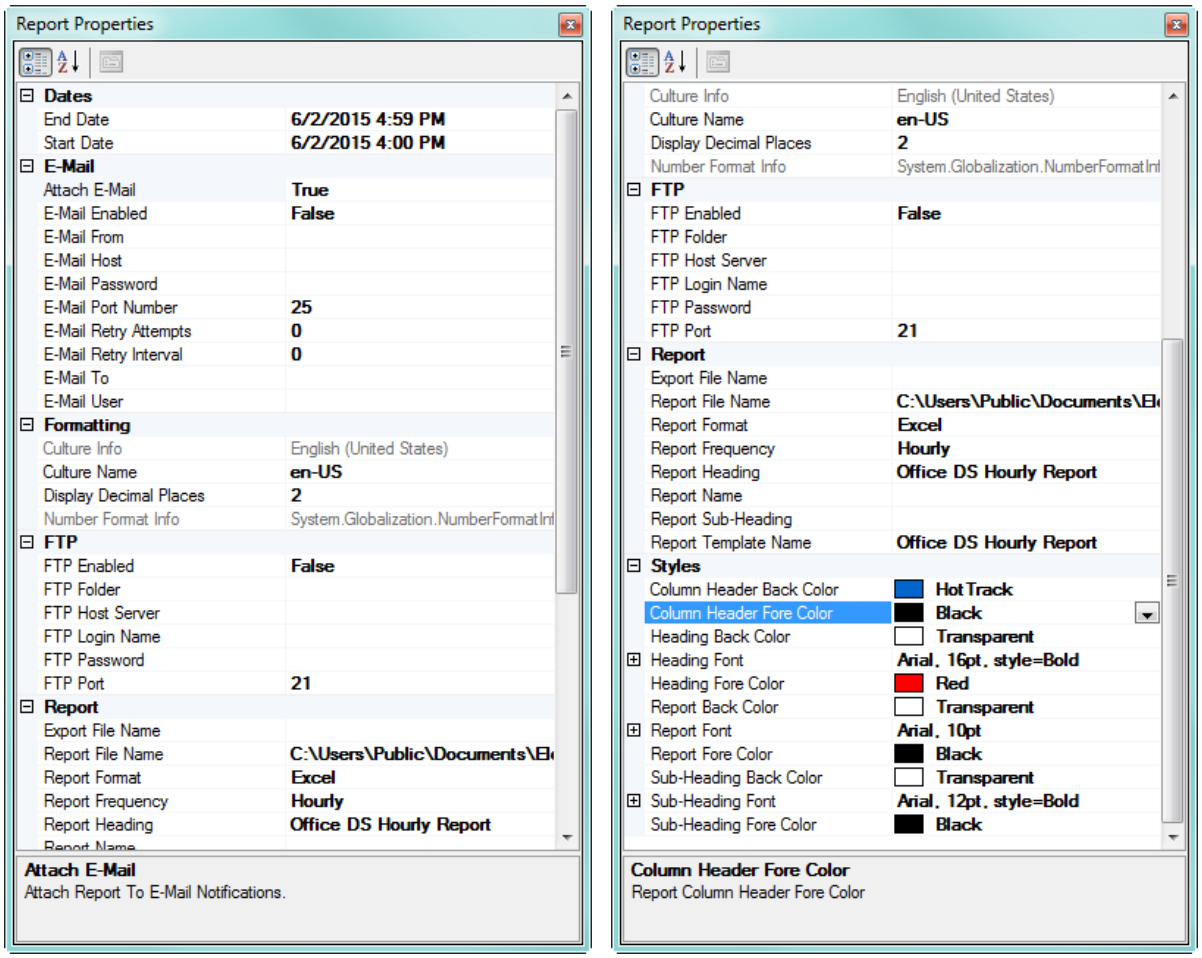
     e. Enter the log in name in the FTP Login Name field.

     f. Enter the password for accessing FTP in the **FTP Password** field. The password will be stored in an encrypted method, for security.

     g. Click **OK** to save your settings.

18.2.3.14.2: Advanced Features

1. Click **Advanced** from the right side of the screen to open the Report Properties screen, to view report settings and/or change the report style. You will be able to view style changes, such as font and color selections, in the **Report Preview** window (see "18.2.3.14.3: Report Preview Feature" on page 18-50).



2. Use the scroll bar to display the entire screen.

   This screen displays the report settings: period dates, email/FTP settings, language, etc.

   You can also format the using the **Styles**, **Heading Font**, **Report Font**, and **Sub-Heading Font** sections:

   - **Styles**: click on Column Header Back Color, Column Header Fore Color, and/or Heading Back Color to display a pull-down menu that lets you choose the color you want to use.
   - **Heading Font**:

     a. Click on the [...] button or the plus sign to display the choices for the heading font.

     b. Click on **Heading Fore Color** and/or **Report Back Color** to display a pull-down menu that lets you choose the color you want to use.

- **Report Font**:

  a. Click on the [...] button or the plus sign to display the choices for the report font.

  b. Click on **Report Fore Color** and/or **Sub-Heading Back Color** to display a pull-down menu that lets you choose the color you want to use.

- **Sub-Heading Font**:

  a. Click on the [...] button or the plus sign to display the choices for the sub-heading font.

  b. Click on **Sub-Heading Fore Color** to display a pull-down menu that lets you choose the color you want to use.

3. Click the X in the upper right-hand corner of the screen to close the **Report Properties** screen.

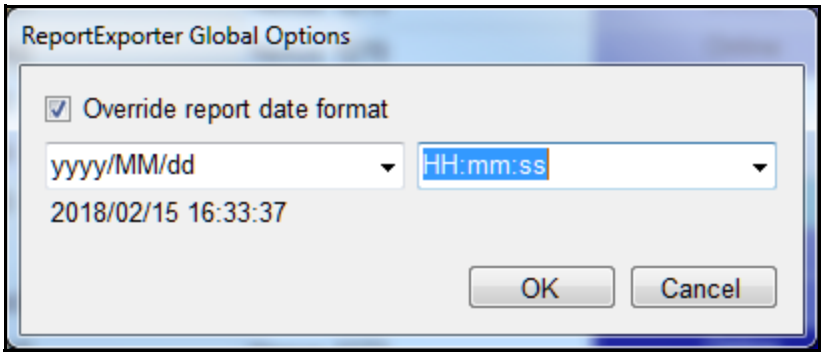
18.2.3.14.3: Report Preview Feature

Use the Report Preview feature to: see what the report will look like before it is generated; add mathematical formulas to manipulate the data as needed, for example to get a total of energy use for a day; save the report to a file; copy the report data; generate a one-time, manual report.

NOTE

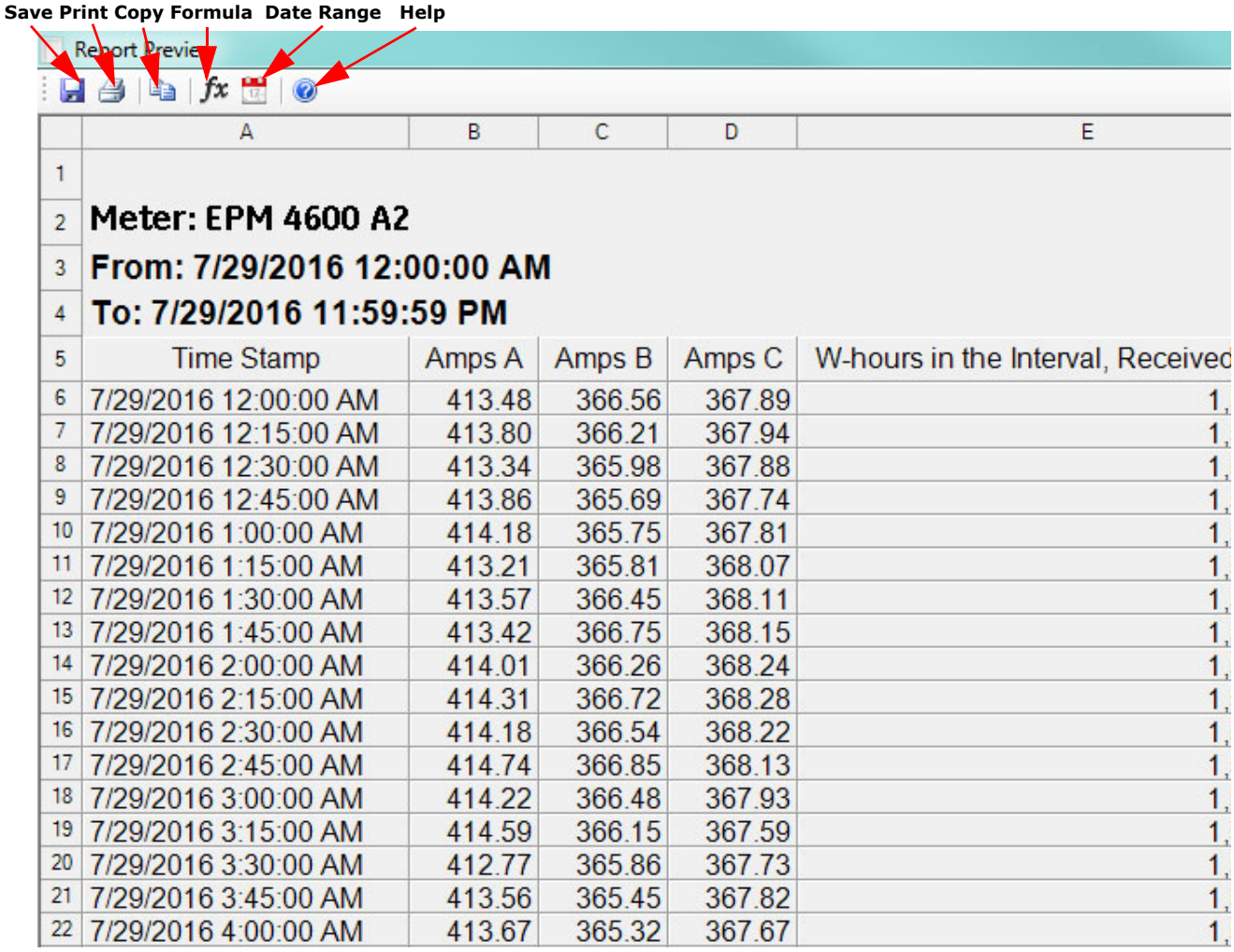
Report Exporter uses the PC's default system time format to display the time stamps in the report. If you need to override this setting, for example, if you are using a report internationally, you can customize your Report Exporter's date time format. Follow these instructions:

1. From the main GE MeterManager screen, click **Tools > Configure > System > Report Exporter Options**.



2. Check the box next to **Override report date format** and choose the date and time format you want to use for the report from the pull-down menus.
3. Click **OK**.

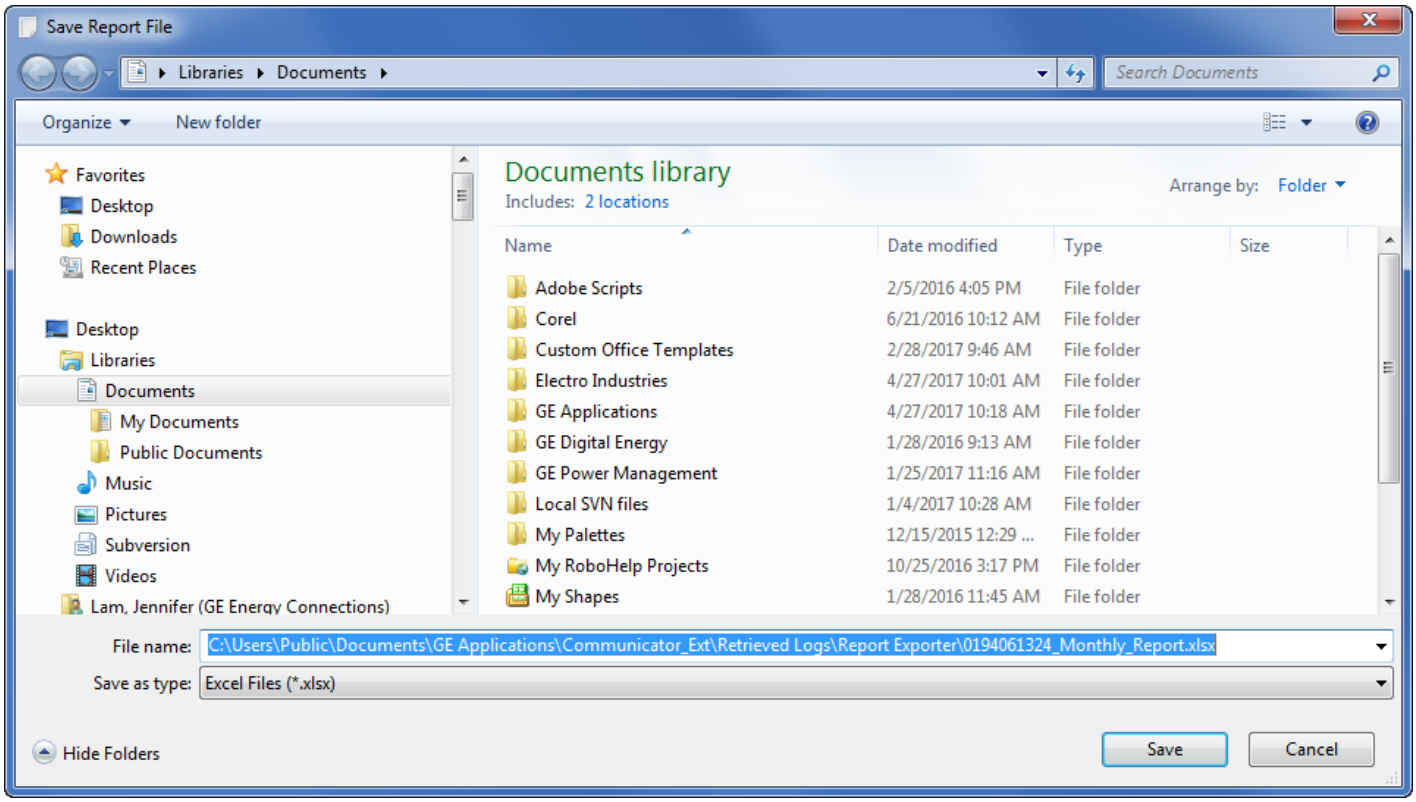
1. To use the Report Preview feature, click **Preview** from the right side of the screen to open the Report Preview screen. See the example below.



Time Stamp	Amps A	Amps B	Amps C	W-hours in the Interval, Received
7/29/2016 12:00:00 AM	413.48	366.56	367.89	1,
7/29/2016 12:15:00 AM	413.80	366.21	367.94	1,
7/29/2016 12:30:00 AM	413.34	365.98	367.88	1,
7/29/2016 12:45:00 AM	413.86	365.69	367.74	1,
7/29/2016 1:00:00 AM	414.18	365.75	367.81	1,
7/29/2016 1:15:00 AM	413.21	365.81	368.07	1,
7/29/2016 1:30:00 AM	413.57	366.45	368.11	1,
7/29/2016 1:45:00 AM	413.42	366.75	368.15	1,
7/29/2016 2:00:00 AM	414.01	366.26	368.24	1,
7/29/2016 2:15:00 AM	414.31	366.72	368.28	1,
7/29/2016 2:30:00 AM	414.18	366.54	368.22	1,
7/29/2016 2:45:00 AM	414.74	366.85	368.13	1,
7/29/2016 3:00:00 AM	414.22	366.48	367.93	1,
7/29/2016 3:15:00 AM	414.59	366.15	367.59	1,
7/29/2016 3:30:00 AM	412.77	365.86	367.73	1,
7/29/2016 3:45:00 AM	413.56	365.45	367.82	1,
7/29/2016 4:00:00 AM	413.67	365.32	367.67	1,

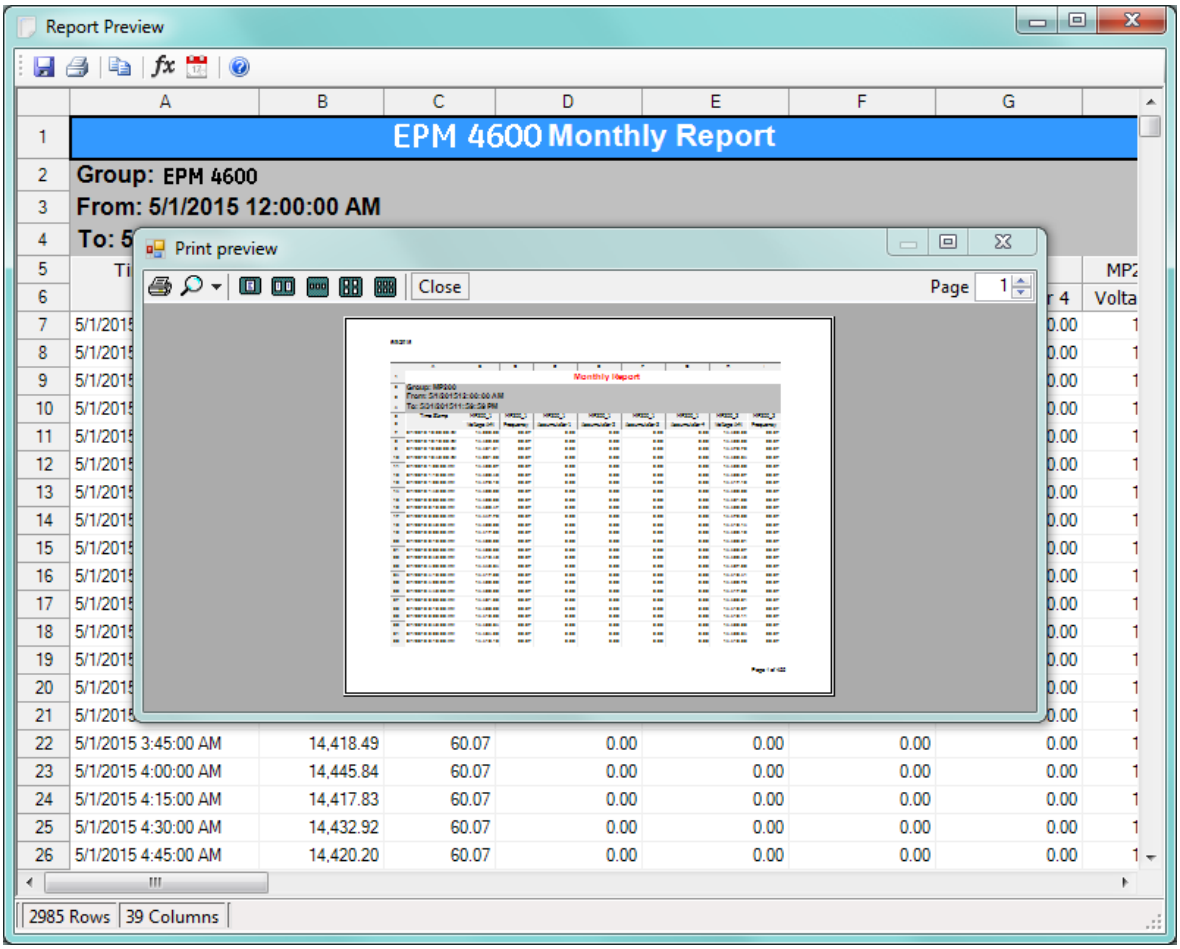
2. The icons at the top of the screen let you save, print, copy selected parts of the report to the clipboard, add formulas to the report, or change the date range of the report to generate a manual report.

Click the **Save** icon to save a copy of this report.



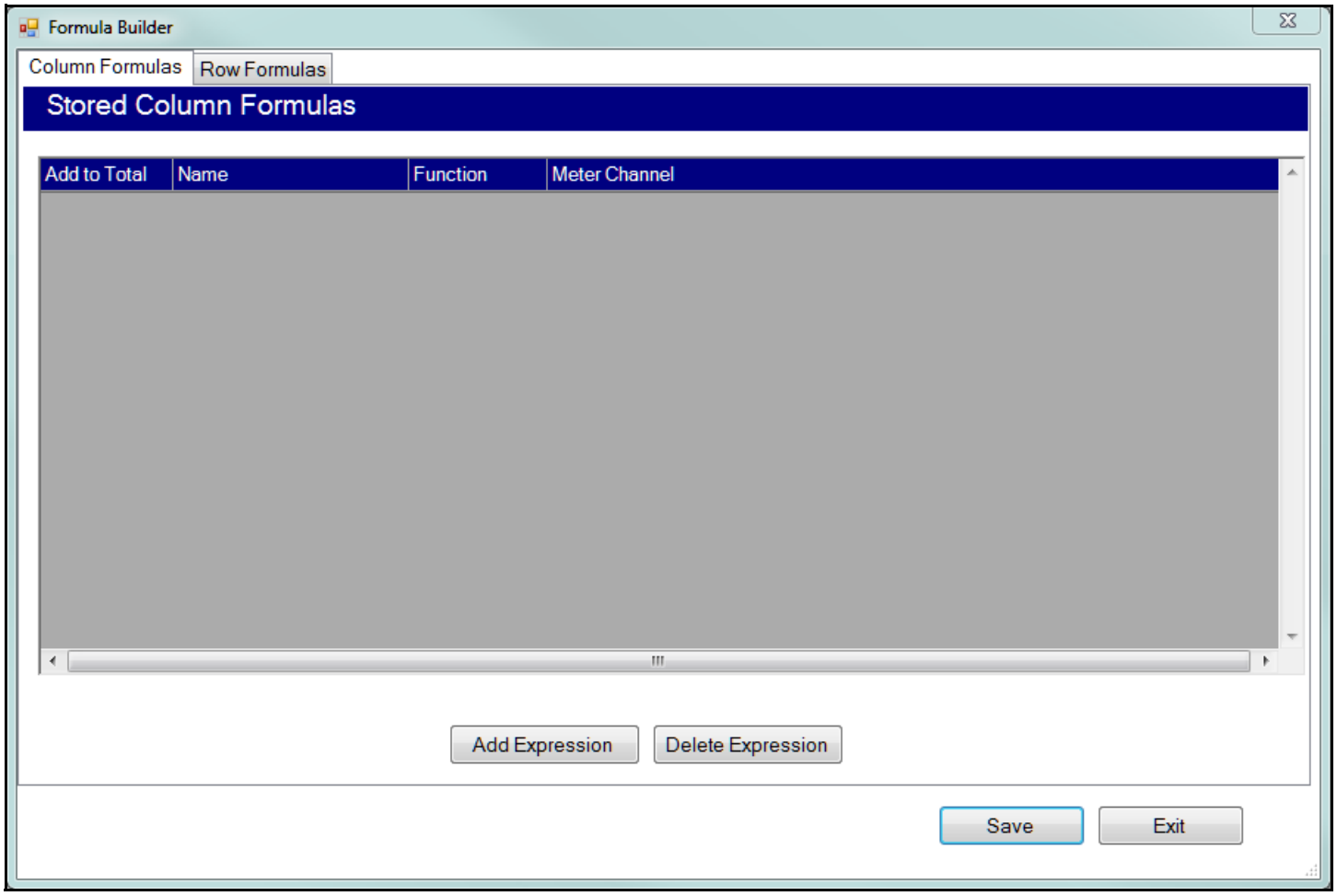
- The path that is shown is the default path for the reports, but you can change that if you wish.
- You can save the file as a .xlsx file or select .csv file type from the pull-down menu.
- Click **Save** to save the file.

Click the **Print** icon to open a print preview of the report. See the example below.



- Click the **Print** button from the Print Preview screen to send the report to your default printer.
- Select part or all of the report and then click the **Copy** icon to copy to the clipboard. From there you can paste the copied data into the application of your choice.

To add a formula to the report, click the ***fx*** icon. You will see the Formula Builder screen, shown below. This screen lets you add formulas to a report template or a manually generated report.



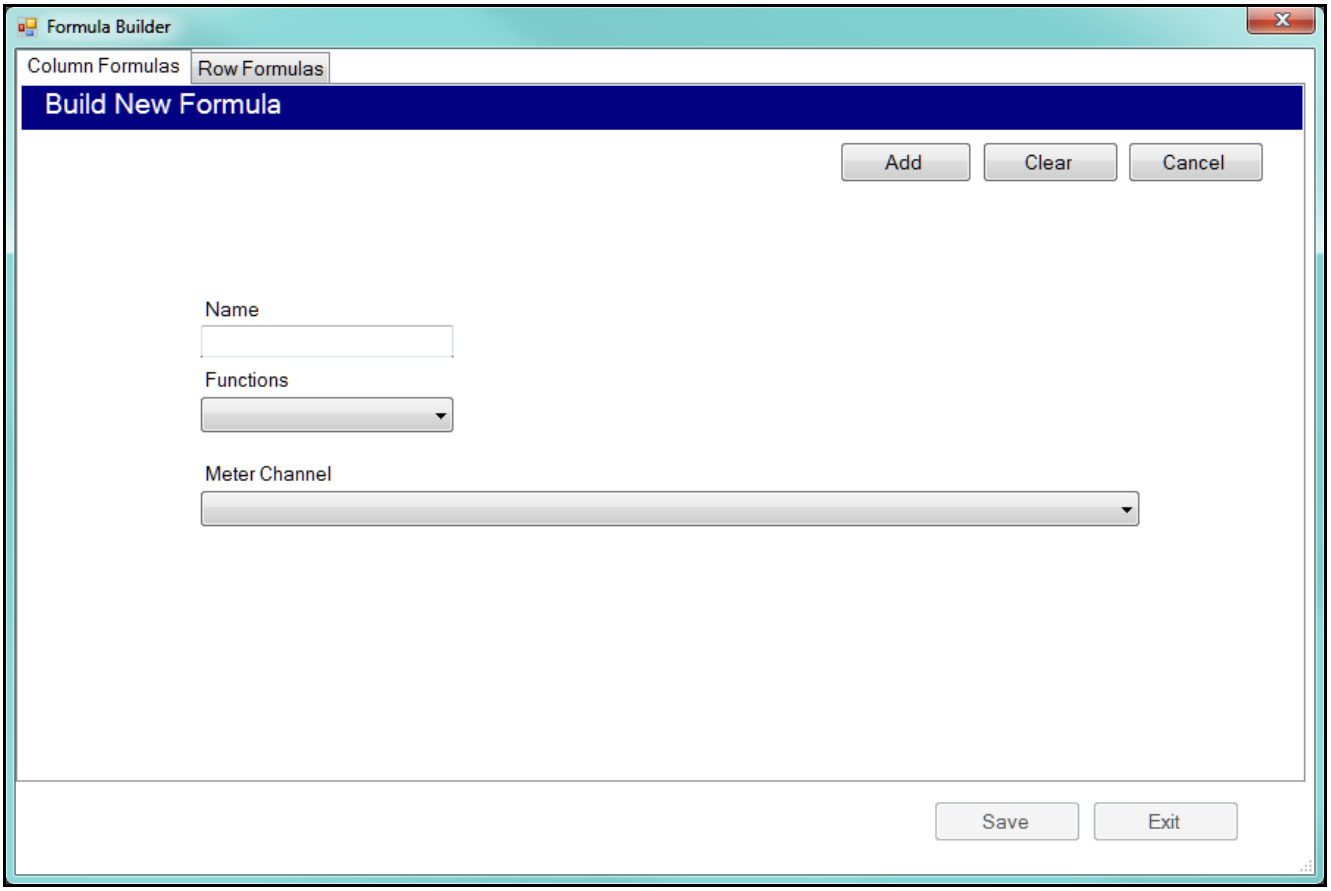
- You can add two types of formulas: a column formula or row formula, depending on the type of information you want for your report. The tabs at the top of the screen let you select Column Formulas or Row Formulas.
- The column formula takes data in one meter data channel (e.g., Volts A-N) and performs a function (e.g., totaling) on all of the values in the column.

  For example, if this is a daily report, and you select the function SUM, all of the hourly values for Volts A-N would be added together to get the result, which will be displayed at the bottom of that column in the report.
- The row formula performs mathematical operations (e.g., add) on selected meter data channels (e.g., Volts A-N and Volts B-N) and/or constant values (e.g., 1).

- To add a column formula:

  a. Click the **Column Formula** tab (this is the initial tab when the screen opens). Note that if column formulas have already been created, they will be shown on this screen.

b. Click the **Add Expression** button.



c. The screen you see lets you build a new column formula. To create the formula, enter:

- **Name**: give the formula a name. This name will be used in the report

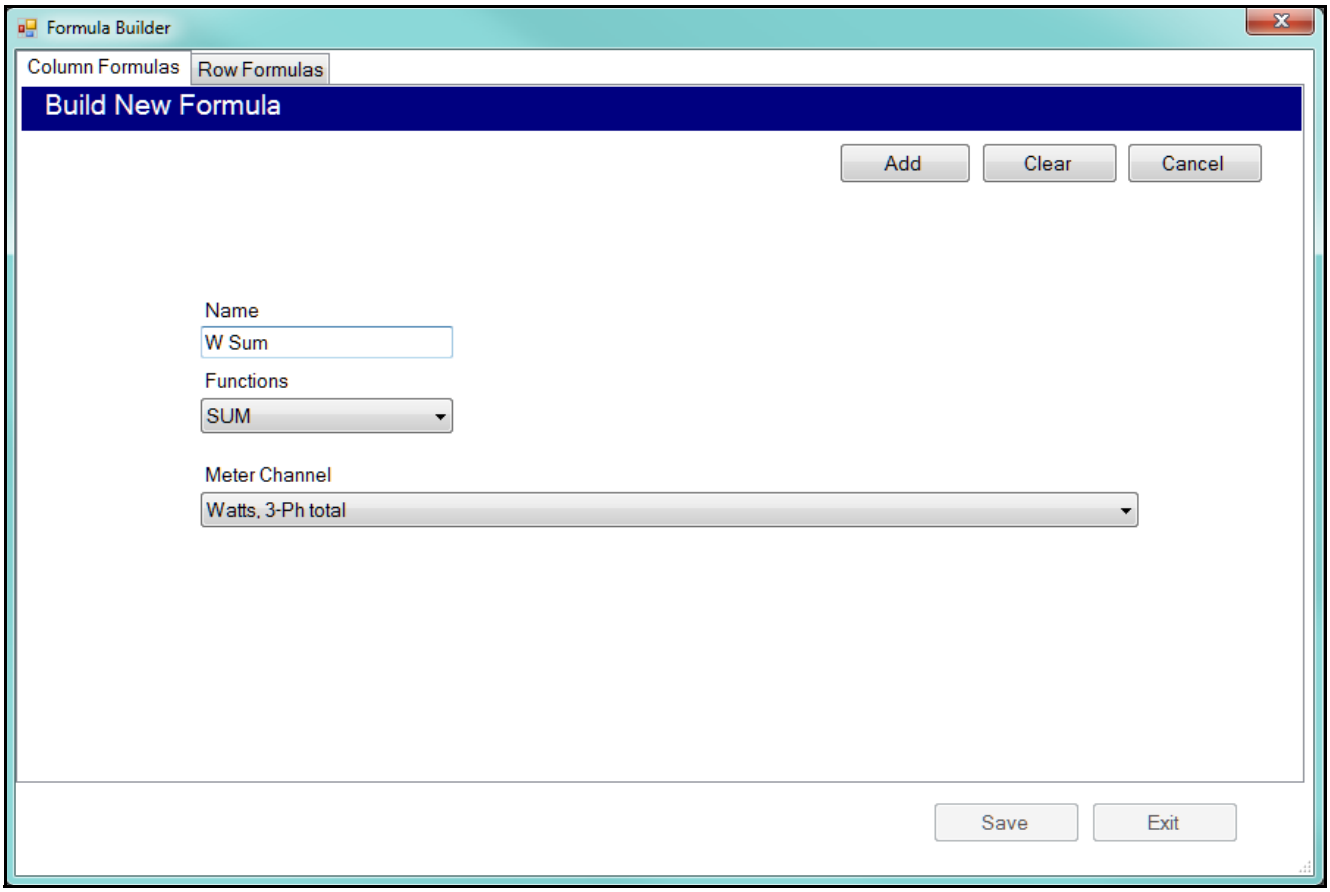
- **Function**: select from the pull-down menu.

The functions available for a Column formula are:

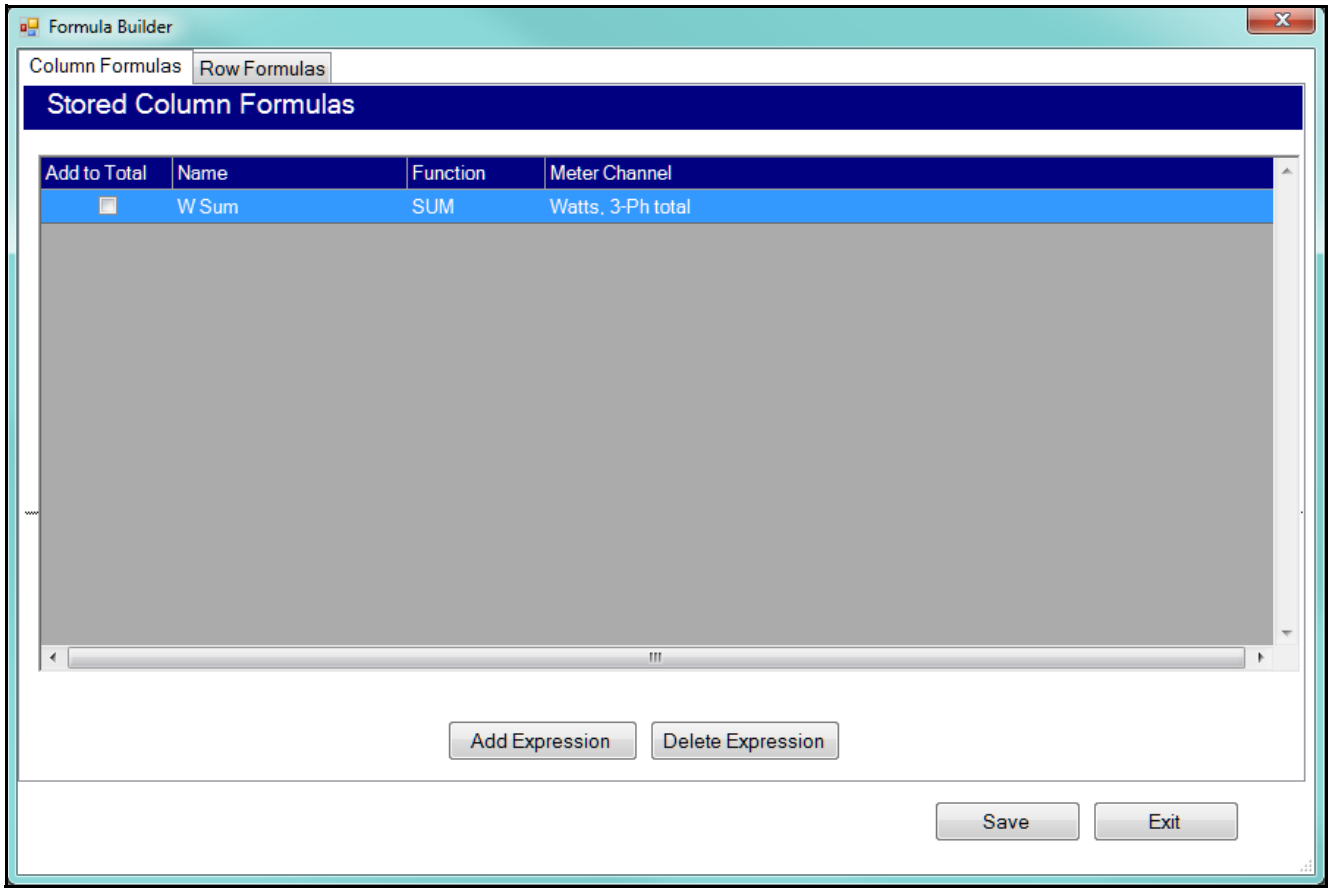
- **SUM**: total of the values in the column.
- **AVERAGE**: average value for the column.
- **MIN**(IMUM): smallest value in the column.
- **MAX**(IMUM): largest value in the column.
- **STDEV** (Standard Deviation): the standard deviation for the data in the column, which is a measure of the amount of variation in the data in the column.

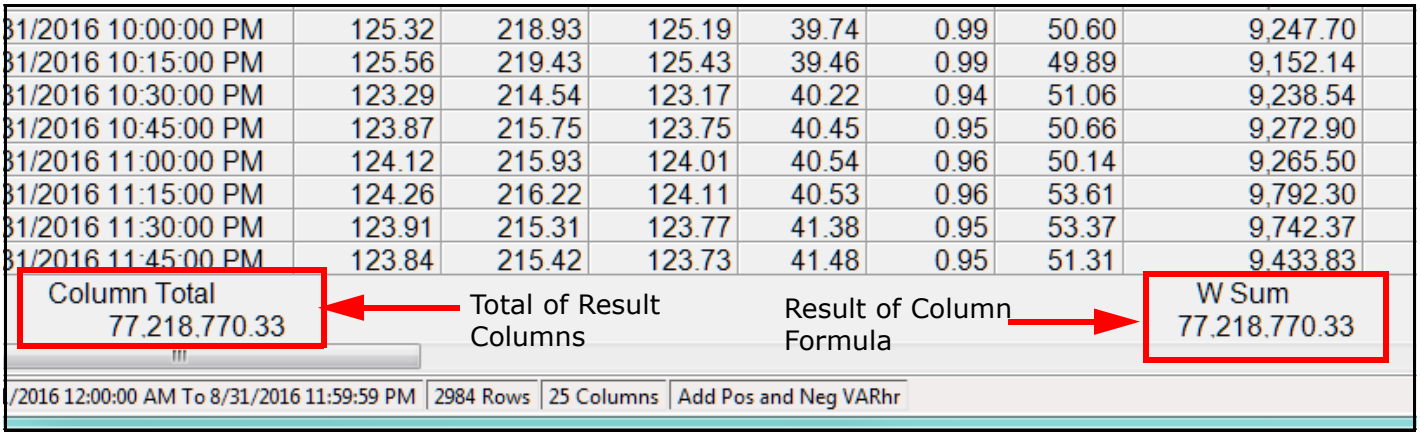
- **Meter Channel**: select the channel to perform the function on. You can create a column formula for as many meter data channels as are available in a report, but you can only use one function per meter data channel; i.e., you cannot add some of the Volts A-N values, and take an average of others.

d. When you have entered data in this screen, you will see additional buttons at the top right hand side. See the example screen, below.



- Click **Add** to accept the formula.
- Click **Clear** to remove the selections you made.
- Click **Cancel** to return to the Column Formula screen.





NOTE

Note that the above fields are the same value because there is only one column formula in this report example.

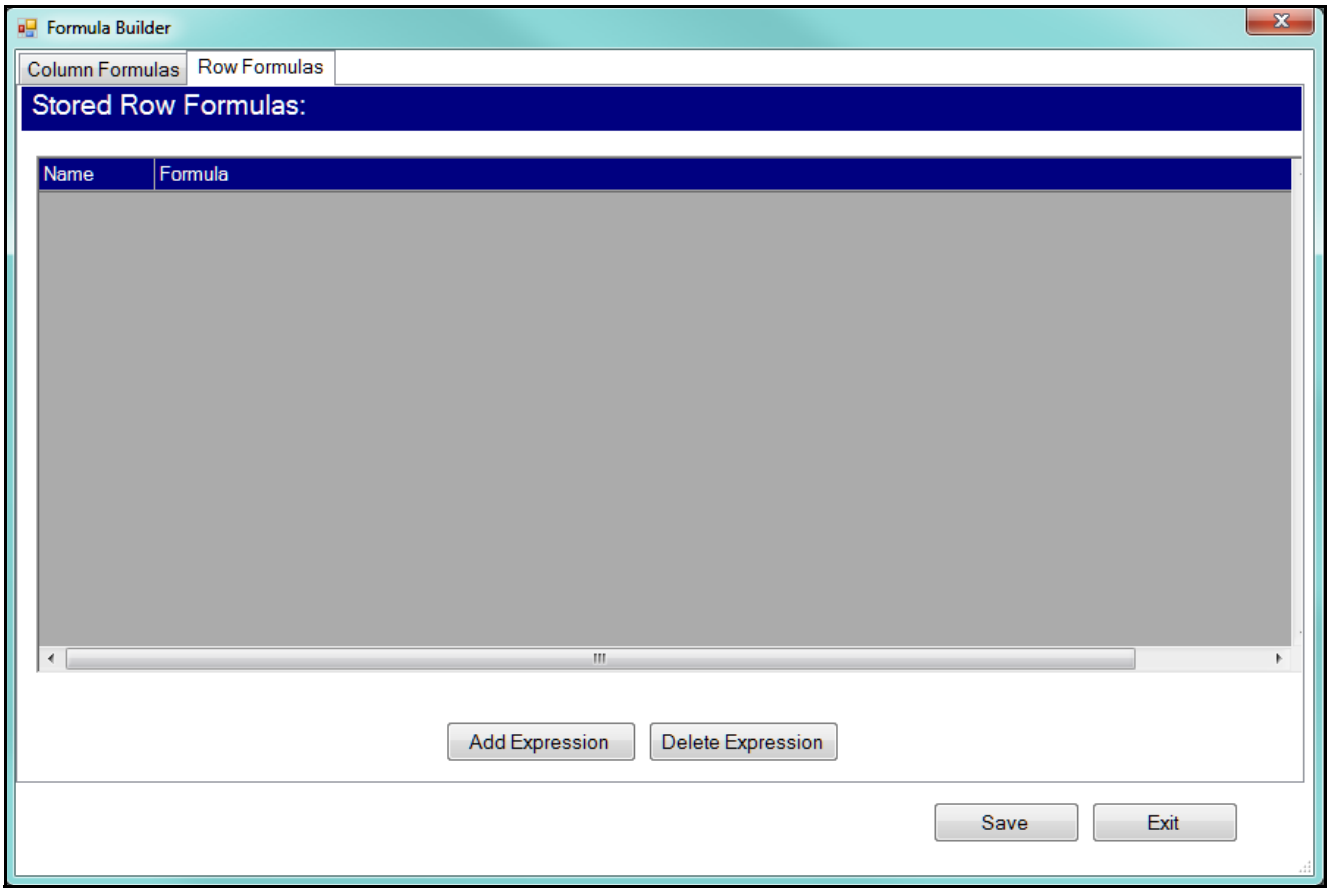
- If you want to delete a formula, highlight it in the list and click **Delete Expression**.

f. You can repeat steps b-e to add additional column formulas.

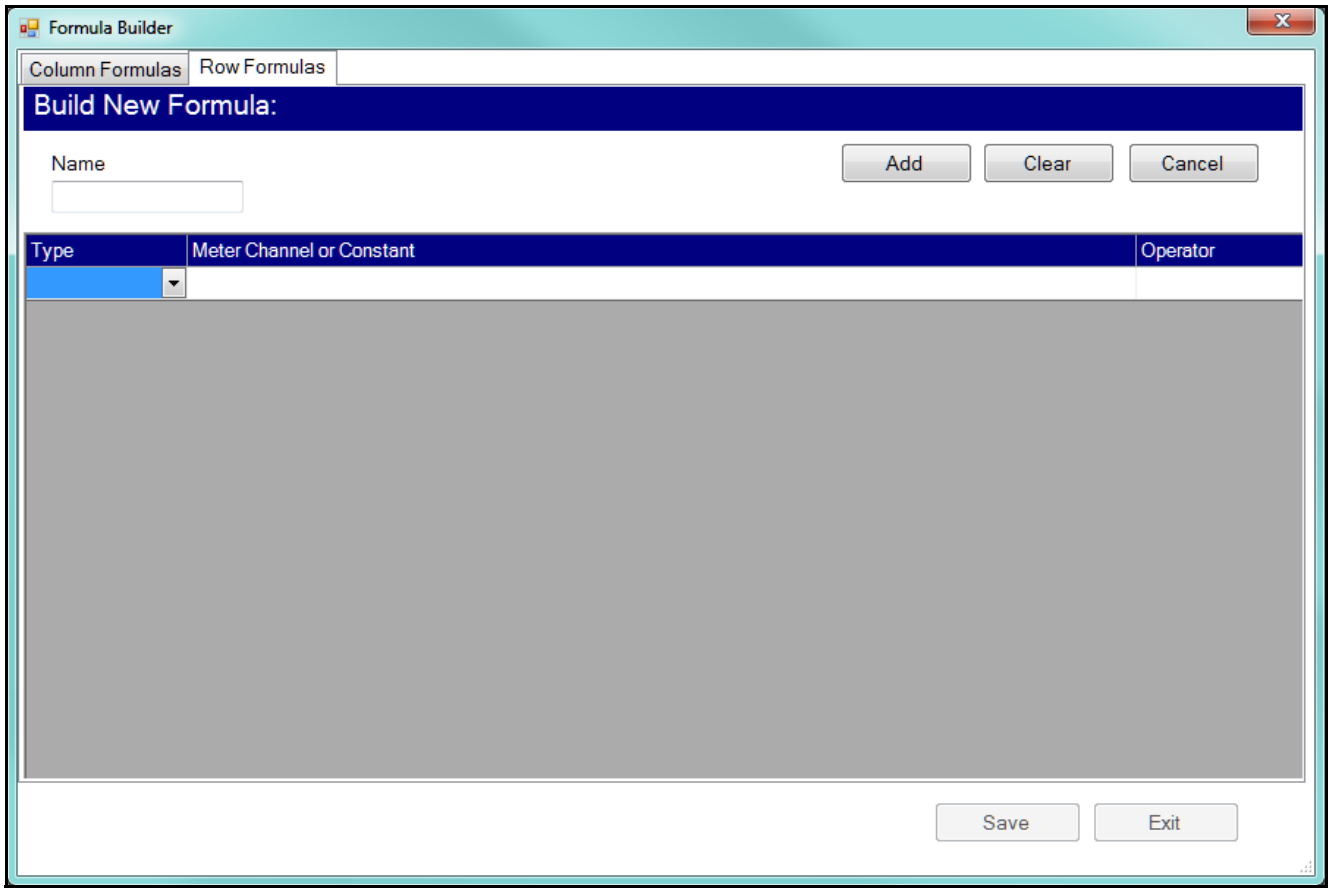
g. If you want to add a Row Formula, continue to the next section. Otherwise, click Save to save the formula(s) and see the Preview screen with the new fields displayed.

- To add a row formula:

  a. Click the **Row Formula** tab.



b. Note that if row formulas have already been created, they will be shown on this screen. To add a row formula, click the **Add Expression** button.



c. The screen you see lets you build a row formula. With a row formula, you can perform multiple operations; for example, add two meter data channels, add a constant value, and then subtract a third meter data channel. The formula is applied across each data row in the report and the result is displayed in the rightmost columns in the report, in order. To create the formula, enter:

- **Name**: give the formula a name. This name will be used in the report.

- **Type**: select Channel (data channel) or Constant from the pull-down menu.

- **Meter Channel or Constant**: depending on your type entry, either select the data channel you want from the pull-down menu, or enter the constant's value.

- **Operator**: select the operator you want from the pull-down menu.

The row formula performs mathematical operations (e.g., add) on selected meter data channels (e.g., Volts A-N and Volts B-N) and/or constant values (e.g., 1).

The operations available for a Row formula are:

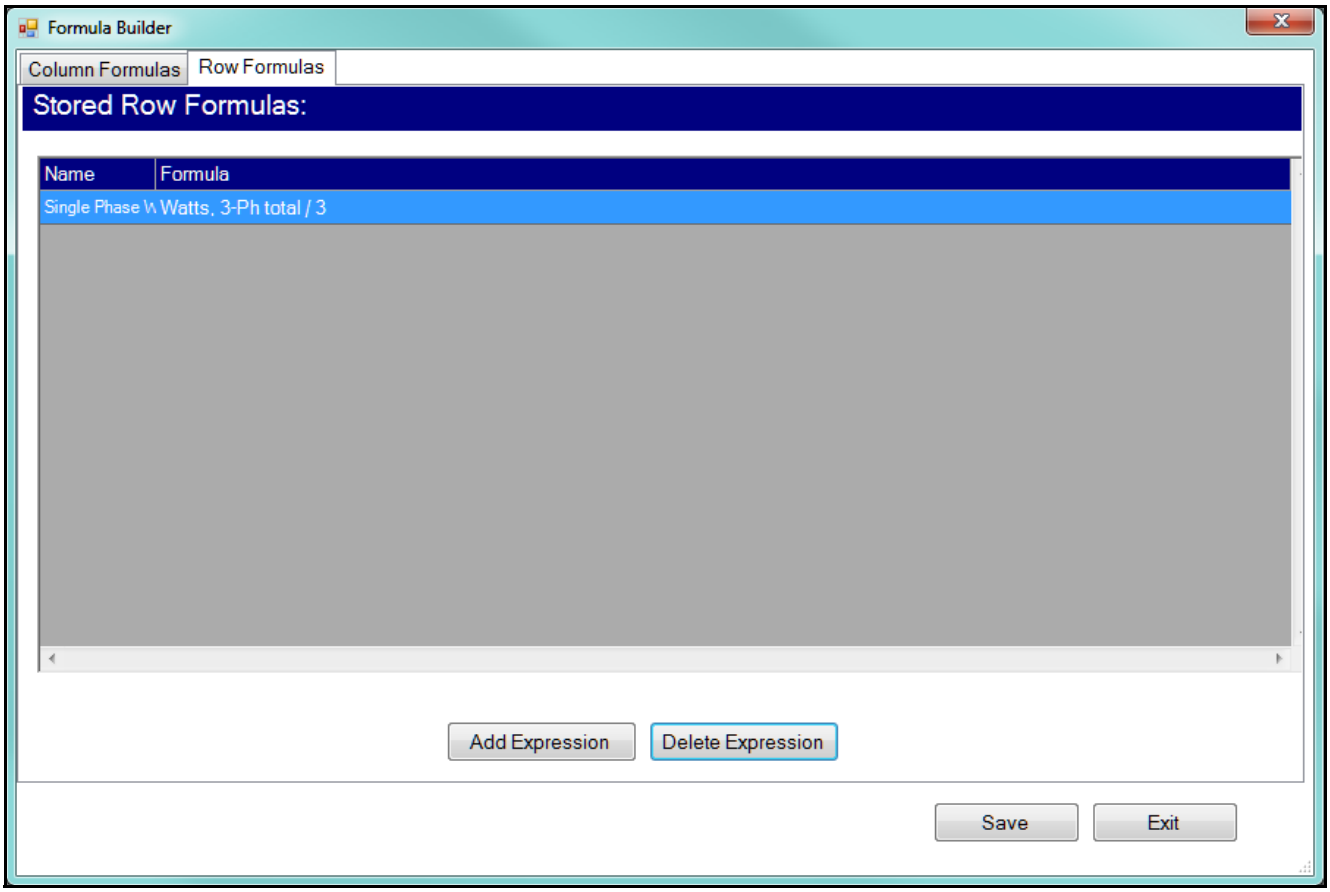
- "+": addition.
- "-": subtraction.
- "*: multiplication.
- "/": division.

d. Repeat selecting Type, Meter Channel or Constant value, and Operator until you have built the formula you want. Note that you cannot end a formula with an Operator - the last line of the
formula must have the Operator field blank.

e. When the formula is done:

- Click **Add** to accept the formula.
- Click **Clear** to remove the selections you made.
- Click **Cancel** to return to the Column Formula screen.

f. After you click **Add**, you will see the screen shown below.



- If you want to delete a formula, highlight it in the list and click **Delete Expression**.

g. You can repeat steps b-e to add additional row formulas.

h. When you have finished entering your formulas, click **Save** to save all the column and row formulas you entered. The formula calculations will be performed and displayed in the report preview screen.

See the following examples:

Report Preview

Monthly Report

From: 2018/01/26 23:00:00
To: 2018/01/27 23:00:00

Time Stamp	173,233,120.00	176,654,433.00	176,663,332.00	Total Wh in Interval
	W-hours in the Interval, Received	W-hours in the Interval, Received	W-hours in the Interval, Received	
2018/01/26 23:15:00	0.00	29.00	30.00	59.00
2018/01/26 23:30:00	0.00	29.00	29.00	58.00
2018/01/26 23:45:00	0.00	30.00	30.00	60.00
2018/01/27 00:00:00	0.00	29.00	29.00	58.00
2018/01/27 00:15:00	0.00	30.00	30.00	60.00
2018/01/27 00:30:00	0.00	29.00	30.00	59.00
2018/01/27 00:45:00	0.00	29.00	29.00	58.00
2018/01/27 01:00:00	0.00	30.00	30.00	60.00
2018/01/27 01:15:00	1,000.00	29.00	29.00	1,058.00
2018/01/27 01:30:00	0.00	30.00	29.00	59.00
2018/01/27 01:45:00	0.00	29.00	30.00	59.00
2018/01/27 02:00:00	0.00	29.00	29.00	58.00
2018/01/27 02:15:00	0.00	30.00	30.00	60.00
2018/01/27 02:30:00	0.00	29.00	29.00	58.00
2018/01/27 02:45:00	0.00	30.00	30.00	60.00
2018/01/27 03:00:00	0.00	29.00	30.00	59.00
2018/01/27 03:15:00	0.00	29.00	29.00	58.00
2018/01/27 03:30:00	0.00	30.00	30.00	60.00
2018/01/27 03:45:00	0.00	29.00	29.00	58.00
2018/01/27 04:00:00	1,000.00	30.00	30.00	1,060.00

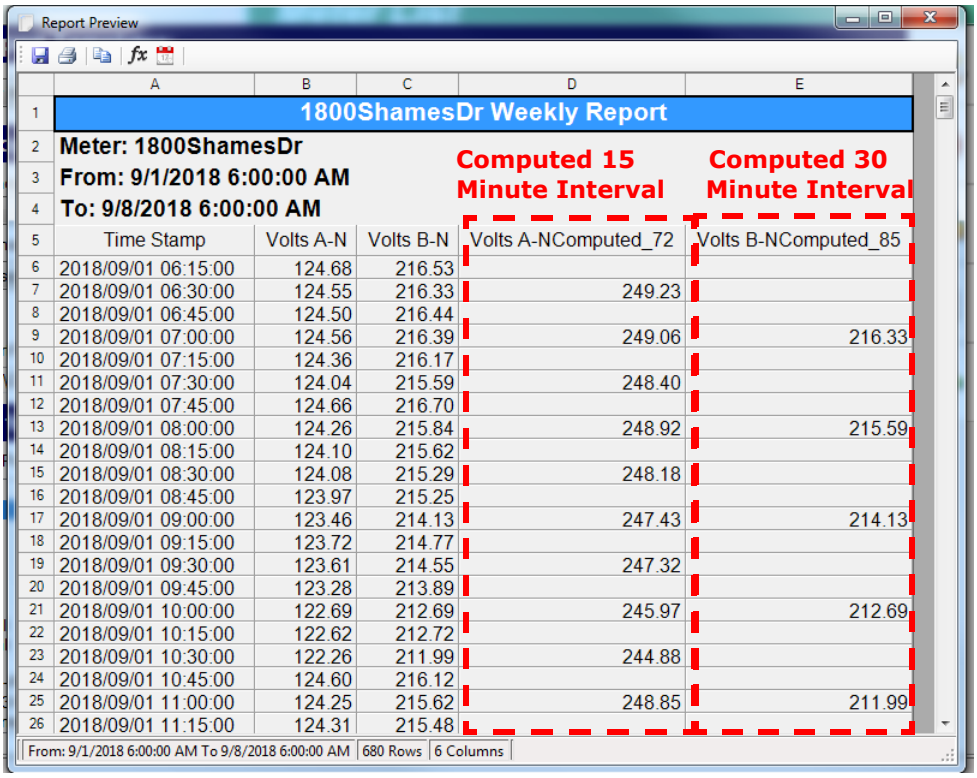
Figure 18-1: Report Preview Showing Row Formula Field (right)

Report Preview

	A	B	C
6785	2/24/2017 12:55:00 PM	9.00	
6786	2/24/2017 1:00:00 PM	8.00	
6787	2/24/2017 1:05:00 PM	8.00	
6788	2/24/2017 1:10:00 PM	9.00	
6789	2/24/2017 1:15:00 PM	8.00	
6790	2/24/2017 1:20:00 PM	8.00	
6791	2/24/2017 1:25:00 PM	9.00	
6792	2/24/2017 1:30:00 PM	8.00	
6793	2/24/2017 1:35:00 PM	9.00	
6794	2/24/2017 1:40:00 PM	8.00	
6795	2/24/2017 1:45:00 PM	8.00	
6796	2/24/2017 1:50:00 PM	9.00	
6797	2/24/2017 1:55:00 PM	8.00	
6798	2/24/2017 2:00:00 PM	9.00	
6799	2/24/2017 2:05:00 PM	8.00	
6800	2/24/2017 2:10:00 PM	8.00	
6801	2/24/2017 2:15:00 PM	9.00	
6802	2/24/2017 2:20:00 PM	8.00	
6803	2/24/2017 2:25:00 PM	8.00	
6804	2/24/2017 2:30:00 PM	9.00	
6805	2/24/2017 2:35:00 PM	8.00	
6806	2/24/2017 2:40:00 PM	9.00	
6807	2/24/2017 2:45:00 PM	8.00	
6808	2/24/2017 2:50:00 PM	8.00	
6809	2/24/2017 2:55:00 PM	9.00	
6810	2/24/2017 3:00:00 PM	8.00	
6811	2/24/2017 3:05:00 PM	9.00	
6812	2/24/2017 3:10:00 PM	8.00	
6813		Total Energy	
6814		59,143.00	

From: 2/1/2017 12:00:00 AM To 2/28/2017 11:59:59 PM | 6815 Rows | 4 Columns

Figure 18-2: Report Preview Showing Column Formula Field (bottom)



Report Preview

1800ShamesDr Weekly Report

Meter: 1800ShamesDr
From: 9/1/2018 6:00:00 AM
To: 9/8/2018 6:00:00 AM

Computed 15 Minute Interval

Computed 30 Minute Interval

	A	B	C	D	E
5	Time Stamp	Volts A-N	Volts B-N	Volts A-NComputed_72	Volts B-NComputed_85
6	2018/09/01 06:15:00	124.68	216.53		
7	2018/09/01 06:30:00	124.55	216.33	249.23	
8	2018/09/01 06:45:00	124.50	216.44		
9	2018/09/01 07:00:00	124.56	216.39	249.06	216.33
10	2018/09/01 07:15:00	124.36	216.17		
11	2018/09/01 07:30:00	124.04	215.59	248.40	
12	2018/09/01 07:45:00	124.66	216.70		
13	2018/09/01 08:00:00	124.26	215.84	248.92	215.59
14	2018/09/01 08:15:00	124.10	215.62		
15	2018/09/01 08:30:00	124.08	215.29	248.18	
16	2018/09/01 08:45:00	123.97	215.25		
17	2018/09/01 09:00:00	123.46	214.13	247.43	214.13
18	2018/09/01 09:15:00	123.72	214.77		
19	2018/09/01 09:30:00	123.61	214.55	247.32	
20	2018/09/01 09:45:00	123.28	213.89		
21	2018/09/01 10:00:00	122.69	212.69	245.97	212.69
22	2018/09/01 10:15:00	122.62	212.72		
23	2018/09/01 10:30:00	122.26	211.99	244.88	
24	2018/09/01 10:45:00	124.60	216.12		
25	2018/09/01 11:00:00	124.25	215.62	248.85	211.99
26	2018/09/01 11:15:00	124.31	215.48		

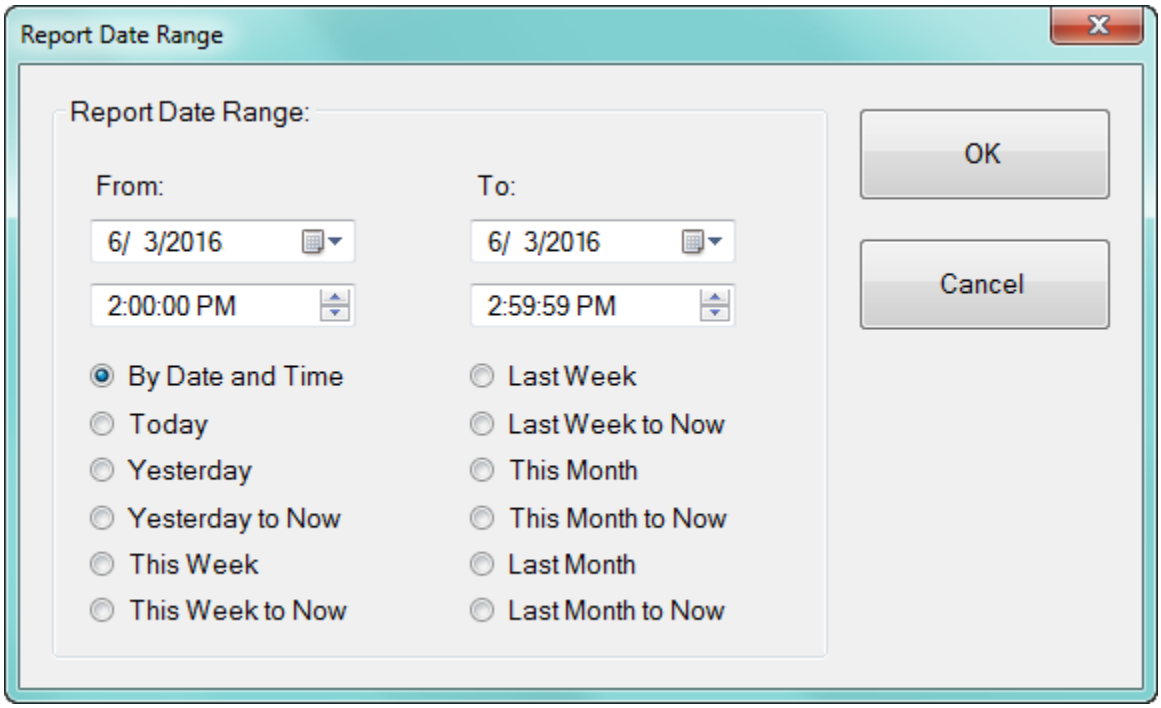
From: 9/1/2018 6:00:00 AM To 9/8/2018 6:00:00 AM | 680 Rows | 6 Columns

Figure 18-3: Report Preview Showing Two COmputed Channels

NOTE

The ability to save the report in a variety of formats allows you to perform additional calculations using the report data. For example, saving the report as an .xlsx. file lets you add additional mathematical functions.

Click the **Report Dates** icon to set the date range for a manual report.



- You can either use the **From** and **To** date and time fields to choose the date range, or you can select one of the options listed on the screen, e.g., Last Week to Now, to select that range for the report.

- Click **OK** to implement your selection. The report will re-process and display the results for the new date range. You can then save the file of and/or print the manual report.

- Click the **Help** icon to display these instructions on the screen.

3. Click the X in the upper right-hand corner of the screen to close the Report Preview screen.

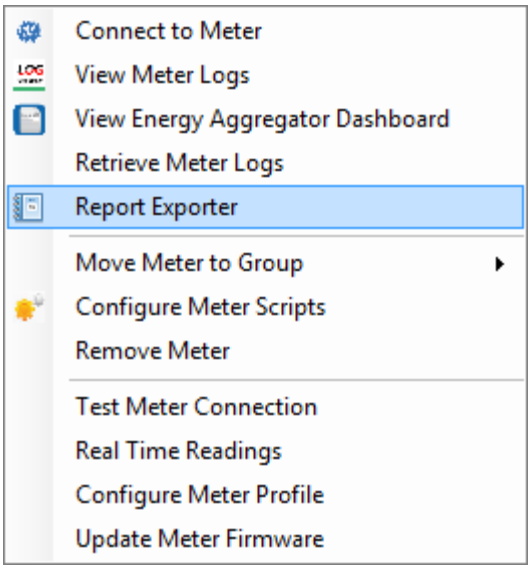
18.2.3.14.4: Report Exporter Example

This section gives an example using:

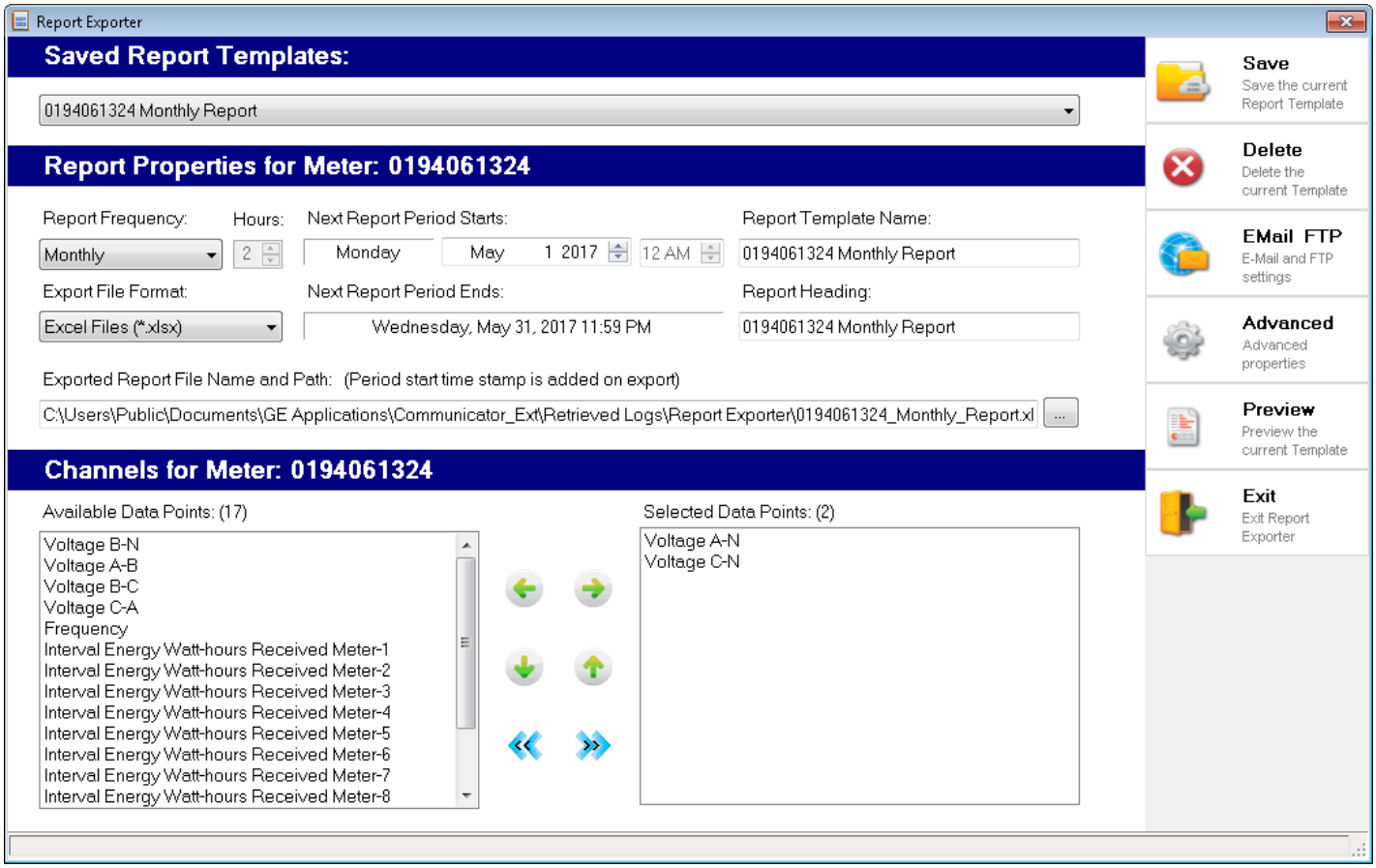
- A meter group containing two meters.
- A Report Exporter script set up for a one hour interval.
- Historical logs retrieved for the meter group.

1. Open GE MeterManager.

2. From the Meter List screen, right-click on the meter group you want to create a report for, and select **Report Exporter**.



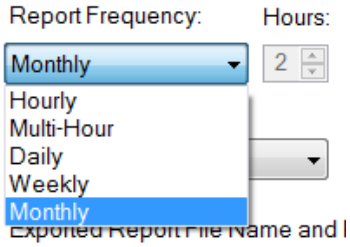
3. Report Exporter opens.



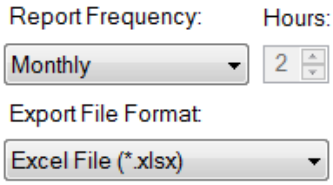
NOTE

Common channels are stored measurements that are available for all the meters in the group.

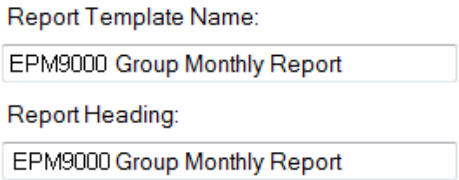
a. Select report frequency, in this case, Monthly.
Note that the report **Template Name** and **Heading** fields change to reflect your choice.



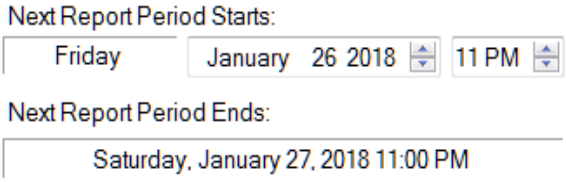
b. Select the **Export File Format**, in this case Excel File (*.xlsx).



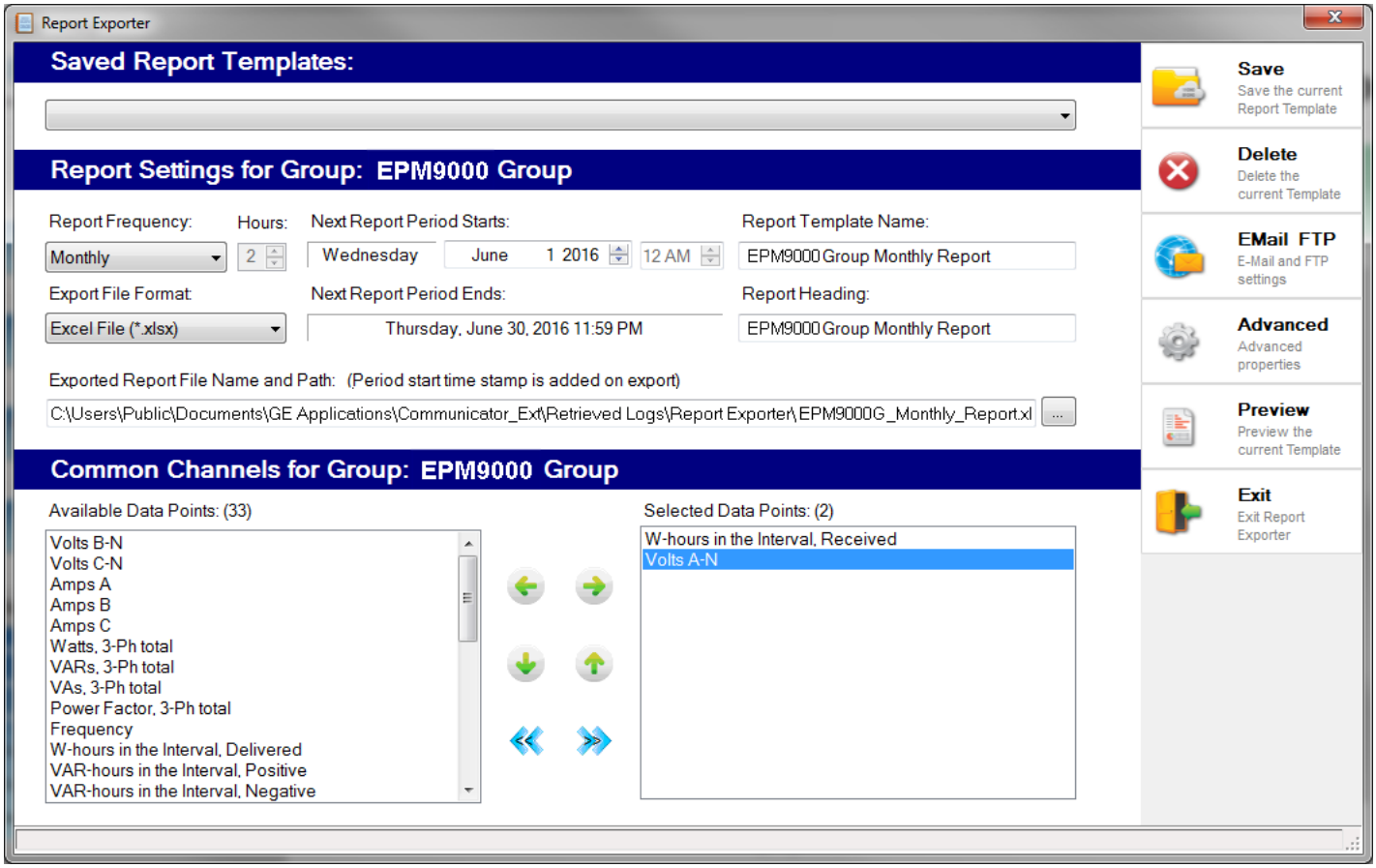
c. Enter the Report Template Name, which is used for saving the report template, and the Report Heading, which will appear at the top of the report.



d. The application suggests a starting date for the report. You can click on the up/down arrows next to the date to change the starting date. The Next Report Period Ends date display only, and is based on the starting date and the report frequency.
Note that you can set the starting date for the initial report period to any date for which there is available data.



e. Available data points for the report are listed in the bottom, left of the screen. When you select a data point for the report, it is moved to the Selected Data Points list on the right. In this example, "W-hours in the Interval, Received" and "Volts A-N' have been moved to the selected list.



f. Once the report is generated, it is saved in the folder shown in the Report Exporter screen, in the Exported Report File Name and Path field. You can also set up emailing and/or uploading of the report file to a network FTP server. To do so, click Email FTP on the right side of the screen. See *18.2.3.14.1: Email/FTP Feature* on page 18–46, for detailed instructions for this screen.

g. You can use the Report Preview screen to add any formulas to the data. See *18.2.3.14.3: Report Preview Feature* on page 18–50, for detailed instructions.

18.2.3.14.5: Report Exporter Troubleshooting

Following is a list of possible Report Exporter messages and steps to resolve any error conditions:

- "Automatic Log Retrieval is Disabled for all Groups. Enable "Automatic Log Retrieval" in "System Options" for automated report generation":
  Since Automatic Log Retrieval is turned off for all meters, you cannot create a report with Report Exporter. To remedy this, click **Tools > Configure > System > System Options** from the GE MeterManager screen, un-check the **Disable Automatic Log Retrieval** checkbox, and click **Save**.
- "Automatic Log Retrieval is Disabled for the Group: *Group Name*. Enable Automatic Log Retrieval in Configure Group Scripts for automated report generation":
  Since Automatic Log Retrieval is turned off for the selected group of meters, you cannot create a report for that group with Report Exporter. To remedy this, click **Configure** Group Scripts, select the desired group from the pull-down list at the top of the screen, check the "**Retrieve Logs for this group**" checkbox, select each log to be retrieved in the list below the checkbox, and click **Save**.
- "No Historical Log data is available for the Meter: Meter Name. Retrieve the *Meter Name* Logs now?":
  Before you can create a report template, there must be historical log data for the selected meter. Click **Yes** to retrieve the logs from the meter.
- "No Historical log data is available for: Meter: *Meter Name;* Group: *Group Name*. Retrieve "*Meter Name*" logs now?":
  Before a report template can be created to automatically generate reports, there must be historical log data for all of the meters in a meter group. This will be either the meter selected to create a report, or the first meter in a group of meters, for which there is no historical log data. Click **Yes** to retrieve the logs for that meter.
- "WARNING! Group: *Group Name*; Report: *Report Template Name*. Group configuration has been modified since report creation! Be advised report data may not match meters contained in the group. Edit this Report?":
  This error occurs when the group that the report was originally created for has been modified in some manner since the report template was created. For example, a meter was added to the group, or a channel was removed from one of the logs. Click **Yes** to edit the report as needed, and then save the modified report template.
- "Group: *Group Name* is included in the Report: *Report Template Name*. Edit this Report?":
  You will see this message when a group of meters already has a report template configured for it. Click **Yes** to edit the existing report template; or, click **No** to create a new, additional report template for this group of meters. For example, you may need both weekly and monthly reports for the same meter or group of meters.
- "Group: *Group Name*; Meter: *Meter Name* is included in the report: *Report Template Name*. Edit the Report for this Meter?":
  You will see this message when a meter you are trying to create a report for is already included in a group's report template. Click Yes to edit the existing report template that contains the meter; or, click No to create a new report template for this meter.

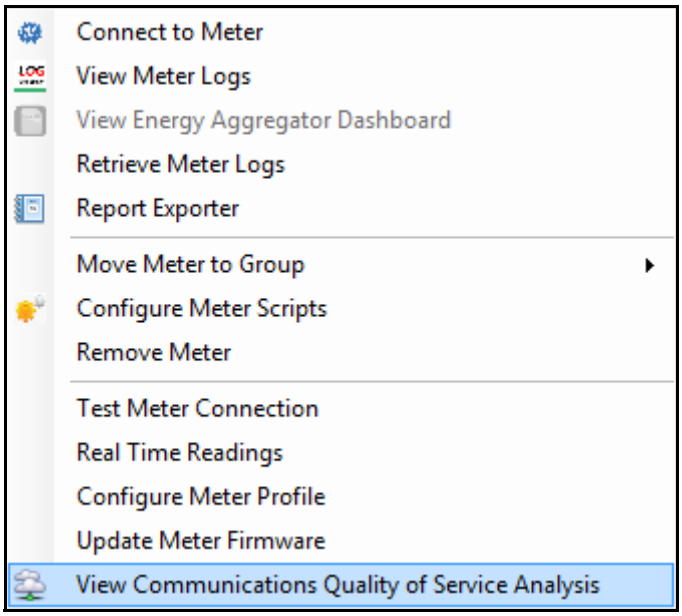
18.2.3.15 View Communications Analysis

This feature lets you view communication status for the network and meters. You can use it to identify any problems occurring within the system's communication infrastructure and with individual meters.

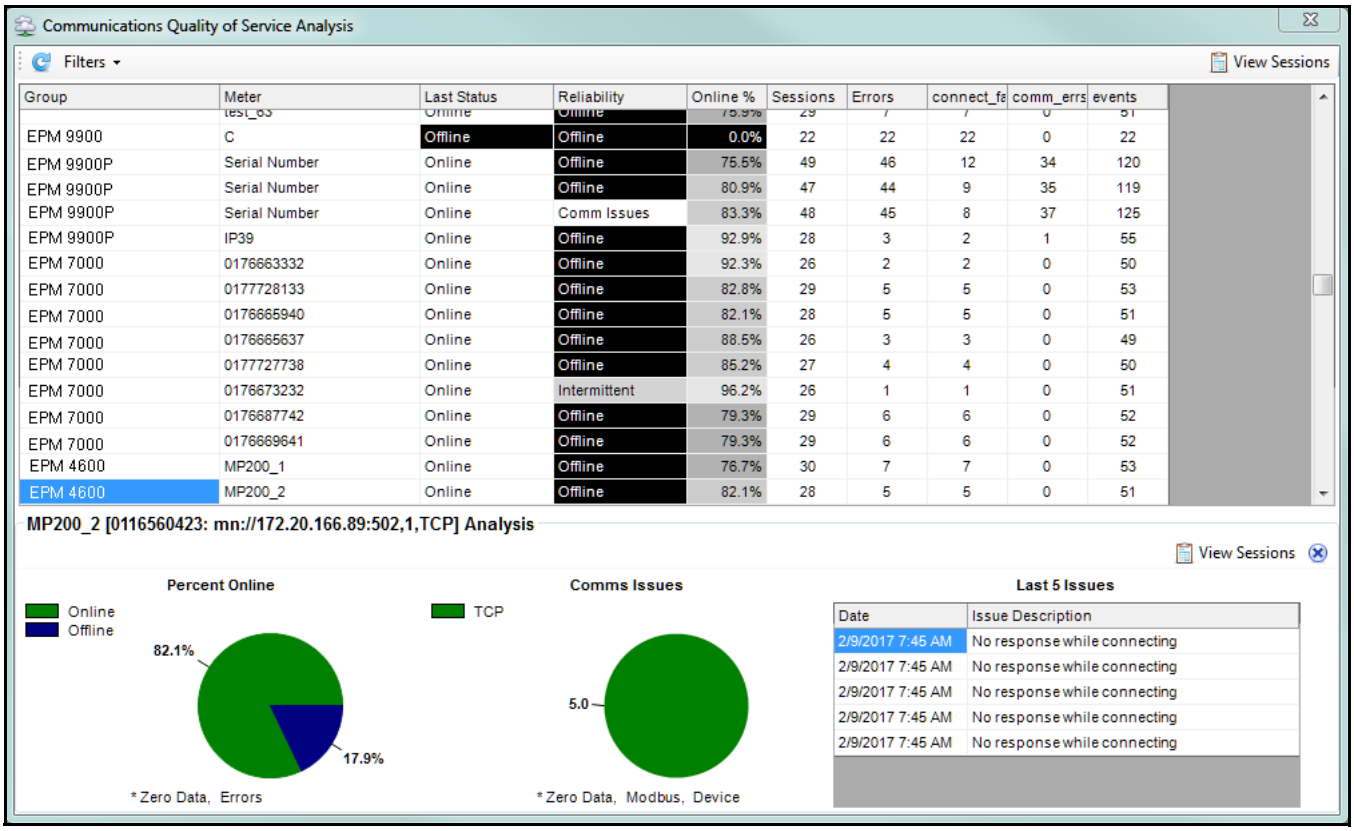
- The start and end of each connection session is logged, along with any communication and framework errors detected during the session.
- Events are stored in rolling day files by connection, allowing logs to be quickly cleaned up based on connection or age. Note that only the previous 30 days of events are saved.

There are two ways to view this information - through the Meter List or the Tools Menu.

1. Double-click or right-click on a meter in the Meter List screen and select **View Communications Analysis**.



The screen shown below opens. From this screen you can get a quick overview of meters that are having communication problems, see how reliable the connection is, and view information showing how the software communicates with the meter.



Group	Meter	Last Status	Reliability	Online %	Sessions	Errors	connect_fa	comm_errs	events
EPM 9900	C	Offline	Offline	0.0%	22	22	22	0	22
EPM 9900P	Serial Number	Online	Offline	75.5%	49	46	12	34	120
EPM 9900P	Serial Number	Online	Offline	80.9%	47	44	9	35	119
EPM 9900P	Serial Number	Online	Comm Issues	83.3%	48	45	8	37	125
EPM 9900P	IP39	Online	Offline	92.9%	28	3	2	1	55
EPM 7000	0176663332	Online	Offline	92.3%	26	2	2	0	50
EPM 7000	0177728133	Online	Offline	82.8%	29	5	5	0	53
EPM 7000	0176665940	Online	Offline	82.1%	28	5	5	0	51
EPM 7000	0176665637	Online	Offline	88.5%	26	3	3	0	49
EPM 7000	0177727738	Online	Offline	85.2%	27	4	4	0	50
EPM 7000	0176673232	Online	Intermittent	96.2%	26	1	1	0	51
EPM 7000	0176687742	Online	Offline	79.3%	29	6	6	0	52
EPM 7000	0176669641	Online	Offline	79.3%	29	6	6	0	52
EPM 4600	MP200_1	Online	Offline	76.7%	30	7	7	0	53
EPM 4600	MP200_2	Online	Offline	82.1%	28	5	5	0	51

Date	Issue Description
2/9/2017 7:45 AM	No response while connecting
2/9/2017 7:45 AM	No response while connecting
2/9/2017 7:45 AM	No response while connecting
2/9/2017 7:45 AM	No response while connecting
2/9/2017 7:45 AM	No response while connecting

The bottom of the screen shows a detailed analysis for the meter on which you right-clicked. You can click on another meter in the list to view its detailed analysis. The detailed analysis includes:

- **Percent Online**: this summarizes the number of Connection Sessions which were Good (Online), Failed to Connect (Offline), or contained communications issues (Errors).
- **Comms Issues**: this summarizes the count of communications issues in the categories of TCP Errors, Modbus Errors, and Device Errors.
- **Last 5 Issues**: this displays a summary of the last five issues detected for this meter, and when they occurred.
- **View Sessions**: this opens the Connection Session Viewer to display the raw session events for this meter. (This screen is explained on page 18-86.)
- **X**: this closes the Meter Analysis view, and shows the overview analysis.

The screen displays a list of all the meters in the system, along with their group, an analysis of how good their communication is, and information about each connection session, including:

- **Last Status**: the current status of the meter, as of the last update for the current day. This can be one of Online, Offline, or Unknown.

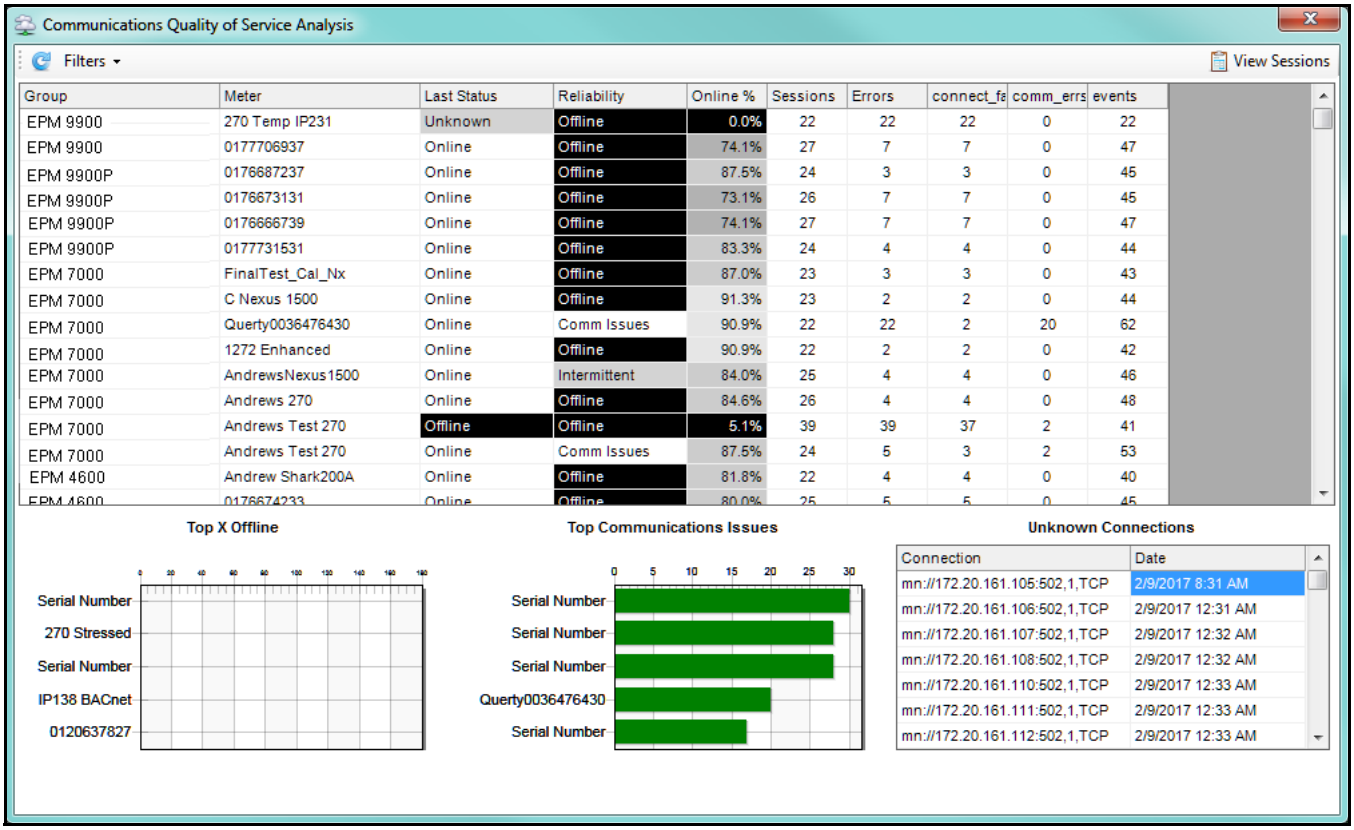
- **Reliability**: an indication of how reliable communication with the meter is.
  - **Good**: no problems found.
  - **Comm Issues**: connections to the meter are successful, but errors were detected while communicating to it.
  - **Intermittent**: while some connections failed, later attempts succeeded.
  - **Offline**: the meter is currently offline, and has been for multiple attempts to connect.
- **Online %**: a percentage of how often connections with the meter succeed. 100% indicates the meter was able to connect 100% of the time.
- **Sessions**: the number of connection sessions recorded.
- **Errors**: the number of connection sessions which contain an error of one sort or another.
- **Connect Failed**: the number of connection sessions which failed to connect to the meter.
- **Comm Errors**: the number of connection sessions which had a communication error after connecting.
- **Events**: the total number of communication events recorded across all connection sessions.

Right-click a meter in the list to see these options:

- **View Analysis File**: this opens the connection analysis file for this meter.
- **View Raw Events**: this opens the Connection Session Viewer which shows the raw session events for this meter.
- **Copy**: copies the currently selected cells to the clipboard.
- **Copy All**: copies all the displayed cells to the clipboard.

NOTE

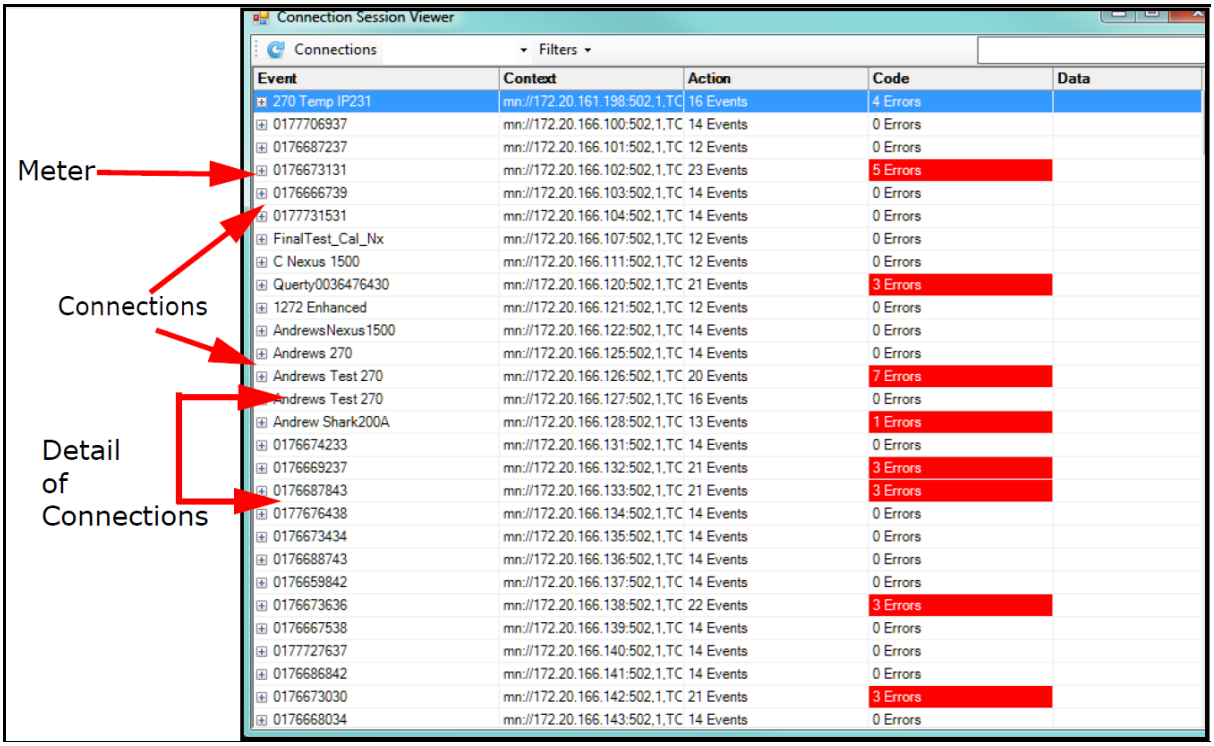
Note that you can also access this screen by clicking **Tools > Utilities > Connections > View Communications Analysis**, but the screen looks a bit different.



Group	Meter	Last Status	Reliability	Online %	Sessions	Errors	connect_fa	comm_errs	events
EPM 9900	270 Temp IP231	Unknown	Offline	0.0%	22	22	22	0	22
EPM 9900	0177706937	Online	Offline	74.1%	27	7	7	0	47
EPM 9900P	0176687237	Online	Offline	87.5%	24	3	3	0	45
EPM 9900P	0176673131	Online	Offline	73.1%	26	7	7	0	45
EPM 9900P	0176666739	Online	Offline	74.1%	27	7	7	0	47
EPM 9900P	0177731531	Online	Offline	83.3%	24	4	4	0	44
EPM 7000	FinalTest_Cal_Nx	Online	Offline	87.0%	23	3	3	0	43
EPM 7000	C Nexus 1500	Online	Offline	91.3%	23	2	2	0	44
EPM 7000	Querty0036476430	Online	Comm Issues	90.9%	22	22	2	20	62
EPM 7000	1272 Enhanced	Online	Offline	90.9%	22	2	2	0	42
EPM 7000	AndrewsNexus1500	Online	Intermittent	84.0%	25	4	4	0	46
EPM 7000	Andrews 270	Online	Offline	84.6%	26	4	4	0	48
EPM 7000	Andrews Test 270	Offline	Offline	5.1%	39	39	37	2	41
EPM 7000	Andrews Test 270	Online	Comm Issues	87.5%	24	5	3	2	53
EPM 4600	Andrew Shark200A	Online	Offline	81.8%	22	4	4	0	40
EPM 4600	0176674233	Online	Offline	80.0%	25	5	5	0	45

You will see all the events for all the attempted connections. Note that viewing this log from the Tools menu lets you see connection attempts to invalid and unknown devices, which can help identify connection problems or IP addresses to blacklist.

- **Refresh**: the Communication Analysis data is refreshed in the background, so clicking Refresh can reload the most recent data.
- **Filter > Show Comm Counts**: this view also shows Modbus communication counts, such as which types of requests are made, in the grid.
- **Filter > Show Error Counts**: this view also shows the raw communication error counts in the grid.
- **Top 5 Offline**: this view displays the five meters which have the worst online %.
- **Top Communications Issues:** this view displays the five meters which have the most communication issues.
- **Unknown Connections**: this view lists all connections which failed to respond, or responded with an unknown device, and the last time they were tested.
- **View Sessions**: this opens the Connection Session Viewer to display the raw session events for all meters. When the Connection Session Viewer is opened, it may take a while to load all of the events. A progress bar is displayed while events are being loaded. If you select Cancel, all of the connection sessions loaded so far will be displayed. See the example screen on the next page.

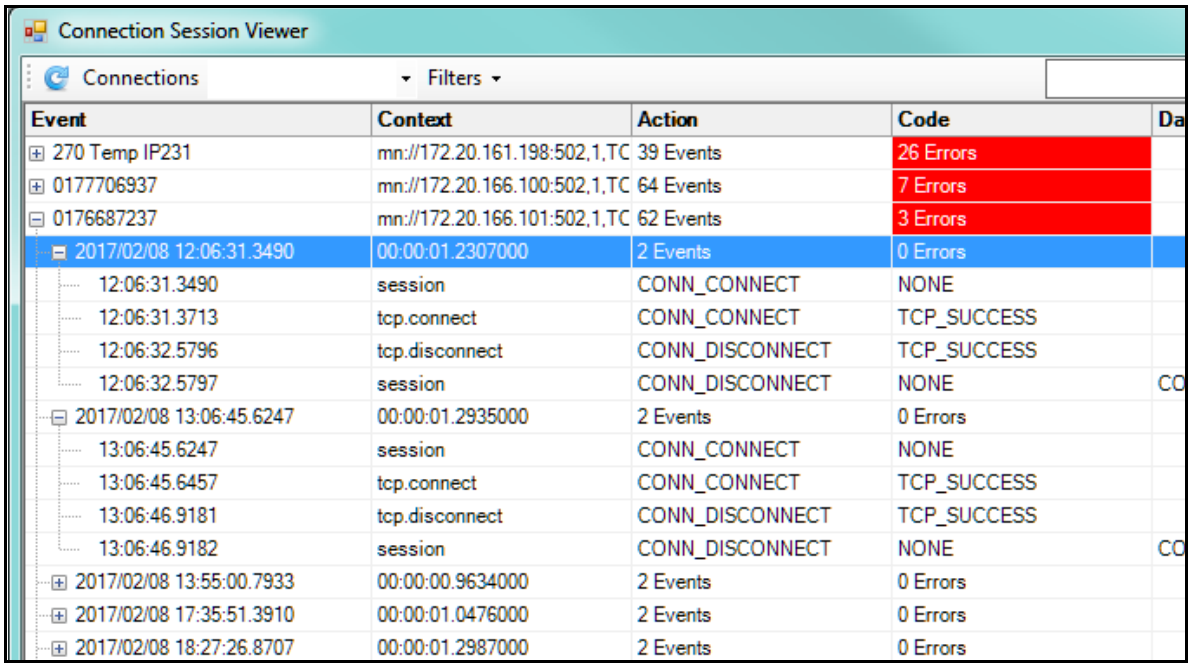


NOTE

If you click View Sessions from the detailed meter portion of the screen (see page 18-83), you will only see data for the meter you selected.

- Once loaded, all of the meters and connections found are displayed. A summary of the number of events found and a count of the errors that occurred during those sessions, is displayed for each connection.
- You can click the plus sign next to a meter to view a list of connections for the meter by initial connect date, along with the computed duration of the event, and the number of events and errors found in the session.

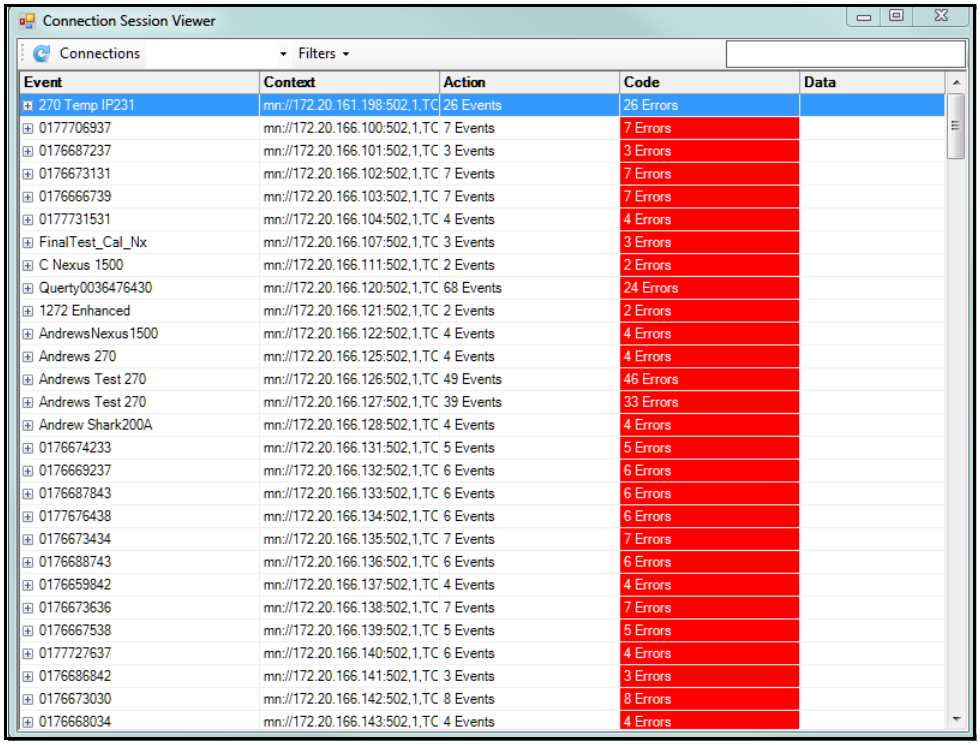
You can click on one of the connections to view the list of events for that session, flagging any errors. See the example screen, below.



Event	Context	Action	Code	Da
270 Temp IP231	mn://172.20.161.198:502,1,TC	39 Events	26 Errors	
0177706937	mn://172.20.166.100:502,1,TC	64 Events	7 Errors	
0176687237	mn://172.20.166.101:502,1,TC	62 Events	3 Errors	
2017/02/08 12:06:31.3490	00:00:01.2307000	2 Events	0 Errors	
12:06:31.3490	session	CONN_CONNECT	NONE	
12:06:31.3713	tcp.connect	CONN_CONNECT	TCP_SUCCESS	
12:06:32.5796	tcp.disconnect	CONN_DISCONNECT	TCP_SUCCESS	
12:06:32.5797	session	CONN_DISCONNECT	NONE	CO
2017/02/08 13:06:45.6247	00:00:01.2935000	2 Events	0 Errors	
13:06:45.6247	session	CONN_CONNECT	NONE	
13:06:45.6457	tcp.connect	CONN_CONNECT	TCP_SUCCESS	
13:06:46.9181	tcp.disconnect	CONN_DISCONNECT	TCP_SUCCESS	
13:06:46.9182	session	CONN_DISCONNECT	NONE	CO
2017/02/08 13:55:00.7933	00:00:00.9634000	2 Events	0 Errors	
2017/02/08 17:35:51.3910	00:00:01.0476000	2 Events	0 Errors	
2017/02/08 18:27:26.8707	00:00:01.2987000	2 Events	0 Errors	

Additional commands/options for this screen are:

- Refresh: this reloads the Communication logs.
- Meter Filter: this filters the meter or connection shown. Select the top blank entry to show all meters.
    - Devices Only Filter: this selection shows only connections which have a matching discovered device. Un-checking this option will show unknown devices, which can be useful for debugging invalid connections.
    - Errors Only Filter: this selection shows only sessions which contain errors. See the example screen on the next page.



Event	Context	Action	Code	Data
270 Temp IP231	mn://172.20.161.198:502,1,TC	26 Events	26 Errors	
0177706937	mn://172.20.166.100:502,1,TC	7 Events	7 Errors	
0176687237	mn://172.20.166.101:502,1,TC	3 Events	3 Errors	
0176673131	mn://172.20.166.102:502,1,TC	7 Events	7 Errors	
0176666739	mn://172.20.166.103:502,1,TC	7 Events	7 Errors	
0177731531	mn://172.20.166.104:502,1,TC	4 Events	4 Errors	
FinalTest_Cal_Nx	mn://172.20.166.107:502,1,TC	3 Events	3 Errors	
C Nexus 1500	mn://172.20.166.111:502,1,TC	2 Events	2 Errors	
Querty0036476430	mn://172.20.166.120:502,1,TC	68 Events	24 Errors	
1272 Enhanced	mn://172.20.166.121:502,1,TC	2 Events	2 Errors	
AndrewsNexus1500	mn://172.20.166.122:502,1,TC	4 Events	4 Errors	
Andrews 270	mn://172.20.166.125:502,1,TC	4 Events	4 Errors	
Andrews Test 270	mn://172.20.166.126:502,1,TC	49 Events	46 Errors	
Andrews Test 270	mn://172.20.166.127:502,1,TC	39 Events	33 Errors	
Andrew Shark200A	mn://172.20.166.128:502,1,TC	4 Events	4 Errors	
0176674233	mn://172.20.166.131:502,1,TC	5 Events	5 Errors	
0176669237	mn://172.20.166.132:502,1,TC	6 Events	6 Errors	
0176687843	mn://172.20.166.133:502,1,TC	6 Events	6 Errors	
0177676438	mn://172.20.166.134:502,1,TC	6 Events	6 Errors	
0176673434	mn://172.20.166.135:502,1,TC	7 Events	7 Errors	
0176688743	mn://172.20.166.136:502,1,TC	6 Events	6 Errors	
0176659842	mn://172.20.166.137:502,1,TC	4 Events	4 Errors	
0176673636	mn://172.20.166.138:502,1,TC	7 Events	7 Errors	
0176667538	mn://172.20.166.139:502,1,TC	5 Events	5 Errors	
0177727637	mn://172.20.166.140:502,1,TC	6 Events	4 Errors	
0176686842	mn://172.20.166.141:502,1,TC	3 Events	3 Errors	
0176673030	mn://172.20.166.142:502,1,TC	8 Events	8 Errors	
0176668034	mn://172.20.166.143:502,1,TC	4 Events	4 Errors	

- Search this performs an exact string search on the meter name, connection, context, action, code, and data fields. This option is useful for rapidly finding specific errors, or all meters in a specific subnet. Press enter to start the search, and clear the box to remove the search filter.

  For example:

  _REJECT will show all sessions which the TCP connection has rejected.

  172.20.166 will show all meters in the 172.20.166 subnet.

  tcp.read will show all sessions which had errors reading from the TCP interface.

Some common connection errors are shown in the table, below.

Context	Action	Code	Data	Description
tcp.connect	CONN_CONNECT	TCP_CONNECT_TIMEOUT		No response during connect
tcp.connect	CONN_CONNECT	TCP_CONNECT_REJECTED		The meter rejected the connection
tcp.connect	CONN_CONNECT	TCP_INVALID	Host not known	The computer doesn't know how to reach the destination address. Verify that it is a valid address.
tcp.read	MSG_READ	TCP_OTHER	WSAETIMEDOUT	Connect was successful, but a read request timed out waiting for a response.
tcp.read	MSG_READ	TCP_CONNECT_TERMINATED		The connection was terminated while trying to read from the device.
SCAN_KNOWN	DEV_LOOKUP	DEV_UNEXPECTED_DEV	(id)	When querying the device id at the specified connection, the device found did not match what is recorded in GE MeterManager.

18.3 Scripts

GE MeterManager runs automated scripts for meter discovery and lets you set up scripts that automate log retrieval for a group of meters or an individual meter. This makes it easy to manage trending for large groups of meters, by eliminating the need for manual retrieval of logs.

Another use of log retrieval is to build the GE Energy Aggregator usage database, which is used for usage reporting and analysis. For more information on the GE Energy Aggregator application, see the *GE Energy Aggregator Instruction Manual*.

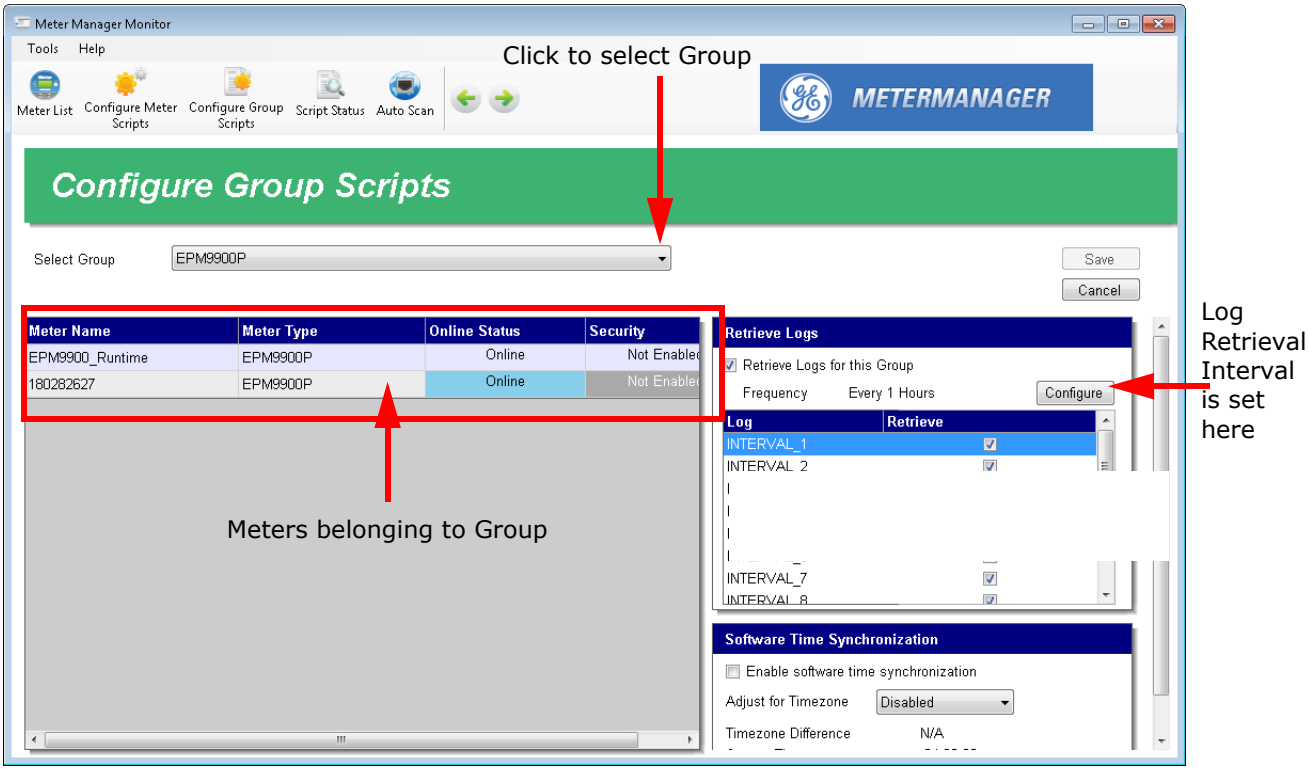
NOTE

When a meter's log database gets too large, archiving it makes room for new data. GE MeterManager can automatically compress and archive the log database before retrieving logs, so that the database only contains new data. This archiving can be set up for a group - see 18.3.1 *Configure Group Scripts* on page 18–76; or for an individual meter - see *18.3.2.1.2: Log Archiving for Meter* on page 18–25.

18.3.1 Configure Group Scripts

Scripts for log retrieval are set up for groups of meters (see "Meter Groups" on page 18-20 for information on meter groups). A group consists of one or more meters.

1. Click **Configure Group Scripts** from the left side or the top of the Meters List screen.

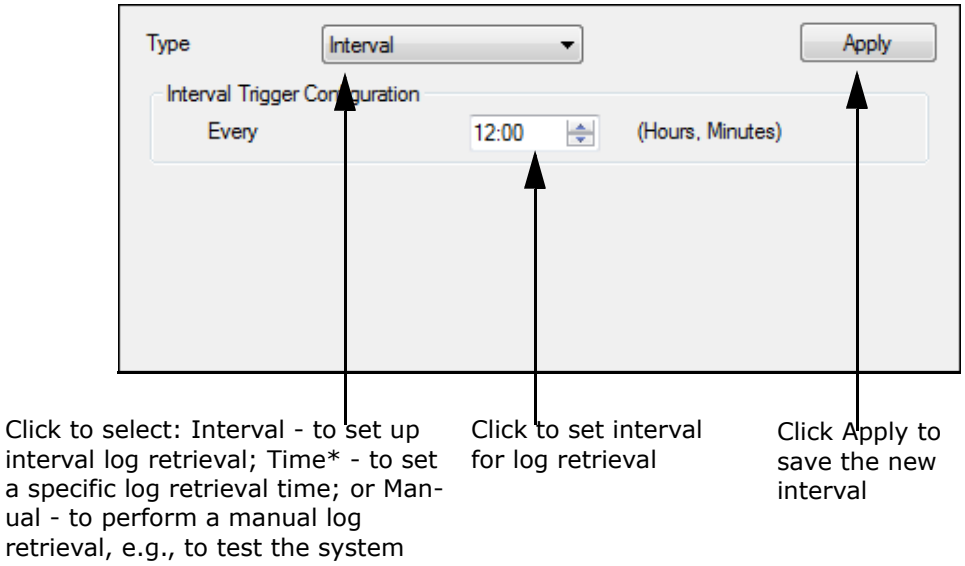


2. Select a group from the pull-down menu. The meters in that group are displayed in the box on the left (see example screen above).

3. Make sure the box next to Retrieve logs for this group is checked.

   The Retrieve Log box also tells you the frequency of log retrieval. The default log retrieval interval is every 12 hours. You can set the log retrieval interval to any time you want, from every hour to once every 30 days. Log retrieval every 12 hours is recommended as optimal.

   - To change the log retrieval interval click the **Configure** button in the **Retrieve Logs** box. The screen shown below will open.

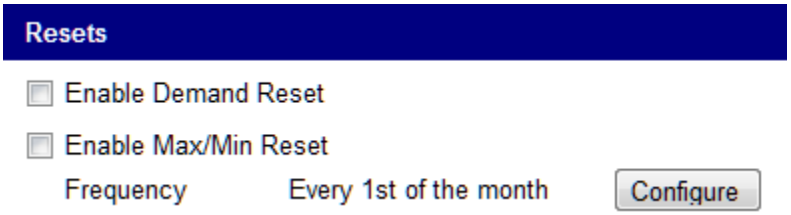


NOTE

You can also specify the interval for log retrieval for the meters from the Auto Scan screen described in "Add Meters Using Auto Scan" on page 18-11.

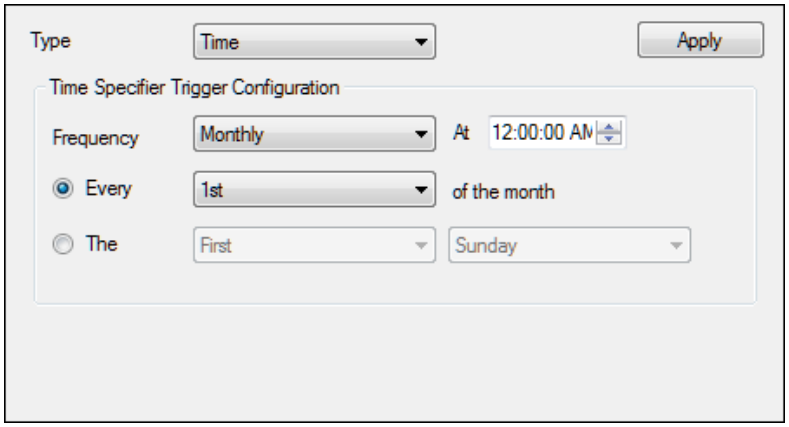
- Select any of the logs you want to retrieve for the group.

4. The Resets section is used to schedule a download of peak Demand and/or usage values and then to set the values back to 0. The values are downloaded into a .csv file located in:
   C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs>Reset_Logs; the filename is <meter_serial>_<meter name>.processed.csv. Each time a reset occurs, another line is added to the file, along with a timestamp.



   a. You can select to enable either or both Demand reset and Max/Min reset, by checking the box for each.

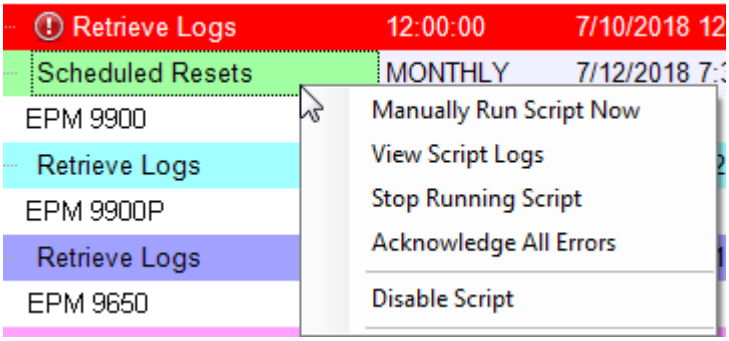
b. The download/reset frequency default is every first of the month, but you can configure a new time or interval by clicking the Configure button. The window shown below will open.



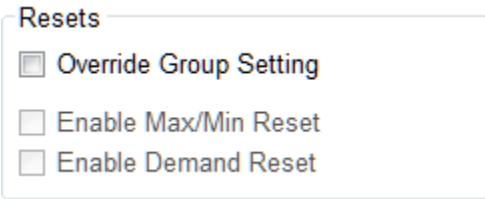
- To download/reset at a specific time: select Time from the Type pulldown menu; select the Frequency - Monthly, Weekly, or Daily, and the time of day for the download/reset.
  - - If you selected Monthly, you will see the additional settings shown above. Select either “Every” and the day of the month (for example, Every 1st of the month) or “The” and number and day (for example, The last Thursday (of the month).
  - If you selected Weekly, there will be a pull-down menu that lets you select the day of the week to perform the download/reset.
  - If you selected Daily, you just need to enter the time of day.
- To download/reset at a specific Interval: select Interval from the Type pull-down menu and select the hour and minute interval (for example, 06:00 to perform the download/reset every 6 hours.
- To download/reset manually, select Manual from the Type pull-down menu. Note that you must also set up the download/reset with either a Time or Interval setting. Manual allows you to perform the download/reset at will, rather than waiting for the programmed time/interval.

When you have made your selections, click **Apply**.

c. The download/reset will take place as scheduled. If you selected a manual download/ reset, go to the Scripts Status screen and right-click on the Scheduled Resets script and select Manually Run Script Now to perform the download/reset immediately.



d. You can override the Reset settings for a meter within a group. to do so, go to Configure Meter Scripts for the meter and scroll to the Resets section of the screen.



i. Check the Override Group Setting box.

ii. If you are overriding the download/reset completely, you don't need to select anything else. To override the Group setting and select one or both of the Min/ Max and Demand download/resets, check the appropriate boxes.

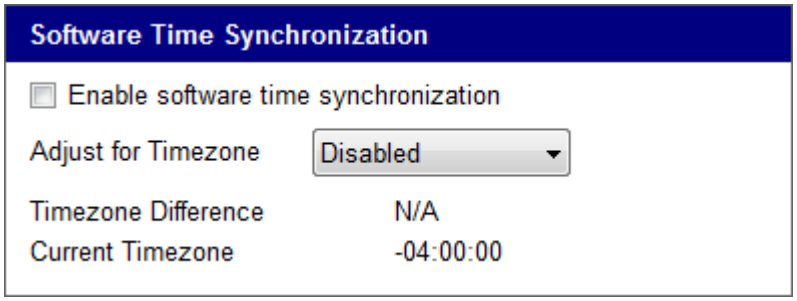
iii. Click the **Save** button.

NOTE

All meters in the group will adhere to the same schedule for download/reset that was configured in step b.

5. Software Time Synchronization is used to set up Time Sync for all of the meters in a group. The Time Sync feature allows for tracking the time difference of meters from the GE MeterManager server. When Time Sync is enabled, it also sets the meter's time when it drifts beyond a configured threshold. Scanning the meters' times is done

automatically - no configuration is required. Note that if a meter is configured individually for Time Sync, that will take precedence over the group setting (see "Configure Meter Scripts" on page 18-21).



a. Check **Enable software time synchronization** to enable time sync for all meters in the group.

b. Select the **Timezone Offset from UTC** (Coordinated Universal Time). This will be applied to all meters in the group, unless they already have a timezone offset specified.

The current timezone offset is listed, along with the adjustment factor (timezone difference), to assist in configuring the time. The Timezone Offset works by offsetting the PC time being compared against the meter.

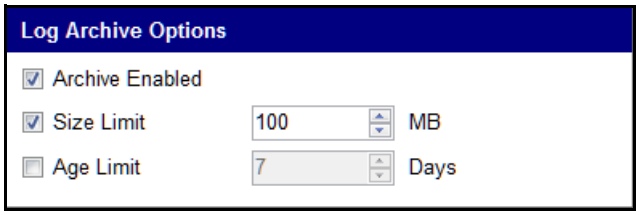
PC Time	Meter Time	PC Timezone	Meter Timezone	Difference
2015/04/28 01:00	2015/04/28 01:01	-4	-4	00:01
2015/04/28 01:00	2015/04/27 23:01	-4	-6	00:01
2015/04/28 01:00	2015/04/27 23:01	-4	0	-05:59
2015/04/28 01:00	2015/04/28 05:01	-4	0	00:01
2015/04/28 01:00	2015/04/27 23:01	-4	disabled	-01:59

NOTE

- The UTC offset specified should be current daylight savings offset, if applicable. For example, for the eastern timezone of the United States, EST is -5:00, EDT is -4:00. If you are currently in Daylight Savings, specify -4, otherwise -5.
- The Allowed Time Drift is set in the System Options screen. See "System Options" on page 18-100, for instructions.
- Time Sync will be disabled for 12 hours before and after the DST transition time for the PC's current regional settings, in order to prevent updating the meter's time while it is automatically updating for its own internal DST transition times.

6. When a meter's log database gets too large, it should be archived to make room for new data. GE MeterManager can automatically compress and archive the log database before retrieving, so the database only contains new data. To configure

automatic log archival for a group of meters, scroll down to see the settings below (they are located underneath the Software Time Synchronization box).



a. Click the **Archive Enabled** checkbox to enable archiving for this group.

b. Click the checkbox next to one of the limit options (Size Limit or Age Limit).

- **Size Limit** - The log database will be archived if the file(s) size exceeds the limit entered here, for example 100 MB.

NOTE

For EPM 9900/9900P meters, this will be the largest database in the LOGS folder, not the sum of all of the databases.

- **Age Limit** - The log database will be archived if the age since the first download of the log database exceeds the limit entered here, for example 7 days.

NOTE

For EPM 9900/9900P meters, this will be the oldest database in the LOGS folder.

- If you select both options, the first limit reached will trigger an archive. For example, if you select 100 MB Size Limit and 7 days Age Limit, and you reach the 7 days limit first, the log will be archived at that point.
- Once this option is enabled, the group's log archiving limits set up here will automatically be checked before log retrieval for a group. If one of the limits is exceeded, the log database(s) will be archived to a compressed file in the Archived Logs folder configured in the System Options screen - see 18.4.2 *System Options* on page 18–100. The file will be named for the range of data it contains:

  [metername]__[meterserial]\[metername]__[meterserial].[oldestdate]_[newestdate].zip

  For example, if the MeterName was 1800ShamesDr, the Serial# was 0123995130, and the database contained log data from 2017/01/08 to 2017/08/25, the archive might be:

  C:\Users\Public\Documents\Electro Industries\Communicator_Ext\Retrieved Logs\log_archive\1800ShamesDr__0123995130\1800ShamesDr__0123995130.20170108_20170825.
  zip

  A record of the archive will be entered in the Retrieve Logs Script runlog for that group.
- If you wish to set up log archival for individual meters, override the group settings and make specific log archival settings for the meters - see *18.3.2.1.2: Log Archiving for Meter* on page 18–25, for instructions.

7. If you have changed anything on the screen, "Settings Changed" will be displayed underneath the Device Type, on the upper right of the screen. Click Save to implement any new settings.

When log retrieval is performed by the GE MeterManager application, logs for all meters in the group(s) are automatically retrieved at the programmed interval, making the job of managing multiple meters simple. GE Energy Aggregator automatically imports the retrieved logs and uses them to build the usage database. The usage database is then used to generate usage reports, bills, and Dashboard Viewer data.

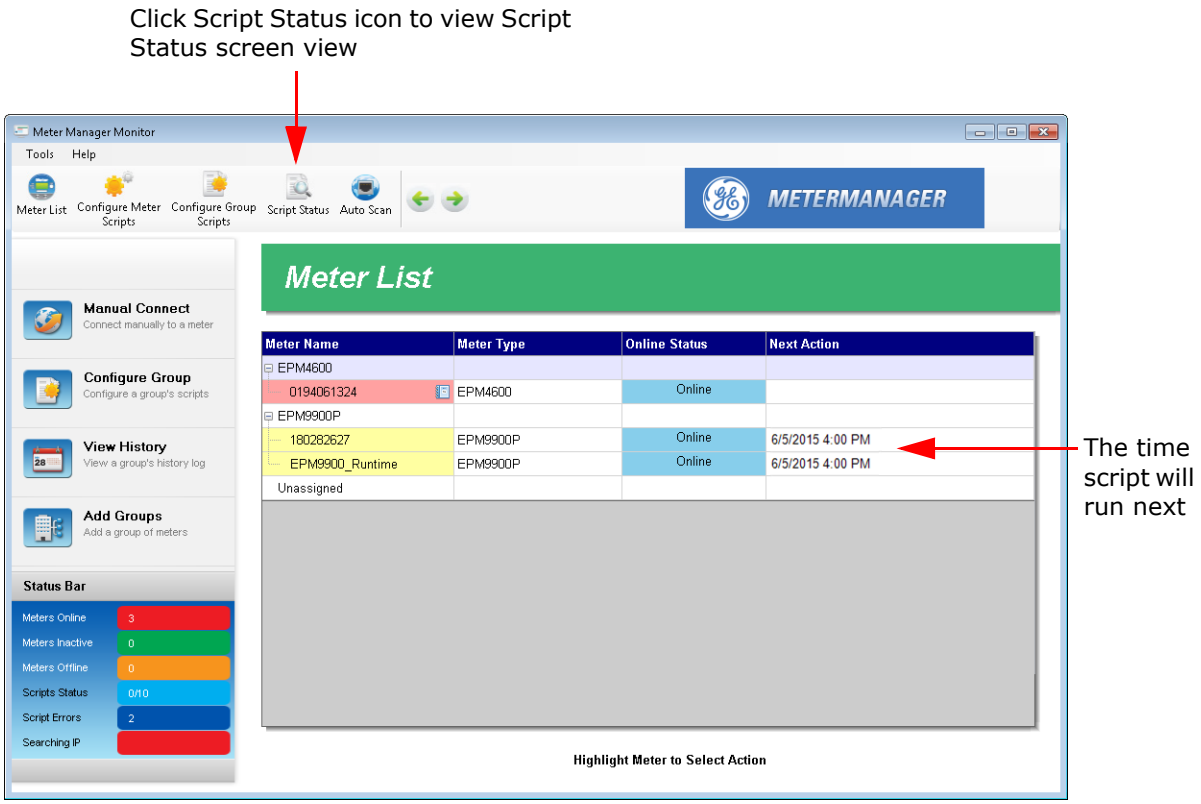
For more detailed instructions on the GE Energy Aggregator application, see the *GE Energy Aggregator Instruction Manual*.

18.3.2 Script Status

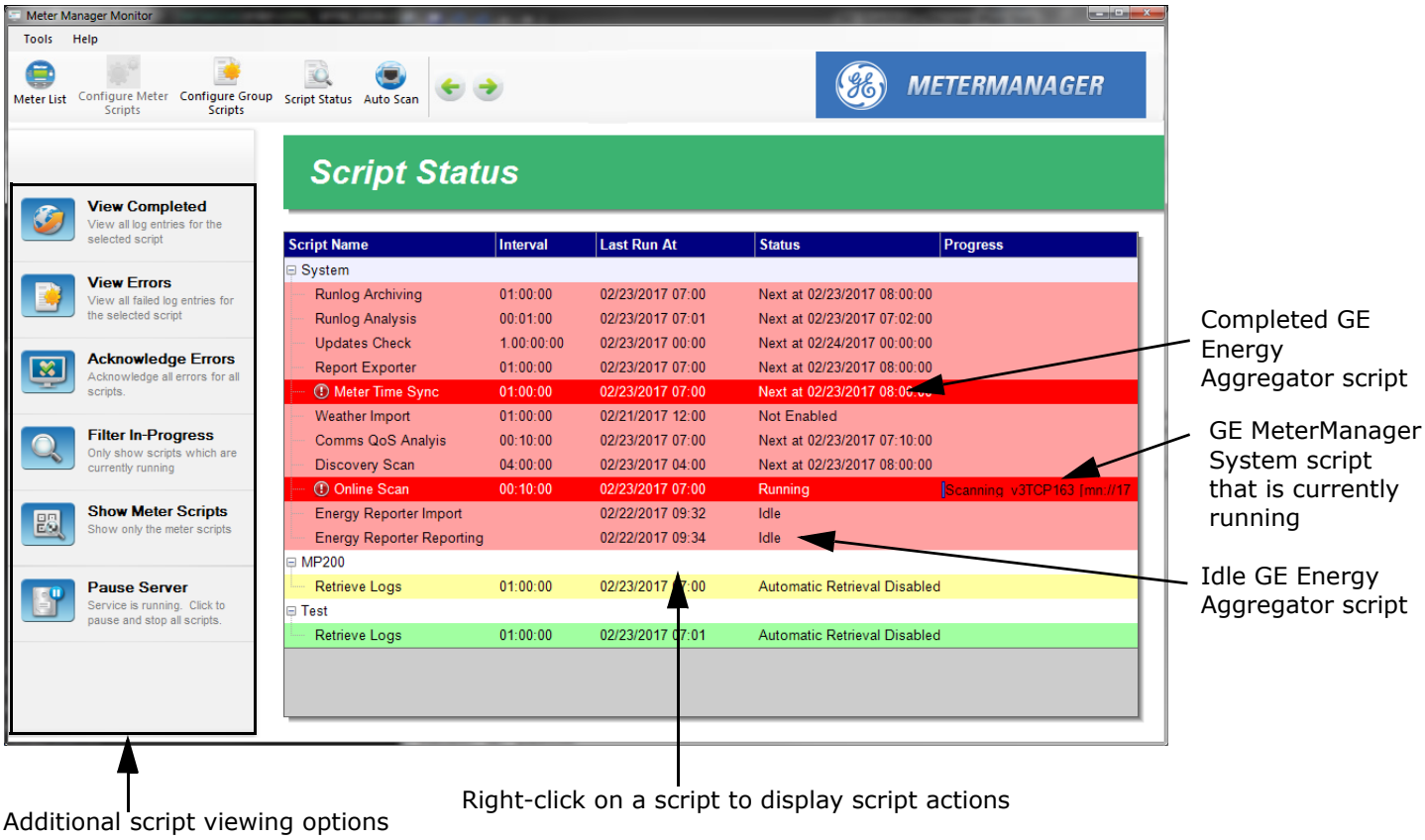
GE MeterManager gives you two ways to view the status of the configured scripts.

- One place you can view script status is in the Meter List screen, where any meters with active scripts display "Running" in the Next Action field; and those with scripts scheduled to run display the time they will run in the Next Action field (see example screen, below).
- The place you can view detailed status information for scripts is in the Scripts Status screen, which is the GE MeterManager Monitor second main screen view (the first being the Meter List screen).

1. To see the Script Status screen view, click the Script Status icon from the top of the Meter List screen view.



2. You will see all script actions, as shown in the example screen.



The screen shows all script activity, including all configured meter log retrieval ; GE Energy Aggregator application activity, such as Importing and Reporting; and GE MeterManager system activity, such as Discovery Scan and Runlog Archiving.

The right side of the screen lists the following information for each script:

- Script name, e.g., Online Scan
- Interval the script runs, e.g., 12:00:00 - every 12 hours
- The date and time the script last ran
- The script status, i.e., Running, or the date and time the script will next run
- The progress of a running script, e.g., Scanning EPM7000P23 Relay Unit

The left side of the screen gives you additional viewing options. Click on a script in the list to select it, and then click one of the following buttons:

- **View Completed** - click to view all log history for the script (see "View Script Logs" on page 18-86).
- **View Errors** - click to view all errors for the script (see "View Script Errors" on page 18-93).
- **Acknowledge Errors** - click to acknowledge all of the errors for all of the scripts - this will remove them from being displayed when View Errors is selected.

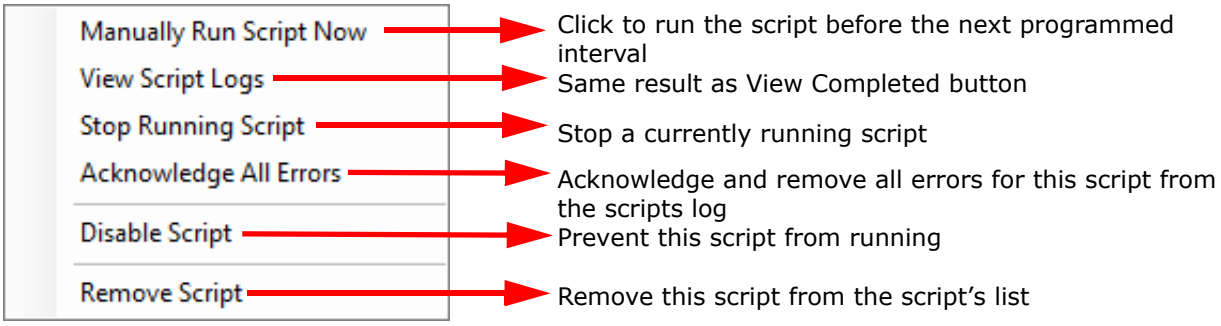
- **Filter In-Progress** - click to view only currently running scripts. The Filter In-Progress button changes to Show All Scripts - click the button to return to the total scripts display.
- **Show Meter Scripts** - click to view only the configured meter scripts. The button changes to Show All scripts - click to return to the total scripts display.
- **Pause Server** - click to pause the server and stop all scripts. The button changes to Start Server - click to restart the server and continue running the scripts.

The possible scripts are as follows:

- **Runlog Archiving [internal.update.runlog.archive]**: this script is used to clean up old logs by collecting the runlogs and archiving them to zip files if they are older than the configured number of days. If the feature is enabled, older runlog archives will be deleted after the configured number of days.
- **Runlog Analysis [internal.update.runlog.analysis]**: this script scans the runlog for errors, which, if found, are reported to the user when a script is completed.
- **Updates Check [internal.update.check]**: this script contacts the Updates server once a day to check if there are any available software updates. If any are found, the user is notified the next time the Monitor software is opened.
- **Report Exporter [report.exporter]**: this script performs the automated generation of Report Exporter reports. It generates a report for every available period from the current report start date to the last available data retrieved from the meter.
- **Online Scan [scan.known]**: this script runs through all known meters and checks if the meter is offline or online by attempting to connect to it. If a meter is offline, the status is reported in the log, and if email notification is configured, a notification email is sent out.
- **Meter Time Sync [meter.time_sync]**: this script performs a software time synchronization for meters without a built-in time sync feature, such as IRIG-B or NTP. If the configured meter is more than 15 seconds off from the server's PC time, the script attempts to synchronize the meter's time with the PC's time. The Meter Time Sync script works with the Online Scan script. The Online Scan script first determines if the time is off, and then Meter Time Sync updates any meters whose time is off.
- **Energy Aggregator Reporting [ebilling.reportgen]**: this script automatically generates all the bills, executive summary usage reports, and custom usage reports for the GE Energy Aggregator application. Note that reports will automatically be generated when new data is imported to the GE Energy Aggregator database.
- **Energy Aggregator Importing [ebilling.import]**: this script automatically imports retrieved logs into the GE Energy Aggregtator database. Note that imports will automatically occur when a meter's logs are retrieved.

- **Weather Import [ebilling.import.weather]**: this script automatically reads the weather information from a weather service and logs it into the GE Energy Aggregator database.
- **Discovery Scan [scan.ping]**: this script automatically scans your network for new meters to add to the Meter List. You can configure the range the script scans via Auto Scan and **Tools > Configure > System > Meter Discovery**.
- **Retrieve Logs [loc.{group}.retrieve.logs]**: this script performs the automatic log retrieval for each group. Note that Automatic Log Retrieval must be enabled globally, i.e., for the entire application, for this script to perform the log retrieval.
- **Scheduled Resets [resets]**: schedule a download of Peak Demand and/ or usage values and then to set the values back to 0.

3. Right-click on a script in the list to select from these script actions:



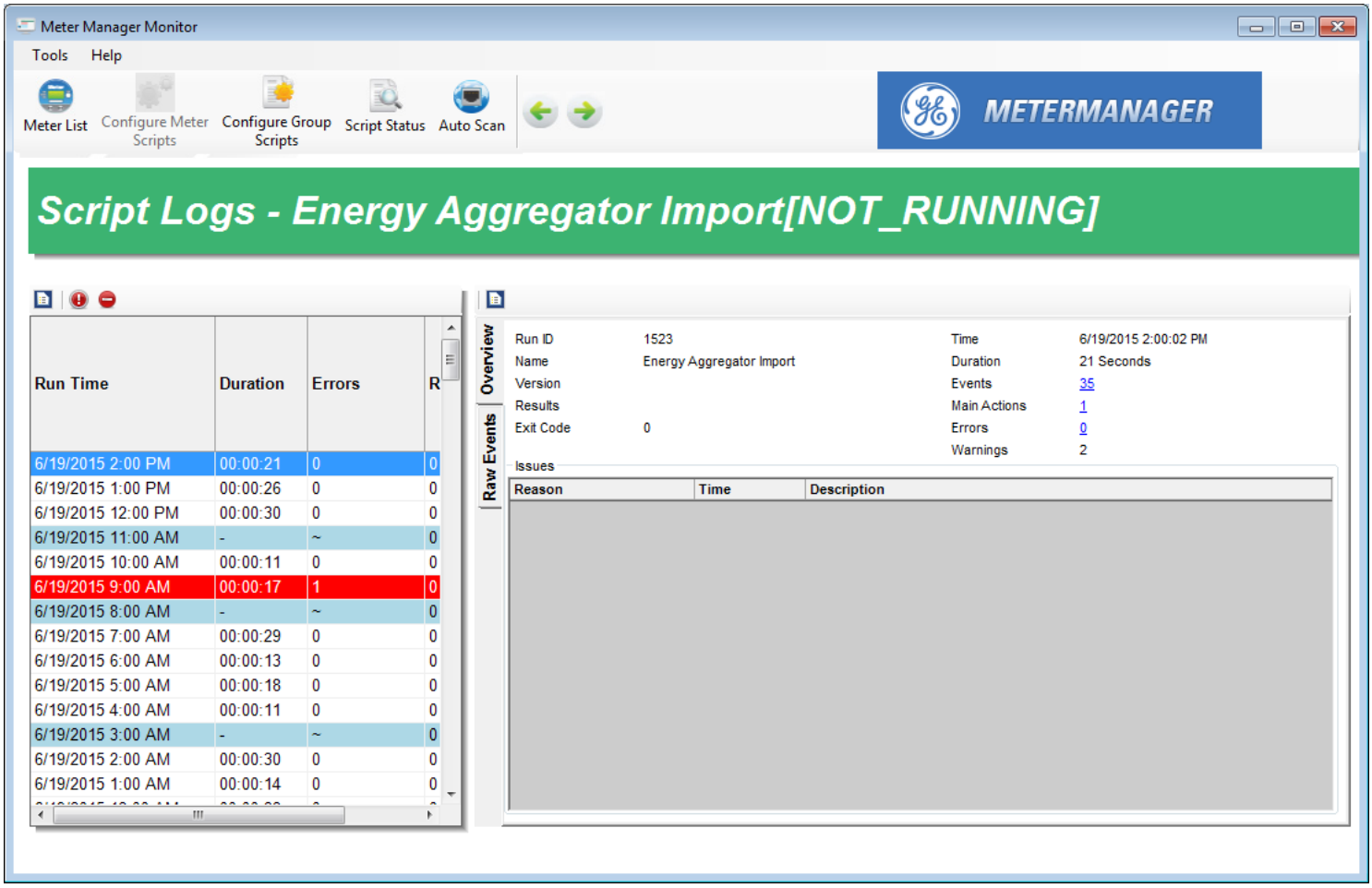
NOTE

Not all actions are available for all scripts.

18.3.2.1 View Script Logs

1. To view script logs, either:
   - Click on a script and then click the **View Completed** button from the **Script Status** screen
   - Right-click on a script and select **View Script Logs** from the sub-menu.

2. You see a screen that gives you access to detailed information.



The left side of the screen lists:

- The time the script ran (Run Time)
- The amount of time the script took to run (Duration)
- The number of Errors, if any
- A code related to the script results (Results)

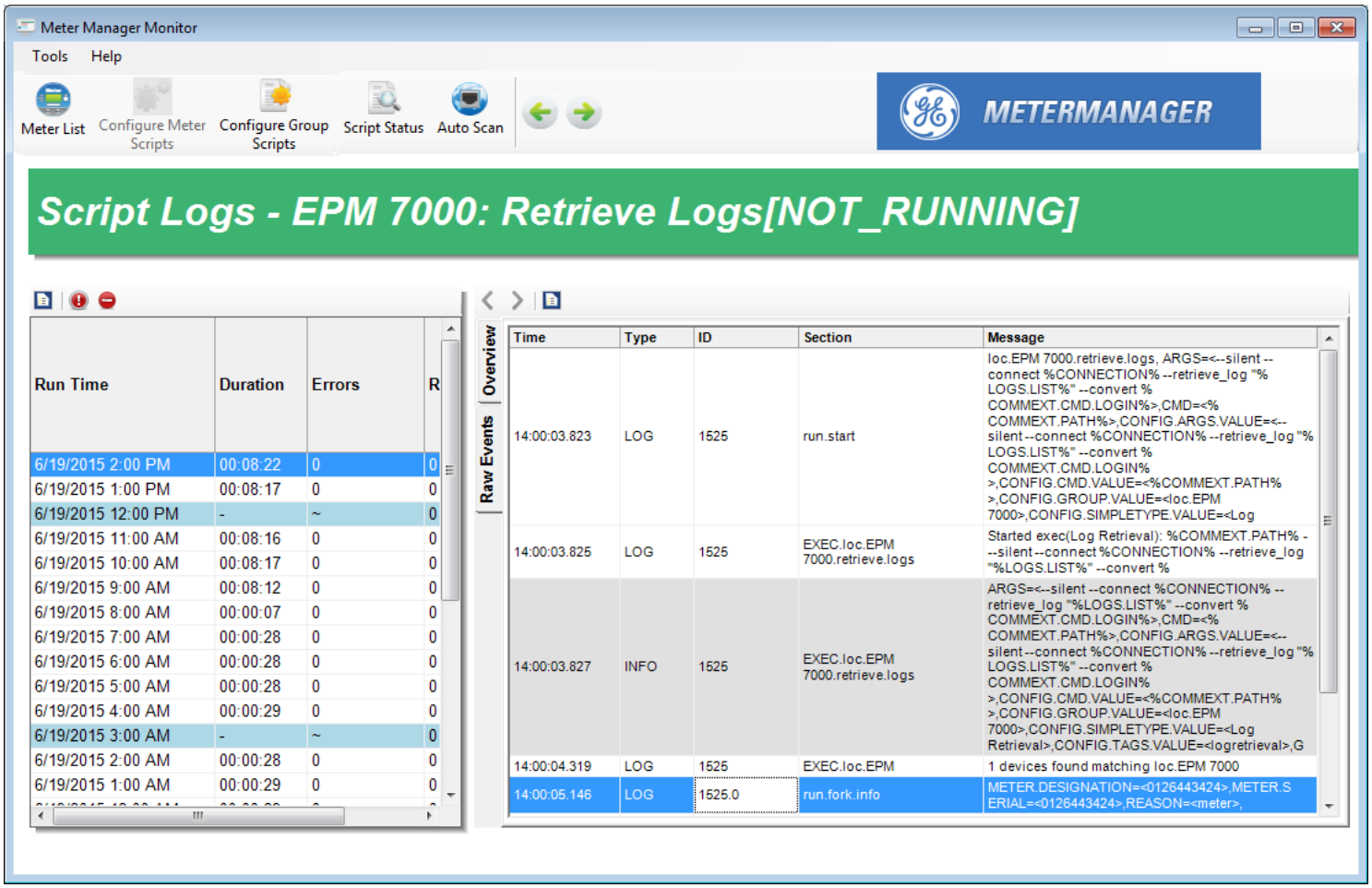
The result code is unique to each script.

For example: The GE Energy Aggregator script normally returns a 0; but if it had a problem during import, and failed to connect to the database, it might store 1 as its result code, 2 if there were errors in the data, or 3 if it failed to read the data.

The right side of the screen shows details about the script (click on a script in the list on the left of the screen to view its details), and has three tabs:

- Overview tab (shown on the previous page): shows an overview of the script, with details of any errors: this is the first tab you'll see on the screen. The right top of the screen view shows:
- The internal Run ID number of the script
- The script name

- The time the script began running
- The amount of time the script ran (Duration field)
- The number of events in the script run, which are steps in a script's main actions, e.g., importing a log from an individual meter; you can click on the underlined number of events to see the Event Tree screen view (see the Event Tree and Raw Events tab descriptions for more information)
- The number of Main actions, which are the actions composed of events, e.g., Log retrieval for all meters in a group
- The number of errors in the script run (see "View Script Errors" on page 18-93 for a description of script errors)
- Version of script, if applicable
- Internal codes, such Results, Exit, and Warnings
- Raw Events tab (shown below):



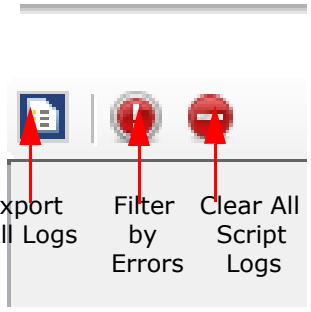
The Raw Events screen view shows every event which occurred during the running of the script. Each event is timestamped, and may have one of the following types:

- **Log** - a log of occurrences during the running of the script.

- **Info** - displays information about what is taking place during the running of the script. You may disregard this field unless you are investigating a specific issue.
- **Warning** - displays problems which may have occurred during the running of the script, but which may be common (i.e., not something you need to address), such as retries on reading files, or an action that was attempted, but which is not supported.
- **Error**- displays problems which prevent the operation of the script, such as the meter being offline, unable to retrieve logs at this time, or bad values, such as invalid timestamps, being found in the log.

The three icons at the top of the screen let you:

- **Export All logs** - click to save the script logs to a file. You will be prompted to name the file and choose a location for it.
- **Filter by Errors** - click to view only the errors in this log - see "View Script Errors" on page 18-93.
- **Clear All Script Logs** - click to clear the log files for this script.



NOTE

Clear All Script Logs will delete the history of the script.

WARNING! Clear All Script Logs will delete the script's history.

The **Clear All Logs** function can be automated from **Tools > Configure > System > System Options** - see "System Options" on page 18-100.

In general, most of the information on the right side of the Script Logs screens is diagnostic. For example:

- The online scan will tell you when devices go offline, and when meters are confirmed to be online
- Log Retrieval may tell you problems with the connection, or errors in the logs, or problems with the meter
- The issues list will inform you of problems with the script, such as:
  - Meter offline
  - Problem retrieving logs
  - Errors in the log records
  - Software locking up

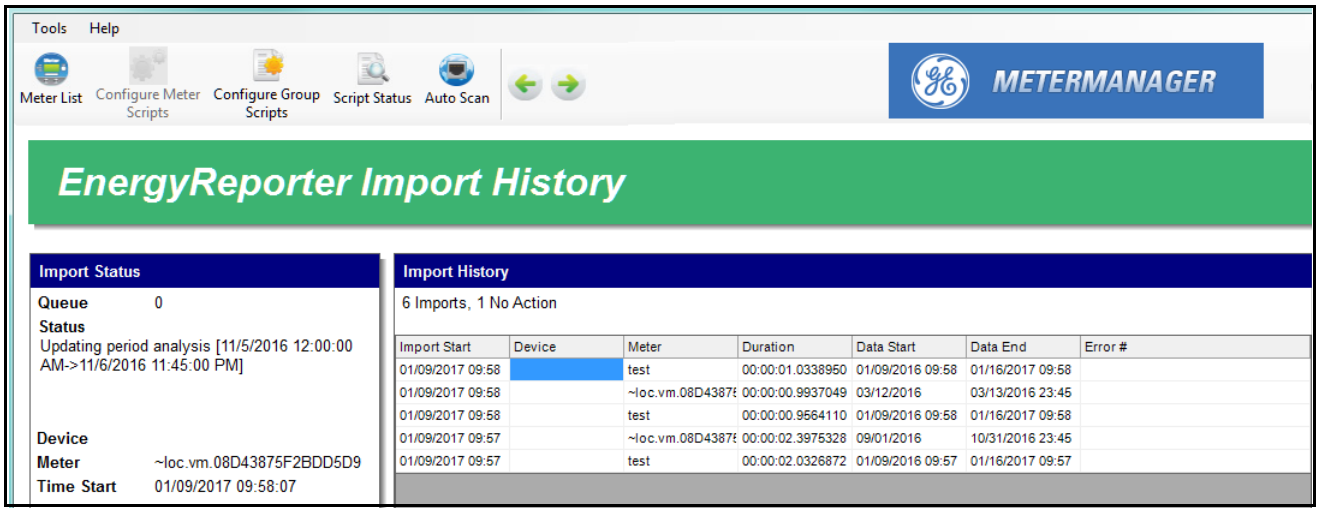
8.3.2.1.1: View Import/Report Script Status

You can access information on the Energy Aggregator Import and Energy Aggregator Reporting scripts from the Scripts Status screen.

Script Name	Interval	Last Run At	Status	Progre
System				
Runlog Archiving	01:00:00	02/23/2017 07:00	Next at 02/23/2017 08:00:00	
Runlog Analysis	00:01:00	02/23/2017 07:01	Next at 02/23/2017 07:02:00	
Updates Check	1.00:00:00	02/23/2017 00:00	Next at 02/24/2017 00:00:00	
Report Exporter	01:00:00	02/23/2017 07:00	Next at 02/23/2017 08:00:00	
Meter Time Sync	01:00:00	02/23/2017 07:00	Next at 02/23/2017 08:00:00	
Weather Import	01:00:00	02/21/2017 12:00	Not Enabled	
Comms QoS Analyis	00:10:00	02/23/2017 07:00	Next at 02/23/2017 07:10:00	
Discovery Scan	04:00:00	02/23/2017 04:00	Next at 02/23/2017 08:00:00	
Online Scan	00:10:00	02/23/2017 07:00	Running	Scann
Energy Reporter Import		02/22/2017 09:32	Idle	
Energy Reporter Reporting		02/22/2017 09:34	Idle	
MP200				

Double-click on the Import script or the Reporting script to see additional information. The screen you see will list current status and history of the script.

The screen you see will list current status and history of the script. See the example screen, below.



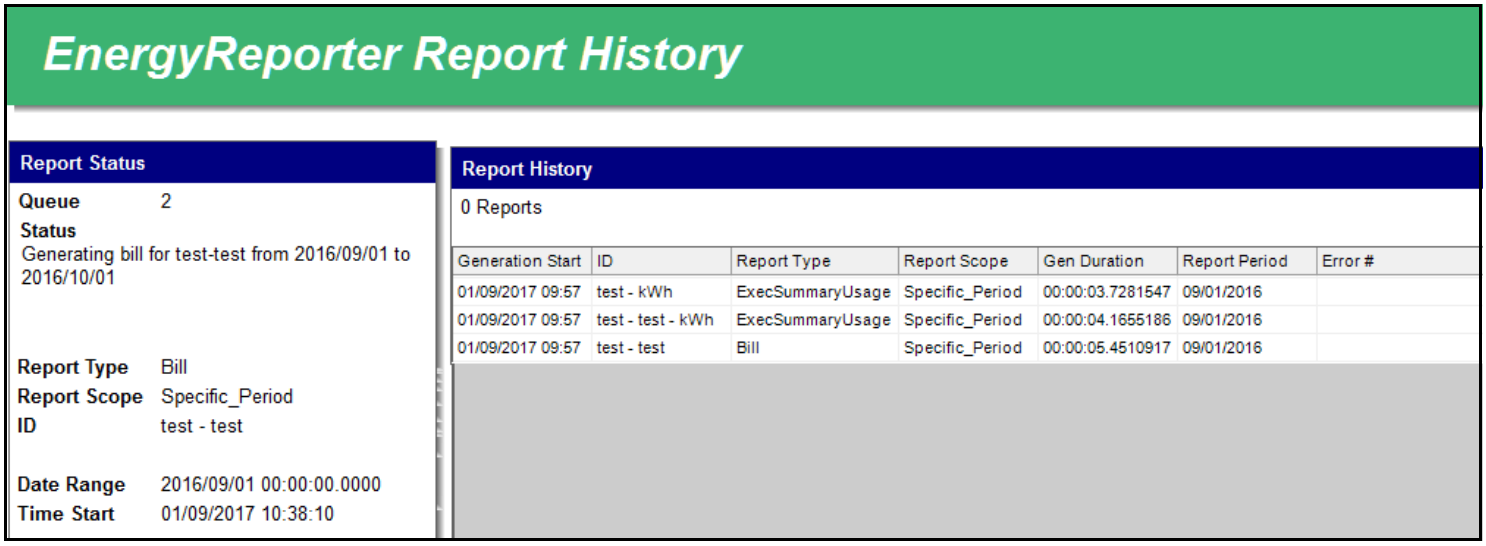
The Import History screen shows:

- Import Status provides information about the imports currently being processed:
  - **Queue**: number of currently pending imports.
  - **Status**: the action being performed by the current import.
  - **Device**: if the meter being imported is connected to the Meter List, the device will be listed here.
  - **Meter**: the meter currently being imported.

- **Time Start:** when the import started.

Import History provides information about the last 1000 imports that have been performed (this history will be reset when the GE MeterManager service is restarted):

- **Import Start**: starting date and time of the import.
- **Device**: same as above.
- **Meter**: same as above.
- **Duration**: the amount of time the import took to run.
- **Data Start**: the first timestamp of the data being imported.
- **Data End**: the last timestamp of the data being imported.
- **Error#**: any errors that occurred during importing are listed here.



The Reporting History screen shows:

- Report Status provides information about the reports currently being generated:
  - Queue: number of currently pending reports.
  - Status: the action being performed by the current report generation.
  - Report Type: the type of report being generated: Bill, Usage Report, or Custom Report.
  - ID: the customer or location the report is being generated for.
  - Date Range: the range of data to be included in the report.
  - Time Start: when the report generation started.
- Report History provides information about the last 1000 reports that have been generated (this history will be reset when the GE MeterManager service is restarted):
  - Generation Start: when the report generation started.
  - ID: same as above.
  - Report Type: same as above.
  - Report Scope: Specific Period, which means the report is being generated for a specific time range.
  - Gen Duration: the amount of time the reporting generation ran.

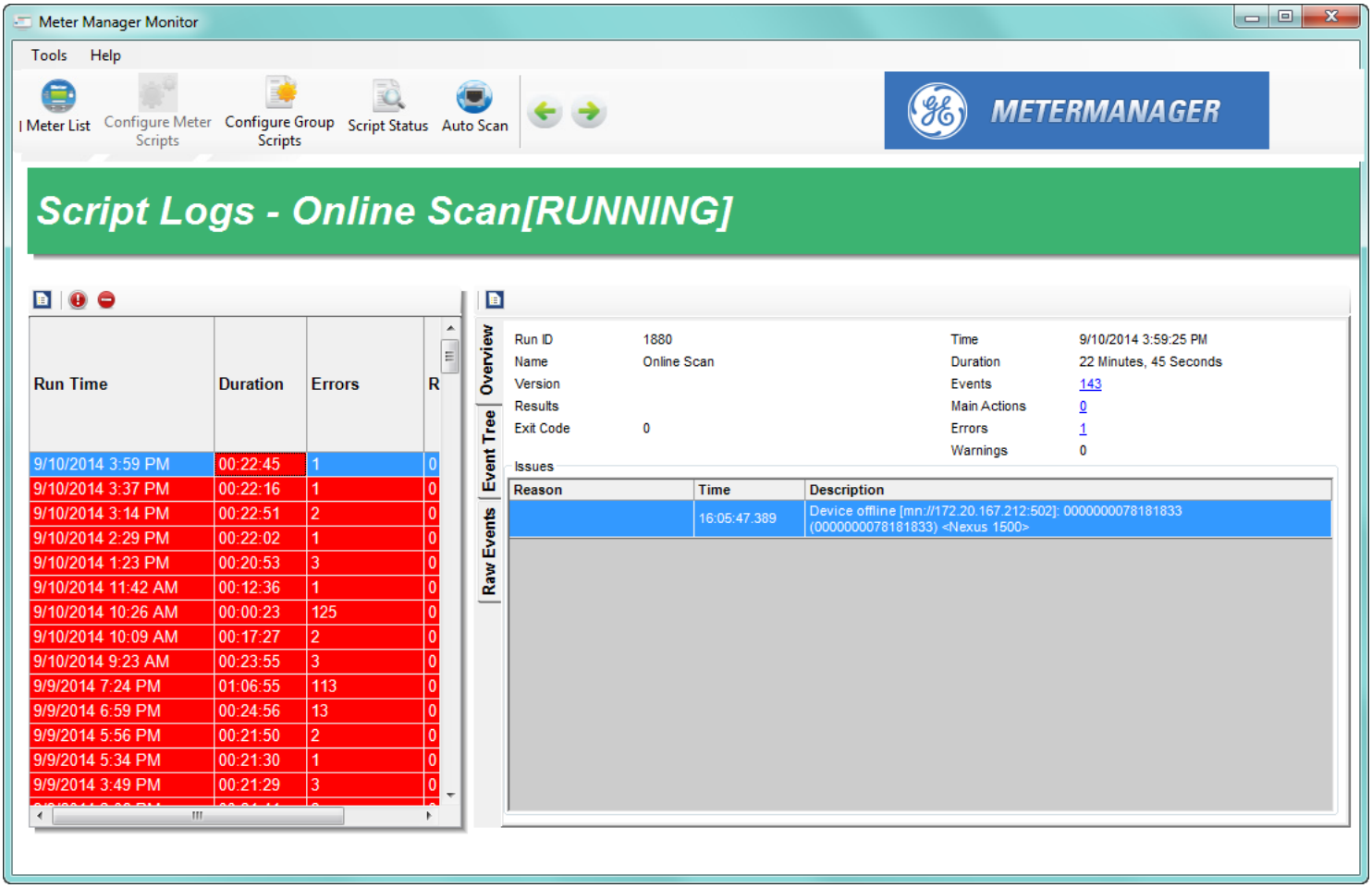
- Report Period: the period this report was generated for.
- Error#: any errors that occurred while generating the report are listed here. If there is more then one error, hover over the history item with your mouse to see the list of errors.

  Some common errors are:

  - Generate Usage Report Failed [NOT_FOUND] - There is not enough data in the month to generate the Executive Summary Usage Report.
  - Generate Bill Failed [MISSING_VALUE] - There is not enough data in the month to generate the Bill Report.

18.3.2.2 View Script Errors

1. To view script errors, either:
   - Click the **Filter by Errors** button in the Log Status screen (see previous section for instructions)
   - Click on a script and then click the **View Errors** button from the Script Status screen
2. You see the Script Logs screen described in the previous section ("View Script Logs" on page 18-86). The only difference is that this screen only displays script error information.



To view an error, click on it in the left column of the screen. The right side of the screen will show details for the error in the Overview, Event Tree, and Raw Events screen views, as described in 18.3.2.1 *View Script Logs* on page 18–86.

Some possible script errors and their recovery information is as follows:

- Updates Check [internal.update.check]:
  - "Failed to retrieve current version info from server [FAILED]": this error is usually caused by being unable to connect to the server. Verify that the computer has access to the Internet, and is not behind a proxy server.
- Report Exporter [report.exporter]:

    - "No Data for Period": this error occurs when there is a gap in data for a meter or group. The may be caused by the meter being offline, or by the meter's device profile being changed and the data channel no longer being available. Verify that the meter still has the channel configured in its device profile and that the data is available in the logs, via Log Viewer. Note that this error is not caused by the retrieval of logs from this meter not being "caught up," since reports are only generated if there is newer data than that of the period of the report being generated.
- Online Scan [scan.known]:
    - "Device Offline": this error occurs when the online scan tried to connect to a meter previously connected to, and failed. Check the following items:
        - Check to see if the meter has gone offline: make sure the meter is operational and the connection is OK.
        - If multiple meters have gone offline, check to see if their segment of the network is operational.
        - If the server loses network connections, you may see all of the meters go offline, since the server can no longer contact the meters.
        - If there are meters that go offline frequently, they may have unreliable network connections, such as wireless connections. Verify that the connection is stable and reliable, and does not drop communication packets.
- Meter Time Sync [meter.time_sync]:
    - "Device described by connection does not match Device Info, not updating": this error occurs when time sync finds a different meter than it expected. Verify that the meter at the specified connection is the correct one, and that the network does not have multiple meters with the same IP address. Note that this message is informational only, the error will be corrected by the Online Scan script.
    - Meter time not updating: if the meter's time doesn't seem to be updating even though time sync is configured, and the runlog says that time update is being attempted, verify the following:
        - That the meter doesn't require login to set time, and if it does, that the correct username and password have been entered.
        - That the meter doesn't have any other time sync protocol connected, since multiple time synchronization methods cause problems in the meter time.
        - That Online Scan is enabled (this is necessary for Meter Time Sync).
        - Note that Meter Time Sync is not currently supported for the EPM 9000/9000P meter.
- Weather Import [ebilling.import.weather]:
    - "Failed to query weather info. SocketException: A connection attempt failed because the connected party did not properly respond after a

period of time": this error means that the application failed to connect to the weather service; try connecting, again, later.

- "Failed to query weather info. XmlException: Data at the root level is invalid": this error means that the data returned from the weather service is not valid; try connecting, again, later.
- "Failed to query weather info. WebException: The remote name could not be resolved": this error means that the DNS lookup could not find the weather service URL; verify that your DNS or Firewall is not blocking the URL.
- "Failed to query weather info. Bad Gateway": this error means that the network gateway on the machine was invalid; verify that the computer's network connection is configured correctly.

- Discovery Scan [scan.ping]
  - Meters not found: if the Discovery Scan does not detect a meter that you know should be there, use one of the following options:
    - Make sure the meter can be pinged. The Discovery Scan pings the IP address before attempting to connect, and if it gets no response, it will not try to connect to the meter.
    - Manually connect to the meter. If this fails, make sure the meter is actually online.
- Retrieve Logs [loc.{group}.retrieve.logs]:
  - The script runs, but no logs are retrieved; verify that Automatic Log Retrieval is enabled.
  - "Connection Failed to: {connstr}": this error indicates the meter may not be online; verify that you are able to connect to the meter.
  - "Failed to create log retrieval session [CONNECTION_TIMEOUT]": this error indicates the meter may not be online; verify that you are able to connect to the meter.
  - "Failed to create log retrieval session [INVALID_TYPE]": this error indicates that log retrieval is not valid for this meter. If the meter doesn't support logging, e.g, the EPM 6000 meter, disable Automatic Log Retrieval for the meter.
  - "Failed to create log retrieval session [CE_CNORESP]": this error indicates the meter may not be online, or may not be responding to Modbus; verify that you are able to connect to the meter.
  - "Failed to open location [CONNECTION_LOGIN_FAILED] {connstr}": this error indicates an EPM 9000/9000P meter may not be online; verify that you are able to connect to the meter.
  - "Connection failed, unable to login with user '"': this error indicates an EPM 9000/9000P meter requires a username and password to retrieve logs, but none was supplied. Go to Configure Meter Scripts > Scripts Settings, enable security, and specify the username and password (see "Configure Meter Scripts" on page 18-21).
  - "Connection failed, unable to login with user 'user'": this error indicates the username or password specified for an EPM 9000/9000P meter is invalid, and the software was unable to log in. Go to Configure Meter

Scripts > Scripts Settings, and verify that the correct username and password is entered (see “Configure Meter Scripts” on page 18-21).

- “Invalid record (#) timestamp: {time}”: this error indicates that LogConverter detected that there was a problem with one of the timestamps recorded in the meter.
- “Unable to retrieve log [#], port # is already retrieving a log”: EPM 7000 meters and EPM 4600 metering systems allow only one user at a time to retrieve logs. Since the meter has multiple ports, this error indicates that another software may already be retrieving logs from the meter; in this case, you can try again, later. If the message itself is in error, and there is no other software retrieving logs from the meter, verify that there are no other GE MeterManager applications installed on your network.
- “Unable to engage log, log failed to engage after 10000ms”:EPM 7000 meters and EPM 4600 metering systems allow only one user at a time to retrieve logs. This error indicates that another software may already be retrieving logs from the meter on the same network connection; in this case, you can try again, later. If the message itself is in error, and there is no other software retrieving logs from the meter, verify that there are no other GE MeterManager applications installed on your network.
- "Username and password not specified, unable to login": the EPM 7000P meter requires a username and password to retrieve logs. this error indicates that the username and password were not supplied. Go to **Configure Meter Scripts > Scripts Settings**, enable security, and specify the username and password (see 18.2.3.1 *Configure Meter Scripts* on page 18–21).
- "Retries exceeded setting waveform record window: NOT_READY": or "Currently engaged log {log1} is not the one desired {log2}": the EPM 7000P meter allows only one user at a time to retrieve logs. Since the meter has multiple ports, this error indicates that another software may already be retrieving logs from the meter, and you can try again, later. If the message itself is in error, and there is no other software retrieving logs from the meter, verify that there are no other GE MeterManager applications installed on your network.
- "Bad record crc bit set in timestamp": this error indicates that LogRetrieval detected that there was a problem with one of the timestamps recorded in an EPM 7000P meter.
- “Invalid timestamp found while scanning for partial records [#]": in order to perform partial log retrieval for the EPM meters, the software must search for the last record retrieved. If it finds an invalid timestamp during this process, it must retrieve all the records.
- “OutOfMemoryException,” “Out of Memory,” “Error # 7,” or “Log Converter: Not enough memory to run; quitting”: this error indicates that too many applications are running for the server to handle. Either decrease the number of applications, or increase the server memory.

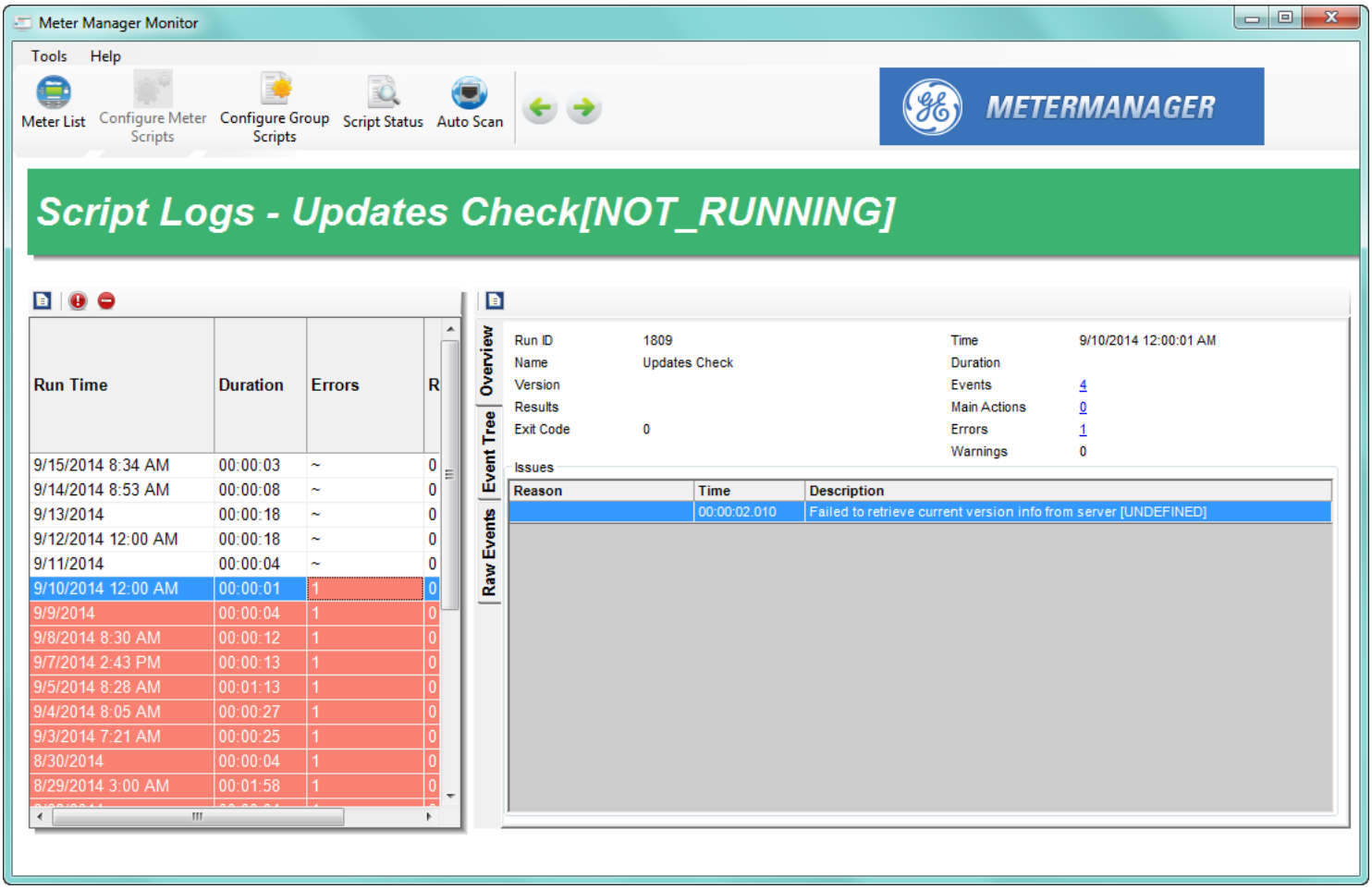
18.3.2.3 Manually Run Scripts

You have the ability to force a script to run. You might want to do this in order to test the script.

1. From the **Script Status** screen, right-click on a script and select **Manually Run Script Now**.
2. The Script status changes to **Running** and its **Progress** is shown.

18.3.2.4 Acknowledge Script Errors

Errors remain in the script logs even after they are acknowledged, but the red highlighting and exclamation point are no longer shown in the Script Status screen, and the errors are highlighted in pink, rather than red, in the Script Logs screen (see the example below). For this reason you may not want to acknowledge the errors even after you've viewed them, e.g., if you want someone else to see them before they are acknowledged.

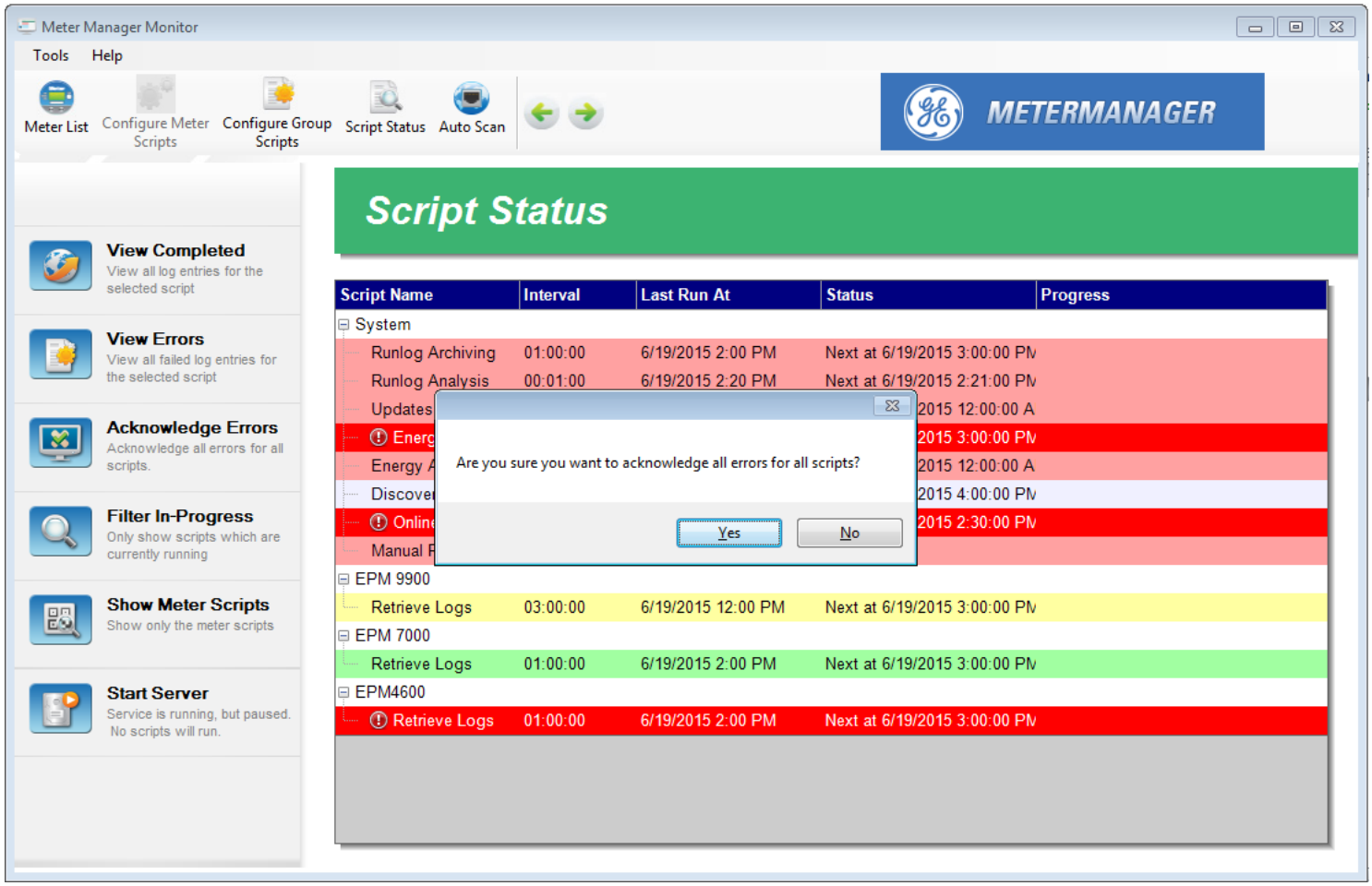


If you have viewed script errors and do want to indicate that you have viewed them, you have two options:

- Acknowledge all script errors:

  ▷ Click **Acknowledge Errors** from the left side of the **Script Status** screen.

▷ You are asked to confirm your choice: click **Yes** to acknowledge all of the errors; click **No** to leave the errors unacknowledged.



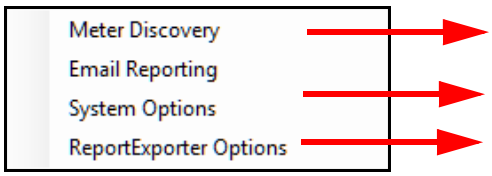
- Acknowledge errors for a specific script:

  ▷ Right-click on the script in the **Script Status** screen and select **Acknowledge all Errors**.

  ▷ You are asked to confirm that you want to acknowledge the errors. Click **Yes** to acknowledge the errors for this script; click **No** to leave the errors unacknowledged.

18.4 System Configuration Tasks

From the top of the screen, click **Tools > Configure > System** from the Menu Bar. You will see this sub-menu.

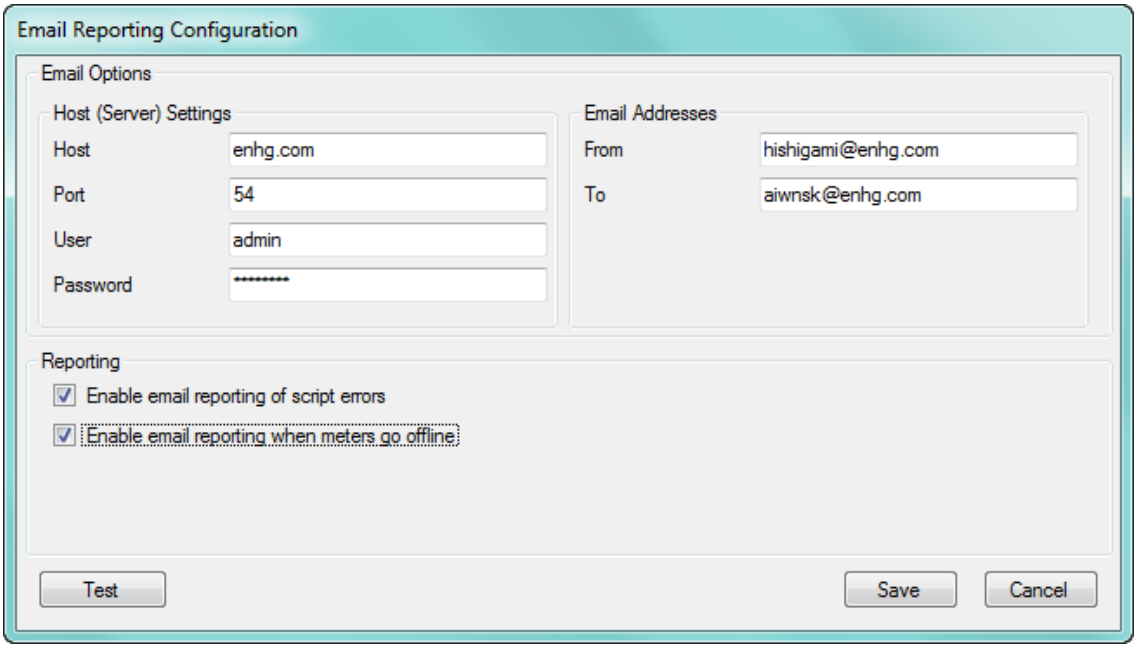


See 18.2.1.1 *Add Meters to the Meter List Using Auto Discovery* on page 18–11
See 18.4.1 *Email Reporting* on page 18–99
See 18.4.2 *System Options* on page 18–100
See *18.2.3.14.3: Report Preview Feature* on page 18–50

18.4.1 Email Reporting

You can set up GE MeterManager to generate an email whenever there is a script error and/or whenever a meter goes offline. This feature alerts you to problems when they arise, so that you can respond to them quickly.

1. To set up email for GE MeterManager problems, click **Tools > Configure > System > Email Reporting.**



2. Enter the following information:
   - The Host (Sever) email settings: Host, Port, User, Password
   - The From and To Email Addresses
   - Reporting options: click the checkboxes next to Enable Email Reporting on Script Errors and/or Enable Email Reporting When Meters Go Offline to implement those selections.

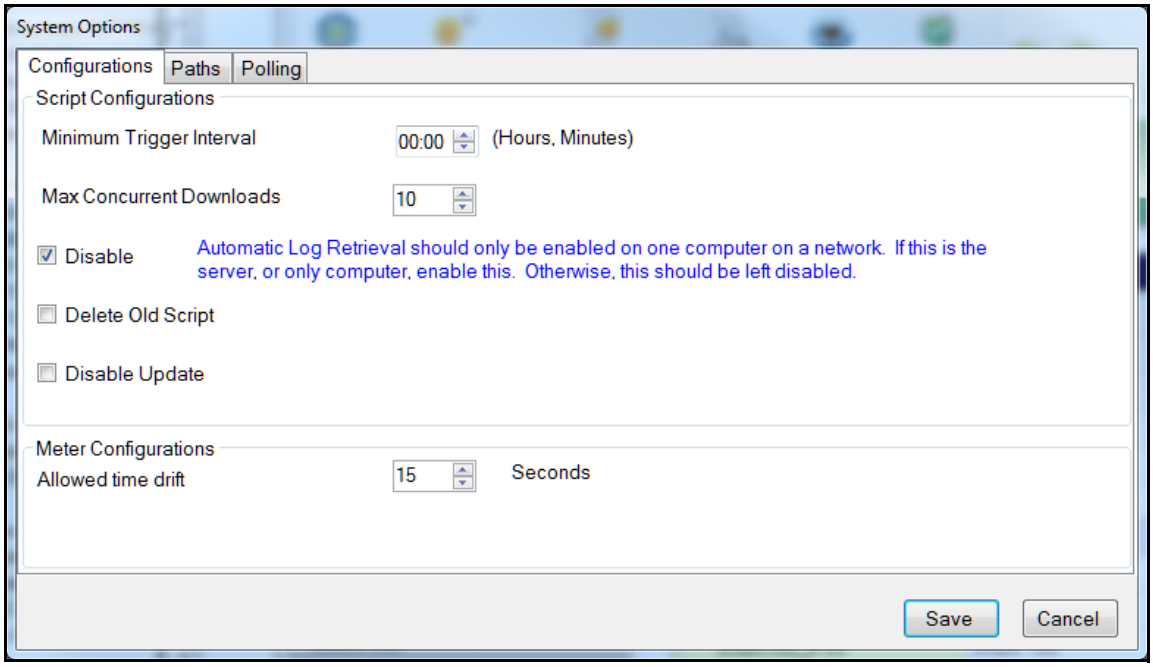
- Enable Email Reporting on Script Errors - an email will be sent if a script encounters an error, e.g., if an error occurred while trying to convert a meter's logs, or it failed to retrieve a meter's logs.
- Enable Email Reporting When Meters Go Offline - an email will be sent if connection to a meter is lost.
- Enable Email on Time Synchronization - an email will be sent when time is synchronized for a meter.

3. Click **Test** to send a test email.
4. Click **Save** to save your settings.

18.4.2 System Options

System Options are settings that pertain to GE MeterManager as a whole.

1. Click **Tools > Configure > System > System Options**.



2. System Options has three settings tabs: Configurations, Paths, and Polling. The first tab lets you set up Script configurations. Make the following settings:
   - **Minimum Trigger Interval** - click the arrows to set a minimum log retrieval interval time. This prevents any user from setting log retrieval to be more frequent than this value, e.g., four hours (04:00). Click in the hours field to set hours, and in the minutes field to set minutes.
   - **Max Concurrent Downloads** - click the arrows to set the largest number of downloads that can be made at one time by currently running scripts. Use this setting to make adjustments for your computer's capacity. For example, for a computer that has low resources you might want to set this to 1, so as to not overload the server. On a powerful machine, this can be set higher; however do not set it any higher than 10.

- **Disable Automatic Log Retrieval** - unless this computer is the Log Collection server, leave this box checked.
- **Delete Old Script Run Logs** - when you click this checkbox a field opens that lets you select the number of days to keep script logs before they are deleted.

NOTE

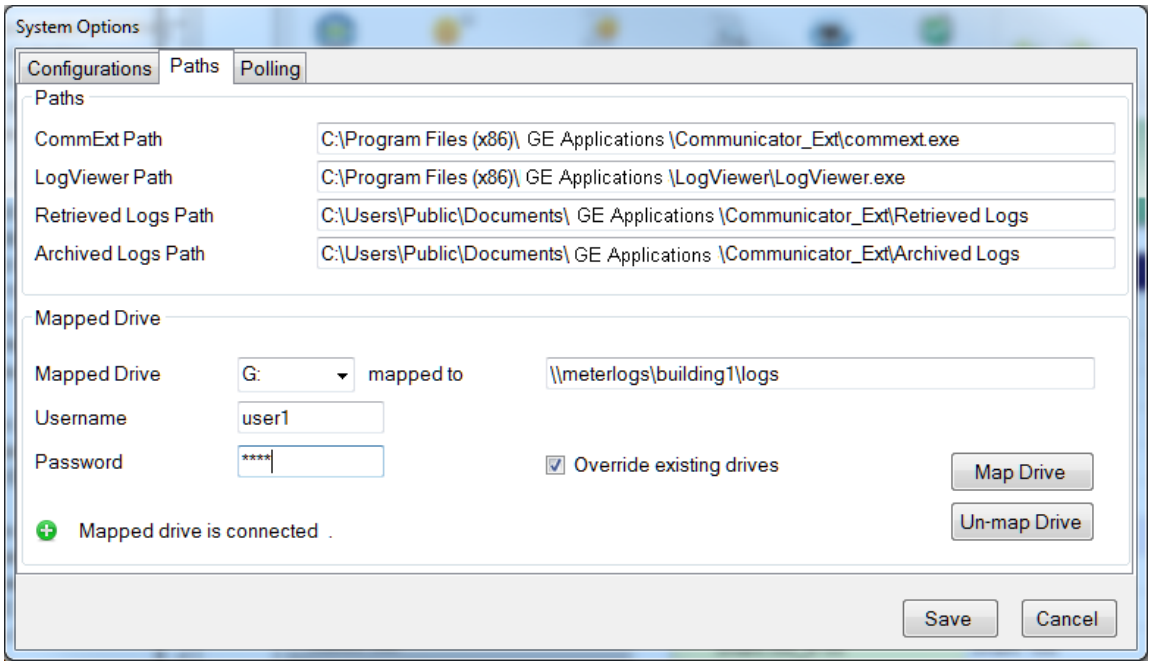
WARNING! Deleting the script logs will delete the history of the script.

- **Disable Update** - check this box to disable automatic update of the software.
- **Meter Configurations: Allowed time drift** - select the amount of time, in seconds, that will be considered an acceptable time difference for meters using the Time Sync feature - see sections 18.2.3.1 *Configure Meter Scripts* on page 18–21 and 18.3.1 *Configure Group Scripts* on page 18–76 for details on Time Sync. Anything greater than this time will be corrected.

NOTE

IMPORTANT! This value should not be set less then 5 seconds, as it may result in the accuracy of the meter's time being made worse.

3. Click the Paths tab to enter the directory paths for GE Communicator, the Log Viewer application, the Retrieved Logs files, and the Archived Logs files. This only needs to be changed if GE Communicator was installed in a non-default location. If you changed the retrieved logs path in GE Communicator, you need to change the path here, also, so that GE MeterManager is able to find the logs. If you cannot view logs that you retrieved, check to make sure that this setting is configured properly.

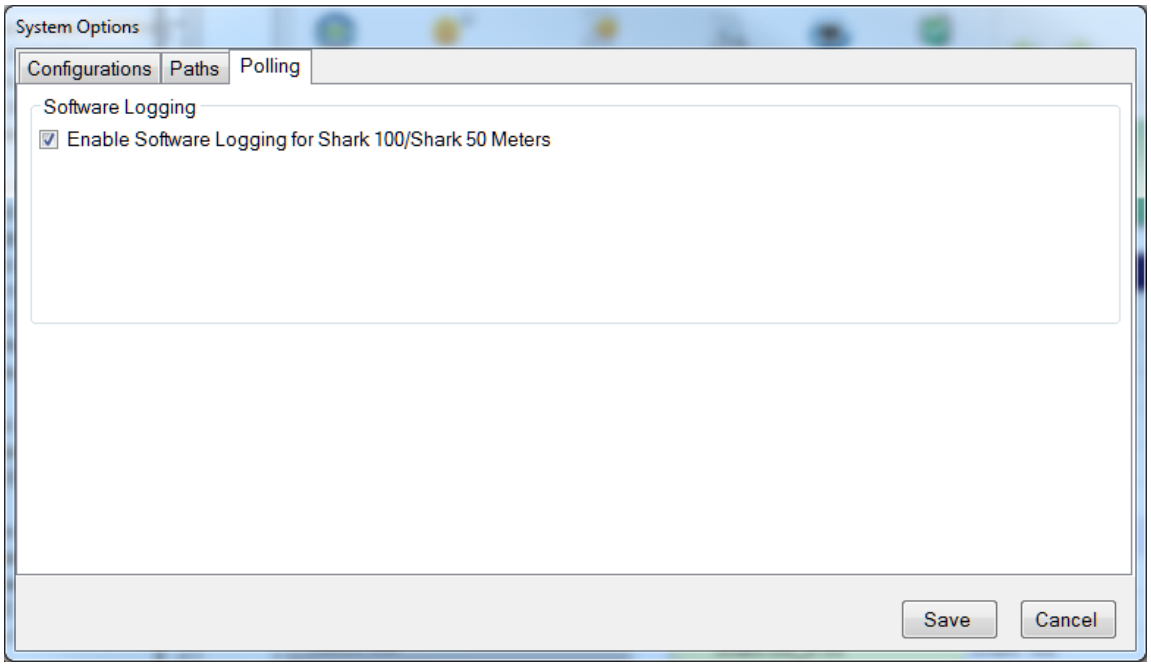


You can also use this setting to map a drive that can be used to store retrieved logs on a network drive. This lets you free space on the drive where GE MeterManager is located. To map a drive, make these settings:

- Select the mapped drive from the pull-down menu and enter the path in the "mapped to" field (the default of this setting is Disable).

- If the mapped drive is secured with a username and password, enter them. Note that due to operating system limitations, passwords cannot be more than 14 characters.
- Override existing drives - if this box is checked, if GE MeterManager tries to connect to the mapped drive and the drive has already been mapped, but to a different path than the one you have configured, GE MeterManager forces a connection with the (new) mapped drive.
- Click Map Drive to immediately map the drive. If the drive is unavailable, the message at the bottom of the screen will indicated that. Otherwise, the message says that the mapped drive is connected.
- Click Unmap Drive to immediately un-map the drive.
- Retrieved Logs Path - To use the mapped drive for log retrievals, replace the current path in this field with the mapped drive letter in this format - [drive]:/[folder]
  e.g., G:/ or, if using a different folder than the one specified in the "mapped to" field in the mapped drive directory: G:/logs
  Note that the folder is only needed if you are not using the path entered in the "mapped to" field.
- Once the drive settings are saved, GE MeterManager automatically reconnects the mapped drive whenever the PC is rebooted. In addition, GE MeterManager periodically checks if the mapped drive is connected, and reconnects to it, if necessary.

4. Click the Polling tab to enable data polling for EPM 2200 and EPM 6000 series meters.



- To enable polling, check the box. The data polled will be available for the GE Energy Aggregator application and viewable in the Log Viewer - see "View Meter Logs" on page 18-28.

- Once enabled, the Software Poller will log the following readings every 15 minutes:
    - Voltage A-N/B-N/C-N
    - Voltage A-B/B-C/C-A
    - Current A/B/C
    - Frequency
    - Voltage A/B/C THD%
    - Current A/B/C THD%
    - Voltage A/B/C Phase
    - Current A/B/C Phase
    - W/VAR/VA Total
    - Wh (Q1+4)/(Q2+3)
    - VARh (Q1+2)/(Q3+4)
    - VAh (Q1+2+3+4)

NOTE

The Software Poller polls and logs the values as quickly as it can, so that values are polled as closely as possible to the 15 minute interval. Under noisy conditions or with many meters, there can be a significant delay between the interval and the time that the value is actually polled: in some cases the delay can be more than a minute. Because of this, the Software Poller cannot guarantee the same level of data integrity as a meter with logging, and should not be used for critical systems.

NOTE

GE MeterManager offers a diagnostic screen that shows the status of the software polling process. To access the screen, click **Tools > Utilities > System > Poller Status**. This screen is most helpful for technical support purposes.

5. Click **Save**.

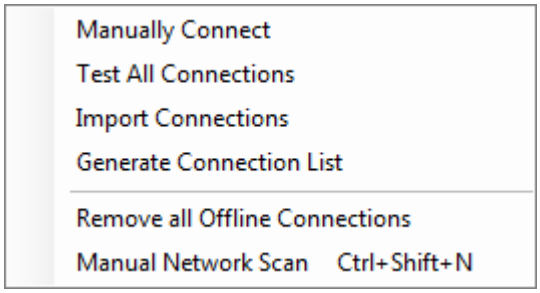
18.4.3 Utilities Tasks

The Utilities menu gives you access to specific GE MeterManager tasks: connection tasks, manual Network scan, and language tasks. These tasks are explained in the following sections.

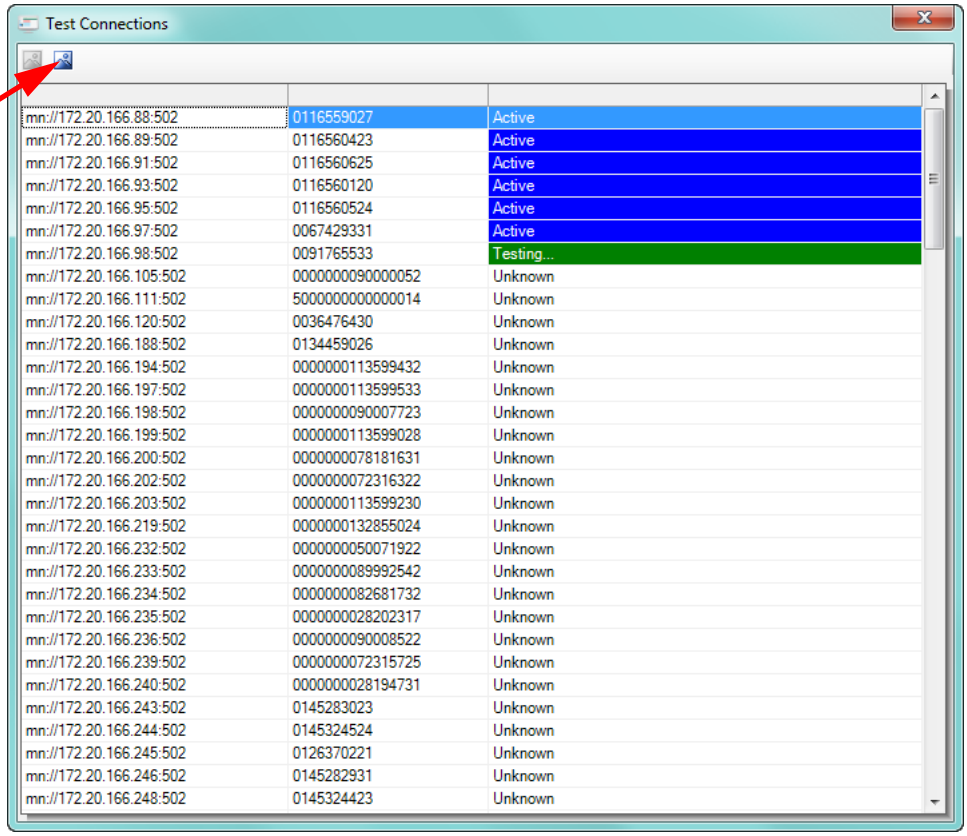
18.4.3.1 Connections Tasks

1. Click **Tools > Utilities** to see the following tasks:

   Connections Tasks - click **Tools > Utilities > Connections** to see this sub-menu.



- **Manually Connect** - click to manually enter a meter (see the instructions in "Add Meters to Meter List Manually" on page 18-18.
- **Test All Connections** - click to test all of the meters to see if they are active. You will see the screen shown below as this process takes place.



mn://172.20.166.88:502	0116559027	Active
mn://172.20.166.89:502	0116560423	Active
mn://172.20.166.91:502	0116560625	Active
mn://172.20.166.93:502	0116560120	Active
mn://172.20.166.95:502	0116560524	Active
mn://172.20.166.97:502	0067429331	Active
mn://172.20.166.98:502	0091765533	Testing...
mn://172.20.166.105:502	0000000090000052	Unknown
mn://172.20.166.111:502	5000000000000014	Unknown
mn://172.20.166.120:502	0036476430	Unknown
mn://172.20.166.188:502	0134459026	Unknown
mn://172.20.166.194:502	0000000113599432	Unknown
mn://172.20.166.197:502	0000000113599533	Unknown
mn://172.20.166.198:502	0000000090007723	Unknown
mn://172.20.166.199:502	0000000113599028	Unknown
mn://172.20.166.200:502	0000000078181631	Unknown
mn://172.20.166.202:502	0000000072316322	Unknown
mn://172.20.166.203:502	0000000113599230	Unknown
mn://172.20.166.219:502	0000000132855024	Unknown
mn://172.20.166.232:502	0000000050071922	Unknown
mn://172.20.166.233:502	0000000089992542	Unknown
mn://172.20.166.234:502	0000000082681732	Unknown
mn://172.20.166.235:502	0000000028202317	Unknown
mn://172.20.166.236:502	0000000090008522	Unknown
mn://172.20.166.239:502	0000000072315725	Unknown
mn://172.20.166.240:502	0000000028194731	Unknown
mn://172.20.166.243:502	0145283023	Unknown
mn://172.20.166.244:502	0145324524	Unknown
mn://172.20.166.245:502	0126370221	Unknown
mn://172.20.166.246:502	0145282931	Unknown
mn://172.20.166.248:502	0145324423	Unknown

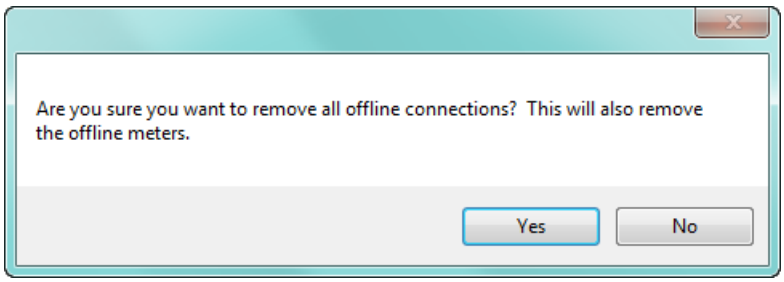
- **Import Connections** - a window will open prompting you to find the .csv connections file that you want to import. See Generate Connections List (below) for more information.
    - During import, only the Group, Connection Str, and Meter Notes columns are used. All other fields will be automatically queried from the meter during meter discovery.
    - In fact, the import file only needs to contain the "Connection Str" column. All other columns are optional.

NOTE

The new file format requires that the header be included, and thus will not work with any older imported files that were created with an earlier version of GE MeterManager.

The network connection string must be prefixed with "mn://", which indicates that a Modbus network connection is being specified. A serial connection can be specified with "ms://", such as "ms://COM29:57600,8,N,1".

- **Generate Connection List** - click to save a list of the meter connections to a .csv file. You will be prompted to select a location for the file. The file will contain the following fields:
    - **Serial Number** - the unique identifier of the meter
    - **Display Name** - the meter designation programmed in the meter
    - **Device Type** - the type of the meter,e.g., EPM 9800
    - **Connection Str** - the connection information used to connect to the meter. Note that a single meter may have multiple connection entries
    - **Connection Status** - the current status of the connection
    - **Last Active** - the last time the software successfully connected to the meter
    - **Last Updated** - the last time the software tried to connect to the meter
- **Remove All Offline Connections** - click to remove connections to meters that are offline. Since this will also remove the meters, you will be asked to confirm.



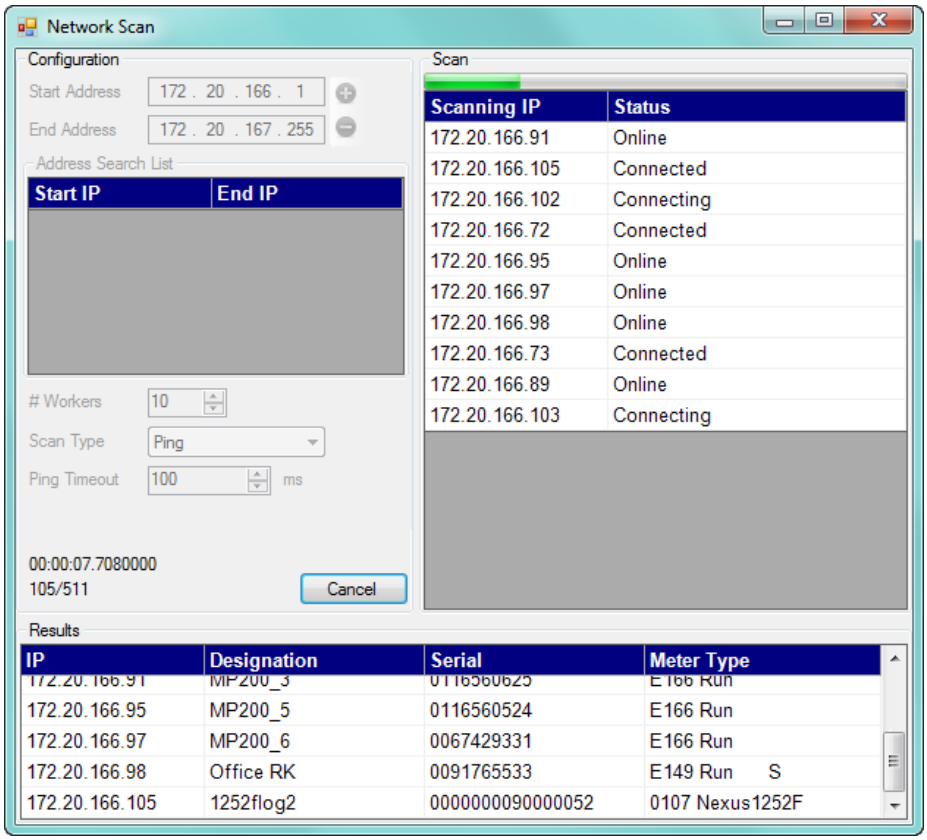
Click **Yes** to remove the offline connections and meters; click **No** to leave them.

18.4.3.2 Manual Network Scan

This feature is used to perform a parallel network meter scan. While the recommended method of meter discovery has already been explained (see “Add Meters to the Meter List Using Auto Discovery” on page 18-11), this method may be preferred for very large networks with many meters to discover, as it is discovers meters more quickly due to: 1. the scan being run in parallel mode, and 2. there being no speed limiter, as with Auto

Discovery. It also has the advantages of being manually begun whenever you want and allowing you to see the progress of meter discovery. Note that this will only detect meters at address 1, listening on Modbus TCP Port 502.

1. Click **Tools > Utilities > Connections > Manual Network Scan** or press Ctril+Shift+N on your keyboard to open the **Network Scan** screen.



2. Enter the IP range to scan in start/end address and click the **Plus** button to add them to the scan list.
3. Select the number of parallel worker scans to use. This lets you scan multiple separate ranges of IP addresses. The example above uses ten scans.
4. Scan Type is either Ping or TcpConnect:
   - Ping: a ping is first performed to make sure that a device is there to connect to. This method of scanning is faster than TcpConnect, but it may not work if the device or network doesn't allow pinging. You have the option of increasing the ping timeout to accomodate discovery of slow devices, but this will slow down the scanning time, significantly.
   - TcpConnect: this scan is performed by opening a TCP connection to port 502. This is a very slow method, as each connection must wait the full 30 seconds (minimum) TCP timeout before giving up.
5. Click **Start** to begin the scan.
   - Each scan displays its current status on the top right of the screen.
   - Discovered meters are displayed on the bottom of the screen.
   - The scan progress is displayed next to the cancel button.

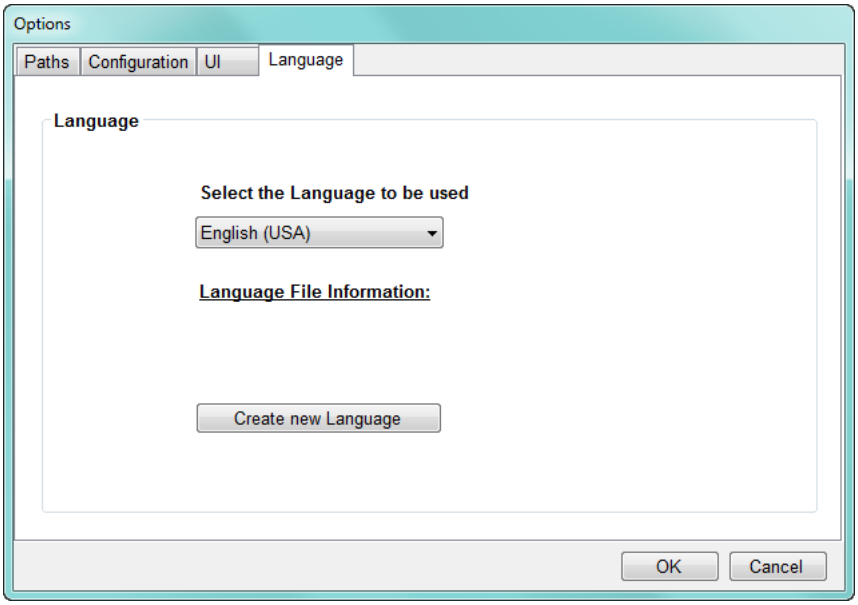
- Click the **Cancel** button at any time to abort the scan. Note, if the software is attempting to connect to a meter at that time, the scan may continue for a short time after you click the **Cancel** button.
- All discovered meters will automatically be added to the **Meter List**, in the **Unassigned** Group.

6. When you are done, click the **X** in the upper right-hand corner of the screen, to close it.

18.4.3.3 Language Tasks

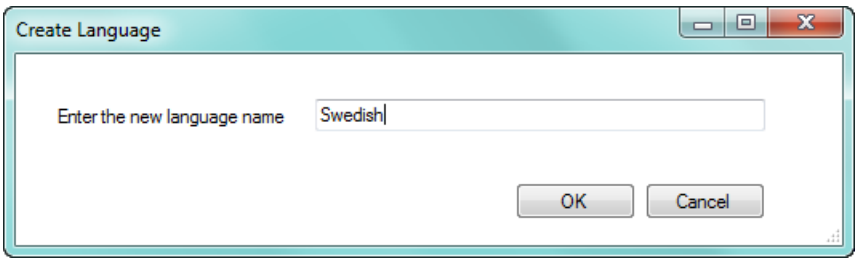
This feature allows you to select a translation of the software to use, as well as providing a tool that can be used to translate the software.

▷ Click **Tools > Utilities > Language**.

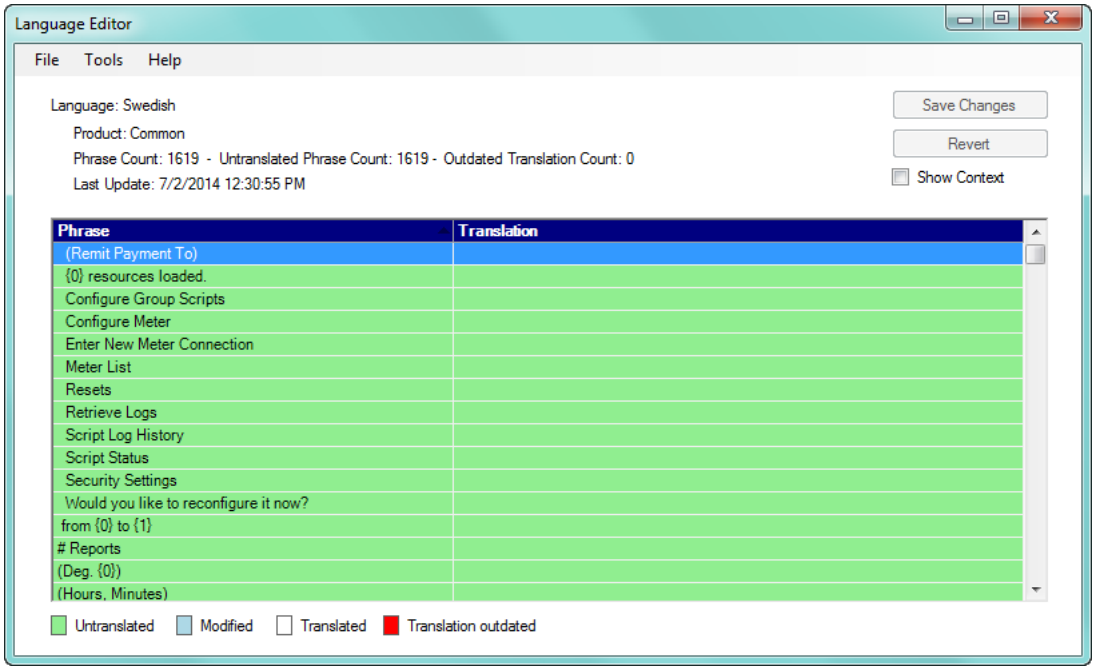


▷ Select one of the available languages from the pull-down menu. You can click **Language File Information** for details of the selected Language file.

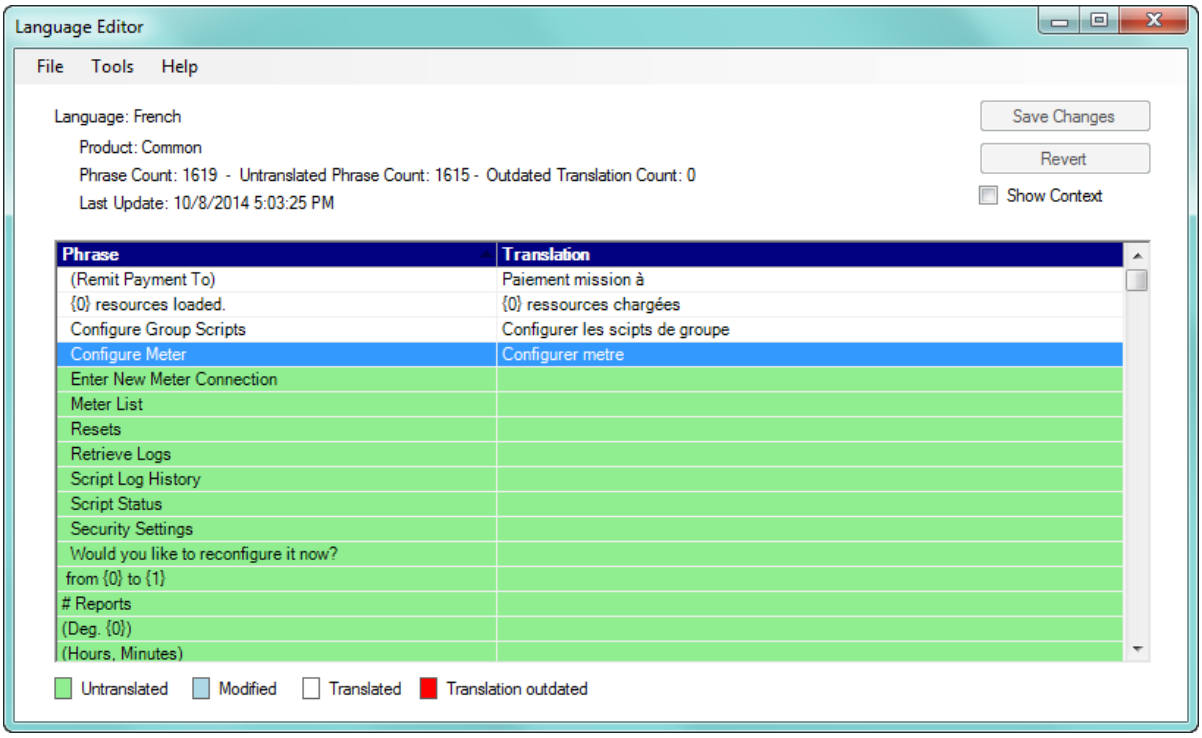
▷ To add a new translation, click the **Create New Language** button.



▷ Enter the language name and click **OK**.

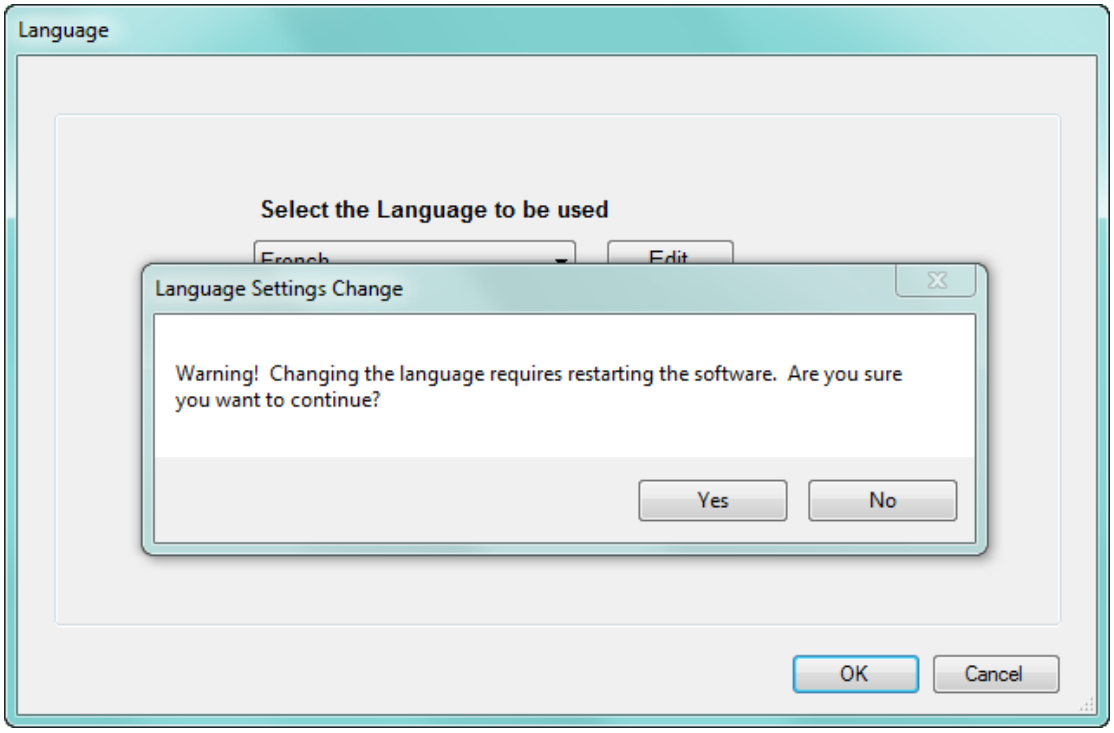


▷ Use the screen shown above to enter the translations. You enter the translation in the Translation column for each term in the Phrase column. See the example screen.



▷ When you have finished entering the translations, click **Save Changes** to save the language file.

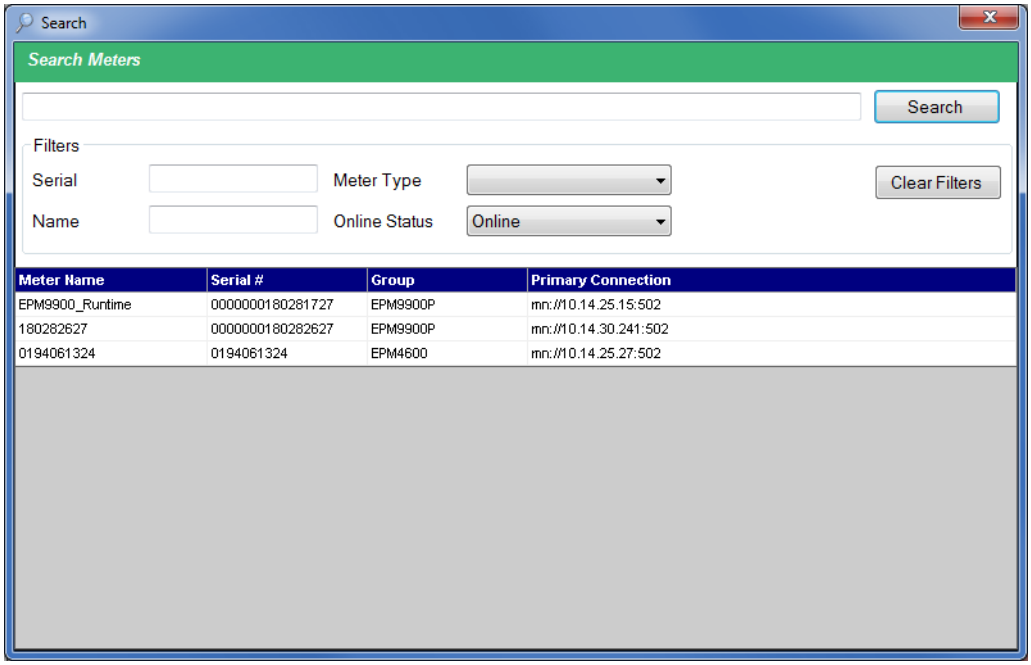
▷ The Language screen is redisplayed. Select the language you want to use from the pull-down menu and click **OK**. You will see the following confirmation window.



▷ Click **Yes**. The software will shut down. Open it again to display the translated application.

18.4.4 Search Meters

The Search Meters feature lets you perform functions on multiple meters at one time, as well as to find specific meters in a large list of meters. To open the Meter Search screen, either press Ctrl+F or click **Tools > Utilities > Search Meters**.



1. This screen gives you the following search options:
   - The bar at the top of the screen is a string comparison against all meter fields, including meter name, serial, group, connection, meter type, and notes. You can enter any value in it that you want to search on.
   - **Serial** - enter part or all of a serial number.
   - **Name** - enter part or all of a meter name.
   - **Meter Type** - select the meter type from the pull-down menu.
   - **Online status** - select Online, Offline, or Inactive (if the meter's last connection activity is more than a day ago, it is considered inactive) from the pull-down menu.
2. Click **Search**. When meter(s) are found that match the search criteria, they are displayed in the lower portion of the screen.
   - The filters restrict the results to only those fields that match. A blank in a search field will bring up all results for that field. However, if you specify no search criteria, you will get no results.
3. From the list of found meters, you can perform all actions that are available from the main screen, including connecting, viewing logs, and moving meters to a group, for either one meter or a group of meters.
   - To perform actions on one meter, right-click on the meter in the list and select the action from the pull-down menu.
   - To perform actions on multiple meters, hold down Ctrl while clicking meter entries. When you right-click and select an action from the pull-down menu, the action will

apply to all selected meters. You can select a range of meters by holding Shift while selecting the first and last meter in the range.

4. Click outside of the Search Meters screen to close it. When you open it again, the last search options will be displayed.

18.4.5 Service Control

The Service Control functions: Restart Service, Stop Service, Kill All, Kill Processes, all require admin permission to execute. Following is a description of the functions:

- Restart Service: This will restart the GE MeterManager Scheduler.
- Stop Service: This will stop the GE MeterManager Scheduler.

WARNING

This will prevent GE MeterManager from working.

The GE MeterManager Service will automatically restart the next time you reset your PC.

- Kill All: This will "kill" all processes related to GE MeterManager, including GE Communicator, Log Retrieval, Log Converter, and the MeterManager Scheduler.

WARNING

This will prevent GE MeterManager from working.

The GE MeterManager Service will automatically restart the next time you reset your PC.

- Kill Processes: This will kill all processes which are launched by GE MeterManager, including GE Communicator, Log Retrieval, and Log Converter.

GE Communicator

Chapter 19: Viewing Logs

19.1 Overview

EPM meters have the ability to store in internal memory information about the circuit they are monitoring. There are multiple types of logs that are created in meter memory that stores this data with an appropriate time stamp. Most meters have a variety of different logs. These logs are designed to provide data about a specific aspect of the electrical circuit being measured.

Log Viewer is the charting and graphing application that comes with the GE Communicator software. This application is database driven, and it normalizes data that comes from any meter, so that the Viewer package displays the data in a concise easy-to-understand presentation.

Chapter 16 "Databases and Log Data" explained the GE Communicator application's databases and log data, log retrieval and log archiving; Chapter 17 "Script & Scheduler Program" explained using Script & Scheduler to automate log retrieval; and Chapter 18 "GE MeterManager" explained using MeterManager to automate log retrieval. This chapter explains how to use the Log Viewer application to view the meter's data logs, and gives details on the available logs.

19.1.1 Available Logs

- **Historical Trends Logs:**
  - These logs are collections of time-stamped records (or "snapshots") used to track any parameter over time. Each record or snapshot can contain multiple data items, which are recorded at specific intervals and stamped with the time of recording. The following programmable criteria determine when the meter will take a snapshot:
  - The user-specified time interval
  - A parameter's exceeding of a limit or a return to within limits

  - An I/O event (a change in a relay or High-speed input)
  - EN 50160/IEC 61000-4-30 data: EPM 9650/9900/9900P meter
  - The EPM 9650/9800 meters have 2 Historical Logs; the EPM 7000 meter has 3 Historical Logs; the EPM 4600 metering system has 2 Historical Logs; and the EPM 9900/9900P meter has 8 Historical Logs
- **Limits Log:** the Limits Log retrieves independent out-of-limit information, creating a sequence of events for any occurrence.
- **Event-Triggered Waveform Log:** the Event-Triggered Waveform Log records a waveform when a user-programmable value goes out of limit and when the value returns to normal. All information is time-stamped to the nearest 1msec. A new feature for inter-harmonic analysis observes further frequencies.
- **Power Quality (CBEMA) Log:** this log records magnitude and duration of voltage and current surges and sags for every power quality (PQ) event. The associated waveform is also recorded.
- **Status Change (Input) Log:** this log displays the inputs change status for a selected meter file and time range.
- **Control Output (Relay) Log:** this log displays the relay change status for a selected meter file and time range.
- **System Events Log:** the System Events Log provides data for security and anti-tampering. It contains information on instances of the following: power up/power down, password access/modification, change of programmable settings, change of a run time, change of clock time by communication (Modbus or DNP), Test Mode usage, and meter resets (Logs, Max/Min, Energy).
- **Flicker Log:** the log records Flicker information for a selected meter and time range (only available for EPM 9000 family meters).
- **Transients Log (EPM 9900/9900P meter): t**he Transient log lets you view voltage transients and the EN 50160/IEC 61000-4-30 log generates a report.

19.1.2 Log Procedure Sequence

The following is the general sequence for working with all meter logs:

1. Program parameters specific to each log in the meter's Device Profile (see the programming chapter for your meter type). Logs run automatically on the programmed interval/criteria.
2. Retrieve the logs manually from the meter; or retrieve logs automatically using the MeterManager or the Script & Scheduler application. See chapters 16, 17, and 18 for details.
3. View and analyze log data using the Log Viewer (explained in 19.2 *Log Viewer*).
4. Diagnose PQ Events from meter logs; create comprehensive reports.

19.1.3 Free Space Calculation Feature

Log Converter is a software application that runs after a download of meter memory through the GE Communicator application. The Log Converter then takes the binary file data and converts it to the database file to be read by Log Viewer.

The Log Converter automatically checks your computer and calculates the amount of free space on your hard drive. This calculation is performed to insure enough hard drive space for the Log Converter to operate. The table below shows the parameters for the calculations and the actual calculation performed by the meter.

FREE SPACE CALCULATION PARAMETERS		
ITEM	**DESCRIPTION**	**MINIMUM VALUE**
THDS	Total Hard Disk Space	
THDFS	Total Hard Disk Free Space	
MIN THDS	Minimum of Free Space of Total Space (Minoffreespace)	1
MinSetFS	Minimum Free Space (MinFreeSpace)	50M
CalMinFS	Calculated Minimum Free Space	

NOTE

MinofFreeSpace and MinFreeSpace Values are set in the LogConverter.ini file.

CALCULATION:

MinTHDS x THDS = CalMinFS
If CalMinFS < MinSetFS then CalMinFS = MinSetFS
If CalMinFS <= THDFS then OK
If CalMinFS > THDFS then Need More Space on your HD

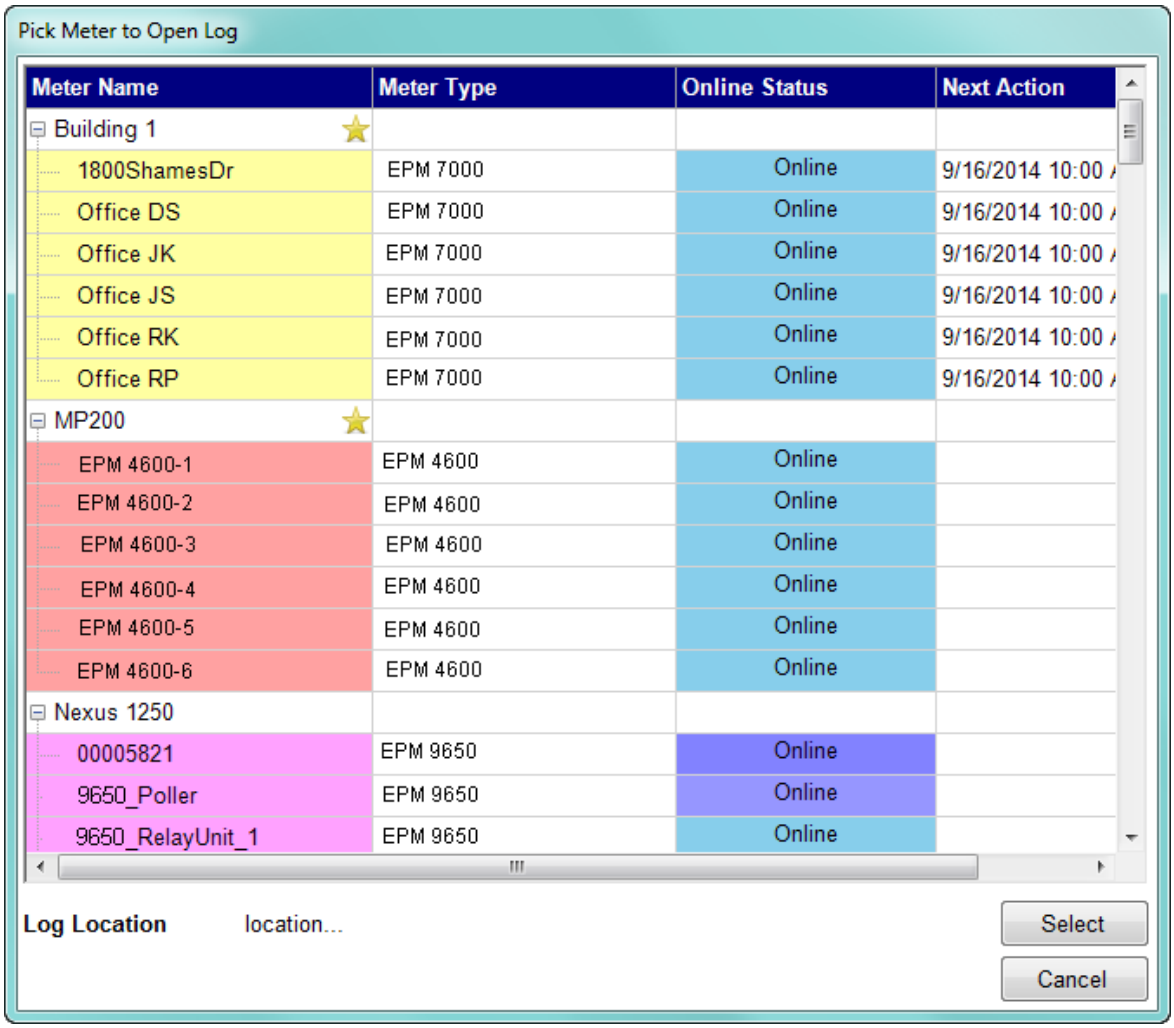
It is a good practice to provide this software with plenty of free space. Logs are very large, so you should allocate a large amount of hard drive space. 500GB is the minimum recommended amount of available hard drive space when starting a new project.

19.2 Log Viewer

The GE Communicator application's Log Viewer displays retrieved logs in a variety of formats.

1. To access Log Viewer, either:

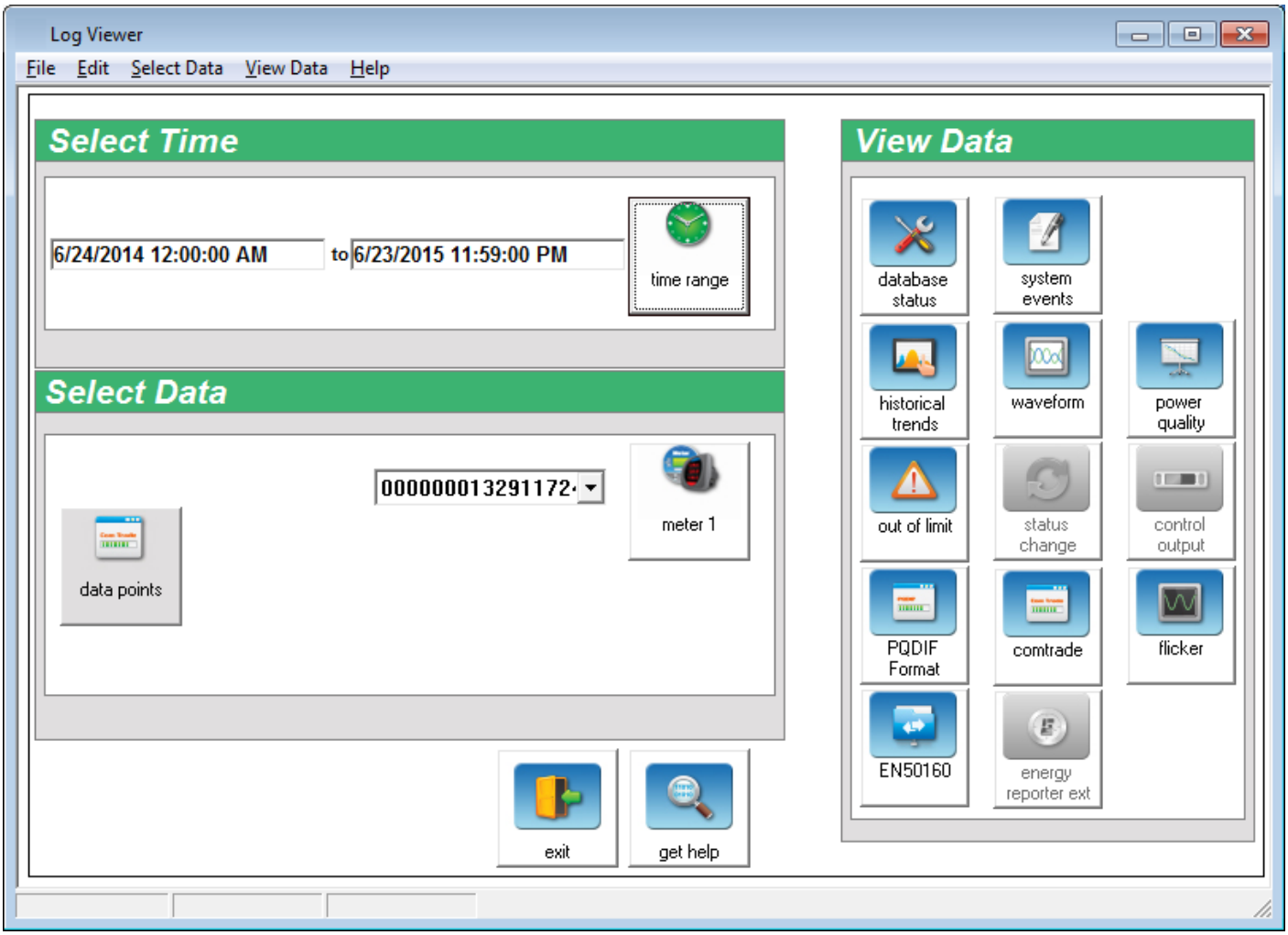
- Retrieve logs from a connected meter, as explained in Chapter 16 "Databases and Log Data". Use this option if you are running the Lite version of GE Communicator software.
- Click the Open Log icon. If MeterManager is installed, you will see the screen shown below. (If MeterManager is not installed, e.g., you are in Lite mode, the GE Communicator application will open the Retrieved Logs directory, prompting you to pick a previously stored log file Then Log Viewer will open - go to step 2.)



- Click on the meter whose log you want to view.
- The location of the log will be displayed at the bottom of the screen. Click Select to select the displayed log.

- Run Log Viewer from the Start menu: **Start> GE Applications >Log Viewer**

2. You will see the Log Viewer's main screen, shown below.

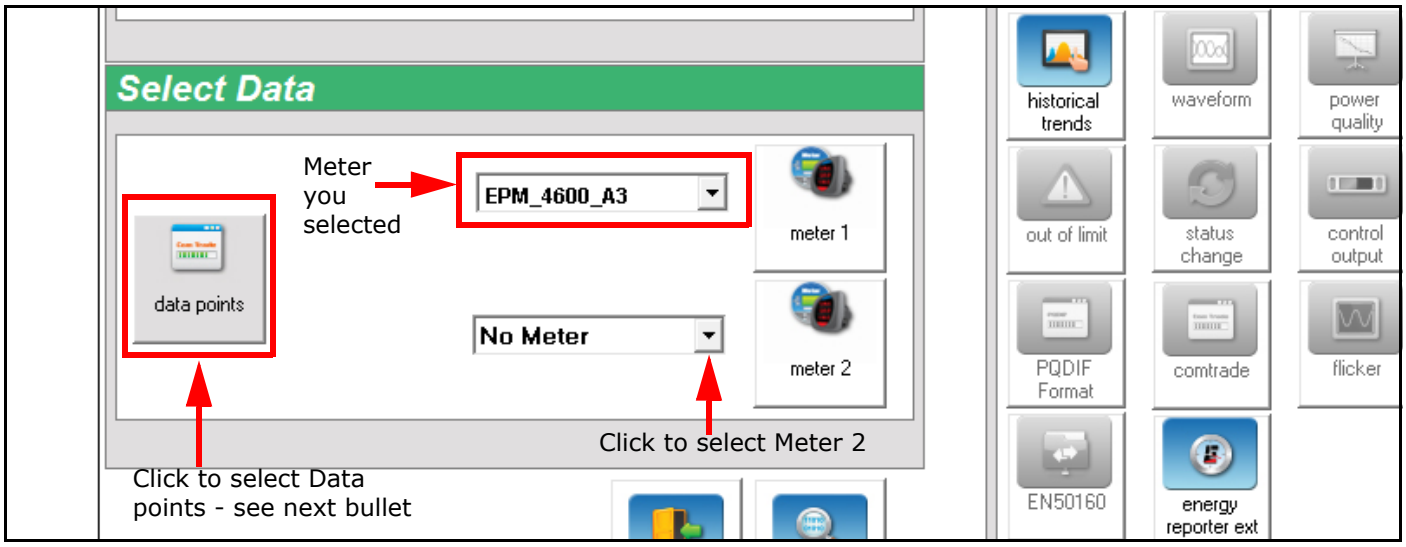


NOTE

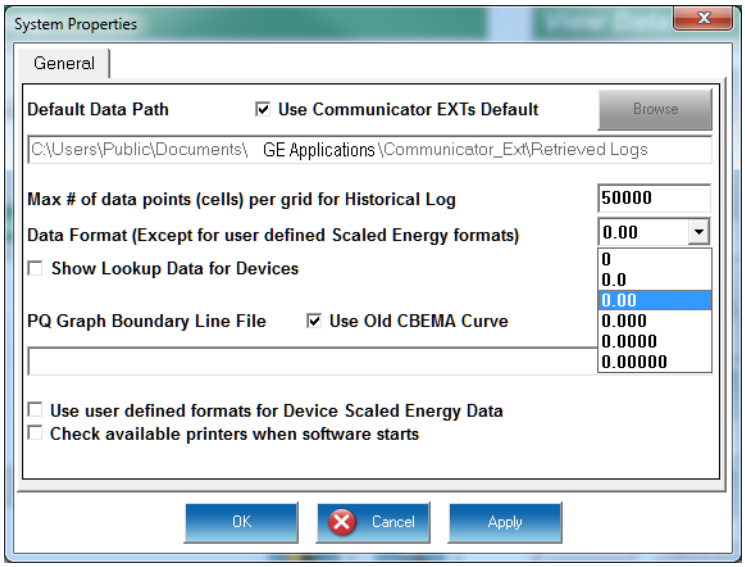
The screen shown above has the Meter 1 field. If you are connected to an EPM 9900/ 9900P meter you will see only Meter 1. If you are connected to another EPM meter you will see Meter 2 fields underneath Meter 1 (see the following example).

- The logs are listed on the right side of the screen, in the View Data box. You click the Log's button to view the data for that log. The buttons of unavailable logs are grayed out and unselectable.
- The Select Time box shows the time range for the data display. The default time range is the last year from the current date. This time range can be changed (instructions follow, in step 6).
- The Select Data box contains the meter(s) you will view logs for and the Data Points button you use to select the data you will see for the log.
  - If you accessed the Log Viewer through the GE Communicator application, the meter you selected or retrieved logs from is in the Meter 1 display. You can change

the meter by clicking in the pull-down menu; and you can choose a second meter by clicking in its pull-down menu.



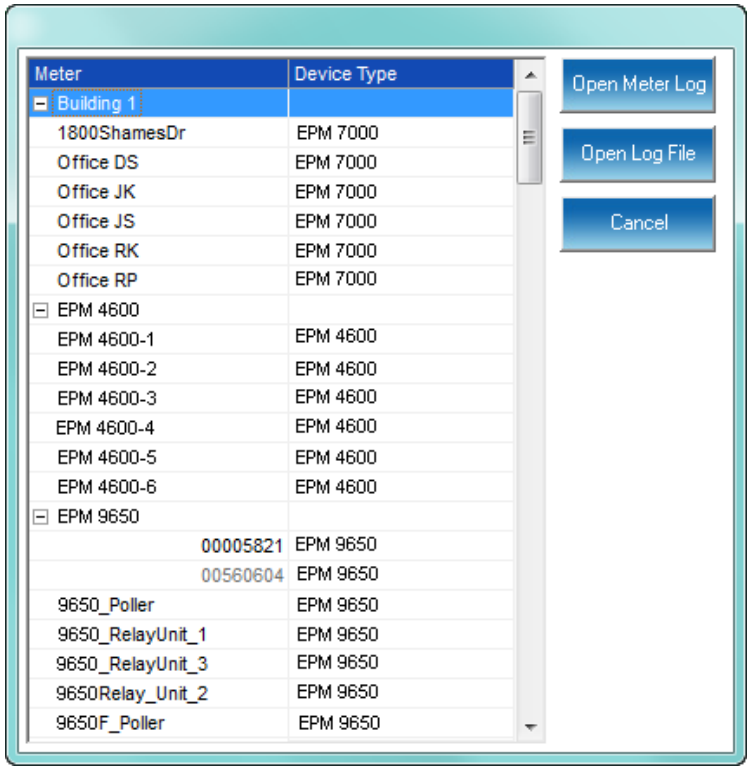
- Note that you can set the resolution of the data, e.g., Power Factor, by clicking **Edit > System Properties** from the top of the Log Viewer screen.



- Select the resolution you want to use from the pull-down menu and click **OK**.

3. Choose the log data file(s) you would like to view, in either of the following ways:
   - If you have retrieved logs through the GE Communicator application, the meter's designated label is shown in the field next to the Meter 1 button. Click the Log's button on the right side of the screen to view a log. (The buttons of unavailable logs are grayed out and unselectable.)
   - If you want to view a previously retrieved log, click either Meter button (1 or 2).

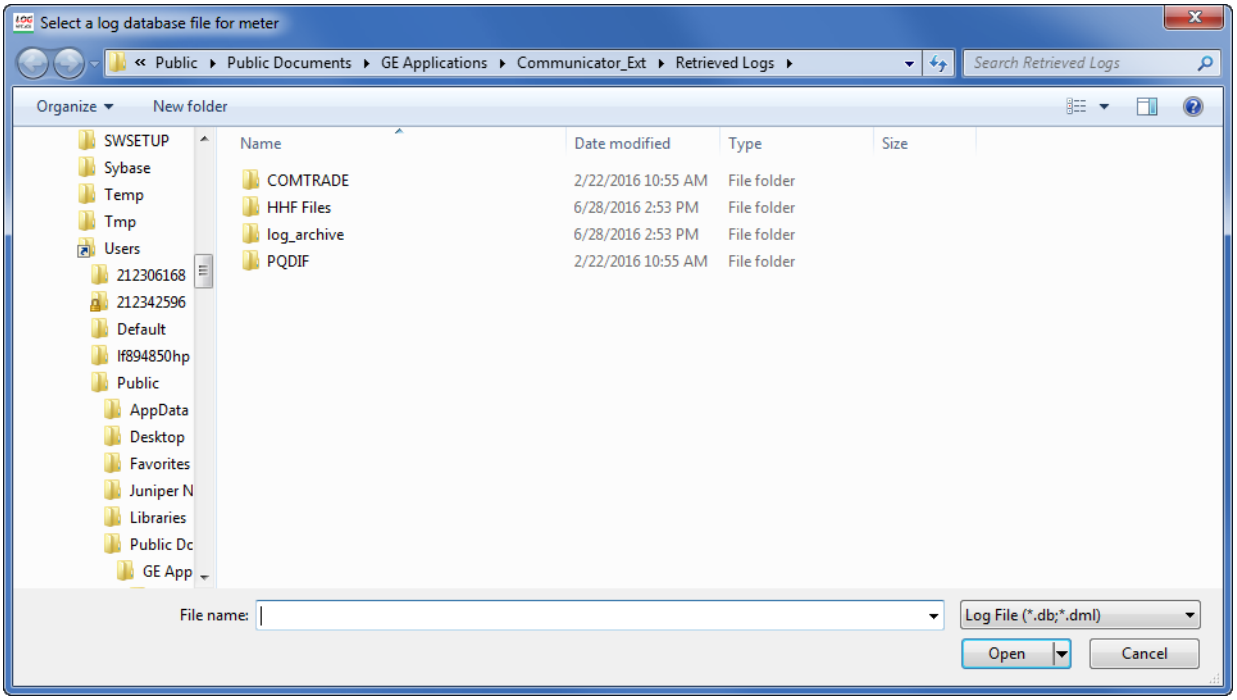
When running the Professional version of GE Communicator software, with the MeterManager automation component, Log Viewer opens the window shown below.



Click a meter and click **Open Meter Log** to automatically add the current log file in the Meter 1 (or Meter 2) field in the main screen.

You also have the option of choosing a specific log file, by clicking **Open Log File**, and then following the instructions for GE Communicator software's Lite mode, starting on the next page.

If you are running the Lite Mode (unlicensed version) of the GE Communicator software application, when you click on Meter 1 or Meter 2 the following screen opens, prompting you to select a log database file to view.



- Click on the file you want to view and click **Open**.

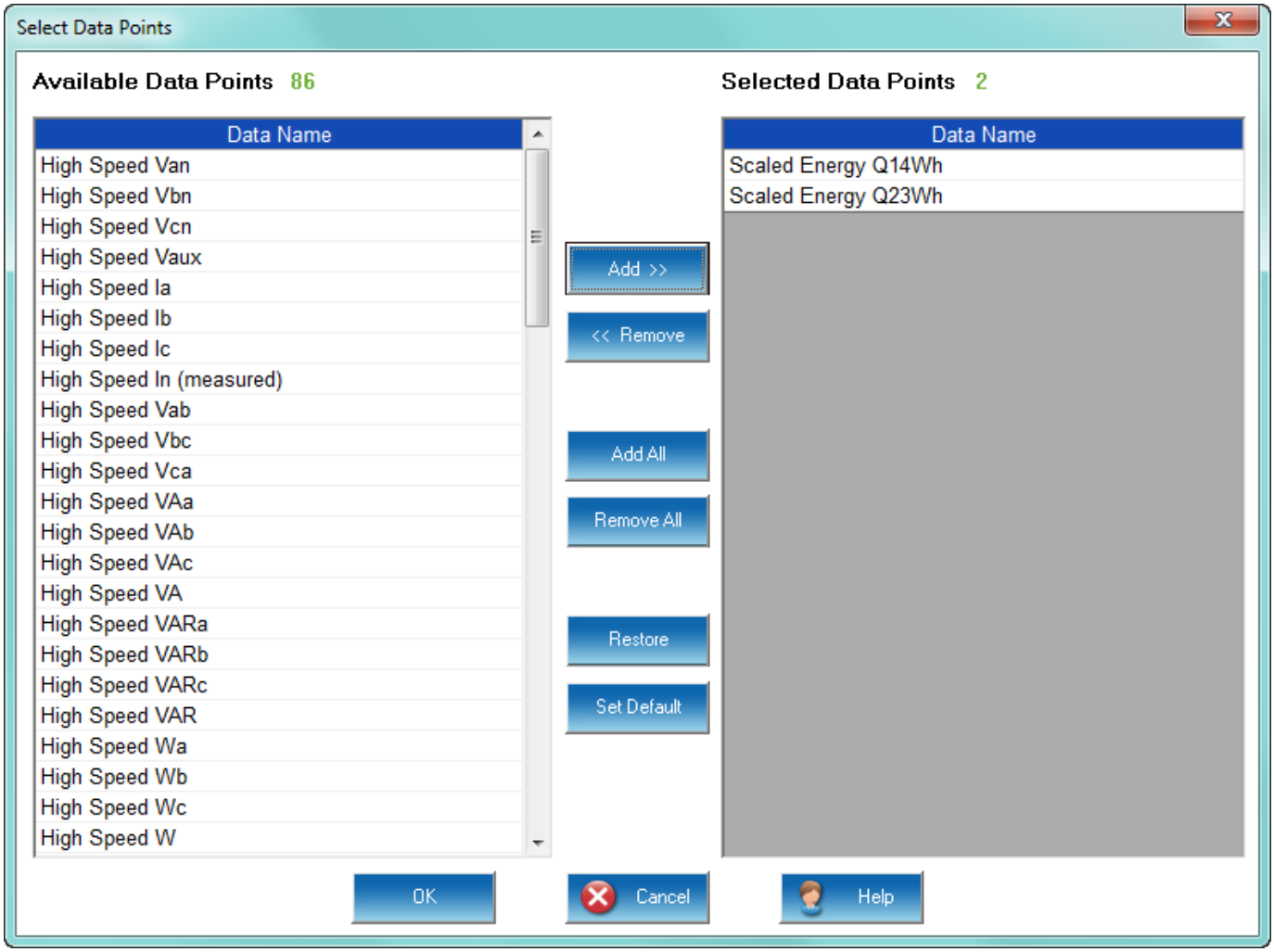
NOTE

For an EPM 9900/9900P meter, click the Meter 1 button and then choose the device master log (.dml) file, located in the folder with the meter's name. This allows you to view all of the retrieved logs for the EPM 9900/9900P meter.

NOTE

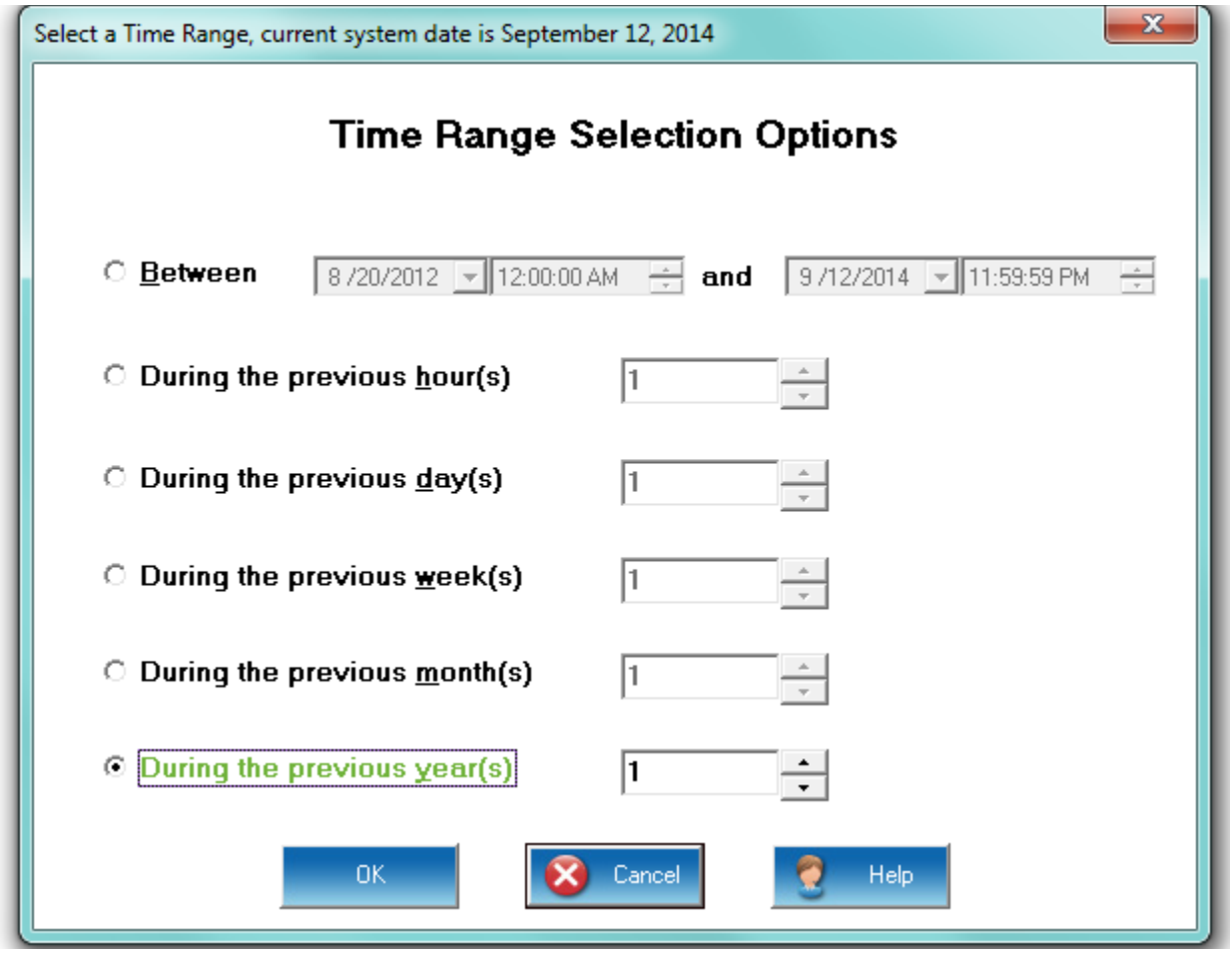
- You may choose a different log file (.db) for Meter 1 and for Meter 2.
- If you select a .dml file for the EPM 9900/9900P meter, you can only see the retrieved logs for that meter: you cannot select a second meter.

4. Select the log data points you would like to view by clicking on the **Data Points** button in the Select Data section. You will see the screen shown below. When you are viewing a Historical Trends log this screen will open automatically when you click on the **Historical Trends** button from Log Viewer's Main screen.



- The available data points vary with the type of log and the parameters set for it. The available data points and the number selected display on the top of the screen. The data points in the left column are the parameters that are in the log. The data points in the right column are the parameters that will be shown in the Log Viewer screen and the graphs. This screen lets you select what data you want to view.
- From the Available Data Points column, click on the data points you want to include when viewing the log file. To select multiple points, hold down the Ctrl key while clicking. To select a sequence of points, hold down the Shift key while clicking.
- Click the **Add** button to move the Data Points to the Selected Data Points column.
- Click the **Restore** button to return the selection to its previous setting.
- You can also click on a data point in the Available column, and "drag and drop" it into the Selected column.

5. When you have made your selections, click **OK** to return to Log Viewer's main screen.
6. Select the portion of the log(s) you wish to view by specifying a time range. Log Viewer bases its time/date format on your computer's Regional Settings made through the PC's Control Panel. Click on the Time Range button in the Select Time section. You will see the screen shown below:



- To select a specific time range, click the **Between** radio button and enter a date and time in each field. Double-click either date/time field to bring up the following calendar. Click the selected day and use the slide at the bottom of the screen to select a time. Click **OK**.
- To select a range of hours, days, months or years only, click the appropriate radio button and the counter menu beside it.
- To return to the main screen, click **OK**. The time range you selected is displayed to the left of the **Time Range** button.

7. After you have loaded the log file(s), selected data points and chosen a time range, you may begin viewing the data.

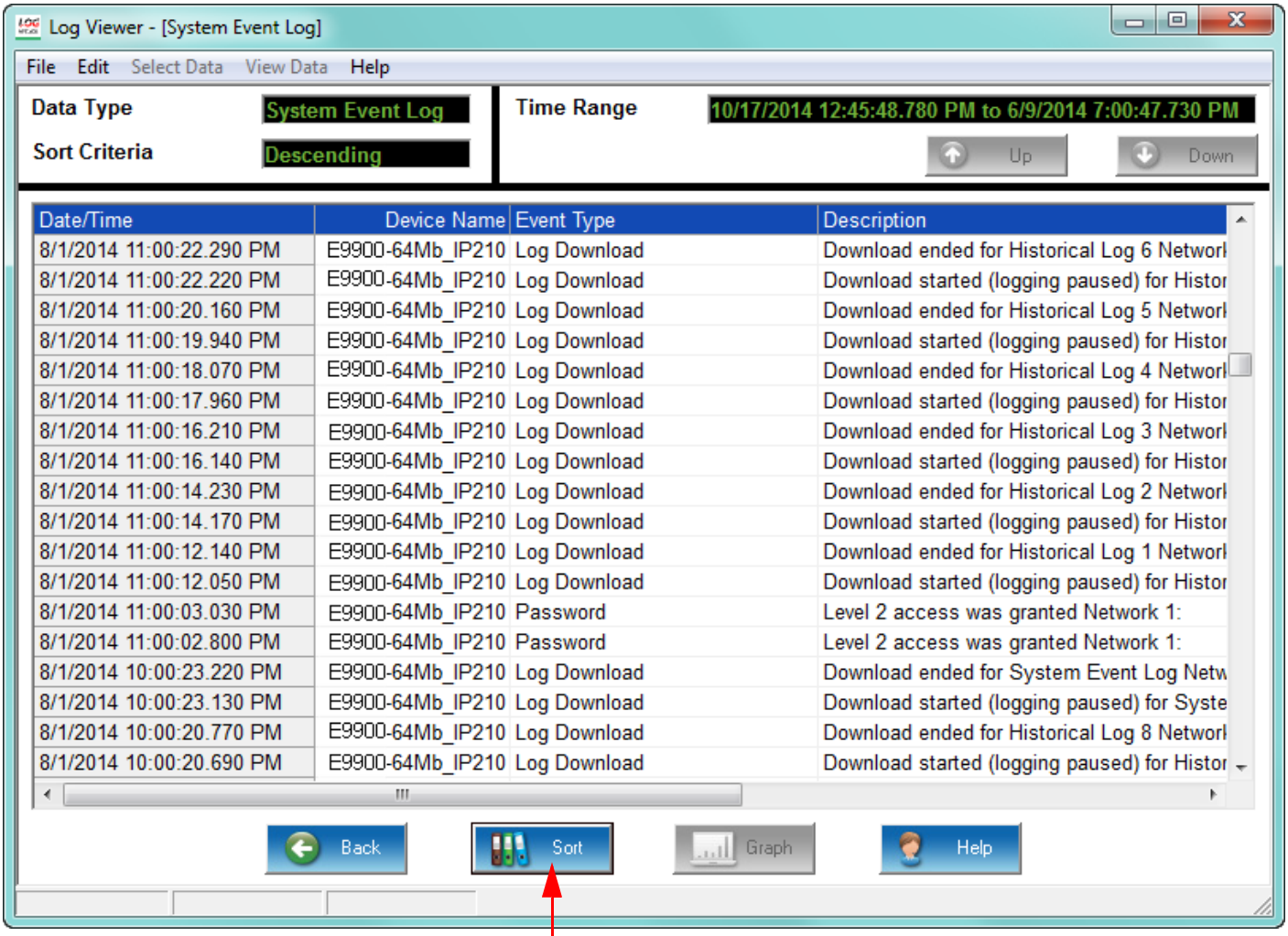
19.3 Additional Information About Log Viewer

There are a few additional instructions for using the Log Viewer. Depending on the type of log you are viewing, you may have a Sort option for the data, and you may have a Graph option.

19.3.1 Sorting Log Data

Most of the log data you will be viewing has a timestamp associated with it, which is the time and date of the "snapshot" - when the data was stored in the log. The default sort order of timestamped data is Descending order - the most recent timestamp is first and subsequent timestamps are earlier.

1. If you want to change the sort order, so that you view the data with the earliest timestamp first, click the Sort button at the bottom of the log display screen. See the example screen, below.



Click the Sort button to change order of data

2. You will see the Sort Order Option screen shown below. Click in the pull-down menu and choose Ascending and then click OK to close the screen.

3. Your timestamped data will now be shown in ascending order.

19.3.2 Graphing Log Data

Most of the logs have a Graph option. This section explains general information about the graphs. The detailed log screen descriptions starting with 19.4.1 *Viewing Historical Trends and Snapshots*, will explain the graphing options for the particular log.

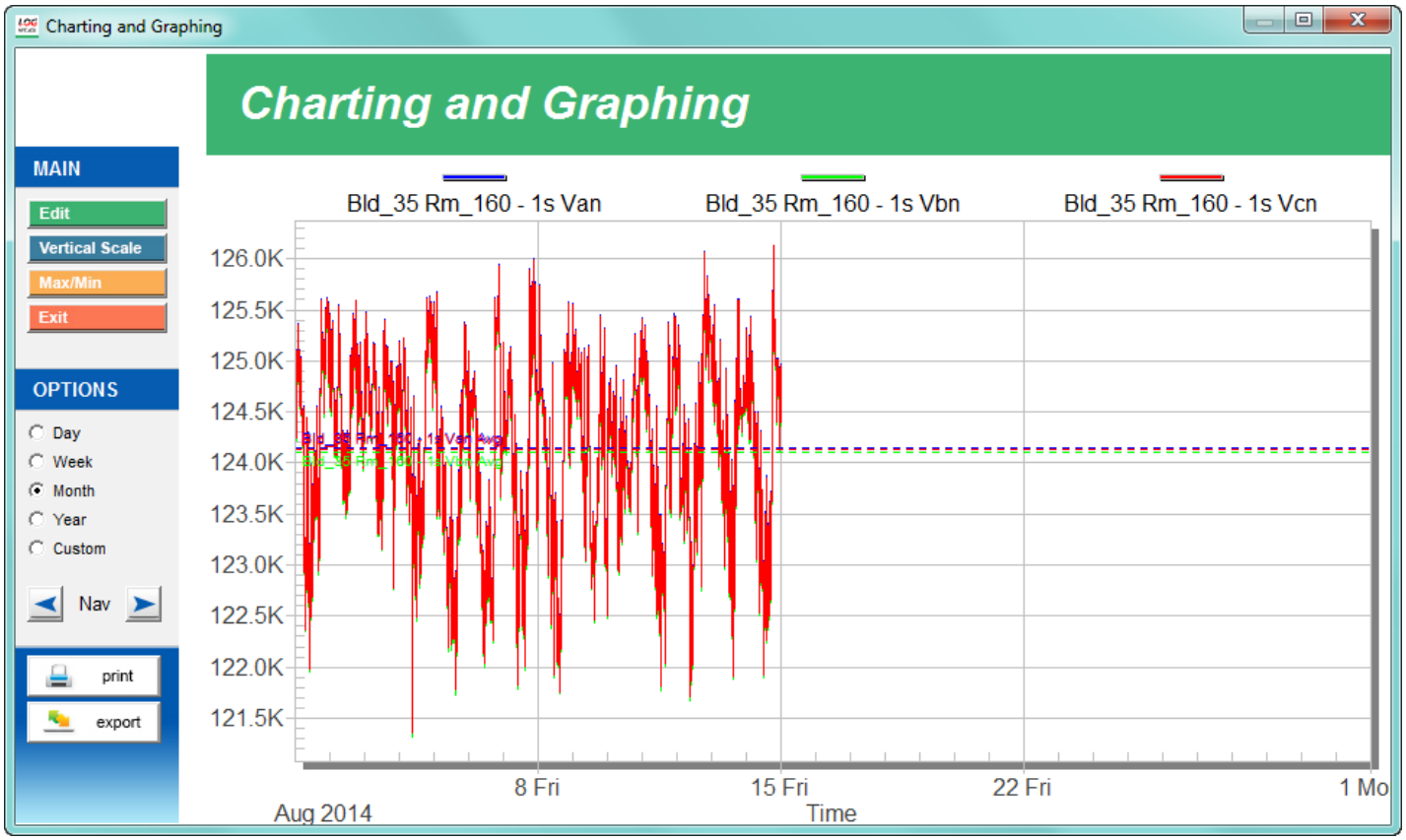
There are 2 basic types of graphs:

- Advanced Graph
- Waveform Graphs

19.3.2.1 Advanced Graph

The Advanced Graph lets you view log data for up to six data points. The features of this graph allow you to analyze the data quickly and efficiently. It gives you the capability to zero in on particular ranges of data, view bar, line, or point graphs, view information about individual data points, and customize the presentation of your data in a variety of ways. You can also print graphs from this screen.

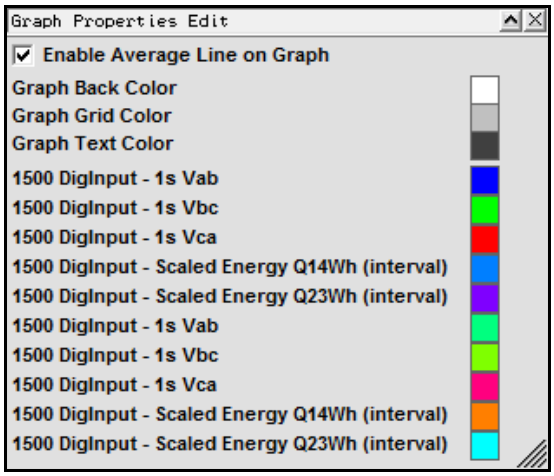
- If you are using a Historical log for Input Triggered Logging and want to view the data, use the Millisecond option of this graph.
- The next page shows an example figure of the Advanced Graph.



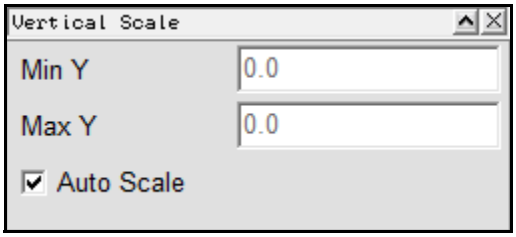
The components of the Advanced graph are as follows:

- The Main Graph displays the selected data. The top of the Main Graph lists the data points you are looking at and the colors of their pens.
- The Main box, located on the left side of the screen, gives you these options:

- Edit - click to open a window that gives you options for changing the appearance of the graph: choosing the colors used for data points and enabling/disabling the average line showing on the graph.



  - To disable the average line from showing in the graph, click to uncheck the box.
  - To choose a new color for a data point, double click in its color box to open another window that lets you pick a color to use. You can also create a custom color if you wish.
  - To expand the window, click and hold on the diagonal lines in the lower right corner, and pull out with the mouse.
  - Click the X in the screen to close it.
- Vertical Scale - click to open the window shown below, which lets you either choose auto-scale (the default selection) or to specify the value for the x and y graph display. If you want to specify the vertical scale yourself, you must first click in the Auto Scale box to uncheck it..



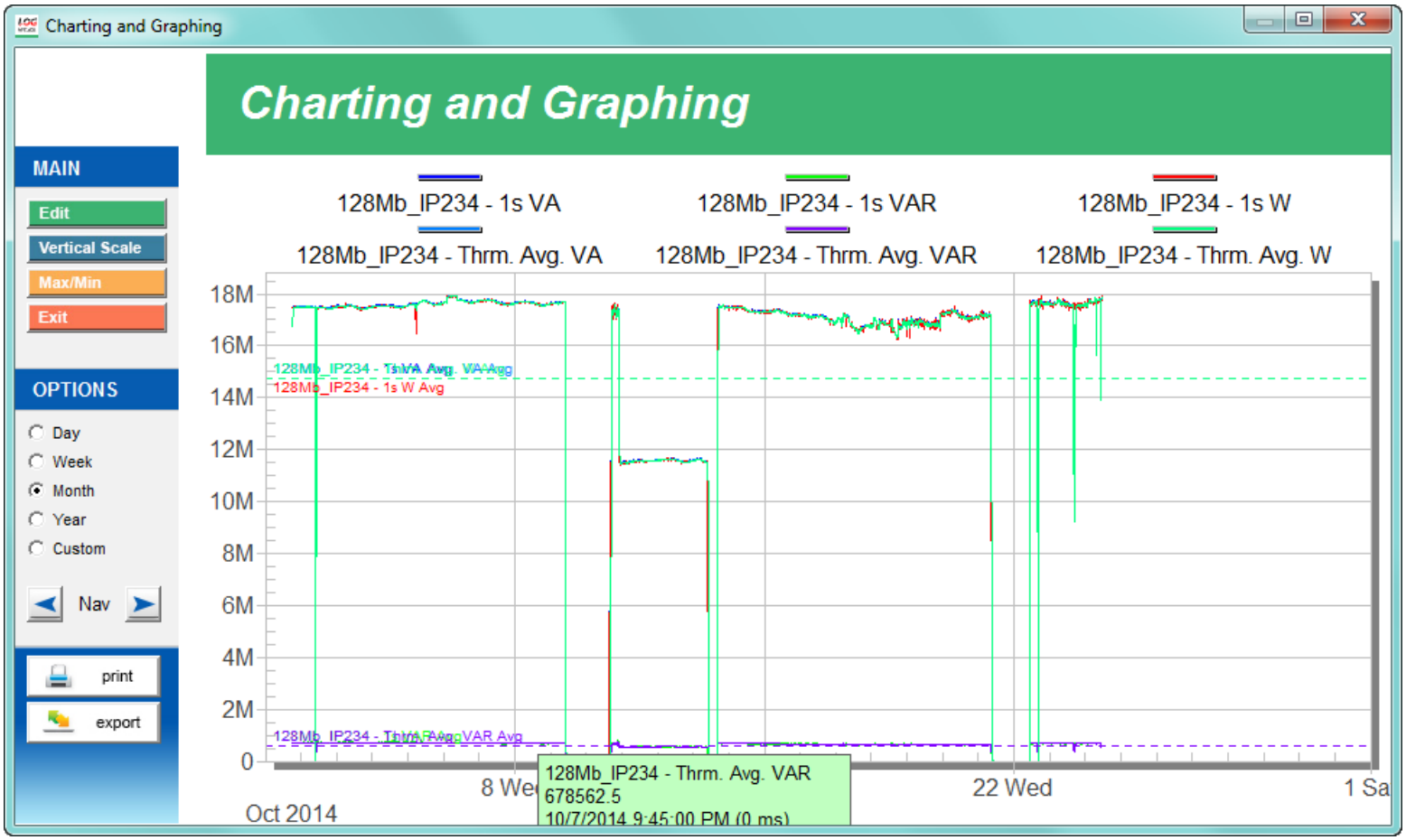
- Max/Min - click to open a window that shows you the maximum, minimum, and average values for the data points in the graph, along with the timestamp for the maximum and minimum values.

Max/Min/Average

Channel	Max Value	Max Time	Min Value	Min Time	Average
FinalTest_Cal_Nx - Rolling Avg. V	148167.508	8/9/2014 9:15:00 PM	0.000	8/6/2014 9:15:00 AM	3465.693
FinalTest_Cal_Nx - Rolling Avg. W	13746.597	8/8/2014 3:45:00 PM	-130949.844	8/9/2014 8:30:00 PM	-2669.056
FinalTest_Cal_Nx - Rolling Avg. P	232226.395	8/9/2014 8:30:00 PM	-28847.946	8/6/2014 10:15:00 AM	3395.828

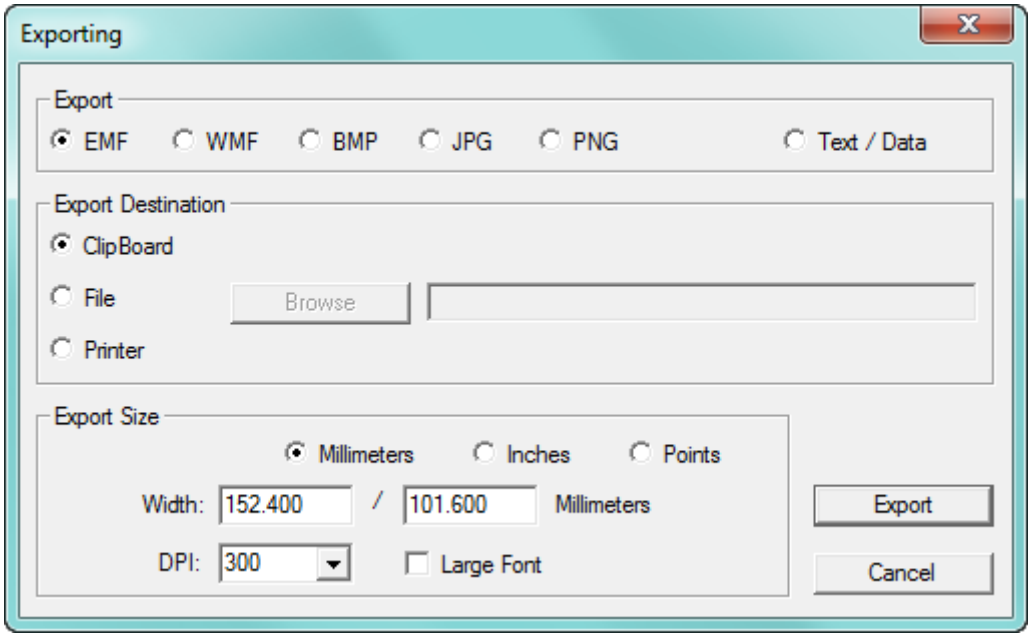
- Exit - click this button to close the graph and return to the log's display screen.

Clicking on a data point in the Main Graph gives you the Channel, Value, and Time Stamp for that data point. See the example screen, below.



- The **Options** box, located in the left side of the screen, lets you select the time range for the graph display: Day, Week, Month, Year, or Custom. Custom opens a window that lets you specify the date range. Use the Nav buttons to scroll back and forth within the time range.
- Click the **Print** button to print the graph on your default printer.

- Click the **Export** button to open the screen shown below.



This screen lets you specify:

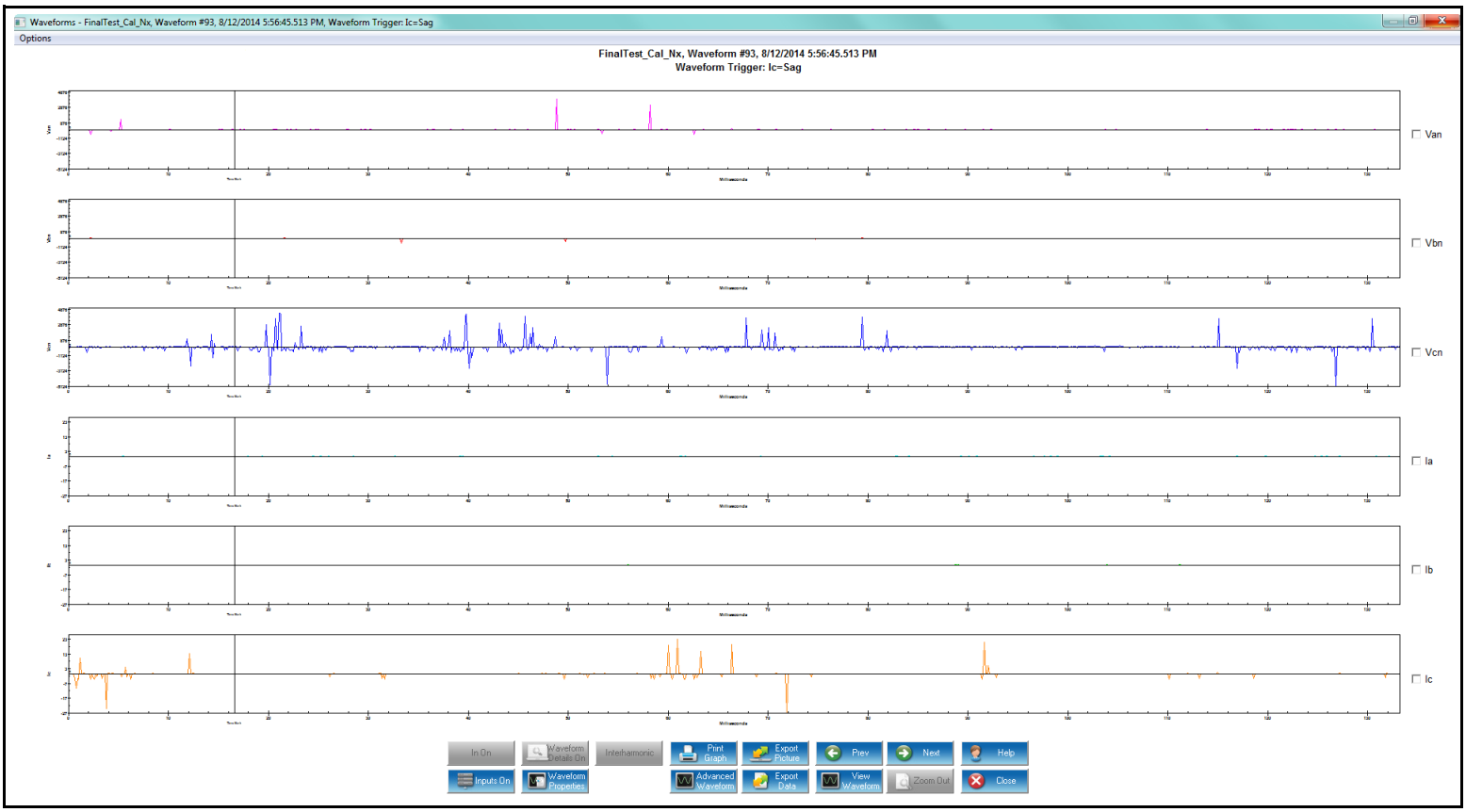
- The format you want to use for the export, either:
  - One of the image files: EMF, WMF, BMP, JPG, or PNG
  - A text file: Text/Data option
- If you want to copy the graph to:
  - The clipboard
  - A file
  - To the connected printer
- The export size you want:
  - Set as millimeters, inches, or points
  - The DPI setting you want to use
  - Whether you want to use large fonts
- The most common settings are:
  - For an image: JPG or PNG, File or Clipboard, and Points-Desired size.
  - For a data (CSV) file: Text/Data, File or Clipboard.

When you have made your selections, click the Export button to perform the export.

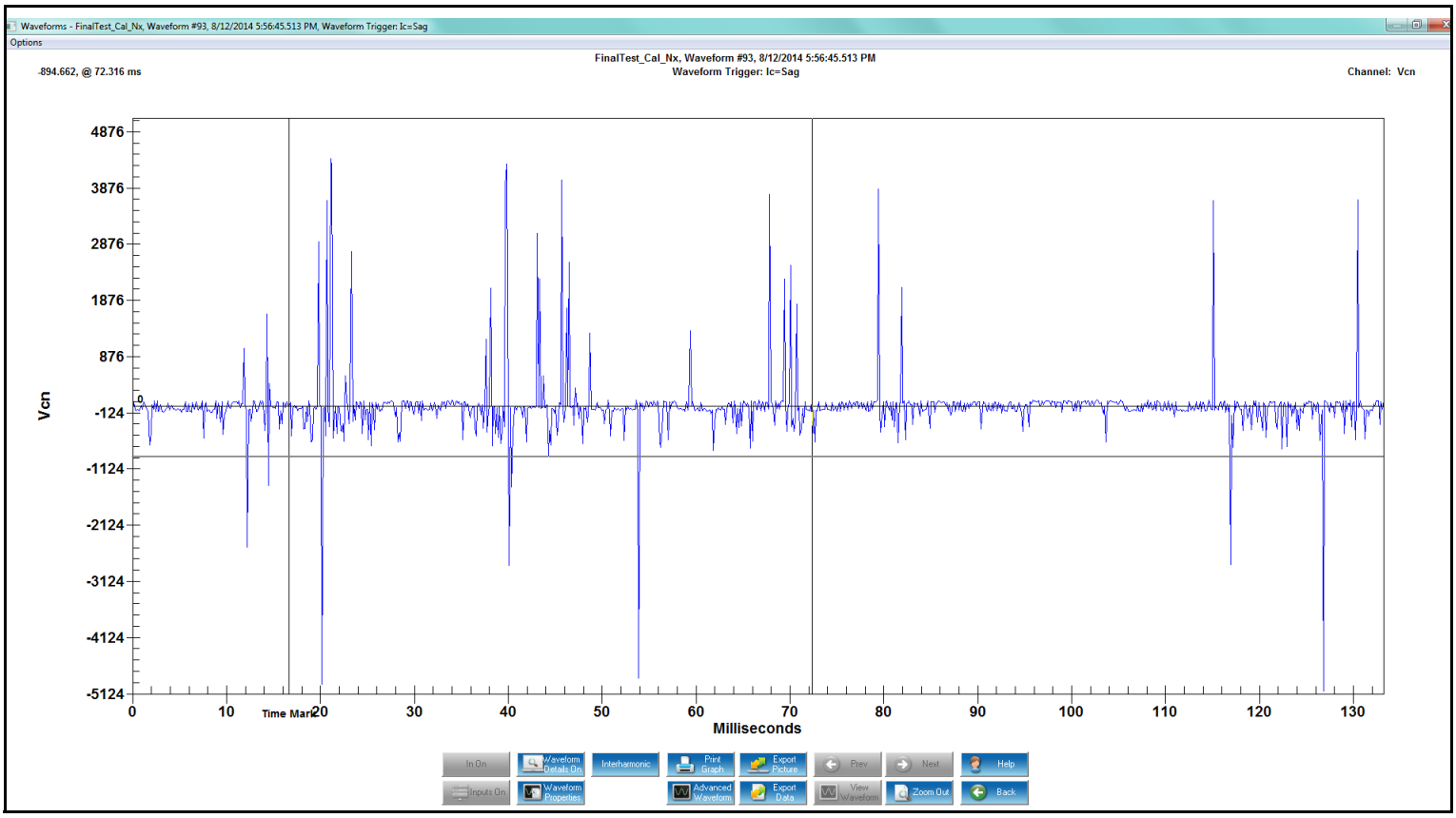
19.3.2.2 Waveform Graphs

The Waveform Graph viewer allows the user to view data from high speed fault records from EPM meters. In addition to viewing, the user can annotate, analyze, and enter comments on these waveform files. All of the data is maintained in this database.

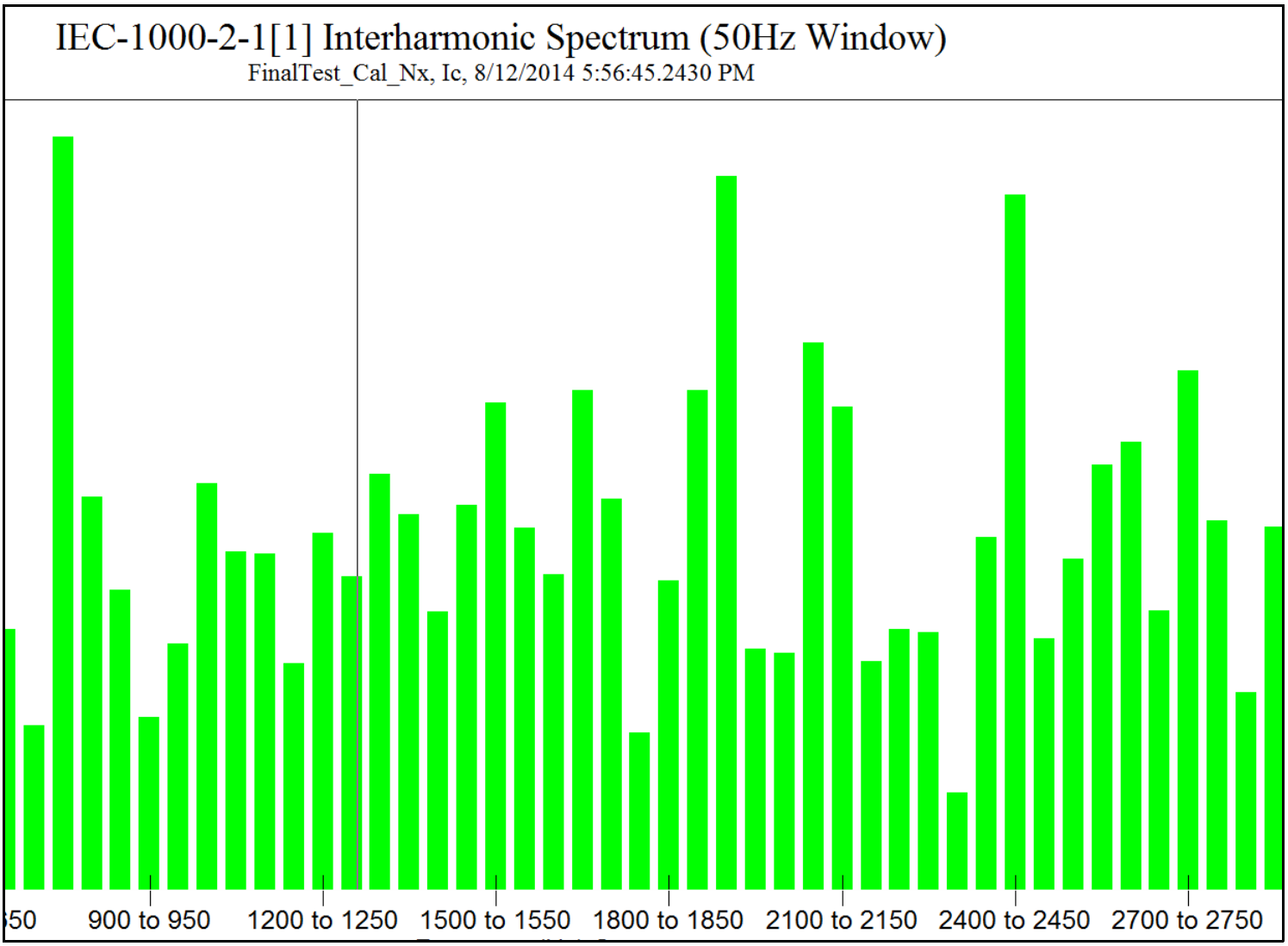
To view any waveform in the main Waveform Log screen (see "Viewing the Waveform Log" on page 19-34), click on the desired record and then click the Graph button. The Waveform graph gives you many options for viewing waveform data.



- Double-click on a point in the waveform to show the milliseconds display of the waveform.

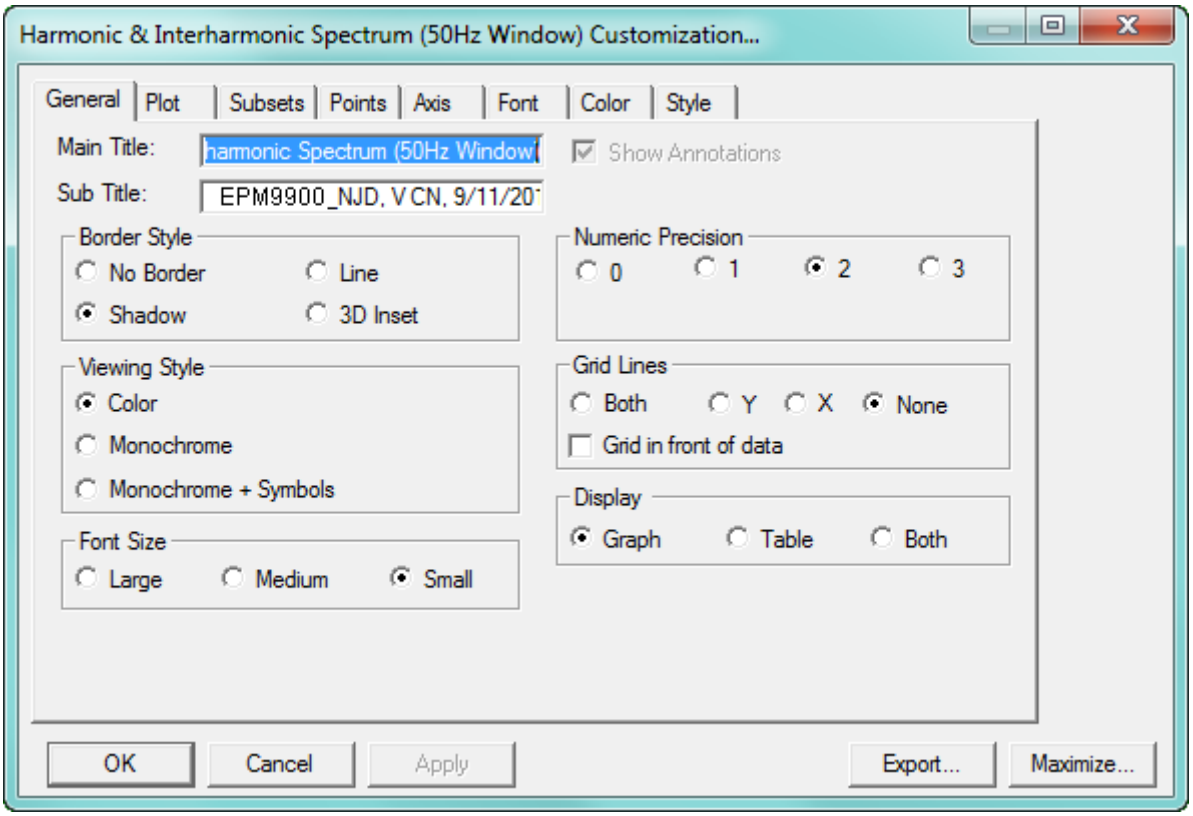


- From the millisecond display, you can then click Interharmonic to see those values. See the example screen below.



- Click **Harmonic & Interharmonic** to see a combined graph of both values for the waveform.
- Both the IEC 1000-2-1 Interharmonic and the Harmonic & Interharmonic screens offer another button - **Edit Graph.** Click it to display the window shown below, which allows

you to customize the graph display. Click on the tabs to adjust the Plotting, fonts, color, style, etc. for the graph.

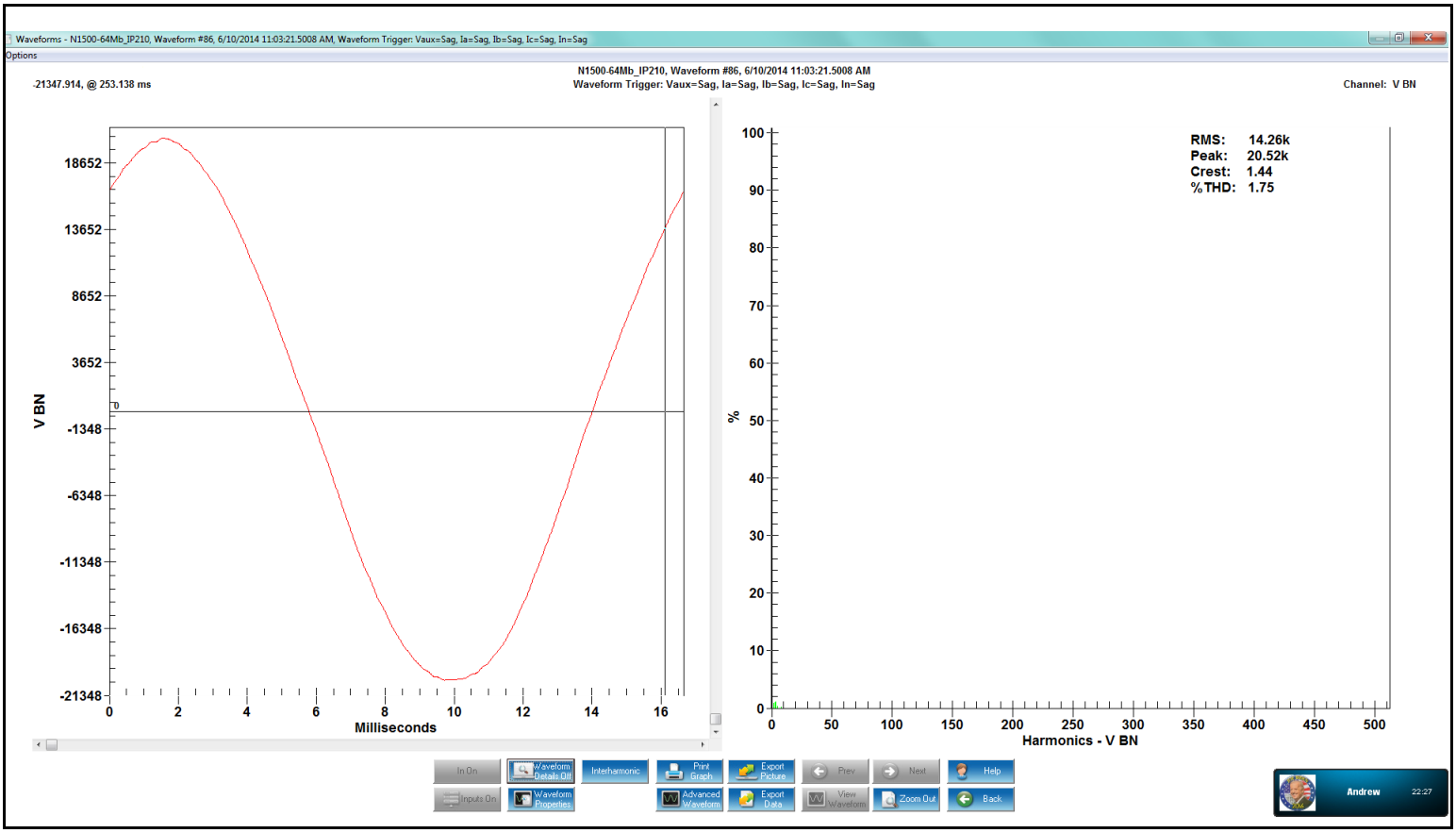


- To Apply changes, click **Apply**.

- From the Waveform graph, click **In On** to turn on the I neutral phase current waveform.*
- From the Waveform graph, click **Inputs On** to include the High Speed Inputs that were included with the waveform. Double-click on the Inputs graph for a closer view. Each input is listed on the Y axis followed by a 1 or 0—a 1 denotes that the input is open; a 0 denotes that the input is closed. Click **Inputs Off** to remove their display.*

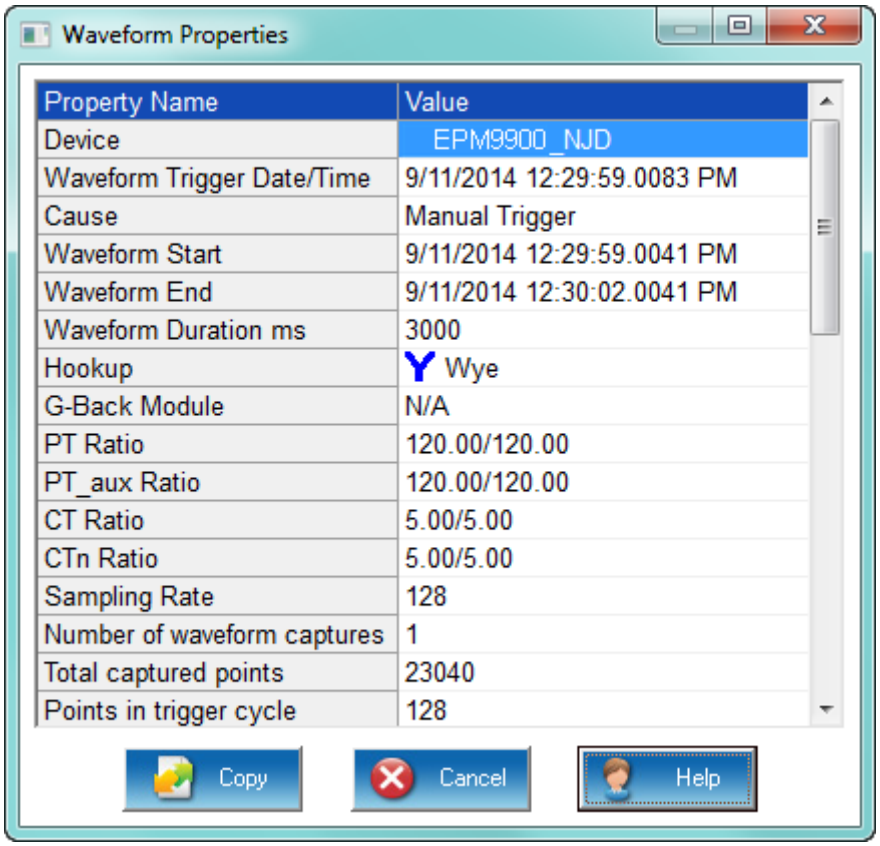
  * These buttons are only enabled if the meter supports these items. Also, you must be on the screen that displays each analog channel in its own graph.

Waveform Cycle by Cycle Harmonic Spectrum Analysis:
Click **Waveform Details On** to display detailed information on the right side of the screen.



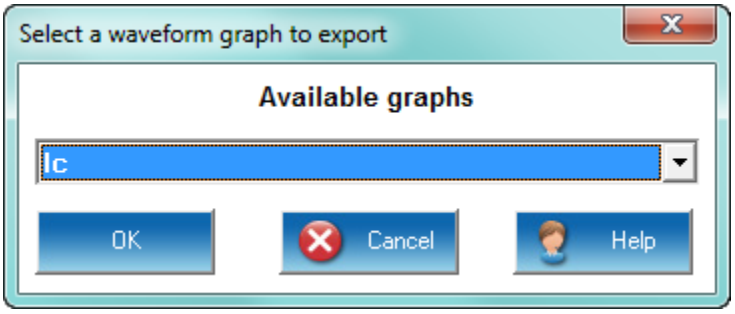
Click **Waveform Details Off** to remove the detailed display.

Click **Waveform Properties** to open the window shown below, which shows detailed information regarding the waveform. You can click the **Copy** button to copy this window's information to the clipboard. Click **Cancel** to close the window.



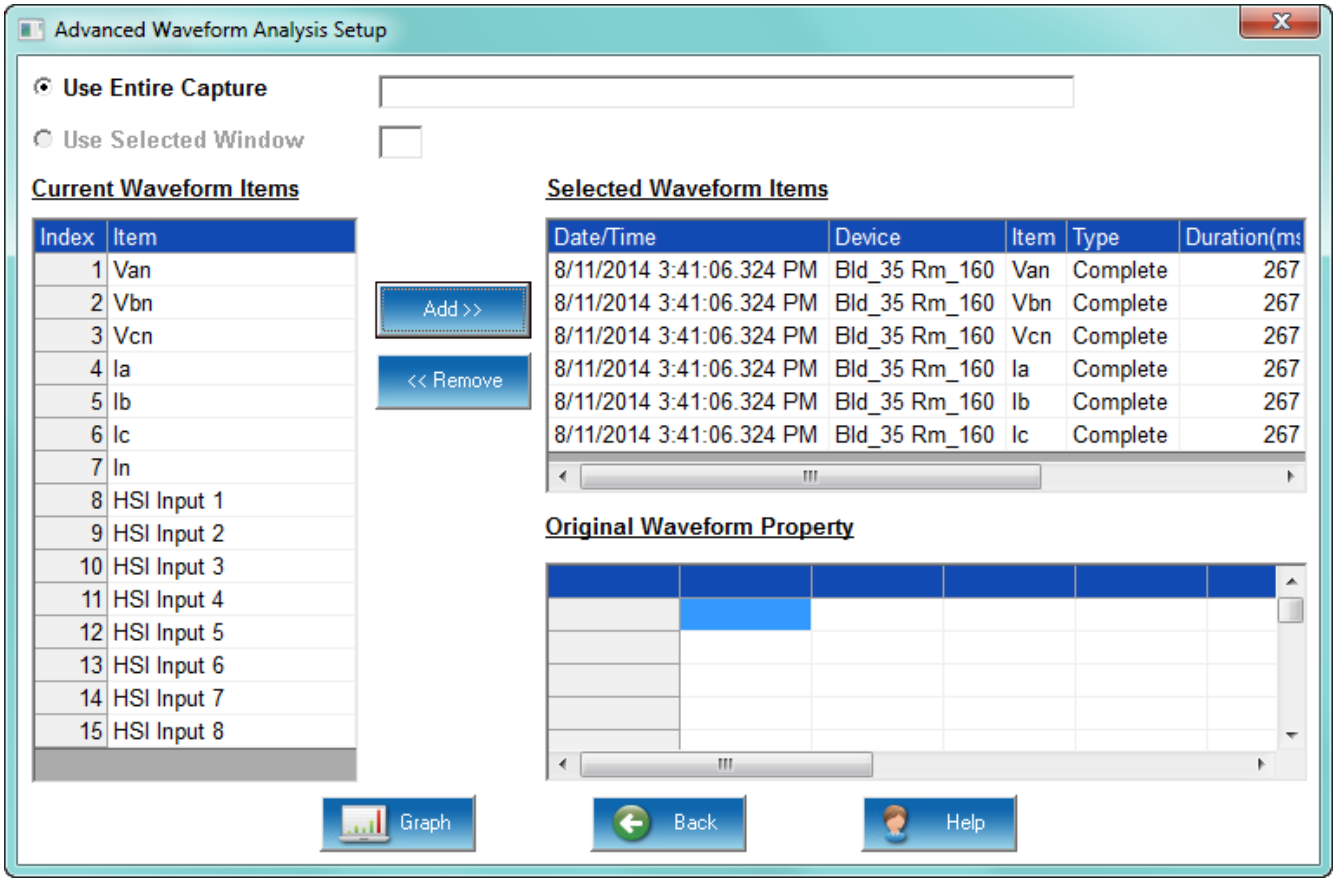
Property Name	Value
Device	EPM9900_NJD
Waveform Trigger Date/Time	9/11/2014 12:29:59.0083 PM
Cause	Manual Trigger
Waveform Start	9/11/2014 12:29:59.0041 PM
Waveform End	9/11/2014 12:30:02.0041 PM
Waveform Duration ms	3000
Hookup	Y Wye
G-Back Module	N/A
PT Ratio	120.00/120.00
PT_aux Ratio	120.00/120.00
CT Ratio	5.00/5.00
CTn Ratio	5.00/5.00
Sampling Rate	128
Number of waveform captures	1
Total captured points	23040
Points in trigger cycle	128

- Click **Print Graph** to copy the graph to the clipboard.
- Click **Export Picture** to open a selection screen which lets you pick which waveform graph you want to export. Select the graph from the pull-down menu and click **OK**.



- Click **Export Data** to copy the data to the clipboard.
- Click **Previous** to see the previous waveform data.
- Click **Next** to see the next waveform data.

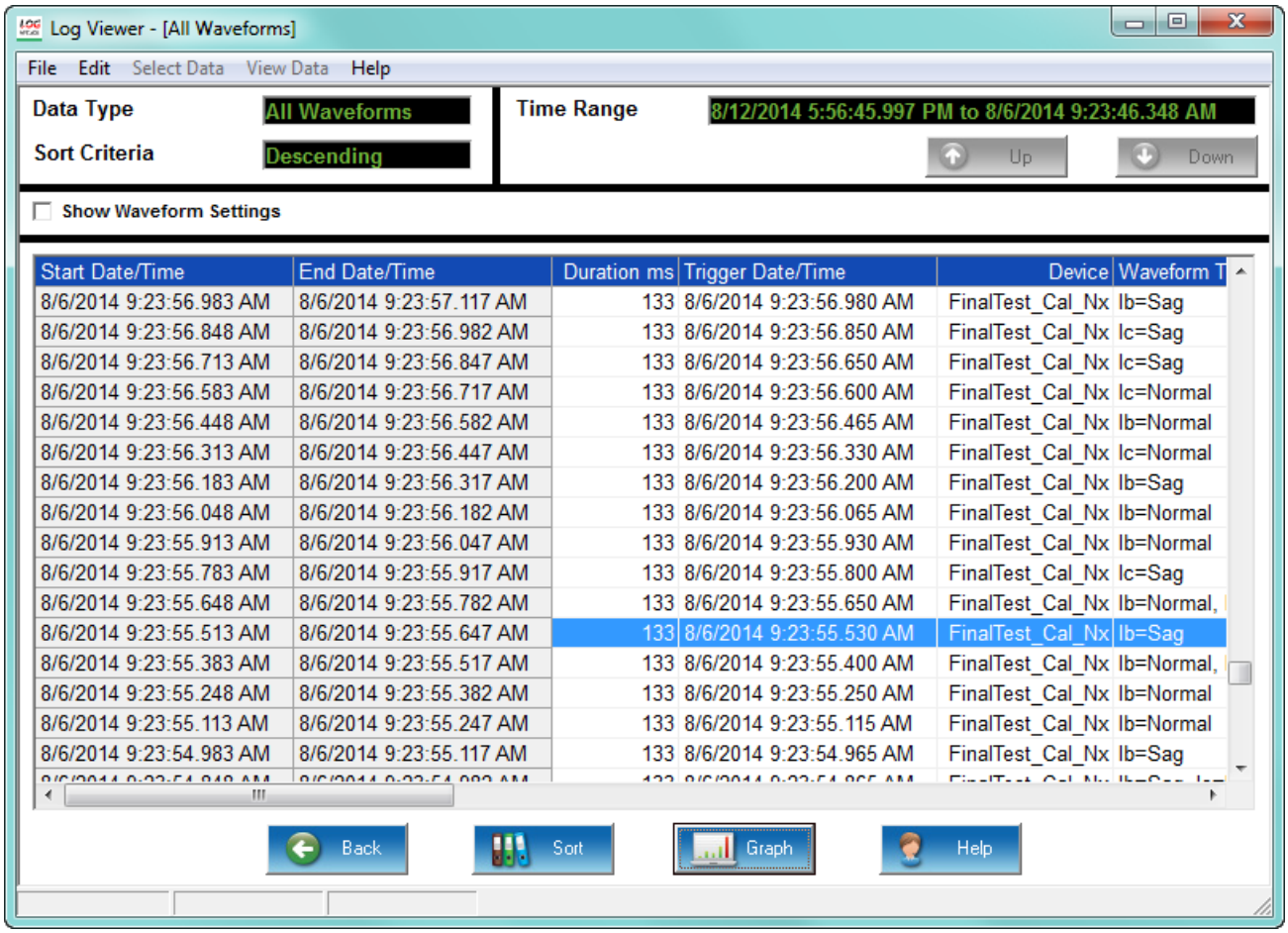
Click **Advanced Waveform** to open the window shown below. It lets you set up a customized millisecond waveform display.



- Click on any of the channels in the **Current Waveform Items** box and click **Add** to copy them to the **Selected Waveform Items** box. The channels you select will display in the **Advanced Waveform Graph**.
- Click on any of the channels in the **Selected Waveform Items** box to display information about them in the **Original Waveform Property** box.
- Click **Graph** to open the **Advanced Waveform Graph**.

A useful application of the Advanced Waveform graph is in comparing events. For example, to compare two current sag events:

1. In the Waveform Log screen, click on the first Sag waveform you want to view.



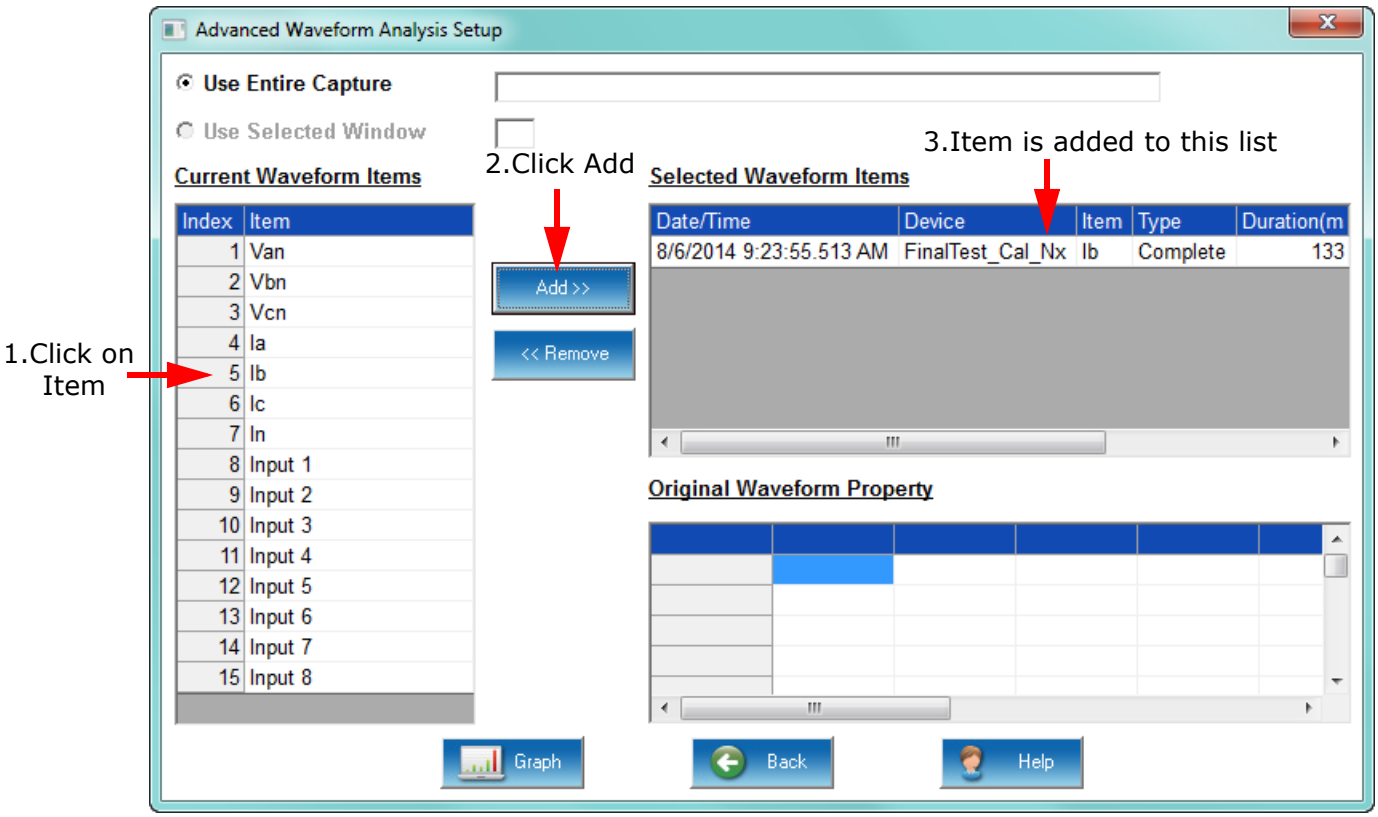
Start Date/Time	End Date/Time	Duration ms	Trigger Date/Time	Device	Waveform T
8/6/2014 9:23:56.983 AM	8/6/2014 9:23:57.117 AM	133	8/6/2014 9:23:56.980 AM	FinalTest_Cal_Nx	Ib=Sag
8/6/2014 9:23:56.848 AM	8/6/2014 9:23:56.982 AM	133	8/6/2014 9:23:56.850 AM	FinalTest_Cal_Nx	Ic=Sag
8/6/2014 9:23:56.713 AM	8/6/2014 9:23:56.847 AM	133	8/6/2014 9:23:56.650 AM	FinalTest_Cal_Nx	Ic=Sag
8/6/2014 9:23:56.583 AM	8/6/2014 9:23:56.717 AM	133	8/6/2014 9:23:56.600 AM	FinalTest_Cal_Nx	Ic=Normal
8/6/2014 9:23:56.448 AM	8/6/2014 9:23:56.582 AM	133	8/6/2014 9:23:56.465 AM	FinalTest_Cal_Nx	Ib=Normal
8/6/2014 9:23:56.313 AM	8/6/2014 9:23:56.447 AM	133	8/6/2014 9:23:56.330 AM	FinalTest_Cal_Nx	Ic=Normal
8/6/2014 9:23:56.183 AM	8/6/2014 9:23:56.317 AM	133	8/6/2014 9:23:56.200 AM	FinalTest_Cal_Nx	Ib=Sag
8/6/2014 9:23:56.048 AM	8/6/2014 9:23:56.182 AM	133	8/6/2014 9:23:56.065 AM	FinalTest_Cal_Nx	Ib=Normal
8/6/2014 9:23:55.913 AM	8/6/2014 9:23:56.047 AM	133	8/6/2014 9:23:55.930 AM	FinalTest_Cal_Nx	Ib=Normal
8/6/2014 9:23:55.783 AM	8/6/2014 9:23:55.917 AM	133	8/6/2014 9:23:55.800 AM	FinalTest_Cal_Nx	Ic=Sag
8/6/2014 9:23:55.648 AM	8/6/2014 9:23:55.782 AM	133	8/6/2014 9:23:55.650 AM	FinalTest_Cal_Nx	Ib=Normal,
8/6/2014 9:23:55.513 AM	8/6/2014 9:23:55.647 AM	133	8/6/2014 9:23:55.530 AM	FinalTest_Cal_Nx	Ib=Sag
8/6/2014 9:23:55.383 AM	8/6/2014 9:23:55.517 AM	133	8/6/2014 9:23:55.400 AM	FinalTest_Cal_Nx	Ib=Normal,
8/6/2014 9:23:55.248 AM	8/6/2014 9:23:55.382 AM	133	8/6/2014 9:23:55.250 AM	FinalTest_Cal_Nx	Ib=Normal
8/6/2014 9:23:55.113 AM	8/6/2014 9:23:55.247 AM	133	8/6/2014 9:23:55.115 AM	FinalTest_Cal_Nx	Ib=Normal
8/6/2014 9:23:54.983 AM	8/6/2014 9:23:55.117 AM	133	8/6/2014 9:23:54.965 AM	FinalTest_Cal_Nx	Ib=Sag

2. Click **Graph**.

Ib waveform with Sag event

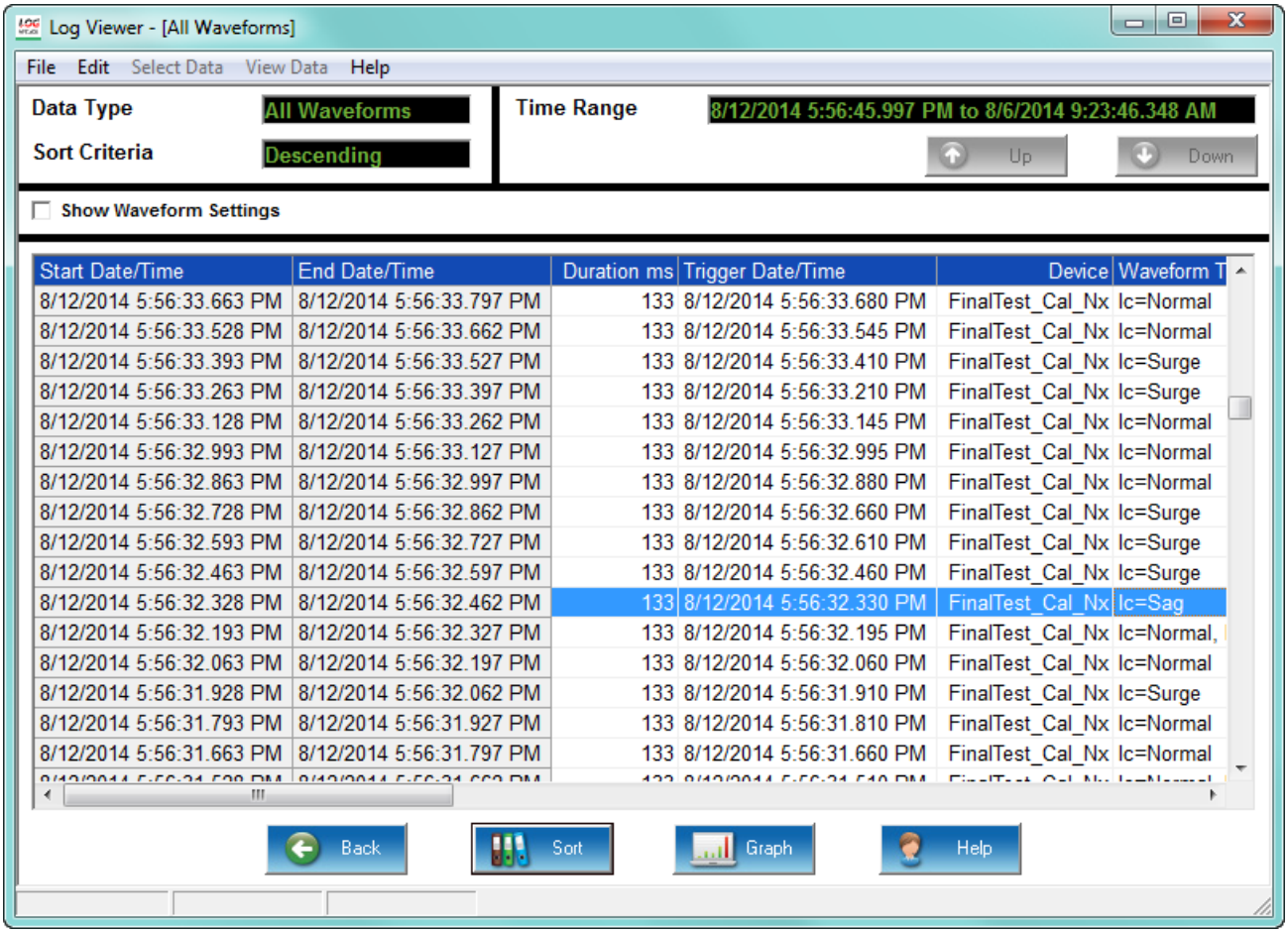
The Sag event is in the Ib waveform.

3. Click **Advanced Graph** and add the IB channel to the list.



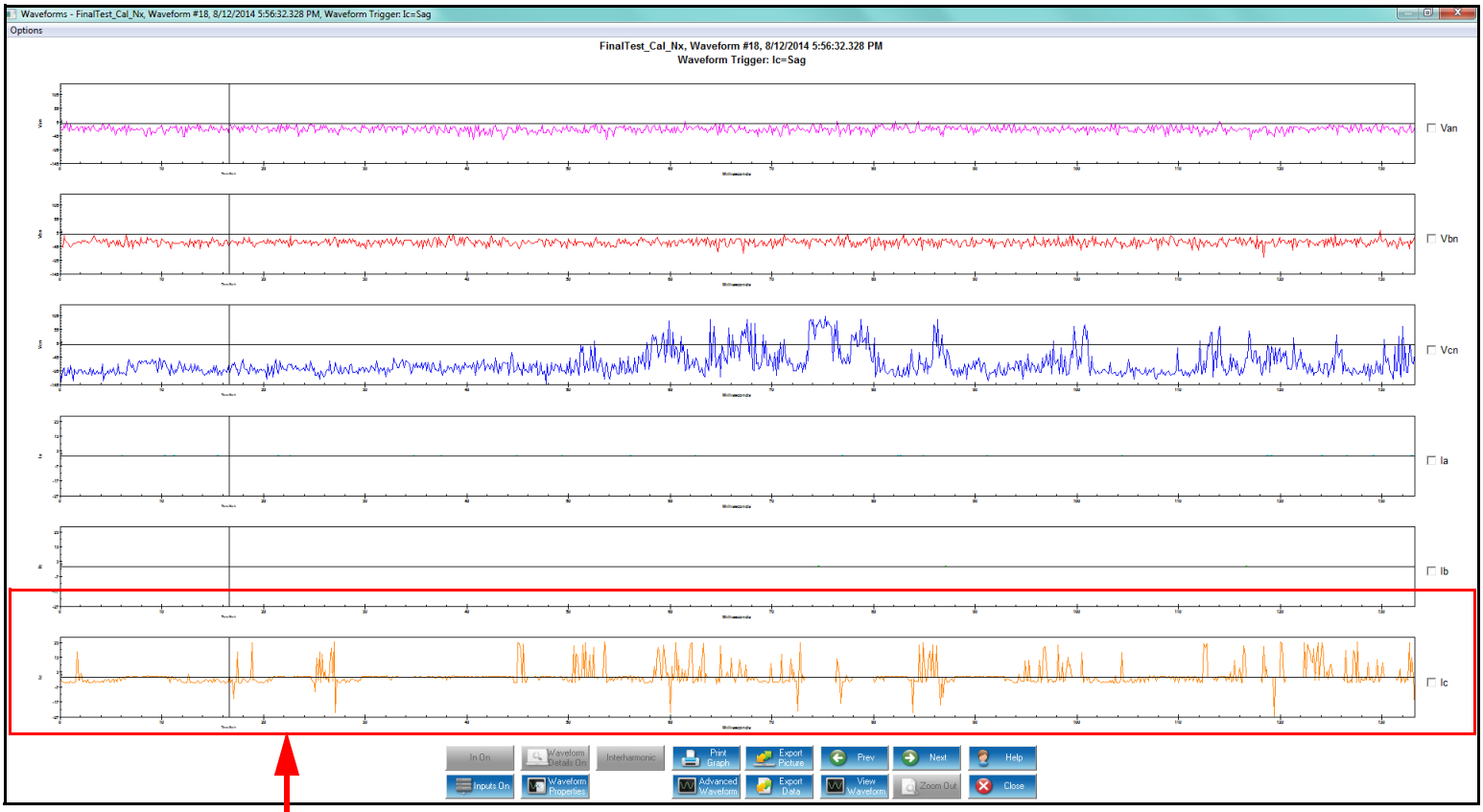
4. Click **Back**, and then click **Close** to return to the Waveform Log screen.

5. Pick the second Sag event you want to view, from the Waveform log.



Start Date/Time	End Date/Time	Duration ms	Trigger Date/Time	Device	Waveform T
8/12/2014 5:56:33.663 PM	8/12/2014 5:56:33.797 PM	133	8/12/2014 5:56:33.680 PM	FinalTest_Cal_Nx	Ic=Normal
8/12/2014 5:56:33.528 PM	8/12/2014 5:56:33.662 PM	133	8/12/2014 5:56:33.545 PM	FinalTest_Cal_Nx	Ic=Normal
8/12/2014 5:56:33.393 PM	8/12/2014 5:56:33.527 PM	133	8/12/2014 5:56:33.410 PM	FinalTest_Cal_Nx	Ic=Surge
8/12/2014 5:56:33.263 PM	8/12/2014 5:56:33.397 PM	133	8/12/2014 5:56:33.210 PM	FinalTest_Cal_Nx	Ic=Surge
8/12/2014 5:56:33.128 PM	8/12/2014 5:56:33.262 PM	133	8/12/2014 5:56:33.145 PM	FinalTest_Cal_Nx	Ic=Normal
8/12/2014 5:56:32.993 PM	8/12/2014 5:56:33.127 PM	133	8/12/2014 5:56:32.995 PM	FinalTest_Cal_Nx	Ic=Normal
8/12/2014 5:56:32.863 PM	8/12/2014 5:56:32.997 PM	133	8/12/2014 5:56:32.880 PM	FinalTest_Cal_Nx	Ic=Normal
8/12/2014 5:56:32.728 PM	8/12/2014 5:56:32.862 PM	133	8/12/2014 5:56:32.660 PM	FinalTest_Cal_Nx	Ic=Surge
8/12/2014 5:56:32.593 PM	8/12/2014 5:56:32.727 PM	133	8/12/2014 5:56:32.610 PM	FinalTest_Cal_Nx	Ic=Surge
8/12/2014 5:56:32.463 PM	8/12/2014 5:56:32.597 PM	133	8/12/2014 5:56:32.460 PM	FinalTest_Cal_Nx	Ic=Surge
8/12/2014 5:56:32.328 PM	8/12/2014 5:56:32.462 PM	133	8/12/2014 5:56:32.330 PM	FinalTest_Cal_Nx	Ic=Sag
8/12/2014 5:56:32.193 PM	8/12/2014 5:56:32.327 PM	133	8/12/2014 5:56:32.195 PM	FinalTest_Cal_Nx	Ic=Normal,
8/12/2014 5:56:32.063 PM	8/12/2014 5:56:32.197 PM	133	8/12/2014 5:56:32.060 PM	FinalTest_Cal_Nx	Ic=Normal
8/12/2014 5:56:31.928 PM	8/12/2014 5:56:32.062 PM	133	8/12/2014 5:56:31.910 PM	FinalTest_Cal_Nx	Ic=Surge
8/12/2014 5:56:31.793 PM	8/12/2014 5:56:31.927 PM	133	8/12/2014 5:56:31.810 PM	FinalTest_Cal_Nx	Ic=Normal
8/12/2014 5:56:31.663 PM	8/12/2014 5:56:31.797 PM	133	8/12/2014 5:56:31.660 PM	FinalTest_Cal_Nx	Ic=Normal

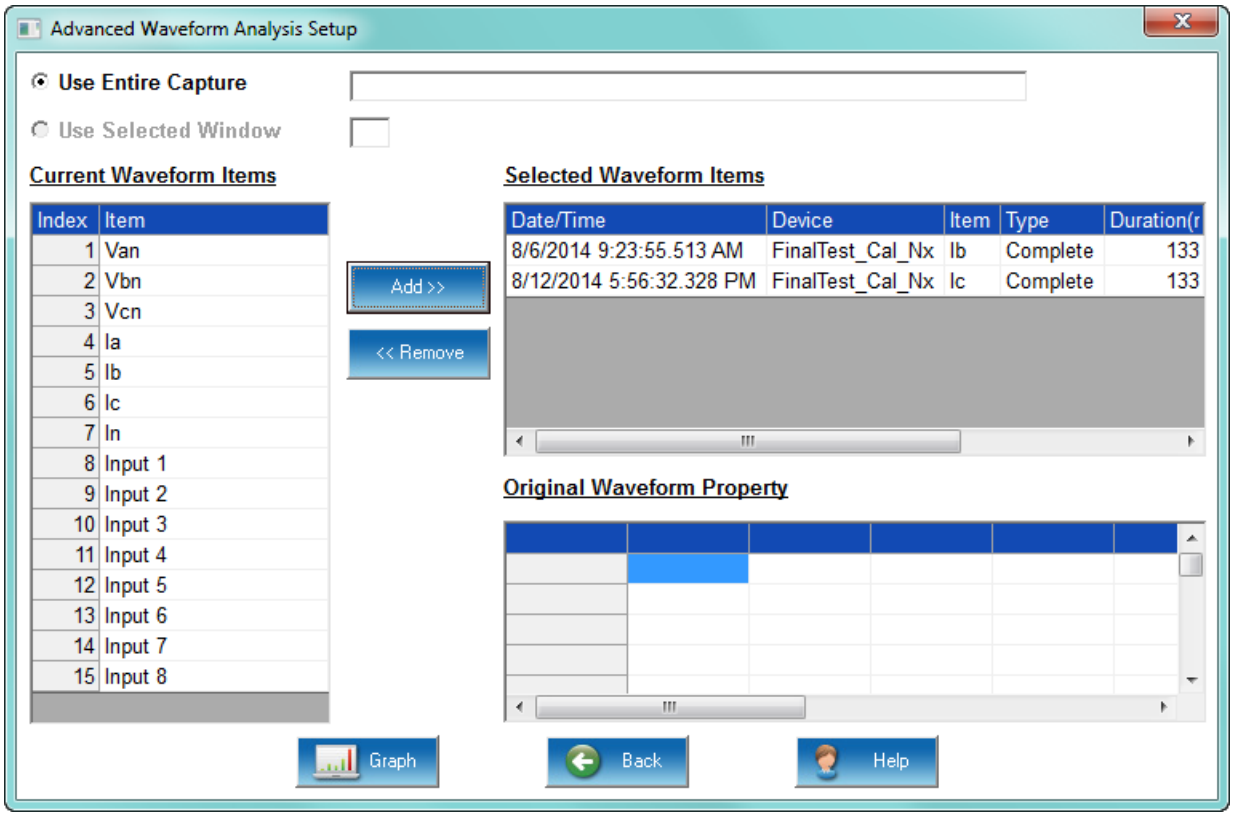
6. Click **Graph**.



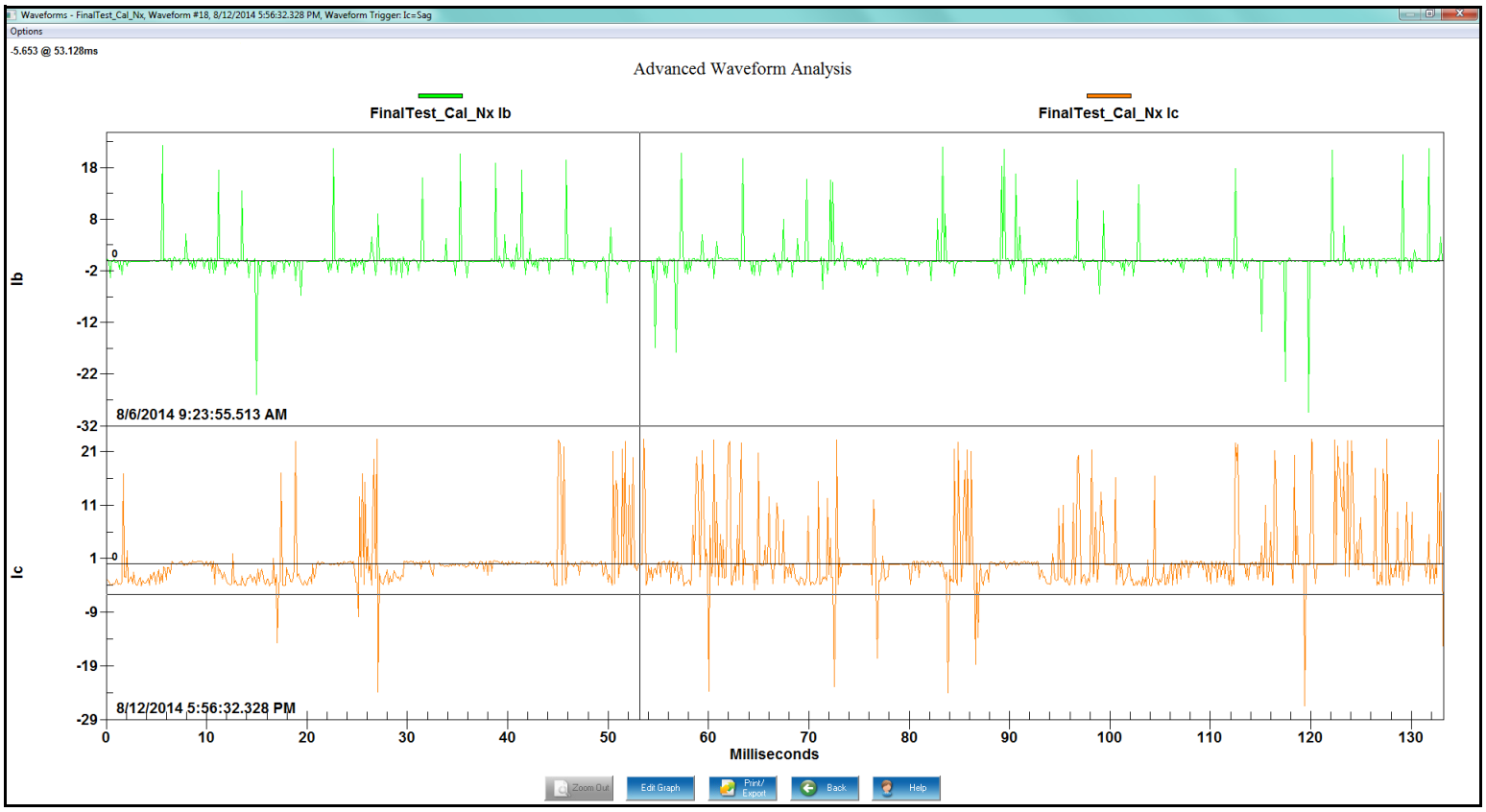
Ic waveform with Sag event

The Sag event is in the Ic waveform.

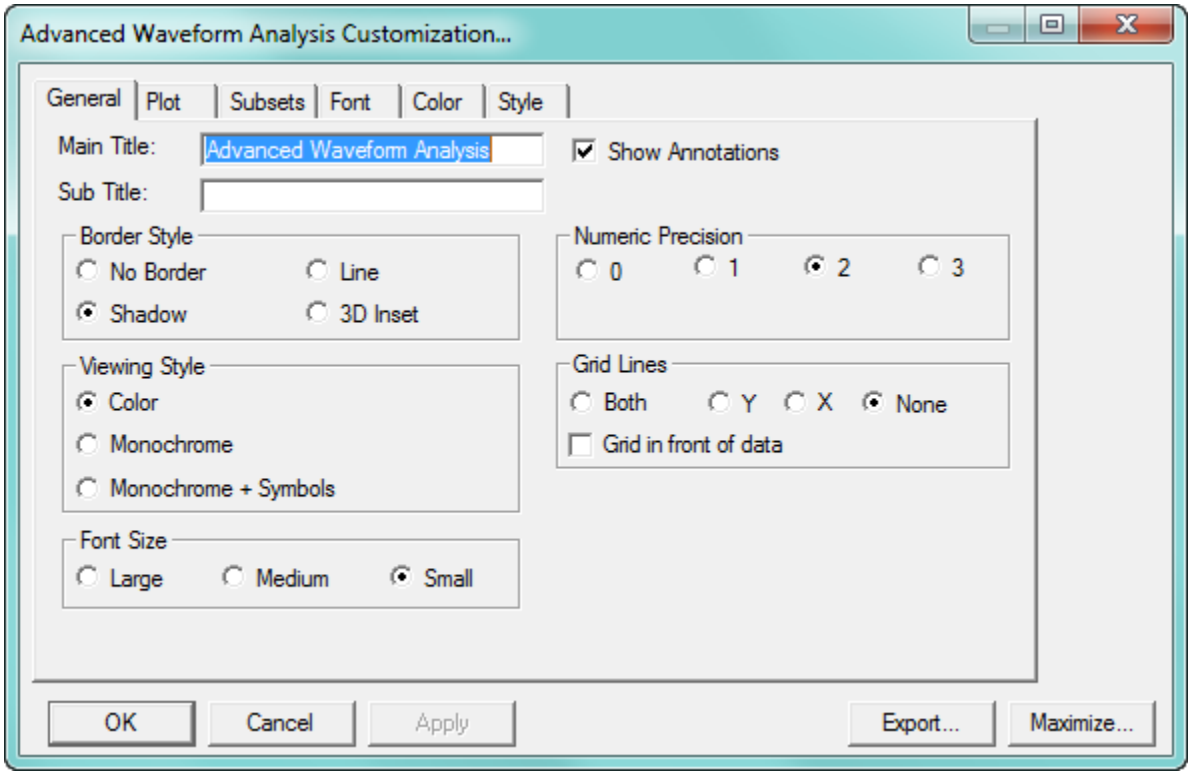
7. Click **Advanced Graph** and add Ic to the selected items.



8. Click **Graph**. You see the two sag events in detail.



- To edit the Advanced Waveform Graph, click **Edit Graph**. You will see the screen shown below, which you can use to customize the graph display. Click on the tabs to set up plotting, fonts, colors, style, etc. for the graph.



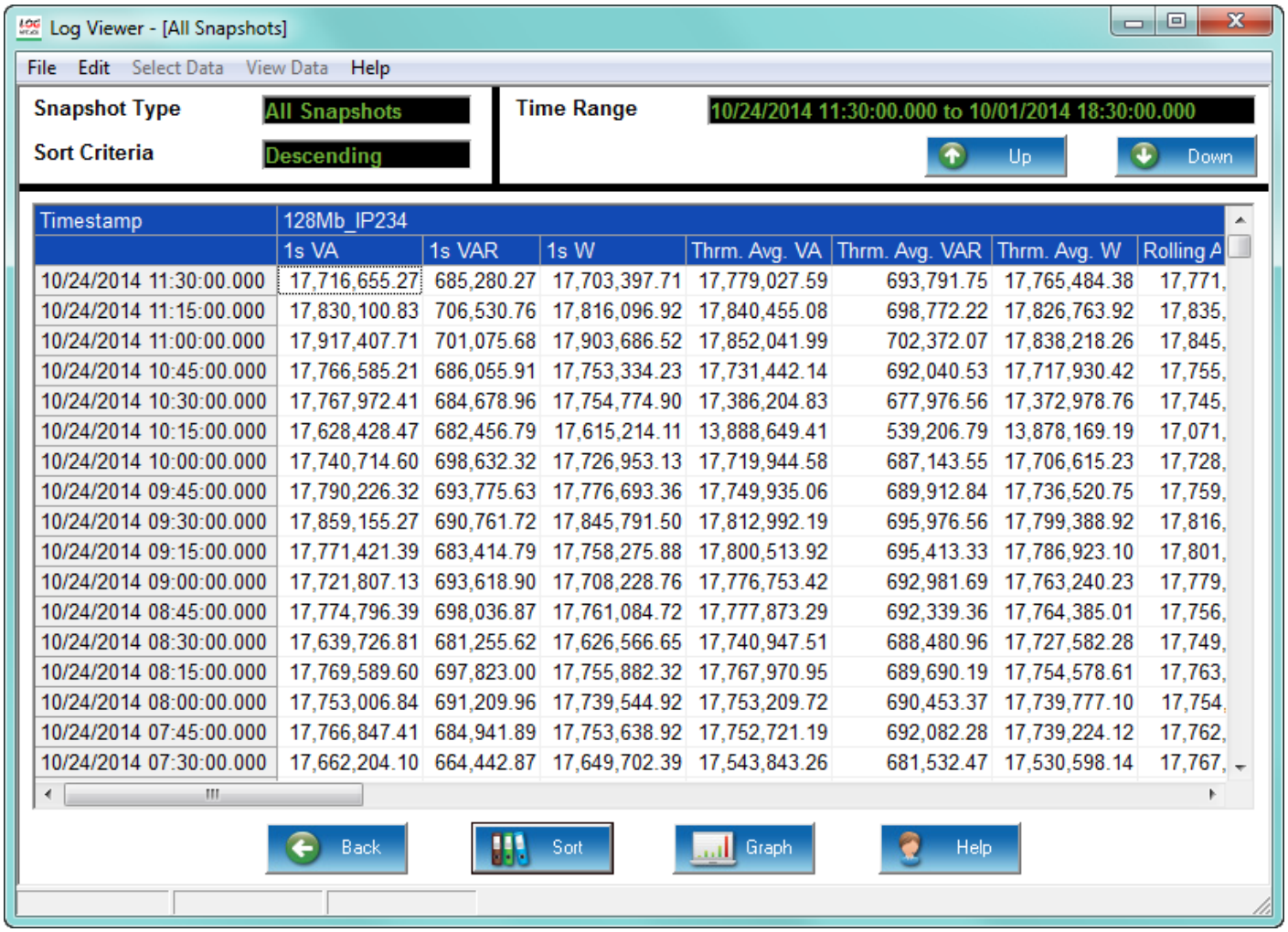
- To Apply changes, click **Apply**.
- To zoom in on a portion of the graph, draw a box around the desired area by dragging the mouse and holding down the left button. Release the mouse button to activate the zoom. Click the **Zoom Out** button to decrease the resolution.
- Click **Waveform** to return to the original waveform graph.
- Click **Close** to close the Waveform graph.

19.4 Log Screens

The following sections explain the available log screens. Note that not all logs are available for all meters.

19.4.1 Viewing Historical Trends and Snapshots

From Log Viewer's main screen, click on the Historical Trends button or View **Data > Snapshots**. Log Viewer will display Snapshot Information for the selected log file(s) based on the time range and data points specified in the Select Data and Time Range windows of the main screen (see 19.2 *Log Viewer*).



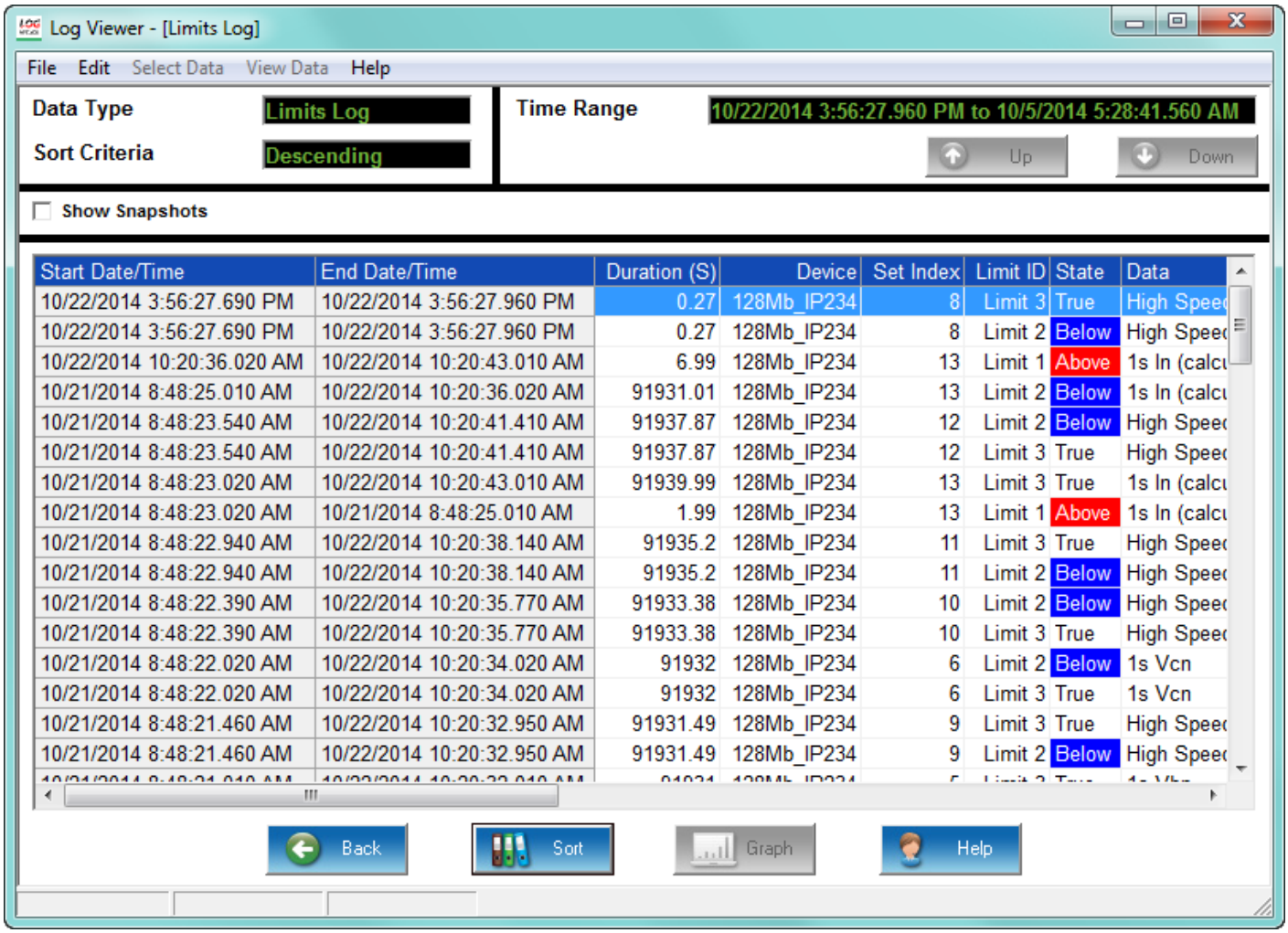
Timestamp	128Mb_IP234						
	1s VA	1s VAR	1s W	Thrm. Avg. VA	Thrm. Avg. VAR	Thrm. Avg. W	Rolling A
10/24/2014 11:30:00.000	17,716,655.27	685,280.27	17,703,397.71	17,779,027.59	693,791.75	17,765,484.38	17,771,
10/24/2014 11:15:00.000	17,830,100.83	706,530.76	17,816,096.92	17,840,455.08	698,772.22	17,826,763.92	17,835,
10/24/2014 11:00:00.000	17,917,407.71	701,075.68	17,903,686.52	17,852,041.99	702,372.07	17,838,218.26	17,845,
10/24/2014 10:45:00.000	17,766,585.21	686,055.91	17,753,334.23	17,731,442.14	692,040.53	17,717,930.42	17,755,
10/24/2014 10:30:00.000	17,767,972.41	684,678.96	17,754,774.90	17,386,204.83	677,976.56	17,372,978.76	17,745,
10/24/2014 10:15:00.000	17,628,428.47	682,456.79	17,615,214.11	13,888,649.41	539,206.79	13,878,169.19	17,071,
10/24/2014 10:00:00.000	17,740,714.60	698,632.32	17,726,953.13	17,719,944.58	687,143.55	17,706,615.23	17,728,
10/24/2014 09:45:00.000	17,790,226.32	693,775.63	17,776,693.36	17,749,935.06	689,912.84	17,736,520.75	17,759,
10/24/2014 09:30:00.000	17,859,155.27	690,761.72	17,845,791.50	17,812,992.19	695,976.56	17,799,388.92	17,816,
10/24/2014 09:15:00.000	17,771,421.39	683,414.79	17,758,275.88	17,800,513.92	695,413.33	17,786,923.10	17,801,
10/24/2014 09:00:00.000	17,721,807.13	693,618.90	17,708,228.76	17,776,753.42	692,981.69	17,763,240.23	17,779,
10/24/2014 08:45:00.000	17,774,796.39	698,036.87	17,761,084.72	17,777,873.29	692,339.36	17,764,385.01	17,756,
10/24/2014 08:30:00.000	17,639,726.81	681,255.62	17,626,566.65	17,740,947.51	688,480.96	17,727,582.28	17,749,
10/24/2014 08:15:00.000	17,769,589.60	697,823.00	17,755,882.32	17,767,970.95	689,690.19	17,754,578.61	17,763,
10/24/2014 08:00:00.000	17,753,006.84	691,209.96	17,739,544.92	17,753,209.72	690,453.37	17,739,777.10	17,754,
10/24/2014 07:45:00.000	17,766,847.41	684,941.89	17,753,638.92	17,752,721.19	692,082.28	17,739,224.12	17,762,
10/24/2014 07:30:00.000	17,662,204.10	664,442.87	17,649,702.39	17,543,843.26	681,532.47	17,530,598.14	17,767,

- The time stamp of the data, the name of the log file and the type of data point are listed in the top row.
- The user can move columns, so that the most important data is most accessible: right-click on the column title and drag it to the desired location on the table. Repeat as desired to customize the table.

- To save the data to your clipboard, right-click with the cursor positioned anywhere in table.
- To sort the data by record type in either ascending or descending order, click on the Sort button. See "Sorting Log Data" on page 19-11, for instructions.

19.4.2 Viewing the Limits Log

From Log Viewer's main screen click on the Limits button or View Data>Limits. Log Viewer displays limit information for the selected log file(s) based on the time range specified in the Select Time Range section of its main screen (see 19.2 *Log Viewer*).

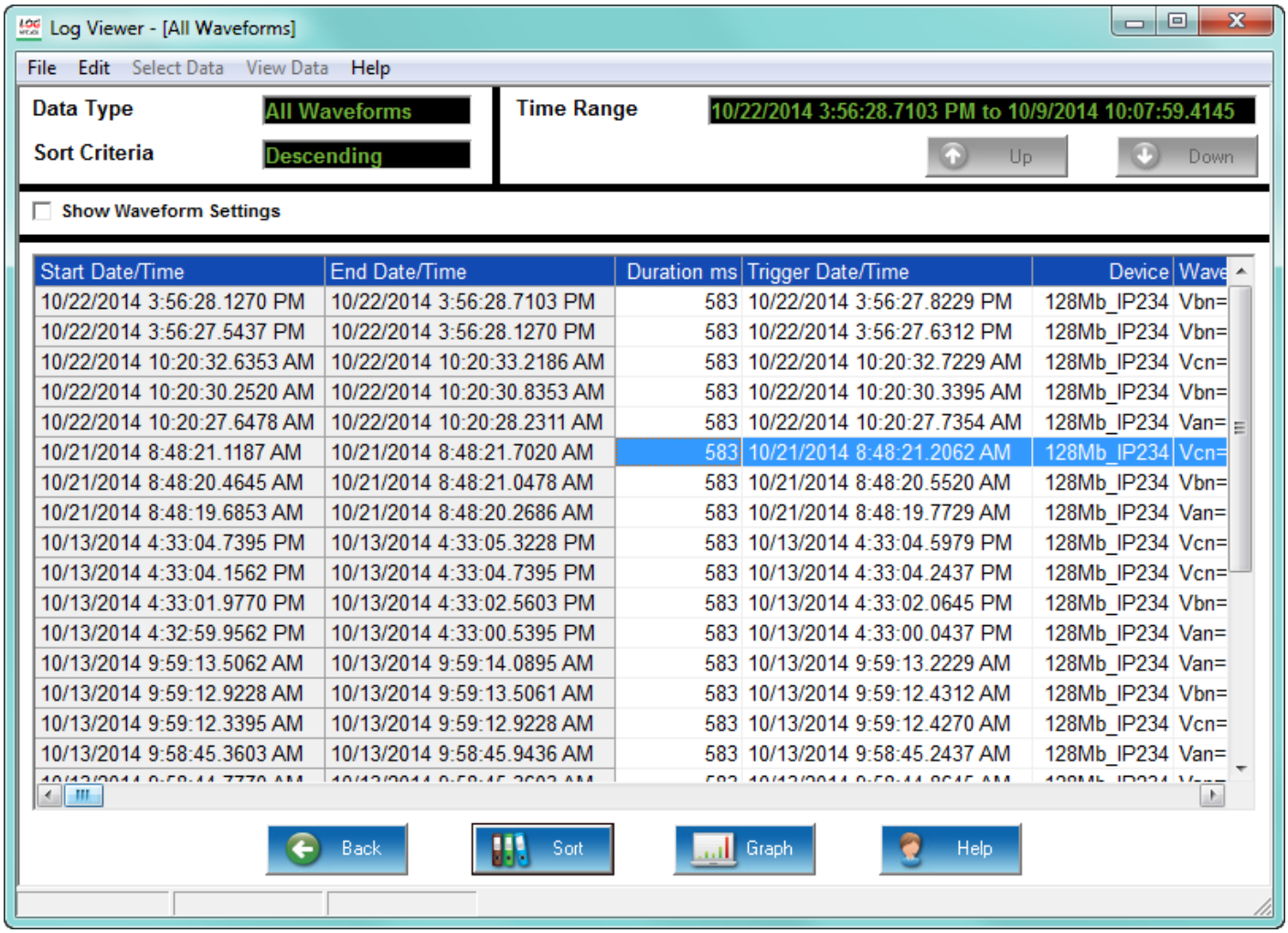


Start Date/Time	End Date/Time	Duration (S)	Device	Set Index	Limit ID	State	Data
10/22/2014 3:56:27.690 PM	10/22/2014 3:56:27.960 PM	0.27	128Mb_IP234	8	Limit 3	True	High Speed
10/22/2014 3:56:27.690 PM	10/22/2014 3:56:27.960 PM	0.27	128Mb_IP234	8	Limit 2	Below	High Speed
10/22/2014 10:20:36.020 AM	10/22/2014 10:20:43.010 AM	6.99	128Mb_IP234	13	Limit 1	Above	1s In (calcu
10/21/2014 8:48:25.010 AM	10/22/2014 10:20:36.020 AM	91931.01	128Mb_IP234	13	Limit 2	Below	1s In (calcu
10/21/2014 8:48:23.540 AM	10/22/2014 10:20:41.410 AM	91937.87	128Mb_IP234	12	Limit 2	Below	High Speed
10/21/2014 8:48:23.540 AM	10/22/2014 10:20:41.410 AM	91937.87	128Mb_IP234	12	Limit 3	True	High Speed
10/21/2014 8:48:23.020 AM	10/22/2014 10:20:43.010 AM	91939.99	128Mb_IP234	13	Limit 3	True	1s In (calcu
10/21/2014 8:48:23.020 AM	10/21/2014 8:48:25.010 AM	1.99	128Mb_IP234	13	Limit 1	Above	1s In (calcu
10/21/2014 8:48:22.940 AM	10/22/2014 10:20:38.140 AM	91935.2	128Mb_IP234	11	Limit 3	True	High Speed
10/21/2014 8:48:22.940 AM	10/22/2014 10:20:38.140 AM	91935.2	128Mb_IP234	11	Limit 2	Below	High Speed
10/21/2014 8:48:22.390 AM	10/22/2014 10:20:35.770 AM	91933.38	128Mb_IP234	10	Limit 2	Below	High Speed
10/21/2014 8:48:22.390 AM	10/22/2014 10:20:35.770 AM	91933.38	128Mb_IP234	10	Limit 3	True	High Speed
10/21/2014 8:48:22.020 AM	10/22/2014 10:20:34.020 AM	91932	128Mb_IP234	6	Limit 2	Below	1s Vcn
10/21/2014 8:48:22.020 AM	10/22/2014 10:20:34.020 AM	91932	128Mb_IP234	6	Limit 3	True	1s Vcn
10/21/2014 8:48:21.460 AM	10/22/2014 10:20:32.950 AM	91931.49	128Mb_IP234	9	Limit 3	True	High Speed
10/21/2014 8:48:21.460 AM	10/22/2014 10:20:32.950 AM	91931.49	128Mb_IP234	9	Limit 2	Below	High Speed

- Click the **Show Snapshots** box on the left side of the screen to display the limits snapshot information.
- To copy the data to the computer's clipboard, right-click with the cursor positioned anywhere in the table.
- To sort the data by record type in either ascending or descending order, click on the **Sort** button and use the pull-down menus to make your selection.

19.4.3 Viewing the Waveform Log

From Log Viewer's main screen, click on the **Waveform** button or **View Data > Waveform**. Log Viewer will display waveform information for the selected log file(s) based on the time range specified in the Select Time Range section of its main screen.



Start Date/Time	End Date/Time	Duration ms	Trigger Date/Time	Device	Wave
10/22/2014 3:56:28.1270 PM	10/22/2014 3:56:28.7103 PM	583	10/22/2014 3:56:27.8229 PM	128Mb_IP234	Vbn=
10/22/2014 3:56:27.5437 PM	10/22/2014 3:56:28.1270 PM	583	10/22/2014 3:56:27.6312 PM	128Mb_IP234	Vbn=
10/22/2014 10:20:32.6353 AM	10/22/2014 10:20:33.2186 AM	583	10/22/2014 10:20:32.7229 AM	128Mb_IP234	Vcn=
10/22/2014 10:20:30.2520 AM	10/22/2014 10:20:30.8353 AM	583	10/22/2014 10:20:30.3395 AM	128Mb_IP234	Vbn=
10/22/2014 10:20:27.6478 AM	10/22/2014 10:20:28.2311 AM	583	10/22/2014 10:20:27.7354 AM	128Mb_IP234	Van=
10/21/2014 8:48:21.1187 AM	10/21/2014 8:48:21.7020 AM	583	10/21/2014 8:48:21.2062 AM	128Mb_IP234	Vcn=
10/21/2014 8:48:20.4645 AM	10/21/2014 8:48:21.0478 AM	583	10/21/2014 8:48:20.5520 AM	128Mb_IP234	Vbn=
10/21/2014 8:48:19.6853 AM	10/21/2014 8:48:20.2686 AM	583	10/21/2014 8:48:19.7729 AM	128Mb_IP234	Van=
10/13/2014 4:33:04.7395 PM	10/13/2014 4:33:05.3228 PM	583	10/13/2014 4:33:04.5979 PM	128Mb_IP234	Vcn=
10/13/2014 4:33:04.1562 PM	10/13/2014 4:33:04.7395 PM	583	10/13/2014 4:33:04.2437 PM	128Mb_IP234	Vcn=
10/13/2014 4:33:01.9770 PM	10/13/2014 4:33:02.5603 PM	583	10/13/2014 4:33:02.0645 PM	128Mb_IP234	Vbn=
10/13/2014 4:32:59.9562 PM	10/13/2014 4:33:00.5395 PM	583	10/13/2014 4:33:00.0437 PM	128Mb_IP234	Van=
10/13/2014 9:59:13.5062 AM	10/13/2014 9:59:14.0895 AM	583	10/13/2014 9:59:13.2229 AM	128Mb_IP234	Van=
10/13/2014 9:59:12.9228 AM	10/13/2014 9:59:13.5061 AM	583	10/13/2014 9:59:12.4312 AM	128Mb_IP234	Vbn=
10/13/2014 9:59:12.3395 AM	10/13/2014 9:59:12.9228 AM	583	10/13/2014 9:59:12.4270 AM	128Mb_IP234	Vcn=
10/13/2014 9:58:45.3603 AM	10/13/2014 9:58:45.9436 AM	583	10/13/2014 9:58:45.2437 AM	128Mb_IP234	Van=

- To save the data to your clipboard, right-click anywhere in table.
- To view the Waveform Settings, click on a waveform record and then click the **Show Waveform Settings** box on the left side of the screen.
- To adjust the column widths, position the cursor between columns at the top of the screen. When the cursor changes to a left/right arrow, hold down the left mouse button and drag the column border left or right. Release the button when the column is at the desired width.
- To sort the data by record type in either ascending or descending order, click on the **Sort** button and use the pull-down menus to make your selection.
- To view the waveform graphs, see "Waveform Graphs" on page 19-16.

19.4.4 Interharmonic Analysis

A new feature has been added to the Log Viewer program for Interharmonic Analysis. It is only available for EPM 9000 series meters on Voltage (VA, VB, VC) and Current channels (IA, IB, IC, IAUX).

IEC-1000-2-1 [1] defines Interharmonics as follows: "Between the harmonics of the power frequency voltage and current, further frequencies can be observed which are not an integer multiple of the fundamental. They can appear as discrete frequencies or as a wide-band spectrum."

To perform the analysis, there must be a waveform record with a 200ms duration. For a 50Hz system, the waveform is 10 cycles; for a 60Hz system, the waveform is 12 cycles. By default, the starting point for Interharmonic Analysis of a Waveform is its first point. But, a user can set a starting point (place the mark) anywhere in the waveform, assuming that there will be enough sample points available after the starting point. If there are not enough points in this waveform capture, the software will check the next waveform record(s) stored in the database. If it is contiguous, additional points up to 200ms will be retrieved for analysis.

- For a waveform with sampling rate equal to or less than 64, the software will only check the next (1) contiguous record.
- For a waveform with a sampling rate equal to or greater than 128, the software will check the next two contiguous records.

Resetting the mark will set the starting point back to the waveform's first point.

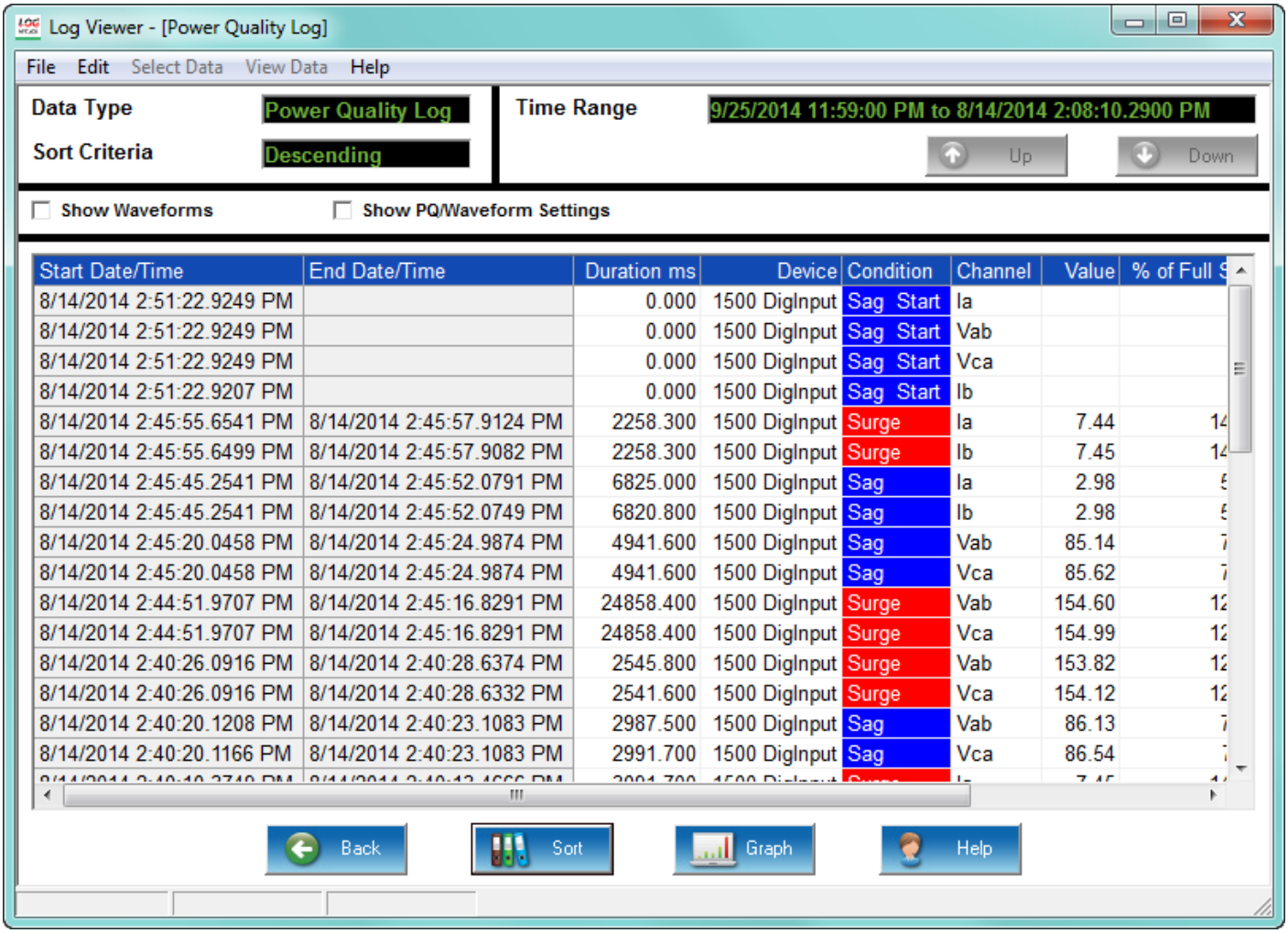
Measurement: IEC 61000-4-7 ([ref] First Edition) establishes a well disciplined measurement method for harmonics which utilizes 10 (50Hz systems) or 12 cycle (60Hz systems) sample windows upon which to perform the Fourier transform. The result is a spectrum with 5H resolution for both 50Hz and 60Hz systems. The standard further defines ways of combining individual 5 Hz bins to produce various groupings and components for referenced limits and guidelines.

The IEC Measurement Method defines interharmonic groups. These indices are the RMS values of the interharmonic components between adjacent harmonic components. The frequency bins directly adjacent to the harmonic bins are omitted.

See "Waveform Graphs" on page 19-16, for information on viewing the Interharmonic waveform data.

19.4.5 Viewing the Power Quality Log

From Log Viewer's main screen, click on the PQ button or View Data>Power Quality. Log Viewer will display power quality information for the selected log file(s) based on the time range specified in the Select Time Range section of its main screen (see 19.2 *Log Viewer*).



Start Date/Time	End Date/Time	Duration ms	Device	Condition	Channel	Value	% of Full S
8/14/2014 2:51:22.9249 PM		0.000	1500 DigInput	Sag Start	Ia		
8/14/2014 2:51:22.9249 PM		0.000	1500 DigInput	Sag Start	Vab		
8/14/2014 2:51:22.9249 PM		0.000	1500 DigInput	Sag Start	Vca		
8/14/2014 2:51:22.9207 PM		0.000	1500 DigInput	Sag Start	Ib		
8/14/2014 2:45:55.6541 PM	8/14/2014 2:45:57.9124 PM	2258.300	1500 DigInput	Surge	Ia	7.44	14
8/14/2014 2:45:55.6499 PM	8/14/2014 2:45:57.9082 PM	2258.300	1500 DigInput	Surge	Ib	7.45	14
8/14/2014 2:45:45.2541 PM	8/14/2014 2:45:52.0791 PM	6825.000	1500 DigInput	Sag	Ia	2.98	5
8/14/2014 2:45:45.2541 PM	8/14/2014 2:45:52.0749 PM	6820.800	1500 DigInput	Sag	Ib	2.98	5
8/14/2014 2:45:20.0458 PM	8/14/2014 2:45:24.9874 PM	4941.600	1500 DigInput	Sag	Vab	85.14	7
8/14/2014 2:45:20.0458 PM	8/14/2014 2:45:24.9874 PM	4941.600	1500 DigInput	Sag	Vca	85.62	7
8/14/2014 2:44:51.9707 PM	8/14/2014 2:45:16.8291 PM	24858.400	1500 DigInput	Surge	Vab	154.60	12
8/14/2014 2:44:51.9707 PM	8/14/2014 2:45:16.8291 PM	24858.400	1500 DigInput	Surge	Vca	154.99	12
8/14/2014 2:40:26.0916 PM	8/14/2014 2:40:28.6374 PM	2545.800	1500 DigInput	Surge	Vab	153.82	12
8/14/2014 2:40:26.0916 PM	8/14/2014 2:40:28.6332 PM	2541.600	1500 DigInput	Surge	Vca	154.12	12
8/14/2014 2:40:20.1208 PM	8/14/2014 2:40:23.1083 PM	2987.500	1500 DigInput	Sag	Vab	86.13	7
8/14/2014 2:40:20.1166 PM	8/14/2014 2:40:23.1083 PM	2991.700	1500 DigInput	Sag	Vca	86.54	7

- To save the data to your clipboard, right-click with the cursor positioned anywhere in table.
- To view waveform information associated with a record or a range of records, click on the record(s) and then click the Show Waveform Settings box on the left side of the screen.
- To view the PQ/Waveform Settings, click on the record(s) and then click the PQ/ Waveform Settings box.
- To view a waveform, double-click on the waveform record. See "Waveform Graphs" on page 19-16, for details on viewing waveforms.
- To adjust the column widths, position the cursor between columns at the top of the screen. When the cursor changes to a left/right arrow, hold down the left mouse

button and drag the column border left or right. Release the button when the column is at the desired width.

- Note that an EPM 9900P meter with runtime firmware version 15.2 or higher has an additional column called Reference Usr. If the USR setting has been used for the waveform rather than the Full Scale setting, the value used is shown here and the % of Full Scale column says % of Usr. See 11.3.3 *PQ Thresholds (Waveform Recording)* on page 11–53, for information on the USR setting.

19.4.5.1 Viewing the Power Quality Graph

To view a graph of any PQ record, click on the desired record and then click the Graph button. You will see the screen shown below. Use the pull-down menu on the lower right of the screen to access a 3D graph, a Histogram, and a SEMI F47 2D graph of the record. See the example screens.

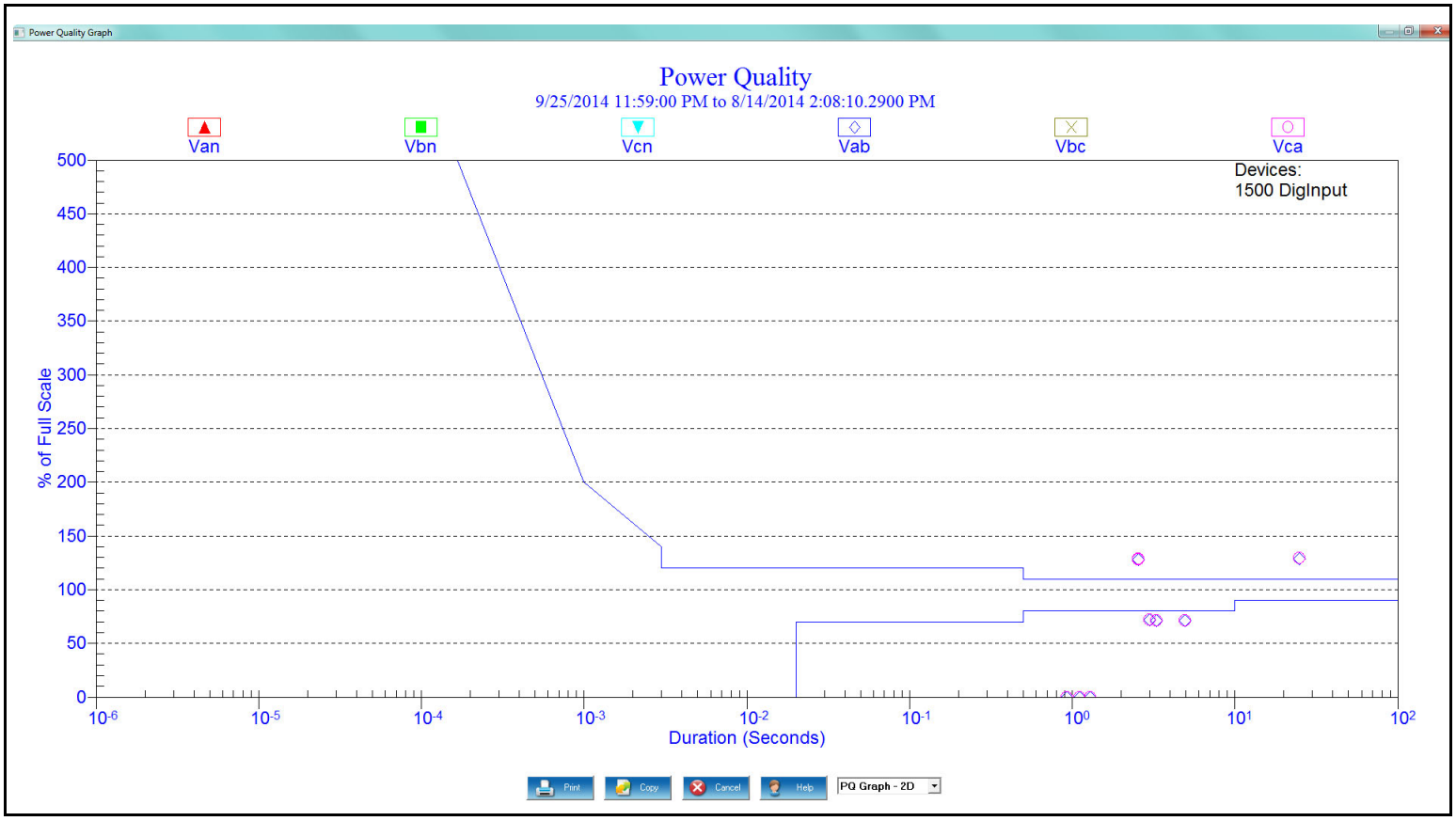


Figure 19-1: Power Quality Graph

This graph provides the ITI CBEMA Curve standard.

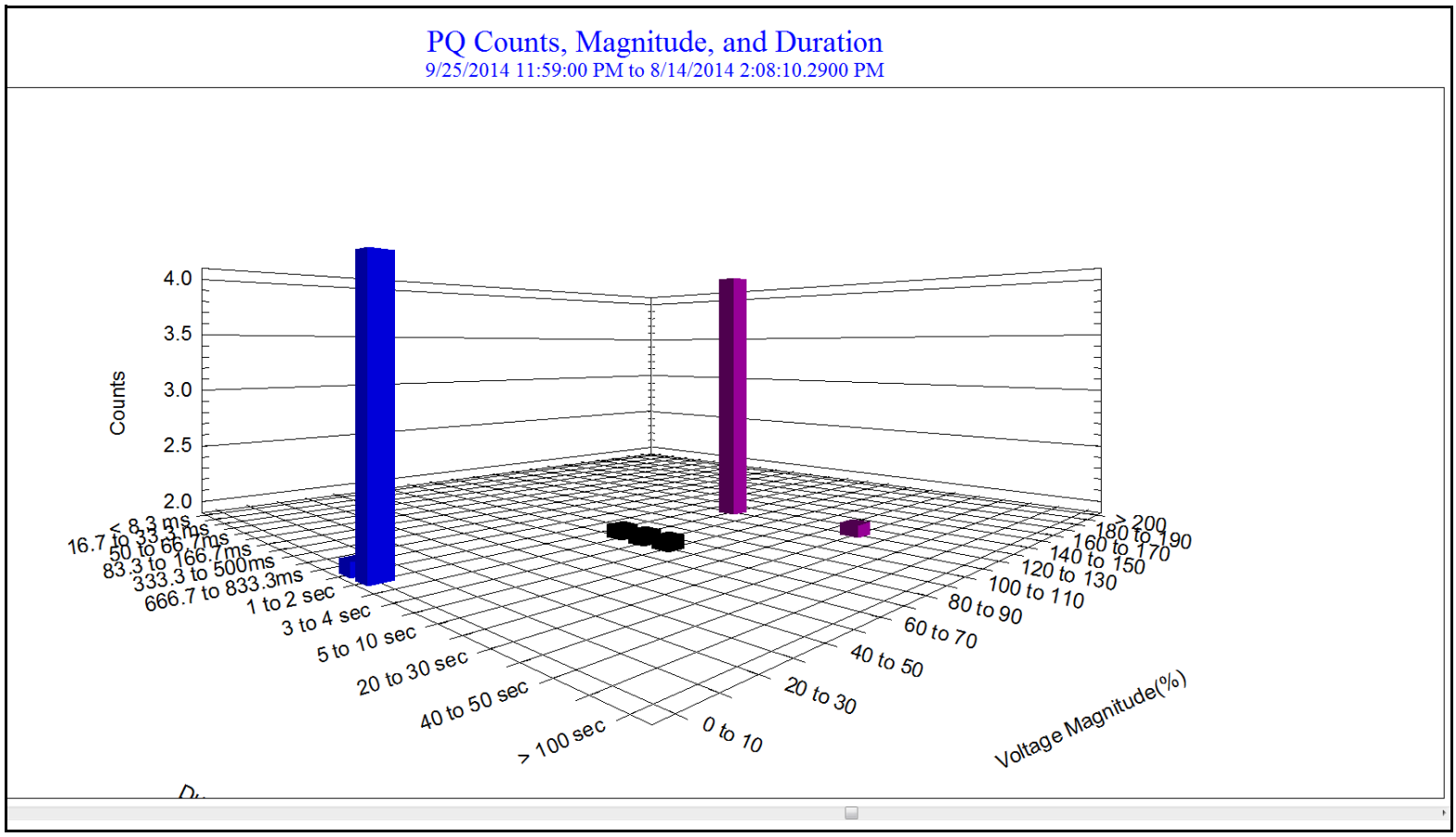


Figure 19-2: Power Quality Graph in 3D

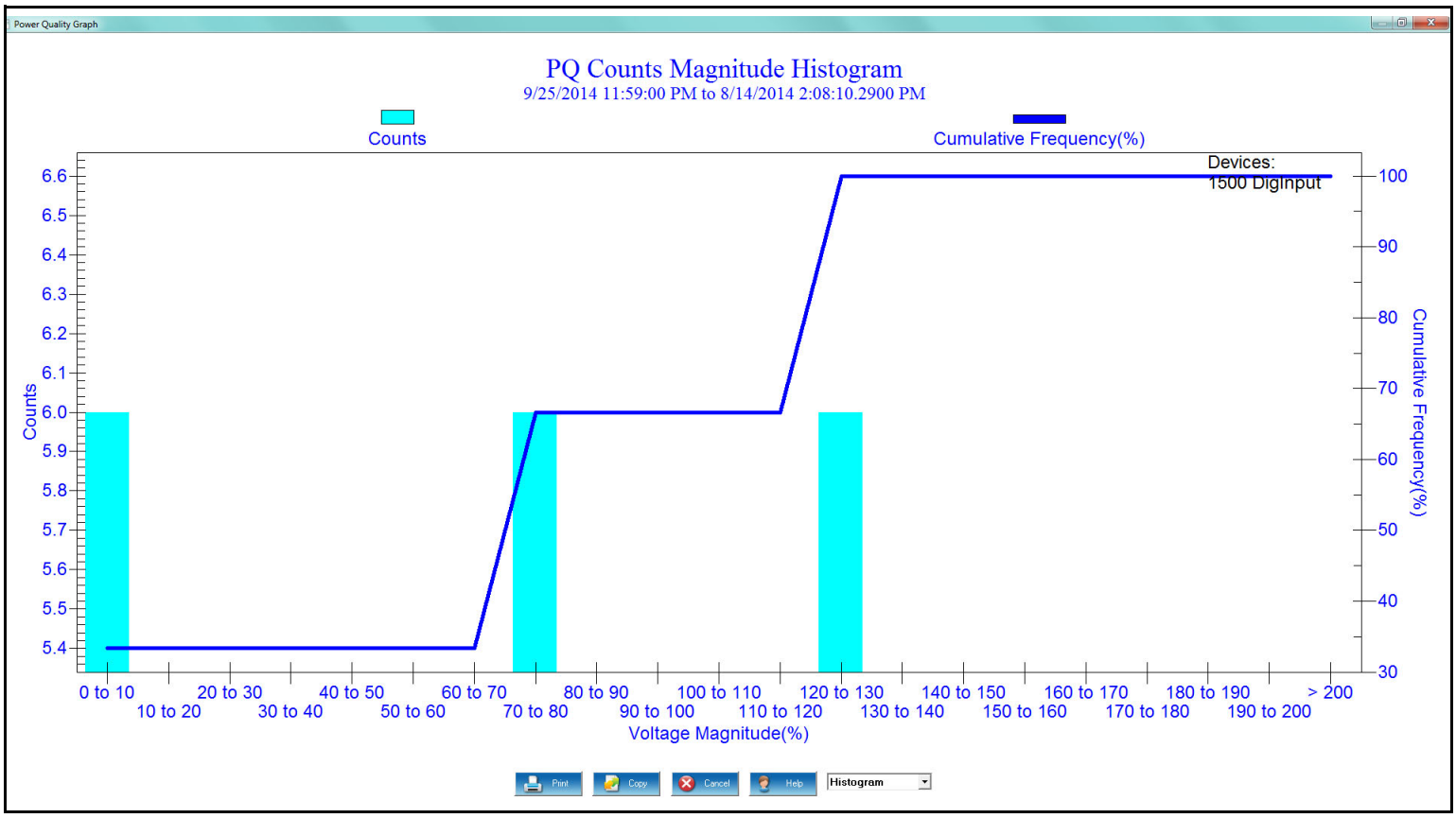


Figure 19-3: Power Quality Histogram Graph

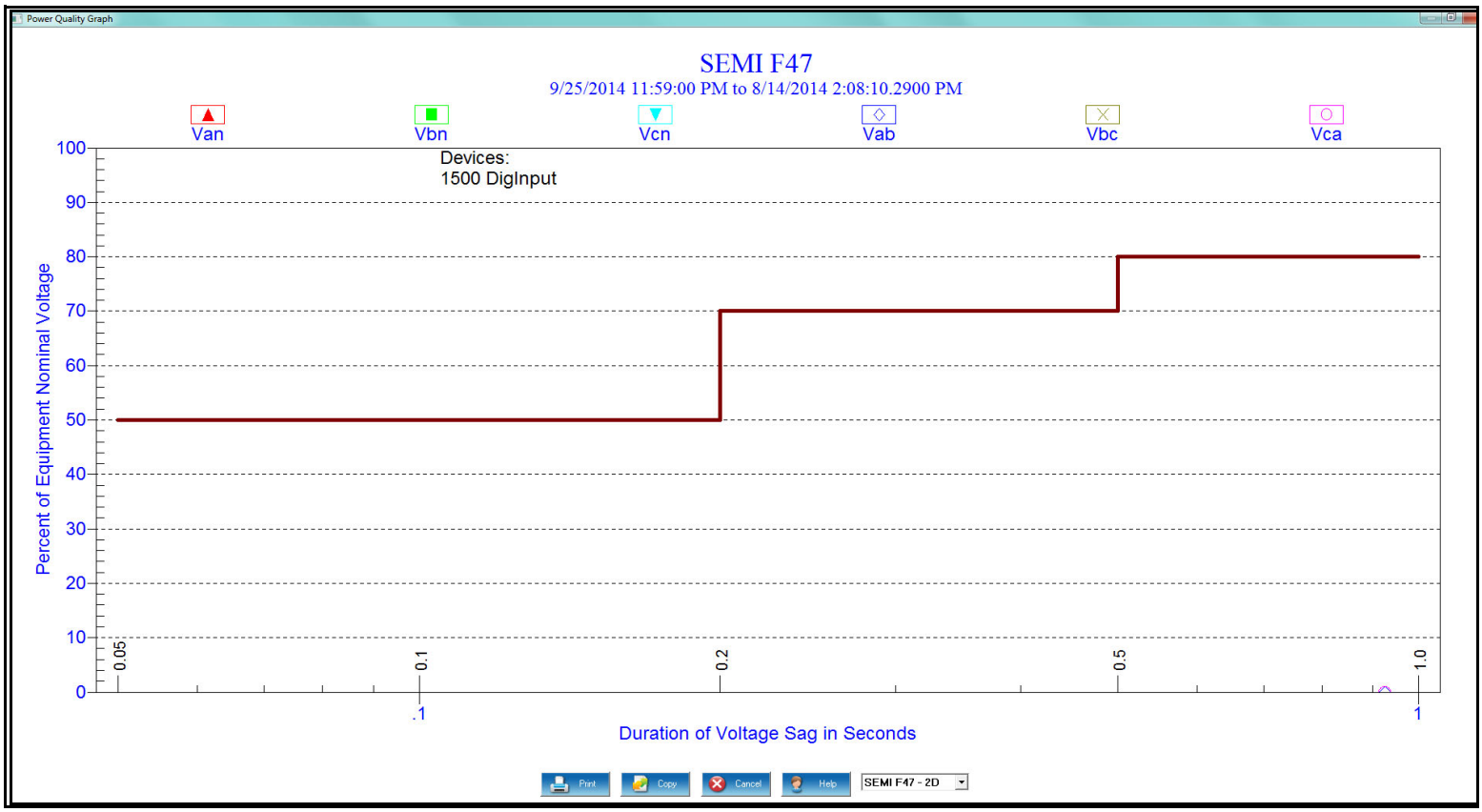
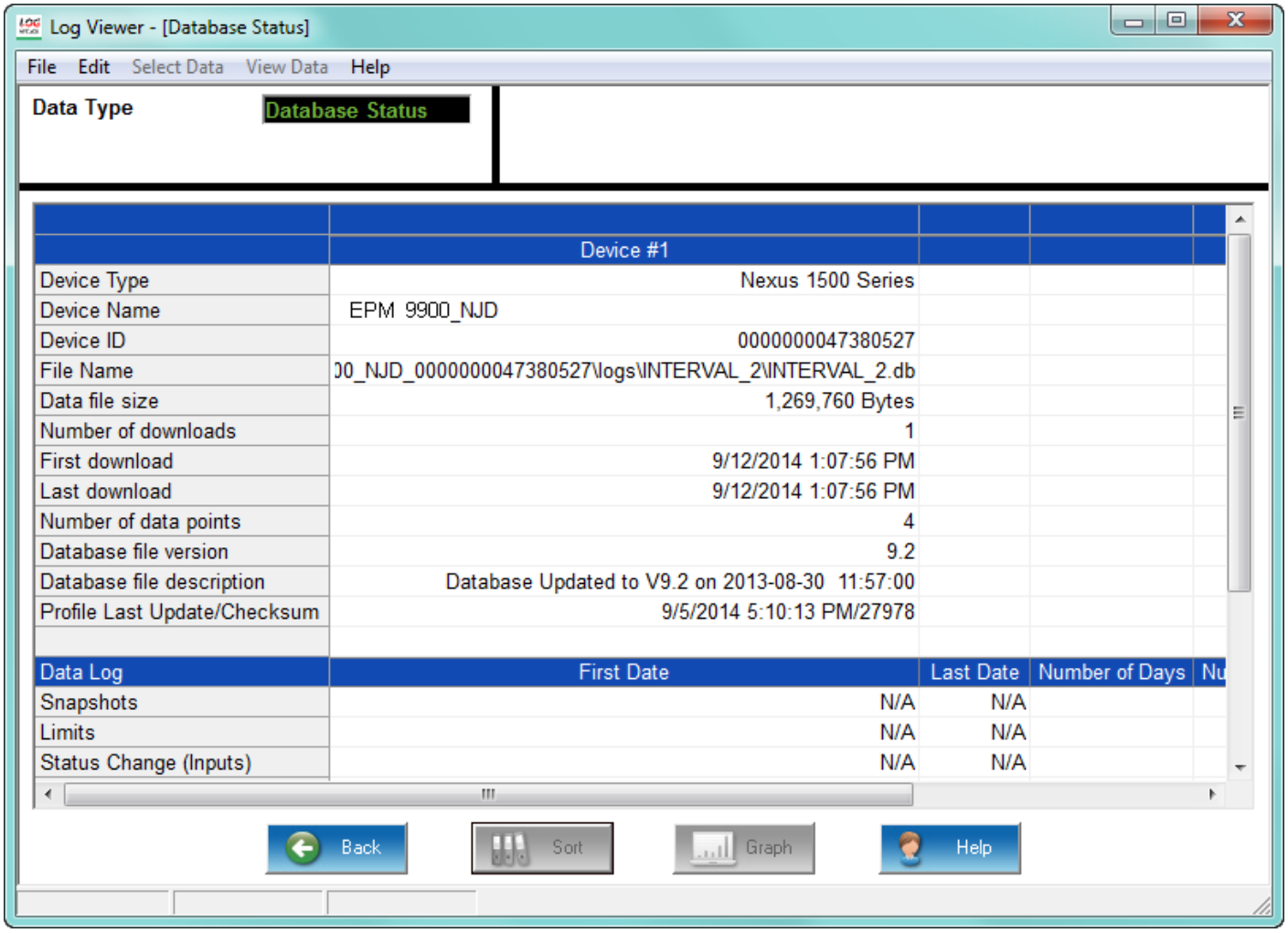


Figure 19-4: SEMI F47 2D Power Quality Graph

This diagram meets the standards of the Specification for Semiconductor Processing Equipment Voltage Sag Immunity.

19.4.6 Database Status

The Database Status screen provides statistical information about the selected log(s). Click on the Database button or View Data>Database Status. You will see the screen shown below.



	Device #1			
Device Type	Nexus 1500 Series			
Device Name	EPM 9900_NJD			
Device ID	0000000047380527			
File Name	)0_NJD_0000000047380527\logs\INTERVAL_2\INTERVAL_2.db			
Data file size	1,269,760 Bytes			
Number of downloads	1			
First download	9/12/2014 1:07:56 PM			
Last download	9/12/2014 1:07:56 PM			
Number of data points	4			
Database file version	9.2			
Database file description	Database Updated to V9.2 on 2013-08-30 11:57:00			
Profile Last Update/Checksum	9/5/2014 5:10:13 PM/27978			
Data Log	First Date	Last Date	Number of Days	Nu
Snapshots	N/A	N/A		
Limits	N/A	N/A		
Status Change (Inputs)	N/A	N/A		

- A partial download consists of the newest records and captures appended to the existing records in the log database. The snapshot must be a time frame within the database dates. Otherwise, there is no data from which to retrieve the snapshot.
- To copy the data to the computer's clipboard, right-click with the cursor positioned anywhere in the table.
- To return to Log Viewer's main screen, click Back.

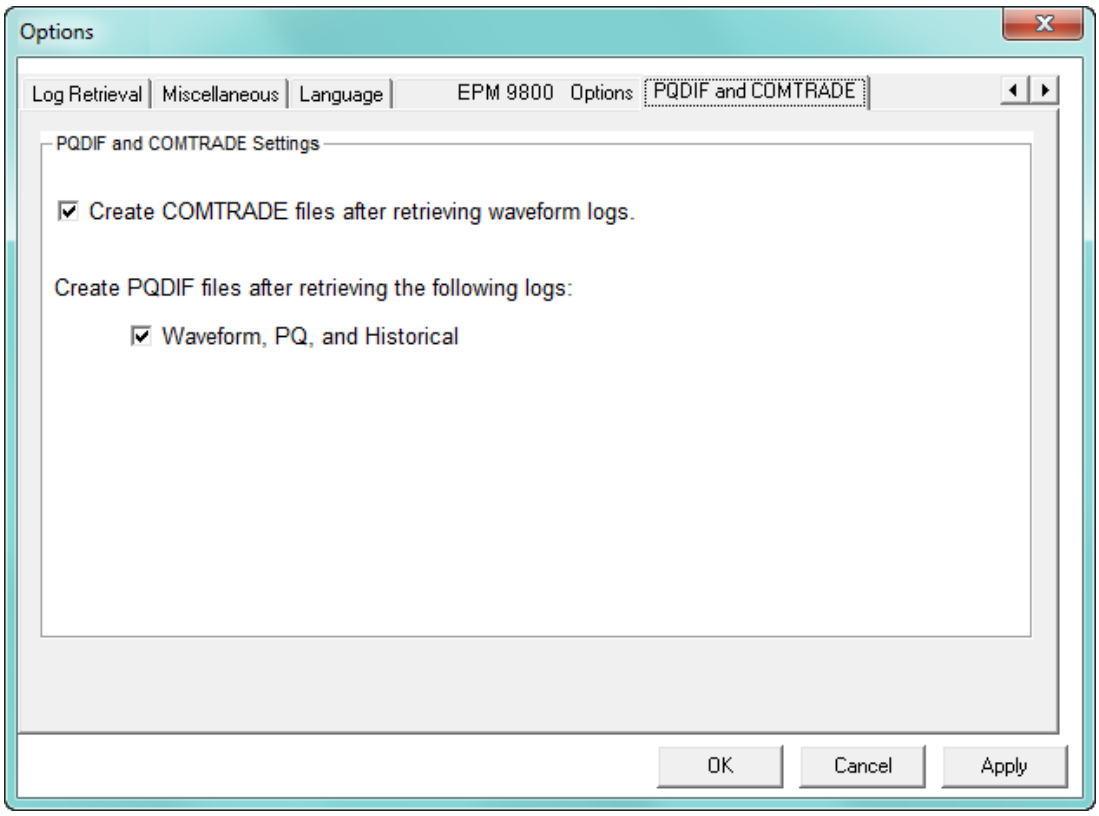
19.4.7 PQDIF Exporter

Power Quality Data Interchange Format (PQDIF) is a tagged, compressible binary file format which offers a platform-neutral, flexible means of exchanging power quality data between instruments and data management and analysis software. PQDIF is currently under adoption by EPRI as the standard file format for power quality data and under consideration by IEEE as its standard file format. The GE Communicator application offers a PQDIF converter, referred to as PQDIF Exporter.

When the PQDIF Exporter is enabled in the GE Communicator application, it will automatically generate PQDIF files after retrieving any Waveform, PQ, and Historical logs, as long as the meter/log support PQDIF (see "Supported Files and Meters" on page 19-45, for more information on supported meters and log items). The PQDIF Exporter provides a reliable way to access a meter's log data from applications other than the GE Communicator application.

19.4.7.1 Configuring the PQDIF Exporter

1. From the **Options** screen, click the **PQDIF and COMTRADE** tab and enable PQDIF file automatic creation when the logs are retrieved from the meter, by clicking the box to check it.



2. Click **Apply** to save the setting.

19.4.7.2 Using the Command Line Interface

In addition to the automated exports that PQDIF Exporter performs, you can perform manual exports on a given PERIOD_INTERVAL, using the Command Line Interface. This may be necessary if you need to utilize PQDIF files/data with other software applications.

NOTE

- All command line arguments must be preceded by -- (e.g., --PERIOD_INTERVAL “day”).
- All command line arguments are optional; running the program without arguments will show the screen (see “Using the PQDIF Exporter” on page 19-44).

These are the command line arguments for manual PQDIF exports:

- **DATABASE "FILE"** - Path to the log data.

```
--DATABASE "C:\Users\Public\Documents\GE
Applications\Communicator_Ext\Retrieved
Logs\128Mb_IP203_0000000054211013\128Mb_IP203_0000000054211013.dml"
```

- **EXPORT_PATH "PATH"** - Path to export the PQDIF data to.

```
--EXPORT_PATH "C:\Users\Frank\Documents\PQDIF\
```

- **TIME_START "yyyy/mm/dd hh:mm:ss"** - (Optional) The Start Time for imported data in the format yyyy/mm/dd hh:mm:ss.

```
--TIME_START "2016/04/15 07:12:18"
```

- **TIME_END "yyyy/mm/dd hh:mm:ss"** - (Optional) End Time for imported data in format yyyy/mm/dd hh:mm:ss.

```
--TIME_END "2016/06/06 08:15:15"
```

- **EXPORT_TYPE "TYPE"** - (Optional) Limits type of PQDIF output to generate to specified format (when not specified, all types will be exported):
  - “waveform"
  - “historical"
  - “pq"

```
--EXPORT_TYPE "historical"
```

- **PERIOD_INTERVAL "TYPE"** - (Optional) Specifies if data is to be grouped in files by (defaults to “unlimited”):
  - "day" - Stores data with the period of a day.
  - "month" - Stores data with the period of a month.
  - "year" - Stores data with the period of a year.
  - "unlimited" - Stores as much data as possible in a single file.

```
--PERIOD_INTERVAL "unlimited"
```

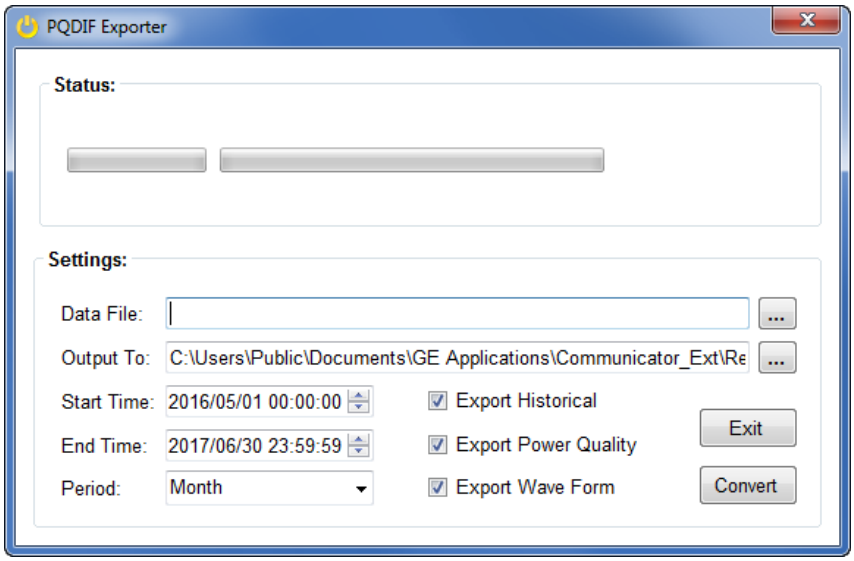
For example, if you wanted to output the waveform data from May 1st 2016 to June 30th 2016, on a daily period, to a subfolder of your Public Documents folder:

```
"C:\Program Files (x86)\GE
Applications\LogViewer\PQDIF\PQDIFExporter.exe"
--DATABASE "C:\Users\Public\Documents\GE
Applications\Communicator_Ext\Retrieved
Logs\128Mb_IP203_0000000054211013\128Mb_IP203_0000000054211013.dml"
--TIME_START "2016/05/01 05:30:00"
--TIME_END "2016/06/30 23:59:59"
```

```
--EXPORT_PATH "C:\Users\Ndeibler\Documents\PQDIF"
--EXPORT_TYPE "WAVEFORM"
--PERIOD_INTERVAL "day"
```

19.4.7.3 Using the PQDIF Exporter

Although PQDIF files are automatically exported upon retrieval of Historical, PQ, and Waveform logs, you can also use PQDIF Exporter outside of GE Communicator software by running the PQDIF Exporter executable. If no command line parameters are detected upon program execution, the software will start in graphical mode, letting you select program parameters and manually export database files in PQDIF format.



Follow these instructions to use the PQDIF Exporter:

1. Run PQDIFExporter.exe without command line arguments. The program is found in this directory path:
   [CommunicatorExt Install Dir] \LogViewer\PQDIF\PQDIFExporter.exe
2. Select a source database file: *.db or *.dml by clicking on the "..." button next to the Data File field.
3. Select the destination folder for the PQDIF output files by clicking on the "..." button next to the Output To field.
4. Select the period **Start Time** from the pull-down menu.
5. Select the period **End Time** from the pull-down menu.
6. Select the **Period** to group data by from the pull-down menu. The default grouping period is by Month.
7. Check the types of data to be exported: Historical, Power Quality, and/or Waveform by clicking in the checkboxes next to the options.
8. Click the **Convert** button. Once clicked, the Convert button is disabled until the export is finished.
9. The generated PQDIF files will be available in the destination folder (if any valid data was found in the selected log(s)).

19.4.7.4 Supported Files and Meters

The meters supported for PQDIF export are the EPM 9450/9650/9000/9000P; and the EPM 7000 meters. Following are the lists of the supported log items (i.e., data channels) for the meters:

- EPM 7000/7000P meter:
  - 1s: Van, Vbn, Vcn, Vab, Vbc, Vca, Ia, Ib, Ic, In (calculated), FQ, V_Imb, I_Imba, Wa, Wb, Wc, W, VARa, VARb, VARc, VAR, VAa, VAb, VAc, VA, PFa, PFb, PFc, PF
  - Avg.: Ia, Ib, Ic, In (calculated), Wa, Wb, Wc, VARa, VARb, VARc, VAa, VAb, VAc, VA
  - %THD: Ia, Ib, Ic, Van/Vab, VBn/VBc, VCn/VCa
  - 10 min Avg. Sym. Comp. Mag. Pos.
  - 10 min Avg. Sym. Comp. Mag. Neg.
  - Energy +Wh (Q1 & Q4)
  - Energy -Wh (Q2 & Q3)
  - Energy +VARh
  - Energy -VARh
  - Phase A Voltage: 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase B Voltage: 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Magn., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase C Voltage: 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase A Current: 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase B Current: 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase C Current: 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Sym. Comp. Voltage Mag. Zero Seq. Min.
  - Sym. Comp. Voltage Mag. Pos. Seq. Min.
  - Sym. Comp. Voltage Mag. Neg. Seq. Min.

- EPM9000 meters:
  - High Speed: Van, Vbn, Vcn, Vaux, Ia, Ib, Ic, Vab, Vbc, Vca, VA, VAR, W, FQ, PFa, PFb, PFc, PFTotal
  - 1s: VAn, VBn, VCn, Vaux, Ia, Ib, Ic, In (measured), In (calculated), VAb, VBc, VCa, VAa, VAb, VAc, VA, VARa, VARb, VARc, VAR, Wa, Wb, Wc, W, FQ, PFa, PFb, PFc, PF, V_Imb, I_Imb
  - Thrm. Avg.: Ia, Ib, Ic, In (calculated), VAb, VBc, VCa, VAa, VAb, VAc, VA, VARa, VARb, VARc, VAR, Wa, Wb, Wc, W, FQ, PFa, PFb, PFc, PF
  - Energy: +VARh, -VARh, +Wh, -Wh, +Wh (Q1 & Q4), -Wh (Q2 & Q3)
  - Phase A-B Voltage: 0th Harm. Mag., 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag Phase B-C Voltage: 0th Harm. Mag., 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag..., 16th Harm. Mag., 17th Harm. Mag.
  - Phase B-C Voltage: 0th Harm. Mag., 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase C-A Voltage: 0th Harm. Mag., 1st Harm. Mag., 2nd Harm. Magn., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harmonic Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase A Current: 0th Harm. Mag., 1st Harm. Magn., 2nd Harm. Mag., 3rd Harmonic Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase B Current: 0th Harm. Mag., 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 16th Harm. Mag., 17th Harm. Mag.
  - Phase C Current: 0th Harm. Mag., 1st Harm. Mag., 2nd Harm. Mag., 3rd Harm. Mag., 4th Harm. Mag., 5th Harm. Mag., 6th Harm. Mag., 7th Harm. Mag., 8th Harm. Mag., 9th Harm. Mag., 10th Harm. Mag., 11th Harm. Mag., 12th Harm. Mag., 13th Harm. Mag., 14th Harm. Mag., 15th Harm. Mag., 15th Harmonic Mag., 17th Harm. Mag.
  - %THD: Ia, Ib, Ic, Van/Vab, VBn/VBc, VCn/VCa
  - Block Window Avg.: VA, VAR, W
  - Flicker PST: Va, Vb, Vc
  - Flicker PLT: Va, Vb, Vc
  - Flicker Inst.: VAN, VBN, VCN
  - 10 min Avg. Van/Ab THD%
  - 10 min Avg. VBn/Bc THD%

- 10 min Avg. VCn/Ca THD%
- Sym. Comp. Voltage Mag. 3s Zero Seq.
- Sym. Comp. Voltage Mag. 3s Pos. Seq.
- Sym. Comp. Voltage Mag. 3s Neg. Seq.
- Sym. Comp. Voltage Mag. 10m Avg. Pos. Seq.
- Sym. Comp. Voltage Mag. 10m Avg. Neg. Seq.
- Sym. Comp. Voltage Mag. 10m Avg. , Neg/Pos 100%

19.4.7.5 PQDIF Files

Storage:

- The PQDIF files automatically generated by the GE Communicator software are stored in this directory:

  C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\PQDIF

  - If command line argument is used to generate the exported files or if the PQDIF Exporter is used in standalone mode (see "Using the PQDIF Exporter" on page 19-44) the files are stored where specified in the EXPORT_PATH command or PQDIF Exporter screen.

NOTE

Each meter's output files are stored in a subdirectory with the meter's designation, an underscore, and the meter's serial number; for example:

C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\PQDIF\128Mb_IP203_0000000054211013\

File Structure:

- PQDIF files have .pqd as their extension.
- PQDIF output files begin with "yyyy-mm-dd". However if there's too much data for a single file, the file is split into multiple files named "yyyy-mm-dd_##" where ## is the index of the file in the sequence of data.
- If "year" or "month" was specified for the file period, some of the date will be truncated, since days, for a monthly period, and months, for a yearly period, would not be relevant.
- If the period interval was set to "unlimited," output files will begin with "unassigned." If there is too much data to be stored in one .pqd file the multiple files will be named 'unassigned_##' where ## is the index of the file in the sequence of data.
- The PQDIF formatted files can be viewed with PQDIF viewers such as Top or PQDiffractor.
- Below are some examples of PQDIF output files.
  - A PQDIF file generated for May 2017:

  C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\PQDIF\128Mb_IP203_0000000054211013\2017-05-01.pqd

  - A PQDIF file generated for an unspecified time range:

  C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\PQDIF\128Mb_IP203_0000000054211013\unassigned.pqd

19.4.8 COMTRADE Converter

Common Format for Transient Data Exchange (COMTRADE) is a standard that defines a format for the files containing transient waveform and event data collected from power systems or power system models. The format is intended to provide an easily interpretable form for use in exchanging data. As such, it does not make use of the economies available from data encoding and compression that proprietary formats depend upon for competitive advantage. The standard is for files stored on physical media, such as digital hard drives and diskettes. It is not a standard for transferring data files over communication networks. This standard defines a common format for the data files and exchange medium needed for the interchange of various types of fault, test and simulation data.

The GE Communicator application offers a COMTRADE converter, which carefully adheres to COMTRADE specification IEC 60255-24 (2001) and produces files with a data format compliant with the IEEE Stndard C37.111-1999 COMTRADE for Power Systems.

The COMTRADE converter will generate the following types of files (see "COMTRADE Files" on page 19-51, for additional information):

- filename.cfg
- filename.dat
- filename.inf
- filename.d##
- filename_*.cfg
- filename_*.dat
- filename_*.inf
- filename_*.d##
    - The term 'filename' represents the user specified file name.
    - The symbol '##' represents a value from '00' through '99'.
    - The symbol '*' is the number of 1 or above for each additional waveform record.
    - File type 'cfg' is for Configuration.
    - File type 'dat' is for Data.
    - File type 'inf' is for Information.

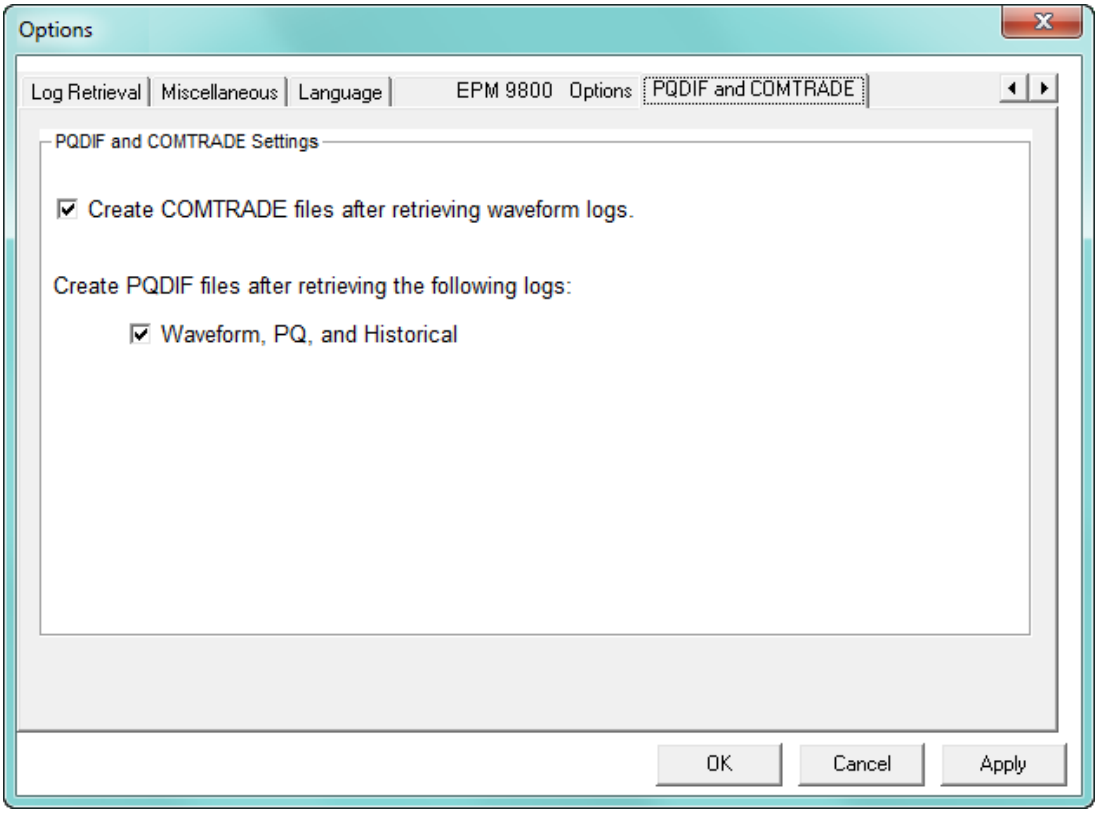
NOTE

The software will not overwrite an existing file; it will only convert to a new filename.

19.4.8.1 Configuring the COMTRADE Converter

To use the COMTRADE Converter, you first need to enable it.

1. From the Options screen, click the PQDIF and COMTRADE tab and enable COMTRADE file creation by clicking the box to check it.



2. Click **Apply** to save the setting.

19.4.8.2 Using the Command Line Interface

When it is enabled, the COMTRADE Converter works with GE Communicator software to automatically export the COMTRADE files. However, you may need to customize the export in order to use the log data with other software. You can do so using the Command Line interface.

NOTE

- All command line arguments must be preceded by -- (e.g., --TIME_START "2017/02/04 12:24:36").
- All command line arguments are optional except for DATABASE.

These are the command line arguments for COMTRADE exports:

- **DATABASE "FILENAME"** - Path to the log database file to convert data from.

```
--DATABASE "C:\Users\Public\Documents\GE
Applications\Communicator_Ext\RetrievedLogs\128Mb_IP203_0000000054211013\1
28Mb_IP203_0000000054211013.dml
```

- **TIME_START "yyyy/mm/dd hh:mm:ss"** - Start date and time for data conversion.

```
--TIME_START "2017/01/05 12:23:24"
```

- **TIME_END "yyyy/mm/dd hh:mm:ss"** - End date and time for data conversion.

```
--TIME_END "2017/01/24 18:32:10"
```

- **EXPORT_PATH "PATH"** - Path to the directory where data will be exported.

```
--EXPORT_PATH "C:\Users\NDeibler\Documents\COMTRADE"
```

- **OUTPUT_FILE_FORMAT "FORMAT"** - File output format - either ASCII or BINARY.

```
--OUTPUT_FILE_FORMAT "BINARY"
```

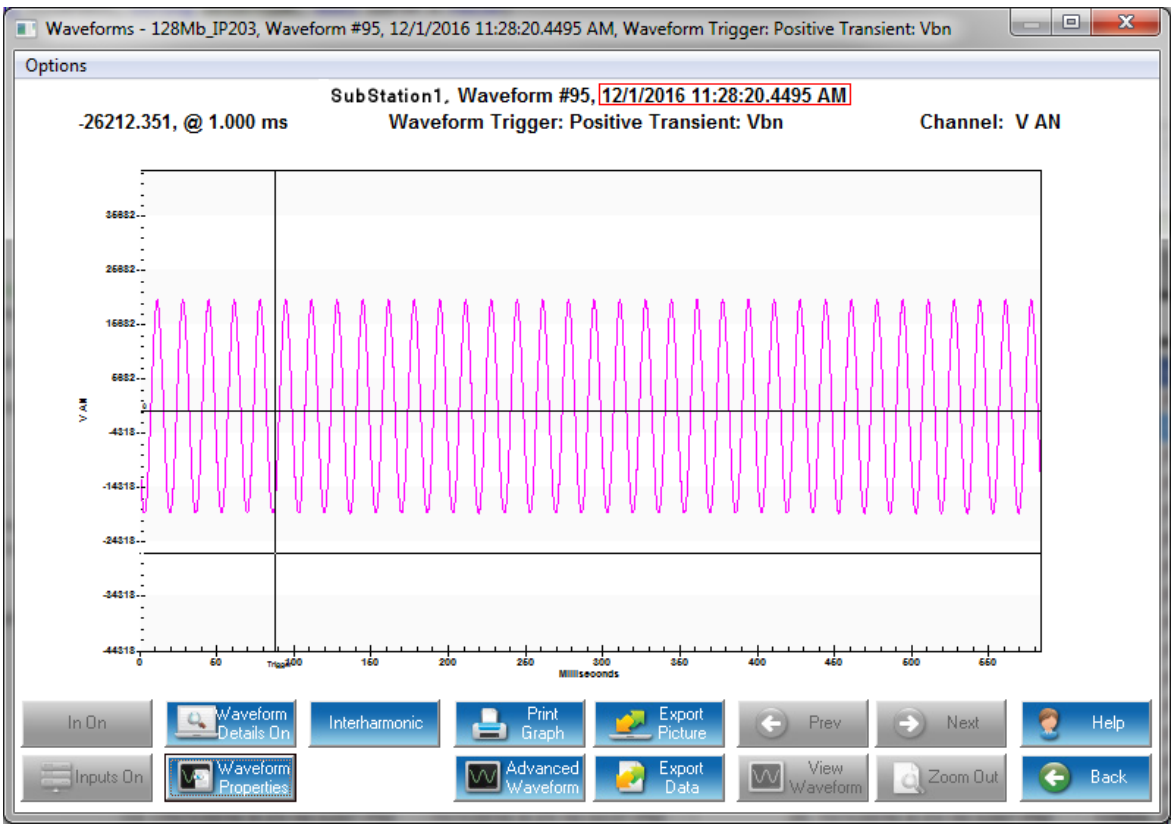
For example, if you wanted to export log data from February 1, 2017 until February 28, 2017:

```
"C:\Program Files (x86)\GE
Applications\LogViewer\COMTRADE\ComtradeExporter.exe"
--DATABASE "C:\Users\Public\Documents\GE
Applications\Communicator_Ext\Retrieved
Logs\128Mb_IP203_0000000054211013\128Mb_IP203_0000000054211013.dml"
--TIME_START "2017/02/01 06:45:00"
--TIME_END "2017/02/28 13:05:20"
--EXPORT_PATH "C:\Users\NDeibler\Documents\COMTRADE"
--OUTPUT_FILE_FORMAT "BINARY"
```

Example:

To export a single waveform from log data:

1. Find the start time of the waveform you are interested in, from LogViewer.



2. Using the time of the waveform, subtract one second for the start time and add 1 second for the end time. Your command line argument will be as follows:

```
"C:\Program Files (x86)\Electro
Industries\LogViewer\COMTRADE\ComtradeExporter.exe"
--DATABASE "C:\Users\Public\Documents\Electro
Industries\Communicator_Ext\Retrieved
Logs\SubStation1_0000000054211013\SubStation1_0000000054211013.dml"
--TIME_START "2016/12/01 11:28:19"
--TIME_END "2016/12/01 11:28:21"
--EXPORT_PATH "C:\Users\NDeibler\Documents\COMTRADE"
```

3. Once the COMTRADE Converter is finished, you should see two output files:

```
(File 1)
C:\Users\Frank\Documents\COMTRADE\SubStation1_0000000054211013\2016-
12-01_11-28-20-450.cfg
(File 2)
C:\Users\Frank\Documents\COMTRADE\SubStation1_0000000054211013\2016-
12-01_11-28-20-450.dat
```

19.4.8.3 Supported Files and Meters

The Waveform log is the supported file for the COMTRADE Converter. The meters supported for COMTRADE export are the EPM 9000 Series and the EPM 7000 meters.

19.4.8.4 COMTRADE Files

Storage:

- The COMTRADE files automatically generated by the GE Communicator software are stored in this directory:

  C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\COMTRADE

  - If command line argument is used to generate the exported files, the files are stored where specified in the EXPORT_PATH command.

NOTE

Each meter's output files are stored in a subdirectory with the meter's designation, an underscore, and the meter's serial number; for example:

C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\COMTRADE\128Mb_IP203_0000000054211013\

Naming Conventions:

- All output files start with "YYYY-MM-DD_hh-mm-ss-fff" where fff is the time in milliseconds.

  Details of Files (see "COMTRADE Converter" on page 19-48, for a list of COMTRADE files):

  - cfg - Config files specify how the COMTRADE viewer should handle the data in the 'dat' or 'd##' files. For example, the config file could specify the format of data as well as how to scale it.
    - E.g., 2016-01-27_04-21-13-283.cfg
  - dat - Data files contain the waveform data that has been parsed into the COMTRADE format.
    - E.g., 2016-01-27_04-21-13-283.dat

- d## - When there is too much waveform data for a single .dat file, the file is split into multiple files with extensions containing the letter 'd' followed by their sequential number ranging from '00' to '99'. For example:
    - 2016-02-01_10-45-23-225.d00
    - 2016-02-01_10-45-23-225.d01
    - 2016-02-01_10-45-23-225.d02
    - ...

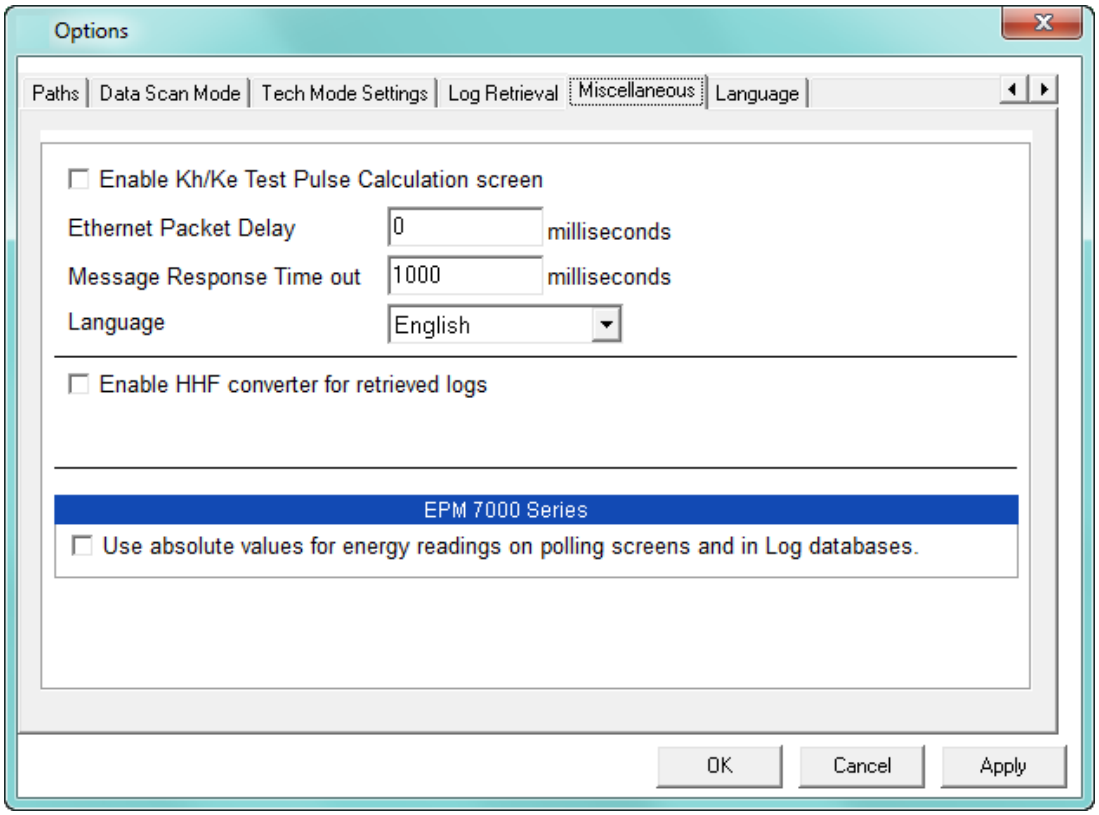
19.4.9 HHF Converter

The HHF Converter converts downloaded historical logs from EPM 9000 Series and 7000 meters to HHF format for use with Itron's MV-90 Meter Reading System. The HHF Adapter converts data as it is downloaded to a meter. It cannot retroactively convert data that has already been stored in the GE Communicator software database. This limitation is due to the method MV-90 uses to retrieve HHF format files.

The HHF Converter is a standalone executable application module that is called from the GE Communicator application whenever historical logs are downloaded from the meter and HHF is enabled. This process is automatic once HHF is enabled. This application intercepts the data being downloaded and simultaneously converts the data to HHF format.

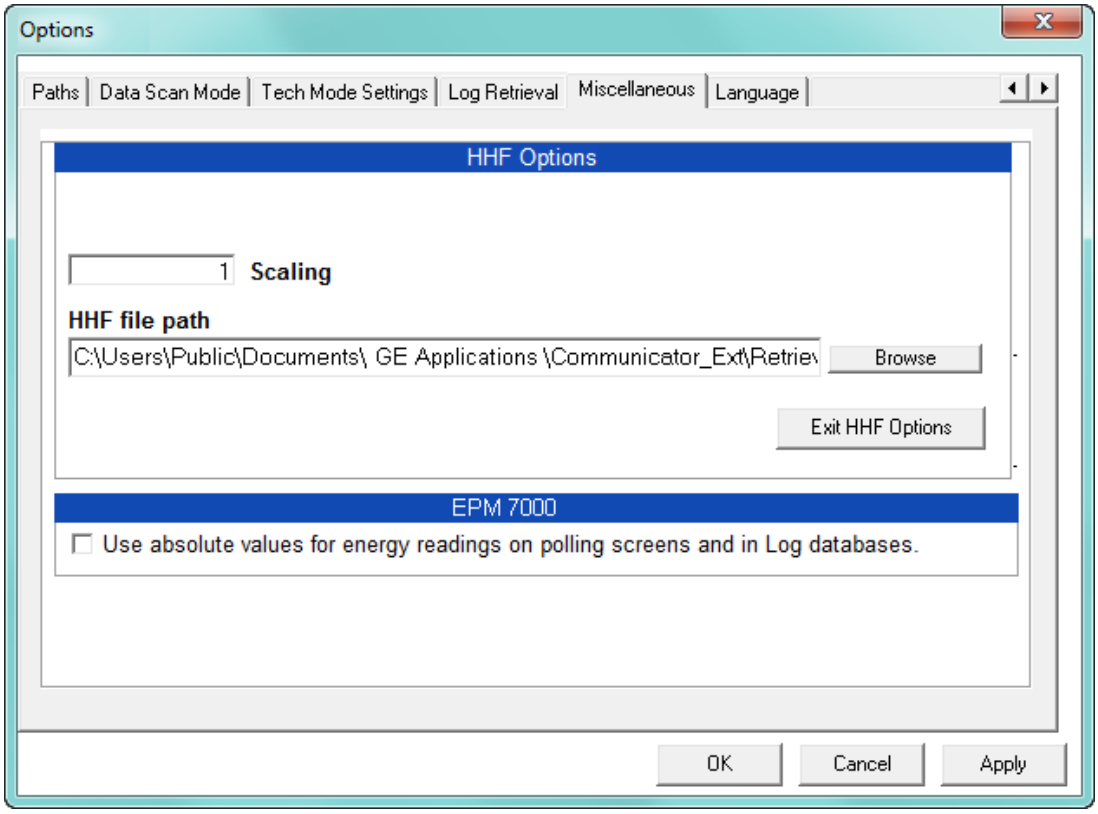
19.4.9.1 Configuring the HHF Converter

1. From the Main screen's Menu Bar, click **View > Options** to open the Options screen.
2. Click the **Miscellaneous** tab. You will see the screen shown below.



3. Click the checkbox next to **Enable HHF converter for retrieved logs**.

4. Click the **HHF Options** button. The screen changes as shown below.

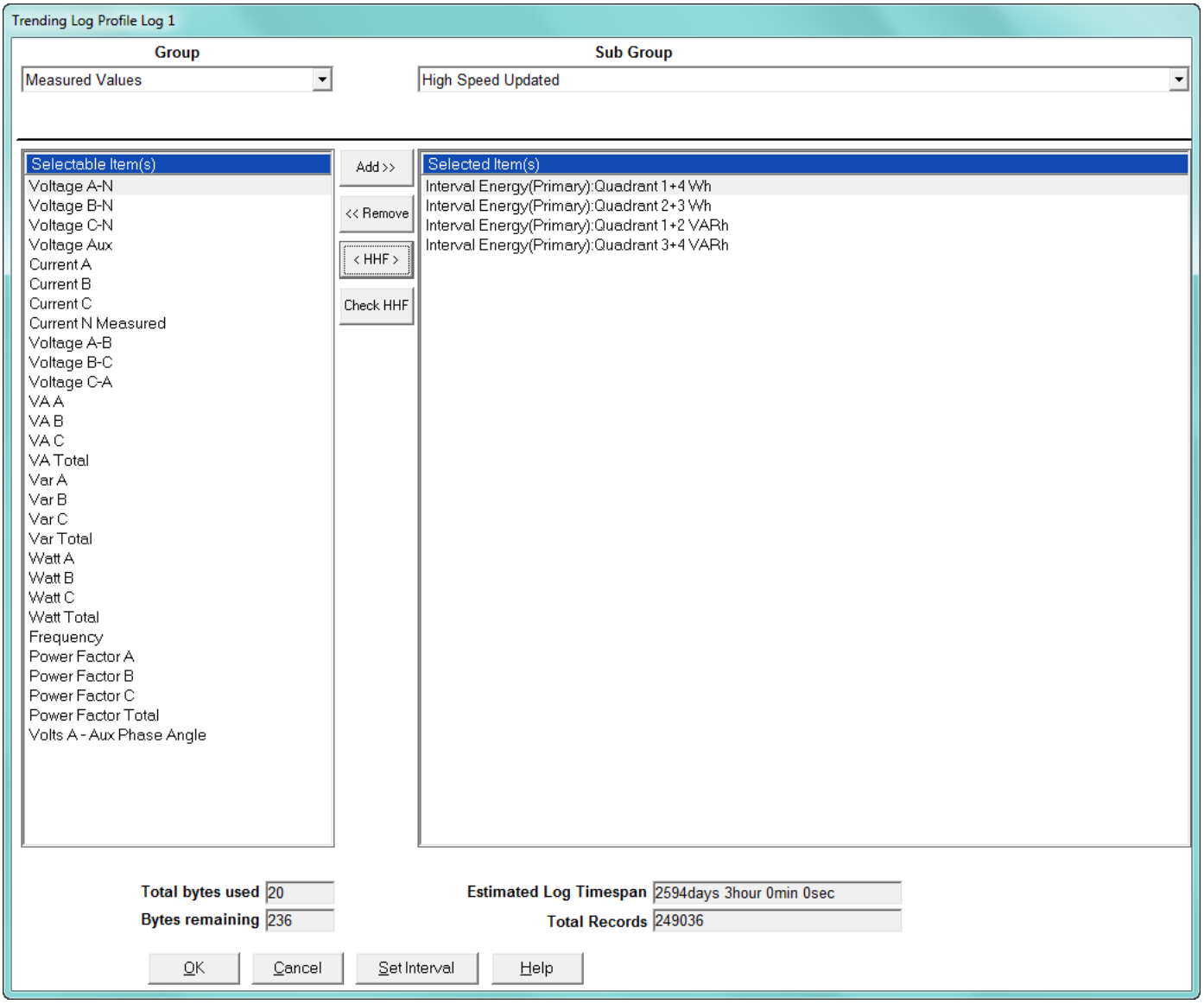


5. Key in the **Scaling Value**. This value is an integer by which all input values are divided before being placed into the HHF files. Values must be rescaled when loaded into MV-90.
   NOTE on Scaling: If Input Values exceed 1,000,000, a Scaling Value must be used to bring the values below 1,000,000. This is due to the limitations of the HHF File Format.
6. **HHF File Path** is the root directory for all HHF files. A folder for each meter with converted files is created in this path and .hhf files for that meter are placed in that folder. The default directory for HHF Folders is shown in the screen. Click Browse if you wish to designate another path.
7. Click **Apply** to save changes.
8. Click **OK** to close the screen.

19.4.9.2 Setting up Logs for Use with the HHF Converter

1. Open the Device Profile for the currently connected meter.
2. Click on **Trending Profile Settings > Trending Setup > Log 1 (or Log 2)**. The Trending Log Profile screen opens.

3. Click the "**<HHF>**" button in the center of the screen. The HHF button automatically sets up a default Historical log and settings for the log.



The HHF changes include the following:

- All items are removed.
- Four items are added: Q1+4 Interval Primary, Q2+3 Interval Primary, Q1+2 Interval Primary, Q3+4 Interval Primary
- The Interval between Records is set at 15 minutes
- The Accumulation Interval is set at 15 minutes

NOTE

These settings can be changed. However, keep the following considerations in mind:

- Only Interval Energy items can be used.

- The Record Interval and the Accumulation Interval MUST be the same. If they are not, the .hhf file created may be corrupt. These intervals are set in the Device Profile.
    - Record Interval is set in the Trending Log Time Interval.
    - Accumulation Interval is set in Energy, Pulses and Accumulations in the Interval.
- There can be 16 items, maximum.

4. Click **OK** to go back to the Device Profile screen.
5. Click **Update Device** to save the settings to the meter.
6. A "Resetting Logs" Warning appears. Click **OK** to update the meter with the new settings.

19.4.9.3 Using the Command Line Interface

When it is enabled, the HHF Converter works with GE Communicator software to automatically generate converted HHF files when historical logs are retrieved. However, you may want to convert HHF files for a specific period interval in order to use them with another software. You can do so using the Command Line interface.

NOTE

- All command line arguments must be preceded by -- (e.g., --PERIOD_INTERVAL "day").
- All command line arguments are optional; running the program without arguments will show the screen (see "Using the HHF Converter" on page 19-57).

These are the command line arguments for manual HHF conversion:

- **DATABASE "FILENAME"** - (Optional) The path of the database file to be converted (*.db, *.sbl, *.nbl, *.mfnbl).

```
--DATABASE "C:\Users\Public\Documents\Electro
Industries\Communicator_Ext\Retrieved Logs\EPM7000Unit8.sbl"
```

- **OUTPUT_PATH "FOLDER"** - (Optional) The folder where the converted output files will be saved. The default output path is C:\Users\Public\Documents\Electro Industries\Communicator_Ext\Retrieved Logs\HHF Files\

```
--OUTPUT_PATH "C:\Users\Ndeibler\Documents\HHF"
```

- **START_TIME "yyyy/mm/dd"** - (Optional) The start date in log data for conversion. The default is 1 year earlier than the current date, on the first day of the current month; e.g, if today is February 24, 2017, the default start time would be February 1, 2016.

```
--START_TIME "2017/01/05"
```

- **END_TIME "yyyy/mm/dd"** - The end date in log data for conversion. The default is a month from the current date, on the last day of the month, at 23:59:59; e.g., if today is February 24, 2017, the default end time would be March 31, 2017.

```
--END_TIME "2017/03/06"
```

- **PERIOD_INTERVAL "PERIOD"** - The interval on which to split files. The default is "month."
    - "**unlimited**" - The entire input date range will be processed at one time.
    - "**year**" - The input date range will be broken into years and be processed one period at a time.
    - "**month**" - The input date range will be broken into months and be processed one period at a time.

- "**week**" - The input date range will be broken into weeks and be processed one period at a time.
- "**day**" - The input date range will be broken into days and be processed one period at a time.

```
--PERIOD_INTERVAL "week"
```

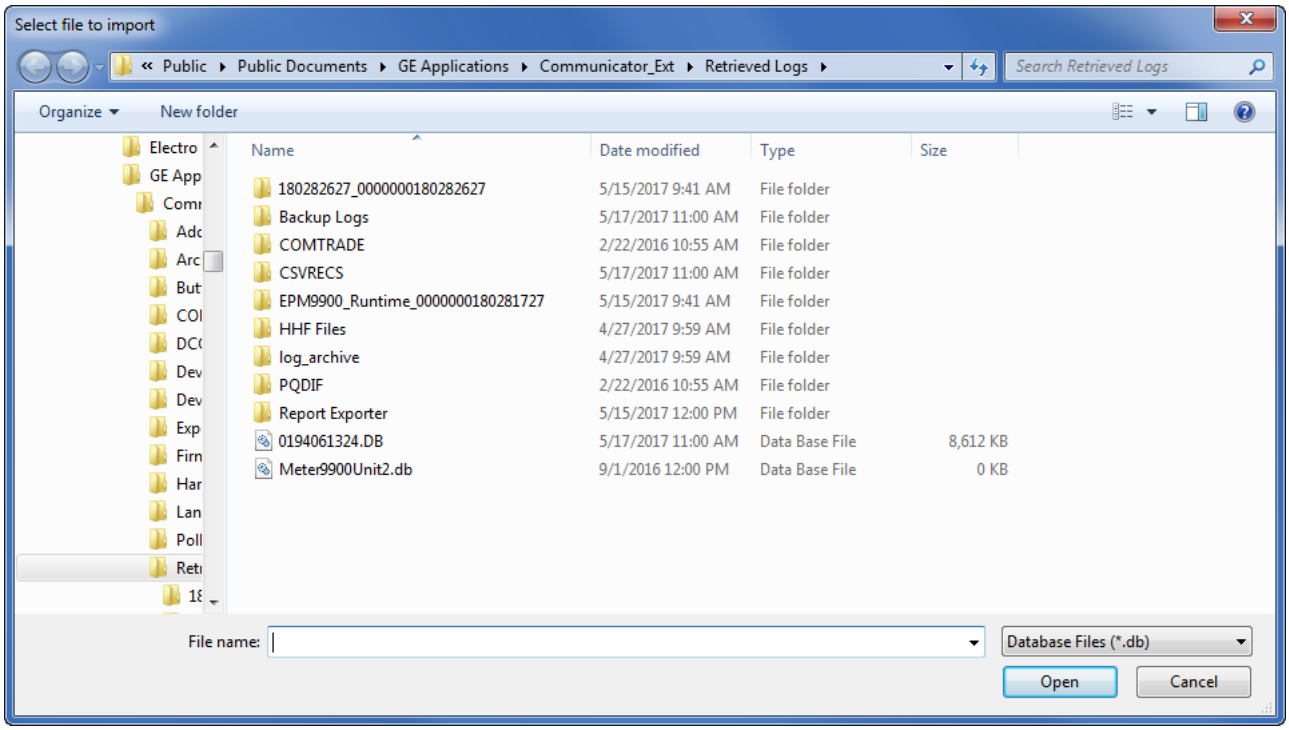
For example, if you wanted to convert the log data from January 1st 2017 to January 15th 2017, with a period interval of week, you could use:

```
"C:\Program Files (x86)\Electro
Industries\LogViewer\HHFConverter\HHFConverter.exe"
--DATABASE "C:\Users\Public\Documents\Electro
Industries\Communicator_Ext\RetrievedLogs\EPM7000Unit8.sbl"
--START_TIME "2017/01/01"
--END_TIME "2017/04/15"
--PERIOD_INTERVAL "week"
```

19.4.9.4 Using the HHF Converter

Although HHF files are automatically converted, when enabled, by the GE Communicator application, you can also use the HHF Converter independently, either through Command Line, shown in the previous section, or as shown in the instructions in this section.

1. Run HHFConverter.exe without command line arguments. The program is found in this directory path:
   [GE Communicator Install Dir]\LogViewer\HHFConverter\HHFConverter.exe



2. Locate the database file of the meter you want to convert data for.
3. Wait for conversion to take place (conversion may take several minutes).
4. The converted file is stored in the location shown in "HHF Files" on page 19-58.

19.4.9.5 Supported Files and Meters

The only supported data for the HHF Converter is interval energy items from a historical log. The meters supported for HHF export are the EPM 9000 Series; and the EPM 7000 meters.

19.4.9.6 HHF Files

Storage

- The HHF files automatically generated by the GE Communicator application (or the HHF Converter run manually, as shown in "Using the HHF Converter" on page 19-57)are stored in this directory:
  C:\Users\Public\Documents\Electro Industries\Communicator_Ext\Retrieved Logs\HHF Files
- If Command Line argument is used to generate the files, they are stored where OUTPUT_PATH was specified.

NOTE

Each meter's output files are stored in a subdirectory with the name of the meter's designation meter, for example:
C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\HHF Files\MyMeterDesignation

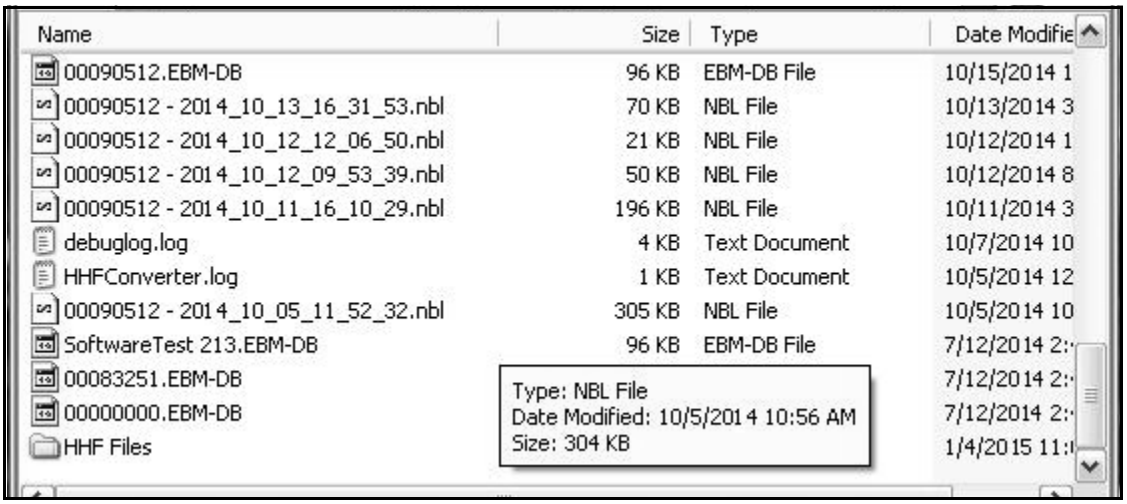
Naming Conventions

- The extension for the HHF output files is .hhf.
- .hhf output files are named using the following template:
  with [meter_designation]_[start_date]_[start_time]-[log_name]
  - meter_designation - The name given to the meter by the user.
  - start_date - The start date used by the converter; the format is yyyy-mm-dd.
  - start_time - The start time used by the converter; the format is hh:mm:ss.
  - log_name - The name of the log that was converted to HHF.
- An HHF output file example is as follows:
  C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\HHF Files\SubStation1\SubStation1_2017-01-11_16-30-00-INTERVAL_1.hhf

Additional File Details

NOTE

The Date (year, month and day) is the date of the oldest record in the log.



- Log File: Contains a list of actions taken by the converter in the process of converting the EPM meter's file into .hhf format that may cause irregularities in the data. Additionally, it contains any errors that were encountered while converting. For example: Data that cannot be represented in .hhf format is found in this file. Shown in the previous figure is a typical example of Retrieved Log Files.
  [HHF file list]
  [Conversion action list]
  [Error list]
- Conversion Action List: List of all the conflicts with the HHF format that occurred in the EPM meter's file and the action taken to convert the files.
  - Trim <Time><Reason>: Value discarded from the .hhf file. “Time” is the time stamp of the value discarded and “Reason” is one of the following:
    - Invalid Interval: Timestamp falls off the even time intervals. Value timestamps are rounded and overlaps are deleted.
    - Invalid Time: Timestamp either lies before the given beginning of the log or after the given end of the log. The record containing the timestamp has been removed from the list.
    - Pad <Time start>”-”<Time end><Reason>: The values for the interval before “Time start” are repeated until “Time end”. “Reason” can be:
    - Missing Interval: Original log missing values to make a continuous log. Values are added to maintain proper timestamps.
- Error List: List of all errors encountered during conversion.
  - Error in file <File Name> “at” <Position>: Parsing error while extracting data from the input file. Position is the number of bytes from the beginning of the file to where the error occurred. This error most often occurs when an invalid log record type is included in the input.
  - Value out of range <Timestamp> <Channel> <Value>: The given channel’s value in the interval given by timestamp is outside of the range HHF can represent.
  - File not found <File Name>: The given input file (with path) does not exist.
  - File overwritten <File Name>: One of the created files in the path has the same name as an existing file. The old file has been overwritten.

- File collision <File Name>: One of the created files in the path has the same name as an existing file and that file cannot be deleted. The new file was not created.
- Invalid file <File Name>: The given input file is not a valid .nbl file.
- Invalid data type <Data Type>: One of the channels contains data that HHF cannot represent.
- Path not found <Path Name>, Created: The given path was not found and the folder structure was created.

19.4.9.7 Troubleshooting the HHF Converter

For your information, this is a short list of occasional problems with the probable solution.

Problem: Program quits while trying to create the HHF file.

Solution: This can be caused by too many values that are too large for the HHF file to hold. Try a larger scaling value.

Problem: Program quits right after opening; no file is created.

Solution: This is most often caused by an item in the historical log that the converter does not recognize. Only Intervaled Energies are valid values for the converter. Remove all invalid items from the log. Make sure that the correct log is selected in the HHF Options.

Problem: MV-90 will not load the file.

Solution: This can be caused by giving MV-90 a file or path that contains ' ' (spaces). Make sure that all files and paths leading to the HHF file contain no spaces.

Problem: MV-90 downloaded and converted log, but values are either incorrect or nonexistent.

Solution: This can be caused by downloading both logs and the wrong log is converted. Make sure that the correct log is selected in the HHF Options.

Problem: Log is OK, convert is OK, but when loaded into MV-90, it is rejected.

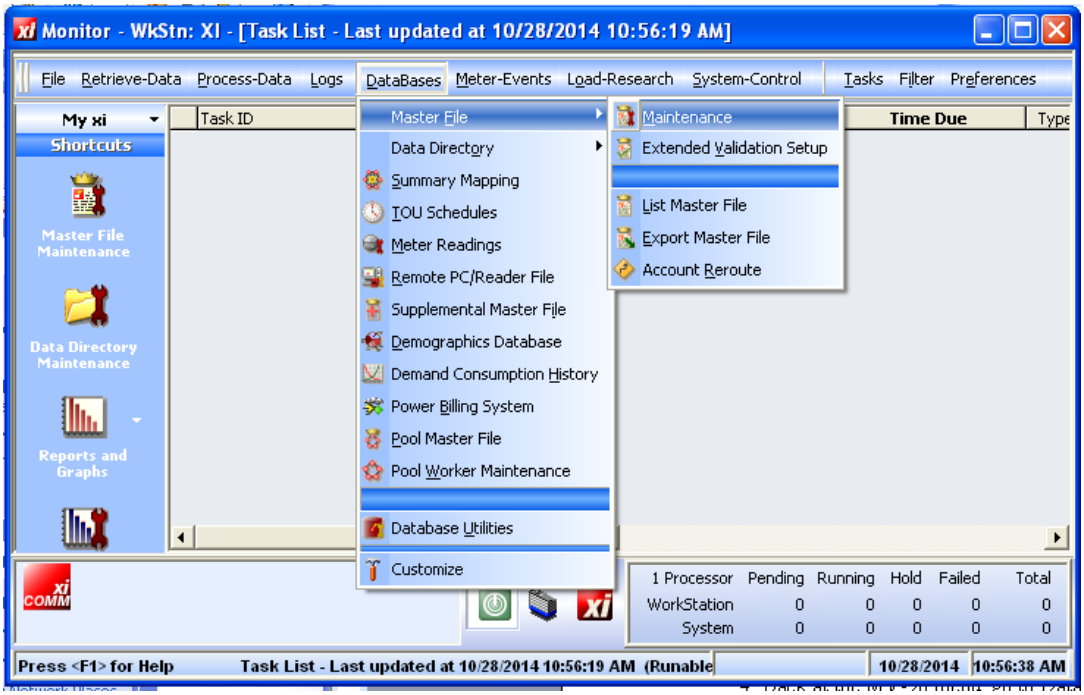
Solution: There may be too many errors in the historical log, including power off gaps, flashing, etc. MV-90 expects no gaps in the data in the .hhf file and tries to verify the integrity of the data. If data must be loaded, despite gaps, make sure Verification Feature in MV-90 is OFF.

19.4.9.8 Set up MV-90 for Use with HHF Files

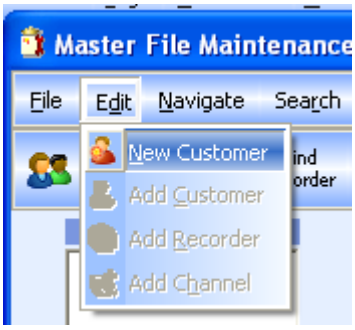
Follow these steps to set up the MV-90 application:

1. Open MV-90 and go to the MV-90 menu.
2. From the Menu Bar, click **System-Control > System Parameters > Operations >Data Retrieval > Portable Readers** and then click **Enable Edit**.
3. Change the value of "**Retrieval/Import Key**" to "**Device ID**" and click **Save**.
4. Go to **Operations > UOM Codes > Descriptions**. Verify that Code 1 is kWh/kW and Code 3 is kVARh/kVAR. These are the default MV-90 Mappings.

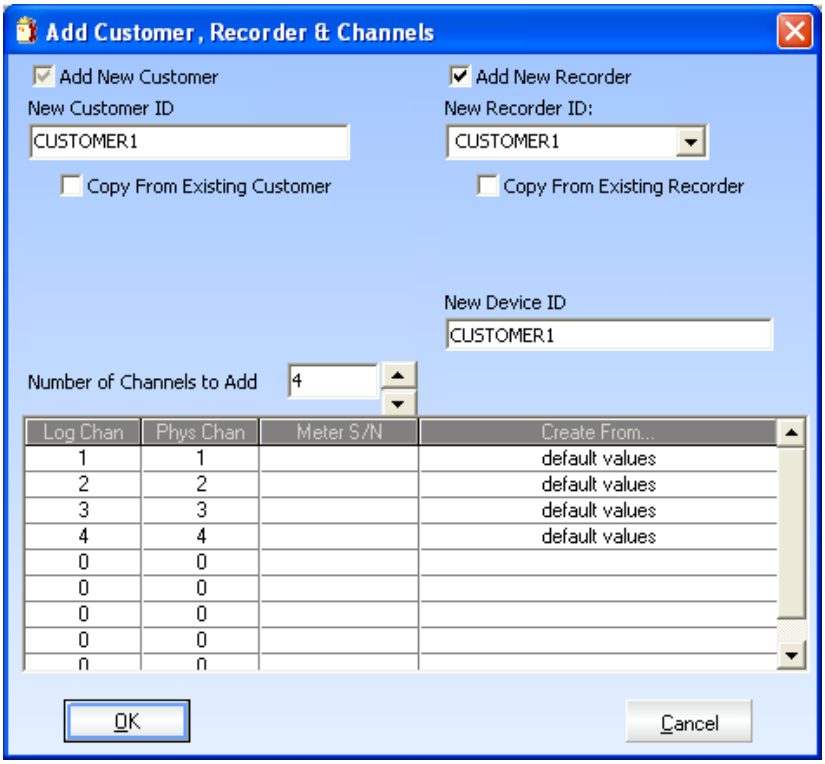
5. Exit System Parameters. From the Menu Bar, go to **Databases >Master File > Maintenance**.



6. Click **Edit > New Customer**.



The "Add Customer, Recorder & Channels" screen opens. On this series of screens, you will create a new Master File entry.

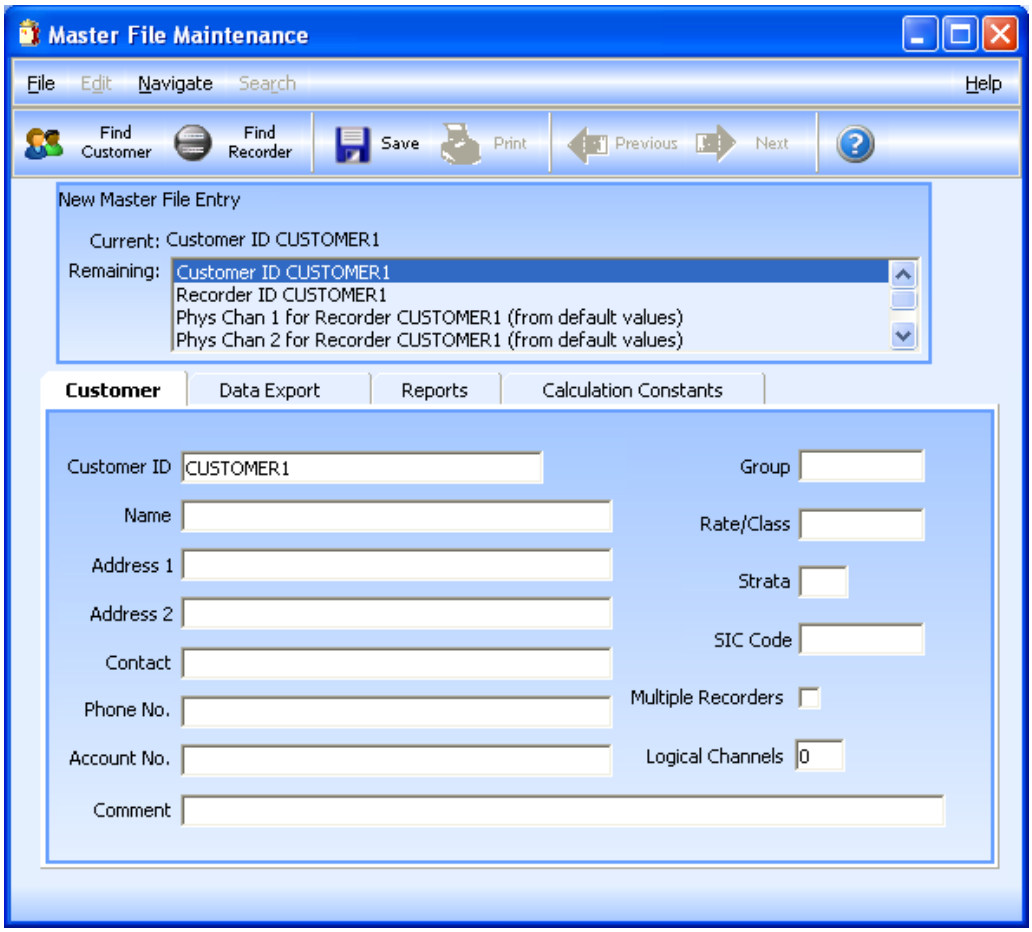


7. Enter the Customer, Recorder and Device ID.

NOTE

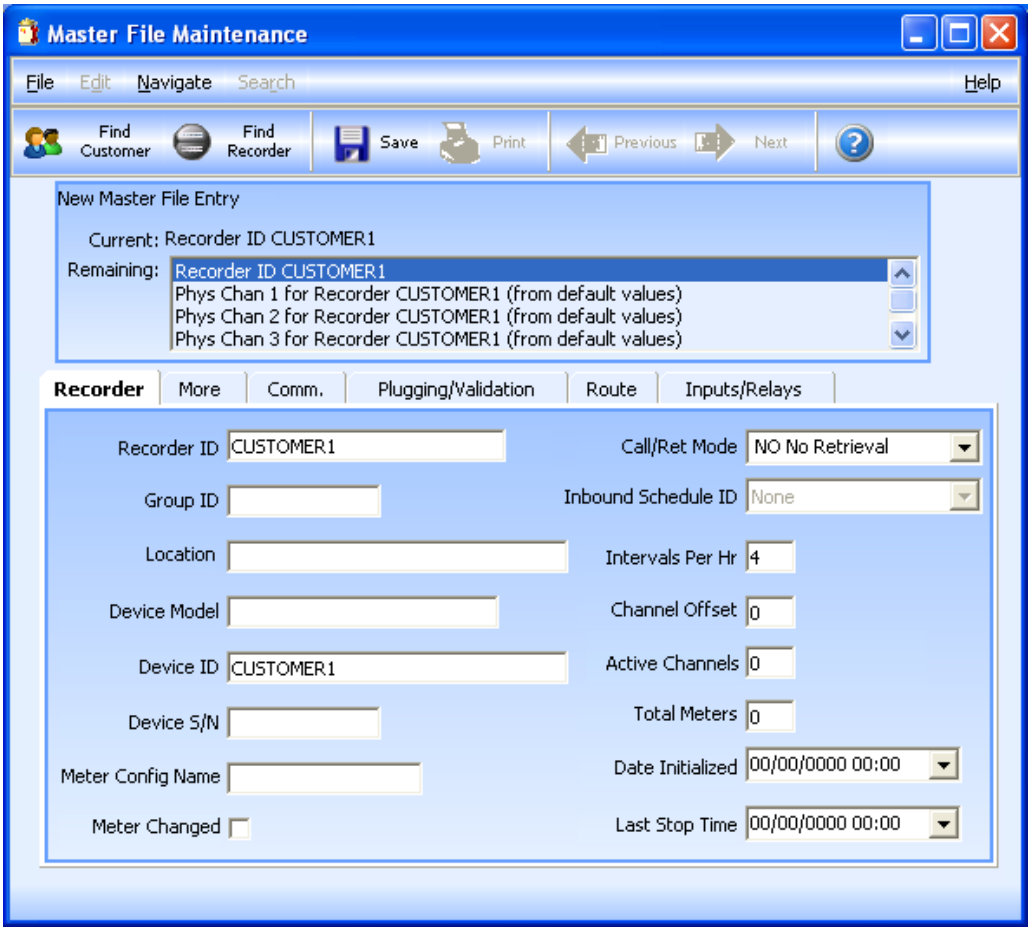
The Device ID must match the Meter name of the meter being used.

8. Set the Number of Channels to 4 and click **OK**. The next screen opens.



9. On this screen, Enter Customer Information.

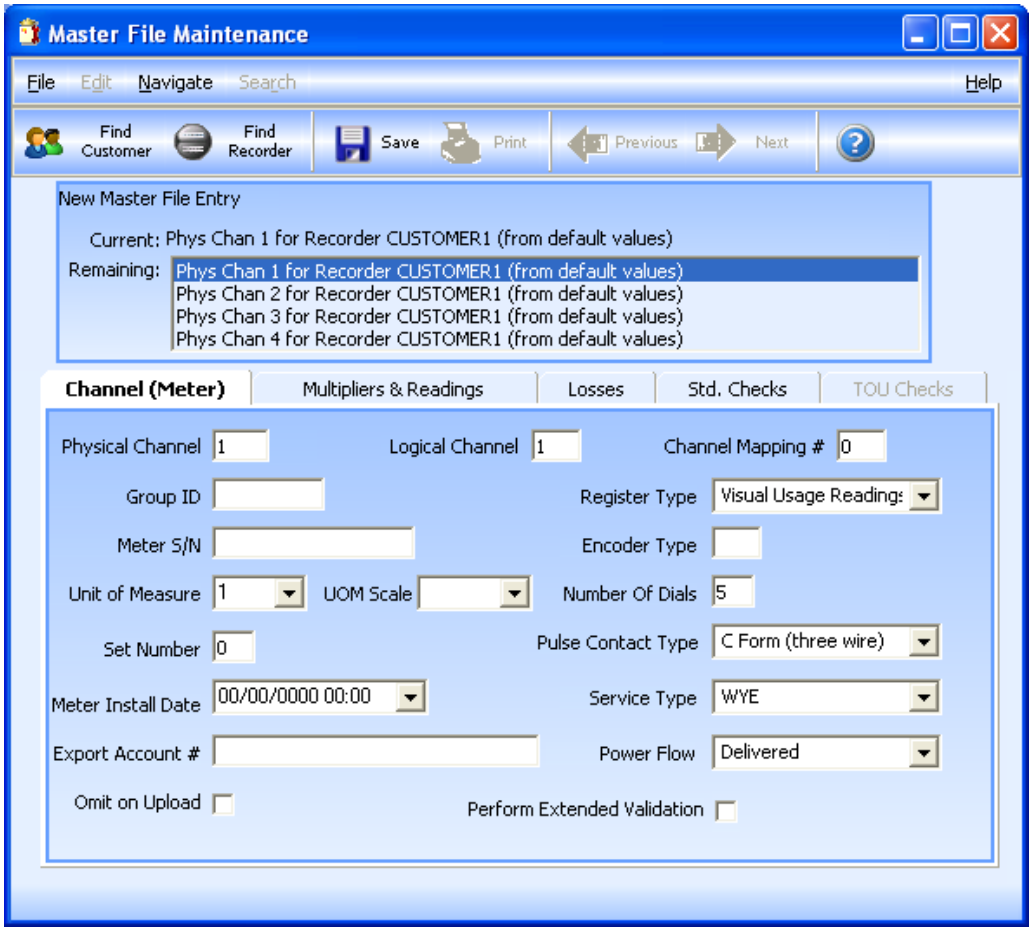
10. Click the **Save** button to continue to the next screen.



a. On this screen, Enter Recorder (Device) Information.

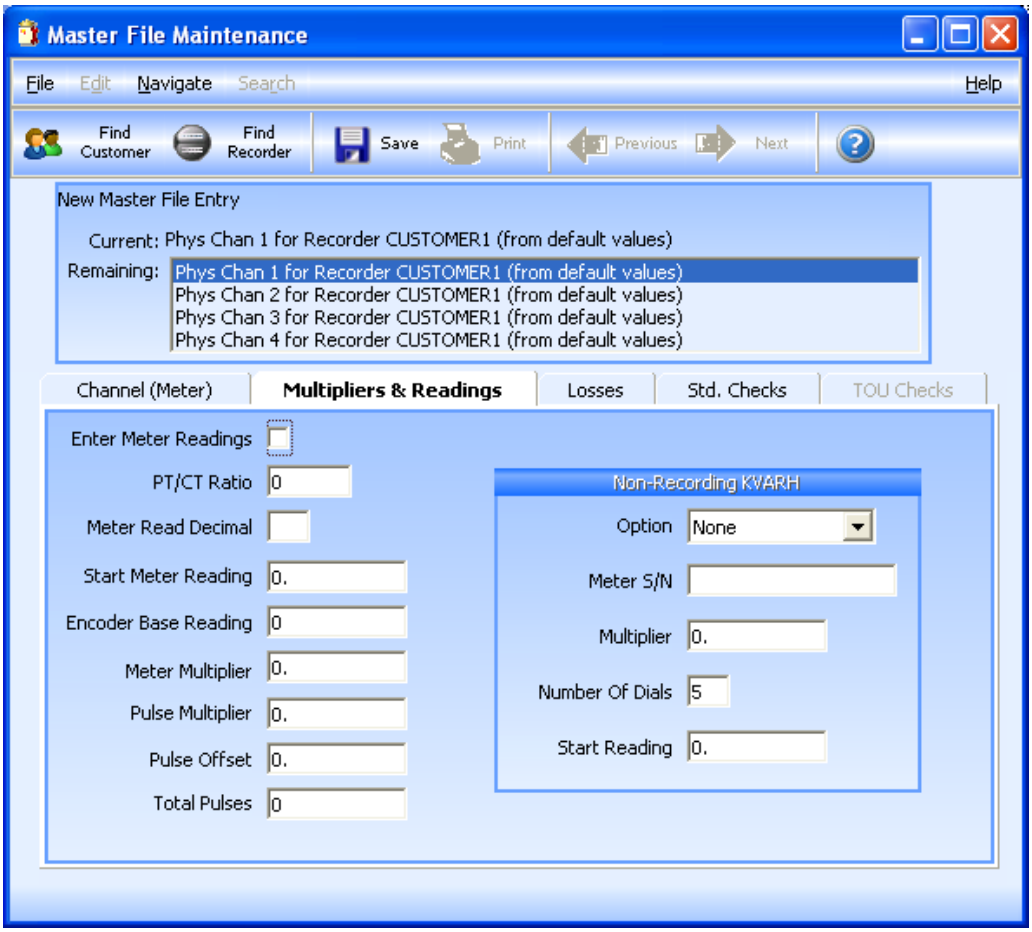
- If the meter has its Daylight Savings Time Option turned on, make sure the DST Option is checked in the Recorder Information: click the **More tab >Device Follows DST**.

b. Highlight one of the channels in the list at the top to see the channel setting tabs - see the example below.



- Enter Channel Information in the first tab.

- Enter Multipliers & Readings Information in the second tab - see the example below.

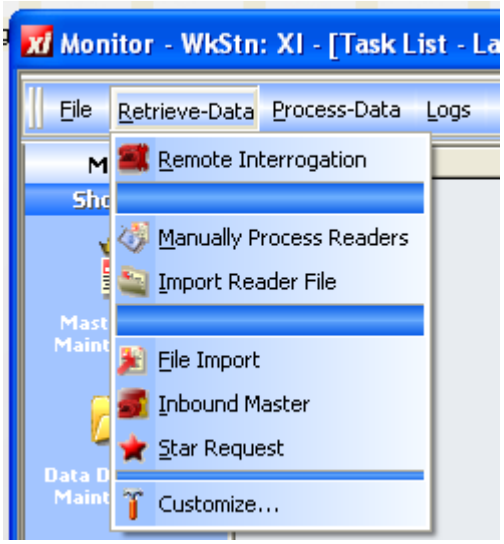


- For Channel 1: On the Channel tab, set the Unit of Measure to 1 and on the Multipliers & Readings tab, set Meter & Pulse Multiplier to 0.0001 (kWh). Fill out any other relevant information.
- For Channel 2: On the Channel tab, set the Unit of Measure to 1 and on the Multipliers & Readings tab, set Meter & Pulse Multiplier to 0.0001 (kWh). Fill out any other relevant information.
- For Channel 3: On the Channel tab, set the Unit of Measure to 3 and on the Multipliers & Readings tab, set Meter & Pulse Multiplier to 0.0001 (kVARh). Fill out any other relevant information.
- For Channel 4: On the Channel tab, set the Unit of Measure to 3 and on the Multipliers & Readings tab, set Meter & Pulse Multiplier to 0.0001 (kVARh). Fill out any other relevant information.

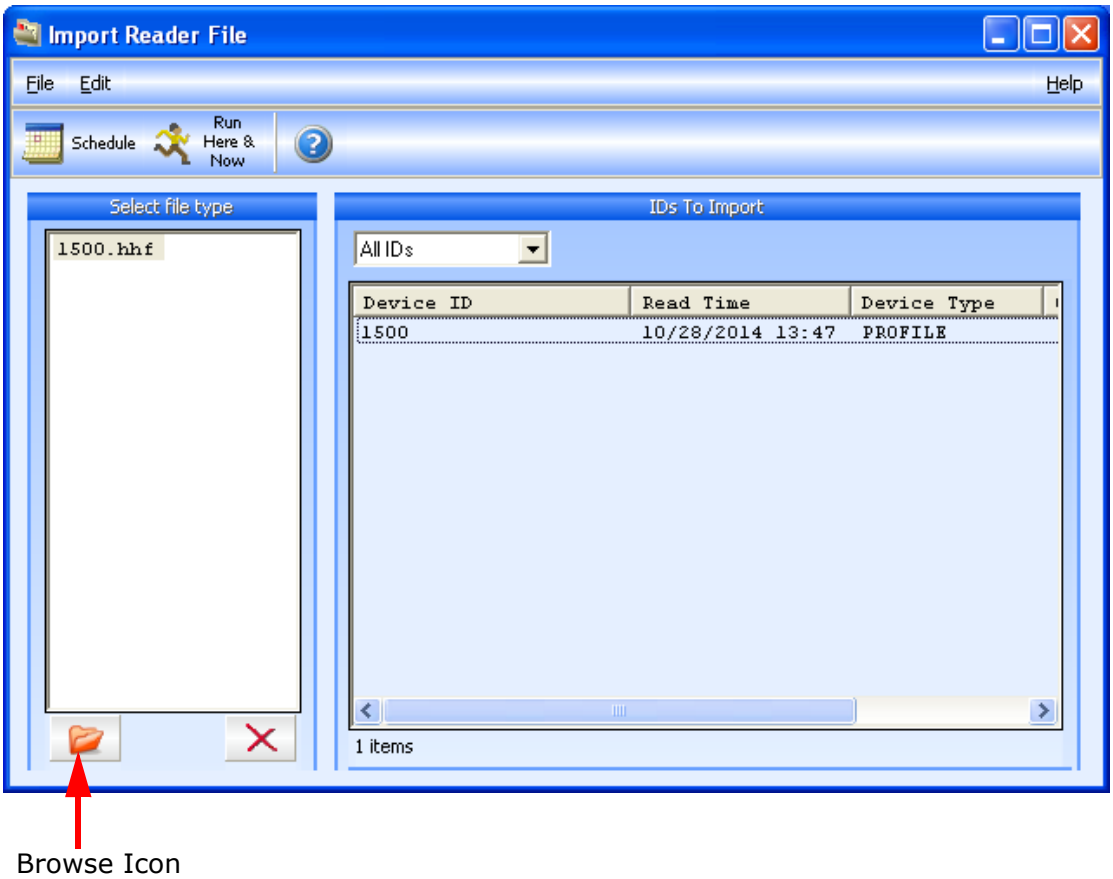
19.4.9.9 Import an HHF File into MV-90

Follow these steps to import a file:

1. Open MV-90 and go to the MV-90 menu. In MV-90 Menu Mode, go to **Retrieve-Data > Import Reader File**.



2. The “Import Reader File” screen opens.

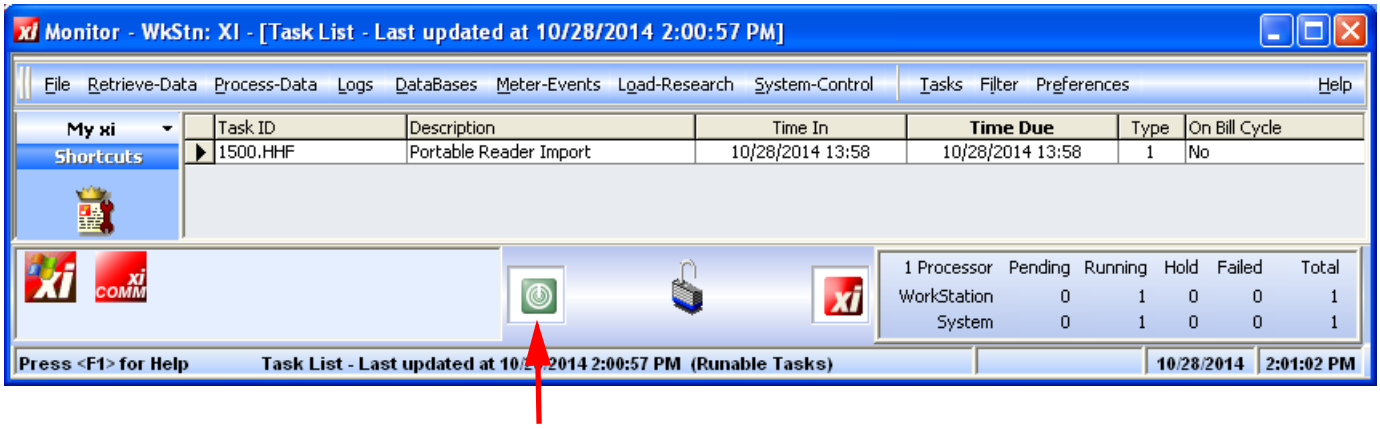


Click the Browse icon to locate an HHF file to import.

- Verify that the Device ID and Read Time are correct.
- The HHF file is saved with the retrieved logs: C:\Users\Public\Documents\GE Applications\Communicator_Ext\Retrieved Logs\HHF Files

3. Click either the **Schedule** icon or the **Run Here & Now** icon:
   - The Schedule option imports the file later.
   - The Run Here & Now option imports the file now.
4. When a file is imported, a report is generated (overview of data and success of importing). See your MV-90 documentation to locate the report.

5. The HHF file import task should show up in the **Task List** box - see example below. If it doesn't, click the "**Scan for Tasks**" icon.



Scan for Tasks Icon

- The Time In field lists when the task was loaded; The Time Due fields lists when the task is scheduled to run.
- When an HHF file is imported, it is added to the database for that client. This data can be viewed in many ways. See your MV-90 documentation for details.

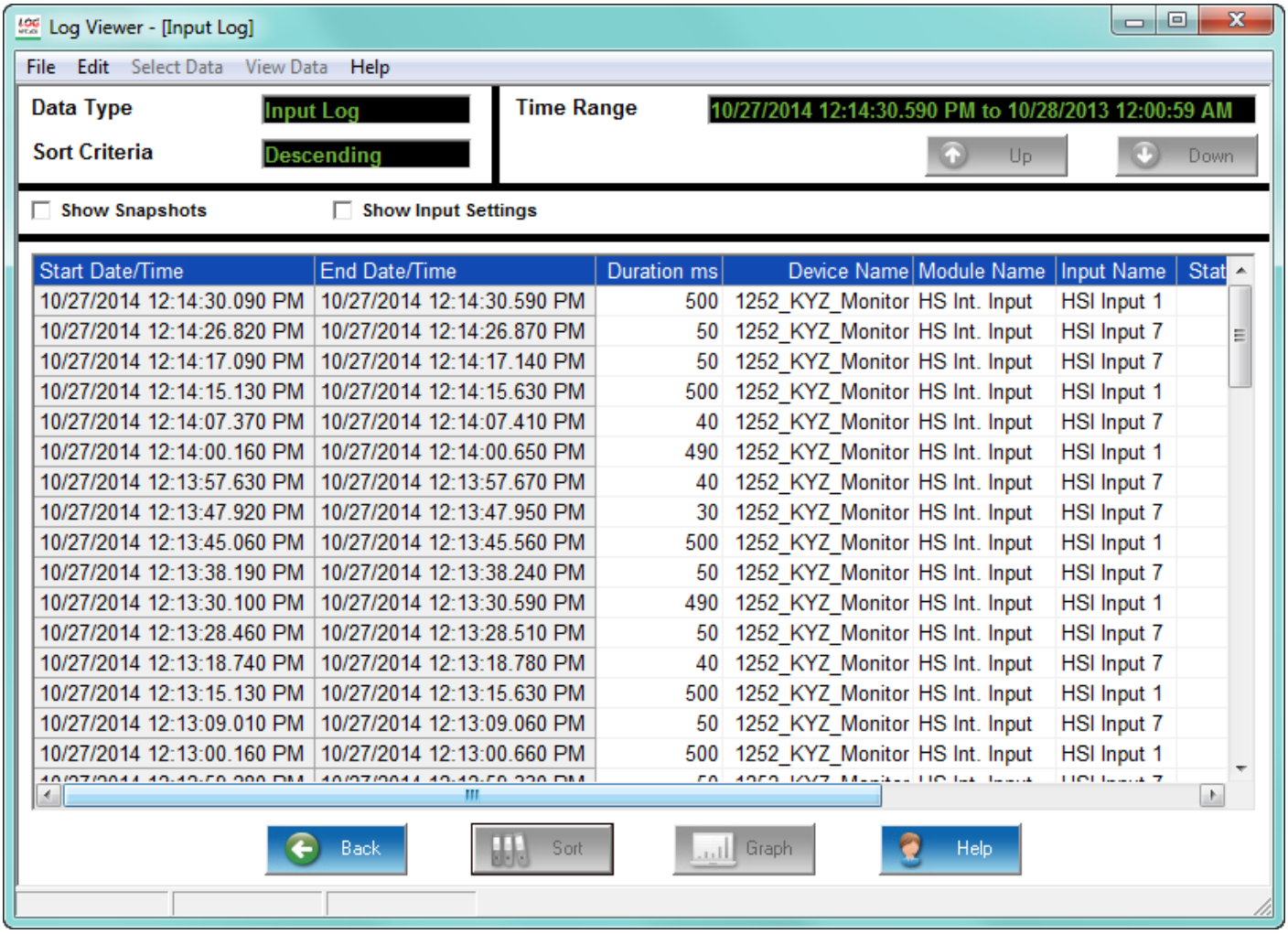
NOTE

MV-90 is based on a DOS Program. File names (including folder names) must not contain blank spaces. All blank spaces should be represented by "_" (underscore). Folder names cannot be longer than 8 characters. When setting up MV-90, make sure that all paths follow these limitations.

- The Progress Window is displayed while converting the logs. This window is always displayed. The window is composed of two parts:
  - Progress Bar: A bar which displays the percentage complete in graphical (bar) and text () format.
  - Text: Output which specifies the actions being taken by the converter, including errors encountered.

19.4.10 Status Change Log (Inputs)

The Status Change Log (Input Log) displays the input change status for a selected meter file and time range. To view the Status Change Log, click the Status Change Log button or View Data>Status Change (Inputs). You will see the screen shown below.



Start Date/Time	End Date/Time	Duration ms	Device Name	Module Name	Input Name	Stat
10/27/2014 12:14:30.090 PM	10/27/2014 12:14:30.590 PM	500	1252_KYZ_Monitor	HS Int. Input	HSI Input 1	
10/27/2014 12:14:26.820 PM	10/27/2014 12:14:26.870 PM	50	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:14:17.090 PM	10/27/2014 12:14:17.140 PM	50	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:14:15.130 PM	10/27/2014 12:14:15.630 PM	500	1252_KYZ_Monitor	HS Int. Input	HSI Input 1	
10/27/2014 12:14:07.370 PM	10/27/2014 12:14:07.410 PM	40	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:14:00.160 PM	10/27/2014 12:14:00.650 PM	490	1252_KYZ_Monitor	HS Int. Input	HSI Input 1	
10/27/2014 12:13:57.630 PM	10/27/2014 12:13:57.670 PM	40	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:13:47.920 PM	10/27/2014 12:13:47.950 PM	30	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:13:45.060 PM	10/27/2014 12:13:45.560 PM	500	1252_KYZ_Monitor	HS Int. Input	HSI Input 1	
10/27/2014 12:13:38.190 PM	10/27/2014 12:13:38.240 PM	50	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:13:30.100 PM	10/27/2014 12:13:30.590 PM	490	1252_KYZ_Monitor	HS Int. Input	HSI Input 1	
10/27/2014 12:13:28.460 PM	10/27/2014 12:13:28.510 PM	50	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:13:18.740 PM	10/27/2014 12:13:18.780 PM	40	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:13:15.130 PM	10/27/2014 12:13:15.630 PM	500	1252_KYZ_Monitor	HS Int. Input	HSI Input 1	
10/27/2014 12:13:09.010 PM	10/27/2014 12:13:09.060 PM	50	1252_KYZ_Monitor	HS Int. Input	HSI Input 7	
10/27/2014 12:13:00.160 PM	10/27/2014 12:13:00.660 PM	500	1252_KYZ_Monitor	HS Int. Input	HSI Input 1	

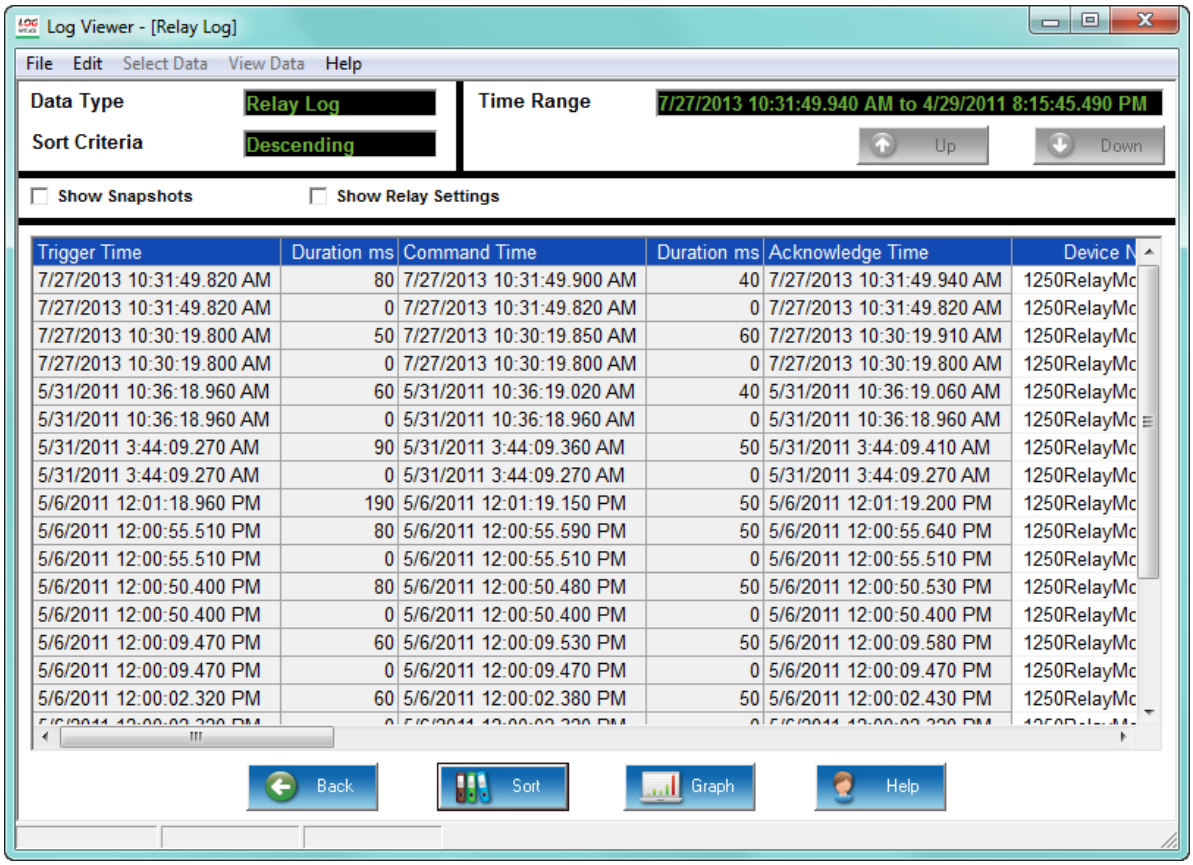
- Usually, if a record being displayed in the grid box has a start date/time and an end date/time, the state being displayed is out of normal state.
- If a record does not show the start time/date or the end date/time, this means that at the time of the log conversion by the Log Converter it could not find the start or end record. This situation can be caused by log roll over and/or other interruptions. Without a start or end record, this will not be a complete record and no duration will be calculated.

NOTE

Module Index 0 refers to HSI Internal Meter Inputs.

19.4.11 Control Output Log (Relays)

The Control Output Log (Relay Log) displays the relay change status for a selected meter file and time range. To view the Control Output Log, click on the Control Output Log button or View Data>Control Output (Relays). You will see the screen shown below.



Trigger Time	Duration ms	Command Time	Duration ms	Acknowledge Time	Device N
7/27/2013 10:31:49.820 AM	80	7/27/2013 10:31:49.900 AM	40	7/27/2013 10:31:49.940 AM	1250RelayMc
7/27/2013 10:31:49.820 AM	0	7/27/2013 10:31:49.820 AM	0	7/27/2013 10:31:49.820 AM	1250RelayMc
7/27/2013 10:30:19.800 AM	50	7/27/2013 10:30:19.850 AM	60	7/27/2013 10:30:19.910 AM	1250RelayMc
7/27/2013 10:30:19.800 AM	0	7/27/2013 10:30:19.800 AM	0	7/27/2013 10:30:19.800 AM	1250RelayMc
5/31/2011 10:36:18.960 AM	60	5/31/2011 10:36:19.020 AM	40	5/31/2011 10:36:19.060 AM	1250RelayMc
5/31/2011 10:36:18.960 AM	0	5/31/2011 10:36:18.960 AM	0	5/31/2011 10:36:18.960 AM	1250RelayMc
5/31/2011 3:44:09.270 AM	90	5/31/2011 3:44:09.360 AM	50	5/31/2011 3:44:09.410 AM	1250RelayMc
5/31/2011 3:44:09.270 AM	0	5/31/2011 3:44:09.270 AM	0	5/31/2011 3:44:09.270 AM	1250RelayMc
5/6/2011 12:01:18.960 PM	190	5/6/2011 12:01:19.150 PM	50	5/6/2011 12:01:19.200 PM	1250RelayMc
5/6/2011 12:00:55.510 PM	80	5/6/2011 12:00:55.590 PM	50	5/6/2011 12:00:55.640 PM	1250RelayMc
5/6/2011 12:00:55.510 PM	0	5/6/2011 12:00:55.510 PM	0	5/6/2011 12:00:55.510 PM	1250RelayMc
5/6/2011 12:00:50.400 PM	80	5/6/2011 12:00:50.480 PM	50	5/6/2011 12:00:50.530 PM	1250RelayMc
5/6/2011 12:00:50.400 PM	0	5/6/2011 12:00:50.400 PM	0	5/6/2011 12:00:50.400 PM	1250RelayMc
5/6/2011 12:00:09.470 PM	60	5/6/2011 12:00:09.530 PM	50	5/6/2011 12:00:09.580 PM	1250RelayMc
5/6/2011 12:00:09.470 PM	0	5/6/2011 12:00:09.470 PM	0	5/6/2011 12:00:09.470 PM	1250RelayMc
5/6/2011 12:00:02.320 PM	60	5/6/2011 12:00:02.380 PM	50	5/6/2011 12:00:02.430 PM	1250RelayMc

There are three stages in the relay process:

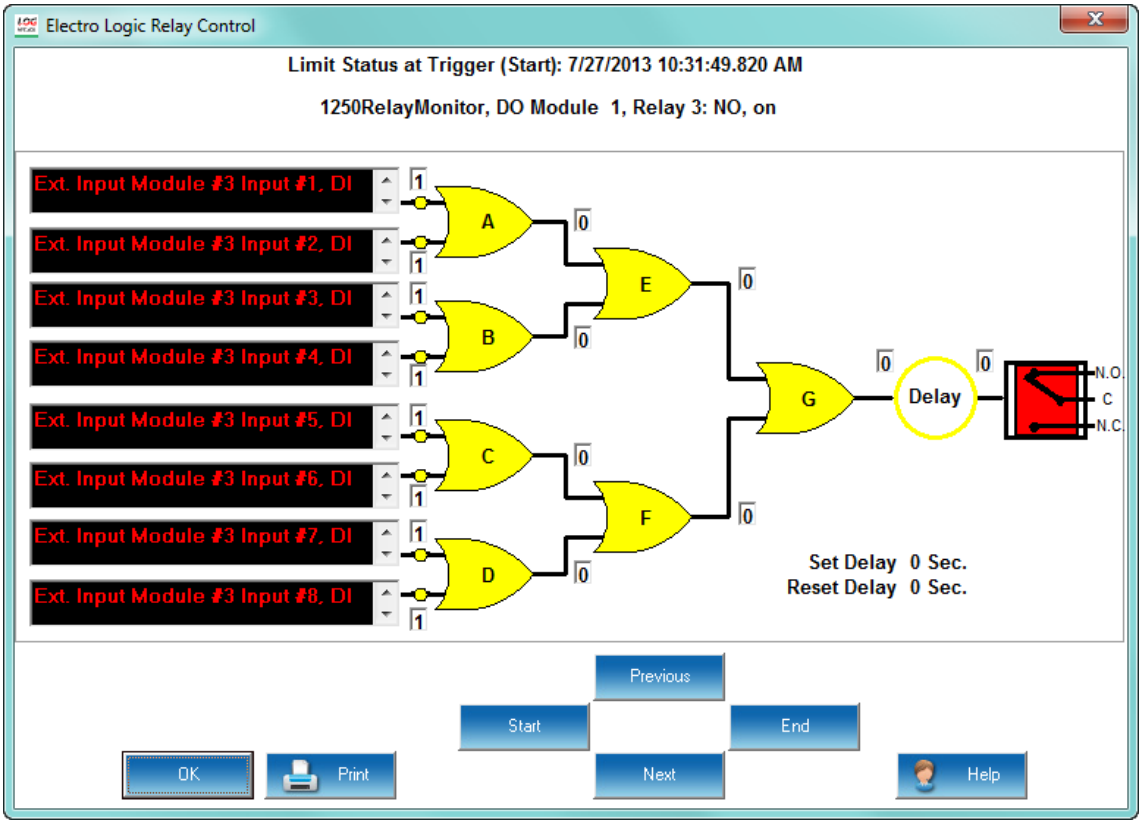
- Stage 1 = Trigger - the change relay state process starts.
- Stage 2 = Command - a meter responds to the change relay request and sends out the change relay command to the relay device.
- Stage 3 = Acknowledgment - the meter gets a response back from the relay device.

A complete record should have all three stages' date/time stamp. The Start State is the relay state at the time of the Trigger. The End State is the relay state at Stage 3 or the Acknowledgment Stage. There are several reasons for incomplete records:

- At the time of the log conversion process, if the Log Converter cannot find the Stage 1 record (which can be caused by log rollover), the Trigger date/time and the Start State will not be displayed.
- At the time of log conversion, if the Log Converter cannot find the Stage 1 record, the Inputs, Gates and the Relay Start State will not be displayed.
- If the Log Converter program cannot find the Stage 2 record, the Command date/time will not be displayed.

- If the Log Converter cannot find the Stage 3 record, the Acknowledgment date/ time and End State will not be displayed and the appropriate duration will not be calculated.
- If any one stage is missing, the appropriate duration will not be calculated.

To view the ElectroLogic™ Graph, click on an event and click the Graph button. You will see the following screen.

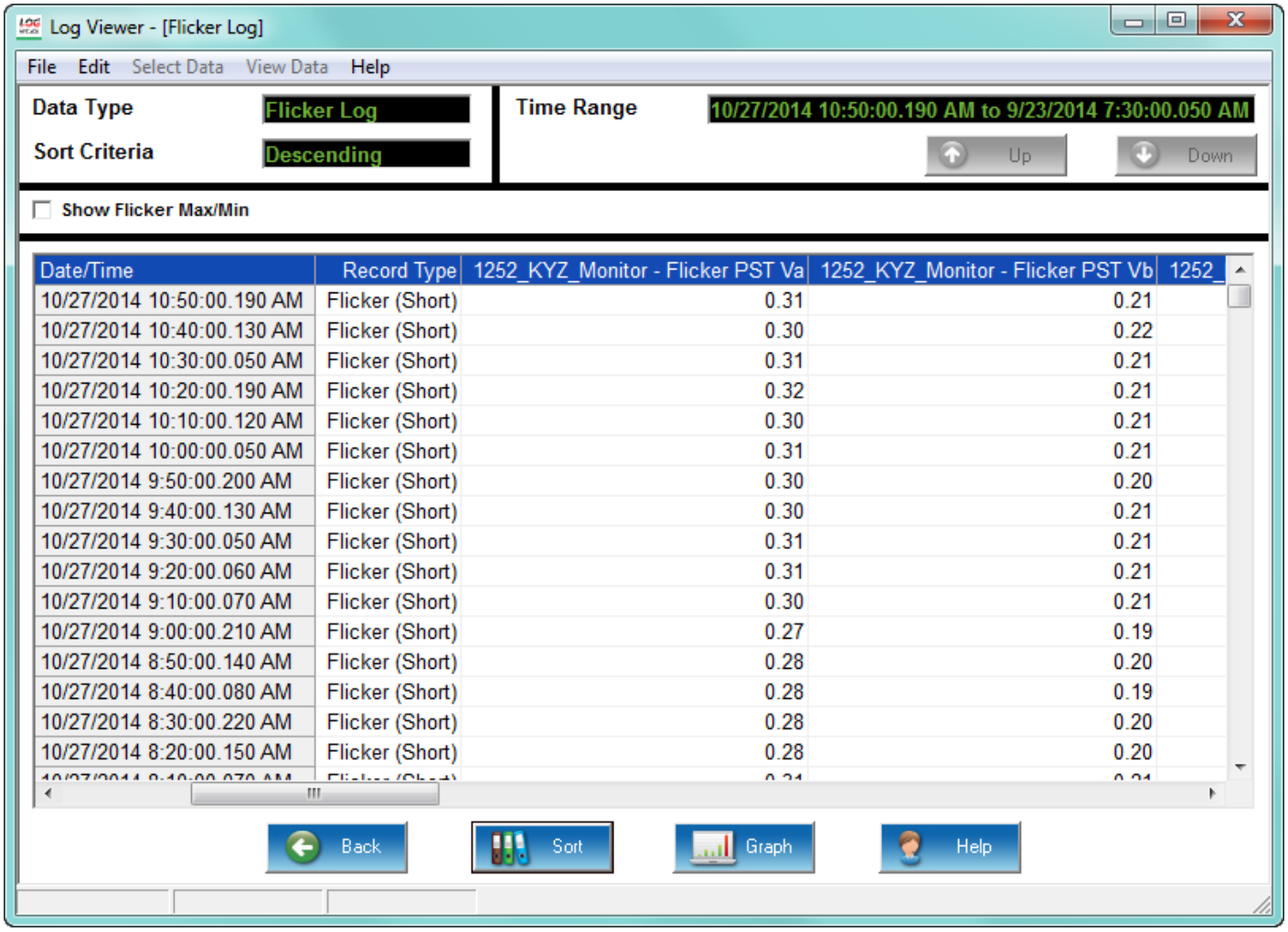


The key functions of the ElectroLogic™ Graph are:

- **Previous** - click to see the previous Relay record.
- **Next** - click to see the next Relay record.
- **Start** - click to see the current Relay's Start state (as shown above).
- **End** - click to see the current Relay's End state.
- **Print** - click to send the screen to the connected printer.

19.4.12 Flicker Log

From the Log Viewer's main screen, click on the Flicker button or **View Data > Flicker**. You will see the screen shown below.



Date/Time	Record Type	1252_KYZ_Monitor - Flicker PST Va	1252_KYZ_Monitor - Flicker PST Vb	1252_
10/27/2014 10:50:00.190 AM	Flicker (Short)	0.31	0.21	
10/27/2014 10:40:00.130 AM	Flicker (Short)	0.30	0.22	
10/27/2014 10:30:00.050 AM	Flicker (Short)	0.31	0.21	
10/27/2014 10:20:00.190 AM	Flicker (Short)	0.32	0.21	
10/27/2014 10:10:00.120 AM	Flicker (Short)	0.30	0.21	
10/27/2014 10:00:00.050 AM	Flicker (Short)	0.31	0.21	
10/27/2014 9:50:00.200 AM	Flicker (Short)	0.30	0.20	
10/27/2014 9:40:00.130 AM	Flicker (Short)	0.30	0.21	
10/27/2014 9:30:00.050 AM	Flicker (Short)	0.31	0.21	
10/27/2014 9:20:00.060 AM	Flicker (Short)	0.31	0.21	
10/27/2014 9:10:00.070 AM	Flicker (Short)	0.30	0.21	
10/27/2014 9:00:00.210 AM	Flicker (Short)	0.27	0.19	
10/27/2014 8:50:00.140 AM	Flicker (Short)	0.28	0.20	
10/27/2014 8:40:00.080 AM	Flicker (Short)	0.28	0.19	
10/27/2014 8:30:00.220 AM	Flicker (Short)	0.28	0.20	
10/27/2014 8:20:00.150 AM	Flicker (Short)	0.28	0.20	

- Click the **Show Flicker Max/Min** box on the left side of the screen to display Max/Min information.
- Parameters available for graphing are: PST Va, Vb, Vc and PLT Va, Vb, Vc.
- To copy data to the computer's clipboard, right-click with the cursor positioned anywhere in the table.
- To sort the data by record type in either ascending or descending order, click on the **Sort** button and use the pull-down menus to make your selection.

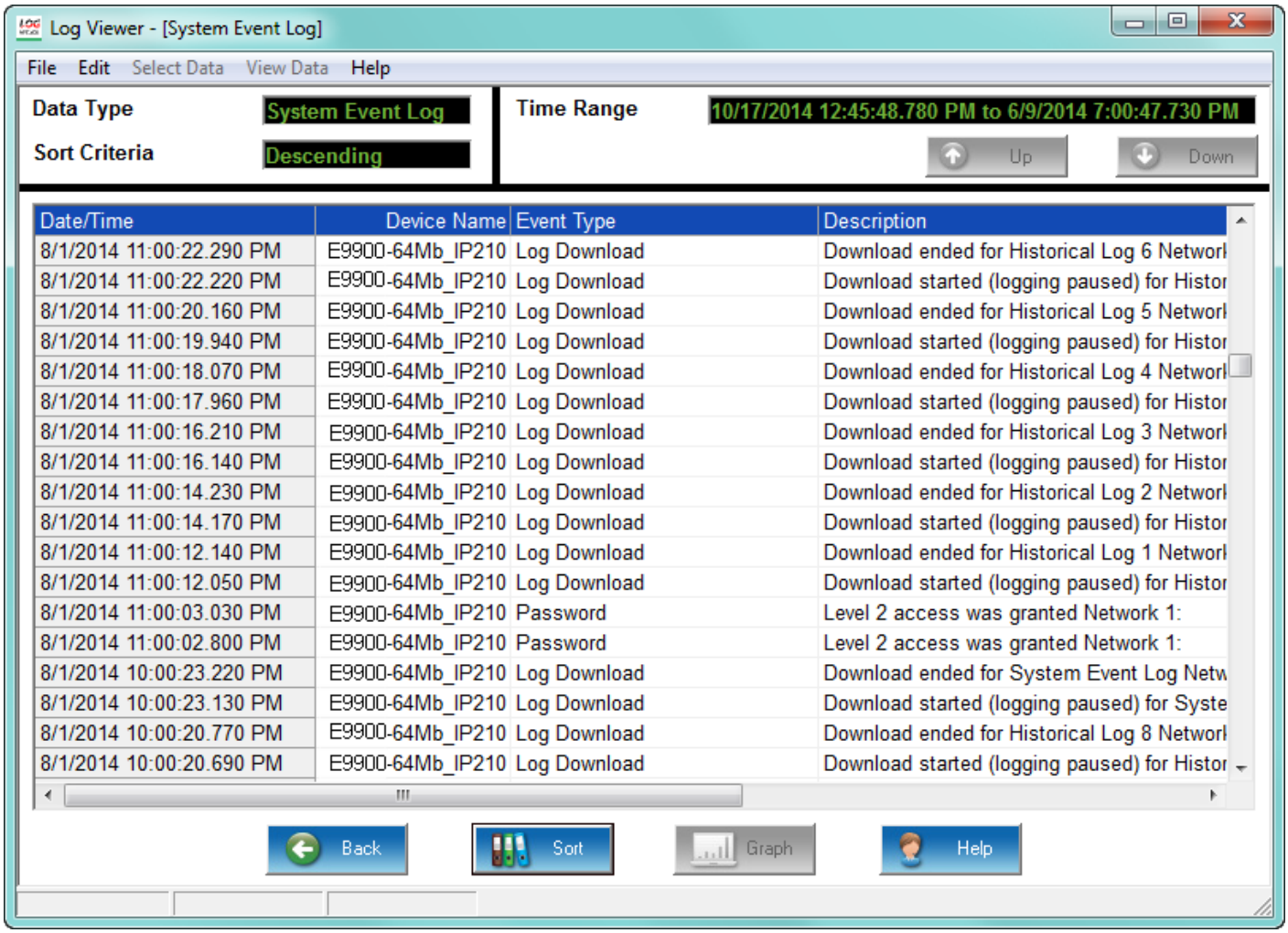
19.4.13 System Event Log

The System Event Log records and time stamps a variety of events, including the following:

- Download started or ended for System Events, Historical Logs, Flicker Log
- Run Time is active, started or stopped

- Firmware has been changed

To view the System Event log, click the System events button or **View Data > System Events**. You will see the screen shown below..



Date/Time	Device Name	Event Type	Description
8/1/2014 11:00:22.290 PM	E9900-64Mb_IP210	Log Download	Download ended for Historical Log 6 Networl
8/1/2014 11:00:22.220 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Histor
8/1/2014 11:00:20.160 PM	E9900-64Mb_IP210	Log Download	Download ended for Historical Log 5 Networl
8/1/2014 11:00:19.940 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Histor
8/1/2014 11:00:18.070 PM	E9900-64Mb_IP210	Log Download	Download ended for Historical Log 4 Networl
8/1/2014 11:00:17.960 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Histor
8/1/2014 11:00:16.210 PM	E9900-64Mb_IP210	Log Download	Download ended for Historical Log 3 Networl
8/1/2014 11:00:16.140 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Histor
8/1/2014 11:00:14.230 PM	E9900-64Mb_IP210	Log Download	Download ended for Historical Log 2 Networl
8/1/2014 11:00:14.170 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Histor
8/1/2014 11:00:12.140 PM	E9900-64Mb_IP210	Log Download	Download ended for Historical Log 1 Networl
8/1/2014 11:00:12.050 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Histor
8/1/2014 11:00:03.030 PM	E9900-64Mb_IP210	Password	Level 2 access was granted Network 1:
8/1/2014 11:00:02.800 PM	E9900-64Mb_IP210	Password	Level 2 access was granted Network 1:
8/1/2014 10:00:23.220 PM	E9900-64Mb_IP210	Log Download	Download ended for System Event Log Netw
8/1/2014 10:00:23.130 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Syste
8/1/2014 10:00:20.770 PM	E9900-64Mb_IP210	Log Download	Download ended for Historical Log 8 Networl
8/1/2014 10:00:20.690 PM	E9900-64Mb_IP210	Log Download	Download started (logging paused) for Histor

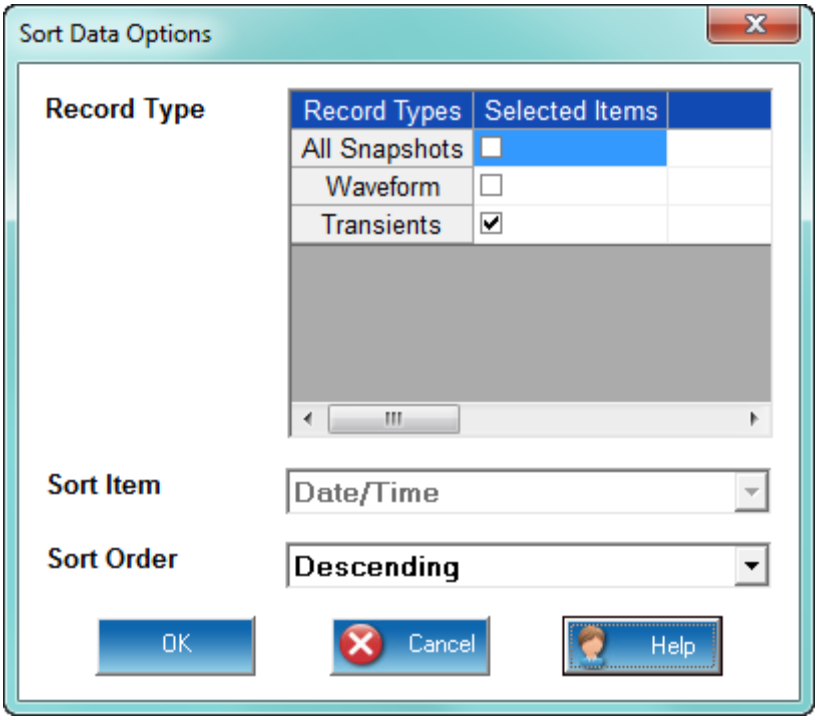
19.4.14 EN 50160/IEC 61000-4-30

When you click Graph you will see a message as the report is being processed, and then a PDF file of the report will open on your PC. To see a sample copy of the EN50160 Report, see Chapter 23 “EN 50160 / IEC 61000-4-30 Power Quality Analysis”.

19.4.15 Transient Log

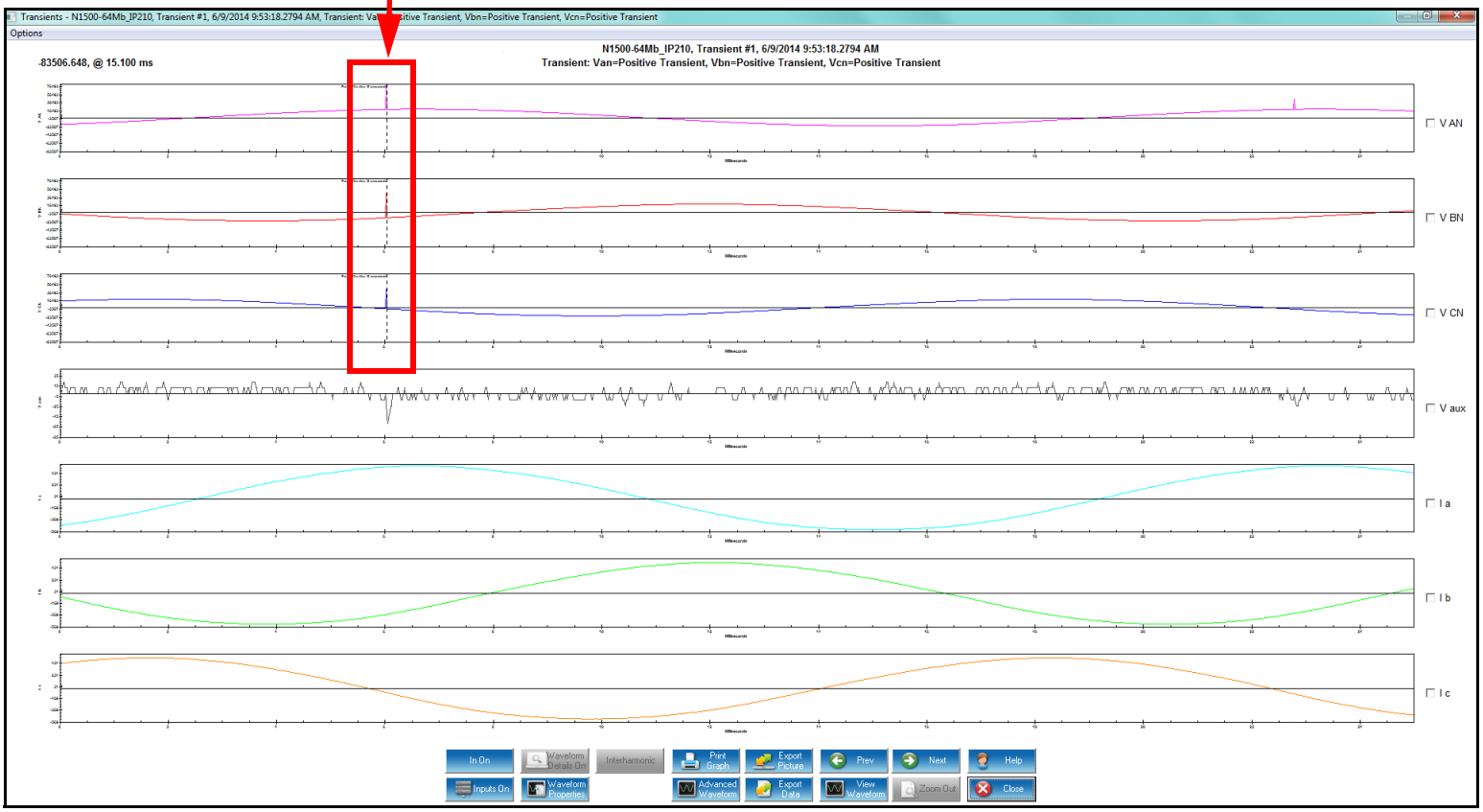
Transients are voltage spikes that lasts less than one cycle. A Transient can be either “impulsive,” i.e., a single, high impulse event, such as that caused by a lightning strike, or “oscillatory,” i.e., oscillating at the natural system frequency and dying down within a cycle. Oscillatory transients (also known as switching transients) can occur when an inductive or capacitive load, such as a motor or capacitor bank, is turned off. Since transients can damage equipment, it is important to measure and analyze them.

To view the Transient log data, click the Waveform button or click **View Data > Waveform**. You will see the screen shown in "Viewing the Waveform Log" on page 19-34. This screen lists both Waveform and Transient events. (The transient events say "Positive Transient" or "Negative Transient" in the Waveform Trigger field.) You can choose to see only transients records, by clicking the Sort button and clicking the Transients box. See the screen shown below.

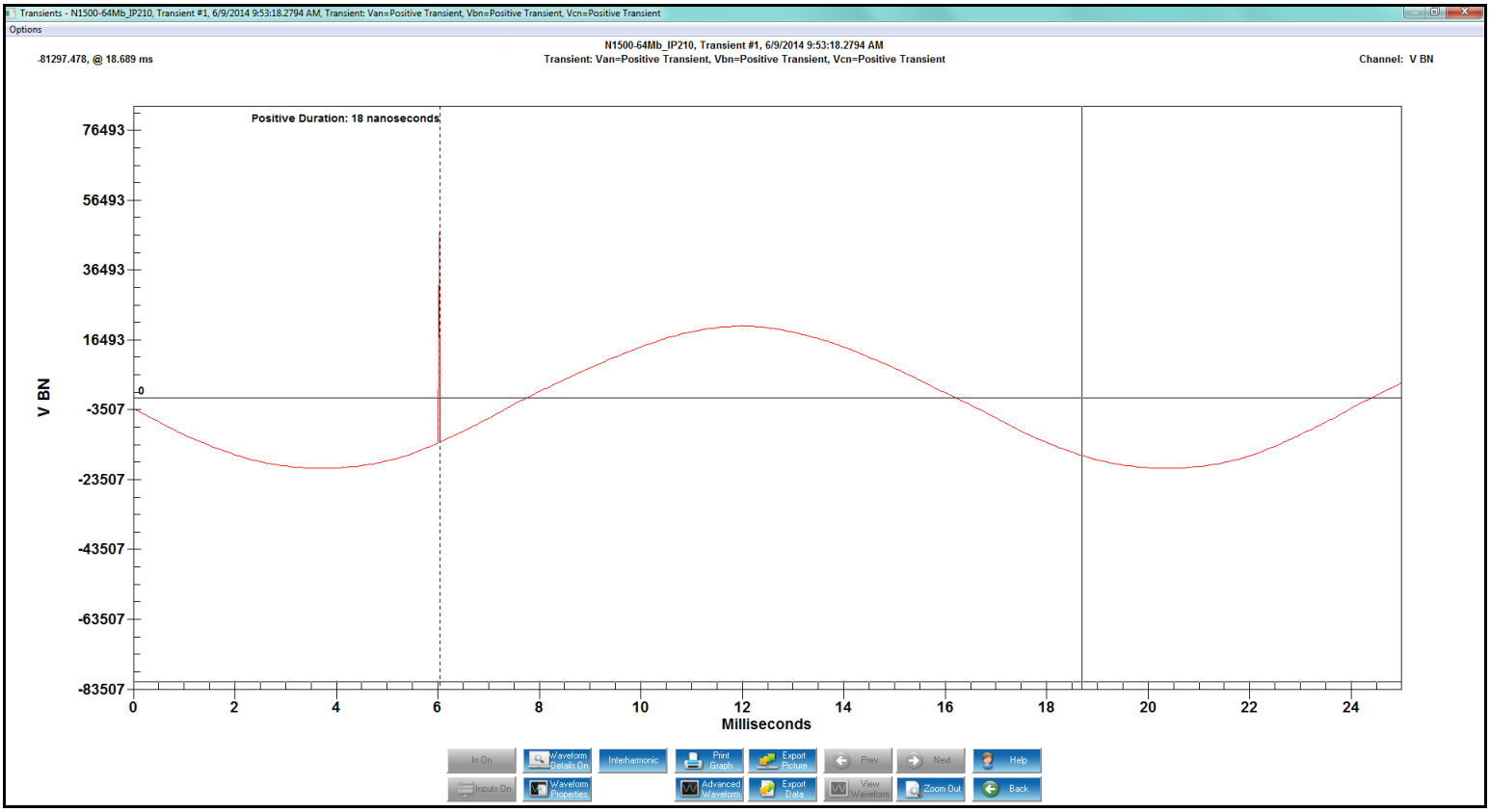


To view a Transient graph, click on one of the Transient records and click **Graph**. See the example screen below.

Transient Spike in VAN, VBN, VCN



Double-click on one of the transients to see the detailed screen shown below. Refer to "Waveform Graphs" on page 19-16 for details on the graph options.



19.4.16 Energy Aggregator Dashboard

You can access the usage dashboard viewer of the GE Energy Aggregator energy management, analysis, reporting, and billing software by clicking the Energy Aggregator button. See the *GE Energy Aggregator Instruction Manual* for details on the application.

GE Communicator

Chapter 20: Other Functions and Screens

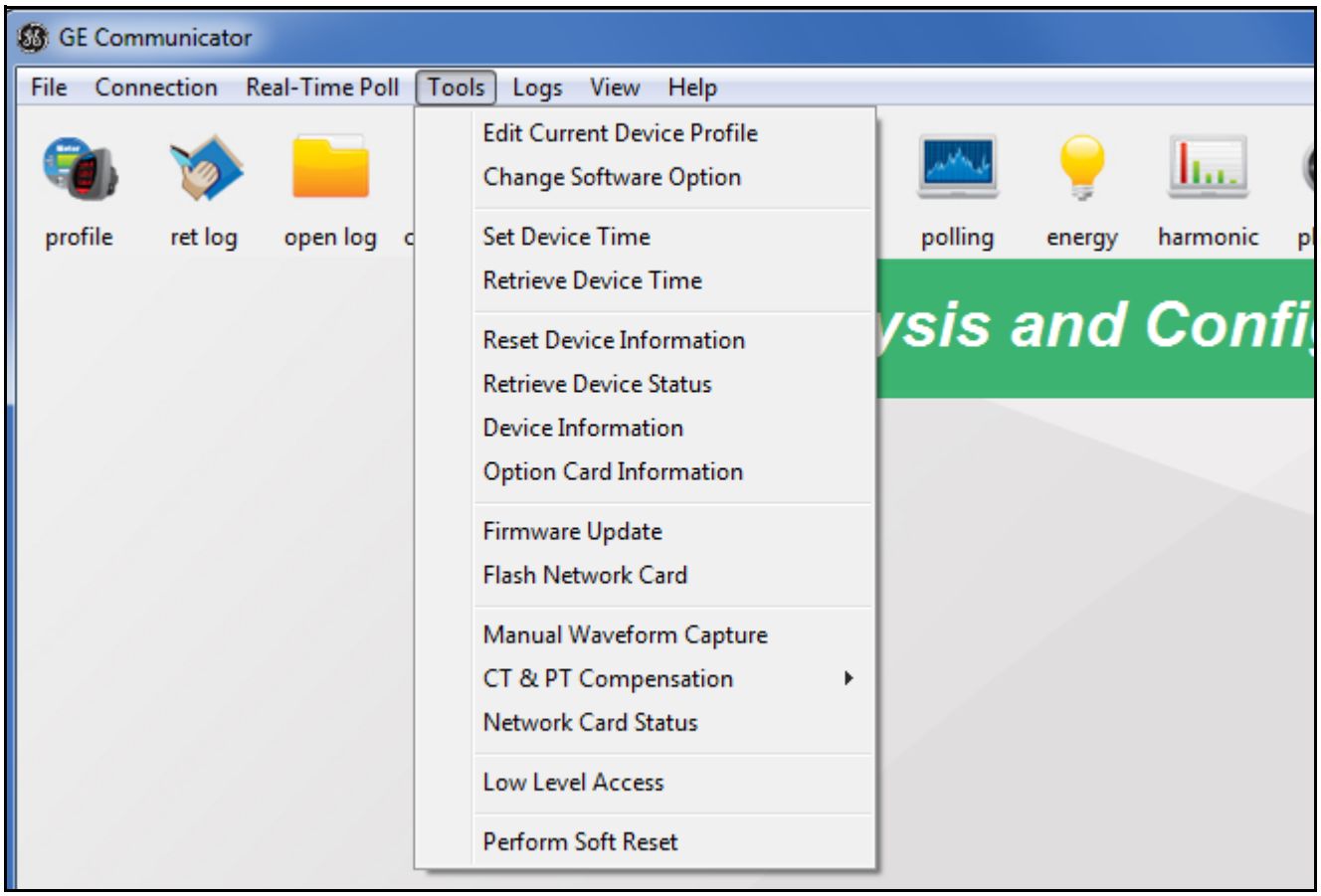
This chapter explains how to use the Tools Menu options, the Options screen, and other GE Communicator software features. The Tools section of the software provides a series of settings and features that enable a user to perform a variety of functions and commands in the meters. The features include setting device time, upgrading firmware, and many other functions. The Options screen lets you change the application's language, among other features.

NOTE

Most of the example screens in this chapter are from a meter with the maximum Software Option - not all features are available at lower level Software Options.

20.1 Tools Menu

The Tools Menu, available from the Main Screen Menu Bar, gives you access to additional software features. Not all meters have the same Tools Menu options. See the examples below, from an EPM 7000 meter.



The following sections explain the options and, where applicable, how they differ between meters. Note that some of the Tools menu options are explained in other chapters of this manual:

- Passwords are explained in Chapter 6 “Meter Security”.
- Firmware Update is explained in Chapter 25 “Flash Updating”.
- Flash Network Card is explained in 25.2.1 *Flash Update the Internal Network Card*.

20.1.1 Edit Current Device Profile

The first Tools Menu item for all of the meters is Edit Current Device Profile. It performs the same action as clicking the Profile icon - opens the Device Profile screen for the currently connected meter, allowing you to configure programmable settings for the meter. See Chapter 7 “Device Profile” for more information on the Device Profile screen.

The EPM 9800 meter has an additional Tools Menu option:

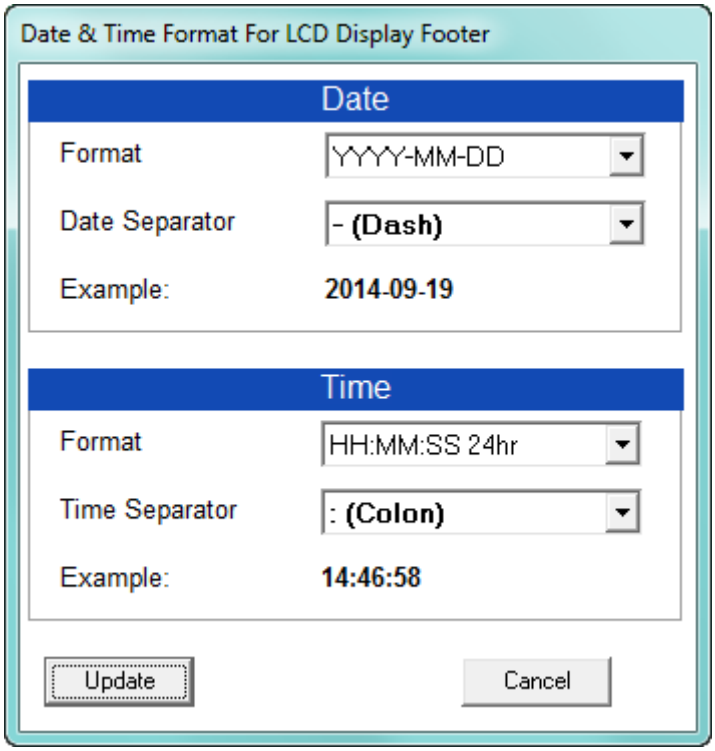
Tools > Edit Current Device Profile (Without the LCD Programmable Settings), which lets you load the meter’s Device Profile without loading the LCD display’s programmable settings, which can take a while to load. This gives you the option of opening the Device Profile more quickly, if you do not need to make changes to the display’s settings, or if you would rather make those changes separately from the rest of the Device Profile. See the next section for instructions on programming the display separately.

20.1.2 Edit LCD Programmable Settings

This option lets you set up a meter's on-board display. The specific fields and programming you perform depend on the meter type.

1. From the Menu Bar, select **Tools > Edit LCD Programmable Settings**.

   If you are connected to EPM 9900/9900P meter, you will see the screen shown below. It lets you customize the time and date presentation for the meter's touch-screen display.



- Use the pull-down menus to select the date and time format you want to display on the touch-screen display. The example fields change to show you what your selections will look like.
- Click the Update button to implement your selections and exit the screen; click Cancel to exit the screen without making any changes.

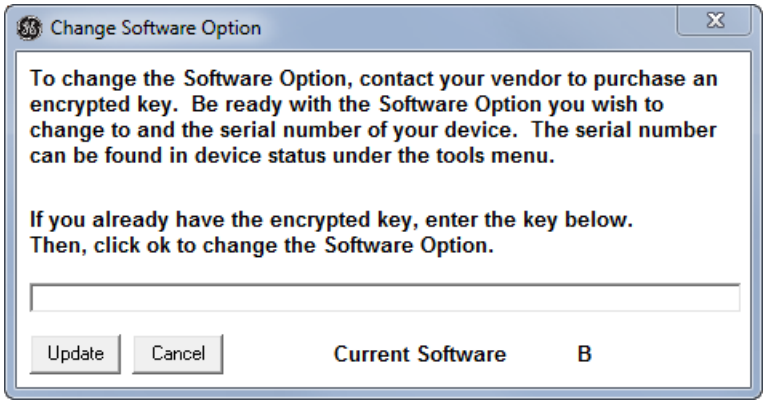
If you are connected to an EPM 9800 meter, this option will open the same screen you see when you select **Revenue and Energy Settings > Display Configuration** from the meter's Device Profile screen. See 12.2.4 *Display Configuration*, for instructions on programming the screen, which has extensive capabilities and options. This feature lets you program the LCD display separately from the rest of the Device Profile.

20.1.3 Change Software Option

GE's EPM 9900/9900P, EPM 9450/9650, EPM 7000/7000P, EPM 2200 meter, EPM 6000, and EPM 6100 meters offer Software Option upgrade. This feature allows the meter to be upgraded to more advanced functionality, in the field, without needing to be removed from installation. The specific features and the specific Software Option levels differ for the different meter types. Refer to the Installation and Operation manual for your meter for information.

All of the meters that support Software Options use the same screen to update the key.

- For the meters other than the EPM 2200/6000/6100 meter, click **Tools > Change Software Option** to open the screen.
- For the EPM 2200/6000/6100 meter, click the Software Option button in the meter Device Profile screen, System Settings tab (see 9.1.4 *Configuring Settings*).



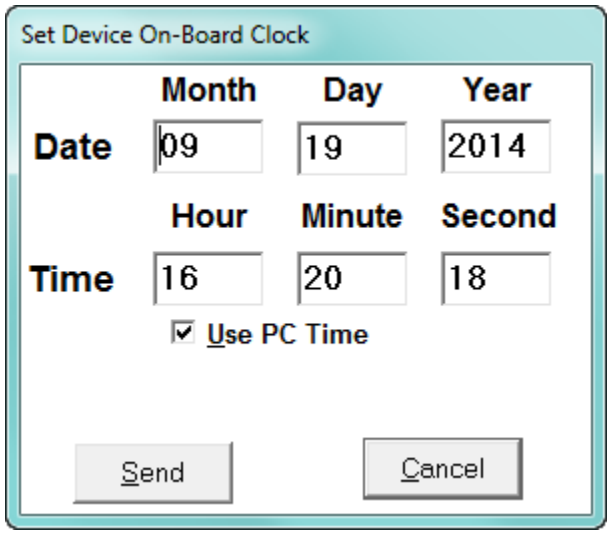
a. As explained in the screen, you need to contact GE with your meter serial number, the letter of the Software Option upgrade you want, and payment. You will be given a Software Option key. (See your meter Instruction Manual for detailed instructions.)

b. Enter the Software Option key in the screen and click Update. You will see a message when the meter has been updated with the new Software Option.

20.1.4 Set Device Time

The meters that support logging use an on-board clock for time stamping any logs being recorded. If you do not have the meter set to line frequency time synchronization, IRIG-B, or SNTP the meter's time is being controlled by its internal crystal. Different meters differ in terms of drift, but typically meters with 20 ppm crystals will drift 30 seconds per month when set to internal crystal. You may want to use this feature to reset the meter's time if it drifts too far from actual time. Please refer to the specific meter specification for actual clock ratings.

1. From the Main screen's Menu Bar, select **Tools > Set Device Time**. You will see the screen shown below.



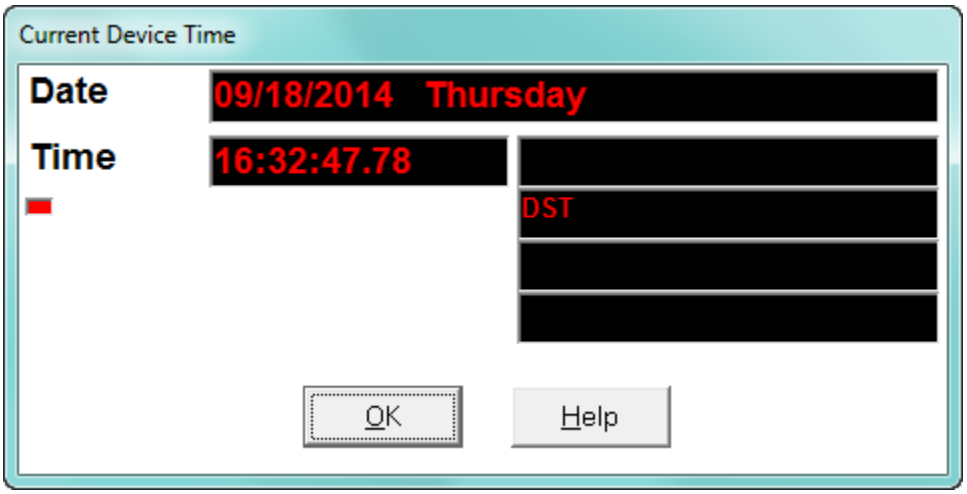
- To synchronize the meter and your computer, leave the Use PC Time box checked.
- o set the date and time independently from the PC, de-select the Use PC Time box and enter the time and date settings.

2. Click the **Send** button to update the meter's time settings and exit the screen; click Cancel to exit the screen without making any changes.

20.1.5 Retrieve Device Time

To retrieve the meter's current time and date settings:

1. From the Main screen's Menu Bar, select **Tools > Retrieve Device Time**. You will see the screen shown below. Date and running time display in the LEDs.



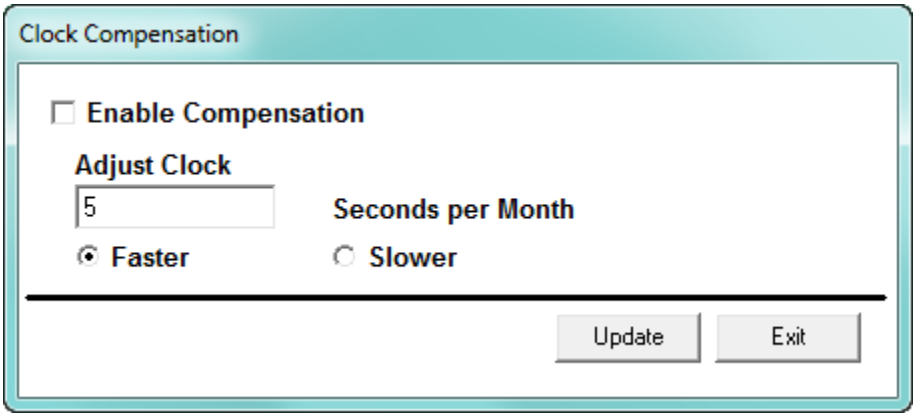
- If IRIG-B is enabled for your meter, IRIG-B is displayed next to the time.
- If Line Frequency Clock Synchronization is enabled for your meter, LINE SYNC is displayed next to the time.
- If Daylight Savings Time is active, DST is displayed next to the time.
- If Cold Load Pickup is active, Active Cold Load is displayed next to the time.

2. Click **OK** to exit the screen.

20.1.6 Set Clock Compensation (EPM 9450/9650/9800 Meters)

EPM 9450/9640/9800 series meters have a feature that allows a user to manually trim the internal clock timing. The feature allows the user to determine what the meter's actual monthly error is and compensate for it by adding or subtracting those seconds into the time. This feature will trim the clock but is not the preferred meter for improving timing accuracy. The more traditional time frequency line synchronization will work better in jurisdictions with controlled frequency.

From the Main screen's Menu Bar, select **Tools > Set Clock Compensation** to set the meter's clock to be faster or slower. You will see the screen shown below.



a. Click the box next to Enable Compensation.

b. Enter the number of seconds per month you want the time adjusted.

c. Click the **Faster** or **Slower** button.

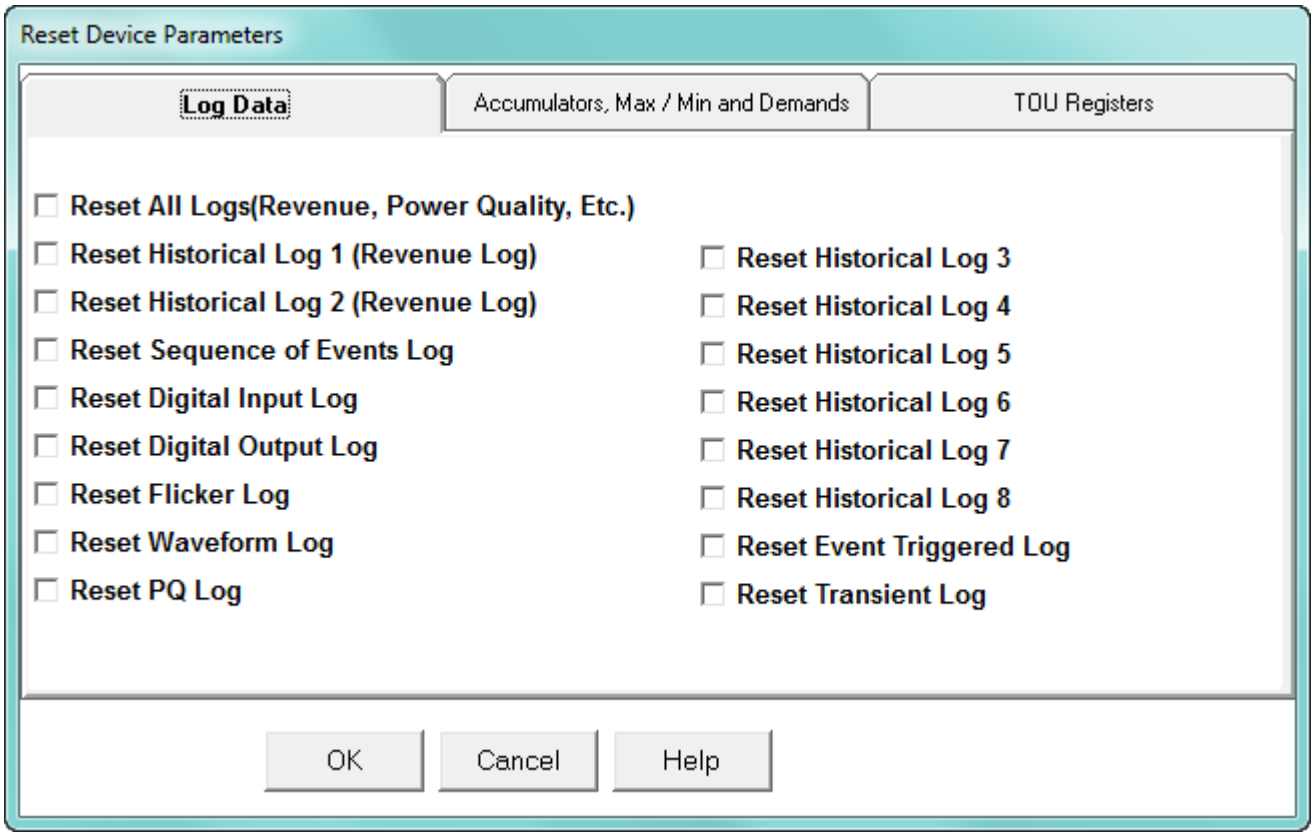
d. Click **Update** to save the setting.

20.1.7 Reset Device Information

This feature lets you reset logs, accumulators, and TOU data. The options your meter has determine the exact data you can reset.

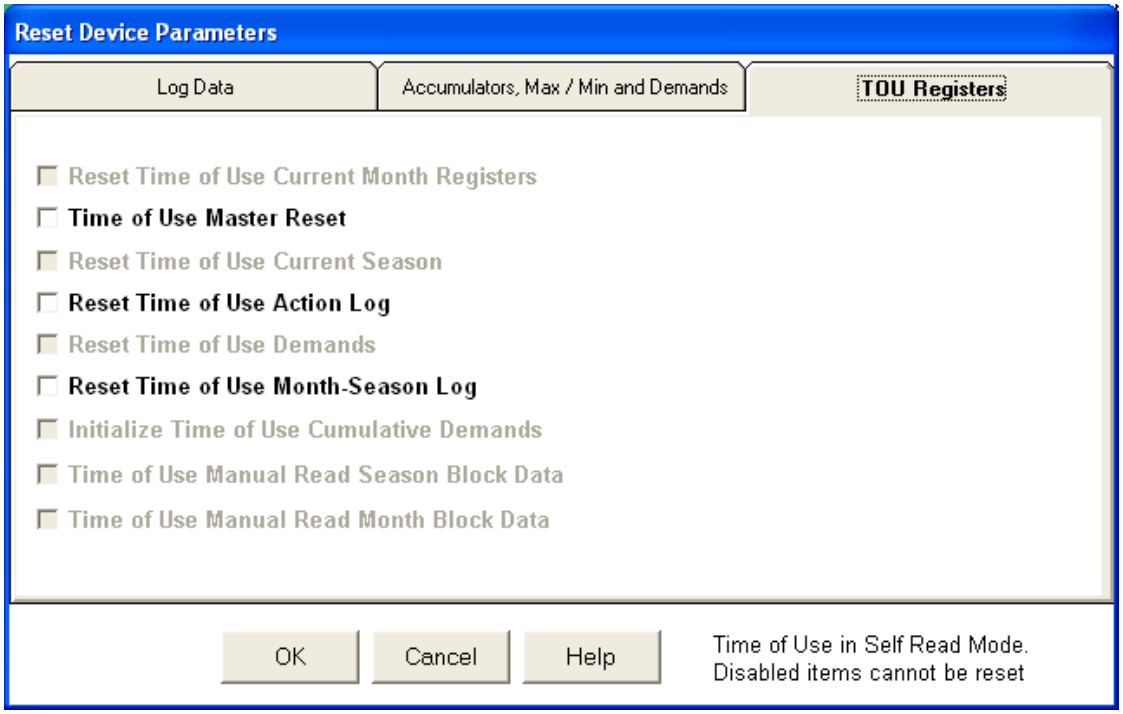
This feature will normally be disabled under password control. Resetting the parameters is not reversible so be careful not to reset energy or log data before saving the readings elsewhere.

1. From the Main screen's Menu Bar, select **Tools > Reset Device Information**. The screen you see depends on the meter type you are connected to.
   - The screen below is from an EPM 9900/9900P meter. The screen for the other EPM meters is the same, except that there are less logs to rest.



- This screen has three tabs. The Log Data Reset screen is shown above.
- Click the tabs to view the Accumulators, Max/Min, and Demands screen and the TOU Registers screen.
- If updating a 9900P meter with firmware version 15.2, first reset the PQ log.

For EPM 9900P meter that is running TOU in Self Read mode, there are restrictions on what can be reset from the TOU tab. See the screen below.



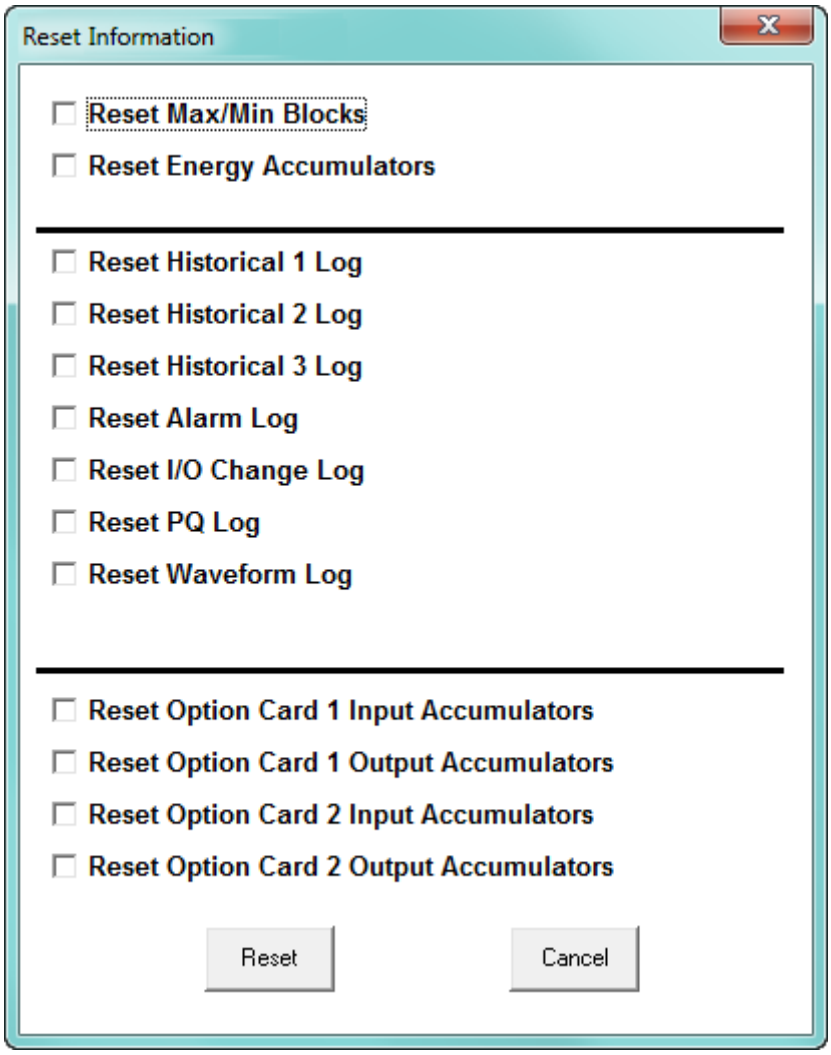
- None of the disabled/grayed out items can be reset individually when the EPM 9900P meter is in TOU Self Read mode.
- The TOU Master Reset option will reset all current and prior TOU data, meter Max/Min values, meter energy values, meter pulse accumulation values, and meter cumulative demand values. It should **only** be used in either of the two following conditions: 1. Meter initial deployment with new meter profile and/or new TOU profile; 2. Updates to meter profile and/or TOU profile which may affect the TOU readings, for example, meter scaled energy format changes, Demand Type change, access of TOU data via DNP with DNP scaling changes, or Pulse accumulation setup changes.

NOTE

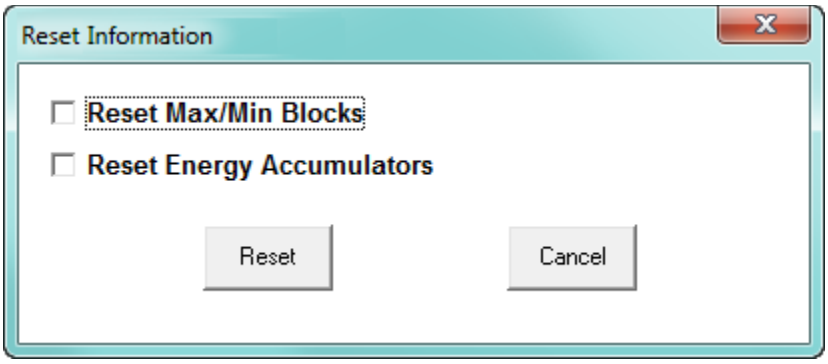
IMPORTANT! The user should back up all existing meter data before performing this reset operation.
Note that this reset command is only available under the meter's Level 2 password access, if meter security is enabled.

See 15.3 *EPM 9700/9900P/7000P TOU Settings*, for additional information on TOU for the EPM9900P meter.

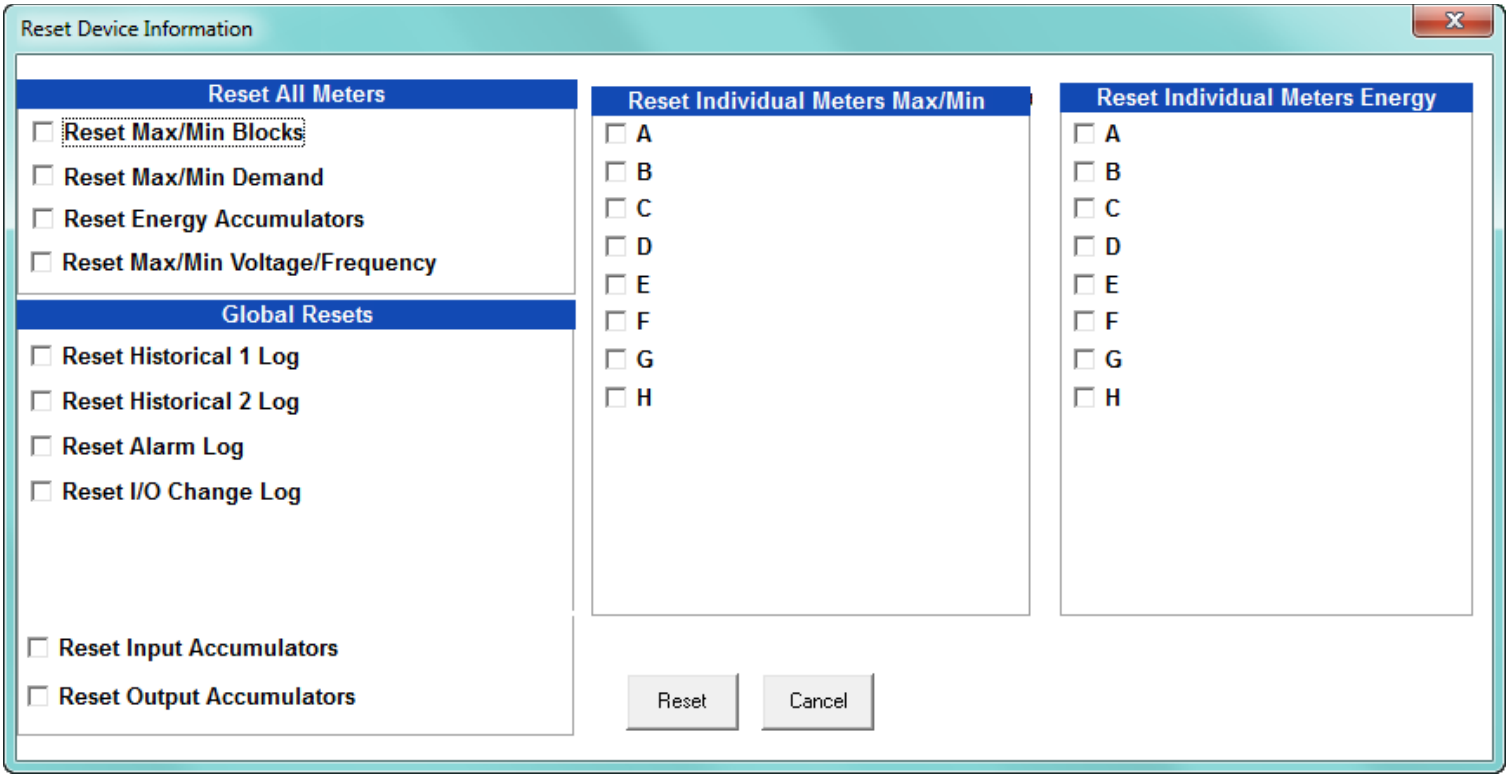
The screen below is from an EPM 7000 meter.



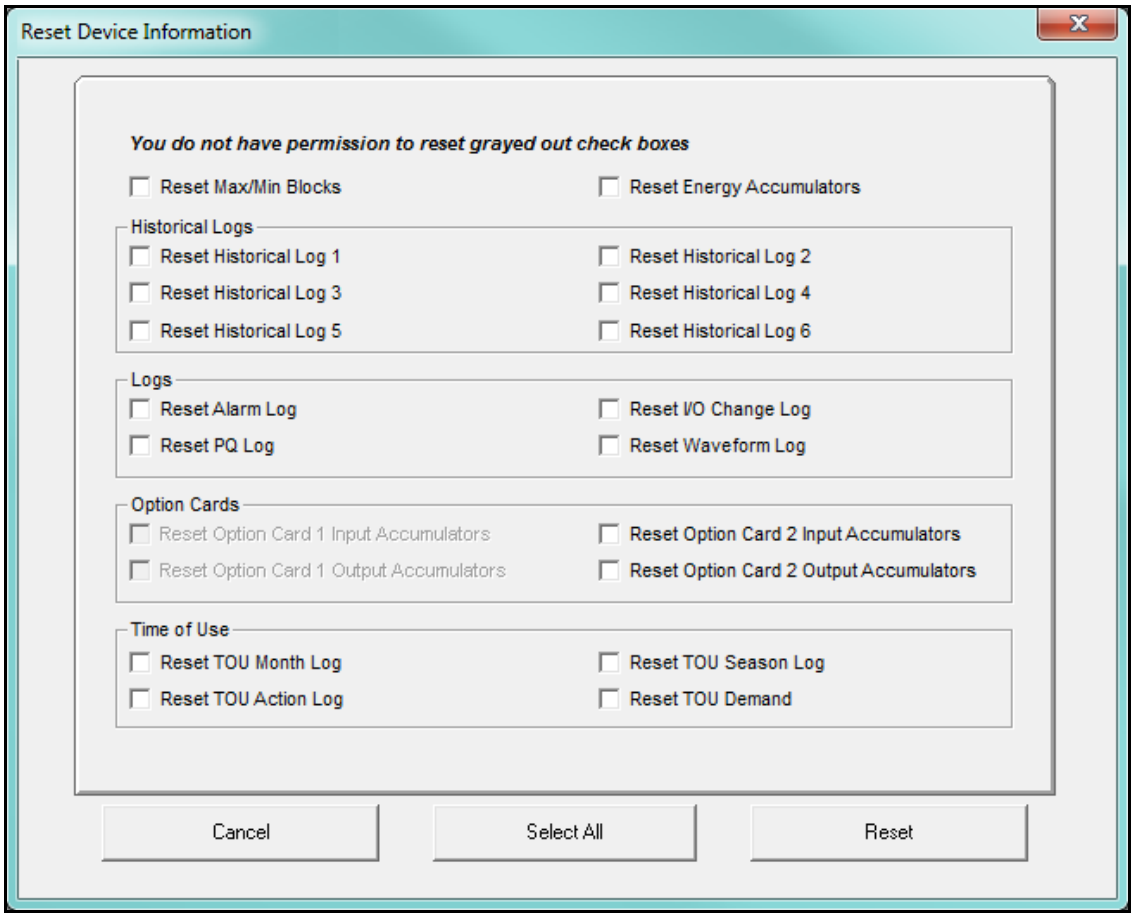
The screen below is from an EPM 6000 meter.



The screen below is from an EPM 4600-T meter. The screen for the EPM 4600-S meter is very similar, except that there are 24 individual meters that can be reset for Max/Min and/or Energy.



The screen below is from an EPM 7000P meter.



2. For any of the Reset screens, click on the box(es) beside the value(s) you want to reset.
3. Click **OK** (EPM 9000 series meters) or **Reset** to process your selections and exit the screen; click Cancel to exit the screen without making any selections.
4. For each box you select, a message window opens, telling you the reset is complete. Click **OK** to close the message window(s).

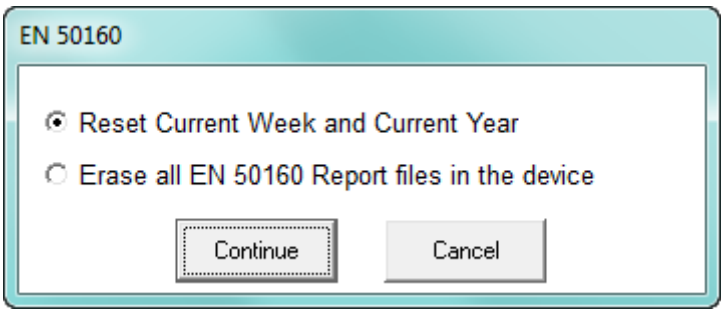
NOTE

- The screen options you see may vary depending on your meter's software option.
- For the EPM 7000 meter, when installing a Pulse Output/Digital Input card or a Relay Output/Digital Input Card, we recommend you reset the accumulators for the card, in order to prevent erroneous counts.
- This feature requires a Password if Password for Reset is enabled in the meter. See Chapter 6 "Meter Security" for more information on passwords.
- For the EPM 4600 metering system, you can perform a reset for all of the meters or individual meters.

20.1.8 Reset EN 50160/IEC 61000-4-30 Information (EPM 9000 series Meters)

Use this feature to reset the EN 50160/IEC 61000-4-30 counters and accumulators for the current period.

1. From the Main screen's Menu Bar, select **Tools > Reset EN50160/IEC61000-4-30 Information**. You will see the message window below.

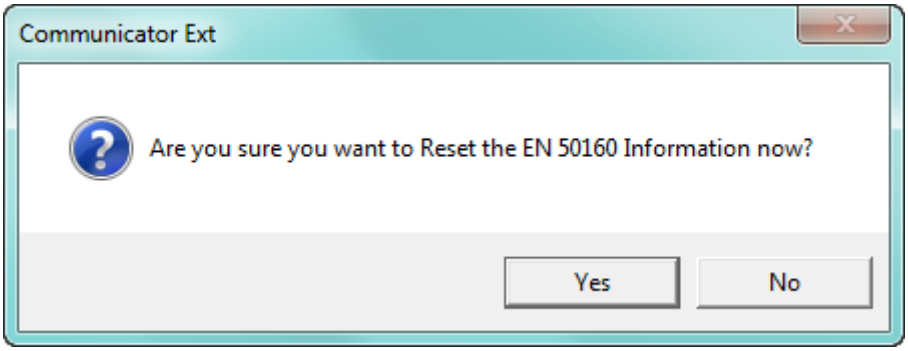


2. Select the option you want: to reset the current week and year data, or to erase all of the EN 50160 report files in the meter.

NOTE

IMPORTANT! Exercise care as with the other reset options. Be sure you select the correct option and/or make sure the data is backed up somewhere if there is the possibility you will need it again.

3. You will see a message window asking if you are sure you want to perform the reset.



4. Click either:
   - **Yes** - to perform the reset
   - **No** - to close the message window without resetting the information.

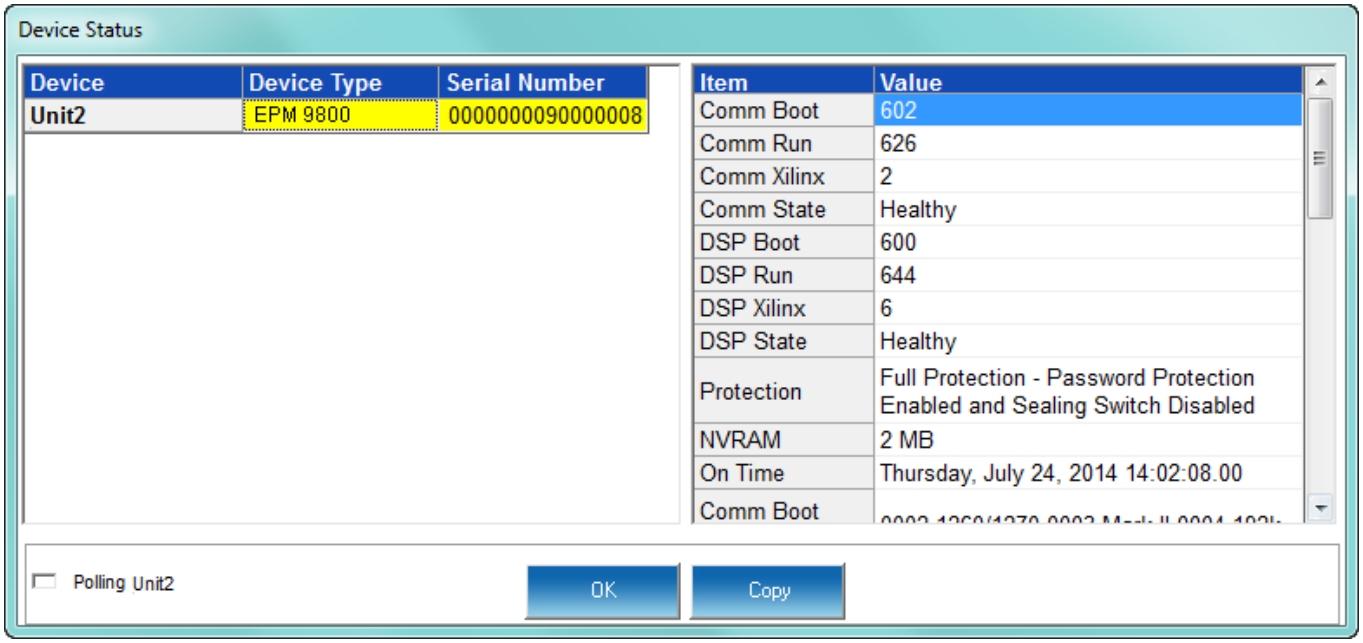
20.1.9 Retrieve Device Status

This option opens the Device Status screen for your meter. See Chapter 4 "Viewing Device Status" for information on the Device Status screens.

20.1.10 Device Information

For the EPM 9900/9900P meter, the EPM 2200/6000 series/7000 series meters, and the EPM 4600 metering system, this option performs the same action as the **Retrieve Device Status** option.

For the EPM 9450/9650/9800 meters, from the Main screen's Menu Bar, select **Tools > Device Information** to see the screen shown below. This is an example from an EPM 9650 meter



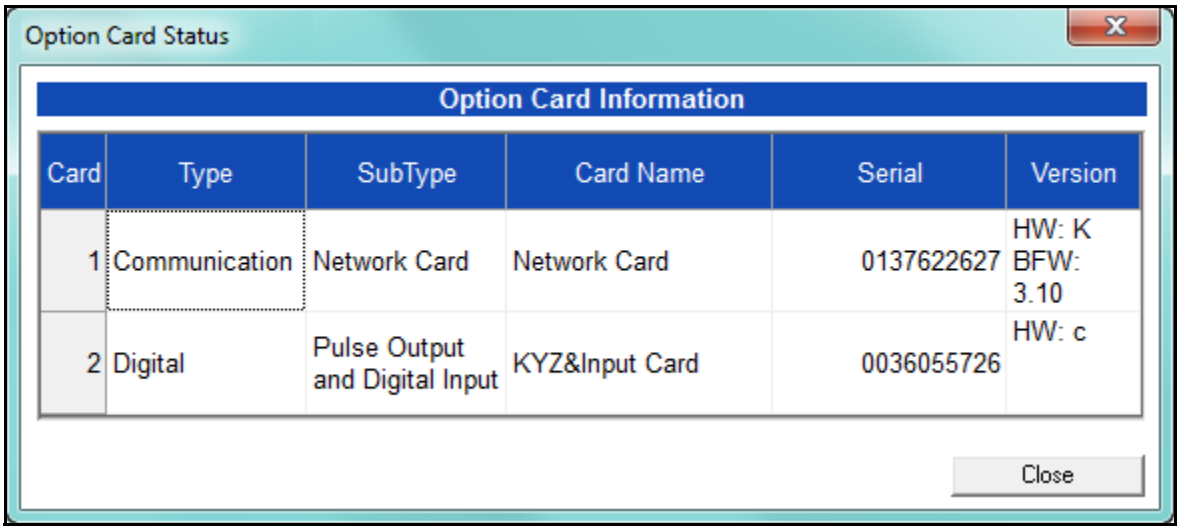
This screen is the same as the newer Device Status screen. It contains information concerning the versions of the meter's firmware and other, related information.

20.1.11 Option Card Information/Board Information/I/O Board Status

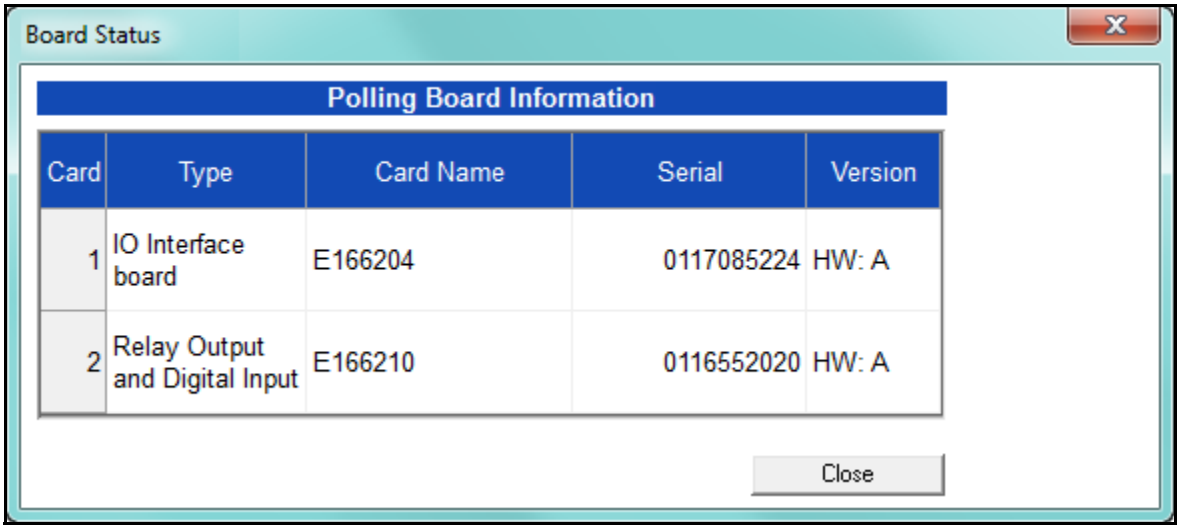
The EPM 9900/9900P meter, EPM 7000 meter, and EPM 4600 metering system have optional or embedded I/O cards and boards. This option lets you view status information for the cards/boards that are in the meter. Refer to your meter's Installation and Operation manual for additional information about I/O cards and boards for your meter.

- For the EPM 7000/7000P meter, from the Main screen's Menu Bar, select **Tools > Option Card Information** to display the screen shown below. It displays information

about any Option cards installed in the meter: Type, Sub Type, Card Name, Serial Number, and Version. Click Close when you are done with the screen.



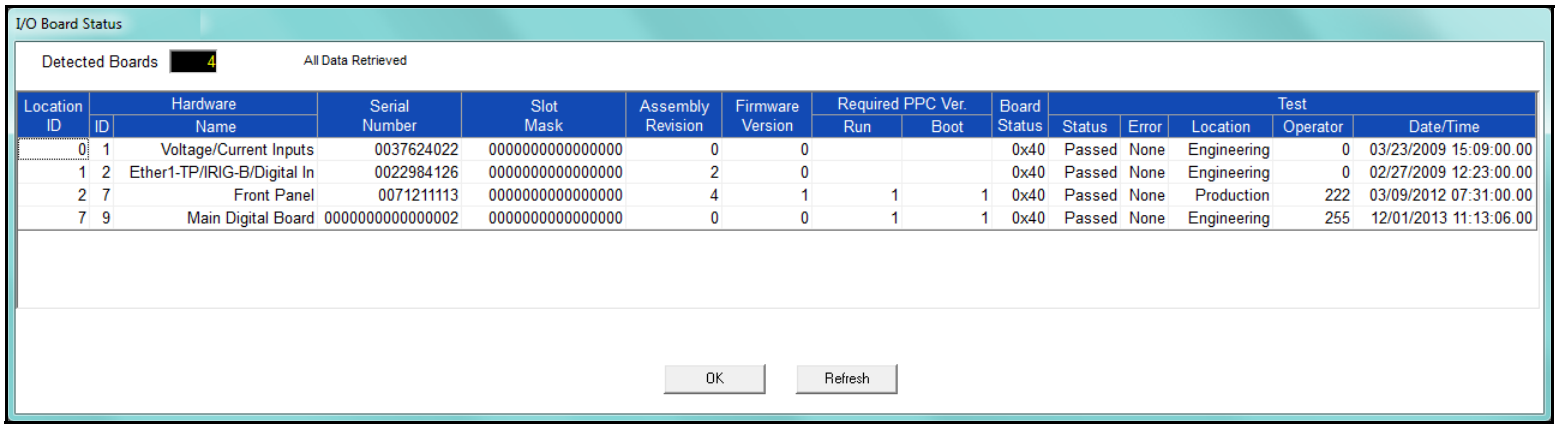
- For the EPM 4600 metering system, from the Main screen's Menu Bar, select **Tools > Board Information** to display the screen shown below. It displays information about the Relay Output/Digital Input card: Type, Card Name, Serial Number, and Version.Click Close when you are done with the screen.



- For the EPM 9900/9900P meter, from the Main screen's Menu Bar, select **Tools > I/O Board Status** to display the screen shown below. All installed I/O Boards are listed, along with the following information for the board:
  - Location ID
  - Hardware Name
  - Serial Number
  - Slot Mask
  - Hardware Version
  - Firmware Version

- Required PPC Run Version
- Board Status
- Test Status
- Test Error
- Test Location
- Test Operator
- Test Date/Time

  Click **Refresh** to update the display with the most current information; click **OK** to close the screen.

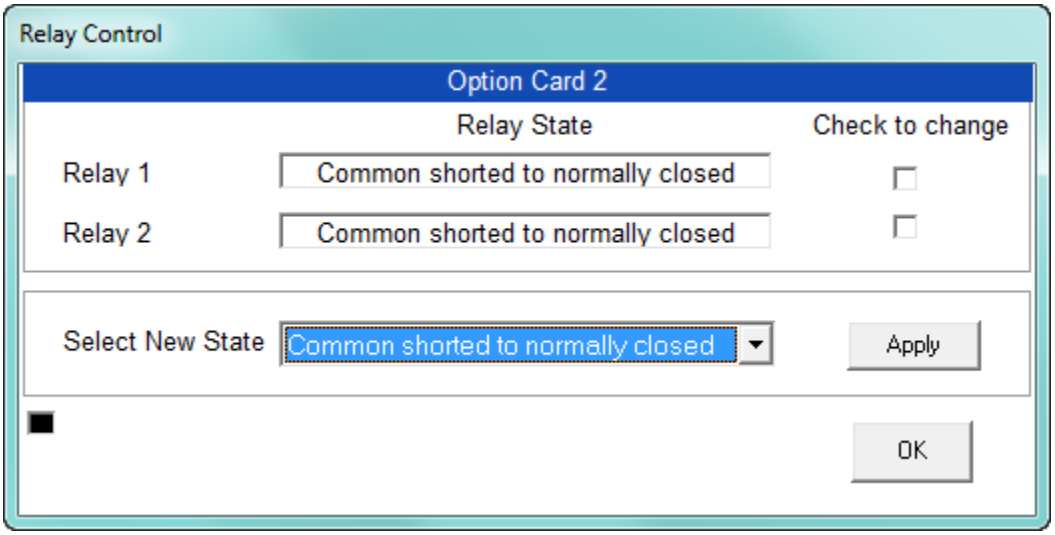


Location ID	Hardware ID	Hardware Name	Serial Number	Slot Mask	Assembly Revision	Firmware Version	Required PPC Ver. Run	Required PPC Ver. Boot	Board Status	Test Status	Test Error	Test Location	Test Operator	Test Date/Time
0	1	Voltage/Current Inputs	0037624022	0000000000000000	0	0			0x40	Passed	None	Engineering	0	03/23/2009 15:09:00.00
1	2	Ether1-TP/IRIG-B/Digital In	0022984126	0000000000000000	2	0			0x40	Passed	None	Engineering	0	02/27/2009 12:23:00.00
2	7	Front Panel	0071211113	0000000000000000	4	1	1	1	0x40	Passed	None	Production	222	03/09/2012 07:31:00.00
7	9	Main Digital Board	0000000000000002	0000000000000000	0	0	1	1	0x40	Passed	None	Engineering	255	12/01/2013 11:13:06.00

20.1.12 Relay Control

This feature allows you to manually change the state of an installed relay output for the EPM 7000/7000P meter optional Relay Output/Digital Input card and the EPM 4600 metering system's embedded Relay Output/Digital Input card. For instructions for using relay control for the EPM 9000 series meters' optional external Relay Output module, see Chapter 14 "External I/O Modules".

1. From the Main screen's Menu Bar, click **Tools > Relay Control**. You will see the screen shown below.



2. The screen displays the current state of the relay outputs. To change the state:

   a. Click the checkbox next to the relays you want to change.

   b. Select the desired state in the Select New State field.

   c. Click **Apply**. If this feature is Password Protected, the Enter Password screen opens. You must enter the correct password to make the change.

3. Click **OK** to close the screen.

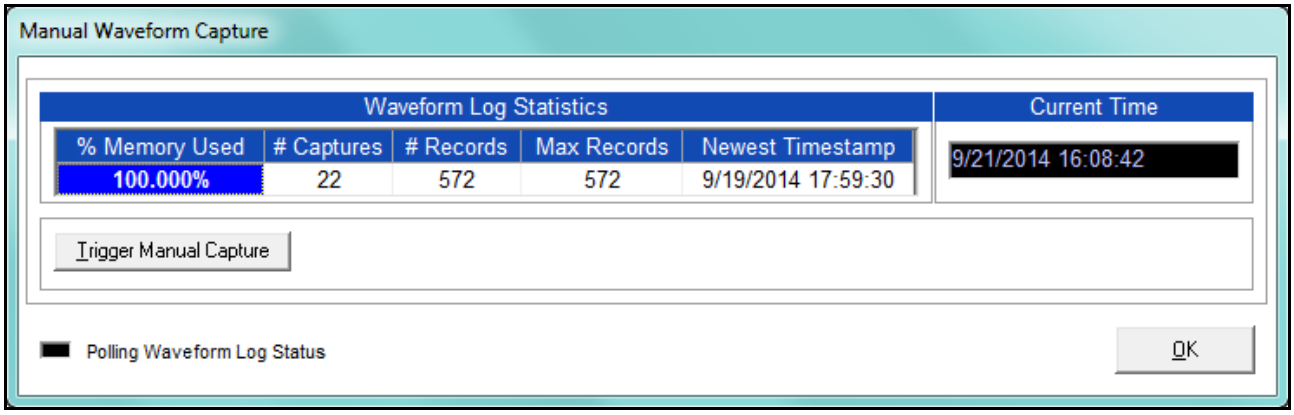
NOTE

- A relay output cannot be manually controlled if a Limit has been assigned to it.
- If the Relay State field is "State is Unknown," verify that the Relay Output card's configuration is correct. You may also see this message after you have performed a Reset. Select a new state for the relay and click **Apply**.

20.1.13 Manual Waveform Capture

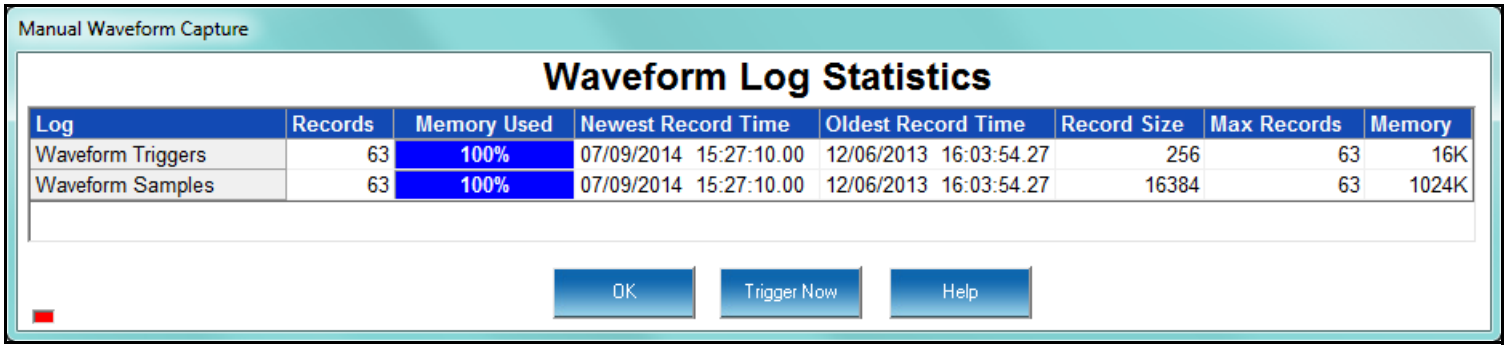
This feature gives you the ability to force the meter to capture a waveform.

For the EPM 7000/7000P meters and the EPM 9450/9650/9800 meters, from the Main screen's Menu Bar, click **Tools > Manual Waveform Capture**.



You will see the screen shown above if you are connected to an EPM 7000/7000P meter. It gives you information on the Waveform log: the amount of memory being used by it, the number of Waveform captures, the number of records in the log, the maximum records the log can hold, the time stamp of the most recent Waveform capture, and the current time.

- To perform a waveform capture, click **Trigger Manual Capture**.
- Click **OK** to close the screen.



You will see the screen shown above if you are connected to a EPM 9450/9650/9800 meter. It gives you information on the Waveform Triggers and Waveform Samples: the number of records for each, the amount of memory being used, the timestamps of the newest and oldest records, the record size, the maximum records that can be held by each, and the amount of memory used by each.

- To perform a waveform capture, click **Trigger Now**.
- Click **OK** to close the screen.

For the EPM 9900/9900P meter, click either the **Ret Logs** icon or **Logs > Retrieve Log(s)** from Device. You will see the screen shown below.

Log Statistics for E9900-64Mb_IP212_0000000078181833

Log	Records	Memory Used	Newest Record Time	Oldest Record Time	Record Size	Max Records	Memory(k)	Select
Historical 1	32767	100.0000%	09/11/2014 14:45:00.00	10/22/2013 08:45:00.00	128	32767	8192	☐
Historical 2	32767	100.0000%	09/11/2014 14:45:00.00	10/22/2013 08:45:00.00	32	32767	8192	☐
Historical 3	32823	21.0880%	09/11/2014 14:45:00.00	10/04/2013 17:00:00.00	64	155648	10240	☐
Historical 4	88939	100.0000%	09/11/2014 14:59:00.00	07/11/2014 20:39:00.00	112	88939	10240	☐
Historical 5	47889	100.0000%	09/11/2014 14:59:00.00	08/09/2014 08:51:00.00	208	47889	10240	☐
Historical 6	88939	100.0000%	09/11/2014 14:59:00.00	07/11/2014 20:39:00.00	112	88939	10240	☐
Historical 7	49235	86.5047%	09/11/2014 14:50:00.00	10/04/2013 17:00:00.00	140	56916	8192	☐
Historical 8	49235	75.1278%	09/11/2014 14:50:00.00	10/04/2013 17:00:00.00	76	65535	5120	☐
Event Triggered	3018530	100.0000%	09/11/2014 14:59:15.97	07/21/2014 03:49:30.64	66	3018530	204800	☐
Sequence of Events (Limits)	29021	25.6387%	08/16/2014 07:19:15.15	10/29/2013 15:03:29.72	88	113192	10240	☐
Digital Inputs	69169	100.0000%	09/11/2014 14:59:15.52	09/05/2014 15:12:30.63	144	69169	10240	☐
Digital Outputs	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	120	8301	1024	☐
Flicker	53333	42.8322%	09/11/2014 14:50:01.20	10/04/2013 17:00:01.19	40	124516	5120	☐
Waveform	93	97.8947%	07/24/2014 08:27:48.77	10/07/2013 09:25:44.76	696032	95	102400	☐
Power Quality	96	0.5513%	07/24/2014 08:27:48.86	10/07/2013 09:25:44.85	572	17413	10240	☐
System Events	562	1.7151%	09/11/2014 14:57:41.10	00/00/0000 00:00:00.00	16	32767	1024	☑
Transients	0	0.0000%	00/00/0000 00:00:00.00	00/00/0000 00:00:00.00	29152	3325	102400	☐
EN50160 / IEC 61000-4-30	Yes	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	☐

☐ Polling Historical 1 Header

To retrieve a log, click on the checkbox in the 'Selected' column of log(s) that you want to retrieve.
Next click the 'Start' Button to begin the retrieval.

Retrieve Selected Log(s) | Start | Close

Retrieve logs using Modbus

- Click in the pull-down menu that says **Retrieve Selected Log(s)** and choose **Manual Waveform Capture**. The bottom of the screen changes as shown below.

To manually trigger a wave capture, click on the 'Start' Button to request a capture. Manual Waveform Capture | Start | Close

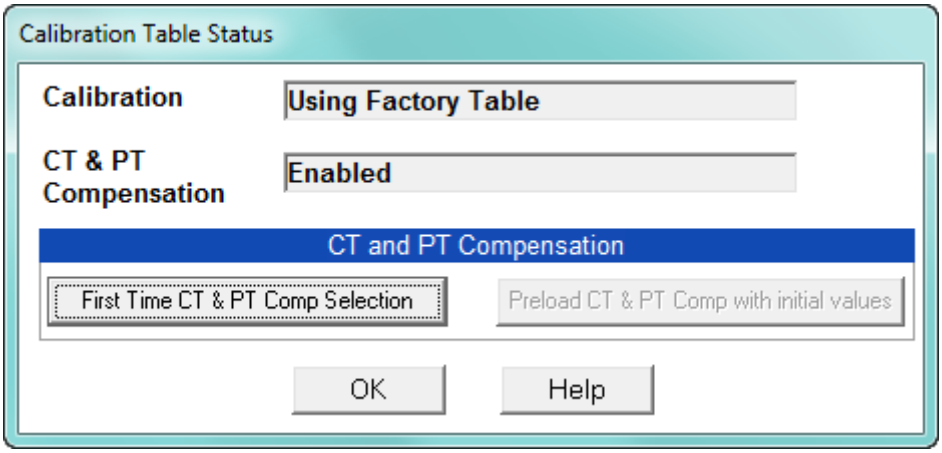
- Click **Start** to perform the waveform capture.
- When you are done, click **Close**.

20.1.14 Performing CT and PT Compensation

The CT and PT Compensation feature allows you to remove an error caused by the CTs (external to unit) and PTs that are connected to the unit. This section is for the EPM 9000 series meters. See 20.1.14.1 *Performing CT and PT Compensation (EPM 7000 Meter)*, for the EPM 7000 meter instructions and 27.2.8 *CT and PT Compensation* on page 27–41 for the EPM 7000P meter instructions.

1. First make sure that CT/PT Compensation is enabled for your meter (see 11.2.5 *Transformer / Line Loss Compensation* (EPM 9900/9900P meter), 12.2.5 *CT and PT Compensation* (EPM 9800 meter), and 13.2.5 *CT and PT Compensation* (EPM 9450/9650 meter).

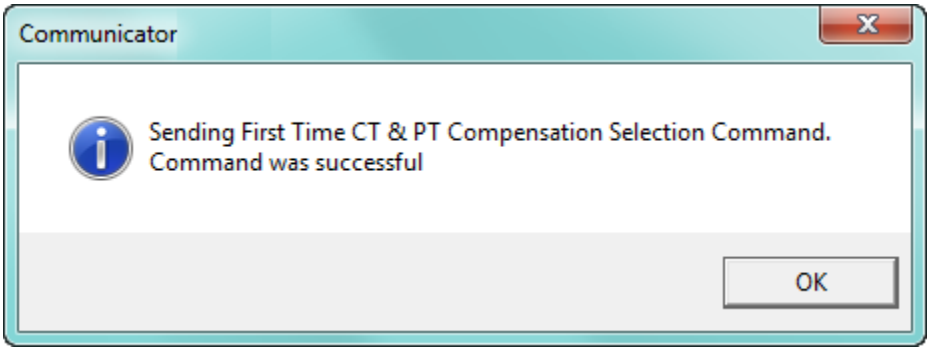
2. From the Main screen's Menu Bar, select **Tools > CT & PT Compensation > Calibration Table Status**. You will see the screen shown below.



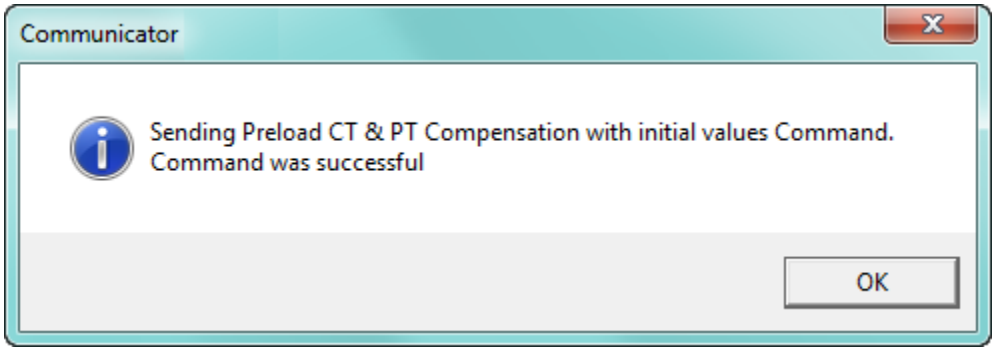
NOTE

If the screen says Disabled next to CT & PT Compensation, follow the instructions mentioned in step 1 to enable CT & PT Compensation.

3. Click **First Time CT & PT Comp Selection**. You will see the message window shown below. Click **OK** to close the window.



4. Click **Preload CT & PT Comp with initial values** in the Calibration Status screen. You will see the message window shown below. Click **OK** to close the window.



5. Click **OK** to close the Calibration Table Status screen.

6. Click T**ools > CT & PT Compensation > View Calibration Tables**. You will see the screen shown on the next page.

Calibration Tables [V2]

Factory Table Blk Time	09/19/2014 18:29:27.74	**CTPT Table Blk Time**	09/19/2014 18:29:27.74
Factory Table Cal Time	12/06/2013 15:57:50.00	**CTPT Table Cal Time**	00/00/0000 00:00:00.00

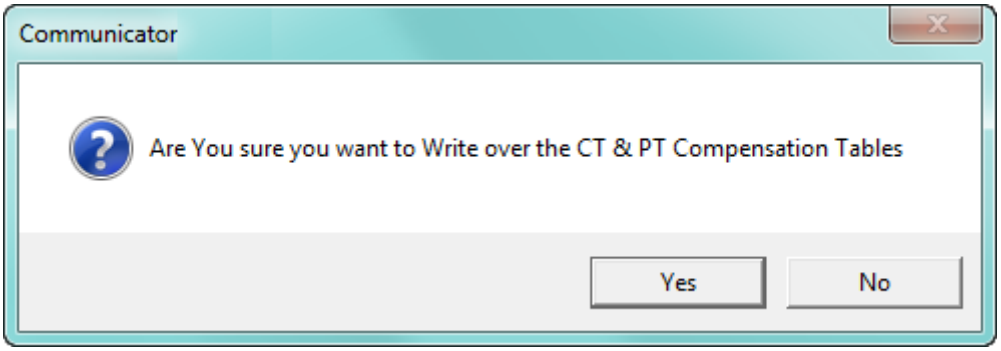
Calibration Point	Factory Table				CT & PT Compensation Table			
	Phase A	Phase B	Phase C	N-E N	Phase A	Phase B	Phase C	N-E N
120V	1049209	1043846	1046242	1041029	1048576	1048576	1048576	1048576
0.025A	1018981	1020708	1013912	1027978	1048576	1048576	1048576	1048576
0.15A	1023014	1017819	1007961	1027142	1048576	1048576	1048576	1048576
0.25A	1022866	1018255	1008357	1027241	1048576	1048576	1048576	1048576
0.50A	1023515	1019207	1008969	1027653	1048576	1048576	1048576	1048576
1.00A	1023259	1019122	1009044	1027317	1048576	1048576	1048576	1048576
2.50A	1023341	1019649	1009494	1027466	1048576	1048576	1048576	1048576
5.00A	1023459	1019881	1009764	1027633	1048576	1048576	1048576	1048576
0.05A @60	210	173	334		0	0	0	
0.15A @60	177	240	254		0	0	0	
0.50A @60	176	234	247		0	0	0	
1.00A @60	169	221	235		0	0	0	
2.50A @60	152	178	193		0	0	0	
5.00A @60	127	129	144		0	0	0	
10.00A @60	93	87	98		0	0	0	

Current Threshold (Factory) Default **Current Threshold (CTPT)** 0.00488

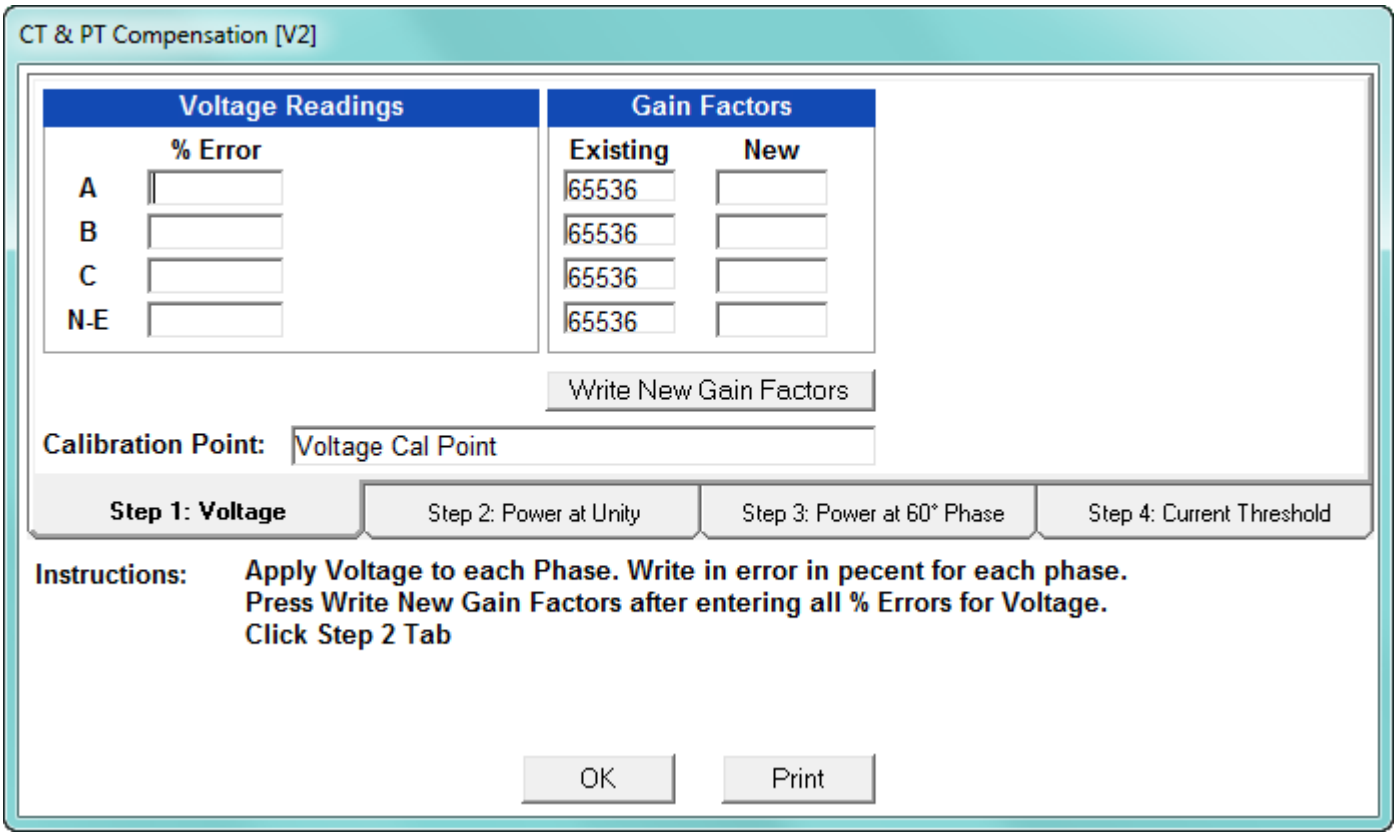
Refresh Print Copy Factory Table to CT & PT Comp Table

OK

This screen shows the factory values for CT and PT Compensation and the current CT & PT Compensation table. To make changes, first click Copy Factory Table to CT & PT Comp Table. You will see the message window shown below.



7. Click Yes to continue (click No to cancel). CT & PT Compensation is now enabled and ready for corrections.
8. To perform compensation, click **Tools > CT & PT Compensation > Compensate CTs & PTs**. You will see the screen shown below. This screen lets you collect data to determine the required correction(s)



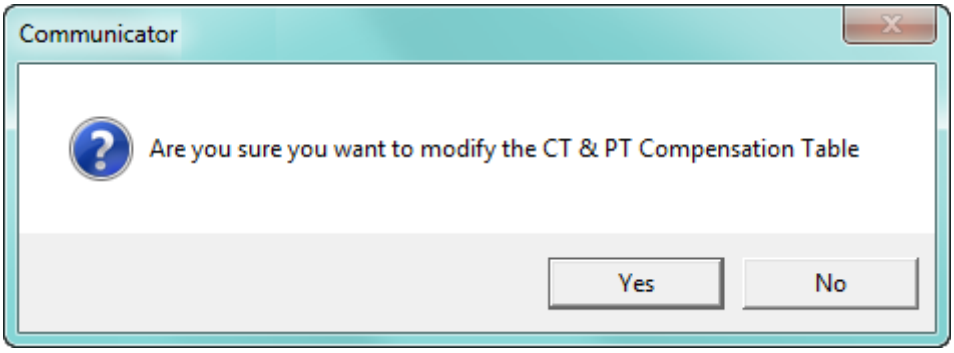
The four step tabs in the middle of the screen - Voltage, Power at Unity, Power at 60° phase, and Current Threshold, display Instructions for performing the step and entry fields you use to calculate the changes that should be made.

- The first step, shown above:

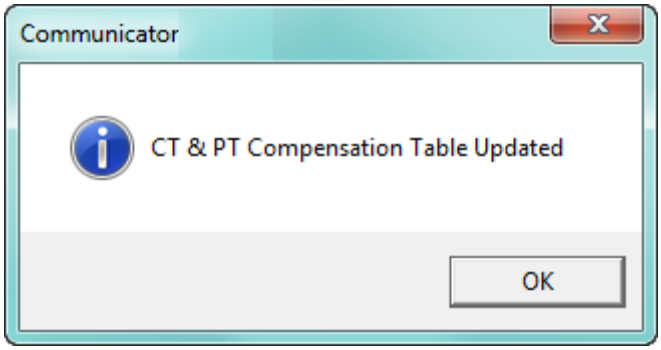
  a. Lets you enter the voltage phase error percentage you see when you apply voltage to each phase.

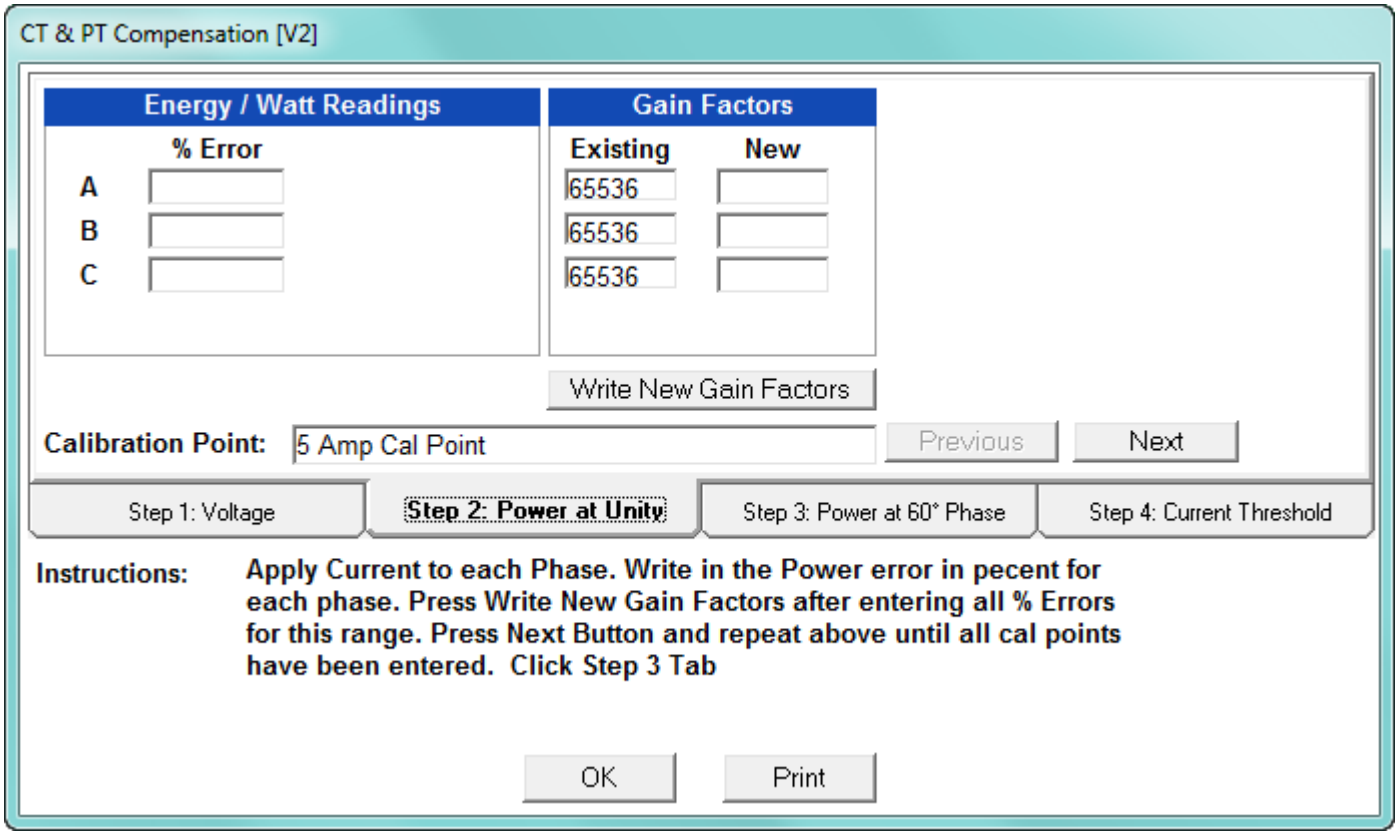
  b. When you enter an error percentage, the recommended adjustment appears in the corresponding Gain Factors New field.

c. When you are done, click **Write new Gain Factors**. You will see the message window shown below. Click **Yes** to update the CT & PT Calibration table with the new Gain Factors.



d. You will see the message window shown below. Click **OK** to close the window.



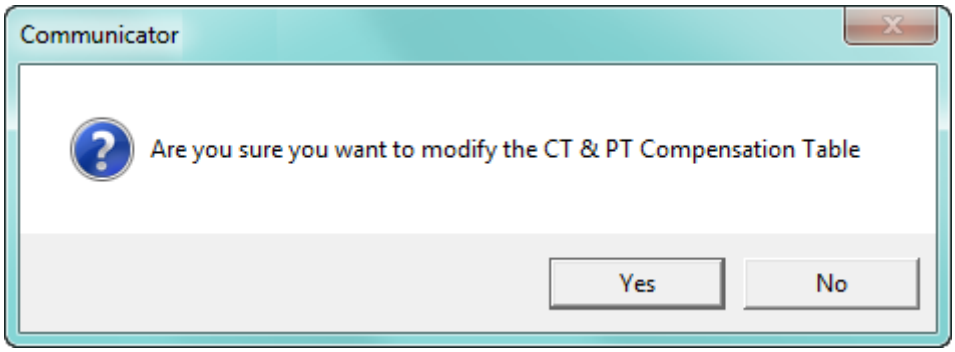


- Step 2, shown above:

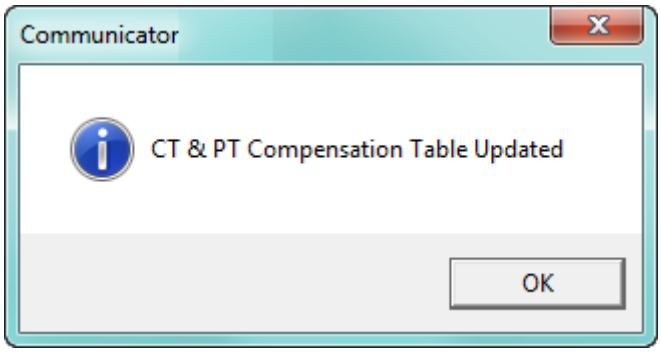
  a. Lets you enter the power error percentage for each phase when current is applied.

  b. When you enter an error percentage, the recommended adjustment appears in the corresponding Gain Factors New field.

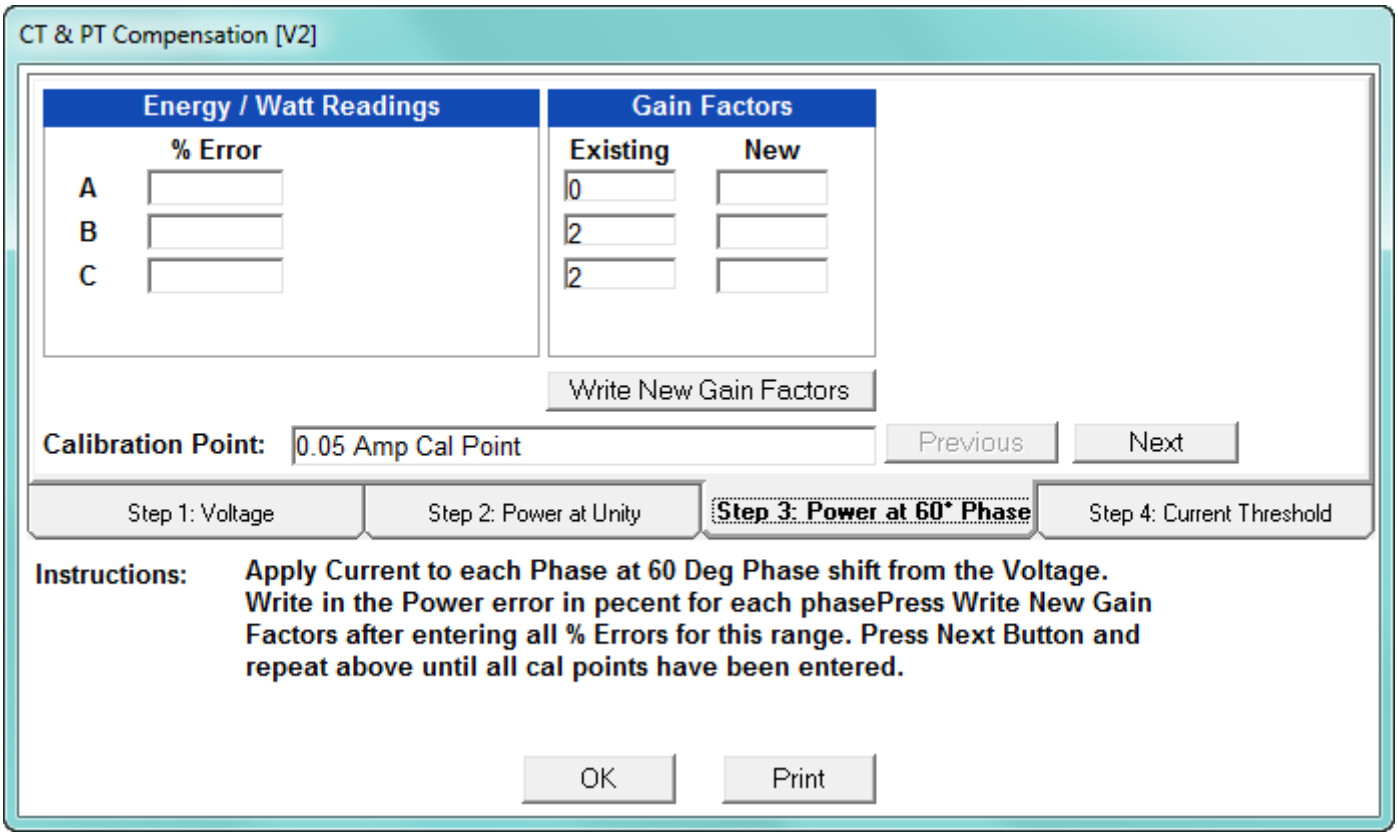
  c. When you are done, click **Write new Gain Factors**. You will see the message window shown below. Click **Yes** to update the CT & PT Calibration table with the new Gain Factors.



d. You will see the message window shown below. Click OK to close the window.



e. Click **Next** to follow the procedure for the next calculation point. When you are done with all of the calculation points for the Power at Unity step, you can continue to the next step.

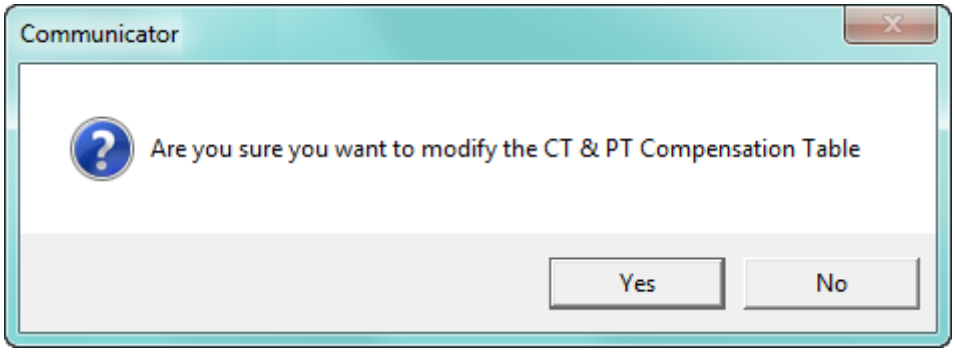


- Step 3, shown above:

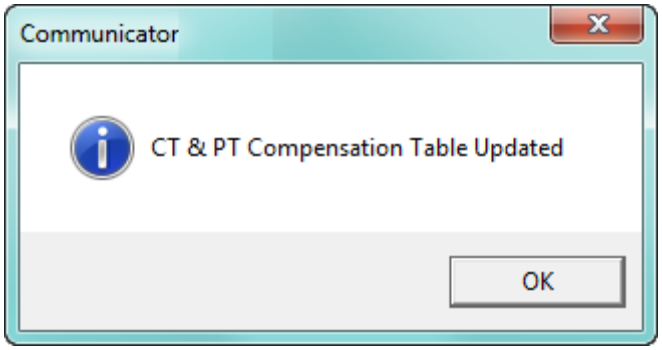
  a. Lets you enter the power error percentage for each phase when current is applied to each phase at a 60 degree phase shift from voltage.

  b. When you enter an error percentage, the recommended adjustment appears in the corresponding Gain Factors New field.

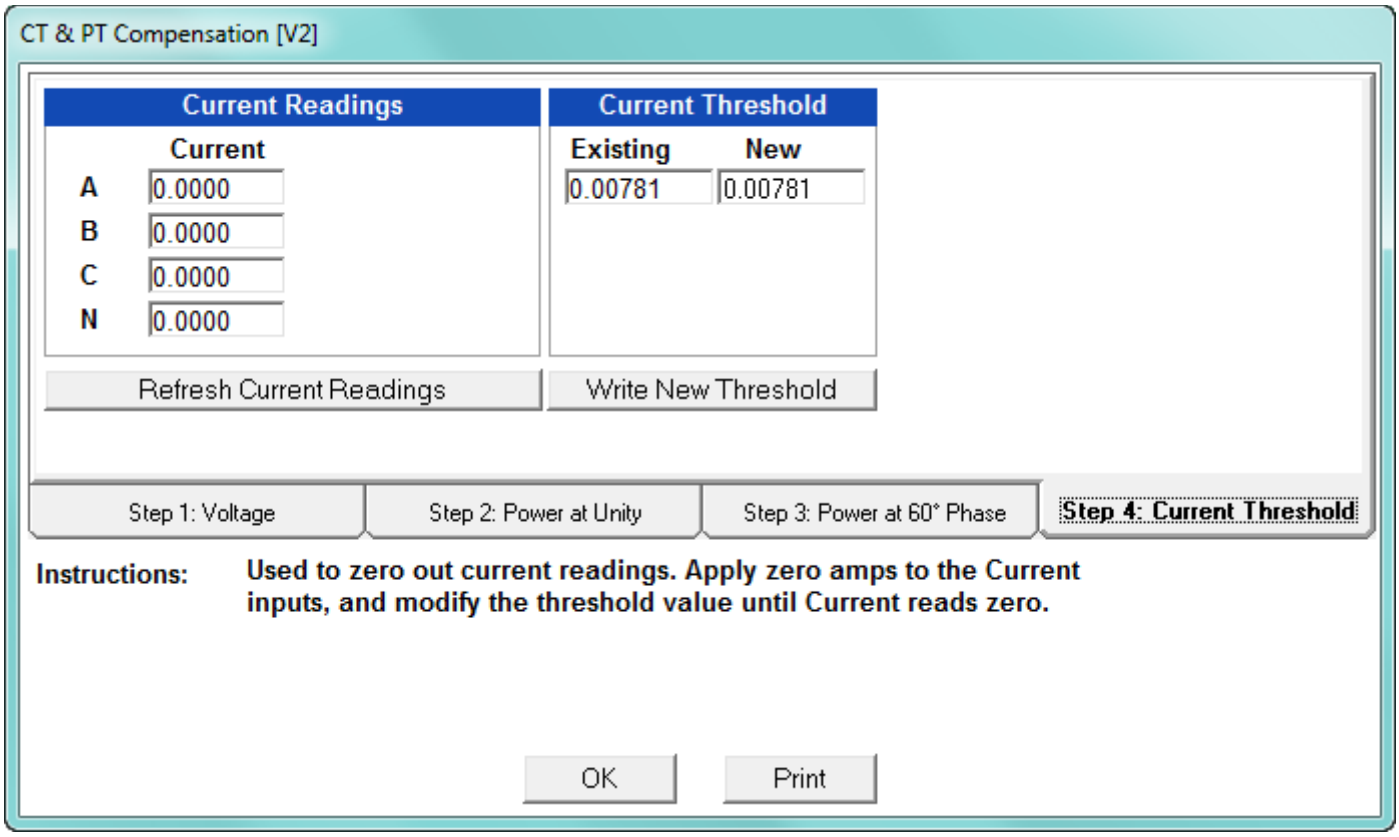
c. When you are done, click **Write new Gain Factors**. You will see the message window shown below. Click **Yes** to update the CT & PT Calibration table with the new Gain Factors.



d. You will see the message window shown below. Click **OK** to close the window.



e. Click **Next** to follow the procedure for the next calculation point. When you are done with all of the calculation points for the Power at 60° Phase step, you can continue to the next step.

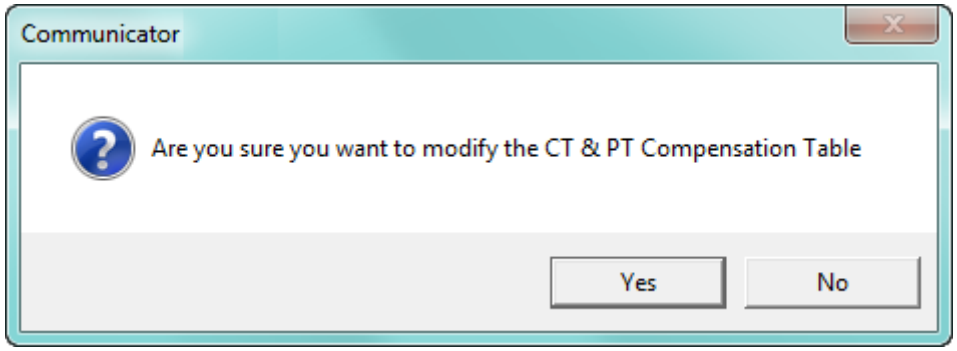


- Step 4, shown above:

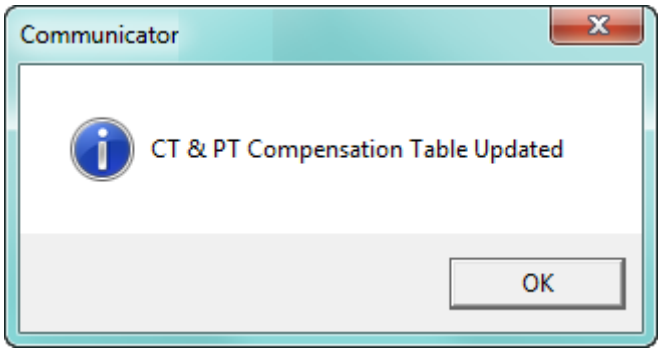
  a. Lets you enter zero out the current readings by applying zero Amps to the current inputs and modifying the threshold value until the current reads 0.

  b. Write the new threshold value in the Current Threshold New field.

  c. When you are done, click **Write New Threshold**. You will see the message window shown below. Click **Yes** to update the CT & PT Calibration table with the new Gain Factors.



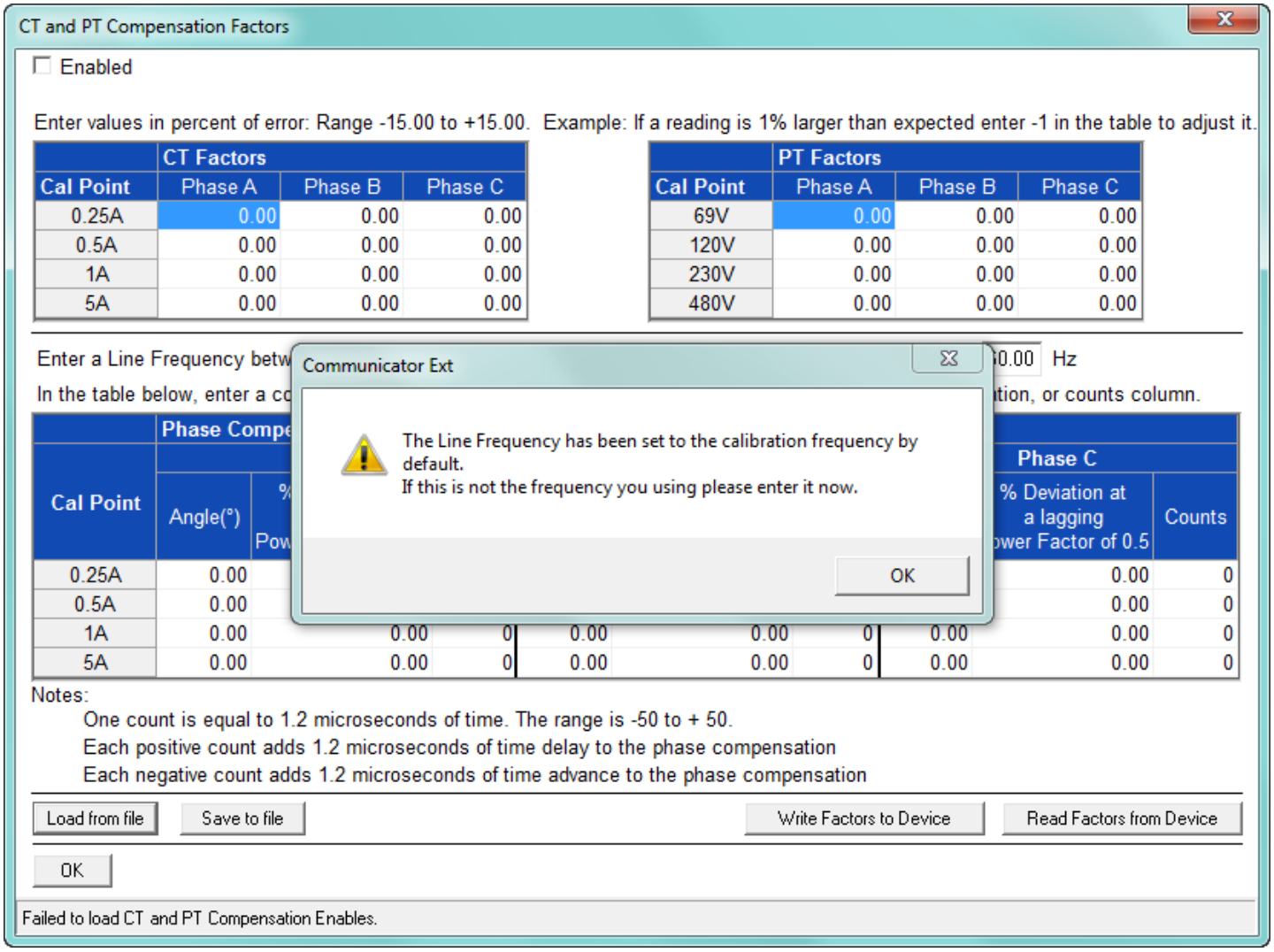
d. You will see the message window shown below. Click **OK** to close the window.



e. Click **OK** to close the CT & PT Compensation screen. You can click **Print** to print the screen information.

20.1.14.1 Performing CT and PT Compensation (EPM 7000 Meter)

1. From the Main screen, click **Tools > CT & PT Compensation > View CT & PT Compensation Factors** to see the screen shown below.



2. Click **OK** to close the message window and then correct the Line Frequency if you don't want it to be set to the calibration frequency, which is the default.

CT and PT Compensation Factors

☐ Enabled

Enter values in percent of error: Range -15.00 to +15.00. Example: If a reading is 1% larger than expected enter -1 in the table to adjust it.

	CT Factors		
Cal Point	Phase A	Phase B	Phase C
0.25A	0.00	0.00	0.00
0.5A	0.00	0.00	0.00
1A	0.00	0.00	0.00
5A	0.00	0.00	0.00

	PT Factors		
Cal Point	Phase A	Phase B	Phase C
69V	0.00	0.00	0.00
120V	0.00	0.00	0.00
230V	0.00	0.00	0.00
480V	0.00	0.00	0.00

Enter a Line Frequency between 45 and 65Hz for your system to be used in the table calculations below: 60.00 Hz

In the table below, enter a correction factor for each phase at each cal point in either the angle, percent deviation, or counts column.

	Phase Compensation Correction Factors								
	Phase A			Phase B			Phase C		
Cal Point	Angle(°)	% Deviation at a lagging Power Factor of 0.5	Counts	Angle(°)	% Deviation at a lagging Power Factor of 0.5	Counts	Angle(°)	% Deviation at a lagging Power Factor of 0.5	Counts
0.25A	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
0.5A	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
1A	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0
5A	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0

Notes:

One count is equal to 1.2 microseconds of time. The range is -50 to + 50.
Each positive count adds 1.2 microseconds of time delay to the phase compensation
Each negative count adds 1.2 microseconds of time advance to the phase compensation

Load from file | Save to file | Write Factors to Device | Read Factors from Device

OK

Failed to load CT and PT Compensation Enables.

3. CT/PT compensation is used to correct for errors caused by the current transformers (CTs) (external to the meter) and Potential/Voltage transformers (PTs) connected to the meter. Use this screen to set compensation factors (Input fields), save them to a file (Save to File button), write them to the meter (Write Factors to Device button), read them from the meter (Read Factors from Device button), load from a file (Load from File button), and enable compensation (Enabled checkbox).

NOTE

- PT compensation is not being applied to symmetrical components.
- For 2.5 Element Wye and 2 CT Delta hookup, set the B phase PT factor to 0.

4. The entry fields and acceptable entries are as follows:
   - **Enabled**: click to enable CT and PT Compensation.
   - **Percent of error values in voltage reading due to PT**: you can enter 4 values per phase for 4 voltage levels 69V, 120V, 230V, and 480V. The allowable range is -15 to +15. For example, if a reading is 1 higher than expected, enter -1 to adjust it.

- **Percent of error in current reading due to CT**: you can enter 4 values per phase for 4 current levels 0.25A, 0.5A, 1A, and 5A. The allowable range is -15 to +15. For example, if a reading is 1 higher than expected, enter -1 to adjust it.
- **Frequency**: enter your system's frequency. The allowable range is between 45 and 65 Hz.
- **Phase Compensation Correction Factors**: Angle, percentage of Deviation, and Counts (time advance or delay in phase shift in term of counts) where 1 count =1.2 microseconds change. You can enter 4 values per phase for 4 current levels 0.25A, 0.5A, 1A, and 5A.

NOTE

- The allowable range for counts is -50 to +50.
- Each positive count adds 1.2 microseconds of time delay to the phase compensation.
- Each negative count adds 1.2 microseconds of time advance to the phase compensation.

5. Click the buttons on the bottom of the screen to perform the following actions:
   - **Load from file**: click to select a file containing the CT and PT Compensation factors you want to use.
   - **Save to file**: click to save the current entries to a file.
   - **Write Factors to device**: click to load the current entries to a device.
   - **Read Factors from Device**: click to download the CT and PT compensation factors from a device to the screen's entry fields.
6. Click **OK** to close the screen.

Formulas and example settings:

<u>Voltage Compensation</u>

Vcomp= Vcalc * PTcf

PTcf=1+ (0.01*Ve)

where Ve is the error percentage due to the PT at that voltage level

For example, if Vcalc = 100V; and error percentage @ 100V is 5.

Then:

PTcf = 1+(0.01*5) = 1.05

Vcomp = 100* 1.05 = 105

<u>Current Compensation</u>

Icomp= Icalc * CTcf

CTcf=1+0.01*Ie

where Ie is the error percentage due to CT at that current level

For example, if Icalc = 5A; and error percentage @ 5A is 5.

Then:

CTcf = 1+0.01*0.5 = 1.05

Icomp = 5* 1.05 = 5.25

20.1.15 Test Mode and Preset Energy Accumulators

Test Mode lets you test a meter for accuracy. When a meter is put into Test Mode, all of the energy registers are frozen, the display is set to 0, and the user can access the energy measurement test sequences.

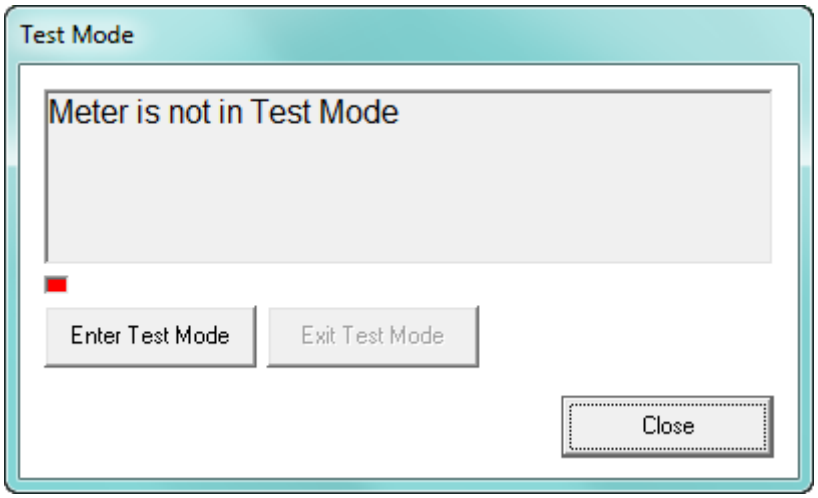
The Energy Preset, or Preset Accumulators, feature supports Test Mode. This feature allows a user to preset the energy accumulators to a desired value. This is important because when a meter is in Test Mode, it is out of service and not monitoring accumulations. You can use the Test Mode Preset Accumulations screens to enter a new value that adjusts for those not monitored while the meter was in Test Mode.

This feature is also useful when removing a meter from service and replacing it with a new meter. You can use the Preset Accumulators screen to set the new meter with the accumulation values from the old meter. This way, the new meter can continue to accumulate where the old meter left off.

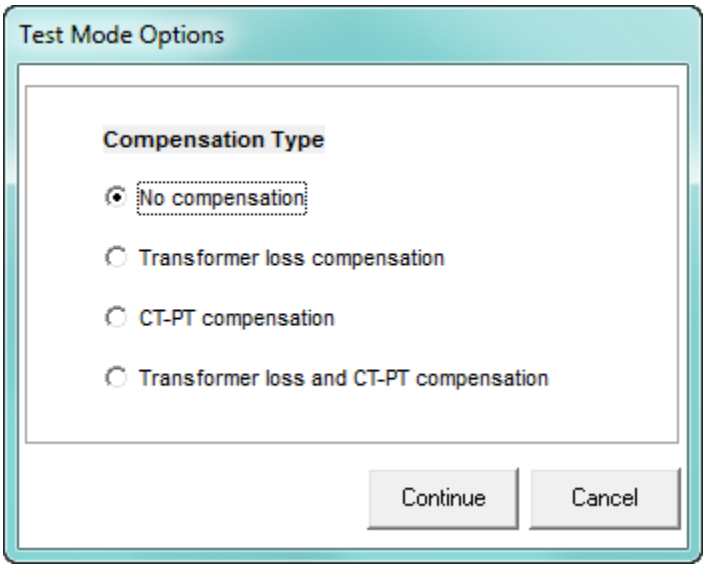
- For the EPM 9800 meter see the *EPM 9800 Instruction Manual* for instructions on using Test Mode and see 20.1.15.2 *Preset Accumulators for the EPM 9800 Meter* for instructions on using Energy Preset.
- For the EPM 9900P meter, follow the instructions in 20.1.15.1 *Test Mode and Preset Energy for the EPM 9900P Meter*.
- For the EPM 7000P meter see 20.1.15.3 *Test Mode and Energy Preset for the EPM 7000P Meter* on page 20–38.

20.1.15.1 Test Mode and Preset Energy for the EPM 9900P Meter

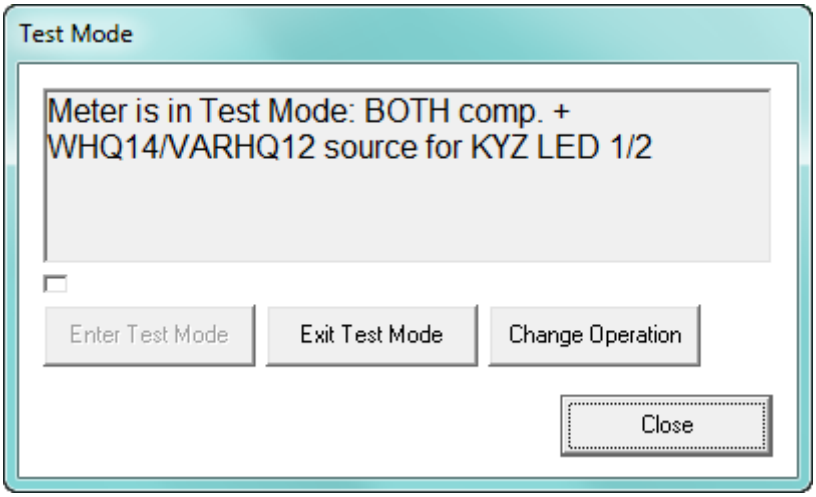
1. Click **Tools > Test Mode > Set Test Mode**. The screen shown below opens.



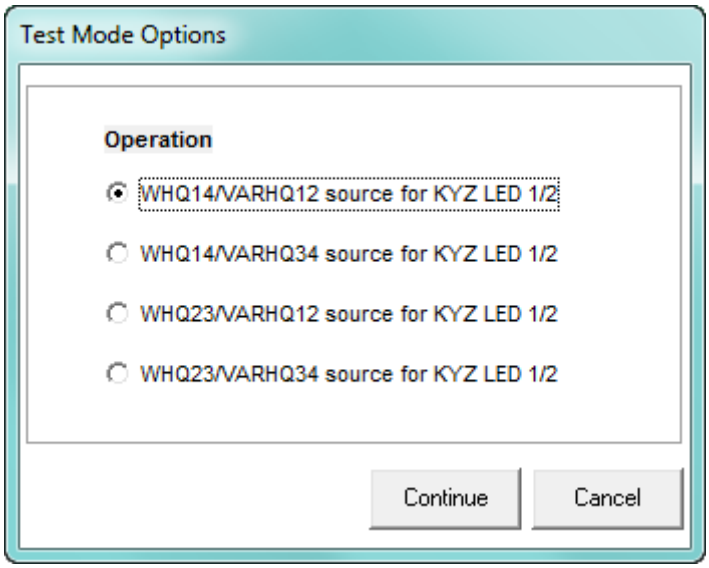
2. Click **Enter Test Mode**. The screen shown below opens.



3. Use this screen to select the type of compensation to apply to the Test Mode. You should select the same compensation you are using for the meter. Refer to 11.2.4 *CT and PT Compensation* and 11.2.5 *Transformer / Line Loss Compensation*, for instructions on setting the meter's Transformer and CT/PT compensation. Your choices are:
   - No compensation - Test Mode readings will be obtained without any compensation applied.
   - Transformer loss compensation - your setting for Transformer Loss compensation will be applied to the readings in Test Mode.
   - CT-PT compensation - your setting for CT/PT compensation will be applied to the readings in Test Mode.
   - Transformer loss and CT-PT compensation - both your settings for Transformer Loss compensation and CT-PT compensation will be applied to the readings in Test Mode.
4. Click **Continue**. You will see the Test Mode screen again. You will see a message that Test Mode is starting and then you will see a message that the meter is in Test Mode, with the compensation you selected and the values that are being read, also displayed. See the example screen on the next page.

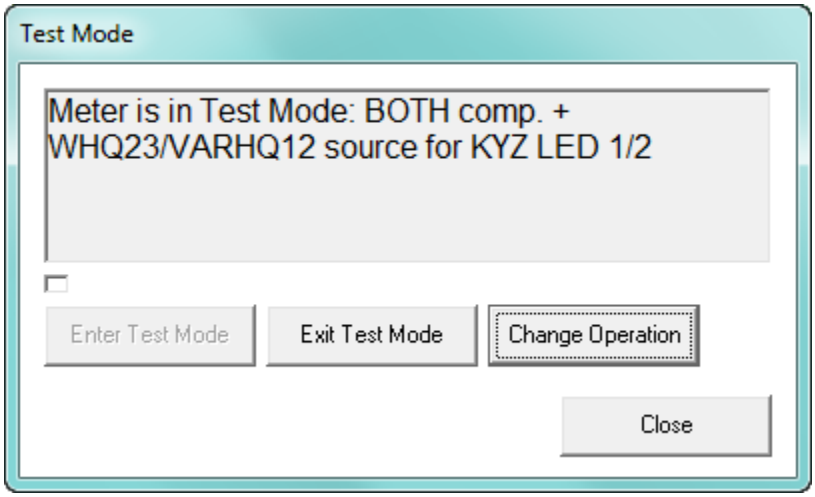


5. WHQ14/VARHQ12 above indicates that the watt-hour readings from quadrants 1 and 4, and the VAR-hour readings from quadrants 1 and 2 are being read in Test Mode. The BOTH comp means that both Transformer loss and CT-PT compensations are being applied. To choose a different energy reading source, click the Change Operation button. You will see the screen shown below.



6. The options on this screen are:
   - WHQ14/VARHQ12
   - WHQ14/VARHQ12
   - WHQ14/VARHQ12
   - WHQ14/VARHQ12

7. Make your selection and click **Continue**. The Test Mode screen is redisplayed, with the current reading source reflecting your selections.

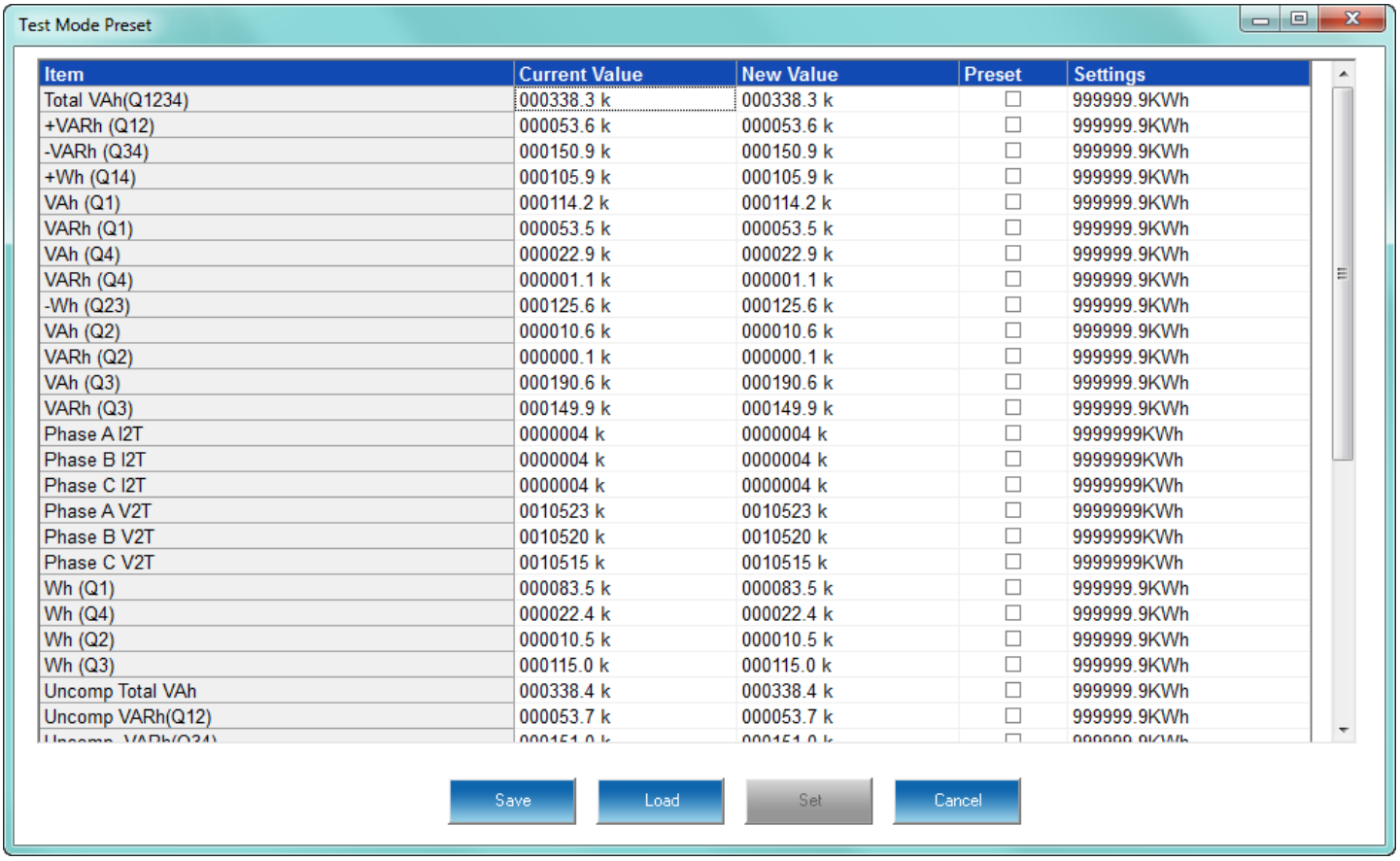


8. If you want to set Energy Presets, click **Close** to close the Test Mode screen (Test Mode will still be active) and continue to step 9. If you do not want to set Energy Presets, once you are done with Test Mode, click **Exit Test Mode**. You will see a message that the meter is exiting Test Mode and then Test Mode will stop.

NOTE

Note that the timeout that you set up in Test Mode Configuration (see 11.2.10 *Test Mode Configuration (EPM 9900P Meter)*) will cause the meter to exit Test Mode after a certain amount of time with no activity, even if you do not actively exit Test Mode.

9. Click **Tools > Test Mode > Energy Presets**. You will see the screen shown below.

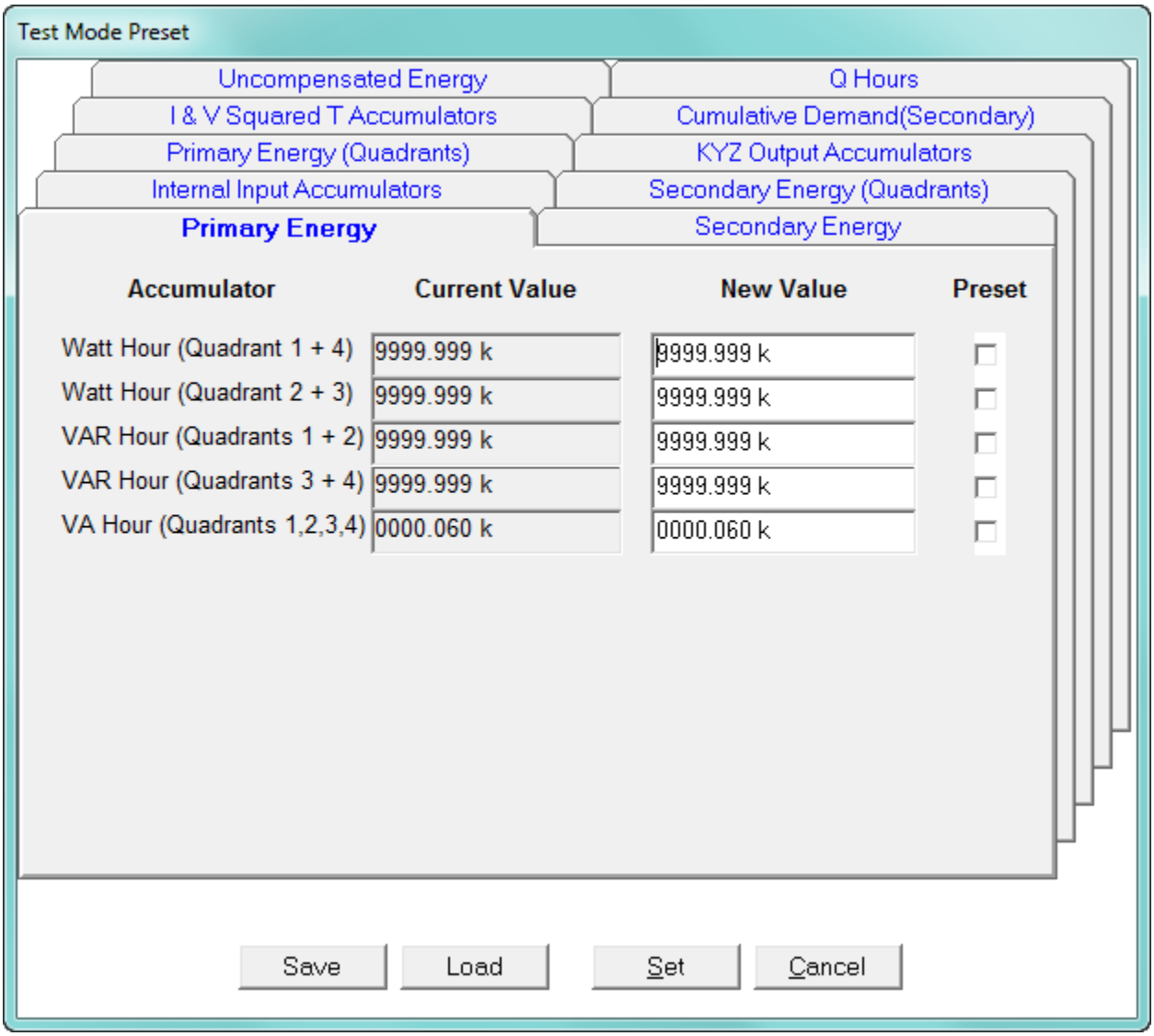


Item	Current Value	New Value	Preset	Settings
Total VAh(Q1234)	000338.3 k	000338.3 k	☐	999999.9KWh
+VARh (Q12)	000053.6 k	000053.6 k	☐	999999.9KWh
-VARh (Q34)	000150.9 k	000150.9 k	☐	999999.9KWh
+Wh (Q14)	000105.9 k	000105.9 k	☐	999999.9KWh
VAh (Q1)	000114.2 k	000114.2 k	☐	999999.9KWh
VARh (Q1)	000053.5 k	000053.5 k	☐	999999.9KWh
VAh (Q4)	000022.9 k	000022.9 k	☐	999999.9KWh
VARh (Q4)	000001.1 k	000001.1 k	☐	999999.9KWh
-Wh (Q23)	000125.6 k	000125.6 k	☐	999999.9KWh
VAh (Q2)	000010.6 k	000010.6 k	☐	999999.9KWh
VARh (Q2)	000000.1 k	000000.1 k	☐	999999.9KWh
VAh (Q3)	000190.6 k	000190.6 k	☐	999999.9KWh
VARh (Q3)	000149.9 k	000149.9 k	☐	999999.9KWh
Phase A I2T	0000004 k	0000004 k	☐	9999999KWh
Phase B I2T	0000004 k	0000004 k	☐	9999999KWh
Phase C I2T	0000004 k	0000004 k	☐	9999999KWh
Phase A V2T	0010523 k	0010523 k	☐	9999999KWh
Phase B V2T	0010520 k	0010520 k	☐	9999999KWh
Phase C V2T	0010515 k	0010515 k	☐	9999999KWh
Wh (Q1)	000083.5 k	000083.5 k	☐	999999.9KWh
Wh (Q4)	000022.4 k	000022.4 k	☐	999999.9KWh
Wh (Q2)	000010.5 k	000010.5 k	☐	999999.9KWh
Wh (Q3)	000115.0 k	000115.0 k	☐	999999.9KWh
Uncomp Total VAh	000338.4 k	000338.4 k	☐	999999.9KWh
Uncomp VARh(Q12)	000053.7 k	000053.7 k	☐	999999.9KWh

10. The accumulators that can be pre-set are listed on the left of the screen with their current values. You can scroll to see accumulators not displayed.
11. To enter a preset value, click the preset box on the same line with the value and enter the preset value in the **New Value** field. The Settings field shows the format your entry needs to be in, that is, the number of digits and decimal places; for example, 999999.9kWh.
12. When you have entered all of the preset values you want, click **Set** to send them to the meter's memory. Once the meter is out of Test Mode, these new values will take effect.
13. You can also save the preset values in a .csv file or load preset values that are already saved in a .csv file to this screen:
    - To save the values, click the **Save** button and give the file a name when you are prompted.
    - To load a .csv file, click the **Load** button and locate the file you want to use.
14. When you have finished with the Test Mode Preset screen, click the red **X** to close it.
15. When you want to exit Test Mode, click **Tools > Set Test Mode** to open the Test Mode screen, and then click the **Exit Test Mode** button.

20.1.15.2Preset Accumulators for the EPM 9800 Meter

1. From the Main screen's Menu Bar, select **Tools > Test Mode > Preset Accumulators**. You will see the screen shown below.



2. Click the tabs to navigate between the Test Mode Preset screens. There are screens for:
   - Primary Energy
   - Secondary Energy
   - Primary Energy (Quadrants)
   - Secondary Energy (Quadrants)
   - Internal Input Accumulators
   - KYZ Output Accumulators
   - I & V Squared T Accumulators
   - Cumulative Demand (Secondary)

- Uncompensated Energy
- Q Hours

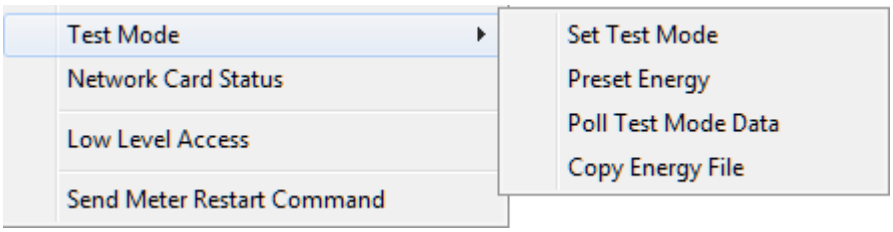
Each screen has a Current Value, New Value and Preset Box for each of its accumulators.

A new meter will have zeros for Current Values.

3. For any accumulators you want to preset, enter the new value, click the **Preset Box** next to it, and when you are done with that tab, go to any other tabs you want to enter preset values for.
4. When you have finished entering all of the preset values you need, click **Set** to implement the new settings in the currently connected meter. You also have other options:
   - **Save** - to save the new settings to a file.
   - **Load** - to load a file of previously saved settings.
   - **Cancel** - to exit without making changes.

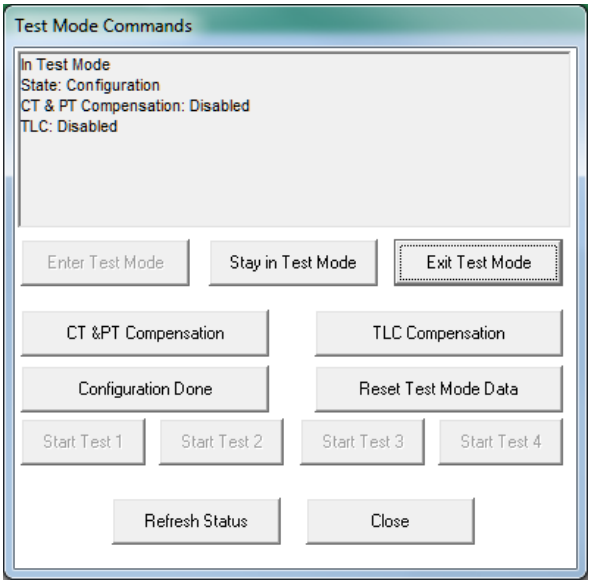
20.1.15.3Test Mode and Energy Preset for the EPM 7000P Meter

The EPM 7000P meter supports Test Mode. This section details the Test Mode and Energy Preset features available through software. The Test Mode sub-menu is shown below.



20.1.15.4.1: Set Test Mode

1. To set up test mode for the meter, click **Tools > Test Mode > Set Test Mode**.

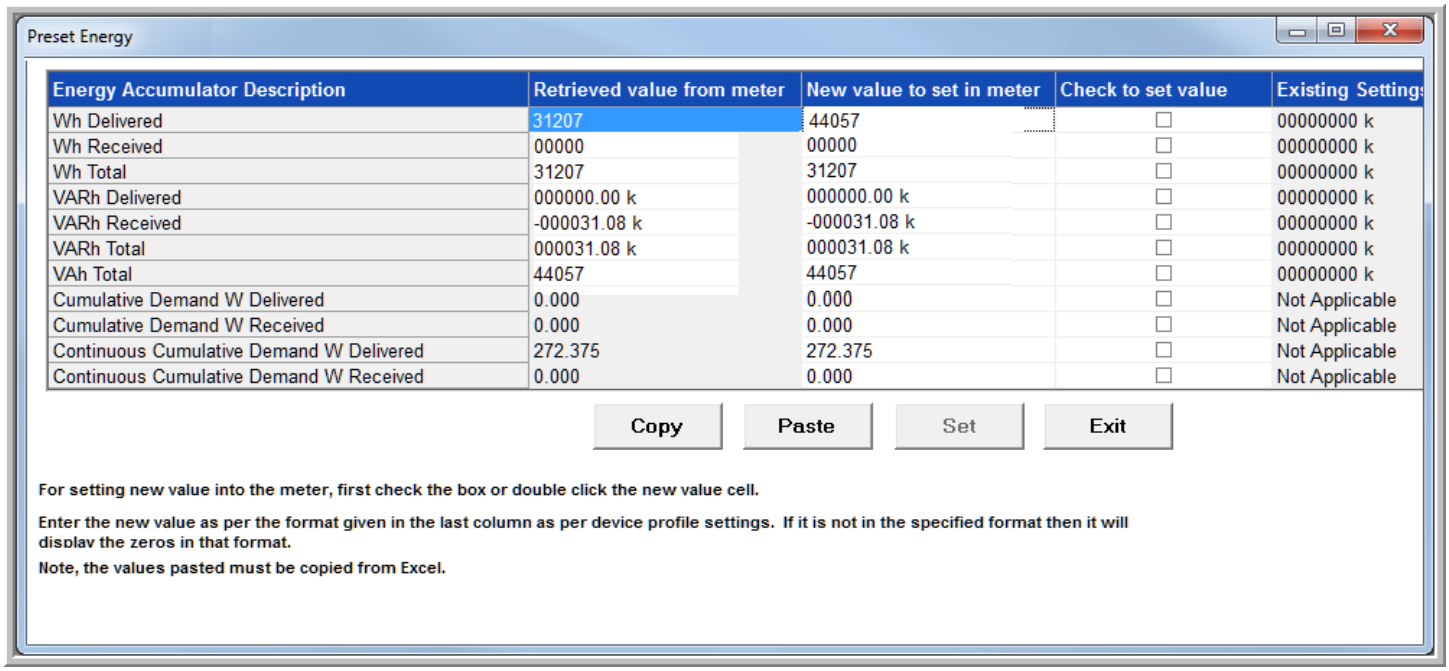


2. Use the buttons on this screen to perform the following functions:
   - **Enter Test Mode**: click to enter Test Mode. You will have the amount of time programmed in the System Settings screen, e.g., 10 minutes, to perform the testing (see 27.1.3 *Configuring System Settings* on page 27–6 for instructions on setting the Test Mode timeout period).
     NOTE: As long as the meter recognizes measurable load (i.e., total power is greater than 0), the meter uses an extended timeout period consisting of the programmed timeout plus the programmed Block Interval Time for block window averaging or programmed sub interval time for rolling window average. This is to insure that the meter completes a Demand test without interruption.
   - **Stay in Test Mode**: click to restart the timeout period. For example, if the programmed timeout is 10 minutes and you click Stay in Test Mode, you will have 10 minutes in which to perform the task. Each time you click Stay in Test Mode, the timeout period is restarted.
   - **Exit Test Mode**: click to exit Test Mode.
   - **CT& PT Compensation**: click to have your setting for CT/PT compensation applied to the readings in Test Mode.
   - **TLC Compensation**: click to have your setting for Transformer Loss compensation applied to the readings in Test Mode.
   - **Configuration Done**: click after selecting any compensation options (TLC or CT/PT).
   - **Reset Test Mode Data**: click to reset the Test Mode data to 0.
   - **Start Test (1-4)**: click the appropriate button to start tests from 1-4.
   - **Refresh Status**: click to see the current status of Test mode.
   - **Close**: click to close the Test Mode screen.

20.1.15.4.2: Preset Energy

The EPM 7000P meter lets you pre-set billing revenue registers to specific values. This is used when replacing meters in the field, to create continuity with the prior register values.

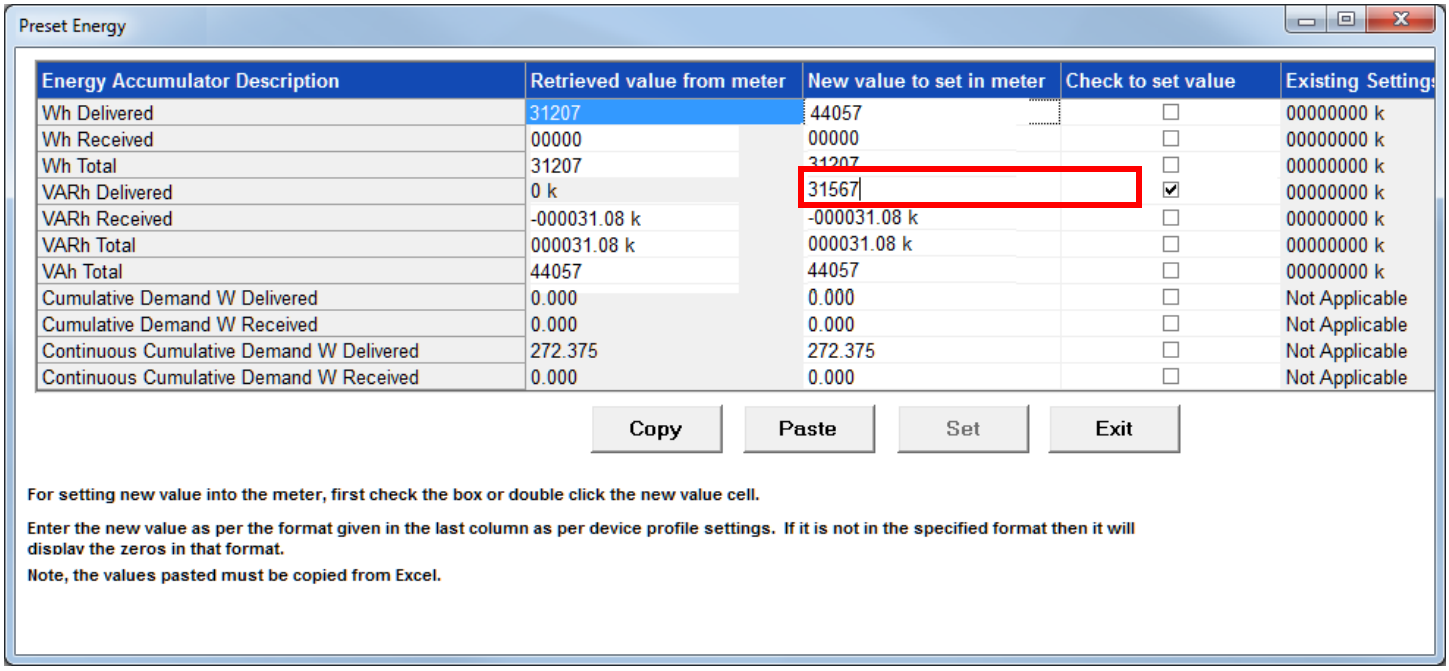
1. From the Main screen's Menu Bar, click **Tools > Test Mode > Preset Energy**.



Energy Accumulator Description	Retrieved value from meter	New value to set in meter	Check to set value	Existing Settings
Wh Delivered	31207	44057	☐	00000000 k
Wh Received	00000	00000	☐	00000000 k
Wh Total	31207	31207	☐	00000000 k
VARh Delivered	000000.00 k	000000.00 k	☐	00000000 k
VARh Received	-000031.08 k	-000031.08 k	☐	00000000 k
VARh Total	000031.08 k	000031.08 k	☐	00000000 k
VAh Total	44057	44057	☐	00000000 k
Cumulative Demand W Delivered	0.000	0.000	☐	Not Applicable
Cumulative Demand W Received	0.000	0.000	☐	Not Applicable
Continuous Cumulative Demand W Delivered	272.375	272.375	☐	Not Applicable
Continuous Cumulative Demand W Received	0.000	0.000	☐	Not Applicable

2. The accumulator fields are listed on the left of the screen, along with their current value. The settings field shows the number of digits and decimals for the number, which were set in the Configuring Energy, Power Scaling, and Averaging setting of the meter's Device Profile (see 27.2.1 *Configuring Energy, Power Scaling, and Averaging* on page 27–26).

3. To enter a new value for the accumulator, double-click in the New Value field for that accumulator.



Energy Accumulator Description	Retrieved value from meter	New value to set in meter	Check to set value	Existing Settings
Wh Delivered	31207	44057	☐	00000000 k
Wh Received	00000	00000	☐	00000000 k
Wh Total	31207	31207	☐	00000000 k
VARh Delivered	0 k	31567	☑	00000000 k
VARh Received	-000031.08 k	-000031.08 k	☐	00000000 k
VARh Total	000031.08 k	000031.08 k	☐	00000000 k
VAh Total	44057	44057	☐	00000000 k
Cumulative Demand W Delivered	0.000	0.000	☐	Not Applicable
Cumulative Demand W Received	0.000	0.000	☐	Not Applicable
Continuous Cumulative Demand W Delivered	272.375	272.375	☐	Not Applicable
Continuous Cumulative Demand W Received	0.000	0.000	☐	Not Applicable

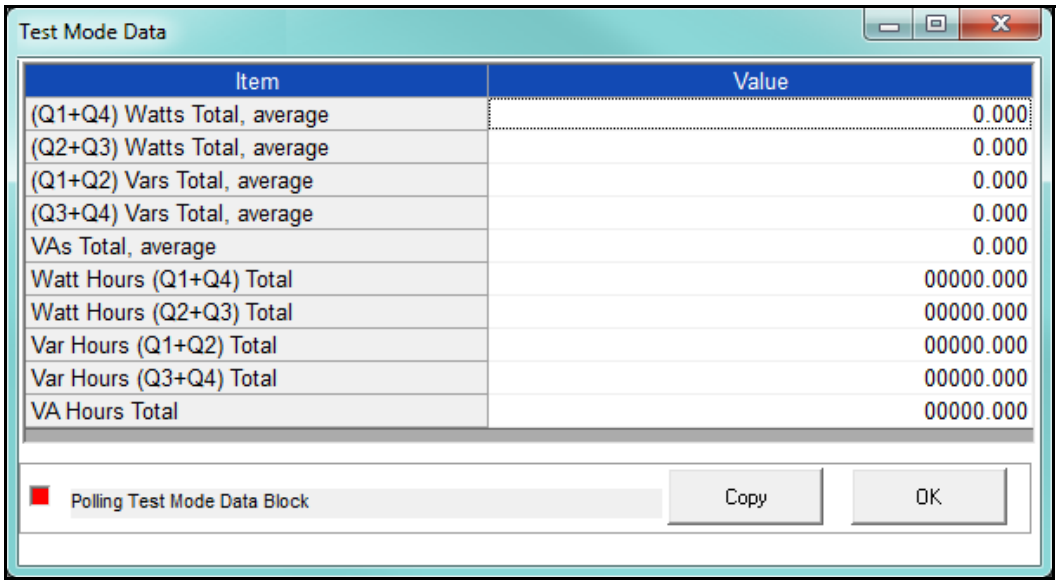
4. The Preset box is now checked and the New Value field is highlighted. Enter a new value for the accumulator.
5. When you have finished entering the preset values, click the Set button (it becomes selectable when you have made New Value field entries).

   You will see messages on the bottom of the screen as the preset file is being saved.

20.1.15.4.3: Poll Test Mode Data

Use this command to view Test Mode data.

1. From the Main screen's Menu Bar, click **Tools > Test Mode > Poll Test Mode Data**.



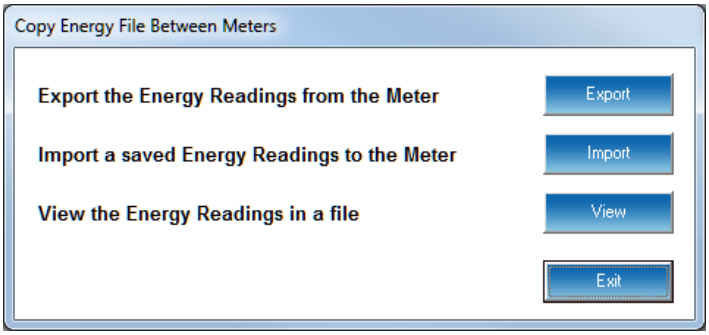
- The test data is shown in the Values column.
- You can copy this data to the clipboard (for pasting into another application) by clicking the Copy button.

2. Click **OK** to close this screen.

20.1.15.4.4: Copy Energy File

Use this command to copy a preset energy file to an EPM 7000P meter.

1. From the Main screen Menu Bar, click **Tools > Test Mode > Copy Energy File**.



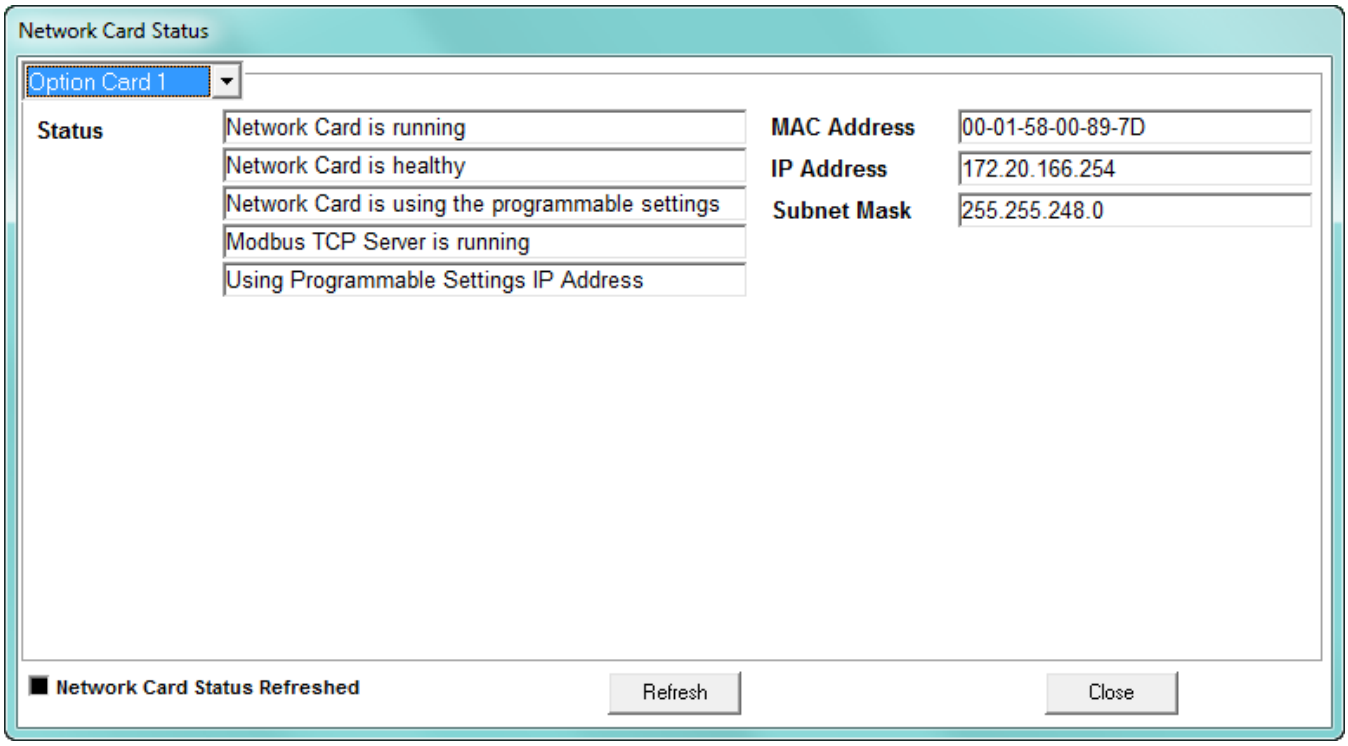
- Click **Export** to export the meter's energy readings into a saved preset energy file. You will be prompted to give the file a name and location. You can later view the file or import it into a meter.
- Click **Import** to import a saved preset energy file into the meter. You will be prompted to select the file to import.
- Click **View** to see the preset energy file. You will be prompted to select the file to view.

2. Click **Exit** to close the screen.

20.1.16 Network Card Status (EPM 7000/7000P Meter)

This feature gives you status information on any installed Network cards in an EPM 7000/7000P meter.

1. From the Main screen, select **Tools > Network Card Status** to open the screen shown below.

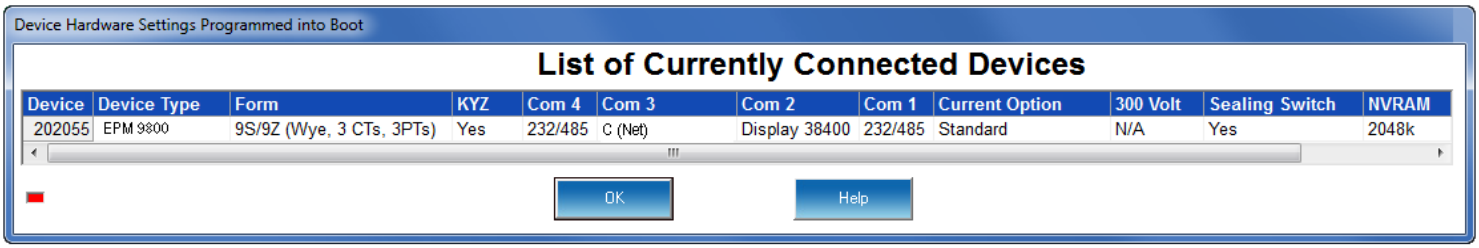


2. This screen displays the location of an installed Network Card (Option Card 1 or Option Card 2), its current status, and information about its settings. Click in the pull-down menu to choose Option Card 2.
3. Click **Refresh** to see the latest status of the Network card.
4. Click **Close** to exit the screen.

20.1.17 Hardware Settings (EPM 9000 series Meters)

This feature lets you see the meter's hardware settings that have been programmed into Boot firmware.

1. From the Main screen's Menu Bar, select **Tools > Hardware Settings**. See the example screen below.

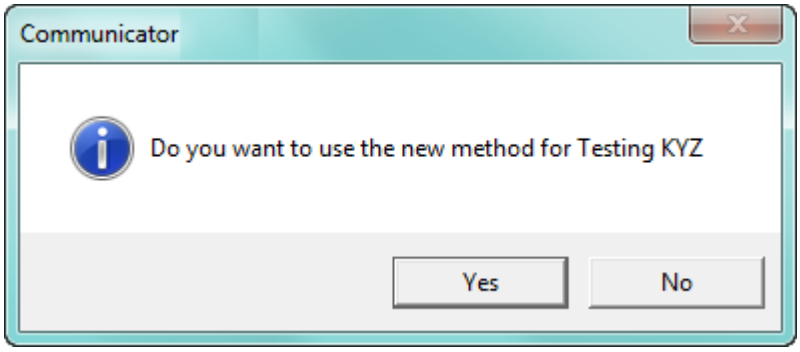


2. Click **OK** to close the screen.

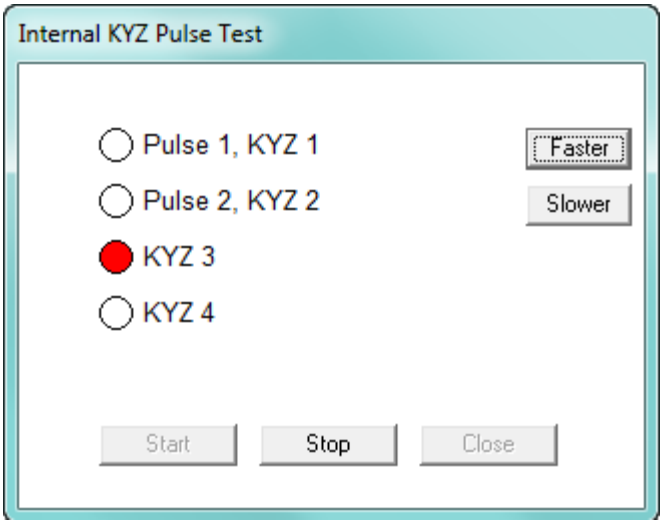
20.1.18 Internal KYZ Pulse Test (EPM 9650/9900/9900P Meters)

Use the Internal KYZ Pulse Test feature to test the meter's KYZ pulses.

1. From the Main screen's Menu Bar, click **Tools > Internal KYZ Pulse Test**. You will see the message window shown below.



2. Click **Yes** to use the new testing method (this is the correct method to use); you will see the screen shown below.



3. Click **Start**. You will see a red circle as each KYZ pulse is being tested.
   - To speed the test pulses, click **Faster**.
   - To slow down the test pulses, click **Slower**.
4. Click **Stop** to end the KYZ pulse testing.
5. Click **Close** to close the screen.

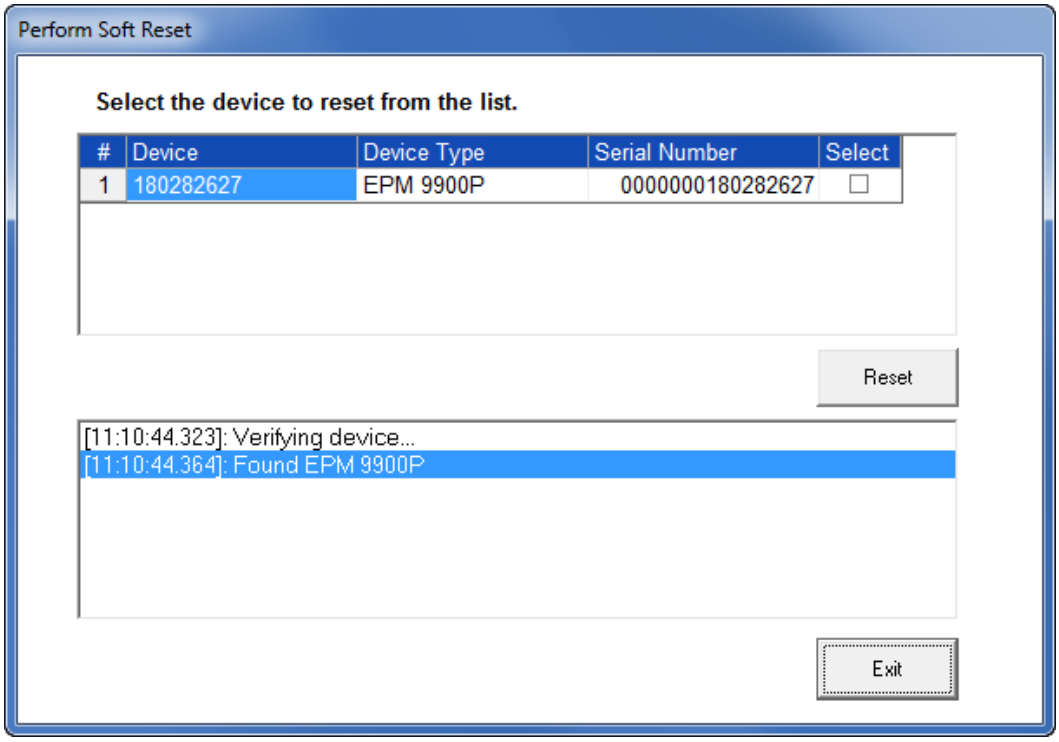
NOTE

The test pulses are not added to any KYZ pulse accumulators.

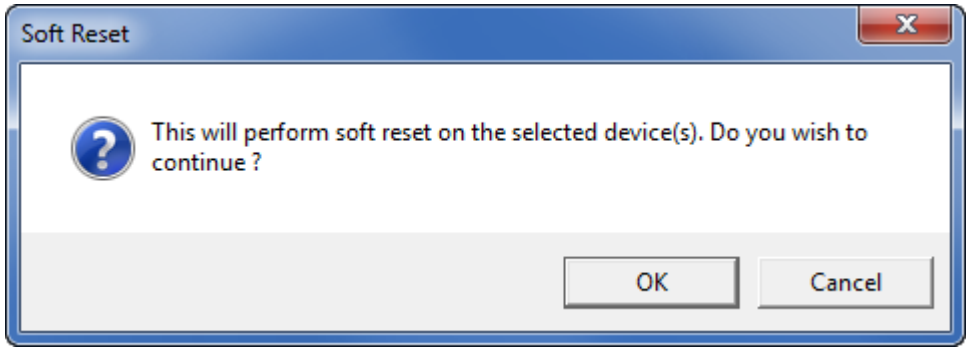
20.1.19 Perform Soft Reset

This feature lets you reset the meter using software rather than performing a manual reset by cycling power to the meter. Soft Reset is available for all EPM meters.

1. From the Main screen's Menu Bar, click **Tools > Soft Reset**. See the example screen below.



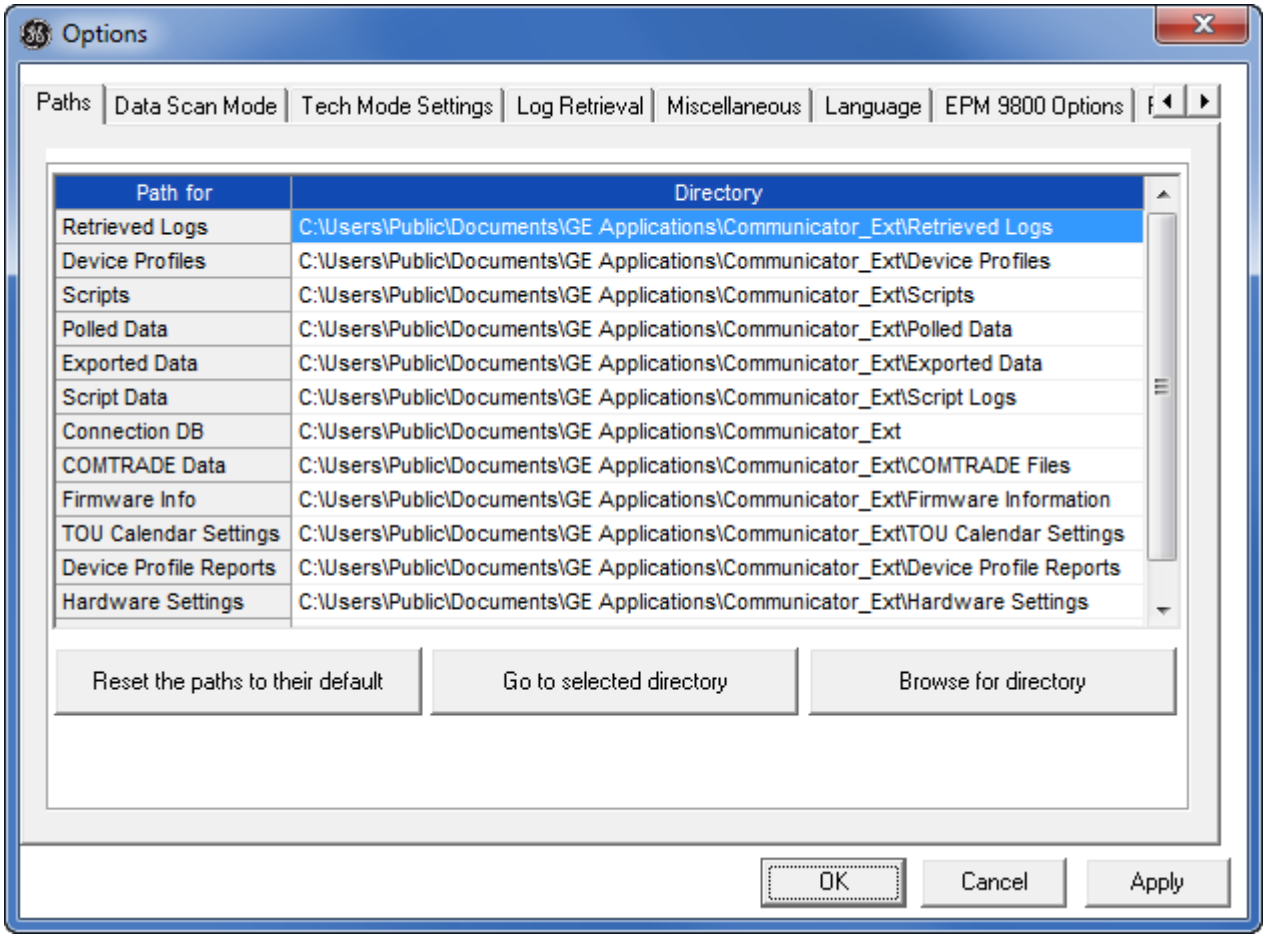
2. Click the **Select** checkbox next to any meter(s) you want to reset.
3. Click **Reset**. You will see the message window shown below. Click **OK** to reset the meter(s); click **Cancel** if you don't want to perform the reset.



4. You will see messages in the bottom portion of the screen and then the window shown below. Click **OK** to close the message window and the Perform Soft Reset screen.

20.2 Options Screen

The Options screen gives you access to additional software functions. To open the screen, from the Main screen's Menu Bar, click **View > Options**. You will see the Options screen, shown below.



- The tabs at the bottom of the screen let you access the different settings screens.
- Click **Apply** on any of the tab screens to implement your changes.

20.2.1 Paths

The first tab is the Paths tab (shown on the previous page). This screen shows the location of the data files stored by the GE Communicator application. You can choose different paths for the data if you want to store the files in different directories. The screen has three buttons:

- Reset the paths to their default - click this button if you have made changes and want to go back to the default directory paths.
- Go to selected directory - click on a directory path, and then click this button to open the directory for those files, e.g., Retrieved Logs.

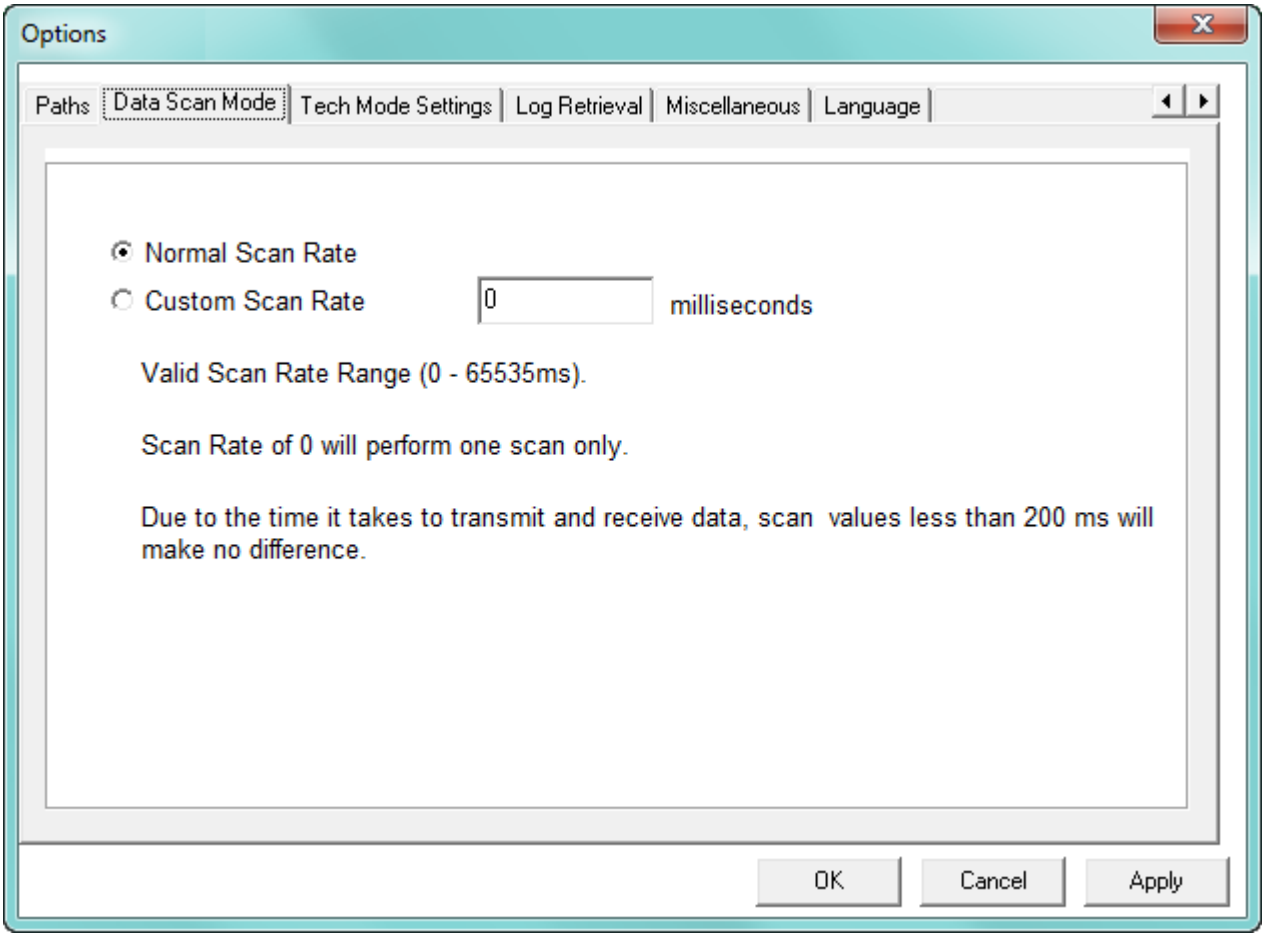
- Browse for directory - click on a directory path, and then click this button to open a window showing the tree structure of this directory. This lets you easily locate a specific file in the directory.

  You can also select a new path from this window and click **OK** to insert the path in the Directory field.

  Click **Apply** to implement any changes.

20.2.2 Data Scan Mode

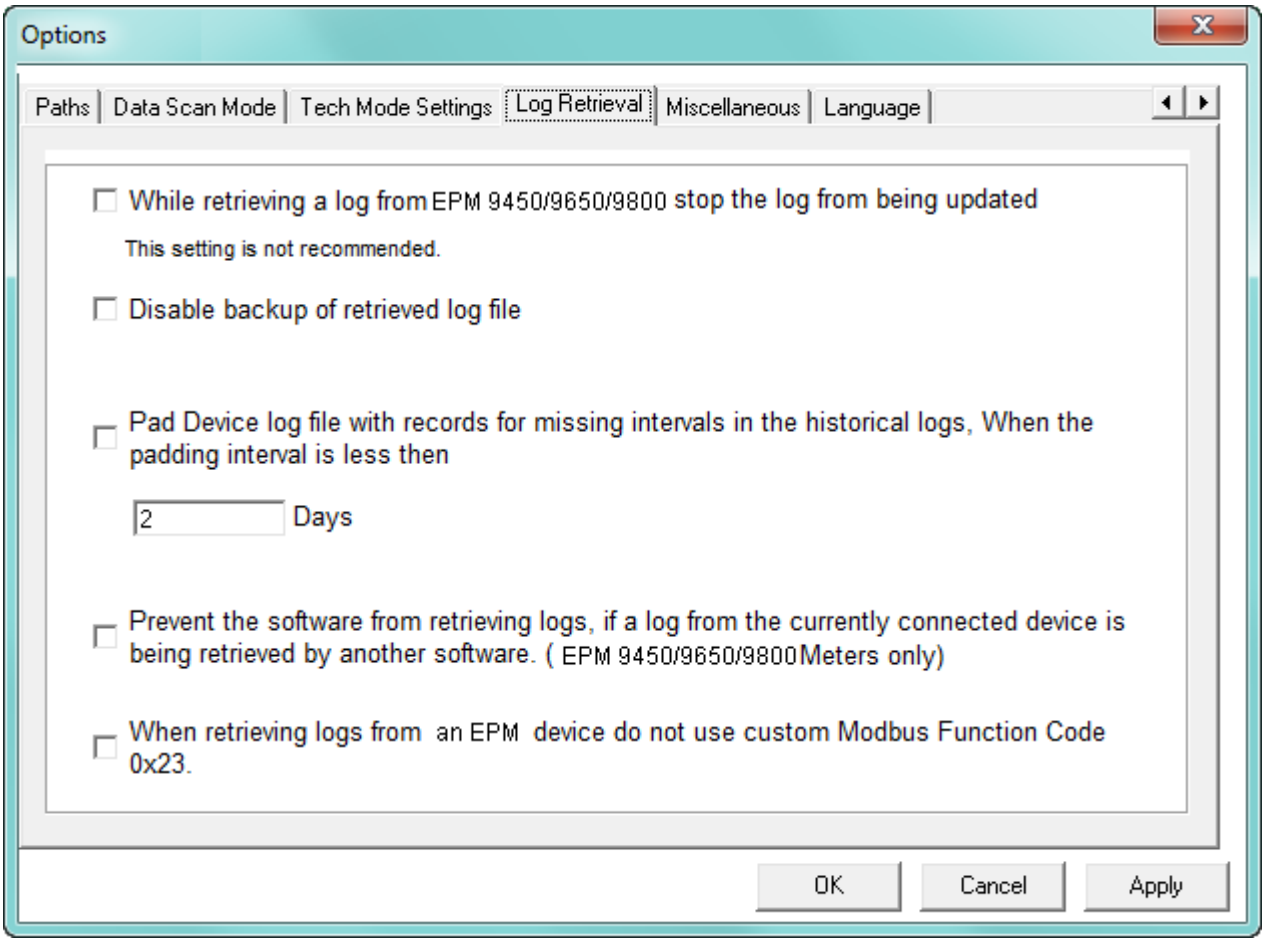
1. Click the Data Scan Mode tab to see the screen shown below.



2. The field on this screen is used to specify how long the meter should wait before performing the next scan. This is a legacy setting for the EPM 9450/9650/9800 meters.
3. Click **Apply** to implement your selections.

20.2.3 Log Retrieval

1. Click the Log Retrieval tab to see the screen shown below. This screen allows you to make specific settings related to meter logs.



- The first setting is not recommended, but it allows you to stop updates to a log when it is being retrieved from an EPM 9450/9650/9800 meter. It is better to continue to log while downloading so you don't lose any newly created snapshots.
- The second setting disables backup of retrieved logs. Generally, unless your hard drive is very small, leave this block un-checked so that log backup is performed.
- If the meter is not in normal operation, it does not record any data for historical logs. For example, during firmware updates or loss of power, data is not saved. Some applications may require that data logs contain those missing records. To remedy this problem, enable the Pad Missing Records for Historical Logs feature. Once enabled, the meter, upon power up after a power down condition, will look at all the intervals that are missing and pad with zeros those intervals in the historical log (s).Check the box next to the Pad Device option by clicking on it, and enter the number of days in the Days field.

NOTE

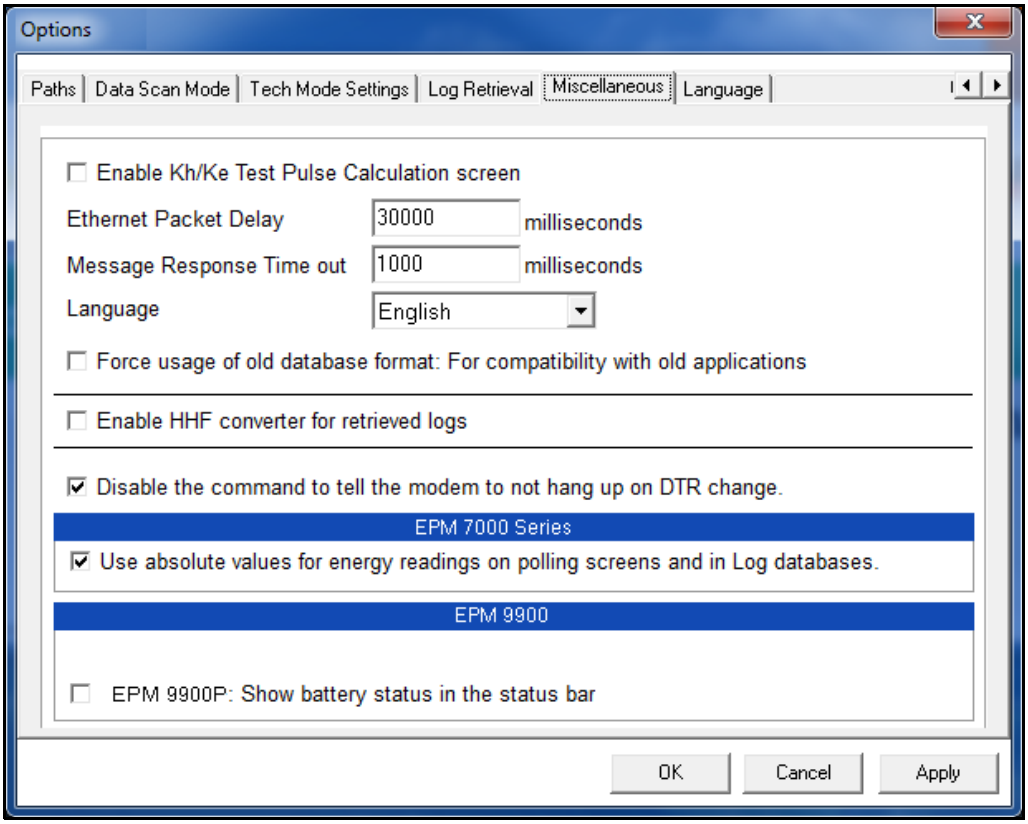
If the box is already checked, this feature is already functional. You can change the number of days, or click the box to disable this feature.

- The fourth setting pertains to EPM 9450/9650/9800 meters. It disables log retrieval by more than one application at a time.
- The last setting disables Modbus Function code 0x23 when logs are being retrieved from an EPM 9000 series meter. Modbus Function code 0x23 is a custom Modbus function code created by GE to allow for large byte transfers in Modbus protocol. Not all Modbus to Modbus TCP converters will support this extended capability. All EPM native network cards have extended buffering to support Function code 0x23.

2. Click the checkbox next to any of the settings you want to select and click **Apply** to implement your selections.

20.2.4 Miscellaneous

1. Click the **Miscellaneous** tab to see the screen shown below.



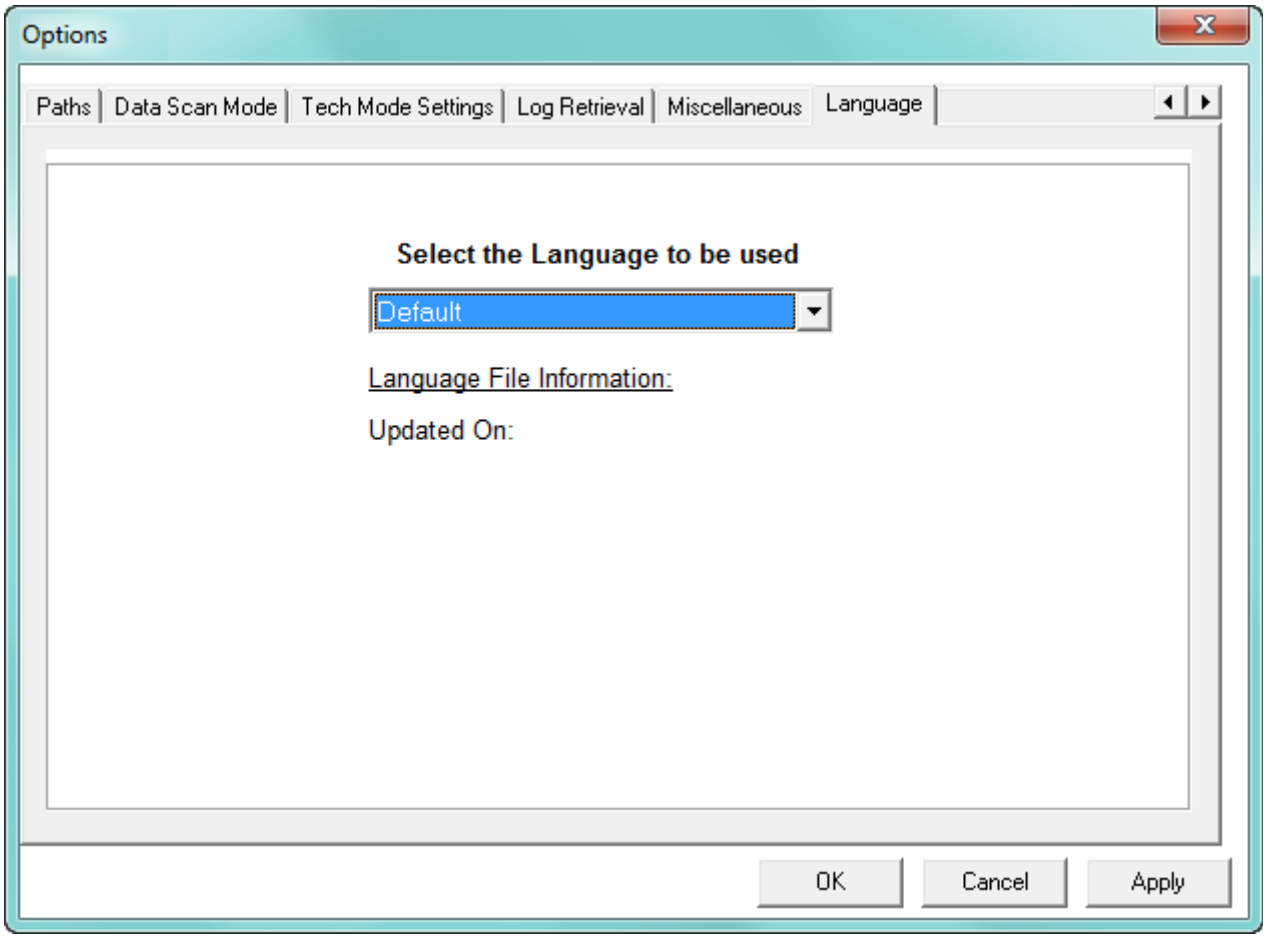
2. This screen lets you make the following settings:
   - **Enable Kh/Ke Test Pulse Calculation screen** - click to enable the screen
   - **Ethernet Packet Delay** - in milliseconds entered in field
   - **Message Response Timeout** - in milliseconds entered in field
   - **Language** - English or Spanish, selected from the pull-down menu

- **Enable HHF Converter for Retrieved Logs** - click this box if you want to enable the HHF converter. See Chapter 19 "Viewing Logs" for additional information on the HHF Converter and meter logs.
- The EPM 7000 meter uses signed energy values. Click the box next to "Use absolute values for energy readings on polling screens and in Log databases" if you need to use unsigned values with your applications.
- The EPM 9900P meter gives you the option of showing the meter's battery status in the Main screen's Status bar. Check the box to display the battery status.

3. Click **Apply** to implement your selections.

20.2.5 Language

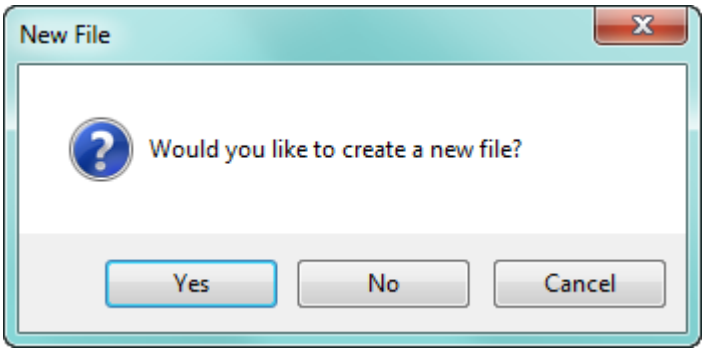
1. Click the **Language** tab to see the screen shown below if you want to change the GE Communicator application's default language.



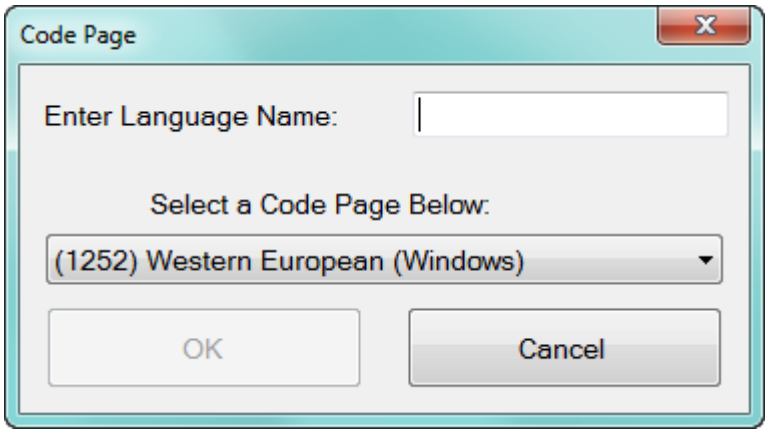
2. This feature gives you the choice of three embedded languages - Default (i.e., English), Spanish and Chinese, to choose from; and also the option to add a new language.
   - To use one of the embedded languages, select it from the pull-down menu and then select either Apply or OK.
   - To modify an embedded language, select it from the pull-down menu and click the Edit Language File button. Continue to step 5.

- To add a language, select Default from the pull-down menu and click the Edit Language File button. Continue to step 3.

3. When setting up a new language file, you will see the following screen.

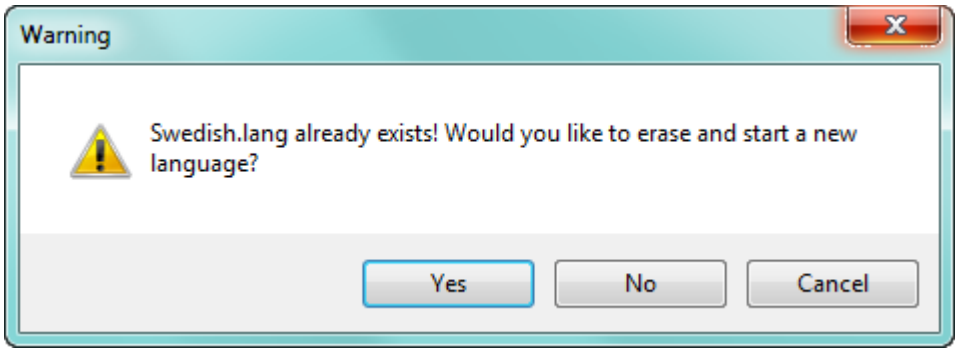


4. Click Yes to continue adding the new language file. You will see the screen below.



- Enter an appropriate name for the language file, e.g., French.
- The default selection for code page is the code page your computer currently uses. A code page determines how characters are displayed. You will only need to change the selection if you are adding a language that uses a different character set than your default language. For example, if your computer uses a Western European code page (used by languages such as English, Spanish, French, German, etc.) and you are adding Russian, you would choose Cyrillic from the Code Page pull-down menu; if your default code page is Chinese, and you are adding German, you would choose Western European from the Code Page pull-down menu.

- Note that if a language file with that name already exists, you will see the following message.



Click **Yes** to start the translation all over again, or **No** or **Cancel** to close the message window.

5. You will see one of the following screens, depending on whether you are adding a new language, or modifying an existing one.

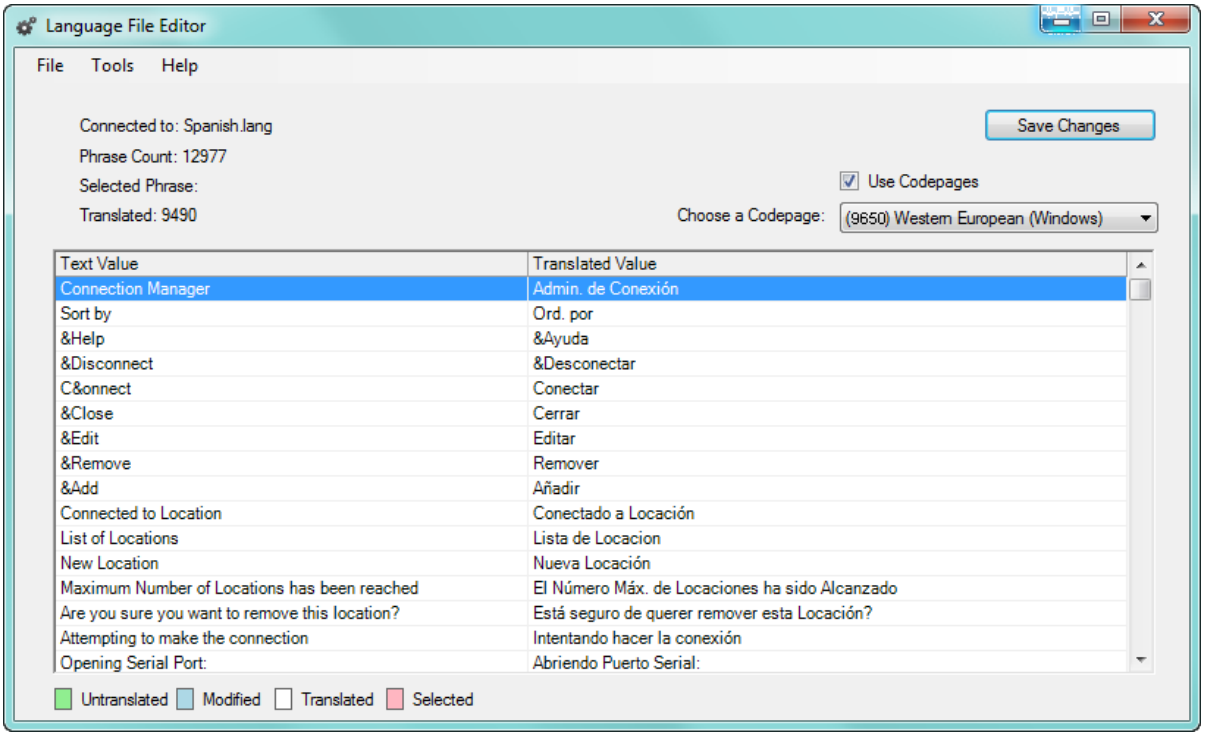


Figure 20-1: Language Editor Screen with Spanish Language Chosen

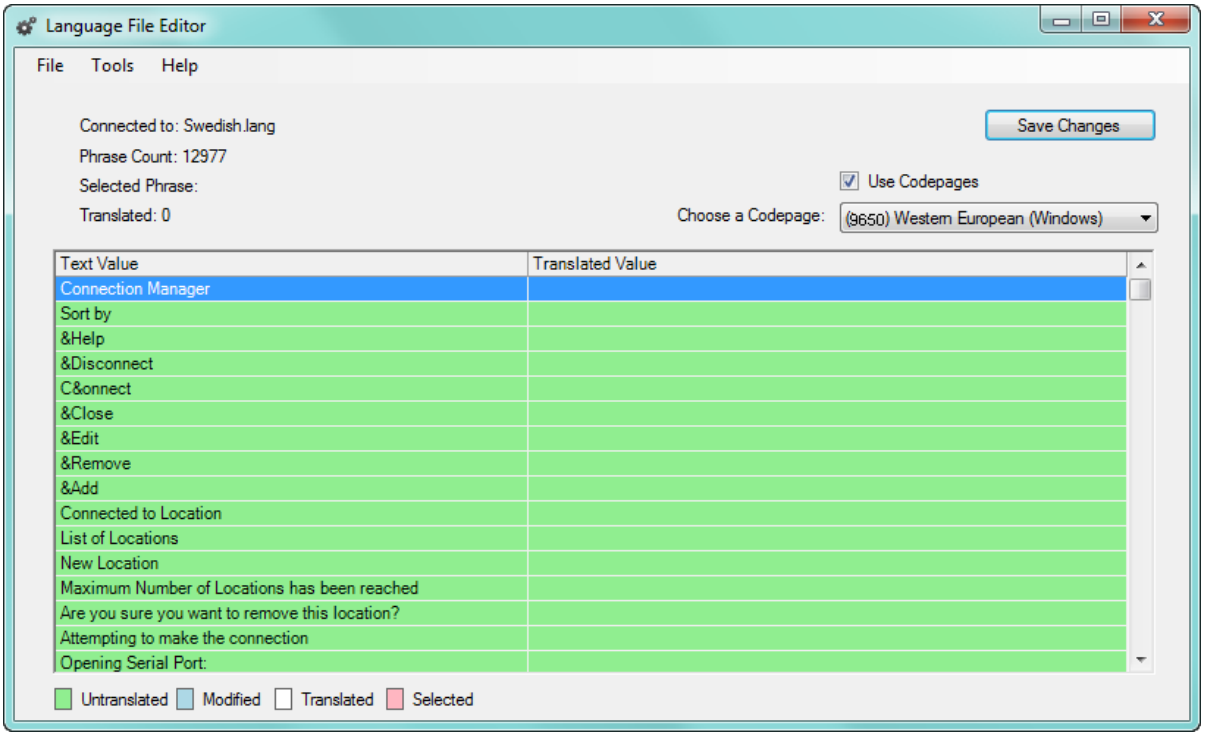


Figure 20-1: Language Editor Screen for New Language

6. The **Text Value** column contains the English phrases from the application, and the Translated Value column lists the phrase in the new language.
   - For an existing language file (example on previous page), there will be entries for each of the English phrases in the Translated Value column. To change an entry, click on the translated value and enter a new value.
   - For a new language, click in the **Translated Value** of each phrase to type in the translation you want to use.
   - The color code used by the screen is displayed at the bottom:
     - Green is untranslated phrase
     - Blue is modified translation
     - White is translated phrase (the phrase line will change from blue to white when you click Save Changes)
     - Pink is currently selected phrase
7. When you are done entering translated phrases, click **Save Changes** and then click the red **X** to close the screen. Note that you can save a partial language file and then go back to it to finish translating at a later time. You would just select the language from the Language tab's pull-down menu (see step 2) and then click **Edit Language file**.

NOTE

The following programs are supported for languages other than English:

- Log Viewer
- Script & Scheduler
- GE Communicator Main application

The following programs are not supported for languages other than English:

- EN50160 Report Generator
- EN50160 Report Viewer
- EN50160 HTML reports
- EN50160 PDF Reports
- PQDIF Converter
- COMTRADE Converter
- Log Retrieval Manager
- Time of Use Editor

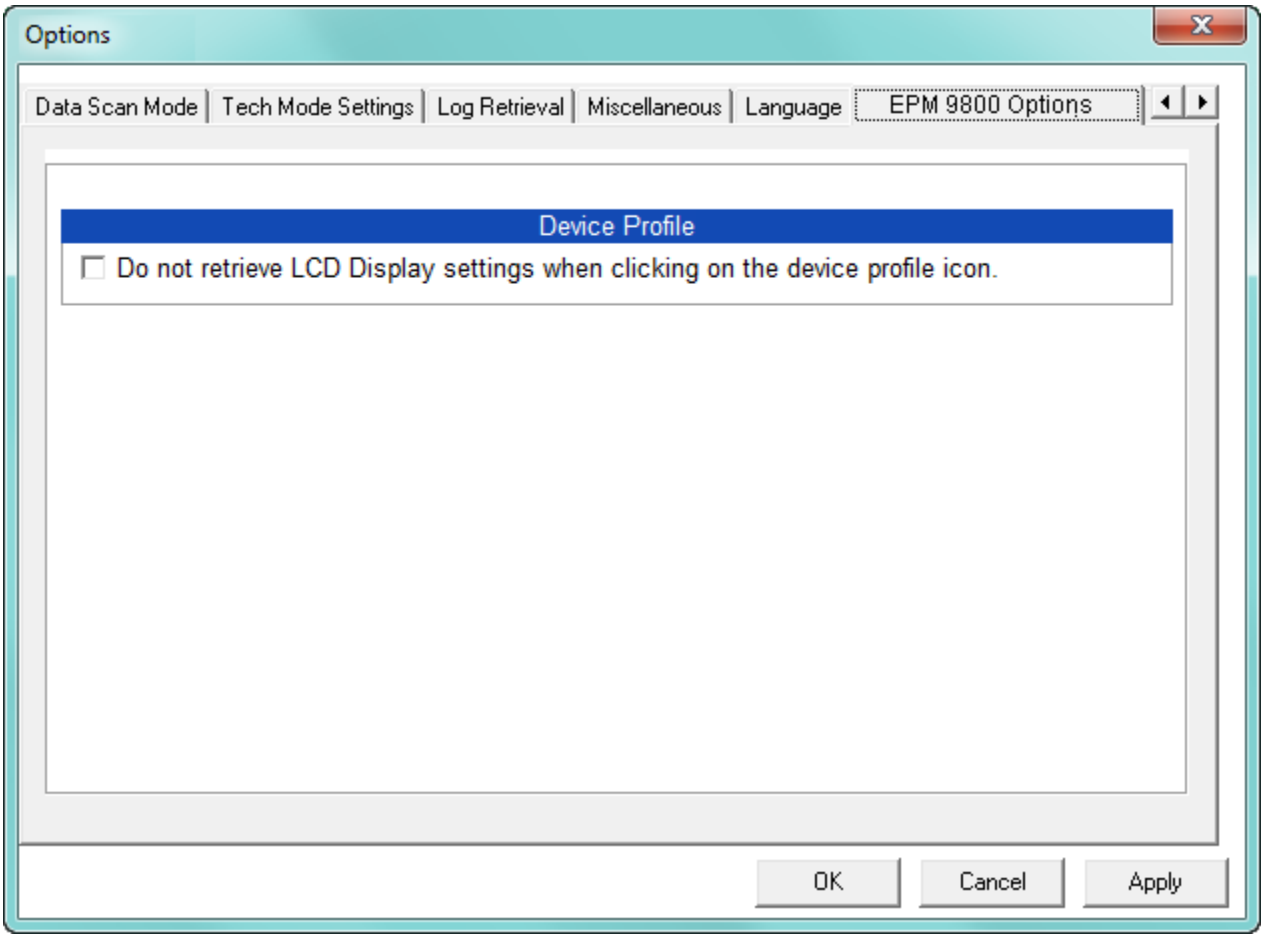
20.2.6 EPM 9800 Options

It takes a few minutes longer to load EPM 9800 meter's Device Profile when the LCD (display) settings are retrieved along with the other programmable settings. To address this issue:

There are two options available from the Tools menu: **Edit Current Device Profile** and **Edit Current Device Profile (Without LCD Programmable Settings)**. Select the latter if you do not want/need to load the LCD settings along with the other meter settings.

You also have the option to change the Device Profile icon so that its default action is to load the meter's programmable settings without loading the LCD programmable settings (the default action of the Device Profile is to load all meter programmable settings, including the LCD settings). To do this you use the EPM 9800 Options tab.

1. Click the EPM 9800 Options tab to see the screen shown below.

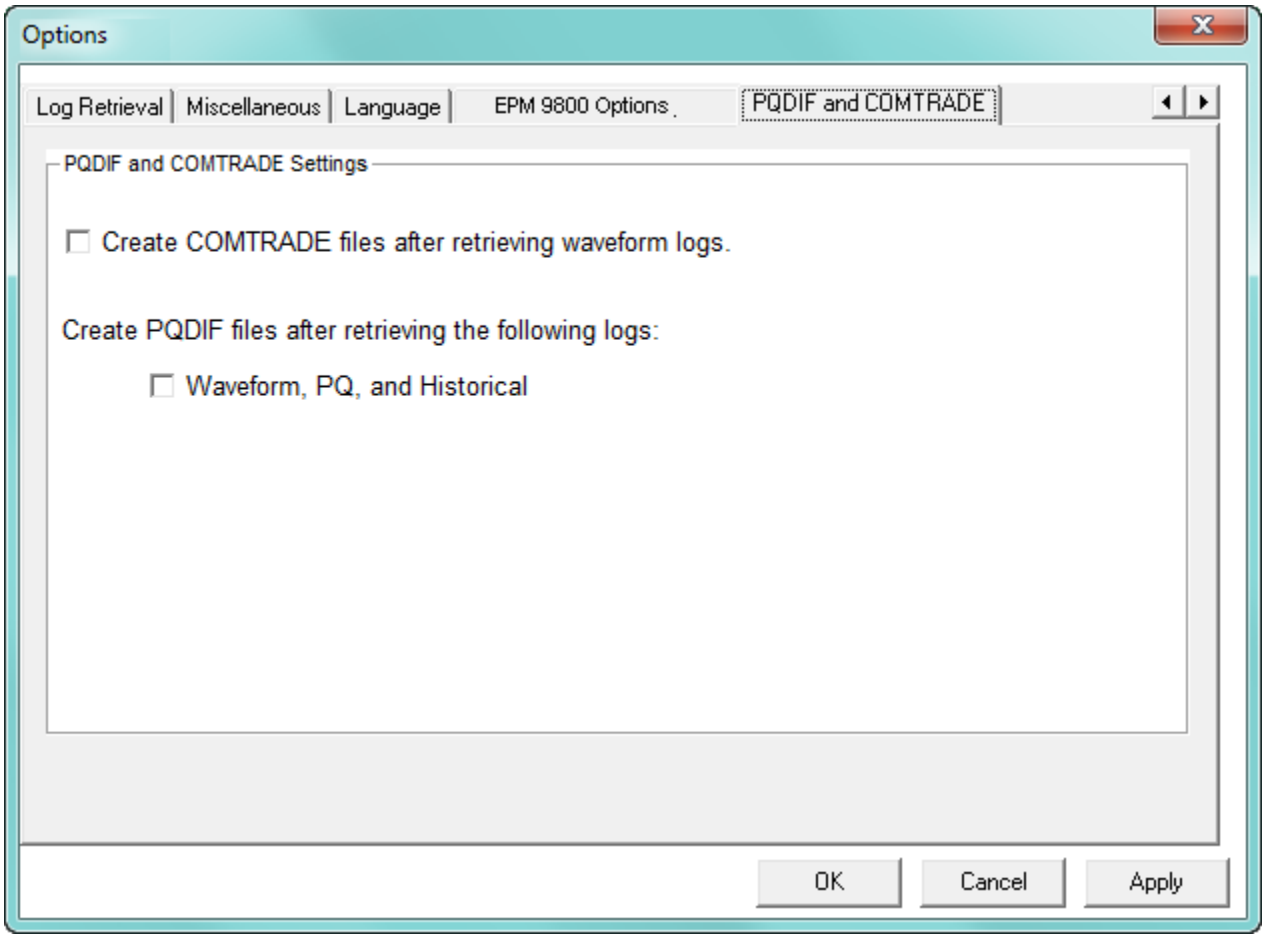


2. Click the checkbox next to "Do not retrieve LCD Display settings when clicking on the device profile icon." Clicking the Device Profile icon now loads the programmable settings without the LCD programmable settings. If you want to change back to the default, un-select the checkbox.

20.2.7 PQDIF and COMTRADE

PQDIF and COMTRADE are two different types of file format that are commonly used by third party software applications. The GE Communicator software application has the ability to automatically create these differing file formats so that waveforms captured by GE meters can be easily imported into the third party waveform and fault analysis applications.

1. Click the PQDIF and COMTRADE tab to enable the creation of PQDIF and/or COMTRADE files.



2. Click either or both of the following to enable PQDIF and CONTRADE file creation:
   - The checkbox next to Create COMTRADE files after retrieving waveform logs
   - The checkbox next to Waveform, PQ, and Historical to create PQDIF files after retrieving those logs.
3. Click **Apply** to implement your selection(s).

GE Communicator

Chapter 21: Total Web Solutions

21.1 Overview

GE Grid Solutions' Total Web Solutions (TWS), is a fully customizable Web server, providing access to real-time data via Internet Explorer. TWS has an open design that allows you to communicate with devices through a variety of open protocols. The system incorporates highly programmable network cards with built-in memory that are installed in meters with the 10/100BaseT Option. The Network cards can be programmed to perform an extensive array of monitoring functions.

NOTE

An EPM meter with the E (network option) does not support Total Web Solutions. The other Network cards - E1/E2 (EPM 7000, 7000P, 9900, 9900P) or Communications Options - 1/2 (EPM 9450/9650) or W/C (EPM 9800) offer various TWS options. Not all of the components are available with all of the Network cards.

The GE WebView Energy Dashboard is a feature of the EPM 9700 meter. It is a unique, HTML5-based web server that lets the user access the meter readings, view reports, and perform detailed analysis through the Internet. See the *EPM 9700 Instruction Manual* for a detailed explanation of the WebViewTM Energy Dashboard. Note that some, but not all, of the settings described in 21.6 *Advanced Features* on page 21–7 are available for the EPM 9700 meter; for example DHCP and FTP functions are not available. If a setting is not available, its tab is not shown in the Advanced Network Option Settings screen. Refer to 21.13 *Comparison of Network Cards* on page 21–42, for more information on the EPM 9700 features.

EPM 9700 Security features also supports security for the WebViewTM Energy Dashboard, requiring the user to log in when security for the meter is enabled and they are attempting to access a restricted permission. In addition, all HTTP communication with the meter is encrypted. See 6.12 *EPM 9700 Security Features* on page 6–26, for meter security details.

NOTE

The Legacy user is not able to access any restricted webpages when security is enabled for the meter.

21.2 System Components

TWS is made up of the following components. For flow charts of the components, see sections 21.10 *WebXML Flow Chart* onwards.

- **WebExplorer:** This component utilizes your Web browser to provide you with direct access to all power data. Using your browser, you can access any data file. And, because it looks like a standard HTML webpage to an IT department, the data transmits through corporate firewalls. This fully configurable component allows you to customize your own SCADA quality webpages, graphics and configurations via an FTP Server and/or FTP Client. The Main Default Page is shown below. This is just an example, because the webpages for your data may be changed or created to your specifications and needs. To access the meter through the Web, just type the IP address of the Network card into your browser's address bar.

Multilin™ EPM 9900P
POWER METERING SYSTEM

Home | Volts/Amps | Power/Energy | Power Quality | Pulse Accumulation | Inputs | Meter Information | Emails | Diagnostic | Tools

Voltage/Freq/Current

Meter Name 180282627

Date/Time 08-18-2016 10:57:00

Voltage/Frequency

	Instantaneous	Maximum	Minimum
Volts AN	69.50	69.44	2.61
Volts BN	69.52	69.54	2.62
Volts CN	69.29	69.38	2.61
Volts A-B	120.40	120.37	4.53
Volts B-C	120.26	120.31	4.52
Volts C-A	120.13	120.15	4.52
Frequency	60.00	60.00	2.26

Current

	Instantaneous	Maximum	Minimum
Amps A	5.14	5.14	0.19
Amps B	5.14	5.13	0.19
Amps C	5.14	5.13	0.19
Amps N (calculated)	5.13	5.13	0.19

Last Max Reset 08-11-2016 14:19:08

- **WebXML:** WebXML allows you to configure data to your specifications. The data is polled, then stored in an XML file for later access by any client on the network. The data can be viewed via multiple applications including Internet Explorer, Excel, Power Point and Word.
- **WebReacher:** With this component, you can access meters anywhere in the world. WebReacher has a built-in Modbus data concentrator that allows you to poll up to 16 devices, with up to 64 unique polling points (8 for the EPM 9900/9900P meters) with up to 64 unique polling points. WebReacher can poll items from any device that speaks Modbus RTU and/or TCP/IP protocols, and it can retrieve data and consolidate it into webpages without separate software.

- **WebMod:** The 10/100BaseT design allows the unit to speak Modbus TCP. Once the programmable Network card is placed inside an EPM meter, a gateway port becomes available. The gateway enables a highspeed interface between the Network LAN and other Modbus-based IED (Intelligent Electronic Device) equipment. Modbus TCP is an industry-proven open protocol that can be easily integrated with any other software or hardware.
- **WebAlarm:** Real Time email alerts are sent via the Internet to up to 9 recipients simultaneously for any combination of event notifications. Email format can be Short Format or Long Format: Short Format is for cellphones with text messaging service; Long Format provides detailed alarm conditions for any devices with full email support (computers, PDAs, cellphones).

21.3 Hardware Connection

The 10/100BaseT Network cards installed in an GE meter give it the ability to connect to a network through an Ethernet LAN or the Internet via Modbus TCP, HTTP, SMTP, FTP and/or DHCP. The 10/100BaseT Network cards can auto detect the cable type, and work with either straight or crossover cable.

Refer to your meter Instruction Manual for connection details.

NOTE

For the EPM 9900/9900P, only the Network card (E1) supports GE EGD protocol.

21.4 Initial Configuration

Connect to the meter through a Network connection, as shown in Chapter 3 “Connecting to a GE Meter”. The Factory set IP address for the Network cards is 10.0.0.1. The EPM 9900/9900P meter E1 card has a default IP address of 10.0.0.1 and a default gateway address of 0.0.0.0. EPM 9900/9900P E2 card has a default IP address of 10.0.1.1 and default gateway address of 0.0.0.0.

If the IP address has been changed and you do not know the new address, connect to the meter’s serial port and program the Network card parameters in the Communications settings of the Device Profile. See individual meter chapters for meter-specific details.

21.5 Basic Configuration Details

Setting up the 10/100BaseT Option consists of configuring the Web connection and the Advanced Network Card screens so that you can access the data you need from the Web. Once the initial configuration is set, you will not need software, unless you want to make changes to the configuration. With the basic setup, you will be able to access the TWS default screens, which display a variety of Real Time Readings. You also have the option of customizing your screens (see "Customizing Screens" on page 21-18).

In order for the Web to access the data from a meter, the meter must have an IP address. An IP address is a number (typically written as four numbers separated by periods, i.e. 107.3.2.54) which uniquely identifies a computer that uses the Internet. An IP address can be assigned by using a DHCP Server or it can be entered manually.

NOTE

For manual IP address setting, see Communications Setting instructions in individual meter chapters for specific meters.

21.5.1 DHCP

(Not available in all meters. See 21.13 *Comparison of Network Cards* on page 21–42).

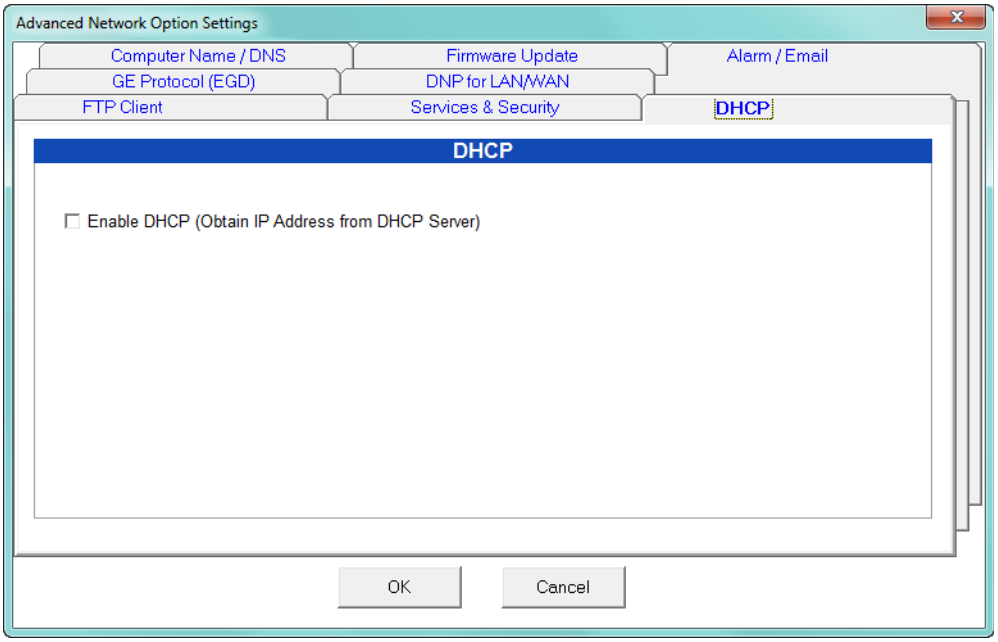
DHCP (Dynamic Host Configuration Protocol) was created by IETF (Internet Engineering Task Force) to enable individual computers on an IP network to extract their configurations from a server (the "DHCP Server") or servers, that have no exact information about the individual computers until they request the information. The DHCP Server "leases" the IP Address to the DHCP Client for a period of time from 15 minutes to a year. More information can be found in the Internet RFCs (Request for Comments) regarding available servers and technical details.

NOTE

In DHCP Mode, if a NACK message is received from the DHCP server, the Network card will stop all Ethernet activities immediately and start a new DHCP process.

1. From the GE Communicator Main screen:
   a. Click the **Device Profile** icon.
   b. Click **General Settings>Communications.**
   c. Click on one of the Ports to open the Communications Settings screen.
   d. Click **Advanced Settings**.

e. Click **DHCP** tab. You will see the screen shown below.



f. Click **Enable DHCP**.

2. Access a working DHCP Server. DHCP Servers automatically assign an IP address and Subnet Mask. Some DHCP Servers, allow you to assign a Default Gateway IP (DHCP Option #3), DNS IP (DHCP Option #6) and SMTP Server IP (DHCP Option #69) to the meter. If your DHCP Server does not let you assign parameters other than the IP address, enter those values manually. See 21.6 *Advanced Features* for instructions.
3. Click **OK** to close this screen.

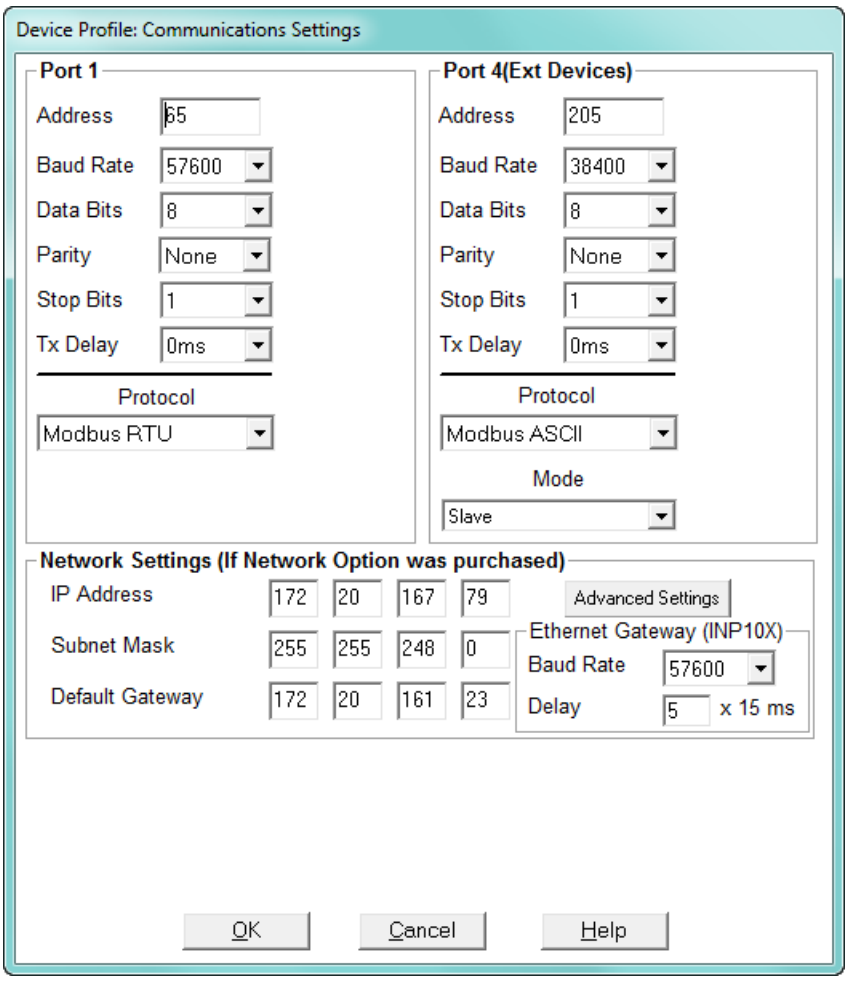
21.5.2 Gateway Settings

Follow these steps to configure the Ethernet Gateway. Port 2 is the Gateway port for the EPM 9450/9650/9900/9900P meters; Port 3 is the Gateway port for the EPM 9800 meters.

1. From the GE Communicator Main screen:
   - Click the **Device Profile** icon.
   - Click **General Settings>Communications.**

     You will see the Communications Settings screen. The Ethernet Gateway information is entered in the section below the Advanced Settings button.

See the screen below.



2. Select **Baud Rate** from the pull-down menu. Make sure any devices using this Gateway have the same Baud Rate.
3. Enter a number in the **Delay** field. This number will be multiplied by 15 milliseconds to arrive at the Delay time that will be applied to the gateway.

NOTE

You only need to enter a Delay time if the device you are connecting to needs additional response time, i.e., is a slower device like a radio modem.

4. Click **OK** to save the settings.

21.6 Advanced Features

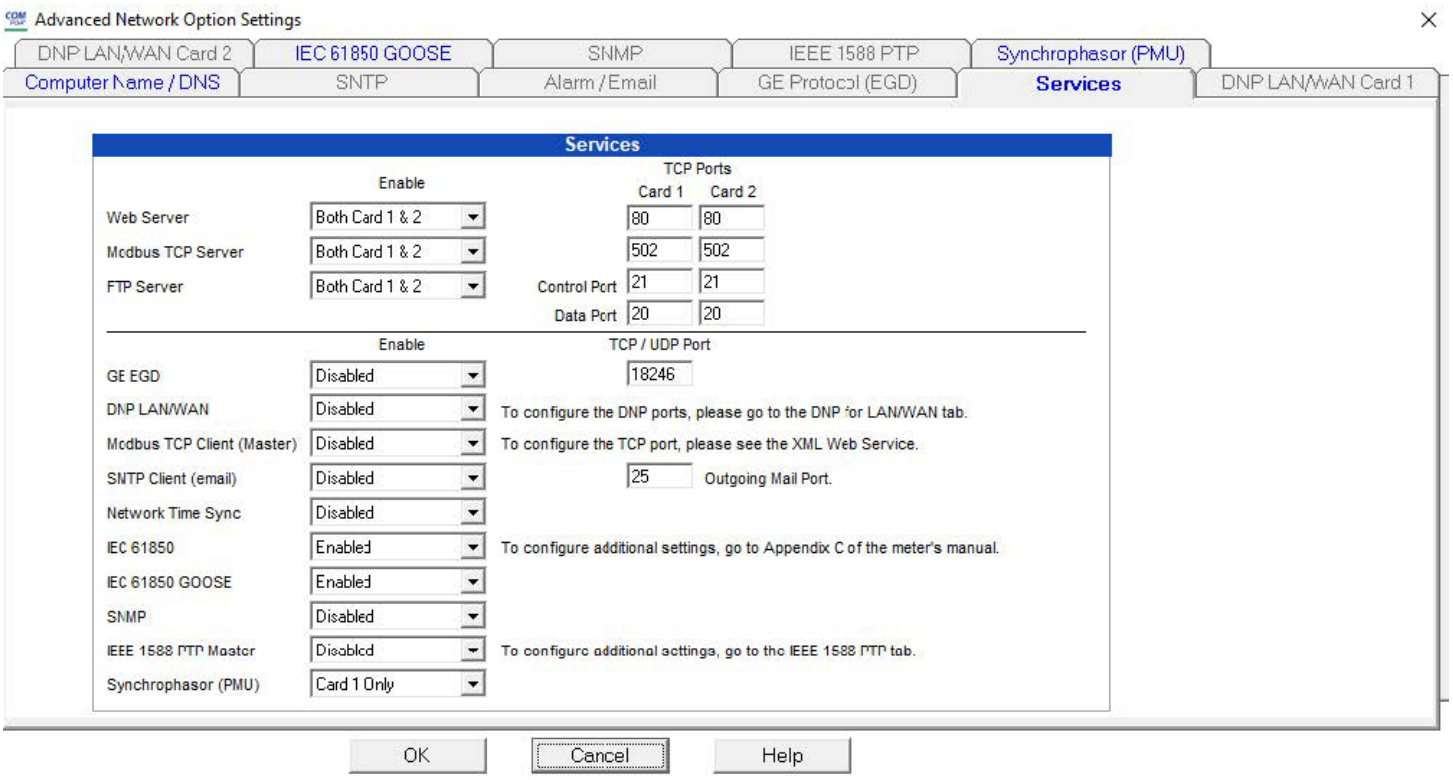
NOTE

Not all of these features are available for all meters. See 21.13 *Comparison of Network Cards*. The settings for the EPM 9900P meter are somewhat different as it has additional capabilities. Refer to 21.17 *EPM 9900P Advanced Features Setting* for instructions on setting the EPM 9900P meter's additional Advanced Settings. The EPM 9700 meter has some slightly different options, which are explained in the appropriate sections.

1. From the GE Communicator Main screen:
   - Click the **Device Profile** icon.
   - Click **General Settings>Communications.**
   - Double-click the active port, then click the **Advanced Settings** button.
2. You will see the **Advanced Network Settings Options** screen. The following sections provide information about each of the settings, available by clicking the tabs at the top of the screen.

21.6.1 Services & Security

1. Click the Services & Security tab.

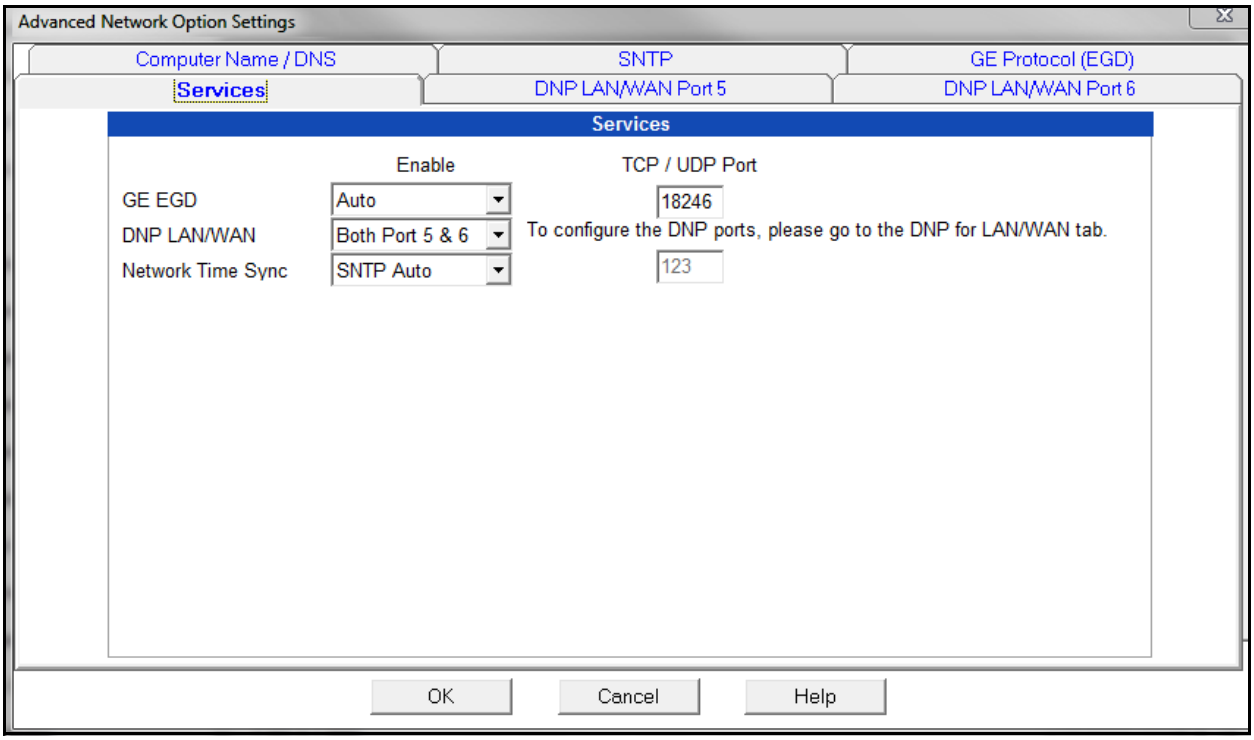


2. Check the boxes in front of the listed Services to Enable the features you want.

NOTE

- You can disable or enable Web server and Modbus TCP Server for IP Port 5 only, IP Port 6, only or both ports, for IPv4 (IP version 4) and IPv6 (IP version 6). You can

designate a Com port for IPv4 ports 80 and 502 are the default); the same Com port will be assigned to IPv6.



- **GE EGD** protocol setting: can be disabled, set to Auto (either port can accept), set for Port 5 only, or set for Port 6 only. See 21.6.3 *GE Protocol (EGD)*, for additional settings; and 21.14 *GE EGD Details*, for details on the protocol.
- **DNP LAN/WAN**: can be disabled or enabled for Port 5, Port 6, or both, for IPv4 (IP version 4) and IPv6 (IP version 6). See 21.6.6 *DNP for LAN/WAN*.
- **SMTP Client** (email): can be disabled or enabled for Port 5, Port 6, or Auto (whichever port is available). You can select the Outgoing Mail port from the pull-down menu and there is a field that displays the email encryption status. See 21.6.4 *WebAlarm/Email*, for more email instructions.
- **Network Time Sync**: meter time synchronization through an NTP server can be disabled, set to Auto (either port can accept), set for Port 5 only, or set for Port 6 only. For the EPM 9700 meter, see 26.1.3 *Time Settings*, for instructions on SNTP configuration.
- **IEC 61850**: select Enabled to enable the IEC 61850 server for one of the Network cards; select Disabled to disable the IEC 61850 server entirely.
- **IEC 61850 GOOSE**: select Enabled to enable IEC 61850 GOOSE messaging for the Network card that is the IEC 61850 protocol server; select Disabled to disable the IEC 61850 GOOSE messaging feature.

NOTE

If you enable IEC 61850 GOOSE, you also need to make settings for it. See 21.17.2 *IEC 61850 GOOSE Tab*, for instructions.

- **IEEE 1588 PTP**: this option is for the EPM 9900P meter. See 21.17.4 *IEEE 1588 PTPv2 Master*.
- **Synchrophasor (PMU)**: This option is for the EPM 9900P meter. See 21.17.5 *Synchrophasor (PMU)*.
- **TCP/UDP Port**: enter the TCP port to use. You need to use the DNP LAN/WAN Port 5 and/or 6 tabs to set up the DNP ports. See 21.6.6: *DNP for LAN/WAN*, on page 21-14, for instructions.

NOTE

The EPM 9700/9900/9900P meter does not use Sleep modem but other meters do offer it.

Use Scaled Energy readings setting is only available for the EPM 9800 meters. See 21.6.1.1 *Use Scaled Energy Readings in Webpages That Contain Energy Readings*.

Block Password is only available for the EPM 9800 meters.

Network card security for some meters is a different than meter security. See *Meter Security* for further details.

3. Click **OK** to save your settings or continue to the next section.

21.6.1.1 Use Scaled Energy Readings in Webpages That Contain Energy Readings

Only EPM 9450/9650/9800 meters support scaled energy readings. For these meters, you have the option to specify which energy readings (old-fashioned energy or scaled energy) you want to display in default webpages.

Enable the scaled energy display by selecting that option in Services & Security (see 21.6.1 *Services & Security*) and also set up the poll_data.xml file to specify scaled energy readings display.

The following Attributes in the poll_data.xml file are used for the scaled energy display option:

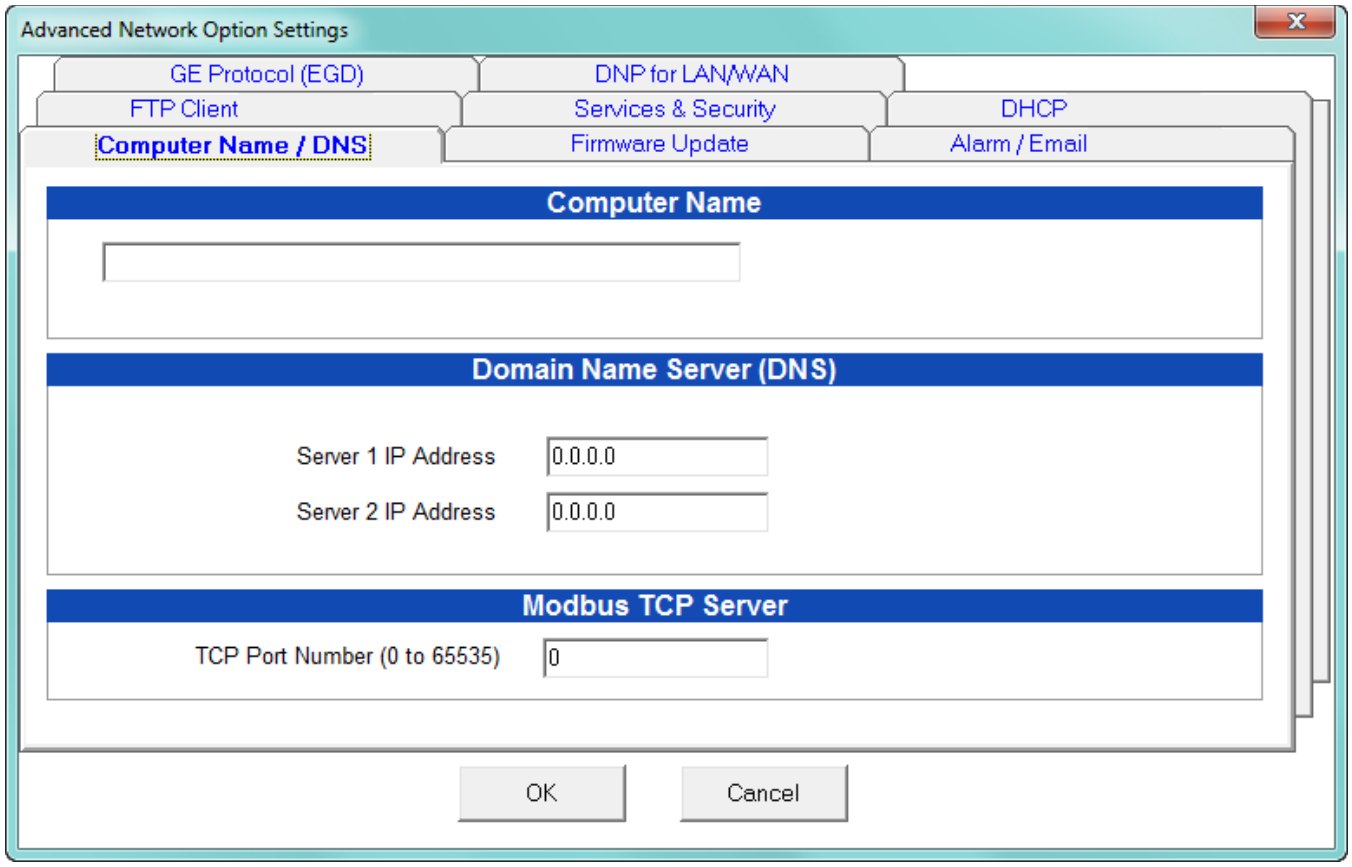
- SYS_Scaled_Energy_Available
  An indicator is provided in the XML file that tells if the meter supports scaled energy readings: Yes=scaled energy readings are supported; No=scaled energy readings are not supported.
- SYS_Use_Scaled_Energy
  This option is set based on the selection in the device profile and is used by the default webpages to determine which energy readings are displayed in the default webpages: Yes=use scaled energy; No=use regular energy.

An example of scaled energy settings in the poll_data.xml follows:

```
<GE_DATA>
<GE_SYSTEM>
<sys_info SYS_Use_Scaled_Energy="Yes"
          SYS_Scaled_Energy_Available="Yes"/>
</GE_SYSTEM>
</GE_DATA>
```

21.6.2 Computer Name / DNS

1. Click the **Computer Name/DNS** tab.



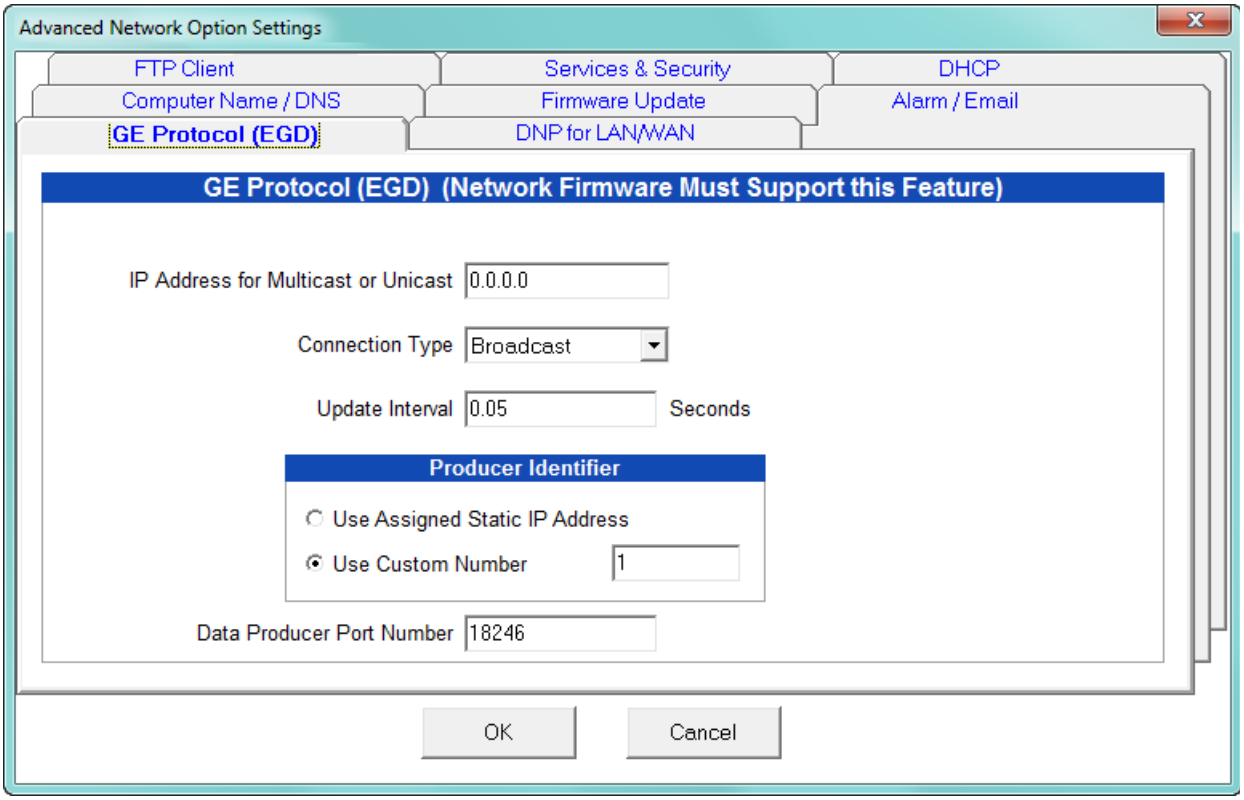
2. Enter the Computer Name (optional). This allows the user to access the meter by name, if there is a DNS Server working in conjunction with the DHCP Server. See your network administrator and the servers' User manuals for further details.
   The Default Computer Name is MULTINET_XXXXXX where the X's are the last 3 octets of the MAC Address.
3. Enter the IP Addresses for Domain Name Servers 1 and 2.
4. Enter the port number for the Modbus TCP server. Note that this setting is not shown in the EPM 9700/9900 meter's screen, since the TCP server settings are on a different screen.
5. Click **OK** to save your settings or continue to the next section.

21.6.3 GE Protocol (EGD)

(See 21.14 *GE EGD Details*, for Detailed Information)

1. Click the **Services** tab. Click the checkbox next to GE EGD Data Port Server.

2. Click the **GE Protocol (EGD)** tab.



3. The settings you make in this screen support your use of GE's EGD Protocol:
   - Enter the IP address
   - Select Connection type
   - Enter Update interval
   - Select the Product identifier
4. Click **OK** to save your settings or continue to the next section.

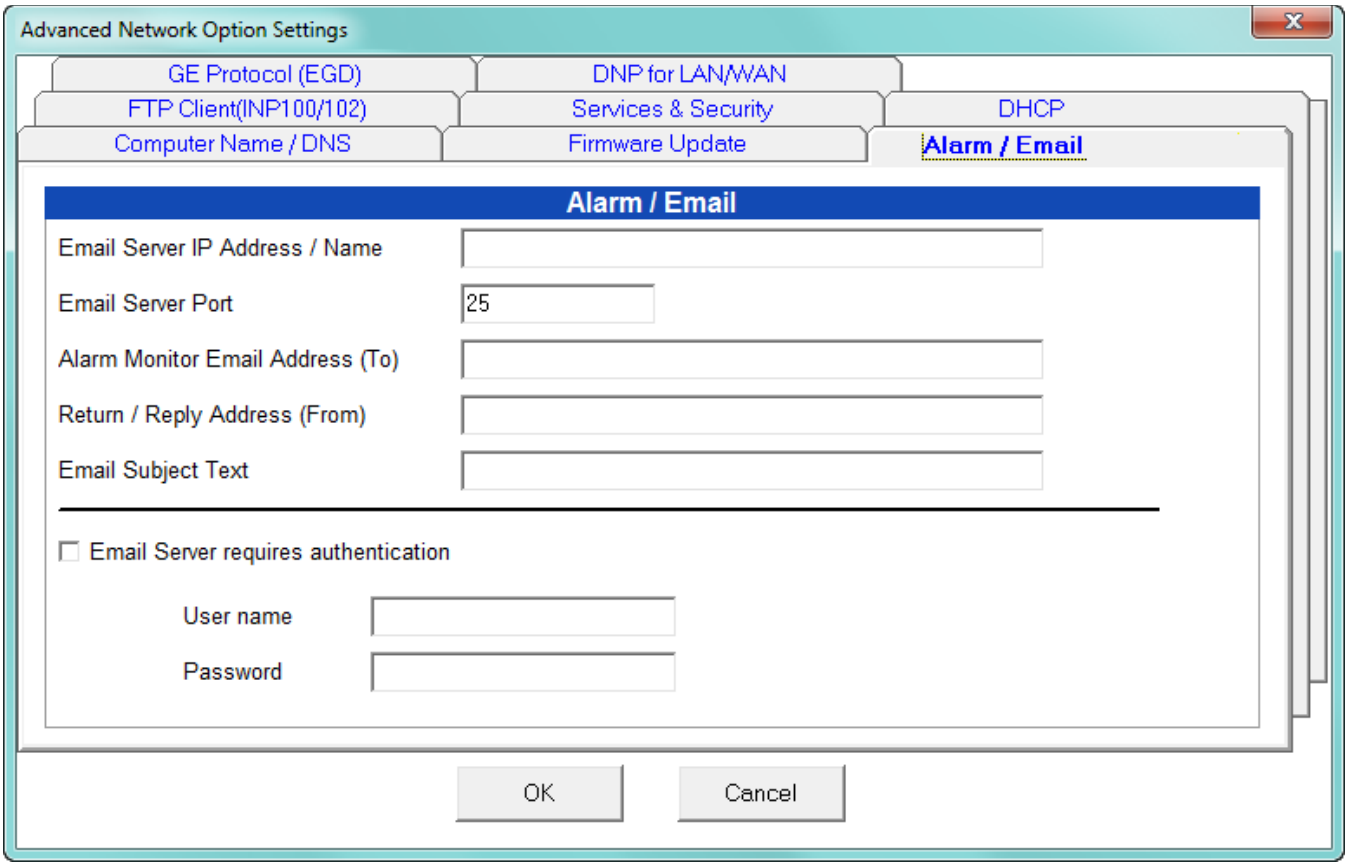
21.6.4 WebAlarm/Email

(Not available in all meters - see 21.13 *Comparison of Network Cards*)

This feature enables email when an alarm condition occurs. Settings for one email are configured in the Alarm/Email tab of the Advanced Network Card settings. An additional 8 email addresses can be configured in the **poll_profile.xml** file (see "Advanced Features" on page 21-7). The EPM 9700/9900/9900P uses **pprofile.xml.**

1. Click the **Services** tab. Enable/Disable the sending of Email by clicking **Alarm Generated Email**. The Initial Setting is Off, indicated by the empty check box.

2. Click the **Alarm/Email** tab. You will see the screen shown.



3. Enter the following settings:
   - SMTP Server IP or Name (Requires DNS Setup).
   - Email Server Port Number: 25
   - Administrator Email Address/ **To Address**: for user preferred address or any monitoring software receive address such as For GE's Dial-In Server
   - Return/Reply/**From Address**.
   - Subject Text: any
4. Click **OK** to save your settings or continue to the next section.

NOTE

For the EPM 9900/9900P meter, when both Network cards are installed, email can be sent from either card. Generally, the email will be sent out on the first network card that has a working path to the gateway IP.

Example 1:

Network card 1: IP=192.168.0.2, mask=255.255.255.0, gateway=192.168.0.1

Network card 2: IP=192.168.0.3, mask=255.255.255.0, gateway=192.168.0.1

Email will be sent out on Network card 1.

Example 2:

Network card 1: IP=192.168.0.5, mask=255.255.255.0, gateway=0.0.0.0

Network card 2: IP=192.168.0.3, mask=255.255.255.0, gateway=192.168.0.1

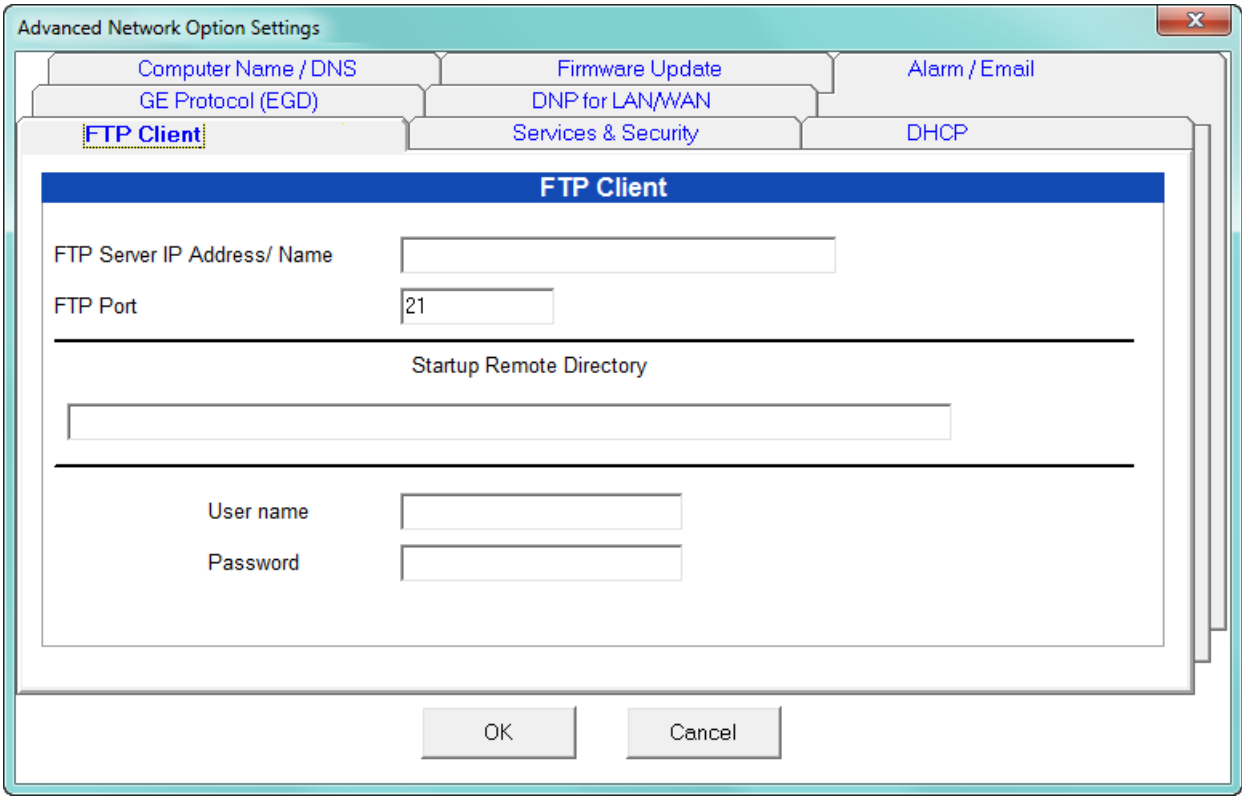
Email will be send out on Network card 2.

21.6.5 FTP Client

(Not available in all meters - see 21.13 *Comparison of Network Cards*)

This feature allows you to substitute your own polling profile, webpages or graphics for the Web server. You must also set up an FTP Server with a user account and read-only access.

1. Click the **Services** tab. To enable FTP, click the checkbox next to **FTP Client**.
2. Click the **FTP Client** tab.



3. Enter the following settings:
   FTP Client Settings:
   - FTP Server IP or Name (requires DNS setup)
   - FTP Server Port: Initial Setting is xx.
   - Startup Directory: where the TWS files are located. The Network card will get the files from this location. When a file in the Startup Directory has the same name as the one in the initial files within the meter, the new file will replace the initial file. If you have set up this directory through your FTP server, leave this field blank.
   - User Name
   - Password

FTP Client Settings Example:

By default, Microsoft's FTP Server will use **"C:\Inetpub\ftproot\"** as the root directory. When you log onto the FTP Server, this is the initial directory you will see.

1. If the files for the E1 network card are stored in the root directory ("C:\Inetpub\ftp root\"), leave the "Startup Remote Directory" text box empty.

   Example Files in FTP Server's Root Directory:

   - "C:\Inetpub\ftproot\index.htm"
   - "C:\Inetpub\ftproot\poll_profile.xml"
   - "C:\Inetpub\ftproot\logo.gif"

   When the E1 network card starts up, it will check to see what files are in the server's directory and will download them all.

2. If the files for the E1 network card are stored in a **subdirectory** in the root directory, such as "C:\Inetpub\ftproot\multilin_meters\feeder_12345\", put **"multilin_meters/ feeder_12345"** in the "Startup Remote Directory" text box.

   NOTE

   Note the different "/, \" slashes between directory names.

   When the E1 network card starts up, it will check for all files in the server's directory ("multilin_meters/feeder_12345") and download all files found. If there is another subdirectory inside this directory that is not listed in the server's directory as above, such as "C:\Inetpub\ftproot\multilin_meters\feeder_12345\info\", E1 will not locate that subdirectory and no files will be downloaded from that subdirectory to E1. That may cause an error during the file downloading process and the system may not enter its normal operation mode until the subdirectory is removed from the server.

3. The user should always check the FTP server to see if it's configured properly. To do this, open the IE browser window, enter the correct address in the URL window. The standard format is: "ftp://[username]:[password]@[ip_address]".

   Example:

   "ftp://john:1a2b3c@192.168.1.1" where John is the user name and 1a2b3c is the password.

4. Click **OK** to save your settings, or continue to the next section.

21.6.6 DNP for LAN/WAN

The original DNP 3.0 was designed for serial point-to-point communication (e.g. RS232) with limited support for half duplex serial networks (e.g. RS485). In order for devices to exchange DNP messages in a local (LAN) and/or wide area network (WAN), one must either augment the protocol to support a network environment or use an existing network transport mechanism. DNP 3.0 LAN/WAN was specifically defined for transporting DNP traffic on the Internet Protocol Suite.

GE's DNP 3.0 LAN/WAN implementation was based on the specifications described in DNP3 Specification, Volume 7, Networking, according to the Version 2.0 Draft E of March 12, 2004. The official DNP 3.0 specifications can be found at www.dnp.org.

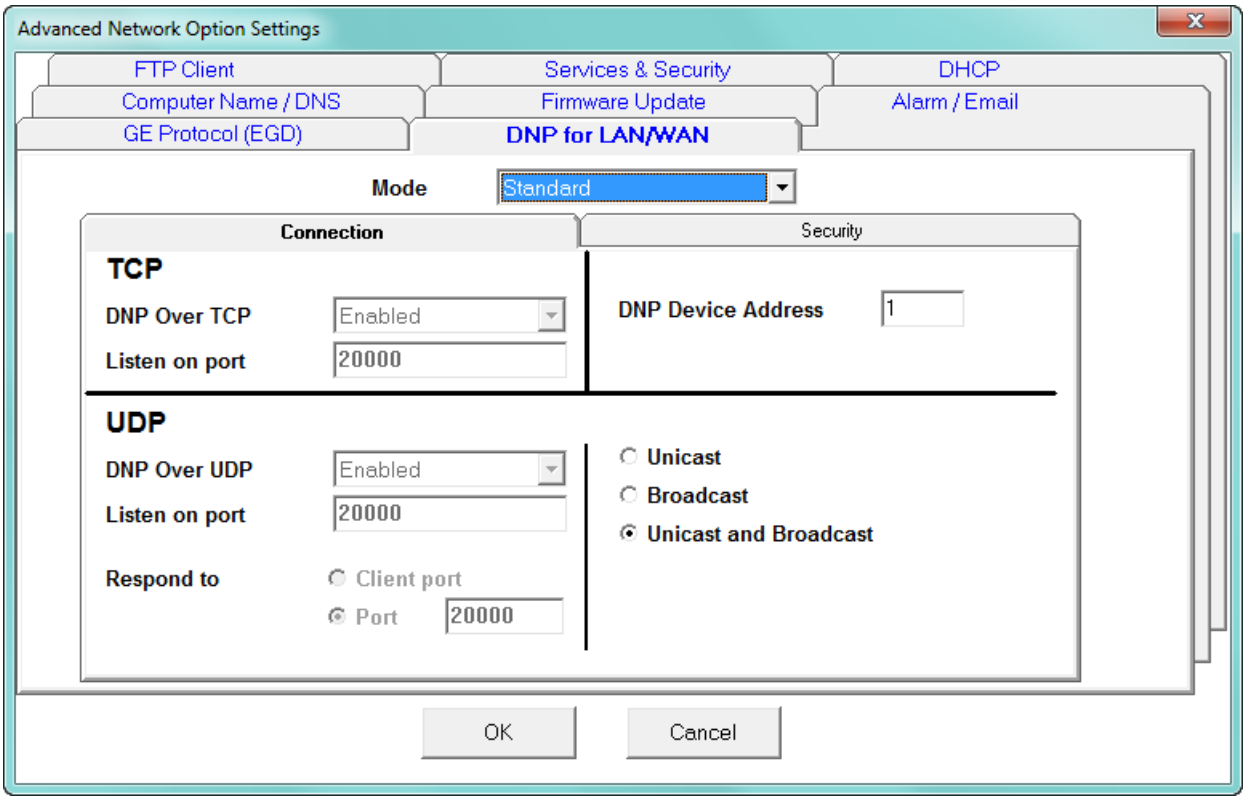
Table 21–1: DNP Parameters (Settings in BOLD are default for Standard Mode)

Name	Settings	Notes
DNP over TCP	**Enabled** Disabled	If set to **Enabled**, network Card will receive DNP over TCP requests.
DNP over TCP Listen on Port	**20000** (User Defined)	TCP Listening Port
DNP over UDP	**Enabled** Disabled	If set to **Enabled**, network Card will receive DNP over UDP requests.
DNP over UDP Listen on Port	**20000** (User Defined)	UDP Listening Port
UDP Respond to	Client Port **(User Defined)**	If set to **Client Port**, UDP response will be sent to the UDP Request Port. Otherwise, UDP Response will be sent to a User Defined Port Number. Default is fixed at 20000.
UDP Addressing	Unicast Broadcast Unicast & Broadcast	If set to **Unicast & Broadcast**, all UDP requests are accepted. If set to Unicast, Network Card will check to see if the UDP Destination address matches the meter's IP address. If set to Broadcast, Network Card will check to see if the UDP Destination address is 255.255.255.255. If no match, the UDP connection is refused.
Validate Source IPs	Validation Disabled 1 IP Address 2 to 4 IP Addresses	If set to Disabled, Network Card will not perform Validation on any incoming IP Addresses. If set to 1 to 4, Network Card will perform Validations on every IP address defined by user.
Validate Source Ports	**No** Yes	If set to No, Network Card will not perform Validations on incoming TCP and UDP Ports for a given IP address.
IP Addresses	(User Defined)	Up to 4 IP addresses to Validate.
Subnet Mask	(User Defined)	Masking bits applied to IP address. When defined properly, user can specify Validation on a single IP address, or a range of IP addresses.
TCP Ports, Start & End	(User Defined)	TCP Port Range to be validated.
UDP Ports, Start & End	(User Defined)	UDP Port Range to be validated.

GE's DNP 3.0 LAN/WAN feature is available for EPM meters with E1/E2 Network Cards. To use this feature, you must configure the EPM meter's DNP Custom Classes Map in the meter's Device Profile.

See individual meter chapters for configuration screens and details.

1. Click the **DNP for LAN/WAN** tab.
   The following screen appears.



- **Mode of operations (at top of screen): Disabled:** Feature is disabled, no DNP 3.0 LAN/WAN communication will be accepted.
- **Standard:** Feature is enabled. Most communication parameters are fixed, except the port number to which the UDP packets respond. Security features are not available.
- **Manual:** Feature is enabled. All communication parameters are configurable. Security features are available..
- For EPM 9450/9650/9800 meters, a single **DNP Over TCP** connection and a single **DNP Over UDP** connection is available when enabled; the EPM 9900/9900P has two **DNP Over TCP** connections and one **DNP Over UDP** connection, and the EPM 9700 has up to two **DNP Over TCP** and 2 **DNP Over UDP** connections, when both ports 5 and 6 are used for DNP. While DNP Over TCP connections may be closed at the decision of the Network Card, the master EPM meter may also determine that the current **DNP Over TCP** connection should be closed.
- Since E1/E2 has several built-in servers, the DNP LAN/WAN TCP and UDP Listen on Ports defined by the user cannot be any of the ports shown in the table below.

Name	Port Number
Echo	7
FTP Server Data	20
FTP Server Control	21

Name	Port Number
Web Server	80
Modbus TCP Server	502

- DNP Device Address is configurable.

2. Click **OK** to save your settings.

Example of setting up validation for IP addresses.

1. Set Validate Source IPs to 1 IP address.
2. Set Validate Source ports to Yes.
3. Enter IP address, such as 10.0.0.101.
4. Enter mask, such as 255.255.255.128.
5. Enter TCP ports range, such as 20000-20000.
6. Enter UDP ports range, such as 20000-20000.

As the result, a valid DNP 3.0 LAN/WAN request must come from a device with IP address of 10.0.0.1 to 10.0.0.127, with TCP and UDP ports set at 20000.

If a DNP Over TCP connection was established and Validation was also enabled, any new incoming DNP Over UDP connection must have the same IP Address as the TCP connection. If they are different, then the UDP connection will be closed.

All incoming communication for DNP LAN/WAN will go to the Master meter; no DNP communication will go to the E1/E2's gateway port.

21.6.7 IEC-61850

Either of the EPM 9900P meter's Ethernet boards, the EPM 9900 meter's main Ethernet board, and the EPM 7000 meter's optional E2 card offer an IEC 61850 Protocol Ethernet Network server. The IEC-61850 tab lets you enable the IEC-61850 server for the EPM 9900 and EPM 7000 meters. For the EPM 9900P meter, this setting is made in the Services tab - see 21.17.1 *Services Tab* on page 21–52.

1. Click the **IEC-61850** tab.
2. Click the checkbox next to **Enable IEC-61850 Server**.
3. Click **OK**.

Consult the meter's Installation and Operation manual for instructions on configuring the IEC 61850 Protocol Network server.

NOTE

For the EPM 9900/9900P meter there is also an SNTP tab that lets you set up the Simple Network Time Protocol Server if you are using it for Time synchronization: see 11.1.3 *Time Settings*, for instructions.

21.7 Customizing Screens

The following sections explain how to customize the TWS screens for your application's specific needs.

NOTE

The EPM 9700 meter does not support this feature.

21.7.1 Configuring WebExplorer™

All polled data for the EPM 9450/9650/7000 meters is stored in an XML file called poll_data.xml. All polled data for the EPM 9900/9900P meter is stored in an XML file called pdata.xml. Each polled item is located in its DEVICE_xsection as it is programmed in the poll_profile.xml file. The standard data format for each device is:

<DEV_NAME> <DEV_TYPE>

up to 64 <items>, each with its D_UID,

D_LABEL and D_VALUE.

This XML file can be viewed directly in your browser (click **View > Source**). To display it on a customized webpage, you must set up your browser to run Java Script. (Configuring XML is detailed in "Configuring WebXML" on page 21-22.)

NOTE

Auto Refresh Rate is set in the SetTimeout ()Function (see Java Script example below).

Example of the data file:

```
<?xml version="1.0" encoding="UTF-8"?>
<!--GE Grid Solutions embedded network server polled data-->
<GE_DATA>
<GE_SYSTEM>
</GE_SYSTEM>
<DEVICE_1>
    <DEV_NAME>Multilin Demo 1</DEV_NAME>
        <DEV_TYPE>Multilin 1250</DEV_TYPE>
    <item D_UID="1_1" D_LABEL="Inst Van" D_VALUE="+122.46"></item>
</DEVICE_1>
<DEVICE_2>
    <DEV_NAME>N/A</DEV_NAME>
        <DEV_TYPE></DEV_TYPE>
    <item D_UID="2_1" D_LABEL="Inst Watt" D_VALUE="+0.08 k"></item>
</DEVICE_2>
</GE_DATA>
```

Displaying a value in an HTM file: (Use Java Script in the web browser.)

1. Define a unique name for a value to be displayed, such as data_name. Insert `<span id="data_name"></span>` in the HTM file where it will be displayed.

2. Create a Java Script code inside the HTM file (Auto Screen Refresh is set at 5000ms in the Set.
   Timeout ()Function; see Example below:

   Example:

```
<Script language=Javascript>
<!--var disp_value;
var timerID;
var tmp_name;
var xmlDoc=new ActiveXObject("MSXML.DomDocument");
xmlDoc.async=true;
xmlDoc.onreadyststechange=do_get_data;
function do_get_xml()
{
    xmlDoc.load("poll_data.xml");
{
function do_get_data()
{
    if (xmlDoc.readyState == 4)
    {
        if (xmlDoc.documentElement == null)
        {
            timerID = setTimeout("do_get_xml();",5000);
        }
        else
        {
            disp_value =
        xmlDoc.documentElement.selectSingleNode
            ("//item[@D_UID='1_1']").
        getAttribute("D_VALUE");
            data_name.innerHTML = disp_value;
            timerID = setTimeout("do_get_xml();",5000);
        }
    }
}
//--></SCRIPT>
```

NOTE

Inside the <body> of the HTML file, add on the following:

```
Load="do_get_xml()"
```

Server Side Include Functions

These functions will send data directly to the browser as part of a requested document.

Example of using Server Side Include Functions:

1. In HTM file, add to the first line of that file

   ```
   <!-- ** THIS FILE DOES CONTAIN REALTIME DATA ** -->
   ```

   Without that line, any server side include functions will not be processed by the web server.

2. Inside the HTM file where you want the info displayed, add

   ```
   <!--#exec cgi="/[server_side_include_function_name]"-->
   ```

   where [server_side_function_name] can be one of the function names.

3. To display stored email #1's date/time, add the following to your HTML file at the location where you want the data displayed:

   ```
   <!--#exec cgi="/ssi_show_email_date_time 1"-->
   ```

Table 21–2: General Functions

Server Side Include Function Name	Parameter	Description
get_ip.fn		Show local IP address

Table 21–3: Diagnostic Functions

Server Side Include Function Name	Parameter	Description
ssi_diag_cpu		Show CPU info
ssi_diag_ethernet_hardware		Show ethernet hardware info
ssi_diag_firmware		Show firmware info
ssi_diag_ftp_server		Show FTP Server info
ssi_diag_imported_files		Show FTP client/imported files status
ssi_diag_memory		Show memory info
ssi_diag_modbus_com		Show all Modbus communication info
ssi_diag_modbus_tcp_server		Show Modbus TCP Server info
ssi_diag_modem		Show internal modem status
ssi_diag_system		Show system info, such as start time
ssi_diag_web_server		Show Web server info
stats.fn		Show ethernet communication status

Table 21–4: Stored Email Functions

Server Side Include Function Name	Parameter	Description
ssi_show_email_date_time 1 to 10		Show stored email's date/time

Table 21–4: Stored Email Functions

Server Side Include Function Name	Parameter	Description
ssi_show_email_subject 1 to 10		Show stored email's subject text
ssi_show_email_from 1 to 10		Show stored email's from text
ssi_show_email_to 1 to 10		Show stored email's to text
ssi_show_email_cc 1 to 10		Show stored email's cc text
ssi_show_email_device_name 1 to 10		Show stored email's device name text
ssi_show_email_contact_person 1 to 10		Show stored email's contact person name
ssi_show_email_contact_phone 1 to 10		Show stored email's contact phone number
ssi_show_email_alarm_ids 1 to 10		Show stored email's alarm IDs
ssi_show_email_alarm_names 1 to 10		Show stored email's alarm names
ssi_show_email_alarm_details 1 to 10		Show stored email's alarm details
ssi_show_email_send_status 1 to 10		Show stored email's send status
NOTE: 1 = Newest, 10 = Oldest		

Table 21–5: Special Functions for Modbus Device 1

Server Side Include Function Name	Parameter	Description
ssi_show_pt		Show PT ratio
ssi_show_ct		Show CT ratio
ssi_show_system		Show hookup info
ssi_show_dev_type		Show device type/model
ssi_show_dev_name		Show device name
ssi_show_boot		Show boot firmware version
ssi_show_run_time		Show runtime firmware version
ssi_show_dsp_boot		Show DSP firmware boot version
ssi_show_dsp_runtime		Show DSP runtime firmware version

Table 21–5: Special Functions for Modbus Device 1

Server Side Include Function Name	Parameter	Description
ssi_show_sn		Show device serial number
ssi_show_com_state		Show COM firmware runtime state
ssi_show_dsp_state		Show DSP firmware runtime state
ssi_show_pw_state		Show password protection state
ssi_show_mac		Show ethernet MAC address
ssi_show_ip		Show IP address
ssi_show_mask		Show subnet mask
ssi_show_gateway		Show default gateway IP address
ssi_show_dnp_lan_wan		Show DNP LAN/WAN status

21.7.2 Configuring WebXML

The term XML stands for Extensible Markup Language. XML is a markup language similar to HTML which is used to describe data. HTML displays the data. XML does not replace HTML; it complements HTML. An XML document is information wrapped in XML tags. A piece of software has to be written to send, receive or display the document.

NOTE

In an EPM 9900 meter with factory set LCD configuration, some data displayed on the LCD screens is configured in the pprofile.xml file, which is also used for configuring the data displayed in the webpages. For this reason, modifying the pprofile.xml file may affect the LCD's data presentation.

NOTE

IMPORTANT! You must follow the "Rules" of XML:

1. The first line of the document, the XML declaration, defines the XML version and the characters used in the document.
2. All XML elements must have a closing tag.
3. XML tags are case sensitive.
4. All XML elements must be properly nested.
5. All XML documents must have a root tag (first tag in an XML document).
6. Attribute values must always be quoted.
7. Comment syntax is similar to HTML. <!-- This is a comment -->

Example of Root Tag and Elements:

The first tag in an XML document is the root tag. All XML documents must contain a single tag pair to define the root element. All other elements must be nested within the root element.

All elements can have subelements (children). Subelements must be correctly nested within their parent elements as shown below:

```
<root>
    <child>
        <subchild>.....</subchild>
    </child>
</root>
```

Example of Attributes:

```
<data id="1" value="123"></data>
```

Poll_profile.xml: File configured to poll parameters of each device

Root tags: `<GE_POLL_DATA> and </GE_POLL_DATA>`

System elements: `<GE_SYSTEM> and </GE_SYSTEM>`

Contains system parameters and email addresses

General attribute:

```
<item DATA_POLL_DELAY="400"
    ALARM_POLL_DELAY="1000"
    SYSTEM_COMM_TIMEOUT="1000"
    ALARM_CONTACT_PHONE=""
    ALARM_CONTACT_PERSON="Administrator"
></item>
```

Table 21–6: System Attributes

Attribute	Description	Settings
DATA_POLL_DELAY	Poll delay between each Modbus poll, in milliseconds	Min=500 Max=65536 Default=500
SYSTEM_COMM_TIMEOUT	System communication timeout, in miliseconds	Min=500 Max=32000 Default=500
ALARM_POLL_DELAY	Poll delay between each Modbus poll for each device's alarm polling, in milliseconds	Min= 1000 Max=65535 Default=1000
ALARM_CONTACT_PHONE	Alarm contact phone number	Max size=10 digits
ALARM_CONTACT_PERSON	Alarm contact person name	Max size=64 characters

Email Attributes:

```
<item EMAIL_1=""FORMAT_1="long"
    EMAIL_2=""FORMAT_2="long"
    EMAIL_3=""FORMAT_3="long"
    EMAIL_4=""FORMAT_4="short"
    EMAIL_5=""FORMAT_5="short"
    EMAIL_6=""FORMAT_6="short"
```

```
    EMAIL_7=""FORMAT_7="short"
    EMAIL_8=""FORMAT_8="short"
></item>
```

Table 21–7: E-mail Attributes

EMAIL_X	Email address, X is from 1 to 8	Max size = 64 characters
FORMAT_Y	Email format, Y is from 1 to 8	Strings 'long' or 'short'

Device Elements: <DEVICE_X> and </DEVICE_X>, where X is from 1 to 16.

Contain parameters for each device.

General attributes:

```
<item DEV_TYPE="Multilin 1250"
    DEV_PROTOCOL="Modbus RTU"
    DEV_NAME="Multilin Demo 1"
    DEV_ADDRESS="1"
    DEV_IP=""
    DEV_MAX_PACKET_LEN="127"
    DEV_POLL_ALARM="yes"
    DEV_ALARM_OPTIONS="1+2+3+4+5+9"
    DEV_ALARM_DELAY="2000"
    DEV_COMM_TIMEOUT="750"
DEV_PARENT="1"
></item>
```

Polling Data Elements: <DEV_DATA> and </DEV_DATA>

Polling data attributes, up to 64 in each <DEV_DATA> element:

```
<item D_UID="1_1"
    D_LABEL="Inst Van"
    D_ADDR="180"
    D_LENGTH="2"
    D_TYPE="7"
    D_USE_SPECIAL="3"
    D_VALUMODE="Primary"
></item>
```

NOTE

Parent device ID (DEV_PARENT), for polling expansion beyond the 64 items per device limitation. If set, it will use the parent device's communication settings.

Table 21–8: System Elements

Device Element	Description	Settings
DEV_TYPE	Supported device name	Generic Modbus EPM 9450/9650 EPM 9800 EPM 9900 [~DEVICE_TYPE_LABEL] = Auto detect device's type (EPM devices only)
DEV_PROTOCOL	Protocol name	Modbus RTU Modbus TCP
DEV_NAME	User assigned device name	Max = 32 characters [~DEVICE_LABEL] = Use the name stored inside the device (EPM devices only)
DEV_ADDRESS	Device address	Modbus protocol = 1 to 247
DEV_IP	IP address for Modbus TCP devices	xxx.xxx.xxx.xxx
DEV_MAX_PACKET_LEN	Max modbus registers for a device's response buffer	Multilin = 127 Futura & DMMS = 50
DEV_POLL_ALARM	Enable or disable device alarm poll function	Yes = Enable No = Disable
DEV_ALARM_OPTIONS	Alarm poll options	1 = Limits changed 2 = Inputs changed 3 = Waveform captured 4 = PQ (CBEMA) event captured 5 = Control output changed 9 = Communication failure
DEV_ALARM_DELAY	Delay time for reporting alarm condition (in milliseconds) for limit and input type alarms	Min = 0 Max = 300000 Default = 0
DEV_COMM_TIMEOUT	Device communication timeout (in milliseconds)	Min = 500 Max = 32000 Default = 500
DEV_DATA_FORMAT	Data format	0 to 0.000000
DEV_PARENT	Parent device ID (see NOTE)	Value from 1 to 16
DEV_MODBUS_REG_BASE	Device's modbus register base is either	0 based integer value or 1 based integer value (default)

Table 21–8: System Elements

Device Element	Description	Settings
DEV_TCP_PORT	Remote Modbus TCP device's port number	Default setting = 502

Table 21–9: Data Element Attributes

Attribute	Description	Settings
D_UID	User assigned device polling data unique ID	Max = 16 characters
D_LABEL	User assigned data label	Max = 32 characters
D_ADDR	Modbus register address	0 or 1 based integer value
D_LENGTH	Number of Modbus registers	
D_TYPE	Data type	For EPM Devices, use Fx Communication Data Formats For Generic Modbus Device Type, see NOTE below for values
D_USE_SPECIAL	Special functions	See NOTE*
D_VALUEMODE	Value mode	Raw Primary Secondary Value (for Generic Modbus Device Type) Interpreted. See NOTE**
D_CHANNEL	Channel ID for I/O type values	(EPM devices only)
D_SHOW_KM	Format value with k or M	Auto = auto show k or M k = fixed to k M = fixed to M
D_NA_VAL	If a numerical value is set here and a real polled value matched with this number, a '***' string will be stored in the xml data file.	Numerical Value for '***' (EPM devices only)
D_FUNCTION_CODE	Modbus protocol function code	1, 2, 3 (default), 4

Table 21–9: Data Element Attributes

Attribute	Description	Settings
D_BYTE_ORDER	Data byte order for Generic Modbus device. (Settings if source is 0x12345678)	0 MSR, MSB 0x1234, 0x5678: MS reg first, MS byte first (default) 1 MSR, LSB 0x3412, 0x7856, MS reg first, LS byte first 2 LSR, MSB 0x5678, 0x1234, LS reg first, MS byte first 3 LSR, LSB 0x7856, 0x3412, LS reg first, LS byte first
D_SPECIAL	Generic multiplier value for Generic Modbus device; applied when D_USE_SPECIAL is set to 6	1 = Default
D_TAG_SPECIAL	Cross linked multiplier ID for Generic Modbus device	Setting is any unique D_UID's setting within polling profile
D_MASKING_TYPE	Data masking type for Generic Modbus device	0 = do nothing (default) 1 = NOT 2 = OR 3 = AND 4 = NOR 5 = NAND 6 = XOR 7 = XNOR
D_MASKING_VALUE	Data masking value for Generic Modbus device; setting is hex ASCII string for up to 8 bytes of data	0 x 0 Default Example of a 3 byte value: 0xAB12CD
D_CFG_FILE	Configuration file name for Generic Modbus device	Case sensitive file name up to 128 characters; the file must be available at system start up using FTP download
D_VALUE	Value processed by Total Web Solutions and stored in poll_data.xml file	
D_REF	Reference info or value for polled item; stored in poll_data.xml file	Data source is the configuration file

NOTE

Values for Generic Modbus D_TYPE:

1 = ASCII string

2 = 1 byte, signed high byte of the Modbus Register

3 = 1 byte, signed low byte of the Modbus Register

4 = 1 byte, unsigned high byte of the Modbus Register

5 = 1 byte, unsigned low byte of the Modbus Register

6 = 2 bytes, signed integer

7 = 2 bytes, unsigned integer

8 = 4 bytes, signed long integer

9 = 4 bytes, unsigned long integer

10 = 8 bytes, signed long long integer

11 = 8 bytes, unsigned long long integer

12 = 4 bytes, IEEE float

13 = 1 digit, 8 bits representation

14 = 1 digit, 4 bits representation (aka Packed BCD)

15.= 1 byte, signed

16 = 1 byte, unsigned

17 = 8 bytes, IEEE float

NOTE

Parameters for D_USE_SPECIAL:

0 = do not multiply any number

1 = multiply by CT ratio (mainly used for current values)

2 = multiply by CT Aux ratio

3 = multiply by PT ratio (mainly used for voltage values)

4 = multiply by PT Aux ratio

5 = multiply by CT and PT ratio (mainly used for power, energy values)

6 = multiply by the value in D_SPECIAL (generic modbus device only)

NOTE

If D_VALUEMODE is set to Interpreted, when used with EPM Input Values, the result will be a user-defined name in the Meter's Device Profile instead of a value of 0 or 1.

NOTE

EPM 9450/9650/9800 and EPM 7000 Network cards use poll_data.xml; EPM 9900/9900P meters use pdata.xml

Poll_data.xml

Root tag: <GE_DATA> and </GE_DATA>

One (1) system element: <GE_SYSTEM> and </GE_SYSTEM>

Sixteen (16) device elements: <DEVICE_X> and </DEVICE_X>, where X is from 1 to 16.

In each of the 16 device elements: Device info elements: card copies data from poll_profile.xml

<DEV_NAME> and </DEV_NAME>

<DEV_TYPE> and </DEV_TYPE>

Up to 64 polling data attributes: card copies data from poll_profile.xml

```
<item D_UID="1_1"
    D_LABEL="Inst Van"
    D_VALUE="+126.06" (Data value).
```

```
></item>
```

21.7.2.1 Configuration File (for Generic Modbus Device)

The purpose of the configuration file is to allow the user to set what real value or information could be available in the poll_data.xml file. Each configuration file allows the user to set up 8 interpreted values or strings. The configuration file's format is XML.

Below is an example xml file with three values:

```
<?xml version="1.0" encoding="UTF-8" ?>
<GE_CONFIGURATION>
<item CFG_COMPARE_TYPE="Value" CFG_VALUE="0" CFG_REF="Disabled" />
<item CFG_COMPARE_TYPE="Value" CFG_VALUE="128" CFG_REF="Enabled" />
<item CFG_COMPARE_TYPE="String" CFG_VALUE="107 EPM 9450/9650"
CFG_REF="EPM 9450/9650 Meter" />
</GE_CONFIGURATION>
```

The root tags are <GE_CONFIGURATION> and </GE_CONFIGURATION> with up to 8 items between the root tags.

CFG_COMPARE_TYPE settings are "Value" for numeric comparison or "String" for text comparison.

CFG_VALUE can be a numeric value or text string (up to 256 characters) to be used for comparison.

CFG_REF is any interpreted value or text string when the comparison returned a match (up to 256 characters for a text string).

D_REF is the corresponding value in the poll_data.xml file.

21.7.2.2 Order of Data Processing for Generic Modbus Device

The steps in data processing are as follows:

1. Set byte order
2. Apply bit masking
3. Apply multiplying factor
4. Apply interpreted values from generic file(s)

21.7.3 Configuring WebReacher

Through the configuration of poll_profile.xml or pprofile (for the EPM 9900 meter), you can poll up to 16 individual devices or up to 1024 unique items via Modbus RTU protocol or Modbus TCP protocol.

Devices supported:

Any device that supports Modbus RTU or Modbus TCP protocol (with at least one available socket).

The EPM 9900 meter supports Modbus TCP and a maximum of 8 devices.

To set up WebReacher™ for the EPM 9900/9900P meter so that it can use the Modbus RTU, you must have the optional RS485 port and follow these steps:

1. In the Communications Settings screen of the Device Profile, set the second RS485 to RTU Master mode and Modbus RTU protocol
2. In the meter's device profile set up RTU master polling (see Chapter 11 "EPM 9900/9900P Meter" for instructions).
3. Configure pprofile.xml with a new device allocation, using Modbus RTU and device address 1, to poll data from the main meter, for the polling items set up in the meter's RTU master configuration.

Devices supported for Advanced Features:

EPM 9450/9650, EPM 9800, EPM 9900/9900P

System setup:

NOTE

The instructions below are slightly different for the EPM 9900/9900P meter. The EPM9900/9900P meter does not use the Poll_data.xml file. It's Web data is stored in: \I\pdata.xml; for Web access http://[IP]/I/pdata.xml. All user configurable webpage files are physically located in the directory \C\TWS\, including the Web server's index.htm file. All files can be accessed as http://[IP]/C/TWS/[file_name.ext]. The meter's Web server automatically loads the \C\TWS\index.htm file into the Web server's root as the default webpage file, http://[IP]/index.htm. Be sure to set the reference link in index.htm properly.

Set DATA_POLL_DELAY in milliseconds; the system will pause between each Modbus poll.

Set SYSTEM_COMM_TIMEOUT in milliseconds.

Example:

```
<GE_POLL_DATA>
    <GE_SYSTEM>
        <item DATA_POLL_DELAY="400"SYSTEM_COMM_TIMEOUT="500"
        ></Item>
    </GE_SYSTEM>
</GE_POLL_DATA>
```

Device Set up: within the boundary of <DEVICE_X> and </DEVICE_X>

1. Assign a device type, DEV_TYPE.
2. Assign a protocol, DEV_PROTOCOL
3. Assign user defined device name, DEV_NAME (should be unique in a system).
4. Assign Modbus device address, DEV_ADDRESS.
5. If protocol is Modbus TCP, assign the remote device's IP address and the TCP port number, DEV_IP and DEV_TCP_PORT.
6. Set max Modbus packet length in number of registers, DEV_MAX_PACKET_LEN.
7. Set device's communication timeout in milliseconds, DEV_COMM_TIMEOUT. The timeout value should be longer for devices that speak Modbus TCP than for devices that speak Modbus RTU, depending on network traffic.
8. Set device's data display format, DEV_DATA_FORMAT, from 0 to 0.000000.

9. You can expand the polling item limitation of 64 items per device by setting a device as a child device of a parent device.

For Example, in <DEVICE_X> section, if you set it to be the parent device, DEV_PARENT must be X or 0. Then for <DEVICE_Y> section, if you set the device to be a child device of X, set DEV_PARENT to X. Other parameters can be omitted.

Example:

```
<GE_POLL_DATA>
    <DEVICE_1>
        <item DEV_TYPE="EPM 9450"
            DEV_PROTOCOL="ModbusRTU"
            DEV_NAME="EPM Demo 1"
            DEV_ADDRESS="1"
            DEV_IP=""
            DEV_TCP_PORT=""
            DEV_MAX_PACKET_LEN="127"
            DEV_COMM_TIMEOUT="750"
            DEV_DATA_FORMAT="0.00"
            DEV_PARENT="1"
        ></item>
    </DEVICE_1>
</GE_POLL_DATA>
```

Polling Item Set up:

In each DEVICE_X, DEV_DATA section, you can have up to 64 items. Any extra items will be ignored.

1. Set a unique ID, D_UID, so any program can easily access this item.
2. Set a data label, D_LABEL, optional.
3. Set Modbus register in decimal, 1 based, D_ADDR.
4. Set how many Modbus registers, D_LENGTH. Note: Each register is 2 bytes long.
5. Set data type, D_TYPE. (See Modbus Protocol Mapping Manual.)
6. Set special operations, such as multiplying PT or CT ratio, D_USE_SPECIAL.
7. Set value mode, D_VALUEMODE as primary, secondary or raw value.
8. Set display units, D_SHOW_KM, optional.
9. Set a N/A value, D_NA_VAL, optional.

Example:

```
<GE_POLL_DATA>
    <DEVICE_1>
        <DEV_DATA>
            <item D_UID="1_1"
                D_LABEL="Inst Van"
                D_ADDR="180"
```

```
                D_LENGTH="2"
                D_TYPE="7"
                D_USE_SPECIAL="3"
                D_VALUEMODE="Primary"
            ></item>
            [...up to 64 items...]
        </DEV_DATA>
    </DEVICE_1>
</GE_POLL_DATA>
```

21.7.4 Configuring WebMod

WebMOD allows the network to interface with Modbus-based EIDs. For the EPM 9450/9650/7000 the WebMOD supports 12 Modbus TCP sockets (12 simultaneous connections).

NOTE

The EPM 9900 meter supports 8 Modbus TCP/IP sockets. The EPM 9900P meter supports up to 32 simultaneous Modbus TCP/IP sockets per card.

The Modbus Port Number is 502. The Modbus Port Number is set on the Location Editor screen and Devices are added to the Network on this card; the EPM 9700 meter supports up to 16 Modbus TCP/IP sockets each for ports 5 and 6, but up to 28 total, e.g., 12 for one port and 16 for the other.

NOTE

If you have a firewall in your system, you must ask your network administrator to grant communication access on TCP/IP Port 502.

Modbus TCP Format: [6-byte Header] [Modbus RTU message without checksum]

Header detail:

[2 Bytes - Sequences/Transactions ID] [2 Bytes - 0s] [2 Bytes - Length, Number of Bytes following]

Example:

Request:

01 03 00 00 00 06 01 03 00 00 00 02

Transaction #259, 6 Bytes long, Modbus RTU Request for Address 01, Function Code 03 (read

holding registers), Start at Register 0 for 2 registers.

Response:

01 03 00 00 00 07 01 03 04 xx xx xx xx

Transaction #259, 7 Bytes long, Modbus RTU Response for Address 01, Function Code 03, 4 Bytes long data.

It will not support multiple Modbus requests and responses in a single Modbus TCP packet. For E1/E2 Options, all requests with Modbus Address 01 will transmit to the meter itself. All other requests with Modbus Addresses other than 01 will transmit to the RS485 Gateway Port.

21.7.5 Configuring WebAlarm

To enable Webalarm, see the instructions in 21.6.4 *WebAlarm/Email*. Through GE Communicator software you can configure one Email address, which will be stored in the meter for single user or administrative use. Eight additional addresses can be programmed in the poll_profile.xml or pprofile.xml file (see 21.7.2 *Configuring WebXML*).

To configure additional Email Recipients:

1. Edit the poll_profile.xml/pprofile.xml file saved in FTP Server (see FTP Server).
2. From EMAIL_1 to EMAIL_8, enter the email address within the double quotes
3. From FORMAT_1 to FORMAT_8, enter the format name as either “short” or “long” within the double quotes.
   A section of a poll_profile.xml file is shown below without values entered.

```
<GE_POLL_DATA>
    <GE_SYSTEM>
        <item EMAIL_1=””FORMAT_1=””
            EMAIL_2=””FORMAT_2=””
            EMAIL_3=””FORMAT_3=””
            EMAIL_4=””FORMAT_4=””
            EMAIL_5=””FORMAT_5=””
            EMAIL_6=””FORMAT_6=””
            EMAIL_7=””FORMAT_7=””
            EMAIL_8=””FORMAT_8=””
        ></item>
    </GE_SYSTEM>
</GE_POLL_DATA>
```

Short Format:

For all handheld mobile devices with text messaging service capable of receiving up to 160 characters. Character number includes sender address, subject and body plus additional separator characters. This format is defined by GE Grid Solutions - the user cannot modify it.

Example of the Short Format:

[64 characters of sender’s email address]##[32 characters of Meter ID]

#Alarm[10digit operator’s phone number]

IDs1+2+3+4+5+6+7+8+9+10+11+12+13+14+15+16

Long Format:

For all handheld mobile devices and PC users who can receive regular email. This includes detailed alarm information.

Example of Long Format:

Device Name: EPM Demo 1

Contact Person: Administrator

Contact Phone: 1234567890

Alarm IDs: 1+2+3+4

Alarm Names:

(1) Limits changed

(2) Inputs changed

(3) Waveform captured

(4) PQ (CBEMA) event captured

Alarm Details:

Limits:

(4) 1s IA, Below Limit 2, Combination=OR, value = +0.38

(5) 1s IB, Below Limit 2, Combination=OR, value = +0.38

(6) 1s IC, Below Limit 2, Combination=OR, value = +0.38

Inputs:

(1) HSI Input 1 BK101 Off

(3) HSI Input 3 Closed

(4) HSI Input 4 Closed

21.7.6 Configure Alarm Polling Options:

▷ Enter values within the double quotes.

To enable the polling for a device, set DEV_POLL_ALARM to "Yes"; to disable it, set "No".

▷ Alarm polling options: 1 to 9 (See table below).

The default is sending alarm emails for all options, 1 to 9.

You can configure the polling profile to have any combination of options.

▷ Edit the poll_profile.xml. Set up the alarm polling options by concatenating the options IDs, such as: "1+2+3+4+5+9".

▷ Set the alarm delay for limits in Milliseconds (a value of 1000 = 1 second). If a limit condition occurs for 1 second or more, an alarm email will be sent.

```
<GE_POLL_DATA>
    <DEVICE_x>
        <item DEV_POLL_ALARM=""
            DEV_ALARM_OPTIONS=""
            DEV_ALARM_DELAY=""
        ></item>
    </DEVICE_x>
</GE_POLL_DATA>
```

NOTE

Most of the **Alarm Triggering Conditions** for EPM 9000 series devices rely on the device's configuration in the Device Profile. Make sure that the settings are correct for Limits,

Inputs, Waveforms, etc..

Table 21–10: Alarm Polling Options

Option ID	Option Name	Description
1	Limits exceeded	Any exceeded Limit condition
2	Inputs abnormal condition	Any internal digital input abnormal condition
3	Waveform captured	The meter has captured a waveform
4	PQ (CBEMA) event captured	The meter has captured a PQ event
5	Control Output changed	A relay module connected to the meter changed state
9	Communication Failure	The Network card has difficulty talking to the meter

To configure Alarm polling for more individual devices:

▷ Edit the poll_profile.xml/pprofile.xml file for each device's section. Configure the parameters.

```
<GE_POLL_DATA>
    <DEVICE_x>
        <item DEV_POLL_ALARM=""
            DEV_ALARM_OPTIONS=""
        ></item>
    </DEVICE_x>
</GE_POLL_DATA>
```

A common problem is described below:

If you entered a name for the SMTP Server instead of an IP address, make sure your DNS Server is working and you have either set a DSP IP inside the meter or your DNS can supply a DNS IP. If it cannot resolve the name to an IP translation, no email will be sent.

Regarding stored emails:

You can access the stored_emails.htm page from any internet browser. The last 10 emails sent will be stored in the RAM on a FIFO basis (First In, First Out) and will be displayed in descending order. The page will be cleared after a complete system restart.

21.8 FTP Server

A built-in FTP Server is available for a meter equipped with E1/E2. It has a 3-user limit, so no more than three users can connect to the FTP Server simultaneously. The FTP Server logon User Name and Password are stored in the E1 card, not in the meter's programmable settings.

For the EPM 9450/9650/7000 the Initial FTP Server User Name and Password are:

multinet and **E1.**

For the EPM 9900 the Initial FTP Server User Name and Password are:

anonymous and **anonymous**.

The FTP Server's quota is 4 Megabytes of RAM

NOTE

The EPM 9700 meter does not support FTP server.

21.9 Update Network Card Firmware from Webpage (in Runtime Mode)

NOTE

The EPM 9700 meter does not support this.

Network Card Firmware can be updated through the Web. Follow these steps:

1. Start your browser.
   Type the meter's IP address in the browser's URL address bar. The Main WebExplorer screen is displayed.
2. Click **Tools>Firmware Upgrade** or, add **/update1.htm** to the end of the URL.
   The Enter Network Password screen opens, prompting you for a User Name and Password.
3. Enter User Name and Password.

   Initial User Name:

   - (EPM 9450/9650/7000) = **multinet**
   - (EPM 9900) = **anonymous**

   Initial Password:

   - (EPM 9450/9650/7000) = **E1**
   - (EPM 9900) = **anonymous**
4. Click **OK**.
   The Update Run-Time Firmware screen opens.
5. Click the **Browse** button to select the correct Run-time firmware file.
6. Click **Update Run-Time Firmware**.
   The update process can take several minutes. Make sure that during the process you do not close the Update Run-Time Firmware screen (or update1.htm browser window). During the update process, the E1/E2 Update Run-Time Firmware Status screen opens. It displays the current status of the update.
7. When you get the message that the update was successful, restart the connected meter, in one of the following ways:
   - Go to **reset_ethernet.htm**. (Click on Restart.) **OR**
   - Power down and then power up the connected meter.

NOTE

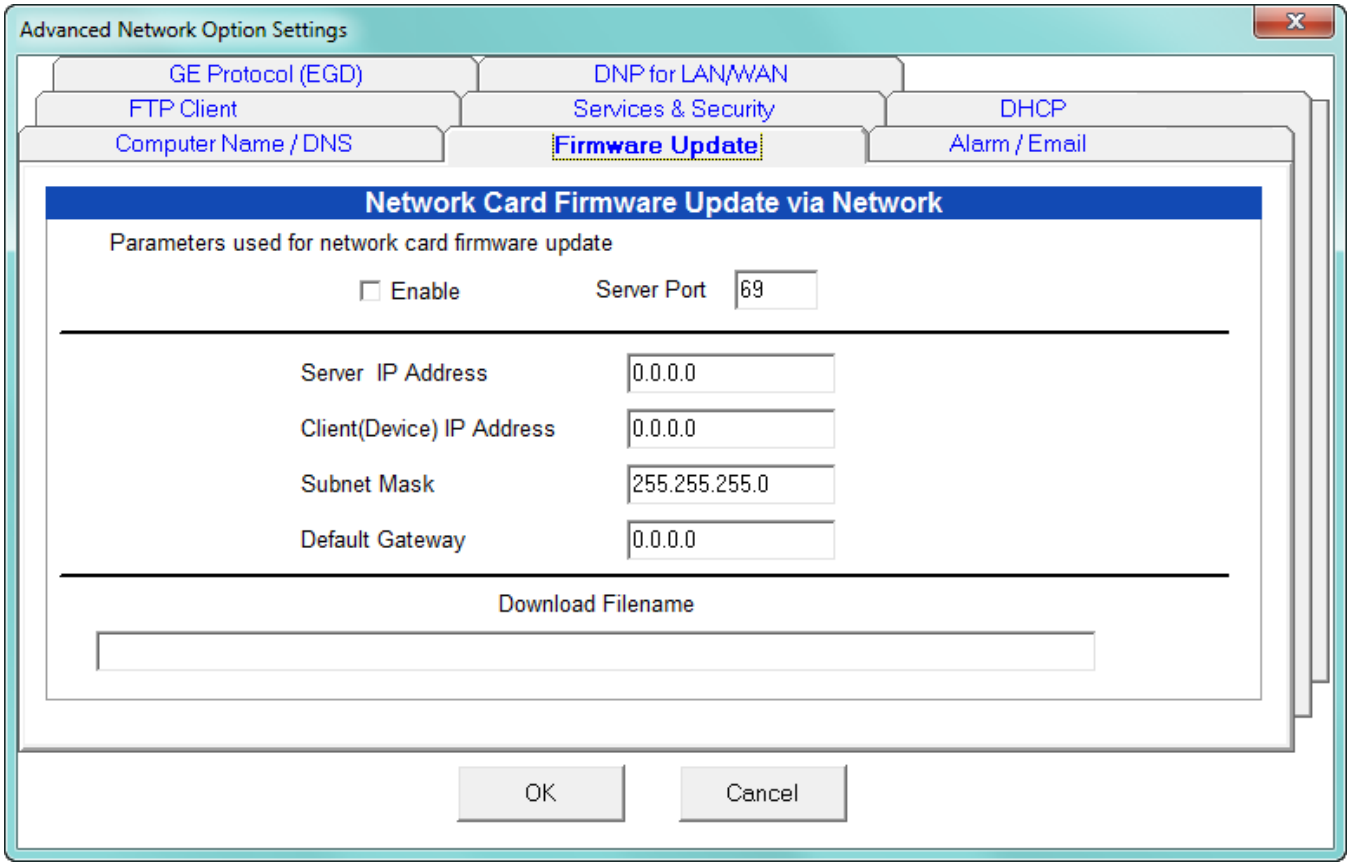
NOTES:

- To flash update Network Card firmware through the GE Communicator application, see 25.2.1 *Flash Update the Internal Network Card* on page 25–9.
- The EPM 7000 meter's network card can only be updated via its webpage. See the *EPM 7000/7000T Instruction Manual* for details.
- The EPM 9700 meter's Network firmware can only be updated via GE Communicator software.

21.9.1 Update Network Card Firmware through Software

There are two methods for updating the network card firmware though GE Communicator software - flash upgrade and the following procedure.

1. From the Device Profile screen, click **General Settings > Communications**.
2. From the Communications Settings screen, double-click the active port and then click the **Advanced Settings** button.
3. Click the **Firmware Update** tab. You will see the screen shown below.

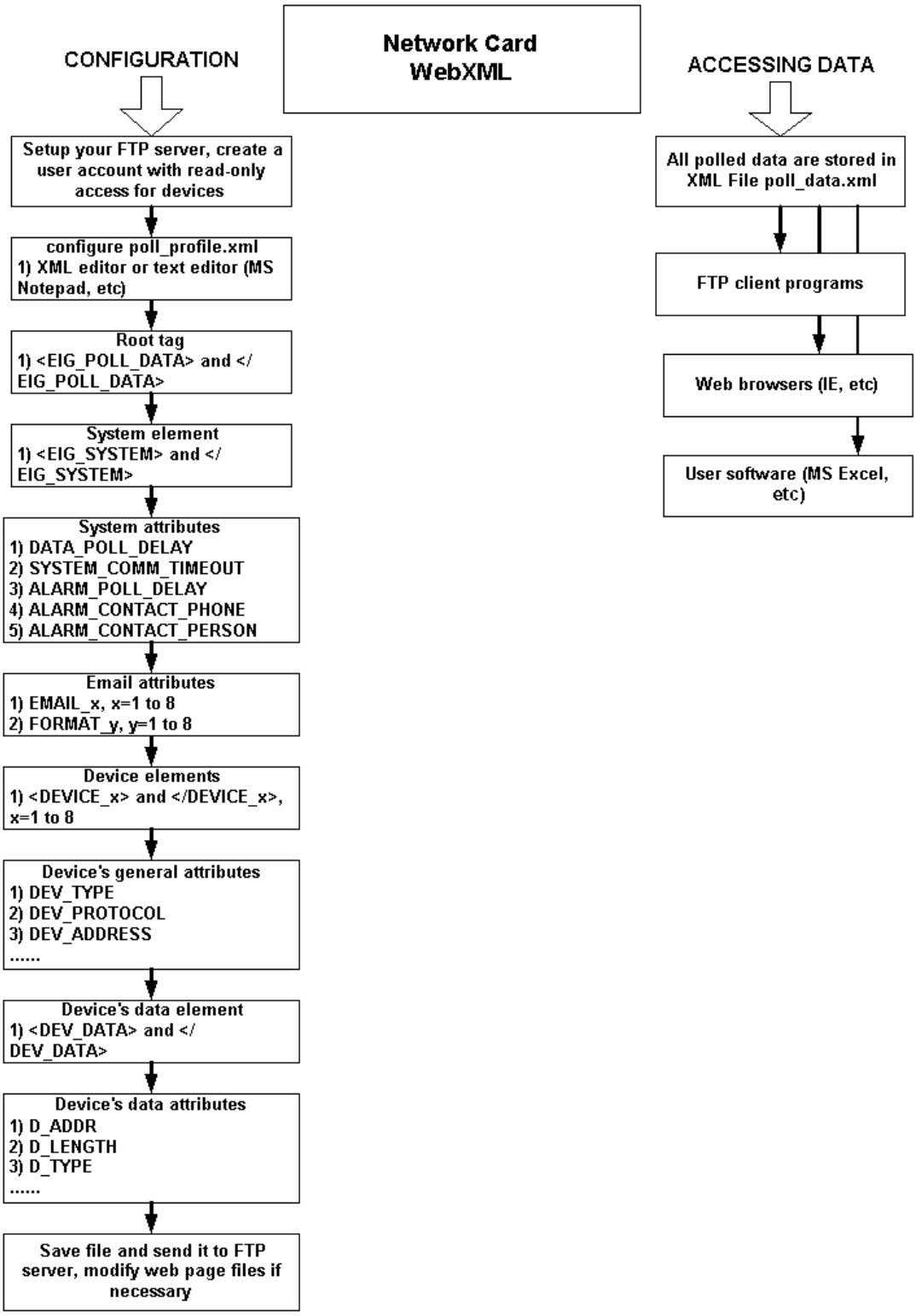


4. Click the **Enable** checkbox.
5. Enter the Server port and IP address; Device's IP address; Subnet Mask, and Default Gateway.
6. In the Download Filename field, enter the path of the Firmware update file. For example: C:GE Applications\Updates\Firmware\V.1.2.3.0.
7. Click **OK** to save your settings.

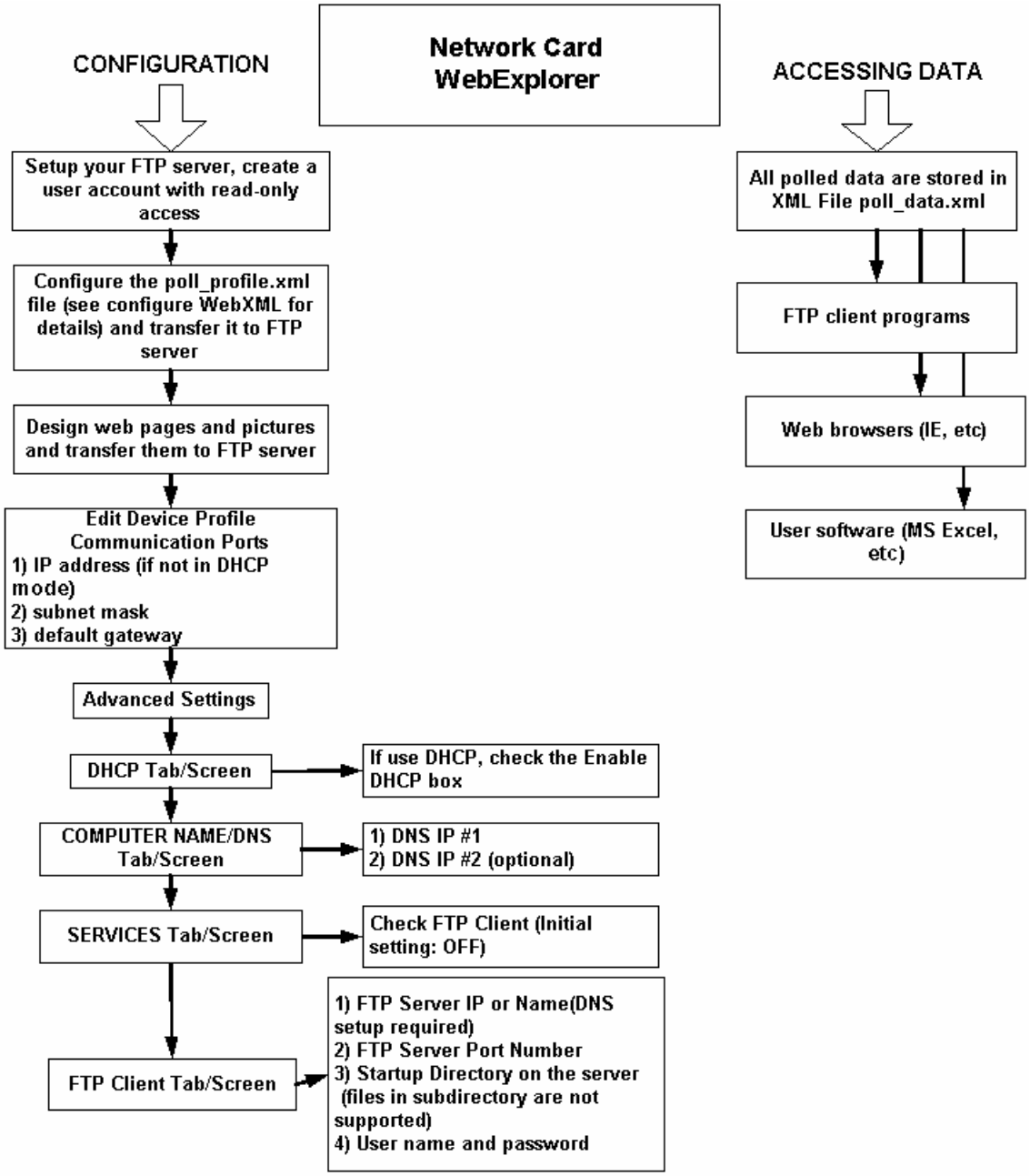
NOTE

- To flash update Network Card firmware through the GE Communicator application, see 25.2.1 *Flash Update the Internal Network Card*.
- The EPM 7000 meter's network card can only be updated via its webpage. See the *EPM 7000 Instruction Manual* for details.

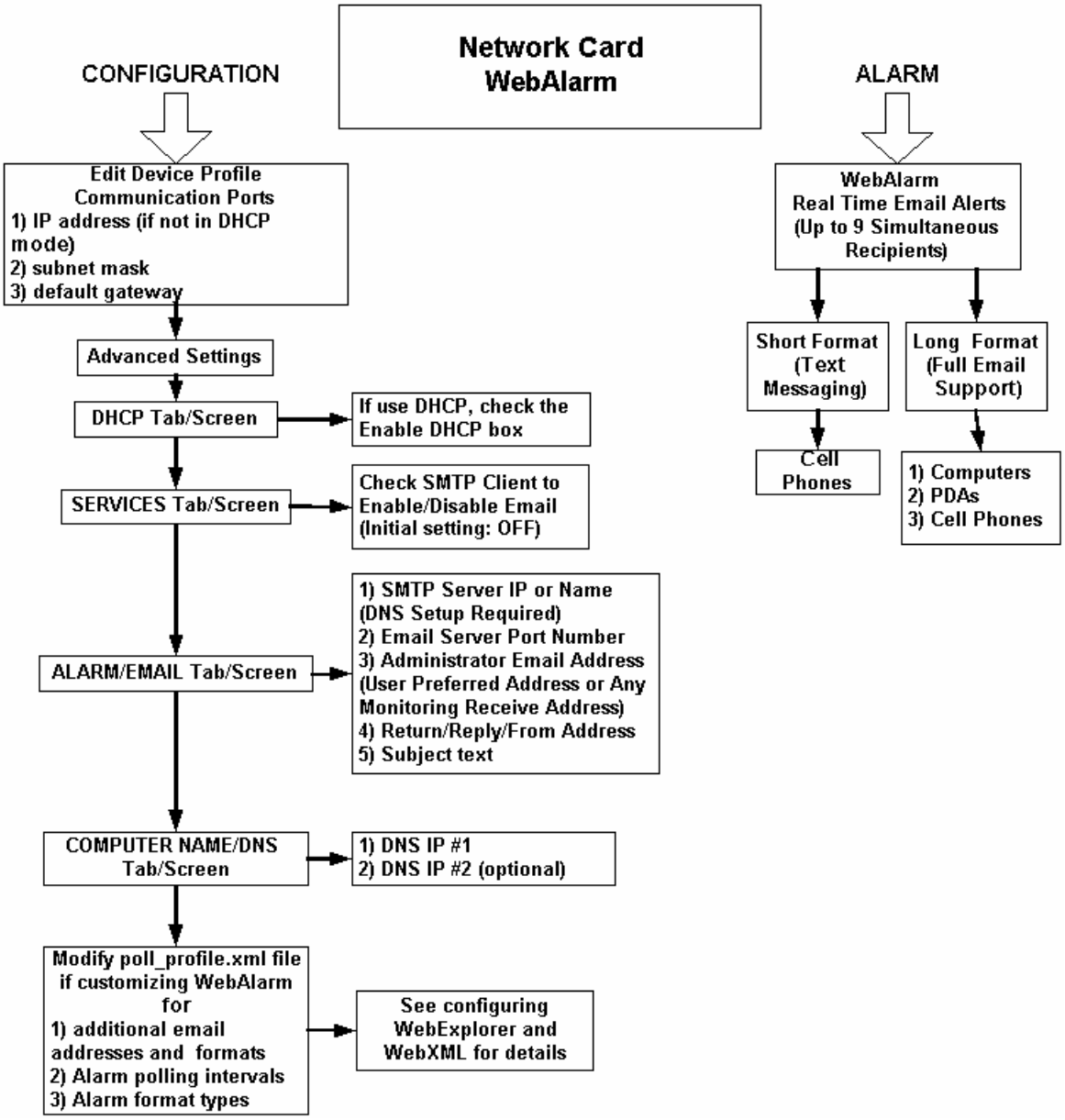
21.10 WebXML Flow Chart



21.11 WebExplorer Flow Chart



21.12 WebAlarm Flow Chart



21.13 Comparison of Network Cards

EPM 9450/9650/9800 and EPM 7000 Meters TWS Supported Features

EPM TWS Features in Runtime Firmware			
Meter	EPM 9450/9650/9800	EPM 9700	EPM 7000/7000P
Network card	EPM 9450/9650: Comms option 1 EPM 9800: Comms options W, C	Standard	E1
Runtime Firmware Version of Network card			
WebExplorer (Web Server)	v1.x.x, v3.x.x	Yes	v1.x, v3.x
WebXML	v1.x.x, v3.x.x	No	v1.x, v3.x Read access to data file only. No configuration.
WebReacher (FTP client)	v1.x.x, v3.x.x	No	N/A
WebMod (Modbus TCP)	v1.x.x, v2.x.x, v3.x.x	Yes	v1.x, v2.x, v3.x
WebAlarm (alarm/email)	v1.x.x, v3.x.x	No	N/A
DHCP	v1.x.x, v3.x.x	No	v1.x, v3.x
Modbus LDA Access for firmware update (alternative to TFTP in boot and Web in runtime)	v1.x.48+, v2.x.x, v3.x.x	No	v2.x.x, v3.x.x
Ethernet Gateway port	v1.x.x, v3.x.x	No	N/A
Modem	v1.x.x, v2.x.x, v3.x.x	Yes	N/A
DNP LAN/WAN (requires meter firmware support)	v1.x.x, v2.x.x, v3.x.x	Yes	N/A
GE EGD protocol (only in specific versions, M66 and M67)	v1.x.x, v2.x.x, v3.x.x	Yes	N/A
Firmware update via Web Server	v1.x.x, v3.x.x	No	v1.x, v3.x
Sleep Mode (only active under certain conditions)	v1.x.x, v2.x.x, v3.x.x		N/A
SNTP	Yes	Yes	Yes
Cable auto detect	v1.x.x, v2.x.x, v3.x.x		v1.x, v2.x, v3.x
Accept Debug commands from meter's UART ports	v1.x.x, v2.x.x, v3.x.x		N/A. Only sends back a fixed set of network parameters, such as IP, MAC address, status, etc.
IEC 61850		Yes	200/200S Yes
IEC 61850 GOOSE		Yes	No

EPM 9900/9900P Meter TWS Supported Features

- IP/Mask/Gateway

- Modbus TCP Server
- Modbus TCP Client
- Web Server
- FTP Server
- DNP LAN/WAN
- Alarm Email
- GE EGD*
- PING
- DNS
- IEC 61850*
- IEC 61850 GOOSE*
- SNTP
- SNMP (with firmware version v15, or higher)
- IEEE 1588 PTPv2 Master (only available on second Ethernet card) or Slave
- Synchrophasor (PMU) (available on one Ethernet card at a time)

* These features are supported on Network (Ethernet) Card 1, only.

21.14 GE EGD Details

Firmware Requirements

- Network card firmware v1.0.40
- The meter's firmware, DSP, and COM must support a 50ms update

Configuring the Meter and Network Card

The GE EGD data producer uses UDP port 18246. The meter must be configured to enable the EGD protocol using GE Communicator software (this setting is made in the Advanced Network Options Setting screen - see the instructions for programming your meter).

EGD Data Specifications

This section contains detailed information about the EGD data packet being sent from a configured meter.

Packet Details

Exchange ID: 1

Configuration Signature: Major=1, Minor=0.

Status bit 0: 1=data is old or not ready to be consumed,
0=data is ready to be consumed.

Status bit 1: 1=timestamp is not synchronized (no IRIG-B signal),
0=timestamp is synchronized (IRIG-B signal received).

Production Data: EPM meter's 50ms second readings, in primary. Total of 124 bytes. Power factor values will be kept in their raw format. Requires Network card firmware v1.0.40 or higher and supporting meter firmware.

GE EGD timestamp format: POSIX 1003.4 (1003.1b) timespec format, 4 byte seconds (signed) followed by 4 byte nanoseconds, signed seconds from 01/01/1970, max year is 2038.

Index	Name	Type	Note
1	Timestamp	8 bytes	GE's date/time format, see note below
2	Van	4 byte float	Little-endian
3	Vbn	4 byte float	Little-endian
4	Vcn	4 byte float	Little-endian
5	Vaux	4 byte float	Little-endian
6	Ia	4 byte float	Little-endian
7	Ib	4 byte float	Little-endian
8	Ic	4 byte float	Little-endian
9	In-measured	4 byte float	Little-endian
10	Vab	4 byte float	Little-endian

Index	Name	Type	Note
11	Vbc	4 byte float	Little-endian
12	Vca	4 byte float	Little-endian
13	VA-a	4 byte float	Little-endian
14	VA-b	4 byte float	Little-endian
15	VA-c	4 byte float	Little-endian
16	VA	4 byte float	Little-endian
17	VAR-a	4 byte float	Little-endian
18	VAR-b	4 byte float	Little-endian
19	VAR-c	4 byte float	Little-endian
20	VAR	4 byte float	Little-endian
21	W-a	4 byte float	Little-endian
22	W-b	4 byte float	Little-endian
23	W-c	4 byte float	Little-endian
24	W	4 byte float	Little-endian
25	Freq	4 byte float	Little-endian
26	PF-a	4 byte float	Little-endian
27	PF-b	4 byte float	Little-endian
28	PF-c	4 byte float	Little-endian
29	PF	4 byte float	Little-endian
30	Van-Vaux Phase Angle	4 byte float	Little-endian

NOTE

See your meter's Modbus Protocol & Register Map for complete detail on special data formats.

Time Stamp Format

Length: 4 Modbus Registers (8 bytes)

Each Modbus register contains two bytes. Each byte contains a binary number representing up to two digits representing a segment of date and time. The units for each byte are:

- Century
- Year
- Month
- Date
- Hour
- Minute
- Second
- 10 Millisecond

Hour is in 24-hour format, i.e., 00H = 0 = 12 AM, 01H = 1 = 1 AM, ..., 0BH= 11 = 11 AM, 0CH = 12 =12 PM, 0DH = 13 = 1 PM, ..., 17H = 23 = 11 PM.

Example:

Registers 00081 – 00084, On Time, might contain the following data:

June 25, 1999 9:19:48.86 AM

In bytes: 13 63 06 19 09 13 30 56 (lower order byte to higher order byte in UDP packet)

Century: 19 = 13H

Year: 99 = 63H

Month: 6 = 06H

Date: 25 = 19H

Hour: 9 = 09H

Minute: 19 = 13H

Second: 48 = 30H

Millisecond: 86 = 56H, 86*10=860ms

NOTE

Regarding bit-masking and limit on the values, you have to apply bit-masking to each byte and set a maximum valid value for date/time reconstruction.

- Byte 1: And 63, Max=63
- Byte 2: And 127, Max=99
- Byte 3: And 15, Max=12
- Byte 4: And 31, Max=31
- Byte 5: And 31, Max=24
- Byte 6: And 63, Max=59
- Byte 7: And 63, Max=59
- Byte 8: And 127, Max=99

NOTE

With the support of DSP/DSP 1 firmware, the meter can provide an advanced warning indicator prior to performing a RefCal (Reference Calibration). The indicator flag is set in the MSB of the GE time stamp's century byte during the final 3 seconds before a RefCal. End user software can use this indicator to avoid generating unnecessary error warnings.

Power Factor Format

0.000 to 3.999 (raw)

PF values in EPM meters have two types of representation, which can be defined by the user in the meter's device profile. The values can be in either GE or Edison format.

GE format

Quadrants	EPM PF raw value	Interpreted PF value
1	0 to 1	0 to 1
4 >	1 to 2	<1 to 0
3 >	2 to 3	<0 to -1
2 >	3 to 4 >	-1 to 0

Edison format:

Quadrants	EPM PF raw value	Interpreted PF value
1	0 to 1	0 to 1
4 >	1 to 2 >	-1 to 0
3 >	2 to 3 >	0 to 1
2 >	3 to 4 >	-1 to 0

Phase Angle Format: +/-180 degrees

EGD Data Protocol Data Unit (PDU) Descriptions

Data Production

The Data Production PDU supports the production of Global Ethernet Data. This packet contains the user data being produced and sent to the consuming node(s). This message is unacknowledged, that is, it is transmitted by the producing node at the configured rate without waiting for a response from the consuming nodes. Receiving nodes that detect an encoding error in a received Data Production PDU will discard the PDU and take no action on its contents. The format of the Data Production PDU is shown in the table below.

0	**PDU Type (13)**	**PVN=1**	**Request ID**
4	**Producer ID**		
8	**Exchange ID**		
12	**Timestamp**		
16			
20	**Status**		**Reserved**
24	**Configuration Signature**		**Reserved**
28	**Reserved**		
32	**Production Data (up to 1400 bytes)**		

The table below contains additional information about these fields.

PDU field	Size (Bytes)	Description
PVN	1	Must be set to 1 for compatibility with older protocol versions.
Request ID	2	2 byte unsigned integer which is incremented each time a data sample is produced
Producer ID	4	Producer identifier
Exchange ID	4	Exchange identifier
Timestamp	8	The time stamp value should correspond as closely as practical to when the data sample was captured

PDU field	Size (Bytes)	Description
Production Status	2	Bit mask indicating the validity of the data sample produced: Bit 0: Set if there is production error or invalid (old) data Bit 1: Set if time stamp is not synchronized on producer node
Configuration Signature	2	2 byte integer indicating relative version of the user data contained in the sample
Production Data	up to 1400	User data sample matching configuration specified in Configuration Signature

EGD Data Verification

You can verify the data sent through EGD by polling the meter's Modbus Registers 119 to 175.

21.15 Troubleshooting the Network Connection

NOTE

If the connection fails, check the connection with the Master meter first. Once that connection is established, check the connections with the Slave devices.
Suggested checkpoints are as follows:

Master Meter

1. Check cables.
2. Check IP Address, Subnet Mask and Default Gateway settings.
3. Check that the Address is 1.
4. Check that Modbus TCP was selected in Device Properties.

Slave Devices

1. Check all the above except #3.
2. Check that the Address is unique and not set to 1.
3. Check that the Baud Rate settings for the Ethernet Gateway (Port 2) and the Devices are the same.

General

Try "Pinging" to a known good network device, such as another computer, to verify that your computer is connected properly to the network.

1. From the Start menu, type Run, then cmd to open the command.exe window.
2. Type ping and the IP address, for example, Ping 10.0.0.1

21.16 Total Web Solutions (TWS) MEGA PAGE

Displaying Data from Multiple E1 Units on One Webpage

Using the TWS components WebExplorer and WebReacher, you can design a single webpage that displays data from multiple meters with E1 Network Options. To accomplish this, you should have a basic understanding of TWS, explained earlier in this chapter.

You should modify the Java Script Code on the webpages in use and also make a

change to the Internet Explorer browser setting, as detailed below.

1. Using the default files supplied by the E1 Network Options as templates, modify the Java Script code for all webpages using the sample below. This sample portion of Java Script code is for demonstration purpose only. You must insert your own code where needed.

```
<script language=Javascript>
// insert your own code here
// Define multiple XMLDOM Documents objects
var xmlDoc_EPM_1 = new ActiveXObject("MSXML.DomDocument");
var xmlDoc_EPM_2 = new ActiveXObject("MSXML.DomDocument");
xmlDoc_EPM_1.async = true;
xmlDoc_EPM_1.onreadystagechange = do_get_data_EPM_1;
xmlDoc_EPM_2.async = true;
xmlDoc_EPM_2.onreadystatechange = do_get_data_EPM_2;
// function name 'start_process' should be placed in webpage's <body> tag
// such as '<body onLoad="start_process()">'
function start_process()
{
do_get_xml_EPM_1();
do_get_xml_EPM_2();
}
// Load each poll_data.xml file from different locations into an XMLDOM Document
objects function
do_get_xml_EPM_1()
{
xmlDoc_EPM_1.load("http://192.168.1.2/poll_data.xm l");
}
function do_get_xml_EPM_2()
{
xmlDoc_EPM_2.load("http://192.168.7.8/poll_data.xml");
```

```
}
// functions to read, parse and display data from each XMLfile
function do_get_data_EPM_1()
{
// insert your own code here
}
function do_get_data_EPM_2()
{
// insert your own code here
}
// insert your own code here</script>
```

2. To enable the MEGA Page on your browser, follow these steps:

   a. From Internet Explorer, click **Tools > Internet Options > Security**.

   b. Click the **Custom Level** button and scroll to the Miscellaneous section.

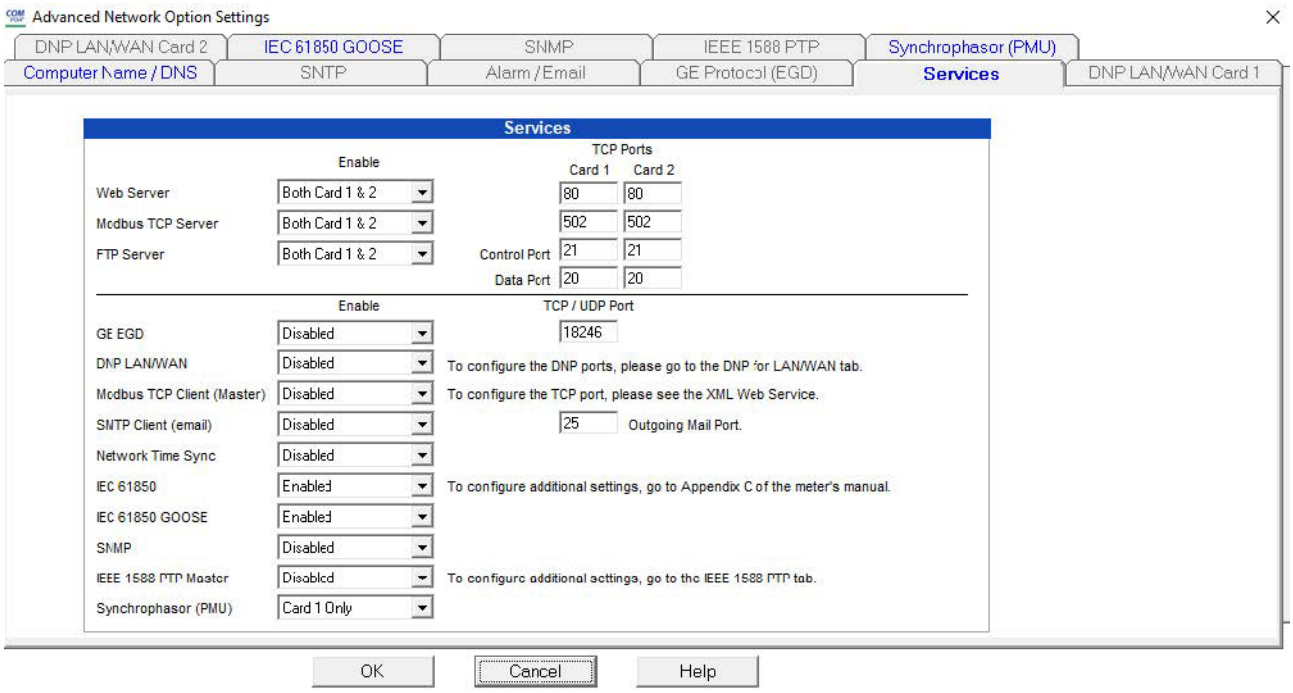
   c. Click the **Enable** radio button next to "Access data sources across domains" and "Navigate subframes across different domains."

   d. Click **OK** twice to close the windows.

21.17 EPM 9900P Advanced Features Setting

The EPM 9900P meter has some additional advanced features. This section contains instructions for additional programming of the EPM 9900P meter's Main and optional Ethernet cards.

21.17.1 Services Tab



The first tab in the Advanced Network Option Settings screen for the EPM 9900P meter is Services. The settings here let you enable/disable server and other network capabilities for each Network card independently - the Main Ethernet card, which comes standard with the meter, and the optional second Ethernet card. This gives you the flexibility to program each card as best fits your application needs. These are the settings on the screen:

- **Web Server**: select one of the following choices from the pull-down menu:
  - Card 1 Only to allow Internet access to the meter's readings only through the Main Network card
  - Card 2 Only to allow Internet access to the meter's readings only through the optional Network card
  - Both Card 1 and 2 to enable Internet access to the meter's readings for either Network card
  - Disabled to not allow Internet access to the meter for either Network card
- **Modbus TCP Server**: select one of the following choices from the pull-down menu:
  - Card 1 Only to allow Modbus TCP communication only through the Main Network card

  - Card 2 Only to allow Modbus TCP communication only through the optional Network card
  - Both Card 1 and 2 to allow Modbus TCP communication through either Network card
  - Disabled to not allow Modbus TCP communication for either Network card
- **FTP Server** (see 21.6.5 *FTP Client* for additional information on FTP): select one of the following choices from the pull-down menu:
  - Card 1 Only to allow only the Main Network card to support file transfer protocol
  - Card 2 Only to allow only the optional Network card to support file transfer protocol
  - Both Card 1 and 2 to allow both Network cards to support file transfer protocol
  - Disabled to not allow either Network card to support file transfer protocol
- **GE EGD Protocol** (see 21.6.3 *GE Protocol (EGD)* for additional information on GE EGD protocol): select one of the following choices from the pull-down menu:
  - Card 1 Only to allow only the Main Network card to GE EGD protocol
  - Card 2 Only to allow only the optional Network card to support GE EGD protocol
  - Auto to allow either Network card to support GE EGD protocol (see *NOTE on Auto setting* on page 21–55)
  - Disabled to not allow either Network card to support GE EGD protocol
- **DNP LAN/WAN**: select one of the following choices from the pull-down menu:
  - Card 1 Only to allow only the Main Network card to support DNP LAN/WAN communication
  - Card 2 Only to allow only the optional Network card to support DNP LAN/WAN communication
  - Both Card 1 and 2 to allow both Network cards to support DNP LAN/WAN communication
  - Disabled to not allow either Network card to support DNP LAN/WAN communication

NOTE

If you are enabling DNP LAN/WAN communication for either (or both) Network cards, also use the DNP for LAN/WAN Card 1 and/or DNP for LAN/ WAN Card 2 tabs to make additional settings. The settings are the same as described in 21.6.7 *IEC-61850*.

- Modbus TCP Client (Master): select one of the following choices from the pull-down menu:
  - Card 1 Only to allow only the Main Network card to act as a Modbus master
  - Card 2 Only to allow only the optional Network card to act as a Modbus master
  - Auto to allow both Network cards to act as a Modbus master (see *NOTE on Auto setting* on page 21–55)
  - Disabled to not allow either Network card to act as a Modbus master
- SMTP Client (Email): select one of the following choices from the pull-down menu:
  - Card 1 Only to allow only the Main Network card to receive email
  - Card 2 Only to allow only the optional Network card to receive email
  - Auto to allow both Network cards to receive email (see *NOTE on Auto setting* on page 21–55)

- Disabled to not allow either Network card to receive email

- Network Time Sync: select one of the following choices from the pull-down menu:
  - SNTP Card 1 to allow the Main Network card to use a Simple Network Time Protocol (SNTP) server for time synchronization
  - SNTP Card 2 to allow the optional Network card to use an SNTP server for time synchronization
  - SNTP Auto to allow either Network cards to use an SNTP server for time synchronization (see *NOTE on Auto setting* on page 21–55)
  - Disabled to not allow either Network card to use an SNTP server for time synchronization

NOTE

The EPM 9900P meter also has an SNTP tab that lets you set up the Simple Network Time Protocol Server if you are using it for Time synchronization: see 11.1.3 *Time Settings* for instructions on using it.

IEEE 1588 PTP - This high-accuracy time synchronization method is available for the meter's Synchrophasor PMU feature.

- IEC 61850: select Enabled to enable the IEC 61850 server for one of the Network cards; select Disabled to disable the IEC 61850 server entirely.
- IEC 61850 GOOSE: select Enabled to enable IEC 61850 GOOSE messaging for the Network card that is the IEC 61850 protocol server; select Disabled to disable the IEC 61850 GOOSE messaging feature.

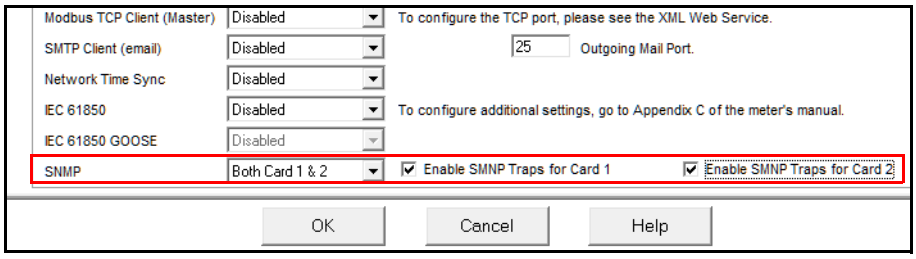
NOTE

If you enable IEC 61850 GOOSE, you also need to make settings for it. See the next section for instructions.

- SNMP: SNMP communication can be disabled; enabled for Network card #1; enabled for Network Card #2; or enabled for both Network cards. Select the option you want.

NOTE

When you enable SNMP for one or both of the Network cards, you see additional selections that let you choose to support traps for the card supporting SNMP (see figure below). Traps are messages sent to the SNMP manager in response to specific conditions. When you enable SNMP you must also configure settings in the SNMP tab. See 21.17.3 *SNMP Tab* on page 21–57, for instructions.



- • IEEE 1588 PTP Master: to set the meter as a Master clock for IEEE 1588 Precision Time Protocol, click Enabled. (Network Card 2 is used for IEEE 1588 PTP

communication.) Then configure settings in the IEEE 1588 tab - see 21.17.4 *IEEE 1588 PTPv2 Master*.

NOTE

IEEE 1588 PTP cannot be used as a Master if you are using it as a time synchronization source for synchrophasors.

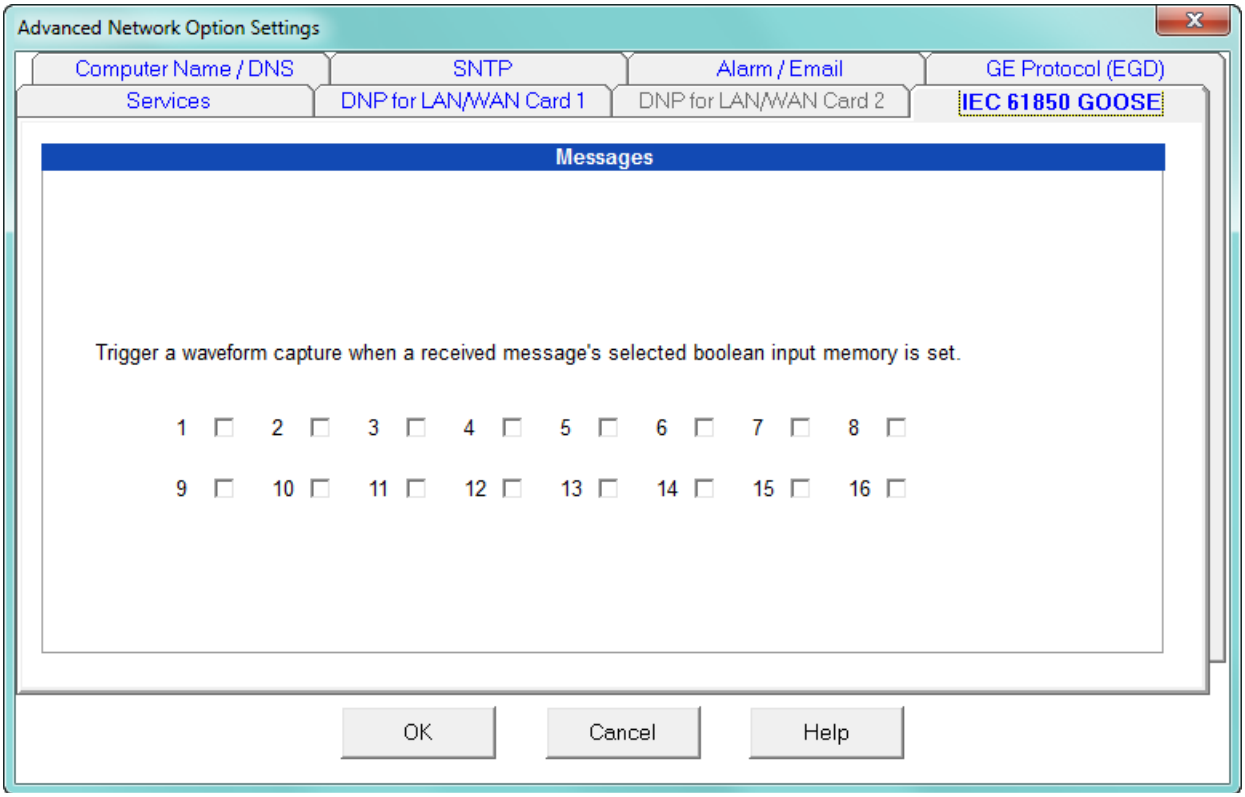
- Synchrophasors (PMU): you can select either Card to use as a PMU for synchrophasors. Then configure settings in the Synchrophasor tab - see 21.17.5 *Synchrophasor (PMU)*.
- TCP Ports: use these fields to set up ports for Cards 1 and 2 for:
    - Web server
    - Modbus TCP server
    - Control port
    - Data port
- TCP/UDP port: enter the port that will be used for IEC 61850 (TCP port) or GE EGD (UDP port) communication.
- Enter the outgoing mail port and the port name if SMTP is enabled.

NOTE

NOTE on Auto setting

The Auto setting will let the meter choose which Network card will be used for communication, based on the meter IP/gateway IP settings and available connections to the gateway device. This is most useful when used in a redundant network environment, so that the meter will automatically switch to the network card that has the connection to the gateway device if the other network card has lost the connection to its gateway device.

21.17.2 IEC 61850 GOOSE Tab

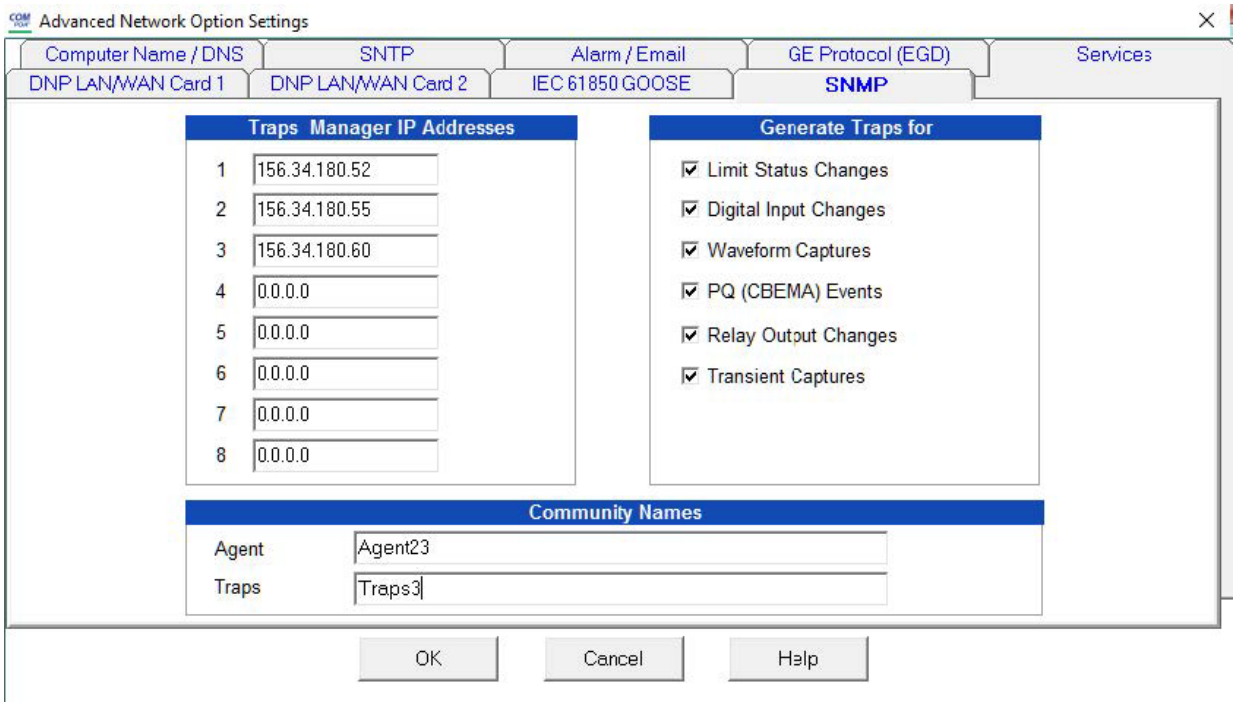


Use the **IEC 61850 GOOSE** tab to set waveform capture through GOOSE messaging. These are the screen settings:

- Trigger a waveform capture when a received message's selected boolean input memory is set: the 16 boxes refer to the 16 limits that can be programmed in the meter. Click the checkboxes of any of the limits for which you want a GOOSE message sent upon the limit change. This message will, in turn, trigger a waveform capture.

See the EPM 9900P Meter Instruction Manual for details on GOOSE messaging and the EPM 9900P meter's IEC 61850 protocol server.

21.17.3 SNMP Tab



If you selected sending traps in SNMP in the Services tab, click the SNMP tab to make the settings for the trap messages.

- You can enter the IP address of up to eight SNMP manager devices in the Traps Managers IP Addresses field. These IP addresses will receive any traps generated by the meter. If you are not using all eight addresses, you can leave the unused ones as 0.0.0.0. Note that the meter will not accept Broadcast IP addresses that are sent to multiple devices in one packet, such as 255.255.255.255 or 12.1.1.255.
- You can select the conditions that will generate trap messages in the Generate Traps for field. Click in the box to the left of any of the listed conditions to generate traps that will be sent to the SNMP managers when the condition occurs. For example, if you select Limit status Changes, anytime a limit is triggered or goes back within limit, a trap will be generated and sent to the devices at the IP addresses you entered.
- Enter the Community Name for Agent and Traps. The default name for both fields is: public.
    - The Agent Community name provides security by ensuring that the SNMP manager will only read (the manager's Read Community name)/ write (the manager's Write Community name) from/to a managed object if it matches the Agent community name.
    - The Traps Community name provides security by ensuring that only traps that match the Traps Community name of the Agent are received by the SNMP manager.

21.17.4 IEEE 1588 PTPv2 Master

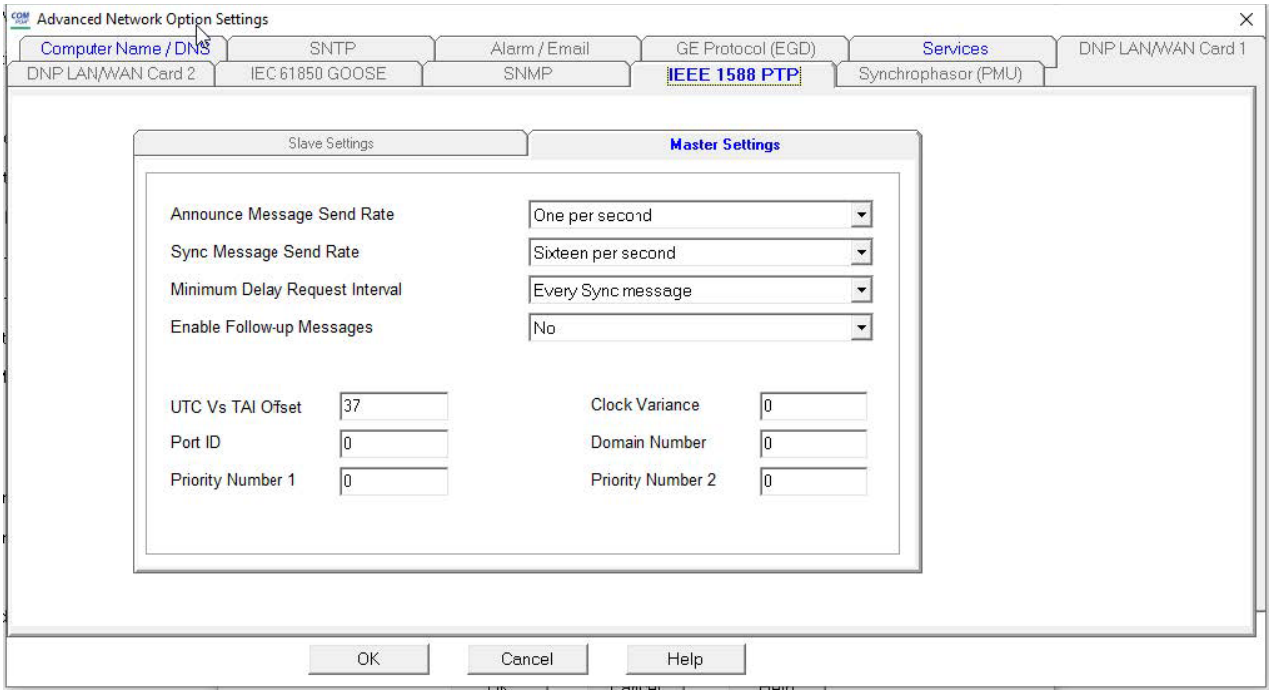
If the IEEE 1588 PTP Master has been enabled, click the IEEE 1588 PTP tab to enter the

settings for the Master clock.

NOTE

IEEE 1588 PTP cannot be used as a Master if you are using it as a time synchronization source for synchrophasors. In that case, you would set the time synchronization source and then enter settings in the Slave Settings tab. Detailed instructions for PMU settings are given in Appendix F of the EPM 9900P Instruction Manual.

The settings explained here are for using the meter as a Master clock for other devices.



The settings are:

- **Announce Method Send Rate**: choose from One per Second, Two per Second, Four per Second, Eight per Second, or Sixteen Per Second.
- **Sync Message Send Rate**: choose from Sixteen per second, Eight per second, Four per Second, Two per second, One every second, or One every two seconds.
- **Minimum Delay Request Interval**: choose from Every sync message, Every two Sync messages, Every four Sync messages, Every eight Sync messages, Every sixteen Sync messages, or Every thirty-two Sync messages.
- **Enable Follow-up Messages**: Yes or No.
- **UTC Vs TAI Offset**: the amount of offset (in seconds) between the UTC and TAI clocks.
- **Port ID**: the meter port used for Master clock communication.
- **Priority Number 1**: the number of the device that will get communication first.
- **Clock Variance**:
- **Domain Number**:
- **Priority Number 2**: the number of the device that will get communication second.

21.17.5 Synchrophasor (PMU)

This feature and its programming are explained in detail in the EPM 9900P Instruction Manual - Appendix E and Appendix F.

Please consult the manual if you are using the meter as a PMU.

GE Communicator

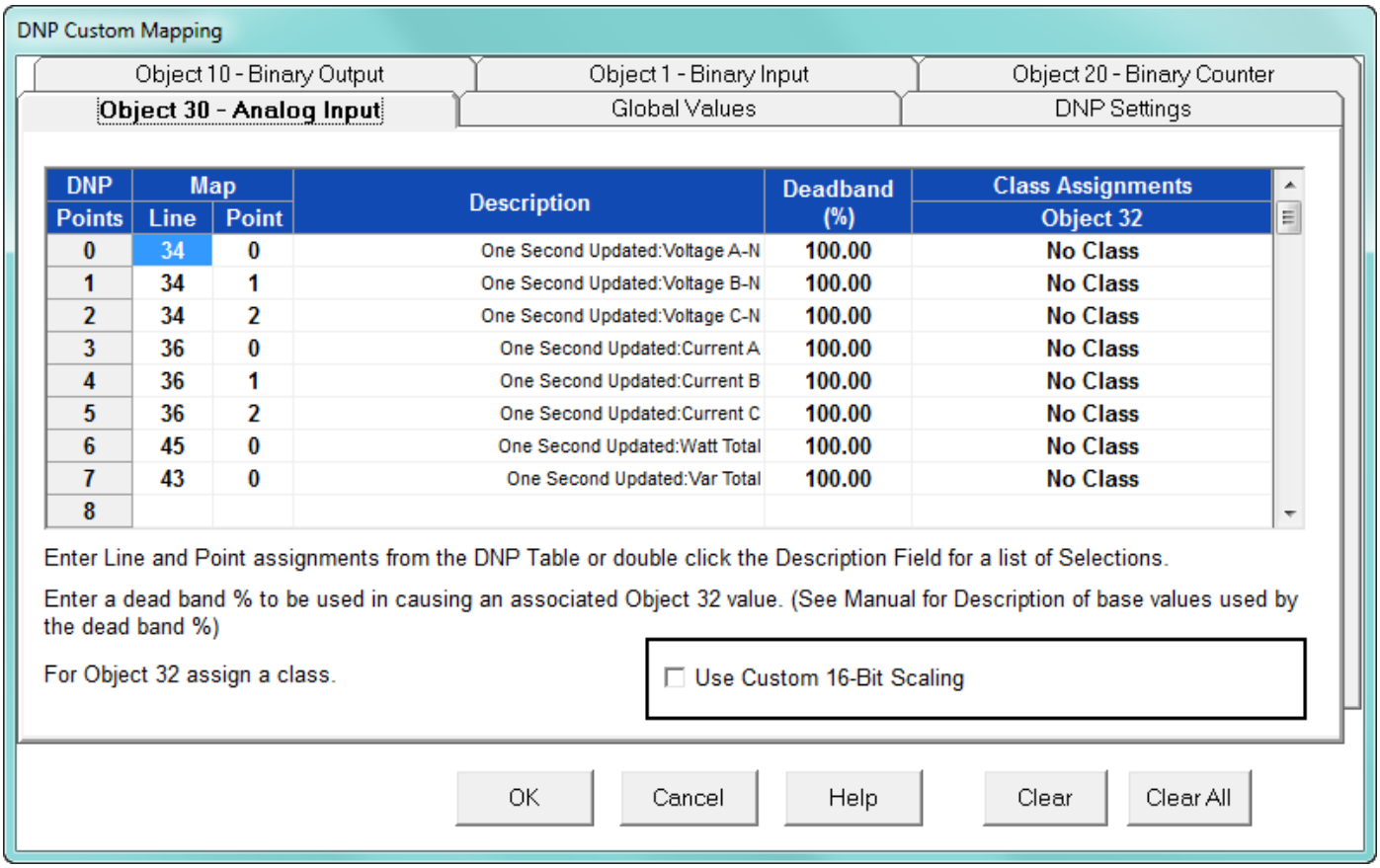
Chapter 22: DNP 3.0 Configuration

An EPM 9000 series meter (EPM 9450/9650/9700/9800/9900/9900P) can measure more than 3000 DNP Static Points, but not all points can be polled at the same time. In order for the meter to have the appropriate data, you should customize the DNP Point Map via GE Communicator software.

Up to 250 points of Event Data can be created in an EPM 9000 series meter. Refer to chapters 11, 12, and 13 of this manual for details on configuring DNP 3.0 for EPM 9000/9700 series meters, and chapter 27 for instructions on configuring DNP for the EPM 7000P meter.

22.1 Opening the DNP Settings Screen

From the meter's Device Profile, click **General Settings> DNP Custom Classes Map > DNP Level 2**. You will see the DNP Custom Mapping screen. Click on the tabs at the top of the screen to move between the following Settings screens.

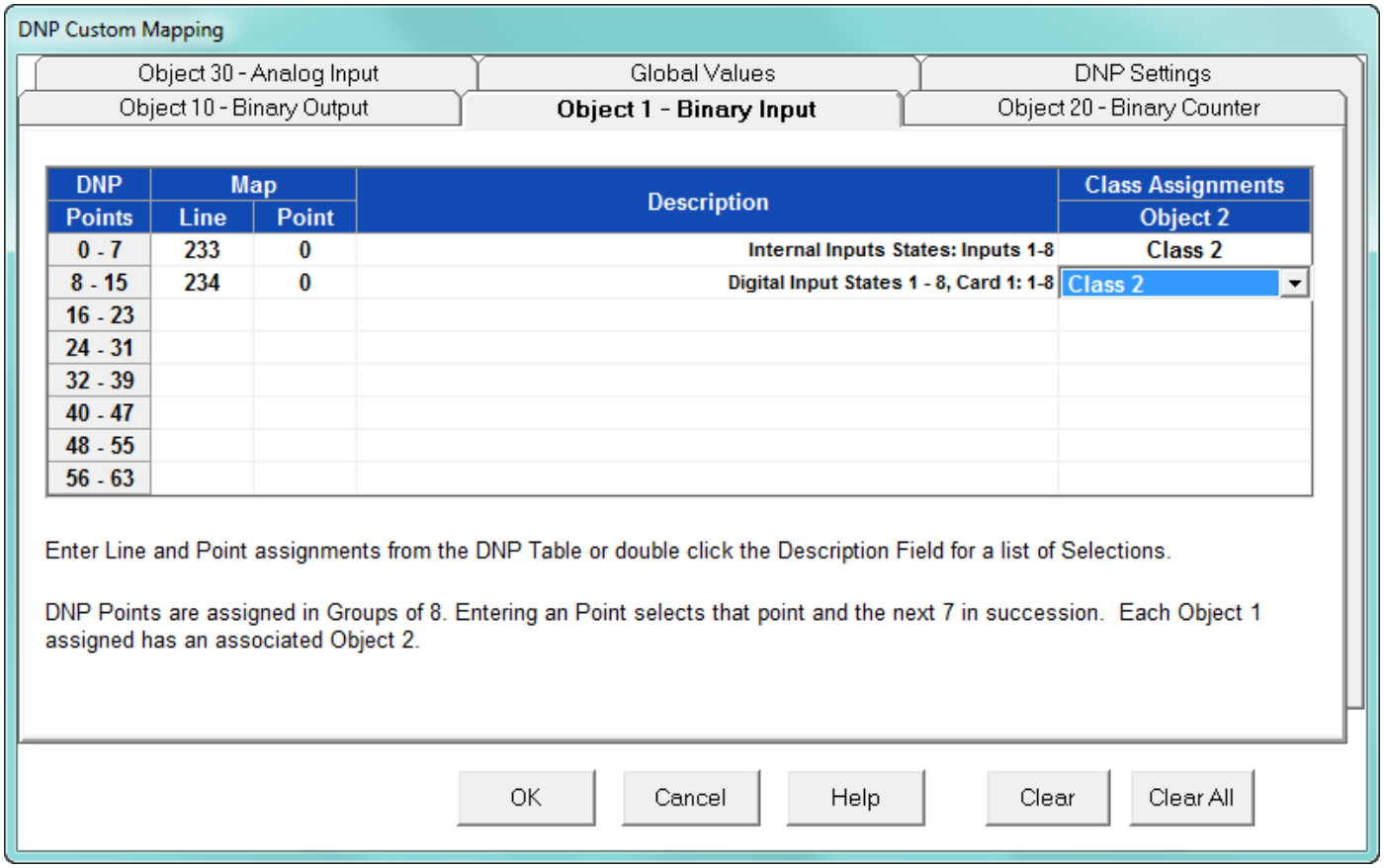


DNP Points	Map Line	Map Point	Description	Deadband (%)	Class Assignments Object 32
0	34	0	One Second Updated:Voltage A-N	100.00	No Class
1	34	1	One Second Updated:Voltage B-N	100.00	No Class
2	34	2	One Second Updated:Voltage C-N	100.00	No Class
3	36	0	One Second Updated:Current A	100.00	No Class
4	36	1	One Second Updated:Current B	100.00	No Class
5	36	2	One Second Updated:Current C	100.00	No Class
6	45	0	One Second Updated:Watt Total	100.00	No Class
7	43	0	One Second Updated:Var Total	100.00	No Class
8					

- The Clear All Button clears all assigned items on all the tabs.
- The Clear Button clears only the items on the current tab view.

22.2 Binary Input (Object 1)

An EPM 9000 series meter can use up to 64 Binary Input Points. Values available for Binary Input use can be found in the DNP Object Mapping. Only Class 0 is used when polling Binary Input (Object 1) Data. Class 1, 2 or 3 is used when polling Binary Input Change (Object 2) Data.



Line, Point, Description setting:

- Double-click on the box under Description to Add, Delete or Modify DNP Points to the screen above.
- From the pull-down menu, choose a Type (of reading) and a Channel and click **OK**.
- The corresponding numbers for the selected reading and channel will appear in the Line and Point columns.

Numbers for a Binary Input value can also be found in the DNP Object Mapping.

- For example, 1 Cycle High Speed Input Delta and Current State has Line Number 16 and Point Number 0 in the DNP Object Mapping. Write those numbers into the Object 1 – Binary Input tab. When the Line and Point Numbers are written, the software fills in the description on the screen. Repeat for each desired Binary Input Point.

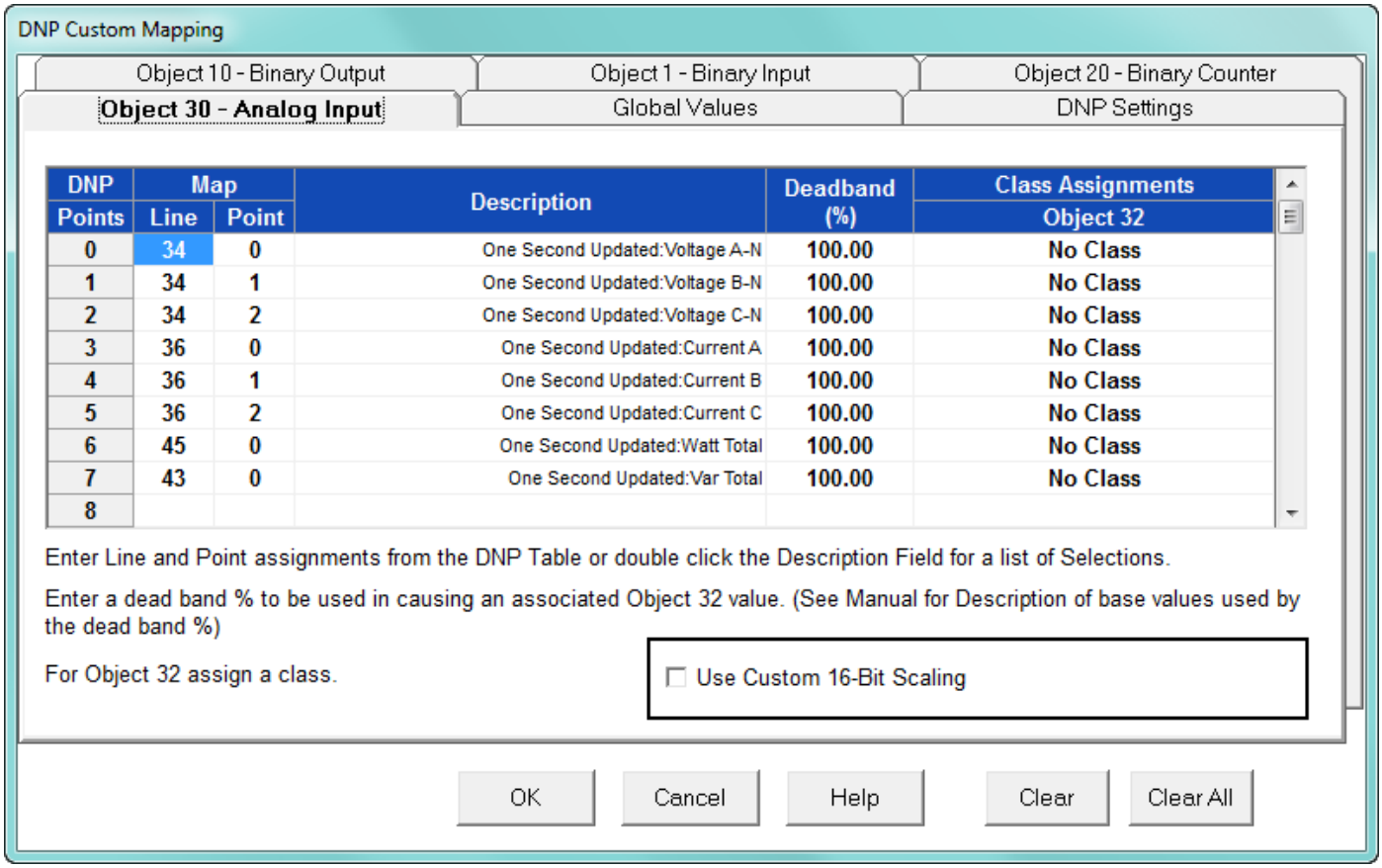
Object 2 setting:

Any DNP Static Point can be configured to create a DNP Event Point. Class Assignments on the Object 2 screen are used to configure Binary Input Change Event Points. In order to create Event Data, Object 2 Points must be assigned to Class 1, 2 or 3. Each point can have a different Class Assignment.

Click **OK** to return to the Device Profile screen; click **Update Device** to update the meter. The EPM 9000 series meter will scan the programmed points every second.

22.3 Analog Input (Object 30)

An EPM 9000 series meter can use up to 64 Analog Input points. Values available for Analog Input use can be found in the DNP Object Mapping. Only Class 0 is used when polling Analog Input (Object 30) Data. Class 1, 2 or 3 is used when polling Analog Change Event (Object 32) Data.



DNP Points	Map Line	Map Point	Description	Deadband (%)	Class Assignments Object 32
0	34	0	One Second Updated:Voltage A-N	100.00	No Class
1	34	1	One Second Updated:Voltage B-N	100.00	No Class
2	34	2	One Second Updated:Voltage C-N	100.00	No Class
3	36	0	One Second Updated:Current A	100.00	No Class
4	36	1	One Second Updated:Current B	100.00	No Class
5	36	2	One Second Updated:Current C	100.00	No Class
6	45	0	One Second Updated:Watt Total	100.00	No Class
7	43	0	One Second Updated:Var Total	100.00	No Class
8					

- Line, Point, Description settings:

  a. Double-click on the box under Description to Add, Delete or Modify DNP Points to the screen above.

  b. From the pull-down menu, choose a Type (of reading) and a Channel and click OK.

  c. The corresponding numbers for the selected reading and channel will appear in the Line and Point columns.

  Line and Point Numbers can also be found in the DNP Object Mapping.

For example, One Second Phase A-N Voltage is Line Number 34 and Point Number 0 in the DNP Object Mapping. Write these numbers into the Object 30 – Analog Input tab. When the Line and Point Numbers are written, the software will fill in the description. Repeat for each desired Analog Input Point.

- Deadband (), Object 32:

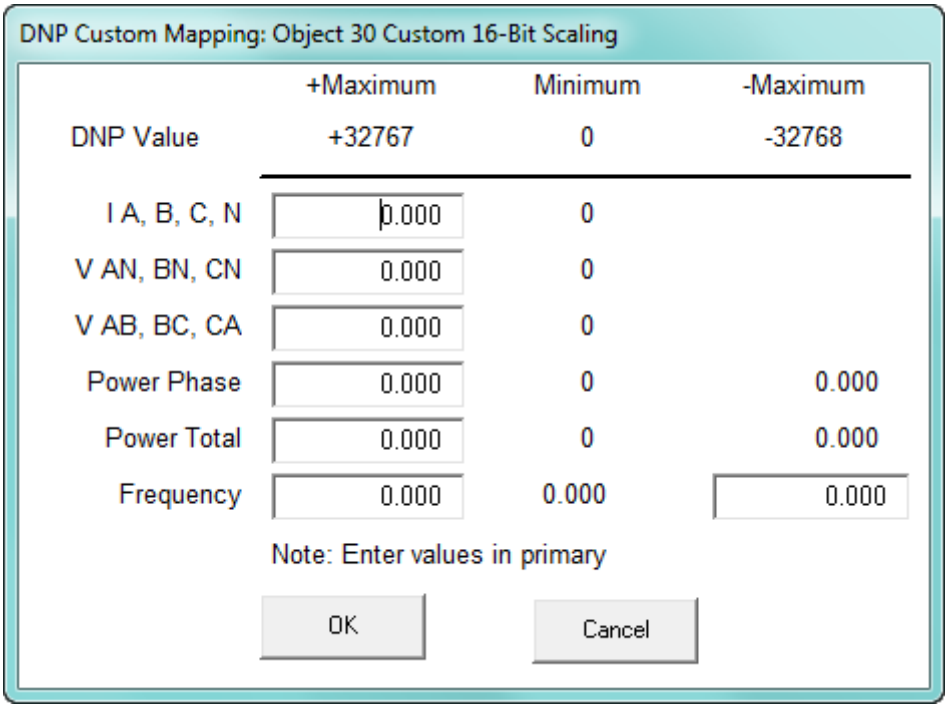
  Any DNP Static Point can be configured to create DNP Event Points. Deadband and Class Assignments on the Object 32 screen are used to configure Analog Change Event Points. In order to create Event Data, Object 32 Points must be assigned to Class 1, 2 or 3. Each point can have a different Class assignment. Deadband () defines the boundary value for that point.

  - For example, suppose One Second Phase to Neutral Volts AN is programmed and the Voltage Full Scale is 120.00V for the meter. Entering 10 for Deadband will define the boundary value of 12V (10 of 120V). Every second, new Static Data is scanned for One Second Phase to Neutral Volts AN. If the new data is different from the previous standard value by the boundary value, an Analog Change Event will be created.

    For example, if the previous standard value is 110 and new data is lower than 98V or higher than 122V, a new Analog Change Event Point will be created. The new value then becomes the previous standard value for future scans.

  Analog Input Points have various Full Scales values due to different data types (Volts, Amps, Watts, etc.). These Full Scale values are used for Exception Polling in DNP. Some Full Scale values are programmable by users and others have fixed numbers. See the chart of Full Scale Values on page 22-7.

- To use the custom-scaling feature, click the checkbox next to Use Custom 16-Bit Scaling. The Custom Scaling button will display - click this button to see the screen shown below.



Use this screen to program the secondary scale that will be used to maximize the 16-bit resolution precisely around the parameters you choose:

- Enter values (in Primary) in the Maximum entry fields next to the readings you want to scale.
- Click **OK** to save your entry and return to the previous screen; click Cancel to close the screen without making any changes.

NOTE

Depending on the age of your meter, you may not have the custom-scaling option.

Full Scale values are 4-byte integer numbers. The units are as follows:

Analog Input	Full Scale	Unit
I A, B, C, Nc	Programmable	1/65536 Amps
I Nm	Programmable	1/65536 Amps
V AN, BN, CN	Programmable	1/65536 Volts
V AB, BC, CA	Programmable	1/65536 Volts
V Aux	Programmable	1/65536 Volts
Power Phase	Programmable	1/65536 Watts
Power Total	Programmable	1/65536 Watts
Frequency	Programmable	1/65536 Hz

Analog Input	Full Scale	Unit
Power Factor	4000	0.001 PF
Angles	18000	0.001 PF
Percent	10000	0.01
K-Factor	500	0.01
TOU Ratio	N/A	N/A
Temperature	10000	0.01
Flicker	65536	0.0001
In Interval	1000	1000
Day of Week	6	1
Sequence	1	1
Status	100	1
Avg Select	100	1
Delay	100	1
Log Index	100	1
Countdown	100	1

For example, in order to find out if there is new log data, use a Log Index Number. One of the Log Index Numbers (Last Index) will increase when a new log is created. In Object 30, Program Last Log Record Index:

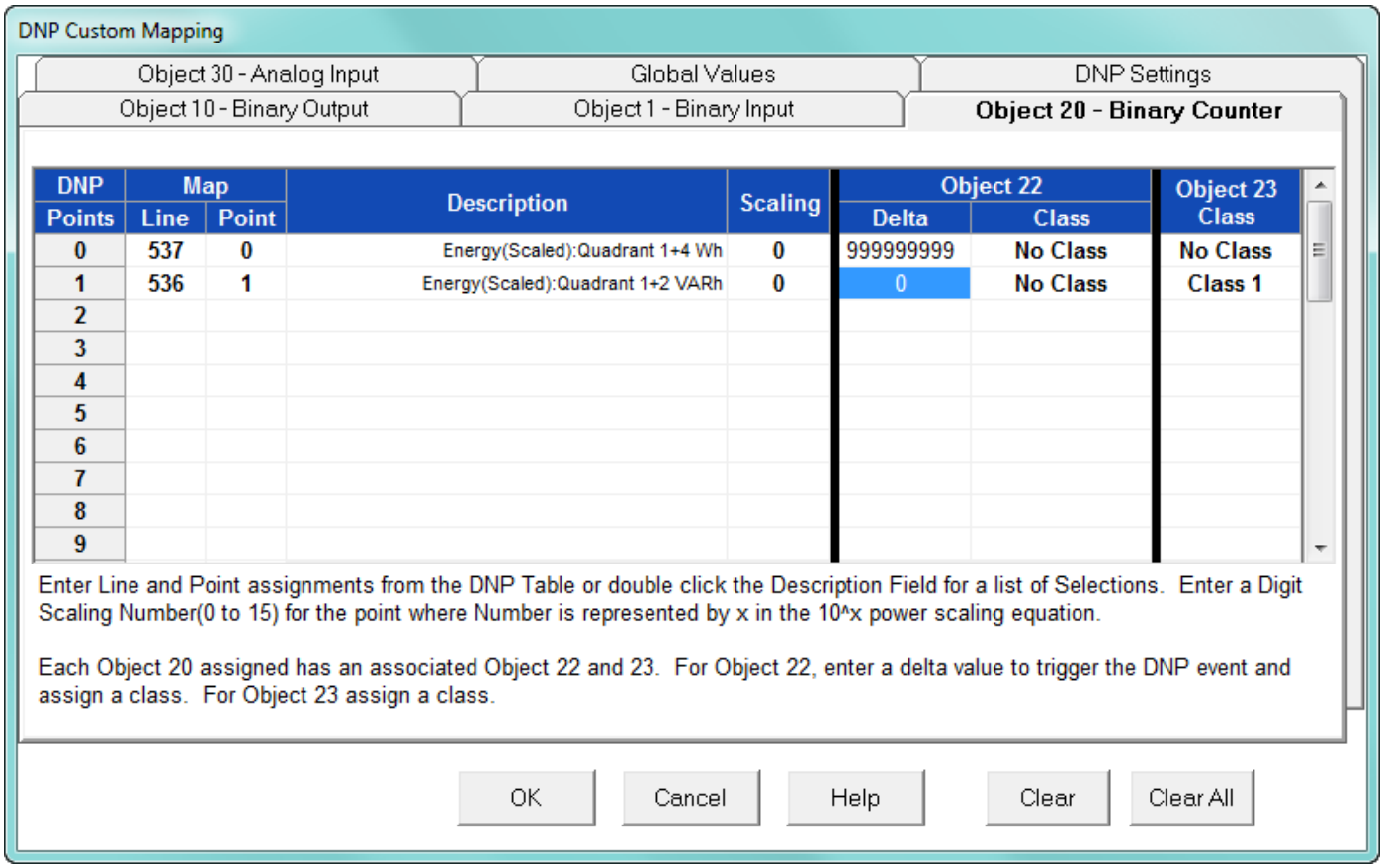
Waveform Log (Line 499, Point 7). Input Deadband 1.00 and assign a Class.

The exception data will be created when the Index Number increases by one.

- Click **OK** to return to the Device Profile screen; click **Update Device** to update the meter. The EPM meter will scan the programmed points every second (except for Tenth Second Readings: Tenth Second Readings (Line 18 to 32) are scanned as soon as the meter detects a change (as often as every 50 milliseconds).

22.4 Binary Counter (Object 20)

An EPM 9000 series meter can use up to 8 Binary Counter Points. Values available for Binary Counter use can be found in the DNP Object Mapping. Only Class 0 is used when polling Binary Counter (Object 20) Data and Frozen Counter (Object 21) Data. Class 1, 2 or 3 is used when polling Counter Event (Object 22) Data and Frozen Counter Event (Object 23) Data.



Line, Point, Description settings:

a. Double-click on the box under Description to Add, Delete or Modify DNP Points to the screen above.

b. From the pull-down menu, choose a Type (of reading) and a Channel and click OK.

c. The corresponding numbers for the selected reading and channel will appear in the Line and Point columns.

- Line and Point Numbers can also be found in the DNP Object Mapping.

For example, VA hour has Line Number 133 and Point Number 0 in the DNP Object Mapping. Write those numbers into the Object 20- Binary Counter tab. When the Line and Point Numbers are written, the software fills in the description on the screen. Repeat for each desired Binary Counter Point.

Scaling:

An EPM 9000 series meter can measure its Binary Counter value using up to a 16-digit number (0 to 9,999,999,999,999,999). DNP Binary Counter Points use up to 32 bits. That means that the range is 0 to 4,294,967,295 (0x0FFFFFFFF). This maximum number is only a 10-digit number. In order to deal with a 16-digit number, Scaling is necessary.

Scaling is used to select a unit in powers of 10: 1 = x10, 2 = x100 and so on. The Scaling value can be 0 to 15.

For example, if the value inside the meter is 3,000,000 and a Scaling value of 2 (x100) is used, the Binary Counter value will be reported as 30000. The actual value is 30000x100 = 3,000,000.

Delta, Object 22:

Any DNP Static Point can be configured to create DNP Event Points. Delta and Class Assignments on the Object 22 screen are used to configure Counter Change Event Points. In order to create Event Data, Object 22 must be assigned to Class 1, 2 or 3. Each point can have a different Class Assignment.The Delta value defines the boundary value for that point.

For example, suppose VA hour is programmed and the Delta is 5. That represents 5 increments from the returned 32-bit Binary Counter value. Every second, new Static Data is scanned for VA hour. If new data is different from the previous standard value by the Delta value, the Counter Change Event Data will be created. That means, if the previous standard polled value is 50000 VA hour and if the VA hour reading increases to 50005, it will create a Counter Change Event Point for VA hour and 50005 VA hour will become the previous standard value for the next Static Data.

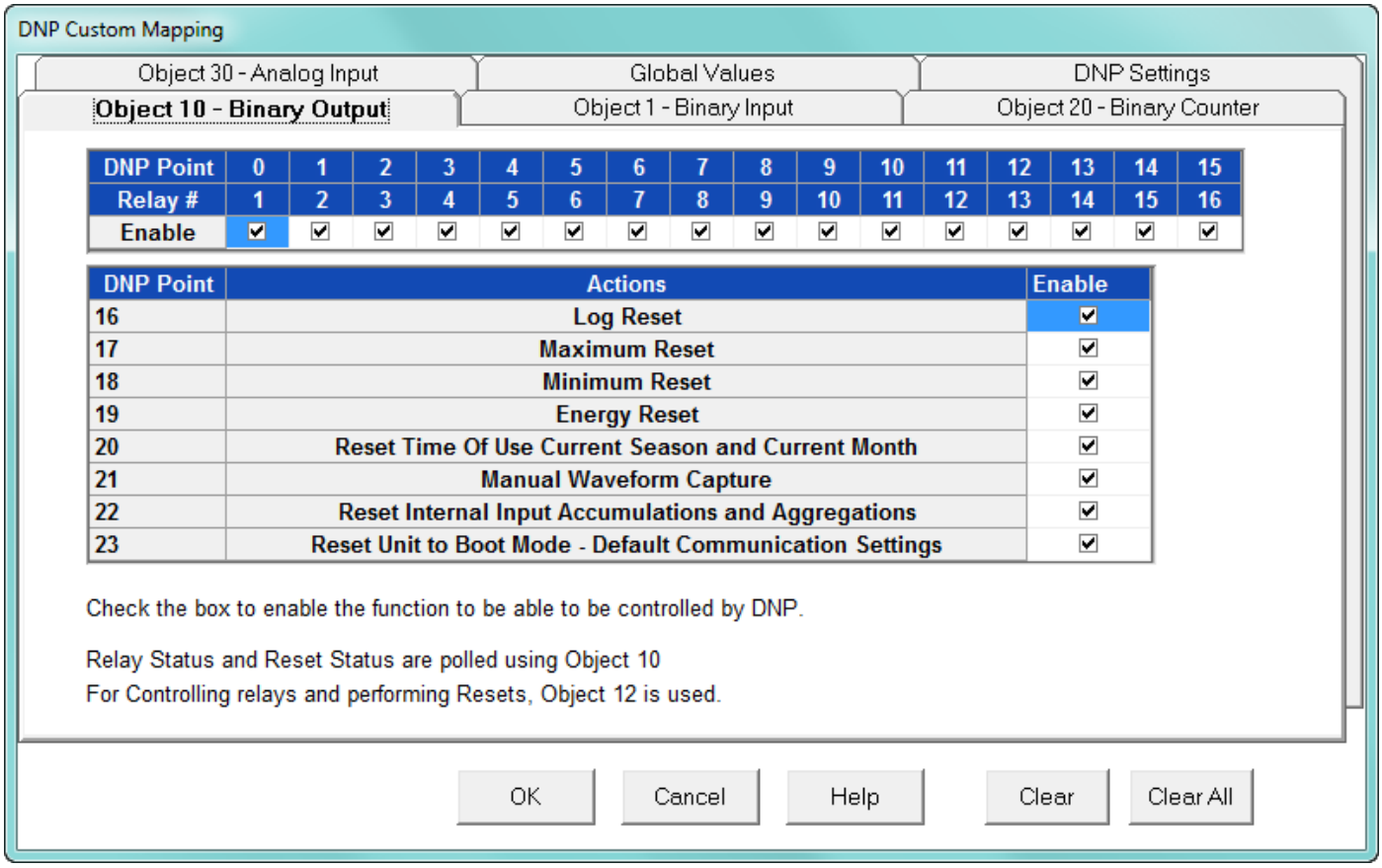
The Scaling setting for a point also applies to the Delta value. If Delta is 5 and Scaling is 2, this indicates a 500-count change in the internal representation.

Object 23: Frozen Analog Event (Object 23) will be created if Object 23 is assigned to Class 1, 2 or 3.

- Click **OK** to return to the Device Profile screen; click **Update Device** to update the meter. The EPM meter will scan the programmed points every second.

22.5 Binary Output (Object 10)

Class 0 is used when polling Binary Output (Object 10) Data. External Relay Output Modules can be attached to the EPM 9450/9650/9800/9900/9900P meter. Up to 4 Relay Output Modules can be attached and each Relay Module has 4 Relay Outputs.



- To enable control of a Relay by DNP, check its box. If unchecked, the relay will not be controlled by DNP.
- The Master in DNP protocol can control 16 relays. In order to do that, each relay box should be checked and the EPM meter should be updated with this profile.
- Check the box for the Reset Enable you want to control through DNP. The Master not only controls relays but also can do various resets.
- Relay Status and Reset Status can be polled using Object 10. For Controlling Relays and performing Resets, Object 12 is used. Each box should be checked in order for the Master to do the reset.

Example 1 - The Master can control Relay 1 by sending this message (Meter Address 1, Master Address 10):

05 64

18 C4 01 00 0A 00 6C 1A

C0

C0 05

06

01 17 01

00 03 01 01 00 00 00 00 00 3B EF 00 00 00 FF FF

Example 2 – The Master can control Relay 2 by sending this message:

05 64

18 C4 01 00

0A 00 6C 1A

C0

C1 05

0C

01 17 01

01 03 01 01 00 00 00 00 00 E2 5F 00 00 00 FF FF

Example 3 – The Master can do a Log Reset by sending this message:

05 04

18 C4 01 00 0A 00 6C 1A

C0

C2 05

0C

01 17 01

10 03 01 01 00 00 00 00 00 C5 1B 00 00 00 FF FF

Example 4 – The Master can do an Energy Reset by sending this message:

05 04

18 C4 01 00 0A 00 6C 1A

C0

C3 05

0C

01 17 01

13 03 01 01 00 00 00 00 00 E7 5B 00 00 00 FF FF

NOTE

The preceding examples use Function 5 (Direct Operate Relay) and Qualifier 0x17.

The Point Numbers for Relays and Resets are as follows:

Points Assignment

0 Relay 1

1 Relay 2

2 Relay 3

3 Relay 4

4 Relay 5

5 Relay 6

6 Relay 7

7 Relay 8

8 Relay 9

9 Relay 10

10 Relay 11

11 Relay 12

12 Relay 13

13 Relay 14

14 Relay 15

15 Relay 16

16 Log Reset

17 Reset of Maximum Thermal Average

18 Reset of Minimum Thermal Average

19 Energy Reset

20 Reset Time of Use Current Frozen Register and Current Month

21 Manual Waveform Capture

22 Reset Internal Input Accumulations and Aggregations

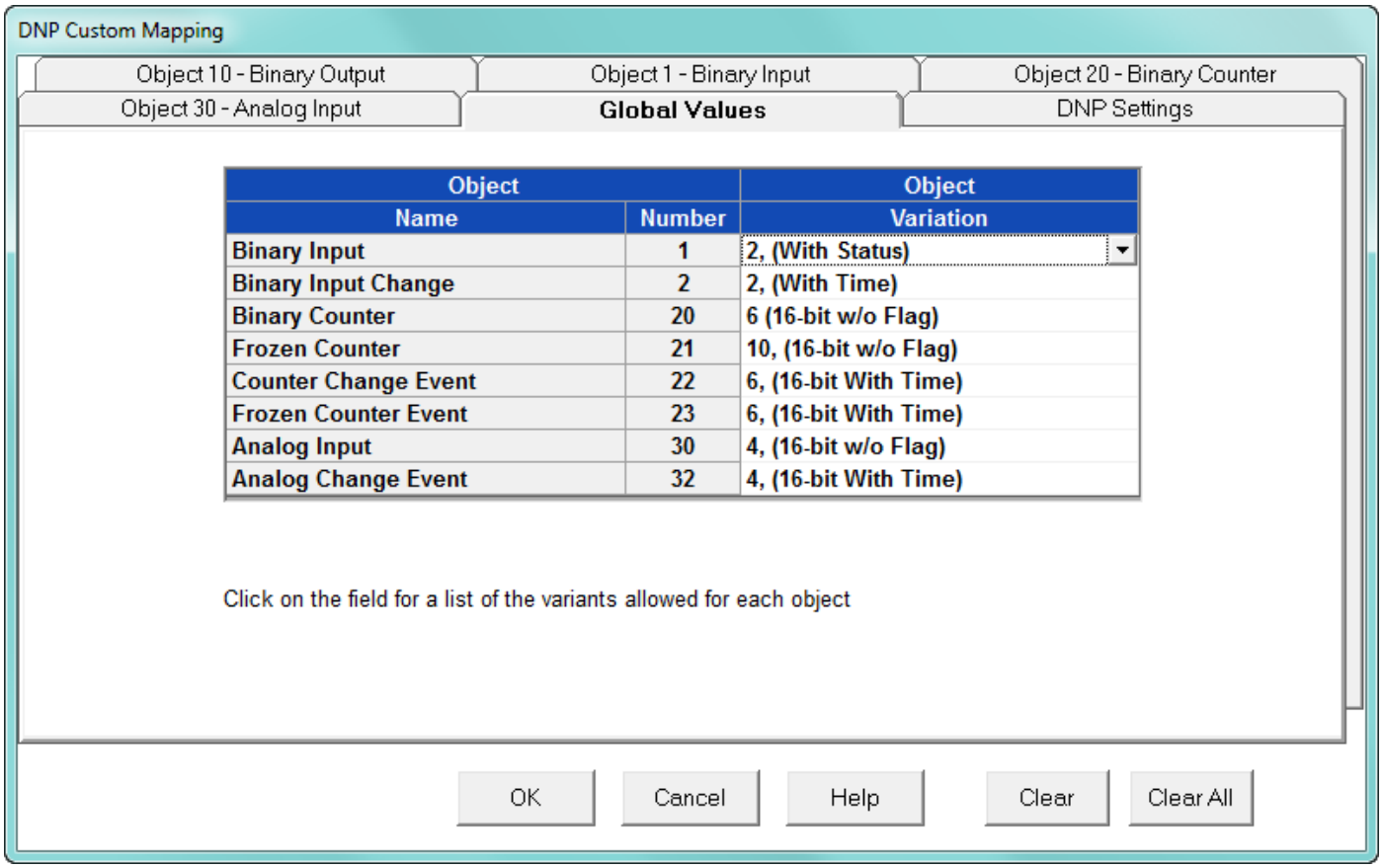
23 Reset Unit to Boot Mode – Default Communication Settings

NOTE

Point 23 is a temporary switch to Boot in Modbus Protocol. This switch times out.

22.6 Global Values

Each Object can be polled by Variation 0.



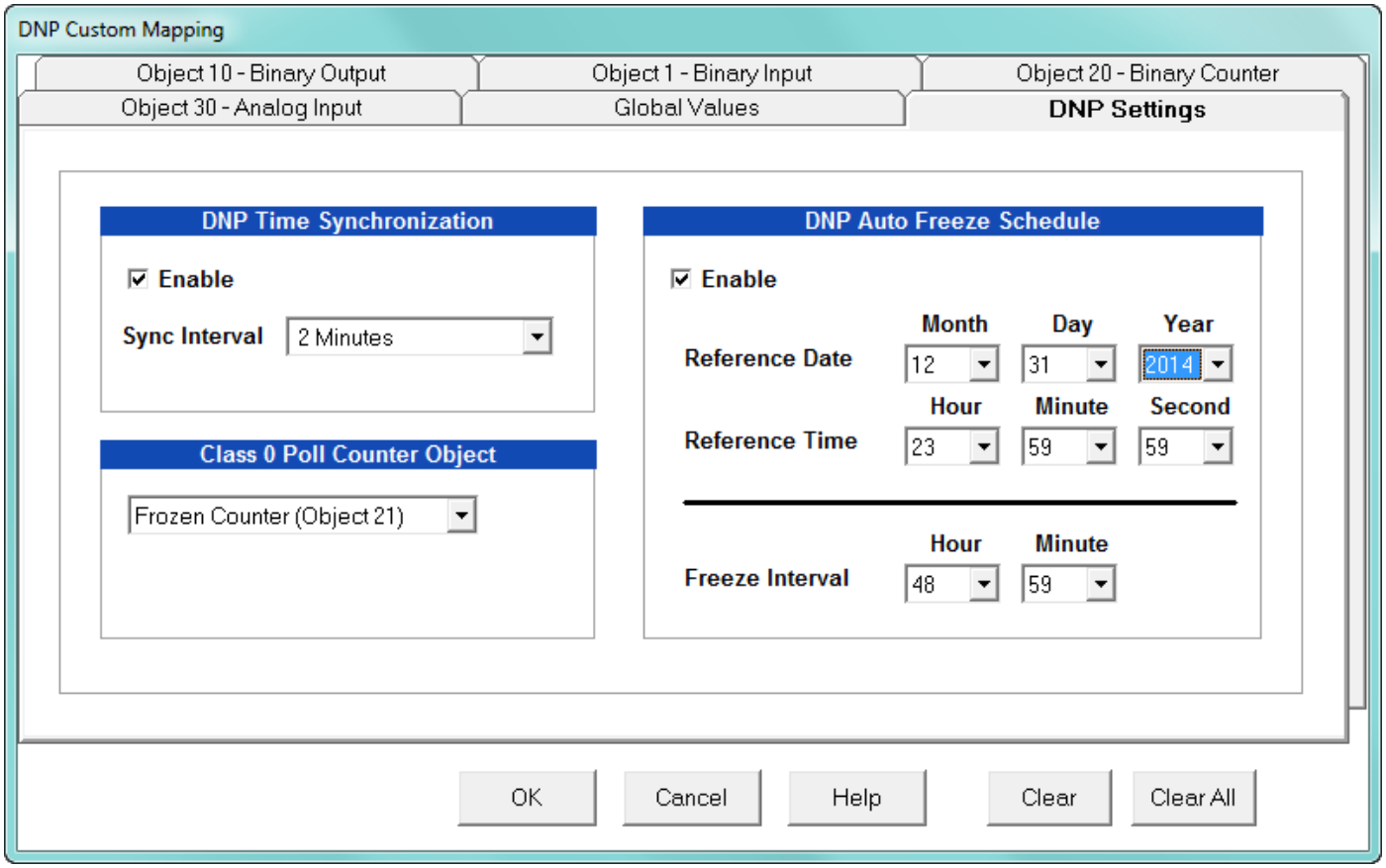
Using this tab, you can assign a default variation to be returned for each Object.

- Click on the Object on the left side of the screen.
- Click on a Variation on the right side of the screen.

Click **OK** to return to the Device Profile screen; click Update Device to update the meter. The EPM meter will scan the programmed points every second.

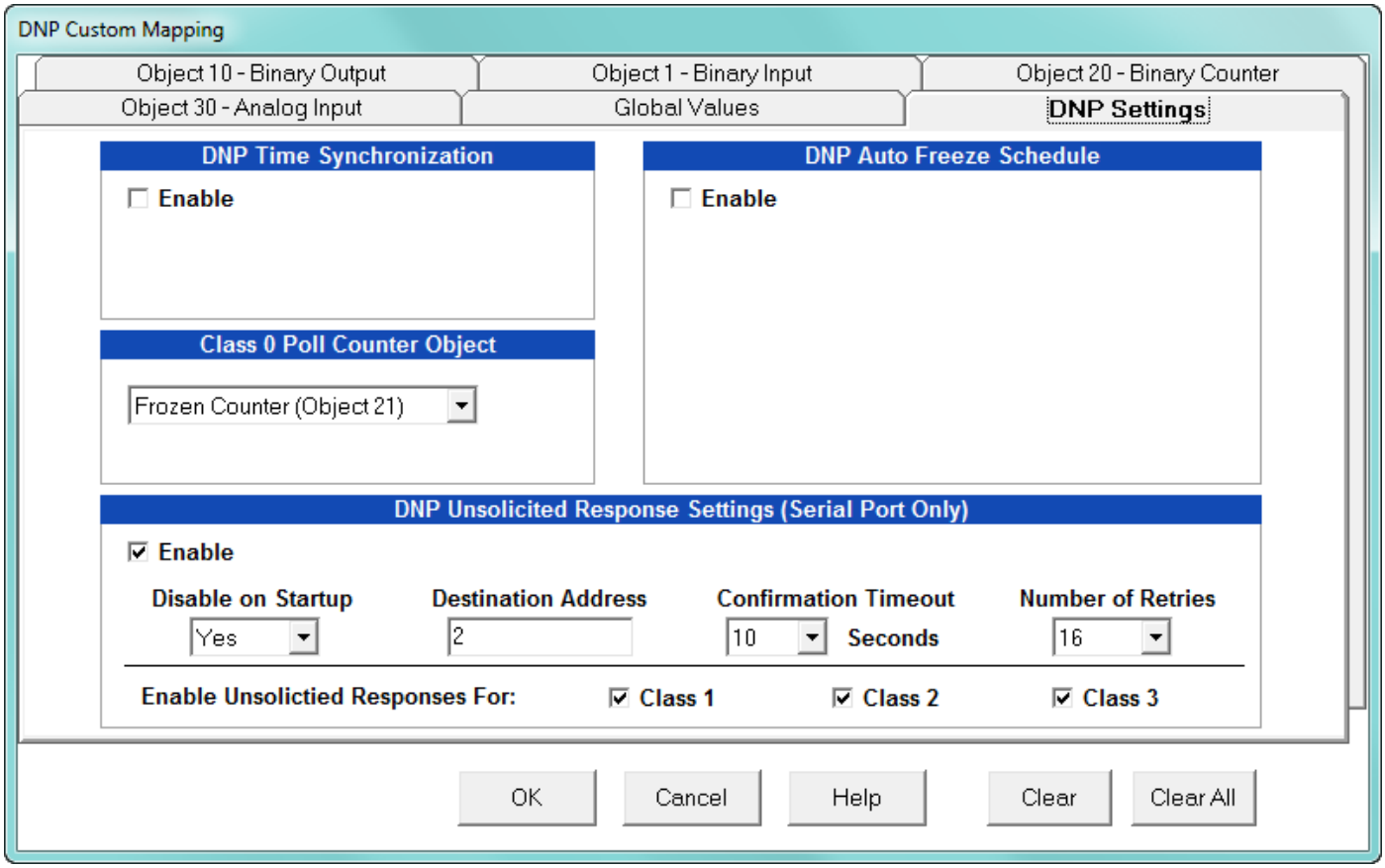
22.7 DNP Settings

With this tab, you can enable DNP Time Synchronization.



- The **Sync Interval** is the amount of time the device waits before requesting Time Synchronization from the Master (using IINI-4). The Time Interval is configurable from 1 minute to 1 day in 1-minute intervals. The initial factory setting is Not Enabled.
- **Class 0 Poll Counter Object** allows you to select Binary Counter (Obj. 20) or Frozen Counter (Obj. 21) for a Class 0 Poll.
- **DNP Auto Freeze Schedule** enables and sets the interval for a Class 0 Poll.

For the EPM 9900P meter, there is an additional section of settings for the Unsolicited Response feature. See the example screen on the next page.



Unsolicited Response is a DNP feature in which the meter sends an unrequested message to the master device when certain specified events occur. This setting lets you enable and configure unsolicited response messages for the EPM 9900P meter.

Note that unsolicited response can only take place through a serial port connection. The settings for unsolicited response are as follows:

- **Enable** - check the box to enable unsolicited response - un-check it to disable unsolicited response.
- **Disable on startup** - this setting disables (Yes) or enables (No) the sending of a null (empty) message to the master device, on meter startup.
- **Destination Address** - enter the destination address of the master device to which the unsolicited response will be sent. The allowable range is from 1 to 65519.
- **Confirmation Timeout** - enter the amount of time that the meter will wait for a confirmation back from the master device. This is also the amount of time between transmissions of unconfirmed unsolicited responses. The range of allowable values is from 1 second to 60 seconds.
- **Number of Retries** - enter the number of unsolicited retries that the meter will transmit in each unsolicited response series, if it does not receive confirmation back from the master device. The configured value includes identical and regenerated retry messages. The allowable values are from 1 to 16. Selecting 16 causes continual retries, until there is a response.

- **Enable Unsolicited Response For** - the meter can monitor all data points from 3 DNP3 Classes, which can then be included inside unsolicited response messages. Check the box next to Class 1, Class 2 and/or Class3 to include data from those classes; uncheck the boxes to not send data from those classes in unsolicited response messages.
- Click **OK** to return to the Device Profile screen; click Update Device to update the meter.

GE Communicator

Chapter 23: EN 50160 / IEC 61000-4-30 Power Quality Analysis

23.1 Overview

EN 50160 is the European Standard approved by CENELEC (European Committee for Electrotechnical Standardization). This standard and other standards, such as IEC 61000-4-30, define the properties of the power supply as delivered to the user in normal operating conditions. The properties are defined in terms of continuity of supply and characteristics of voltage (symmetry, frequency, magnitude, waveform, Flicker). These standards define the main characteristics of the voltage at the customer's supply terminals in public voltage electricity distribution systems. They do not describe the typical situation for a customer connected to a public supply network.

The term "Flicker," for example, is defined by EN50160/IEC61000-4-30 and refers to the human eye's perception of luminance differences in light sources. Flicker is discussed in the Rapid Voltage Changes section.

In recent years, power quality has become a very important issue. Competitive markets require constant attention to customer satisfaction. Increasing use of non-linear and pulsed loads can cause mains interference. And, many electronically controlled devices that we use to "run" our countries, businesses, and homes require quality supply voltage. For these reasons, it is important to collect reliable power quality data for electricity suppliers and customers alike.

Following are the ten Power Quality measurements that comprise analysis as per the EN 50160/IEC 61000-4-30 standards (depending on the meter model, the measurement label may differ, as shown in the table below):

EPM 9450/9650/9800 Meters	EPM 9900 Meter	EPM 9900P Meter
Frequency Fluctuations	Power Frequency	
Low Speed Voltage Fluctuations	Supply Voltage Variations	
Fast Voltage Fluctuations	Rapid Voltage Changes	Rapid Voltage Changes

EPM 9450/9650/9800 Meters	EPM 9900 Meter	EPM 9900P Meter
Flicker	Flicker PLT	Flicker PLT
		Flicker PST
Supply Voltage Unbalance	Supply Voltage Unbalance	Supply Voltage Unbalance
Harmonic Magnitude	Harmonic Magnitude and % THD	Harmonic Magnitude and % THD
% THD		
Voltage Dip	Supply Voltage Dips	Supply Voltage Dips
		Voltage Swells
Short Interruption Supply Voltage	Short Interruption of Supply Voltage	Short Interruption of Supply Voltage
Long Interruption Supply Voltage	Long Interruption of Supply Voltage	Long Interruption of Supply Voltage
	Mains Signaling Voltage on the Supply Voltage	Mains Signaling Voltage on the Supply Voltage
	Temporary Power Frequency Overvoltage Between Live Conductors and Earth	Temporary Power Frequency Overvoltage Between Live Conductors and Earth

23.2 Power Quality Compliance Standards

The following sections describe the Power Quality standards for compliance.

23.2.1 Mains Interference

The increased use of power electronics and other devices puts a strain on the network. Because of this, electricity suppliers need detailed data on the quality of their network. New, advanced measuring and testing systems are used to record voltage quality at various points, convert the data and add it to a central database. By correlating the applicable fluctuations and studying the time of events, the cause for a disturbance can be confined and ultimately eliminated.

For a number of reasons, power quality has become an important issue:

1. Mains interference feedback can be caused by increased use of non-linear and pulsed loads.
2. An ever-widening number of electronic devices are very sensitive to mains pollution. A certain quality of supply voltage is required for them to operate properly.
3. With deregulation a global reality, a good relationship between supplier and customer is essential. Permanent monitoring of voltage quality in networks is one key to maintaining quality control, which helps to sustain relationships.

23.2.2 Power Quality and Network Disturbances

The quality of an electric power supply is determined by examining two aspects of Power Quality:

1. Reliability of the energy supply
2. Quality of the voltage (similarity of the waveform of the supplied voltage to an ideal sinusoidal voltage)

Divergences from the ideal come in many shapes and sizes. In the next sections, we will discuss Network disturbances in detail.

23.2.2.1 Voltage Dips

The Voltage Level determines the Voltage Quality.
When the voltage drops to a low level, a voltage dip occurs. If the voltage drops to zero, a power failure occurs. The depth and duration of the dip determine the severity.

A dip is a sudden drop of the voltage to a level below 90 of the nominal voltage, followed by an increase to a level above 90 within a period of 10ms to 60s. Most dips in medium or high voltage networks have durations of less than 0.2s.

Short dips can cause serious problems, such as failure of equipment and machine control systems. Short dips can also cause sudden torque change in motors, which causes damage.

Faults in the insulation of medium and high voltage networks are the primary cause of most dips. Other possible causes of dips are branches of trees in contact with lines, ice, frost, snow and thunderstorms. During most dips, all customers in the network are affected to the same degree.

Customers themselves can cause many dips. The start-up of big machines or capacitor banks can cause voltage dips, and short circuits can cause losses when there is insufficient short-circuit capacity.

23.2.2.2 Flicker

The term Flicker, defined in IEC 61000-4-15, applies to
luminescent variations of light sources as perceived by the human eye. Since each human eye is different, this perception varies with each person. Flicker is the sensation that is experienced by the human visual system when it is subjected to changes occurring in the illumination intensity of light sources. The primary effects of Flicker are headaches, irritability and sometimes epilepsy. Flicker can be caused by voltage variations which are caused by variable loads, such as arc furnaces, laser printers and microwave ovens.

IEC 61000-4-15, IEC61000-4-30 and former IEC 868 describe the methods used to determine Flicker severity. This phenomenon is strictly related to the sensitivity and the reaction of individuals. To determine the standard, Flicker measurement was performed through observation of groups of people, and statistical operations were applied to the observations.

Flicker is computed using the three phase-to-neutral voltages in WYE configurations and the three phase-to-phase voltages when in DELTA. Evaluation occurs in the following forms: Instantaneous, Short Term or Long Term.

The range of analysis is from 0.01 to 33Hz. Sensitivity of the human brain correlates with the frequency of the sensation. To make sure that most people do not perceive flickers, the Plt (Long Term Flicker) value must be below 1.00. This value is obtained with the following equation:

$$P_{lt} = \frac{\sqrt[3]{\sum_{i=1}^{N} P_{sti}^{3}}}{N}$$

Where P_{sti} (i = 1, 2, 3, ...) are consecutive readings of the short-term severity P_{st}

23.2.2.3 Transients

A transient over-voltage is a short duration oscillatory
or non-oscillatory over-voltage, usually highly damped and with a duration of a few milliseconds or less. Transients are generally incidental and are considered single short term events. Switching capacitor banks on, switching inductive loads off, and lightning that affects power lines are the primary causes of transients.

However, regular transients can occur when loads controlled by power electronics are switched on and off. Modern switching technology can be applied to minimize regular transients.

23.2.2.4 Harmonics

Harmonic voltage is defined as a sinusoidal voltage
with a frequency equal to an integer multiple of the fundamental frequency of the supply voltage. Harmonic voltages can be evaluated:

- Individually by their relative amplitude (Uh) related to the fundamental voltage (U1), where h is the order of the harmonic.
- Globally, for example by the total harmonic distortion factor (THD), which is the sum of all harmonics (all frequency contents), calculated using the following equation:

$$THD = \sqrt{\sum_{h=2}^{40} (u_h)^2}$$

Supply voltage harmonics are usually caused by customers' non-linear loads connected to all voltage levels of the supply system. Harmonic currents flowing through the system impedance create harmonic voltages.

In office and residential buildings, harmonics are usually caused by energy-efficient lamps, TVs and PCs. These devices in large numbers can produce high harmonic content in low voltage networks. Fast Fourier transformation is used to measure harmonics. This method generates a spectrum of a signal yielding a frequency-domain representation. EN 50160 defines the values for harmonics and THD in percentages of the nominal voltage Uh.

23.2.2.5 Frequency

The supply voltage nominal frequency (U_{fn}) is 50Hz or 60Hz. Under normal operating conditions, the 10-second average value of the fundamental frequency in a distributive mains must be in the following ranges:

U_{fn} +/- 1For mains with connection to an interlinking mains* during 95 of one week.

U_{fn} + 4 / -6 For mains with connection to an interlinking mains* during 100 of one week.

U_{fn} +/- 2 For stand-alone mains** during 95 of one week.

U_{fn} +/- 15 For stand-alone mains** during 100 of one week.

In today's interconnected grids, frequency fluctuations are very small.

* Interlinking mains are also known as synchronous. They are large, inter-connected power grids.

** Stand-alone mains are also known as unsynchronous. They are independent power systems, unconnected to the main electrical grid.

23.3 Permanent Monitoring Provides Valuable Data

The types of data provided by permanent monitoring are listed below. This data is invaluable to the successful operation of electricity suppliers.

- Types and levels of disturbances in the network
- Overview and detailed analysis of voltage quality in the network
- Time-stamped recordings of disturbances

Through analysis of the data provided, causes of a disturbance can be determined, events clarified and associated problems or trends discovered. Preventive maintenance may also be facilitated by the data. Indicators may predict disturbances early enough to avoid the event altogether.

23.4 Power Quality Monitoring

EN 50160 has standardized the voltage quality of electricity supplied by public distribution systems since 1994. Amendments have been added to the standard to reflect changes in technology. Other standards, such as IEC 61000-3-6 and 61000-3-7, set the standard for distortions across medium and high voltage networks.

With this standard in hand, customers have new rights regarding the quality of supply. For example, if the voltage quality at the point of common coupling does not conform to the standard, according to EN 50160 the customer has the right to complain. As a result, there has been a shift towards partnership between the electricity supplier and customer. The quality of the electricity should be constantly monitored at the point of common coupling and throughout the network to the benefit of both partners. And, since disturbances caused by one customer can affect others indirectly linked to them in the network, the continuous monitoring will benefit all customers.

23.5 EN 50160/IEC 61000-4-30 Meter Setting and Report Viewing

You set up your meter for use with the Power Quality Compliance Standards through the meter's Device Profile - see chapter 11, 12, and 13 for instructions.

- Through the Flicker Polling screen - see 5.4.3 *Flicker* for instructions
- Through the Flicker log - see 19.4.12 *Flicker Log* for instructions on viewing and graphing the Flicker data
- Through the EN50160 report - see 19.4.14 *EN 50160/IEC 61000-4-30* for instructions on viewing the data and printing an EN 50160 report. A sample copy of the report follows. Note that the example report is for an EPM 9900P meter - the EN 51060 report generated from an EPM 9450/9650/9800 meter or an EPM 9900 meter with earlier firmware, will look slightly different.

EN50160 Individual Report Summary

Power Frequency (x.1)	Fail
Supply Voltage Variations (x.3.x)	Fail
Rapid Voltage Changes (x.4.1)	Fail
Flicker PLT (x.4.2)	Fail
Flicker PST	Fail
Supply Voltage Dips (x.5)	Pass
Voltage Swells	Pass
Short Interruption of Supply Voltage (x.6)	Fail
Long Interruption of Supply Voltage (x.7)	Fail
Temporary power frequency overvoltage (x.8)	Pass
Supply Voltage Unbalance (x.10)	Fail
Harmonic Voltage (x.11)	Pass
Mains Signaling Voltage (x.13)	Pass

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

EN50160 (2010) Report Details

Device Info	
Meter Type	EPM 9900P
Meter Name	128Mb_IP194
Serial Number	0000000113599432
Firmware	4.6027
Profile CRC	0x9E5B
Profile Date	2014-07-21 15:10:56
Hookup	Wye
Supply Type	Medium Voltage
Synchronous Connection	No
Nominal Voltage	120V
Nominal Frequency	60Hz

Report Info	
Report Version	S2010-1
Standard Version	EN50160 (2010)
Report Type	Weekly
First Day of Week	Sun
Time Range	10/6/2014 to 10/12/2014

Report Errors	
Date Range	Unknown date range type: Weekly

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for

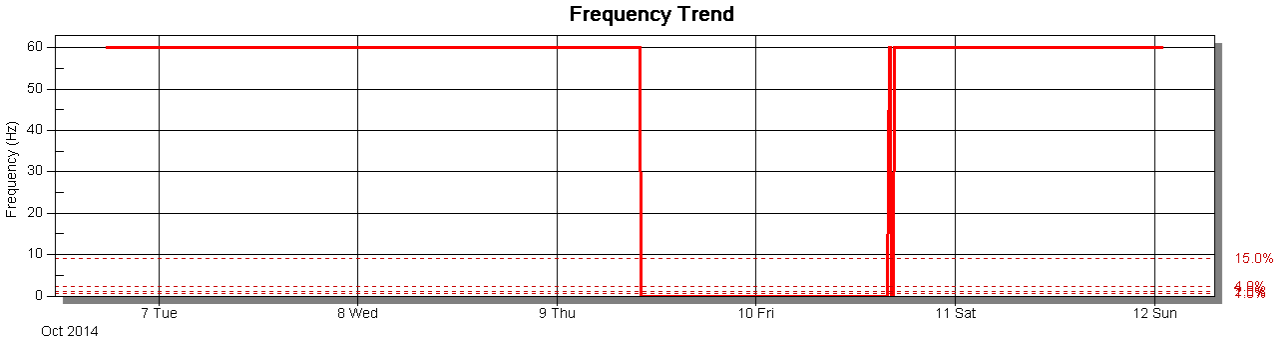
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

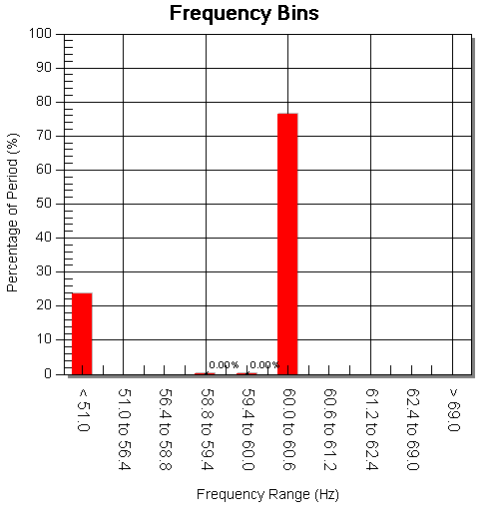
FREQ

Section x.1 Power Frequency (Not Synchronized)

Fail

Under normal operating conditions for a non-synchronized system, the mean value of the fundamental frequency measured over 10 seconds shall be within ±1.0% of the nominal frequency (60Hz) for 99.0% of the year, and within +4.0%/-6.0% for 100.0% of the year. This report gives the results over the course of the specified period.





Results Summary

Zone	Required	Actual	Result
±1.0%	99.0%	76.35%	Failed
+4.0%/-6.0%	100.0%	76.35%	Failed

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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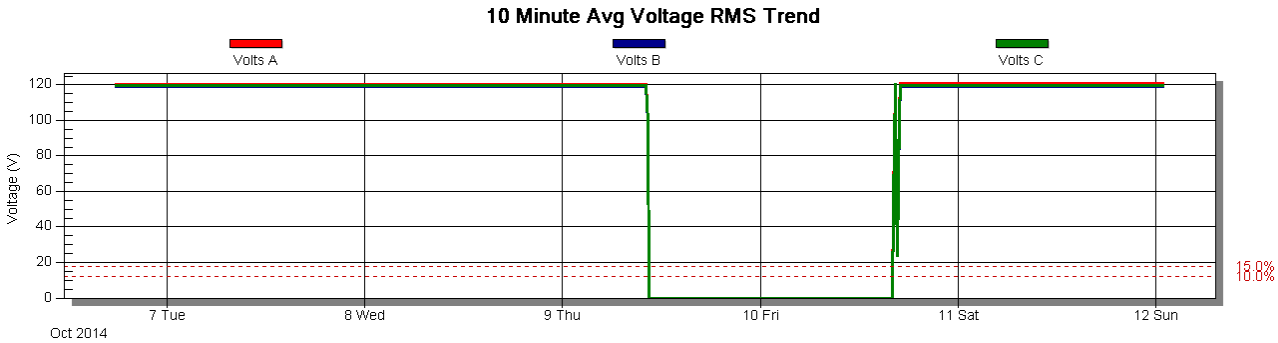
Weekly report for

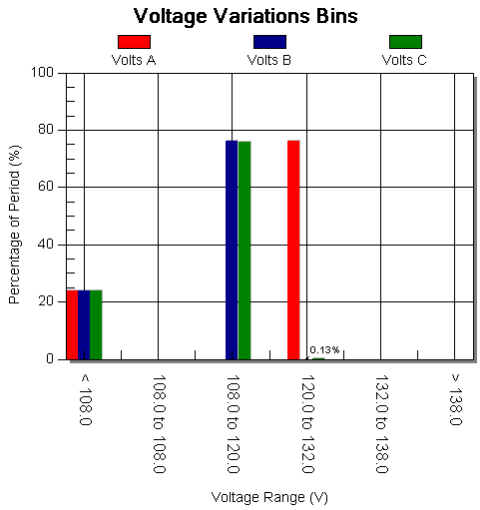
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

Section x.3.x Supply Voltage Variations

Fail

Supply voltage shall vary no more than ±10.0% of Un for 99.0% of the week. The voltage must be within +15.0%/-10.0% of Un for 100.0% of the time. Situations like those arising from faults or voltage interruptions, the circumstances of which are beyond the reasonable control of the parties, are excluded.





Results Summary

Zone	Required	Volts A	Volts B	Volts C
±10.0%	99.0%	76.04%	76.04%	76.04%
+15.0%/-10.0%	100.0%	76.04%	76.04%	76.04%

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for

Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

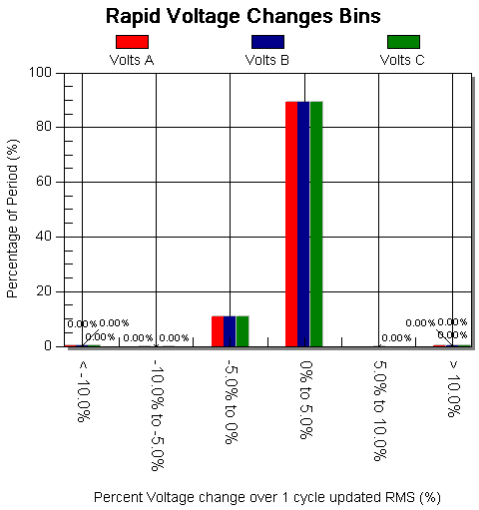
RVC

Section x.4.1 Rapid Voltage Changes

Fail

A rapid voltage change of the supply voltage is mainly caused either by load changes in network users' installations, or by switching in the system. Under normal operating conditions, a rapid voltage change generally does not exceed ±5.0% Un, but a change of up to ±10.0% Un with a short duration might occur some times per day in some circumstances. Note: A negative voltage change resulting in a voltage less than 85.0% Un is considered a supply voltage dip.

Note: The results displayed for ±10.0% Un are over the course of the week, and do not represent a single day. 14 ±10.0% changes are allowed in one week.



Results Summary

Zone	Required	Volts A	Volts B	Volts C
±5.0%		100.00%	100.00%	100.00%
±10.0%	14	2	2	2
> ±10.0%	0	79	36	44

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for

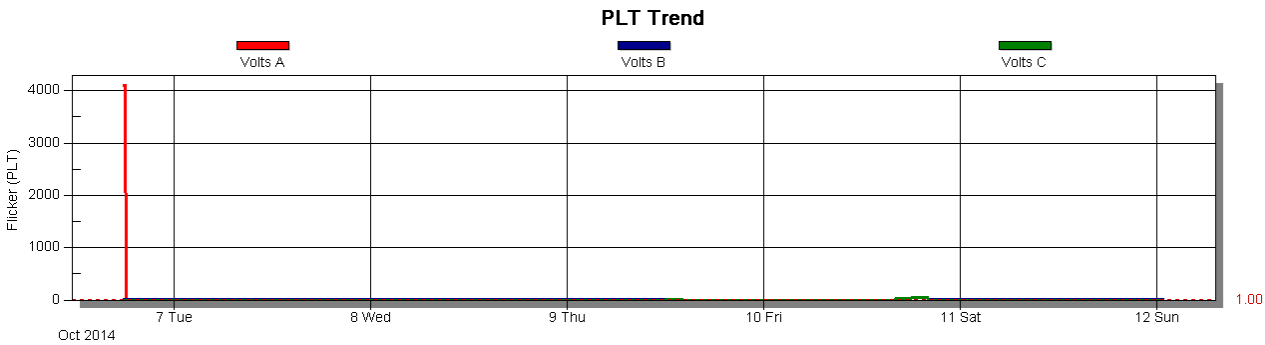
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

Flicker

Section x.4.2 Flicker

Fail

Flicker is the impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time. Under normal operating conditions, during a period of one week, the long term flicker (PLT) severity caused by voltage fluctuations should be <= 1.00 for 100.0% of the time.



Results Summary

Zone	Required	Volts A	Volts B	Volts C
<= 1.00	100.0%	95.31%	95.31%	95.31%
> 1.00		4.69%	4.69%	4.69%

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for

Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

Flicker

Flicker PST

Fail

Flicker is the impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time. Under normal operating conditions, during a period of one week, the short term flicker (PST) severity caused by voltage fluctuations should be <= 1.00 for 100.0% of the time.

Results Summary

Zone	Required	Volts A	Volts B	Volts C
<= 1.00	100.0%	99.35%	99.35%	99.35%
> 1.00		0.65%	0.65%	0.65%

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for

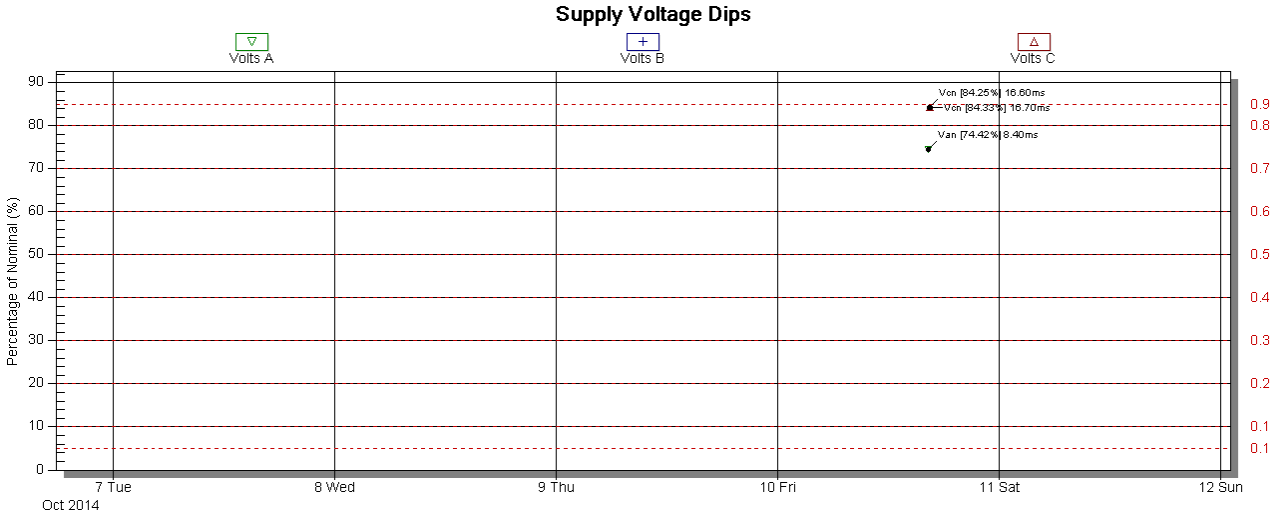
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

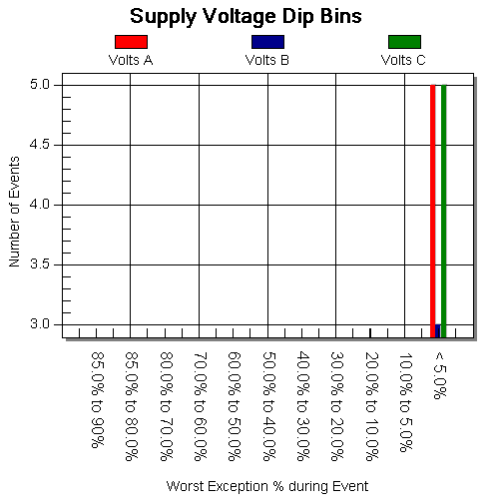
Section x.5 Supply Voltage Dips

Pass

A Supply Voltage Dip is a sudden reduction of the supply voltage to a value between 90% and 1% of the declared voltage Uc, followed by a recovery after a short period of time.

Under normal operating conditions, the expected number of voltage dips in a year may be from a few tens up to one thousand. The majority of voltage dips have a duration less then 1s and a retained voltage greater then 70%. However, voltage dips with greater depth and duration can occur infrequently.





Results Summary

Zone	Required	Volts A	Volts B	Volts C
85.0% to 90%		0	0	0
85.0% to 80.0%		0	0	0
80.0% to 70.0%		0	0	0
70.0% to 60.0%		0	0	0
60.0% to 50.0%		0	0	0
50.0% to 40.0%		0	0	0
40.0% to 30.0%		0	0	0
30.0% to 20.0%		0	0	0
20.0% to 10.0%		0	0	0
10.0% to 5.0%		0	0	0
< 5.0%		5	3	5

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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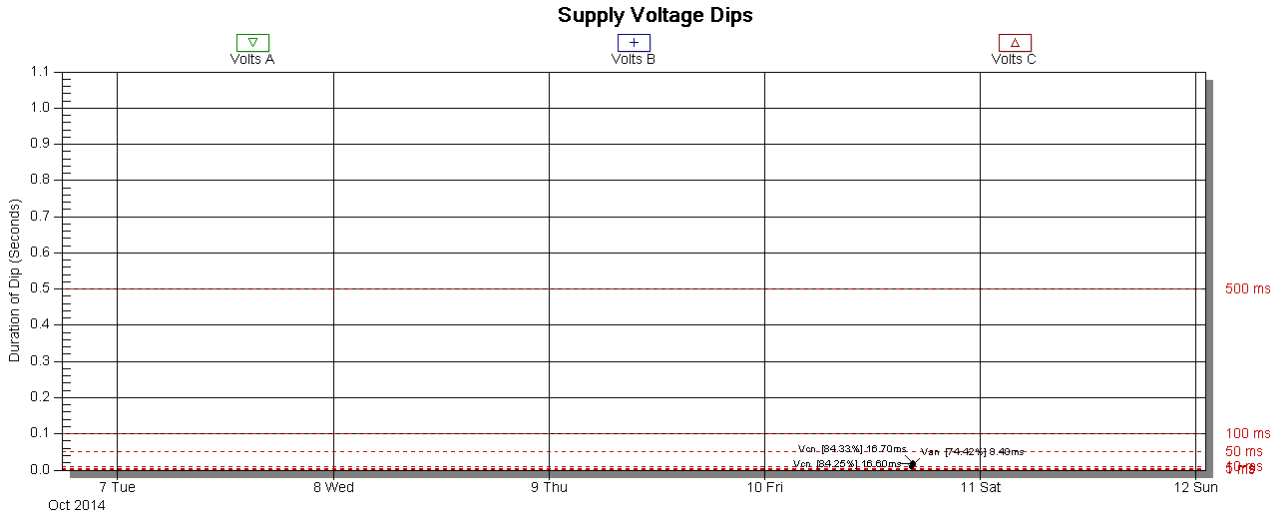
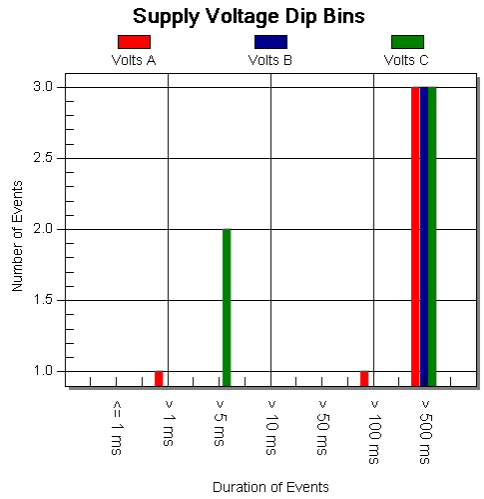
Weekly report for

Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500





Results Summary

Zone	Required	Volts A	Volts B	Volts C
<= 1 ms		0	0	0
> 1 ms		1	0	0
> 5 ms		0	0	2
> 10 ms		0	0	0
> 50 ms		0	0	0
> 100 ms		1	0	0
> 500 ms		3	3	3

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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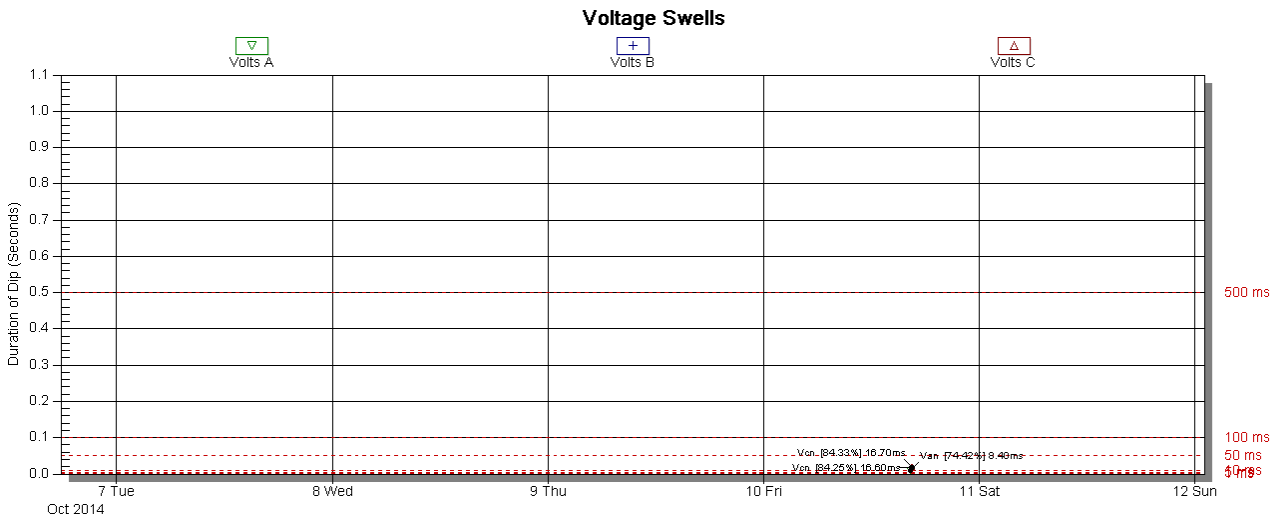
Weekly report for

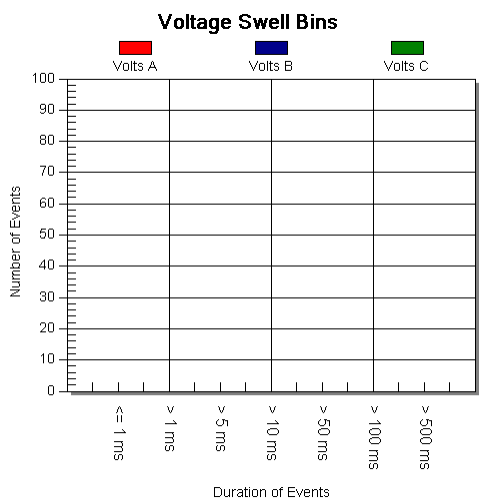
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

Voltage Swells

Pass

A Voltage Swell is a increase of the supply voltage to a value above 115.0% of the declared voltage Uc, followed by a recovery after a period of time.





Results Summary

Zone	Required	Volts A	Volts B	Volts C
<= 1 ms		0	0	0
> 1 ms		0	0	0
> 5 ms		0	0	0
> 10 ms		0	0	0
> 50 ms		0	0	0
> 100 ms		0	0	0
> 500 ms		0	0	0

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for

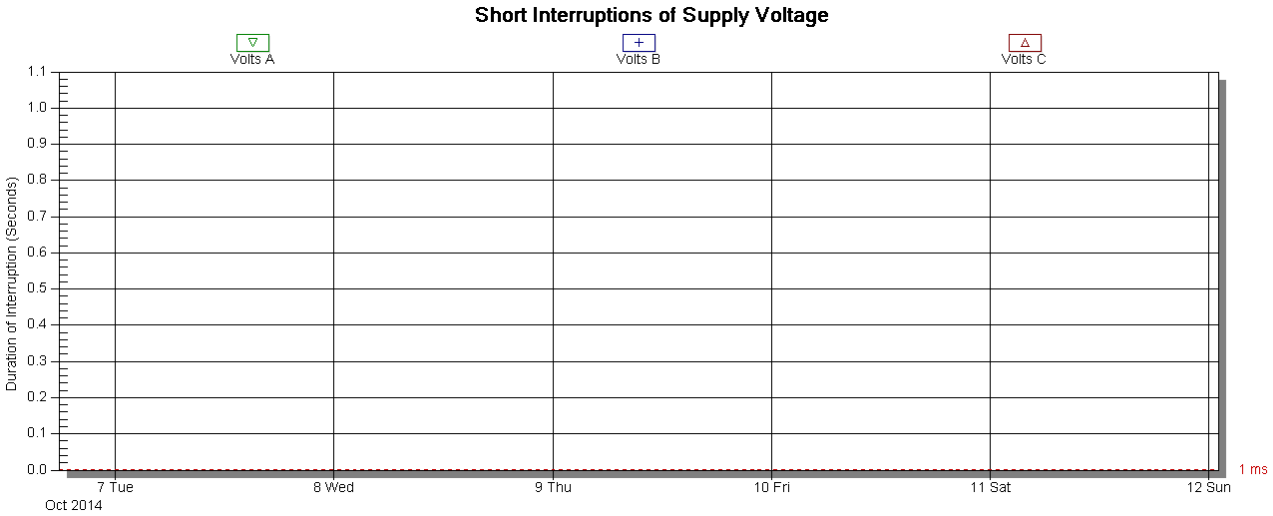
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

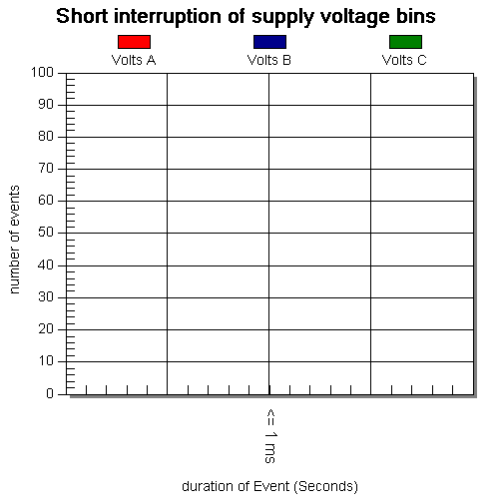
Section x.6 Short Interruption of Supply Voltage

Fail

An Interruption of Supply Voltage is a condition in which the voltage at the the supply terminals is lower than 5.0% on Phase A, 5.0% on Phase B, and 5.0% on Phase C, of the declared voltage Uc. A Short Interruption is defined as an event which lasts for less than 1 milliseconds.

Under normal operating conditions, the annual occurence of short interruptions ranges from a few tens to several hundreds. The duration of approximately 70% of the Short Interruptions may be less than one second.





Results Summary

Zone	Allowed	Volts A	Volts B	Volts C
<= 1 ms		0	0	0

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Weekly report for

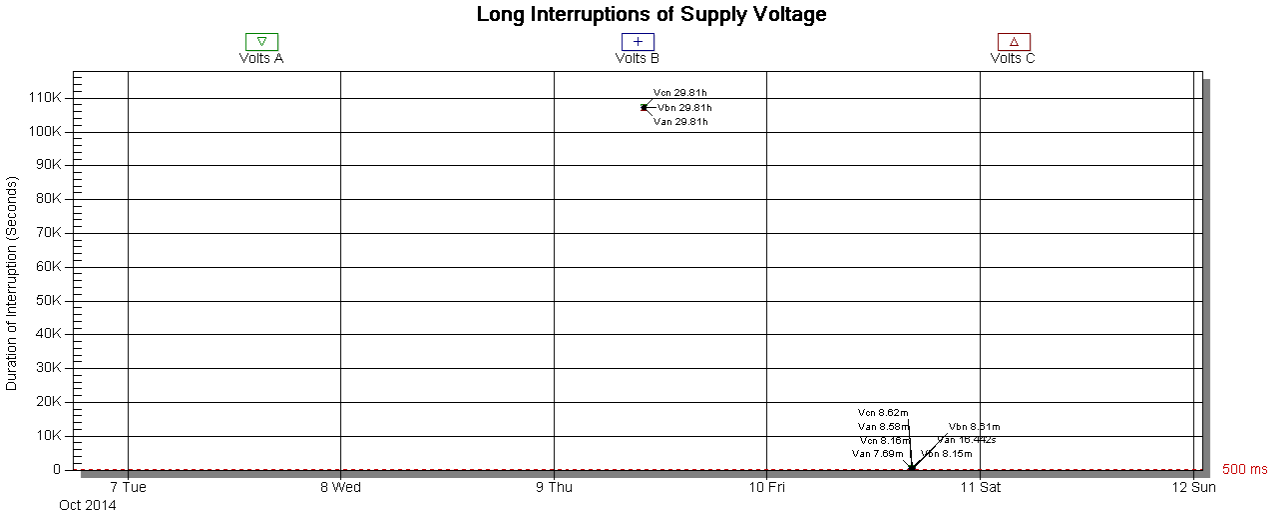
Mon, 06 Oct 2014 16:47:46 -0500 to Sat, 11 Oct 2014 23:59:59 -0500

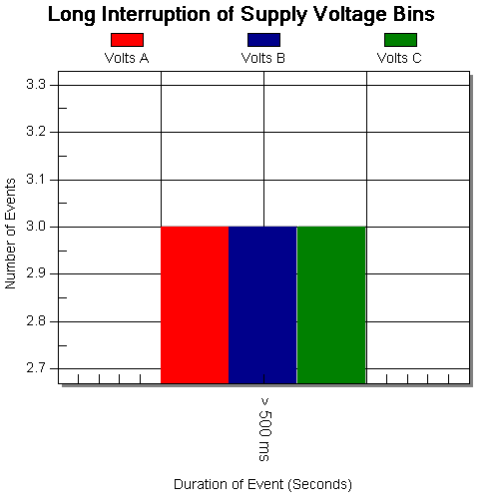
Section x.7 Long Interruption of Supply Voltage

Fail

An Interruption of Supply Voltage is a condition in which the voltage at the supply terminals is lower than 5.0% on Phase A, 5.0% on Phase B, and 5.0% on Phase C, of the declared voltage Uc. A Long Interruption is defined as an event which lasts for more than 500 milliseconds.

Under normal operating conditions, the annual occurence of long interruptions ranges from 10 to 50, depending on the area. This location is allowed up to 1 long interruptions per year.





Results Summary

Zone	Allowed	Volts A	Volts B	Volts C
<= 1 ms	1	3	3	3
> 500 ms				

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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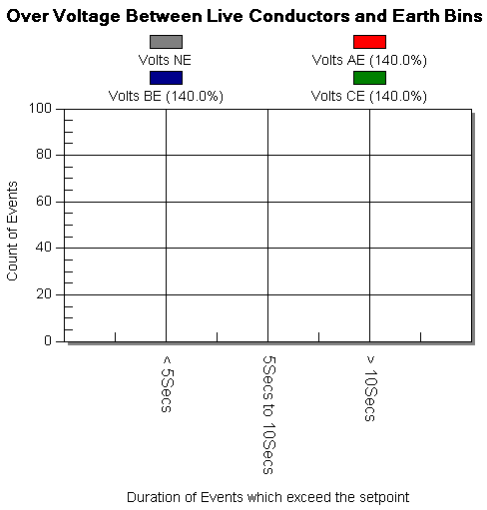
Section x.8 Temporary Power Frequency Overvoltage

Pass

A temporary power frequency overvoltage generally appears during a fault in the public distribution network, or in a network user's installation, and disappears when the fault is cleared. Under these conditions, the overvoltage may reach the value of the phase-to-phase voltage, due to a shift of the neutral point of the three-phase voltage system, the actual value depending upon the degree of load unbalance, and the remaining impedance between the faulty conductor and earth.

The duration of the event is limited by the time taken for protection to clear the fault, typically no more than 10Secs.

The magnitude of the event may not exceed 140.0% Uc for Vae, 140.0% Uc for Vbe, or 140.0% Uc for Vce.



Results Summary

Zone	Required	Vne	Vae (140.0%)	Vbe (140.0%)	Vce (140.0%)
< 5Secs		0	0	0	0
5Secs to 10Secs		0	0	0	0
> 10Secs	0%	0	0	0	0

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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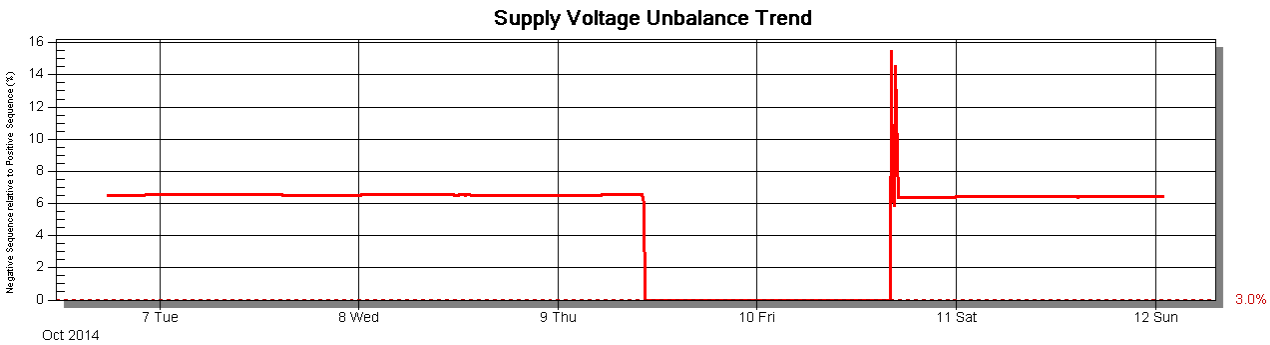
Section x.10 Supply Voltage Unbalance

Fail

Under normal operating conditions, during each period of one week, 100.0% of the 10 Minutes mean RMS values of the negative phase sequence component (fundamental) of the supply voltage shall be within the range of 0% to 3.0% of the positive phase sequence component (fundamental).



Results Summary

Zone	Required	Actual	Result
0% to 3.0%	100.0%	23.30%	Failed
> 3.0%		76.70%	Failed

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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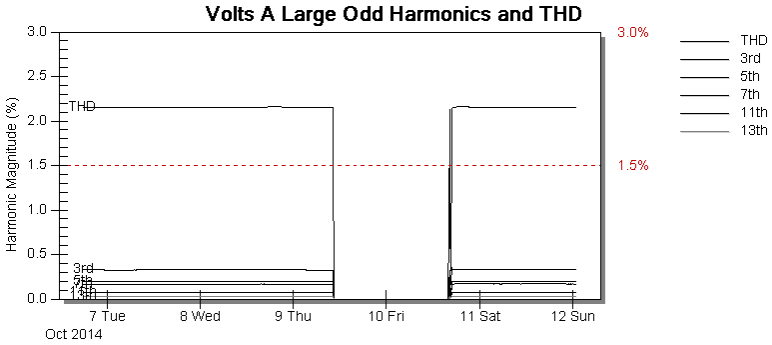
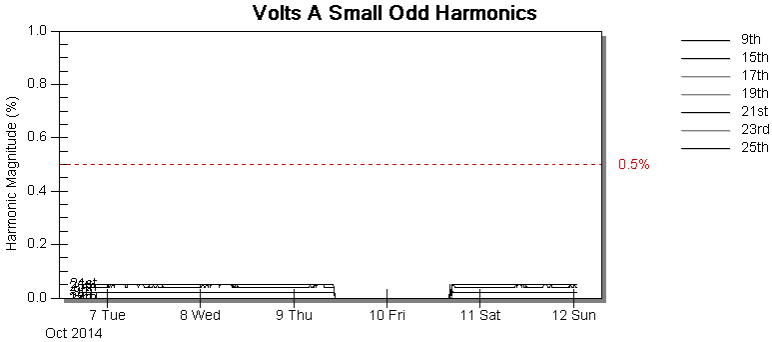
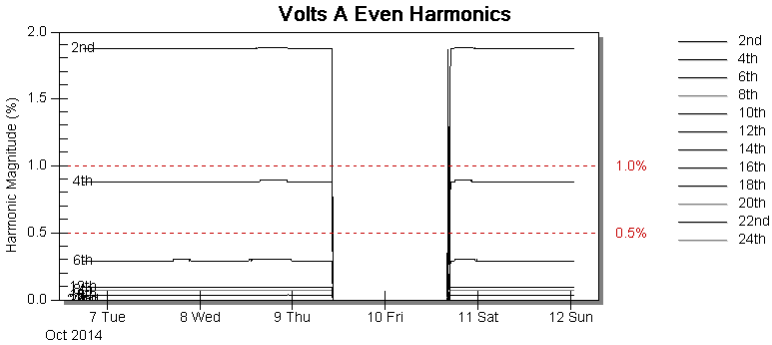
Section x.11 Harmonic Voltage

Pass

Under normal operating conditions, during each period of one week, a percentage of the 10 min mean RMS values of each individual harmonic voltage shall be less than or equal to the limit value given in the results table. Additionally, 5.0% the THD of the supply voltage (including all harmonics up to the 40th order) shall be less than or equal to 8.0%.







Volts A Harmonic Summary

Zone	Allowed	Limit	% Out
THD	95.0%	8.0%	0.00%
2nd	5.0%	2.0%	0.00%
3rd	5.0%	5.0%	0.00%
4th	5.0%	1.0%	0.00%
5th	5.0%	6.0%	0.00%
6th	5.0%	0.5%	0.00%
7th	5.0%	1.5%	0.00%
8th	5.0%	50.0%	0.00%
9th	5.0%	1.5%	0.00%
10th	5.0%	0.5%	0.00%
11th	5.0%	3.5%	0.00%
12th	5.0%	0.5%	0.00%
13th	5.0%	3.0%	0.00%
14th	5.0%	0.5%	0.00%
15th	5.0%	0.5%	0.00%
16th	5.0%	0.5%	0.00%
17th	5.0%	2.0%	0.00%
18th	5.0%	0.5%	0.00%
19th	5.0%	1.5%	0.00%
20th	5.0%	0.5%	0.00%
21st	5.0%	0.5%	0.00%
22nd	5.0%	0.5%	0.00%
23rd	5.0%	1.5%	0.00%
24th	5.0%	0.5%	0.00%
25th	5.0%	1.5%	0.00%

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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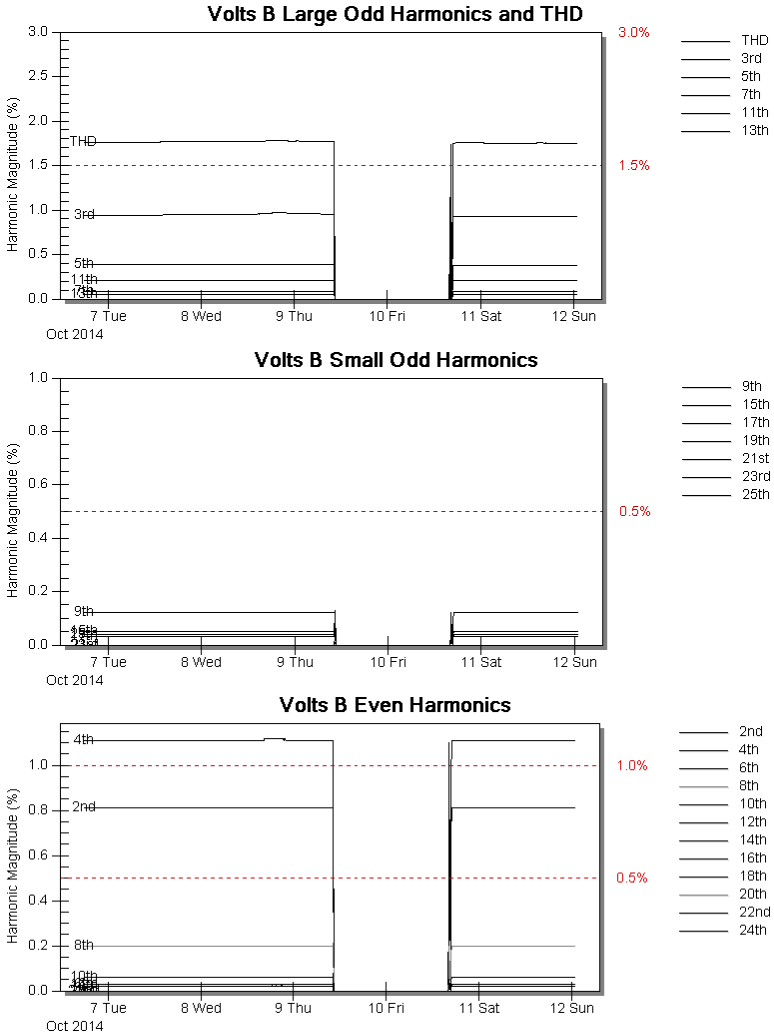

Volts B Harmonic Summary

Zone	Allowed	Limit	% Out
THD	95.0%	8.0%	0.00%
2nd	5.0%	2.0%	0.00%
3rd	5.0%	5.0%	0.00%
4th	5.0%	1.0%	76.05%
5th	5.0%	6.0%	0.00%
6th	5.0%	0.5%	0.00%
7th	5.0%	1.5%	0.00%
8th	5.0%	50.0%	0.00%
9th	5.0%	1.5%	0.00%
10th	5.0%	0.5%	0.00%
11th	5.0%	3.5%	0.00%
12th	5.0%	0.5%	0.00%
13th	5.0%	3.0%	0.00%
14th	5.0%	0.5%	0.00%
15th	5.0%	0.5%	0.00%
16th	5.0%	0.5%	0.00%
17th	5.0%	2.0%	0.00%
18th	5.0%	0.5%	0.00%
19th	5.0%	1.5%	0.00%
20th	5.0%	0.5%	0.00%
21st	5.0%	0.5%	0.00%
22nd	5.0%	0.5%	0.00%
23rd	5.0%	1.5%	0.00%
24th	5.0%	0.5%	0.00%
25th	5.0%	1.5%	0.00%

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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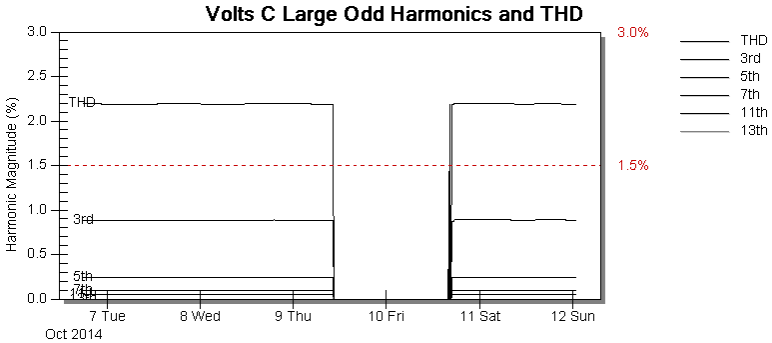

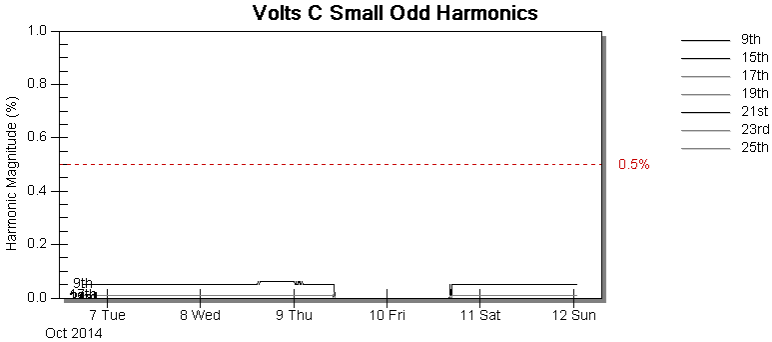

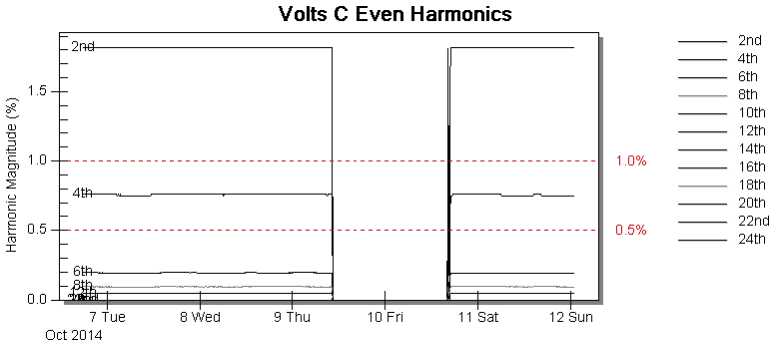

Volts C Harmonic Summary

Zone	Allowed	Limit	% Out
THD	95.0%	8.0%	0.00%
2nd	5.0%	2.0%	0.00%
3rd	5.0%	5.0%	0.00%
4th	5.0%	1.0%	0.00%
5th	5.0%	6.0%	0.00%
6th	5.0%	0.5%	0.00%
7th	5.0%	1.5%	0.00%
8th	5.0%	50.0%	0.00%
9th	5.0%	1.5%	0.00%
10th	5.0%	0.5%	0.00%
11th	5.0%	3.5%	0.00%
12th	5.0%	0.5%	0.00%
13th	5.0%	3.0%	0.00%
14th	5.0%	0.5%	0.00%
15th	5.0%	0.5%	0.00%
16th	5.0%	0.5%	0.00%
17th	5.0%	2.0%	0.00%
18th	5.0%	0.5%	0.00%
19th	5.0%	1.5%	0.00%
20th	5.0%	0.5%	0.00%
21st	5.0%	0.5%	0.00%
22nd	5.0%	0.5%	0.00%
23rd	5.0%	1.5%	0.00%
24th	5.0%	0.5%	0.00%
25th	5.0%	1.5%	0.00%

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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Section x.13 Mains Signaling Voltage

Pass

In some countries the public distribution networks may be used by the public supplier for the transmission of signals. Over 100.0% of a day, the 3 second mean of the signal voltage shall be less than or equal to the mains signaling threshold.

The Mains Signaling Threshold is 120.0% of Un, or 144V.

Results Summary

Zone	Required	Vae	Vbe	Vce
<= 120.0% Un	100.0%	100.00%	100.00%	100.00%
> 120.0% Un	<= 0.0%	0.00%	0.00%	0.00%

Meter Name	128Mb_IP194
Serial	113599432
Nominal Frequency	60Hz
Nominal Voltage (Un)	120V

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GE Communicator

Chapter 24: Configuring Dial-In/ Dial-Out

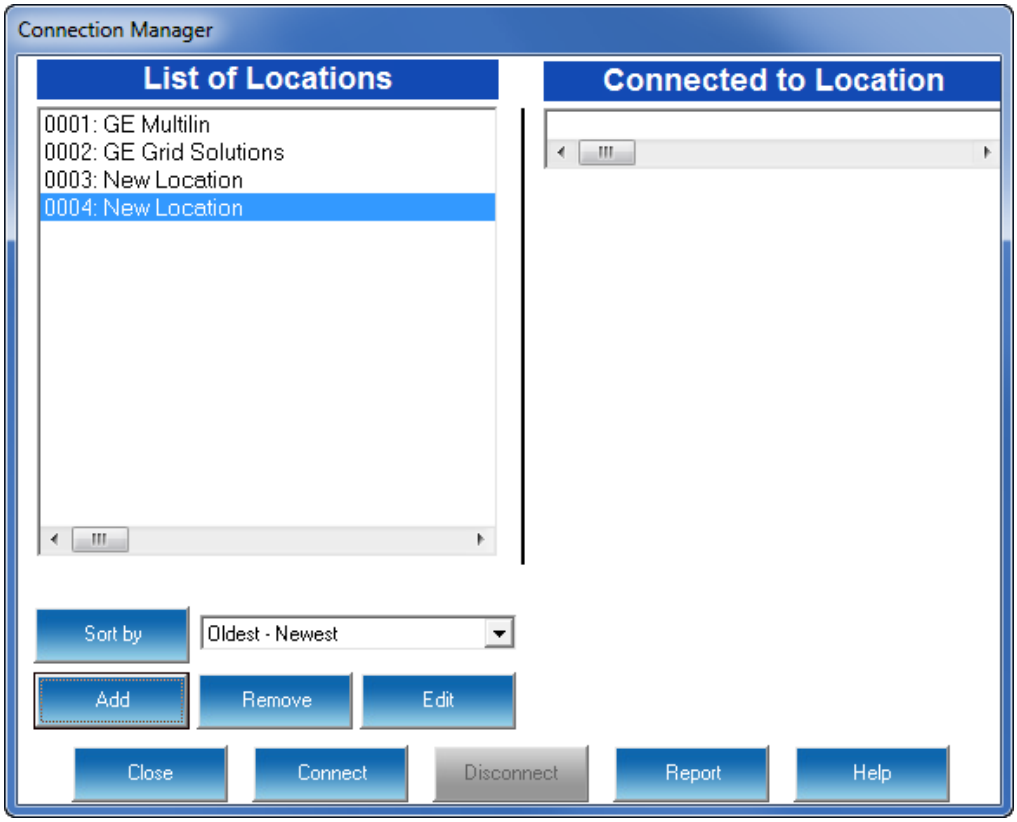
24.1 Overview

The EPM 9450/9650 and EPM 9800 meters have an optional Internal Modem that has a Dial-In/Dial-Out feature (Internal Modem discontinued on February 2020). This chapter explains how to use GE Communicator software to configure the following settings for the Modem Dial-In/Dial-Out function:

- Modem Dial-Out Programming ("Modem Dial-Out Programming" on page 24-7)
- Dial-In Programming ("Dial-In Settings" on page 24-11)
- Disable Email / Page Generation ("Dial-In Settings" on page 24-11)
- Modem Monitor ("Modem Monitor" on page 24-14)
- Alarm Server ("EPM Alarm Server" on page 24-15)

24.2 Setting the Dial-In Connection

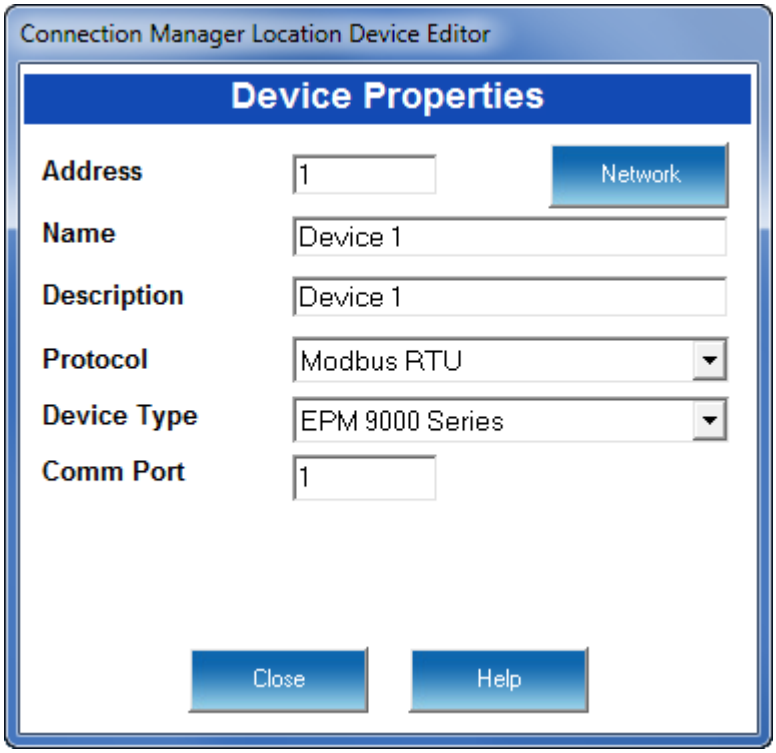
1. Install the modem connected to the computer (the "originate modem"). See your meter's Installation and Operation Manual for details on hardware requirements.
2. From the GE Communicator application's Main screen, click the Connect Mgr icon or select **Connection > Connection Manager**. You will see the screen shown below.



3. Click the Add button to add a "New Location"; then click the Edit button. You will see the screen shown on the next page.

4. Configure the Location Editor screen as follows:
   - Type in a Location Name.
   - Select a Com Port Number.
   - Set the Baud Rate to 38400.
   - Enable Hardware Flow Control.
   - Set Data Bits to 8.
   - Set Parity to None.
   - Click the Use Modem checkbox.
   - Enter Phone Number or Setup String - whichever is applicable for your modem.
   - If you want to control access, click Use Password and then enter a Password.

- In the Devices at Location section, click Add Serial, then select the new Device and click **Edit**. You will see the screen shown below.



5. Configure the Location Device Editor screen as follows:
   - Address will be 1 for the Primary Device; something other than 1 if it is not the Primary Device.
   - Type in Name.
   - Type in Description.
   - Select Modbus ASCII from the Protocol pull-down menu.
   - Device Type is EPM 9000 Series Series.
   - Enter the Com port you are using.
   - Click Close. You will return to the Location Editor screen.
6. Click once on the device you want to connect to your computer and then click Connect. The computer begins dialing. When the GE Communicator application locates the EPM meter at that location, the Device Status screen appears to confirm the connection.
7. The GE Communicator software will search for a Modem. If you do not get a "Modem Found" message, check your computer configuration and External Modem setup.

24.2.1 Troubleshooting the Connection

If you have communication problems, check the following:

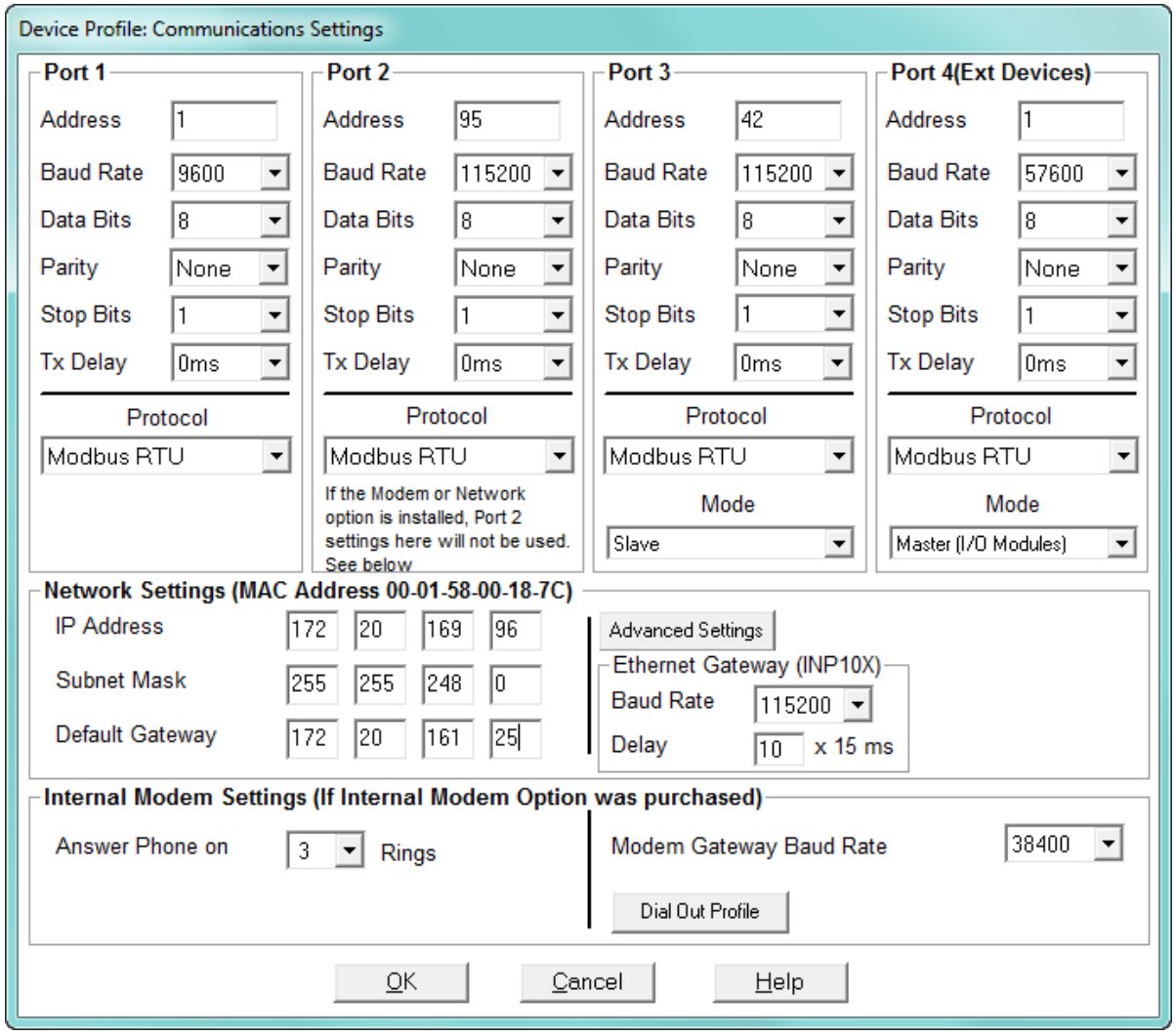
- Confirm that all cables are secure.
- Confirm that the RS232 cable is connected to the correct Com Port on the PC.
- Confirm that the PC and the meter's ports have the same Baud Rate and are both set to Modbus ASCII.

24.3 Setting the Dial-Out Connection

1. From the GE Communicator application's Main screen, click the Profile icon. GE Communicator retrieves the programmable settings for the currently selected, connected EPM meter. You will see a screen showing the retrieval progress.
2. Once the settings are retrieved, the Device Profile menu is displayed. Click on the (+/-) icon next to Communications, and then double-click on one of the displayed ports. You will see the screen shown below if you are connected to an EPM 9450/9650 meter:

NOTE

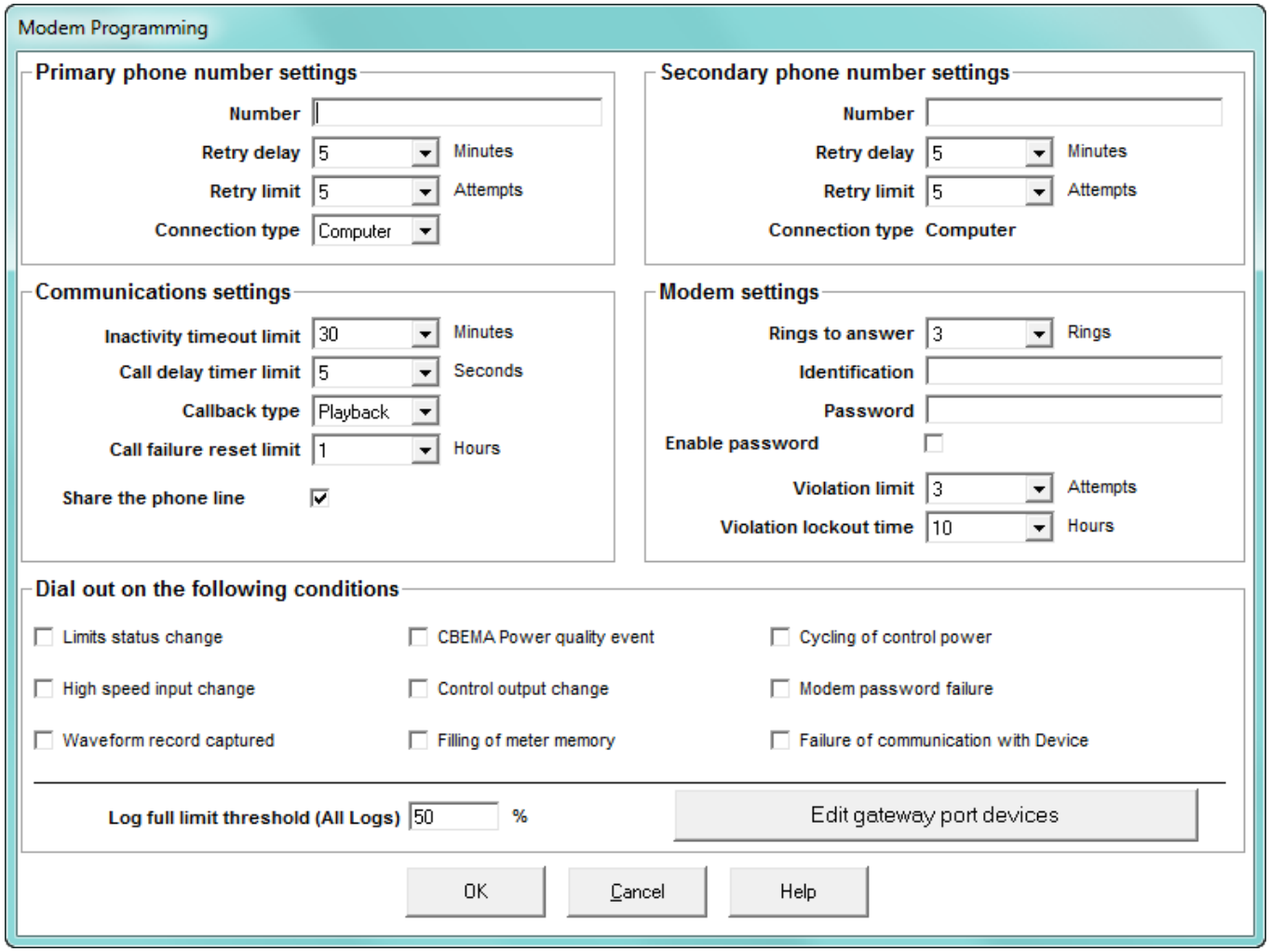
The screen for the EPM 9800 meter shows only Ports 1 and 4.



3. Configure the Internal Modem Settings as follows:
   - Answer the Phone on 2 Rings.
   - Modem Gateway Baud Rate set to 38400.
4. Click the Dial-Out Profile button to configure the Dial-Out feature of the Internal Modem - see 24.4 *Modem Dial-Out Programming* for instructions for configuring the Dial-Out settings.
5. When you have completed your modem settings, click OK to save your settings and return to the Device Profile menu.
6. Click **Update Device** to send your settings to the meter.

24.4 Modem Dial-Out Programming

When you click the **Dial-Out Profile** button from the Communications screen, you see the Modem Programming screen, shown below.



This screen helps you configure the Dial-Out Profile. It has five sections - each is detailed below:

- Primary Phone Number Settings
    - Number: The first phone number (up to 50 characters) called for automated callout.
    - Retry Delay: The number of minutes (1-1000) between retries.
    - Retry Limit: The user-set limit for retry attempts (0-1000).
    - Connection Type: Computer.
- Secondary Phone Number Settings
    - Number: The second phone number (up to 50 characters) for automated callout.
    - Retry Delay: The number of minutes (1-1000) between retries.

- Retry Limit: The user-set limit for retry attempts (0-1000).
- Connection Type: Computer.

The modem will retry the Primary Number according to the Retry Limit set. The modem will then dial the Secondary Number for the programmed number of retries set in the Retry Limit.

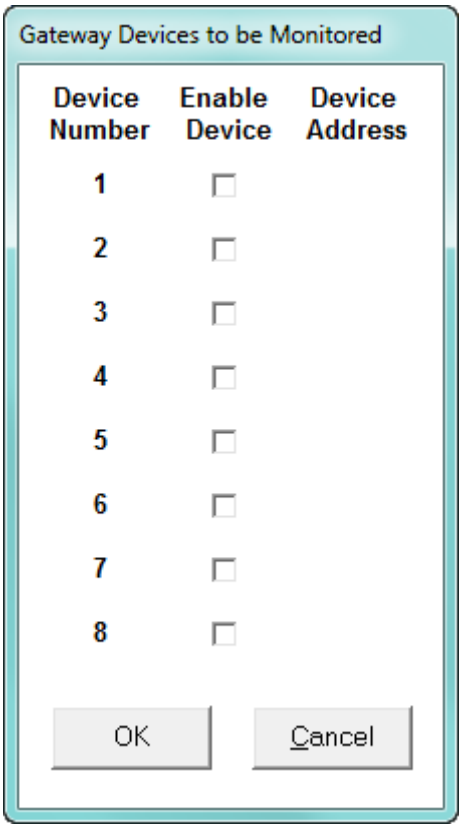
- Communication Settings
  - Activity Timeout Limit: User-set value that is the number of minutes of inactivity (no communication activity) that is allowed on an open modem connection before the modem terminates the connection (1-30 minutes).
  - Call Delay Timer Limit: User-set variable that defines the number of seconds the modem waits before processing a callback event (0-240 seconds). This setting applies to calls caused by Limit or Input Status conditions.
  - Callback Type: There are two types of callback:
    - **Playback**: The Modem waits 500ms after connection and plays back the Modem ID string displayed (if programmed) and the reason for the call.
    - **Standard**: When performing a callback, once connection is established the modem waits to be queried by the PC it has called.

NOTE

You can override Playback mode by turning Playback off. You will not be able to override the setting to Playback mode if the Modem ID string is blank ("-----").

  - Call Failure Reset Limit: User-set value for the number of hours the modem locks out incoming calls if the Incoming Connection Failure Limit is reached (1-50 hours).
  - Share the Phone Line: If checked, the modem monitors phone line voltage during all calls. If the phone line voltage drops by more than 30 during a call (indicating that someone else has taken another phone off the hook) the modem disconnects and returns to normal polling operation. If not checked, the modem does not watch for line voltage deviations.
- Modem Settings
  - Rings to Answer: User-set value for the number of Rings (0-9) before the modem goes off the hook and attempts to answer an incoming call. Zero = Never Answers. Ring is a Voltage Change.
  - Identification: Up to 32 Western Alphabet Characters (16 Asian Characters).
  - Password: Up to 10 alphanumeric characters (user-set) in addition to passwords that restrict access to certain levels of the EPM meter. If the password is not entered correctly, the modem asks the user to enter the password again (up to three times) and disconnects after the third incorrect attempt.
  - Enable Password: If checked, a Password must be entered.

    - Violation Limit: User-set value for number of times the modem allows unsuccessful connection attempts (unable to supply correct password in three attempts) before locking-up to incoming calls (1-10). The Modem disconnects from the incoming call and does not accept incoming calls for a period of time equal to the Violation Lockout Time.
    - Violation Lockout Time: User-set time limit for the number of hours (1-32) the Modem will be inaccessible. The Violation Lockout provides a level of security against bad passwords.
- Dial-Out on the Following Conditions:
    - Limits Status Change
    - High Speed Input Change
    - Waveform Record Captured
    - CBEMA Power Quality Event
    - Control Output Change
    - Filling of Meter Memory
    - Cycling of Control Power
    - Modem Password Failure
    - Failure of Communication with the EPM meter
    - Log Full Limit Threshold (Covers All Logs): Percent that a log is full before a call is triggered.
- Edit Gateway Port Devices: the Edit Gateway Port Devices button at the bottom of the screen is used to enable up to 8 devices that are connected via the gateway and are to be monitored. When you click the Edit Gateway Port Devices button, you will see the screen shown.



1. Click the E**nable Device** box next to the Device to be monitored. A Device address will be displayed next to the Enabled Device.
2. Change the Device Address, if needed, to any address except 1. Address number 1 is always reserved for the Primary Device.
3. Click either:
   - **OK** to save changes and return to the Modem Programming screen
   - **Cancel** on either screen to cancel changes and return to the previous screen.

When your Dial-Out settings are complete, click OK to return to the main Device Profile menu. For these changes to take effect, you must click the Update Device button to send the new settings to the meter.

24.5 Dial-In Settings

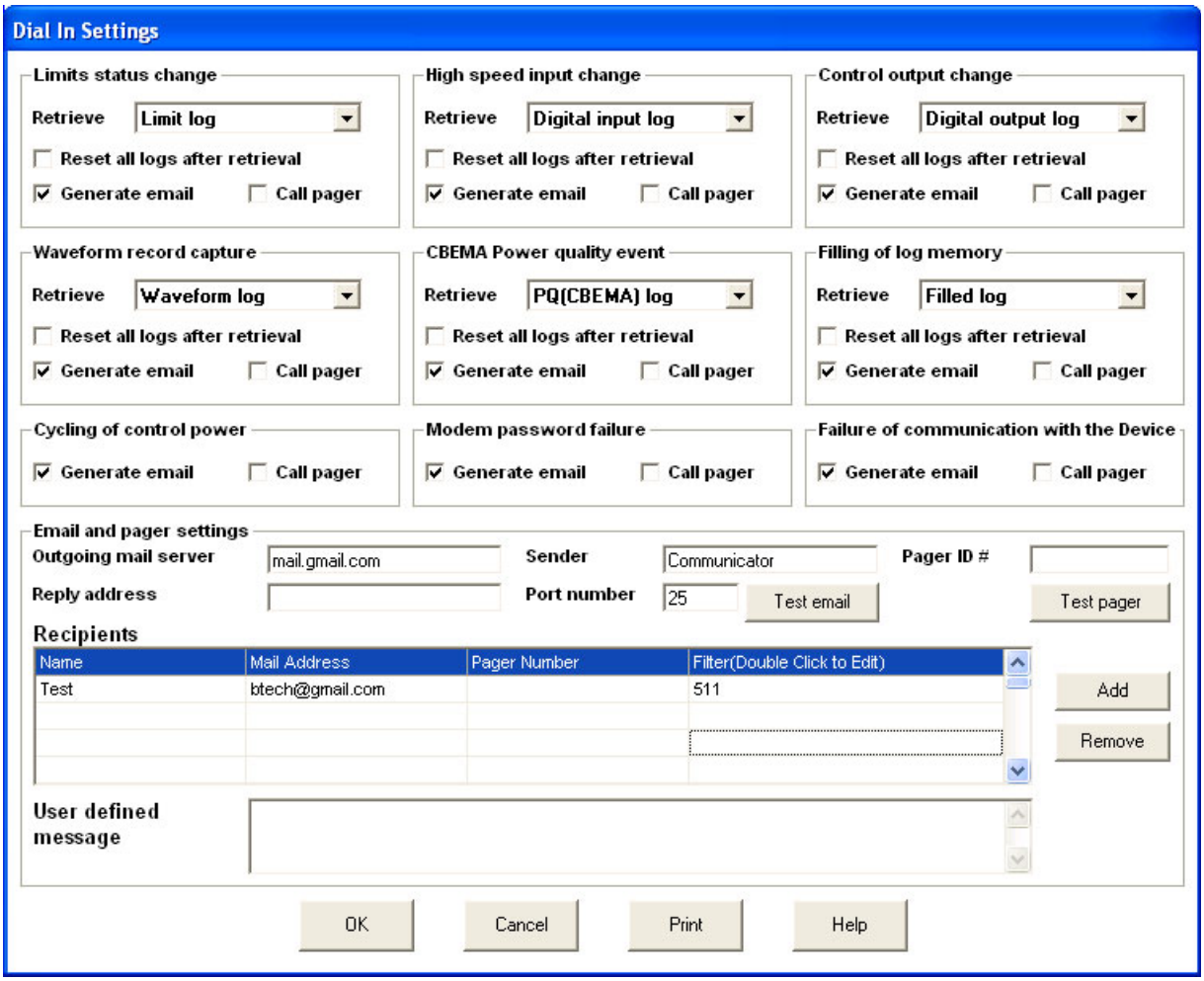
The EPM meter's Dial-In Settings screen is divided into 9 possible event or problem sections. Any one event/problem or a combination of event/problems can trigger a call. The settings on this screen tell the PC what to do when the Modem calls with one or more problems:

- Who to call
- Where to call
- What message to send.

NOTE

You must have installed Dial-In Server software for the Dial-In screens to work.

1. From the GE Communicator application's Main screen, click Dial-In Settings. You will see the screen shown below.



2. These are the settings in the screen:

Events/Problems

- Limits Status Change: The EPM meter contains up to 64 monitored limit conditions. One or more limit states had a change.
- High Speed Input Change: One or more of the 8 High Speed Inputs had a change.
- Control Output Change: When a control event occurs, an integer counter increments (range of 0-65,536).
- Waveform Record Capture: A Waveform Record Capture was triggered in response to observed transient conditions. An integer counter increments each time a waveform record is captured (range of 0-65,536).
- CBEMA Power Quality Event: The meter captures CBEMA event records in response to observed transient conditions. The counter has a range of 0-65,536.
- Filling of Log Memory: When any one log reaches or exceeds the user-set download level, the modem calls to report a log fill condition and perform an automated download of all stored data.
- Modem Password Failure: When the Password Limit is reached, the modem initiates a callback with no delay (because there is no opportunity for the condition to reset). If the phone line is available, the modem attempts a reporting call; if the phone line is unavailable, the modem continues polling.
- Failure of Communication with EPM meter: If the meter fails to the modem within the allotted time, the modem initiates a callback with no delay (because there is no opportunity for the condition to reset). If the phone line is available, the modem attempts a reporting call; if the phone line is unavailable, the modem continues polling.

Event/Problem Settings

- Retrieve: For those events that trigger log retrieval, six of the screens have pull-down menus for you to select the logs to be retrieved.
- Reset All Logs after Retrieval: Check those sections that apply.

NOTE

In order to use the Reset function, you must select “All Logs” from the pull-down menu next to the word “Retrieve.”

- Generate Email: Send an email message to the designated recipient.
- Call Pager: Call the designated recipient's pager number.

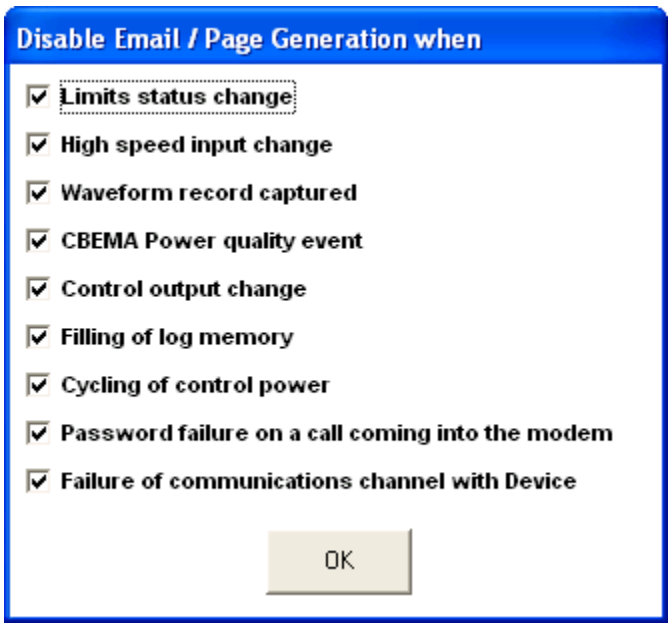
NOTE

Selecting “All Logs” from multiple events sections does not cause duplication in log retrieval.

Email and Pager Settings

- Outgoing Mail Server: Enter name of Valid Email Server that does not require password and user name to send mail (POP3 type).
- Sender: GE Communicator
- Pager ID#: User-set numeric value used to identify this meter when a numeric page is issued (up to 5 digits, 00000 to 99999).
- Reply Address: None or Email Address to let recipient know where to send replies.
- Port Number: 25 is normal for email servers.

- Test Email: Sends a Test Message to a recipient to test the email settings (uses email of the first recipient only).
- Test Pager: Sends a Test Message to a recipient to test the paging (uses the number for first recipient only).
- Recipients: List Name, Email Address and Pager Number.
- Filter: Double-click and the Edit screen will open.



Click in front of message(s) you want to exclude from the highlighted recipient.

- **Add**: Click to Add a Recipient.
- **Remove**: Click to Remove a Recipient.
- **User Defined Message**: Type in a message for the highlighted recipient.

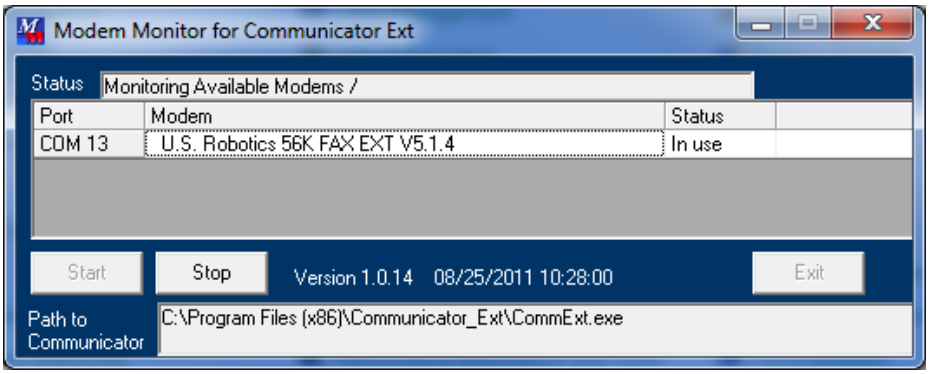
The screen buttons are used as follows:

- **OK**: click to Save Settings and return to the Main screen.
- **Cancel**: click to Exit the screen without saving the settings.
- **Print**: click to Print the screen.

24.6 Modem Monitor

The Modem Monitor, as the name implies, checks the PC for connected modems and monitors available modems for incoming calls. The Status line coaches you in setting up the modem and keeps you informed of the status of the available modems.

1. To start the Modem Monitor screen, click **Start > Programs > GE Applications > Modem Monitor** icon.



2. After the screen appears, press Start to allow the Modem Monitor to monitor available modems. After a search for modems, the software will continue to locate the modems that were found for a "Call Back."

3. The main screen lists the available modems with the Ports to which they are connected and their Status. When an incoming call is detected, the Modem Monitor starts the GE Communicator application, which answers the call and processes it.

   - Command Line Switches

     /S: Autostart Modem Monitoring when program is started.

     /M: Minimize program when started. Program will appear as icon in the system tray on your computer screen.

     When program is minimized, it appears as an icon in the system tray. Click on this icon to restore the program to a normal sized window.

   - Example Command Line Switches

     EPMmonitor.exe /S:

     EPMmonitor.exe /M:

     EPMmonitor.exe /S: /M:

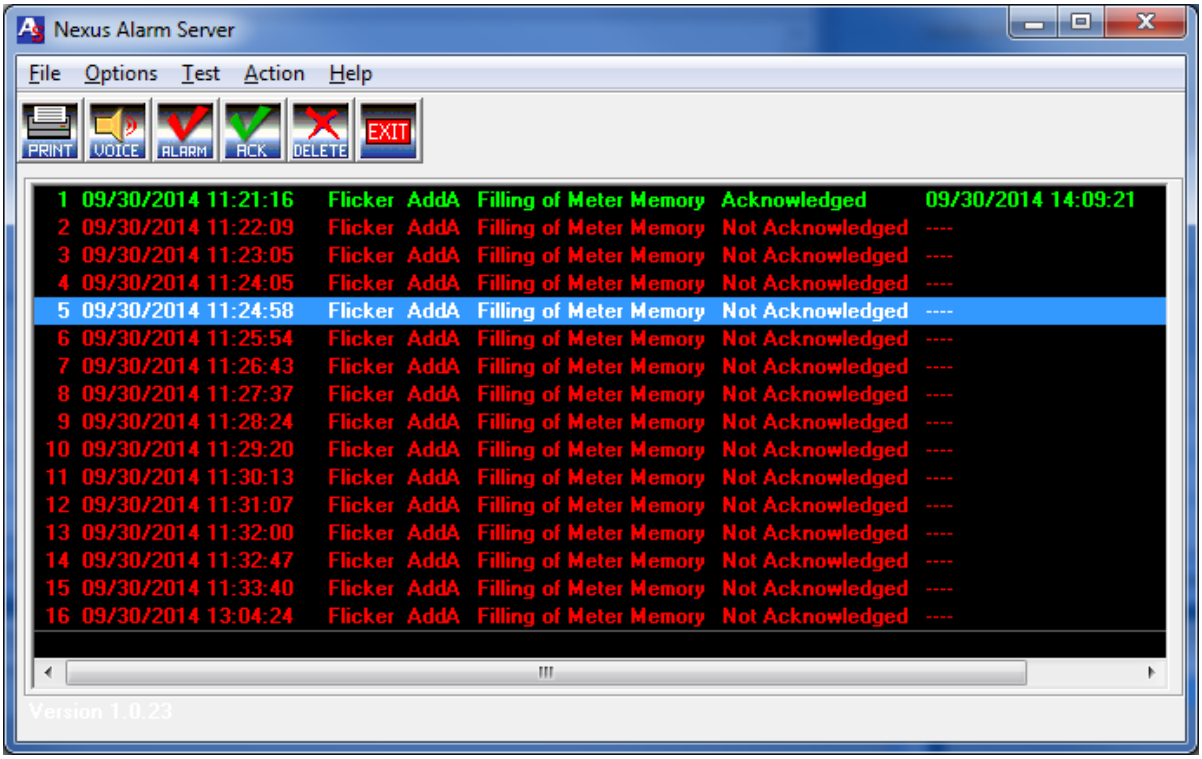
     Spaces are required between the components.

   - Screen Buttons
     - Click **Stop** to disconnect the Modem Monitor.
     - Click **Start** to connect the Modem Monitor.

24.7 EPM Alarm Server

The EPM Alarm Server screen lists all Call Back Events that have occurred. Data included with each event entry is as follows: Number of the Alarm on the list, Date, Time of the Call Back Event, Name of Modem, Type of Event/Problem, whether that Event has been acknowledged and the Time of the Acknowledgement. Settings for this screen are located on the Modem Programming screen/Dial Out Profile in the EPM meter's Device Profile.

To start the EPM Alarm Server screen, click **Start > Programs > GE Applications > EPM Alarm Server** icon.



The screen's Tool Bar has these options:

- File: Select one of the following
  - Export - Excel Compatible Values file
  - Print - Print the contents of the box of events
  - Exit - Exit the program
- Options:
  - Items
    Insert to Top of the list of events.
    Append to Bottom of the list of events.
  - Alarm - Enable or Disable Audio or Visual
    - Audio - Can replace with another 2 second sound file with the same name (alarm.wav in the directory where the GE Communicator software files are installed)
    - Visual - Text box display

- Test - Generate a Test Message
- Action
  - Silence Alarm - Turn Noisemaker and/or Alarm Message off (not mute)
  - Acknowledge Item - Red to Green color change
  - Acknowledge All - Red to Green color change
  - Remove All - Erase All Alarms

The screen Icons are:

- Print: lick to select Setup Options.
- Voice: Microsoft Speech Properties.
- Alarm Silencer: To stop audio and/or visual alarm until next entry arrives.
- Acknowledge Event
- Delete Entry in Server Box
- Exit

GE Communicator

Chapter 25: Flash Updating

25.1 Flash Overview

The **Flash** command allows you to upgrade the following firmware components:

- **GE Communication Processor ("GE Comm").**
  This processing chip performs all tasks related to communication and storing data.
- **GE Digital Signal Processor ("GE DSP").**
  This processing chip performs all tasks related to data calculation.
- **LED Display.**
  This processing chip is installed in the GE External LED Display.
- **Internal Modem Card.**
  This optional card is installed in the meter and enables the meter to act as meter and modem in one device. This card must be upgraded in addition to upgrading the GE Comm and DSP. (Refer to 25.2.2 *Flash Update the Internal Modem Card*.)
- **Internal Network Option.**
  This meter option allows a meter to communicate with multiple PC's concurrently. This card must be upgraded in addition to upgrading the GE Comm and DSP. (Refer to 25.2.1 *Flash Update the Internal Network Card*.)
- **GE Comm and DSP.**
  (Refer to 25.2.1 *Flash Update the Internal Network Card*.)
- **Network Option card:**
  This option gives an EPM 9000 series or EPM 7000 meter 100BaseT Ethernet capability.

There are 3 ways to learn what firmware versions are currently installed in your meter:

- Click the Device Status icon (or select **Tools > Retrieve Device Status**). The "Run-time" field shows the current Comm firmware version number; the "DSP Run-time" field shows the current DSP firmware version number.

- Click the **Profile** icon to retrieve the current Device Profile from the connected meter. Click Report. The Comm and DSP firmware are listed in the Runtime column.
- If you have an EPM External Display connected to the meter, see the Installation and Operation Manual for your meter for details on using it to access firmware version numbers.

To flash update, you must have the most recent update file from GE.

Flash updating erases the existing firmware and replaces it with the new version.

WARNING

- Flash updating should only be done with the proper firmware. Otherwise, data may be lost.
- Perform Backup of your stored data prior to installing new flash programming into your unit.

Section 25.2 *Flash Update an EPM 9450/9650/9800 Meter* contains instructions for updating the EPM 9450/9650/9800 meters.

Section 25.3 *Flash Update an EPM 9900/9900P Meter* contains instructions for updating the EPM 9900/9900P meter.

Section 25.4 *Flash Update other EPM Meters* contains instructions for updating the other EPM meters and the EPM 4600 metering system.

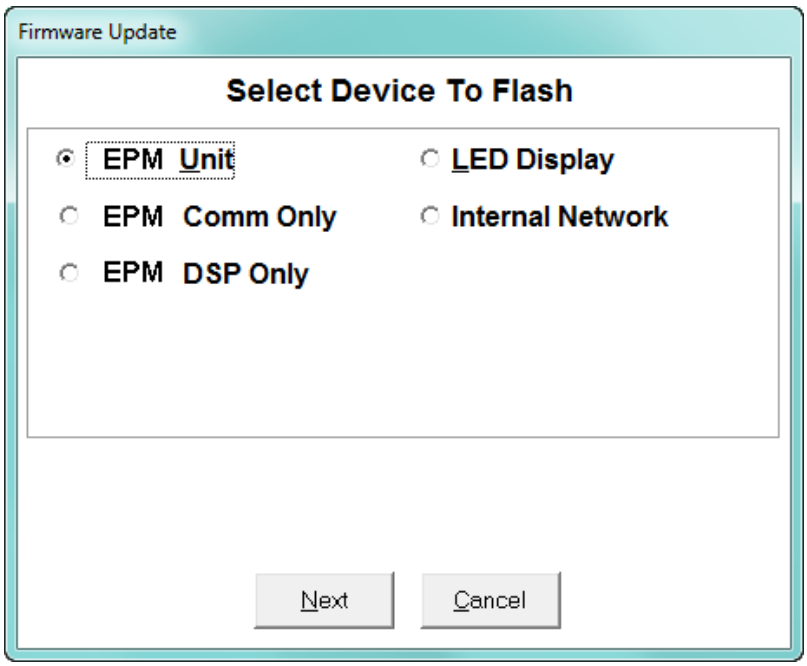
25.2 Flash Update an EPM 9450/9650/9800 Meter

1. Contact GE to receive the most recent EPM meter firmware update. Be sure your version of GE Communicator software is compatible with the firmware update you want to perform.
2. Copy the new firmware update files to a directory on your computer. The Comm firmware update is divided into two files; the DSP update is a single file. The **GE Unit** button will update all three files (Comm and DSP) at the same time. Generally, when you perform an update, update all firmware at the same time.
3. Be sure to read the text file accompanying the firmware files for important information such as the checksum code. Write down the Checksum Code. If you are flashing "GE Comm Only" or "GE DSP Only", you will need it later in the Flash update process. Flash updating will fail, if an incorrect checksum code is entered. If you are flashing using "GE Unit," the checksum will be entered automatically.

NOTE

The checksum code consists only of the digits 0–9 and the letters A–F. The checksum will never contain the letters O or I, which are often confused for zeros and ones.

4. Connect to the meter. From the Main screen Menu Bar, select **Tools > Firmware Update**. You will see the following screen.



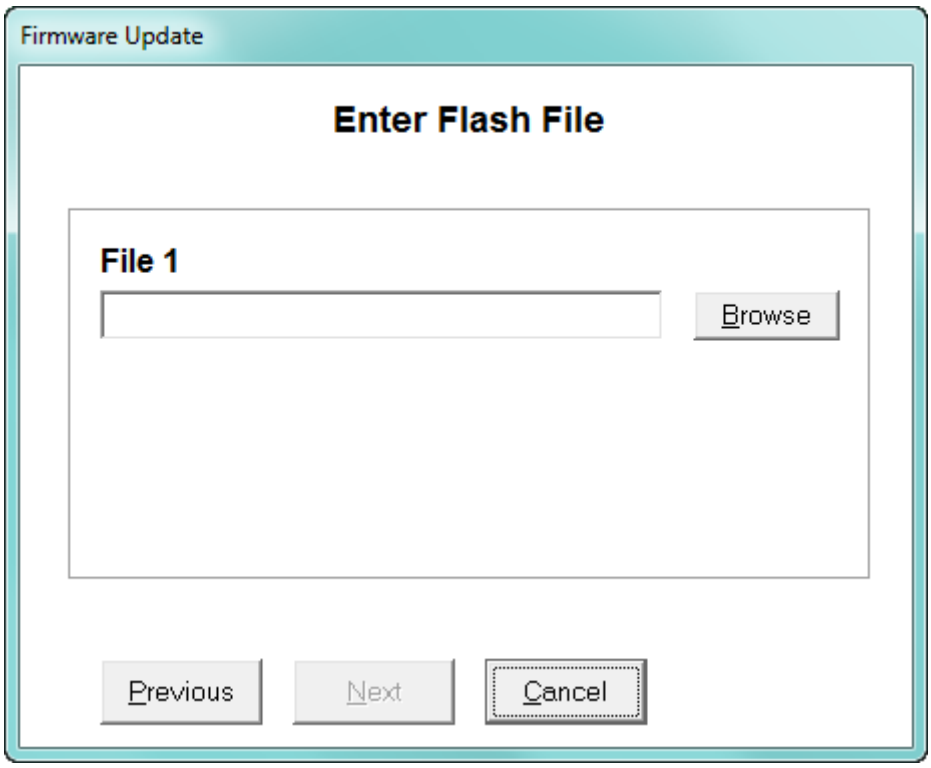
5. Choose the type of update you want to perform:
   - EPM Unit
   - EPM Comm Only
   - EPM DSP Only
   - LED Display
   - Internal Network

- Internal Modem: you will only see this option if your meter has the Internal Modem.

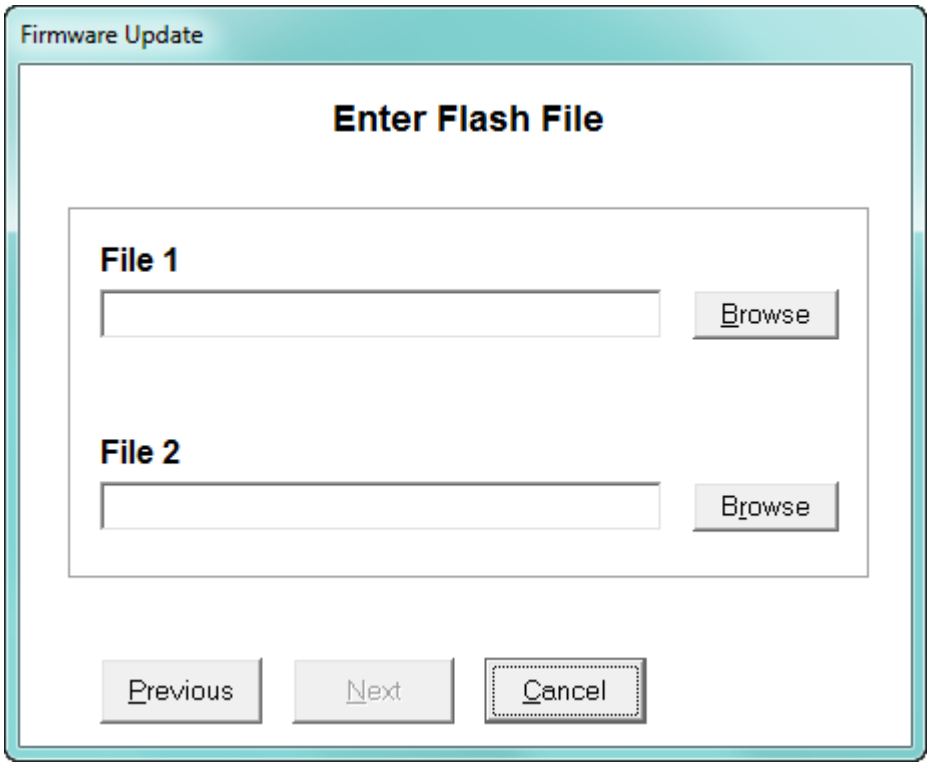
NOTE

The **EPM Unit** button updates the EPM Comm and EPM DSP firmware files at the same time and provides the checksum automatically. The Internal Modem and Internal Network cards must be updated separately.

6. Click **Next**. You will see one of the following screens.
   - You will see the screen below if you selected **EPM Unit**.



- You will see the screen below if you selected **GE Comm Only**, **GE DSP Only**, or **LED Display**.



NOTE

The firmware update settings for the Internal Network and Internal Modem are different from the other update screens, so they are explained in separate sections. See 25.2.1 *Flash Update the Internal Network Card* for the Internal Network firmware update instructions and Section 25.2.2 *Flash Update the Internal Modem Card* for the Internal Modem firmware update instructions.

7. Click the **Browse** button beside File 1 to open a screen that lets you locate the firmware file on your computer.
8. Click on the file and click **Open**.
   - You will need only one file (*.ini file) for the GE Unit update, the GE DSP firmware update and the External Display Update.

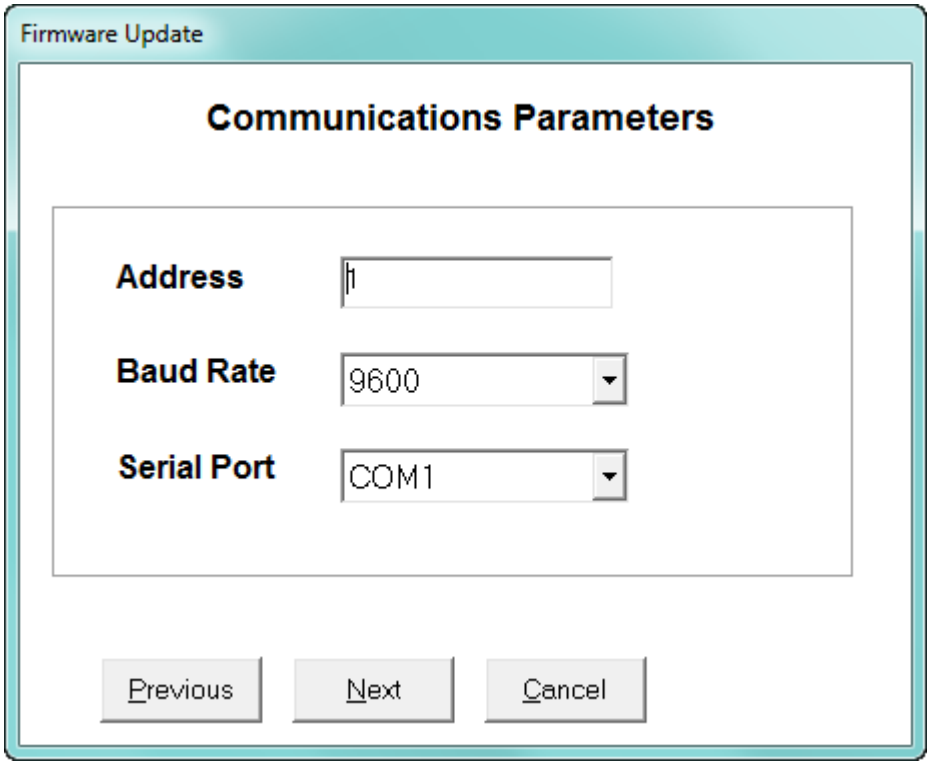
For the GE Comm firmware, repeat the process for File 2, as this update uses two files.

NOTICE

Be sure to read the text file, located in the same directory as the firmware file(s). Some updates require you to know the checksum, which is in the text file.

9. When the files have been entered, click **Next**.

The following screen opens only if you are not connected to a meter. Skip to step 11 if you do not see this screen.



10. To connect to the meter you want to update:
    - Enter the Address of the EPM meter you want to Flash update.
    - Enter the Baud Rate of the EPM meter port your computer is connected to.
    - In the **Serial Port** field enter the COM port of the computer you are using.
    - Click **Next**.

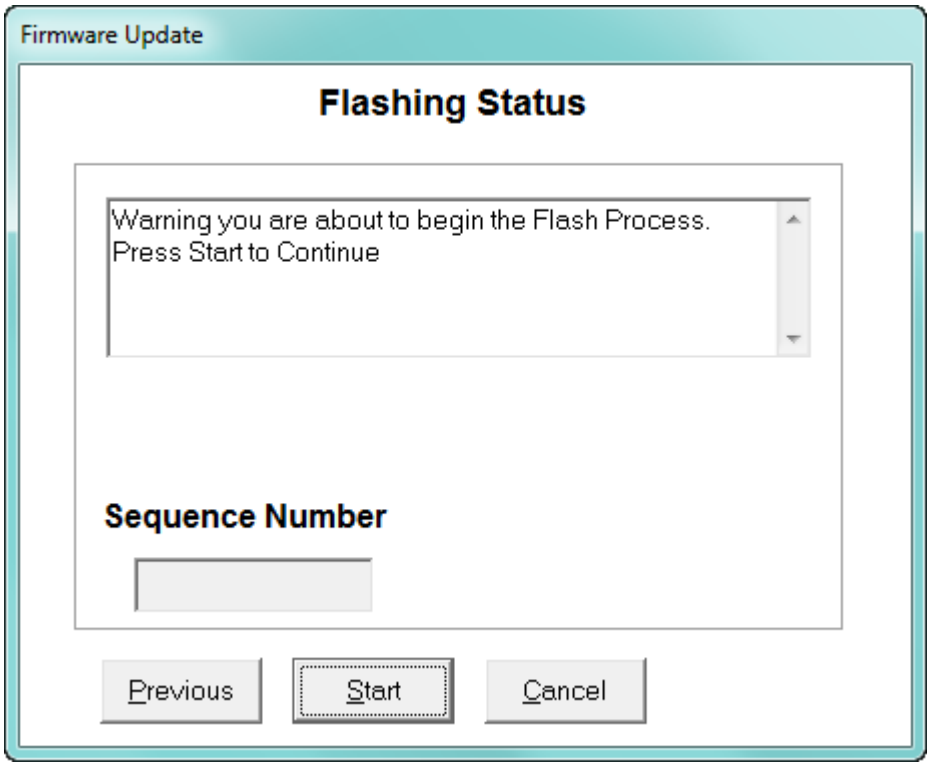
NOTE

If you want to Flash update using a modem, make the modem connection first; then enter the Flash sequence mode.

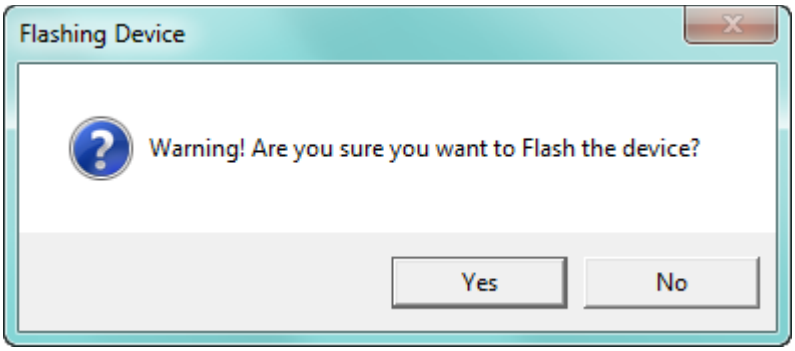
NOTE

To update additional EPM meters once you finish following the instructions in this section, click **Previous** and return to the Communications Parameters screen. Repeat the steps as needed, entering a unique address for each meter you are updating.

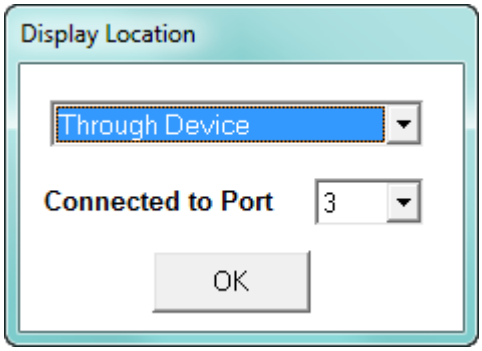
11. You will see the screen shown below. Click **Start** to perform the update.



12. Another warning screen opens - click **Yes** to continue.

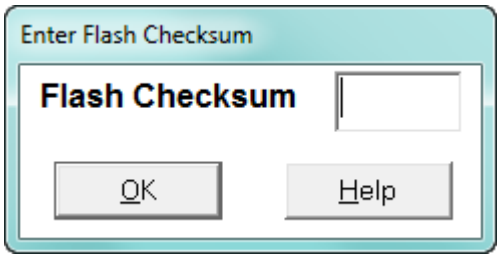


13. If you are updating the LED Display, you will next see this screen:



- Select **Through Device** if the display is connected to a meter; or standalone if it is connected directly to your PC.
- Select the meter's port the display is connected to. Make sure the port is set to 9600 Baud.
- Click **OK** to continue.

14. If you are updating the LED Display, GE Comm, or GE DSP, you will next see a screen asking for the checksum: enter the checksum code from the firmware text file and press **OK** to continue. If you do not enter the correct checksum code, the flash update will fail.



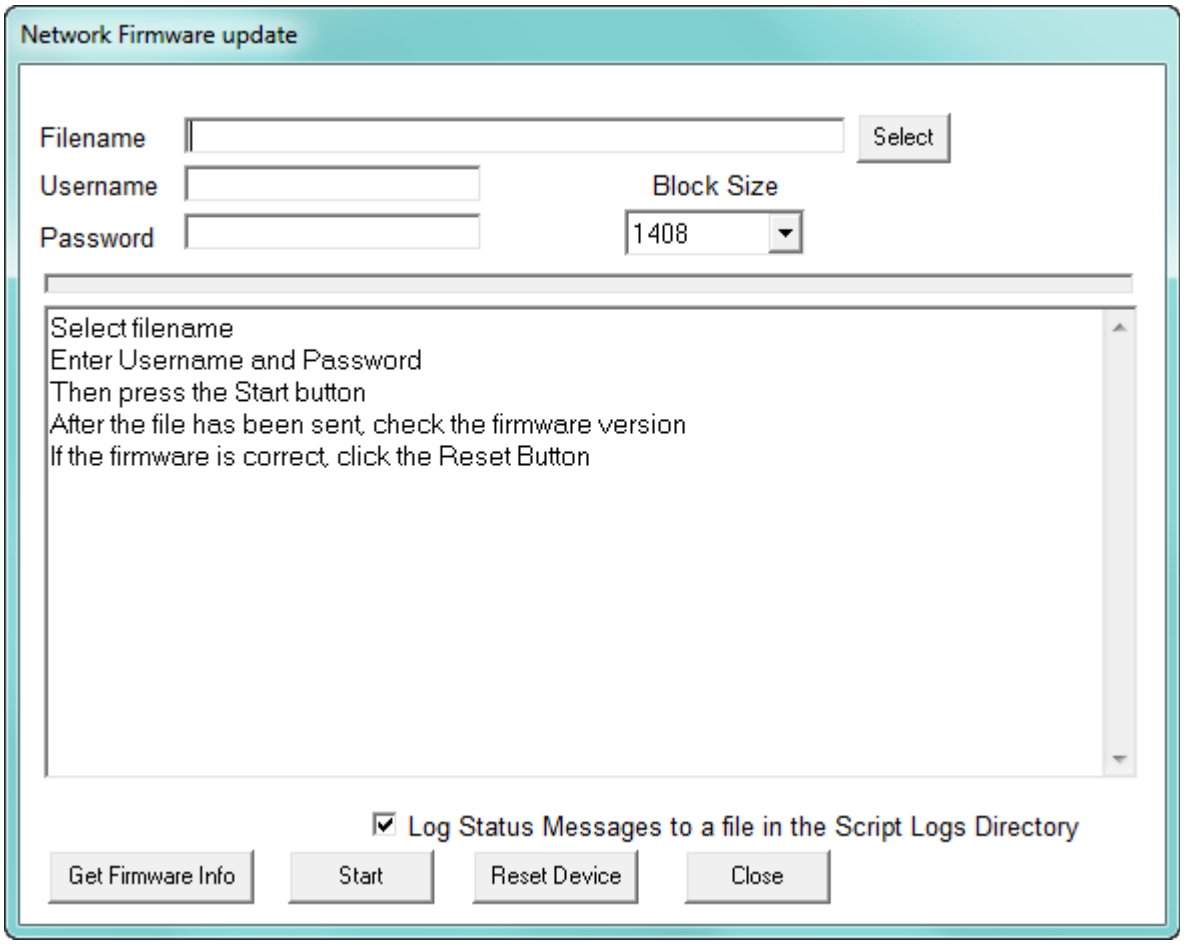
15. A screen displays the progress of the firmware update. When the update is complete, the **Cancel** button changes to **OK**. Click **OK** to close the screen.

NOTE

Flash updating the LED display takes about 15 minutes.

25.2.1 Flash Update the Internal Network Card

1. When you have selected **Internal Network** and clicked **Next**, you will see the screen shown below.



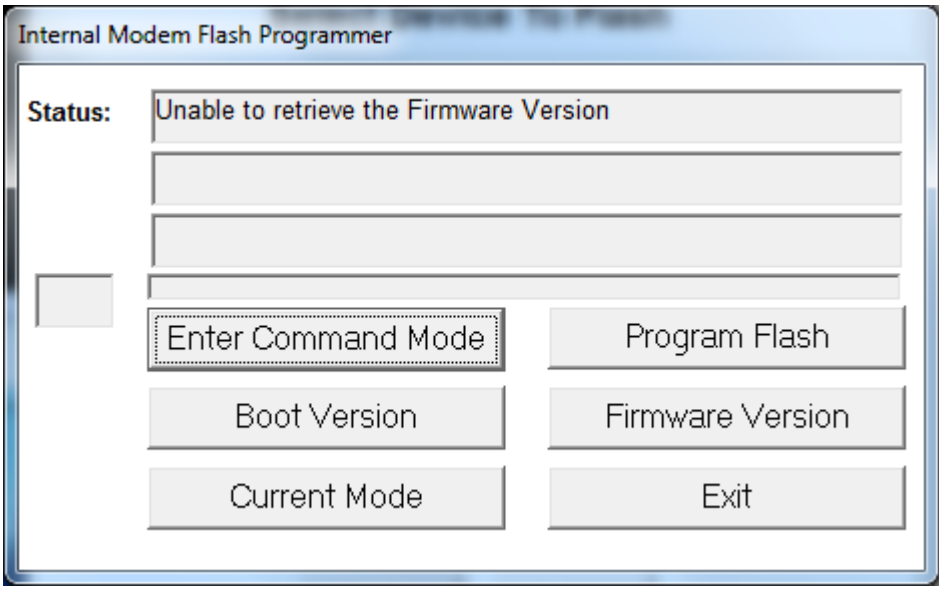
2. Click **Select** to find the Firmware file on your PC.
3. If password protection is enabled, enter the Username and Password.
4. Click **Start** to begin the Firmware Update process. Flash updating the Internal Network card takes approximately 30 minutes.
5. The screen displays messages while the firmware is loading. When you see the message "Run-time firmware updated to flash successfully," click **Reset Device**.

NOTE

You can click **Get Firmware Info** to verify that you have the correct firmware before you reset the meter.

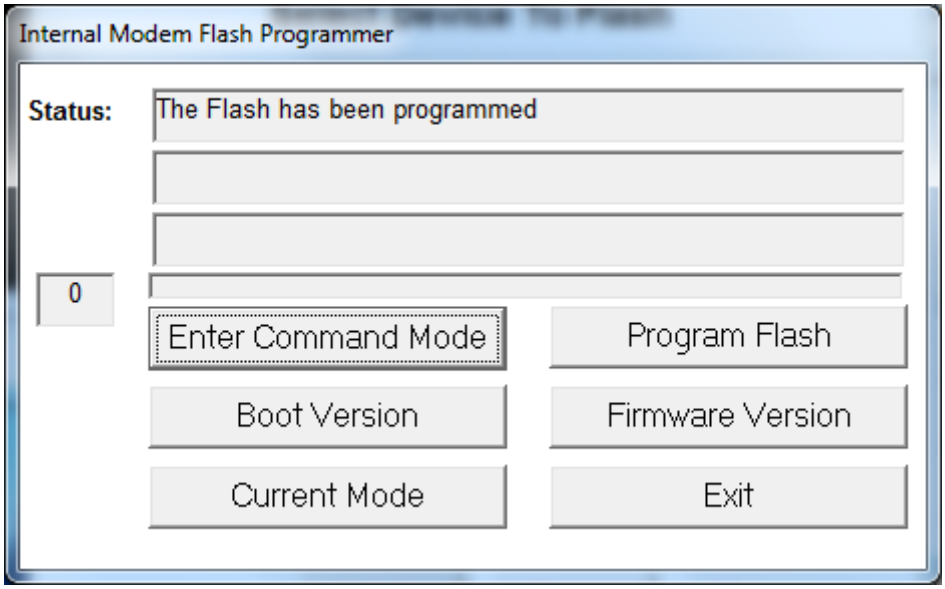
25.2.2 Flash Update the Internal Modem Card

1. When you have selected **Internal Modem** and clicked **Next**, you will see the screen shown below. (If the Password Feature is Enabled, you will be prompted to enter your Level 2 Password - do so and click **OK**.) You will see the screen shown below.



- Click **Enter Command Mode**. In the Status fields, the words "Entering Command Mode," "Sending Escape Sequence," and then, "In Command Mode" will be displayed.
- Click **Program Flash** to open a window that lets you locate the firmware file on your computer. You will need only one file (*.hex file) for the Internal Modem firmware update. Be sure to read the text file located in the same directory as the firmware file.
- Select the file and click **Open**. The program automatically uploads the data. Lines 1 and 2 of the Status fields display the progress of the update.

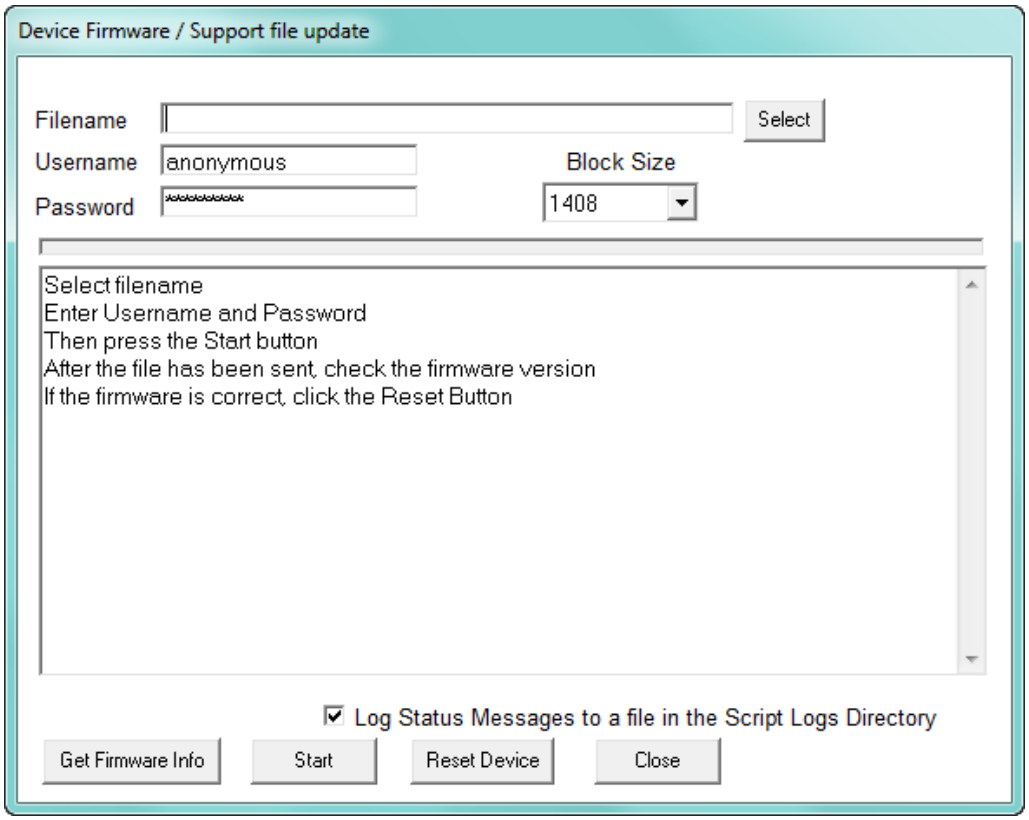
- When the Flash update is complete, the Status field will say "The Flash has been programmed."



2. Click **Exit** to return to the Main screen.

25.3 Flash Update an EPM 9900/9900P Meter

1. From the Main screen, Click **Tools > Firmware Update**. You will see the screen shown below.



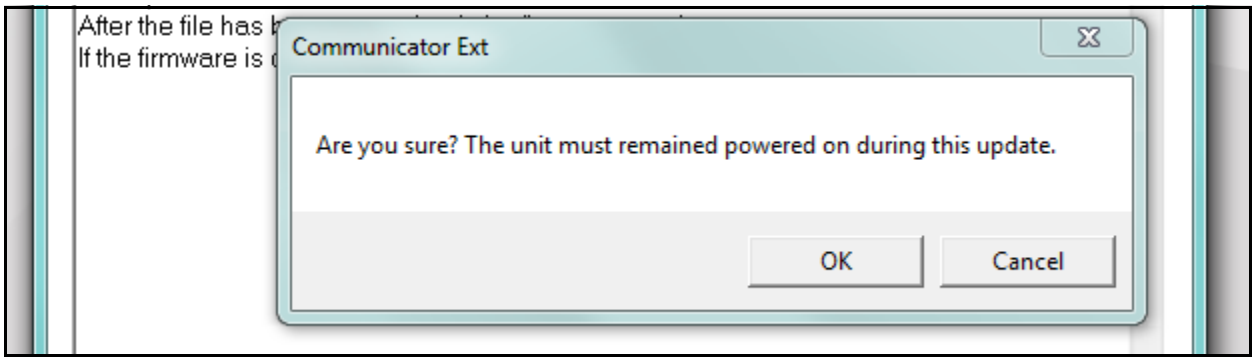
2. Click **Select** to locate the firmware update file. You use this same screen to perform any firmware updates for the meter.

NOTE

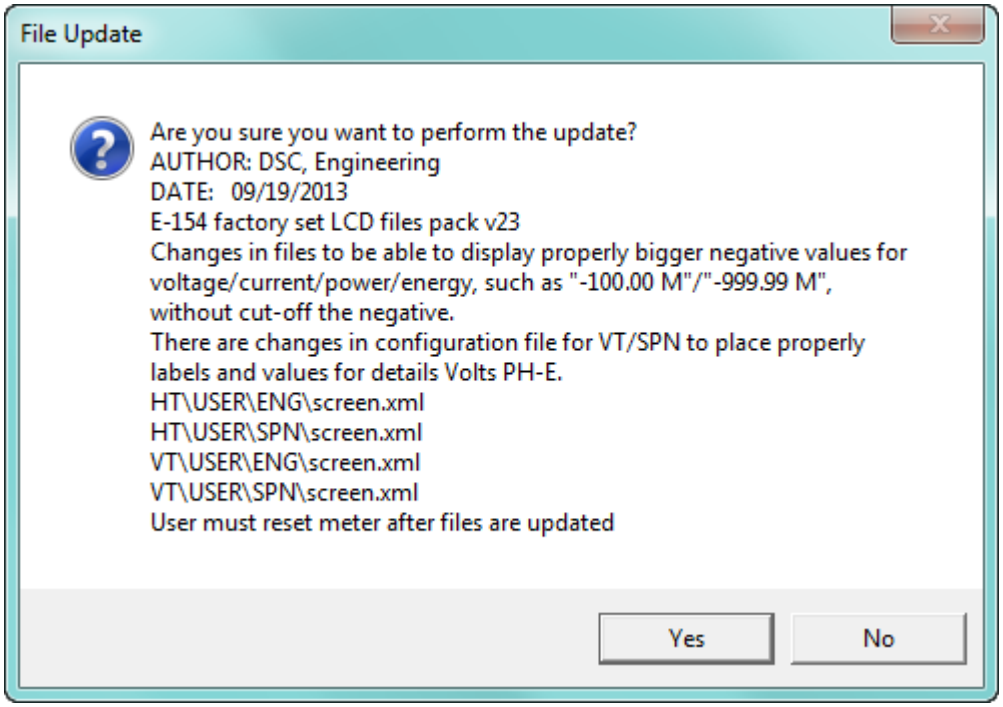
IMPORTANT! If you are updating an EPM 9900P with firmware version 15.2, first download the PQ log, and then reset it (see 16.3 *Retrieving Log Data* on page 16–4 and 20.1.7 *Reset Device Information* on page 20–8. for instructions).

3. Enter Username and Password: if password protection is enabled enter the programmed information. If password protection is disabled, enter **anonymous** in both the User Name and Password fields.

4. Click **Start**. You will see the window shown below. Click **OK** to continue.



5. You will see the message window shown below. Click **Yes** to continue.



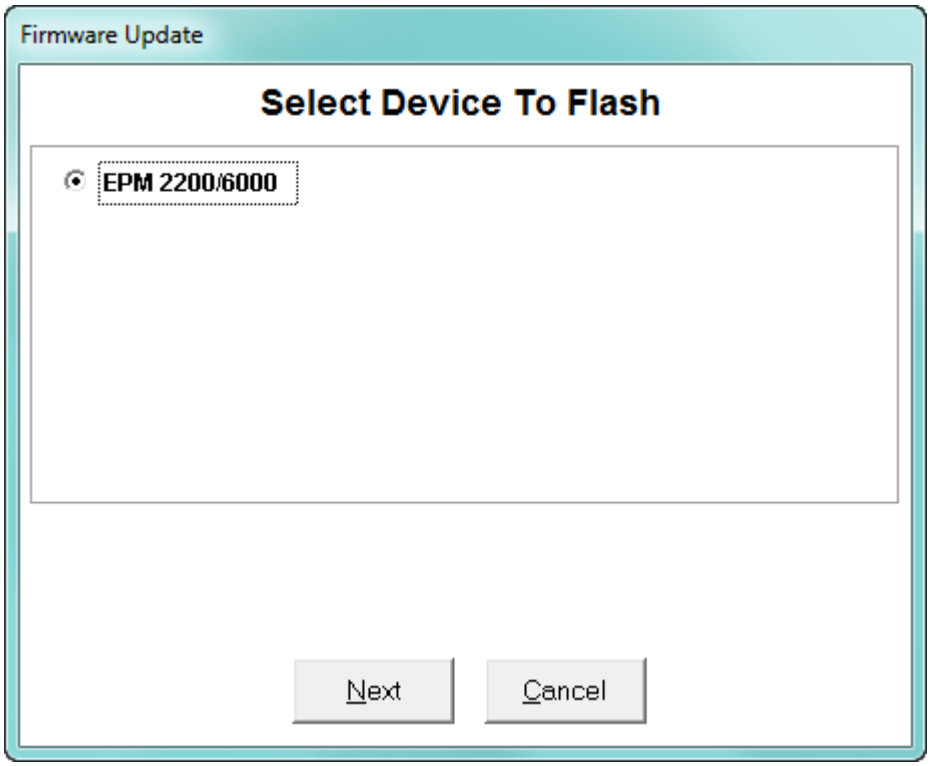
6. The progress bar will show the status of the update. When the update has completed successfully, a message to that effect displays in the message field.
7. Click **Get Firmware Info** to see and confirm the meter's firmware version information.
8. If the version is correct, click **Reset Device**. (If the version is not correct, click Select to choose another update file.)
9. Click **Close** to exit the screen.

25.4 Flash Update other EPM Meters

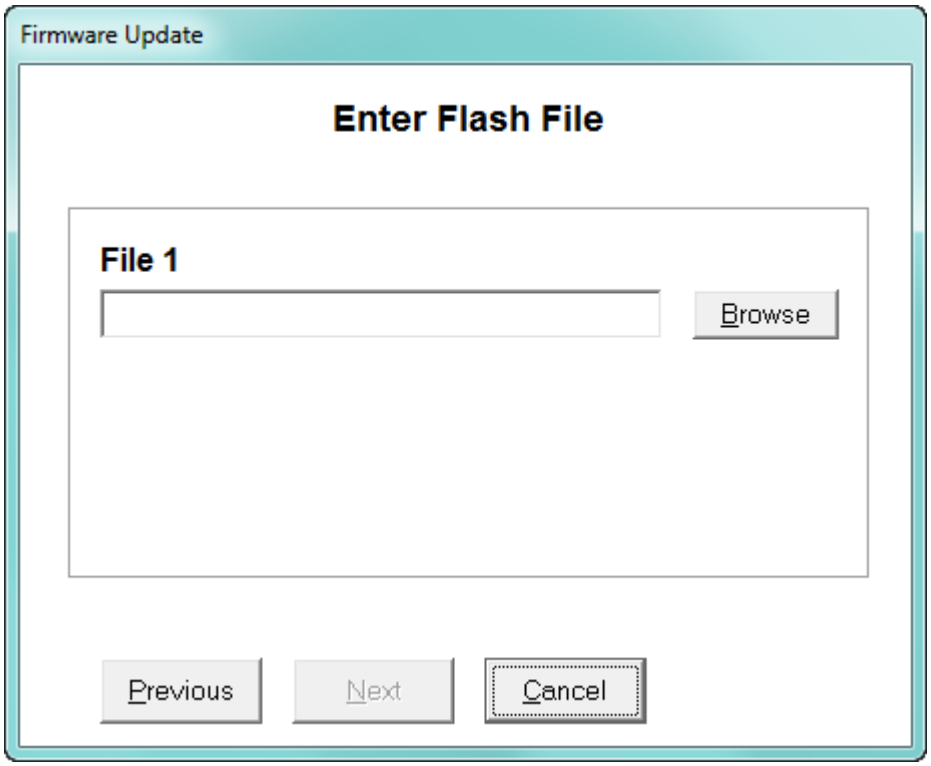
The next section tells how to perform a firmware update for the EPM 2200/6000/6010/6100 meters. Section 25.4.2 *Firmware Update for EPM 7000 Meter and EPM 4600 Metering System* explains how to perform a firmware update for the EPM 7000 meter and the EPM 4600 metering system.

25.4.1 Firmware Update for EPM 2200/6000/6010/6100 Meter

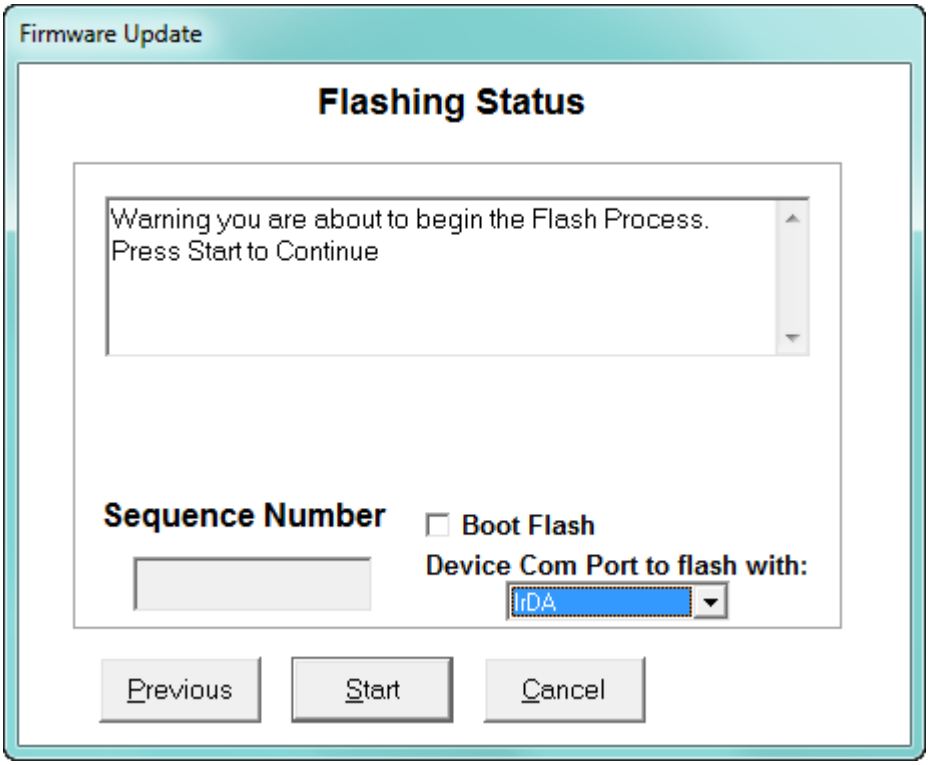
1. From the Main screen, select **Tools > Firmware Update**. You will see the screen shown below.



2. Click **Next**. You will see the screen shown on the next page.

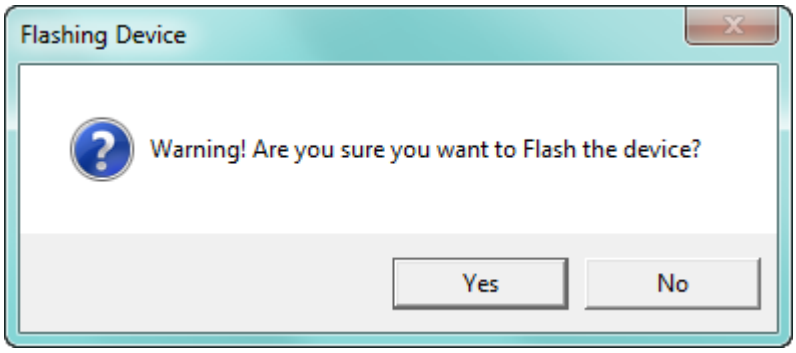


3. Click **Browse** to locate the flash file and click **Next**.
4. You will see the screen shown below.



- Select the meter's Com port you want to use for the update: IrDA or RS485.
- If the meter is in Boot Mode, click the **Boot Flash** checkbox.

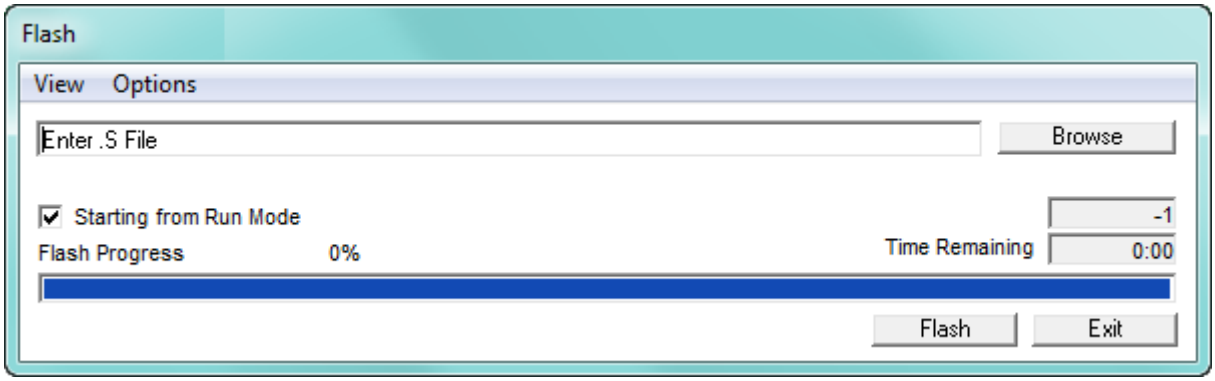
5. Click **Start** to perform the firmware update. You will see the confirmation message window shown below. Click **Yes** to continue.



6. When the update is complete, the **Cancel** button changes to **OK**. Click **OK** to close the screen.

25.4.2 Firmware Update for EPM 7000 Meter and EPM 4600 Metering System

1. From the Main screen, select **Tools > Firmware Update**. You will see the screen shown below.



2. Click **Browse** to locate the flash file.
3. Click **Flash** to update the firmware with the flash file.
4. When Flash is complete, click **Exit** to close the screen.

NOTE

If Flash Update fails, you will see a message to that effect. Check Device Status to see if your meter is in Boot Mode.

- If the meter is in Boot Mode, uncheck the Starting from Run Mode box in the Firmware Update screen and try flash updating the firmware again.
- If the meter's status is not displayed in the Device Status screen, the meter may be stuck in Boot Mode. If you are certain the communication settings are correct for the meter, try connecting to the meter using the following defaults:
    - **For RS485 connection:**
      Address 001
      Baud Rate 9600
      Protocol Modbus RTU
    - **For IrDA connection:**
      Address 001
      Baud Rate 57600
      Protocol Modbus ASCII

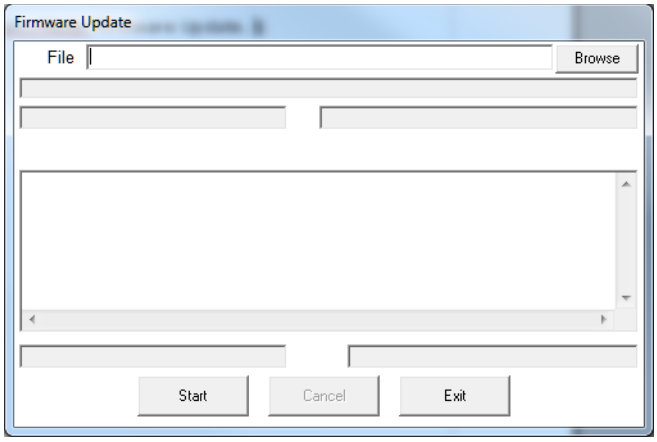
Once you connect to the meter, you can try flash updating again.

NOTE

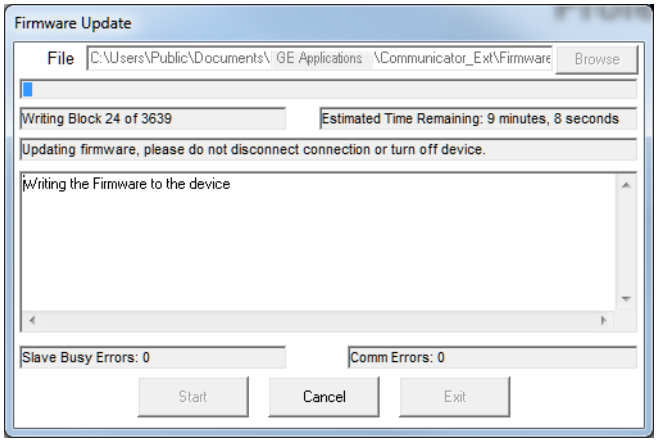
The EPM 7000 meter's network card can only be updated via its webpage. See the *EPM 7000 Instruction Manual* for details.

25.4.3 Firmware Update for the EPM 7000P Meter

1. From the Main screen, select **Tools > Meter Firmware Update**.



2. Click **Browse**. You will be prompted to select the firmware file.
3. Once the file is shown in the File field, click **Start** to begin firmware update. You will see messages as the update takes place. See the example screen, below.



4. The screen will show a message when the update is complete. Click **Exit** to close the screen.

GE Communicator

Chapter 26: EPM 9700 Meter

This chapter explains how to configure an EPM 9700 meter's programmable settings, which are stored in the unit's Device Profile. Chapter 7 contains detailed information on the Device Profile.

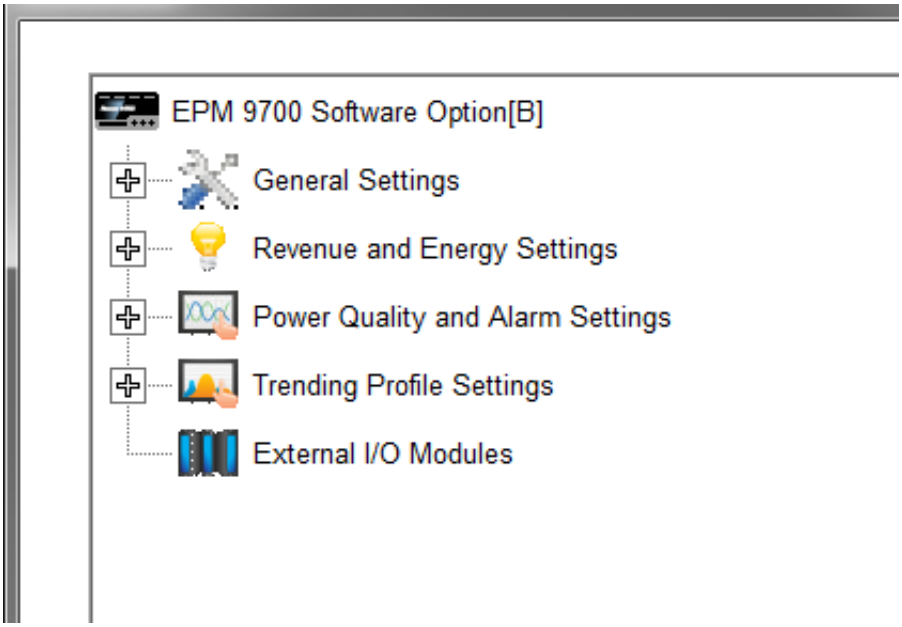
NOTE

When the Device Profile of an EPM 9700 meter is updated, the meter reboots. If security was enabled when the meter rebooted, users may need to login again by disconnecting from the meter, reconnecting to it, and logging in again. This is true both for the user that updated the Device Profile and for any other users connected to the meter when it is updated.

If any of the meter settings are not valid, the meter update fails and an error message displays.

26.1 Device Profile General Settings

1. From the Device Profile screen, double-click on the General Settings line or click on the + button next to it. All of the settings in the General Settings group are listed.



2. Click on the programmable setting you want to modify.

The following sections explain the settings in the General Settings menu.

26.1.1 CT and PT Ratios and System Hookup

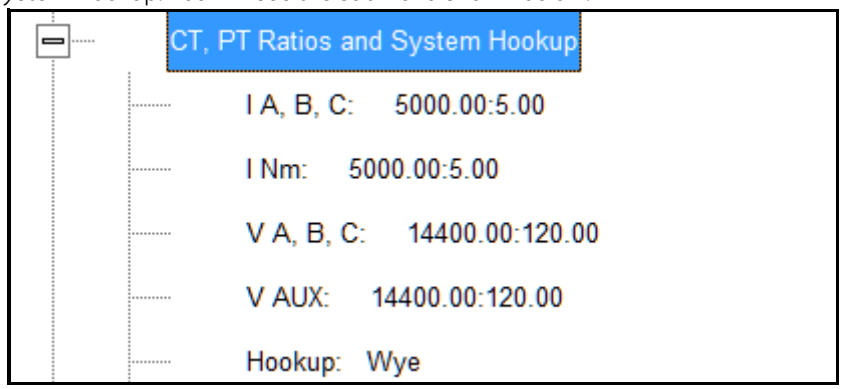
Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

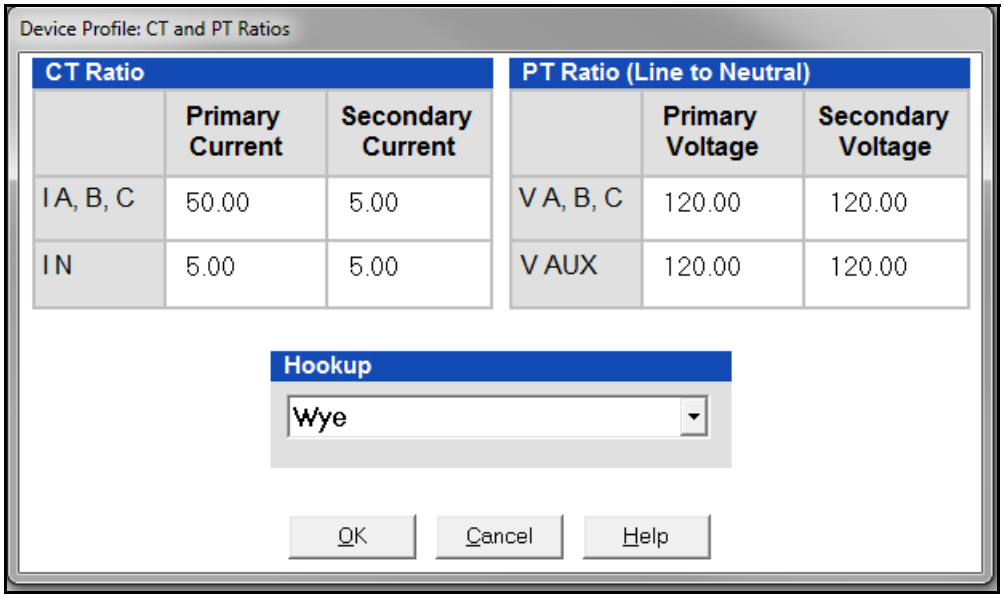
The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

1. From the General Settings menu, click the + button next to CT, PT Ratios and System Hookup. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for CT, PT ratios and connection type.

2. Double-click on any of the settings. You will see the CT and PT Ratios screen.



3. Make changes to this screen according to your application requirements.

When you change a PT or CT Ratio, GE Communicator software updates the corresponding Full Scale value entered in the Limit and Waveform Full Scales setting. When you click OK on this screen, GE Communicator software opens the Limit & Waveform Full Scales screen so that you can verify the settings (see 26.1.2 *Limit and Waveform Full Scales* on page 26–4).

- Enter Primary and Secondary Current and Voltage.
- Using the pull-down menu, choose the Hookup mode that matches the connection you have to the EPM 9700 meter. Choose from the following:
    - Wye
    - Delta 3 CTs
    - Delta 2 CTs
    - 2.5 Element Wye
    - 4 Wire Delta

  This value must be set properly for the meter to calculate readings correctly.

  See the *EPM 9700 Instruction Manual* for connection diagrams.

4. Click **OK**. If changes have been made, a message window opens asking you to verify that the Limit Full Scales are correct.
5. Click **OK**. The Limit and Waveform Full Scales screen opens (see Section 26.1.2 *Limit and Waveform Full Scales* on page 26–4).
6. To implement any changes, click the **Update Device** button to send the new profile to the meter.

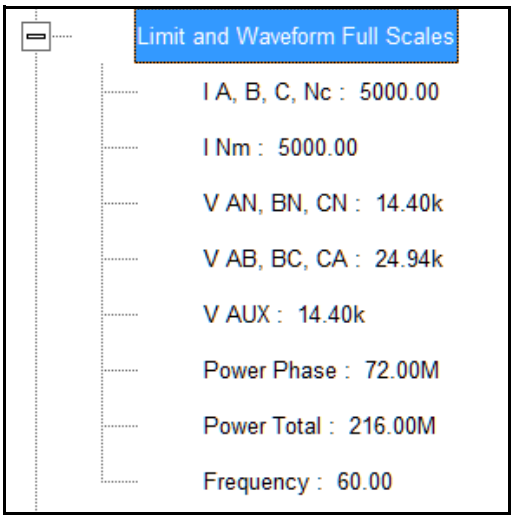
   You will see a warning message that logs will be reset, and you will be given the opportunity to retrieve the logs before they are cleared. Resetting the logs prepares the meter for placement in a new installation or change of the meter Transformers.

26.1.2 Limit and Waveform Full Scales

All Limit and Waveform settings are based on a percentage of the Full Scale. Full Scales are based on the CT and PT ratios (see Section 26.1.1 *CT and PT Ratios and System Hookup* on page 26–3). The % of Full Scale is defaulted based on the CT and PT ratio. If the user wants, the Full Scales can be adjusted to the actual power system condition, to optimize the triggering conditions.

Set the CT and PT ratios first; GE Communicator software automatically recalculates the Full Scales every time the CT and PT ratios change and presents them for your verification.

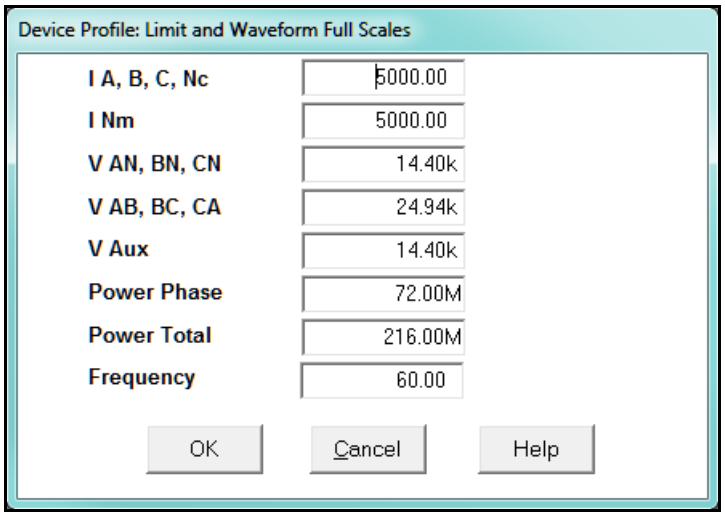
1. From the General Settings menu, click on the + button beside Limit and Waveform Full Scales or double-click on the Limit and Waveform Full Scales line. You will see the submenu shown below.



This submenu displays the current Device Profile's settings for the Limit and Waveform Full Scales. The values shown here are the default meter settings.

Frequency and Voltage values are nominal values. The Power Phase is computed using nominal Voltage and rated maximum current. In most cases the software automatically computes the proper value - you will not need to change it.

2. Double-click any of the settings. You will see the Limit and Waveform Full Scales screen.



NOTE

- The Limits and Waveform settings (Sections 26.3.1 *Limits* on page 26–30 and 26.3.3 *PQ Thresholds (Waveform Recording)* on page 26–42) are based on a percentage of the Full Scales entered here.
- GE Communicator software automatically recalculates the Full Scale Voltages, currents and power every time the CT and PT ratios change. However, frequency is

not changed, even if the operational frequency range is changed. **Frequency can only be changed on this screen**.

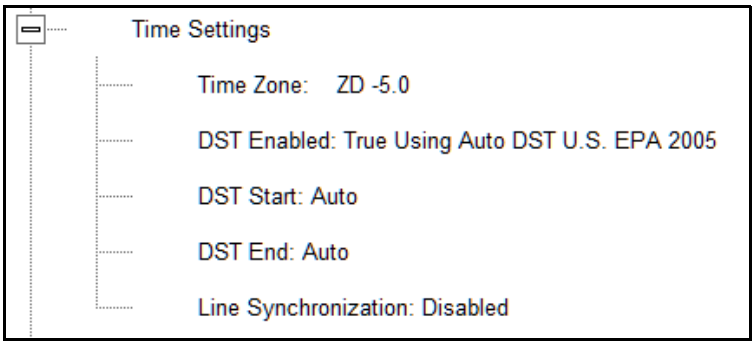
- Power Phase is the amount of power per each phase; Power Total is the power of all phases combined.

3. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

26.1.3 Time Settings

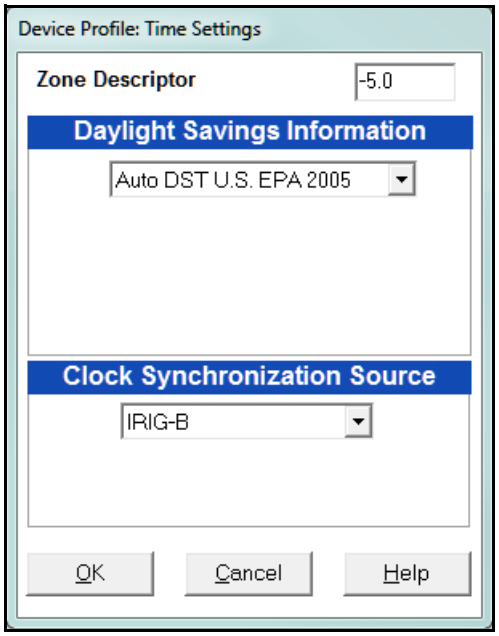
To edit a Device Profile's Time settings:

1. From the General Settings menu, double-click on the Time Settings line. You will see the submenu shown below.



- DST stands for Daylight Savings Time.

2. Double-click on any of the programmable settings; you will see the Time Settings screen.



3. Make changes to this screen according to your application requirements.
   - Zone Descriptor: A Zone Descriptor sets the time zone for the meter. 0 = Greenwich Mean Time. Consult the chart below to find the Zone Descriptor for your time zone.

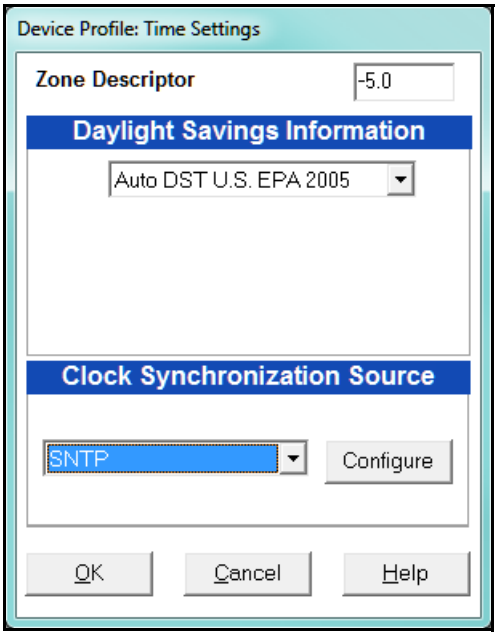
GMT Greenwich Mean Time Table (Dublin, London)	
-1.00 Azores	+1.00 Brussels, Paris, Warsaw
-2.00 Mid-Atlantic	+2.00 Athens, Cairo, Helsinki
-3.00 Buenos Aires, Georgetown	+3.00 Baghdad, Kuwait, Moscow, Tehran
-4.00 Atlantic Time (Canada), Santiago	+4.00 Kabul, Baku
-5.00 Eastern Time (USA and Canada), Lima	+5.00 Karachi
-6.00 Central Time (USA and Canada), Mexico City	+6.00 Dhaka
-7.00 Mountain Time (USA and Canada)	+7.00 Bangkok, Hanoi, Jakarta
-8.00 Pacific Time (USA and Canada), Tijuana	+8.00 Beijing, Hong Kong, Singapore
-9.00 Alaska	+9.00 Osaka, Sapporo, Seoul
-10.00 Hawaii	+10.00 Brisbane, Melbourne, Guam, Hobart
-11.00 Midway Island	+11.00 Magadan, Solomon Islands
-12.00 Eniwetok	+12.00 Auckland, Fiji

- Daylight Savings Information:
  - **Disabled**: Disables an automatic adjustment for Daylight Savings Time.
  - **Auto DST U.S. EPA 2005**: Sets Daylight Savings Time automatically to the 2007 standard for the United States: the time changes automatically occur at 2:00 AM (your local time), on the second Sunday in March and the first Sunday in November.
  - **User Defined**: Allows you to set the Daylight Savings Time start and end times manually. Fields open that let you set the beginning and ending dates for Daylight Savings Time.
- Clock Synchronization Source: select the type of meter clock synchronization to use from the pull-down menu:
  - **IRIG-B:** is a standard time code format that synchronizes event time-stamping to within 1 millisecond. An IRIG-B signal-generating device connected to the GPS satellite system synchronizes EPM 9700 meters located at different geographic locations. EPM meters use an un-modulated signal from a satellite-controlled clock (such as Arbiter 1093B). For details on installation, refer to the *EPM 9700 Instruction Manual* and the User's Manual for the satellite-controlled clock in use.
  - **Line Synchronization**: uses the frequency zero crossings to provide a time reference for the meter. The basic function of Line Frequency Clock Synchronization is to adjust the real time clock to track the time based on the power line frequency. For this purpose, Phase A voltage only is used. When you select this option, a Frequency pull-down menu is displayed, letting you select between 60 Hz and 50 Hz. The selection

should be based on the nominal frequency in the jurisdiction where the meter is located.

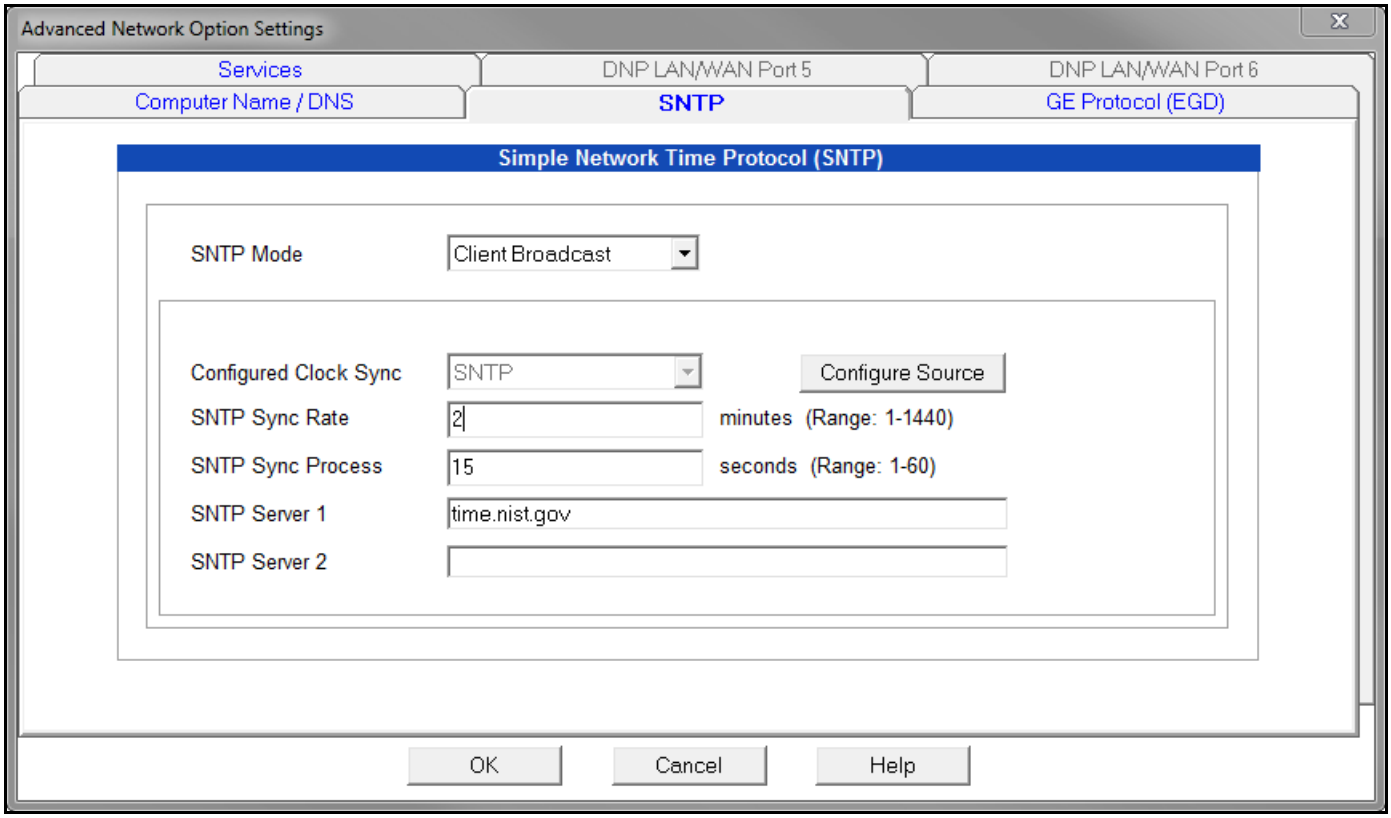
- **How Time is Adjusted**
  After the clock is synced to the line, the meter periodically checks the cumulative difference between the real time clock in seconds and the line cycle count. If the absolute difference between the two accumulations is more than 1 second or 60 (50) cycles, the clock is adjusted + / - 1 second accordingly.

- **SNTP** (Simple Network time Protocol): with SNTP you access a Network Time Protocol (NTP) Server for time synchronization. The NTP server can be either a device with a real-time clock that is networked with your meter, or an NTP server on the Internet. To use SNTP, select it from the pull-down menu.



a. The screen changes to include a Configure SNTP button: click this button to set up SNTP.

b. The Advanced Network Options screen opens. Click the SNTP tab.



c. Enter:

- SNTP Mode: select Client Unicast or Client Broadcast:
  - In Client Unicast mode, the meter connects to the specified SNTP server using the configured SNTP IP address(es). First, the meter synchronizes with the SNTP server. After that, the meter periodically sends time requests to the SNTP server.
  - In Client Broadcast mode, the meter listens for broadcast messages sent by the SNTP server. After receiving the first broadcast message, the meter synchronizes its clock using the unicast mode, and afterwards does not send any packets to the SNTP server. Instead, it uses received broadcast messages from the SNTP server to adjust its clock.
- If Configured Clock Sync is not SNTP, click the Configure Source button to display the Time Settings screen, and choose SNTP for time synchronization. This situation can occur if you previously selected a different time sync method and are now setting up SNTP directly through the Advanced Network Settings screen (Chapter 21 explains the options in the Advanced Network Settings screen).

  Note that if SNTP is already displayed in the Configured Clock Sync field, you do not need to click the Configure Source button.

- The SNTP Sync Rate in minutes: this is how often the meter checks the SNTP server for time updates. GE recommends that the sync rate be set to other than the logging interval, if possible; for example, if the logging interval is every 15 minutes, set the sync rate to every seven minutes. This is done to prevent erroneous time stamps in the log.
- The SNTP Sync Process Timeout in seconds: this is how long to wait for the server to respond. Typical timeout should be set for 30 seconds.

  NOTE: Make sure to set SNTP Sync Rate and SNTP Sync Process Timeout as non-zero values; e.g., 1440 minutes, 60 seconds.
- At least one SNTP server: set NTP server 1 to time.nist.gov (you can enter a second SNTP server address if you want, if you are using Client Unicast mode.)

d. Click **OK**.

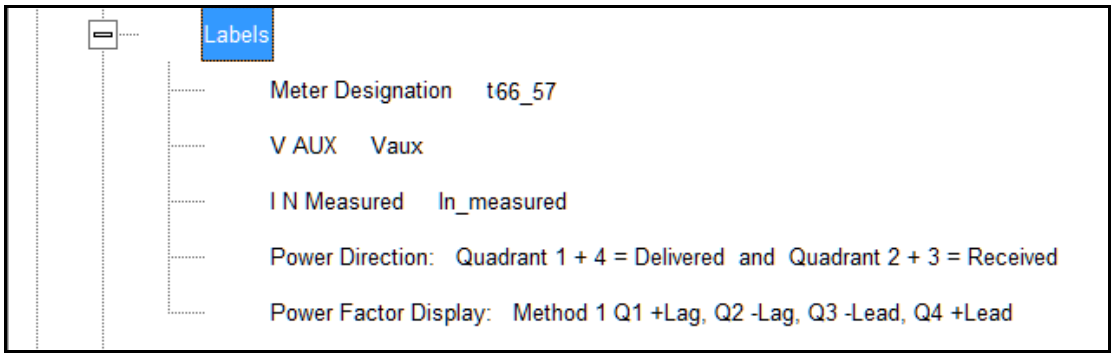
4. To set the meter's on-board clock, use Set Device Time from the Tools Menu (see 20.1.4 *Set Device Time* on page 20–5).
5. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

26.1.4 Labels

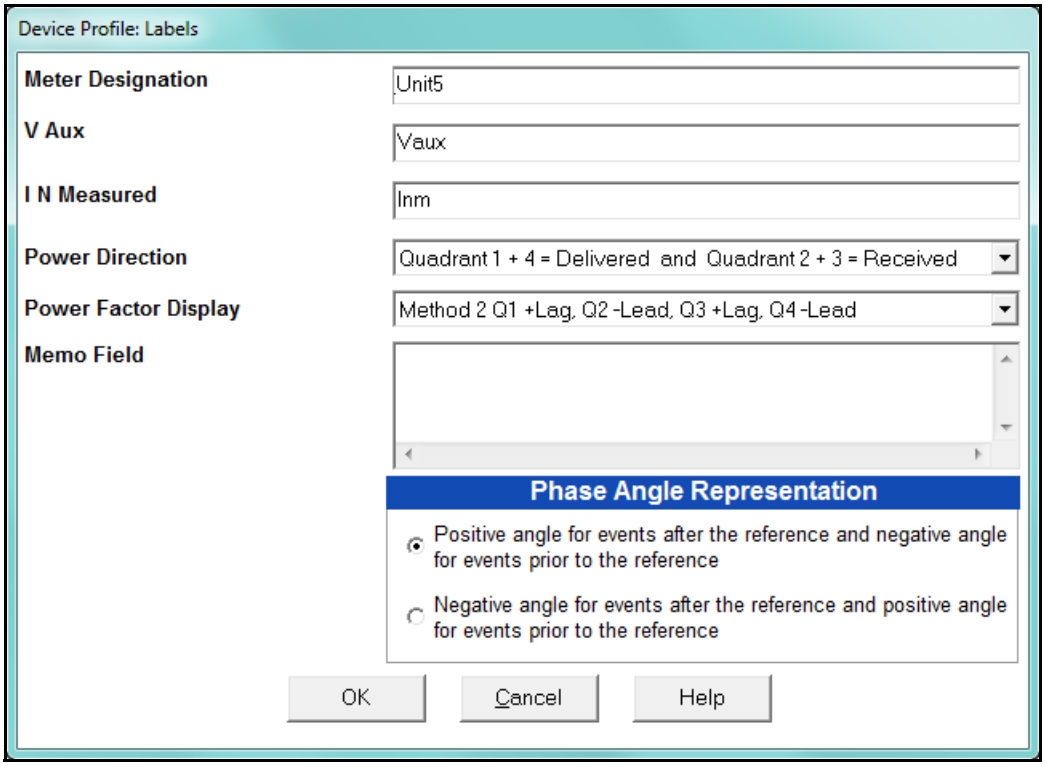
Labels are user-defined names for the EPM 9700 meter and the I N Measured terminal. You also use the Labels screen to select the power direction, and the power factor display.

It is important to label the meter (under "Meter Designation") with a unique name because that label becomes the file name of any logs retrieved from that meter. Duplicate meter designations interfere with retrieved log databases. See Chapters 16 and 19 for more details on logs.

1. From the General Settings menu, double-click on the Labels line. You will see the submenu shown below.



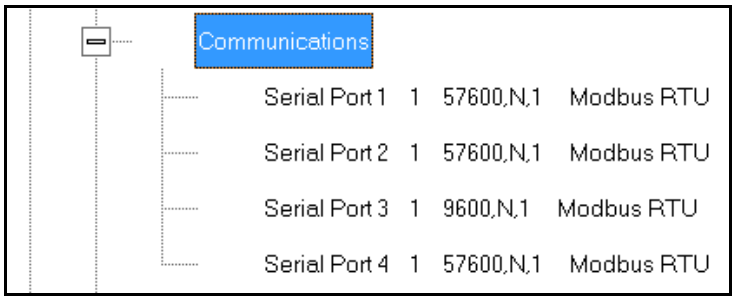
2. Double-click on any of the parameters; you will see the Labels screen.



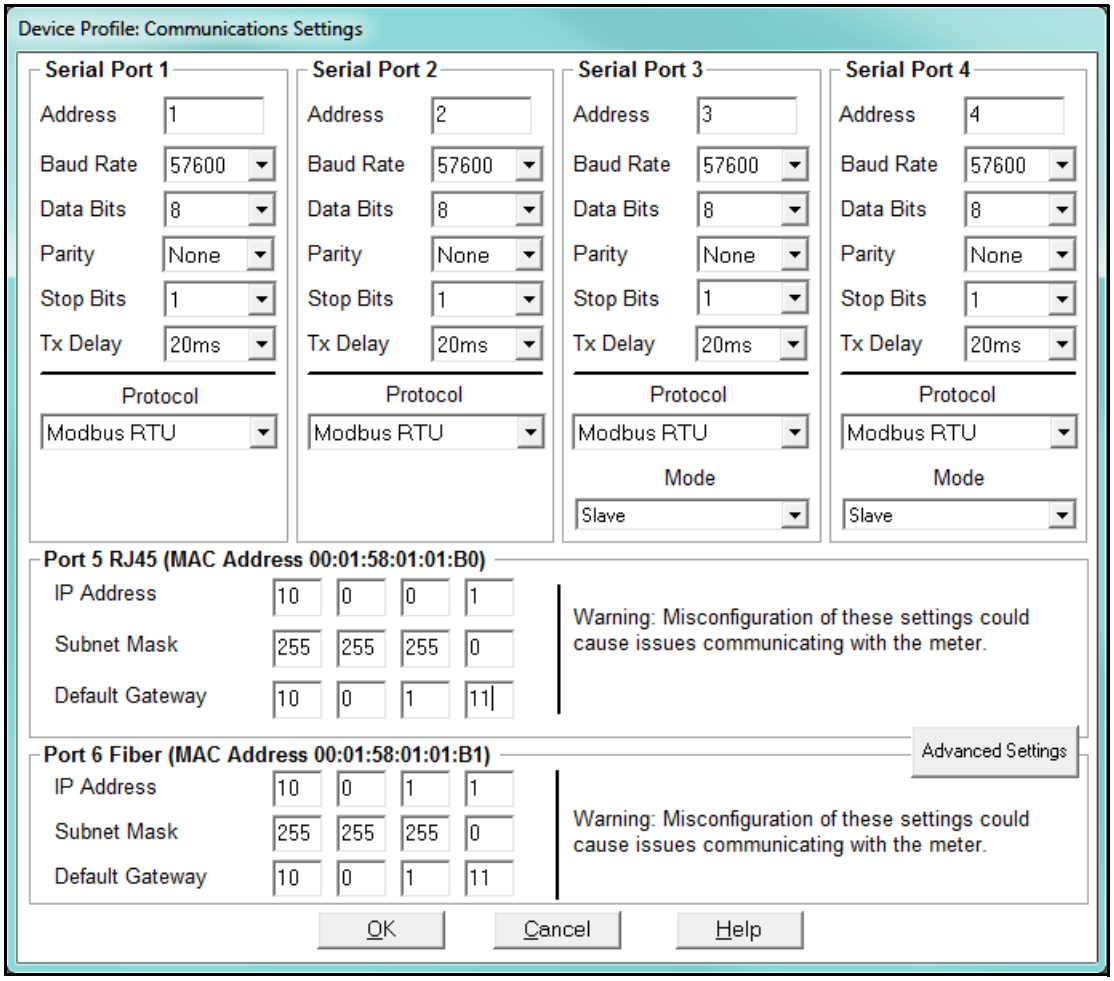
3. Enter labels in the appropriate fields.
   - Meter Designation must be set for partial log retrieval. You can use any character allowed by the Windows® operating system.
     - In English versions the following characters don't work: \ / : * ? " < > |
     - For meters used internationally by multilingual users, we recommend you use only alphanumeric characters allowed by your operating system.
   - Your selection in Power Direction determines which quadrants of Watt-hours are considered Received and Delivered.
   - Your selection in Power Factor Display determines the display of Quadrants in the Power Factor screen.
   - The Memo field is used to enter notes about the meter, such as the location, or other relevant details.
   - The Phase Angle representation determines how the voltage phase angles are represented. 90% of users will use the default, which is the first radio button: "Positive angle for events after the reference and negative angle for events prior to the reference'; however, you can choose the opposite display by selecting the second radio button, if you wish.
4. When all changes are entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter

26.1.5 Communications

1. From the General Settings menu, double-click on the Communications line. You will see the submenu shown below.



2. Double-click on any of the settings (e.g., "Serial Port 1"): you will see the Communications Settings screen.



This screen displays the current Device Profile settings for the EPM 9700 meter's 4 Communications ports: address, baud rate, data bits, parity, stop bits, Tx (Transmit) delay, (communication) protocol, and mode. You may use the one of the EPM 9700 External Displays to learn the current baud rate, address and communication protocol of each meter port. *See the EPM 9700 Instruction Manual* for details.

3. Make changes to this screen according to your application requirements by clicking on the box or pull-down menu of any of the following settings:
   - **Address**: assign an address to each port to communicate with other devices. Multiple EPM meters on an RS485 bus must each have a unique address set for the port that is connected to the bus.
   - **Baud Rate**: from the pull-down menu, select 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. The baud rate entered in this field must match the baud rate of the device connected to the NEPM 9700 meter at this port. Use 9600 for modem connections.
   - **Data Bits**: this field is display only.
   - **Parity**: this field is display only.
   - **Stop Bits**: this field is display only.
   - **TxDelay (Transmit Delay)**: use the pull-down menu to select from: 0ms, 10ms, 20ms, 30ms, 40ms, 50ms, 60ms, or 70ms. Leave the Tx delay at 0ms unless you are using equipment that requires a delay in the response time, such as a radio modem.
   - **Protocol**: use the pull-down menu to select from Modbus RTU and Modbus ASCII. Direct connections made through GE Communicator software must use either Modbus RTU or Modbus ASCII protocol (we recommend Modbus RTU).
   - **Mode**: Select the serial port mode from the pull-down menu:
     - Serial ports 1 and 2 are Slave ports, which is the only option. Serial ports 3 and 4 can optionally be set as Slave ports.
     - Serial port 3 or 4 can be used as an RTU Master. To do so, select RTU Master from the Mode menu.
     - Serial ports 3 and/or 4 can be used for Output modules. To do so, set the port to Master (I/O modules) mode, and set the port 's Baud Rate to 57600, which is the default Baud Rate for the I/O modules.
     - Serial ports 3 and 4 can be set up as an Ethernet Gateway. To do so, set the port to Ethernet Gateway mode.
   - **Network Card Settings**: Port 5 is an RJ45 Ethernet port and Port 6 is a Fiber Optic Ethernet port. The settings for these ports are:
     - **IP Address**: enter the IP address of the card.
     - **Subnet Mask**: enter the subnet mask.
     - **Default Gateway**: enter the Ethernet gateway's IP address.

     See your Network Administrator for the correct settings to enter into the Network Settings fields. Settings will vary from network to network.
   - **Advanced Settings button**: click to open a screen that lets you set Network card features for the Ethernet ports (ports 5 and 6); see Chapter 21 "Total Web Solutions" for details.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button. This sends the new profile to the meter.

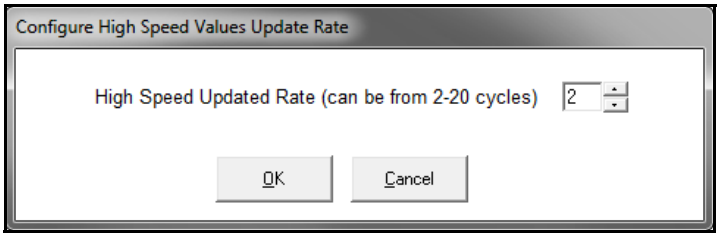
NOTICE

IMPORTANT! In order to prevent communications problems, be careful when making changes in the Communications Settings screen. For example, if you change the baud rate of the port connected to a computer, be sure to make the same change to the computer port's baud rate. If you change a port's address, be sure to update the address settings of any device that communicates with the port.

26.1.6 Configure High Speed Value Update Rate

The Configure High Speed Value Update Rate setting lets you configure the update rate for the meter's High Speed Inputs. You can set a number from two to 20 cycles. This number determines how often any values assigned to the High Speed Inputs are updated.

1. From the General Settings menu, double-click on the Configure High Speed Value Update Rate line. You will see the screen shown below.



2. Enter the number of cycles you want before an update is performed: enter a number from 2 to 20.
3. Click **OK** to save your changes and exit the screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

26.1.7 DNP Custom Classes Map

The DNP Custom Classes Map setting lets you set up DNP communication for the meter. From the General Settings menu, double-click on the DNP Custom Classes Map line and on the DNP Level 2 line. You will see the screen shown below. For details on programming the DNP Level 2 settings, see Chapter 22 “DNP 3.0 Configuration”.

DNP Custom Mapping

Object 10 - Binary Output | Object 1 - Binary Input | Object 20 - Binary Counter

Object 30 - Analog Input | Global Values | DNP Settings

DNP	Map		Description	Deadband	Class Assignments
Points	Line	Point		(%)	Object 32
0	34	0	One Second Updated:Voltage A-N	100.00	No Class
1	34	1	One Second Updated:Voltage B-N	100.00	No Class
2	34	2	One Second Updated:Voltage C-N	100.00	No Class
3	36	0	One Second Updated:Current A	100.00	No Class
4	36	1	One Second Updated:Current B	100.00	No Class
5	36	2	One Second Updated:Current C	100.00	No Class
6	45	0	One Second Updated:Watt Total	100.00	No Class
7	43	0	One Second Updated:Var Total	100.00	No Class
8					

Enter Line and Point assignments from the DNP Table or double click the Description Field for a list of Selections.

Enter a dead band % to be used in causing an associated Object 32 value. (See Manual for Description of base values used by the dead band %)

For Object 32 assign a class.

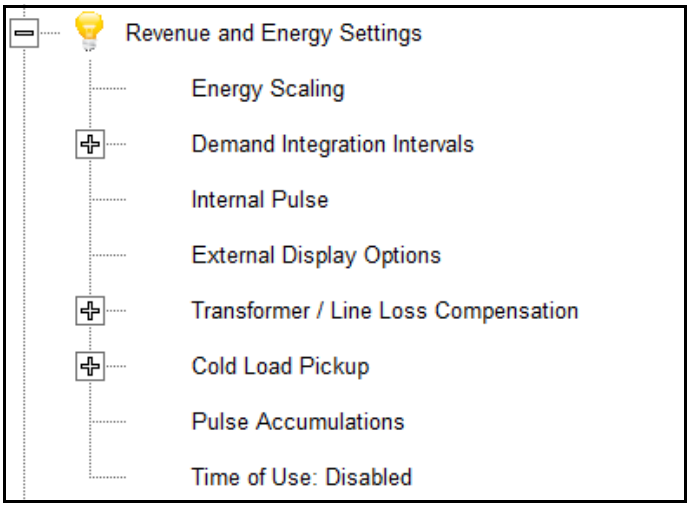
☐ Use Custom 16-Bit Scaling

OK | Cancel | Help | Clear | Clear All

26.2 Revenue and Energy Settings

Revenue and Energy Settings are the second group of settings in the Device Profile.

1. From the Device Profile screen, click on the + button next to Revenue and Energy Settings or double-click on the Revenue and Energy Settings line. All of the settings in the Revenue and Energy Settings group are listed.

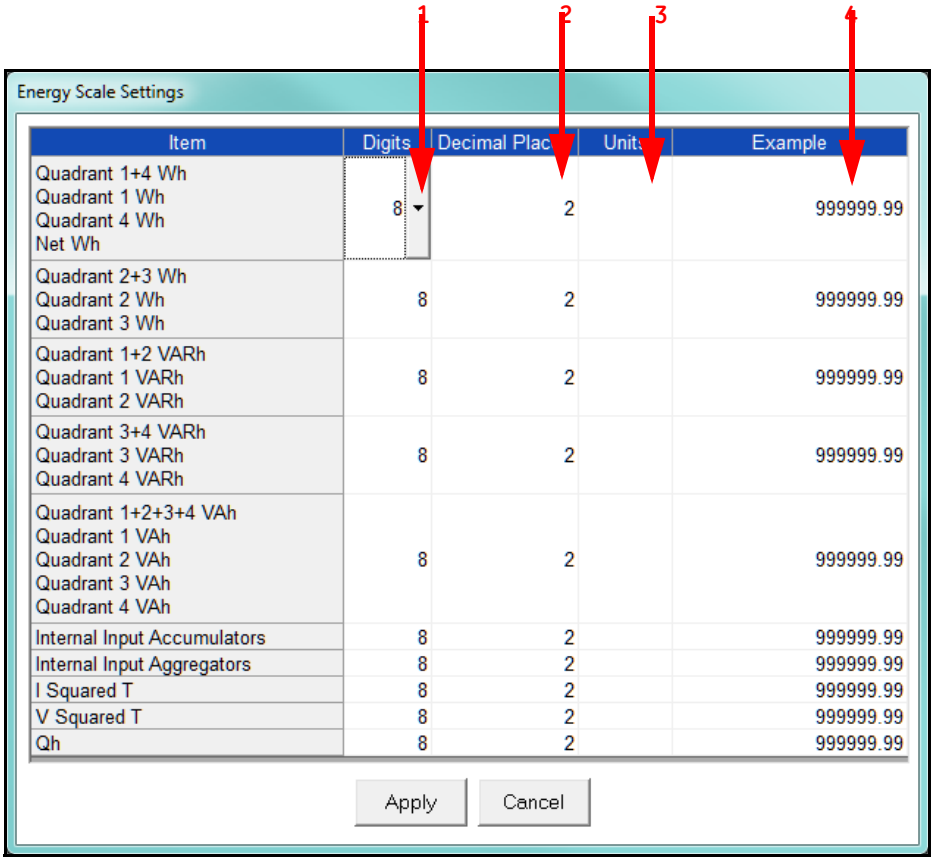


2. Click on the programmable setting you want to modify. The following sections explain the settings in the Revenue and Energy Settings menu.

26.2.1 Energy Scaling

1. From the Revenue and Energy Settings menu, double-click on the Energy Scaling line. You will see the Energy Scale Settings screen.

To configure scaling for a reading, enter:
1. Number of Digits, 2. Number of Decimal Places,
3.Unit of Measurement; 4. Example of the resultant scaling is shown here



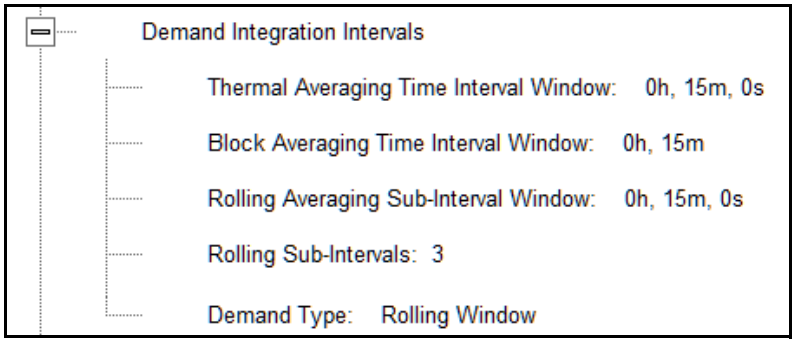
- Using the Energy Scale Settings screen you can select the number of digits, decimal point placement and Energy unit for displayed readings.
- The Example field shows you the scaling choices you made applied to an example reading.

2. When you are done, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

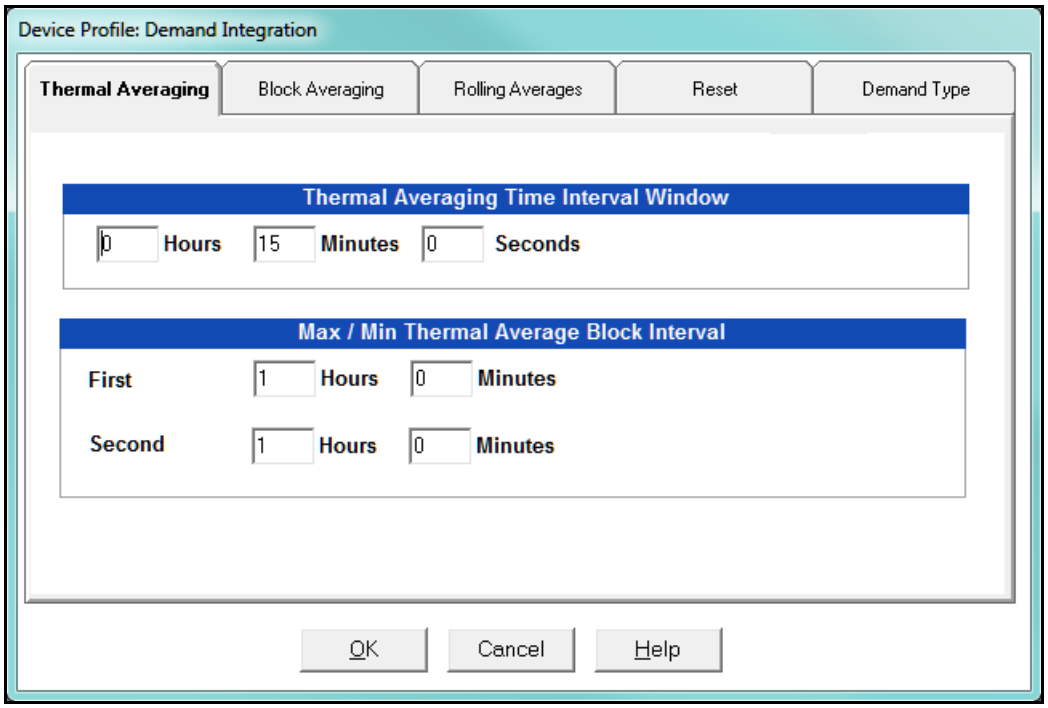
26.2.2 Demand Integration Intervals

See the EPM 9700 *Meter Instruction Manual* for details on Demand intervals.

1. From the Revenue and Energy Settings menu, click on the + button next to Demand Integration Intervals or double-click on the Demand Integration Intervals line. You will see the submenu shown below.



2. Double-click on any of the settings. You will see the screen shown below.



3. Click on the tabs at the top of the screen to navigate from one setting to another. Make changes to the settings according to your application requirements. Following is a brief description of each setting and its function:
   - **Thermal Averaging** (tab shown on previous page): use to set hours, minutes and seconds for a precise thermal window of demand data.

Traditional analog Watt-hour meters use heat-sensitive elements to measure temperature rises produced by an increase in current flowing through the meter. A pointer moves in proportion to the temperature change, providing a record of demand. The pointer remains at peak level until a subsequent increase in demand moves it again, or until it is manually reset.

The EPM 9700 meter mimics traditional meters to provide Thermal Demand readings. Electronic thermal demand emulation is the logarithmic average of the power used, with a more recent load being weighted more heavily than a less recent load, (approximated exponentially). Each second, as a new power level is computed, a recurrence relation formula is applied. This formula recomputes the thermal demand by averaging a small portion of the new power value with a large portion of the previous thermal demand value. The occurrence of the proportioning of new to previous is programmable, set by the averaging interval. The averaging interval represents a 90 change in thermal demand to a step change in power. So, for example, with a 15 minute set interval, the meter will record 90 of a change in load in 15 minutes, 99 in 30 minutes, and 99.9 in 45 minutes.

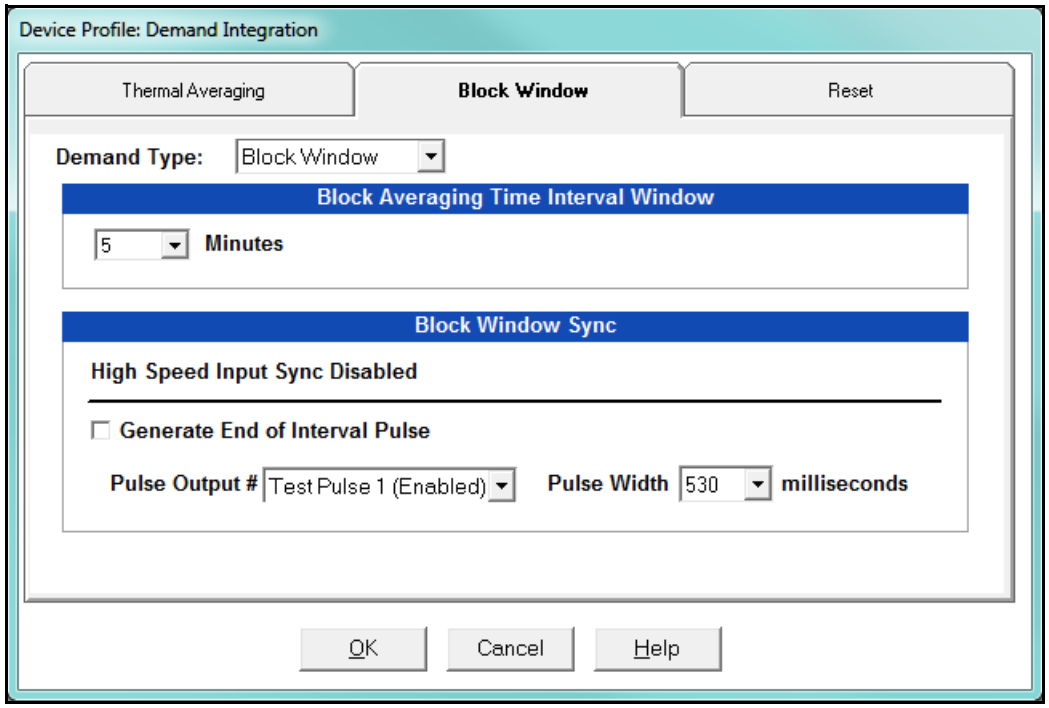
Because thermal demand emulation is the logarithmic average, the demand is not set to zero on a demand reset. On a demand reset, present demand becomes the new maximum demand.

The Max/Min Thermal Average Block Interval fields are used if you want to track the maximum and minimum Demand in more than one interval, e.g., the Max and Min Demand in a 10 minute (First Interval) and a 15 minute interval (Second Interval).

- **Block Window/Rolling Window**: select the type of Demand Averaging to use - Block or Rolling - from the Demand Type pull-down menu:

  Block Window settings: to set the length of the block interval used for Demand calculations and other interval-based functions; also used to set End of Interval pulse. Block averaging is also known as fixed window averaging. A window is the user set time range, e.g., 15 minutes. Computation is performed on that 15 minute

interval, and after that, a new set of computations will be started. For example, Window 1 will be from 0 to 15 minutes, Window 2 will be from 16 to 30 minutes, and so on.

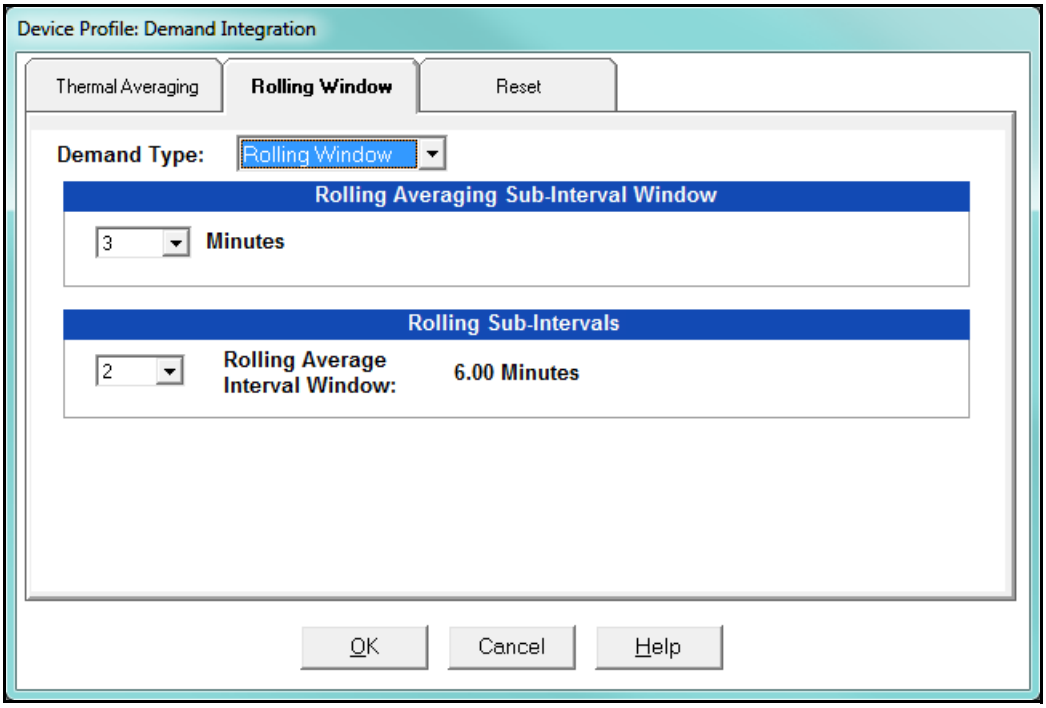


a. Use the Hours, Minutes, and Seconds fields to set the length of the Block Interval.

b. If you want to generate a pulse at the end of the set interval, click the box next to the Generate End of Interval Pulse field and select the number of the internal relay (1-4) you want to use and the pulse width (600 - 635 milliseconds).

NOTE: The Block Window Sync field indicates whether the meter is being synchronized with pulses from a High Speed input. This option is set in the Input Type field of the High Speed Inputs screen (see 26.3.5 *High Speed Inputs* on page 26–50).

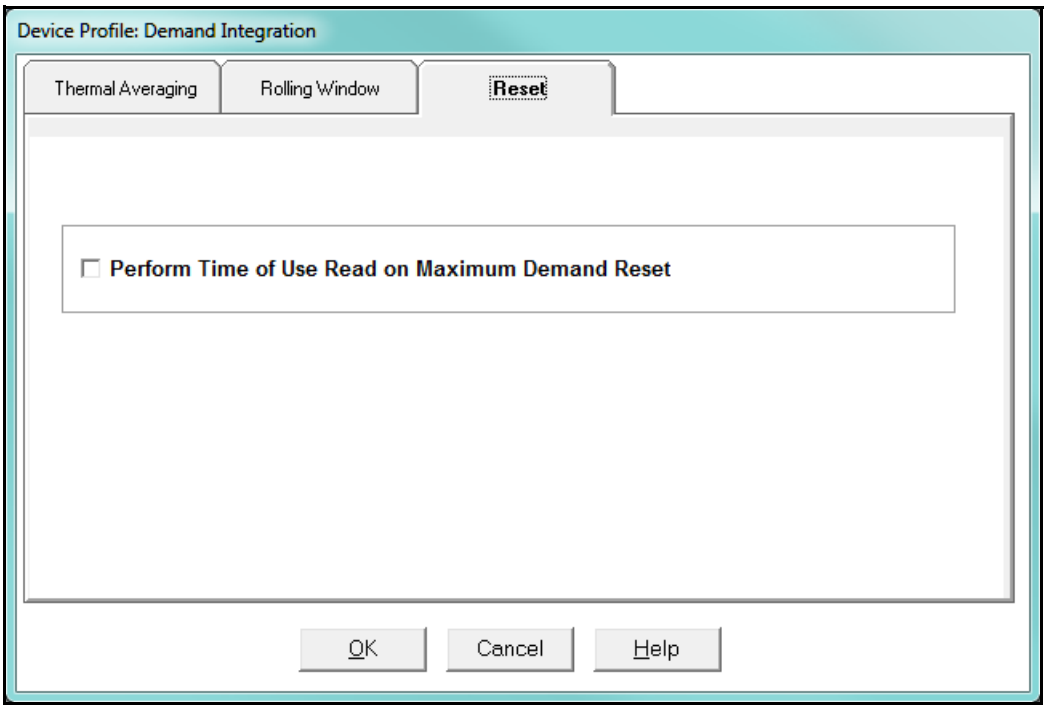
Rolling Window: also known as a sliding window, functions like multiple, overlapping Block averages. You define the subintervals at which an average of Demand is calculated. A window duration is the user set time, such as 15 minutes, but it moves, so that, for example, Window 1 is 0 to 15, Window 2 is 1 to 16, Window 3 is 2 to 17, and so on.



a. Set the Hours and Minutes fields under Rolling Averaging Sub-Interval Window.

b. Rolling Sub-Intervals: set the number of rolling windows you want to "string together." The display field shows the amount of time in the Rolling Average Interval Window (in the example screen above, 15 minute sub-intervals x 3 rolling sub-intervals = 45 minute rolling average interval window).

Reset: Allows you to specify a Time of Use read whenever Maximum Demand is reset.



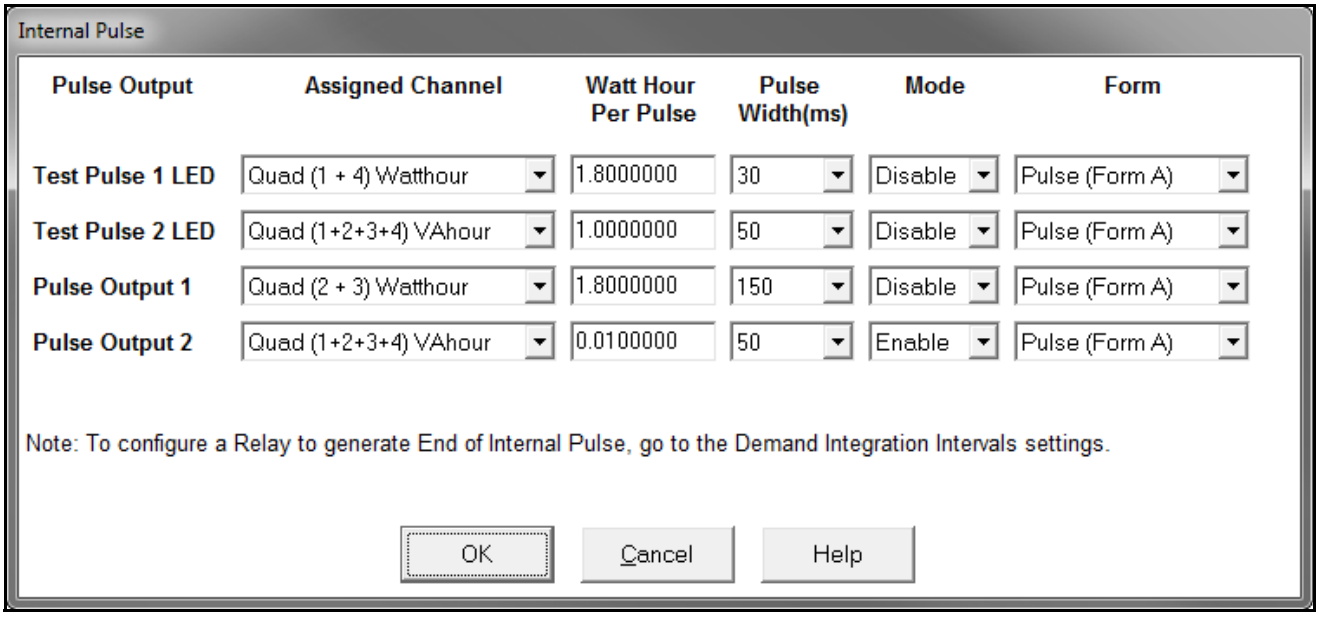
- Check the box to perform the TOU read. By selecting this, the meter will place all of the TOU values in the previous month's registers. Otherwise, the meter will default to self read based on a date set in the meter.
- Leave the box unchecked if you don't want to perform a TOU read.

4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

26.2.3 Internal Pulse

The Internal Pulse setting lets you assign channels to the meter's pulse outputs and to the test LEDs. The channel selection sets the type of pulse that will be generated. For example, the Test Pulse 1 LED can generate Energy Pulses for conventional testing or Reactive (VARh) Pulses for complex testing and approvals. This setting also allows you to determine the frequency and duration of the pulse for each output and LED.

1. From the Revenue and Energy Settings menu, click on the + button next to Internal Pulse or double-click on the Internal Pulse line. You will see the screen shown below.



2. To make selections on this screen:
   - Select the assigned channel for the pulse/output. This is the demand that will be output as a pulse.
   - Enter Watt hour per pulse, pulse width, mode and form for each pulse/output.

NOTE

- Form A = Pulse; Form C = Transition
- No more than one Pulse Output can be assigned as an Operation Status Output.

3. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

Considerations on Setting KYZ Outputs

KYZ Pulses are produced at a rate proportional to the rate of energy accumulation, a feature that makes them useful for accuracy testing. Decreasing the value of the Watt Hour per Pulse field increases the pulse rate, improving the moment-to-moment precision of the output. The increased pulse rate means that the pulses are of shorter duration. Most equipment for detecting and counting pulses has a minimum detection time, so pulses that occur too rapidly might not be detected and counted.

The value in the Pulse Width field is used to force the meter to generate minimum width pulses in situations where proportional width pulses would occur too quickly to be measured. A pulse width setting that does not match appropriately with the input level and Watt hour per pulse setting will result in output that, in the short term, will not verify correctly.

For proper operation of this feature, the pulse width should be set to a value that is longer than the detection time required by the monitoring equipment, and shorter than the pulse period that the inputs and Watt hour per pulse setting would produce. The formula for the second quantity is:

$$\frac{3600 \text{ x } \textit{Watt-hr per pulse}}{\textit{Total Power}}$$

Some example cases are shown in the table below. For proper operation the pulse width should be set to a value that is less than the computed value of seconds per pulse.

Voltage Phase to Neutral/Phase		Current		Total Power Wh/ Pulse	Pulses/Hour	Seconds/Pulse
Volts	Volts	Amps	Watts	Wh	Pulses	Seconds
69.28	120.00	1	207.85	1.8000000	115.47	31.18
69.28	120.00	1	207.85	0.2078461	1000.00	3.60
69.28	120.00	5	1039.23	1.8000000	577.35	6.24
69.28	120.00	5	1039.23	1.0392305	1000.00	3.60
120.00	207.85	1	360.00	1.8000000	200.00	18.00
120.00	207.85	1	360.00	0.3600000	1000.00	3.60
120.00	207.85	5	1800.00	1.8000000	1000.00	3.60
277.13	480.00	1	831.38	1.8000000	461.88	7.79
277.13	480.00	1	831.38	0.8313844	1000.00	3.60
277.13	480.00	5	4156.92	1.8000000	2309.40	1.56
277.13	480.00	5	4156.92	4.15629219	1000.00	3.60

26.2.4 Transformer / Line Loss Compensation

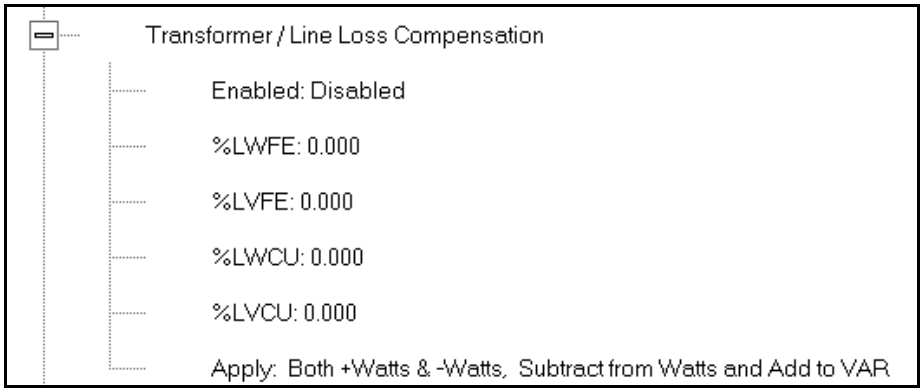
Transformer losses are power used by the transformer while working. The more load on the transformer, the higher the transformer losses. There are two types of transformer losses:

- No load losses - these are the fixed losses that keep the transformer up and running.
- Load losses - these vary with changes in the load.

When the meter is located on the secondary side of a customer's transformer, a utility will want to add the transformer losses into the energy usage calculation. However, this practice is regulated by local jurisdiction and regulations. The meter has the capability to add in or subtract out these transformer losses, depending on the user's specific needs.

Line losses are similar to transformer losses, except that they are used to compensate for loss incurred on wires, such as transmission lines.

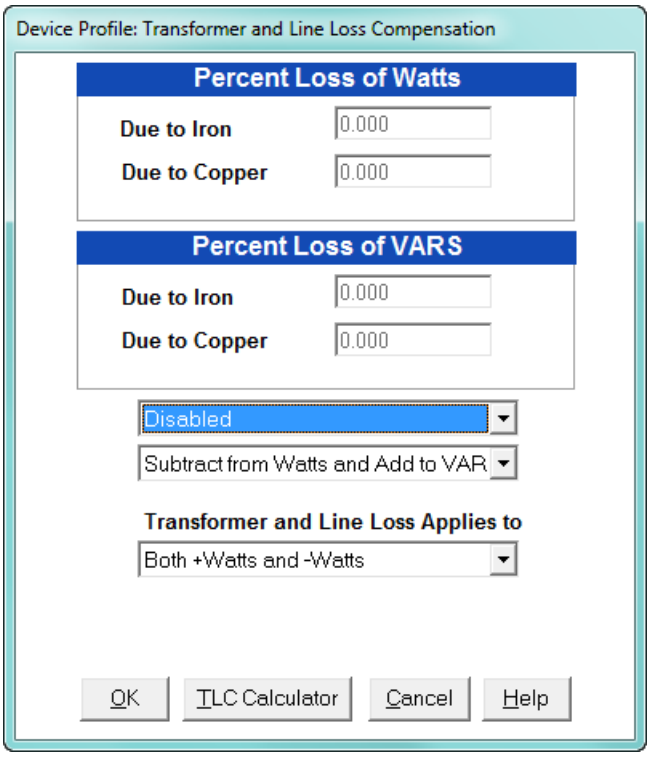
1. From the Revenue and Energy Settings menu, click on the + button next to Transformer/Line Loss Compensation or double-click on the Transformer/Line Loss Compensation line. You will see the submenu shown below.



2. The menu displays the current values for the meter's Transformer Loss Compensation.

- LWFE = percent loss of Watts due to iron
- LVFE = percent loss of Vars due to iron
- LWCU = percent loss of Watts due to copper
- LVCU = percent loss of Vars due to copper

1. Double-click on any of the loss values. You will see the screen shown below.



2. Click on **TLC Calculator** to find the values to enter into the Percent Loss fields. The TLC Calculator button launches the TLC Calculator that performs the calculations for you once the required data is entered.

NOTE

Appendix A contains screen captures of the TLC Calculator with example numbers, and an explanation of Loss Compensation considerations.

3. Enter the percent loss of Watts and VARS for copper and iron in the appropriate fields.
4. Enable or Disable Transformer Loss Compensation with the first pull-down menu at the bottom of the screen. The optional selections are:
   - Disabled
   - Iron (Fe) Only
   - Copper (Cu) Only
   - Both Iron and Copper (Fe and Cu)
5. With the second pull-down menu, select from the following options:
   - Add to Watts and Subtract from VAR
   - Subtract from Watts and Add to VAR
   - Add to Watts and VAR
   - Subtract from Watts and VAR
6. With the third pull-down menu, apply the loss based on the power flow direction by selecting one of the following options:
   - Both +Watts and -Watts

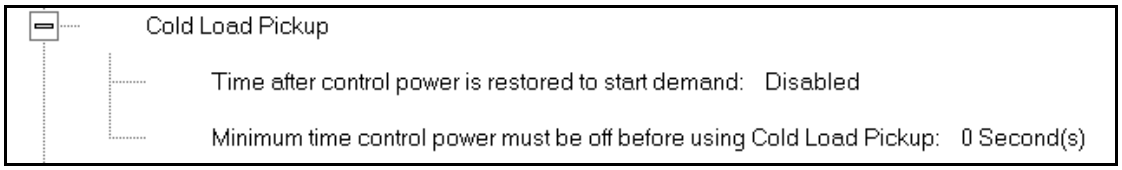
- -Watts only
- +Watts only

7. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

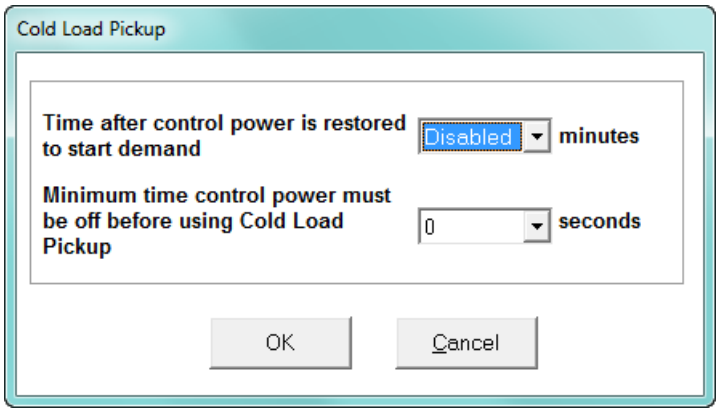
26.2.5 Cold Load Pickup

Cold Load Pickup is used to manage Demand in the event of a power outage. You set the amount of time (in seconds) power is off to identify a power outage that is the responsibility of the utility (as opposed to a very short term loss of power that is not their responsibility); then you set the amount of time (in minutes) you want to wait before Demand starts again. This time should correspond to the "grace" period the utility applies to avoid charging for motor startup, etc. after a power outage.

1. From the Revenue and Energy menu, click on the + button next to Cold Load Pickup or double-click on the Cold Load Pickup line. You will see the submenu shown below.



2. Double-click on one of the parameters to open the screen shown below.



3. Make the following selections in accordance with your application needs:
   - Time after control power is restored to start demand - can be 1 to 60 minutes, or Disabled.
   - Minimum time control power must be off before using Cold Load Pickup - can be from 0 to 255 seconds.
4. When all changes are entered, click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

26.2.6 Pulse Accumulations

Pulse accumulators are used to count and/or aggregate pulse information from external devices, using the High Speed inputs. These devices may be gas, water, or electricity meters; energy management systems; SCADA devices; or any pulse-generating device.

This section of the Device Profile displays a series of eight running totals available on the EPM 9700 meter. Each total can be added to (or subtracted from) other totals. This allows you to set the High Speed inputs located directly on the meter to accumulate pulses.

NOTE

If you use these inputs for pulse accumulations, do not set them to record waveforms - if you do, you will record endless waveforms.

1. From the Revenue and Energy Settings menu, click on the + button next to Pulse Accumulations or double-click on the Pulse Accumulations line. You will see the screen shown below.

Device Profile: Internal Input Pulse Accumulators Setup

Source	Units/Count	Aggregator	User Assigned Label	Mode	Average Full Scale
1	1	None	Accumulator1	Pulse (Form A)	1000000000000000
2	1	None	Accumulator2	Pulse (Form A)	1000000000000000
3	1	None	Accumulator3	Pulse (Form A)	1000000000000000
4	1	None	Accumulator4	Pulse (Form A)	1000000000000000
5	1	None	Accumulator5	Pulse (Form A)	1000000000000000
6	1	None	Accumulator6	Pulse (Form A)	1000000000000000
7	1	None	Accumulator7	Pulse (Form A)	1000000000000000
8	1	None	Accumulator8	Pulse (Form A)	1000000000000000

Source	Hour Reading	Aggregator
Device	Quadrant(1 + 4) Watt Hour	None

Aggregator	User Assigned Label	Average Full Scale
1	Aggregator 1	1000000000000000
2	Aggregator 2	1000000000000000
3	Aggregator 3	1000000000000000
4	Aggregator 4	1000000000000000

OK Cancel Help

2. High Speed inputs 1-8 are listed in order under Source. Enter the following information or use the pull-down menus to select:
   - Units/Count - this is the scale factor that normalizes the pulses so that they can be aggregated. Pulses are stored in primary values.
   - Aggregator - this allows you to place the pulse register into a separate accumulation register that can aggregate (add) or net (subtract) values.
   - User Assigned Label - this window allows you to enter a label designation for the source.

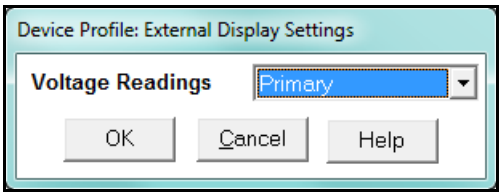
- Mode - you can set Pulse or Transition. A transition means from open to shorted/closed or from shorted/closed to open; a pulse contains 2 transitions, open to shorted/closed, followed by shorted/closed to open.
- Average Full Scale - for EPM 9700 meters, in order to set a limit on a reading it needs a Full Scale value as the 100 reference. You can set a limit on the average number of pulses per interval.
- Device Hour Reading and Aggregator - source device is the meter you are connected to. The Hour reading is either Quadrant 1 and 4 Watt-hour or Quadrant 2 and 3 Watt-hour. The Aggregators indicate whether the count should be added to, or subtracted from, Aggregators 1-4. You can choose None if you don't want the count to affect any of the Aggregators.
- Aggregators: The "buckets," or Totalizer fields where pulse counts from the High Speed inputs and from the Watt-Hour counters can be totaled. The user can assign a label to each of the Aggregators. See the Average Full Scale description above for an explanation of this field - it has the same use here, except for the Aggregators.

3. When all data has been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

26.2.7 External Display Options

Many utility companies want to read secondary volts and primary power readings. This setting configures a P40N+ external display to read either primary or secondary Volts. All other readings will be in the primary, regardless of this setting.

1. From the Revenue and Energy Settings menu, double-click on the External Display Options line. You will see the screen below.

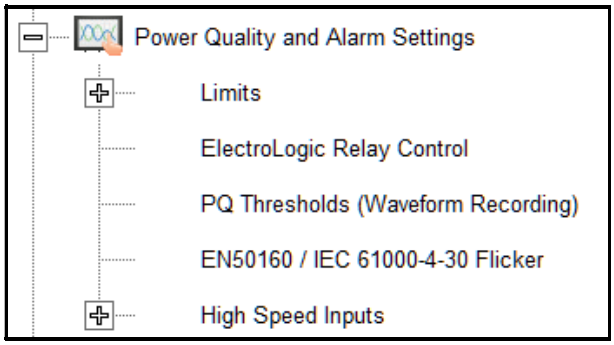


2. Use the pull-down menu to select either primary or secondary units for Voltage.
3. Click **OK** to return to the main Device Profile screen. For these changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

26.3 Power Quality and Alarm Settings

Power Quality and Alarm Settings are the third group of settings in the Device Profile.

1. From the Device Profile screen, click on the + button next to Power Quality and Alarm Settings or double-click on the Power Quality and Alarm Settings line. All of the settings in this group are listed.



2. Click on the programmable setting you want to modify. The following sections explain the settings in the order in which they appear in the Power Quality and Alarm Settings menu.

26.3.1 Limits

Limits are threshold settings that can be set by a user to trigger a record in a log when an alarm condition is met. Utilizing the limits, the user can then control a relay or send a warning email on that alarm.

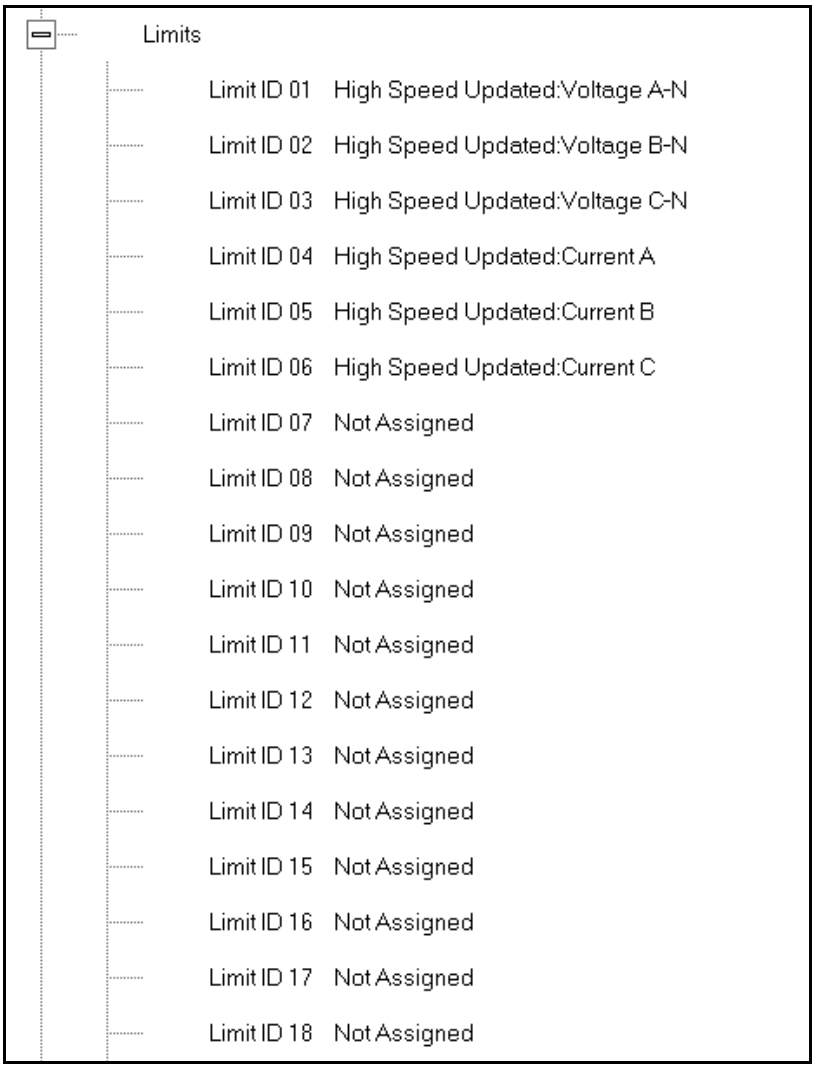
Limit settings are based on a percentage of the Full Scale (% of FS), which is set in the Limit and Waveform Full Scales setting (see 26.1.2 *Limit and Waveform Full Scales* on page 26–4). Full Scale is based on CT and PT ratios set in the CT, PT Ratios and System Hookup setting (see 26.1.1 *CT and PT Ratios and System Hookup* on page 26–3). Limits are based on a percent of Full Scale settings so that the same settings can be used no matter what the CT and PT Ratio needed.

Before programming limits, set the CT and PT ratios. Then, set the Limit and Waveform Full Scales if you want to change to automatic configuration. In most cases the software will configure the Full Scale optimally.

NOTE

The software automatically updates the Full Scale; however, you can set it separately from the CT and PT Ratios.

1. From the Power Quality and Alarm Settings menu, click on the + button next to Limits or double-click on the Limits line. You will see the submenu shown below.



This submenu displays the current Device Profile Limit settings. Not all limits are shown in the figure above: there are 32 Limit ID fields.

2. Double-click on any of the settings (Limit ID 01, for example). You will see the Limits screen, shown below.

Device Profile: Limits

Limit ID	Assigned Item	Limit 1			Limit 2			Combination Limit 3
		Setting	Setpoint		Setting	Setpoint		
			% of FS	Primary		% of FS	Primary	
1	High Speed Updated:Voltage A-N	Above	120.00	17.28K	Below	80.00	11.52K	AND
2	High Speed Updated:Voltage B-N	Above	120.00	17.28K	Below	80.00	11.52K	AND
3	High Speed Updated:Voltage C-N	Above	120.00	17.28K	Below	80.00	11.52K	AND
4	High Speed Updated:Current A	Above	120.00	6000.00	Below	80.00	4000.00	AND
5	High Speed Updated:Current B	Above	120.00	6000.00	Below	80.00	4000.00	AND
6	High Speed Updated:Current C	Above	120.00	6000.00	Below	80.00	4000.00	AND
7	Not Assigned	Below	0.00	0.00	Below	0.00	0.00	AND
8	Not Assigned	Below	0.00	0.00	Below	0.00	0.00	AND
9	Not Assigned	Below	0.00	0.00	Below	0.00	0.00	AND
10	Not Assigned	Below	0.00	0.00	Below	0.00	0.00	AND
11	Not Assigned	Below	0.00	0.00	Below	0.00	0.00	AND
12	Not Assigned	Below	0.00	0.00	Below	0.00	0.00	AND

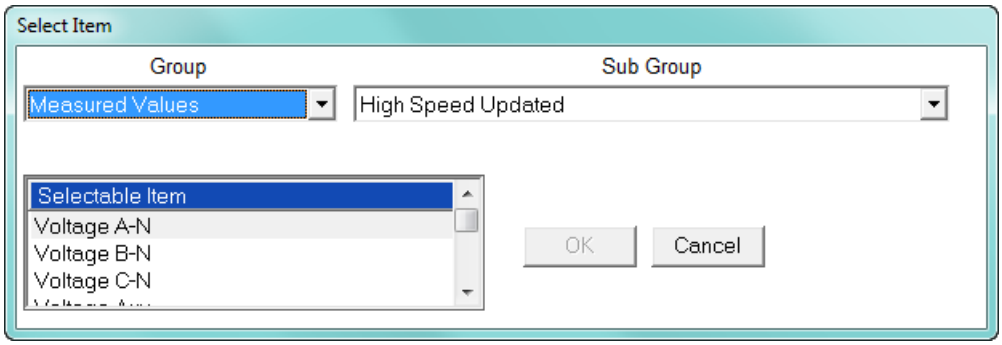
Channels	Primary Values at 100%
I A, B, C, Nc	5000.00
I Nm	5000.00
V Phase to Neutral	14.40k
V Aux	14.40k
V Phase to Phase	24.94k
Power Phase	72.00M
Power Total	216.00M
Frequency	60.00

OK Cancel Help

- This screen can be expanded to show all of the limits. Click on the top or bottom of the screen to display sizing arrows you can click on and drag to expand the screen.
- Percentage of Full Scale settings (% of FS): The limits are set in % of Full Scale so that when you create a profile, you can keep your settings. This is true, even though the CT and PT ratios change when the meter (or a new meter) is placed in a different location. Changing the CT and PT ratios does not affect the % of Full Scale limits previously set. This is useful when you are using large numbers of meters because one profile can be used with a common set of limit settings no matter what the CT and PT ratio. Full Scale reference information is available in the lower left box.

3. Make changes to this screen according to your application requirements.
   - To set the type of limit and the channel assigned to it:

     a. Double-click in either the Limit ID or Assigned Item column. You will see the screen shown below.



b. From the pop-up menus, choose the desired settings and click OK. Following is a list of the available Groups, Sub Groups, and Items.

Group: Measured Values
Sub Group: High Speed Updated
Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A
VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Volts A-Aux Phase Angle

Sub Group: One second updated
Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A
VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Uncompensated VA A
Uncompensated VA B
Uncompensated VA C
Uncompensated VA Total
Uncompensated VAR A
Uncompensated VAR B
Uncompensated VAR C
Uncompensated VAR Total
Uncompensated Watt A
Uncompensated Watt B
Uncompensated Watt C
Uncompensated Watt Total
THD Volts A
THD Volts B
THD Volts C
THD Current A
THD Current B
THD Current C

K Factor Current A
K Factor Current B
K Factor Current C
Internal Temperature
Sub Group: Harmonic Values
Item: 0 - 127th Harmonic on selectable Harmonic Magnitude
(Voltage Phases A, B, and C; Current Phases A, B, and C)
Sub Group: Internal Inputs, States
Item: Internal Inputs 1-8
Sub Group: Phase Angles
Item: Phase A-N Voltage
Phase B-N Voltage
Phase C-N Voltage
Phase A Current
Phase B Current
Phase C Current
Phase A-B Voltage
Phase B-C Voltage
Phase C-A Voltage
Volts A-Aux Phase Angle
Voltage Phase Sequence
Sub Group: Flicker
Item: Flicker: PInst Volts A
Flicker: PInst Volts B
Flicker: PInst Volts C
Flicker: PST Volts A
Flicker: PST Volts B
Flicker: PST Volts C
Flicker: PLT Volts A
Flicker: PLT Volts B
Flicker: PLT Volts C
Group: Averages
Sub Group: Thermal Average
Item: Voltage A-N
Voltage B-N
Voltage C-N
Voltage Aux
Current A
Current B
Current C
Current N Measured
Current N Calculated
Voltage A-B
Voltage B-C
Voltage C-A
VA A
VA B
VA C
VA Total
VAR A

VAR B
VAR C
VAR Total
Watt A
Watt B
Watt C
Watt Total
Frequency
Power Factor A
Power Factor B
Power Factor C
Power Factor Total
Voltage Imbalance
Current Imbalance
Sub Group: Block Window Average
Item: VA
VAR
Watt
Sub Group: Pulse Accumulation/Aggregation Block Window Average
Item: Internal Inputs #1 - #8
Aggregators #1 - #4
Sub Group: Rolling Window Average
Item: Predictive VA
Predictive VAR
Predictive Watt
VA
VAR
Watt
Sub Group: Voltage and Current Means
Item: Volts PN
Current P
Volts PP
Group: External I/O Devices
Sub Group: Analog Input Modules
Item: Module 1: Analog Input 1 - Analog Input 8
Module 2: Analog Input 1 - Analog Input 8
Module 3: Analog Input 1 - Analog Input 8
Module 4: Analog Input 1 - Analog Input 8

- To designate the limit as either above or below a percentage of the Full Scale, click once in each Settings column and select the desired setting from the pull-down menu.
- To set the percentage of the Full Scale that will trip the limit, enter the value in the % of FS column. GE Communicator software automatically calculates the Primary value.

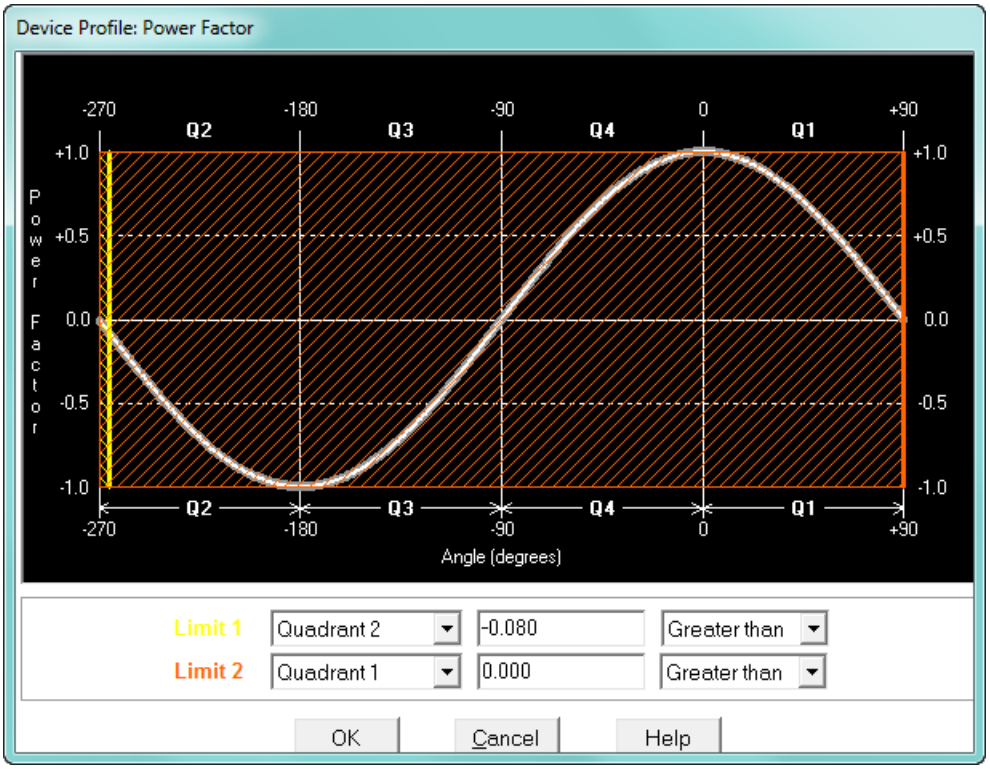
- Combination Limit 3 is the logical combination of Limit 1's state and Limit 2's state.

  Example 1
  Limit I D
  Type: 1 Second Readings
  Channel: Volts AN
  Limit 1 Setting: Limit exceeded if Volts AN is below 120 F.S.
  Limit 2 Setting: Limit exceeded if Volts AN is above 80 F.S.
  Combination Limit 3 Setting: AND
  If Limit 1 AND Limit 2 are tripped (e.g., the reading is 100F.S.), then Limit 3 is tripped.

  Example 2
  Limit I D
  Type: 1 Second Readings
  Channel: Volts AN
  Limit 1 Setting: Limit exceeded if Volts AN is above 120 F.S.
  Limit 2 Setting: Limit exceeded if Volts AN is below 80 F.S.
  Combination Limit 3 Setting: OR
  If either Limit 1 OR Limit 2 is tripped (e.g., the reading is 75), then Limit 3 is tripped.
- Full Scales settings are shown in the lower left of the screen. These values are set in the Limits and Waveform Full Scales section of the Device Profile (see 26.1.2 *Limit and Waveform Full Scales* on page 26–4).

4. Power Factor is broken into four quadrants. Selecting the Full Scale value brings up a screen that lets you set a limit in two of the four quadrants.

- To set the power factor limits, double click on any of the power factor settings in the Limit 1 or Limit 2 columns. You will see the Power Factor screen.



- To set a limit: from the pull-down menus, select a quadrant and Less Than or Greater Than (Full Scales). Enter the power factor number. The graph will illustrate your selections by shading the out of limit bands. The area of the graph not covered by shading is within normal operational range.
  NOTE: Whether you see method 1 Quadrants (Q1 +Lag, Q2 -Lag, Q3 -Lead, Q4 +Lead) or method 2 Quadrants (Q1 +Lag, Q2 -Lead, Q3 +Lag, Q4 -Lead) depends on the setting in the Power Factor Display field of the Labels setting (see 26.1.4 *Labels* on page 26–10).

NOTE

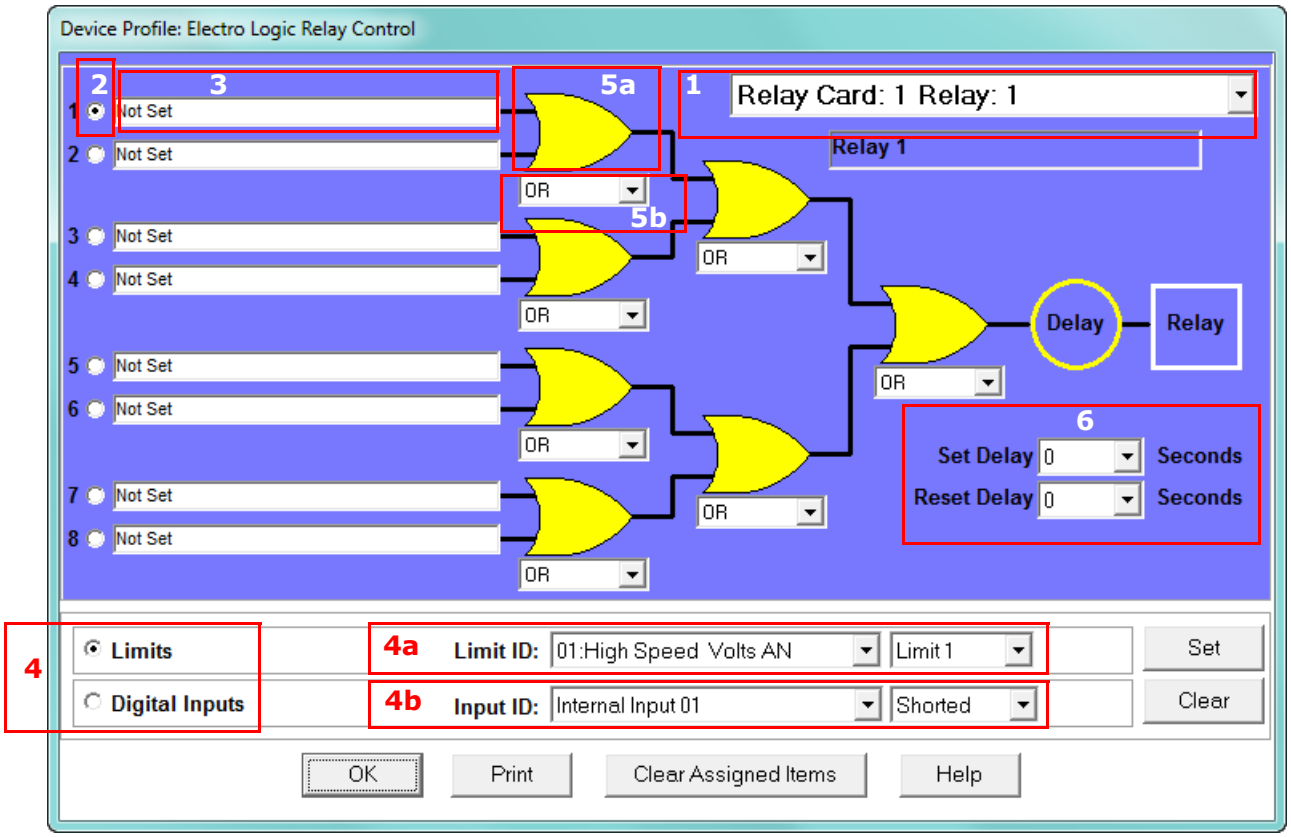
The EPM 9700 device is a four-quadrant meter. Therefore, limits can be set for capacitive and inductive PF when generating or consuming power.

5. When all settings are complete, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

26.3.2 Electrologic™ Relay Control

1. From the Power Quality and Alarm Settings menu, double-click on the ElectroLogic™ Relay Control line. You will see the screen shown below.

Figure 26-1: ElectroLogic Relay control screen



ElectroLogicTM Relay Control lets you set up a logic tree to control the meter's optional relays. Each relay can be programmed individually. The end result of the logic tree is to set, or not set, a relay, with an optional programmed Set Delay and/or Reset Delay. The initial inputs to the logic tree are chosen from among the 32 Limits and 40 Digital Inputs (both internal and external inputs). The gates, in several stages, perform logical combinations (AND, OR, etc) on pairs of inputs (either initial inputs or the outputs of earlier gates), and in combination produce an ultimate "true" or "false" state to drive the relay open or closed.

For example, one of the gates is AND. For data to pass an AND gate, both pieces of data must be "true." For a Limit to be true, the data must be in the Out-of-Limit condition on either Limit 1, Limit 2, or both (you decide which). For a Digital Input to be true, it must be in the condition you specify - either Open or Shorted.

The gates used in ElectroLogicTM Relay Control are used as follows:

OR: If either or both of the two conditions are true, the gate is passed

AND: If both of the conditions are true, the gate is passed

Hysteresis: For Limits only, the if the Limit is within the programmed hysteresis value, the gate is passed

XOR: If either of the two conditions are true, but not both, the gate is passed

NOR: If either of the two conditions are true, the gate is not passed

NAND: If both of the two conditions are true, the gate is not passed

NHysteresis: For limits only, if the Limit is within the programmed hysteresis value, the gate is not passed

NXOR: If either of the two conditions are true, but not both, the gate is not passed

NOTE

See Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.

2. To assign an item to the Relay Logic tree:

   a. Select the relay card/module from the pull-down menu - see number 1 in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.

   b. Select an input for the tree by clicking on a radio button next to numbers 1 through 8 - see number 2 in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.

   c. Choose Limits or Digital Inputs by clicking on the radio button in front of the word - see number 3 in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.

   d. From the pull-down menus, select the limit (Limit ID) or input (Input ID) you want to assign to this Relay Logic tree input (step b) - see number 4 in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.

   - For a limit, use the second pull-down menu to select Limit 1, Limit 2, or Combination - see number 4a in the screen on the previous page.
   - For an input, use the second pull-down menu to select Shorted or Open - see number 4b in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.

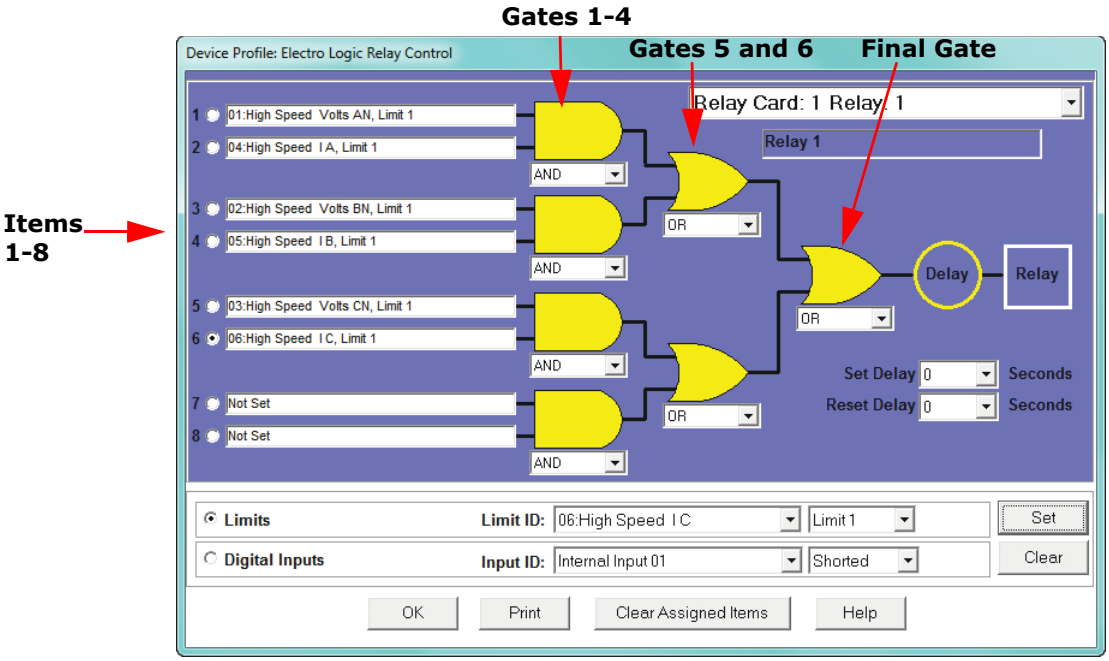
   e. Press **Set** to confirm your selection. The software places the selection in the appropriate field in the screen.

3. After you assign all the Relay Logic inputs, select the gates that will be used to combine the logic to trigger the relay. To select a gate type, either:
   - Click on the gate (yellow fields) - see number 5a in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.
   - Choose a gate type from the pull-down menu below the gate - see number 5b in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.
4. If you want, select **Set Delay** and **Reset Delay** from the pull-down menus. You can choose between 0 and 255 seconds. Use these fields if you want to program a delay before the relay is set, or before it is reset - see number 6 in Figure 26-1: *ElectroLogic Relay control screen* on page 26–39.
5. To change items on the Relay Logic tree, follow the previous steps.
   - To clear an item from the Relay tree, click on that item and click the Clear button.
   - To clear all items from the Relay Tree, click the Clear Assigned Items button.
6. When all settings are complete, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

NOTE

In order to use this screen, you must have purchased at least one Relay Option card or one External Relay Output module. For more details on external Output modules, see Chapter 14 “External I/O Modules”.

Figure 26-2: Example of an ElectroLogicTM Relay Logic Tree:



Inputs 1 through 8 are set to High Speed Volts AN Limit 1, High Speed Amps A Limit 1, High Speed Volts BN Limit 1, High Speed Amps B Limit 1, High Speed Volts CN Limit 1, High Speed Amps C Limit 1, Not Set and Not Set. The four first gates are AND gates, and the remaining three gates are OR gates.

Each first level gate looks at the state of the two limits, and the result is "true" if and only if both the inputs (Voltage Limit and Current Limit) are "true" (Out-of-Limit Condition). The second and third level gates look at the state of the earlier gates, and their results are "true" if either one (or both) of the previous gates are "true". The end result is a relay that is energized if one or more of the three phases (A, B, and/or C) is currently Out-of-Limit on both its voltage and current Limit 1 tests.

26.3.3 PQ Thresholds (Waveform Recording)

The PQ Thresholds/Waveform Recording capability allows the meter to act as a high-speed waveform recorder to record any anomaly that occurs within a cycle of duration. This provides a user with advanced waveform analysis including pre- and post- waveform recording.

The meter has the capability to record both surges and sags of the measured signals. A voltage surge is any event that increases the RMS voltage for one cycle, calculated every half cycle. A voltage sag is a dip in the RMS of one cycle of voltage, calculated every half cycle. A current fault (or surge) is also calculated in the same manner. When the RMS value of any of these triggers exceeds the threshold settings, the meter will trigger a waveform capture.

The Power Quality (PQ) and Waveform Thresholds setting determines at what point the EPM 9700 meter executes a waveform capture and/or records a power quality event.

See Chapter 19 "Viewing Logs" for instructions on viewing Waveform and PQ logs.

PQ and Waveform Thresholds are given as a percentage of the Full Scales (% of FS). Set the Full Scales in the Limits and Waveform Full Scales setting of the Device Profile (see 26.1.2 *Limit and Waveform Full Scales* on page 26–4). Full Scales are based on the CT and PT ratios set in the CT, PT Ratios and System Hookup setting of the Device Profile (see 26.1.1 *CT and PT Ratios and System Hookup* on page 26–3).

Before programming the PQ and Waveform Thresholds, set the CT and PT ratios and the Limits and Waveform Full Scales.

Note on Sampling Rate: A higher sampling rate allows for transients to be monitored. Generally, the meter is set to take 1024 samples per cycle for this purpose. Lower sampling rates have advantages, however, because they allow you to record more cycles of information per event. Therefore, low sampling rates are better for long duration events, like motor starts or distribution faults. The meter enables you to tailor its recording for both these applications. For more information on sampling rate, see Table 26–1: *EPM 9700 Sampling Rate Chart (at 60 Hz)* on page 26–47.

1. From the Power Quality and Alarm Settings menu, double-click on the PQ Thresholds (Waveform Recording) line. You will see the screen shown below

Waveform and Voltage Interruption Settings

Voltage RMS Triggers | Current RMS Triggers

		Voltage RMS Triggers (Fixed)									
Voltage		Above Setpoints				Below Setpoints				Waveform Enable	PQ Enable
Channel				Return Hysteresis				Return Hysteresis			
ID		Value(%)	Primary	Value(%)	Primary	Value(%)	Primary	Value(%)	Primary		
1	AN	110.00	15.84k	108.00	15.55k	90.00	12.96k	92.00	13.25k	☑	☑
2	BN	110.00	15.84k	108.00	15.55k	90.00	12.96k	92.00	13.25k	☑	☑
3	CN	110.00	15.84k	108.00	15.55k	90.00	12.96k	92.00	13.25k	☑	☑
7	Aux	110.00	15.84k	108.00	15.55k	90.00	12.96k	92.00	13.25k	☐	☐

Limits are based on: ◉ Fixed RMS ○ U_{SR}

Group	Full scale
Volt AN, BN, CN	14.40k
Volt AB, BC, CA	24.94k
Volt Aux	14.40k
I A, B, C	5000.00
I N	5000.00

	Enabled High Speed Input Triggers							
Input #	1	2	3	4	5	6	7	8
Enabled	☐	☐	☐	☐	☐	☐	☐	☐

Sampling Rate 128 Samples per cycle @ 60Hz

Pre Trigger Cycles 24

Post Trigger Cycles 36

Total Waveform Capture Windows per event 1

OK Cancel Help

2. This screen allows you to set the voltage RMS triggers, the current RMS triggers, and the voltage transients triggers for waveform recording. It also allows you to set the voltage interruption settings for IEC61000-4-30 Class A recording. Use the tabs at the top of the screen to navigate between the voltage, current, and voltage transient and settings.

NOTE

- The Waveform clipping threshold for the EPM 9700 meter is 66.7A RMS and 1140V RMS on the secondary side of all channels.
- The High Speed Inputs field allows you to see which High Speed input is enabled for Waveform recording. You assign the High Speed input to its trigger in the High Speed Inputs screen. (Flicker is discussed in detail in Chapter 23.)
- Voltage and current Full Scale values are shown in the lower left corner of the screen.

3. The Voltage setpoints are used to record voltage type events, such as voltage surges and sags. To set the Voltage RMS triggers for a PQ event and waveform capture (Voltage RMS Triggers tab):

   a. Select either Fixed RMS or U_{SR} (radio buttons).

NOTE

NOTE on U_{SR} Setting:

The U_{SR} setting lets you configure waveform capture thresholds based on sliding reference voltage rather than Full Scale (see instructions on the next page). This is useful if you know your line voltage will be varying and you want the voltage reference to be adjusted accordingly.

The formula used is as follows:
$U_{sr}n = 0.9967 \times U_{sr\,(n-1)} + 0.0033 \times U_{(10/12)rms}$

where
$U_{sr}n$ is the present value of the sliding reference voltage;
$U_{sr\,(n-1)}$ is the previous value of the sliding reference voltage; and
$U_{(10/12)rms}$ is the most recent 10/12-cycle RMS value.

When the measurement is started, the initial value of the sliding reference voltage is set to the programmed input voltage. The sliding reference voltage is computed every 10/12-cycles. If a 10/12-cycle is flagged as being out-of-limits, that voltage is not used - the previous sliding reference voltage is used instead.

   b. If you select Fixed RMS:

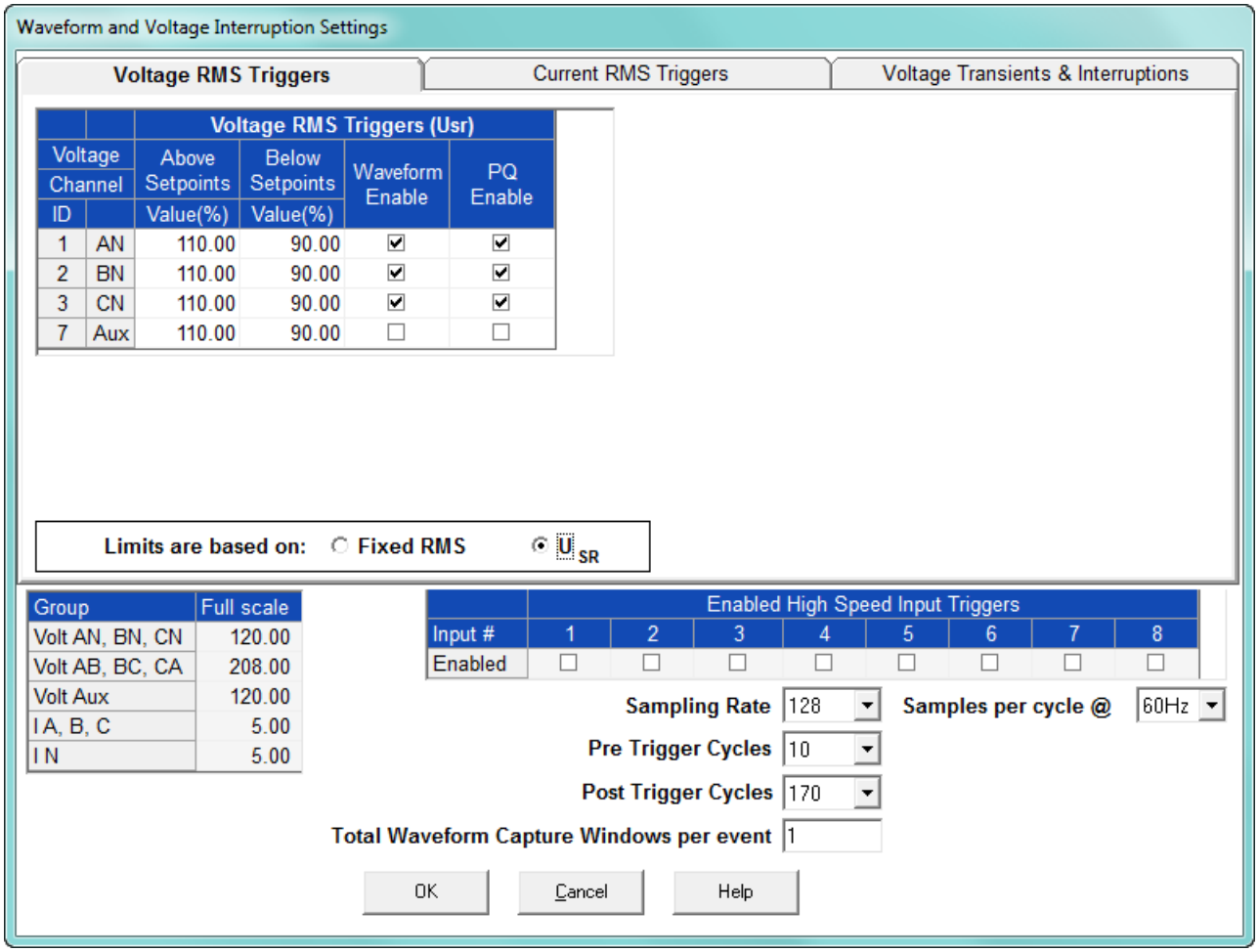
      i. Enter the desired percentage of Full Scale in the Value() column of the Above setpoints and Below setpoints sections. After you make an entry, the Primary field (display only) adjusts accordingly. When the RMS value crosses the setpoint, a capture is taken.

      ii. Enter the desired percentage for Return Hysteresis for the Above and Below setpoints. After you make an entry, the Primary field (display only) adjusts accordingly. Hysteresis is the value that must be met for the out of limit condition to be considered ended. Hysteresis is useful in preventing excessive out of limit conditions when the readings are hovering around a setpoint, since it dictates that the readings must recover to a certain level before dropping again in order for them to be considered out of limit.

      iii. Click the box(es) to enable Waveform Recording (Waveform Enable box) and/or PQ Recording (PQ Enable box).

c. If you have a load with slowly changing voltage, you probably do not want to use Full Scale as your reference point. In that case, you can use the U_{SR} function to set up a sliding reference voltage rather than a Full Scale voltage reference.
Follow these instructions:

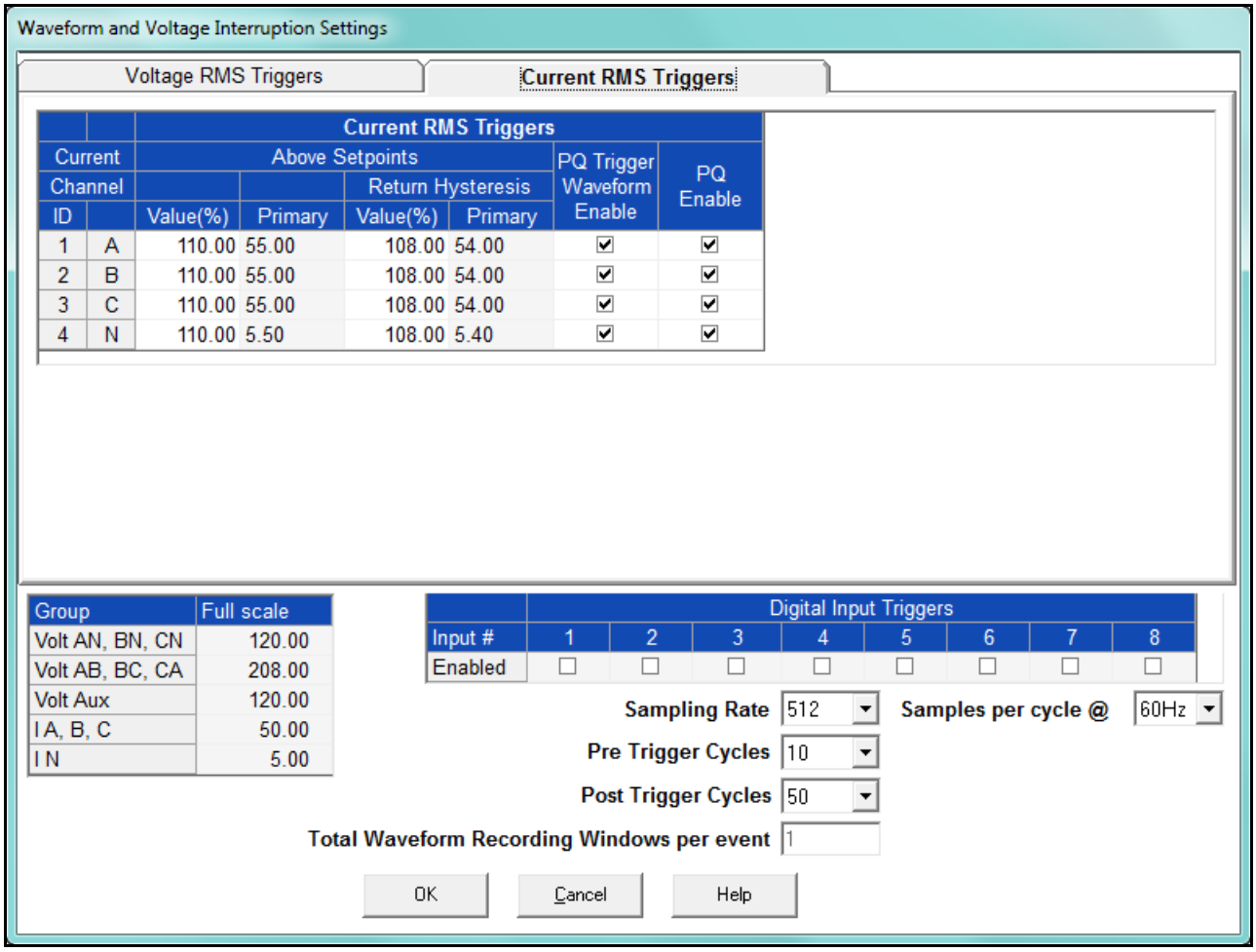
i. Click the U_{SR} button. The top of the screen changes as seen in the example below.



ii. Enter the desired percentage of the sliding reference voltage in the Value(%) column of the Above setpoints and Below setpoints sections.

iii. Click the box(es) to enable Waveform Recording (Waveform Enable box) and/or PQ Recording (PQ Enable box) when the setpoints are exceeded.

4. To set the current RMS triggers for a PQ event and waveform capture (Current RMS Triggers tab - see the example screen below):



a. Enter the desired percentage of Full Scale in the Value(%) column of the Above setpoints section. After you make an entry, the Primary field (display only) adjusts accordingly.

b. Enter the desired percentage for Return Hysteresis for the Above setpoints. After you make an entry, the Primary field (display only) adjusts accordingly. Hysteresis is the value that must be met for the out of limit condition to be considered ended. Hysteresis is useful in preventing excessive out of limit conditions when the readings are hovering around a setpoint, since it dictates that the readings must recover to a certain level before dropping again in order for them to be considered out of limit.

c. Click the box(es) to enable Waveform Recording (Enable box) and/or PQ Recording (PQ Enable box).

NOTE

The current setpoints are used to record faults on the line or in-rush currents from devices such as motors. Typically, to catch these events, set the limit to above 200% of Full Scale. As a general rule you do not want to set either any below current thresholds because that will trigger waveforms when the current drops, since this setting will constantly trigger waveforms.

5. Select the number of samples per cycle to be recorded from the Sampling Rate field's pull- down menu. Choose from 16, 32, 64, 128, 256, 512 or 1024 samples per cycle. The number of samples per cycle you choose above 128 samples per cycle affects the number of cycles per capture.

   The following table shows the effects of sampling rate on the number of cycles captured. Increasing the sampling rate increases waveform resolution; but for higher sampling rates, reduces the length of the observed window. The approximate length of the observed window is shown in the last column.

NOTE

- The table shows sampling data for 60 Hz systems.
- The table shows values for one waveform capture window. If you have more than one waveform capture window, the maximum time per capture increases.

Table 26–1: EPM 9700 Sampling Rate Chart (at 60 Hz)

Samples per Cycle	Channels		Samples per Channel	Cycles per Channel per Window*	Time (approx.)
	Analog pts	Digital Inputs			
16	6	8	2880	180	3 sec
32	6	8	5760	180	3 sec
64	6	8	11520	180	3 sec
128	6	8	23040	180	3 sec
256	6	8	30720	120	2 sec
512	6	8	30720	60	1 sec
1024	6	8	40960	40	0.6 sec

6. You can select Frequency - either 60Hz or 50Hz - from the pull-down menu next to “Samples per cycle @”. This is only to help you decide what options to select - it does not affect the meter.
7. From the Pre-Trigger Cycles and Post-Trigger Cycles fields' pull-down menus, select the number of cycles you want to record before and/or after the triggered recording. See the table above for the maximum cycles per capture for each sampling rate.
8. The Total Waveform Recording Windows per event is fixed at 1, and cannot be changed.

NOTE

Note on CBEMA (PQ Recording):

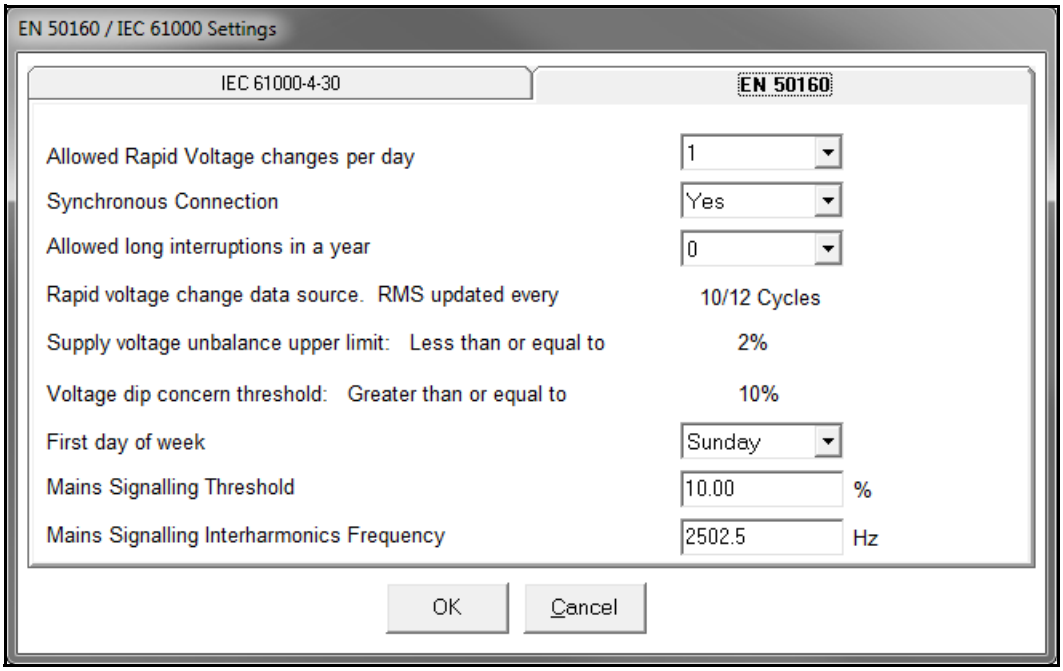
CBEMA plotting is a power quality standard known worldwide for recording the amount of damage Voltage transient conditions have done to the equipment being monitored. The meter automatically records this information. For CBEMA purposes, program internal set points for Voltage below 90 and above 110 of Full Scale (+/- 10 from the nominal Voltage). These set points are defined by the ITI (CBEMA) specification. The ITI (CBEMA) Curve is published by Information Technology Industry Council (ITI) and is available online. You can set a recording with tighter Voltage limits to trigger a waveform recording. However, CBEMA plotting is based only on the limits internally set.

9. When all changes are entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

26.3.4 EN 50160/IEC 61000-4-30 Flicker

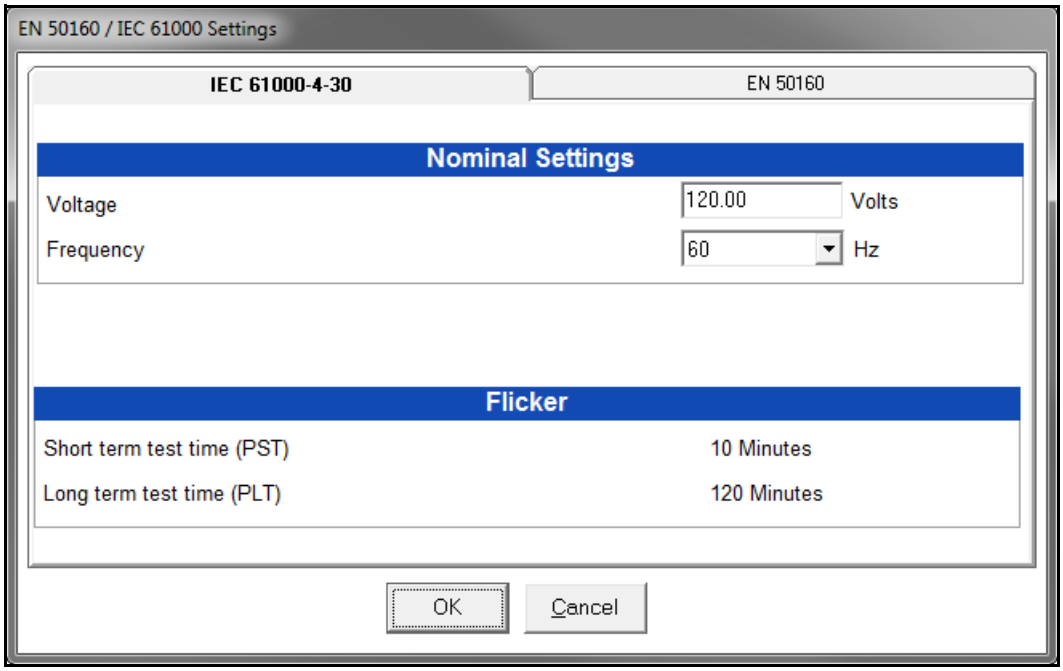
Using the EN 50160/IEC 61000-4-30 Flicker screen, you make the settings needed for Flicker reporting.

1. From the Device Profile screen double-click on the EN50160/IEC61000-4-30 Flicker line. You will see the following screen, which has two tabs.



2. The initial tab is the EN 50160 tab. Some of the fields are display only and cannot be changed. You can select the following settings from their pull-down menus:
   - Allowed Rapid Voltage changes per day: this field determines how many rapid voltage variations are allowed before they are considered a fault condition, and reported - select between 1 and 50.
   - Synchronous Connection: this field specifies whether the system has a synchronous connection to another system - select Yes or No.
   - Allowed long interruptions in a year: this field determines how many long voltage interruptions per year are allowed, before they are considered a fault, and reported - select between 1 and 100.
   - First day of the week: for the report, select Sunday or Monday as the first day of the week.
3. Enter the Mains Signaling Threshold.
4. Enter the Mains Signaling Interharmonics Frequency (in Hz).

5. Click the IEC-61000-4-30 tab.



6. Enter:
   - Voltage: enter the Nominal voltage.
   - Frequency (50 or 60Hz) - this field is used to calculate the harmonics and interharmonics associated with the set fundamental frequency. Select the frequency from the pull-down menu.
7. Short Term Test Time and Long Term Test Time are display only and cannot be changed.
8. When all changes have been entered, click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

NOTE

Flicker is discussed in detail in Chapter 23.

26.3.5 High Speed Inputs

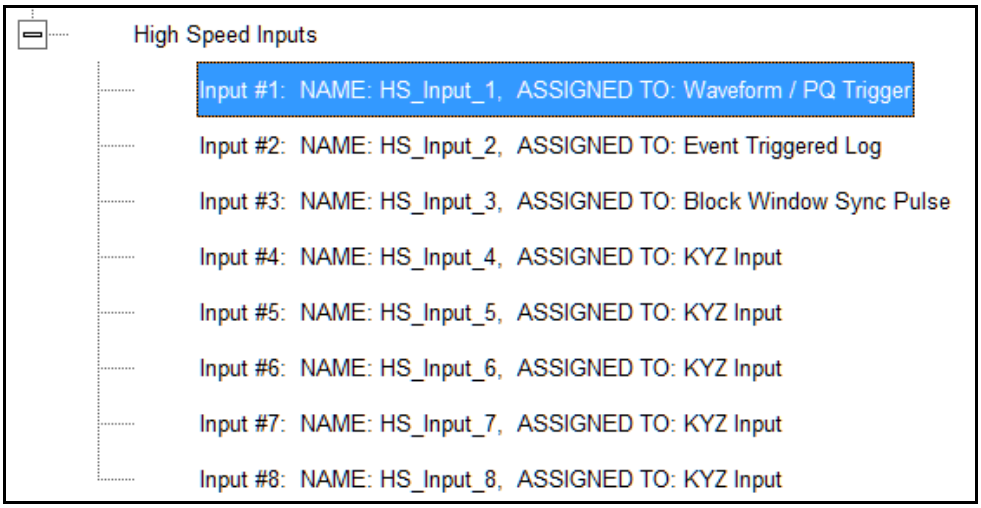
The EPM 9700 meter's built-in High Speed Inputs can be used in two ways:

- Attaching status contacts from relays, breakers or other devices for status or waveform initiation
- Attaching the KYZ pulse outputs from other meters for pulse counting and totalizing

Even though these inputs are capable of being used as high speed digital fault recording inputs, they serve a dual purpose as KYZ counters and totalizers. The function in use is programmable in this setting of the Device Profile, which lets you label the eight High Speed inputs and to specify their status.

- Labeling the inputs allows you to determine the source of status change when data is later analyzed.
- This feature lets you set the High Speed Inputs' status as a KYZ input, a trigger for waveform capture or PQ recording, a trigger for logging, or a means of synchronizing the meter.
- In the Pulse Accumulations setting (see 26.2.6 *Pulse Accumulations* on page 26–28), you can assign the High Speed Inputs' counts to be accumulated in one of four internal Aggregators of the meter.
- You can use Historical Log 2 for logging High Speed Input transitions.

1. From the Power Quality and Alarm Settings menu, double-click on the High Speed Inputs line or click on the + button next to it. You will see the submenu shown below.



2. Double-click any of the Input lines. You will see the screen below.

Device Profile: High Speed Digital Input Assignments

Input ID	Name	Open Label	Shorted Label	Normal Condition	Input Type
1	HS_Input_1	open	shorted	Open	Waveform / PQ Trigger
2	HS_Input_2	open	shorted	Open	Event Triggered Log
3	HS_Input_3	open	shorted	Open	Block Window Sync Pulse
4	HS_Input_4	open	shorted	Open	KYZ Input
5	HS_Input_5	open	shorted	Open	KYZ Input
6	HS_Input_6	open	shorted	Open	KYZ Input
7	HS_Input_7	open	shorted	Open	KYZ Input
8	HS_Input_8	open	shorted	Open	KYZ Input

OK Cancel Help

3. Double-click a field to enter the following:
   - Name.
   - Open Label.
   - Shorted Label.
   - Normal Condition: Open or Shorted.
4. Click on the Input Type field to select an option from the pull-down menu. The available selections are:
   - KYZ Input - select this option to designate the input as a pulse (KYZ) input.
   - Waveform/PQ Trigger - select this option if you want the input to trigger a waveform/PQ recording (see 26.3.3 *PQ Thresholds (Waveform Recording)* on page 26–42).
   - Block Window Sync Pulse - select this option if you want to synchronize the meter with pulses from the input (see Section 26.2.3 *Internal Pulse* on page 26–23).
   - Event Triggered Log - select this option if you want the input to trigger logging. Logging occurs when the input's state changes from Open to Closed. Only one High Speed input at a time can be set for Event Triggered logging. You must also set the length of logging and the parameters to be logged (see 26.4.1 *Programming the Trending Log Time Intervals* on page 26–52 and 26.4.2 *Programming the Trending Setup* on page 26–55).
5. When you have finished making your selections, click **OK** to exit the screen and return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

26.4 Trending Profile Settings

This section of the Device Profile enables you to configure parameters for the EPM 9700 meter's eight historical logs.

1. From the Device Profile screen, click on the + button next to Trending Profile Settings or double-click on the Trending Profile Settings line. You will see the menu shown below.

2. Double-click on one of the Trending lines to access the programming screens.

NOTE

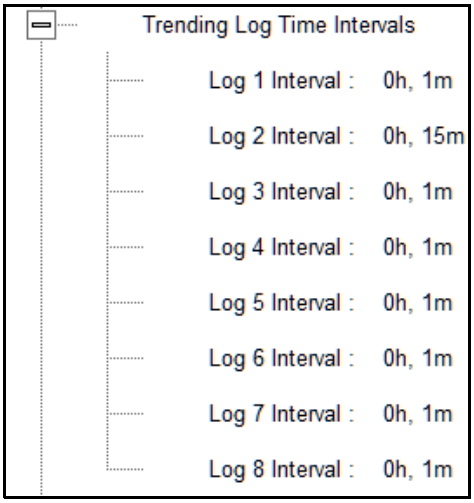
NOTE on Load Profile Recording:

oad Profile recording is a subset of the EPM meter's more general logging and trending capability. The same screens are used for setup, but Load Profile recording only deals with accumulated values; Energy (Wh), reactive Energy (VARh) and apparent power (VAh). Historically, Load Profile recording referred to recording of quadrant 1 Energy (Wh) because electromechanical meters only measured energy and were designed to prevent reverse rotation outside of quadrant 1.

26.4.1 Programming the Trending Log Time Intervals

The Trending Log Time Intervals setting determines the interval at which the Historical logs take a "snapshot" of data. To set the parameters for the logs, see 26.4.2 *Programming the Trending Setup* on page 26–55. See Chapter 16 "Databases and Log Data" for information on retrieving logs and Chapter 19 "Viewing Logs" for information on viewing logs.

1. From the Trending Profile Settings menu, double-click Trending Log Time Intervals or click the + button next to it. You will see the submenu shown below. The submenu shows the interval set for the Historical logs. If one of the High Speed inputs has been assigned to the Event Triggered log, the event Triggered Log will be shown after Log 8 in the submenu.

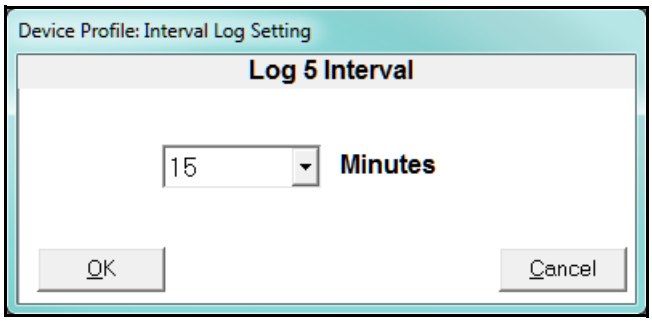


2. To change the interval for a Historical log, double-click on one of the logs.

NOTE

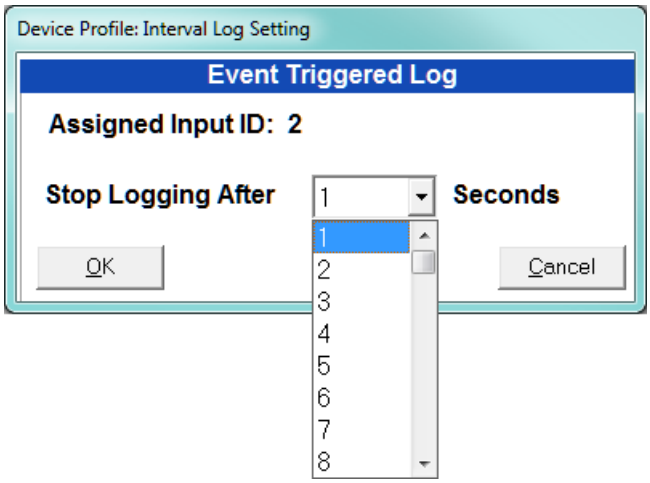
NOTE: You can also access the Interval setting screens from the Trending Setup screens (see 26.4.2 *Programming the Trending Setup* on page 26–55).

3. You will see the screen shown below.



4. Select the interval you want for the log from the pull-down menu: 1, 3, 5, 10, 15, 30 or 60 minutes.

5. If one of the High Speed Inputs has been set up as a trigger for logging, you will see the setting screen shown below.



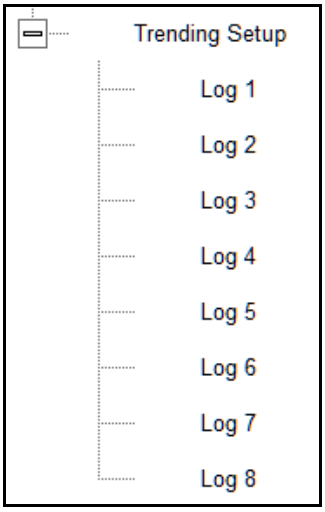
Select the number of seconds the log should record when a High Speed Input transition triggers recording, e.g., if you select 10 seconds, a transition will trigger recording of the log's parameters for ten seconds, and then stop until the next transition triggers recording for another 10 seconds. You can choose between 1 and 60 seconds.

6. Click **OK** to save your changes. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

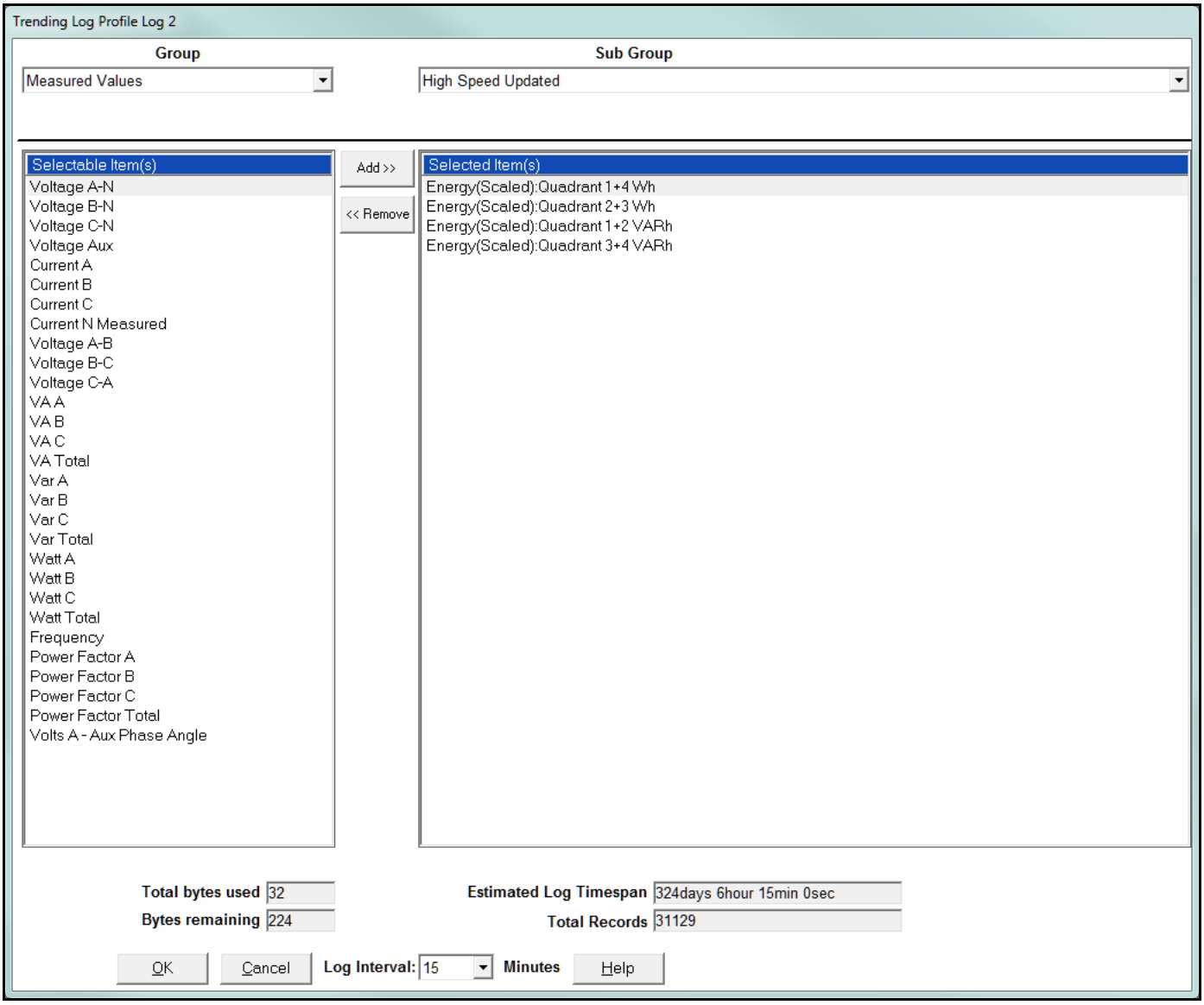
26.4.2 Programming the Trending Setup

The Trending Setup controls the channel assignments for the Historical logs. See Chapter 16 “Databases and Log Data” for information on retrieving logs and Chapter 19 “Viewing Logs” for information on viewing logs.

1. From the Trending Profile Settings menu, click on the + button next to Trending Setup or double-click on the Trending Setup line. You will see the submenu shown below. If one of the High Speed inputs has been assigned to the Event Triggered log, the event Triggered Log will be shown after Log 8 in the submenu.



2. Double-click on the log whose settings you want to configure. You will see the Trending Log Profile screen for the log you selected. An example screen is shown below.



3. Make changes to this screen according to your application requirements.

   a. **Group**: Using the pull-down menu, select the type of snapshot. The options are: Measured Values, Averages, Accumulators, Interval Accumulators, External Output Devices, TOU Cumulative Dmd.

   b. **Sub-Group**: Using the pull-down menu, select a channel for the snapshot. The options are: Fifty Millisecond Updated; One Second Updated; Harmonic Values; Internal Inputs, States; Phase Angles; Flicker.

   c. **Sub-Group 2**: With some selections, a second sub-group field will be shown underneath the first one. Select a value for this field from the pull-down menu.

d. Highlight items in the Selectable Items(s) box and click **Add** to include the selections in the Log. The items will be copied to the Selected Item(s) box. To remove an item from the log, highlight the item in the Selected Item(s) box and click **Remove** or double-click the item. The item will be removed from the Selected Item(s) box.

NOTE

- To select multiple items, hold Control while highlighting the items.
- To select a range of items, click the first item, hold Shift, and click the last item.
- Move the cursor to the lower left corner of an item, or group of items, to view its size in bytes.

e. Click **Check HHF** if you want to check if current settings are compatible with the HHF Converter.

NOTE

You will not see the HHF options unless you have enabled the HHF converter using the Options menu. See Chapter 20 "Other Functions and Screens" for instructions, and see Chapter 16 "Databases and Log Data" for HHF information.

f. The Total bytes used and Bytes remaining fields display the amount of memory used for each record of the log. The meter assumes 256 bytes of memory for each record. Total memory is determined at time of purchase.

g. The Estimated Log Timespan field displays the length of the time between the first and last records in the log when it is full.

h. The Total Records field displays the total number of records that will be in the log when it is full.

i. You can set the log interval bu selecting it from the pull-down menu next to Log Interval: you can select 1, 5, 10, 15, 30 or 60 minutes.

4. When all changes have been entered, click **OK** to return to the main Device Profile screen. For any changes to take effect, you must click the **Update Device** button to send the new profile to the meter.

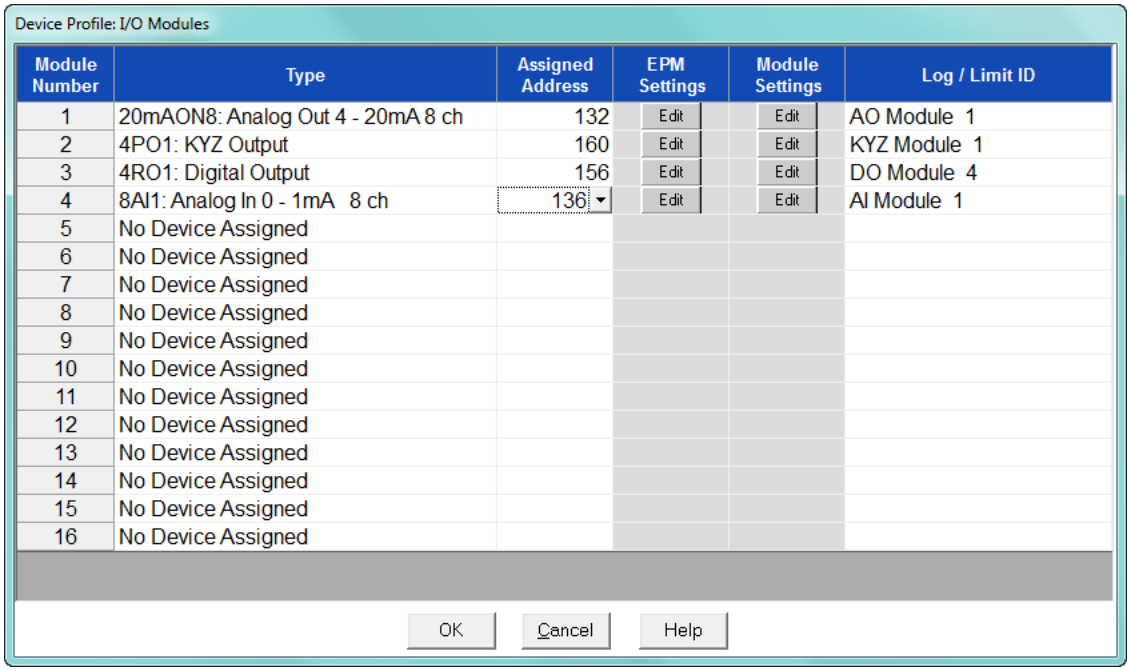
26.5 External I/O Modules

The EPM 9700 meter offers expanded I/O through external I/O modules. These modules add both analog and digital inputs and outputs to the meter to greatly expand the capability of the instrument.

This setting of the Device Profile lets you set up the meter's optional external Input/Output modules (see Chapter 14 for more information on the I/O modules) and RTU Master settings. I/O modules work as Modbus slave devices. The meter polls these modules to get the data from them. I/O modules generally have default RS485 Modbus addresses, so, they don't have to be configured. Once you set up which module you want, put in the default address and start with the basic configuration of readings you want to gather.

26.5.1 Configuring the Input/Output Modules

1. From the Device Profile screen, double-click on the External I/O Modules icon. You will see the screen shown below.



2. Click in the Type column and use the pull-down menu to select the specific module you want to add. The Assigned Address, EPM Settings, and Module settings you can make depend on the module you are configuring. The modules and settings are as follows:

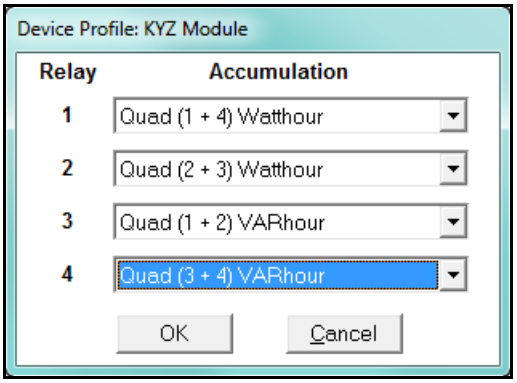
Module	Assigned Address*	EPM Setting**	Module Setting
4PO1 - KYZ Output	160*	Click to Edit Relay Accumulations	Click to enter Transmit Delay and configure KYZ outputs' Watt/pulse, rollover and minimum pulse width.
20mAON4 - Analog Transducer Signal Outputs, 4 channels, 4-20 mA	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
20mAON8- Analog Transducer Signal Outputs, 8 channels, 4-20 mA	132*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
1mAON4 - Analog Transducer Signal Outputs, 4 channels, 0-1 mA	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings

Module	Assigned Address*	EPM Setting**	Module Setting
1mAON8 - Analog Transducer Signal Outputs, 8 channels, 0-1 mA	128*	Click to Assign Items to and configure the Analog Outputs	Click to enter Transmit Delay and configure Channel settings
4RO1 - Digital Output	156*	Click to configure Relays	Click to enter Transmit Delay
8AI1 - Analog Input Module, 0-1 mA	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI2- Analog Input Module, 0-20 mA	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI3 - Analog Input Module, 0-5 VDC	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8AI4 - Analog Input Module, 0-10 VDC	247*	Click to configure Analog Outputs	Click to enter Transmit Delay and configure Channel settings
8DI1 - Digital Status Input Module	164*	Click to configure Digital Inputs	Click to enter Transmit Delay and configure Channel settings

* The Assigned address on this screen is the address the meter uses to identify the I/O module. The default is the factory set address, which you can change by clicking in the field and choosing a new address from the pull-down menu. This address is not the actual I/O module address. You set that from the I/O Devices menu; see Chapter 14 for instructions.

**When you click in this field you see an Edit button. Click the button to open a screen that lets you edit that module. See the following example screens.

Figure 26-3: 4PO1 Screen - Pulse Output module

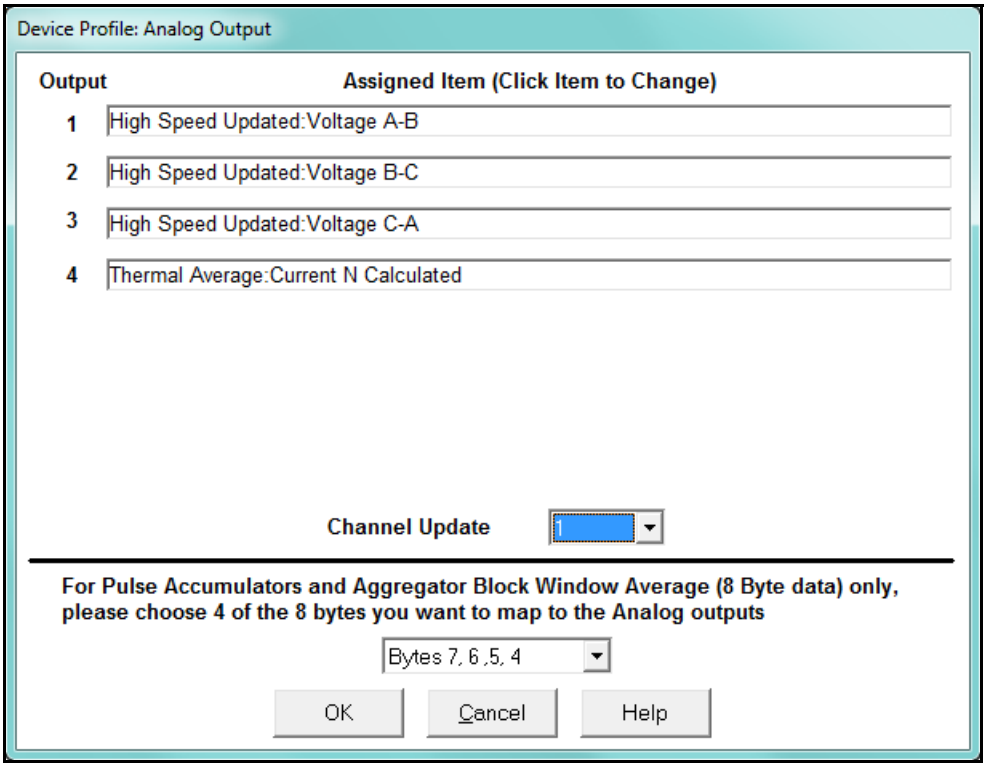


This screen allows you to assign a KYZ output to an accumulator. Click on the pull-down menu to select accumulation configuration for each of the 4 relays. The options are:

- Disabled
- Quad (1+4) Watthr
- Quad (2+3) Watthr
- Quad (1+2) VARhr
- Quad (3+4) VARhr
- Quad (1+2+3+4) VAhr

- Quad 1 Watthr
- Quad 2 Watthr
- Quad 3 Watthr
- Quad4 Watthr
- Quad 1 VARhr
- Quad 2 VARhr
- Quad 3 VARhr
- Quad 4 VARhr
- Quad 1 VAhr
- Quad 2 VAhr
- Quad 3 VAhr
- Quad 4 VAhr
- +Qh Total
- -Qh Total
- Internal Input (#1-8) Totals
- Accumulation (#1-4) Totals
- External Digital Input Modules (1-4) Inputs (#1-8)
- I Squared T (A, B, C)
- V Squared T (A,B,C)

Figure 26-4: 20 mAON4 Screen, 4 channel Analog Output module, 4-20 mA



3. Click in Output channels 1-4 to assign them to a parameter. The other Analog Output Modules - 20mAON8, 1mAON4, and 1mAON8 have similar setting screens, except for the number of channels you can program.

- The analog outputs are used to send a variable current dependent on the programmed reading. This screen lets you select the readings to output.

Figure 26-5: 4RO1 Screen- Relay Output module

Device Profile: Digital Output

Relay	Label	Common Shorted to N.C.	Common Shorted to N.O.	Lock to Manual Control
1	Relay 1	Closed1	Open1	☑
2	Relay2	Closed2	Open2	☑
3	Relay3	Closed3	Open3	☑
4	Relay4	Closed4	Open4	☐

OK Cancel Help

4. Click in the Relay fields 1-4 to enter relay label, common shorted to N.C., common shorted to N.O., and check the box to lock the relay to manual control. When a relay is locked to manual control, it cannot be used in ElectroLogic Relay Control (see *ElectrologicTM Relay Control* on page 26–39 for detailed information).

Figure 26-6: 8AI2- Analog Input Module, 4-20 mA

Device Profile: Analog Input

Input	Channel Label	High Value (20mA)	Low Value (4mA)
1	Temperature	100.0000	0.0000
2	Humidity	100.0000	0.0000
3		0.0000	0.0000
4		0.0000	0.0000
5		0.0000	0.0000
6		0.0000	0.0000
7		0.0000	0.0000
8		0.0000	0.0000

OK Cancel Help

5. Click in Input Channels 1-8 to assign a label and a High and Low Value for each of the analog inputs.
   - The two analog input module's settings are the same, except for the Inputs' high and low range.
   - The High and Low Value fields let you map the inputs' high and low range to values that are appropriate for the parameters you are measuring. For example, in the screen above, the first input is measuring temperature. The high value for the input is set to 100, and the low value is set to 0. An input reading of 12 mA will translate to 50 for the temperature.

- The Analog Input modules can be trended in the historical logs, and the data can be viewed and graphed in Log Viewer (see Chapter 19 for details). The readings shown in the logs and graphs will use the setting range programmed in the screen above, i.e., the results will be reported as 0 through 100.

Figure 26-7: 8DI1 - Digital Status Input module

Device Profile: Digital Input Option Card in Slot 3

Input	Channel Label	Open Label	Closed Label	Normal State	Rollover
1	Input 1	Opened	Closed	Open	999999999
2	Input 2	Opened	Closed	Open	999999999
3	Input 3	Opened	Closed	Open	999999999
4	Input 4	Opened	Closed	Open	999999999
5	Input 5	Opened	Closed	Open	999999999
6	Input 6	Opened	Closed	Open	999999999
7	Input 7	Opened	Closed	Open	999999999
8	Input 8	Opened	Closed	Open	999999999
9	Input 9	Opened	Closed	Open	999999999
10	Input 10	Opened	Closed	Open	999999999
11	Input 11	Opened	Closed	Open	999999999
12	Input 12	Opened	Closed	Open	999999999
13	Input 13	Opened	Closed	Open	999999999
14	Input 14	Opened	Closed	Open	999999999
15	Input 15	Opened	Closed	Open	999999999
16	Input 16	Opened	Closed	Open	999999999

Initialize OK Cancel

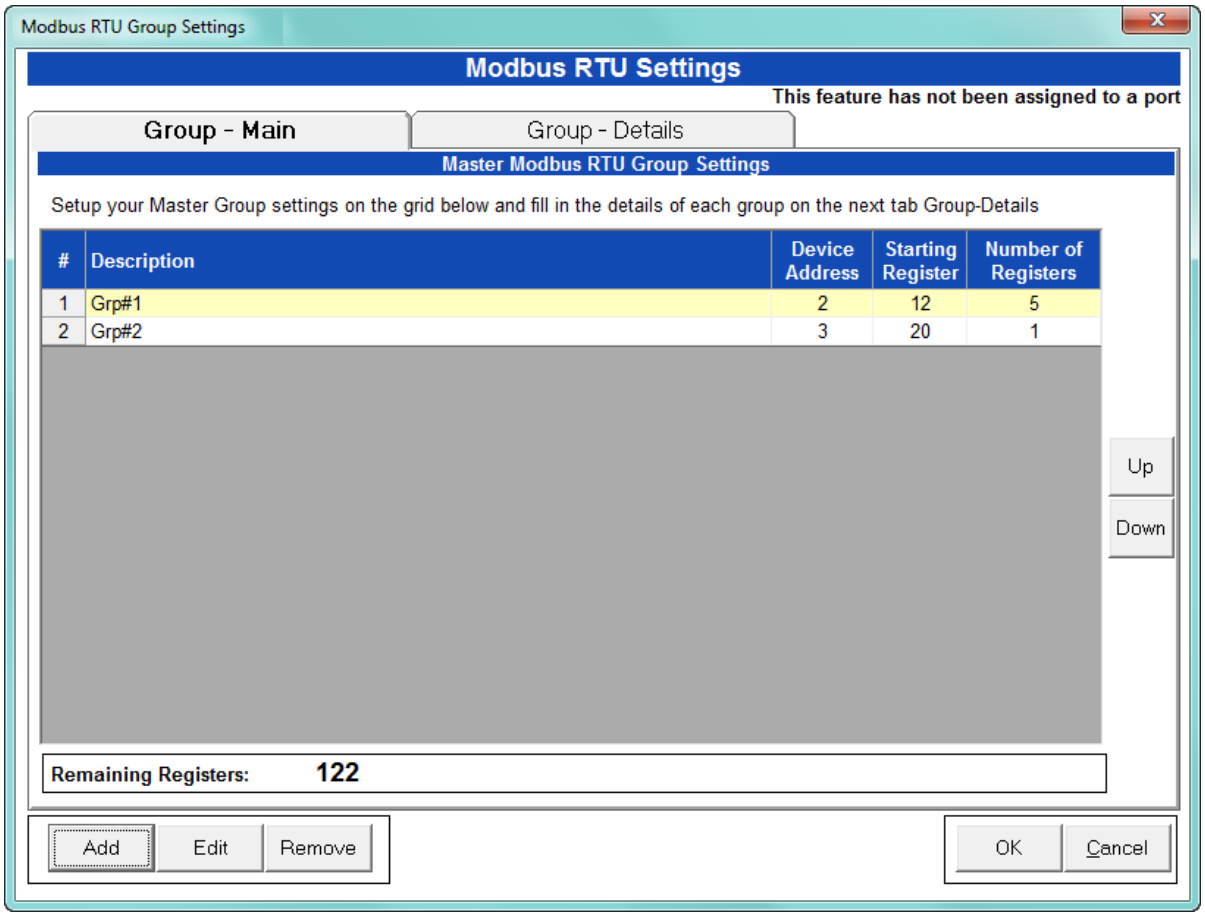
6. Click in Channel Label's 1-8 to assign a Channel label, Open and Closed label, and Normal State (Open or Shorted) for each of the digital inputs.
   - The Log/Limit ID is a display only field. It shows the ID that the software generates to identify this module in the Log Viewer and Limits functions.
7. Click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

26.5.2 RTU Settings

The EPM 9700 meter provides a feature that allows it to act as a simple Remote Terminal Unit (RTU). It can poll Modbus registers from downstream devices and bring that data into its memory for logging. This is very useful when trying to integrate data from existing, simpler, legacy Modbus devices. This section of the Device Profile enables you to configure RTU Master settings. This feature is used when you want to have the meter act as an RTU, polling data from other Modbus-based devices, such as lower end meters.

1. From the Device Profile screen, click on the + button next to the External I/O Modules line. You will see the menu option shown below.

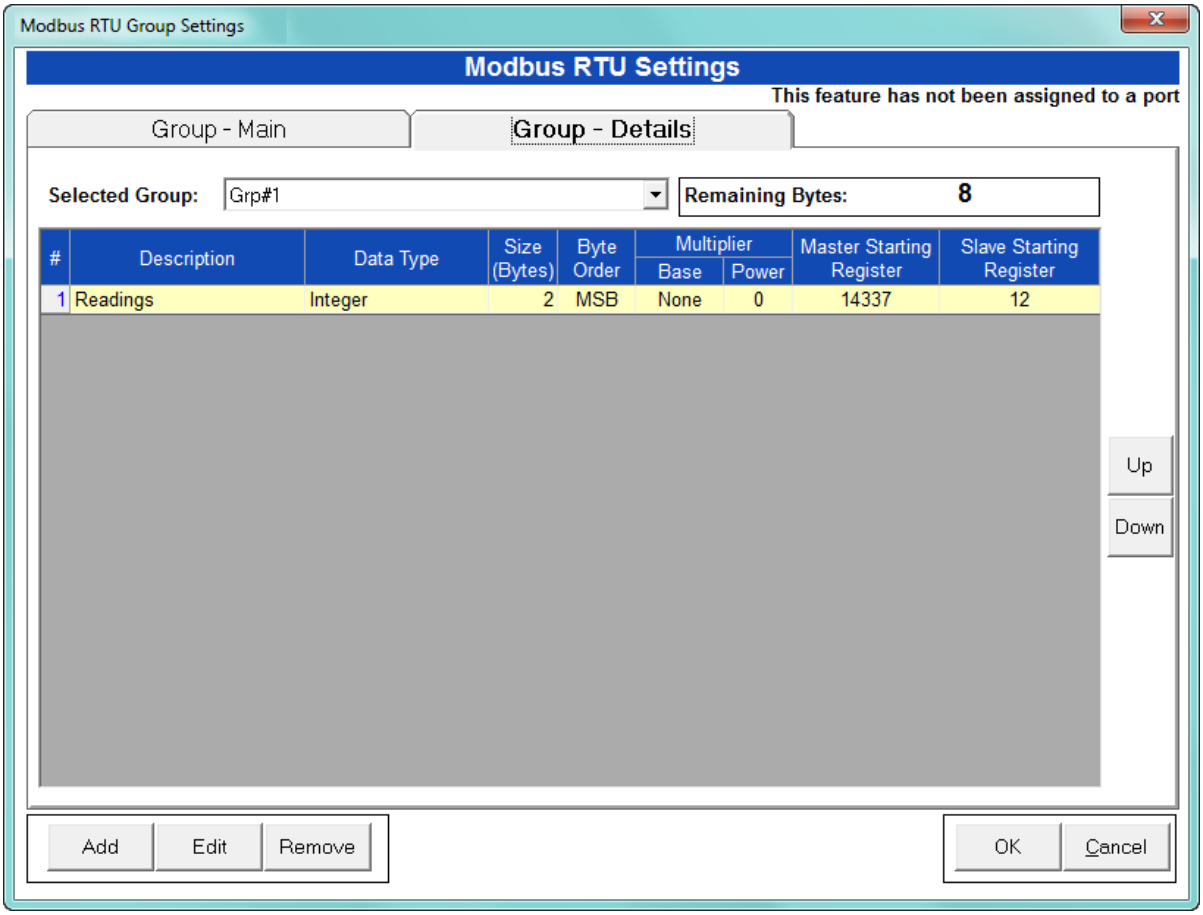
2. Double-click on RTU Settings. You will see the screen shown below.



Use this screen to configure the settings when Port 2 is set as an RTU Master (*Communications* on page 26–12).

3. The first view you see is the Group Main tab (shown on the previous page). This screen lets you set up the RTU Master groups, i.e. the devices the EPM 9700 meter is polling. You can enter up to 16 groups. You have the following options:
   - Click Add to add a Master group. Fill in the Description, Device Address, Starting Register, and Number of Registers; click Save to save your entries.
   - Click on a group and click Edit to change data for the group; click Save to save your changes.
   - Click on a group and click Remove to delete the group.
   - Click on a group and click Up or Down to change the position of the group.

4. Click the Group Details tab to set up the readings for the devices. See the example screen shown below.



You have the following options:

- Click Add to add a reading to the group. Fill in the Data Type, Size in Bytes, Byte Order, Multiplier Information, and Slave Starting Register (the Master Starting Register is read-only); click Save to save your entries.

  NOTE: The readings in the group must have consecutive register numbers. If necessary you can break the readings into two or more groups.
- Click on a reading and click Edit to change data for the reading; click Save to save your changes.
- Click on a reading and click Remove to delete the reading from the group.
- Click on the Selected Group pull-down menu to select and display details for another group.

5. Click OK to return to the main Device Profile screen. For any changes to take effect, you must click the Update Device button to send the new profile to the meter.

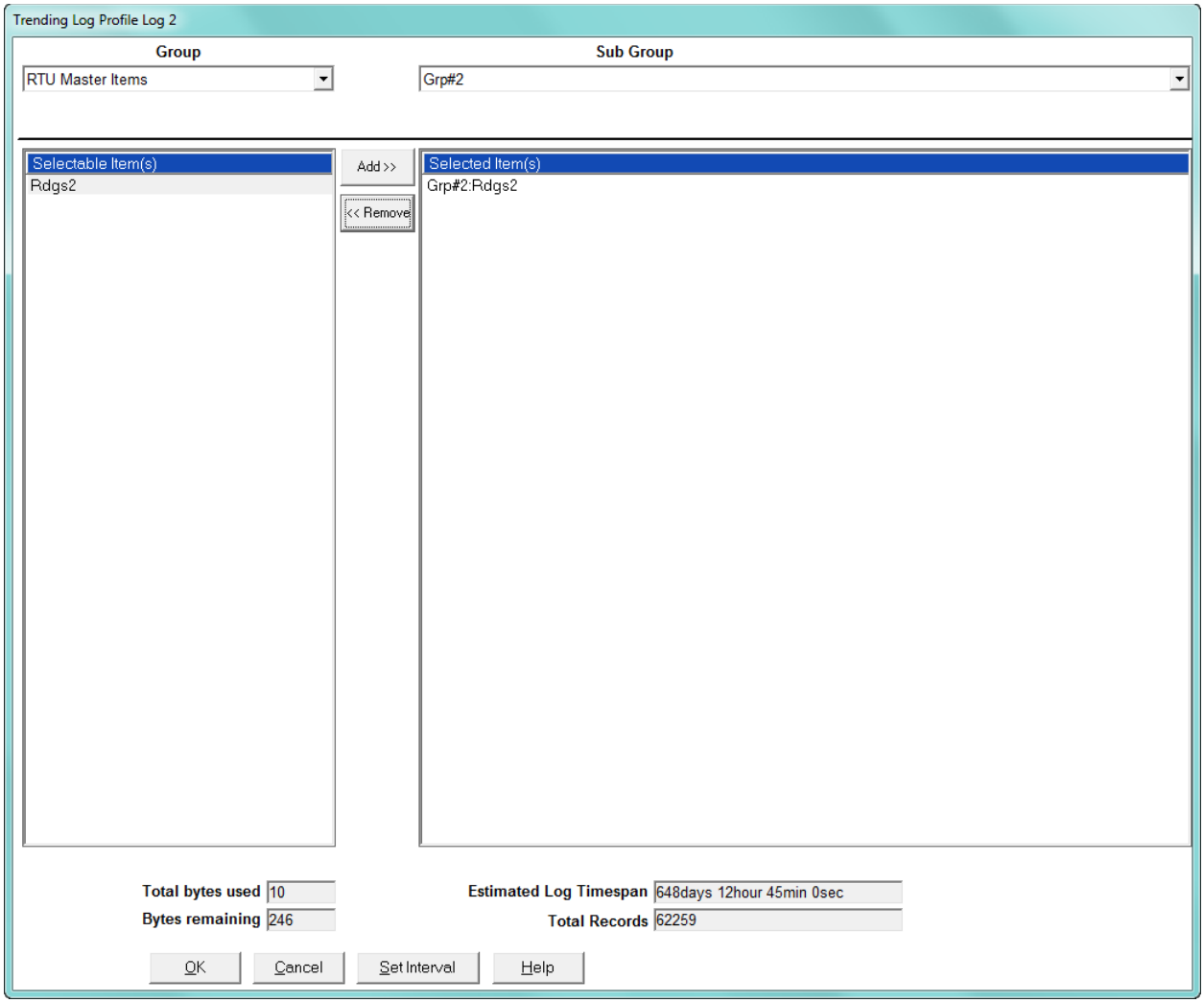
   For more details on I/O Modules, see Chapter 14.

   You can then use the polled data in the following ways:

   - Access the data using Modbus protocol: Modbus registers, starting at #define MB_REG_xxxxx_MASTER_DATABASE 0x03800; #define MB_REG_xxxxx_MASTER_DATABASE_LEN 0x00080.

You can see the meter's full Modbus map in the Modbus user manual.

- Log the data by selecting Master RTU Items for the group in the Trending Profiles screen: see the example screen, below.



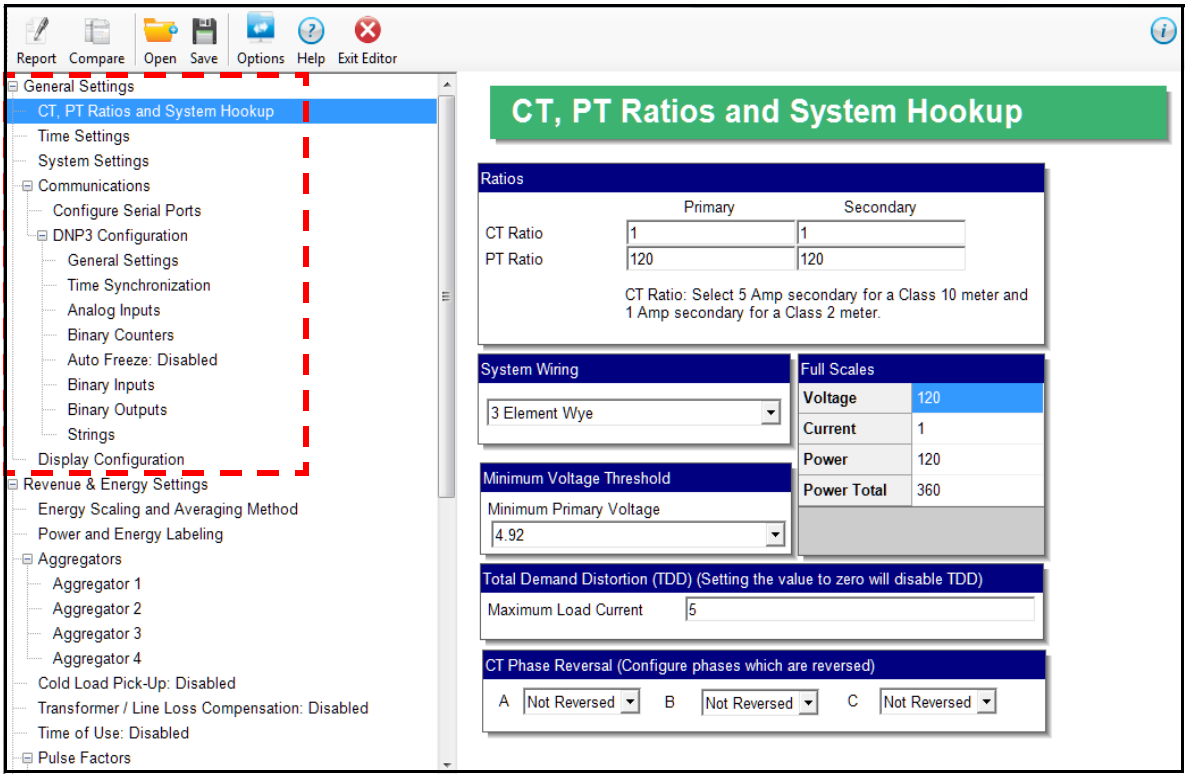
GE Communicator

Chapter 27: EPM 7000P Meter

This chapter explains how to configure an EPM 7000P meter's programmable settings, which are stored in the unit's Device Profile. Chapter 7 contains detailed information on how to use the Device Profile.

27.1 Device Profile General Settings

1. From the Tree Menu on the left side of the EPM 7000P meter Device Profile screen, double-click on the **General Settings** line or click on the **+** button next to it. All of the settings in the General Settings group are listed.



27.1.1Configuring CT, PT Ratios and System Hookup

Use this setting to configure Current Transformer and Potential Transformer ratios and to select the System Hookup. The Full Scales values are display only.

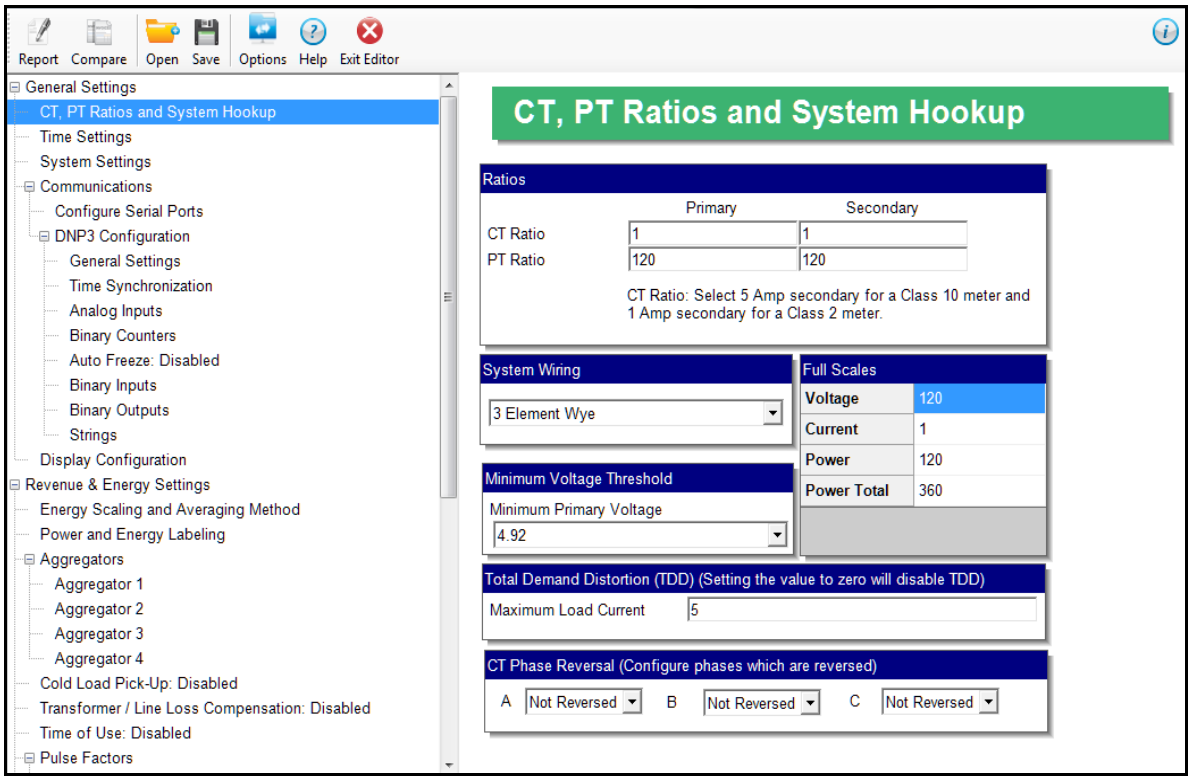
Functional Overview of CT and PT Ratios:

Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits.
- To change the primary voltage and current to standard values and sizes that the meter can measure.

The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

1. From the Tree Menu, click **General Settings > CT, PT Ratio and System Hookup**.



2. Set the following values:
   - CT Ratio, enter:
     - Primary (CT Numerator): 1 - 9999
     - Secondary (CT Denominator): 5 or 1 Amp
   - PT Ratio, enter:
     - Primary (PT Numerator): 1 - 9999
     - Secondary (PT Denominator): 1 - 9999
   - System Wiring, select from pull-down menu:
     - 3 Element Wye; 2.5 Element Wye; 2 CT Delta (This value must be set properly for the meter to calculate readings correctly.)

Example Settings:

For a CT of 2000/5 A, set the following CT Ratios in the entry fields:

CT Numerator (Primary) 2000
CT Denominator (Secondary) 5
The Current Full Scale field will read 2000.

For a system that has 14400 V primary with a 120 V secondary line to neutral PT Ratio of 120:1), set the following PT Ratios in the entry fields:

PT Numerator (Primary) 1440
PT Denominator (Secondary) 120
The Voltage Full Scale field will read 14.4k.

- Minimum Voltage Threshold box: Enter the minimum voltage threshold, which is a percentage of the voltage full scale. This setting adjusts the pick up threshold for the voltage. You set a percentage of the PT primary (PT numerator X PT multiplier) up to 12.7 in the entry field, to configure when the meter will start reading values above 0 voltage.
- Total Demand Distortion (TDD Setting): This setting of the Device Profile allows you to set the maximum value for current, which is used for the TDD (Total Demand Distortion) calculation. TDD is an index used to measure harmonics. TDD is defined in the IEEE 519 Standard, "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems" as "the total root-sum-square harmonic current distortion in percent of the maximum load current." It gives a better indication of the impact of distortion on Demand than THD (Total Harmonic Distortion) which analyzes the harmonic distortion relative to the fundamental, without consideration of load. In this field enter the maximum load current for TDD. To disable TDD, enter 0 in the field.
- CT Reversal Phase Enables: Use this setting to enable CT reversal for any phase. This feature is useful if a CT is wired the wrong way and you do not want to (or cannot) change the wiring. When CT reversal is enabled, the meter firmware shifts the current phase by 180 degrees for that phase. This will reverse the power direction, and all computations such as power factor, phase angle etc., which are derived after that will be affected

NOTE

This setting is only available for a three element WYE hookup. For any other hookup, this setting will be ignored.

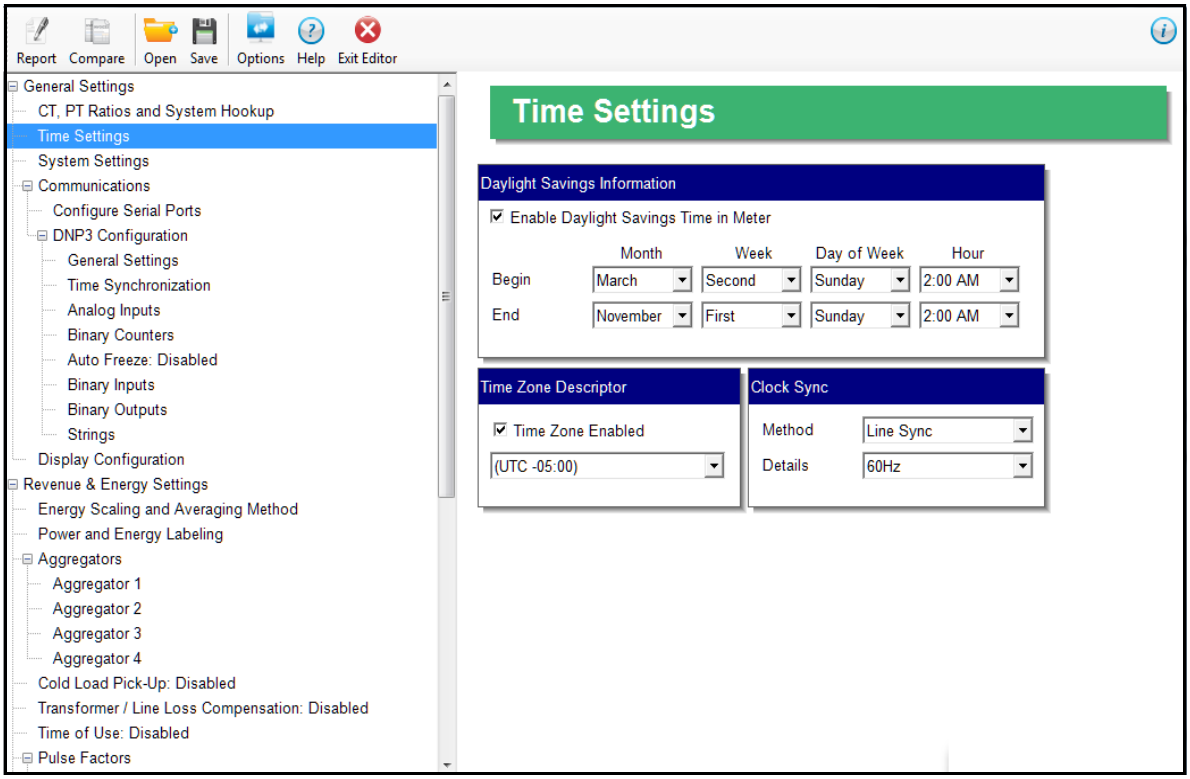
To implement phase reversal for a phase (A, B, or C), select **Reversed** next to that field.

3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.1.2 Configuring Time Settings

Use this setting to enable or disable Daylight Savings Time for the meter, to set the beginning and ending times for Daylight Savings Time, and to set up Time Zone information and clock synchronization information.

1. From the Tree Menu, click **General Settings > Time Settings**.



2. Check the box to Enable Daylight Savings time, or un-check it to Disable Daylight Savings Time.
3. Use the entry fields to set the beginning and ending times for the Daylight Savings Time feature, if enabled. Select the values you want from the Month, Week, Day of the Week, and Hour fields.

NOTE

The Hour field uses a 24-Hour clock.

4. You can choose clock synchronization for the meter. If your meter has a Network Option card, you can use it to access a Network Time Protocol (NTP) Server** for time synchronization. You can also select Line Sync for clock synchronization. Use these fields to set up clock synchronization:
   - Time Zone: Zone Descriptor - Select the hour and minute of your time zone in relation to Greenwich Mean Time. For example, if your time zone is Eastern Standard time, you would select -5 from the pull-down Hour menu and leave the Minutes field at 0.
   - Clock Sync - To enable clock synchronization, select:
     - Yes from the Enable pull-down menu.
     - Line (line synchronization) or NTP** from the Method pull-down menu

- For line synchronization, select 50Hz or 60Hz from the Line Frequency pull-down menu; for NTP select either Option Card in Slot 1 or Option Card in Slot 2 from the Interface pull-down menu.

  Line synchronization uses the frequency zero crossings to provide a time reference for the meter. This is the most common method to synchronize a meter's clock. GE recommends that you always select this method unless there is a specific reason not to select it. If the meter is not synchronized to line frequency or NTP, it will default to internal crystal. Different meters differ in terms of drift, but typically meters with 20 ppm crystals will drift 30 seconds per month when set to internal crystal.

NOTE

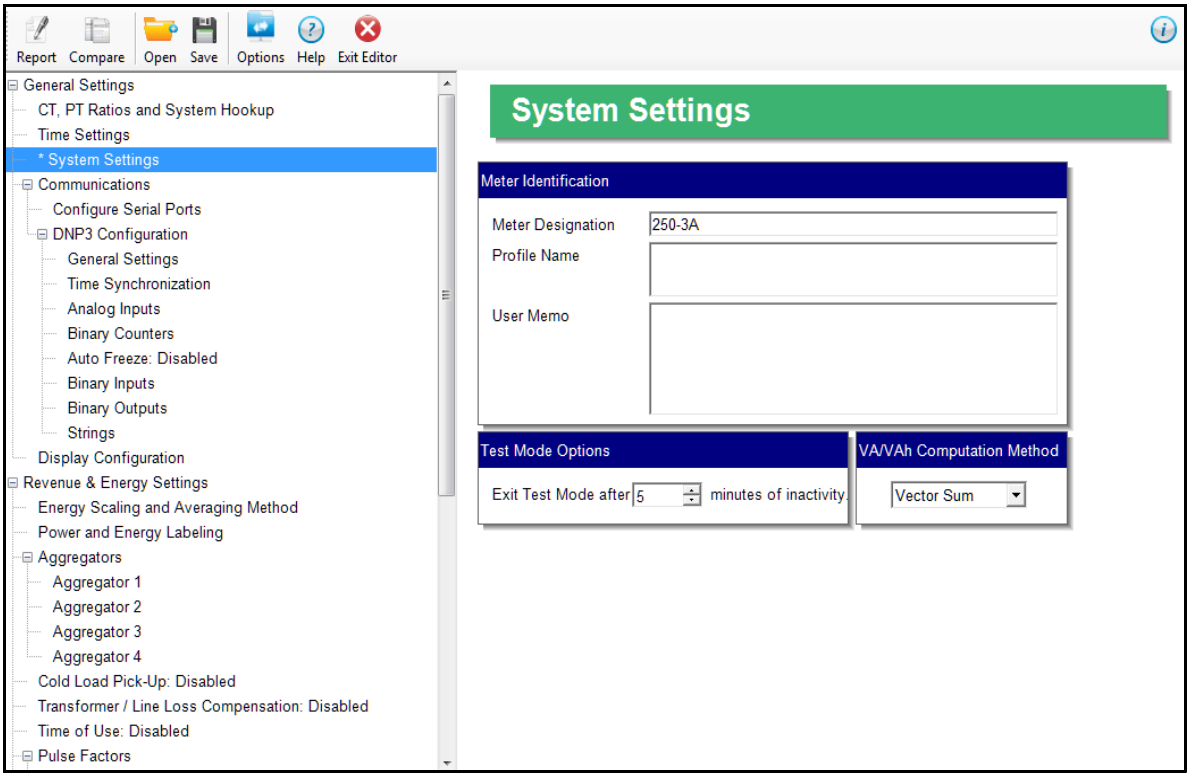
IMPORTANT! You also need to set up the NTP server information for the Network card. See 27.5.6 *Configuring a Network Card* on page 27–67 for instructions.

5. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.1.3 Configuring System Settings

Use the system settings to set up a meter ID and a time out setting for Test Mode.

1. From the Tree Menu, click **General Settings > System Settings**.



2. From this screen, you can do the following:
   - Change the Device Designation: input a new meter designation into this field.

     It is important to name each meter individually, since the meter name is used to name the log databases when logs are downloaded.

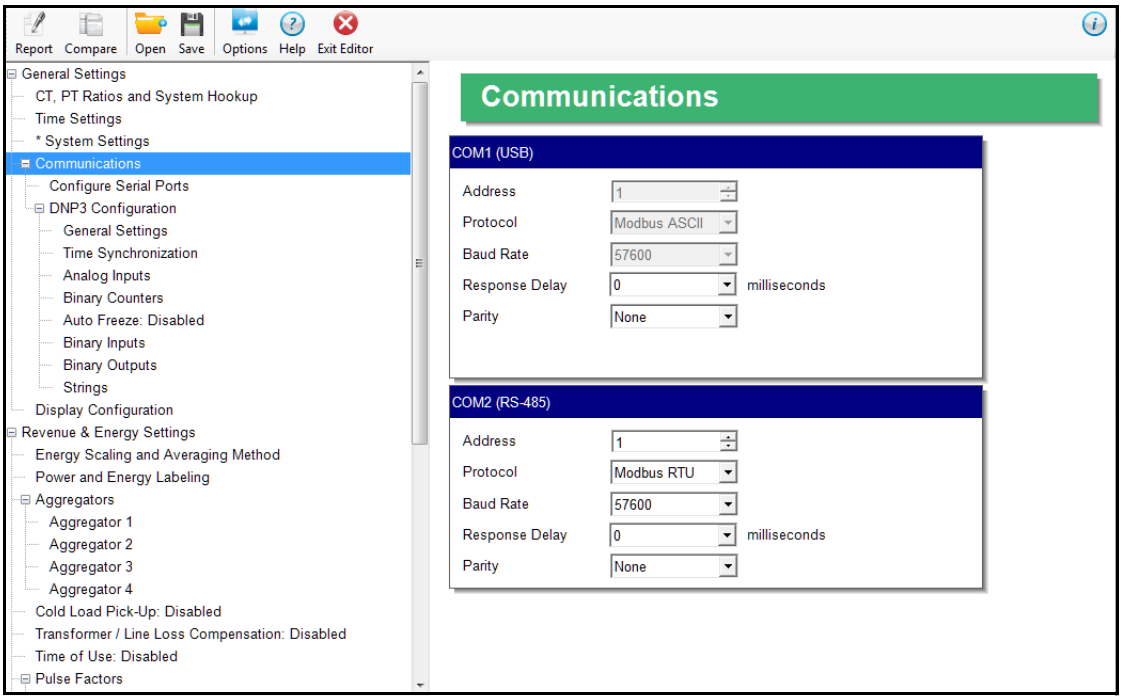
     NOTE

   - You can enter additional relevant information in the User Memo field, if you wish. It will be displayed in the Memo field in the Main screen's Status bar - see 2.2.2 *Main Screen Status Bar* on page 2–5.
   - Test Mode Options: set the number of minutes without activity that will cause the meter to exit Test Mode. See 20.1.15.3 *Test Mode and Energy Preset for the EPM 7000P Meter* on page 20–38 for more information on Test Mode.
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.1.4 Configuring Communication Settings

Communications settings have two parts: communication settings for the meter's two on-board ports: the USB Port (COM 1) and RS485 Port (COM 2), and DNP 3.0 configuration.

1. Click **General Settings > Communications > Configure Serial Ports**.



NOTE

IMPORTANT! The settings on this screen are the current settings for communication. Any changes you make may affect communication between the meter and your PC.

2. The screen fields and acceptable entries are as follows:
   - COM 1 (USB) - Response Delay: 0 - 750 (50msec increments)

NOTE

You will not see the USB setting if you are connected to an EPM 7000PT transducer.

   - COM 2 (RS-485)
     - Address:1 - 247 (Modbus); 1-65520 (DNP)
     - Protocol:Modbus RTU, Modbus ASCII or DNP 3.0. If you select DNP 3.0 communication, see 27.1.4.1 *DNP 3.0 Configuration* on page 27–8, for configuration settings.
     - Baud Rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600
     - Response Delay: 0 - 750 (50 msec increments) Response Delay is the delay the meter should use before responding to queries. If your connecting device requires a delay before receiving information, use response delay to program the time to wait before the meter starts responding to queries.
     - Parity: Odd, Even, or None
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

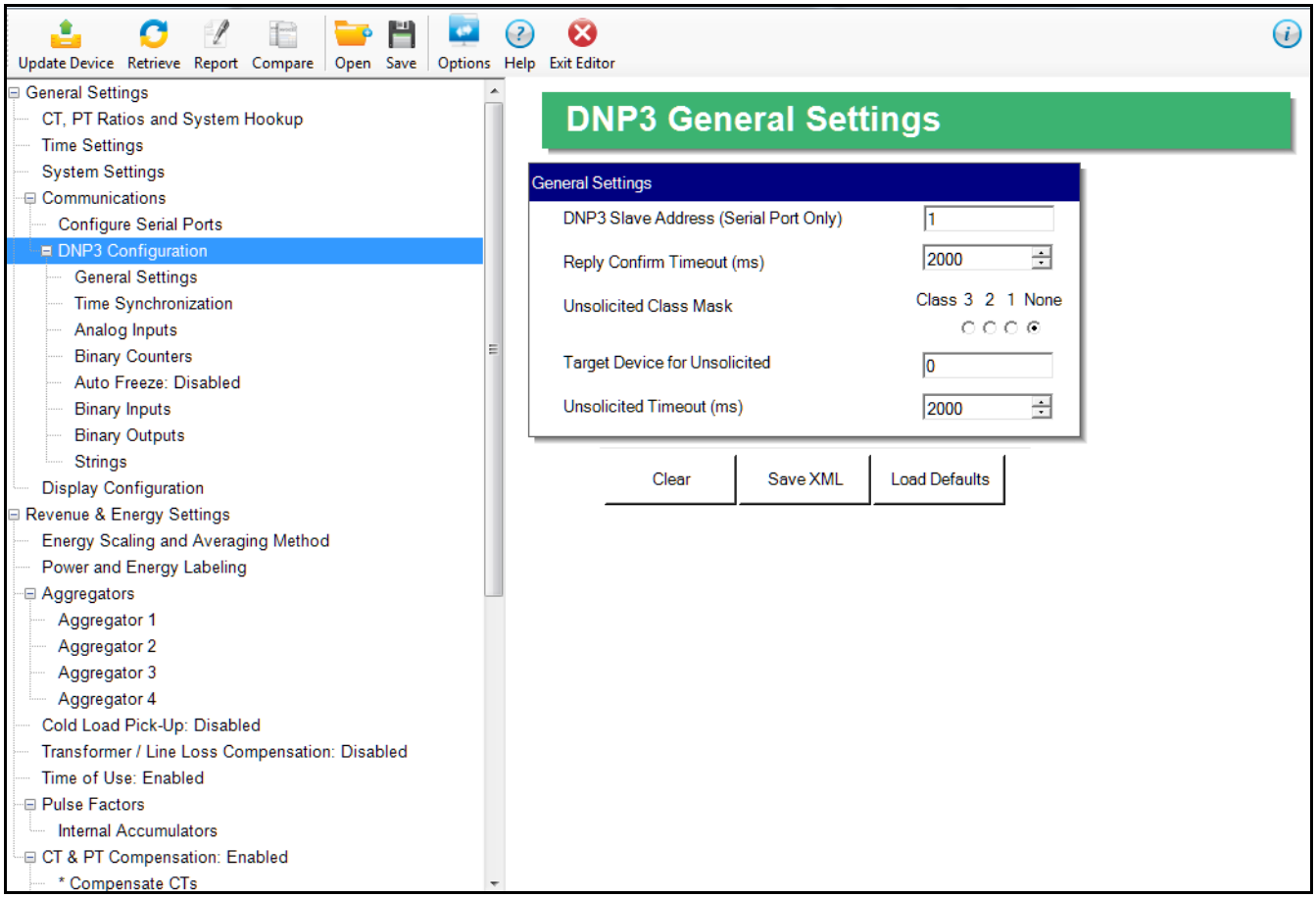
27.1.4.1 DNP 3.0 Configuration

DNP Configuration consists of multiple settings that let you customize DNP3 for your application needs.

NOTE

DNP protocol must be selected for either COM2 (the RS485 port) or an Ethernet Option card in order to use these settings screens (see 27.1.4 *Configuring Communication Settings* on page 27–7 and 27.5.6 *Configuring a Network Card* on page 27–67).

To access the DNP configuration screens, from the Tree menu, click **Communications > DNP3 Configuration**.



NOTE

See the *EPM 7000P Instruction Manual* for detailed information on settings, including the meter default settings, and example use cases.

NOTE

Clicking the **Save XML** button in the DNP3 screens generates the DNP XML Profile. The DNP XML Profile is a file that contains the characteristics and configuration parameters set in the DNP3 screens, as well as data from the meter itself (serial numbers, channels, etc.). This file can be used to further configure other peers, e.g., the Master device, in the DNP3 Network. If you need a DNP XML Profile, GE recommends you click the **Save** button after making all of your DNP3 settings. Refer to official DNP3 documentation for DNP3 Network details.

NOTE

Formatting of energy and power values (number of digits, decimal point position, etc.) is used for display, only - DNP3 always uses the raw values from the Modbus register.

27.1.4.1.1 General Settings

The first setting is General Settings.

1. From the Tree menu, click **DNP 3.0 Configuration > General Settings**. You will see the screen shown on the previous page.
2. You have the following options:
   - You can click **Load Defaults** to load the settings from the meter.
   - You can enter the settings manually.
   - You can edit any edit any of the settings.
   - You can clear the entries by clicking **Clear**.
3. The settings on this screen are:
   - DNP Slave Address: enter the DNP slave address for this meter. This is the address used with an RS485 serial link, only (not an Ethernet link).
   - Reply Confirm Timeout (ms): enter the reply confirmation timeout in milliseconds.
   - Unsolicited Class Mask: select the class that the unsolicited message should belong to.
   - Target Device for Unsolicited: enter the address for the target device for unsolicited messages.
   - Unsolicited Timeout (ms): enter the unsolicited timeout in milliseconds.

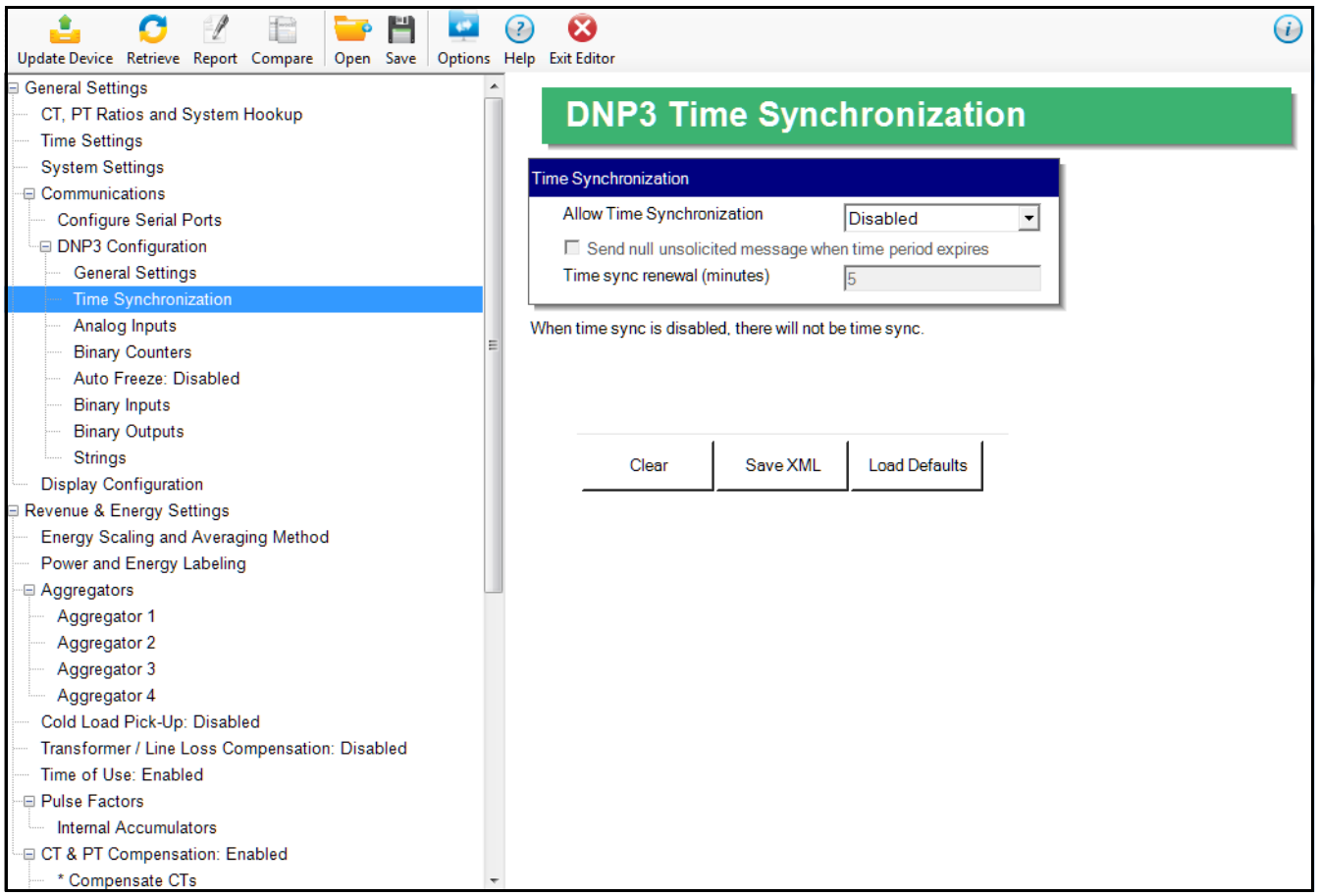
27.1.4.1.2 Time Synchronization

The next setting for DNP is Time Synchronization.

NOTE

It is recommended that you use only one method for meter time synchronization: if you enable the DNP Time Sync and you have a Network card, do not use the NTP feature for the Network card.

1. From the Tree menu, click **DNP3 Configuration > Time Synchronization**.



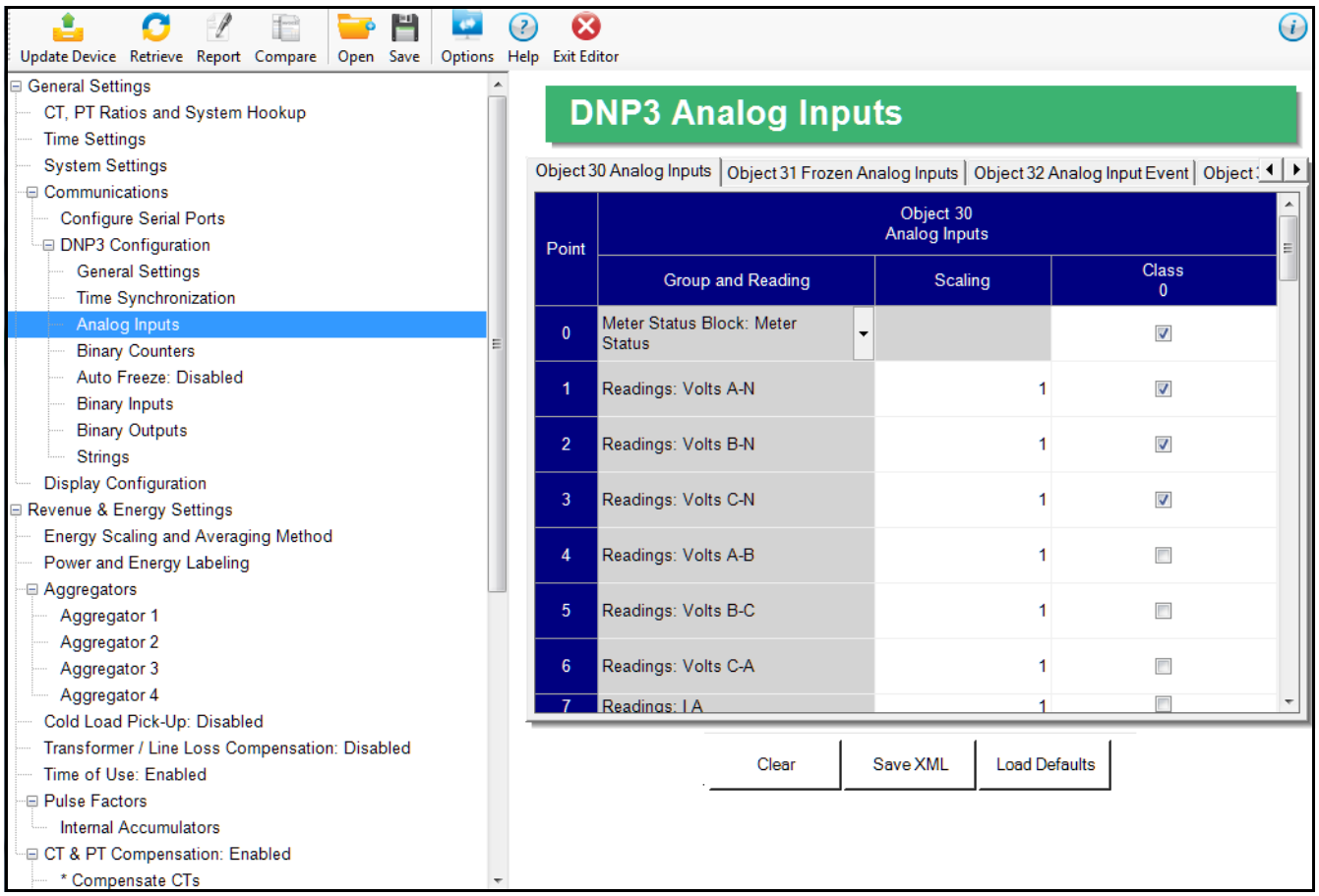
2. You have the following options:
   - Load the default setting by clicking the **Load Default** button.
   - Clear the entry by clicking **Clear**.
   - Choose the allow time synchronization of the meter through DNP. When time synchronization is enabled, a Master must write the time into the meter. The time is updated frequently to reduce jitter and offsets. The options for time synchronization are:
     - **Disabled** - no time sync through DNP is allowed.
     - **From Serial** - the time sync will be accepted from DNP only through the serial line (RS485 or other serial option).
     - **From Serial or Network Card** - the time sync will be accepted from DNP serial or DNP network communication.

3. The Sync Renewal Time is the period the time is considered valid after the Master has written it into the meter. After this time, the Meter will flag NEED_TIME in its responses, to let other devices know that it needs a time update.
4. The Send Null unsolicited message checkbox allows the meter to send a null unsolicited message when the valid time expires, letting other devices know, immediately, about the need for time resynchronization. This is an additional feature which is not required by the DNP3 standard.

27.1.4.1.3 Analog Inputs

The next setting for DNP is Analog Inputs, which are non-accumulator readings.

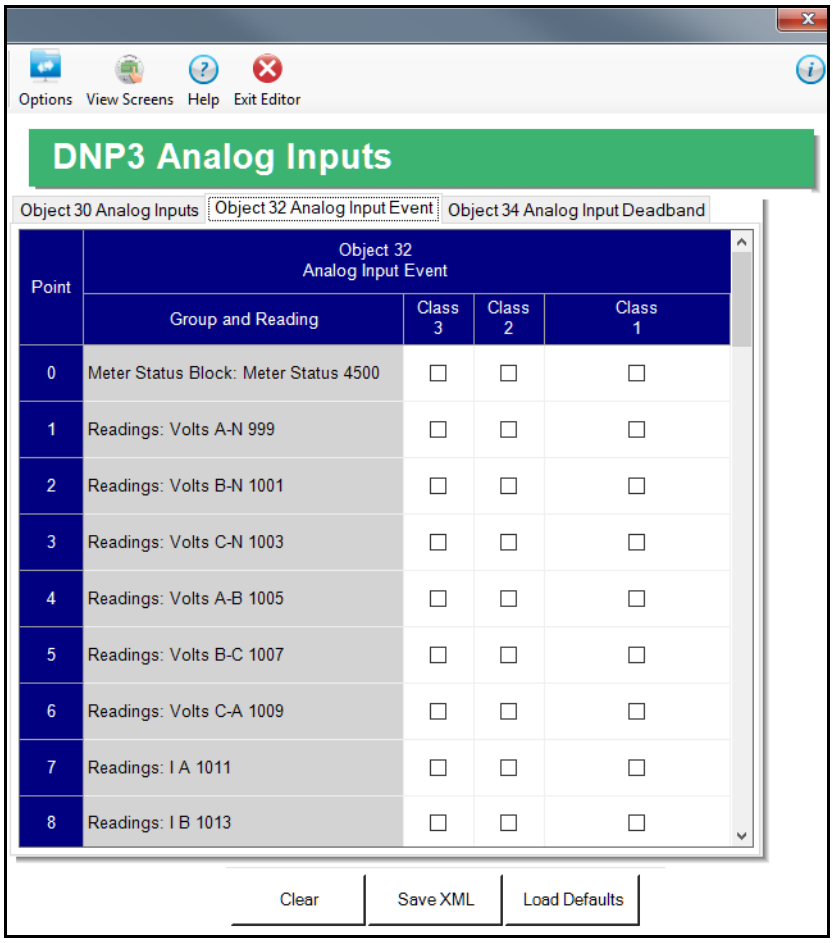
1. From the Tree menu, click **DNP3 Configuration > Analog Inputs**.



2. You can make settings for Objects 30, 32, and 34 by clicking on the different tabs. The screen above shows the settings for Object 30. You have the following options:
   - Load the default settings by clicking the **Load Default** button.
   - Clear the entries by clicking **Clear**.
   - Enter the Analog Input settings manually:
     - Up to 64 points can be defined for DNP Analog Inputs. Select the reading you want to use from the pull-down menu, which lets you choose from groups of Measured Values, Demand, Harmonics, Angles and Basic setup parameters. For example, the reading Volt-A can be selected.
3. For the Object 30 tab:

- You can use the Scaling field to enter a multiplier value to change the magnitude of the reading for DNP. The scaling can be a positive fraction or integer; enter 1 for no scaling.

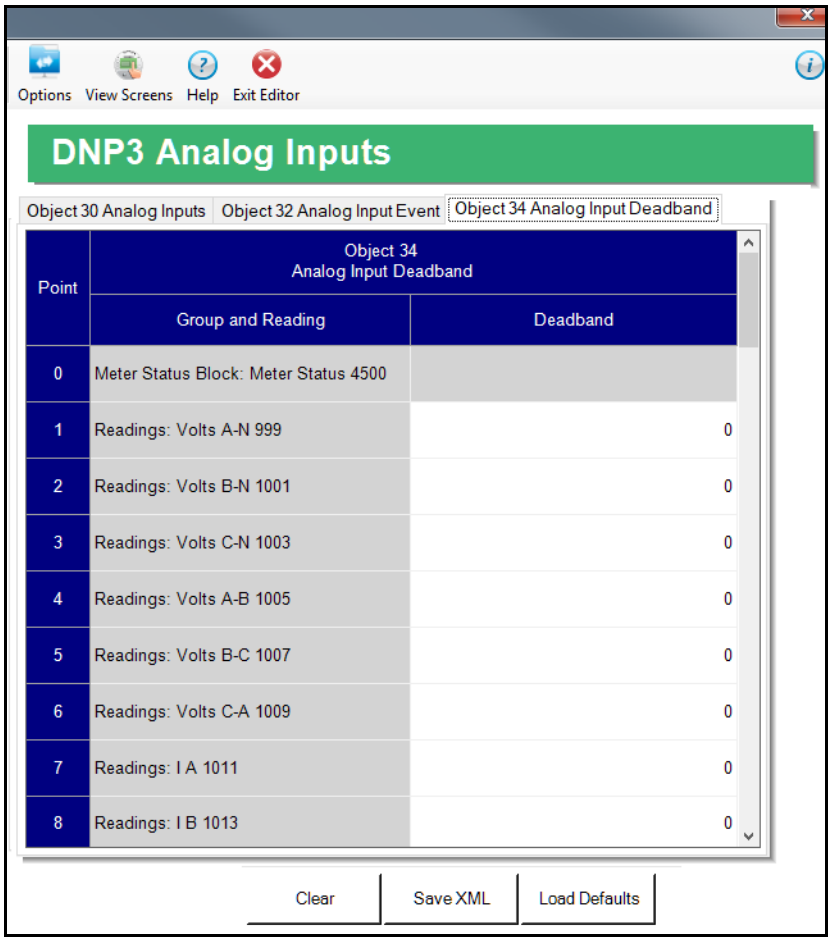
  For example, you might want to scale the Volt-A reading, which has a full scale value of 600, to a higher range, e.g., 60000. To do that, you would set the Scaling value to 100. Scaling can also be used to scale down the value by using a fraction in the Scaling field. If no change is needed, the Scaling field must be left as 1.
- The Class 0 column allows you to include or not include the reading in a DNP Class-0 response. This gives you a practical way to poll several readings at a time, through grouping them into a class query.



Point	Object 32 Analog Input Event			
	Group and Reading	Class 3	Class 2	Class 1
0	Meter Status Block: Meter Status 4500	☐	☐	☐
1	Readings: Volts A-N 999	☐	☐	☐
2	Readings: Volts B-N 1001	☐	☐	☐
3	Readings: Volts C-N 1003	☐	☐	☐
4	Readings: Volts A-B 1005	☐	☐	☐
5	Readings: Volts B-C 1007	☐	☐	☐
6	Readings: Volts C-A 1009	☐	☐	☐
7	Readings: I A 1011	☐	☐	☐
8	Readings: I B 1013	☐	☐	☐

4. For the Object 32 tab (shown above):
   - The Analog Event Object 32 is used as a capture placeholder (data storage) for dead banding events. Dead banding events are used when you want to know if an Analog Input varies by more than a specified amount. The amount of allowable variation is called a deadband. If the Analog Input varies in an amount less than the deadband, nothing happens, since it is considered within limits. Whenever the variation amount exceeds the deadband, a snapshot is taken of the Analog Input, i.e., the data is copied to the corresponding Object 32 and an event is flagged for that reading. This allows the user to later check on the Analog Input value at the time of the event.

- Object 32 can be also assigned to Class 1,2 or 3, allows creation of different groups for different events.



5. For the Object 34 tab (shown above):
   - The deadband value is used for detecting the changes in the Analog Input. A value of 0 disables this feature. The deadband is always a positive number, but it checks for the absolute variation, either positive or negative.

NOTE

If Scaling is used, the deadband will compare the Analog Input value after scaling has been applied.

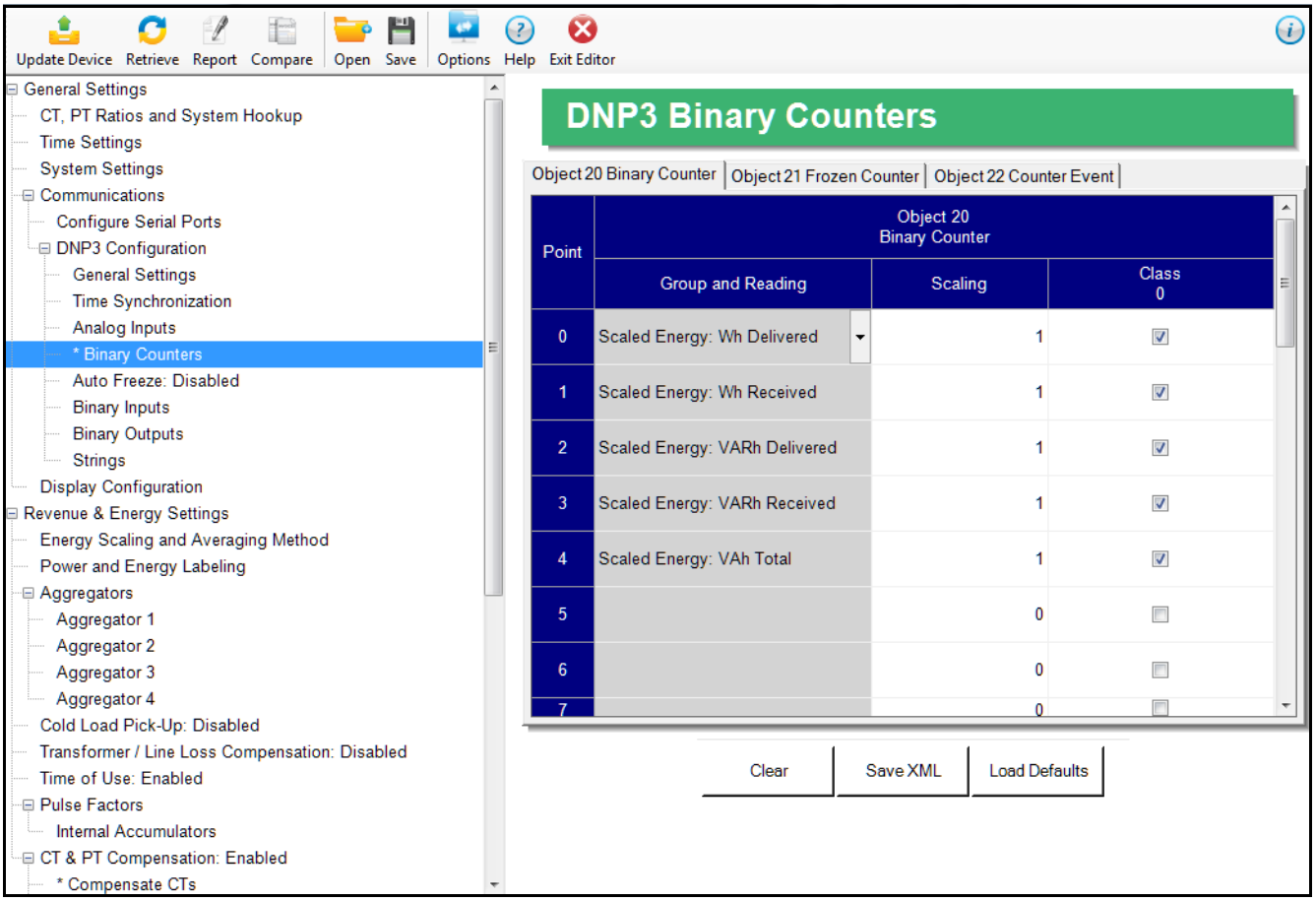
NOTE

It is recommended that you do not set the deadband value too small, to avoid filling up the DNP Event Buffer with very minor fluctuations, causing bigger fluctuations to be missed.

27.1.4.1.4 Binary Counters

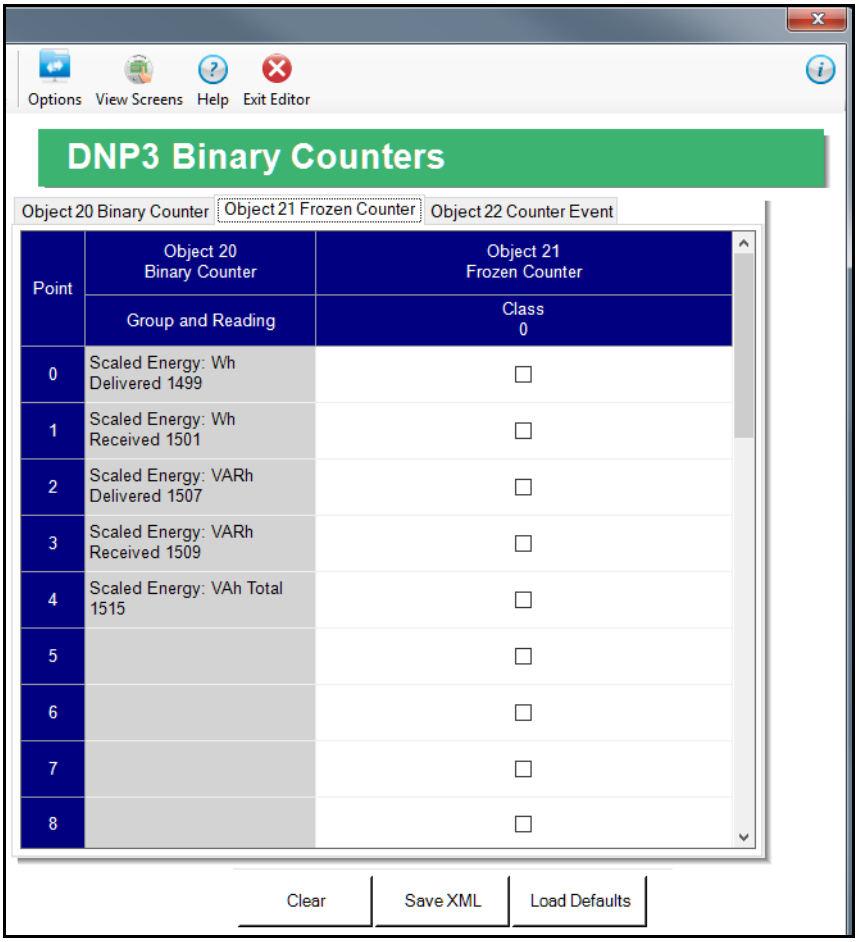
The next setting for DNP is Binary Counters, which are accumulator readings.

1. From the Tree menu, click **DNP3 Configuration > Binary Counters**.



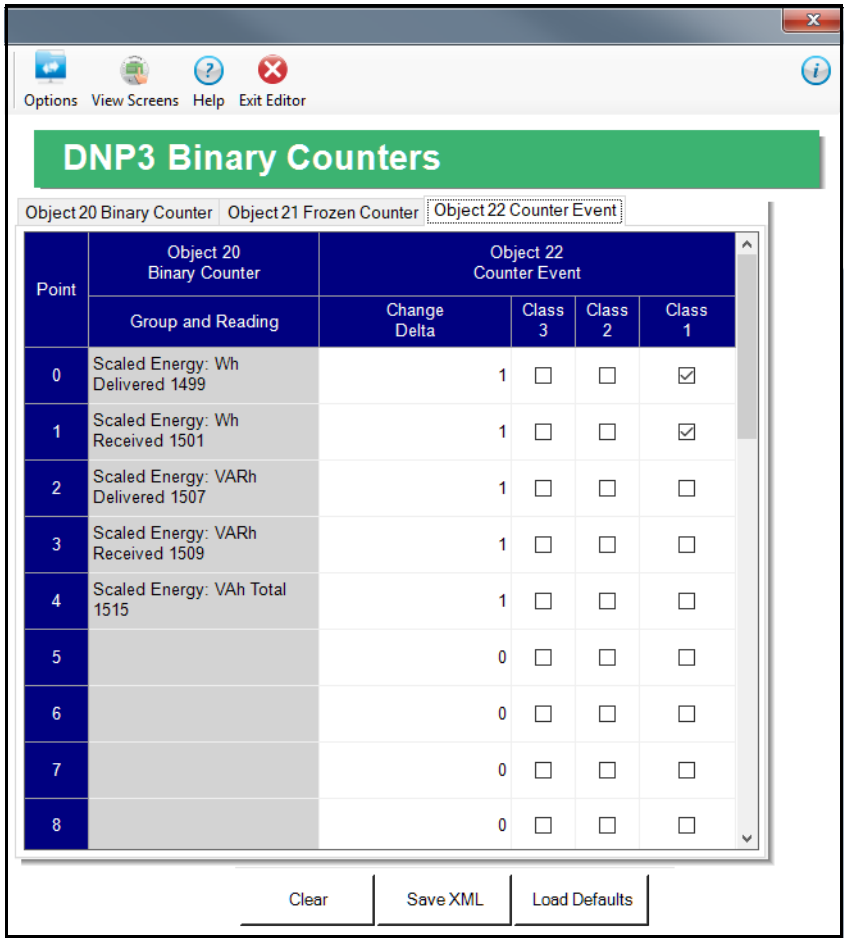
2. You can make settings for Objects 20, 21, and 22 by clicking on the different tabs. The screen above shows the settings for Object 20 Binary counter. You have the following options:
   - Load the default settings by clicking the **Load Defaults** button.
   - Clear the entries by clicking **Clear**.
   - Enter the settings manually, for the binary counters:
     - Select the reading you want to use from the Group and Reading pull-down menu, e.g., Group - Uncompensated, Reading - Wh.
3. For the Object 20 tab:
   - You can use the Scaling field to enter a multiplier value to change the magnitude of the reading for DNP. The scaling can be a positive fraction or integer; enter 1 to keep the reading's scaling the same as in the meter.

- The Class 0 column allows you to include or not include the counter in a DNP Class-0 response.



4. For the Object 21 tab (shown above):
   - Frozen Binary Counter Object 21 is a placeholder used when the meter is instructed to freeze the respective counter. In other words, when the meter receives the instruction to freeze counters, it copies the Binary Counter (Object 20) into the Frozen Binary Counter (Object 21) placeholder, where it is kept available for the user to read. Only a new freeze will update the Frozen Binary Counter Object 21.

- The Frozen Binary Counter can be assigned to Class 0, only. (It does not have to be assigned to Class 0, though.)



Point	Object 20 Binary Counter	Object 22 Counter Event			
	Group and Reading	Change Delta	Class 3	Class 2	Class 1
0	Scaled Energy: Wh Delivered 1499	1	☐	☐	☑
1	Scaled Energy: Wh Received 1501	1	☐	☐	☑
2	Scaled Energy: VARh Delivered 1507	1	☐	☐	☐
3	Scaled Energy: VARh Received 1509	1	☐	☐	☐
4	Scaled Energy: VAh Total 1515	1	☐	☐	☐
5		0	☐	☐	☐
6		0	☐	☐	☐
7		0	☐	☐	☐
8		0	☐	☐	☐

5. For the Object 22 tab (shown above):
   - Use the Change Delta field to set up a value in the same raw unit as the reading, which is used to define a threshold value for the counter. This threshold value instructs when to create an event for Binary Counter Event Object 22. Every time the Binary Counter changes by the value of the Change Delta field, or by a greater value, an event for Object 22 is created. If the Change Delta value is 0, changes for this reading are not monitored.
   - The Binary Counter Event Object 22 can be assigned to Class 1,2 or 3.

NOTE

GE recommends you do not set the Change Delta value too small, to avoid filling up the DNP Event Buffer with very minor fluctuations, causing bigger fluctuations to be missed.

27.1.4.1.5 DNP3 Auto-Freeze

The meter DNP implementation lets you freeze defined Object 20 and Object 30 points automatically, on a periodic schedule, without needing to send the Freeze command through DNP. This feature is set up through the fifth DNP setting, DNP3 Auto Freeze, which copies the original Object 20 and Object 30 data points into Object 21 and Object 31 data points, respectively, along with the time stamp of the copy process.

- The Object 21 and Object 31 data points are also referred to as "previous" values: they belong to the previous Auto Freeze period.
- If the meter loses power, the frozen points in Object 21 and Object 31 are preserved.

NOTE

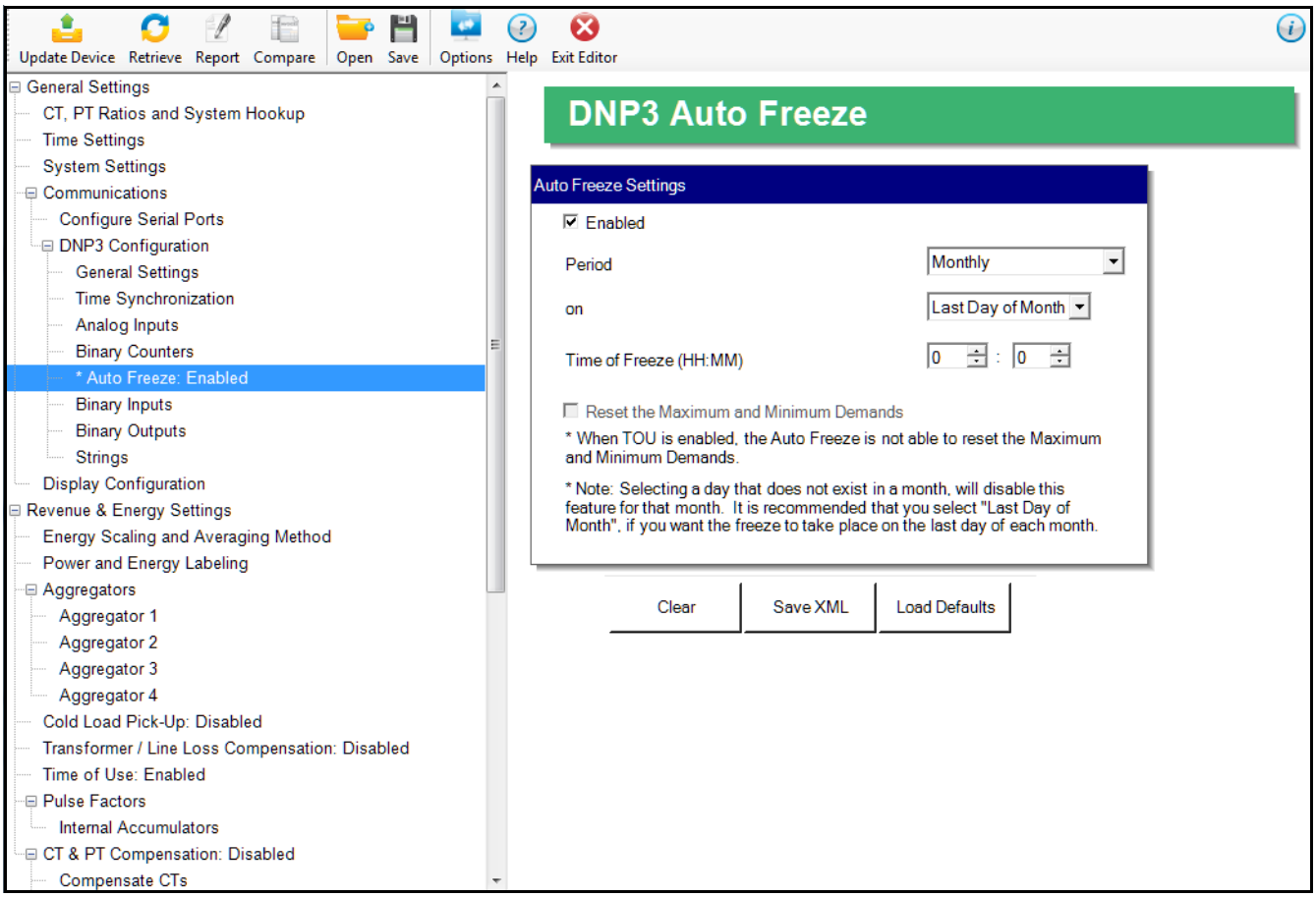
The frozen DNP points (Object 21 and Object 31) have the same scale and unit as their respective points in Object 20 and Object 30.

For example, if point# 0 of Object 20 has been configured with Wh Total register and 0.001 scaling, reading point #0 of Object 20 will give us a KWh value. When the Auto Freeze period has elapsed, the value in reading point# 0 is copied into point #0 of Object 21. Further readings to point# 0 of Object 20 will show the current KWh value (increasing, if there is energy flow), but the point# 0 of Object 21 will stay frozen in its original value until the next Auto Freeze period has elapsed. At that point, the new KWh value will be written into the Object 21 point.

1. From the Tree menu, click **DNP3 Configuration > Auto Freeze**.

NOTE

If you haven't enabled DNP3 Auto Freeze, the menu option will say **Auto Freeze: Disabled**; and if Auto Freeze is already enabled, it will say **Auto Freeze: Enabled**.



2. To enable Auto Freeze, check the **Enabled** box.
3. To set up the Auto Freeze period, i.e., the time the current values of objects 21 and 31 are copied into the Frozen objects 21 and 31:

   a. From the Period pull-down menu, select the Auto Freeze period, i.e., frequency: Monthly, Weekly, Daily, or Hourly.

   b. From the On pull-down menu, select the day of the month the Auto Freeze period starts: 1-31, or "Last Day of Month."

NOTE

If you selected Monthly as your period, you shouldn't select a day that doesn't exist in all months, since that would cause that month's Auto Freeze to be disabled; e.g., if you select 30, February is skipped. In that case, use the "Last Day of the Month" setting.

   c. From the Time of Freeze pull-down menus, select the hour (0-23, using a 24-hour clock, where 0 is midnight and 23 is 11 P.M.), and minute (0, 15, 30, 45) the Auto Freeze period begins.

4. If you want the Maximum and Minimum Demand to be reset when Auto Freeze takes place, check the box.

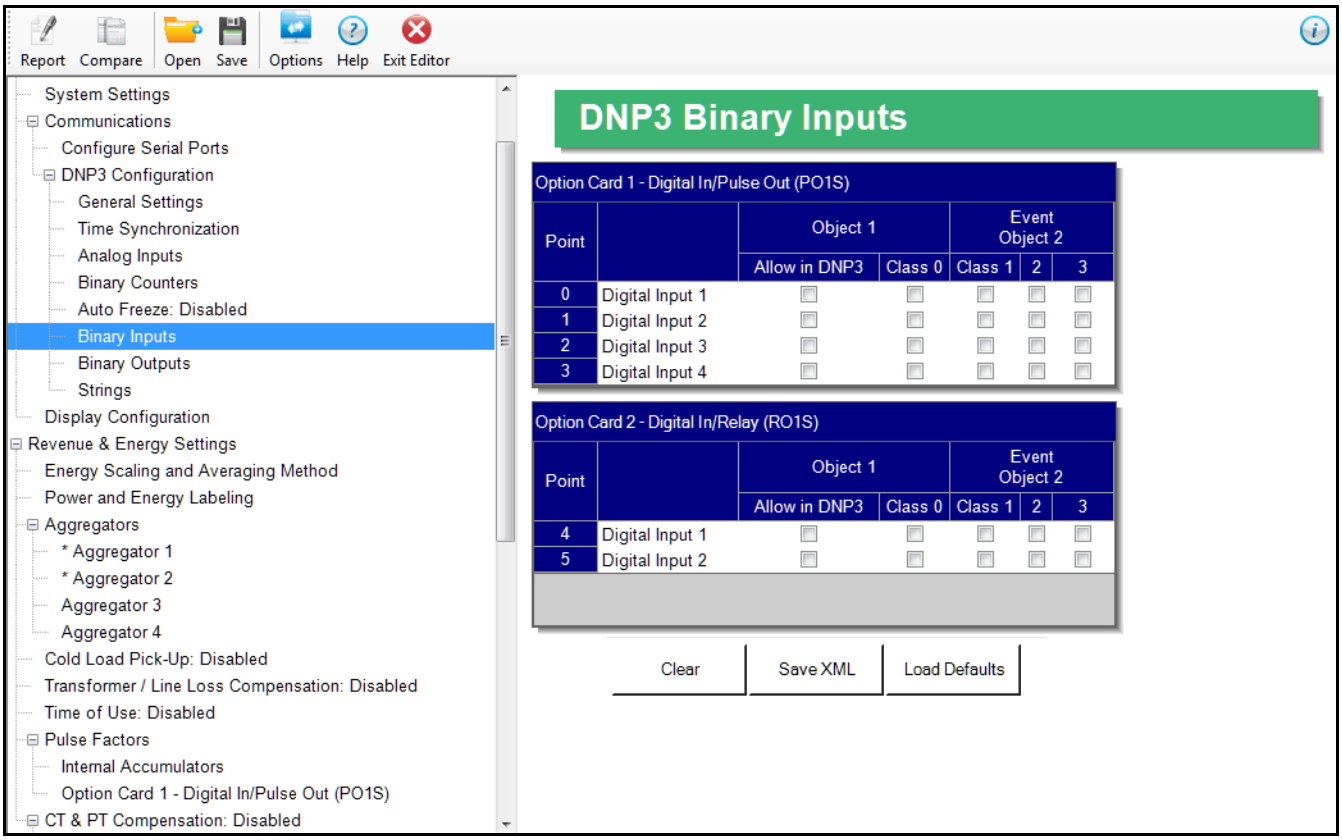
NOTE

This box will not be selectable if TOU is enabled.

27.1.4.1.6 Binary Inputs

The next setting for DNP is Binary Inputs, which is used for the digital inputs from the meter's RS (relay output/digital input) and/or PS (pulse output/digital input) Option cards.

1. From the Tree menu, click **DNP3 Configuration > Binary Inputs**.



You will only see settable fields if an Option card is installed in the meter.

NOTE

The RS has two digital inputs and the PS has four digital inputs.

2. You have the following options:
   - Load the default settings by clicking the **Load Defaults** button.
   - Clear the entries by clicking **Clear**.
   - Enter the settings manually, for the Binary Inputs:
     - For the Event Object 2 fields, select the Class you want to use: Class 0, which corresponds to Object 1 (static binary inputs), or Class 1, 2, or 3, which all correspond to Object 2 (binary input events).
       - If Class 1,2 or 3 is assigned to the Binary Input Event Object 2, the Binary Input will be checked for changes. Every time the input changes state, an event will be created and the value put into the Binary Input Event Object 2. This allows the user to later check on the value at the time of the event.

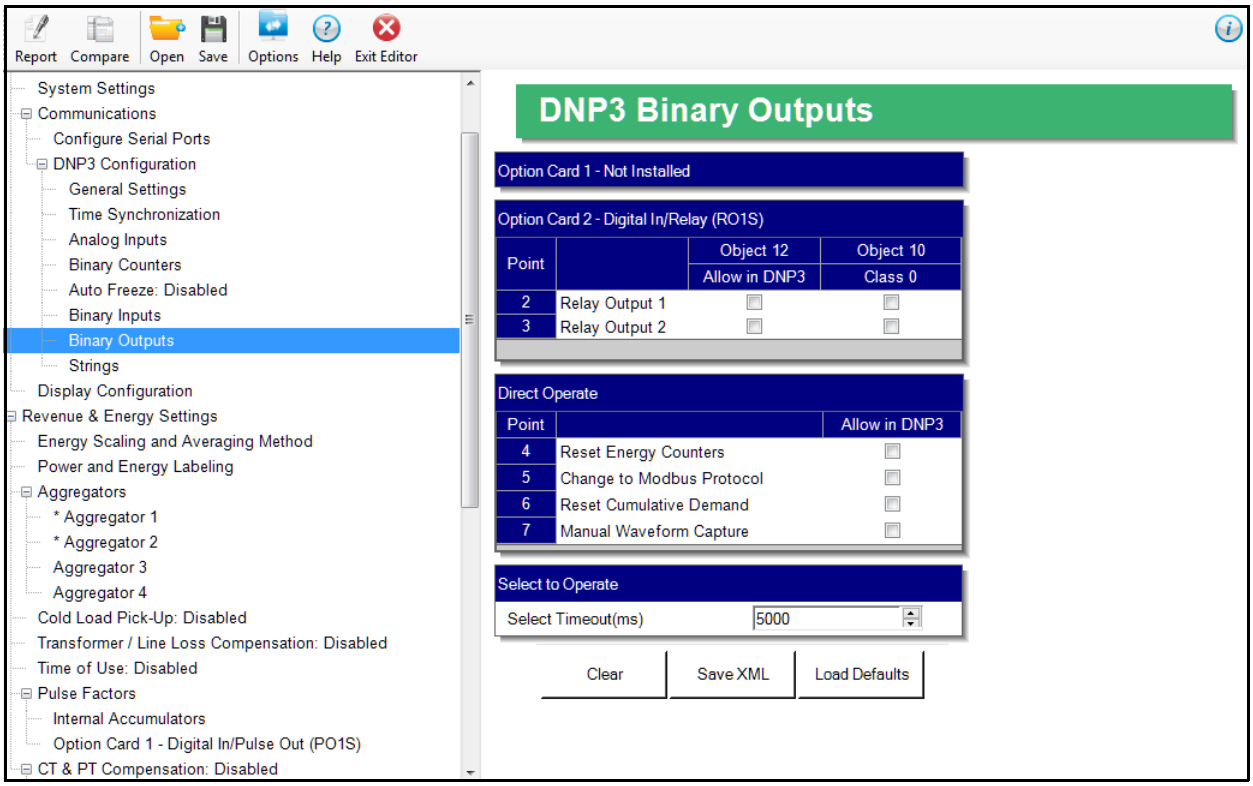
NOTE

When you select a Class, the Allow in DNP3 box is checked automatically. If you uncheck the box, all selected classes will be unchecked.

27.1.4.1.7 Binary Outputs

The next setting for DNP is Binary Outputs, which is used for the relay outputs of the RS Option card.

1. From the Tree menu, click **DNP3 Configuration > Binary Outputs**.



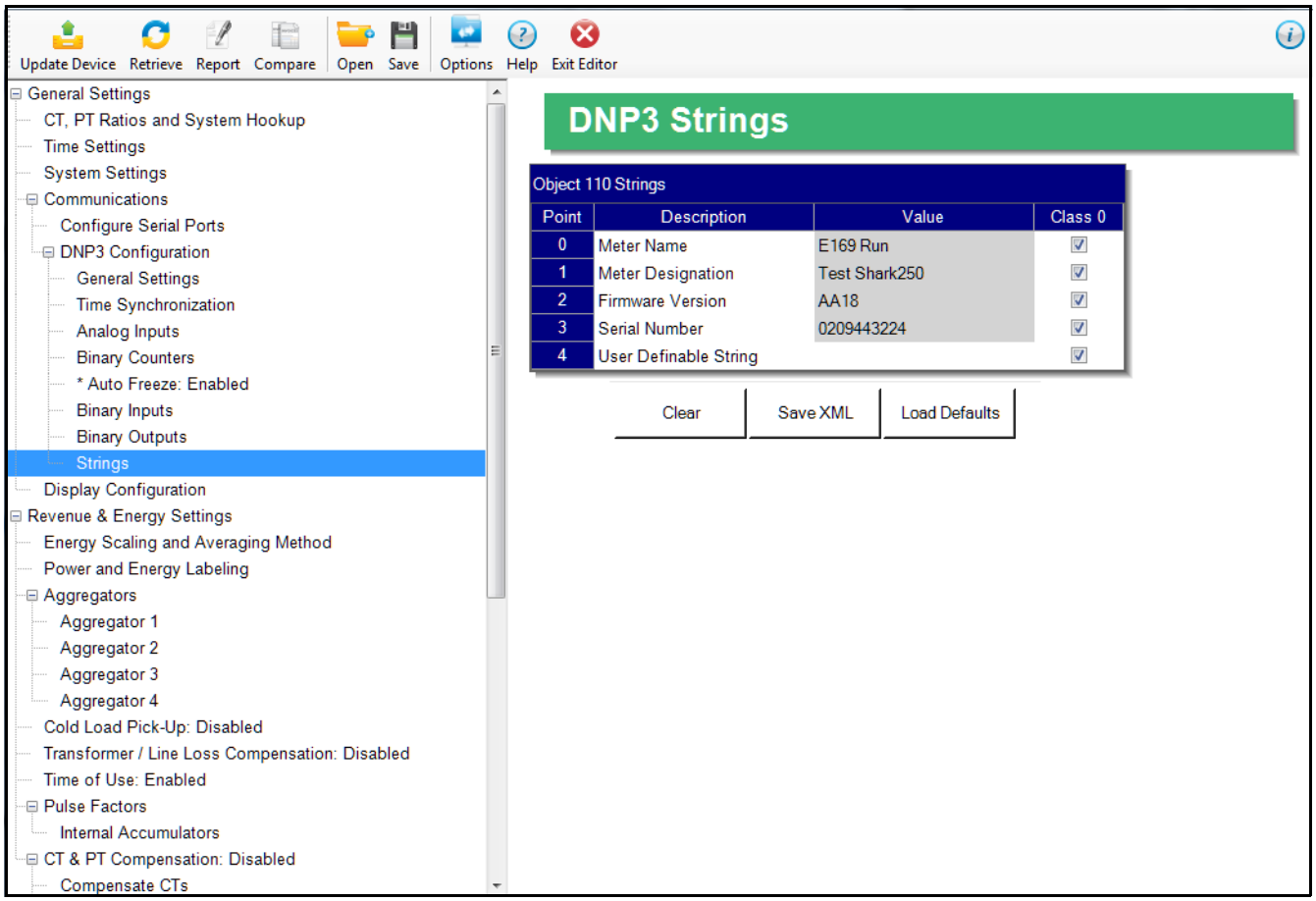
You will only see settable fields if at least one RS card is installed in the meter. You can have two RS cards installed in a meter.

2. You have the following options:
   - Load the default settings by clicking the **Load Defaults** button.
   - Clear the entries by clicking **Clear**.
   - Enter the settings manually, for the binary outputs:
     - Under Object 12 Allow in DNP, click the checkbox next to any relay output you want to be accessed through DNP.
     - For the Object 12 Class 0 fields, Class 0 corresponds to Object 10 (static output state).
     - The relay outputs require a Select before Operate procedure through DNP in order to change them. If instead you want the relay output to be pulsed directly, set up Direct Operate for the options listed: Reset Energy Counters, Change to Modbus Protocol, Reset Demand Counters, and Manual Waveform Capture.
     - Select a timeout in milliseconds. The timeout is the maximum time allowed between the select command being issued and the relay being operated.

27.1.4.1.8 Strings

The last setting for DNP is Strings, which is used to set up reporting of static information, such as meter model.

1. From the Tree menu, click **DNP3 Configuration > Strings**.

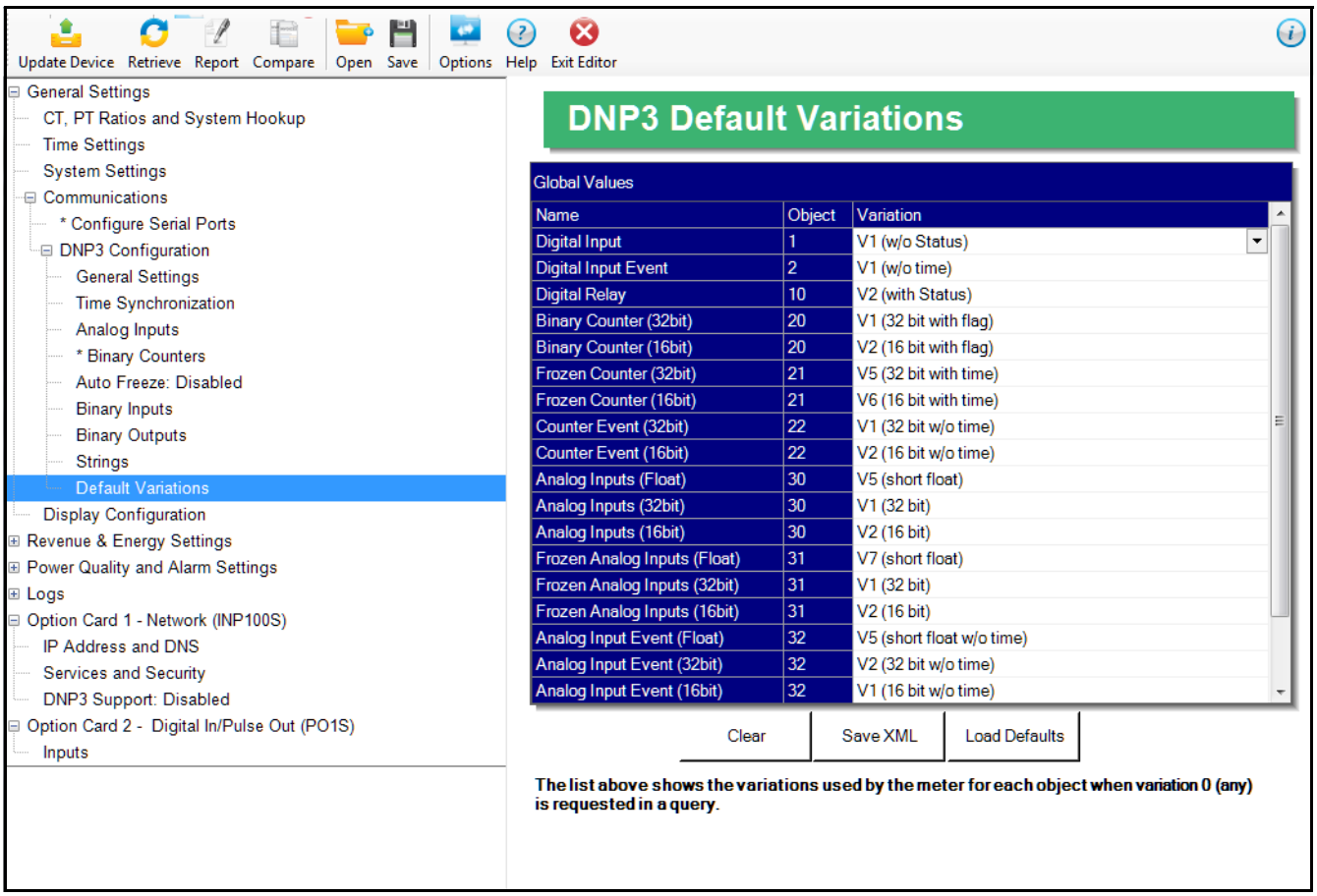


2. You have the following options:
   - Load the default settings by clicking the **Load Defaults** button.
   - Clear the entries by clicking **Clear**.
   - Enter the settings manually, for the strings:
     - Points 0, 2 and 3 are hard-coded and fixed in the meter.
     - Point 1 can be configured in the meter Device Profile. See 27.1.3 *Configuring System Settings* on page 27–6.
     - Point 4 is an editable string, which you can enter. The maximum number of characters you can use is 16.
     - The only assignable class for the strings is Class 0. Click the checkbox to assign any of the strings to Class 0.
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.1.4.1.9: Default Variations

The last setting for DNP is Default Variations, which is used to configure the variations used by the meter for each object when Variation 0 is requested by a query. Note that there are default configurations already set up in the meter for Variation 0, but this setting lets you change them. Refer to Appendix C in the *EPM 7000P Instruction Manual* for details on this setting.

1. From the Tree menu, click **DNP3 Configuration > Default Variations**.



2. For each of the objects listed under Global Values, you can select the Variation number you want to use. Note that some objects have more than one Type, i.e., Float, 16-Bit, or 32-bit - for these objects you can assign a variation to each type.

See the example configuration for Object 30, Analog Inputs, below; each of the object's types has been programmed with a different default Variation.

Global Values		
Name	Object	Variation
Digital Input	1	V1 (w/o Status)
Digital Input Event	2	V1 (w/o time)
Digital Relay	10	V2 (with Status)
Binary Counter (32bit)	20	V1 (32 bit with flag)
Binary Counter (16bit)	20	V2 (16 bit with flag)
Frozen Counter (32bit)	21	V5 (32 bit with time)
Frozen Counter (16bit)	21	V6 (16 bit with time)
Counter Event (32bit)	22	V1 (32 bit w/o time)
Counter Event (16bit)	22	V2 (16 bit w/o time)
Analog Inputs (Float)	30	V5 (short float)
Analog Inputs (32bit)	30	V1 (32 bit)
Analog Inputs (16bit)	30	V2 (16 bit)
Frozen Analog Inputs (Float)	31	V7 (short float)
Frozen Analog Inputs (32bit)	31	V1 (32 bit)
Frozen Analog Inputs (16bit)	31	V2 (16 bit)

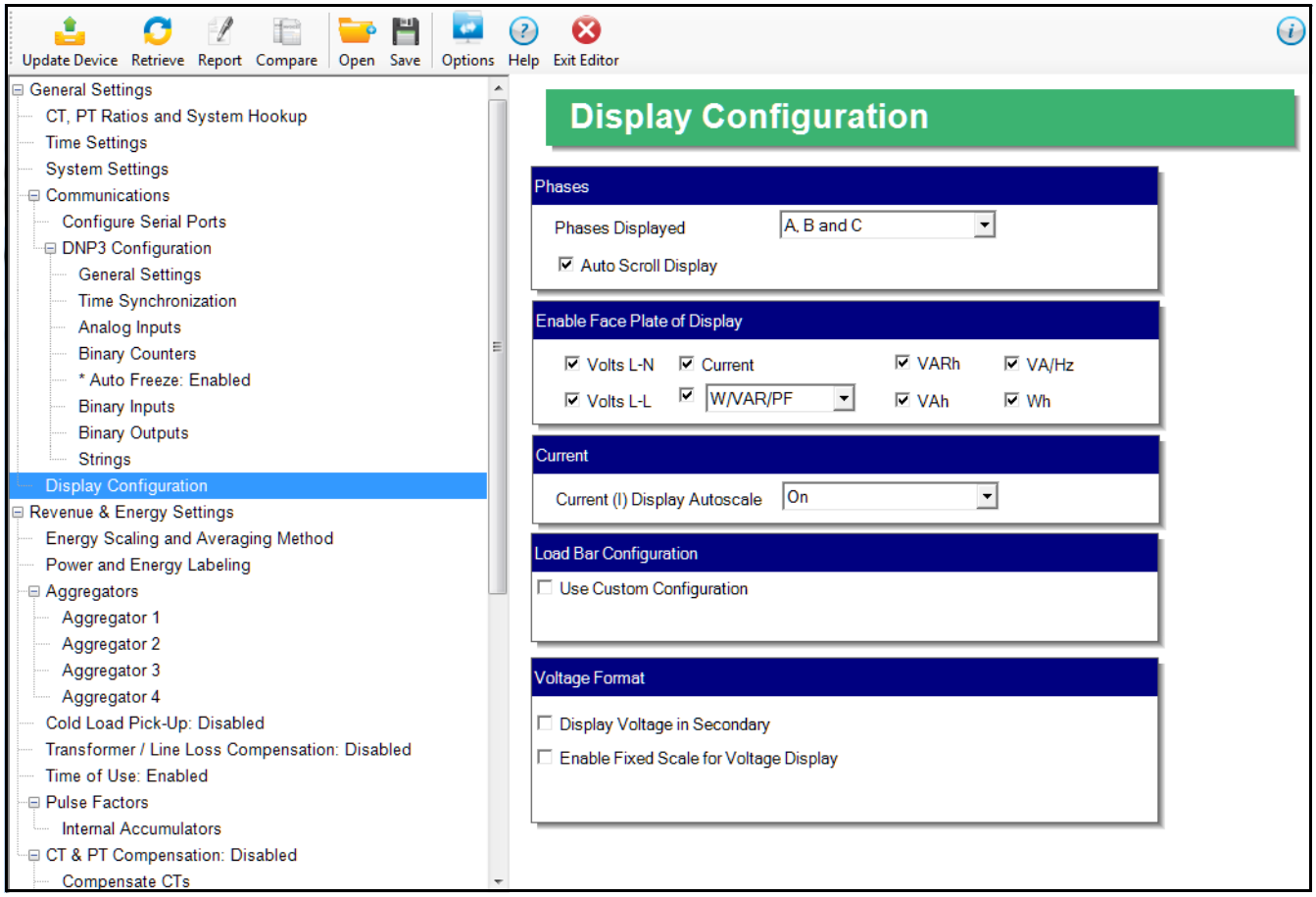
27.1.5 Setting Display Configuration

Some users may want to lock the meter to a particular faceplate display or series of displays. For example, if you would like the meter to act only as a Volt meter, or only as an ammeter, the meter can be configured to display only the relevant screen. Use this setting to lock the display of the EPM 7000P meter's faceplate to the specific combination you want. Refer to the *EPM 7000P Instruction Manual* for additional information on the faceplate.

NOTE

You will not see this setting if you are connected to a EPM 7000PT transducer.

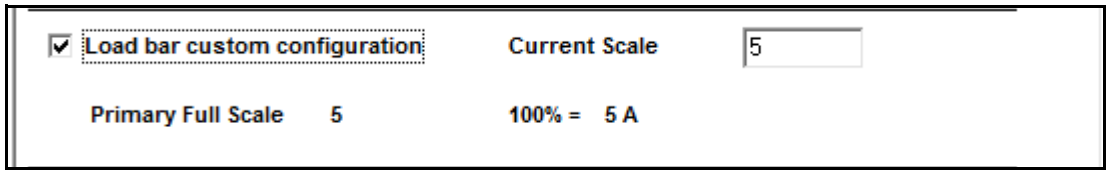
1. From the Tree Menu, click **General Settings > Display Configuration**.



2. The screen fields and acceptable entries are as follows:
   - **Phases Displayed**: A; A and B; A, B, and C. This field determines which phases display on the faceplate. For example, if you select A and B, only those two phases will be displayed on the faceplate.
   - **Auto Scroll Display**: Click to enable, leave unchecked to disable. This field enables/disables the scrolling of selected readings on the faceplate. If enabled, the readings scroll every 5 seconds.
   - **Enable on Face Plate of Display**: Check the boxes of the Readings you want displayed on the faceplate of the meter. You must select at least one reading.

- **Current (I) Display Autoscale**: On to apply scaling to the current display or Off (No decimal places).
- **Load Bar Custom Configuration**: This allows the meter to display load with an analog representation. This way the user can get a visual presentation of the loading of the circuit. To enter scaling for the Load Bar:

  a. Click the **Use Custom Configuration** checkbox. Fields display on the screen that allow you to enter a Scaling factor for the display. See the figure below

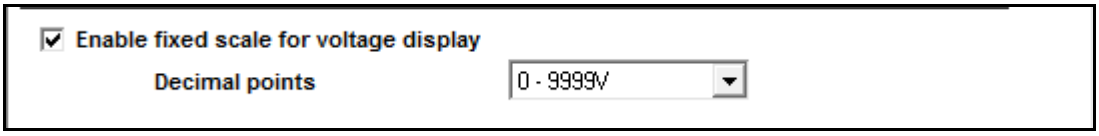


  b. Enter the scaling factor you want in the Current Scale field. This field is multiplied by the CT Multiplier set in the CT, PT Ratios, and System Hookup screen (see 27.1.1 *Configuring CT, PT Ratios and System Hookup* on page 27–2) to arrive at the Primary Full Scale. Make sure you set the CT multiplier correctly.
- **Display Voltage in Secondary**: Click to enable or uncheck to disable. This setting overrides the next setting, i.e., if it is selected, the fixed scale setting is ignored.
- **Enable Fixed Scale for Voltage Display**: To enter a scaling factor for the Voltage display:

NOTE

This setting is ignored if you select to display voltage in secondary in the previous setting.

  a. Click the checkbox next to **Enable Fixed Scale for Voltage Display**. The screen changes - see the figure below.

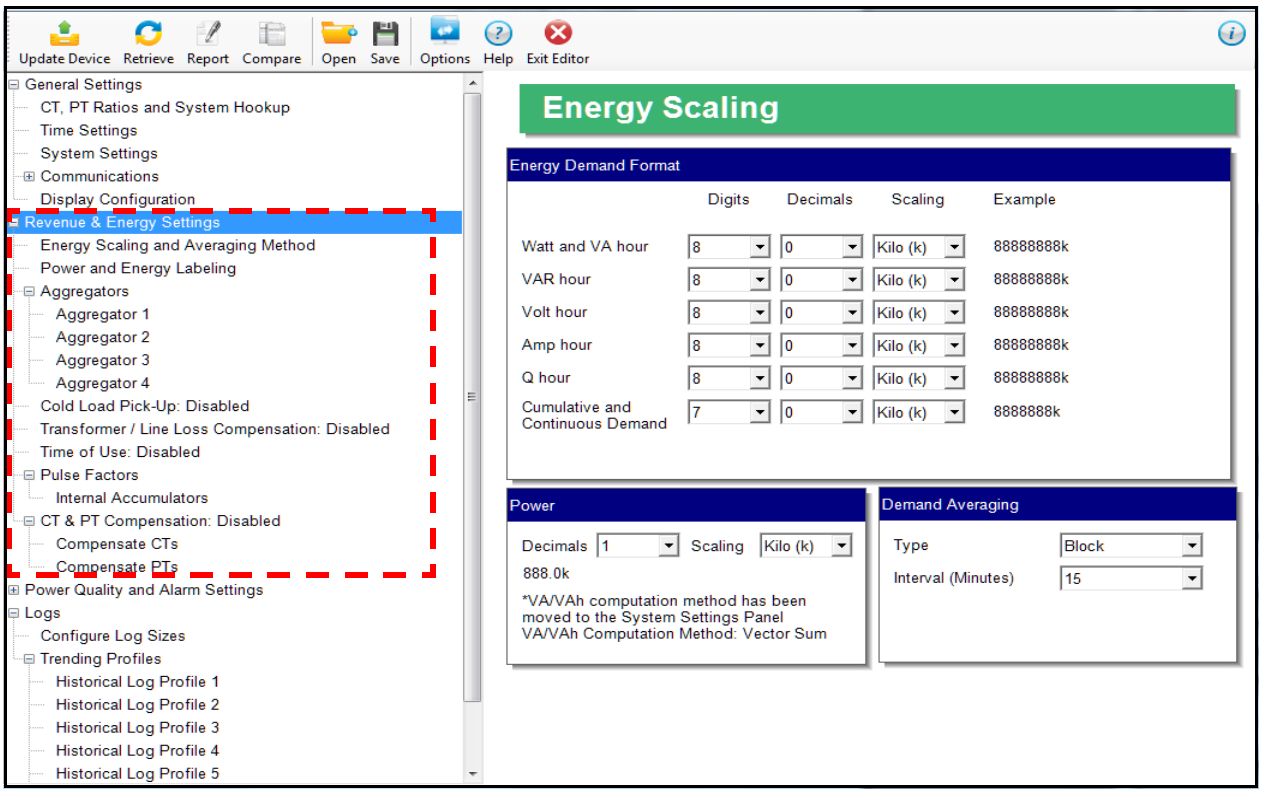


  b. Select the scaling you want to use from the pull-down menu. The options are: 0-9999V, 100.0kV-999.9kV, 10.00kV-99.99kV, or 0kV-9.999kV.

3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.2 Revenue and Energy Settings

From the Tree Menu on the left side of the EPM 7000P meter Device Profile screen, double-click on the **Revenue and Energy Settings** line or click on the **+** button next to it. The settings in the Revenue and Energy Settings group are listed.



27.2.1 Configuring Energy, Power Scaling, and Averaging

From the Tree Menu, click **Revenue & Energy Settings > Energy, Power Scaling, and Averaging** (see the screen above). Use this setting to configure:

- The display and storage of Energy registers in the meter
- The display of Power data in the meter
- The method of VA computation
- The interval over which Average values are computed, as well as the Interval Energy

Functional Overview of Energy Settings, VA Computation, and Averaging:

- **Energy Scaling**
  Energy Setting includes:
  Digits (the number of digits in the reading)
  Decimals (the number of decimal places in the reading)
  Energy Scale: the scale of the reading - unit; kilo (number times 1000); Mega (number times 1 million)

  Energy settings allow you to balance the resolution (or accuracy) of the energy stored,

with the interval over which energy rollover occurs. For example, the maximum resolution for a k scale reading is: 99999.999k.

To calculate the speed at which the energy will rollover, you must know the Power Full Scale, which is computed from the CT and PT Full Scale values (see 27.1.1 *Configuring CT, PT Ratios and System Hookup* on page 27–2). The formula for calculating Power Full Scale is:
Wye system: CT Full Scale x PT Full Scale x 3
Delta system: CT Full Scale x PT Full Scale x 3 x $\sqrt{3}$

For example, for a CT Full Scale of 2000, PT Full Scale of 14400, Wye system:
2000 x 14400 x 3=86400000
In this example, the energy will increment at 86400000 Watts per hour, or 24000 Watts per second.
This value allows you to determine the number of digits, decimal places, and energy scale you want to configure for the Energy settings, when you take into account the rollover time.

To determine the number of hours before rollover, use this formula:
[Max Resolution]/[Full Scale] = #Hours, where Max Resolution = maximum digits and decimals for the Energy scale in use.

Using the example from above, with an energy scale of Mega, the formula would be:
99999.999 M/86.4 M = 1157.4074 hours or about 48 days until rollover.

NOTE

To increase the number of days until rollover, you can increase the number of digits (to 8), decrease the number of decimal places (to 0), or increase the Energy Scale (to M).

- **Apparent Power (VA) Computation**:

  There are two optional methods of VA Computation:

  Arithmetic Sum - the formula for this calculation is:

$$VA_T = VA_a + VA_b + VA_c$$

  Vector Sum - the formula for this calculation is:

$$VA_T = \sqrt{W_T^2 + VAR_T^2}$$

  Generally, the superior method for calculating VA is to use the Vectoral method; however, both methods are provided.

- **Demand Averaging**
  Demand is the average rate of energy use over time. The EPM 7000P meter supports two types of demand averaging: Block demand and Rolling demand.

  Block demand records the average demand for time intervals that you define (usually 5, 15 or 30 minutes).

  Rolling demand functions like multiple, overlapping Block demands. You define the subintervals at which an average of demand is calculated. An example of Rolling demand would be a 15-minute Demand block using 5-minute subintervals, thus providing a new demand reading every 5 minutes, based on the last 15 minutes.

1. The screen fields and acceptable entries are as follows:
   - Energy Demand Format: for each of the readings, enter:
     - Digits (number of digits): 5; 6; 7; 8
     - Decimals (number of decimals): 0 - 6
     - Scaling: unit; kilo (k); mega (M)

     Example: shows the result of your choices, i.e., reading for Digits: 8; Decimals: 3; Scale: k, show leading zeros, would be formatted as:
     00123.456k

NOTE

Your selection in the Energy Demand Format fields determines the precision of energy stored for display and polling. Refer to the Functional Overview at the beginning of this section for more information.

If you are changing the energy settings, we recommend you first reset the Energy Accumulators, in order to prevent erroneous counts. See 20.1.7 *Reset Device Information* on page 20–8, for instructions on resetting the EPM 7000P meter's Energy Accumulators.

   - Power Settings
     - Decimals (number of digits): 0-3
     - Scaling: Auto; unit; kilo (k); mega (M)
     - VA (Apparent Power) Calculation Method: Arithmetic Sum; Vector Sum (See explanation on the previous page.)
   - Demand Averaging
     - Type: Block or Rolling
     - Interval (Block demand) or Sub-Interval (Rolling demand): 5; 15; 30; 60
     - Number of Subintervals: 1; 2; 3; 4
     - Interval Window: This field is display only. It is the product of the values entered in the Sub-Interval and Number of Subintervals fields.

NOTE

You will only see the Number of Subintervals and Interval Window fields if you select Rolling demand.

NOTE

If you have set an Input to trigger EOI demand averaging (using either a Relay Output/ Digital Input or Pulse Output/Digital Input Option card) any entry you make in the Demand Averaging field will be ignored. A message to that effect appears on the screen. See 27.5.2 *Configuring a Relay Output/Digital Input Card* on page 27–56 and 27.5.3 *Configuring a Pulse Output/Digital Input Card* on page 27–60, for instructions on setting EOI pulse for demand averaging. This affects Time of Use as well, since the TOU accumulations will occur at the EOI trigger point, rather than on the programmed interval, which can result in TOU periods of longer or shorter length than expected.

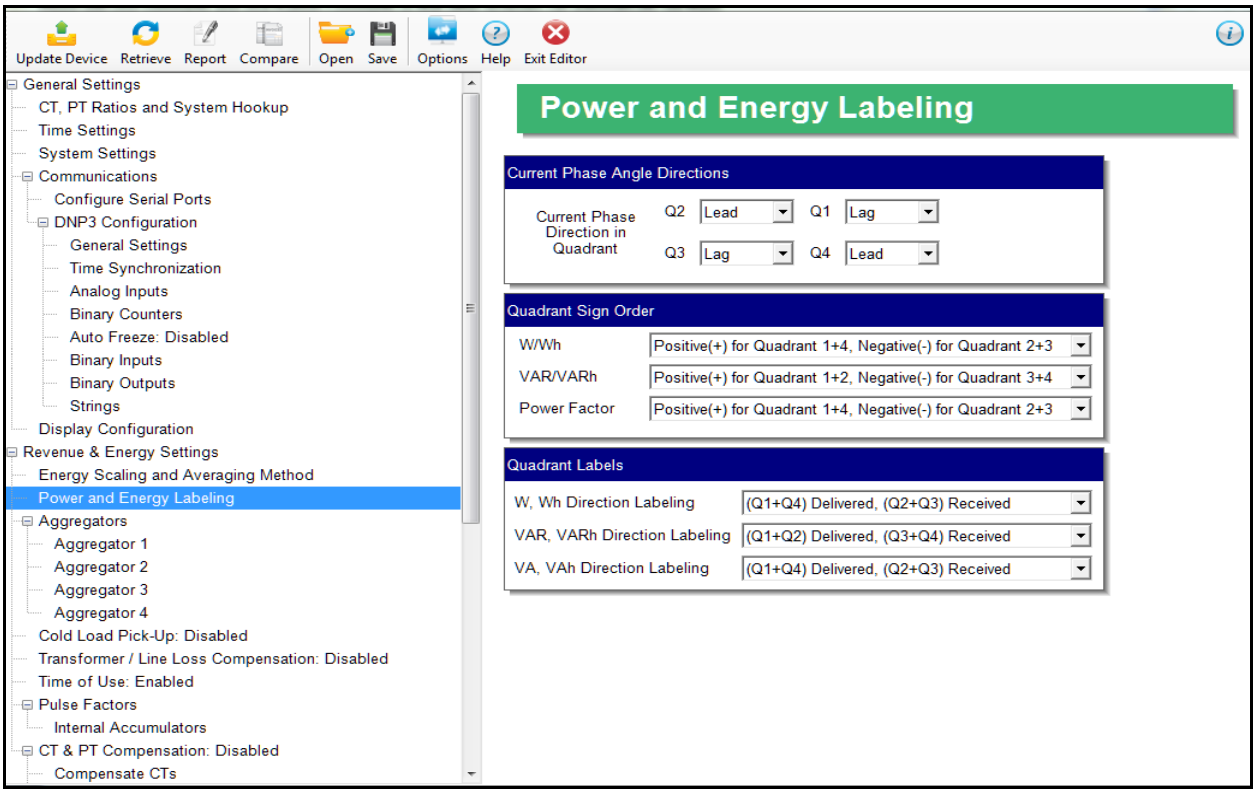
2. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.2.2 Power and Energy Labeling

This setting matches the direction of power for the meter to that of the electrical system being measured. Use it to designate the system as an inductive (lagging) load, with current lagging voltage; or as a capacitative (leading) load with current leading voltage.

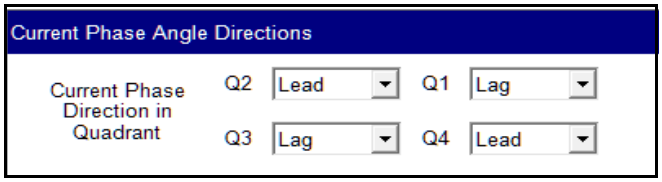
Power direction for the meter is determined by setting the power quadrants as lagging or leading; setting the sign order for power and energy readings, such as watt/watt-hour; and setting the quadrant labels as received or delivered. This setting insures that the meter power measurements match the electrical system. There are examples of different power direction settings, after the instructions.

1. From the Tree Menu, click **Revenue & Energy Settings > Power and Energy Labeling**.

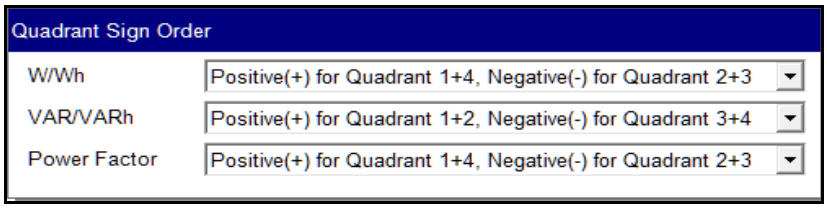


2. Assign the following settings:

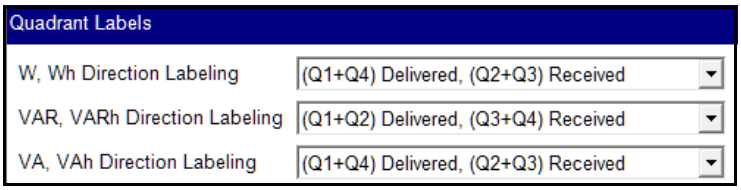
a. Current Phase Angle Directions: designate each of the 4 energy quadrants, Q1, Q2, Q3, Q4, as Lead(ing) or Lag(ging).



b. Quadrant Sign Order: designate the positive and negative power quadrants for W/Wh, VAR/VARh, and Power Factor.



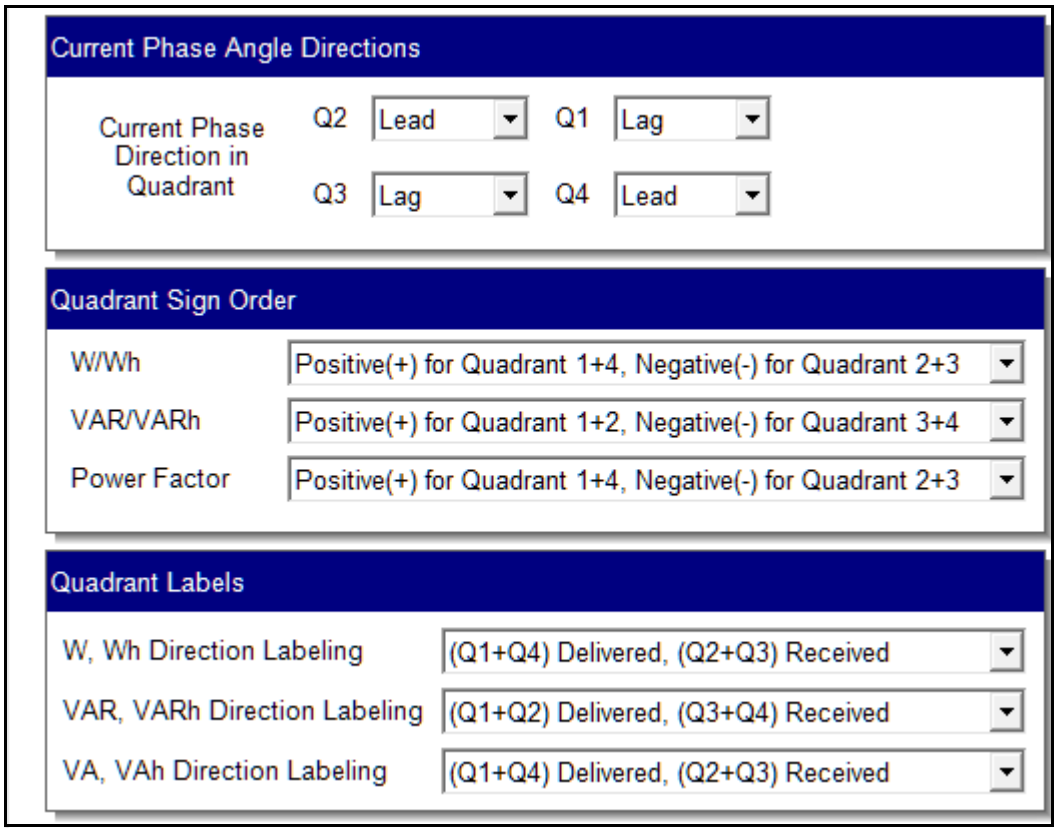
c. Quadrant Labels: select the labels from the pull-down menus.



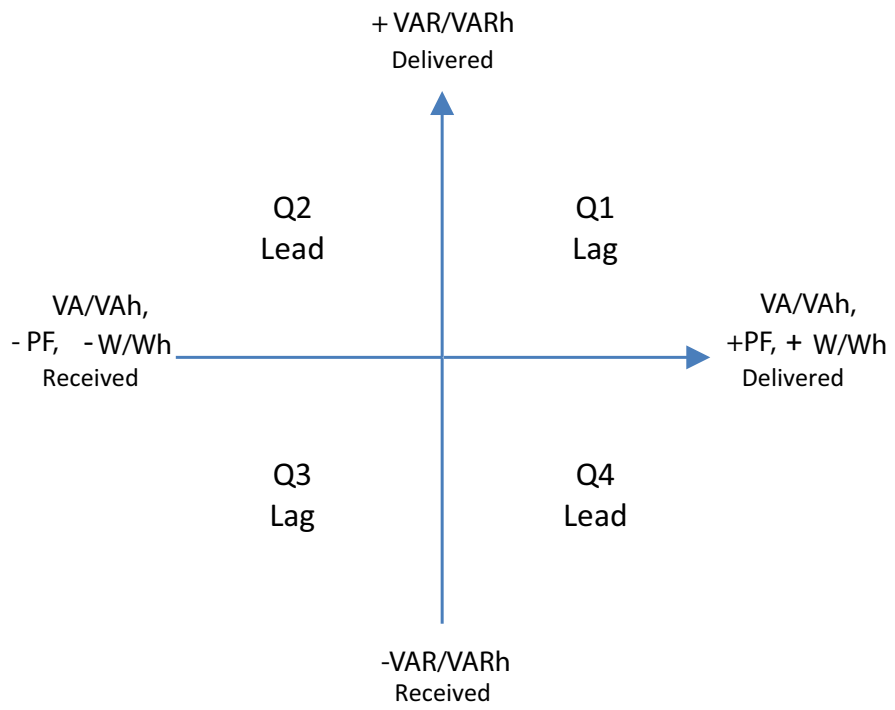
See the examples of different quadrant settings on the next two pages.

3. To implement any changes, click the Update Device button to send the new profile to the meter.

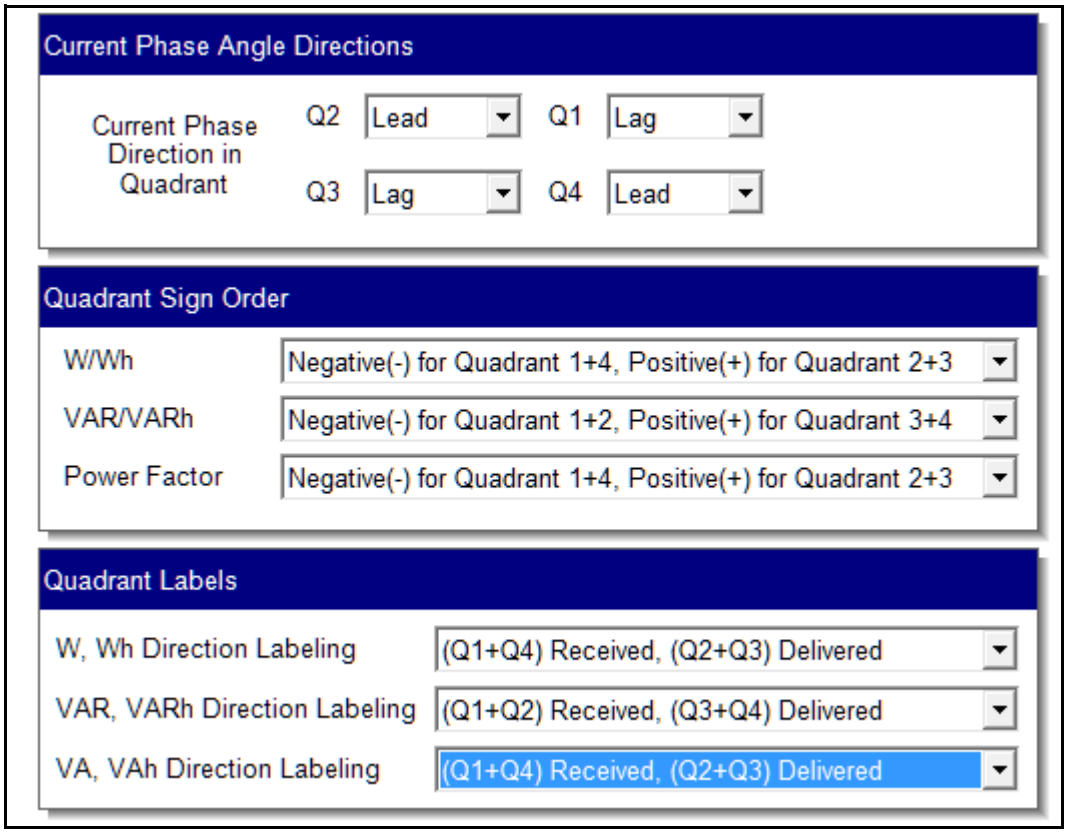
Example 1

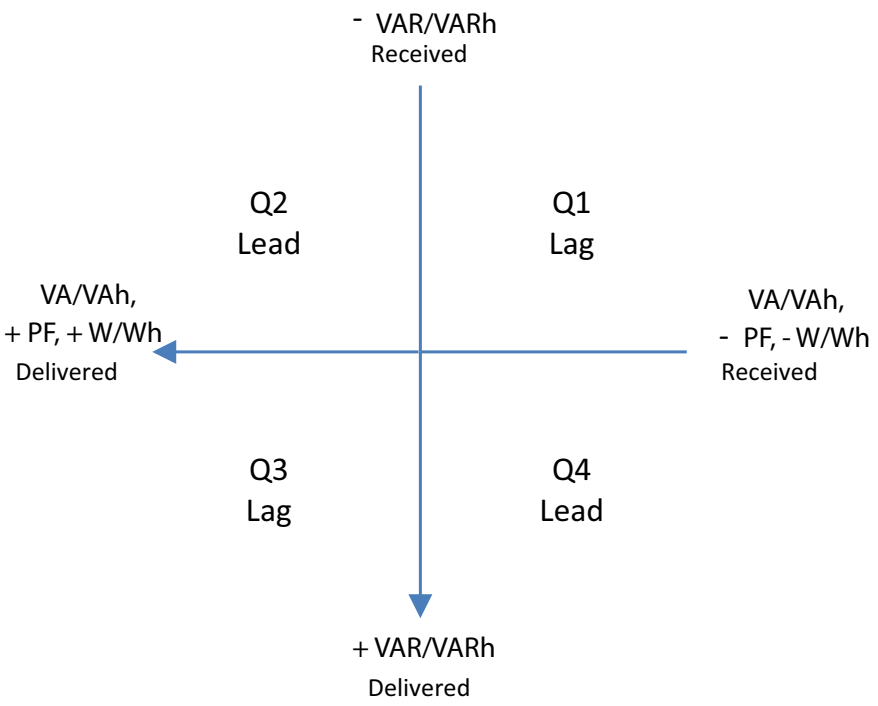


These settings are illustrated below (they are the factory default settings).



Example 2




- VAR/VARh
Received
Q2
Lead
Q1
Lag
VA/VAh,
+ PF, + W/Wh
Delivered
VA/VAh,
- PF, - W/Wh
Received
Q3
Lag
Q4
Lead
+ VAR/VARh
Delivered

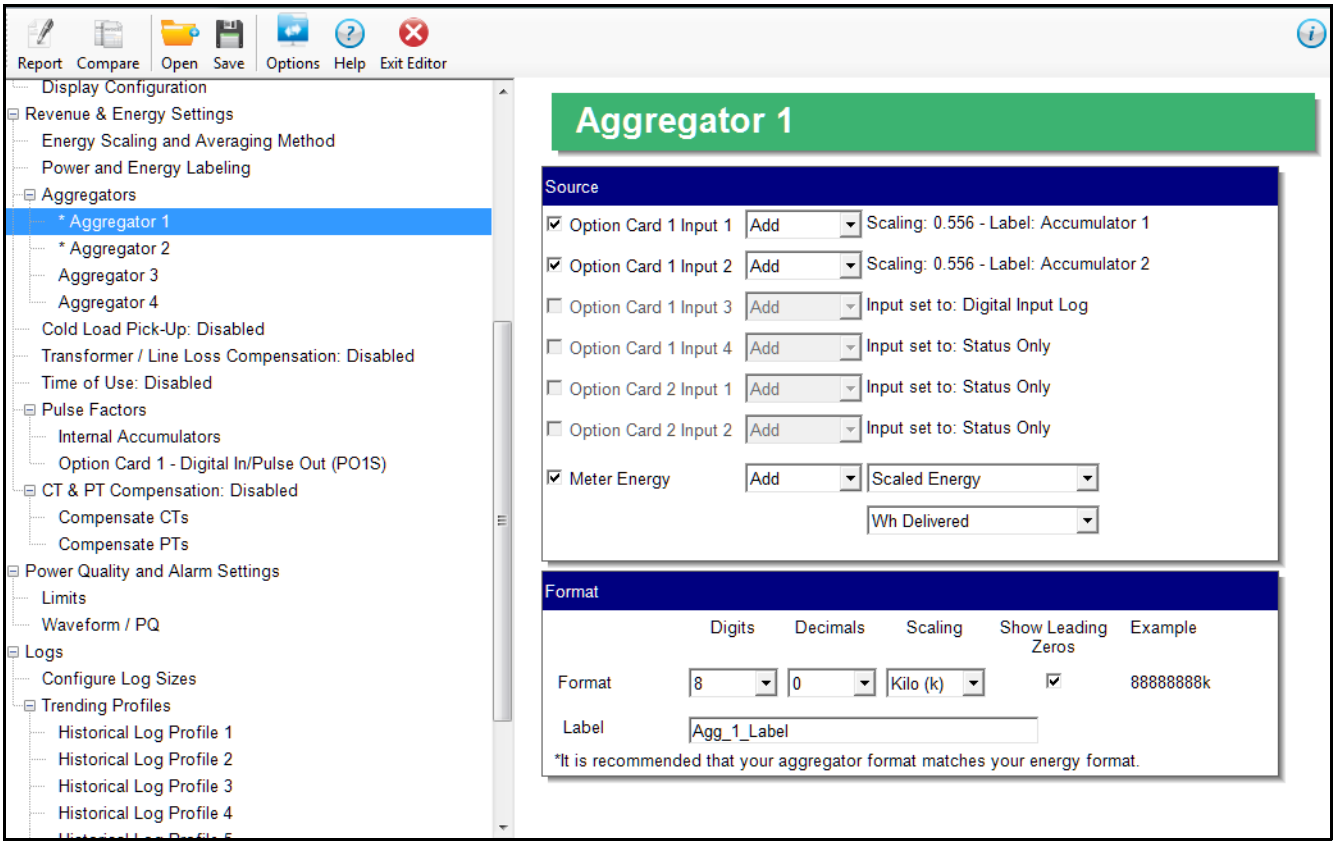
27.2.3 Aggregators Setting

Aggregators are registers that hold the sum/difference of data from multiple sources, internal and external. An example use for an aggregator is to totalize pulses from different meters. The EPM 7000P meter offers four aggregators. The aggregators get data from two sources: 1. an input that is set up as an accumulator (see 27.5.2 *Configuring a Relay Output/Digital Input Card* on page 27–56 and 27.5.3 *Configuring a Pulse Output/ Digital Input Card* on page 27–60) and 2. one of the meter's energy registers. The value of the Input accumulator(s) and of the energy register can either be added to, or subtracted from, the aggregator.

The Pulse Output/Digital Input card has four inputs and the Relay Output/Digital Input card has two inputs. Each aggregator can hold the addition/subtraction of one to eight of the digital inputs and 1 energy register listed in the table below and on the following page.

Energy (Compensated & Uncompensated)
It, Phase A
It, Phase B
It, Phase C
Vt, Phase A-N
Vt, Phase B-N
Vt, Phase C-N
Vt, Phase A-B
Vt, Phase B-C
Vt, Phase C-A
Wh, (Q1+Q4)
Wh, (Q2+Q3)
VARh, (Q1+Q2)
VARh, (Q3+Q4)
VAh, Total
Quadrant 1 Wh, Total
Quadrant 1 VARh, Total
Quadrant 1 VAh, Total
Quadrant 2 Wh, Total
Quadrant 2 VARh, Total
Quadrant 2 VAh, Total
Quadrant 3 Wh, Total
Quadrant 3 VARh, Total
Quadrant 3 VAh, Total
Quadrant 4 Wh, Total
Quadrant 4 VARh, Total
Quadrant 4 VAh, Total
VAh (Q1+Q4), Total
VAh (Q2+Q3), Total
+Qh, Total
-Qh, Total

1. To set up aggregators, click Revenue and Energy Settings > Aggregators > Aggregator (1-4). All four aggregators are set up the same way.



2. In the Source section you set up the Input and the Energy register to use:

a. Depending on the Option card(s) installed in the meter, you will see between none and eight Option card Inputs listed. Click the checkbox to the left of any Inputs you want to use in the aggregator. The scaling and label for that accumulator is listed to the right of the Input's field.

NOTE

IMPORTANT! The Input must be assigned as an accumulator. See 27.5.2 *Configuring a Relay Output/Digital Input Card* on page 27–56 and 27.5.3 *Configuring a Pulse Output/ Digital Input Card* on page 27–60, for instructions on setting up an Input as an accumulator.

b. Select Add or Subtract from the pull-down menu next to each Input you are using. Add means that you want to add the Input accumulator value to the aggregator; subtract means you want to subtract the Input accumulator value from the aggregator.

c. Click the checkbox to the left of Meter Energy and select the energy register you want to use from the pull-down menu. The top menu lets you select the Energy type, e.g., Scaled Energy, and the bottom menu lets you select the energy register, e.g., Wh Delivered.

d. Select Add or Subtract from the pull-down menu next to the Meter Energy field. Add means that you want to add the Energy value to the aggregator; subtract means you want to subtract the Energy value from the aggregator.

3. In the Format section you set up the energy format and label for the aggregator:

   a. Select the number of digits (5-8), decimals (0-6), and scaling (kilo or Mega), from the pull-down menus.

   b. If you want to show leading zeros, click the checkbox.

   c. The Example field shows what your formatting choices will look like.

   d. Enter a label for the aggregator. The label can be up to 32 characters.

4. To implement any changes, click the Update Device button to send the new profile to the meter.

27.2.4 Cold Load Pickup (Demand Forgiveness)

The EPM 7000P meter offers Cold Load Pickup, so that in case a power system outage or excessive power system voltage drop occurs, when normal service is resumed, the customer will not be billed for the initial surge or in-rush of power to feed its "cold loads." During the initial time period immediately following the return of normal electric service, the demand is not computed in the Demand Registers if the two threshold conditions described below are met, so the customer is not billed for possible excessive demand due to "cold load pickup."

- A power system outage which drops the metering potential inputs to the meter (to below a programmed threshold) and also drops the meter power.
- A power system outage which drops the metering potential inputs to the Meter (to below a programmed threshold), but the meter external power remains supplied by an alternate source (e.g., station battery, station service, etc.), that is, the meter continues to operate.

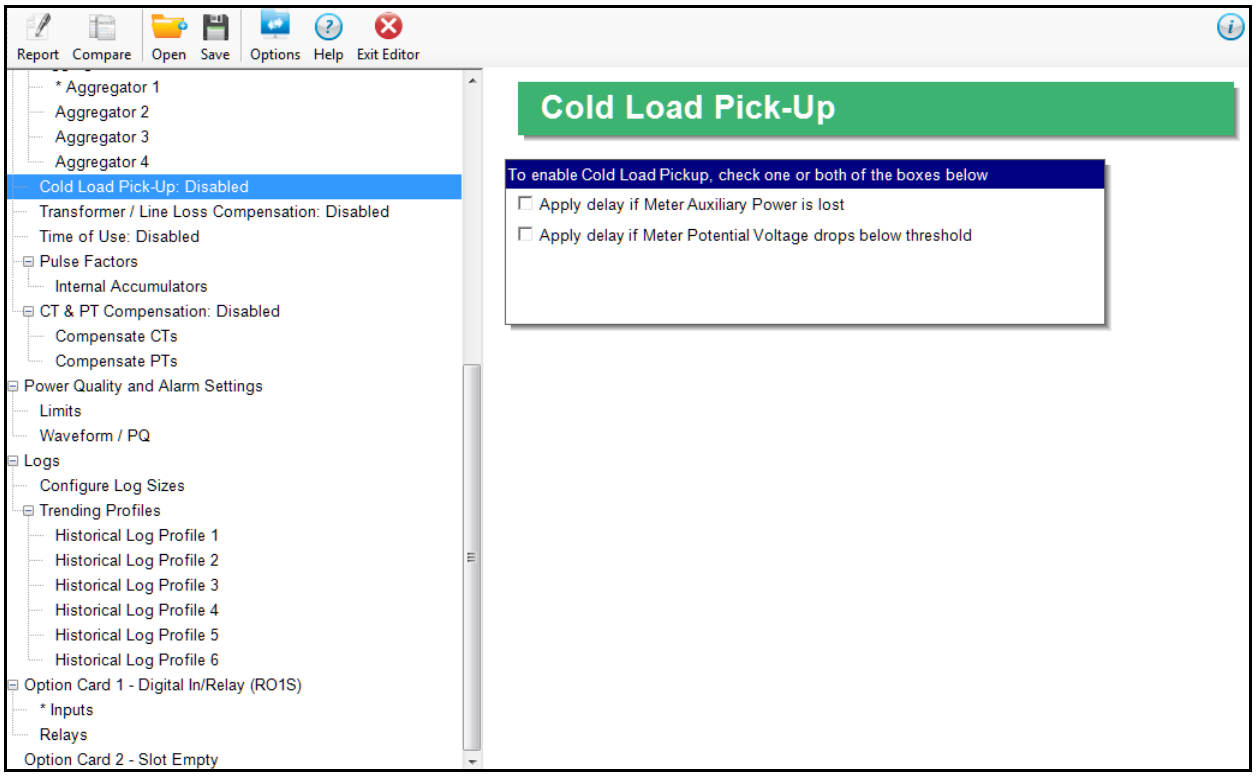
NOTE

Energy is always continuously measured and is also recorded in the Power Profile Logs, if so configured (see 27.4.2 *Trending Profiles - Configuring Historical Logs* on page 27–50, for log setup procedures).

1. From the Tree Menu, click **Revenue & Energy Settings > Power and Energy Labeling**.

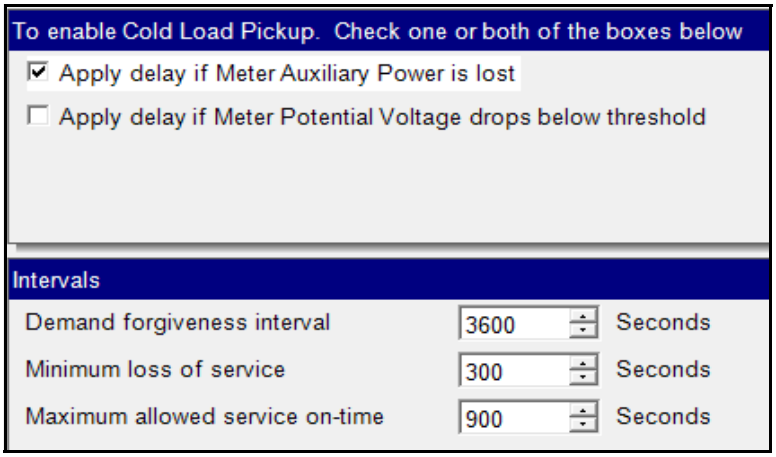
   Use this setting to enable and configure the meter cold load pickup/demand forgiveness feature. When enabled, this feature lets you set the amount of time power is off to identify a power outage that is the responsibility of the utility (as opposed to a very short term loss of power that is not their responsibility) and the amount of time

you want to wait before demand starts again. This time should correspond to the "grace" period the utility applies to avoid charging for motor startup, etc. after a power outage.



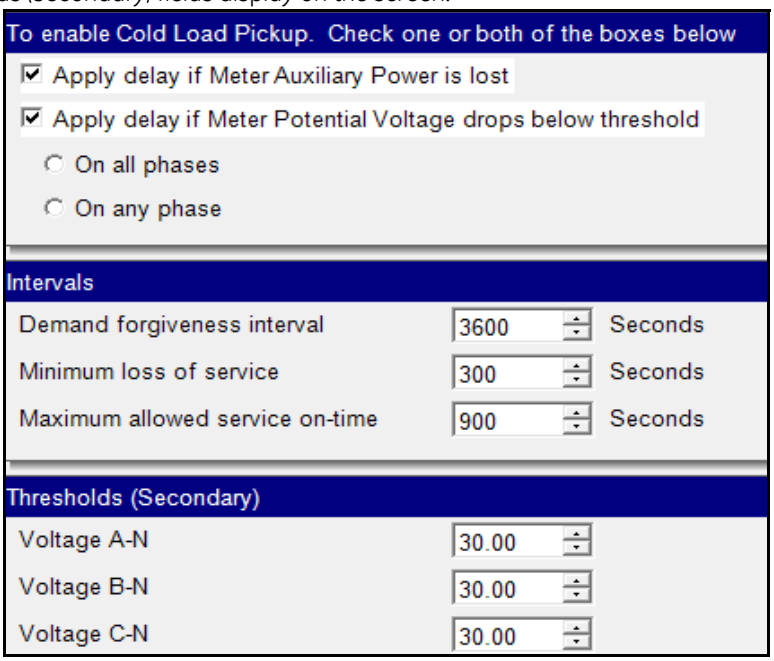
2. Assign the following settings:

   a. Click **Apply** delay if meter Auxiliary Power is Lost. The Intervals fields display on the screen.



- Demand Forgiveness Interval: use the up and down arrows to reset the cold load condition cycle.
- Minimum Loss of Service: use the up and down arrows to set the minimum amount of time that power needs to be off before a cold load condition occurs.
- Maximum Allowed Service On-Time: use the up and down arrows to set the maximum time that Demand is not accumulated when a cold load condition occurs.

b. Click Apply Delay if Meter Potential Voltage Drops Below threshold. The Intervals and Thresholds (Secondary) fields display on the screen.



- You can select to apply the threshold to either all phases (click On All Phases radio button) or any of the phases (click On Any Phase radio button).
- Make the Intervals settings the same as in step a.
- Set the thresholds: use the up and down arrows to enter the percentage drop for each phase A-N, B-N, C-N.

3. To implement any changes, click the Update Device button to send the new profile to the meter.

27.2.5 Transformer/Line Loss Compensation

Transformer losses are power used by the transformer while working. The more load on the transformer, the higher the transformer losses. There are two types of transformer losses:

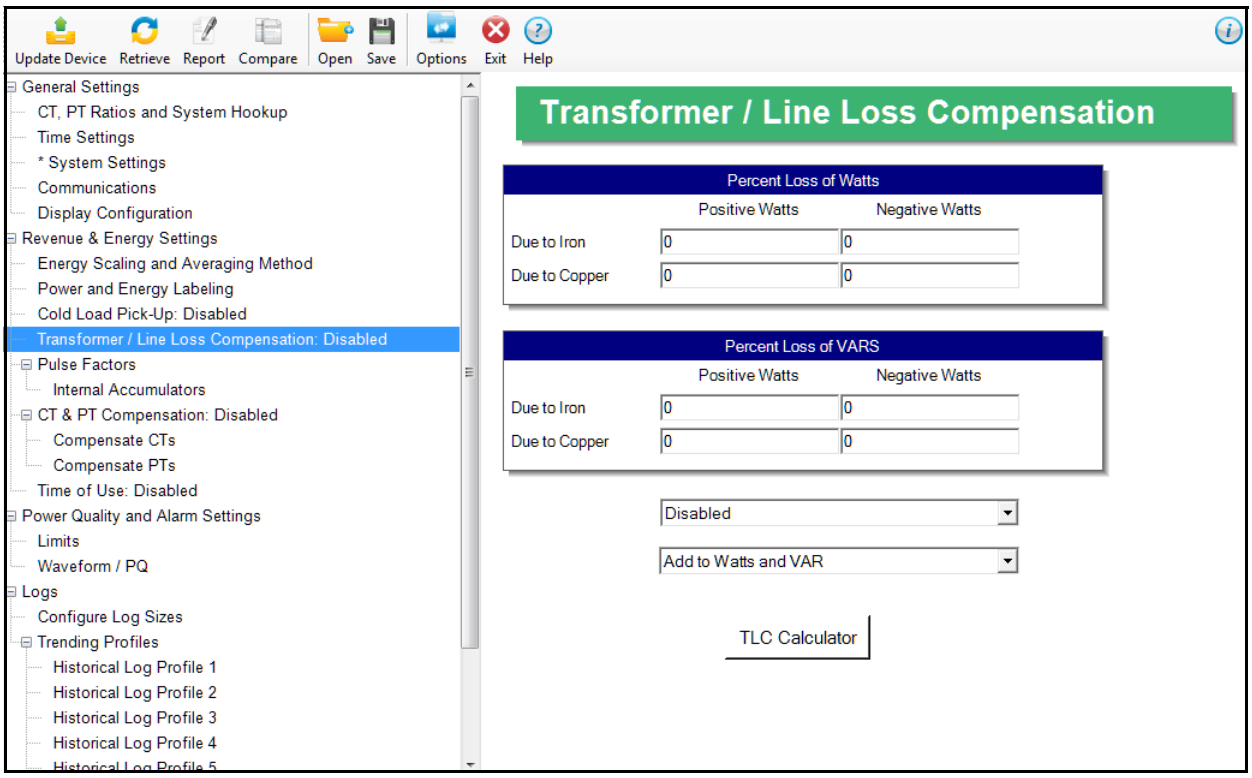
- No load losses - these are the fixed losses that keep the transformer up and running.
- Load losses - these vary with changes in the load.

When the meter is located on the secondary side of a customer's transformer, a utility will want to add the transformer losses into the energy usage calculation. However, this practice is regulated by local jurisdiction and regulations. The meter has the capability to add in or subtract out these transformer losses, depending on the user's specific needs.

Line losses are similar to transformer losses, except that they are used to compensate for loss incurred on wires, such as transmission lines.

Transformer/Line Loss Compensation allows you to add or subtract transformer and/or line losses to meter registration.

1. From the Tree Menu, click **Revenue & Energy Settings > Transformer/Line Loss Compensation.**



2. This screen displays the current values for the meter's Transformer Loss Compensation. The screen fields and acceptable entries are as follows
   - Percent Loss of Watts due to Iron and Copper/Positive Watts and Negative Watts
   - Percent Loss of VARS due to Iron and Copper/Positive and Negative Watts
   - Drop-down menu #1. Choose from: Disabled, Fe Only, Cu Only, Both Fe and Cu.
   - Drop-down menu #2. Choose from: Add to Watts and VAR; Add to Watts and Subtract from VAR; Subtract from Watts and Add to VAR; Add to Watts and VAR; Subtract from Watts and VAR.

3. Click **TLC Calculator** to find the values to enter into the Percent Loss fields. The TLC Calculator button launches the TLC Calculator that makes the calculations for you once you enter the required data.

NOTE

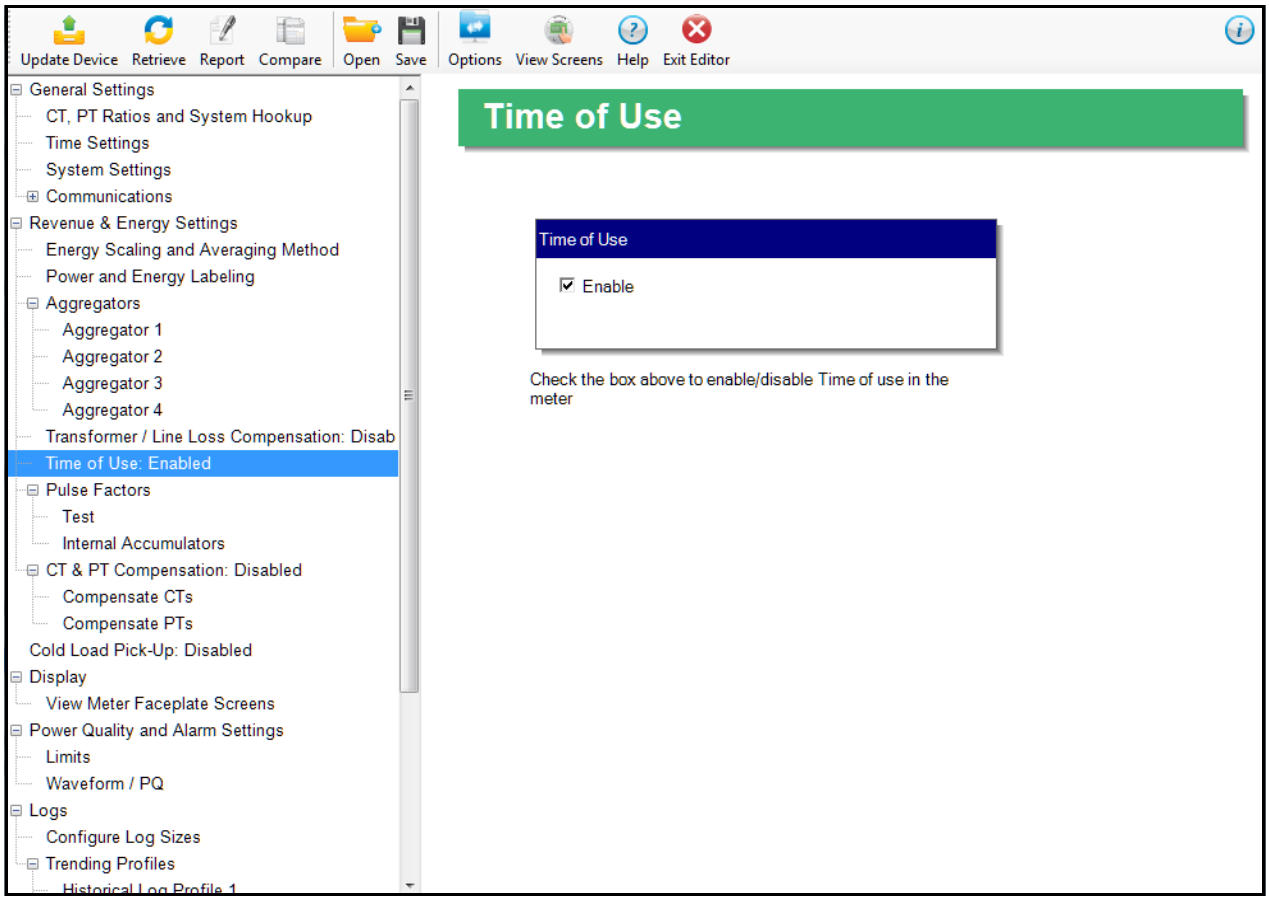
Appendix A contains screen captures of the Loss Calculator with example numbers, and an explanation of Loss Compensation considerations.

4. Enter the percent Loss of Watts and VARS for copper and iron in the appropriate fields.
5. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.2.6 Time of Use Setting

The EPM 7000P meter offers Time of Use. See Chapter Chapter 15 "Time-of-Use", for instructions. To enable or disable Time of Use for the meter:

1. Click **Revenue & Energy Settings > Time of Use**.

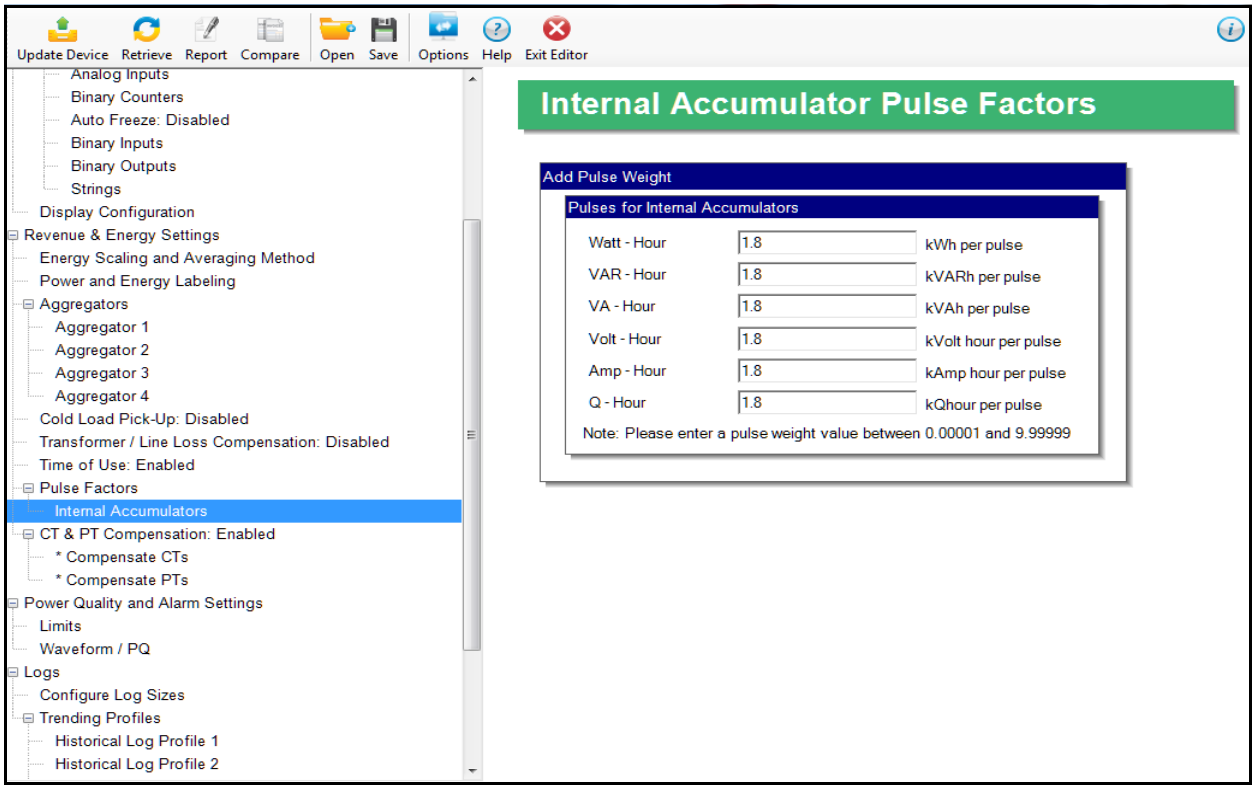


2. Check the box to enable Time of Use; uncheck the box if you want to disable it.
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.2.7 Internal Accumulators for Pulse Factors

Pulse factors are the weight of a KYZ pulse for energy consumed. The meter uses pulses for load profiling of accumulated energy over demand intervals. The pulse weights are assigned in this Device Profile setting.

1. From the meter Programmable Settings screen in the GE Communicator application, click **Revenue and Energy Settings > Pulse Factors > Internal Accumulators**.

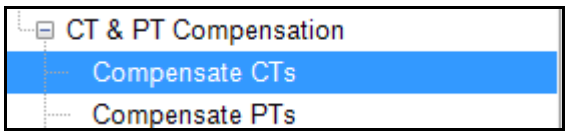


2. For each of the energy reading accumulators, enter the pulse weight you want to assign to it. The pulse weight must be between 0.01000 and 9.99999.
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.2.8 CT and PT Compensation

CT/PT compensation is used to correct for errors caused by the current transformers (CTs) (external to the meter) and Potential/Voltage transformers (PTs) connected to the meter.

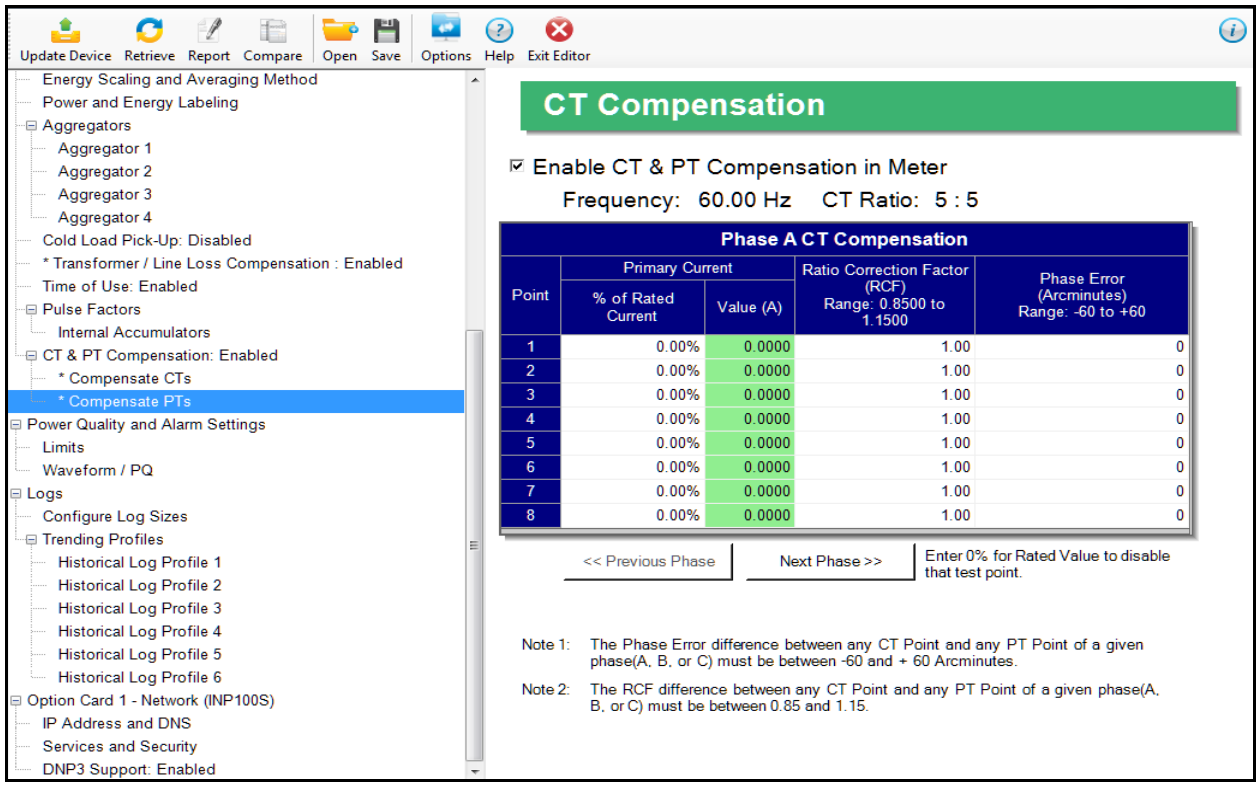
- From the Tree Menu, click **Revenue and Energy Settings > CT & PT Compensation**. Two options open under CT & PT Compensation: Compensate CTs and Compensate PTs. Use these settings to enable and set compensation factors for the meter.



27.2.8.1 Compensate CTs

The first CT & PT Compensation setting option is Compensate CTs.

1. From the Tree menu, click **CT & PT Compensation > Compensate CTs**.



2. Make sure the Enable CT & PT Compensation in Meter box is checked. If it is not, any settings you enter won't be implemented. The top of the screen shows the system frequency and the CT ratio (see 27.1.1 *Configuring CT, PT Ratios and System Hookup* on page 27–2). Assign the following settings:

   a, The first screen you see displays the settings for Phase A CT compensation. Click the **Next Phase** button at the bottom of the screen to enter settings for phases B and C.

b. For each of the phases, enter up to 8 points of % of rated current, ratio correction factor (0.08500 to 1.1500), or phase error/arcminutes (-60 to +60). The Value (A) field displays the current value for the "% of rated current" setting you entered. For example, if the current Full Scale is 5 A, and you enter 0.01% in the "% of rated current field," the value will be 0.0005 A. Refer to your CT manufacturer's documentation for the values to enter on this screen.

- If you don't want to use a test point, enter 0% for the rated current.

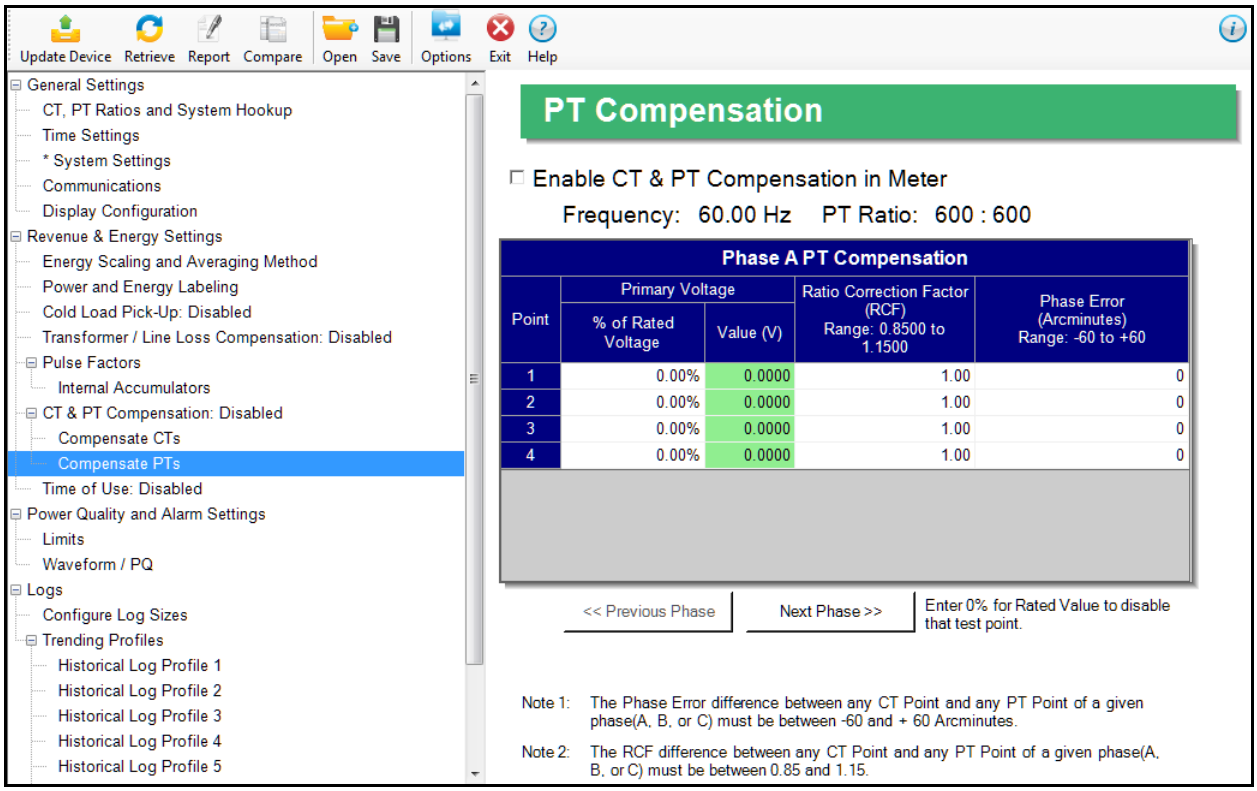
c. Continue to the next phase and repeat step 2b.

3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.2.8.2 Compensate PTs

The second CT & PT Compensation setting option is Compensate PTs.

1. From the Tree menu, click **CT & PT Compensation > Compensate PTs**.

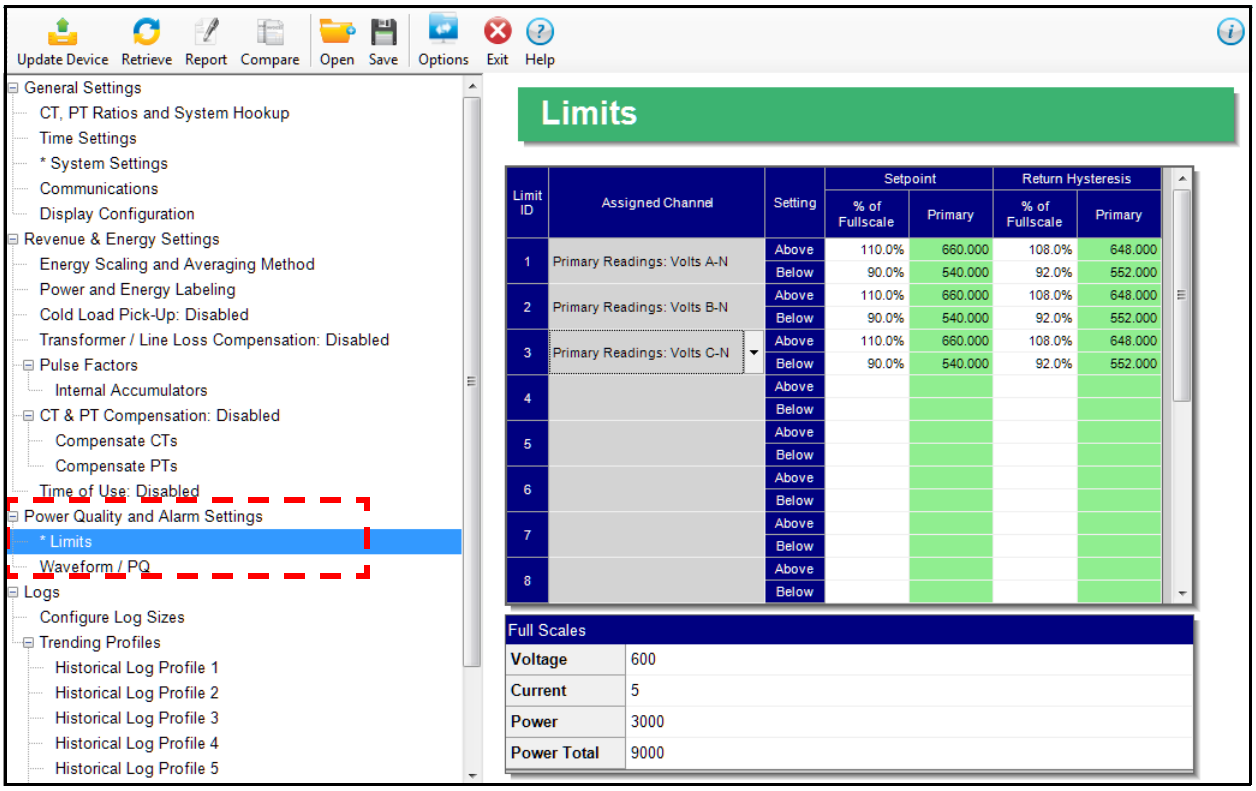


2. Make sure the Enable CT & PT Compensation in Meter box is checked. If it is not, any settings you enter won't be implemented. The top of the screen shows the system frequency and PT ratio (see 27.1.1 *Configuring CT, PT Ratios and System Hookup* on page 27–2). Assign the following settings:

3. The first screen you see displays the settings for Phase A PT compensation. Click the **Next Phase** button at the bottom of the screen to enter settings for phases B and C.

27.3 Power Quality and Alarms Settings

From the Tree Menu on the left side of the EPM 7000P meter Device Profile screen, double-click on the **Power Quality and Alarms Settings** line or click on the + button next to it. All of the settings in the Power Quality and Alarms Settings group are listed.



27.3.1 Configuring Limits

1. From the Tree Menu, click **Power Quality and Alarm Settings > Limits** (see the screen on the previous page). The current settings for Limits are shown in the screen. Use this screen to assign Limits for the EPM 7000P meter.

   Functional Overview for Limits:
   Limits are transition points used to divide acceptable and unacceptable measurements. When a value goes above or below the limit, an out-of-limit condition occurs. You can set and configure up to 16 Limits for the EPM 7000P meter.

   Once they are configured, you can view the out-of-Limits (or Alarm) conditions in the Limits Log (see Chapter 19) or Limits Polling screen (see Chapter 5). You can also use Limits to trigger relays.

You can assign the eight limits to readings from three groups of parameters:

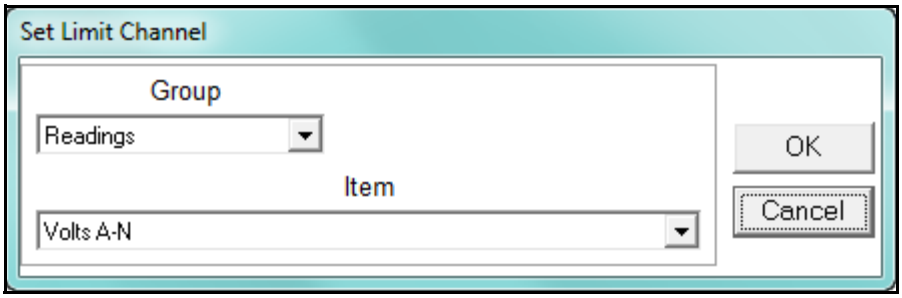
- Readings (Instantaneous Voltage; Instantaneous Current; Total and Per Phase Power and Power Factor; Frequency; Neutral Current; Symmetrical Components and Voltage Imbalances)
- Demand (Current; Per Phase, Total Power and Power Factor)

- THD (For Voltage and Current)

2. The bottom of the screen shows the Full Scale values for:
   - Voltage
   - Current
   - Frequency
   - Power
   - Power Total
   - Power Factor
   - THD
3. To set or change a Limit:

   a. Select a limit by double-clicking on the Assigned Channel field.

   b. You will see the screen shown below.



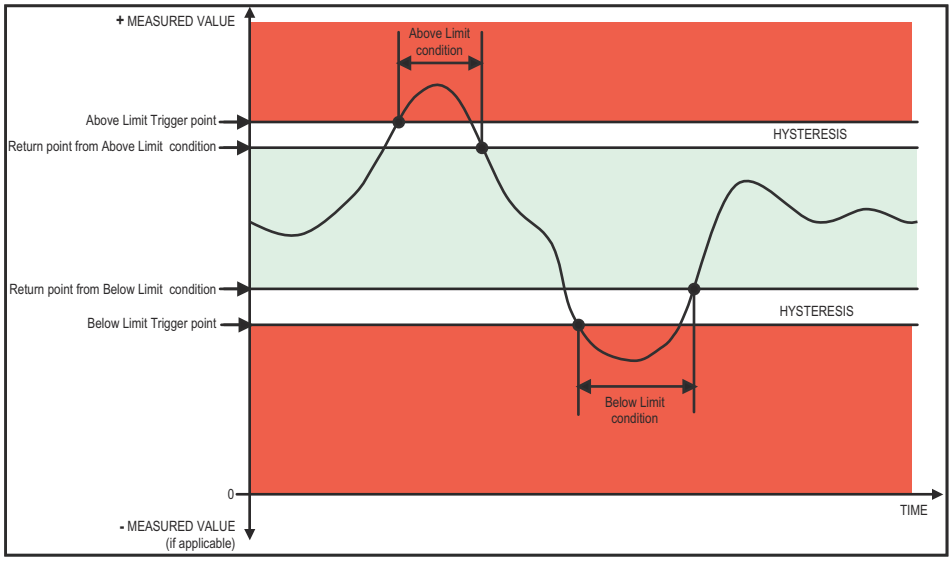
   c. Select a Group and an Item for the Limit.

   d. Click **OK**. The Limit you selected will now appear in the Limits screen.

4. To configure a Limit, double-click on the following fields to set their values:

- Above and Below Set Point: of Full Scale (the point at which the reading goes out of limit: see figure on the next page)
  For example:
  100 of 120V Full Scale = 120V
  90 of 120V Full Scale = 108V
- Above and Below Return Hysteresis (the point at which the limit's status changes from out of limit to within limit: see figure below)
  For example:
  Above Set Point = 110Below Set Point = 90
  (Out of Limit above 132V)(Out of Limit below 108V)

Above Return Hysteresis = 105Below Return Hysteresis = 95
(Stay Out of Limit until below 126V) (Stay Out of Limit until above 114V)



NOTE

- The Primary fields are display only. They show what the set point and return Hysteresis value are for each limit.
- If the Above Return Hysteresis is greater than the Above Set Point, the Above Limit is Disabled; if the Below Return Hysteresis is less than the Below Set Point, the Below Limit is Disabled. You may want to use this feature to disable either the Above Limit or Below Limit condition for a reading.
- If you are entering negative limits, be aware that the negative value affects the way the above and below limits function, since negative numbers are processed as signed values.

5. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.3.2 Configuring Waveform/PQ (Software Option C and Higher)

The EPM 7000P meter has upgradeable Software Options. If you have purchased Software Option C or D, the waveform recording feature will be available with your meter. The Waveform/PQ capability allows the meter to act as a high-speed waveform recorder to record any anomaly that occurs within a cycle of duration. This provides a user with advanced waveform analysis including pre- and post- waveform recording.

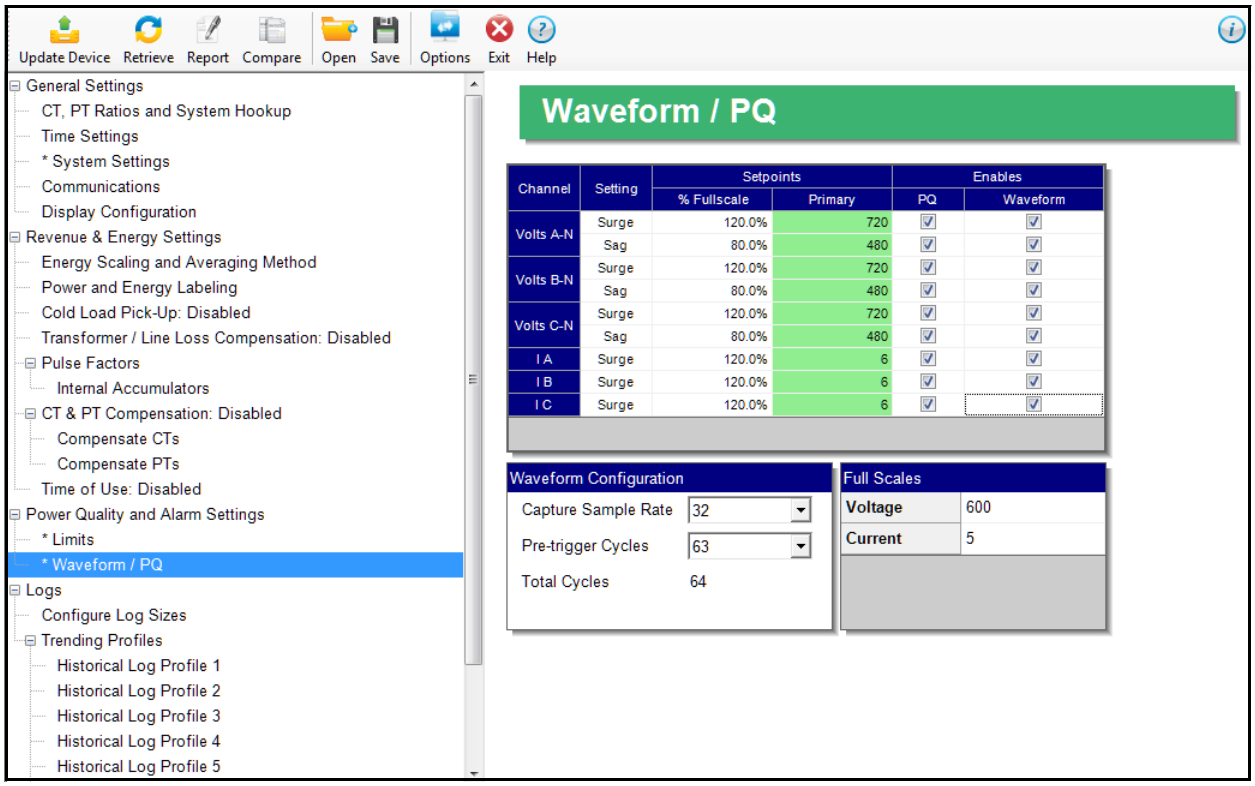
The meter has the capability to record both surges and sags of the measured signals. A voltage surge is any event that increases the RMS voltage for one cycle, calculated every half cycle. A voltage sag is a dip in the RMS of one cycle of voltage, calculated every half cycle. A current fault (or surge) is also calculated in the same manner. When the RMS value of any of these triggers exceeds the threshold settings, the meter will trigger a waveform capture.

This setting determines at what point the meter executes a waveform capture and/or records a power quality event. See Chapter 19 for instructions on viewing Waveform and PQ logs. See 27.4.2 *Trending Profiles - Configuring Historical Logs* on page 27–50 for instructions on configuring the log sectors for the EPM 7000P meter.

NOTE

PQ and Waveform Thresholds are given as a percentage of the Full Scales (Full Scale fields). Full Scales are based on the CT and PT Ratios set in the CT, PT Ratios and System Hookup setting. Before programming the Waveform/PQ Thresholds, set the CT and PT ratios. See 27.1.1 *Configuring CT, PT Ratios and System Hookup* on page 27–2, for instructions.

1. From the Tree Menu, click **Power Quality and Alarm Settings > Waveform/PQ**. The current settings, if any, are shown in the screen.



2. Set the Surge and Sag Setpoints (in percent of Full Scale), for Voltage, and the Surge Setpoint for Current. When you enter the percentage for a reading, the primary value is displayed in the Primary field. The bottom of the screen displays the Full Scales for Voltage and Current.
3. Click the checkbox under PQ to enable PQ recording when the programmed threshold is exceeded.
4. Click the checkbox under Waveform to enable Waveform recording when the programmed threshold is exceeded.
5. Select the sampling rate from the Capture Sample Rate pull-down menu. The options are:

- For Software Option C: 32, 64, 128
- For Software Option F: 32, 64, 128, 256, 512.

6. From the Pre-trigger pull-down menu, select the number of cycles of waveform data prior to the triggering event, that you want to be included in the waveform capture. The options are 2 to 63.

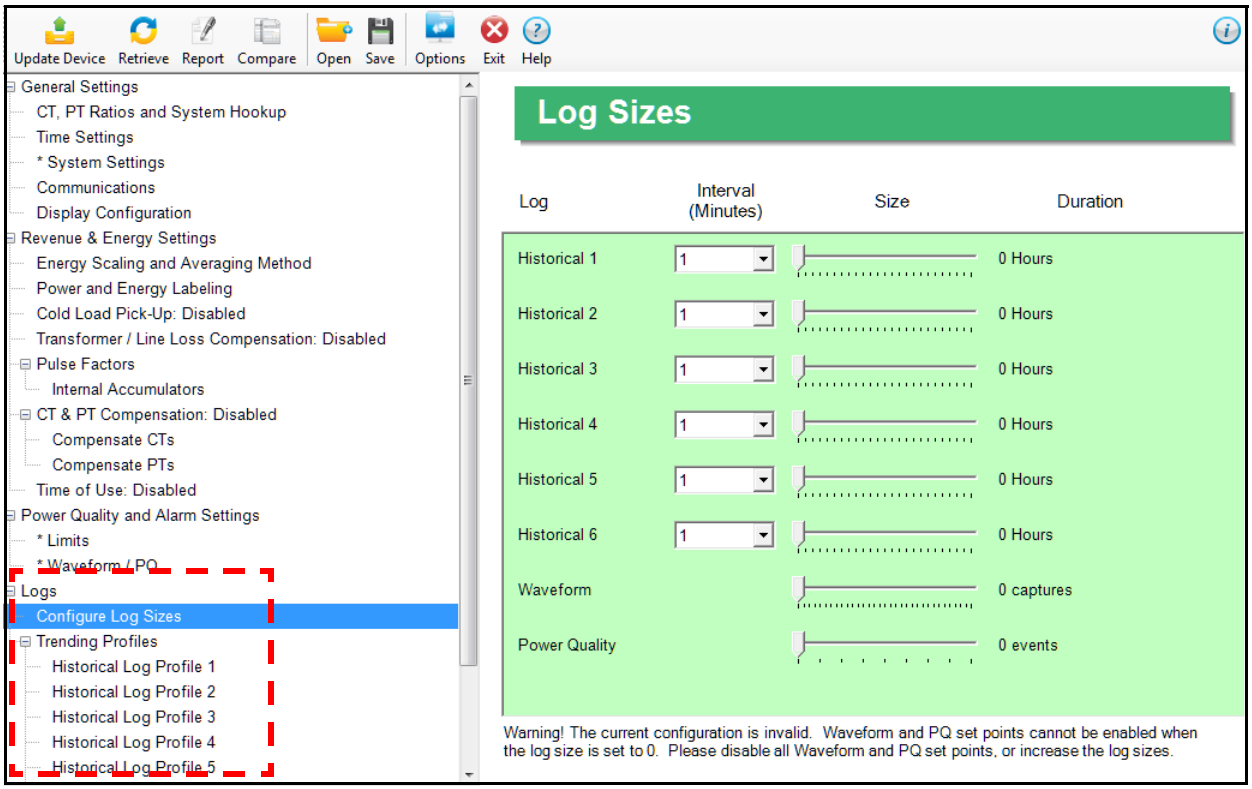
NOTE

Increasing the number of pre-cycles will decrease the number of cycles of data recorded after the event.

7. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.4 Logs

From the Tree Menu on the left side of the EPM 7000P meter Device Profile screen, double-click on the **Logs** line or click on the **+** button next to it. All of the settings in the Logs group are listed.



27.4.1 Configure Log Sizes

This setting allows a user to allocate the amount of memory available for each log, based on the number of recording days desired. Once the log's memory fills, the log "rolls over" and the records are overwritten in a FIFO (first in, first out) sequence. Depending on the meter Software Option, the user is able to memory allocation for up to 6 historical logs and the waveform and PQ logs, to optimize the number of records stored for each log.

- For Software Options B and higher, use this setting to increase or decrease the amount of records that each of the EPM 7000P meter's three Historical logs can store.
- For Software Options C and D, use this setting to set the allocation for the Waveform(V3 and V4) and Power Quality (V4 only) logs, as well as for 6 Historical logs.

1. From the Tree Menu, click **Logs > Configure Log Sizes**. You will see the screen shown on the previous page.

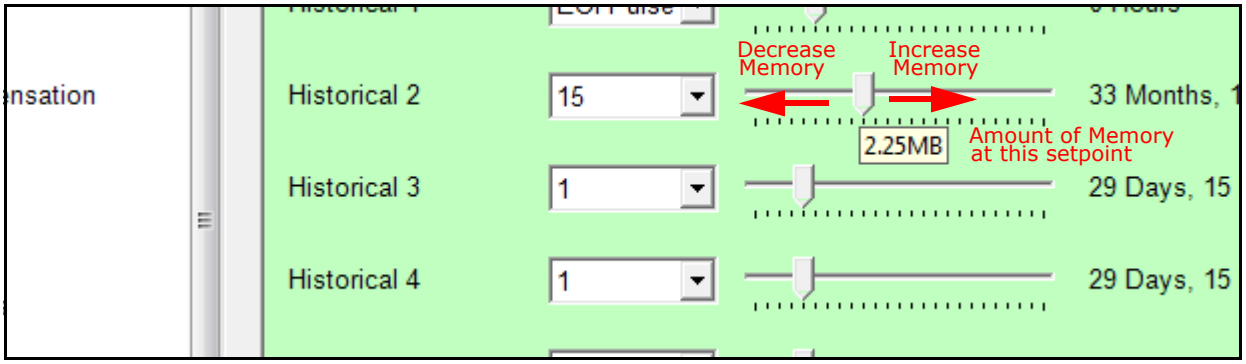
NOTE

The example screen is for a meter with Software Option D - the screen you see will look a bit different if your meter has a lower Software Option.

2. For each log, set both the logging interval and size. (Note that for the Waveform and PQ logs, you only set the size.) For the historical logs, the Duration field tells how many months and days of logging your setting will provide; for the Waveform log, it tells how many waveform captures it will provide; and for the Power Quality log, it tells how many PQ events, i.e., surges and sags, will be recorded.

   a. Select the logging interval from the pull-down menu. The interval is in minutes. You can set between 1 and 60 minutes, or EOI pulse, for the historical logs.

   b. Set the log size (the amount of memory allocated to it), by moving the bar in the size field to the right to increase the amount of memory, and to the left to decrease the amount of memory. When your cursor is on the bar, the amount of memory for that setting point is displayed.



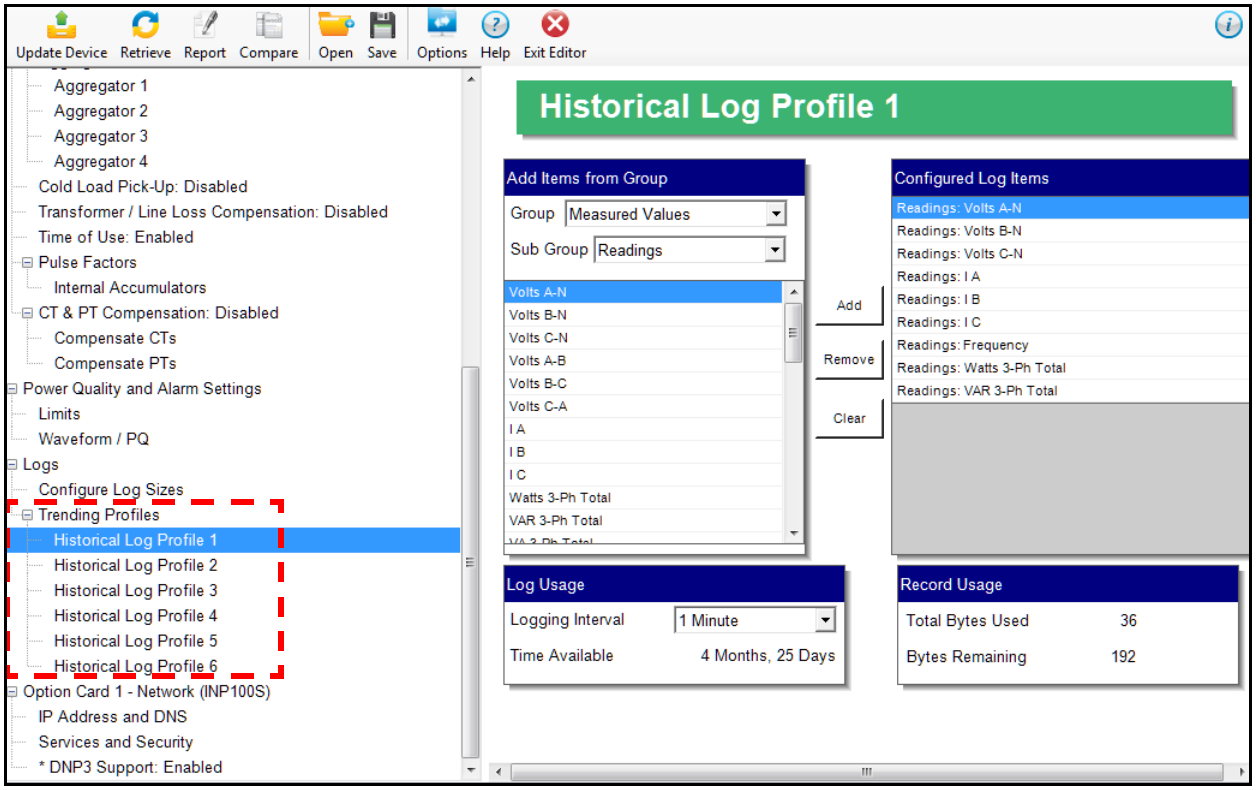
NOTE

- The maximum allowable size for the historical logs is 6 MB, and for the Waveform log, is 8 MB. The Software Option ordered may limit this maximum number, e.g., a meter with Software Option B has 2 MB memory in total to assign to the available logs.
- When EOI Pulse is set as the Logging Interval for a Historical log (see 27.4.2 *Trending Profiles - Configuring Historical Logs* on page 27–50), the Interval field will display EOI Pulse, and the duration field will say "0 Hours."

3. To implement any changes, click the **Update Device** icon to send the new profile to the meter.

27.4.2 Trending Profiles - Configuring Historical Logs

From the Tree Menu on the left side of the EPM 7000P meter Device Profile screen, double-click on the **Trending Profiles Settings** line or click on the **+** button next to it. All of the settings in the Trending Profiles Settings group are listed.



Use this setting to select the parameters to be stored in each of the EPM 7000P meter's Historical Logs. For additional information on logs, including using the HHF Converter, see chapters 16 and 19.

Functional Overview of Historical Logs:

The EPM 7000P meter allows a user to set up 3 (for Software Option B) or 6 (Software Options C and higher) separate historical profile logs that can log up to 64 parameters. Each of these logs can log at different time frames. For example, one log can be set for one minute intervals to record voltage; while another log can be set for 15 minute intervals for energy consumption logging.

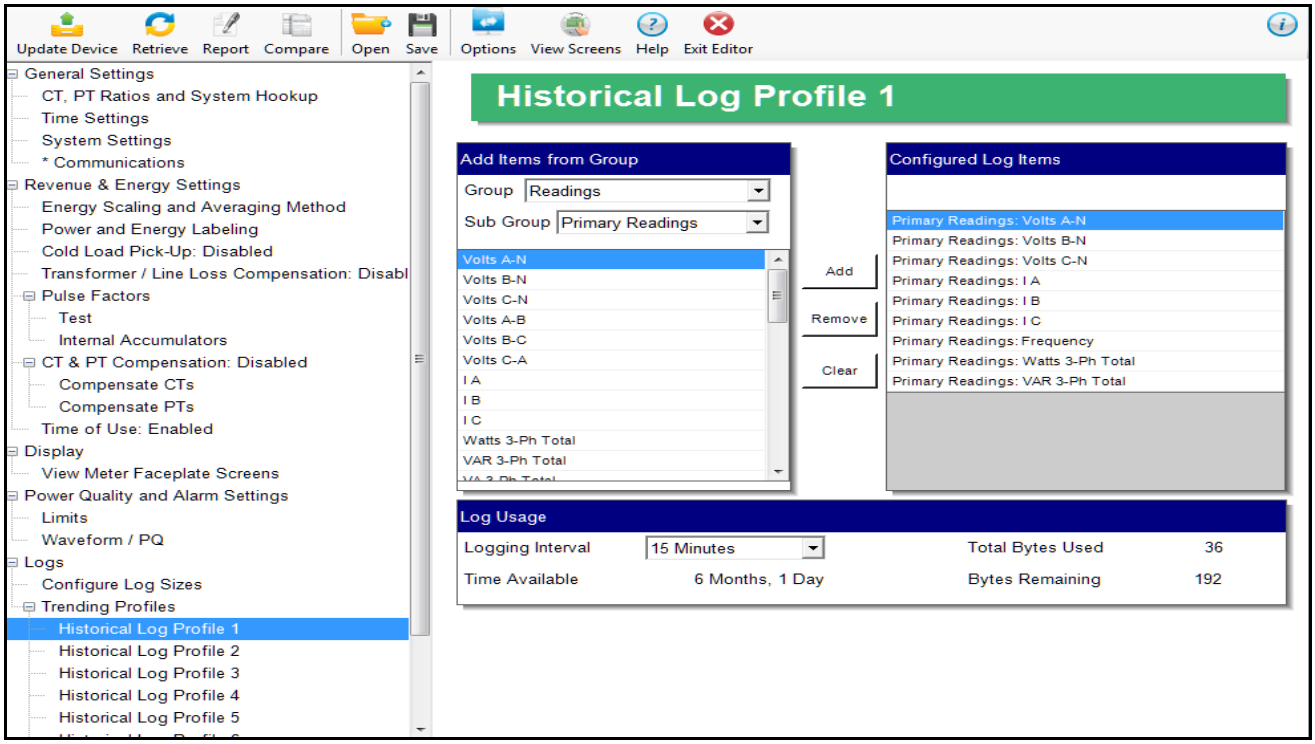
Having multiple historical logs additionally affords you the flexibility of programming each log with unique parameters. For example, you might program Historical Log 1 to record Power Quality parameters (for example, THD), Log 2 to record Demand parameters, and Log 3 to record Energy parameters.

Historical Log parameters can be selected from eleven groups:

- Measured Values (Instantaneous Voltage; Instantaneous Current; Total and Per Phase Power and Power Factor; Frequency; Neutral Current; Symmetrical Components and Voltage Unbalances)
- Demand (Current; Per Phase, Total Power and Power Factor)
- Maximums (Maximum values for all of the readings listed above, including THD voltage and currents)

- Minimums (Minimum values for all of the readings listed above, including THD voltage and currents)
- Energy (Watt-hours, VA-hours, VAR-hours, Energy in the Interval)
- Accumulators (Input and Output Accumulator values)
- Short Term Min (Min value within the Demand Interval)
- Short Term Max (Max value within the Demand Interval)
- Uncompensated ((Watt-hours, VA-hours, VAR-hours)
- THD (For voltage and current)
- Harmonic Magnitudes (For voltage and current up to the 40th order)

1. From the Tree Menu, click **Trending Profiles > Historical Log Profile (1-3)**.



This screen allows you to select items to be stored in the historical log you selected. The Group field determines the items that are available for selection.

2. Select a Group. The possible selections are: Measured Values, Demand, Maximums, Minimums, Energy, Energy in the Interval, Accumulators, Short Term Min, Short Term Max, Uncompensated, THD, Harmonic Magnitudes, and Rollover Counters.

NOTE

If you select Harmonic Magnitudes, another field opens on the screen allowing you to select one of the following for Harmonic Magnitude: Volts A; Volts B; Volts C; I A; I B; I C.

3. Select items for your log:

   a. Highlight the item(s) you want in the Selectable Items box.

   b. Click **Add**. The item(s) are added to the Selected Items box.

   c. To remove item(s), highlight them in the Selected Items box and click **Remove**.

4. Set the Logging Interval (Minutes). The available choices are: 1, 3, 5, 10, 15, 30, 60, EOI (End of Interval) Pulse. The Logging Interval determines when the meter takes a snapshot.

NOTE

IMPORTANT! If you are trending Energy in the Interval, the Logging interval must be the same as the Demand interval.

NOTE

- Only **one** of the following can be set for the EOI pulse feature:
  - EITHER **1** Option card input can be set to receive an EOI pulse from another device
  - OR **1** Option card output can be set to trigger an EOI pulse
- The maximum rate for EOI Pulse used to trigger a log is once per minute.
- When you choose EOI Pulse, the meter takes a snapshot when the pulse is either received or generated (depending on whether the EOI pulse is assigned to an input or output), rather than on a time interval.

NOTE

There are two display fields at the bottom of the Historical Log Profile screen. They show the Total Bytes Used and the Bytes Remaining for this historical log. These fields are updated as you make selections on the screen. The total number of bytes available per log record is approximately 234.

5. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.5 Configuring Option Cards

The EPM 7000P meter automatically detects the presence of any Option cards installed in it. You will see the installed card(s) listed in the Tree Menu (see the figure on the next page). Up to two Option cards can be installed in the EPM 7000P meter. Refer to the *EPM 7000P Instruction Manual* for additional information concerning Option cards, including installation procedures.

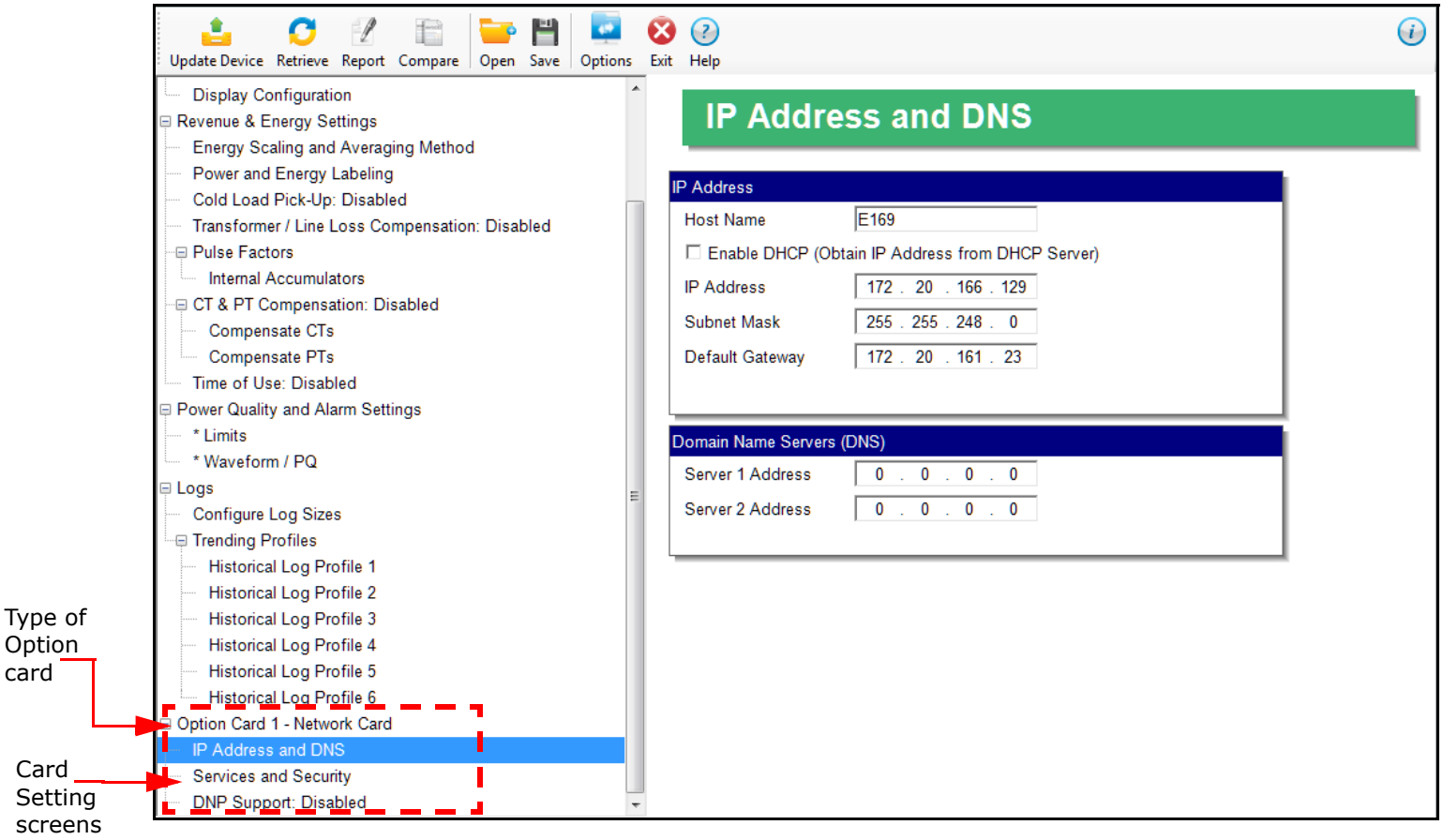
You must configure an Option card before using it. The following sections give instructions for configuring each of the Option cards.

NOTE

You can configure settings for an Option card when you are not connected to a meter. Click **Option Card 1 or 2** from the EPM 7000P meter Device Profile screen. The drop-down menu on the displayed screen allows you to select your Option card. The available selections are: Fiber Optic, Network, Digital Relay, Pulse Output, Analog Output (0-1mA), Analog Output (4-20mA), None. Click **Apply**. The Option card you chose is now listed in the menu. Refer to the instructions for configuring the card.

From the Tree Menu on the left side of the EPM 7000P meter Device Profile screen, double-click on the **Option Card 1 or Option Card 2** line or click on the **+** button next to it. The settings for the option card(s) installed in your meter are shown.

The type of Option card installed in the meter determines the settings you need to configure, and so, the screens you see. Click on the selectable lines under your Option card in the EPM meter Device Profile menu. See the example below.



NOTE

The Option card settings for your meter will only show the option cards currently installed in your meter.

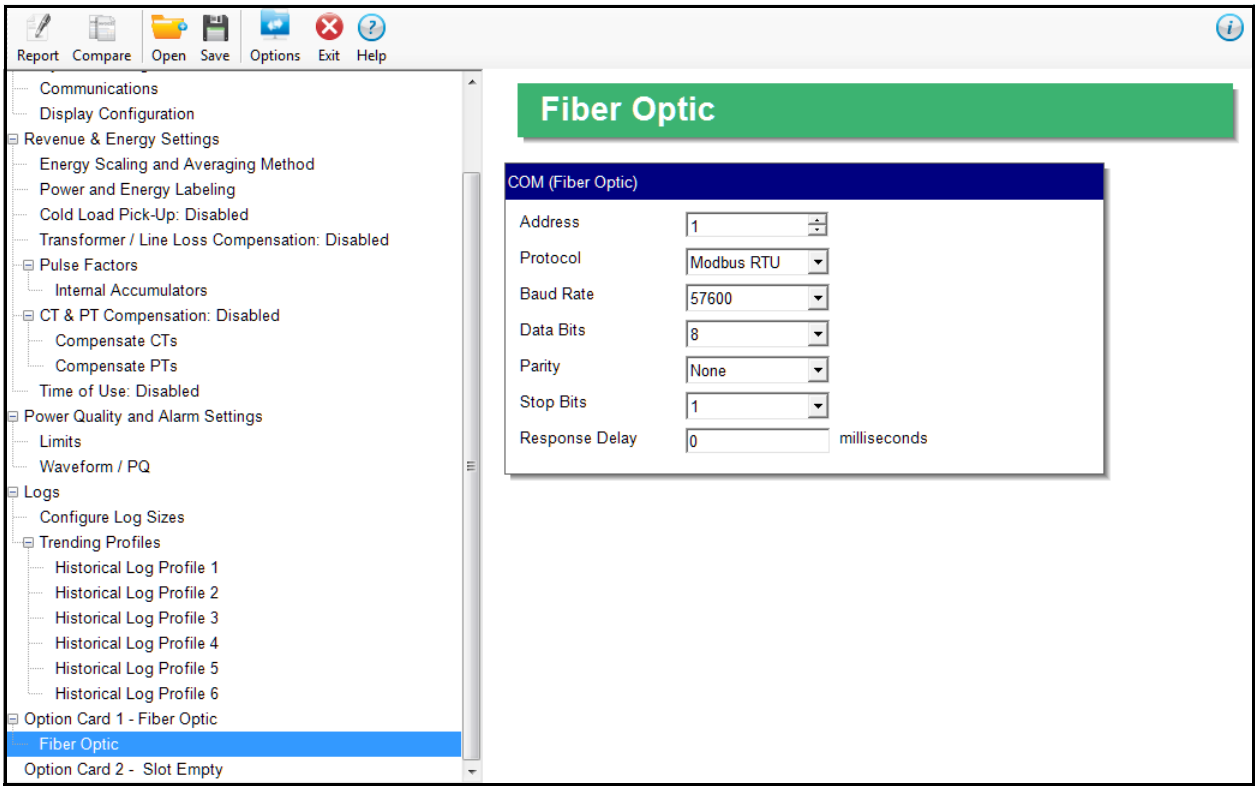
27.5.1 Configuring a Fiber Optic Card

The Fiber Optic Option Card (F1 or F2) is a Communication card that provides a standard, serial communication port over a fiber optic application. For technical specifications and hardware installation, refer to the *EPM 7000P Instruction Manual*.

Example:

An example use of the optional Fiber Optic card is in a daisy chain topology, using the Echo switch on the Fiber Optic Card to allow messages to bypass the unit.

1. In the Tree menu, click **Option Card 1/2 - Fiber Optic > Fiber Optic**.



2. The screen fields and acceptable entries are as follows:
   - Address: 1 - 247 (Modbus); 1-65520 (DNP)
   - Protocol: Modbus RTU; Modbus ASCII; DNP subset 2; DNP subset 3
   - Baud Rate: 9600; 19200; 38400; 57600
   - Data Bits: 5; 6; 7; 8
   - Parity: None, Odd, Even
   - Stop Bits: 1 or 2
   - Response Delay (msec): the suggested delay is 50 msec, but you can increase the delay, if necessary.
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

27.5.2 Configuring a Relay Output/Digital Input Card

The Relay Output/Digital Input card (RS) is used for a few purposes. The relay portion is used to send a control output when a limit is exceeded. The input portion can be used to either count KYZ pulse or detect the status of a circuit.

The Relay Output/Digital Input Option Card has:

- Two relay contact outputs for load switching
- Two wet/dry contact sensing digital inputs.

Accumulators in the GE Communicator software count the transitions of the Inputs and Outputs. For technical specifications and hardware installation, refer to the *EPM 7000P Instruction Manual*.

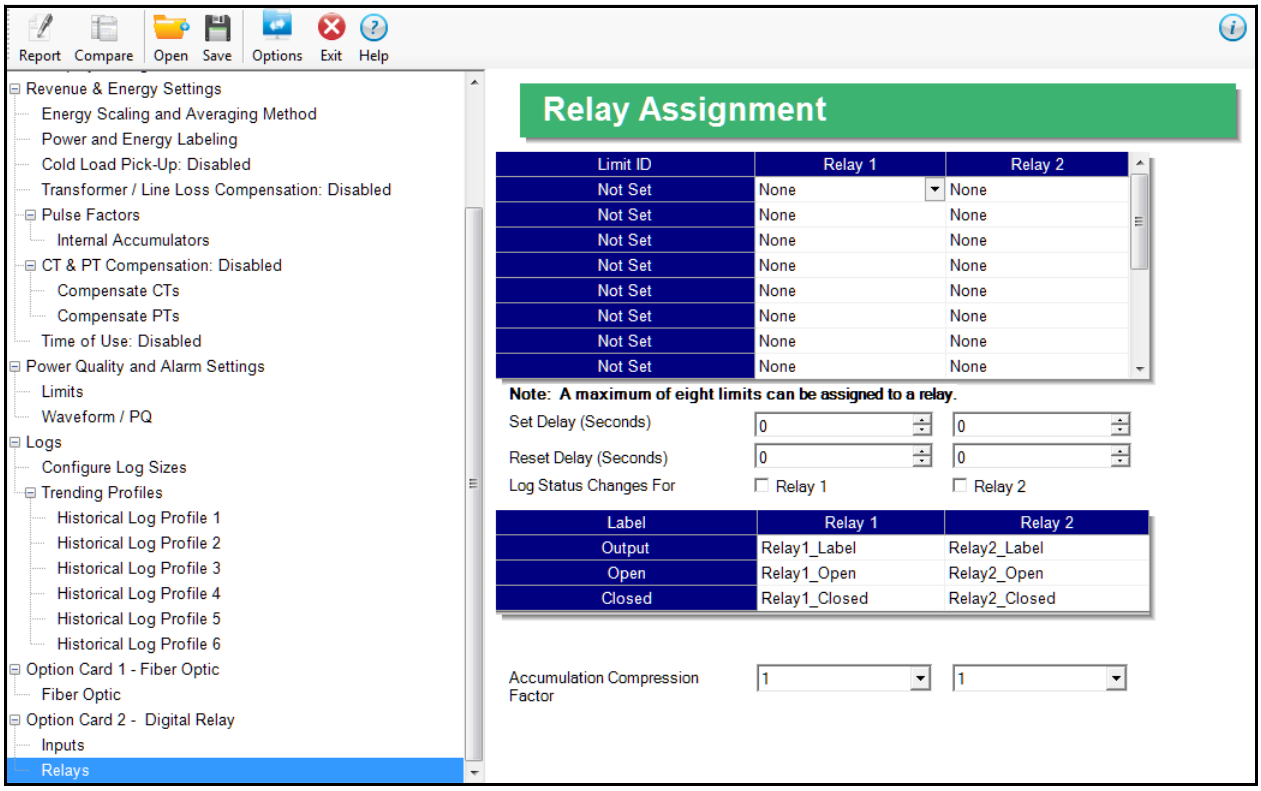
NOTE

When installing a Relay Output/Digital Input card, we recommend you reset the accumulators for the card, in order to prevent erroneous counts. See 20.1.7 *Reset Device Information* on page 20–8, for instructions on using the Reset EPM Information screen to reset card accumulators.

Example:

An example use of the optional Relay Card is in monitoring the status of circuit breakers or relays in your electrical system. The two status inputs could be used to monitor two circuit breakers, and the two relay outputs could be used to sound an alarm upon the occurrence of a programmed out of limit condition.

1. In the Tree menu, click **Option Card 1/2 - Digital Relay > Relays** to set the limits/alarm conditions and logging options for the card's Relay Outputs.



2. From the Relay Assignment screen, you can:

- Configure up to 8 output conditions for each of the two Relay Outputs.

NOTE

The Limits used are configured in Power Quality and Alarm Settings > Limits (see *Configuring Limits* on page 27–43).

- Set a Delay and Reset Delay for the Outputs.
- Choose to log Status Changes for each Relay Output.
- Assign each Output an Output Label, Open Label, and Closed Label, which are used when viewing the Relay Status Log.
- Assign an Accumulation Compression Factor for each output.

NOTE

IMPORTANT! First use the Limits screen to set up the limits you want to assign to an Output. See *Configuring Limits* on page 27–43 for instructions.

3. The available Limits appear in the Limit ID column. To assign a limit to an Output relay:

   a. Select the output condition from the pull-down menu next to the Limit ID. The options are: Above Limit (the Output is triggered when the Above Limit condition occurs) and Below Limit (the Output is triggered when the Below Limit condition occurs).

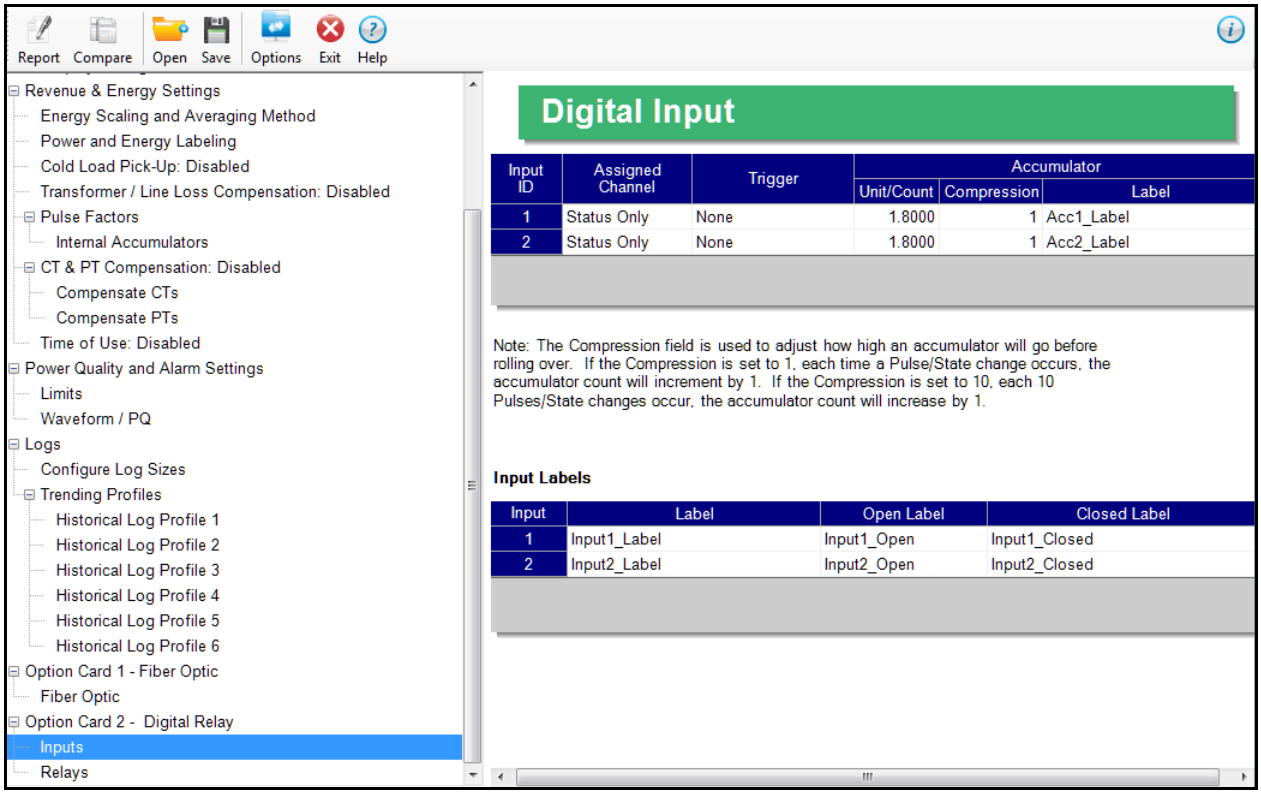
   b. You can assign the limit to one or both (or neither) of the Relay Outputs.

NOTE

A Relay operates when any one assigned Limit is tripped, and stays in the Set condition as long as one Limit is in the Alarm state.

4. You can enter Set Delay and/or Reset Delay. These values are the delay before the Output is changed: Set is when the common is shorted to Normal Open (this is the Set Condition), Reset is when the Output is shorted (closed).
5. Check the box next to Log Status Change for if you want to log output status changes for either or both Relay. See Chapter 19 for information on the I/O Change Log.
6. The current Output Labels are displayed in the screen. These labels are used for Logging. To change the Output labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
   - Output Label - Label ID
   - Open Label - Open state ID
   - Closed Label - Closed state ID
7. You can specify an Accumulation Compression Factor. The Compression Factor is used to adjust how high an accumulator will go before rolling over. Because of this, it is useful in delaying rollover. For example, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count increments by 1. The available Compression Factors are: 1, 10, 100, 1000, 10000, and 100000. The default Compression Factor is 1.
8. To configure the Digital Inputs:

a. Click **Option Card 1/2 - Digital Relay > Inputs**. Use this screen to assign labels and functions to the Inputs.



b. Make a selection in the Assigned to field. The available selections are:

- Status Only - select this to use the digital inputs just to indicate if the state is open or closed.
- Accumulator - select this to use the digital input as a pulse counter.
- Digital Input Log - select this to use the digital input to trigger an entry in the I/O change log.
- EOI Pulse - only one Input can be set to receive an EOI pulse.

NOTE

NOTES on End of Interval (EOI):

- EOI is triggered in a device when the programmed condition is met. Only one Option Card input can be set to receive an EOI pulse. EOI is used for the following:
  - As a trigger for demand averaging: the received EOI pulse delineates an interval that results in demand averaging being performed. The minimum interval between received EOI Pulses used to trigger demand averaging should be 5 minutes. An EOI pulse allows the meter to be synchronized with an installed revenue meter, so that both meters are calculating Demand at the same time. When an Input is assigned to EOI, the demand interval is now the time between two received pulses.
- For historical logging: when the EOI pulse is received, it causes any log that has been configured for EOI Pulse interval to capture a record. Refer to 27.4.2 *Trending Profiles - Configuring Historical Logs* on page 27–50, for additional information on EOI Pulse and logging.

NOTE

IMPORTANT! The EOI setting will affect Time of Use, if it is active for the meter. Instead of using the demand interval for TOU accumulations, TOU will perform automatic data usage accumulation and calendar actions (rate change, day type change, season/ billing month self reads) based on the EOI input trigger. This can result in shorter or longer interval periods, depending on the EOI input timing, so the rate/day type/ calendar actions may differ from what is expected.

c. Select Trigger from the pull-down menu. The Trigger you select depends on your Assigned to selection:

- For Status Only, select None.
- For Accumulator, select from Closing, Opening, High Speed Closing or High Speed Opening.

NOTE

Only one accumulator can be assigned to a High Speed Trigger.

- For Digital Input Log, select Change.
- For EOI Pulse, select from Closing, Opening, or Change.

d. Enter Units/Count. The Units/Count is the output ratio from the device that is being input into the EPM 7000P meter. For example, if you have a KYZ module that is outputting a pulse every 1.8 kWh, with the input set to Accumulator, Increment on Contact Opening, you would set the Units/Count to be the value of the KYZ; in this case either 1.8 or a ratio of that number.

e. Enter Compression. The Compression Factor is used to adjust how high an accumulator will go before rolling over. For example, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count increments by 1. The available Compression Factors are: 1, 10, 100, 1000, 10000, and 100000. The default Compression Factor is 1.

f. Enter a Label for the Accumulator.

g. The current Input Labels are displayed in the screen. To change the Input Labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:

- Input Label - Input ID
- Open Label - Open state ID
- Closed Label - Closed state ID

9. To implement any changes to the Relay Output/Digital Input card settings, click the **Update Device** button to send the new profile to the meter.

27.5.3 Configuring a Pulse Output/Digital Input Card

The Pulse Output/Digital Input card (PS) is similar to the Relay Output/Digital Input card (RS) except that the card contains 4 KYZ pulse output contacts instead of relay control outputs. These solid state output contacts can be configured to have the meter pulse out for user-assigned energy values. The Pulse Output/Digital Input Option Card has:

- Four Pulse Outputs via solid state contacts
- Four wet/dry contact sensing digital inputs.

Accumulators in the GE Communicator software count the pulses of Inputs and Outputs. For technical specifications and hardware installation, refer to the *EPM 7000P Instruction Manual*.

NOTE

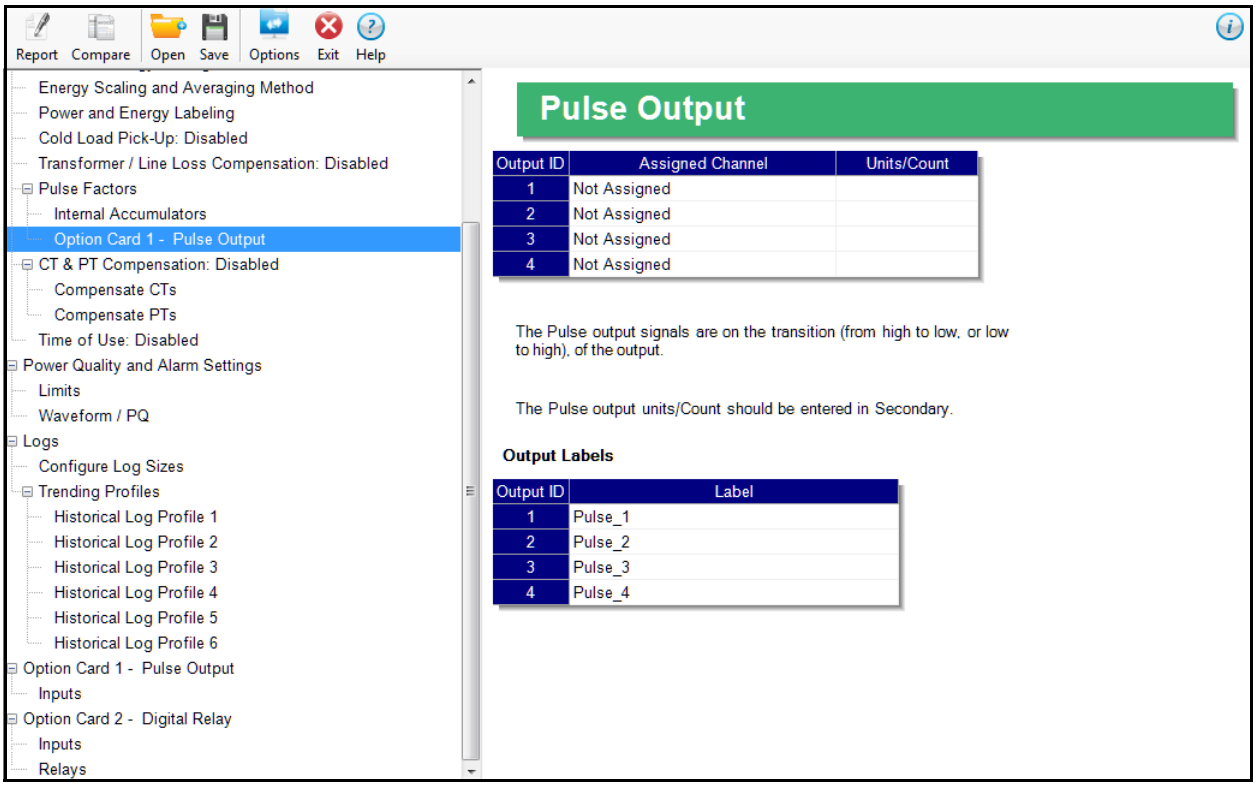
When installing a Pulse Output/Digital Input card, we recommend you reset the accumulators for the card, in order to prevent erroneous counts. See 20.1.7 *Reset Device Information* on page 20–8, for instructions on using the Reset EPM Information screen to reset card accumulators.

Example:

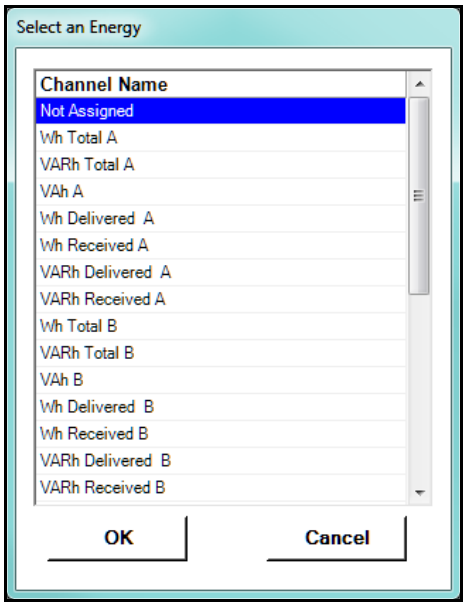
An example use of the Pulse Output/Digital Input Card is in a sub-metering application where a pulse output is needed. The Input Accumulator allows you to count the pulses from another device, for example, a KYZ module or another meter. The Output Accumulators allow you to count the pulses being output by the card.

The Pulse Output and Digital Input Card has two screens for configuration: the Pulse Output Settings screen and the Digital Input Settings screen.

1. To set the pulse outputs, in the Tree menu, click **Pulse Factors > Option Card 1/2 - Pulse Outputs**.

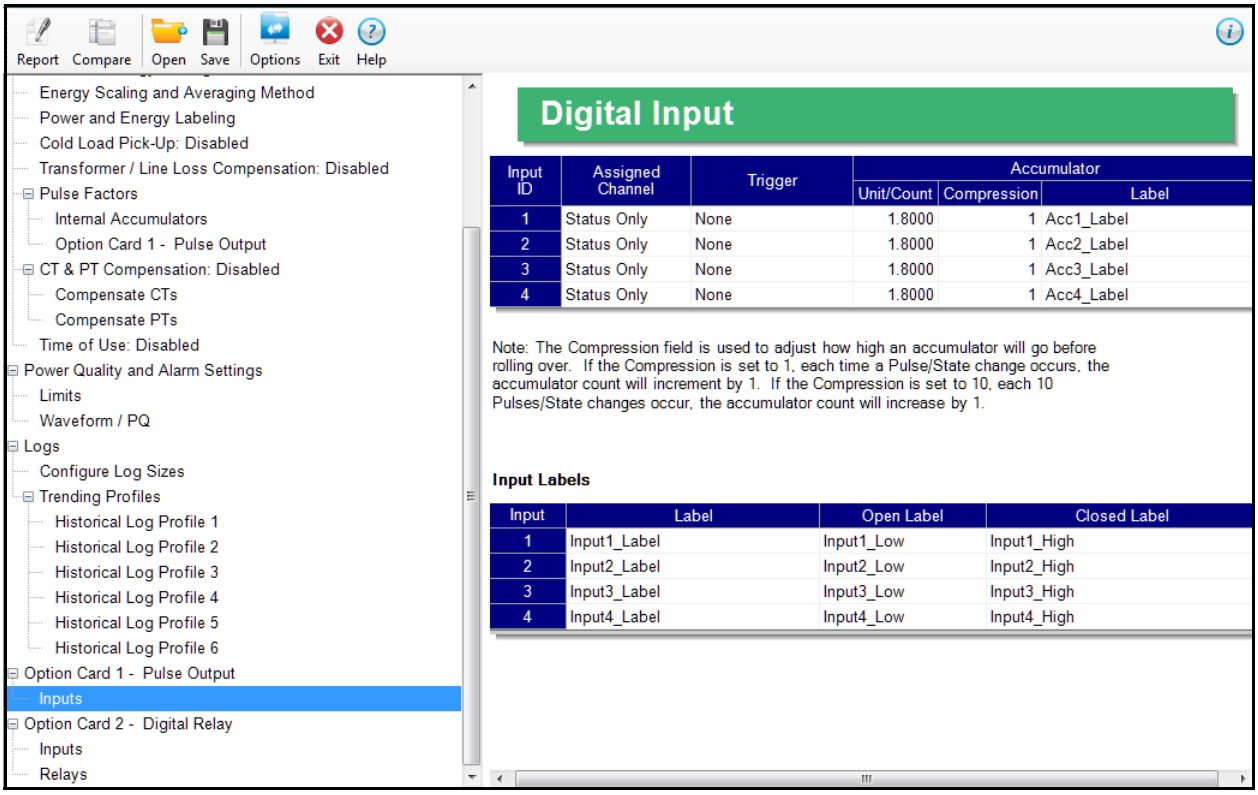


2. You can set up to four Output IDs for your Card. Each Output has a Label, an Assigned Channel, and a Unit/Count. Double-click an Assigned Channel field to add or edit an the assigned channel. You will see the window shown below.



3. Select the Energy channel to use for the output. Click **OK**. The energy channel you selected displays in the Assigned Channel field.
4. When you select the Assigned Channel, a value is entered for it in the Units/Count field. You can edit this field by double-clicking in it. The Units/Count is determined by the Secondary (the readings in the meter). For example, if you have a three-phase meter with 600 Watts per element, for a total of 1800 Watts, the Units/Count field will be 1.8. That means that every 1.8 Watt-hours, the count will accumulate by 1, and each count will represent 1.8 Watt-hours. If you are using CTs that have a ratio of 1000 to 1, for example, the count will still increment every 1.8 Watt-hours, but the count in that case will represent 1.8 Watt-hours times 1000, or 1800 Watt-hours.
5. The current Output Labels are displayed on the screen. To change the Output labels, click in the Labels field you want to change, and enter a new label.

6. Click **Option Card 1/2 - Pulse Output > Inputs**. Use this screen to assign labels and functions to the Inputs.



Make a selection in the **Assigned to** field. The available selections are:

- Status Only - select this to use the digital inputs just to indicate if the state is open or closed.
- Accumulator - select this to use the digital input as a pulse counter.
- Digital Input Log - select this to use the digital input to trigger an entry in the I/O change log.
- EOI Pulse - only one Input can be set to receive an EOI pulse.

NOTE

NOTES on End of Interval (EOI):

- EOI is triggered in a device when the programmed condition is met. Only one Option Card input can be set to receive an EOI pulse. EOI is used for the following:
    - As a trigger for demand averaging: the received EOI pulse delineates an interval that results in demand averaging being performed. The minimum interval between received EOI Pulses used to trigger demand averaging should be 5 minutes. An EOI pulse allows the meter to be synchronized with an installed revenue meter, so that both meters are calculating Demand at the same time.
    - For historical logging: when the EOI pulse is received, it causes any log that has been configured for EOI Pulse interval to capture a record. Refer to 27.4.2 *Trending Profiles - Configuring Historical Logs* on page 27–50, for additional information on EOI Pulse and logging.

NOTE

IMPORTANT! The EOI setting will affect Time of Use, if it is active for the meter. Instead of using the demand interval for TOU accumulations, TOU will perform automatic data usage accumulation and calendar actions (rate change, day type change, season/ billing month self reads) based on the EOI input trigger. This can result in shorter or longer interval periods, depending on the EOI input timing, so the rate/day type/ calendar actions may differ from what is expected.

7. Select Trigger from the pull-down menu. The Trigger you select depends on your Assigned to selection:
   - For Status Only, select None.
   - For Accumulator, select from Closing, Opening, High Speed Closing or High Speed Opening.

NOTE

     - Only one accumulator can be assigned to a High Speed Trigger.
     - High speed opening and closing would be used when monitoring pulses from water meters that can be pulsing very quickly.
   - For Digital Input Log, select Change.
   - For EOI Pulse, select from Closing, Opening, or Change.
8. Enter Units/Count. The Units/Count is the output ratio from the device that is being input into the EPM 7000P meter. For example, if you have a KYZ module that is outputting a pulse every 1.8 kWh, with the input set to Accumulator, Increment on Contact Opening, you would set the Units/Count to be the value of the KYZ; in this case either 1.8 or a ratio of that number.
9. Enter Compression. The Compression Factor is a divider used to adjust how high an accumulator will go before rolling over. For example, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count increments by 1. The available Compression Factors are: 1, 10, 100, 1000, 10000, and 100000. The default Compression Factor is 1.
10. Enter a Label for the Accumulator.
11. The current Input Labels are displayed in the screen. To change the Input Labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
    - Input Label - Input ID
    - Open Label - Open state ID
    - Closed Label - Closed state ID
12. To implement any changes to the Pulse Output/Digital Input card settings, click the **Update Device** button to send the new profile to the meter.

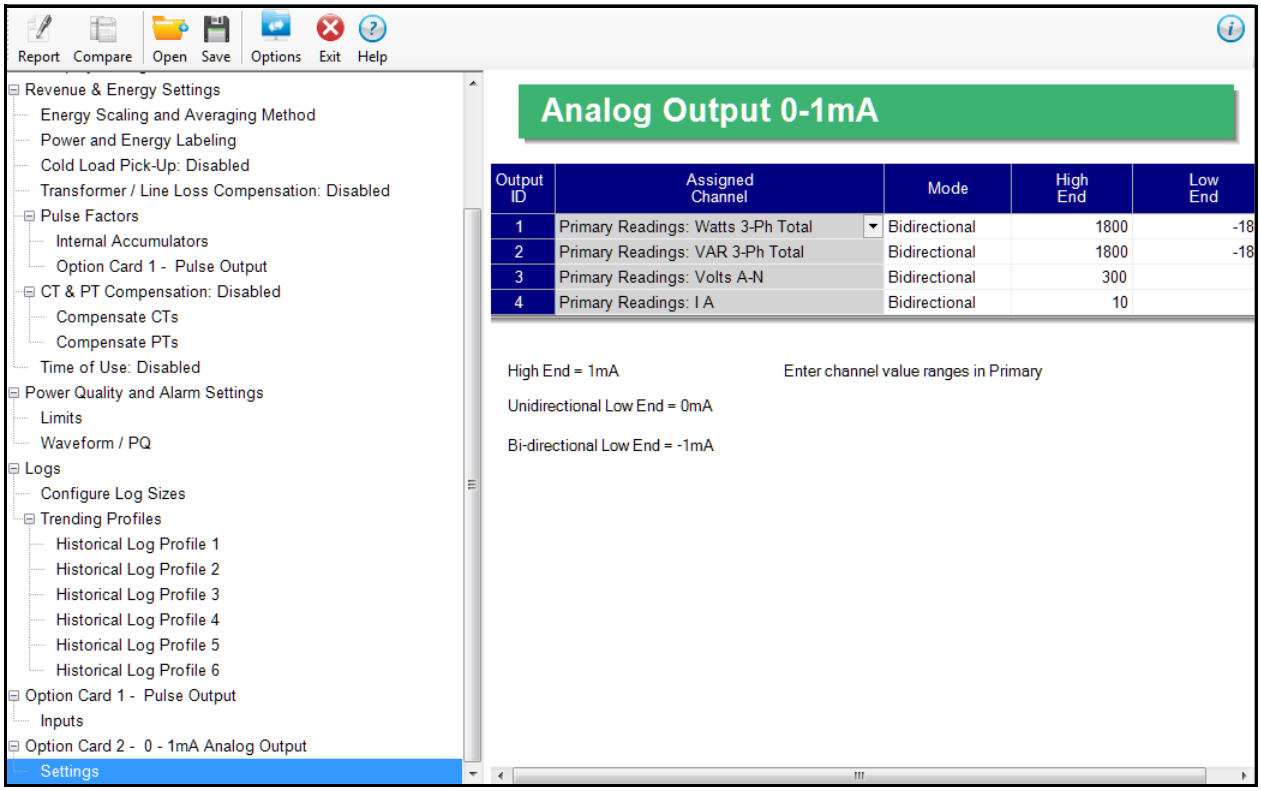
27.5.4 Configuring a 0-1 mA Output Card

The 0-1mA Output Option card (C1) is an analog output card, which transmits a standard, bidirectional 0-1 milliamp signal proportional to the value selected. This card mimics an analog transducer. With the EPM 7000P design, the user can select any measured parameter to output on an analog transducer signal. For technical specifications and hardware installation, refer to the *EPM 7000P Instruction Manual*.

Example:

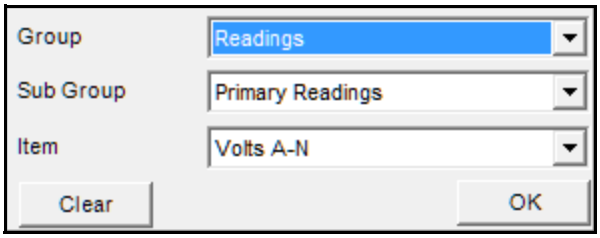
An example use of the optional 0-1mA Output Card is in enabling the EPM 7000P meter to communicate with an RTU.

1. Click **Option Card 1/2 - 0-1 mA Output > Settings**.



You can set up to four Output IDs for your Output Card.

2. Double-click an Assigned Channel field to add or edit an Output ID. You will see the window shown below.



3. Select Group for your Output Channel. The available selections are as follows:
   - Readings
   - Max/Min Demand

- Average Demand
- Harmonics/THD

4. Select the Sub Group for your Output Channel. The sub group values are dependent on the group selection.
5. Select the Item for your Output Channel. The items are the available readings for the group and subgroup you selected. For example, as shown in the window above, Volts A-N is an item you can select when you have selected Readings as the group, and Primary Readings as the sub group.
6. Click **OK**. The Output Channel you selected is displayed in the Assigned Channel field.
7. Enter Low End and High End for the channel.

NOTE

For the Item selected for the Assigned Channel, the Output Card takes the value in the meter and outputs a DC current within its range. The Low End is the lowest value, and the High End is the highest value. For example, for VOLTS A-N and Bidirectional Mode, at Nominal of 120V, the Low End is set to 115V and the High End is set to 125V. The Analog Output Card will output -1 mA when the reading is 115V, 0 mA when the reading is 120V, and 1 mA when the reading is 125V. The analog card can output below -1mA and above +1mA, proportionally to VOLTS A-N. For limiting values refer to the *EPM 7000P Instruction Manual*.

8. You can select either Unidirectional or Bidirectional for Mode. Unidirectional mode is used for unsigned data, e.g., voltage; and bi-directional mode is used with signed data, e.g., Watts.
9. To implement any changes to the 0-1mA Output card settings, click the **Update Device** button to send the new profile to the meter.

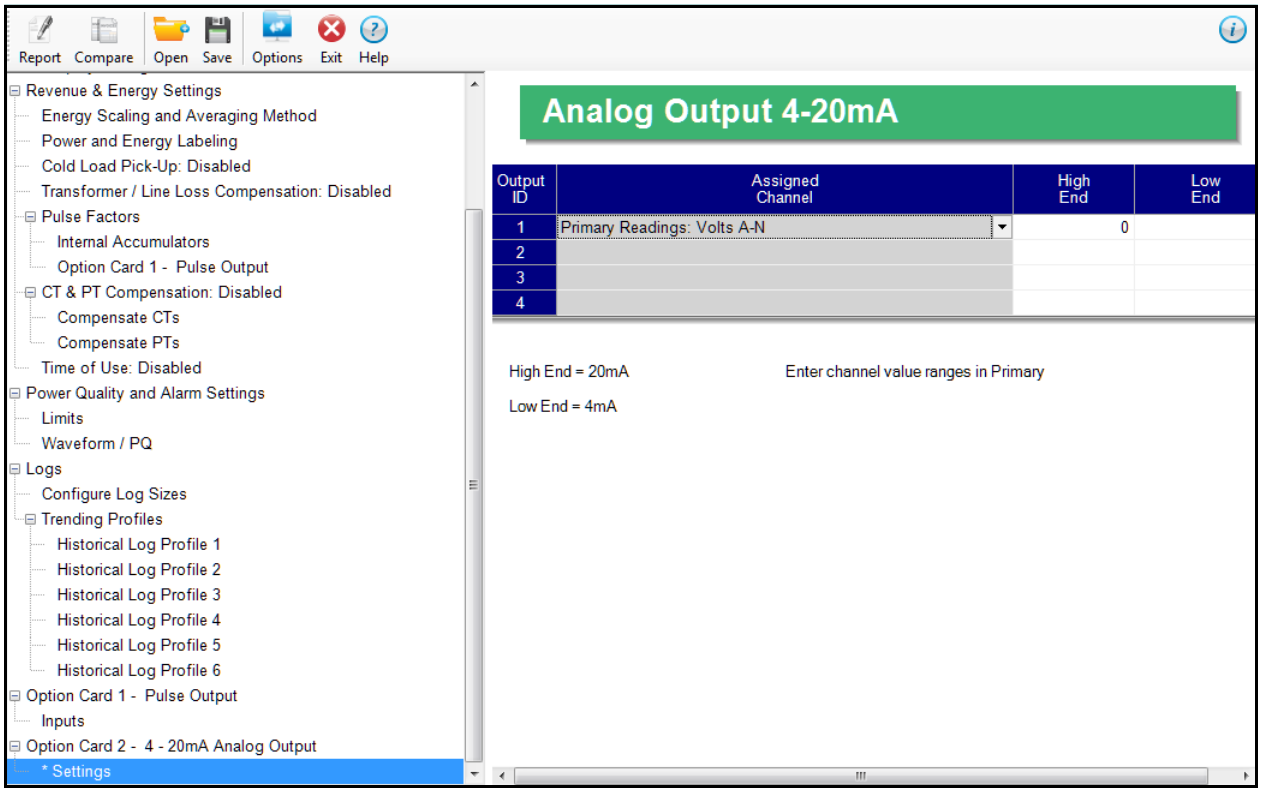
27.5.5 Configuring a 4-20 mA Output Card

The 4-20mA Output Option card (C2) is an analog communication card, which transmits a standard, unidirectional 4-20 milliamp signal. For technical specifications and hardware installation, refer to the *EPM 7000P Instruction Manual*.

Example:

An example use of the optional 4-20mA Output Card is in enabling the EPM 7000P meter to communicate with an RTU.

1. Click **Option Card 1/2 - 4-20 mA Output > Settings**.

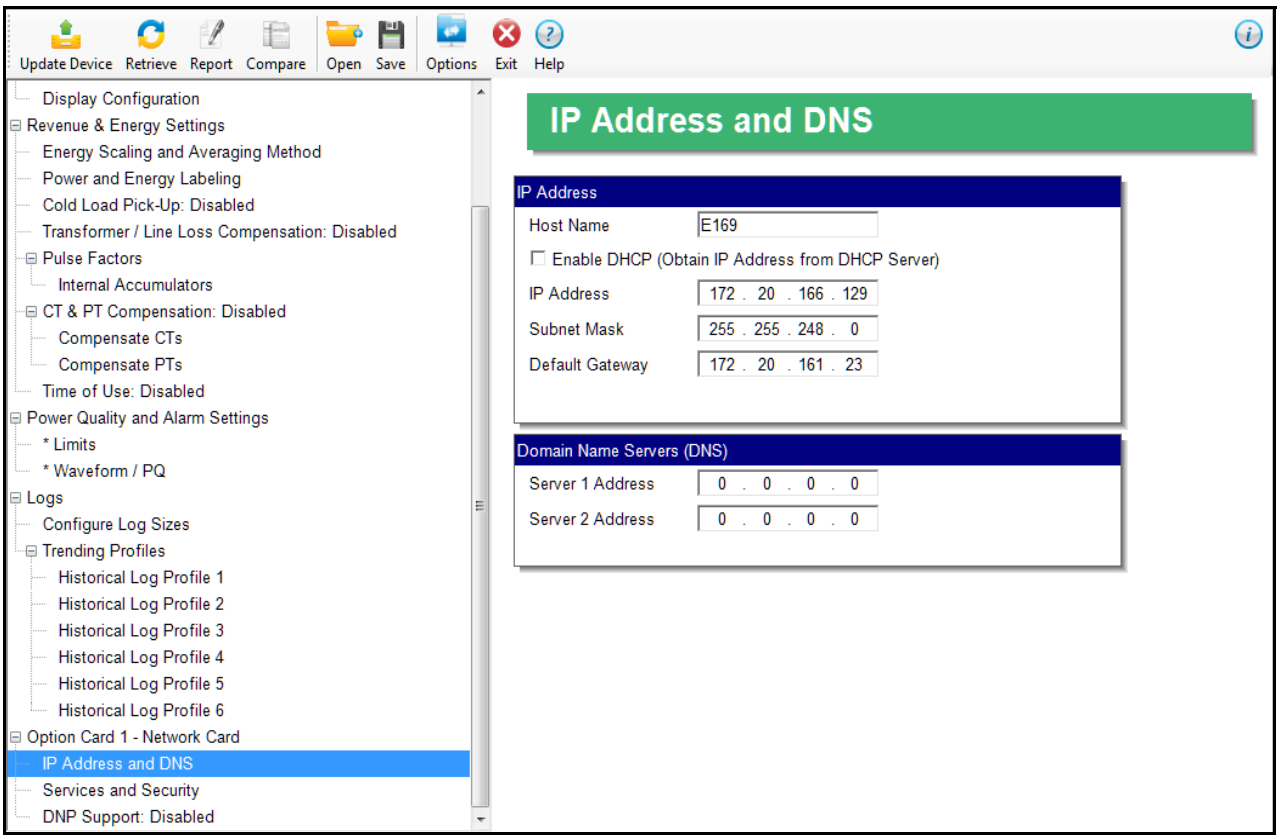


2. Follow the instructions for configuring the 0-1 mA Card. The configuration of a 4-20 mA Card is the same as a 0-1 mA Card, except that this card can only be unidirectional, so there is no Mode setting.

27.5.6 Configuring a Network Card

The optional Network card (E1) enables 10/100BaseT Ethernet communications. It also acts as a Web server, allowing the meter data to be viewed on a standard web browser. For technical specifications, hardware installation, and additional information on the Web server, refer to the *EPM 7000P Instruction Manual*.

1. Click **Option Card 1/2 - Network Card > IP Address and DNS**. You will see the screen shown below. It allows you to configure the IP Address, DNS, and Network Time Protocol Server for the card.



2. Enter the following information:

- Computer Name: Either click the DHCP box to enable a DHCP server to assign the IP address for your network card or enter the following for the network card:
  - IP Address
  - Subnet Mask
  - Default Gateway

NOTE

If no mask is entered (blank) or 0.0.0.0 is used, the network card will use an automatic mask based on the network address class, or will not apply a mask, according to the following table:

Network Class	Address range	Mask used
Class A	1.0.0.0-127.x.x.x	255.0.0.0
Class B	128.0.0.0-191.x.x.x	255.255.0.0

Network Class	Address range	Mask used
Class C	192.0.0.0-223.x.x.x	255.255.255.0
Other classes		No masking will be applied

- Domain Name Server Address(es)
- URL address of a Network Time Protocol server if you are using one.

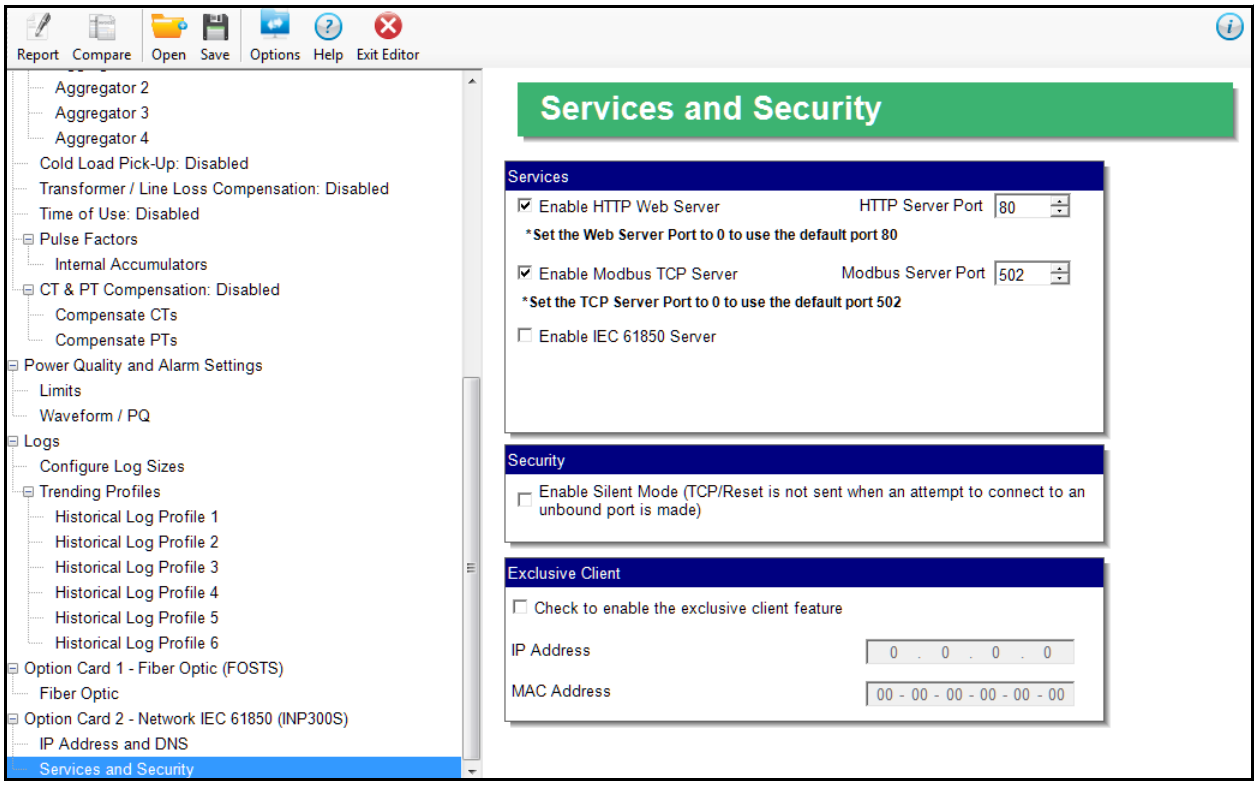
NOTE

The Network Time Protocol server is used for clock synchronization. It can be either a device with a real-time clock that is networked with your meter, or an NTP server on the Internet.

NOTE

IMPORTANT! You must also enable Clock Synchronization in the Time Settings screen (see 27.1.2 *Configuring Time Settings* on page 27–4).

3. Click **Option Card 1/2 - Network Card > Services and Security**. You will see the screen shown below.



4. This screen allows you to disable certain features of the meter Ethernet connection, for security purposes:

- The HTTP Web Server can be disabled, or its default port can be changed.
- The Modbus TCP server can be shut down, or its default port can be changed.
- The Alarm Email and Notification feature of the Network card can be disabled.

NOTE

The network card's firmware must support alarm and notification email for this feature to be available. The settings for the alarm/notification email feature are made using the card's Web server. See the *EPM 7000P Instruction Manual* for instructions.

- If the port entered is less than "10," the standard port is used: 80 for Web Server and 502 for Modbus TCP Server.
- To disable one of the servers, uncheck the box next to it.

- When the Security feature "Silent Mode" is enabled, the meter will totally ignore incoming connections, in such a way that not even TCP/IP Reset packets will be sent. When "Silent Mode" is disabled, the meter follows standard TCP/IP procedures for incoming connections to unused ports. This feature is useful in preventing hacking (attempted security intrusions).
- The Exclusive Client feature lets you Whitelist an IP and/or MAC address. When that address is used to connect to the meter, all other network communication with the meter, though the same Network card, is suspended. This ensures that anything being done, e.g., updating programmable settings, while the Whitelist address is being used to communicate with the meter, is secure.
  - Click the checkbox and enter the IP address or MAC address you want to establish as the Exclusive Client.

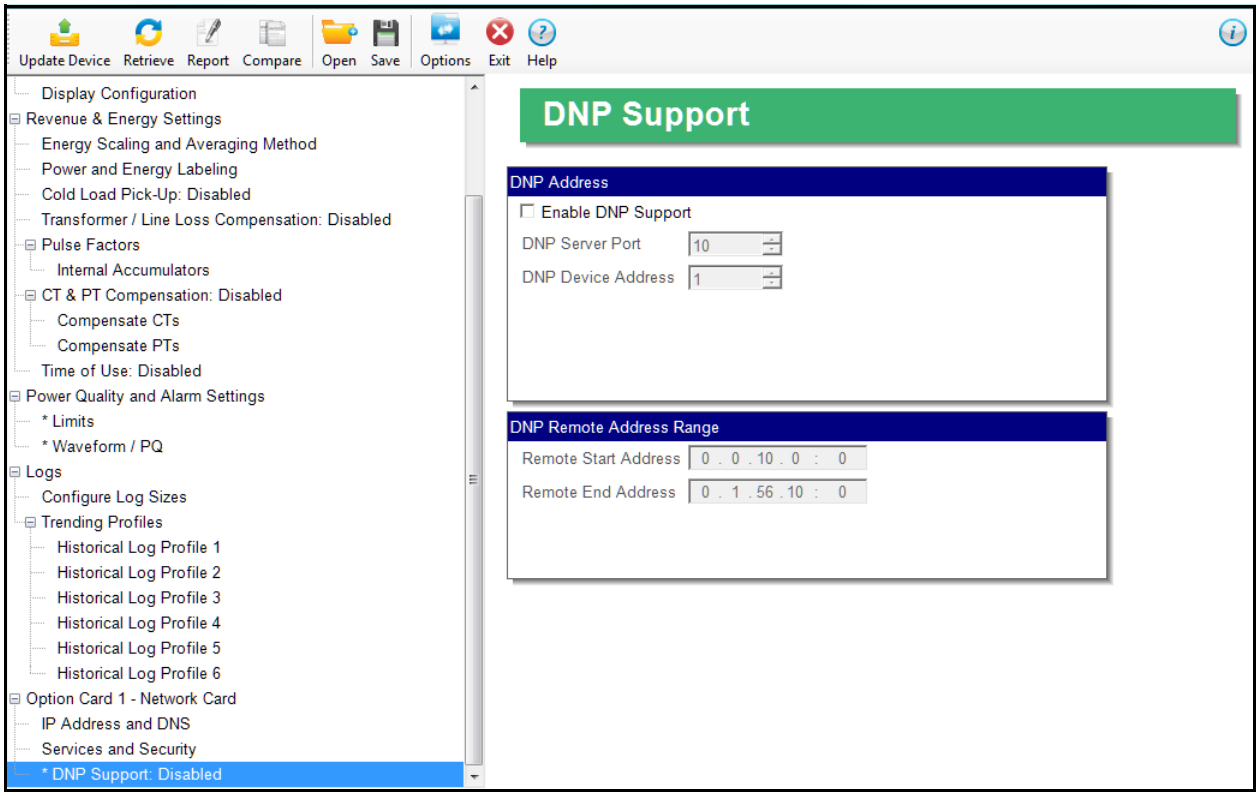
NOTE

To disable the exclusive Client feature, uncheck the checkbox - the IP and MAC addresses will be set to all zeros.

NOTE

- If you do not know this information, contact your Systems Administrator.
- See Chapter 25 "Flash Updating" for instructions on updating the Network card's firmware.

5. Click **Option Card 1/2 - Network Card > DNP Support** if you want to set up DNP over Ethernet for the Network Card. You will see the screen shown below.



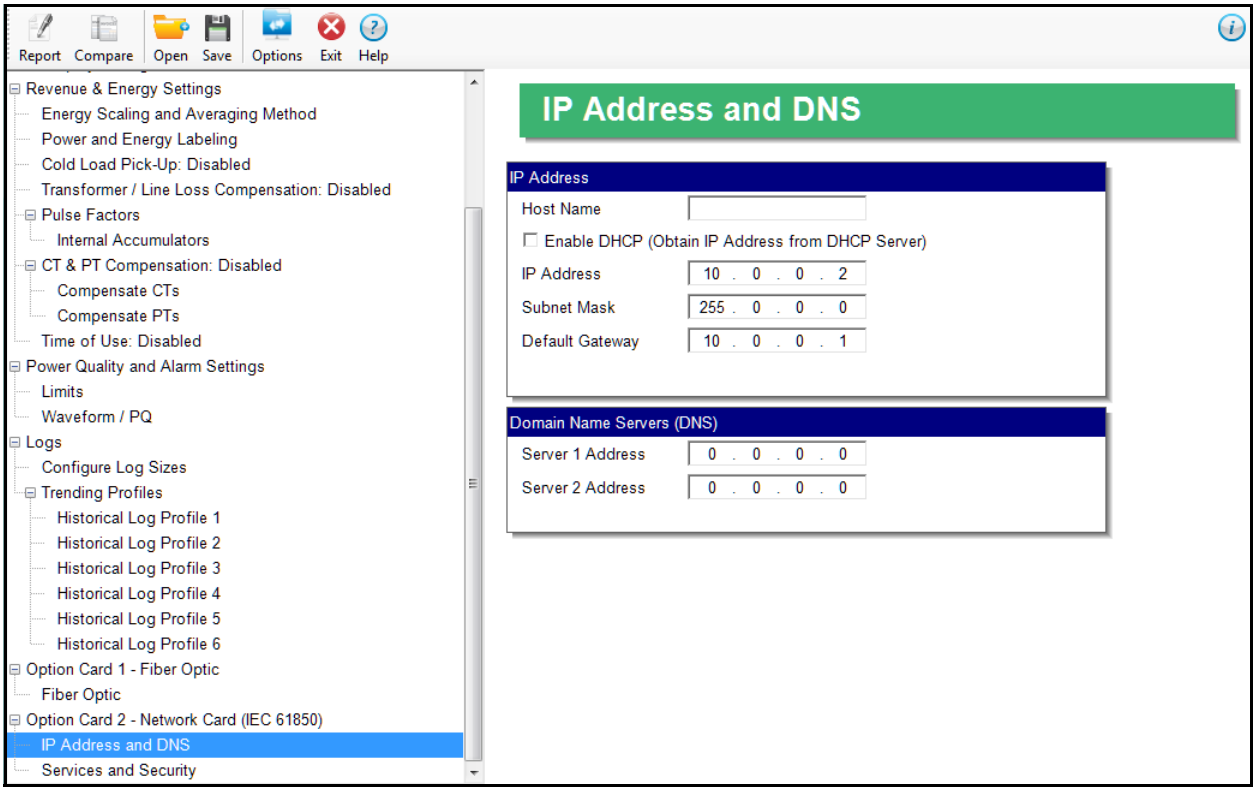
This screen lets you set up a DNP Server gateway for the Network Option card. This gateway enables DNP 3.0 protocol communication over Ethernet, for the meter.

6. Make the following settings:
   - Enable DNP Support: by default the DNP server support is disabled. Check the box to enable it. Once it is enabled, the other parameters can be entered.
   - DNP Server Port: this is the TCP/IP port where the meter Network card unit will be listening for incoming connections via the DNP protocol. Valid numbers are from 1 to 65535. We recommend that you set a value over 1024, because most of the lower numbers are reserved, or are already allocated to other popular services. If you set a port number of less than 10, the network card will set the port to its default, which is 20000.
   - DNP Device Address: this is the meter's configured address; currently, this setting should be 1.
   - IP Address Start/End: this setting implements Internet security by letting you specify a range of IP addresses that are authorized to connect to the DNP port. Any requester with an IP address outside of this range will be rejected. Enter the range in the start and end fields. To disable the IP range restriction, write 0.0.0.0 in the start field and 255.255.255.255 in the end field.
     An example of a range is 172.20.167.100 in the start field and 172.20.167.150 in the end field. That would authorize connection to the DNP port for any IP address from 172.20.167.100 up to and including 172.20.167.150.
   - IP Port Start/End: you can also use this setting to implement Internet security by through specifying a range of authorized port addresses. Any requester originating the connection from a port outside of this range will be rejected. Enter the range in the start and end fields (valid port ranges are from 1 to 65535). To disable the port range restriction, use 0 in either the start or the end field.
7. To implement any changes to the Network card settings, click the **Update Device** button to send the new profile to the meter.

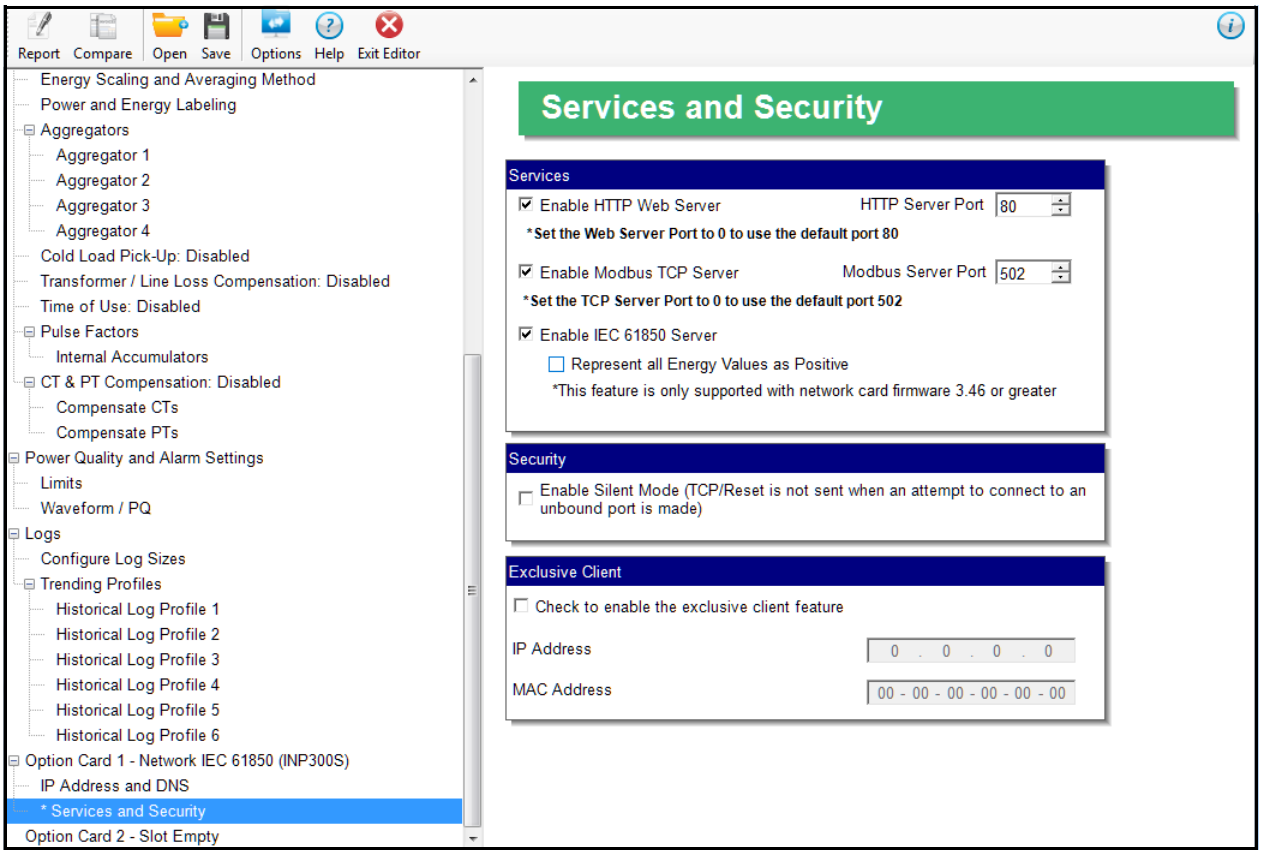
27.5.7 Configuring an IEC 61850 Card

The optional IEC 61850 card (E2) enables the meter to fit into an IEC 61850 network, which is an architecture used in substation automation. The settings for this card are the same as for the Network card, except that there is no DNP setting, since the IEC 61850 card uses its own protocol for communication.

1. Click **Option Card 1/2 - IEC 61850 > IP Address and DNS** to set up the adress information for the IEC 61850 card, or Option Card 1/2 - IEC 61850 > Services and Security to enable/disable the servers and other features.



2. See the instructions in 27.5.6 *Configuring a Network Card* on page 27–67, for instructions on setting up the IP Address and DNS configuration. For the Services and Security tab, click **Option Card 1/2 - IEC 61850 > Services and Security**.



3. This screen allows you to disable certain features of the meter Ethernet connection, for security purposes:

- The HTTP Web Server can be disabled, or its default port can be changed.
- The Modbus TCP server can be shut down, or its default port can be changed.
  - If the port entered is less than "10," the standard port is used: 80 for Web Server and 502 for Modbus TCP Server.
  - To disable one of the servers, uncheck the box next to it.
- To use the card for IEC 61850 communication, check the Enable IEC 61850 Server box. For INP300S Option cards with Network card firmware version 3.46 or greater, there is another option box under Enable IEC 61850 Server. It lets you specify that all energy values are represented ad positive numbers: check the box to enable this option.

NOTE

To see what your Network card's firmware version is, open the Device Status screen. See 20.1.10 *Device Information* on page 20–14.

- When the Security feature "Silent Mode" is enabled, the meter will totally ignore incoming connections, in such a way that not even TCP/IP Reset packets will be sent. When "Silent Mode" is disabled, the meter follows standard TCP/IP procedures for incoming connections to unused ports. This feature is useful in preventing hacking (attempted security intrusions).
- The Exclusive Client feature lets you Whitelist an IP and/or MAC address. When that address is used to connect to the meter, all other network communication with the meter, though the same Network card, is suspended. This ensures that anything being

done, e.g., updating programmable settings, while the Whitelist address is being used to communicate with the meter, is secure.

- Click the checkbox and enter the IP address or MAC address you want to establish as the Exclusive Client.

NOTE

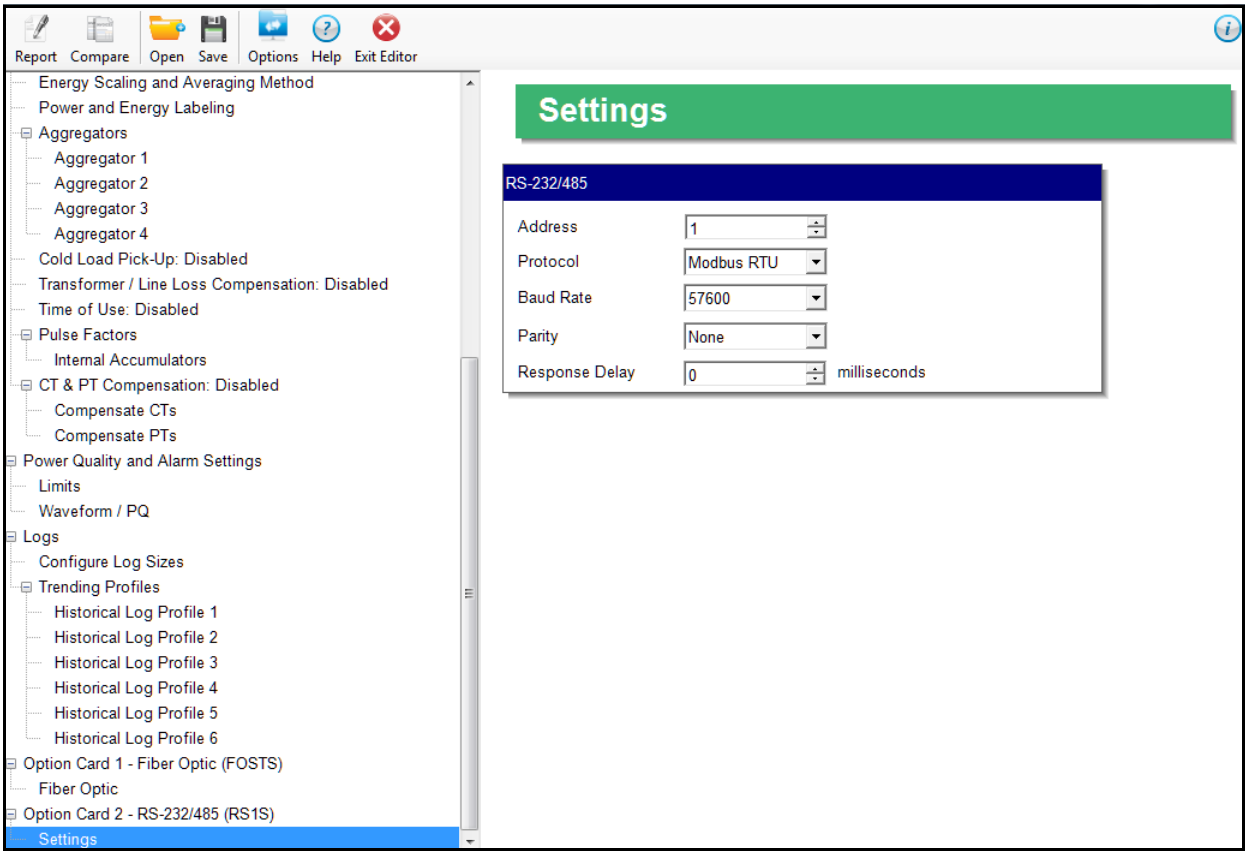
To disable the exclusive Client feature, uncheck the checkbox - the IP and MAC addresses will be set to all zeros.

If you do not know this information, contact your Systems Administrator.

27.5.8 Configuring an RS232/RS485 Card

The optional RS232 card (S1) lets you add an RS232 serial connection for the meter.

1. Click **Option Card 1/2 - RS232**.



2. Use this screen to make the following settings for the card:
   - Address: 1 - 247 (Modbus); 1-65520 (DNP).
   - Protocol: Modbus RTU; Modbus ASCII; DNP3.
   - Baud Rate: 9600; 19200; 38400; 57600.
   - Parity: None, Odd, Even.
   - Response Delay (msec): the suggested delay is 50 msec, but you can increase the delay, if necessary.
3. To implement any changes, click the **Update Device** button to send the new profile to the meter.

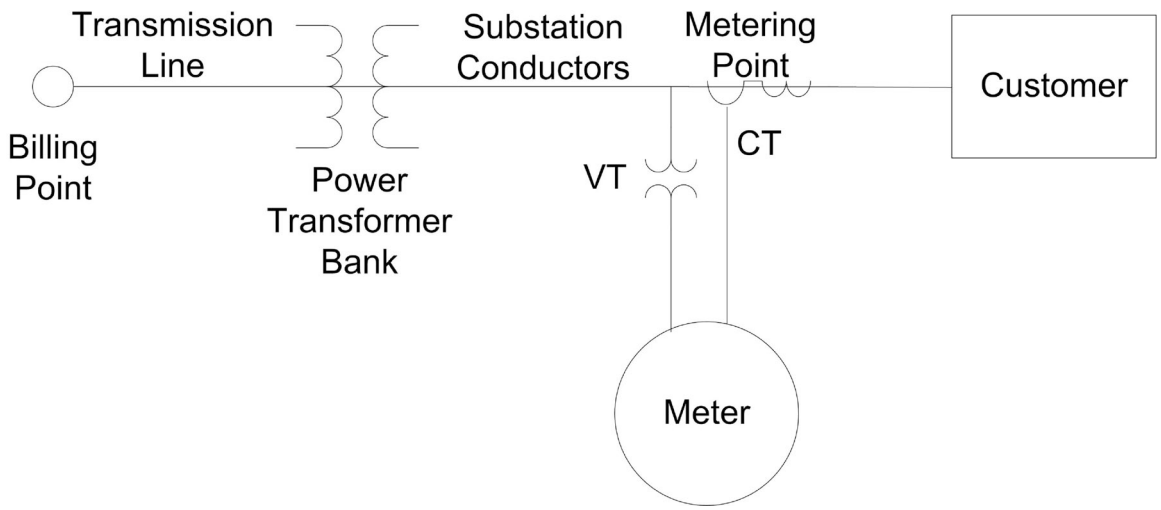
GE Communicator

Appendix A: Transformer/Line Loss Compensation

A.1 What is System Loss Compensation?

System Loss Compensation is a metering technique that adds or subtracts losses to meter registration. This technique is used because it is often much less expensive and safer to meter the low voltage side of a Power Transformer than the contractual billing point.

System Loss Compensation also provides a method for moving the billing point from a boundary point on a transmission line back to a practical metering point.



System Loss Compensation adjusts for losses between the billing point and the metering point. These losses are lumped into Transmission Line Losses, Power Transformer Losses and Substation Conductor Losses. The GE Loss Calculator allows for the use of any or all of these elements at a meter installation.

A.1.1 GE Loss Calculator Overview

The GE Loss Calculator is simple to use and can easily be adapted for your requirements. It comprises a complete model that handles loss compensation from meter to distribution line, covering Power Transformer losses, Substation Conductor losses, Transmission Line losses, and optionally, adjustments for Transmission Line Charging effects. It produces a printable document of the installation, with technical description that can be used with both customers and reviewing agencies.

To use the calculator, you plug data into spreadsheet cells, which have been color-coded for ease of use. In addition, the calculator contains:

- Instructions for its use
- Technical descriptions of calculations performed
- Equations expressed in typical metering abbreviations
- “Mouse over” notes on Key Cells, explaining their function.

The current version of the GE Loss Calculator contains the following enhancements:

- Substation Conductor losses
- Optional adjustment for Transmission Line Charging effects
- Programmable Meter Nominal Current (see explanation in A.2 *Loss Model*)
- Enhanced color coding of data and page tabs
- Improved instructions and technical descriptions.

A.2 Loss Model

The model used is a typical Loss Model used in Electricity Metering. The primary source for this model is the "Handbook for Electricity Metering". However, if your business uses a different model, the Spreadsheet can be easily modified to use your model.

The elements and assumptions used in the model are described in the following sections.

A.3 Loss Triangles and Calculations

The Loss Triangles are developed from the Simplified Transformer High Side Model. Loss values not supplied by the Manufacturer are calculated by solving the Load and No-Load Loss triangles.

No-Load Calculations:

- No-Load Watts (NLW) are given by the manufacturer's data.
- No-Load VA is defined as:

$$NLVA = \%I_x \times kVAR$$

NLVA = No-Load VA
I_x = Exciting Current
NLV = No-Load VARs
NLVC = Compensated No-Load VARs

- Then, No-Load VARs (NLVC) can be calculated as:

$$NLV = \sqrt{NLVA^2 - NLW^2}$$

Full Load Calculations:

- Full Load Watts (FLW) are given by the manufacturer's data.
- Full Load VA is defined as:

$$VA = \%Z \times kVAR$$

FLVA = Full Load VA
Z = Impedance
FLV = Full Load VARs
NLVC = Compensated No Load VARs

- Then, No-Load VARs (NLVC) can be calculated as:

$$FLV = \sqrt{FLVA^2 - FLW^2}$$

NOTE

All calculations are done on a single element basis averaging the Total number or using the per element number entered in the spreadsheet. It is assumed that Total numbers are the sum of the three (3) actual element values provided by the Transformer Manufacturer.

A.4 System Losses

A.4.1 Transmission Line Losses

Transmission Line Losses are made up of series resistance, series capacitance and shunt capacitance.

Total Line Length = 3 x Line Length

$$I_p = \frac{kVAR}{3 \times V_{L-N}}$$

Line Current is calculated at rated kVA.
I_p = Primary Current

$$LLW = I_p^2 \times R \times TLL$$

Then,
Line Loss Watts
where R is the resistance in ohms/unit of length

$$LLW = I_p^2 \times X \times TLL$$

Line Loss VARs
where X is effective series inductive reactance in ohms/unit of length

A.4.2 Substation Conductor Losses

Substation Losses are calculated at secondary current of the Power Transformer Bank at Rated kVA.

Total Conductor Length = 3 x Conductor Length

$$I_r = \frac{kVAR}{3 \times V_{L-N}}$$

Rated secondary current

$$CLW = I_r^2 \times R \times TLL$$

Conductor Loss Watts
where R is the Resistance in ohms/unit of length

$$CLV = I_r^2 \times X \times TLL$$

Conductor Loss VARs
where X is effective series inductive reactance in ohms/unit of length
= Apparent Power or Power in Circuit
(voltage x current)

A.4.3 Total System Losses

Transformer, Transmission Line and Substation Conductor Losses are combined to compute Total System Losses. The GE Loss Calculator does not require that all pieces of the model be used to calculate System Losses.

Losses are then shifted to the Primary of the Instrument Transformers using the Compensation Calculation Assumptions:

LWFE = Core Loss Watts LVFe = Core Loss VARs

LWCu = Copper Loss Watts LVCu= Copper Loss VARs

A.4.4 Meter Loss Coefficients

Losses are scaled by the meter rating to compute Meter Loss Coefficients.

$$VAm = 3 \times Vm \times TA \times CTR \times VTR$$

Meter VA Rating where:
TA= Test Amps
CTR= CT Ratio
VTR= VT (PT) Ratio
VAm = VA (apparent power) in meter circuit

LWFE= LWFE/VAm No-Load Loss Watts

LVFE= LVFE/VAm No-Load Loss VARs

LWCu= LWCu/VAm Full Load Loss Watts

LVCu=LVCu/VAm Full Load Loss VARs

A.4.5 Dynamic Compensation Calculations

The EPM meter dynamically computes system losses instantaneously using the Meter Loss Coefficients and the assumed voltage and current relationships for Watts and VARs.

- No-Load Loss Watts are proportional to V Squared.
- Load Loss Watts are proportional to I Squared.
- No-Load Loss VARs are proportional to V to the 4th power.
- Load Loss VARs are proportional to I Squared.

Demand, Energy, TOU and Load Profile values are compensated instantaneously.

A.4.6 Transmission Line Charging Current

Capacitive effects are not part of the basic EEI/IMO transmission line loss model but can be significant when large energy transfers occur.

Capacitive Reactance per unit of length is the only additional input required. The unit of measure is megohm-miles or megohm-kilometers.

So,

$$X_c = \frac{X_c \, perunit}{LineLength} \times 10^6$$

in ohms

then, calculate charging current

$$I_c = \frac{\mathrm{Pr}\, imaryVoltage}{X_c}$$

in amps

so,

$$CapacitativeLosses = \frac{3 \times V\,primary \times I_c}{1000}$$

The 3 is included because 3 lines are assumed.

NOTE

The sign of Capacitive Losses is negative.

Since both the Inductive and Capacitive Losses are quadrature components they can be added as scalars.

Then,

Total kvars Losses = Reactive Losses + Capacitive Losses

NOTE

Adding the Capacitive Losses always reduces total kvar losses because of the negative sign on the capacitive losses.

The GE Loss Calculator makes these adjustments for Line Charging on the Line Loss Page. This adjustment is optional and not typically used in most metering applications. However, Transmission Engineers do use these adjustment on Medium Length Lines (10 to 50 miles), when the meter is upstream of net energy flow.

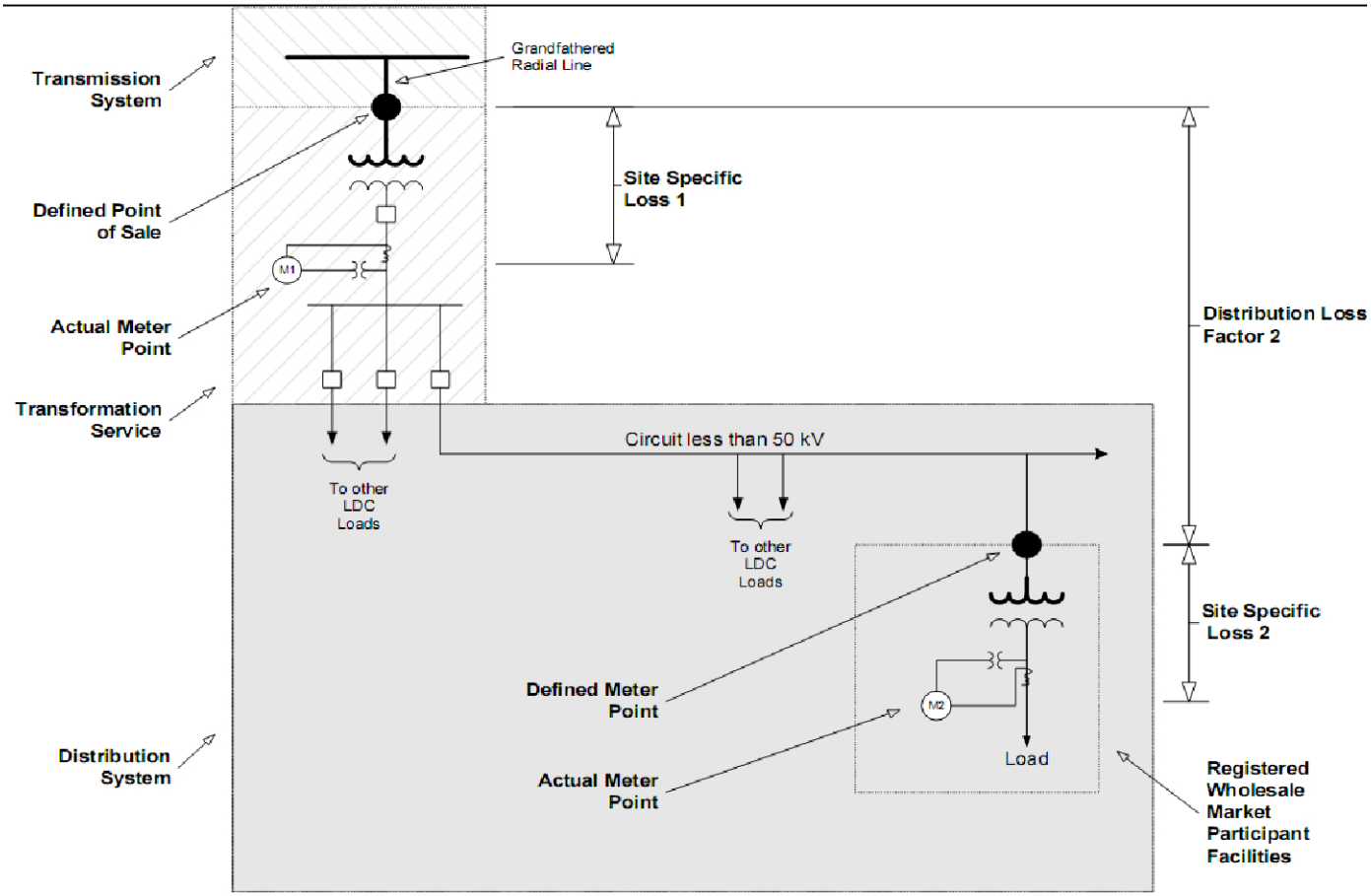
A.5 EPM Meter Loss Compensation Setting

All real and reactive energy measurements in EPM meters, unless otherwise labeled, are compensated for losses once Loss Compensation is enabled in the Device Profile. See sections 11.2.5 *Transformer / Line Loss Compensation* (EPM 9900/9900P meter), 12.2.6 *Transformer / Line Loss Compensation* (EPM 9800 meter), 26.2.4 *Transformer / Line Loss Compensation* on page 26–25 (EPM 9700 meter), 13.2.6 *Transformer / Line Loss Compensation* (EPM 9450/9650 meter) and 27.2.5 *Transformer/Line Loss Compensation* on page 27–38 (EPM 7000P meter) for TLC setting instructions.

A.5.1 Common Compensation Examples

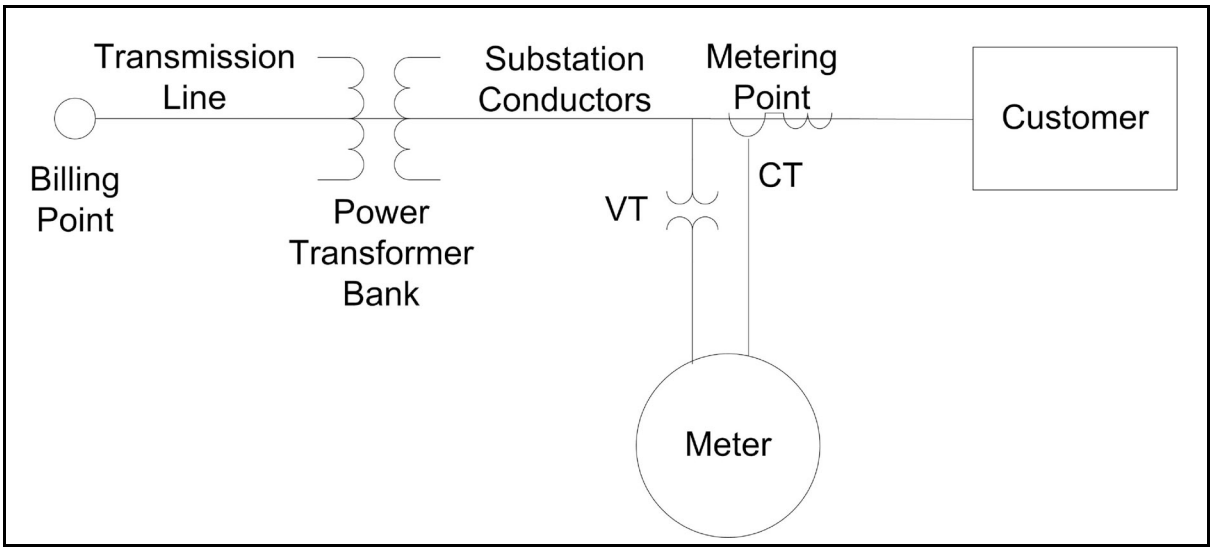
NOTE

For Revenue Metering, how compensation is handled is usually dictated by the Metering Tariff and that should be your primary guide. These examples may or may not agree with your company's practice and the applicable Tariff at a metering point. They are simply intended to present examples of how Loss Compensation can be used. Refer to the IMO Loss Diagram, below.



A.5.1.1 Application Example #1: Substation Instrumentation or SCADA Metering

Objective: Monitor Net Energy and VAr flow.



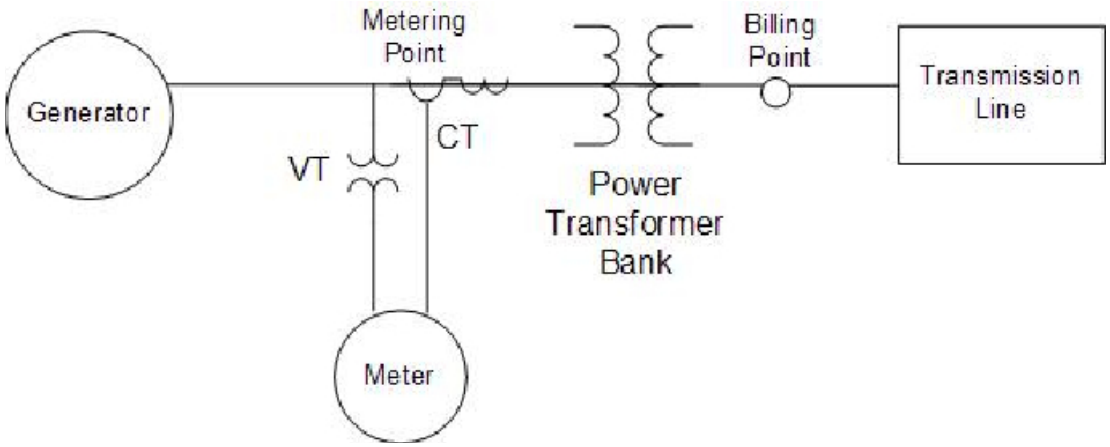
In this application, the meter will not see the real (Watts) and reactive energy (VArs) delivered by the Electrical Distribution System used to charge and energize the Power Transformer that it would have seen if it was placed at the metering point so these losses must be added to the meter readings.

Assumptions:

1. We want to compensate the meter reading to add both No Load (Fe) and Full Load (Cu) loses from the Power Transformer. From the Transformer and Line Loss Compensation screen's first pull-down menu, select: Both Fe and Cu.
2. We also want to add both estimated Watts and VArs to the meter readings. From the Transformer and Line Loss Compensation screen's second pull-down menu, select: Add to Watts and VAr.
3. With the meter on the low voltage side of the Power Transformer only Delivered Energy needs to be compensated for losses, Received energy is properly metered because the Power Transformer is energized from the Primary side. From the Transformer and Line Loss Compensation screen's third pull-down menu, select: +Watts.

A.5.1.2 Application Example #2: Generation Instrumentation or SCADA Metering

Objective: Monitor Net Energy and VAr flow.



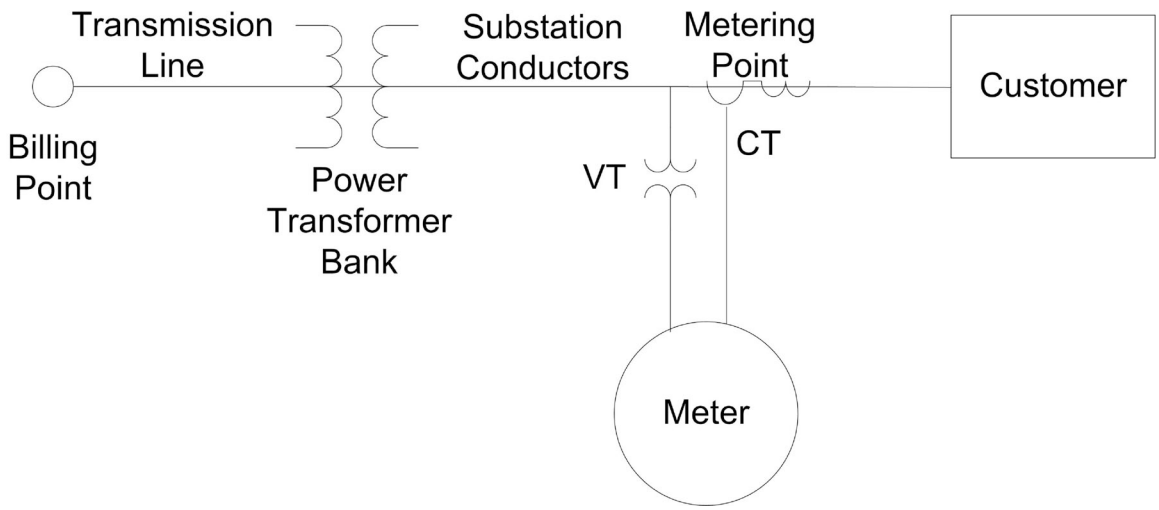
In this application, the meter will see the real (Watts) and reactive energy (VArs) delivered by the Generator that is used to charge and energize the Power Transformer. However, the billing point is on the Load side of the Power Transformer and the losses should not be added to the meter readings. So to compensate the meter, we must subtract the metered losses.

Assumptions:

1. We want to compensate the meter reading by subtracting both No Load (Fe) and Full Load (Cu) loses from the Power Transformer. From the Transformer and Line Loss Compensation screen's first pull-down menu, select: Both Fe and Cu.
2. We also want to subtract both estimated Loss Watts and Loss VArs from the meter readings. From the Transformer and Line Loss Compensation screen's second pull-down menu, select: Subtract from Watts and VArs.
3. With the meter on the Generator side of the Power Transformer only Energy flowing to the Transmission Line needs to be compensated for losses because the Power Transformer is energized from the Generator Side. From the Transformer and Line Loss Compensation screen's third pull-down menu, select: +Watts.

A.5.1.3 Application Example #3: Revenue Metering at Industrial or Commercial Customer

Objective: Meter per Tariff for this customer class or per contract.



NOTE

The following comments are typical but may not be in agreement with the Tariff or Contract to be applied or your company practice.

The meter has been placed on the secondary side of the Power Transformer but the customer is buying energy on the Primary Side of the Power Transformer, therefore, transformer losses are part of the customer's load and should be added to the meter reading. No credit is given to the customer for Watts or VArs the customer supplies to the Utility System.

In this application, the meter will not see the real (Watts) and reactive energy (VArs) delivered by the Electrical Distribution System used to charge and energize the Power Transformer that it would have seen if it was placed at the metering point so these losses must be added to the meter readings.

Assumptions:

1. We want to compensate the meter reading to add both No Load (Fe) and Full Load (Cu) loses from the Power Transformer. From the Transformer and Line Loss Compensation screen's first pull-down menu, select: Both Fe and Cu.
2. We also want to add both estimated Watts and VArs to the meter readings. From the Transformer and Line Loss Compensation screen's second pull-down menu, select: Add to Watts and VAr.
3. At the metering point we want to know only Delivered energy flow and ignore any real or reactive energy supplied by the customer to the Electrical System. From the Transformer and Line Loss Compensation screen's third pull-down menu, select: +Watts Only.

In this example we also need to consider the meter's displayed quantities. The EPM 900 series meter is a true Four Quadrant Meter but Tariff Requirements in this case ignore Watts and VARs that the customer sends to Distribution System.

NOTE

See "Four Quadrant Power Flow Conventions" on page A-13, for a graphic display of the terms used.

For more information on display options see the Instruction Manual for the meter model you are using, but all EPM 9000 series meters can display and log Four Quadrant Metering Quantities.

In this example the quantities used for Revenue Metering would be:

Q1 – Delivered Watts

Q1 – Lagging VArs

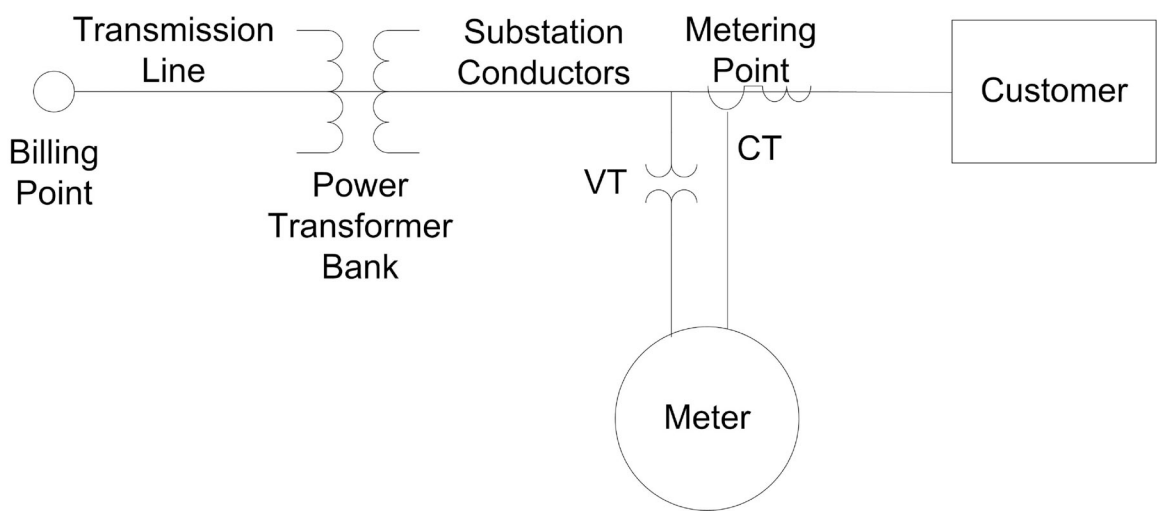
All of the other quantities are still available in the meter but only these will typically be used for billing purposes and displayed for the customer.

A.5.1.4 Application Example #4: Revenue Metering at Industrial Cogeneration

Objectives:

- Measure Delivered and Received Watts and all VArs supplied to the customer; no credit is given to the customer for VArs the customer supplies to the Utility System.

Meter per Tariff for this customer class or per contract.



NOTE

The following comments are typical but may not be in agreement with the Tariff or Contract to be applied or your company practice.

The meter has been placed on the secondary side of the Power Transformer but the customer is buying energy on the Primary Side of the Power Transformer, therefore, transformer losses are part of the customer's load and should be added to the meter reading. No credit is given to the customer for VArs the customer supplies to the Utility System, but Watts supplied by the customer are used to offset the energy the customer buys.

In this application, the meter will not see the real (Watts) and reactive energy (VArs) delivered by the Electrical Distribution System used to charge and energize the Power Transformer that it would have seen if it was placed at the metering point, so these losses must be added to the meter readings.

NOTE

Losses are typically subtracted instead of added when the meter is placed on the Supply side of the Power Transformer instead of the more typical Load side installation.

Assumptions:

1. We want to compensate the meter reading to add both No Load (Fe) and Full Load (Cu) loses from the Power Transformer. From the Transformer and Line Loss Compensation screen's first pull-down menu, select: Both Fe and Cu.
2. We also want to add both estimated Watts and VArs to the meters readings. From the Transformer and Line Loss Compensation screen's second pull-down menu, select: Add to Watts and VAr.
3. At the metering point we want to know only Delivered energy flow and ignore any real or reactive energy supplied by the customer to the Electrical System. From the Transformer and Line Loss Compensation screen's third pull-down menu, select: Both +Watts and – Watts.

To obtain the Tariff Quantities we need to look at 4 Quadrant Data. The following metered values would typically be used:

Q1 + Q4 - Delivered Watts/Watthours – this is energy delivered to the load.

Q2 + Q3 - Received Watts/Watthours – this is energy received from the load.

Q1 + Q2 - Lagging VArs – these are typically referred to as Supplied or Delivered VARs

An alterative would be to measure QHours if that is part of the Tariff.

NOTE

QHours are not typically used with Electronic Meters.

NOTE

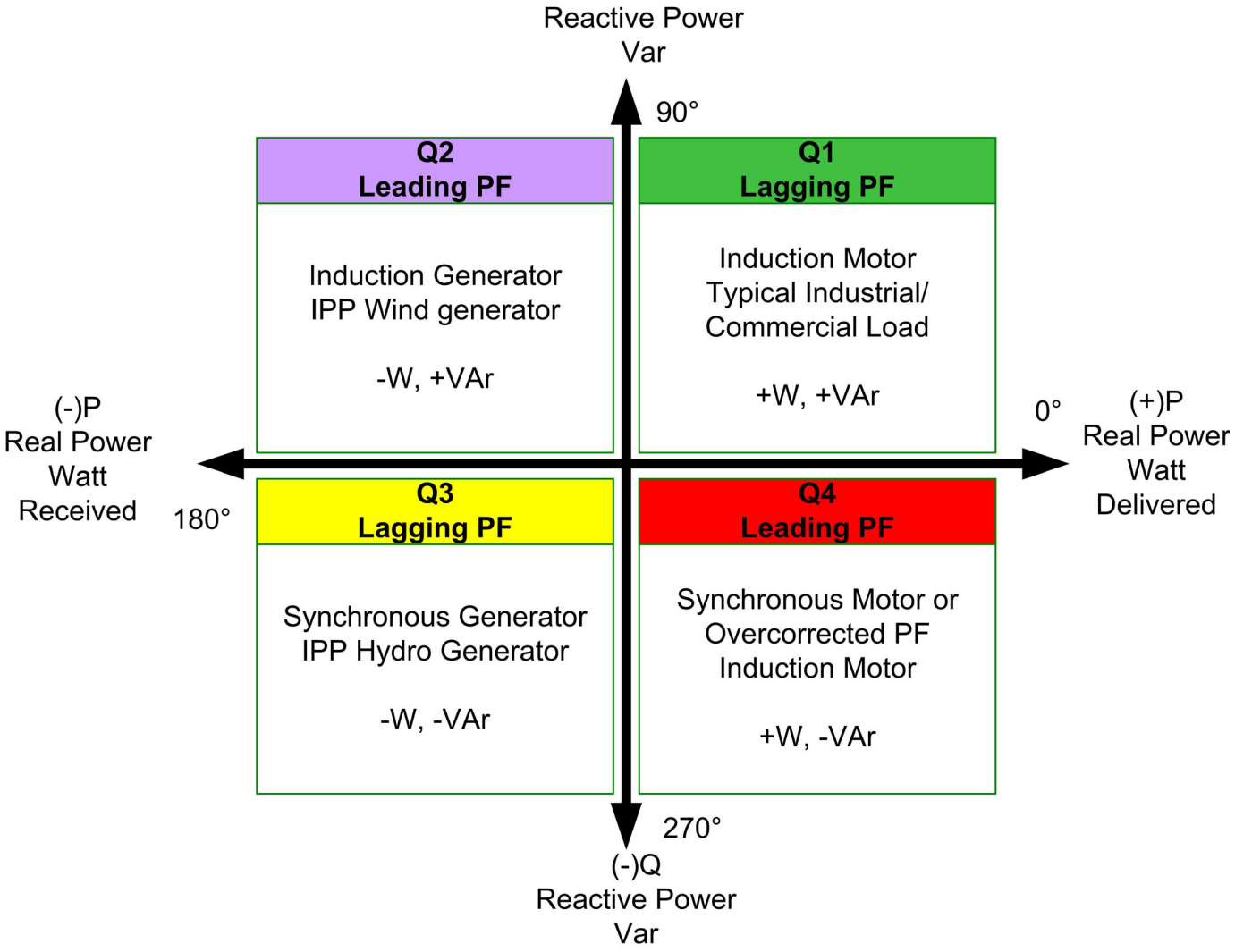
Typically, VArs would not be used for billing except if a Power Factor Penalty condition exists. To determine if PF is outside of Tariff Requirements, we would typically set the Power Factor Limit as a Device Profile Limit in the GE Communicator software and Log Power Factor. This would provide documentation of when and how badly the Metered Load dropped below the required minimum Power Factor.

A.5.1.5 Loss Calculation References

For more information, consult the following documents:

- MDP_STD_005 - IMO Site Specific Loss Adjustments
- EEI Handbook for Electricity Metering
- MDP_PRO_0011 IMO Market Manual 3: Metering, Part 3.5 Site Specific Loss Adjustments

A.5.2 Four Quadrant Power Flow Conventions



NOTE

The Terms "Export/Import" and "Delivered/Received" are equivalent and use the Utility Power Grid as their reference. So, "Delivered or Export" refers to Energy Flow from the Power Grid to the Load.

The Delivered and Received conventions shown are the default setting for EPM 9000 series meters. However, these setting can be changed in the meter's Device Profile Labels screen. For instructions, refer to the chapter that explains how to program the Device Profile settings for your meter model: Chapter 11 "EPM 9900/9900P Meter", Chapter 12 "EPM 9800 Meter", Chapter 26 "EPM 9700 Meter", or Chapter 13 "EPM 9450/9650 Meter").

A.6 GE Loss Compensation Calculator Instructions and Examples

If you have MS Excel installed on your computer, click the TLC Calculator button on the Transformer and Line Loss Compensation screen (see A.5 *EPM Meter Loss Compensation Setting*). The following pages contain Loss Compensation Calculator instructions and several copies of the Loss Calculator with example numbers to assist you.

A.6.1 GE Loss Compensation Calculator Instructions

For 3 stator meters with 3 PTs and 3 CTs.

This model has been tested by GE and has been demonstrated to provide answers consistent with the Loss Model presented in the EEI Handbook for Electricity Metering, 10th Edition. **However, GE assumes no liability associated with its use.**

Information in red text is for advanced users who need to modify the model to meet their business requirements.

Before you begin:

Start:

1. Begin data entry on Transformer Loss Calculation Sheet (Xmfr Loss).

   Make sure that unwanted data is not left in the spreadsheet from previous use.

NOTE

2. Data is entered in Yellow cells only: do not change data in other cells. You can use the examples later on in this chapter to verify proper operation of the model.

Transformer Loss Calculation

3. Enter Transformer Manufacturer Supplied or Measured Data for Transformer Bank. Typical values that are often used are shown in the table below.

Value	Comment
No Load Loss Watts	Core or Iron Losses
Load Loss Watts	Copper or I squared r Losses
Exciting Current	
Impedance	
Transformer kVA Rating	Rating of whole bank in kVA
Rated Primary L_L Volts	Primary Line to Line Voltage Rating
V Secondary Side of Xmfr Line-Line	Secondary Line-Line Voltage

- The model assumes there are three power transformers.
- Transformer data may be entered as Total or per element values.
- Total values are the sum of the values for all three transformers.
- Calculations are made on a per element basis using either Total values divided by 3 or per elect values.

4. Enter configuration of transformer secondary - Wye or Delta.
5. Enter Instrument Transformer Information

Example Data

Instrument Transformers	Primary	Secondary
Voltage Xmfr	7200	120
Current Xmfr	500	5

Enter primary and secondary values for voltage and current ITs. The model calculates CTR, VTR, and TF. The Model assumes 3 CTs and 3 VTs (PTs) are used.

6. The meter rating should not be changed unless you are using a special version of the meter and the Instruction Book instructs you to change these values.
7. Select Nominal Metered Current (the red box). The EEI/IMO Model uses TA for Nominal Current. You can find the TA on the meter nameplate; the TA for EPM meters is 2.5A. 2.5 is the value most typically entered into this box on the spreadsheet. However, many Electric Companies use 1/2 of Class Current (10A) or Class Current for Nominal Current. This is a carryover from Rates written before Class 20 meters became the standard class for Transformer Rated Meter, and has been carried forward as part of the Rate Structure. The selection of Nominal Metered Current is very important because all losses will be scaled against this nominal value. Leave 2.5 as the Nominal Current unless your company practice differs. If you are not using Transmission Line or Substation Conductor Losses, the values shown in Red on the Total Losses Sheet should be entered into the GE Communicator software when programming the EPM meter.

NOTE

If you see values for Transmission Line or Substation Conductor Losses, go to those sheets and clear data from yellow cells.

If you are using Transmission Line or Substation Conductor Losses, continue with the instructions.

Transmission Line Losses:

8. Entry of transmission Line Data is optional. If the data entries are left at zero then no addition losses are added to the Total Losses. This is easily verified by checking the loss summary on the System Losses Sheet. The Total System Losses will show zero contribution from Line and Substation Losses.
9. Enter per unit ohmic values, resistance per unit and conductive reactance per unit.
10. Enter the length of a single conductor. The model assumes 3 conductors and calculates Total Conductor Length.
11. Enter the per unit label. Typically Miles (Mile) or Kilometers (KM). This value does not affect the model calculations but is carried for clarity.
12. Line Losses will now be reflected in Total System Losses. If you are not using Substation Conductor Losses, the values now shown in Red on the Total Losses Sheet should be entered into the GE Communicator software when programming the EPM meter.

NOTE

If you see values for Substation Conductor Losses go to that sheet; clear data from yellow cells.

If you are using Substation Conductor Losses, continue with instructions.

Substation Conductor Losses:

13. Entry of Substation Conductor Data is optional. If the data entries are left at zero, then no additional losses are added to the Total Losses. This is easily verified by checking the loss summary on the System Losses Sheet. The Total System Losses will show zero contribution from Substation Losses.
14. Enter per unit ohmic values, resistance per unit and conductive reactance per unit.
15. Enter the length of a single conductor. The model assumes 3 conductors and calculates Total Conductor Length.
16. Enter the per unit label. Typically Feet (FT) or Meters (M). This value does not affect the model calculations but is carried for clarity.
17. Substation Conductor Losses will now be reflected in Total System Losses. The values now shown in Red on the Total Losses Sheet should be entered into the GE Communicator Software when programming the EPM meter.

A.6.2 Example 1 Data

System Losses (Transformer, Line and Substation Conductor Losses)

This example will use all elements of the Loss Calculator, compensation for Transmission Line Losses, Substation Conductor Losses, and Power Transformer Losses. Examples 2 and 3 are less complex Transformer Loss Compensation examples with Wye and Delta circuits. This example will present an application and a filled Spreadsheet. Examples 2 and 3 will present the application.

NOTE

The TLC Calculator has pop-up instructions for all of the entry fields to help you fill out the spreadsheet.

Application Description

- Installation Description: The installation includes a 36-mile transmission line, a 10 MVA transformer bank and 156 feet of substation conductor.
- Transformer Data Supplied by Manufacturer

kVA rating of transformer bank	10MVA
Rated primary voltage	115kV
Secondary line-to-line voltage	12,470 V
Secondary line-to-neutral voltage	7200 V
No-load watts loss	45 kW
Copper losses at 75°C	135 kW
Percent impedence	7.5
Percent exciting current	1.03

Secondary Connection	Wye

NOTE

If the transformer bank is composed of three single-phase transformers, each transformer's VA, Watt and VAR losses are added to obtain total losses.

Transmission Line Data

Resistance per mile	0.306 ohms per mile
Inductive reactance per mile	0.451 ohms per mile
Line length	36 miles

NOTE

The spreadsheet will compute Total Line Length assuming three conductors, Total Line Length = 3 x Line Length.

Substation Conductor Data

Resistance per 1000 feet	0.005 ohms per 1000 feet
Inductive reactance per 1000 feet	0.090 ohms per 1000 feet
Conductor length	156 feet

NOTE

The spreadsheet will compute Total Conductor Length assuming three conductors, Total Conductor Length = 3 x Conductor Length.

Metering Data:

The model assumes a three-phase, 4-wire meter installation with 3 Voltage Transformers and 3 Current Transformers. This is not a limitation because all EPM Transformer Rated Meters are 3 stator, 4-wire meters. The model should not be used with other meter types.

Voltage Transformer Ratio, VTR	7200/120 = 60/1
Current Transformer Ratio, CTR	500/5 = 100/1
Meter Voltage Rating, V_m	120V
Meter Test Amps, TA, I_{nom}	2.5A

A.6.2.1 Example 1 Spreadsheet - System Losses Summary for Example 1

System Losses Summary

GE Loss Compensation Calculator

Meter Correction Factors from this sheet are manually entered into GE Communicator Software

Note: Begin Data Entry by Going to Xfmr Loss Sheet

Company:	Example 1	Project	
Name:		Location	
Date:			

Comments: Example of Loss Calculator with Transformer, Substation, and Line Losses

Meter Correction Factors		**Loss Factors**		
for Communicator Software		**Calc**	**Used**	
% No-Load Loss Watts	**%LWFE**	**0.83344**	**0.833**	**Enter These**
% Full-Load Loss Watts	**%LWCU**	**1.17956**	**1.180**	**Values in**
% No-Load Loss VARs	**%LVFE**	**1.71616**	**1.716**	**Communicator**
% Full-Load Loss VARs	**%LVCU**	**4.66247**	**4.662**	**Software**

Losses Shifted to IT Primary		per element	Total	Unit
LWFE	Core-Loss Watts	15.00	45.0100	kW
LWCU	Watts Loss due to Cu	21.23	63.70	kW
LVFE	Core-Loss VArs	30.89	92.67	kVAr
LVCU	VA Rated Loss due to Cu	83.92	251.76	kVAr
VAnom	Nominal Meter VA Rating		5,400.00	kVA

Total System Losses

total losses *Note: If no data entered in Line or Substation Loss sheets contribution to total is zero*

Type	**Source**		**kWatts Loss**		**kVAr Losses**
No-Load Losses	**Transformer Core**	**NLW**	135.00	**NLV**	277.95
Load Losses	**Transformer Windings**	**FLW**	405.00	**FLV**	2,207.25
	Transmission Line	**LLW**	27.77	**LLV**	40.92
	Substation Conductors	**CLW**	0.51	**CLV**	9.03
	Total Load Losses	**TLW**	433.28	**TLV**	2,257.20

per element losses

Type	**Source**		**kWatts Loss**		**kVAr Losses**
No-Load Losses	**Transformer Core**	**NLW**	45.00	**NLV**	92.65
Load Losses	**Transformer Windings**	**FLW**	135.00	**FLV**	735.75
	Transmission Line	**LLW**	27.77	**LLV**	40.92
	Substation Conductors	**CLW**	0.17	**CLV**	3.01
	Total Load Losses	**TLW**	162.94	**TLV**	779.68

Comments:

Legend	
Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

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A.6.2.2 Example 1 Spreadsheet - Xmfr Loss for Example 1

Transformer Losses

GE Loss Compensation Calculator

Company:	Example 1	Substation:	
Name:		Xmfr Bank No.:	
Date:		Xmfr S/N:	
Xmfr Manf:		Company Number	
Winding			
HV - High			
XV - Low			
YV - Tert.			
Comments:			

Transformer Losses		Losses		
		per Element	Total	Unit
No Load VA	NLVA	34.3333	102.9999	kVA
No Load Watts	NLW	15.0000	45.0000	kW
No-Load Loss VARs	NLV	30.8833	92.6498	kVAr
Full Load VA	FLVA	250.0000	750.0000	kVA
Full-Load Loss Watts	FLW	45.0000	135.0000	kW
Full-Load Loss VARs	FLV	245.9167	737.7500	kVAr

3 Phase Power Transformer Data		Losses			
Value		Total	Per element	Calculated	kVA
No Load Loss Watts	LWFe	45,000.00		15,000.00	15.00
Full Load Loss Watts	LWCu	135,000.00		45,000.00	45.00
% Exciting Current	%Ix	1.03			
% Impedance	%Z	7.5			
Transformer kVA Rating	kVA Rated	10,000.00		3,333.33	
Rated Primary L_L Volts	Vp	115,000			

Power Transformer - 3 Transformer bank		
Secondary Side Voltage [V]	Vs	12470
Secondary Side Rated Current [A]	I Rated	267.31
Feed - Load Connection		Wye

Meter Setup/ Installation Data	*Three Element Meter with 3 PTs and 3 CTs*		
Instrument Transformers	Primary	Secondary	Ratio
Voltage Transformer	7200	120	60
Current Transformer	500	5	100
Transformers Factor	TF	6000	
Nominal Voltage	VM	120	
Nominal Current	Inom	5	
Meter Test Amps	TA	5	
Meter Class	CL	20	
Meter Form	Fm	x	

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A.6.2.3 Example 1 Spreadsheet - Line Loss for Example 1

Line Losses

GE Loss Compensation Calculator

Three Element Meter with 3 PT's and 3 CT's
Note: Leave Data Entry Cells Blank if not including Line Losses

Company:	Example 1	Substation:	
Name:		Stn Trf Bank No.:	
Date:			

Metering Point Information	

Line Losses		Losses		
Value		**per phase**	**Total**	**Unit**
Total Line Length			108.0000	**Mile**
Line Current	**Ip**		28.9855	**Amp**
Line Loss Watts	**LLW**	27.7656	83.2968	**kW**
Line Loss VArs	**LLV**	13.6408	40.9225	**kVA**

Transmission Line Impedance Data				
Value		**per Unit**	**Total**	**Unit**
Resistance	**R/unit**	**0.360000**	33.0480	**Ohms**
Inductive Reactance	**XL/unit**	**0.415000**	48.7080	**Ohms**
Length of Line	**LL - Units**	**36.0000**		
Length Unit	**U**	**Mile**		
Resistive Losses			27.7656	**kW**
Inductive Losses			40.9225	**kars**

Note: Please make sure data entered uses a consistent unit of length

Adjustment for Line Charging Current				
Value		**per Unit**	**Total**	**Unit**
Capacitive Reactance	**XC-unit**	**0.0000**	**0.0000**	**Ohms**
Charging Current per line	**Amps**		**0.0000**	**Amps**
Capacitive Losses	**kvar**		**0.0000**	**kvars**

Line Losses refected to Secondary of PT		Losses		
Value		**per phase**	**Total**	**Unit**
Nominal Pri kVA Rating	**VA mom-pri**		54.2174	**kVA**
Nominal Sec kVA Rating	**VA mom-sec**		54.2174	**kVA**
Line Loss Watts	**LLW**	32.6654	97.9962	**kW**
Line Loss VArs	**LLV**	13.6408	40.9225	**kVA**

Transformer Data from Xmfr Loss Sheet				
Value		**per phase**	**Total**	**Unit**
Transformer kVA Rating	**kvars**	**3333.3333**	**10,000.00**	**kvars**
Rated Primary L_L Volts	**Vp**	**115,000.00**		**Volts**

Note: This Data must be entered on Transformer Loss Sheet before completing Line Loss Calculation

Notes:

Legend

Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

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A.6.2.4 Example 1 Spreadsheet - Substation Losses for Example 1

Substation Losses

GE Loss Compensation Calculator

Three Element Meter with 3 PT's and 3 CT's

Note: Leave Data Entry Cells Blank if not including Line Losses

Company:	Example 1	Substation:	
Name:		Stn Trf Bank No.:	
Date:			

Substation Information	

Line Losses		Losses		
		Total	per Element	Unit
Total Conductor Length		156.00		FT
Secondary Current @ Rating	**Ir**	462.991		Amp
Conductor Loss Watts	**CLW**	0.167	0.056	kW
Conductor Loss VArs	**CLV**	3.010	1.003	kVA

Transmission Line Impedance Data		
Value		**per Unit**
Resistance		**0.000005**
Inductive Reactance	**x**	**0.000090**
Length of Conductor	**CL**	**52.00**
Length Unit	**U**	**FT**

Legend	
Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

Note: This Data must be entered on Transformer Loss Sheet before completing Substation Loss Calculation

Transformer Data from Xmfr Loss Sheet			
Value			
Transformer kVA Rating	**kVAr**	**10,000**	**3333.3333**
Rated Secondary L_N Volts	**Vr**	**7,200**	

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A.6.3 Example 2 - Transformer Losses Data - Delta Connected

Application Description

- Installation Description: The installation includes three 115 kV, 3.333 MVA single phase power transformers with a Delta connected secondary.

Transformer Data Supplied by Manufacturer

kVA rating of transformer bank	9999kVA
Rated primary voltage	115kV
Secondary line-to-line voltage	2520V
No-load watts loss	28680W
Copper losses at 75°C	56027W
Percent impedence	8.1
Percent exciting current	0.183
Secondary Connection	Delta

NOTE

If the transformer bank is composed of three single-phase transformers, each transformer's VA, watt, and VAR losses are added to obtain total losses.

Metering Data:

The model assumes a three-phase, 4-wire meter installation with 3 Voltage Transformers and 3 Current Transformers. This is not a limitation because all EPM Transformer Rated Meters are 3 stator, 4-wire meters. The model should not be used with other meter types.

Voltage Transformer Ratio, CTR	3000/5 = 600/1
Current Transformer Ratio, VTR	2400/120 = 20/1
Meter Voltage Rating, V_m	120V
Meter Test Amps, TA, I_{nom}	2.5A

A.6.3.1 Example 2 Spreadsheet - System Losses Summary for Example 2

System Losses Summary

GE Loss Compensation Calculator

Meter Correction Factors from this sheet are manually entered into GE Communicator Software

Note: Begin Data Entry by Going to Xfmr Loss Sheet

Company:	Example 2	Project	
Name:		Location	
Date:			

Comments: Example of Loss Calculation with Transformer Losses only

Meter Correction Factors		Loss Factors		
for Communicator Software		Calc	Used	
% No-Load Loss Watts	%LWFE	0.24087	0.241	Enter These
% Full-Load Loss Watts	%LWCU	0.22242	0.222	Values in
% No-Load Loss VARs	%LVFE	0.72173	0.722	Communicator
% Full-Load Loss VARs	%LVCU	3.20751	3.208	Software

Losses Shifted to IT Primary		per element	Total	Unit
LWFE	Core-Loss Watts	8.67	26.0100	kW
LWCU	Watts Loss due to Cu	8.01	24.02	kW
LVFE	Core-Loss VArs	25.98	77.95	kVAr
LVCU	VA Rated Loss due to Cu	115.47	346.41	kVAr
VAnom	Nominal Meter VA Rating		10,800.00	kVA

Total System Losses

total losses *Note: If no data entered in Line or Substation Loss sheets contribution to total is zero*

Type	Source		kWatts Loss		kVAr Losses
No-Load Losses	Transformer Core	NLW	28.68	NLV	94.74
Load Losses	Transformer Windings	FLW	56.03	FLV	807.98
	Transmission Line	LLW	0.00	LLV	0.00
	Substation Conductors	CLW	0.00	CLV	0.00
	Total Load Losses	TLW	56.03	TLV	807.98

per element losses

Type	Source		kWatts Loss		kVAr Losses
No-Load Losses	Transformer Core	NLW	9.56	NLV	31.58
Load Losses	Transformer Windings	FLW	18.68	FLV	269.33
	Transmission Line	LLW	0.00	LLV	0.00
	Substation Conductors	CLW	0.00	CLV	0.00
	Total Load Losses	TLW	18.68	TLV	269.33

Comments:

Legend

Information Only
Required Data
Calculated Value
Data from other Sheet
Enter this Data
Comments

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A.6.3.2 Example 2 Spreadsheet - Xmfr Loss for Example 2

Transformer Losses

GE Loss Compensation Calculator

Company:	Example 2	Substation:	
Name:		Xmfr Bank No.:	
Date:		Xmfr S/N:	
Xmfr Manf:		Company Number	
Winding			
HV - High			
XV - Low			
YV - Tert.			
Comments:			

Transformer Losses		Losses		
		per Element	Total	Unit
No Load VA	NLVA	32.9967	98.9901	kVA
No Load Watts	NLW	9.5600	28.6800	kW
No-Load Loss VARs	NLV	31.5815	94.7445	kVAr
Full Load VA	FLVA	269.9730	809.9190	kVA
Full-Load Loss Watts	FLW	18.6757	56.0271	kW
Full-Load Loss VARs	FLV	269.3263	807.9788	kVAr

3 Phase Power Transformer Data		Losses			
Value		Total	Per element	Calculated	kVA
No Load Loss Watts	LWFe	28,680.00		9,560.00	9.56
Full Load Loss Watts	LWCu	56,027.00		18,675.67	18.68
% Exciting Current	%Ix	0.99			
% Impedance	%Z	8.1			
Transformer kVA Rating	kVA Rated	9,999.00		3,333.00	
Rated Primary L_L Volts	Vp				

Power Transformer - 3 Transformer bank		
Secondary Side Voltage [V]	Vs	2520
Secondary Side Rated Current [A]	I Rated	2291.00
Feed - Load Connection		Delta

Meter Setup/ Installation Data	*Two Element Meter with 2 PTs and 2CTs*		
Instrument Transformers	Primary	Secondary	Ratio
Voltage Transformer	2400	120	20
Current Transformer	3000	5	600
Transformers Factor	TF	12000	
Nominal Voltage	VM	207.8460969	
Nominal Current	Inom	5	
Meter Test Amps	TA	5	
Meter Class	CL	20	
Meter Form	Fm	x	

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A.6.3.3 Example 2 Spreadsheet - Line Loss for Example 2

Line Losses

GE Loss Compensation Calculator

Three Element Meter with 3 PT's and 3 CT's
Note: Leave Data Entry Cells Blank if not including Line Losses

Company:	Example 2	Substation:	
Name:		Stn Trf Bank No.:	
Date:			

Metering Point Information	

Line Losses		Losses		
Value		**per phase**	**Total**	**Unit**
Total Line Length			0.0000	**Mile**
Line Current	**Ip**		28.9826	**Amp**
Line Loss Watts	**LLW**	0.0000	0.0000	**kW**
Line Loss VArs	**LLV**	0.0000	0.0000	**kVA**

Transmission Line Impedance Data				
Value		**per Unit**	**Total**	**Unit**
Resistance	**R/unit**		0.0000	**Ohms**
Inductive Reactance	**XL/unit**		0.0000	**Ohms**
Length of Line	**LL - Units**			
Length Unit	**U**	**Mile**		
Resistive Losses			0.0000	**kW**
Inductive Losses			0.0000	**kars**

Note: Please make sure data entered uses a consistent unit of length

Adjustment for Line Charging Current				
Value		**per Unit**	**Total**	**Unit**
Capacitive Reactance	**XC-unit**	**0.0000**	**0.0000**	**Ohms**
Charging Current per line	**Amps**		**0.0000**	**Amps**
Capacitive Losses	**kvar**		**0.0000**	**kvars**

Line Losses refected to Secondary of PT		Losses		
Value		**per phase**	**Total**	**Unit**
Nominal Pri kVA Rating	**VA mom-pri**		32.8696	**kVA**
Nominal Sec kVA Rating	**VA mom-sec**		32.8696	**kVA**
Line Loss Watts	**LLW**	0.0000	0.0000	**kW**
Line Loss VArs	**LLV**	0.0000	0.0000	**kVA**

Transformer Data from Xmfr Loss Sheet				
Value		**per phase**	**Total**	**Unit**
Transformer kVA Rating	**kvars**	**3333.0000**	**9,999.00**	**kvars**
Rated Primary L_L Volts	**Vp**	**0.00**		**Volts**

Note: This Data must be entered on Transformer Loss Sheet before completing Line Loss Calculation

Notes:

Legend

Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

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A.6.3.4 Example 2 Spreadsheet - Substation Losses for Example 2

Substation Losses

GE Loss Compensation Calculator

Three Element Meter with 3 PT's and 3 CT's

Note: Leave Data Entry Cells Blank if not including Line Losses

Company:	Example 2	Substation:	
Name:		Stn Trf Bank No.:	
Date:			

Substation Information	

Line Losses		Losses		
		Total	per Element	Unit
Total Conductor Length		0.00		FT
Secondary Current @ Rating	**Ir**	2290.843		Amp
Conductor Loss Watts	**CLW**	0.000	0.000	kW
Conductor Loss VArs	**CLV**	0.000	0.000	kVA

Transmission Line Impedance Data		
Value		**per Unit**
Resistance		
Inductive Reactance	**x**	
Length of Conductor	**CL**	
Length Unit	**U**	**FT**

Legend

Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

Note: This Data must be entered on Transformer Loss Sheet before completing Substation Loss Calculation

Transformer Data from Xmfr Loss Sheet			
Value			
Transformer kVA Rating	**kVAr**	**9,999**	**3333.0000**
Rated Secondary L_N Volts	**Vr**	**7,200**	

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A.6.4 Example 3 - Transformer Losses Data

Application Description

- Installation Description: The installation includes a 138 kV,16.8 MVA transformer bank with a Wye connected secondary.

Transformer Data Supplied by Manufacturer

kVA rating of transformer bank	16800kVA
Rated primary voltage	138kV
Secondary line-to-line voltage	13090V
Secondary line-to-neutral voltage	7558V
No-load watts loss	15400W
Copper losses at 75°C	69200W
Percent impedence	9.78
Percent exciting current	0.133
Secondary Connection	Wye

Metering Data:

The model assumes a three-phase, 4-wire meter installation with 3 Voltage Transformers and 3 Current Transformers. This is not a limitation because all EPM Transformer Rated Meters are 3 stator, 4-wire meters. The model should not be used with other meter types.

Voltage Transformer Ratio, CTR	1500/5 = 300/1
Current Transformer Ratio, VTR	7200/120 = 60/1
Meter Voltage Rating, V_m	120V
Meter Test Amps, TA, I_{nom}	5A

A.6.4.1 Example 3 Spreadsheet - System Losses Summary for Example 3

System Losses Summary

GE Loss Compensation Calculator

Meter Correction Factors from this sheet are manually entered into GE Communicator Software

Note: Begin Data Entry by Going to Xfmr Loss Sheet

Company:	Example 3	Project	
Name:		Location	
Date:			

Comments:	Transformer losses only
	Meter Noimnal Current 5A

Meter Correction Factors		**Loss Factors**		
for Communicator Software		**Calc**	**Used**	
% No-Load Loss Watts	**%LWFE**	**0.04314**	**0.043**	**Enter These**
% Full-Load Loss Watts	**%LWCU**	**0.87524**	**0.875**	**Values in**
% No-Load Loss VARs	**%LVFE**	**0.06765**	**0.068**	**Communicator**
% Full-Load Loss VARs	**%LVCU**	**20.76262**	**20.763**	**Software**

Losses Shifted to IT Primary		per element	Total	Unit
LWFE	Core-Loss Watts	4.66	13.9800	kW
LWCU	Watts Loss due to Cu	94.53	283.58	kW
LVFE	Core-Loss VArs	7.31	21.92	kVAr
LVCU	VA Rated Loss due to Cu	2,242.36	6,727.09	kVAr
VAnom	Nominal Meter VA Rating		32,400.00	kVA

Total System Losses					
total losses	*Note: If no data entered in Line or Substation Loss sheets contribution to total is zero*				
Type	**Source**		**kWatts Loss**		**kVAr Losses**
No-Load Losses	**Transformer Core**	**NLW**	15.40	**NLV**	26.61
Load Losses	**Transformer Windings**	**FLW**	69.20	**FLV**	1,641.58
	Transmission Line	**LLW**	0.00	**LLV**	0.00
	Substation Conductors	**CLW**	0.00	**CLV**	0.00
	Total Load Losses	**TLW**	69.20	**TLV**	1,641.58

per element losses					
Type	**Source**		**kWatts Loss**		**kVAr Losses**
No-Load Losses	**Transformer Core**	**NLW**	5.13	**NLV**	8.87
Load Losses	**Transformer Windings**	**FLW**	23.07	**FLV**	547.19
	Transmission Line	**LLW**	0.00	**LLV**	0.00
	Substation Conductors	**CLW**	0.00	**CLV**	0.00
	Total Load Losses	**TLW**	23.07	**TLV**	547.19

Comments:

Legend

Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

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A.6.4.2 Example 3 Spreadsheet - Xmfr Loss for Example 3

Transformer Losses

GE Loss Compensation Calculator

Company:	Example 3	Substation:	
Name:		Xmfr Bank No.:	
Date:		Xmfr S/N:	
Xmfr Manf:		Company Number	
Winding			
HV - High			
XV - Low			
YV - Tert.			
Comments:			

Transformer Losses		Losses		
		per Element	Total	Unit
No Load VA	NLVA	10.2480	30.7440	kVA
No Load Watts	NLW	5.1333	15.3999	kW
No-Load Loss VARs	NLV	8.8696	26.6088	kVAr
Full Load VA	FLVA	547.6800	1,643.0400	kVA
Full-Load Loss Watts	FLW	23.0667	69.2001	kW
Full-Load Loss VARs	FLV	547.1940	1,641.5821	kVAr

3 Phase Power Transformer Data		Losses			
Value		Total	Per element	Calculated	kVA
No Load Loss Watts	LWFe	15,400.00		5,133.33	5.13
Full Load Loss Watts	LWCu	69,200.00		23,066.67	23.07
% Exciting Current	%Ix	0.183			
% Impedance	%Z	9.78			
Transformer kVA Rating	kVA Rated	16,800.00		5,600.00	
Rated Primary L_L Volts	Vp	138,000			

Power Transformer - 3 Transformer bank		
Secondary Side Voltage [V]	Vs	13091
Secondary Side Rated Current [A]	I Rated	2291.00
Feed - Load Connection		Wye

Meter Setup/ Installation Data	*Three Element Meter with 3 PTs and 3 CTs*		
Instrument Transformers	Primary	Secondary	Ratio
Voltage Transformer	7200	120	60
Current Transformer	1500	5	300
Transformers Factor	TF	18000	
Nominal Voltage	VM	120	
Nominal Current	Inom	5	
Meter Test Amps	TA	5	
Meter Class	CL	20	
Meter Form	Fm	x	

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A.6.4.3 Example 3 Spreadsheet - Line Loss for Example 3

Line Losses

GE Loss Compensation Calculator

Three Element Meter with 3 PT's and 3 CT's
Note: Leave Data Entry Cells Blank if not including Line Losses

Company:	Example 3	Substation:	
Name:		Stn Trf Bank No.:	
Date:			

Metering Point Information	

Line Losses		Losses		
Value		**per phase**	**Total**	**Unit**
Total Line Length			0.0000	**Mile**
Line Current	**Ip**		40.5797	**Amp**
Line Loss Watts	**LLW**	0.0000	0.0000	**kW**
Line Loss VArs	**LLV**	0.0000	0.0000	**kVA**

Transmission Line Impedance Data				
Value		**per Unit**	**Total**	**Unit**
Resistance	**R/unit**		0.0000	**Ohms**
Inductive Reactance	**XL/unit**		0.0000	**Ohms**
Length of Line	**LL - Units**			
Length Unit	**U**	**Mile**		
Resistive Losses			0.0000	**kW**
Inductive Losses			0.0000	**kars**

Note: Please make sure data entered uses a consistent unit of length

Adjustment for Line Charging Current				
Value		**per Unit**	**Total**	**Unit**
Capacitive Reactance	**XC-unit**	**0.0000**	**0.0000**	**Ohms**
Charging Current per line	**Amps**		**0.0000**	**Amps**
Capacitive Losses	**kvar**		**0.0000**	**kvars**

Line Losses refected to Secondary of PT		Losses		
Value		**per phase**	**Total**	**Unit**
Nominal Pri kVA Rating	**VA mom-pri**		142.2826	**kVA**
Nominal Sec kVA Rating	**VA mom-sec**		142.2826	**kVA**
Line Loss Watts	**LLW**	0.0000	0.0000	**kW**
Line Loss VArs	**LLV**	0.0000	0.0000	**kVA**

Transformer Data from Xmfr Loss Sheet				
Value		**per phase**	**Total**	**Unit**
Transformer kVA Rating	**kvars**	**5600.0000**	**16,800.00**	**kvars**
Rated Primary L_L Volts	**Vp**	**138,000.00**		**Volts**

Note: This Data must be entered on Transformer Loss Sheet before completing Line Loss Calculation

Notes:

Legend

Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

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A.6.4.4 Example 3 Spreadsheet - Substation Losses for Example 3)

Substation Losses

GE Loss Compensation Calculator

Three Element Meter with 3 PT's and 3 CT's *Note: Leave Data Entry Cells Blank if not including Line Losses*

Example 3

Company:		Substation:	
Name:		Stn Trf Bank No.:	
Date:			

Substation Information	

		Losses		
Line Losses				
		Total	**per Element**	**Unit**
Total Conductor Length		0.00		FT
Secondary Current @ Rating	**Ir**	790.984		Amp
Conductor Loss Watts	**CLW**	0.000	0.000	kW
Conductor Loss VArs	**CLV**	0.000	0.000	kVA

Transmission Line Impedance Data		
Value		**per Unit**
Resistance		
Inductive Reactance	**x**	
Length of Conductor	**CL**	
Length Unit	**U**	**FT**

Legend

Information Only	
Required Data	
Calculated Value	
Data from other Sheet	
Enter this Data	
Comments	

Note: This Data must be entered on Transformer Loss Sheet before completing Substation Loss Calculation

Transformer Data from Xmfr Loss Sheet			
Value			
Transformer kVA Rating	**kVAr**	**16,800**	**5600.0000**
Rated Secondary L_N Volts	**Vr**	**7,200**	

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GE Communicator

Appendix B:

B.1 Overview

The GE Communicator application supports two forms of command line arguments:

- The earlier 'slash' commands ('/s'), documented in B.2 *Command Line Arguments - Slash Commands*.
- The newer 'dash' commands ('--cmd'), documented in B.3 *Command Line Arguments - Dash Commands*.

NOTE

Note that the two types are mutually exclusive: if the first command found starts with '--', then the command line is processed as dash commands. Otherwise, the slash command processing is used.

By default, when used in command line mode, the GE Communicator application will shut down after all the commands are executed.

The GE Communicator application supports log retrieval from EPM 9900/9900P and EPM 7000 meters via the -- command line.

B.2 Command Line Arguments - Slash Commands

B.2.1 Script Command Line Method

Tells GE Communicator to perform a task corresponding to the Script ID Number. /

/snnnn Script ID Number

Example :

CommExt /s1234 (/s Script ID Number)

uc: Start Log Converter

0 Do not start log converter

1 Start log converter

If left out of command line, Start Log Converter is assumed.

Example : CommExt with Script 1234 will Start Log Converter if Log Retrieval is in the script.

CommExt /s1234 uc:1

B.2.2 Application Command Line Method

Tells GE Communicator to make a connection and display a particular application screen.

/c (additional arguments with a space between each argument)

Example 1: Meter with address 2 on network with IP address 10.0.0.1 using Modbus TCP Start on device status screen.

CommExt /c cm:1 ad:2 pr:3 ip:10.0.0.1 np:502

Example 2: Meter with address 2 at remote location with Phone Number 555-545-5110 using Modbus ASCII Start on device status screen.

CommExt /c cm:0 ad:2 pr:1 cp:3 BR:3 um:1 pn:555-545-5110

cm: Connect Mode

0 Serial Port

1 Network

If left out of command line, Serial Port assumed.

ec: Echo Mode

0 Off

1 On (When the meter Fiber Optic Option Card's switch is set to Echo On)

If left out of command line, defaults to 0. Used when selected connection mode is Serial Port, with a Fiber Optic Option Card in an EPM 2200/6000 series/7000 series meter.

ad: Address

1 - 247

If left out of command line, Address 1 assumed.

nm: Network Mode

0 One IP Address for n Devices

If left out of command line, 0 assumed.

pr: Protocol

0 Modbus RTU

1 Modbus ASCII

2 DNP 3.0 (Not Supported)

3 Modbus TCP

4 GE EGD Protocol

If left out of command line, Modbus RTU assumed.

ip: IP Address or Host Name

xxx.xxx.xxx.xxx or 1 - 16 Alphanumeric characters with no spaces.

If left out, error assumed.

np: Network Port

502 Open Modbus (Modbus TCP)

If left out, Port 502 assumed.

cp: Com Port

1 - 98

If left out, Com Port 1 assumed.

br: Baud Rate

0 1200

1 2400

2 4800

3 9600

4 19200

5 38400

6 57600

7 115200

If left out, Baud Rate is 9600.

um: Use Modem

0 No

1 Yes

If left out, No modem selected.

pn: Phone Number

Use No spaces. User-defined phone number of the remote modem.

ms: Modem Setup String

User-defined Setup String (if the originate modem has been used for another program and needs to be reset).

dc: Data Switch Connect String

User-defined Data Switch String to connect to Remote Modem.

Check with the device's manual to create the Data Switch String appropriate for the device.
Typical characters used with GE Communicator software are:
, (pause one second)

(escape sequence or switch to command mode)

PTnn (command) (number 01-16)

Enter (<CR> ASCII character 13)

dd: Data Switch Disconnect String

To be defined.

ss: Start Screen

0 Device Status

1 Phasors Diagram (EPM 9000 series meters only)

2 Instantaneous Polling

3 Poll All (EPM 9000 series meters only)

4 Poll Max/Min

5 Poll Power Readings (Use 19 to 22 for EPM 9000 series meters)

6 Poll Harmonics

7 Poll Internal Inputs

8 Poll Multiple Devices (EPM 9000 series meters only)

9 Poll Pulse Accumulations (EPM 9000 series meters only)

10 Poll Limit Status

11 Poll Time of Use Readings (EPM 9000 series meters only)

12 Poll External Digital Inputs (EPM 9000 series meters only)

13 Poll External Analog Inputs (EPM 9000 series meters only)

14 Poll ElectroLogic™ Status (EPM 9000 series meters only)

15 Poll Relay Control

16 Poll Readings with DDE Service (EPM 9000 series meters only)

17 Poll Log Statistics

18 Log Retrieval Screen

19 Poll Power and Demand (EPM 9000 series meters only)

20 Poll Energy (EPM 9000 series meters only)

21 Poll Power Only (GE Communicator Only, EPM 9000 series meters only)

22 Poll Demand Only (GE Communicator Only, EPM 9000 series meters only)

23 Poll meter Time

24 Poll meter Volts and Current (EPM 6000 series meter)

25 Poll meter Power and Energy (EPM 6000 meter)

26 Poll meter Phasor Diagram (EPM 6000 meter)

30 Device Status (EPM 7000 meter)

31 Phasor Diagram (EPM 7000 meter)

32 Instantaneous Polling (EPM 7000 meter)

33 Poll Max/Min (EPM 7000 meter)

34 Poll Power and Energy (EPM 7000 meter)

35 THD/Harmonics (EPM 7000 meter)

36 Average Demand (EPM 7000 meter)

37 Option Card Accumulators (EPM 7000 meter)

39 Option Card Digital Input Status (EPM 7000 meter)

40 Limits Status Screen (EPM 7000 meter)

41 Symmetrical Components (EPM 7000 meter)

42 Real Time Trends (EPM 7000 meter)

43 Time (EPM 7000 meter)

44 Relay Control (EPM 7000 meter)

45 Option Card Status (EPM 7000 meter)

46 Device Information (EPM 7000 meter)

47 Device Profile (SEPM 7000 meter)

48 Log Status/Retrieval (EPM 7000 meter)

NOTE

- If the number is undefined, i.e. less than 0 or greater than 48, the GE Communicator application will automatically shut down.
- If left out of command line, Start screen is Device Status.

dn: Device Name

Must use period as place holder for a space.

ln: Location Name

Must use period as place holder for a space.

vm: View Mode

0 Normal

1 Hide Main Window and Exit Program upon closing of Start Screen.
GE Communicator acts as a plug-in for integrating with third party software.

If left out, Normal is the View Mode.

am: Answer Modem

0 No

1 Open Port.
Wait for Modem to ring and attempt to answer Modem if ringing.

If left out, software does not answer Modem.

dr: Dial Out Receive Call

0 No

1 After Software successfully answers the call, it looks for a reason of call code (based on the code Perform Automated functions).
Upon completion of all functions, GE Communicator places the Remote Modem into command mode, sends an acknowledgment, hangs up, closes the communications port and exits the program.

mp: Modem Password

Must use period as place holder for a space.

dt: User Defined DDE Topic Name for Start Screen 16

Topic Name must contain no spaces.

If left out, Meter Designation is used as Topic.

lr: Retrieve Log Number

1 Historical Log 1

2 Historical Log 2

3 Both 1 and 2

See Table Below for Other Combinations:

Log to Retrieve	Bits														
	15	14	13	12	10	9	8	7	6	5	4	3	2	1	0

Historical Log 1															X
Historical Log 2														X	
Limit Log													X		
PQ/Waveform Log												X			
Digital Input Log											X				
Digital Output Log										X					
Reserved (Max/Min Log)									X						
Flicker								X							
System of Events Log							X								
Reset Log (Disabled)						X									

Example: To retrieve Historical Log 1 and Limit Log

101b = 5d = 5

Use this table in the following way:

1. Put a 1 in column of the log(s) you want to retrieve, a 0 in the column of any unwanted logs that are between the selected logs.

   In the example above, Historical Log 1 and the Limit Log are selected. A '1' is placed in each of their columns. Since Historical Log 2 is between them and is not selected a '0' is placed in its column.

2. Convert the Binary number to Decimal.
   In this example: 101(binary) = 5(decimal) = 5

3. Put the decimal number in the lr command line.
   In this example, you would use the number 5 to retrieve Historical Log 1 and the Limit Log.

B.3 Command Line Arguments - Dash Commands

B.3.1 Command Line Reference

--connect [connstr]

--stay_open

--retrieve_log [log],[log]

--username [username]

--password [password]

--start_screen [start screen]

B.3.2 Dash Commands

- If dash commands are used, then slash commands are not processed (and will become arguments to the dash commands). Dash commands separate each command by the '--', with each argument (separated by spaces) until the next command belonging to the previous command.
- Dash commands do support quoting arguments. So, if an argument has spaces (e.g., a filename), you can put quotation marks around it so that it will be processed as one argument.

--connect [connstr]: Connect with the specified parameters. If no further commands are specified, include --stay_open to prevent the software from automatically shutting down.

[connstr]: The connection string to describe how to connect.

mn://[host]{:[port],[addr],[protocol]}
Modbus over Network connection

[host]: The IP address to connect to. May be a dotted quad (1.2.3.4), or an Internet address (www.mymeter.com).

[port]: The TCP port to connect to; defaults to 502.

[addr]: The Modbus device address to connect to; must be between 1 and 247.

[protocol]: The Modbus protocol to use; defaults to TCP. Valid options are:

TCP: Modbus TCP

ASCII: Modbus ASCII

RTU: Modbus RTU

For example:
mn://172.20.166.98:502,21,TCP

ms://[com]{:[baud],[databit],[parity],[stopbit],[addr],[protocol]}
Modbus over Serial connection

[com]: The com port to connect to; may be the name (COM7) or just the number (7).

[baud]: The baud rate to use to connect with; default is 57600.

[addr]: The Modbus device address to connect to; must be between 1 and 247.

[protocol]: The Modbus protocol to use; defaults to RTU. Valid options are:

TCP: Modbus TCP

ASCII: Modbus ASCII

RTU: Modbus RTU

Specify a blank argument to use the default. For example:
ms://COM7:57600,,,,10,RTU

--silent: Prevents warning and error messages from being displayed (when possible).

--stay_open: By default, the software shuts down after all commands are executed. This command prevents that from happening, allowing further action by the user.

--retrieve_log: "[log1],[log2], ..., [logn]"

Valid Log Names to be used in the command line args:

Historical Log 1: "INT1" or "INTERVAL_1"

Historical Log 2: "INT2" or "INTERVAL_2"

Historical Log 3: "INT3" or "INTERVAL_3"

Historical Log 4: "INT4" or "INTERVAL_4"

Historical Log 5: "INT5" or "INTERVAL_5"

Historical Log 6: "INT6" or "INTERVAL_6"

Historical Log 7: "INT7" or "INTERVAL_7"

Historical Log 8: "INT8" or "INTERVAL_8"

Event Triggered Log: "EVTT" or "EVENT_TRIGGERED"

Limit/Alarm: "LIMT" or "LIMIT_LOG"

Digital Input: "DIGI" or "DIGITAL_INPUT"

Digital Output: "DIGO" or "DIGITAL_OUTPUT"

Flicker: "FLIC" or "FLICKER"

Waveform: "WAVE" or "WAVEFORM"

Power Quality: "PQ" or "PQ_LOG"

System Event: "SYS" or "SYSTEM_EVENT"

Transient: "TRAN" or "TRANSIENT"

EN50160: "EN50160"

For example:
--connect mn://172.20.167.39 --retrieve_log "INTERVAL_1, INTERVAL_2"

--username [username]: Set the username for log retrieval to the value in [username]; by default it is blank.

--password [password]: Set the password for log retrieval to the value in [password]; by default it is blank.

--start_screen [start screen]: Starts the program on the screen in [start screen].

Valid Start Screen Names to be used in the command line args:

For all EPM Devices:

Screen	[Start Screen]
Device Status Screen:	device_status
Phasor Screen:	phasor_diagram
Polling Screen:	inst_polling
Demand Screen:	demand
Energy Screen:	energy
Alarm Status Screen:	alarm_status
Device Profile Screen:	device_profile
Firmware Update Screen:	firmware_update

For EPM 9000 series Devices:

Screen	[Start Screen]
Log Status Screen:	log_status
Harmonics Screen:	harmonics
Retrieve Time Screen:	retrieve_time
Power Screen:	power
Max and Min Values Screen:	max_and_min
Pulse Accumulations Screen:	pulse_accumulations
Short Term Max and Min Values Screen:	short_term_max_and_min
Symmetrical Components Screen:	symmetrical_components
Flicker Screen:	flicker

For EPM 7000 Devices:

Screen	[Start Screen]
Log Status Screen:	log_status
Harmonics Screen:	harmonics
Retrieve Time Screen:	retrieve_time
Power Screen:	power
Max and Min Values Screen:	max_and_min
Pulse Accumulations Screen:	pulse_accumulations
Short Term Max and Min Values Screen:	short_term_max_and_min

Screen	[Start Screen]
Symmetrical Components Screen:	symmetrical_components
Real Time Trends Screen:	real_time_trends

For EPM 6000 Devices:

Screen	[Start Screen]
Power Screen:	power
Real Time Trends Screen:	real_time_trends

For EPM 4600 Devices:

Screen	[Start Screen]
Log Status Screen:	log_status
Retrieve Time Screen:	retrieve_time
Max and Min Values Screen:	max_and_min
Pulse Accumulations Screen:	pulse_accumulations
Short Term Max and Min Values Screen:	short_term_max_and_min

GE Communicator

Appendix C:

C.1 Network Error Codes Reported by Software that uses Ethernet (including GE Communicator)

These codes are provided for your information.

Error # 10004: = "Interrupted system call."

Error # 10009: = "Bad file number."

Error # 10013: = "Permission Denied."

Error # 10014: = "Bad Address."

Error # 10022: = "Invalid Argument."

Error # 10024: = "Too many open files."

Error # 10035: = "Operation would block."

Error # 10036: = "Operation now in progress."

Error # 10037: = "Operation already in progress."

Error # 10038: = "Socket operation on nonsocket."

Error # 10039: = "Destination address required."

Error # 10040: = "Message too long."

Error # 10041: = "Protocol wrong type for socket."

Error # 10042: = "Protocol not available."

Error # 10043: = "Protocol not supported."

Error # 10044: = "Socket type not supported."

Error # 10045: = "Operation not supported on socket."

Error # 10046: = "Protocol family not supported."

Error # 10047: = "Address family not supported by protocol family."

Error # 10048: = "Address already in use."

Error # 10049: = "Can't assign requested address."

Error # 10050: = "Network is down."

Error # 10051: = "Network is unreachable."

Error # 10052: = "Network dropped connection."

Error # 10053: = "Software caused connection abort."

Error # 10054: = "Connection reset by peer."

Error # 10055: = "No buffer space available."

Error # 10056: = "Socket is already connected."

Error # 10057: = "Socket is not connected."

Error # 10058: = "Can't send after socket shutdown."

Error # 10059: = "Too many references: can't splice."

Error # 10060: = "Connection timed out."

Error # 10061: = "Connection refused."

Error # 10062: = "Too many levels of symbolic links."

Error # 10063: = "File name too long."

Error # 10064: = "Host is down."

Error # 10065: = "No route to host."

Error # 10066: = "Directory not empty."

Error # 10067: = "Too many processes."

Error # 10068: = "Too many users."

Error # 10069: = "Disk quota exceeded."

Error # 10070: = "Stale NFS file handle."

Error # 10071: = "Too many levels of remote in path."

Error # 10091: = "Network subsystem is unusable."

Error # 10092: = "Winsock DLL cannot support this application."

Error # 10093: = "Winsock not initialized."

Error # 10101: = "Disconnect."

Error # 11001: = "Host not found."

Error # 11002: = "Nonauthoritative host not found."

Error # 11003: = "Nonrecoverable error."

Error # 11004: = "Valid name, no data record of requested type."

GE Communicator

Appendix D:

NOTE

The Advanced Settings screen for the EPM 9450/9650/9800 meter Network card has a TFTP option you can use to update the card's firmware. However, you may want to use an alternate method, e.g., if the device is "stuck" in Boot mode.

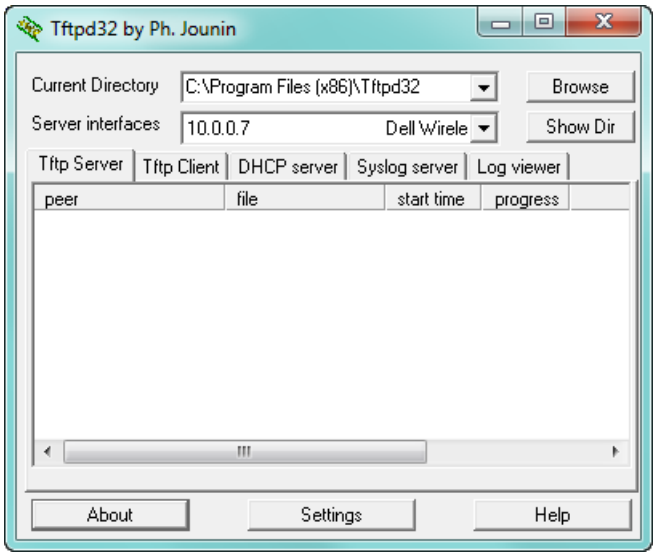
A free shareware TFTP (Trivial File Transfer Protocol) server program known as tftpd32 is available to customers to use for updating firmware for the E1/E2 Ethernet card for EPM 9000 series meters. The program can be downloaded (for no charge) online at:

http://tftpd32.jounin.net/tftpd32_download.html.

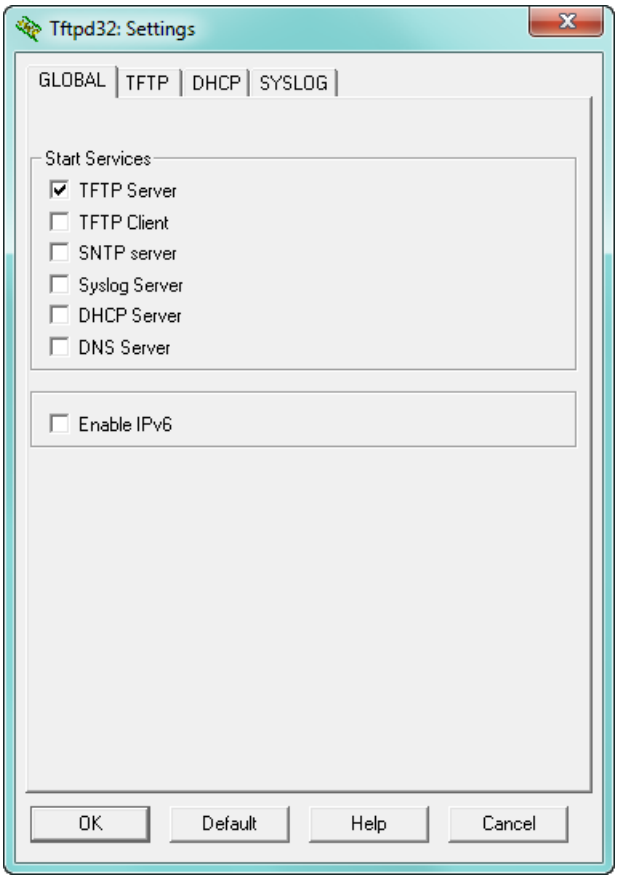
D.1 Setup requirements

- Windows® Operating System
- A working Ethernet card with a valid IP Address
- Winzip software (only if the Windows Operating System does not open the zip file automatically)

1. Install the TFTPD32 application. You will see the screen below after the application has installed. Note that the Current Directory is the location of the TFTPD32 application.

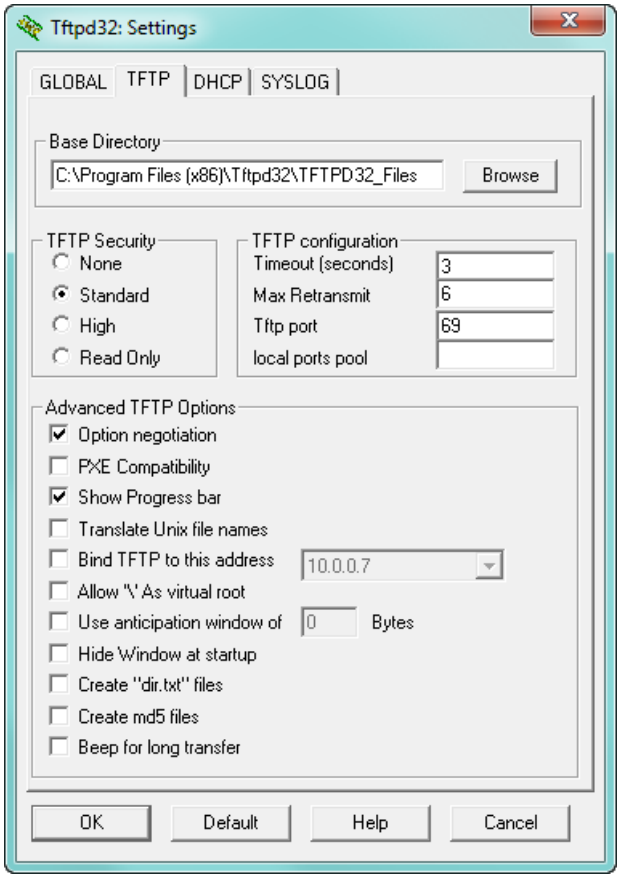


2. Click the **Settings** tab at the bottom of the screen.



3. Be sure that ONLY **TFTP Server** is selected on this Global tab screen.

4. Click the **TFTP** tab at the top of the screen.



5. Shown above are recommended settings. The Base Directory is the location of the firmware files. You should create a new folder somewhere on your PC's hard drive where you will store any network card firmware files and then Browse to locate that folder. In the example above, the folder created is called TFTPD32_Files and it was placed in the Tftpd32 folder in the Program Files directory. All firmware files for for network cards would be placed inside the C:\Program Files\Tftpd32\TFTP_Files folder before updating firmware.
6. Click **OK** to save the settings.
7. You will see a message window informing you that you must restart the application to save the settings. Click **OK**.
8. Make a serial connection between your PC and the meter.
9. Click **Tools > Network Card Settings**.
10. Click the **Connect** button. This allows the software to send commands to the meter and Network card, causing the Network card to go into Boot mode. As a result, Network card Boot firmware information will be displayed in the screen in the Boot Version box, as shown in the example above.
11. When you see from the messages that the Network card is in Boot mode, enter the correct settings for the firmware file update using TFTP, in the Flash File Update Settings section.
12. Click the **Write Settings** button.

13. Connect an RJ45 cable from the PC to the Network card so that the Network card can access the TFTP server.
14. To update the Network card's Boot firmware, click the **Update Boot** button; to update the Network card's Runtime firmware, click the **Update Runtime** button.
15. The Network card will start the firmware update process. Click the **Refresh** button to retrieve the Network card's firmware information again, to verify that the firmware version was updated properly.
16. Click **OK** to close this screen and allow the Network card to restart.

GE Communicator

Appendix E:

E.1 Troubleshooting Using the Phasor Diagram

A Phasor diagram is a vector representation of the voltage and current angles of a three phase power system. By looking at the six channels of waveform in a phasor representation, you can obtain troubleshooting information to determine if the voltage and current inputs are wired properly.

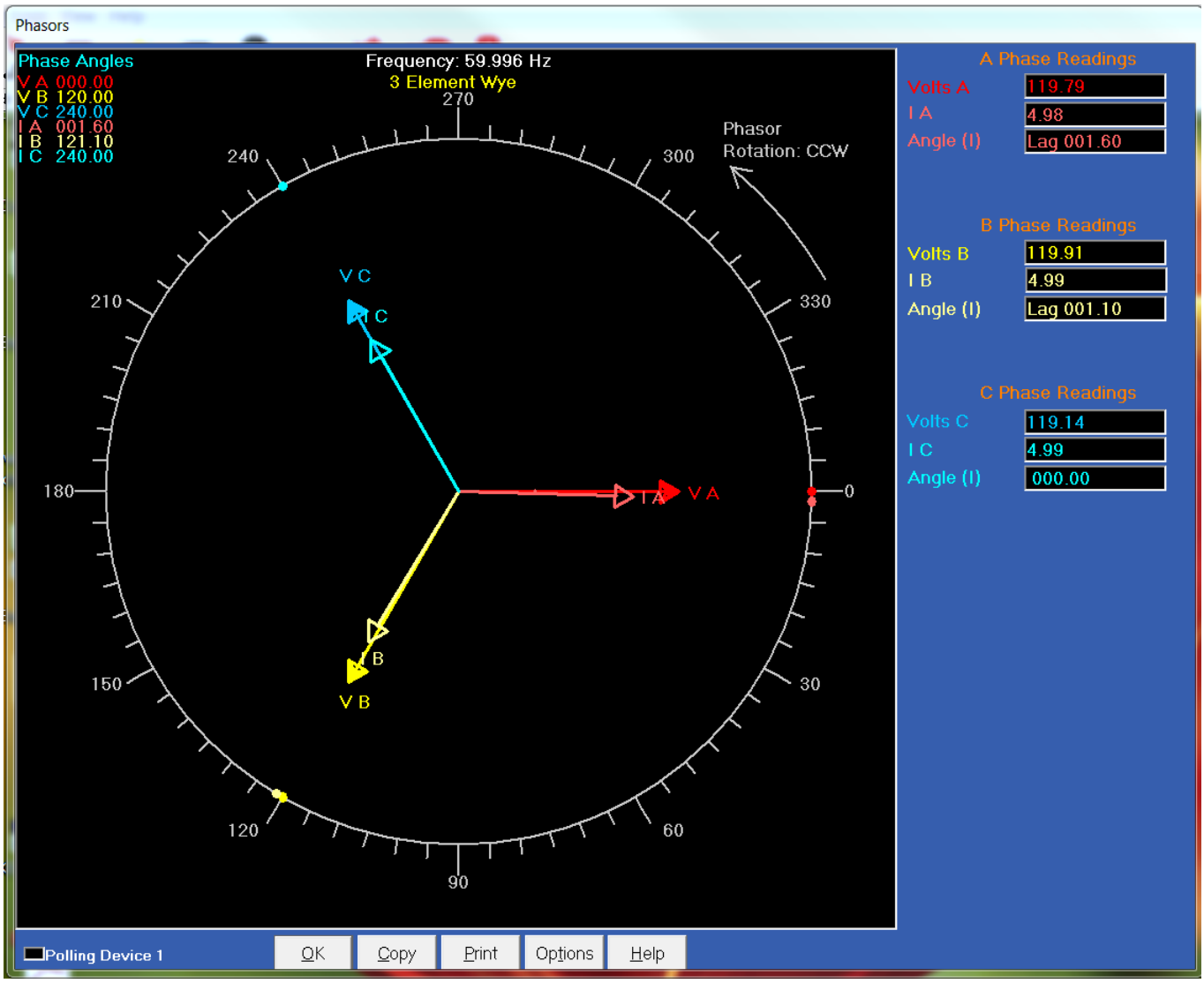
Generally, a Phasor diagram relies on Volts AN to be fixed at 0 degrees. Then, rotating clockwise, the next voltage is Volts BN, and thirdly Volts CN. Current is also represented on the Phasor diagram. If the current is leading, it is a capacitative load. If the current is lagging, it is an inductive load. For example, current influenced by motor loads is usually inductive.

To open the phasor diagram for the connected meter, either:

- Click **Real-Time Poll > Power Quality** and **Alarms > Phasors**
- Click the **Phasors** icon in the Icon Bar

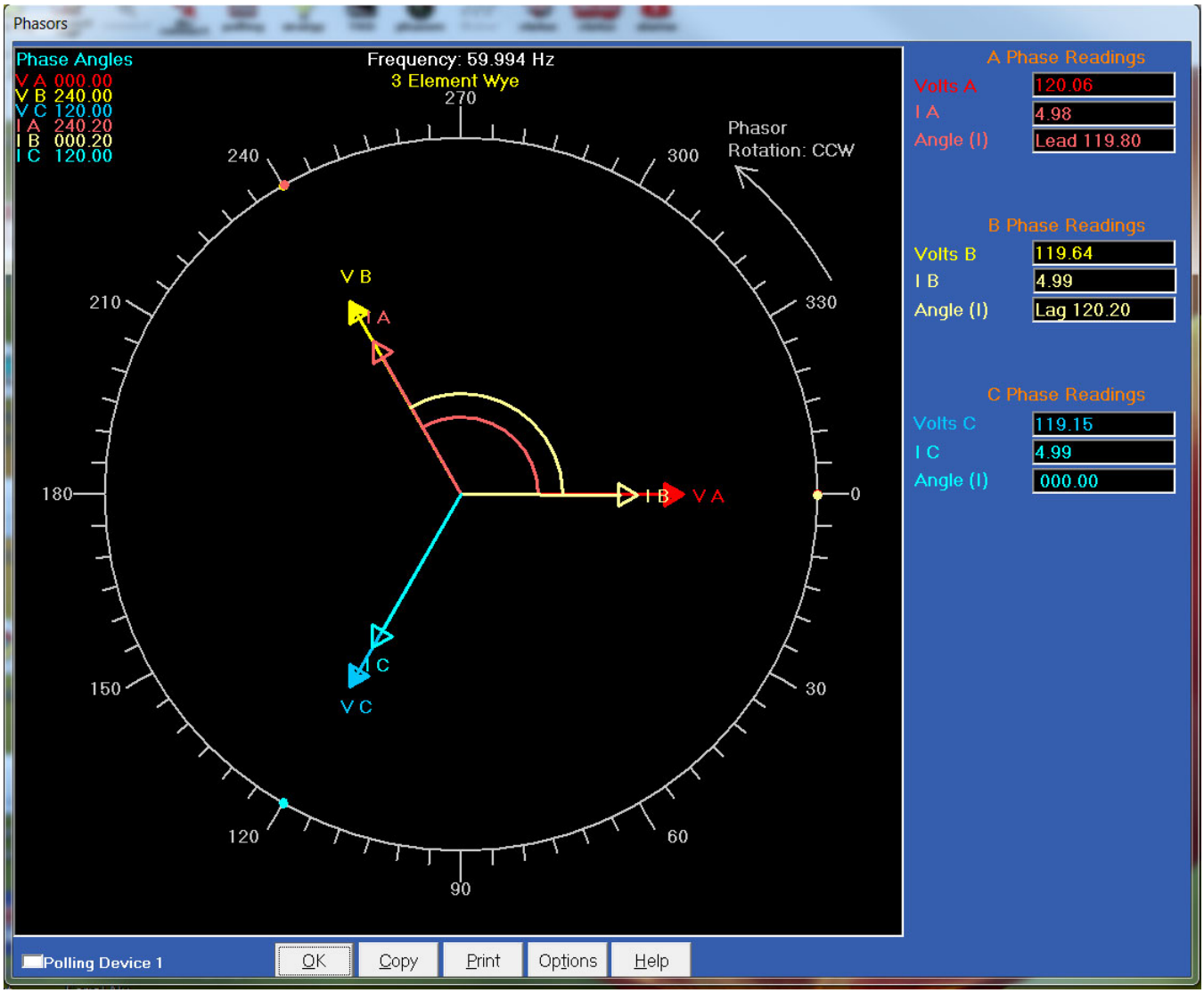
Use the following phasor diagrams and their description as a guide.

1. System: WYE Hookup with Unity Power Factor

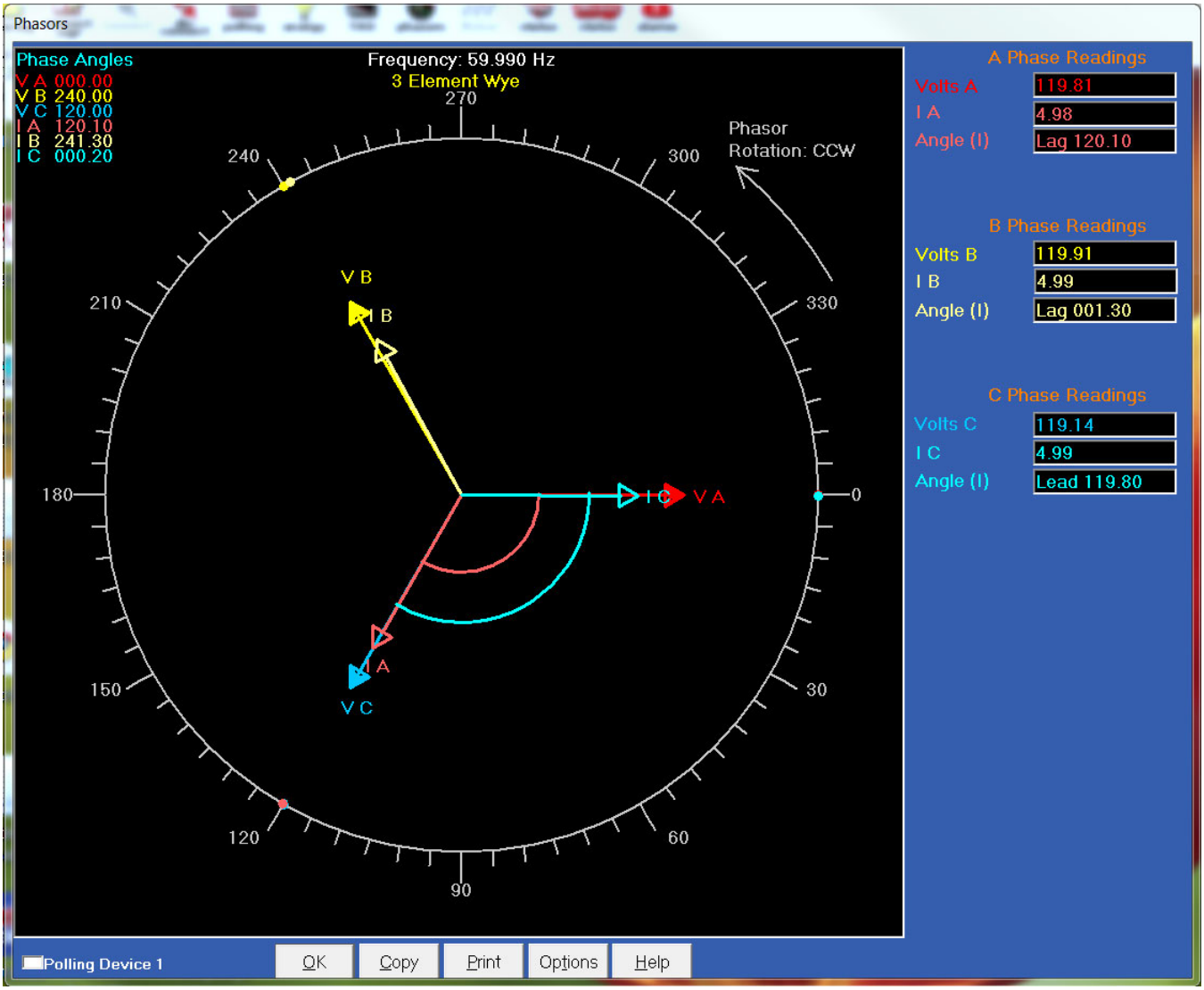


This diagram shows an ideal WYE system, with voltage 120° apart, and current having a perfect resistive load.

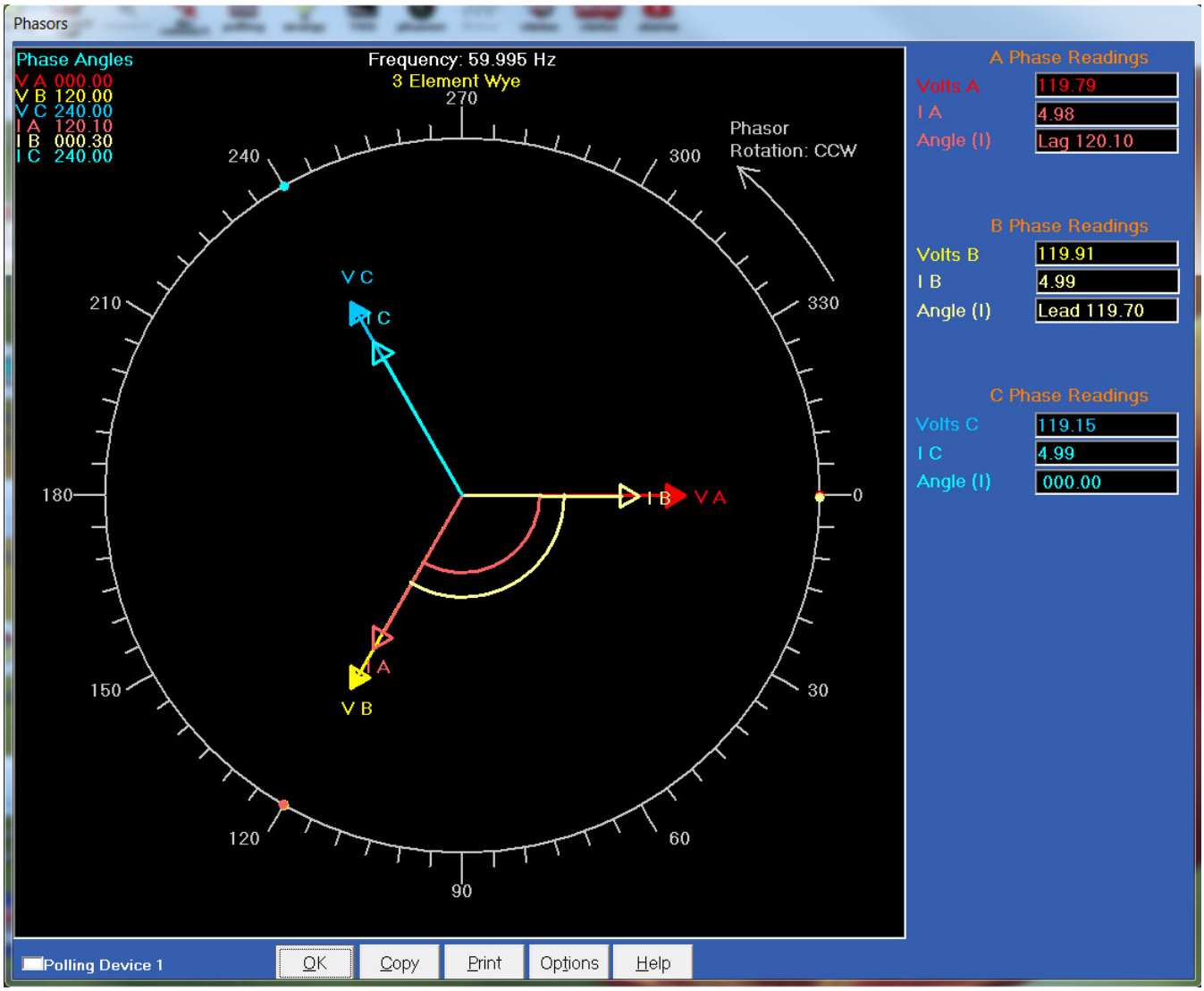
2. System: WYE Hookup with the VA and VB Swapped



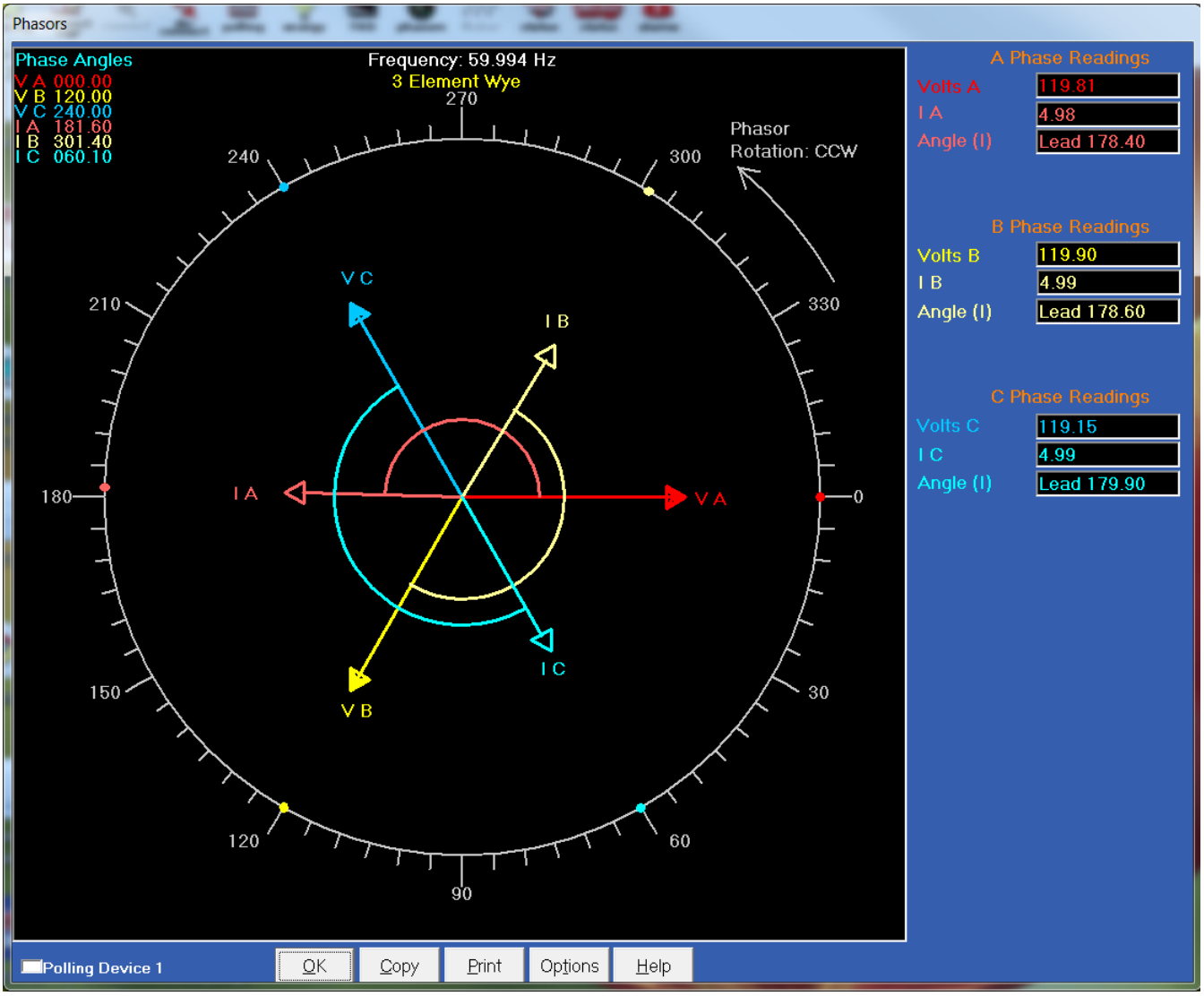
3. System: WYE Hookup - VA and VC Swapped



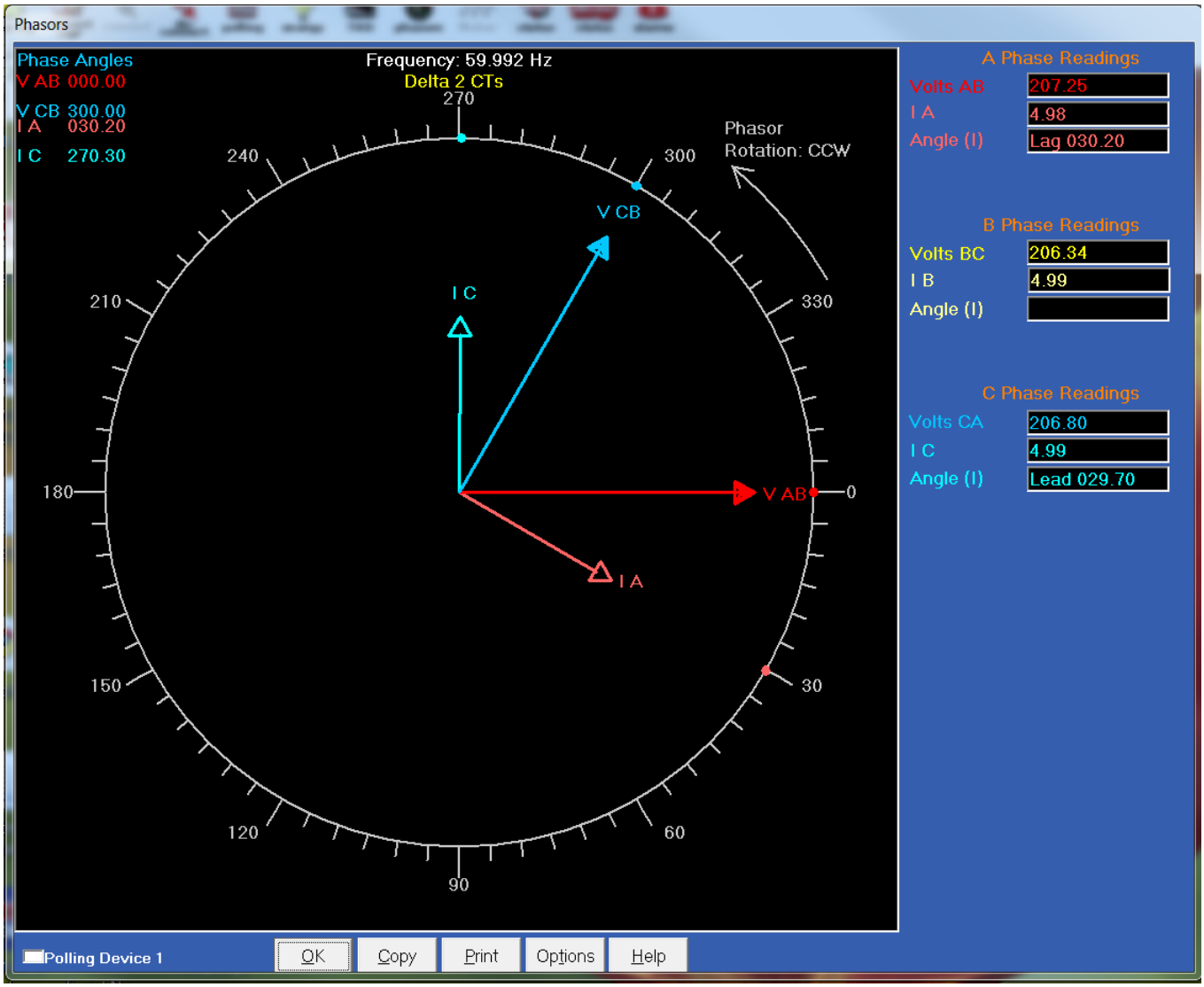
4. System: WYE Hookup with IA and IB Swapped



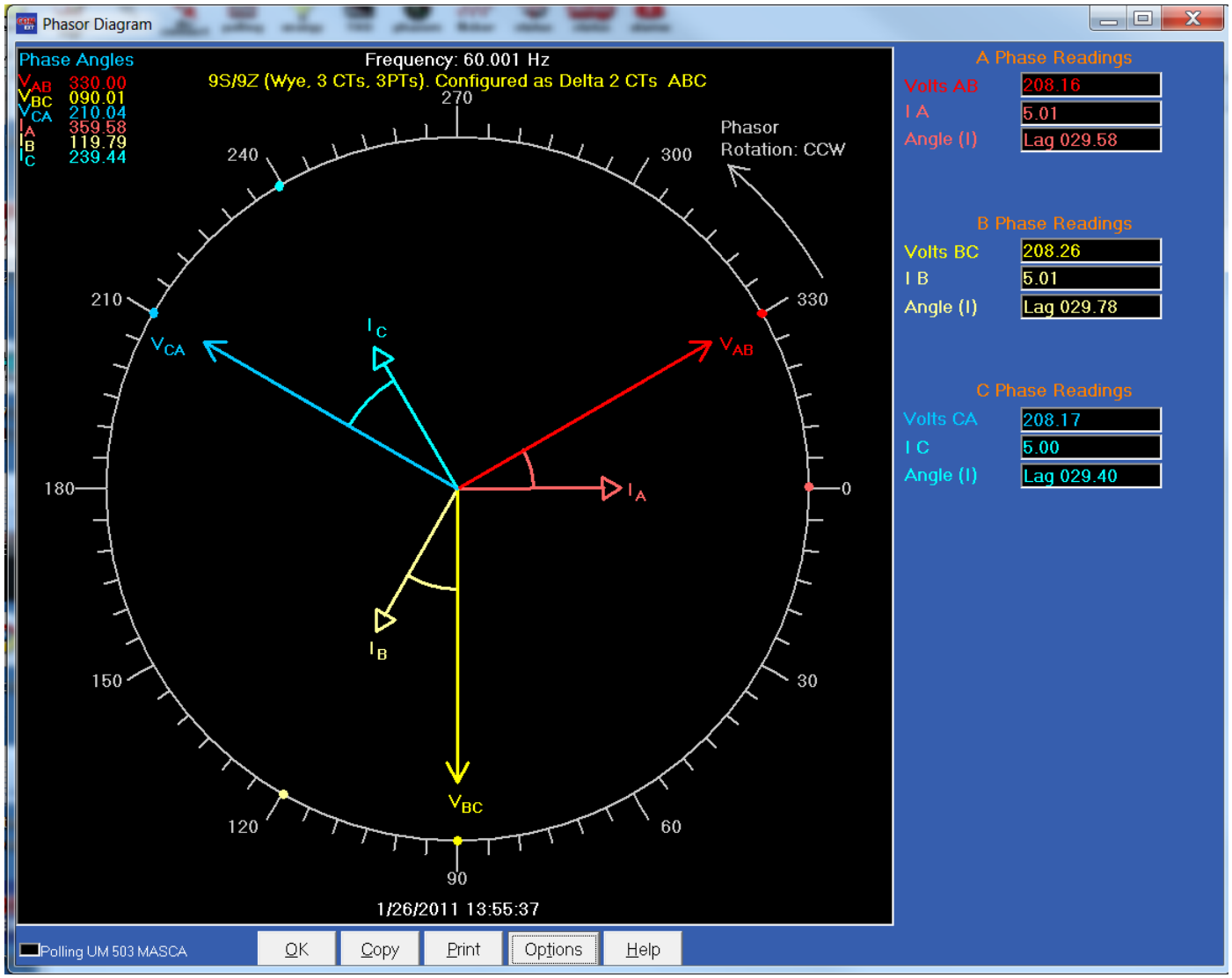
5. System: WYE Hookup - Either the Hi and Low Swapped on all CTs or Generating Power



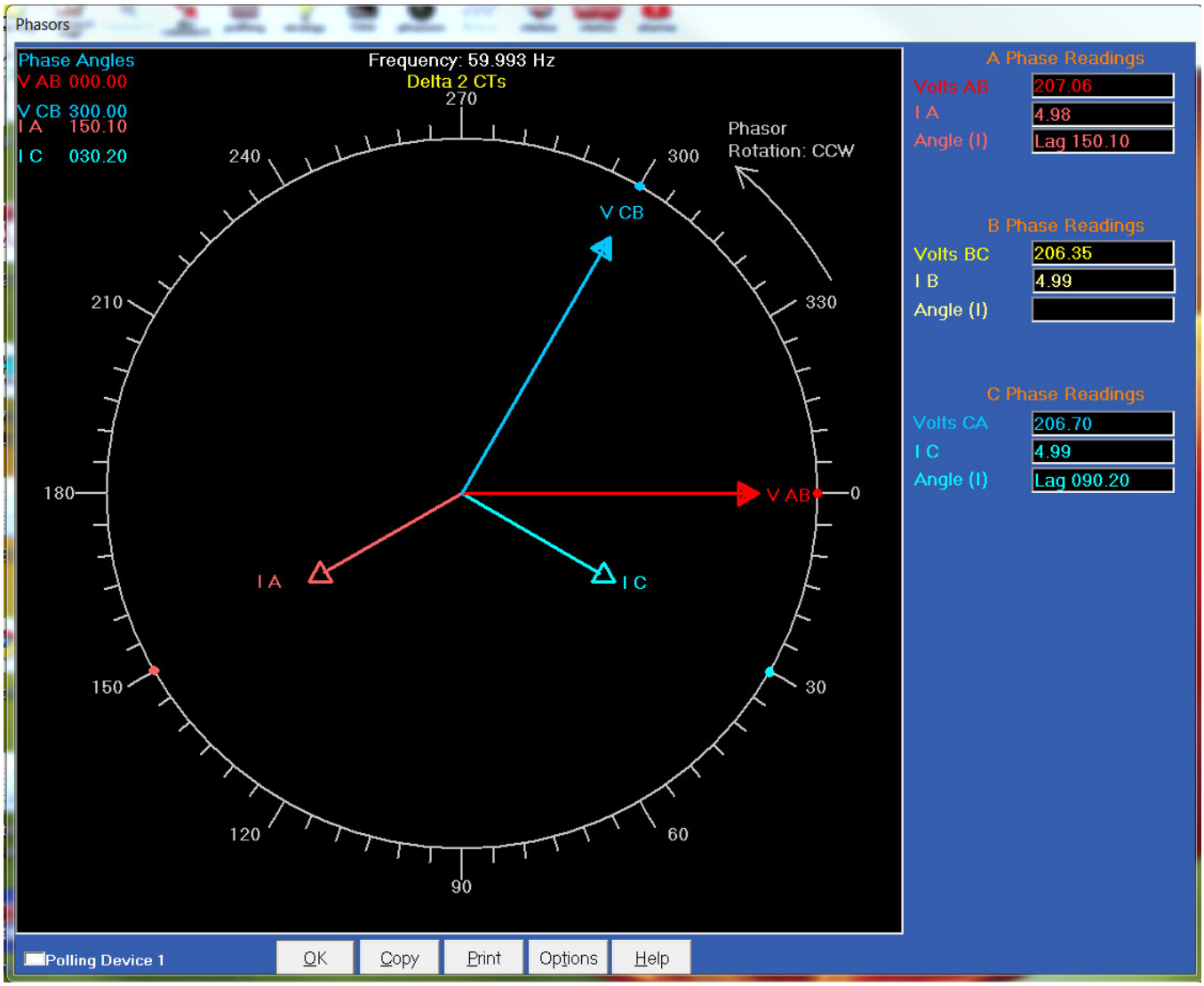
6. System: Delta Hookup - EPM Meter with 2 Voltage Settings



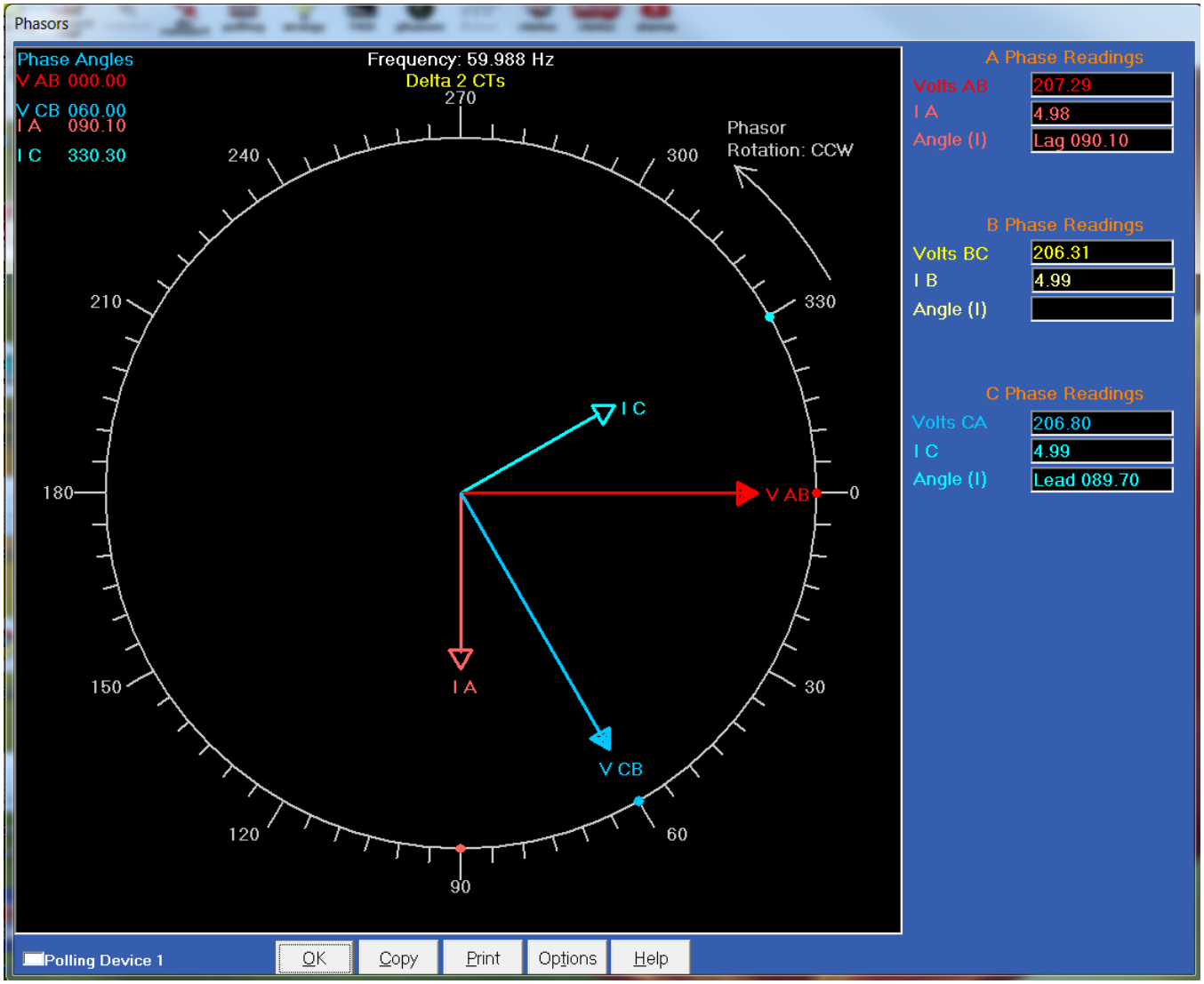
7. System: Delta Hookup - EPM Meter with 3 Voltage Settings



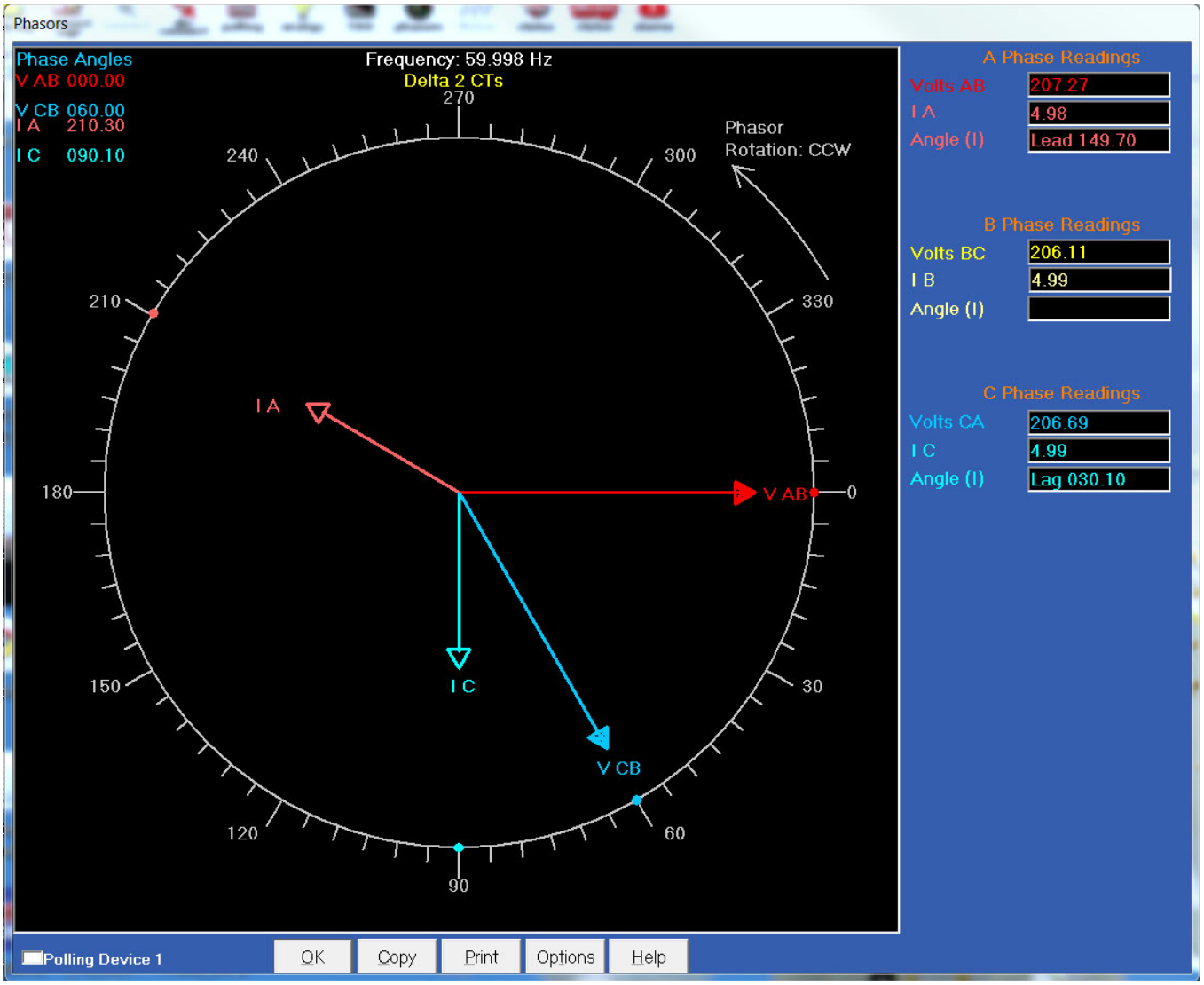
8. System: Delta Hookup - VA and VB Swapped



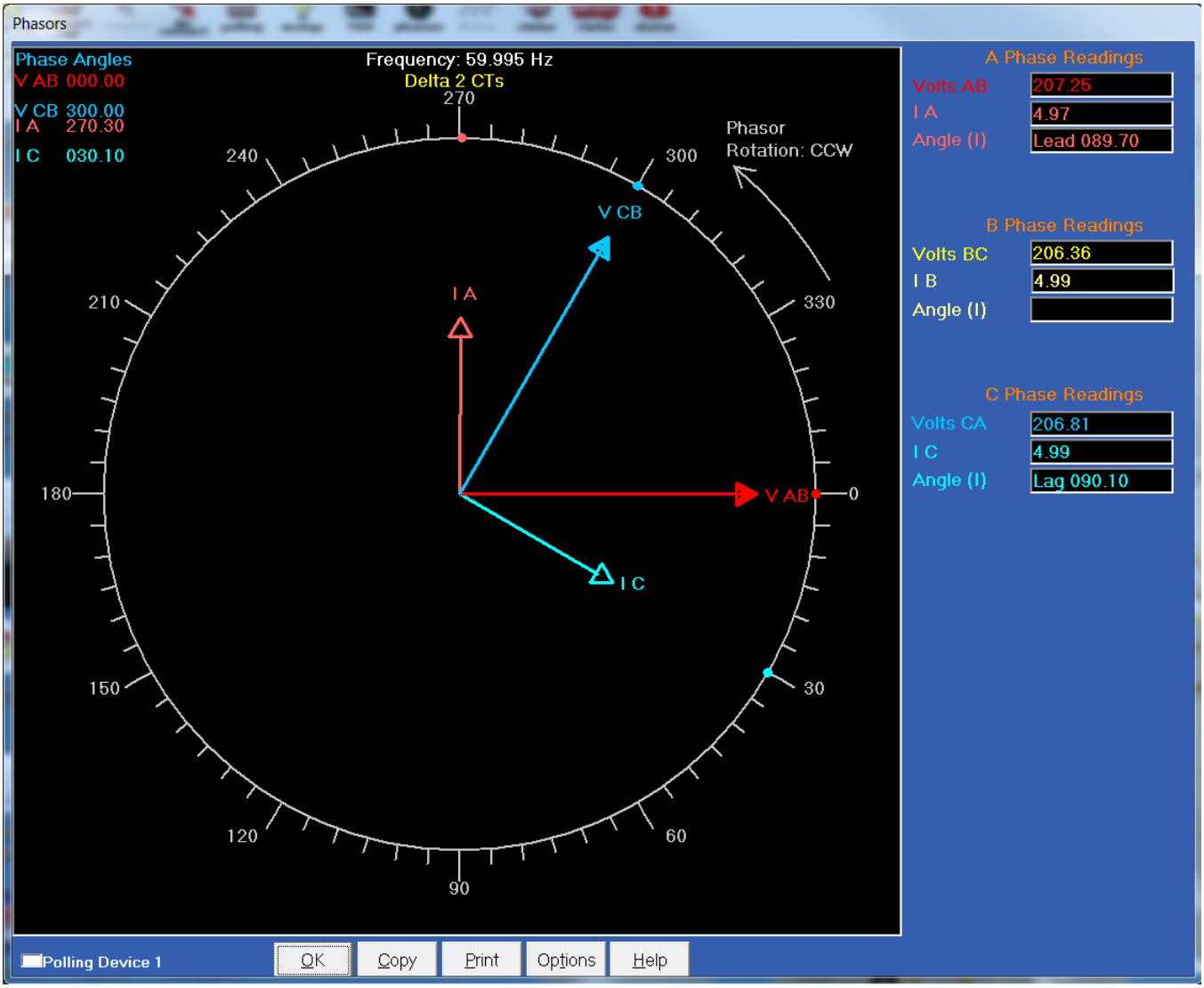
9. System: Delta Hookup - VA and VC Swapped



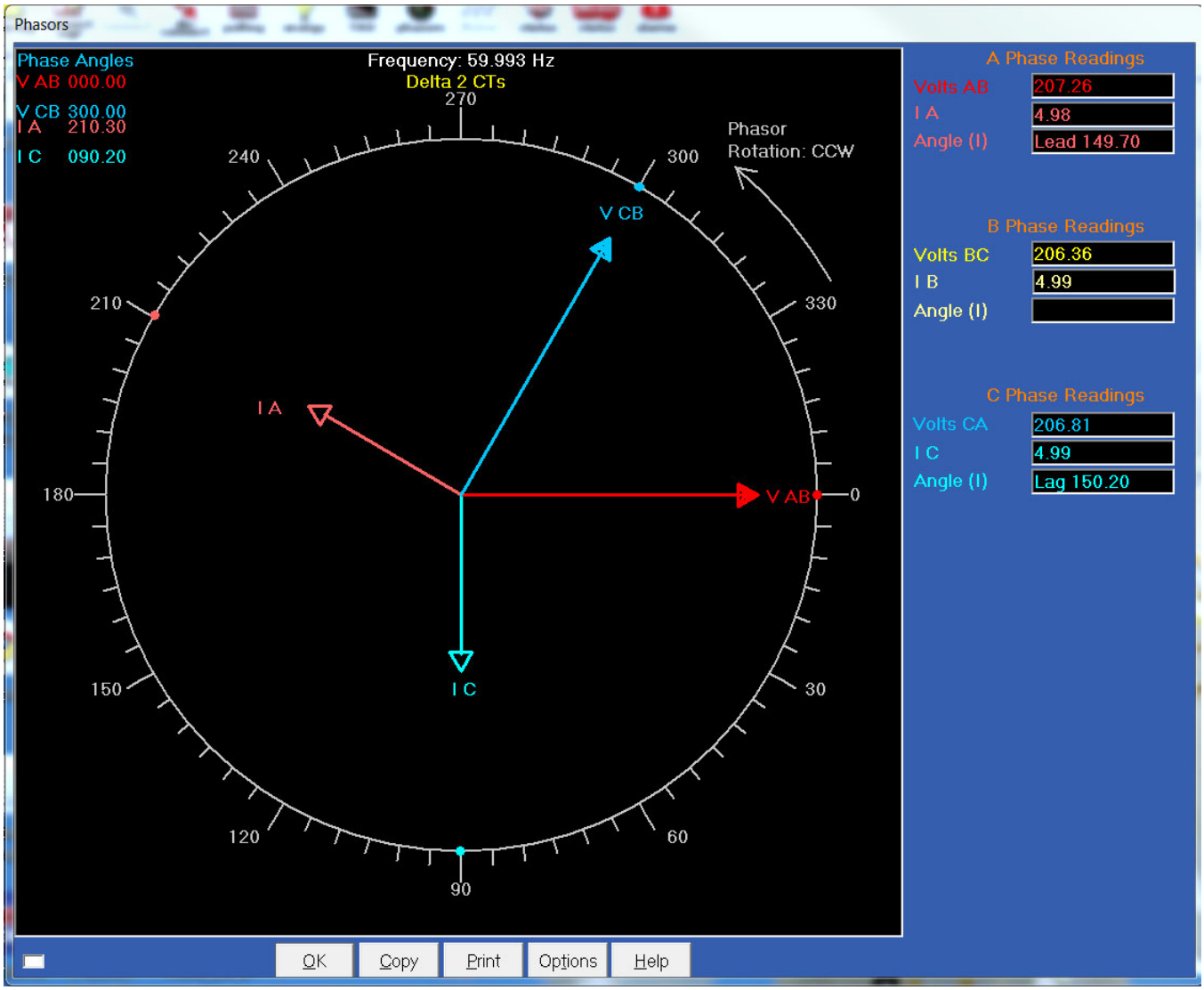
10. System: Delta Hookup - VA in C, VB in A, VC in B



11. System: Delta Hookup - IA and IC Swapped



12. System: Delta Hookup - Either all the CTs Swapped or Generating Power

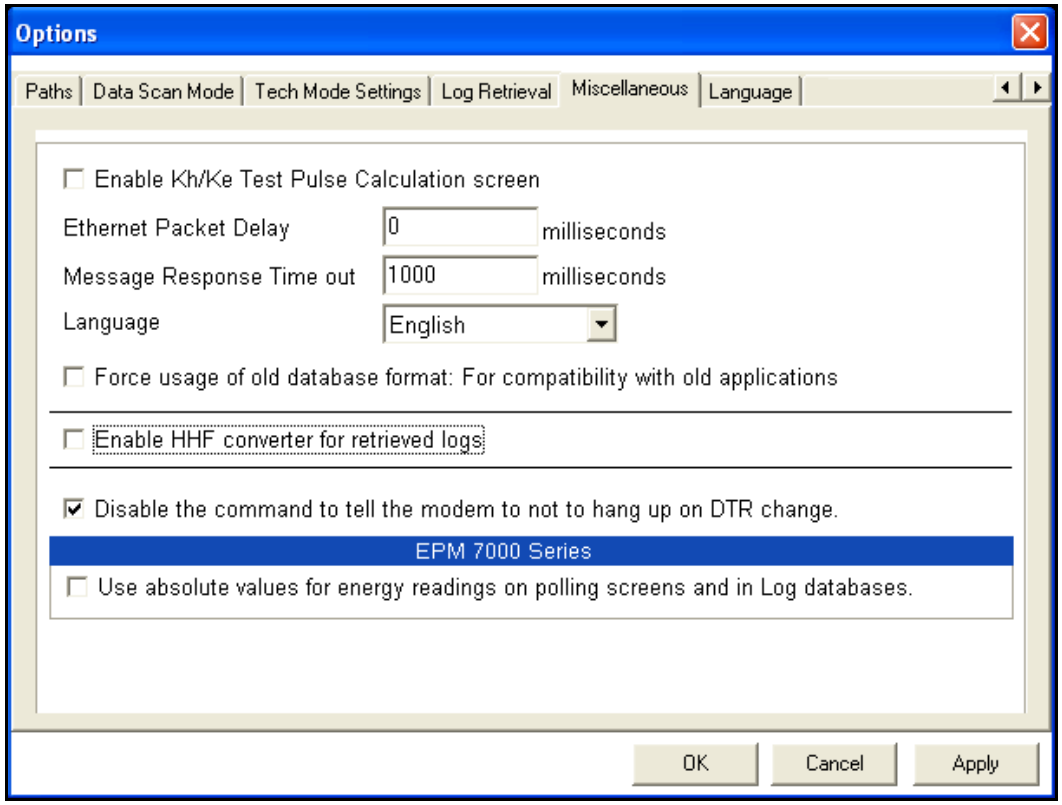


E.2 Optical Port Communication Problems

If you are having new communication problems with your Optical port reader, this may be due to software changes that were implemented for the EPM 9900/9900P/7000P meters, to disable a modem from hanging up on a DTR change during log retrieval or meter configuration. You may encounter a problem with this fix, since the Optical port reader using DTR to determine the Inverted or Not Inverted mode.

To fix this issue, follow these instructions:

1. From the GE Communicator software Main screen, click **View > Options** to open the Options screen.
2. Click the **Miscellaneous** tab.



3. Check the box next to **Disable the command to tell the modem not to hang up on DTR change.** (By default, this box is un-checked).
4. Click **OK** (or **Apply**, if you are going to make other changes using the Options screen).

GE Communicator

Appendix F:

F.1 Release Notes

Table F–1: Release Dates

MANUAL	GE PART NO.	RELEASE DATE
GEK-113307	1601-9020-A1	27 April 2007
GEK-113307A	1601-9020-A2	16 September 2008
GEK-113307B	1601-9020-A3	15 November 2008
GEK-113307C	1601-9020-A4	18 October 2011
GEK-113307D	1601-9020-A5	May 2012
GEK-113307E	1601-9020-A6	July 2013
GEK-113307F	1601-9020-A7	February 2014
GEK-113307G	1601-9020-A8	N/A
GEK-113307H	1601-9020-A9	September 2016
GEK-113307J	1601-9020-AA	June 2017
GEK-113307K	1601-9020-AB	May 2018
GEK-113307M	1601-9020-AC	January 2019
GEK-113307N	1601-9020-AD	April 2020
N/A	1601-9020-AE	January 2022

Table F–2: Major Updates for 1601-9020-AE

CHAPTER	DESCRIPTION
11	EPM 9900P Updates to settings for Time Synchronization - IRIG-G, SNTP, IEC 1588 PTP
21	EPM 9900P - Updates for PMU, Time Sync IEC 1588 PTP settings

GE Communicator

Glossary

0.1 Second Values:	These values are the RMS values of the indicated quantity as calculated after approximately 50 milliseconds (3 cycles) of sampling.
1 Second Values:	These values are the RMS values of the indicated quantity as calculated after one second (60 cycles) of sampling.
Alarm:	An event or condition in a meter that can cause a trigger or call-back to occur.
Annunciator:	A short label that identifies particular quantities or values displayed, for example kWh.
Average (Current):	When applied to current values (amps) the average is a calculated value that corresponds to the thermal average over a specified time interval. The interval is specified by the user in the meter profile. The interval is typically 15 minutes. So, Average Amps is the thermal average of amps over the previous 15-minute interval. The thermal average rises to 90% of the actual value in each time interval. For example, if a constant 100amp load is applied, the thermal average will indicate 90 amps after one time interval, 99 amps after two time intervals and 99.9 amps after three time intervals.
Average (Input Pulse Accumulations):	When applied to Input Pulse Accumulations, the "Average" refers to the block (fixed) window average value of the input pulses.

Average (Power): When applied to power values (watts, VARs, VA), the average is a calculated value that corresponds to the thermal average over a specified time interval. The interval is specified by the user in the meter profile. The interval is typically 15 minutes. So, the Average Watts is the thermal average of watts over the previous 15-minute interval. The thermal average rises to 90% of the actual value in each time interval. For example, if a constant 100kW load is applied, the thermal average will indicate 90kW after one time interval, 99kW after two time intervals and 99.9kW after three time intervals.

Bit: A unit of computer information equivalent to the result of a choice between two alternatives (Yes/No, On/Off, for example). Or, the physical representation of a bit by an electrical pulse whose presence or absence indicates data.

Binary: Relating to a system of numbers having 2 as its base (digits 0 and 1).

Block Window Avg (Power): The Block (Fixed) Window Average is the average power calculated over a (Power) user-set time interval, typically 15 minutes. This calculated average corresponds to the demand calculations performed by most electric utilities in monitoring user power demand. (See Rolling Window Average.)

Byte: A group of 8 binary digits processed as a unit by a computer (or device) and used especially to represent an alphanumeric character.

CBEMA Curve: A voltage quality curve established originally by the Computer Business Equipment Manufacturers Association. The CBEMA Curve defines voltage disturbances that could cause malfunction or damage in microprocessor devices. The curve is characterized by voltage magnitude and the duration which the voltage is outside of tolerance. (See ITIC Curve.)

Channel: The storage of a single value in each interval in a load profile.

Cold Load Pickup: This value is the delay from the time control power is restored to the time when the user wants to resume demand accumulation.

CRC Field: Cyclic Redundancy Check Field (Modbus communication) is an error checksum calculation that enables a Slave device to determine if a request packet from a Master device has been corrupted during transmission. If the calculated value does not match the value in the request packet, the Slave ignores the request.

CT (Current) Ratio: A Current Transformer Ratio is used to scale the value of the current from a secondary value up to the primary side of an instrument tranformer.

Cumulative Demand: The sum of the previous billing period maximum demand readings at the time of billing period reset. The maximum demand for the most recent billing period is added to the previously accumulated total of the maximum demands.

Demand: The average value of power or a similar quantity over a specified period of time.

Demand Interval: A specified time over which demand is calculated.

Display: User-configurable visual indication of data in a meter.

DNP 3.0: A robust, non-proprietary protocol based on existing open standards. DNP 3.0 is used to operate between various systems in electric and other utility industries and SCADA networks. EPM 9450 supports Level 1; EPM 9650 & 9800 support Level 2.

EEPROM: Nonvolatile memory. Electrically Erasable Programmable Read Only Memory that retains its data during a power outage without need for a battery. Also refers to meter's FLASH memory.

Energy Register: Programmable record that monitors any energy quantity. Example: Watthours, VARhours, VAhours.

Ethernet: A type of LAN network connection that connects two or more devices on a common communications backbone. An Ethernet LAN consists of at least one hub device (the network backbone) with multiple devices connected to it in a star configuration. The most common versions of Ethernet in use are 10BaseT GE Grid Solutions Glossary-3 and 100BaseT as defined in IEEE 802.3 standards. However, several other versions of Ethernet are also available.

Exception Response: Error Code (Modbus communication) transmitted in a packet from the Slave to the Master if the Slave has encountered an invalid command or other problem.

Flicker: Flicker is the sensation that is experienced by the human visual system when it is subjected to changes occurring in the illumination intensity of light sources. IEC 61000-4-15 and former IEC 868 describe the methods used to determine flicker severity.

Form: Wiring and Hookup configuration for the EPM 9800.

Harmonics: Measuring values of the fundamental current and voltage and percent of the fundamental.

Heartbeat Pulse: Energy indicator on the face of the EPM 9450/9650; pulses are generated per the programmed Ke value.

I_2T Threshold: Data will not accumulate until current reaches programmed level.

Infrared Test Pulse: Energy indicator located on the upper left side of the face of the EPM 9800 meter; pulses are generated per the programmed Ke value.

Integer: Any of the natural numbers, the negatives of those numbers or zero.

Internal Modem: An optional modem within the meter's enclosure that connects to the RJ-11 telephone connector.

Invalid Register: In the meter's Modbus Map there are gaps between Registers. For example, the next Register after 08320 is 34817. Any unmapped Register stores no information and is said to be invalid.

ITIC Curve: An updated version of the CBEMA Curve that reflects further study into the performance of microprocessor devices. The curve consists of a series of steps but still defines combinations of voltage magnitude and duration that will cause malfunction or damage.

Ke: kWh per pulse; i.e. the energy.

kWh: kilowatt hours; kW x demand interval in hours.

KYZ Output: Output where the rate of changes between 1 and 0 reflects the magnitude of a metered quantity.

LCD: Liquid Crystal Display.

LED: Light Emitting Diode.

Master Device: In Modbus communication, a Master Device initiates and controls all information transfer in the form of a Request Packet to a Slave Device. The Slave reponds to each request.

Maximum Demand: The largest demand calculated during any interval over a billing period.

Modbus ASCII: Alternate version of the Modbus protocol that utilizes a different data transfer format. This version is not dependent upon strict timing, as is the RTU version. This is the best choice for telecommunications applications (via modems).

Modbus RTU: The most common form of Modbus protocol. Modbus RTU is an open protocol spoken by many field devices to enable devices from multiple vendors to communicate in a common language. Data is transmitted in a timed binary format, providing increased throughput and therefore, increased performance.

Network: A communications connection between two or more devices to enable those devices to send and receive data to one another. In most applications, the network will be either a serial type or a LAN type.

NVRAM: Nonvolatile Random Access Memory is able to keep the stored values in memory even during the loss of circuit or control power. High speed NVRAM is used in the EPM 9450, 9650 & 9800 to gather measured information and to insure that no information is lost.

Optical Port: A port that facilitates infrared communication with an EPM 9800 meter. Using an ANSI C12.13 Type II magnetic optical communications coupler and an RS-232 cable from the coupler to a PC, the meter can be programmed with GE Communicator software.

Packet: A short fixed-length section of data that is transmitted as a unit. Example: a serial string of 8-bit bytes.

Percent (%) THD: Percent Total Harmonic Distortion. (See THD.)

Protocol: A language that will be spoken between two or more devices connected on a network.

PT Ratio: Potential Transformer Ratio used to scale the value of the voltage to the primary side of an instrument transformer. Also referred to as VT Ratio.

Pulse: The closing and opening of the circuit of a two-wire pulse system or the alternate closing and opening of one side and then the other of a three-wire system (which is equal to two pulses).

Q Readings: Q is the quantity obtained by lagging the applied voltage to a wattmeter by 60 degrees. Values are displayed on the Uncompensated Power and Q Readings screen.

Quadrant (Programmable Values and Factors on the EPM 9450, 9650 and 9800): Watt and VAR flow is typically represented using an X-Y coordinate system. The four corners of the X-Y plane are referred to as quadrants. Most power applications label the right hand corner as the first quadrant and number the, remaining quadrants in a counter-clockwise rotation. Following are the positions of the quadrants: 1st - upper right, 2nd - upper left, 3rd - lower left and 4th - lower right. Power flow is generally positive in quadrants 1 and 4. VAR flow is positive in quadrants 1 and 2. The most common load conditions are: Quadrant 1 - power flow positive, VAR flow positive, inductive load, lagging or positive power factor; Quadrant 2 - power flow negative, VAR flow positive, capacitive load, leading or negative power factor.

Register: An entry or record that stores a small amount of data.

Register Rollover: A point at which a Register reaches its maximum value and rolls over to zero.

Reset: Logs are cleared or new (or default) values are sent to counters or timers.

Rolling Window Average (Power): The Rolling (Sliding) Window Average is the average power calculated over a user-set time interval that is derived from a specified number of sub-intervals, each of a specified time. For example, the average is calculated over a 15-minute interval by calculating the sum of the average of three consecutive 5-minute intervals. This demand calculation methodology has been adopted by several utilities to prevent customer manipulation of kW demand by simply spreading peak demand across two intervals.

RS-232: A type of serial network connection that connects two devices to enable communication between devices. An RS-232 connection connects only two points. Distance between devices is typically limited to fairly short runs. Current standards recommend a maximum of 50 feet but some users have had success with runs up to 100 feet. Communications speed is typically in the range of 1200 bits per second to 57,600 bits per second. RS-232 connection can be accomplished using Port 1 of the EPM 9450/9650 or the Optical Port on the face of the EPM 9800.

RS-485: A type of serial network connection that connects two or more devices to enable communication between the devices. An RS-485 connection will allow multi-drop communication from one to many points. Distance between devices is typically limited to around 2,000 to 3,000 wire feet. Communications speed is typically in the range of 120 bits per second to 115,000 bits per second.

Sag: A voltage quality event during which the RMS voltage is lower than normal for a period of time, typically from 1/2 cycle to 1 minute.

Secondary Rated: Any Register or pulse output that does not use any CT or VT Ratio.

Serial Port: The type of port used to directly interface with a PC.

Slave Device: In Modbus communication, a Slave Device only receives a Request Packet from a Master Device and responds to the request. A Slave Device cannot initiate communication.

Swell: A voltage quality event during which the RMS voltage is higher than normal for a period of time, typically from 1/2 cycle to 1 minute.

THD: Total Harmonic Distortion is the combined effect of all harmonics measured in a voltage or current. The THD number is expressed as a percent of the fundamental. For example, a 3% THD indicates that the magnitude of all harmonic distortion measured equals 3% of the magnitude of the fundamental 60Hz quantity.

Time Stamp: A stored representation of the time of an event. Time Stamp can include year, month, day, hour, minute and second and Daylight Savings Time indication.

TOU: Time of Use.

Uncompensated Power: VA, Watt and VAR readings not adjusted by Transformer Loss Compensation.

V_2T Threshold: Data will stop accumulating when voltage falls below programmed level.

Voltage Imbalance: The ratio of the voltage on a phase to the average voltage on all phases.

Voltage Quality Event: An instance of abnormal voltage on a phase. The events the meter will track include sags, swells, interruptions and imbalances.

VT Ratio: The Voltage Transformer Ratio is used to scale the value of the voltage to the primary side of an instrument transformer. Also referred to as PT Ratio.

Voltage, Vab: Vab, Vbc, Vca are all Phase-to-Phase voltage measurements. These voltages are measured between the three phase voltage inputs to the meter.

Voltage, Van: Van, Vbn, Vcn are all Phase-to-Neutral voltages applied to the monitor. These voltages are measured between the phase voltage inputs and Vn input to the meter. Technologically, these voltages can be “measured” even when the meter is in a Delta configuration and there is no connection to the Vn input. However, in this configuration, these voltages have limited meaning and are typically not reported.

Voltage, Vaux: This is the fourth voltage input measured from between the Vaux and Vref inputs. This input can be scaled to any value. However, the actual input voltage to the meter should be of the same magnitude as the voltages applied to the Va, Vb and Vc terminals.