PowerLogic™ PM8000 series

User manual

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11/2014

Schneider Electric

Safety information

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

NOTICE is used to address practices not related to physical injury.

Please note

Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Notices

Legal information

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Electrical equipment should be installed, operated, serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.

FCC Part 15 notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that of the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

The user is cautioned that any changes or modifications not expressly approved by Schneider Electric could void the user's authority to operate the equipment.

CAN ICES-3 (B) /NMB-3(B)

About this manual

This manual discusses features of the PowerLogic™ PM8000 series power meter and provides installation and configuration instructions. Throughout the manual, the term “meter” refers to all models of the PM8000. All differences between the models, such as a feature specific to one model, are indicated with the appropriate model number or description.

This manual assumes you have an understanding of power metering and are familiar with the equipment and power system in which your meter is installed.

Topics not covered by this manual

This manual does not provide configuration information for advanced features where an expert user would perform advanced configuration. It also does not include instructions on how to incorporate meter data or perform meter configuration using energy management systems or software, other than ION Setup. ION Setup is a free configuration tool available for download from www.schneider-electric.com.

Please contact your local Schneider Electric representative to learn what additional training opportunities are available regarding ION meters.

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Chapter 1 Safety precautions

Installation, wiring, testing and service must be performed in accordance with all local and national electrical codes.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462 or applicable local standards.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Do not exceed the device's ratings for maximum limits.
- Never short the secondary of a voltage transformer (VT).
- Never open circuit a current transformer (CT).
- Always use grounded external CTs for current inputs.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Chapter 2 Introduction

PM8000 overview

The PowerLogic™ PM8000 series power and energy meters help meet the needs of your energy monitoring and cost management applications. All PM8000 meters comply to international metering accuracy standards. You can customize your meter by loading specialized frameworks, and adding option modules and incorporating mounting accessories into the physical installation.

Meter features

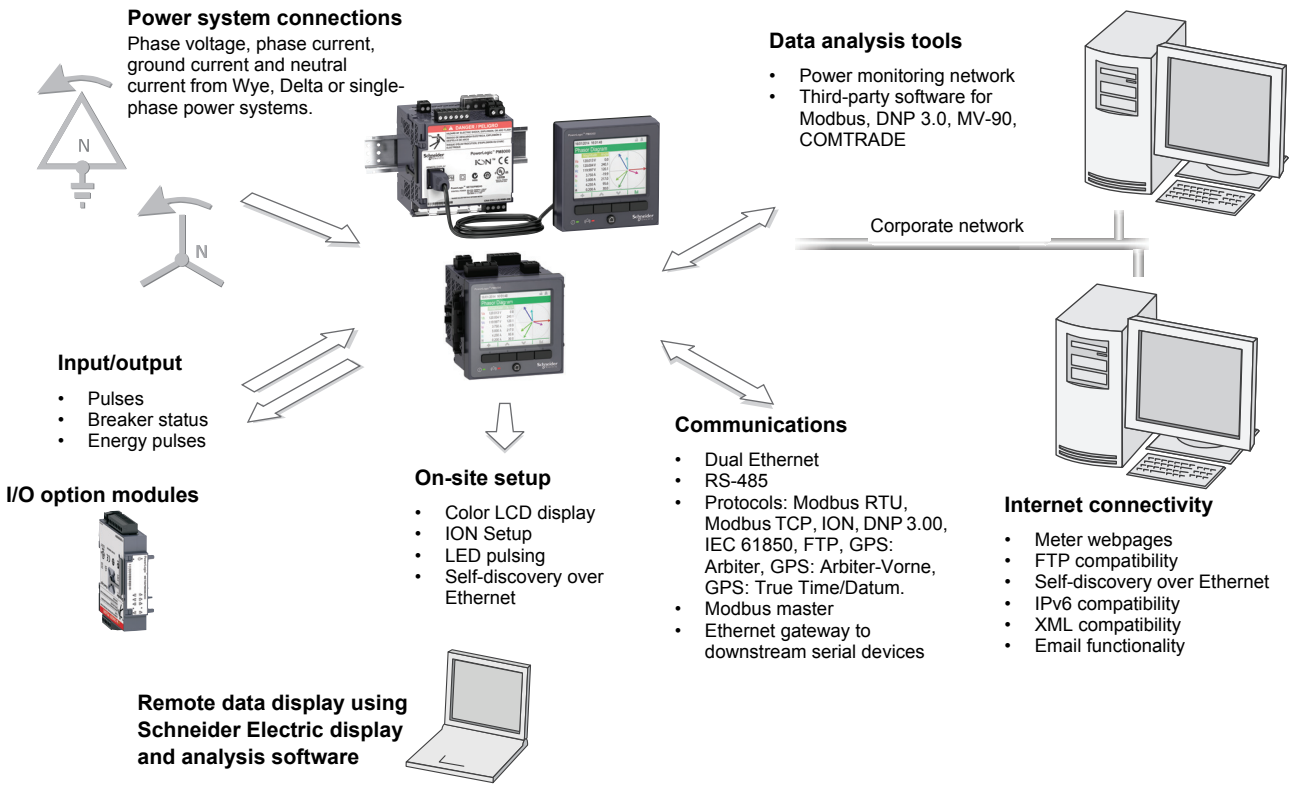
Feature
True RMS metering to the 63rd harmonic
Active (kW), reactive (kVAR) and apparent (kVA) power
600 V direct connection on voltage inputs
Minimum/maximum readings of metered data
Power quality readings (THD)
Downloadable firmware and template
Configuration through integrated or remote display
Modbus master, Ethernet gateway protocols supported
Web interface
Sag/Swell capture for voltage and currents
Time synchronization to 1 ms accuracy
Dual port Ethernet (two physical ports, one Ethernet IP address)
WAGES support
Time of use support
Trending and forecasting
Alarms (active and historic) display viewing and acknowledgment
Multiple languages supported

Your meter in an energy management system

In an energy management system the PM8000 meter collects and aggregates data. This data is used to perform non-critical control or shared with other equipment in the energy management system. Data from the meter can be used by energy management software to help with energy cost management, trending and forecasting, network management, power quality analysis, and more.

The meter is user-configurable to adapt to many situations. Communications allow data to be shared simultaneously across multiple networks, built-in and optional I/O provides monitoring and non-critical control capabilities, and a variety of display and analysis tools can be used to monitor your system.

The following graphic outlines your meter's capabilities in an energy management system.



Measured parameters

Your meter provides bi-directional 4-quadrant energy metering. The following is a selection of some of the values provided by your meter.

Energy

Your meter provides active, reactive and apparent energy values, including:

- kWh, kVARh, kVAh delivered and received
- kWh, kVARh, kVAh net (delivered - received)
- kWh, kVARh, kVAh total (delivered + received)
- Volt-squared-hours and amp-squared-hours

Energy parameters can be logged automatically on a programmed schedule.

All energy values represent the total for all three phases.

Demand

Your meter supports several demand calculation methods, including block, rolling block, synchronized and predicted demand. It can measure demand on any instantaneous value and record peak (maximum) and minimum demand with time and date information. Demand measurements include:

- kW, kVAR, kVA demand
- kW, kVAR, kVA peak demand
- Amps, Volts demand

Instantaneous

Your meter provides one second and half-cycle measurements, per phase and totals for many values, including:

- Voltage and current
- Apparent power (kVA), active power (kW) and reactive power (kVAR)
- Power factor and frequency
- Voltage and current unbalance

Harmonics

Your meter provides harmonic distortion metering, recording and real-time values for all voltage and current inputs, including:

- Individual harmonics (including magnitude and phase angle) up to the 63rd harmonic
- Total even harmonic distortion (TEHD) and total odd harmonic distortion (TOHD)
- Total harmonic distortion (THD) or total demand distortion (TDD)
- K-factor, Crest factor

Min/max recording

Your meter records new minimum and maximum data every recording interval for the following vlaues:

- Voltage and current
- kW, kVAR and kVA
- Power factor
- Frequency
- Voltage unbalance
- Plus any measured value

Power quality

Your meter measures and records voltage and current sags and swells. Your meter also has many power quality related features, including:

- Disturbance direction detection: this allows the meter to analyze disturbance (sag/swell) information to help determine the direction of the disturbance relative to the meter.
- Setpoint learning: this allows the meter to learn the power quality characteristics of your system, to help identify what constitutes a sag or a swell.
- COMTRADE: this allows the meter to save waveform data in COMmon format for TRAnsient Data Exchange (COMTRADE) on its internal FTP server.

Your meter includes the following power quality compliance:

- EN50160: Your meter measures and presents statistics for determining EN50160 compliance.
- IEC 61000-4-30: Your meter complies with the IEC 61000-4-30 power quality standard.
- IEC 62586-1: Your meter complies with the IEC 62586-1 power quality standard.

Localization options

The meter can be customized to use different regional settings, including:

- The language used for the display and webpages
- Time, date and digit formats
- IEC/IEEE symbols and calculations

Data display and analysis tools

Software

Your meter integrates with display and analysis software available from Schneider Electric™, such asStruxureWare™ Power Monitoring Expert that lets you analyze and monitor your system and produce reports for different departments in your organization. This software is designed to make use of your meter's advanced capabilities. You can also use the data acquired by the meter in a variety of third-party systems.

Display

Use the meter's display for local monitoring and standalone applications. The color LCD display lets you view real-time values, events and alarms, and perform basic device configuration. Connect a remote display to a meter without an integrated display to get the same functions as those provided on the integrated display.

Active and historical alarms

The meter's display shows an alarm icon and the alarm LED flashes if your meter detects an active alarm condition. Depending on the priority of the alarm, your meter's display also flashes. You can view and acknowledge active alarms and historic alarms and events through the display and software webpages. An active alarm becomes a historic alarm when the alarm condition no longer exists.

Meter internal web server feature

Your meter's internal web server provides quick and easy access to real-time energy and basic power quality information without special software using an on-board web server combined with an Ethernet port. The built-in web pages display selected energy and power quality information through the web-enabled device; these pages also support basic meter configuration.

Email messaging feature

You can configure your meter to automatically email information, whether notification of a high-priority event or a regularly scheduled send of logged data, to an external email address. Specify the type of event that triggers an email alert, such as a power quality disturbances or interval for logged data. Email messages from your meter are received like any other email message.

Supported protocols

Your meter's fundamental protocol and architecture is ION. You can integrate the meter into various industry-standard networks. Data that the meter measures can be made available to other devices using Modbus, DNP 3.0 and SNMP as well as the MV-90 translation system. You can configure the meter to import data from other devices on

these networks. Your meter supports the IEC 61850 protocol and COMTRADE waveform data format.

Your meter also supports IPv6, DPWS and RSTP Ethernet protocols.

ION Setup device configuration tool

ION Setup is a free configuration tool for your meter that allows you to remotely configure your meter's features over Ethernet or serial communications.

- Use the Setup Assistant to guide you through the process of configuring your meter.
- Use the real-time data screens to verify your meter's configuration.
- Use the data screens to view your meter's recorded data.
- Use the charting function to view your meter's recorded waveforms.

You can download ION Setup from www.schneider-electric.com.

NOTE: Advanced users with a thorough understanding of their meter's architecture, protocols, and the power system in which their meter is installed, can use the advanced mode of ION Setup to create specialized features on their meter.

Related topics

- See the online ION Setup help, available from www.schneider-electric.com, for instructions on connecting to your meter and accessing the Setup Assistant.

Additional information and files

The most up-to-date documentation about your meter is available for download from www.schneider-electric.com. You can also contact your local Schneider Electric representative for more information.

Installation sheets

Multilingual installation sheets are shipped with each device or accessory, and provide the information required to install the product.

ION reference

The ION reference describes ION architecture (the common software architecture in all ION devices) and provides an explanation of each of the ION modules.

ION device template reference

The ION device template reference details the type and quantity of ION modules available on your device and how they are configured in the default template.

ION Setup

ION Setup is a free meter configuration tool that can be downloaded for free at www.schneider-electric.com. It has online help that provides instructions on how to connect to and configure your meter using ION Setup.

Technical notes

Technical notes provide instructions for using meter features and for creating custom configurations.

Protocol documents

Each protocol document contains information explaining how your meter interacts with a protocol, such as DNP 3.0, IEC 61850 and MV-90.

Additional files

Additional files for your meter are available for download from www.schneider-electric.com.

File type	Description
Firmware (*.upg)	Firmware upgrade files let you upgrade your meter's firmware to get new features.
Template (*.dcf)	Template files let you replace your meter's existing template with an updated template with new features.
Protocol files	Files required to support a particular protocol on your meter, such as the MIB file for SNMP and your meter's Modbus register map.
Remote display (*.bin) and option module (*.si9) firmware	Firmware upgrade files let you upgrade your remote display or option module's firmware.

Display and analysis software

Documentation for display and analysis software available from Schneider Electric, such as StruxureWare Power Monitoring Expert, is available for download from www.schneider-electric.com.

Chapter 3 Hardware reference

This section provides additional information regarding physical characteristics and capabilities.

Related topics

- See your device's installation sheets, available from www.schneider-electric.com, for installation instructions and specifications.
- See "Specifications" on page 181 for additional specifications.

Meter types

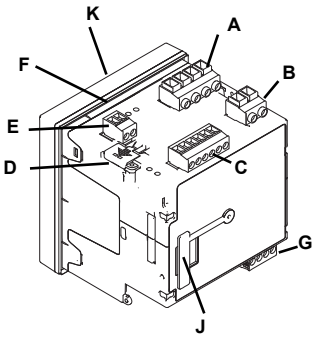
The PM8000 series is available in two physical form factors, and has several accessories:

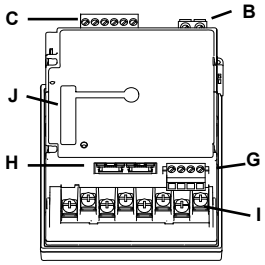
Model	Commercial reference	Description
PM8240	METSEPM8240	Panel-mounted meter with integrated display
PM8243	METSEPM8243	DIN rail-mounted meter without display, which can be connected to a remote display
PM8244	METSEPM8244	DIN rail-mounted meter packaged with a remote display
PM89RD96	METSEPM89RD96	Remote display (for DIN meter only)
PM89M2600	METSEPM89M2600	Digital I/O option module (2 out, 6 in)
PM89M0024	METSEPM89M0024	Analog I/O option module (2 out, 4 in))
PM8000SK	METSEPM8000SK	PM8000 voltage and current sealing kit
METSEPMAK	METSEPMAK	PM8000 mounting adapter kit for remote display and DIN meter

Related topics

- See the PM8000 catalog pages, available from www.schneider-electric.com, or consult your local Schneider Electric representative for the most up-to-date information about your device, its options and accessories.

Panel meter

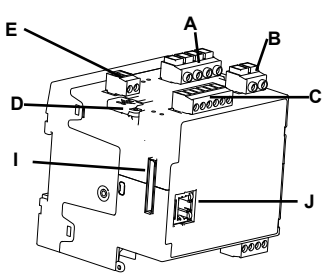


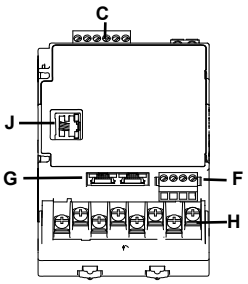


A	Voltage inputs
B	Control power
C	Digital inputs (3)
D	Revenue lock switch cover
E	Digital output
F	Gasket
G	RS-485
H	Ethernet (2)
I	Current inputs
J	Option module connector
K	Display

Mounting hardware and accessories not shown.

DIN meter





A	Voltage inputs
B	Control power
C	Digital inputs (3)
D	Revenue lock switch cover
E	Digital output
F	RS-485
G	Ethernet (2)
H	Current inputs
I	Option module connector
J	Remote display connector

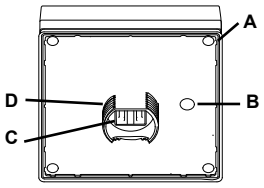
Mounting hardware and accessories not shown.

Related topics

- See the PM8000 catalog pages, available from www.schneider-electric.com, or consult your local Schneider Electric representative for information about your device, its options and accessories.

Remote meter display (RMD)

The remote meter display can be used with DIN meters. It has the same buttons, icons and LEDs as the display on a panel meter, and is powered by the connection to the meter. A remote display cannot be used with meters that have an integrated display.



A	Gasket
B	Alignment pin location
C	Display connection
D	Mounting post

Mounting hardware and accessories not shown.

Option modules

Option modules are ordered separately from your meter, and can be connected to your meter without specialized equipment.

Related topics

- See the PM8000 catalog pages, available from www.schneider-electric.com, or consult your local Schneider Electric representative for information about option modules available for your meter.

Mounting adaptors

There are different mounting adaptor accessories that can help when installing your meter in existing panels and cutouts where the default mounting hardware is not appropriate. Mounting adaptor kits are ordered separately from the meter.

Related topics

- See the PM8000 catalog pages, available from www.schneider-electric.com, or consult your local Schneider Electric representative for information about mounting adaptors available for your meter.

Other accessories

Voltage and current input covers

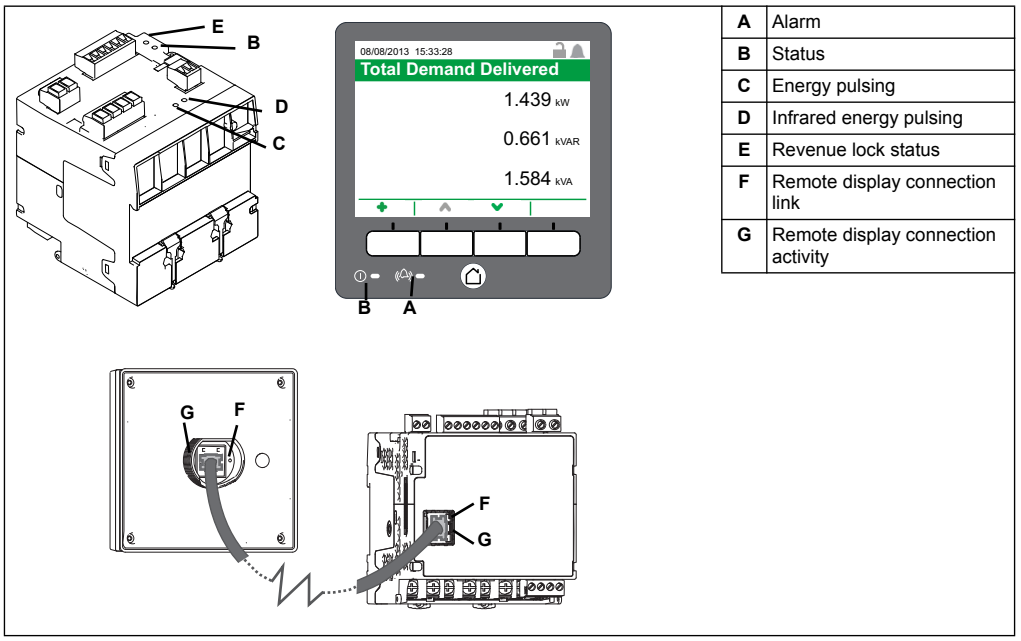
Sealable voltage and current input covers are available and can be ordered separately for your meter. These covers are included for meter models where sealable voltage and current covers are required to comply with revenue or regulatory standards.

Replacement hardware

You can order replacement mounting and installation hardware for your meter and accessories.

Indicator LEDs

LED locations



A	Alarm
B	Status
C	Energy pulsing
D	Infrared energy pulsing
E	Revenue lock status
F	Remote display connection link
G	Remote display connection activity

Related topics

- See“Alarm and status LED indicators” on page 28 for a description of alarm and status LED behavior.

Energy pulsing LED behavior

The visible and infrared LEDs are configured by default to pulse based on the energy (kWh) received by the meter. You can configure the pulse weight (pulses per kWh) and the energy source.

Energy pulsing is used to help verify the energy measurement accuracy of your meter for revenue purposes.

Related topics

- See “Energy pulsing overview” on page 145 for more information about energy pulsing on your meter.
- See “Verifying accuracy” on page 175 for more information about how to perform accuracy verification testing on your meter.

Revenue lock LED behavior

State	Description
Off	The meter is not revenue locked.
On	The meter is revenue locked.
Flashing	New revenue lock state is pending; power cycle your meter to set the revenue lock to on or off.

Remote display connector LED behavior

There are two LEDs in the remote display connector.

LED	Description
Green (link)	On: link established. Off: no link established with the remote display. Check the connections to the remote display and DIN meter.
Yellow (activity)	Flashing: active communications between the meter and the remote display. Off: no communication activity. Check remote display and meter operation.

Chapter 4 Mounting and installation

This section provides supplemental information to help mount and install your meter. It is intended to be used in conjunction with the installation sheet that ships in the box with your meter and accessories. See your device's installation sheet for information related to installation, such as dimensions, mounting and wiring instructions.

The latest technical documentation related to your meter and accessories is available for download from www.schneider-electric.com.

Before you begin

Carefully read and follow the safety precautions and instructions in the installation sheet before working with your meter or accessory.

Safety precautions

Installation, wiring, testing and service must be performed in accordance with all local and national electrical codes.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA, CSA Z462 or applicable local standards.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Do not exceed the device's ratings for maximum limits.
- Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.
- Never short the secondary of a voltage transformer (VT).
- Never open circuit a current transformer (CT).
- Always use grounded external CTs for current inputs.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
2. Always use a properly rated voltage sensing device to confirm that all power is off.

Mounting

Panel mount meters

The meter retainer clips, located on either side of the meter base and used to secure the meter in the panel, do not usually require any tools to install. If necessary, for panels with limited space, you can use a long-handled slot screwdriver to help install the meter retainer clips.

Mounting adaptors

There are different mounting adaptor accessories that can help when installing your meter in existing panels and cutouts where the default mounting hardware is not appropriate. Mounting adaptors are ordered separately from the meter.

Related topics

- See the PM8000 catalog pages, available from www.schneider-electric.com, or consult your local Schneider Electric representative for information about your device, its options and accessories.

Wiring

This information is supplemental to the installation sheets that shipped with your meter or accessory.

Remote display mounting and wiring

- The remote display can only be used with the DIN meter; it cannot be used by meters with an integrated display.
- The remote display's power and communications is provided through a single, direct, point-to-point connection from the remote display to the DIN meter.

Meter wiring

Power system wiring

You can connect the meter's voltage inputs directly to the phase voltage lines of the power system if the power system's line-to-line or line-to-neutral voltages do not exceed the meter's direct connect maximum voltage limits. The maximum voltage allowed for direct connection may be lower than the manufacturer-specified limits, depending on the local electrical codes and regulations.

If your system voltage is greater than the specified direct connect maximum voltage, you must use PTs (potential transformers) to step down the voltages.

Serial communications (RS-485) wiring

Devices connected to the bus, including the meter, converter(s) and other hardware, must be wired as follows:

- Connect the shield of each segment of the cable to ground at one end only.
- Isolate cables as much as possible from sources of electrical noise.
- Use an intermediate terminal strip to connect each device to the bus. This allows for easy removal of a device for servicing if necessary.
- Install a ¼ Watt termination resistor between the positive and negative terminals of the device at each end of a straight-line bus. The resistor should match the nominal impedance of the RS-485 cable. Consult the cable manufacturer for the cable impedance value.
- Turn on RS-485 biasing if your meter is the RS-485 master device.
- Avoid device connections that cause a branch or "Tee" in the main RS-485 bus as they can lead to signal reflections that may result in interference.
- Do not connect more that two cables at any connection point on the RS-485 bus.

RS-485 terminals

+	Data plus. This transmits/receives the non-inverting data signals.
-	Data minus. This transmits/receives the inverting data signals.
⏚	Shield. Connect the bare wire to this terminal to help suppress signal noise that may be present. Ground the shield wiring at one end only (either at the master or the last slave device, but not both).
C	Signal common. This provides the voltage reference (zero volts) for the RS-485 signals.

NOTE: If some devices in your RS-485 network do not have the common (C) terminal, use the bare wire in the RS-485 cable to connect the common terminal from the meter to the shield terminal on the devices that do not have the common terminal.

Ethernet communications

Your meter's dual port Ethernet connections enable you to use straight-line or network loop (ring) topologies. If local network loop Ethernet topologies are required, you must enable RSTP for your meter's Ethernet communications to function.

Only use unshielded CAT5/5e UTP Ethernet cables to wire your meter's Ethernet communications. Other cable types may provide an undesired ground path.

NOTICE

EQUIPMENT DAMAGE

Only use unshielded CAT5/5e UTP Ethernet cables.

Failure to follow these instructions may result in equipment damage.

Option modules

Perform an option bus reset to restart the option bus and re-initialize the option modules attached to your meter.

Related topics

- See "Option modules" on page 43 for more information about option modules.
- See "Resets" on page 153 for more information about the resets available on your meter.

Default values for commissioning

Parameter	Default value
Display password (also for logging onto meter webpages)	0
Username (for logging onto meter webpages)	8000
IP address	169.254.0.10
Subnet mask	255.255.0.0
Gateway	0.0.0.0
Unit ID	1
Language	English

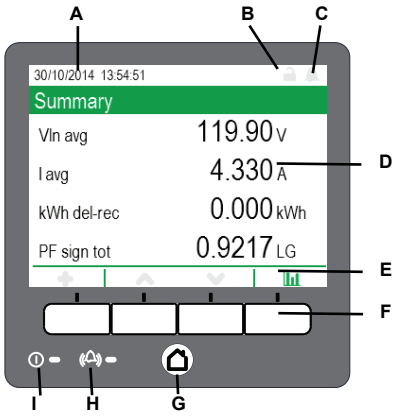
Related topics

- See “Setup menu” on page 33 for instructions on how to perform basic configuration using the display.
- See “Self-discovery over Ethernet” on page 53 for information on how your meter can automatically appear on your network.
- See “Meter webpages” on page 115 for instructions on how to perform basic configuration using your meter’s webpages.
- See the ION Setup online help, available from www.schneider-electric.com, for instructions on how to connect to and configure your meter.

Chapter 5 Display and meter setup

Your meter can have either an integrated or an optional remote display. The display allows you to view meter data and perform basic configuration. The integrated and remote display screens have the same meter data and setup screens. Only meters without an integrated display can use the remote display.

Display overview



A	Date/time
B	Revenue lock icon
C	Alarm icon
D	Display
E	Navigation icons
F	Navigation buttons
G	Home button
H	Alarm LED
I	Status LED

Home button

Pressing the home button takes you to the associated menu screen. If you are in a data screen, pressing the home button takes you to the display menu, and pressing home twice takes you to the summary display screen. If you are in a setup screen, pressing home takes you to the setup menu, and pressing home again takes you to the display menu.

Revenue lock icon

The revenue lock icon indicates the lock status of the meter. When gray and open, the meter is unlocked. When green and closed, the meter is locked. You can lock and unlock your meter using the revenue lock switch located on the body of your meter.

Alarm icon

The alarm icon indicates the highest level and state of alarms detected by your meter. For example, if the meter detects a low priority and a high priority active alarm, the alarm icon indicates a high priority active alarm.

NOTE: Alarms can only be viewed and acknowledged through your meter's display.

Icon	Description
	Active alarm indicator: • Red: high priority alarm state detected • Yellow: medium priority alarm state detected • Blue: low priority alarm state detected The alarm indicator flashes until you acknowledge the alarm. The alarm indicator changes to the historic alarm indicator of the appropriate level when the alarm state is no longer detected by the meter. **NOTE:** Your meter's display backlight flashes for unacknowledged high priority active alarms.

Icon	Description
	Unacknowledged historic alarm indicator: • Red: unacknowledged high priority historic alarm • Yellow: unacknowledged medium priority historic alarm **NOTE:** Low priority historical alarms are not indicated. The active alarm indicator changes to the historic alarm indicator of the appropriate level when the alarm state is no longer detected by the meter.
	No active or unacknowledged high or medium priority historic alarms

Related topics

- See “Revenue locking” on page 173 for more information about your meter’s revenue locking feature.
- See “Alarms and alerts” on page 147 for more information about your meter’s alarms.

Alarm and status LED indicators

Your meter has two LED indicators on the display. These LEDs cannot be configured for other uses.

LED	Description
Status	Off: unpowered Steady green: normal operation Flashing red: no communications (remote display only) Steady red: firmware upgrade required (remote display only) Flashing red/green: startup or firmware upgrade sequence in progress
Alarm	Off: no active or unacknowledged historic alarms On: acknowledged active alarm Flashing: active alarm **NOTE:** Your meter’s display backlight flashes for unacknowledged high priority active alarms.

Related topics

- See “Indicator LEDs” on page 21 for a description of the meter’s communication and status LEDs.

Navigation symbols

Navigation symbols are displayed on the bottom of the screen above their corresponding navigation button.

NOTE: If the symbol is gray, that navigation function is not available.

Symbol	Description
	More Pressing this button displays additional screens.
	Left Pressing this button moves the displayed cursor one position to the left. If you are in a more or info screen, it returns you to the previous screen.
	Right Pressing this button moves the displayed cursor one position to the right.

Symbol	Description
	Up Pressing this button takes you to the previous screen or menu item.
	Down Pressing this button takes you to the next screen or menu item.
	Select Pressing this button selects or confirms the highlighted value.
	Cancel Pressing this button cancels the current selection and returns you to the previous screen.
	Graphic Pressing this button takes you to a graphical data display.
	Numeric Pressing this button takes you to a numeric data display.
	Info Pressing this button takes you to a detailed information screen.
	Edit Pressing this button allows you to edit the displayed parameter.
	Pressing these buttons allow you to navigate parameter tables in the setup screens.
	Pressing both buttons allows you to perform the described action.

More screens access

Pressing the navigation button associated with the more icon brings up a list of additional screens related to the displayed screen. Press cancel to remove the list. If you do not press any button, the list automatically disappears after a short period of time.

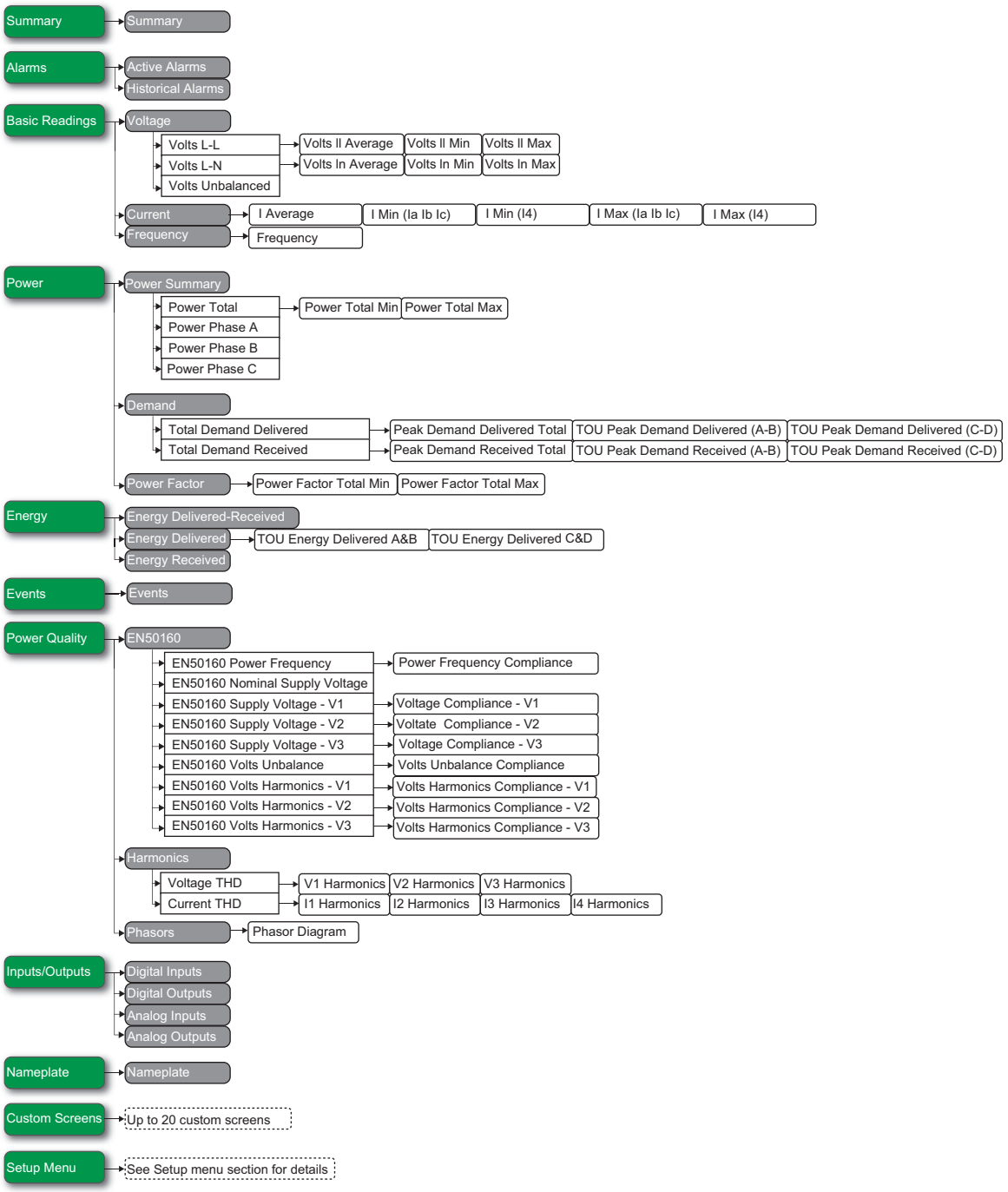
Overrange indication

If any value measured by the meter is too large to fit on the meter's display, the meter initially reduces the size of the text to try and make the value fit. If the value is still too large to be displayed, the meter truncates the value starting with the least significant digit, and encloses the truncated value in a red box.

Display menu

The display menu allows you to select data for viewing and to access the setup menu.

NOTE: Your meter's menus may appear slightly different than shown depending on your display settings.



Viewing data using your meter's display

Use the navigation buttons to view data on your meter's display.

The following examples show how to use the navigation buttons to view data in numeric or graphical format, select and view additional menu screens, and view detailed information about alarms and acknowledge them.

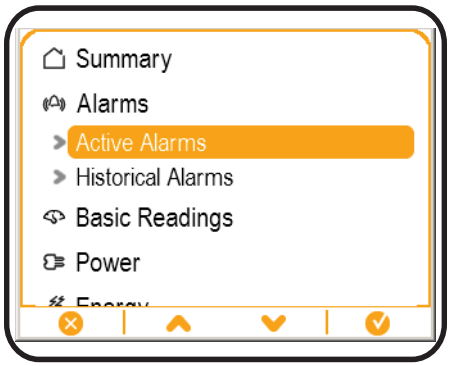
NOTE: Your display may appear differently than shown, depending on your meter's power system and display settings.

NOTE: Your navigation icons change color depending on the type of screen being viewed. If an icon is gray, that navigation option is not available and nothing will happen when you press the button associated with that icon.

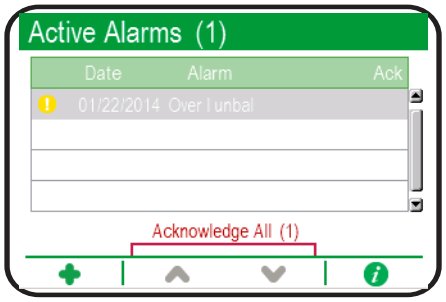
Example: viewing the alarm screens

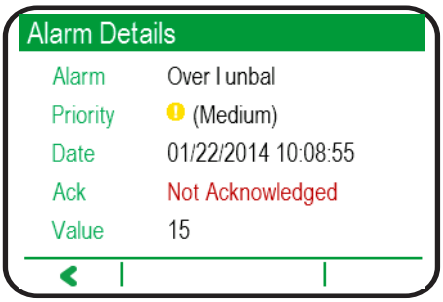
Use the display navigation buttons to access the alarm screens, display detailed information, and acknowledge active and historic alarms.

1. Press ⌂ to display the menu. Press ▲ or ▼ until **Alarms** is highlighted. Press ✓ to display the alarm screens. Press ▼ until Active Alarms is highlighted. Press ✓ to display Active Alarms.The Active Alarms title lists, in brackets, the total number of active alarms.



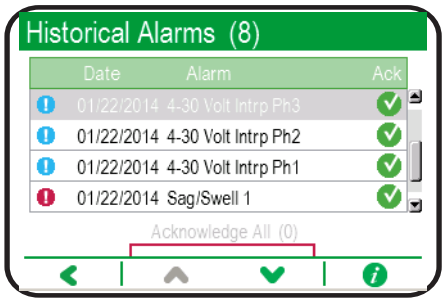
2. Press ▲ or ▼ to highlight a specific alarm, in this case an unbalanced currents alarm. Press i to display detailed information about the highlighted alarm, and press ◀ to return to the Active Alarms screen. Press both ▲ and ▼ simultaneously to acknowledge all active alarms.





3. Press ⌂ to display the menu. Press ▼ to highlight Historical Alarms. Press ✓ to display Historical alarms.The Historical Alarms title lists, in brackets, the total number of historic alarms.

4. Press ▲ or ▼ to highlight a specific alarm, in this case a 4-30 voltage interruption alarm. Press i to display detailed information about the highlighted alarm. Press both ▲ and ▼ simultaneously to acknowledge all historical alarms.

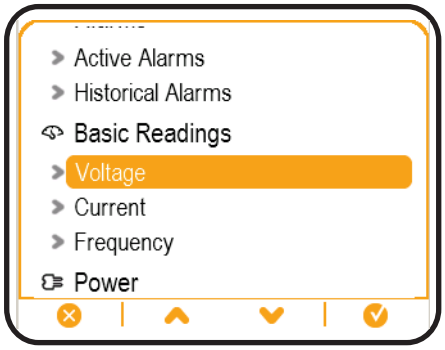


5. Press ⌂ to return to the menu.

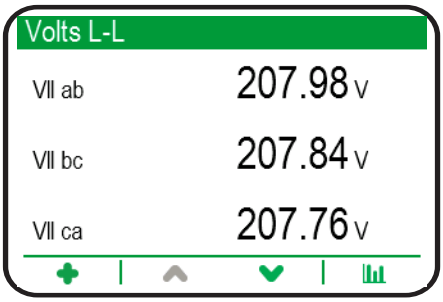
Example: viewing the voltage screens

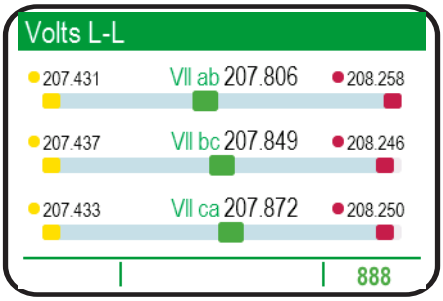
Use the display navigation buttons to view screens, display detailed information, and display graphical representations of measured voltage data.

1. Press ⌂ to display the menu. Press ▲ or ▼ until Basic Readings is highlighted. Press ✓ to view the basic readings screens. Press ▼ until Voltage is highlighted. Press ✓ to view the voltage screens.Voltage line-to-line values are displayed.

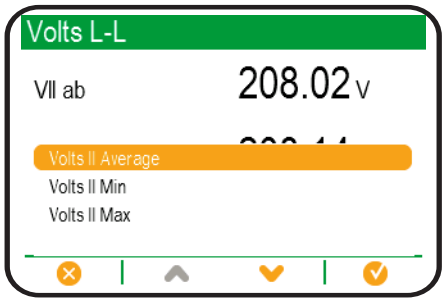


2. Press 📊 to view a graphical display of historic voltage values, then press 888 to return to the numeric display. Press ✚ to show a list of additional screens.

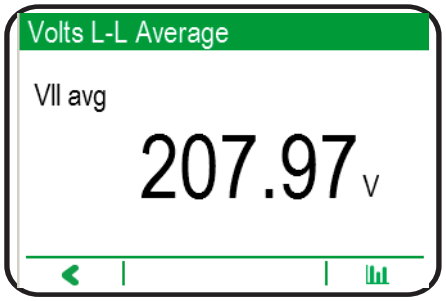




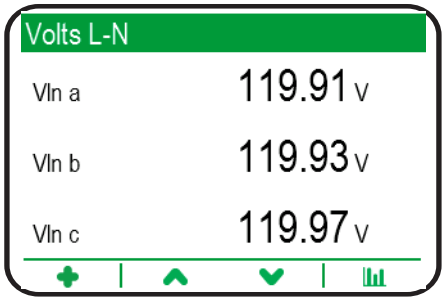
3. Press ▲ or ▼ to highlight an additional screen, in this case, Volts II Average. Press ✓ to go to the highlighted screen. Volts II Average displays the average line-to-line voltage.



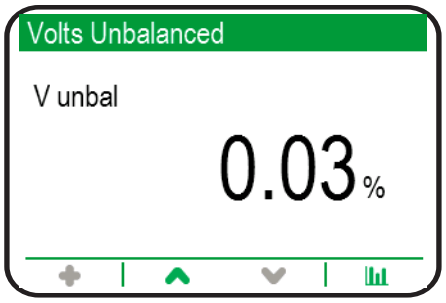
4. Press to view a graphical display of average voltage values, then press 888 to return to the numeric display. Press to return to Volts L-L.



5. Press to view Volts L-N, which also has additional screens and the ability to view the information in a graphical format.



6. Press again to view Volts Unbalanced. This is the last voltage screen, so is grayed out and unavailable. Press to return to Volts L-N, and press again to return to Volts L-L.

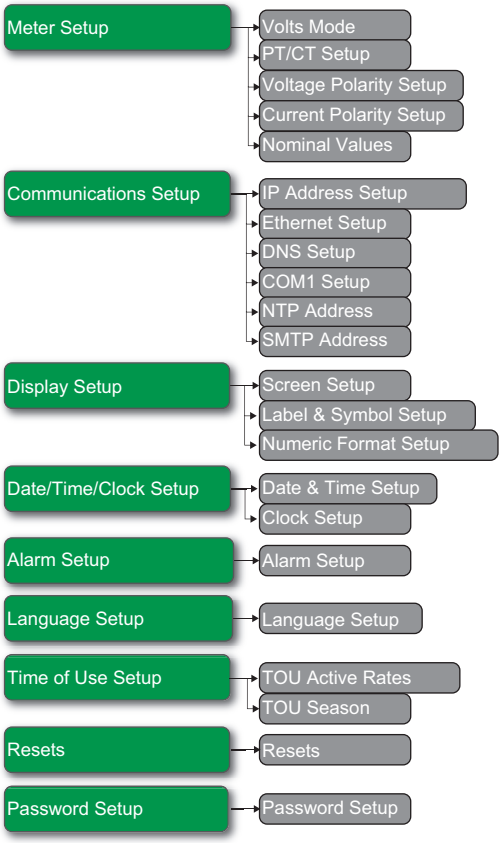


Setup menu

Meter configuration can be performed through the display, using the meter's webpages or through software. This section contains information on how to set up the meter using the display. You must have your meter's security settings configured to allow front panel (display) programming in order to set up the meter using the display.

NOTE: Your display may appear differently than shown, depending on your meter's power system and display settings.

NOTE: Some setup parameters cannot be configured when revenue security is enabled.



Related topics

- See “Revenue locking” on page 173 for more information about your meter’s revenue security and protected parameters.
- See “Security” on page 47 for information about front panel (display) programming security settings.
- See “Accessing the meter’s webpages” on page 116 for instructions on how to access your meter’s webpages.
- See “ION Setup device configuration” on page 84 for instructions on how to configure your meter using ION Setup.

Setting up your meter using the display

Use the navigation buttons and displayed parameters to configure your meter.

The following example shows how to use the navigation buttons to select parameters, enter numeric information or select parameter values from lists.

NOTE: Your display may appear differently than those shown, depending on your meter’s power system and display and localization settings.

NOTE: Your navigation icons change color depending on the type of screen being viewed. If an icon is gray, that navigation option is not available and nothing will happen when you press the button associated with that icon.

NOTE: Your meter goes back to displaying data after a period of inactivity in the setup menu screens.

NOTE: Your meter locks you out of display configuration after you have exceeded the maximum number of attempts to enter an password.

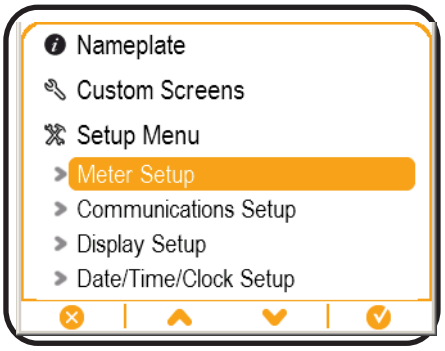
Your meter's default display password is 0 (zero).

Example: setting volts mode and PT/CT ratios

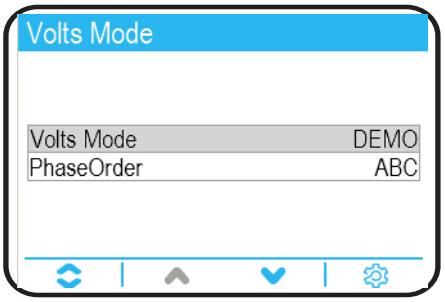
Use the display navigation buttons to set your meter's volts mode and PT ratios.

NOTE: Potential transformers (PT) are also known as voltage transformers (VT).

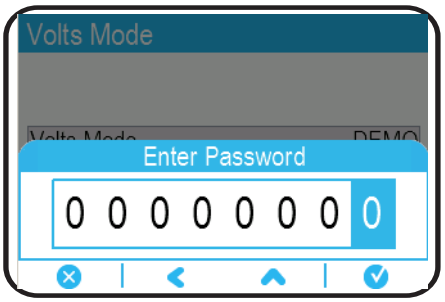
1. Press ⌂ to display the menu. Press ⌄ until Setup Menu is highlighted. Press ✓ to display the Setup Menu.The **Setup Menu** lists the setup selections on your meter.



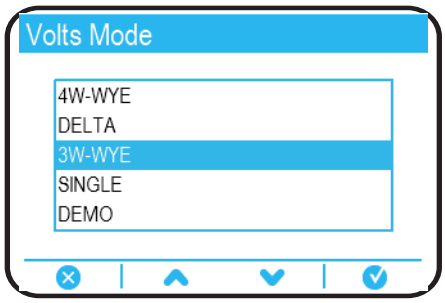
2. Press ⌃ or ⌄ to highlight the different setup menu selections. Highlight Meter Setup and press ✓ to select the meter setup screens.The Volts Mode setup screen is displayed.
3. Press ⇄ to highlight Volts Mode. Press ⚙ to edit the Volts Mode.The Enter Password screen is displayed.



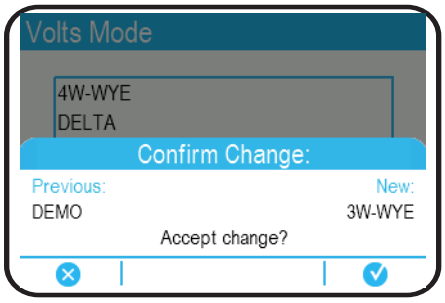
4. Press ⌃ to change the value of the highlighted digit (0 - 9). Press ‹ to go to the next digit. Press ✓ to enter your password.The volts mode configuration screen is displayed.



5. Press ▲ or ▼ to highlight the desired volts mode from the list, in this case, 3W-WYE. Press ✓ to select the highlighted volts mode. A confirmation screen is displayed, showing your meter's previous setting and newly selected setting.

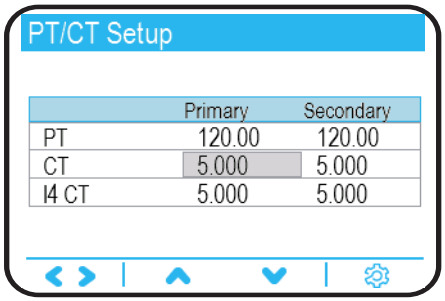


6. Press ✓ to confirm, and the new setting is applied to your meter. Press ✗ to cancel and maintain your meter's original setting.



7. In the Volts Mode screen, press ▼ to go to the PT/CT Setup screen.
8. In the PT/CT Setup screen, press ◄ ► to highlight the potential transformer (PT) or current transformer (CT) value for editing. Press ⚙ to edit the highlighted value.

   NOTE: If you have exceeded the password timeout period, you are prompted to enter your meter's display password.



9. Press ▲ to change the value of the highlighted digit (0 - 9). Press ◄ to go to the next digit. Press ✓ to enter the new value. When the confirmation screen is displayed, press ✓ to confirm the new value or ✗ to revert to the original value.

Related topics

- See “Minimum configuration requirements for basic metering” on page 37 for information on the values that must be configured on your meter.
- See “Security” on page 47 for information about the security features of your meter.

Minimum configuration requirements for basic metering

At a minimum, you must configure the following parameters to help your meter perform basic metering functions.

Setup screen	Screen	Minimum configuration
Meter Setup	Volts Mode	Volts Mode
	PT/CT Setup	PT, CT and I4 CT Primary and Secondary
	Nominal values	V nominal, I nominal, Nominal Frequency

NOTE: You must also configure all the parameters related to the meter features you are using, for example, you must configure the DNS server address if you are using the meter’s DNS feature.

Setup parameters

The following sections list the parameters that can be configured using your meter’s display.

NOTE: Some parameters may appear differently than shown, depending on your meter’s power system and display settings.

Meter setup

Screen title	Parameter	Values	Description
Volts Mode	Volts Mode	4W-Wye, Delta, 3W-Wye, Single, Demo	The power system’s configuration
	PhaseOrder	ABC, ACB	The power system’s phase order
PT/CT Setup	PT Primary	1 to 999,999.99	The potential transformer’s primary winding voltage rating **NOTE:** PTs are also referred to as a VTs or voltage transformers.
	PT Secondary	1 to 999,999.99	The potential transformer’s secondary winding voltage rating **NOTE:** PTs are also referred to as a VTs or voltage transformers.
	CT Primary	1 to 999,999.99	The current transformer’s primary winding current rating
	CT Secondary	1 to 999,999.99	The current transformer’s secondary winding current rating.
	I4 Primary	1 to 999,999.99	The I4 current transformer’s primary winding current rating
	I4 Secondary	1 to 999,999.99	The I4 current transformer’s secondary winding current rating
Voltage Polarity Setup	Va Polarity	Normal, Inverted	The polarity of the potential transformer on Va
	Vb Polarity	Normal, Inverted	The polarity of the potential transformer on Vb
	Vc Polarity	Normal, Inverted	The polarity of the potential transformer on Vc
Current Polarity Setup	Ia Polarity	Normal, Inverted	The polarity of the current transformer on Ia
	Ib Polarity	Normal, Inverted	The polarity of the current transformer on Ib
	Ic Polarity	Normal, Inverted	The polarity of the current transformer on Ic
	I4 Polarity	Normal, Inverted	The polarity of the current transformer on I4
Nominal Values	V Nominal	1 to 999,999	The nominal (normal) voltage of the power system
	I Nominal	1 to 999,999	The nominal (normal) current of the power system
	Nominal Frequency	50, 60	The nominal (normal) frequency of the power system

Communications Setup

Screen title	Parameter	Values	Description
IP Address Setup	IP Address	As defined by your network's system administrator	Sets the IP address for the meter **NOTE:** Your meter's default IP address is 169.254.0.10
	SubnetMask		Used if subnetting applies to your network
	Gateway		Used in networks with multiple segments
	MAC Address	Not configurable	Your meter's media access control (MAC) address.
Ethernet Setup	Enable RSTP	Yes, No	Specifies if rapid spanning tree protocol (RSTP) is enabled **NOTE:** If local network loop or ring Ethernet topologies are required, you must enable RSTP for your meter's Ethernet communications to function
	Enable ION Over TCP	Yes, No	Specifies if ION protocol communications are enabled over Ethernet
	Enable Web Server	Yes, No	Specifies if the meter's internal web server is enabled
DNS Setup	Primary DNS	As defined by your network's system administrator	Sets the address for the primary DNS server that is configured to resolve domain names
	Secondary DNS		Sets the address for the secondary DNS server that is configured to resolve domain names
COM1 Setup	Protocol	ION, Modbus RTU, Modbus Master, DNP v3.00, EtherGate, GPS: Truetime/Datum, GPS: Arbiter, GPS: Arbiter-Vorne, Factory	Sets the communications protocol for your meter's RS-485 port
	Baud Rate	2400, 4800, 9600, 19200, 38400, 57600, 115200	Sets the data rate, in bits per second
	RTS Delay	0 to 1	Sets the transmit delay in seconds
	Unit ID	1 to 9999	Sets the meter's unique ID on the RS-485 network **NOTE:** Modbus serial device range 0 to 247
	Serial Port	8N1, 8N2, 8E1, 8E2, 8O1, 8O2	Sets the parity and stop bits for the port
	RS485 Bias	Off, On	Turns on biasing when mastering devices over the RS-485 port
NTP Address	NTP Server	As defined by your network's system administrator	Specifies the IP address of the SNTP or NTP server used by the meter for time synchronization
SMTP Address	SMTP Server	As defined by your network's system administrator	Specifies the IP address of the SMTP server used by the meter for sending email

Display Setup

Screen title	Parameter	Values	Description
Screen Setup	Backlight Timeout	0 to 720	Specifies how many seconds the display's backlight remains lit after the last button press
Label & Symbol Setup	Phase Lbls	ABC, 123	Sets the voltage and current phase labels
	Measurement Symbols	IEEE, IEC	Specifies whether IEEE or IEC measurement symbols are applied to displayed values
	PF Convention	IEEE, IEC	Specifies whether IEEE or IEC power factor conventions are applied to displayed values
Numeric Format Setup	Digit Grouping	1000.0, 1,000.0, 1 000,0	Specifies how digits are grouped for display
	Volts Resolution	1., 1.X, 1.XXX, 1.XXXX	Specifies the number of decimal places displayed for voltages
	Current Resolution	1., 1.X, 1.XXX, 1.XXXX	Specifies the number of decimal places displayed for currents
	Power Resolution	1., 1.X, 1.XXX, 1.XXXX	Specifies the number of decimal places displayed for power and energy measurements

Date/Time/Clock Setup

Screen title	Parameter	Values	Description
Date & Time Setup	Time Format	12 H, 24 H	Specifies how the time is displayed
	Date Format	MM/DD/YYYY, DD/MM/YYYY, YYYY/MM/DD	Specifies how the date is displayed
	TZ Offset	-12:00:00 to 12:00:00	Sets the time zone of the meter's location, relative to UTC
	DST Offset	-3:00:00 to 3:00:00	Sets the daylight savings time offset of the meter's location

Screen title	Parameter	Values	Description
Clock Setup	Clock Source	Internal, Line Freq, COMM	Specifies the time synchronization source
	Time Sync Source	COM1, Ethernet, Ethernet - ION, Ethernet - DNP, IRIG-B	Specifies the port to receive time synchronization signals
	Time Sync Type	UTC, Local	Specifies whether time synchronization signals are received in local time or UTC

Alarm Setup

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

You can disable alarms through the display in order to prevent nuisance alarms:

Screen title	Parameter	Description
Alarm Setup[1]	Over I unbal	Over unbalanced current alarm
	Over THD V1	V1 over total harmonic distortion (THD) voltage alarm
	Over THD V2	V2 over total harmonic distortion (THD) voltage alarm
	Over THD V3	V3 over total harmonic distortion (THD) voltage alarm
	Over P sd	Over kW sliding demand alarm
	Over Ia	Ia over current alarm
	Over Ib	Ib over current alarm
	Over Ic	Ic over current alarm
	Over I4	I4 over current alarm
	Over V unbal	Over unbalanced voltage alarm
	V1 Setpoint	V1 setpoint alarm
	V2 Setpoint	V2 setpoint alarm
	V3 Setpoint	V3 setpoint alarm
	Freq Setpoint	Frequency setpoint alarm
	Sag/Swell 1	Voltage sag/swell alarm
	Current Sag Ph1	Current sag alarms for phase 1
	Current Sag Ph2	Current sag alarms for phase 2
	Current Sag Ph3	Current sag alarms for phase 3
	4-30 Volt Intrp Ph1	4-30 voltage interruption power quality alarm for phase 1
	4-30 Volt Intrp Ph2	4-30 voltage interruption power quality alarm for phase 2
	4-30 Volt Intrp Ph3	4-30 voltage interruption power quality alarm for phase 3
	Current Swell Ph1	Current swell alarms for phase 1
	Current Swell Ph2	Current swell alarms for phase 2
	Current Swell Ph3	Current swell alarms for phase 3

[1] Any Setpoint or Relative Setpoint module with an event priority greater than the low alarm event priority is also displayed on this screen.

You can only enable or disable alarms using the display. Alarm configuration is done using ION Setup. Alarms with a priority less than low (info only or none) are not displayed.

You must configure all the parameters related to the alarm for alarm functions to operate. For example, for the Over Ia alarm to operate, you must enter the nominal value and the conditions that define an alarm state, even if the alarm is shown as Enabled on the Alarm Setup screen.

Language Setup

Select the language to be shown on the meter's display. By default, your meter has the following languages:

- English
- Spanish
- French
- German
- Italian
- Portuguese
- Russian
- Chinese (simplified)

Resets

NOTICE

LOST DATA

Save your meter's data before performing a reset.

Failure to follow these instructions can result in data loss.

The following resets can be performed using the display:

Screen title	Parameter	Description
Resets	Master Reset	• Clears all the cumulative and derived quantities from the meter (including demand, peak demand, energy, revenue and test mode parameters) • Clears meter event and waveform logs • Clears COMTRADE waveform records from the meter's internal FTP server • Clears the meter's data logs
	Peak Demand Reset	Clears the peak demand values logged in the meter
	Min/Max Reset	Clears all accumulated maximum and minimum values stored in the meter
	Digital Input Count Reset	Clears the digital input state change counters
	Harmonics Min/Max Reset	Clears all accumulated maximum and minimum harmonics values stored in the meter
	Disturbance Count Reset	Clears the sag/swell event counter
	EN50160 Reset	Clears all EN50160 parameters and statistics accumulated in the meter
	Option Modules Reset	Restarts all option modules attached to the meter

Password Setup

It is strongly recommended that you change your meter's display (front panel) password from the default value of 0 (zero).

If your meter's user access information is lost, you must return the meter to the factory, where your meter is reset to its factory defaults and all logged data is lost.

NOTICE
DATA LOSS Record your device's user and password information in a secure location **Failure to follow these instructions may result in data loss.**

Screen title	Parameter	Values	Description
Password Setup	Password	0 to 99999999	Sets the password that must be entered in order to configure parameters using the meter's display **NOTE:** This is also the password used to access the meter's webpages when standard security is enabled

Display behavior

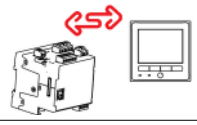
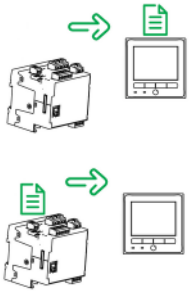
Display backlight

Your meter's display backlight dims after a defined period of inactivity.

When the meter detects an unacknowledged active high priority alarm, the display flashes until the alarm is acknowledged.

Remote display troubleshooting icons

Your meter's remote display shows the following troubleshooting icons in addition to the meter's status LED information:

Icon	Description
	Your remote display cannot communicate to your meter. Check the connection between your meter and the display. Check the meter's status LED to confirm that the meter is operating normally.
	Your remote display needs updated firmware for compatibility with your meter.
	Your remote display is undergoing a firmware upgrade. Do not disconnect your remote display from your meter.

Related topics

- See “Loading remote display firmware using FTP” on page 80 for instructions on how to load remote display firmware.

Localization

The localization settings on the meter affect how information is displayed as well as how some values are calculated. Options include language, number formats as well as the IEEE (Institute of Electrical and Electronics Engineers) or IEC (International Electrotechnical Commission) conventions used for power, power factor and energy.

You can configure your meter’s localization settings using ION Setup.

Related topics

- See the online ION Setup help, available from www.schneider-electric.com, for instructions on how to connect to and configure your meter.
- See “Power and power factor conventions” on page 157 for details on IEEE and IEC power and power factor conventions.

Custom displays

You can create custom displays using ION Setup.

Related topic

- See “Creating custom displays using ION Setup” on page 111 for instructions on how to create custom displays on your meter.

Lost user access

If you lose your meter’s user access information, contact your local Schneider Electric representative for instructions on how to return your meter for factory reconfiguration.

NOTE: Have your meter’s serial number available for reference.

Chapter 6 Option modules

This section supplements the option module installation sheets and provides additional information regarding physical characteristics and capabilities.

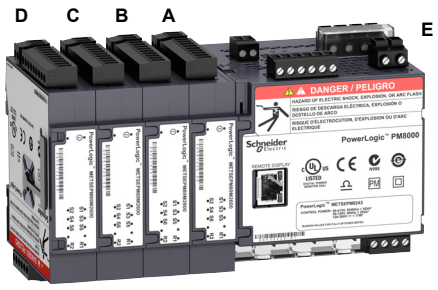
Related topics

- See your device's installation instructions, available from www.schneider-electric.com, for installation instructions and specifications.
- See the PM8000 catalog pages, available from www.schneider-electric.com, or consult your local Schneider Electric representative for information about option modules available for your meter.

Option modules overview

Option modules are ordered separately from your meter, and can be connected to your meter without specialized equipment. Up to four option modules can be added to your meter.

Option modules are identified based on the physical order of the attached modules. The option module attached directly to the meter is module A, the module attached to module A is module B, and so on. The option module identifier is added to the ION module name and ION label to uniquely describe each possible combination of option modules.



A	Option module A
B	Option module B
C	Option module C
D	Option module D
E	Meter

For example, a meter with two option modules, consisting of an analog option module directly attached to the meter (A) and a digital option module attached second (B), describes the Q2 analog output of module A as Port A Q2 and the S3 digital input of module B as Port B S3.

Option modules support

Maximum number of option modules

Depending on the type and quantity of option modules attached to your meter, you may need to reduce your meter's maximum operating temperature.

For a panel mount meter, one limitation on the number of modules that can be attached is the physical strength of the meter mounting hardware. If your meter is mounted in an area subject to vibration or other physical stresses, your meter's ability to physically support multiple option modules and maintain a seal against the mounting surface may be affected.

NOTICE

EQUIPMENT DAMAGE

Do not exceed the maximum number of option modules.

Failure to follow these instructions will result in equipment damage.

Related topics

- See “Specifications” on page 181 for more information about the maximum number and type of attached option modules.

I/O option modules

I/O option modules provide increased digital and analog input/output (I/O) capabilities for your meter.

⚠ WARNING

UNINTENDED OPERATION

Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

These I/O modules can be used to monitor the status of breakers, control analog or digital transducers, or receive signals that can be interpreted to provide WAGES data for your energy system. For applications requiring high accuracy, such as energy pulsing to verify accuracy, the digital output on the meter base is recommended.

Your meter’s digital and analog outputs may change state during a firmware upgrade. Option modules are offline during an option module firmware upgrade; they will not communicate to the meter and the outputs may change state during the upgrade process.

Analog I/O option modules

Your meter’s analog I/O option modules can measure and output either low voltage or current using standard analog transducers such as 4 - 20 mA current transducers.

Analog option module data viewing

To view analog option module data on your meter’s display, go to **Inputs/Outputs** and select either **Analog Inputs** or **Analog Outputs**. If there are no I/O of the specified type, an informative message is displayed.

To view analog option module data on your meter’s webpages, connect to your meter’s webpages, go to **Monitoring > Inputs/Outputs** and select either **Analog Inputs** or **Analog Outputs**. If there are no I/O of the specified type, an informative message is displayed.

Related topics

- See “Analog inputs/outputs” on page 141 for information about analog I/O.

Digital I/O option modules

You can add digital I/O option modules to increase your meter’s capabilities.

Digital option module data viewing

To view digital option module data on your meter’s display, go to **Inputs/Outputs** and select either **Digital Inputs** or **Digital Outputs**. If there are no I/O of the specified type, an informative message is displayed.

To view digital option module data on your meter’s webpages, connect to your meter’s webpages, go to **Monitoring > Inputs/Outputs** and select either **Digital Inputs** or **Digital Outputs**. If there are no I/O of the specified type, an informative message is displayed.

Related topics

- See “Digital inputs/outputs” on page 145 for information about digital I/O.

Option module troubleshooting

Your meter’s option modules operate sequentially; if one module is non-functional all downstream modules may be affected. If your meter cannot communicate with an option module, by default it cycles power to that module and all downstream modules, making multiple attempts to communicate. After the maximum number of communication attempts has been exceeded the meter will remove power to that module and all downstream modules.

When troubleshooting option modules, attach each option module directly to the meter and verify its operation. If each option module operates when directly connected, use combinations of modules or known good modules to help identify the issue.

Events related to option module initialization and operation are stored in your meter’s onboard event log. Perform an option bus reset to restart the option bus and re-initialize the option modules attached to your meter.

Information about your option module’s type, serial number, firmware version and present status is available in the Factory and Diagnostics modules.

Related topics

- See the *ION Reference*, available from www.schneider-electric.com, for more information about the Factory and Diagnostics modules.

Option module reset

During an option module reset, your option module may not operate normally, and digital and analog outputs may change state.

⚠ WARNING

UNINTENDED OPERATION

Do not use this meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

You can reset your meter's option module bus through the display or using ION Setup. This power cycles all the modules attached to your meter. If you have queued firmware updates for your option modules on your meter's internal FTP site, the firmware updates are performed. Your option modules do not operate normally during an option module reset.

By default, your meter is configured so that your meter automatically performs an option bus reset when needed to help keep the option modules operating normally. Contact Technical Support for instructions on changing this default configuration.

Related topics

- See "Meter resets" on page 153 for more information about the resets you can perform on your meter.
- See "Firmware and templates" on page 77 for information about uploading option module firmware.

Chapter 7 Security

Security overview

You can configure standard or advanced security on your meter, as well as optional revenue security.

Your meter comes with configurable security that you can set to either standard or advanced, which helps protect against unauthorized configuration of your meter and access to your meter's data through the meter's display or communications. Your meter has features that allow you to enable/disable Ethernet protocols and port numbers. Your meter also supports revenue locking, which incorporates revenue security on all revenue-related parameters and revenue sealing.

Your meter ships from the factory with standard security enabled.

Standard and advanced security features

Security allows you to configure the following security features to your meter:

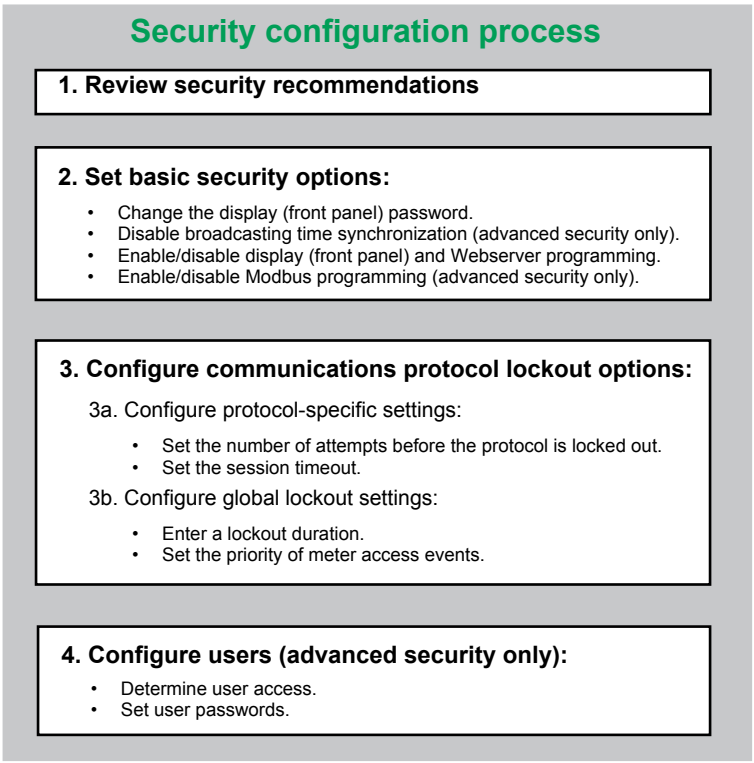
Parameter	Standard/advanced	Details
Meter password	Standard/advanced	The meter's password is used to confirm user access when configuring the meter through the display or over communications. The default meter password is 0 (zero).
Active web server	Standard/advanced	This option allows you to enable or disable the ability to configure your device using webpages.
Allow Modbus programming	Advanced only	This option can only be enabled in advanced security and is disabled for standard security.
Allow front panel programming	Standard/advanced	This option allows you to enable or disable the ability to configure your device using the display.
Allow broadcasting time synchronization	Advanced only	This option can only be disabled in advanced security and is enabled for standard security.
Protocol lockout	Standard/advanced	This option allows you to configure the number of access attempts before lockout, lockout duration and meter access event priorities.

Advanced security user configuration

Advanced security allows you to configure users with specific access levels and passwords.

Security configuration process

The following is an overview of the process to configure security on your meter:



Communications protocol lockout overview

The communications protocol lockout security feature allows you to set the number of invalid login attempts that each user can make using a particular protocol and communications method before being locked out (a user is defined as a user login and password combination). For protocols that are not session-based (ION), you can configure how often the device registers invalid login attempts by configuring the session timeout. You can also configure the lockout duration for all configurable protocols.

NOTE: If protocol lockout is set to 0 (zero) there is no limit to the number of invalid login attempts and the protocol will never be locked out. However, the invalid login attempt events are recorded if the meter access events are configured to record invalid access attempts.

Session timeout specifies the active duration for a protocol; during this time, repeated invalid login attempts using the same USER/password combination are not registered (repeated invalid attempts with different combinations are still registered). Session timeout only applies to protocols which are not session-based and send credentials with each packet, and should be configured to help prevent accidental lockouts and filling the meter's event log with protocol access events.

Once a user is locked out, the device will not accept login attempts from that user on that protocol and communications method until the lockout duration has passed. Invalid login attempts accumulate until the user has completed a valid login or been locked out. For example, once USER01 has been locked out using ION over Ethernet, USER01 cannot access the device using ION over Ethernet until the lockout duration has

passed, even if USER01 enters the correct password. However, if the user enters the correct USER/password combination before being locked out, the invalid attempt counter is reset to zero. Even if the user is locked out using ION over Ethernet, that user can still access the device by entering the correct USER/password combination over a different protocol and communications method (for example, connecting to the device's RS-485 serial port using Modbus protocol).

Related topics

- See "Configuring standard security using ION Setup" on page 87 for instructions on how to set basic security and configure communications protocol lockouts.
- See "Protocols, ports and connections" on page 52 for details of the supported Ethernet protocols, enabling/disabling protocols and changing port numbers.
- See "Specifications" on page 181 for the number of configurable users in advanced security.
- See the ION Reference for more information about the Security Options, Security User and Communications modules.

Security recommendations and best practices

Recommended security configuration

The following meter configuration is recommended to help improve security on your meter.

- Ensure that your meter requires a password for configuration through the display or communications.
- Configure the protocol lockouts to help minimize access to your meter.
- Enable advanced security on your meter.
  - Configure users and passwords to help minimize access to your meter.
- Save a copy of your meter's ION Setup security configuration (*.scf) file in a secure location for future reference or troubleshooting. Your meter's security configuration file can be loaded onto other meters of the same type to configure their security settings.

Password best practices

- Change your meter's display (front panel) password from the default value of 0 (zero).
- Make your meter's display and user-specific passwords as complex as possible.
- Schedule regular changes to your meter's display and user passwords.
- Record your meter's display and user passwords in a secure location.

If your meter's user access information is lost, you must return the meter to the factory, where your meter is reset to its factory defaults and all logged data is lost.

NOTICE
DATA LOSS Record your device's user and password information in a secure location. **Failure to follow these instructions may result in data loss.**

Additional security recommendations

- Disable communications for all unused Ethernet network protocols.
- For the highest level of security, use a revenue-locked meter with advanced security enabled and configured for minimum access.
- Save a copy of your meter's security configuration (*.scf) file in a secure location for future reference or troubleshooting. Your meter's security configuration file can be loaded onto other meters of the same type to configure their security settings.
- Set your meter's time synchronization source to a secure communications port, and disable time synchronization on all other ports.

Related topics

- See "Protocols, ports and connections" on page 52 for more information about your meter's Ethernet network protocols.

Changing your meter's display password using the display

You can change your display password using your meter's display.

NOTE: The display password is also used as the webpage password if standard security is enabled.

1. Go to **Setup Menu > Password Setup**.
2. Configure your meter's display password.

Related links

- See "Setting up your meter using the display" on page 34 for instructions on how to configure your meter using the display.

Chapter 8 Communications

Your meter has one RS-485 connection and two Ethernet connections. The two Ethernet connections have the same IP address; you cannot connect your meter to two different Ethernet networks.

Ethernet communications

Connections

The meter supports a single IP address on both of its two physical Ethernet connections.

Related topics

- See your device's installation instructions, available from www.schneider-electric.com, for communication connection details.

Ethernet LEDs

Your meter has two LEDs that indicate the status of its Ethernet communications:

Link (data rate)	On: valid Ethernet connection • Yellow: data rate is 10 Mbps • Green: data rate is 100 Mbps
Act (activity)	Flashing green: data is being transferred

Related topics

- See your meter's installation sheet for Ethernet wiring information.
- See "Ethernet communications" on page 183 for your meter's Ethernet specifications.

Configuration

In order to use Ethernet communications, you must configure your device's IP address; you must also configure the subnet and gateway information if required by your network. You need to enter network information for any Ethernet servers used by the device (such as for SNTP time synchronization).

NOTE: Contact your network system administrator for your IP address and other Ethernet network configuration values.

Configure your device's Ethernet settings by using the display or directly connecting to your meter and using a web browser to access the device's webpages. Modify your meter's Ethernet settings to those provided by your network system administrator before connecting the device to your local area network (LAN).

After the meter's Ethernet port is configured and connected to the LAN, you can use ION Setup to configure other meter setup parameters

Related topics

- See “Setting up your meter using the display” on page 34 for instructions on how to configure Ethernet communications using your meter’s display.
- See “Self-discovery over Ethernet” on page 53 for instructions on how to connect to and identify your meter over a directly connected network.
- See “Configuring network communications using ION Setup” on page 90 for instructions on how to configure your meter’s Ethernet communications using ION Setup.
- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Communications module and its settings.

Protocols, ports and connections

The Ethernet protocols supported by your device allow simultaneous connections on the following IP service ports:

Protocol	Port (default)	Number of connections
ION	7700	8[1]
DNP	20000	
Modbus TCP	502	
Modbus RTU over Ethernet	7701	
Modbus TCP (dedicated)	502	32
EtherGate	7801	1
FTP	21 (20)	2
Webserver (HTTP)[2]	80	10
SNMP	161	N/A
SMTP server (email) outgoing only	25	1
NTP	123	1
IEC 61850	102	4

[1] These 8 simultaneous connections can be used by ION, Modbus TCP, Modbus RTU over Ethernet, or DNP. You can have a maximum of 3 DNP connections.

[2] This is used for the meter’s webpages.

By enabling or disabling TCP/IP protocols, you can control whether or not your meter accepts new socket connection requests from the TCP/IP protocols supported by the meter. Changing settings does not impact existing connections. Depending on the protocol, you can also change the port number.

If you configure communications so that you cannot communicate to and configure your meter, you must return the meter to the factory, where your meter is reset to its factory defaults and all logged data is lost.

NOTICE

DATA LOSS

Ensure you maintain sufficient access to communicate to and configure your device.

Failure to follow these instructions may result in data loss.

Related topics

- See “Protocols” on page 57 for more information about the protocols supported by your meter.
- See “Network settings” on page 90 for instructions on how to enable/disable your meter’s TCP/IP protocols using ION Setup.

Ethernet topologies

Your device's Ethernet ports have the same IP address. The second Ethernet port acts as an Ethernet switch to help simplify network connections and reduce installation time and costs, by having shorter Ethernet cable runs between devices without needing additional Ethernet routers or repeaters. Your Ethernet connection source should be installed in a location that helps minimize the overall Ethernet cable routing length and complexity of your network.

Each of your device's Ethernet ports has full transmit/receive bandwidth: this means they do not split the signal, so connecting both of your device's Ethernet ports should not impact your communications speed.

When wiring your meter's Ethernet communications, it is recommended to only use straight-line topology. If local network loop or ring Ethernet topologies are required, you must enable RSTP (rapid spanning tree protocol) for your meter's Ethernet communications to function.

Internet protocol (IP) versions and supported features

Your meter supports both IPv4 and IPv6 (local addressing).

Your meter supports DPWS (devices profile for web services). This feature allows for self-discovery of the meter when directly connected on IPv6 local area networks.

Related topics

- See "Configuring network communications using ION Setup" on page 90 for instructions on how to enable and disable IPv6 on your meter.

Self-discovery over Ethernet

When you connect your meter directly to your computer, your meter automatically appears on the network. By default, the meter is named PM8000_<last six digits of MAC address>.

NOTE: You do not need to configure your meter's IP address for self-discovery over Ethernet; an IPv6 address is automatically generated from your meter's MAC address and self-discovery takes place over IPv6.

For example, a meter with a MAC address of 0060784173393 appears on the network as PM8000_713393.

Double-clicking the meter's network icon takes you to the meter's webpages, where you can view data and perform basic meter configuration.

NOTE: For self-discovery, the meter must be connected directly to the computer using only a cable or switches, and not by a router.

Serial communications

The meter supports serial communications through the RS-485 port. Up to 32 devices can be connected on a single RS-485 bus.

In an RS-485 network, there is one master device, typically an Ethernet to RS-485 gateway. It provides the means for RS-485 communications with multiple slave devices (for example, meters). For applications that require only one dedicated computer to

communicate with the slave devices, an RS-232 to RS-485 converter can be used as the master device.

Related topics

- See your device's installation instructions, available from www.schneider-electric.com, for details on how to physically wire your meter's RS-485 connections.
- See "RS-485 communications" on page 183 for specifications related to serial communications.

Serial protocols and ports

Your meter supports the following protocols on its RS-485 serial port:

Protocol
ION
Modbus RTU
Modbus Master
DNP 3.0
EtherGate
GPS: Truetime/Datum[1]
GPS: Arbiter[1]
GPS: Arbiter-Vorne[1]

[1] These protocol settings are for connecting to a GPS receiver communicating in serial ASCII format.

Related topics

- See "Protocols" on page 57 for more information about the protocols supported by your meter.

RS-485 connections

Your meter has one RS-485 connection.

Related topics

- See the "RS-485 communications" on page 183 for maximum devices and wire length.
- See your device's installation instructions, available from www.schneider-electric.com, for communication connection details.

RS-485 configuration

Before connecting your device to the RS-485 bus, use the meter's display, webpages or ION Setup to configure your meter's default RS-485 settings so that it has a unique unit identifier (address) and the following settings match the rest of the devices on the RS-485 bus:

- Protocol
- Baud rate
- Parity and stop bits

You can configure the following settings to help optimize communications performance:

- RTS delay
- RS-485 bias

You can use a communications converter (USB to RS-485 or RS-232 to RS-485) or an Ethernet gateway device to connect to your meter.

RS-485 bias

You can use the RS-485 bias setting to fine tune communications. Turn on the RS-485 bias when the meter is acting as a master over RS-485 communications and turn off the RS-485 bias when the meter is acting as a slave. You can configure RS-485 biasing through the meter's display or ION Setup.

RS-485 and gateway communications

Your meter can act as a gateway from the devices on the RS-485 bus to another communications port on the meter. For example, you can configure your meter as an Ethernet gateway, which lets you communicate through the meter's Ethernet port to the serial devices connected to the meter's RS-485 port using the ION protocol (EtherGate) or Modbus protocol (Modbus gateway).

Related topics

- See the "Configuring an EtherGate gateway using ION Setup" on page 93 for instructions on how to configure EtherGate on your meter.
- See the "Configuring a Modbus gateway using ION Setup" on page 92 for instructions on how to configure Modbus gateway on your meter.

Configuring communications using the display

You can configure your meter's basic communications settings using the display.

Before configuring Ethernet parameters, make sure you obtain your meter's IP address and other network information from your network administrator or IT department.

Before configuring serial parameters, make sure you have a unique unit ID for your meter and know the serial network settings (protocol, baud rate, parity and stop bits).

1. Go to **Setup Menu** > **Communications Setup** > **IP Address Setup**. Configure your meter's IP Address and other network information as required.

   NOTE: Your meter's default IP address is 169.254.0.10

2. Press the down button to access the next screen of meter communications settings and configure as required.

Related links

- See "Setup menu" on page 33 for a description how to navigate and use your meter's display.

Chapter 9 Protocols

Protocols overview

Your meter supports several different protocols over its Ethernet and serial connections.

Your meter's default protocol implementation meets the needs of most systems with only basic configuration. You can customize these implementations to meet your specific needs; these are advanced procedures that require an understanding of ION architecture, the supported protocols, and the communications network and power system that your meter is connected to.

ION

ION is the native protocol and architecture of your meter. The basic building blocks of ION architecture are the ION modules, each of which is specialized to perform a specific task and contains data and instructions on how to manage that data. ION modules are combined (linked) together to create the meter's functions and features. ION modules that are linked together to perform a specialized task are called a framework, such as the Power Quality framework. These different functional frameworks are then grouped together to define the entire meter, and are collectively referred to as the device template.

Your meter ships with a default device template which provides extensive capabilities. You can also configure your meter's template to modify your meter's existing functions or to create new functions.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for further information about ION architecture and a detailed description of the different ION modules.
- See the *ION Device Template Reference,* available from www.schneider-electric.com, for details on the modules and their configuration in your meter's default template.

Modbus

Modbus is a master/slave communications protocol where the master initiates transactions and the slave(s) responds with the requested information or action. Your device can function as a Modbus slave or Modbus master, depending on how it is configured. Your device comes with Modbus slave functionality configured and ready to use. You can add custom Modbus information to the default Modbus slave data provided by your device.

Key terms

Term	Definition
Modbus gateway	A communications method that lets you communicate through an Ethernet gateway device to a Modbus serial network connected to that device.
Modbus master	A device that issues commands and receives responses from Modbus slave devices. Serial Modbus networks can only have one Modbus master per network.

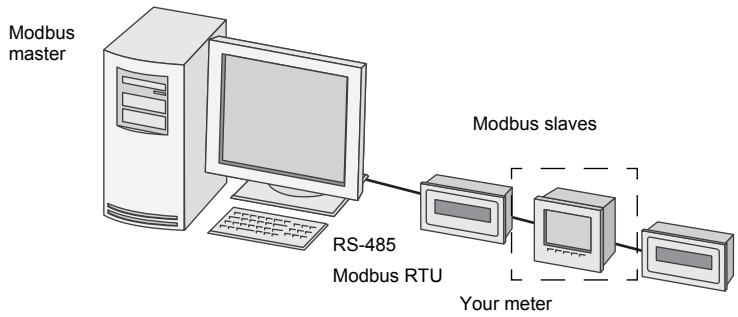
Term	Definition
Modbus RTU	Serial Modbus protocol format; Modbus RTU transmits data using binary. Master and slave devices must use the same format.
Modbus register/address	Identifies the data to read/write. Modbus register maps are available for Modbus slave devices and detail the information available from the slave device. More than one register may be used to store a single value.
Modbus slave	A device that responds to Modbus commands and performs actions or provides information back to the Modbus master. Most Modbus networks contain multiple slave devices.
Modbus TCP	The Ethernet Modbus protocol format.
Modbus unit ID	The identifier for a slave Modbus device.

Related topics

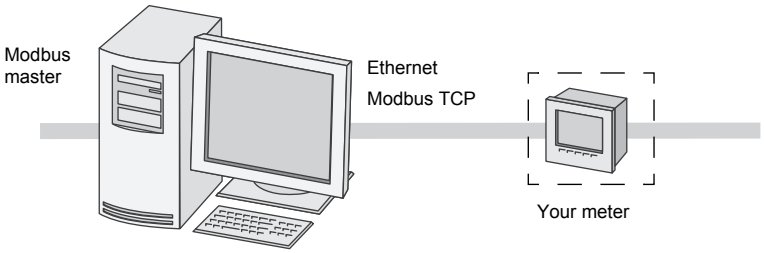
- See “Ethernet gateway (EtherGate and Modbus gateway)” on page 62 for more information about Modbus gateways.
- See “Configuring custom Modbus data using ION Setup” on page 91 for instructions on adding custom Modbus data to your device.
- Download your device’s Modbus map, available from www.schneider-electric.com.
- See the *ION Reference*, available from www.schneider-electric.com, for details about the Modbus Master Device, Modbus Master Map, Modbus Master Options, and Data Mapping modules.
- Go to www.modbus.org for information about the Modbus protocol.

Modbus network examples

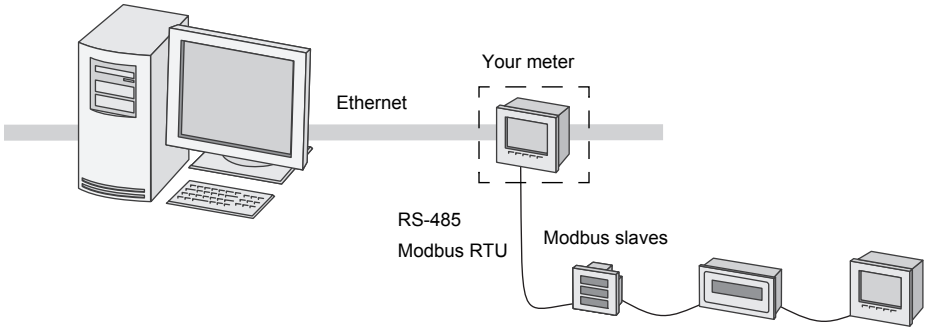
Your meter as a Modbus slave on a serial network



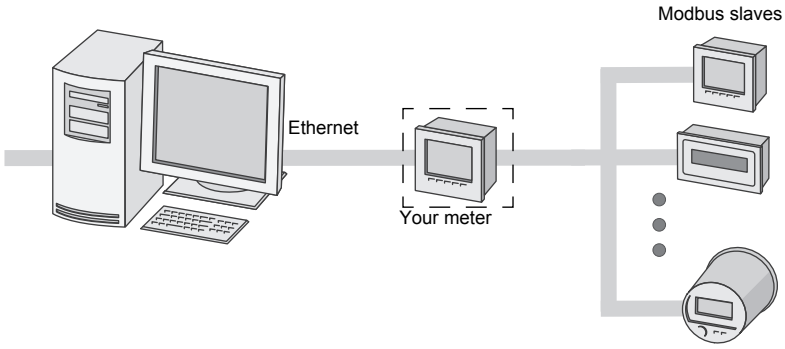
Your meter as a Modbus slave over Ethernet



Your meter as a Modbus master with serial Modbus slave devices



Your meter as a Modbus master with Ethernet Modbus slave devices



Supported features

Modbus data classes

Class	Description
Coils	Digital bits that can be read and written to
Input status	Digital bits that can be read
Input registers	16-bit integers that can be read
Holding registers	16-bit integers that can be read and written to

Modbus data formats

Format	Type	# of Modbus registers used
Unsigned 16-bit	Integer	1
Signed 16-bit	Integer	1
Unsigned 32-bit	Integer	2
Signed 32-bit	Integer	2
Unsigned 32-bit M10k	Integer	2
Signed 32-bit M10k	Integer	2
IEEE float[1]	Floating point	2
Packed Boolean for inputs	Integer	1
Packed Boolean for coils	Integer	1
Unsigned 16-bit read/write	Integer	1
Signed 64 bit	Integer	4

[1] Meters acting as Modbus masters support two versions of IEEE float with different word orders: high/low = Big Endian, low/high = Little Endian.

16-bit data (one word) is transmitted with most-significant byte first and least-significant byte second.

32-bit data (two words) is transmitted with the most-significant word first and the least-significant word second.

Modbus function codes

Function	Description	Master/slave
1	Read coil status	Master and slave
2	Read input status	Master and slave
3	Read holding registers	Master and slave
4	Read input registers	Master
5	Write to a coil	Master
6	Write to a holding register	Master and slave
15	Write to multiple coils	Master
16	Write to multiple holding registers	Master and slave
17	Report slave ID (serial only)	Master and slave
43 (subcode 14)	Read device identification	Master and slave
100	Read scattered holding registers	Master and slave

Modbus commands

A Modbus master command to unit ID 0 is broadcast (sent to) all Modbus slave devices. The only supported broadcast command is preset multiple registers.

For serial Modbus networks with only one slave device, the master can send commands using the single connection, one-to-one address of unit ID 248, regardless of the slave device's actual unit ID.

Modbus implementation

Modbus exception codes

Code	Name	Description
01	Illegal function	The requested command is invalid.
02	Illegal address	This code indicates one of the following: • The requested address is invalid for that function. • The requested address is not within the valid register range for this device. • The requested address is protected by device security.
03	Illegal value	This code indicates one of the following: • The requested value is not allowed for that register in the device. • The requested register is part of a multi-word value.

Modbus invalid read registers responses

Invalid type	Read response
Unmapped (unused)[1] register	0x8000
Reserved[1] register responses by type	
Signed integer 16-bit	0x8000
Unsigned integer 16-bit	0xFFFF
Signed integer 32-bits	0x80000000
Unsigned integer 32-bits	0xFFFFFFFF
Signed integer 64-bits	0x8000000000000000
Float32	0xFFC00000 (NaN = Not a number)

[1] Unmapped (unused) registers are registers that will never be used by the meter, and therefore have no defined format. Reserved registers have a defined format and are intended for use by the meter, its options or its variants.

Modbus invalid write registers response

If the meter receives a write command to a Modbus register address that does not have a register mapped, the meter does not respond. No data is written or stored, and the meter does not send back a rejection to the request.

If the meter receives a write command to a read-only Modbus register address, exception code 3 (illegal value) is returned.

Fixed and configurable Modbus map

Your device has a fixed (static) register map for meter data and a flexible, user-configured register map.

Modbus security

Your meter's onboard security options include Modbus-specific settings. These security settings may need to be configured in order to write Modbus data to the meter.

Modbus TCP ports

Port	Descriptions
502	Modbus TCP
7701	Modbus RTU over Ethernet

Modbus best practices

Serial

In order for your meter to operate as a serial Modbus device, you must complete the following prerequisites:

Prerequisite	Description
Wiring	The device's serial connection must be wired correctly. The Modbus slave devices must have communications wiring to the Modbus master.
Protocol	Slave: for your meter to be a serial Modbus slave, the meter's protocol must be set to Modbus RTU. Master and slave devices must use the same format. Master: for your meter to be a serial Modbus master, the meter's protocol must be set to Modbus Master.
Baud rate	The baud rate must be the same for all devices on the serial Modbus network.
Stop bits and parity	The communication stop bits and parity (for example, 8N1) must be the same for all devices on the serial Modbus network.
Unit ID	Each device on the serial Modbus network must have a unique unit ID (also called the device address).

Ethernet

In order for your meter to operate as an Ethernet Modbus device, you must complete the following prerequisites.

NOTE: You do not need to perform any Modbus-specific configuration for your meter to function as a Modbus slave device over Ethernet.

Prerequisite	Description
Ethernet	All devices must have a working Ethernet connection.
IP address	All devices must have a unique IP address.
Port	All devices must be communicating over Ethernet port 502 for Modbus TCP.

NOTE: Devices supporting multiple simultaneous Modbus TCP connections can have communications delays. Adjust your network timeout settings to accommodate this.

Modbus master

In order for your meter to operate as a Modbus master, you must complete the following prerequisites.

NOTE: These settings are required in addition to the serial or Ethernet Modbus prerequisites.

Prerequisite	Description
Modbus slave devices	All Modbus slave devices must be communicating and appropriately configured.
Protocol	• Modbus mastering serial devices: the master's serial port protocol must be set to Modbus master. • Modbus mastering Ethernet devices: the master must be communicating to the slave devices over Ethernet port 502.
Mastered devices	The Modbus master device must have the slave device information entered for mastering.

Modbus map

Your device's Modbus register information (map) is available for download from www.schneider-electric.com. The Modbus register information includes:

- registers and mapped values
- formats and scaling
- additional details where applicable

Configuring your meter for Modbus using the display

You can use the display to configure your meter as a Modbus slave or partially configure your meter for Modbus mastering.

NOTE: Before your begin, your meter's communications must be wired and configured.

Your meter does not require any Modbus-specific configuration to act as a Modbus slave device over Ethernet.

1. Navigate to **Setup Menu** > **Communications Setup** and select the serial communications setup screen.
2. Configure the serial port's Modbus parameters as required.

Parameter	Setting
Protocol	Modbus RTU or Modbus master
RS485 Bias	• Off if the meter is a Modbus slave • On if the meter is a Modbus master

3. Configure the meter's other serial port parameters as required.

   For Modbus master, you must add the Modbus slave devices using ION Setup.

Related topics

- See "Setting up your meter using the display" on page 34 for instructions on display menu navigation.

Ethernet gateway (EtherGate and Modbus gateway)

Ethernet gateway is a communications method that allows you to communicate through a gateway device to a serial network.

When a meter with gateway capabilities is installed on an Ethernet network, a master device (such as an energy management system) can communicate through the

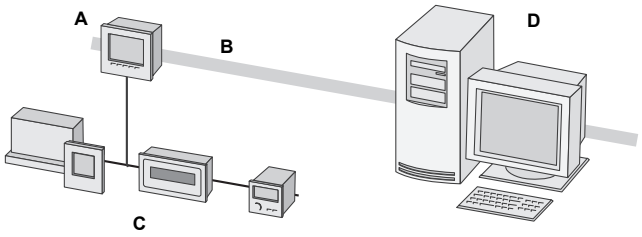
gateway meter to a serial network of devices connected to the gateway meter's serial port(s). The maximum number of devices on the serial network is determined by the limitations of the gateway meter's serial port.

There are two types of Ethernet gateways that you can configure on your meter:

- EtherGate: a single TCP connection communicates through the gateway meter to a serial network of ION devices.
- Modbus gateway: up to a maximum of 32 Modbus master TCP connections communicate through the gateway meter to a serial network of Modbus devices.

EtherGate

The meter can function as an Ethernet gateway (EtherGate). EtherGate is a protocol-agnostic communications method that lets you communicate through a gateway meter to a serial network of devices letting ION or other RTU over TCP data pass through the gateway meter to other networks, including third party systems. When a meter installed on the Ethernet network has EtherGate enabled, a master device (such as an energy management system) can communicate through the gateway meter to a serial network of devices wired to the gateway meter's COM port. You must create an additional communications connection to the gateway meter in order to read its information.



A	Gateway meter
B	Ethernet (single TCP connection)
C	Serial network of devices
D	Master device (one only)

For EtherGate, you must install the serial devices, configure them and connect them to your Ethernet-connected gateway meter. Ensure that each serial device is configured with the same protocol and baud rate and has a unique unit ID. Configure the gateway meter's serial port to use the EtherGate protocol, create the EtherGate site in ION Setup or an energy management system, and add the serial devices to the EtherGate site.

NOTE: EtherGate supports only one master device.

Related topics

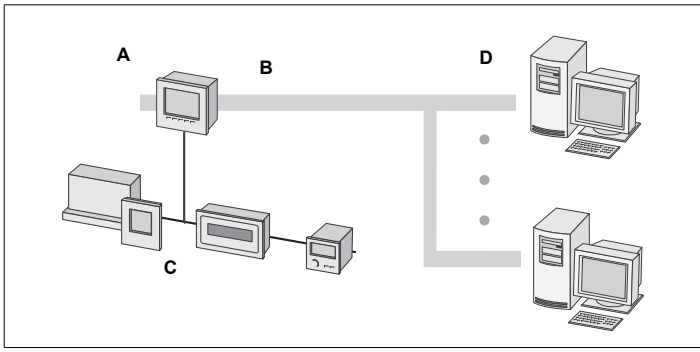
- See "Configuring an EtherGate gateway using ION Setup" on page 93 for instructions on setting up an EtherGate gateway.
- See "Specifications" on page 181 for how many serial devices your meter can support.

Modbus gateway

In a Modbus gateway configuration, a Modbus master device can communicate using Ethernet through the gateway meter to downstream serial devices.

A Modbus request is sent through Ethernet using Modbus/TCP to the gateway meter. If this request is addressed with the slave ID of one of the downstream serial devices, the meter forwards the message to that device using Modbus RTU. When the downstream device responds, the gateway meter forwards the response back to the

Modbus master. In addition to Modbus slave addresses 0 - 247, the Modbus gateway supports slave address 255, which sends a Modbus request to the gateway meter only.



A	Gateway meter
B	Ethernet (multiple Modbus master TCP connections)
C	Downstream serial Modbus slave devices
D	Multiple Modbus master devices

The maximum number of Modbus gateway Ethernet connections available is equal to the number of Modbus TCP connections the gateway meter can handle.

For Modbus gateway, you must install the serial Modbus slave devices, configure them and connect them to your Ethernet-connected Modbus gateway meter. Ensure that each serial device is configured to communicate over Modbus with the same baud rate and has a unique unit ID. Configure the gateway meter's serial port to use the Modbus master protocol and enable the Modbus gateway feature, create a Modbus gateway site in ION Setup or an energy management system, and add the serial devices to the Modbus gateway site.

Related topics

- See "Configuring a Modbus gateway using ION Setup" on page 92 for instructions on setting up a Modbus gateway.
- See "Specifications" on page 181 for how many serial devices your meter can support.

Configuring EtherGate using the display

You can use the meter's display to configure a serial port to use the EtherGate protocol.

1. Navigate to **Setup Menu** > **Communications Setup** and go to the serial communications setup screen.
2. Set the serial port's protocol to EtherGate. Configure the other serial port parameters as required.

Related topics

- See "Setting up your meter using the display" on page 34 for instructions on how to navigate and use your meter's display.

FTP

Your meter has an internal FTP server where you can load custom webpages and other files onto your meter, and where the meter provides files created by meter features such as COMTRADE waveform records.

File transfer protocol (FTP) is a standard, client-server network protocol used to transfer files over TCP (Ethernet) networks.

NOTE: You can update the firmware on your meter's accessories using your meter's FTP site.

FTP memory allocation

Your meter's FTP memory usage changes when you copy a file to the meter's internal FTP site or modify a feature that uses the meter's FTP site.

If you attempt to load a file onto your meter's FTP site that is too large, your FTP program displays an error, and you must delete files from your meter's internal FTP site to free up memory before loading the file.

If you modify a meter feature which uses FTP memory, such as increasing the number of COMTRADE waveform records, the meter checks to confirm sufficient space is available on its internal FTP site before enabling the modified feature. If there is insufficient space, the feature is disabled, and you must delete files from your meter's FTP site to increase the available space before enabling the feature.

FTP file structure and permissions

Your meter's FTP folder structure is as follows:

- COMTRADE: you can read COMTRADE files from these folders, but you cannot delete or add files to these folders.
- IEC61850: you can add an IEC 61850 configuration (CID) file to this folder to activate the IEC 61850 protocol functions of your meter.
- optionModuleUpg and rmdUpg: you can load firmware update files for your meter's remote display or option modules into these folders.
- documents: this folder is intended for user storage. You can read, write and delete any type of files in this folder.
- web: this folder is where the meter's default webpages are stored and where you can add custom webpages to the meter by copying them into the appropriate sub-folders.

FTP filename requirements

FTP filenames are limited to standard ASCII characters, meaning that they cannot contain a blank space, quotation marks or \, /, *, ?, < or >, and are limited to 68 characters in length, including the file extension. The "/" character is only used as part of the FTP file directory information.

NOTE: FTP files from your meter can only be accessed and modified by Windows-based machines.

Supported FTP features

Ports

Port	Description
21	Command connection
20	Data connection (active and passive)

Your meter's command connection FTP port is configurable, and the data connection port is automatically assigned to the command connection port number minus 1.

FTP software

The recommended FTP software is Filezilla, WinSCP or Windows Explorer running on a Windows-based machine.

Related topics

- See “Specifications” on page 181 for the maximum number of FTP sessions and default timeout value.

Accessing your meter’s FTP server

You must have FTP software such as Filezilla, WinSCP or Windows Explorer running on a Windows-based machine to transfer files to and from your meter’s internal FTP server.

1. Start your FTP software.
2. Connect to your meter via FTP by entering your meter’s IP address. Depending on your FTP software and meter security settings, you may be prompted for login credentials.

   NOTE: With standard meter security (no user configured), enter login credentials of 8000 and the meter password to connect to the meter. For advanced meter security, enter a valid user and password.
3. Navigate to the appropriate folder on your meter.
4. Close your FTP software to disconnect from the meter. The FTP connection automatically disconnects once the FTP timeout period has elapsed.

SNMP

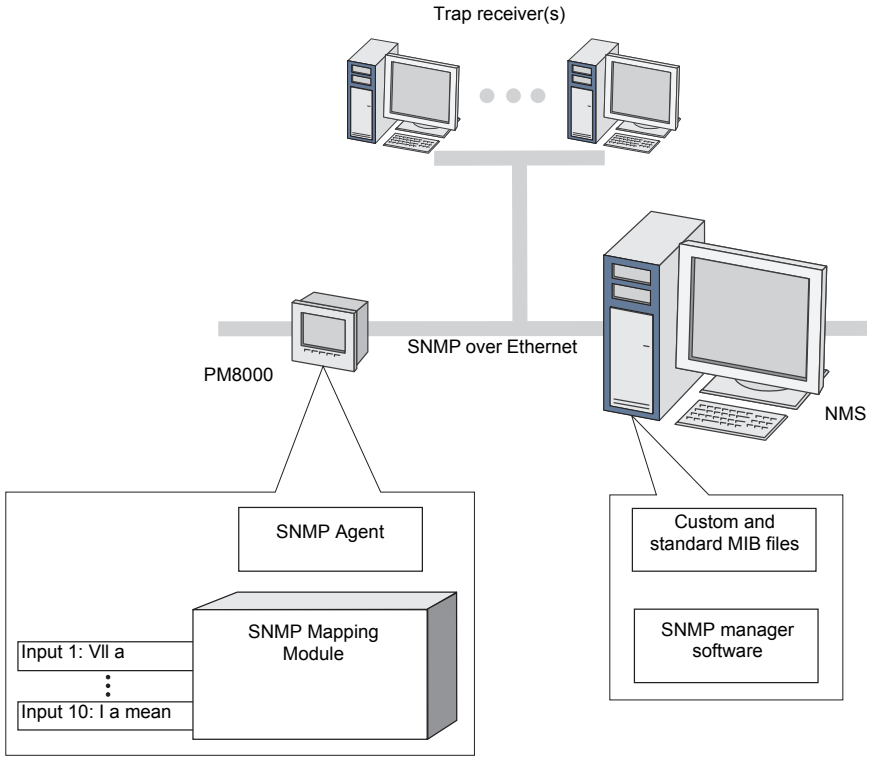
Simple Network Management Protocol (SNMP) is part of the Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite. It is an application layer protocol that enables the exchange of network management information between devices, allowing you to manage network performance and to identify and solve problems on networks with devices of various types.

Your meter supports SNMP once you have enabled SNMP on your meter. You need to upload the your meter’s MIB file (available from www.schneider-electric.com) into the NMS managing your meter.

Key terms

Term	Definition
Agent	Software resident on the managed device which interfaces between the device and the NMS.
Managed device	Your meter in the SNMP network.
Community string	A text string that helps authenticate requests between the managed device and the NMS.
Managed object	Any parameter referenced in the MIB file, for example the parameters linked to the SNMP Mapping module on your meter.
MIB	A management information base which organizes the OIDs in a hierarchical tree.
NMS	A network management station, manager or client that executes applications to monitor and control devices. An NMS must have the standard and custom MIB files and SNMP manager software.
OID	An object identifier that uniquely identifies and labels a managed object in the MIB.
Trap receiver	An NMS that is configured to receive traps and whose IP address is an SNMP trap destination.

The meter in an SNMP system



SNMP implementation

MIB files

SNMP requires that you load your meter's ION MIB file (available for download from www.schneider-electric.com) into the NMS.

Your meter is compliant with MIB-II as defined by the standard MIB file RFC 1213. You must install RFC 1213, which is required to read basic network information for the meter (for example, TCP/IP traffic or number of packets received), if it is not included with your SNMP manager software.

Community strings

A community string is a text string which acts to help authenticate requests from the NMS to your meter. There are two community strings on your meter:

- Read Only Community: this community string is used by SNMP `get` (read-only) requests. The read only community string's initial factory-set value is **public**.
- Read Write Community: this community string is used by SNMP `set` (read/write) requests. The read write community string's initial factory-set value is **private**.

NOTE: You can also use the read write community string for SNMP `get` (read-only) requests.

If your meter receives an incorrect community string, it generates an AuthenticationFailure trap.

System strings

A system string is a text string which can be configured to provide information about your meter. There are three system strings on your meter:

- System contact: enter the name of the SNMP system administrator.
- System name: enter a descriptive name for your meter.
- System location: enter a description of your meter's location.

SNMP trapping

SNMP trapping allows your meter's agent to notify the NMS of events with an unsolicited SNMP message (a "trap" of the meter's alarm event). You can enter up to four IP addresses for SNMP trap notification for generic and enterprise-specific traps. For enterprise traps, you must also define the number of events or maximum time delay before SNMP traps are sent to the NMS.

SNMP trapping is only supported on SNMP v2.

Generic SNMP traps supported by your meter are:

- Coldstart: the meter (SNMP agent) is starting.
- Linkup: the SNMP agent is enabled.
- AuthenticationFailure: the meter (SNMP agent) has received an incorrect community value.

Enterprise-specific SNMP traps supported by your meter are:

- Low: trap of events with a low event priority.
- Medium: trap of events with a medium event priority.
- High: trap of events with a high event priority.

Trap	Event priority range
Low	64 - 127
Medium	128 - 191
High	192 - 255

NOTE: The number of events or maximum time delay settings only apply to enterprise SNMP traps.

SNMP Mapping module

The SNMP Mapping module is linked by default to the most commonly used meter values to make them available to SNMP. Modification of the SNMP Mapping module is an advanced procedure that should only be undertaken by those with an advanced understanding of SNMP, ION architecture and their meter's template.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for detailed information on the SNMP Mapping, SNMP Options and Alarm Options modules.
- See "Configuring SNMP using your meter's webpages" on page 117 for instructions on how to configure your meter's SNMP functions using your meter's webpages.
- See "Configuring SNMP using ION Setup" on page 94 for instructions on how to configure your meter's SNMP functions using ION Setup.

Default SNMP mapping

Enabling SNMP provides SNMP access to the meter values linked to the SNMP Mapping module. You can configure the SNMP Mapping module to link to different meter values. By default, the following meter values are linked to the SNMP Mapping module:

I a	kVAR tot	Vll ca	Vln avg	Ib mean	kW sd mx del-rec
I b	kVA tot	Vll avg	Freq	Ic mx	kW sd del
I c	PF sign tot	Vln a	Ia mx	Ic mean	kW sd rec
I avg	Vll ab	Vln b	Ia mean	kW sd mx del	kW sd del-rec
kW tot	Vll bc	Vln c	Ib mx	kW sd mx rec	kVAR sd mx del
kVAR sd mx rec	kVAR sd mx del-rec	kVAR sd del	kVAR sd rec	kVAR sd del-rec	kVA sd mx del
kVA sd mx rec	kVA sd mx del-rec	kVA sd del	kVA sd rec	kVA sd del-rec	kWh del
kWh rec	kWh del-rec	kVARh del	kVARh rec	kVARh del-rec	kVAh del
kVAh rec	kVAh del-rec				

The following meter information is always provided by default and cannot be configured:

Voltsmode	Model number
Serial number	Device name
Firmware version	MIB version

If you change your meter's default values you must modify the custom MIB file to reflect the new values.

Changing your meter's default SNMP configuration assumes that you have an advanced understanding of ION architecture, SNMP, and the communications network and power system that your meter is connected to.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for detailed information on the SNMP Mapping module.

Configuring your SNMP MIB file

You must configure your MIB file if you have modified the default SNMP information provided by the meter in order for the MIB file labels to reflect the modified values.

Download the ION MIB file from www.schneider-electric.com.

NOTE: You should only configure the variable name and description. Changing other fields in your MIB file may cause the client software to report problems or return errors when trying to retrieve or view parameters.

The variable name must conform to the following rules:

- The first character must be a letter.
- The first character must be lower case.
- The name must not contain any special characters such as *, ?, &.
- The name must not contain spaces.

1. Open your meter's MIB file in a text editing program (such as Notepad).
2. Update the variable name and description so they match the meter values connected to the SNMP Mapping module.

3. Save your meter's MIB file. Make sure you keep the original file extension of .MIB.

Example—This example shows an original and an updated OID entry in an MIB file, where the default meter value of voltage line-to-neutral phase A is modified in the meter's SNMP Mapping module and is now connected to voltage line-to-neutral phase C.

Original OID entry	
Vln_a	OBJECT-TYPE
SYNTAX	DisplayString (SIZE (0. . 255))
ACCESS	read-only
STATUS	mandatory
DESCRIPTION	"Host Meter Voltage Line A to Neutral Units = V (Volts)" ::= { schneiderElectric 34 }

You must update the variable name and description to match the meter values connected to the SNMP Mapping module:

Value	Original	Updated
Variable name	Vln_a	Vln_c
Description	"Host Meter Voltage Line A to Neutral Units = V (Volts)" ::= { schneiderElectric 34 }	Host Meter Voltage Line C to Neutral Units = V (Volts)" ::= { schneiderElectric 34 }

The SNMP client software reads the original and updated file as follows:

Original	Updated
variable name: Vln_a Description: "SNM1 Input 1 - Voltage (line-to-neutral) phase A"	variable name: Vln_c Description: "SNM1 Input 1 - Voltage (line-to-neutral) phase C"

IEC 61850

IEC 68150 is an Ethernet-based protocol designed for electrical substations. It is a standardized method of communications, developed to support integrated systems composed of multi-vendor, self-describing IEDs (intelligent electronic devices) that are networked together.

Your meter can be integrated into an IEC 61850 system as an IED (or server) supporting concurrent IEC 61850 client connections and an FTP connection (used for transferring data or configuration files).

Related topics

- Go to the IEC (International Electrotechnical Commission) website at www.iec.ch for information about the IEC 61850 protocol.
- See the *IEC 68150 and ION Technology* protocol document, available from www.schneider-electric.com, for more information about how IEC 61850 is implemented on your meter.
- See the *ION Reference,* available from www.schneider-electric.com, for a description of the IEC 61850 ION modules.

Implementation

Your meter comes configured with a default set of meter data available to IEC 61850. This default set of meter data is used in the default data sets and reports in the ICD file(s) available for download from www.schneider-electric.com.

NOTE: Select the ICD file that matches your meter's option module configuration.

You must load a valid IEC 61850 configuration (CID) file into the meter's internal FTP site in order to activate the IEC 61850 features of your meter.

NOTE: Your meter can have only one IEC 61850 configuration (CID) file loaded onto its internal FTP storage. If additional CID files are loaded, IEC 61850 functions are deactivated until the additional files are removed.

Your meter has up to five dedicated IEC 61850 client connections.

You can load the IEC 61850 configuration file and configure the IEC 61850 custom modules using ION Setup.

Related topics

- See "FTP" on page 64 for information about your meter's FTP connections and folders.
- See "Loading an IEC 61850 configuration file using ION Setup" on page 95 for instructions on how to load your meter's CID file.
- See "Configuring additional data for IEC 61850 using ION Setup" on page 95 for instructions on how to add extra meter data to IEC 61850.
- See "Configuring digital outputs for IEC 61850 control using ION Setup" on page 113 for instructions on how to configure your meter's digital outputs for IEC 61850.

COMTRADE

COMTRADE stands for COMmon format for TRAnsient Data Exchange defined by IEC 60255-24 edition 2001-05, and defines a common format for power quality event (disturbance) data in order to simplify retrieval, analysis and exchange of disturbance data between multiple sources and vendors.

The format of your meter's COMTRADE files is as defined by IEC 60255-24 edition 2001-05.

Your meter can automatically generate COMTRADE files and store them on the meter's internal FTP site. COMTRADE is configured as part of the default waveform recording but not enabled from the factory.

COMTRADE can be used in conjunction with IEC 61850.

NOTE: If you are generating COMTRADE waveform information, the associated waveform recorders cannot be modified unless COMTRADE is disabled. If the waveform recorders are not configured identically, COMTRADE waveform information will not be generated.

Related topics

- See the *COMTRADE and ION technology technical* note for detailed information about COMTRADE file formats and implementation
- See "Configuring COMTRADE waveform recording using ION Setup" on page 110 for instructions on how to enable and configure COMTRADE waveform recording
- See "FTP" on page 64 for information about your meter's FTP connections and folders.

DNP

The Distributed Network Protocol Version 3.0 (DNP 3.0) is an open protocol used in the electric utility industry for communications and interoperability among substation

computers, Remote Terminal Units (RTUs), Intelligent Electronic Devices (IEDs, e.g. meters), and master stations.

Your meter can be integrated into a DNP network as a DNP slave.

Supported features

Your meter supports a maximum of three concurrent connections (sessions) using the DNP 3.0 protocol; one for each serial port, up to three using Ethernet, or a combination of both. Combinations available depend on the meter's communications options. A session consists of all incoming and outgoing DNP Master/Slave traffic on one of the meter's communications ports.

Default implementation

Your meter is pre-configured for basic DNP Slave functionality. For serial DNP communications, you must assign the DNP protocol to the appropriate serial communication port on your meter; you do not have to configure your meter’s Ethernet port(s).

You can modify your meter’s default DNP map using configuration software.

Importing data using DNP 3.0

Data can be imported into the meter from a DNP control relay or analog output device. This is an advanced feature intended for users with an in-depth understanding of the DNP 3.0 and ION protocols.

Related topics

- See the *PM8000 DNP 3.0 Device Profile* document, available from www.schneider-electric.com, for detailed information on your meter’s default DNP map and implementation.
- See the online ION Setup help for instructions on connecting to your meter and accessing the Setup Assistant, which can be used to modify your meter’s DNP port settings and default DNP map.
- See the *Multiport DNP 3.0 and ION Technology* technical note, available from www.schneider-electric.com, for more information on how your meter supports DNP 3.0.

Chapter 10 Time and time synchronization

Your meter supports different time types and time synchronization methods to adjust its internal clock.

Time overview

Your meter's internal clock is used for keeping time, timestamping data and determining intervals for time-based measurements. The meter's clock does not affect externally logged data.

Your meter monitors the passage of time using the frequency of an internal oscillator or the frequency of the line power being measured. You can view your meter's time and date information using the display or through software. To improve your meter clock's accuracy, you can use an external time reference, such as a Global Positioning System (GPS) signal.

Your meter's battery maintains the internal clock when the meter is unpowered.

Your meter displays local time based on the meter's time sync source and settings for timezone and daylight savings time. You can configure your meter's date and time format.

Related topics

- See "Configuring time and time synchronization using ION Setup" on page 96 for instruction on configuring your meter's clock settings.
- See the *Time synchronization and timekeeping* technical note, available from www.schneider-electric.com, for more information about time formats and settings.
- See the *ION Reference,* available from www.schneider-electric.com, for a detailed description of the Clock module and its operation.

Time synchronization overview

The time synchronization source and the duration between time synchronization messages determines the accuracy of the meter's clock.

The clock is adjusted by synchronizing the meter's time with another time source. Time synchronization messages can be automatically generated and sent to your meter from your energy management system software or other time source such as an SNTP/NTP server or GPS receiver. You can also manually trigger a time synchronization message from your energy management system or configuration software.

NOTE: To help maintain data integrity, some energy management systems impose a blackout rule where time synchronization messages near energy interval boundaries are ignored.

Time synchronization sources

Use only one time synchronization source or method on each network to help prevent conflicting time synchronization information. For meters connected to energy management software, the same time synchronization method must be set for all meters connected to the system to help prevent timestamp inconsistencies.

NOTE: If you are configuring your meter clock remotely from another time zone, make sure you modify the meter's configuration to match local time.

For time synchronization sources with a resolution of one second or more, the meter time is only adjusted by a time synchronization message if the difference between the meter time and the message time is greater than one second.

Related topics

- See "Configuring time and time synchronization using ION Setup" on page 96 for instructions on configuring your meter's time synchronization settings.

Supported time synchronization sources

The following time synchronization sources are available to your meter:

- Meter configuration software (ION Setup): Configuration software can manually synchronize the time of your meter based on the clock of the computer running the configuration software. Configuration software synchronization is usually performed when the meter is initially commissioned.
- Energy management system: Energy management systems can synchronize the time of your meter to be consistent with other meters on the network.
- Simple Network Time Protocol (SNTP): SNTP can synchronize the time of your meter up to ± 1 second of other meters on an Ethernet network. For SNTP time synchronization, your meter must be connected to an Ethernet network that has an active SNTP server and be configured with the server's information.
- GPS receiver (IRIG-B): A GPS receiver using IRIG-B can synchronize the time of a meter up to ± 1 ms of Coordinated Universal Time (UTC). A dedicated serial network is required to implement a GPS scheme. For IRIG-B, one of your meter's digital inputs must be connected to the IRIG-B network, and the digital input must be configured for IRIG-B time synchronization in addition to configuring your meter's clock.

NOTE: Use the digital inputs located on the meter base for IRIG-B time synchronization and other high-accuracy applications.

- GPS over serial: A GPS receiver can synchronize the time of a meter up to ± 1 ms of Coordinated Universal Time (UTC). For GPS over serial, your meter's serial port must be connected to a GPS receiver, and the serial port communications must be configured with the correct protocol setting.
- Network Time Protocol (NTP): NTP can typically synchronize the time of a meter to ± 10 to 100 ms, depending on network configuration. To implement NTP time synchronization, your meter must be connected to an Ethernet network that has an active NTP server and be configured with the server's information.

Configuring time information using your meter's display

1. Go to **Setup Menu > Date/Time/Clock Setup > Date & Time Setup**.
2. Configure your time and date formats, time zone offset, and daylight savings time offset. Press the down button to access the Clock Setup screen.
3. Configure the clock and time synchronization source, and the time synchronization time format.

Related topics

- See “Setting up your meter using the display” on page 34 for instructions on how to navigate and user your meter’s display.

Chapter 11 Firmware and templates

You can load different firmware versions and templates onto your meter.

Firmware and template overview

Firmware is your meter's operating system that enables the functions of your meter. Your meter's template defines the meter's features such as its power measurement and analyzing functionality. Your meter ships from the factory with a default template, or you can customize your meter's template to create features specific to your meter's application. You can save your customized template and upload it to other meters of the same type.

You can view your meter's firmware version on your meter's display, webpages and through ION Setup.

You can upgrade your meter's firmware and template using ION Setup. Firmware updates and new factory templates are available for download from www.schneider-electric.com.

Your meter and accessories do not operate normally during firmware and template upgrades.Your meter's digital and analog outputs may change state during a firmware upgrade. Option modules are offline during an option module firmware upgrade; they will not communicate to the meter and the outputs may change state during the upgrade process.

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Loading firmware or template onto your meter clears the meter's recorded data.

NOTICE

DATA LOSS

Ensure that all important data has been recorded before uploading firmware or a template to your device.

Failure to follow these instructions can result in data loss.

Typical workflows

To update your meter to the latest available firmware and factory template:

- Download the latest firmware and template for your meter.
- Load the firmware onto your meter; the firmware upgrade process includes upgrading the meter template.

To take an existing meter out of service and replace it with a new meter:

- Save the template from the existing meter.
- Load the existing meter's template onto the new meter; the new meter will now have the customized features from the existing meter.

To update your meter's firmware without updating your meter's template:

- Save your meter's template.
- Download the latest firmware.
- Load the firmware onto your meter. When prompted for a template file, select the template you saved from your meter.

To update the firmware on your meter's remote display:

- Download the display firmware.
- Load the firmware onto the meter's internal FTP site using either an FTP program or ION Setup. The results of the firmware update are stored in the meter's event log.

To update the firmware on your meter's option module(s):

- Download the option module firmware; make sure that the firmware matches the option module type.
- Load the firmware onto the meter's internal FTP site using either an FTP program or ION Setup.
- Power cycle or perform an option bus reset to start the option module firmware upgrade.

NOTE: If the meter is power cycled or an option module reset is performed while there are option module firmware upgrade files loaded on the meter's FTP site, the option module firmware is upgraded.

Related topics

- Visit the company website at www.schneider-electric.com and search for "PM8000" to see the available firmware and templates.
- See "Loading meter firmware using ION Setup" on page 84 for more information about loading meter firmware.
- See the online ION Setup help for instructions on how to load meter templates.

Firmware overview

Your meter has the latest firmware loaded onto it at the factory.

Firmware is your meter's operating system. When new firmware is available for your meter, you can upgrade to the latest version to get the added features and functionality. The firmware version loaded on your meter is shown on your meter's display. You can use ION Setup to upgrade the firmware on your meter.

You must load a meter template as part of the firmware upgrade process. You can save your meter's existing framework before performing a firmware upgrade and then reload it back onto the meter if you do not want to change your meter's template.

Your meter's remote display and option module use firmware information from the meter, but they may also need to have their internal firmware updated if internal components change. To load and update to your meter's remote display firmware, you need to copy the file to your meter's internal FTP server.

You can download firmware files from www.schneider-electric.com.

Related topics

- See the online ION Setup help, available from www.schneider-electric.com, for more information on downloading, saving and loading your meter's template.

Laptop computer upgrade considerations

Laptop computers generally have different default power properties than desktop computers. Incorrect power options can adversely affect device upgrading because the connection between the laptop and the device must be maintained in order for the upgrade to proceed. If the laptop's hard disk shuts down or the laptop enters system standby mode, this connection is broken and the upgrade procedure must be restarted.

If you are upgrading your meter's firmware using a laptop computer, follow these guidelines:

- Plug the laptop computer into a wall outlet. Do not run the laptop on its battery.
- Configure the laptop's hard disks so that they do not shut down after a certain period of time (for example, set to "never").
- Turn off the laptop's power suspension (for example, system stand-by) and hibernate options.
- Disable the laptop's option to power down when it is closed. This prevents a shut down if the laptop is accidentally closed.
- Disable the laptop's screen saver; screen savers can burden the CPU.

Firmware upgrade considerations

Ensure that the firmware version you are upgrading to is compatible with your meter, and that the version number is greater than your existing firmware (or else you will downgrade your meter).

Your meter's existing template may not work with different firmware versions if significant meter features have been added or modified.

Remote display (RMD) upgrade behavior

Your meter's remote display will upgrade as soon as the upgrade file is put in the remote display upgrade folder on your meter's internal FTP site. It is deleted as part of the upgrade process.

NOTE: If your meter's remote display loses power during firmware upload, the display will revert to its original firmware and you will have to reload the firmware file.

The results of your remote display firmware upgrade are stored in your meter's event log. Detailed information about your remote display, such as serial number and firmware version is provided in the Factory module.

Related topics

- See “Remote display troubleshooting icons” on page 41 for a description of the icons displayed by the remote display when a display firmware upgrade is required.
- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Factory module.

Option module(s) upgrade behavior

To upgrade option modules, you must load the upgrade file into the appropriate folder on the meter’s internal FTP site. The upgrade is triggered by either a power cycle or option module reset. After the upgrade is performed, the upgrade file is deleted from the meter’s internal FTP site before the option module is reset to run the new firmware. The option module firmware will not upgrade if more than one upgrade file is in the folder. The upgrade file must be the correct file type and match the type of module being upgraded.

All option modules do not perform their regular functions during firmware upgrade. If more than one option module is being upgraded, the firmware on the option module closest to the meter is done first, then the next closest, proceeding to the furthest module from the meter base requiring upgrading. A single option module firmware upgrade should not take more than five minutes.

The option module upgrade results are stored in your meter’s event log. Detailed information about the option module, such as serial number and firmware version is provided in the Factory module. Information about the option module type and details of the option module’s state is provided in the Diagnostics module.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Factory and Diagnostic module.

Loading remote display firmware using FTP

You can upload firmware to your meter’s remote display by loading the firmware upgrade file onto your meter’s internal FTP site.

You must have:

- Your meter’s remote display firmware upgrade (.BIN) file. You can download upgrade files from www.schneider-electric.com.
- The remote display connected to your meter, and have access to your meter’s internal FTP site.

1. Connect to your meter’s internal FTP site. Open the remote display upgrade (rmdUpg) folder.
2. Drag the remote display firmware file into the remote display upgrade folder. The file is immediately transferred to the remote display, and is not stored on the meter.
3. Watch your meter’s display to confirm the firmware upgrade is taking place
4. Review the remote display firmware upgrade details stored in the meter’s event log to confirm that the upload was successful.

Related topics

- See “Accessing your meter’s FTP server” on page 66 for instructions on how to connect to your meter using FTP.
- See “Event log overview” on page 134 for instructions on how to view your meter’s event log.
- See “Remote display troubleshooting icons” on page 41 for more information about the firmware-related icons shown on your meter’s remote display.
- See “Loading remote display firmware using ION Setup” on page 85 for instructions on how to load remote display firmware using ION Setup.

Loading option module firmware using FTP

You can upload firmware to your meter’s option modules by loading the firmware upgrade file onto your meter’s internal FTP site.

You must have:

- Your meter’s option module firmware upgrade (.SI9) file(s). You can download upgrade files from www.schneider-electric.com.
- The option module connected to your meter, and have access to your meter’s internal FTP site.

Your meter’s digital and analog outputs may change state during a firmware upgrade. Option modules are offline during an option module firmware upgrade; they will not communicate to the meter and the outputs may change state during the upgrade process.

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

NOTE: If your meter’s option module loses power during firmware upload, the option module will revert to its original firmware and you will have to reload the firmware file.

1. Connect to your meter’s internal FTP site. Open the option module upgrade (optionModuleUpg) folder.
2. Drag the option module firmware file into the appropriate option module folder. Repeat for all modules that you want to load firmware onto.
3. Power cycle or perform an option module reset to upload the new firmware to the option module(s).
4. Review the option module firmware update details stored in the meter’s event log to confirm that the upgrade was successful.

Related topics

- See “Accessing your meter’s FTP server” on page 66 for instructions on how to connect to your meter using FTP.
- See “Event log overview” on page 134 for instructions on how to view your meter’s event log.
- See “Loading option module firmware using ION Setup” on page 86 for instructions on how to load option module firmware using ION Setup.

Chapter 12 ION Setup

This section details the device configuration you can perform using ION Setup.

ION Setup overview

ION Setup is a free, downloadable device configuration tool. Devices can be configured over communications links whether they are locally or remotely located.

Devices such as your meter, based on ION architecture, have two different configuration methods using ION Setup.

- The standard method uses the setup assistant; a user-friendly tool that walks you through the process of setting up your meter. It is the recommended method for most users.
- The advanced method allows you to view and configure the ION modules directly. This is an advanced procedure that should only be done by those users who are expert in ION architecture and the systems in which the device is installed.

In addition to configuring your device, you can generate reports and view real-time and logged data using ION Setup.

Basic configuration can be done using your device's display or web pages, but many features are configured using ION Setup.

You can download ION Setup from www.schneider-electric.com. It is recommended that you always upgrade to the latest version of ION Setup to help properly configure features available on your device.

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Refer to the online ION Setup help for precautions and detailed information.

⚠ WARNING

INACCURATE DATA RESULTS

Verify that associated devices and ION Setup are configured correctly.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Performing resets and configuring features such as data or waveform recorders will clear recorded data.

NOTICE
DATA LOSS Ensure that all important data has been recorded before configuring device. **Failure to follow these instructions can result in data loss.**

Related topics

- See the online ION Setup help, available from www.schneider-electric.com, for instructions on how to use ION Setup and how to connect to your device using ION Setup

ION Setup device communication

Your device communicates to ION Setup using the ION protocol through its RS-485 serial communications port or over Ethernet.

If you are communicating over Ethernet, there are IP service ports set to the ION protocol, so you do not need to perform any additional device configuration to access your device using ION Setup. If you are communicating over RS-485, you will need to set the serial communications protocol to ION as well as configuring the rest of your serial communications settings.

Related topics

- See “Serial communications” on page 53 for instructions on how to configure your meter’s serial communication.

ION Setup device configuration

The best practice for configuring your device is to go through all the screens in the setup assistant and fill in the appropriate information for each feature as you go. The setup assistant has on-screen information and step-by-step wizards to help guide you through the process of configuring your device’s features.

This section contains additional information for ION Setup configuration tasks that are unique or have been modified for your device’s features and settings.

Template screen

Loading meter firmware using ION Setup

You can load firmware onto your meter using ION Setup.

You can download firmware for your meter from www.schneider-electric.com.

You must load a meter template as part of the firmware upgrade process. You can save your meter’s existing template by navigating to **Template > Save to PC** in the ION Setup Assistant and clicking **Save** to save your meter’s template as a .DCF file. You can also use a template that you have saved from another meter of the same type, or download a factory template from www.schneider-electric.com.

Ensure that you record your meter's user and password information in a secure location before upgrading the meter's firmware. If your meter's user and password information is lost, you must return the meter for factory reconfiguration, which resets your meter to its factory defaults and destroys all logged data.

Your meter's digital and analog outputs may change state during a firmware upgrade.

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

1. Obtain the meter firmware (.UPG) and framework (.DCF) that you want to load onto your meter. Save the files where they can be accessed by the computer running ION Setup.
2. Start ION Setup.
3. Open the Setup Assistant for your meter.
4. Select the Template screen.
5. Click the Firmware Upgrade tab, then click **Upgrade**. Enter your meter's password (if prompted) and click **OK**.
6. Navigate to the meter firmware (.UPG) file and click **Open**. Enter your ION Setup password when prompted and click **OK**.
7. Navigate to the meter framework (.DCF) file and click **OK**. The Template Paste Options dialog box appears. Select the check boxes for the settings you want to retain (not overwrite) and click **OK**.

   A dialog box describes the template upload and firmware upgrade progress, verifies the firmware, and finishes with an overview stating whether the firmware and framework were successfully uploaded onto your meter.

Loading remote display firmware using ION Setup

This procedure is specific to the DIN meters with a remote display, and cannot be performed on meters with an integrated display.

You can load updates to your meter's remote display firmware using ION Setup over an Ethernet connection.

You must have:

- Your meter's remote display firmware update (.BIN) file. You can download update files from www.schneider-electric.com.
- The remote display connected to your meter.
- FTP access to your meter from the computer running ION Setup.

NOTE: If your meter's remote display loses power during firmware upload, the display will revert to its original firmware and you will have to reload the firmware file.

1. Obtain the remote display firmware (.BIN) that you want to load onto your display. Save the files where they can be accessed by the computer running ION Setup.
2. Start ION Setup.
3. Open the Setup Assistant for your meter.
4. Select the Template screen.
5. Click the Firmware Upgrade tab, then click **Upgrade**. Enter your meter's password (if prompted) and click **OK**.
6. Navigate to where you have stored the remote display firmware. Select the Remote Display firmware file (*.BIN) as the file type. Select the remote display firmware (.BIN) file and click **Open**. Enter your ION Setup password when prompted and click **OK**.

   A dialog box describes the firmware upgrade progress, verifies the firmware, and finishes with an overview stating whether the firmware was successfully uploaded

Loading option module firmware using ION Setup

You can upload firmware to your meter's option modules using ION Setup over an Ethernet connection.

You can only upload firmware to the same type of module; if you have different types of option modules connected to your meter, you must perform the upload process for each module type.

You must have:

- Your meter's option module firmware upgrade (.SI9) file. You can download upgrade files from www.schneider-electric.com.
- The option module connected to your meter, and have access to your meter's internal FTP site.
- FTP access to your meter from the computer running ION Setup.

All option modules do not perform their regular functions during firmware upgrade; they will not communicate to the meter and the outputs may change state during the upgrade process.

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

1. Obtain the option module firmware (.SI9) files that you want to load onto your option module(s). Save the files where they can be accessed by the computer running ION Setup.
2. Start ION Setup.
3. Open the Setup Assistant for your meter.
4. Select the Template screen.

5. Click the Firmware Upgrade tab, then click **Upgrade**. Enter your meter's password (if prompted) and click **OK**.
6. Navigate to where you have stored the option module firmware. Select the Option Module firmware file (*.SI9) as the file type. Select the option module firmware (.SI9) file and click **Open**. Enter your ION Setup password when prompted and click **OK**.
7. A dialog box describes the firmware upgrade progress, verifies the firmware, and finishes with an overview stating whether the firmware was successfully uploaded

Basic setup screen

There are no additional tasks specific to your device for this screen.

Security

It is strongly recommended that you change your meter's display (front panel) password from the default value of 0 (zero).

If your meter's display (front panel) or user passwords are lost, or if you configure communications so that you cannot communicate to and configure your meter, you must return the meter to the factory, where your meter is reset to its factory defaults and all logged data is lost.

NOTICE

DATA LOSS

- Record your device's display and user password information in a secure location.
- Ensure you maintain sufficient access to communicate to and configure your device.

Failure to follow these instructions may result in data loss.

Configuring standard security using ION Setup

You can fully configure standard and advanced security on your meter using ION Setup.

In order to change security settings, you must be logged into ION Setup with an appropriate ION Setup user level. You must also have the appropriate meter-level security access to configure meter security.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Security**. Select Security Mode and click **Edit**. The open dialog box appears.
4. Select the appropriate security configuration file (*.scf) to configure your meter:
   - Standard: allows you to configure basic security and communications protocol lockout.
   - Advanced: includes the standard security features and adds user access/ password security settings.

5. The standard options or advanced options configuration screen appears. Configure the security parameters as required, some parameters can only be configured using advanced security:

Parameter	Standard/advanced	Details
Meter password	Standard/advanced	Default meter password is 0 (zero).
Active web server	Standard/advanced	This option allows you to enable or disable the ability to configure your device using webpages.
Allow Modbus programming	Advanced only	This option can only be enabled in advanced security and is disabled for standard security.
Allow front panel programming	Standard/advanced	This option allows you to enable or disable the ability to configure your device using the display.
Allow broadcasting time synchronization	Advanced only	This option can only be disabled in advanced security and is enabled for standard security.

   Click **Next** to configure protocol access information. The protocol lockout screen is displayed.

6. In the protocol lockout screen select the protocols that you want to be protected by the protocol lockout function. Select each protocol and click **Edit** to configure the protocol-specific parameters:

Parameter	Values	Description
Protocol lockout	0 - 255	The number of invalid login attempts before access is denied. If protocol lockout = 0, there is no limit to the number of invalid login attempts and the protocol will never be locked out.
Session timeout	1 - 43200 minutes (30 days)	The interval between access checks for non-session based protocols.

7. Enter the lockout duration (in minutes).
8. Click **Events** to configure user access event priorities. The Event Priorities screen appears.
9. Configure the user access event priorities.
10. If you have selected standard security, click **Finish**. You are prompted to save your security configuration to a file which can be loaded onto other meters.

    NOTE: If you chose to save your security file, enter a descriptive name and click **Save**. It is recommended that you do not overwrite the default security files.

    If you have selected advanced security, click **Next** to configure user access and passwords.

Related topics

- See “Configuring network communications using ION Setup” on page 90 for instructions on how to enable/disable Ethernet protocols and configure protocol port numbers.
- See “Security recommendations and best practices” on page 49 for recommendations for your meter’s security settings.

Configuring users and passwords using ION Setup (advanced security only)

In order to change security settings, you must be logged into ION Setup with an appropriate ION Setup user level. You must also have the appropriate meter-level security access to configure meter security.

You must have configured the standard security settings on your meter using ION Setup.

This task assumes that you are in the user configuration screen in the security wizard in ION Setup.

1. In the user/passwords screen, select (check) the user that you want to configure to view the user access options.
2. Select the appropriate values to configure the user's access:

Access	Description
Time sync	The user can set the meter's time and time synchronization parameters.
Read	The user can view all parameters except the security configuration.
Peak demand reset	The user can reset peak demand values.
Test mode	The user can put the meter into test mode (not applicable to the PM8000).
Full meter config	The user can configure all aspects of the meter except demand resets, test mode or security.
Security config	The user can configure security.

   Some access levels require that multiple access options be selected.
3. Select the user and click **Password**. The password entry screen appears.
4. Enter the desired password and click **OK**.
5. Continue configuring user access and passwords for each unique user of the meter.

   NOTE: Select **Show password when user selected** to display the password associated with that user. This feature is intended to help ensure that the correct password is entered for each user.
6. Click **Finish** to save your security configuration to the meter. You are prompted to save your security configuration to a file which can be loaded onto other meters.

   NOTE: If you chose to save your security file, enter a descriptive name and click **Save**. It is recommended that you do not overwrite the default security files.

Loading an existing security configuration file (.scf) using ION Setup

You can load an existing security configuration file (*.scf) onto your meter using ION Setup. The *.scf file can be a configuration for either standard or advanced security and must be from the same model of meter.

In order to change security settings, you must be logged into ION Setup with an appropriate ION Setup user level. You must also have the appropriate meter-level security access to configure meter security.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to Security. Select Security Mode and click **Send**. The Open dialog box appears.
4. Navigate to the location of the *.scf file you want to load onto your meter. Select the *.scf file and click **Open**. The *.scf file is loaded onto your meter.

Serial Settings

Configuring your meter as a Modbus slave using ION Setup

You can configure your meter as a Modbus slave using ION Setup.

Your meter's serial connection must be wired and configured correctly. The same mode of serial communication must be used for all devices on the network.

Your meter does not require any Modbus-specific configuration to act as a Modbus slave device over Ethernet.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Communications** > **Serial settings**. Select the tab for the serial port you want to configure.
4. Highlight the parameter and click **Edit** to configure the serial port's Modbus parameters as required.

Parameter	Setting
Protocol	Modbus RTU or Modbus master
RS485 bias	• Off if the meter is a Modbus slave • On if the meter is a Modbus master

5. Configure the meter's other serial port parameters as required.

Related topics

- See your device's Modbus map, available from www.schneider-electric.com, for Modbus register information.

Network settings

Configuring network communications using ION Setup

You can configure your device's Ethernet settings using ION Setup.

If you are connected to your device over Ethernet, changing Ethernet configuration parameters without another method of configuration enabled may cause loss of communications with your device and render it inoperable. In this case a factory reconfiguration of your device is required, which resets your device to its factory defaults and all logged data is lost.

NOTICE

DATA LOSS

Ensure you maintain sufficient access to communicate to and configure your device.

Failure to follow these instructions can result in data loss.

1. Start ION Setup.
2. Open the Setup Assistant for your device.
3. Select **Communications** > **Network Settings** and click the **TCP/IP** tab.
4. Select a setting and then click **Edit**. Configure the settings (for example, IP address, subnet or gateway) to match your communications system.

Parameter	Value	Description
Ethernet device name	configurable	This name is associated with your meter when using DPWS. By default, it is the meter type and the last 6 characters of its MAC address (example: PM8000_354386).
Enable IPv6	Yes/no	Specifies if IPv6 is enabled or disabled.
IP address	Contact your local network administrator for parameter values.	The Internet protocol address of your device.
SubnetMask		The Ethernet IP subnetwork address of your network.
Gateway		The Ethernet IP gateway address of your network.
Rx timeout	configurable	Specifies the number of seconds the meter waits for communication acknowledgments.
Modbus TCP Idle Timeout	configurable	Specify number of seconds the meter waits before disconnecting an idle Modbus TCP connection.
Modbus Gateway	Disabled/COM1	Specify the port on which Modbus Gateway sends/receives Modbus TCP requests. Note: For Modbus gateway to function properly, the serial port protocol must be set to Modbus Master.
MAC address	Read-only	The media access control (MAC) address is factory set and is for reference only.

5. Click the **Protocols** tab.
6. Select a protocol and then click **Edit**. Select whether the protocol connection requests are accepted by the meter, and configure the port number. Existing connections are not affected, but any new connections must comply with the meter's latest settings.

   NOTE: The protocol port number is not configurable on all protocols.

Related topics

- See "Configuring standard security using ION Setup" on page 87 for instructions on how to configure protocol read/write access.

3rd party protocols

Configuring custom Modbus data using ION Setup

You can configure your meter's Modbus map using ION Setup.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Communications** > **3rd party protocols** and click on the **Modbus slave** tab.
4. Select the map name and click **Edit**. The Modbus map editor is displayed.
5. Select a parameter and click **Edit** to configure:
   - the data associated with that register value
   - the register value
   - the register's format and scaling
6. Click **Add** to add a new Modbus register, **Delete** to remove a Modbus register, **Set Name** to create a new name for your Modbus map, or **Save As** to save your Modbus map as a separate file.
7. Click **OK**. Your Modbus changes are implemented on your meter.

Related topics

- Refer to your device's Modbus map, available from www.schneider-electric.com, for Modbus register information.

Configuring your meter as a Modbus master using ION Setup

You can configure your device to Modbus master slave devices over serial or Ethernet.

Make sure your master and slave devices have the prerequisite communications wiring and configuration before configuring your meter as a Modbus master.

NOTE: Devices supporting multiple simultaneous Modbus TCP connections can have communications delays. Adjust your network timeout settings to accommodate this.

The meter as a Modbus master over TCP/IP attempts to communicate with a slave device for up to 100 seconds (as per the RFC1122 standard) before moving on to the next slave device.

1. Start ION Setup
2. Open the Setup Assistant for your meter.
3. Navigate to **Communications** > **3rd Party Protocols** and click on the Modbus Master tab.
4. Click **Add** to add a Modbus slave device. The Modbus Device dialog appears.
5. Enter the Modbus slave information:
   - Enter the Modbus slave device's name and a label suffix (if applicable).
   - Select the device type of the slave device from **Device Type**.
   - Enter the unit ID of the Modbus slave device into **Slave ID**.
   - Select the serial or TCP connection from **Connected via**. This is the connection from the Modbus master to the slave device.
6. Click **Connections**. The Modbus Master Connections dialog appears.
7. Select the tab that corresponds to the connection you are configuring (for example, if you selected TCP Connection 1 from **Connected via**, select the TCP 1 tab) and configure it based on the connection type.

Connection type	Configuration
Serial connection	Select the serial communications port that is connected to the Modbus slave devices from the Assigned Port list.
TCP connection	Enter the IP address of the Modbus slave device, making sure that the IP port is set to 502.

   Click **OK** to return to the Modbus Device dialog.
8. Click **OK** to add the slave device. The device now appears on the list. Repeat these steps to add all of your Modbus slave devices.

Related topics

- See "Modbus" on page 57 for Modbus master and slave prerequisites for communications wiring and configuration.

Configuring a Modbus gateway using ION Setup

You can configure Modbus gateway on your meter using ION Setup.

Before you begin, make sure you have completed the following tasks:

- Confirm the serial network of devices are wired and configured to have the same baud rate, serial port settings (for example, 8N1), and protocol (Modbus).
- Confirm each serial device has a unique unit identifier.
- Confirm the serial network of devices are connected to the gateway meter's serial communication port.
- Confirm your gateway meter is communicating over Ethernet.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Communications** > **Serial settings** and select the tab for the communications port that the serial network is connected to.
4. Select **Protocol** and click **Edit**. The protocol selection screen appears.
5. Set the protocol to Modbus Master.
6. Navigate to **Communications** > **Network settings** and select the TCP/IP tab. Select **Modbus Gateway** and click **Edit**. The Modbus gateway selection screen is displayed.
7. Select the communications port that the serial network is connected to (and you just set to use the Modbus master protocol) and click **OK**. The Modbus gateway connection is created.
8. Create an Ethernet gateway site to access the serial network of devices through your gateway meter.

Configuring an EtherGate gateway using ION Setup

You can configure EtherGate on your meter using ION Setup.

Before you begin, make sure you have completed the following tasks:

- Confirm the serial network of devices are wired and configured to have the same baud rate, serial port settings (for example, 8N1), and protocol (ION).
- Confirm each serial device has a unique unit identifier.
- Confirm the serial network of devices are connected to the gateway meter's serial communication port.
- Confirm your gateway meter is communicating over Ethernet.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Communications** > **Serial settings** and select the tab for the communications port that the serial network is connected to.
4. Select **Protocol** and click **Edit**. The protocol selection screen appears.
5. Set the protocol to **EtherGate**.
6. Create an Ethernet gateway site to access the serial network of devices through your gateway meter.

Creating an Ethernet gateway site using ION Setup

You can create an EtherGate or Modbus gateway site in ION Setup to view serial devices connected to your meter when it is functioning as an Ethernet gateway.

You must have Ethernet gateway communications configured and your gateway and serial devices connected and communicating.

1. Start ION Setup.
2. Right-click on your workstation icon and select **Insert Item**. The New Network item dialog appears.
3. Select **Site** and click **OK**. The New Site dialog appears.
4. Select the **General** tab and configure the site.

Parameter	Values/Options	Description
Name	-	Ethernet gateway site name
Comm Link	Ethernet	Ethernet communications
Ethernet options	Gateway	Ethernet gateway communications
Gateway Info: IP Addr	-	IP address of the Ethernet gateway meter
Gateway Info: Port	7801, 502	• 7801 for EtherGate • 502 for Modbus gateway

5. Click **OK** to create the site.
6. Right-click on your newly created site and select **Insert Item**. The New Network Item dialog appears.
7. Make sure your newly created Ethernet gateway site is selected in **Attach to**. Select **Device** and click **OK**. The New Device dialog appears.
8. Enter the details of your serial device. Click **OK** to add the serial device to your Ethernet gateway site. Repeat for all the serial devices on the gateway meter.

NOTE: Use a separate standard Ethernet connection in ION Setup to connect to and read data from your Ethernet gateway meter.

Configuring SNMP using ION Setup

You can enable SNMP and configure SNMP trapping using ION Setup.

You must download the ION MIB file from www.schneider-electric.com.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Communications > Network Settings** and select the **SNMP** tab.
4. Configure your meter's SNMP parameters by selecting the parameter and clicking **Edit**. Click **OK** in the editing screen to set the parameter value.

Parameter	Description
Enable SNMP	Enables or disables SNMP on your meter.
Enable Traps	Enables or disables SNMP trapping on your meter.
Trap Rcvr Addr1 - Trap Rcvr Addr4	Enter up to four trap receiver IP addresses where trap messages will be sent.
Read only community	Enter the community string used for SNMP get (read-only) requests.
Read write community	Enter the community string used for SNMP set (read/write) requests. **NOTE:** You can use the read/write community string for SNMP get (read-only) requests.

Parameter	Description
System contact	Enter the name of your SNMP system administrator.
System name	Enter a descriptive name for your meter.
System location	Enter your meter's location.

5. Review the rest of the SNMP information and modify if necessary.

Related topics

- See the "SNMP" on page 66 for more information about how SNMP is implemented on your device.

Loading an IEC 61850 configuration file using ION Setup

You can load an IEC 61850 configuration (CID) file using ION Setup over an Ethernet connection.

You must have:

- The IEC 68150 configuration file stored in a location accessible by ION Setup. The configuration file is created by customizing the IEC 61850 device (ICD) file, which can be downloaded from www.schneider-electric.com.
- FTP access to your meter from the computer running ION Setup.

NOTE: Your meter can have only one IEC 61850 configuration (CID) file loaded onto its internal FTP site. If additional CID files are loaded, IEC 61850 functions are deactivated until the additional files are removed.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Communications > 3rd Party Protocols** and select the **IEC 61850** tab.
4. Highlight a parameter and click **Upload**. Navigate to where you stored your meter's CID file, select the file, and click **Open**.

   Your meter reviews the CID file to determine if it is valid. This process may take several minutes.

   The CID status indicates whether the meter has received and validated an IEC 61850 CID file and is operating as an IEC 61850 server.

Related topics

- See "IEC 61850" on page 70 for more information about IEC 61850 on your device.

Configuring additional data for IEC 61850 using ION Setup

You can map additional data to IEC 61850 using ION Setup.

You must have a valid IEC 61850 configuration file loaded onto your meter for IEC 61850 functionality, but it is not necessary for configuring additional data.

NOTE: You can configure additional data at any time, whether or not IEC 61850 is operating on your meter.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.

3. Navigate to **Communications > 3rd Party Protocols** and select the **IEC 61850** tab.
4. Select the information type that corresponds to the type of meter information that you want to add to your IEC 61850 data. Select analog for numeric information and digital for boolean or binary information. Click **Edit**. The custom configuration screen is displayed.
5. Select the desired meter value from those available. If the value you want is not shown, select **Show all available registers**.
6. Select an IEC 61850 leaf to associate with the meter data, and click **>>** to map the value. Click **<<** to unmap values. Click **OK** to send and save your changes to the meter.

Related topics

- See “IEC 61850” on page 70 for more information about IEC 61850 on your device.

Clock

Configuring time and time synchronization using ION Setup

You can set the time and date and configure the time synchronization settings using ION Setup.

NOTE: The clock screen is where you set the start date for the time of use feature.

NOTE: You must manually adjust the date and time information if the device is installed in a different time zone location from the computer running ION Setup.

1. Start ION Setup.
2. Open the Setup Assistant for your device.
3. Navigate to **Clock** and select the **Timezone** tab.
4. Select any parameter and click **TimeSync** to synchronize your device’s date and time with the computer that is running ION Setup.

   Click the **DST Settings** tab to modify your meter’s daylight savings time start and end dates, if required.
5. Select the parameter that you want to configure and click **Edit**. Enter the password if prompted.

Parameter	Value	Definition
Timezone	—	Sets the timezone based on the timezones available from the computer’s operating system. **NOTE:** This is also where you can synchronize your meter’s DST settings with the computer’s.
Time sync type	Local time or UTC	Specifies the time format of the time sync message • UTC: Coordinated Universal time: for the purposes of meter configuration, it is equivalent to Greenwich Mean Time (GMT). • Local time: the local time, with DST and timezone information applied.
Time sync source	COM1, Ethernet, Ethernet - ION, Ethernet - DNP, IRIG-B	Sets which device port accepts time synchronization messages. Time synchronization messages on other ports are ignored

Parameter	Value	Definition
Clock Source	Internal, Line frequency, COMM	Sets the source for the clock: • Internal: the meter's internal clock. • Line frequency: the frequency of the measured power system as the clock source. • COMM: the meter's communication port (used by the GPS time sync source).
DST Offset	Numeric Bounded Format/Elapsed Interval Format	Specifies the amount of time the meter clock is moved forward when entering Daylight Savings. A value of zero disables this feature and clock does not adjust for DST.
Start of the Week	Monday - Sunday	Specifies the start day of the week used for Trending and Forecasting. **NOTE:** Changing the start day of the week clears all trending and forecasting data.

For SNTP/NTP time synchronization, you must set the **Time sync type** to **UTC** and the **Time sync source** to **Ethernet**.

For GPS/IRIG-B time synchronization, you must set the **Time sync source** to **IRIGB** and the **Clock Source** to **COMM**.

6. For SNTP/NTP time synchronization, you must also enter the following information under **Communications** > **Network Settings** > **NTP**:

Parameter	Value	Definition
Enable NTP Time Sync	NTP, SNTP, No	NTP: specifies NTP time synchronization. SNTP: specifies SNTP time synchronization. **NOTE:** SNTP is recommended for revenue-related applications. No: neither NTP nor SNTP time synchronization are used.
NTP Time Sync Interval	Numeric value or elapsed interval value	Specifies how often the meter synchronizes over SNTP. **NOTE:** This parameter is not used for NTP.
NTP Event Logging Threshold (NTP only)	1000 to 1000000	Specifies the minimum time difference (in milliseconds) for a time synchronization to be logged as an event. This parameter can be configured to help prevent the meter's event log from being flooded with time synchronization events.
NTP Server	Server IP address or domain name	Specifies the IP address (or fully qualified domain name if DNS is active) of the SNTP or NTP server.

7. For serial GPS time synchronization, you must also enter the following information under **Communications** > **Serial settings**:

Parameter	Definition
Protocol	Select the GPS setting that matches your GPS receiver.
Baud rate	The recommended baud rate for GPS time synchronization is 9600 bps.
Serial port	The recommended stop bits/parity for GPS time synchronization is 8N1.

Related topics

- See "Time and time synchronization" on page 73 for more information about time and time synchronization on your meter.
- See "Electrical characteristics" on page 181 for information on the IRIG-B standard and specifications.

Demand

There are no additional documented tasks specific to your device for this screen.

Energy pulsing

NOTE: This screen is where you can configure the energy pulsing for accuracy verification testing.

Configuring energy pulsing using ION Setup

You can configure your meter's digital output and energy pulsing LED for energy pulsing.

Ensure that the digital output port or energy pulsing LED is available for energy pulsing and not associated with another function.

When configuring your meter, the configuration interface may show all of the possible ports, regardless of what is physically available on your meter.

NOTE: For applications where accuracy is important, use the digital output or energy pulsing LED located on the base of the meter.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Select **Energy pulsing**.
4. Select **LED** and configure the following basic parameters for your meter's energy pulsing LED.

Parameter	Description
Source	The energy source used for LED energy pulsing.
W Kt	The amount of source energy required to make the LED pulse.
W Pulse Width	The minimum time in seconds between LED pulse transitions. **NOTE:** There is a minimum 50% duty cycle on all pulses.
Wh pulse ovrld	Pulsing normally indicates that the energy pulsing LED should be operating normally. Pulsing suspended indicates that the energy pulsing LED is not able to pulse quickly enough. Modify the W Kt value to decrease the number of energy pulses.

NOTE: Only configure parameters other than those described if you have advanced knowledge of ION and the power system your meter is connected to.

5. Select an energy pulsing source tab (such as Wh Del) to configure energy pulsing using your meter's digital output..

Parameter	Description
Kt	The amount of energy source required to make one pulse. For example, in the Wh Del tab, the Kt value would be amount of real energy delivered (Wh Del) per pulse.
Pulse Width	The minimum time in seconds between pulse transitions. **NOTE:** There is a minimum 50% duty cycle on all pulses.
Port	Select an output port from the list. Only available output ports are shown.
(source) ovrld	Pulsing normally indicates that the output port should be operating normally. Pulsing suspended indicates that the output port is not able to pulse quickly enough. Modify the Kt value to decrease the number of energy pulses.

NOTE: Only configure parameters other than those described if you have advanced knowledge of ION and the power system your meter is connected to.

Energy applications

Configuring conditional energy using ION Setup

You can enable and configure conditional energy settings using ION Setup.

When configuring your meter, the configuration interface may show all of the possible ports, regardless of what is physically available on your meter.

One of your device's digital inputs must be connected and configured to define when conditional energy is accumulated.

1. Start ION Setup.

2. Open the Setup Assistant for your meter.
3. Navigate to **Energy Applications** > **Digital Input Based**. Review the digital inputs assigned to applications to help ensure there are no conflicting usages.
4. Select **Conditional Energy** and click **Edit**. The **Conditional Energy Setup** screen is displayed.
5. Select **Enabled** to enable the conditional energy feature.
6. Click **Select** to define the digital input. The input's state determines whether conditional energy is accumulated. When this digital input is on, conditional energy is accumulated.

   NOTE: It is recommended to set **Assigned Input** to No Connection to disable the conditional energy feature by removing any port associations.
7. Click **OK** to save your configuration.

Configuring standard input metering using ION Setup

You can configure input metering with standard units and rates using ION Setup.

When configuring your meter, the configuration interface may show all of the possible ports, regardless of what is physically available on your meter.

NOTE: Your device's digital input must be connected to the input metering pulse source. Review the digital inputs assigned to applications to help you understand your existing configuration.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Energy Applications** > **Digital Input Based**.
4. Select the input metering channel you want to configure and click **Edit**. The **Input Metering Channel Setup** screen is displayed.
5. Select **Enabled** to enable the input metering feature.
6. Click **Select** to define which digital input is the pulse source for the input metering channel.

   NOTE: It is recommended to set **Assigned Input** to No connection to disable the input metering channel by removing any port associations.
7. Configure the remaining parameters as required.

Parameter	Description
Pulse Weight	Enter the value per pulse.
Units	Select the measurement units associated with the pulse.
Demand Period	Enter the frequency in minutes that input metering data is calculated in your energy management system.
Rate	Select the rate associated with the defined Units.
Source ID	Enter a data identifier. This value is added to the input metering channel's data to uniquely identify the data within your energy management system.

8. Click **OK** to save your configuration.
9. Configure your meter to log the input metering data if required.

Related topics

- See the ION Setup online help, available from www.schneider-electric.com, for instructions on how to add input metering data to your meter's onboard data logs.

Configuring custom input metering using ION Setup

You can configure input metering with custom units and rates using ION Setup.

When configuring your meter, the configuration interface may show all of the possible ports, regardless of what is physically available on your meter.

NOTE: Your device's digital input must be connected to the input metering pulse source. Review the digital inputs assigned to applications to help you understand your existing configuration.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Energy Applications** > **Digital Input Based**.
4. Select the input metering channel you want to configure and click **Edit**. The **Input Metering Channel Setup** screen is displayed.
5. Select **Enabled** to enable the input metering feature.
6. Click **Select** to define which digital input is the pulse source for the input metering channel.

   NOTE: It is recommended to set **Assigned Input** to No connection to disable the input metering channel by removing any port associations.
7. Clear the **Standard quantity** checkbox.The screen changes to display custom input metering parameters.
8. Configure the remaining parameters as required.

Parameter	Description
Pulse Weight	Enter the value per pulse.
Units	Enter the measurement units associated with the pulse. **NOTE:** Include source identification information by entering "@" followed by the source identifier.
Demand Period	Enter the frequency in minutes that input metering data is calculated in your energy management system.
Rate	Enter the rate associated with the defined Units.
Scaling	Select the scaling value based on the relationship between Units and Rate.
Time Base	Select the value and units to match the Rate.

9. Click **OK** to save your configuration.
10. Configure your meter to log the input metering data if required.

Related topics

- See the ION Setup online help, available from www.schneider-electric.com, for instructions on how to add input metering data to your meter's onboard data logs.

Configuring incremental energy using ION Setup

You can configure incremental energy using ION Setup.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.

3. Navigate to **Energy Applications** > **Incremental Energy**.
4. Select **Status** and click **Edit**. The incremental energy configuration screen is displayed.

   NOTE: To display parameters for configuration, select **Enable**.
5. Select the parameter to configure and click **Edit**.

Parameter	Range	Description
Status	Enable/disable	Enables the incremental energy feature
Start time	12:00 am to 11:59 pm	The incremental energy first interval's start time. The start time must be prior to the end time for energy accumulation.
End time	12:01 am to 12:00 am	The end time for incremental energy. The end time must be after the start time and be less than or equal to 12 am (midnight)
Interval duration	Configurable	The increment period for the incremental energy duration.

Your changes are made to the meter.

NOTE: Configuring any parameter resets the incremental energy values recorded by your meter.

Onboard I/O

⚠ WARNING

UNINTENDED OPERATION

Do not use this meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Configuring onboard digital inputs using ION Setup

You can use ION Setup to configure your meter's digital inputs.

Digital inputs are available on your meter. You can add more digital inputs using optional I/O modules.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **I/O** > **Digital Inputs**. The tabs correspond to each digital input. Click on the tab for the digital input you want to edit.
4. Configure the digital input by selecting the parameter and clicking **Edit**.

Parameter	Value/Range	Description
Input Mode	Pulse, KYZ, A/C, IRIG-B[1]	Specifies how the meter processes the signal: • Pulse: the meter counts an entire pulse (from off-on to on-off) as one input. • KYZ: the meter counts a transition (from off-on or from on-off) as one input. • A/C: the meter detects analog signals where the ON condition is based on the presence of an AC signal. • IRIG-B[1]: the meter detects an IRIG-B time synchronization signal.
Polarity	Inverting/Non-Inverting	Specifies if the signal from the digital port is inverted or not inverted.
Debounce	0.000 - 1.000	Specifies how long (in seconds) the signal must remain in a state to be considered a valid state change.
Port	Defined by your meter's hardware	Your meter's physical digital input port.

[1] IRIG-B can only be connected to one of the digital inputs located on the meter base, not an option module. You must also configure your meter's clock to use IRIG-B time synchronization.

5. Once the parameter has been configured, click **OK** to save the setting to the meter.

Related topics

- See "Time synchronization overview" on page 73 for IRIG-B time synchronization information

Configuring onboard digital outputs using ION setup

You can configure your meter's digital outputs using ION Setup.

One form A digital output is available on the base of the meter. You can add more digital outputs using optional I/O modules.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to either onboard or expansion I/O, Digital Outputs, and select a digital output tab.
4. Configure the digital output by selecting the parameter and clicking **Edit**.

Parameter	Value/Range	Description
Source	Digital/Boolean	Link this input to the value that drives the state of the digital output. If Source is not linked, the digital output state is driven by the Force ON, Force OFF values.
Force ON	Pulse	Link this input to a pulse that forces the digital output on for the PulseWidth duration, regardless of the Source input.
Force OFF[1]	Pulse	Link this input to a pulse that forces the digital output off.
Normal[1]	Pulse	Pulsing this input will switch the driver of the digital output from Force ON to Source.
Polarity	Inverting/non-inverting	Specifies if the signal to the digital port is inverted or not inverted.
PulseWidth	0 - 2,000,000	Specifies the duration of the pulse, in seconds. Setting this parameter to 0 sets the digital output continuously on.
Port	-	The physical digital output port connection. Only available ports are shown.

[1] These parameters are only valid when pulse width is set to 0.

The digital output is configured.

Expansion Modules

Option I/O modules

You can configure your meter's I/O option modules using ION Setup.

The I/O option module screen has tabs corresponding to the four possible option module, based on how the option modules are connected to the meter. Each has tab an area where the module's ports are listed for viewing and configuration. The module's type and status is displayed.

Status examples	Description
None	No option module detected
Normal	The option module is operating normally
Option module added	A new option module is detected
Option module removed	The option module has been removed
Invalid SI9	The option module's firmware is not supported
Invalid card	The option module type is not supported

In the option module tabs you can also reset your meter's option modules. This power cycles all the option modules. Option module functions are not available during a bus reset and option module digital and analog outputs will change state.

⚠ WARNING

UNINTENDED OPERATION

Do not use this meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Configuring I/O option module analog inputs using ION Setup

You can configure analog inputs using ION Setup.

Analog inputs are available on the optional I/O modules you can connect to the base of your meter.

Calculate your zero scale and full scale values based on the analog source and the input range of your meter.

Make sure that the analog input port that you want to use is properly configured and connected to a valid external analog signal source.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Expansion Module > Option I/O Modules**, and select the module tab that corresponds to the option module with the analog input you want to configure.
4. Select the analog input channel and click **Edit**. The setup screen for that analog input is displayed.
5. Configure the analog input by selecting the parameter and clicking **Edit**.

Parameter	Value/Range	Description
Zero scale	0 to $\pm10^9$	The minimum source value that matches the minimum analog input signal.
Full scale	0 to $\pm10^9$	The maximum source value that matches the maximum analog input signal.
Port	-	The physical analog input port connection.
Mode	Voltage, current	Determines whether the analog input is monitoring voltage or current.

The analog input is configured.

Configuring option module analog outputs using ION Setup

You can configure option module analog outputs using ION Setup.

Analog outputs are available on the optional I/O modules you can connect to the base of your meter.

Calculate your zero scale and full scale values based on the measured value and the analog output range of your meter.

Make sure that the analog output port that you want to use is properly connected to an analog receiver.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Expansion Module > Option I/O Modules**, and select the module tab that corresponds to the option module with the analog output you want to configure.
4. Select the analog output channel and click **Edit**. The setup screen for that analog output is displayed.
5. Configure the analog output by selecting the parameter and clicking **Edit**.

Parameter	Value/Range	Description
Zero scale	0 to $\pm 10^9$	The minimum source value that matches the minimum analog output signal.
Full scale	0 to $\pm 10^9$	The maximum source value that matches the maximum analog output signal.
Port	-	The physical analog output port connection.
Mode	Voltage, current	Determines whether the analog output is putting out voltage or current

The analog output is configured.

Configuring option module digital inputs using ION Setup

You can use ION Setup to configure your meter's digital inputs.

Digital inputs are available on your meter. You can add more digital inputs using optional I/O modules.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Expansion Module > Option I/O Modules**, and select the module tab that corresponds to the option module with the digital input you want to configure.
4. Select the digital input channel and click **Edit**. The setup screen for that digital input is displayed.
5. Configure the digital input by selecting the parameter and clicking **Edit**.

Parameter	Value/Range	Description
Input Mode	Pulse, KYZ, A/C, IRIG-B[1]	Specifies how the meter processes the signal: • Pulse: the meter counts an entire pulse (from off-on to on-off) as one input. • KYZ: the meter counts a transition (from off-on or from on-off) as one input. • A/C: the meter detects analog signals where the ON condition is based on the presence of an AC signal. • IRIG-B[1]: the meter detects an IRIG-B time synchronization signal.
Polarity	Inverting/Non-Inverting	Specifies if the signal from the digital port is inverted or not inverted.
Debounce	0.000 - 1.000	Specifies how long (in seconds) the signal must remain in a state to be considered a valid state change.
Port	Defined by your meter's hardware	Your meter's physical digital input port.

[1] IRIG-B can only be connected to one of the digital inputs located on the meter base, not an option module.

6. Once the parameter has been configured, click **OK** to save the setting to the meter.

Configuring option module digital outputs using ION setup

You can configure your meter's digital outputs using ION Setup.

One form A digital output is available on the base of the meter. You can add more digital outputs using optional I/O modules.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Expansion Module > Option I/O Modules**, and select the module tab that corresponds to the module with the digital output you want to configure.
4. Select the digital output channel and click **Edit**. The setup screen for that digital output is displayed.
5. Configure the digital output by selecting the parameter and clicking **Edit**.

Parameter	Value/Range	Description
Source	Digital/Boolean	Link this input to the value that drives the state of the digital output. If Source is not linked, the digital output state is driven by the Force ON, Force OFF values.
Force ON	Pulse	Link this input to a pulse that forces the digital output on for the PulseWidth duration, regardless of the Source input.
Force OFF[1]	Pulse	Link this input to a pulse that forces the digital output off.
Normal[1]	Pulse	Pulsing this input will switch the driver of the digital output from Force ON to Source.
Polarity	Inverting/non-inverting	Specifies if the signal to the digital port is inverted or not inverted.
PulseWidth	0 - 2,000,000	Specifies the duration of the pulse, in seconds. Setting this parameter to 0 sets the digital output continuously on.
Port	-	The physical digital output port connection. Only available ports are shown.

[1] These parameters are only valid when pulse width is set to 0.

The digital output is configured.

Logging

There are no additional tasks specific to your device for this screen.

Revenue

There are no additional tasks specific to your device for this screen.

Alarming

⚠ WARNING

UNINTENDED OPERATION

Do not use this meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Configuring setpoint/standard alarms using ION Setup

You can use ION Setup to configure the standard alarm settings.

1. Start ION Setup
2. Open the Setup Assistant for your meter.
3. Navigate to **Alarming** and click the **Standard** tab.
4. Select a setpoint and click **Edit**.
5. Enter unit password and click **OK,** if required. The **Setpoint Setup** screen is displayed.
6. Configure the setpoint values as required.

Parameter	Value/Range	Description
By Percentage	By Percentage/By Value	When available, specifies if the Pickup and Dropoff entries are by percentage or by value. If the option is not available, pickup and dropoff entries are by value.
Force Off	Checked/Unchecked	Forcing the alarm off disables all functions of the associated input. To stop an alarm from being displayed without affecting other meter features, set the alarm priority to Info only.
Label	String value	When available, lets you modify the default label so it more clearly identifies the alarm. Letters, numbers, underscores are permitted. Spaces are not permitted.
Pickup	Numeric value	Use this setting to provide a value for when the alarm turns on.
Pickup Delay	Numeric value	This specifies the number of seconds the digital input must be in the alarm pickup state before the alarm turns on.
Dropout	Numeric value	Use this setting to provide a value for when the alarm turns off.
Dropout Delay	Numeric value	This specifies the number of seconds the digital input must be below the alarm dropoff state before the alarm turns off.
Alarm Priority	None, Info only, Low, Medium or High	Specifies the priority level of the standard alarm. To disable the alarm, set priority to Info only.
Custom Priority	0-255	Select custom priority to view and configure the event priority of the event associated with the alarm. The event log cutoff value is displayed for reference; priorities above the cutoff are stored in the meter's event log.

7. Click **Save** to save the settings to your meter.

Related topics

- See "Alarms overview" on page 147 for more information about your meter's alarms and alarm configuration.

Configuring sag/swell alarms using ION Setup

You can use ION Setup to configure the sag/swell alarm settings.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Alarming** > **Sag/Swell**.
4. Select a parameter and click **Edit**.
5. Configure the parameters as required.

Parameter	Value/Range	Description
Nominal voltage	1 to 999,999	Specifies the nominal voltage value used for sag/swell detection.
Voltage Swell%	Percentage of nominal	Specifies the swell limit expressed as a percentage of the nominal voltage.
Voltage Sag%	Percentage of nominal	Specifies the sag limit expressed as a percentage of the nominal voltage.
Nominal Current	1 to 999,999	Specifies the nominal current value used for sag/swell detection.
I Sag Pickup	Numeric value	Specifies the percentage the current must deviate from the nominal current in order to be classified as a sag.
I Sag Dropout	Numeric value	Specifies the additional amount that the current must recover in order to signal the end of the sag.
I Swell Pickup	Numeric value	Specifies the percentage the current must deviate from the nominal current in order to be classified as a swell.
I Swell Dropout	Numeric value	Specifies the additional amount that the current must recover in order to signal the end of the swell.

Related topics

- See “Alarms overview” on page 147 for more information about your meter’s alarms and alarm configuration.

Configuring digital input alarms using ION Setup

You can use ION Setup to configure the digital alarm settings.

When configuring your meter, the configuration interface may show all of the possible ports, regardless of what is physically available on your meter.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate **Alarming** > **Digital Input**.
4. Configure the digital input alarm settings by selecting an input and clicking **Edit**. Some settings are not configurable and are grayed out.

Parameter	Value/Range	Description
Input	Input On/Input Off	Specifies the input state/alarm behavior: • Input On: the alarm is on when the digital input is on. • Input Off: the alarm is on when the digital input is off.
Force Off	Checked/Unchecked	Forcing the alarm off disables all functions of the associated input To stop an alarm from being displayed without affecting digital input features, set the alarm priority to Info only.
Label	String value	When available, lets you modify the default label so it more clearly identifies the alarm. Letters, numbers, and underscores are permitted. Spaces are not permitted.
Alarm Priority	None, Info only, Low, Medium or High	Specifies the priority level of the digital input alarm. To disable the alarm, set priority to Info only.
Custom Priority	0-255	Select custom priority to view and configure the event priority of the event associated with the alarm. The event log cutoff value is displayed for reference; event priorities above the cutoff are stored in the meter’s event log.

5. Click **Save** to save the changes to the meter.

Related topics

- See “Alarms overview” on page 147 for more information about your meter’s alarms and alarm configuration.

Implementing alarm setpoint learning using ION Setup

You can use ION Setup to implement setpoint learning, which analyzes your power system and recommends settings.

NOTE: Your meter’s power system must be stable in order to learn valid setpoint values.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Alarming > Standard**.

   NOTE: You can manually configure setpoint values by selecting the setpoint and clicking **Edit**.
4. Select a setpoint and click **Learn**. The **Global Setpoint Learning** screen is displayed.
5. Select the setpoint tabs to view existing configured or learned setpoint information.
6. Click **Setup**. The **Alarm Learning Setup** screen is displayed.
7. Configure the learning parameters for each setpoint and click **Save**:

Parameter	Value/Range	Description
Install mode	Automatic, Manual	• Automatic: the learned values are automatically applied if valid. • Manual: the learned values are stored for you to review and enter.
Duration	1-365	Days for maximum learning duration

8. Click **Start All** to begin setpoint learning for all setpoints.
   – When setpoint learning is in progress, an asterisk is displayed next to the setpoint.
   – Click **Abort** to stop learning for a specific setpoint. To stop all setpoint learning, repeat for each setpoint tab.
9. Apply the learned setpoint values:
   – Automatic: the setpoint values are automatically applied unless the learning process has issues or the learned values are invalid.
   – Manual: navigate to **Alarming** > **Setpoints** and click **Learn**. On each setpoint tab, click **Install** to apply the learned values to that setpoint.

NOTE: If you click **Install** while learning is in progress (in either manual or automatic installation mode), it stops the learning process and prompts you for confirmation that you want to stop learning and install the learned values. Once you confirm, the learned values are automatically installed or prepared for manual installation.

Related topics

- See “Setpoint learning overview” on page 137 for more information about setpoint learning.

Implementing sag/swell limit learning using ION Setup

You can use ION Setup to implement voltage sag/swell learning, which analyzes your power system and recommends settings.

NOTE: Your meter's power system must be stable in order to learn valid sag/swell limits.

You must have configured your meter's nominal voltage in order to learn valid sag/swell limits.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Alarming** > **Sag/Swell**.
4. Select the **Voltage Swell %** or **Voltage Sag %** and click **Learn**. The **Global Setpoint Learning** screen is displayed.

   NOTE: You can manually configure the limit values by selecting the parameter and clicking **Edit**.
5. Click **Setup**. The **Alarm Learning Setup** screen is displayed. Configure the learning parameters:

Parameter	Value/Range	Description
Install mode	Automatic, Manual	• Automatic: the learned values are automatically applied. • Manual: the learned values are stored for you to review and enter.
Duration	1-365	Days for maximum learning duration

   Click **Start** to begin sag/swell learning. Click **Abort** to stop learning.
6. Apply the learned sag/swell limits:
   – Automatic: the limits are automatically applied unless there are issues with the learning process.
   – Manual: navigate to **Power quality** > **Sag/Swell**. Select the **Swell limit %** or **Sag limit %** and click **Learn**. Click **Install** to apply the learned limits.

NOTE: If you click **Install** while learning is in progress (in either manual or automatic installation mode), it stops the learning process and prompts you for confirmation that you want to stop learning and install the learned limits. Once you have confirmed, the learned limits are automatically installed or prepared for manual installation.

Related topics

- See "Setpoint learning overview" on page 137 for more information about setpoint learning, including sag/swell learning.

Power Quality

Configuring waveform recording using ION Setup

You can configure waveform recording using ION Setup.

For waveform recording to trigger automatically, you must enter your system's nominal (normal) voltage and current values, and then the amount of deviation from the nominal required to trigger waveform recording.

Changing your meter's waveform recording configuration clears your meter's existing waveform records.

NOTICE

DATA LOSS

Ensure that all important data has been recorded before configuring waveform recording.

Failure to follow these instructions can result in data loss.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Alarming** and click the **Sag/Swell** tab. Configure your meter's sag/swell detection parameters:

Parameter	Value/Range	Description
Nominal voltage	0 - 999,999	Specifies the nominal voltage value used for sag/swell detection.
Voltage Swell %	Percentage of nominal	Specifies how much a measured value must exceed the nominal in order to be considered a swell.
Voltage Sag %	Percentage of nominal	Specifies how much a measure value must fall below the nominal in order to be considered a sag.
Nominal current	0 - 999,999	Specifies the nominal current used by Swell and Sag limit % for a current sag or a current swell.
Current Sag Pickup	Numeric value	Specifies the percentage the current must deviate from the nominal current in order to be classified as a sag.
Current Sag Dropoff	Numeric value	Specifies the additional amount that the current must recover in order to signal the end of the sag.
Current Swell Pickup	Numeric value	Specifies the percentage the current must deviate from the nominal current in order to be classified as a swell.
Current Swell Dropout	Numeric value	Specifies the additional amount that the current must recover in order to signal the end of the event.

4. Navigate to **Power Quality** and click the **Sag/Swell** tab to configure your meter's waveform recording parameters.

Parameter	Description
Sag/Swell depth	Specifies the number of records the sag/swell data log can hold
Waveform depth	Specifies the maximum number of waveform records stored on the meter.
Waveform format	Specifies the number of samples per cycle and the number of cycles that are stored in a waveform record.
Post event cycles	Specifies the number of cycles recorded after the waveform is triggered. NOTE: The maximum number of post event cycles cannot exceed the number of cycles in the waveform record.
Hysteresis %	Specifies the difference in magnitude between the start and end thresholds for a power quality event.

NOTE: COMTRADE status must be set to **Disabled** before modifying the waveform format.

Configuring COMTRADE waveform recording using ION Setup

You can enable and configure COMTRADE waveform recording using ION Setup.

COMTRADE is configured as part of the default waveform recording but not enabled from the factory.

Your meter's COMTRADE files' format complies with the standard defined by IEC 60255-24 edition 2001-05.

1. Start ION Setup.

2. Open the Setup Assistant for your meter.
3. Navigate to **Power Quality > COMTRADE**.
4. Configure the COMTRADE parameters:

Parameter	Value	Description
Status	Enabled/Disabled	Enabled: COMTRADE files are generated. Disabled: COMTRADE files are not generated.
Depth	1 or more	The number of COMTRADE records stored on the meter. • By default the oldest COMTRADE record will be overwritten by the newest record. • A message is displayed if the Depth value exceeds the available memory. • A single COMTRADE record uses approximately 45 kB of meter memory.

COMTRADE records are stored as read-only files on your meter's internal FTP server, and are deleted when you perform a Master reset of the meter.

NOTE: To configure waveform recording, you must disable COMTRADE, configure waveform recording, and then enable COMTRADE. COMTRADE records are not generated if the waveform recorders have inconsistent settings.

Downloading COMTRADE files using ION Setup

You can download COMTRADE waveform records from the meter's internal FTP server to another network location using ION Setup.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Power Quality > COMTRADE**.
4. Select the status parameter and click **Save**. The **Upload COMTRADE files** screen is displayed.
5. Select the criteria for the COMTRADE files you want to load from your meter's internal FTP site to another network location. Click **OK**.

   NOTE: If no COMTRADE files are downloaded, the ION Setup status bar provides a descriptive message.

Related topics

- See "COMTRADE" on page 71 for additional information about COMTRADE format waveform data.

Custom displays

Creating custom displays using ION Setup

You can use ION Setup to program new custom displays.

1. Start ION Setup.
2. Open the Setup Assistant for your meter.
3. Navigate to **Custom Displays**.
4. Select **Custom Displays** from the **Front Panel** tab and click **Edit**. ION Setup loads your meter's display information into the **Display Editor** screen.

5. Rename, delete, or change the order of custom displays through the **Display Editor** screen. Click **New** to add a new display. Click **Edit** to bring up the **Display setup** screen, where you can configure new or existing custom displays.
6. Configure your screen type:
   - **Screen Type**: Specify the number of parameters displayed on the screen.
   - **Screen Title**: Enter the title to be shown at the top of your custom display.
7. Click **Edit** to select the displayed parameters. The number of parameters displayed is determined in the Screen Type selection described above.
8. Select your digit display properties:
   - **Resolution**: Specifies the number of decimal places displayed.
   - **Last Digit:** Specifies whether the last number is rounded or truncated.
9. Click **Send** to save the changes in the meter.

Verification

Performing meter resets using ION Setup

You can perform meter resets on your meter using ION Setup.

Revenue-locked meters must be unlocked to perform resets that impact revenue data.

Meter resets clear the meter's onboard data logs and other related information.

NOTICE

DATA LOSS

Ensure all important data from the device has been retrieved before performing a reset.

Failure to follow these instructions can result in data loss.

1. Open the Setup Assistant for your meter.
2. Select the **Verification** screen.
3. Select **Normal Mode** and click **Display**.
4. Select the desired tab in the **Normal Mode** dialog box. Depending on the tab selected, different resets are available.

Tab	Reset available
Energy	Master Reset
Rolling Demand	Peak Reset Master Reset
Volts, Amps and Power	Master Reset
Conditional Energy	Cnd Reset Master Reset
Input Metering	IM(n) Reset **NOTE:** n is the input metering number, for example IM1. Peak Reset Master Reset

5. Click the appropriate button to perform the reset.

For some resets, the meter indicates that the reset is in progress. Do not configure or power down your meter until it indicates that the reset is complete or some parameters may not be completely reset.

Related topics

- See “Revenue locking” on page 173 for more information on revenue locked meters.

Reports

There are no additional tasks specific to your device for this screen.

Advanced ION Setup tasks

These configuration tasks are intended for advanced users with a thorough understanding of ION architecture, the features of their device, and the power system in which it is installed.

Configuring digital outputs for IEC 61850 control using ION Setup

You can configure your digital outputs so that they can be used for non-critical control via IEC 61850.

Your meter has a comprehensive default implementation of IEC 61850 which meets the needs of most systems with only basic configuration. You can customize this implementation so that IEC 61850 can be used to control your meter’s digital outputs; this is an advanced procedure that requires in-depth knowledge of your meter, its underlying architecture, and the system in which it is installed.

⚠ WARNING

UNINTENDED OPERATION

Do not use this device for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

1. Start ION Setup
2. Connect to your meter in advanced mode.
3. Navigate to the GGIO Onboard folder and double-click on the module in the right-hand pane.
4. Select the Setup Registers tab.
5. Select the *SPCS Control Mode* register that corresponds to the digital output you want to control through IEC 61850 and click **Edit**. A dialog appears.
6. Select IEC 61850 CTLVAL from the dropdown list and click **OK**.
7. Select the Inputs tab.

8. Select the digital output *Status* register for the digital output that you want to control through IEC 61850. Click **Delete**.

   NOTE: This digital input register must be deleted in order to prevent a circular reference that will cause the affected modules to go offline.

9. Click **Send** to send your changes to the meter.
10. Select the Setup Registers tab and confirm that the Digital Output module's setup registers are appropriately configured.
11. Select the Inputs tab.
12. Select the *Source* register and click **Edit**.
13. Navigate to the IEC 61850 GGIO Onboard folder and select the *SPCS.stVal* output register that corresponds to the digital output.
14. Click **OK** and **Send** to save your changes to the meter.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for information about the IEC 61850 GGIO and Digital output modules.
- See "IEC 61850" on page 70 for more information about how IEC 61850 is implemented on your meter.

Chapter 13 Meter webpages

Overview

This section describes the meter's webpages. The meter's Ethernet connection allows you to access the meter so you can view data and perform trending and forecasting and some basic configuration using a web browser. You can also view standard filetypes through the meter's webpages and create custom webpages for your meter.

⚠ WARNING

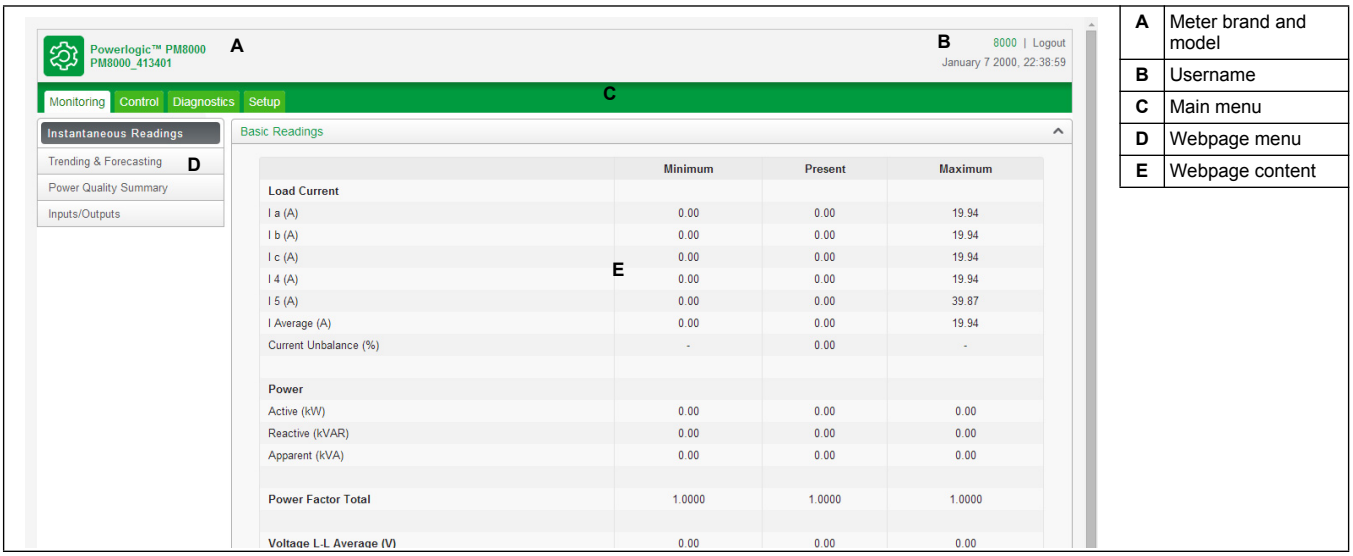
INACCURATE DATA RESULTS

- Do not rely solely on data displayed on the display or in software to determine if this device is functioning correctly or complying with all applicable standards.
- Do not use data displayed on the display or in software as a substitute for proper workplace practices or equipment maintenance.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Webpage interface

Your meter comes with default webpages that contain the typical elements shown below.



A	Meter brand and model
B	Username
C	Main menu
D	Webpage menu
E	Webpage content

NOTE: This graphic is representative only, and your meter's webpages may appear differently than shown.

Default webpages

The following default webpages are available on your meter.

Main menu	Webpage menu	Webpage content
Monitoring	Instantaneous Readings	• Basic readings • Energy readings • Demand readings • Voltage readings • Power Quality
	Trending & Forecasting	Select the target and interval for trending and forecasting and view the results.
	Power Quality Summary	• Harmonics • ITI (CBEMA)-SEMI • NEMA Motor Derating Curve • EN50160
	Inputs/Outputs	• Digital inputs • Digital outputs • Analog inputs • Analog outputs
Control	Resets	Perform resets, and view when previous resets were performed.
Diagnostics	Statistics	• Communications • Ethernet • Serial port • Meter - Basic • Meter - Advanced
	Phasor diagram	View the phasor diagram and numeric values.
Setup	Ethernet	• Basic Settings • Advanced settings
	Serial Port	• Basic Settings • Advanced Settings
	SNMP Parameters	Configure your meter's SNMP parameters.
	NTP	Configure your meter's NTP parameters.
	SMTP	Configure your meter's SMTP parameters.
	Date & Time	Configure your meter's time and time synchronization.
	Preferences	Enter your meter's nameplate information.
	Metering	Configure the parameters that impact metered data.
Maintenance[1]	-	Custom. No default content.

[1] By default the Maintenance menu is empty, and the menu is not displayed until information is added to it.

Accessing the meter's webpages

You can access the meter's webpages through the meter's Ethernet connection using a web browser.

You must have cookies enabled in order to access your meter's webpages.

If you configure communications so that you cannot communicate to and configure your meter, you must return the meter to the factory, where your meter is reset to its factory defaults and all logged data is lost.

NOTICE

DATA LOSS

Ensure you maintain sufficient access to communicate to and configure your device.

Failure to follow these instructions may result in data loss.

1. Open a web browser and enter your meter's IP address in the address box. The webpage login prompt is displayed.

2. Enter a valid username and password, select your desired **Language** from the drop-down list, and click **Log In**. Your meter's webpages are displayed.

   NOTE: The username and password are defined by your meter's security configuration; if standard security is enabled, the password is the same as the display password with a default username of 8000. The default display password is 0 (zero). To help increase the security of your meter's configuration and data, configure your meter's username and passwords to be different from the default values.

   The meter's Monitoring webpage is displayed, showing real-time data.

3. Select the main menu tab that corresponds to the category of information you want to view, and select the webpage menu from the list on the left. The webpage content is displayed. Click the webpage content headings to expand and view the meter's data.

4. Select **Setup** to view and edit your meter's configuration.

Related topics

- See "Trending and forecasting" on page 127 for instructions on configuring and viewing logging and trending information on the meter's webpages.
- See "Security overview" on page 47 for instructions on how to configure security settings on your meter.

Configuring SNMP using your meter's webpages

You can configure SNMP trapping using your meter's webpages.

You must download the ION MIB file from www.schneider-electric.com.

1. Connect to your meter's webpages.
2. Go to **Setup** > **SNMP Parameters**.
3. Configure your meter's SNMP parameters by selecting the parameter value.

Parameter	Range	Description
Enable SNMP	Yes/no	Enables or disables SNMP on your meter.
SNMP Port Number	161 (default)	Enter your meter's SNMP port number.
System contact	—	Enter the name of your SNMP system administrator.
System name	—	Enter a descriptive name for your meter.
System location	—	Enter your meter's location.
Read-only Community Name	—	Enter the community string used for SNMP get (read-only) requests.
Read-write Community Name	—	Enter the community string used for SNMP set (read/write) requests. NOTE: You can use the read/write community string for SNMP get (read-only) requests.
Enable SNMP Traps	Enable/disable	Enables or disables SNMP trapping on your meter.
Enable High Priority Alarms	Yes/no	Enables trapping of events that create high priority alarms.
Enable Med Priority Alarms	Yes/no	Enables trapping of events that create medium priority alarms.
Enable Low Priority Alarms	Yes/no	Enables trapping of events that create low priority alarms.
Report Buffer Size	1 - 30	Enter the maximum number of trap messages to be stored before the trap messages are sent. Traps are sent when the number of trap messages is equal to or greater than this value.
Report Hold Time	1 - 300 seconds	Enter the maximum duration for trap messages to be held. Trap messages are sent when the time after a trap event has occurred is equal to or greater than this value.
Trap Rcvr1 Addr - Trap Rcvr4 Addr	—	Enter up to four trap receiver IP addresses, where trap messages will be sent.

4. Click **Apply** to configure the meter's SNMP parameters.

Viewing files using your meter's webpages

You can load files of a variety of standard formats, such as *.pdf, *.jpg and *.png into the webpage folders on your meter's internal FTP site where they can be viewed using your meter's webpages. Videos in *.mp4 format can be played in most browsers. The filenames must be compatible with your meter's FTP filename requirements.

NOTE: Image files are shown at full-size (100%). Scale images to the desired size before loading them onto your meter's internal FTP site.

1. Access your meter's internal FTP site.
2. Open the web folder. Copy your file into the subfolder that corresponds to the webpage main menu tab you want to access your file from.
3. Connect to your meter's webpages. Select the main menu item that corresponds to the folder where you stored your file in step 2. Your file is listed in the webpage menu.
4. Select your file from the webpage menu to view.

Example

To view a schematic diagram (oneline.pdf) of your power system from the Monitoring menu of your meter's webpages:

1. Access your meter's internal FTP site.
2. Copy oneline.pdf into **web > monitoring**.
3. Access your meter's internal webpages and select the **Monitoring** menu. In the webpage menu click oneline.pdf to view your power system schematic.

Related topics

- See "FTP" on page 64 for instructions on how to connect to your meter over FTP.
- See "FTP filename requirements" on page 65 for a listing of characters not permitted in a FTP filename.

Creating custom webpages for your meter

You can create custom webpages to view data or access configuration parameters from your meter.

Download the PM8000 Modbus registers map from www.schneider-electric.com.

1. Connect to your meter's internal FTP site.
2. Go to **web > examples**. Select samplereadings.html to create a data value webpage, or select sampleconfiguration.html to create a configuration parameters webpage.
3. Save a copy of the sample file. This filename is the webpage name.
4. Open your webpage in an HTML or webpage editor program.
5. Modify the webpage to reference the desired meter data or parameters from the Modbus registers map, and update the other fields where required. Save your custom webpage.

The meter will display translated content if it exists in the meter's memory. If translated content is not available, English is displayed.

6. Connect to your meter's internal FTP site.
   - If you have created a data viewing webpage, copy your custom webpage to **web** > **monitoring**.
   - If you have created a configuration webpage, copy your custom webpage to **web** > **setup**.
7. Login to your meter's webpages. Your custom webpage is available from the webpage menu under the monitoring (data viewing) or setup (configuration) tab.

Related topics

- See "Sample data viewing webpage" on page 119 for a detailed description of the webpage's configurable fields.
- See "Sample setup webpage" on page 122 for detailed description of the webpage's configurable fields.
- See "FTP" on page 64 for instructions on how to connect to your meter over FTP.

Sample data viewing webpage

You can create custom data viewing webpages using the sample webpage stored on your meter.

The sample webpages are stored in the documents folder on your meter's internal FTP site.

The PM8000 Modbus register map is available from www.schneider-electric.com.

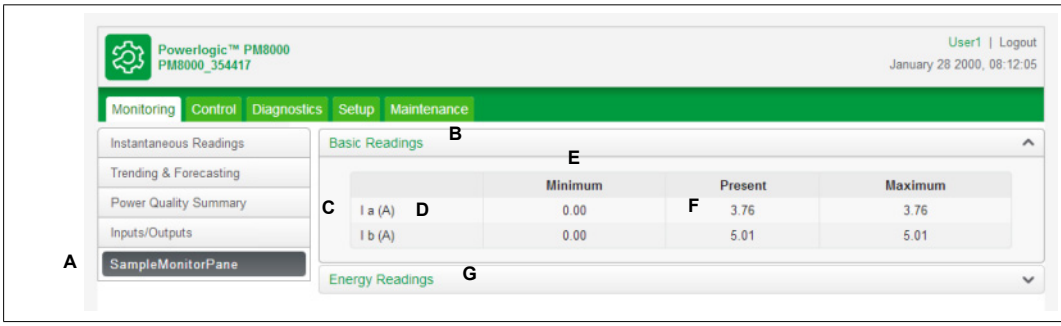
If required, the PM8000 ION handles document is packaged with the meter firmware file which is available for download from www.schneider-electric.com.

The data viewing webpage must be stored on your meter's internal FTP site in the folder for Monitoring. The custom webpage is viewed by selecting the Monitoring main menu tab on your meter's webpage.

Configuring the HTML code other than where described is an advanced procedure and should only be performed by those with an advanced understanding of webpages and how your meter processes them.

Sample webpage data viewing result

NOTE: This graphic is representative only, and your meter's webpages may appear different than shown.



A	HTML filename
B	Content pane title
C	Row heading
D	Units
E	Column heading
F	Named register instantaneous value
G	Second content pane title

Sample data viewing webpage content

Line #	Sample HTML
1	SampleMonitorPane.html
2	
3	
4	<h3 target="sample-readings">$%localizedString(Basic Readings)#$</h3>
5	
6	<table class="datatable">
7	<tr>
8	<th> </th>
9	<th>$%localizedString(Minimum)#$</th>
10	<th>$%localizedString(Present)#$</th>
11	<th>$%localizedString(Maximum)#$</th>
12	</tr>
13	<tr class="minor">
14	<td>$%localizedString(I a)#$ </td>
15	<td regname="I a mn"></td>
16	<td regname="I a"></td>
17	<td regname="I a mx"></td>
18	</tr>
19	<tr class="minor">
20	<td>$%localizedString(I b)#$ </td>
21	<td regname="I b mn"></td>
22	<td regname="I b"></td>
23	<td regname="I b mx"></td>
24	</tr>
25	</table>
26	
27	<h3 target="sample-energy">$%localizedString(Energy Readings)#$</h3>
28	
29	<table class="datatable">
30	<tr>
31	<th> </th>
32	<th>$%localizedString(Present)#$</th>
33	</tr>
34	<tr>
35	<td>$%localizedString(Active Energy)#$ </td>
36	<td regname="kWh del-rec"></td>
37	</tr>
38	<tr>
39	<td>$%localizedString(Reactive Energy)#$ </td>
40	<td regname="kVARh del-rec"></td>
41	</tr>
42	</table>
43	
44	
45	
46	
47	<script type="text/javascript">

Line #	Sample HTML
48	
49	instantaneousReadings.initInstantaneousReadings('sample-readings');
50	
51	</script>
52	

Sample webpage data viewing content description

Line #	Description
1	SampleMonitorPane.html The HTML filename, including the HTML extension (.html). This filename must comply with FTP filename conventions (no spaces or special characters). The filename (without the HTML extension) is the name shown on the webpage menu.
4	<h3 target="sample-readings"> This creates the first webpage content pane. “sample-readings” is the name of the webpage content. This name must be unique. $%localizedString(Basic Readings)#$</h3> Basic Readings is the title of the webpage content pane. This title is translated if possible.
5	 This must match the name of the webpage content in line 4.
9	<th>$%localizedString(Minimum)#$</th> Minimum is the heading for the first column. This heading is translated if possible.
10	<th>$%localizedString(Present)#$</th> Present is the heading for the second column. This heading is translated if possible.
11	<th>$%localizedString(Maximum)#$</th> Maximum is the heading for the last column. This heading is translated if possible.
14	<td>$%localizedString(I a)#$ I a is the row heading. This heading is translated if possible. </td> This displays the units that the meter has defined for the named register I a.
15	<td regname="I a mn"></td> This displays the instantaneous value of the named register I a mn.[1]
16	<td regname="I a"></td> This displays the instantaneous value of the named register I a.[1]
17	<td regname="I a mx"></td> This displays the instantaneous value of the named register I a mx.[1]
20	<td>$%localizedString(I b)#$ I b is the second row heading. This heading is translated if possible. </td> This displays the units that the meter has defined for the named register I b.
21	<td regname="I b mn"></td> This displays the instantaneous value of the named register I b mn.[1]
22	<td regname="I b"></td> This displays the instantaneous value of the named register I b.[1]
23	<td regname="I b mx"></td> This displays the instantaneous value of the named register I bmx.[1]
27	<h3 target="sample-energy"> This creates the second webpage content pane. Sample-energy is the name of the webpage content. This name must be unique. $%localizedString(Energy Readings)#$</h3> Energy Readings is the title of the webpage content pane. This title is translated if possible.
28	 This must match the name of the webpage content in line 27.

Line #	Description
32	`<th>$%localizedString(Present)#$</th>` Present is the heading for the last column. This heading is translated if possible.

35	`<td>$%localizedString(Active Energy)#$`
	Active Energy is the row heading. This heading is translated if possible.
	`<span unitsreg="kWh del-rec"></span></td>`
	This displays the units that the meter has defined for the named register kWh del-rec.

36	`<td regname="kWh del-rec"></td>` This displays the instantaneous value of the named register kWh del-rec.[1]

39	`<td>$%localizedString(Reactive Energy)#$`
	Reactive Energy is the row heading. This heading is translated if possible.
	`<span unitsreg="kVARh del-rec"></span></td>`
	This displays the units that the meter has defined for the named register kVARh del-rec.

40	`<td regname="kVARh del-rec"></td>` This displays the instantaneous value of the named register kVARh del-rec.[1]
49	`instantaneousReadings.initInstantaneousReadings('sample-readings');` Sample-readings is the unique name of the first webpage content name. This HTML code updates all of the webpage's values.

[1] Named registers are listed in the PM8000 Modbus registers map. If the desired value is not listed, you can reference the value by its ION handle, using the following format: <td regname="_0x####"></td>, where #### is the hexadecimal value of the ION handle.

Sample setup webpage

You can create custom setup webpages using the sample webpage stored on your meter.

Sample webpages are stored in the documents folder on your meter's internal FTP site.

The PM8000 register map is available from www.schneider-electric.com.

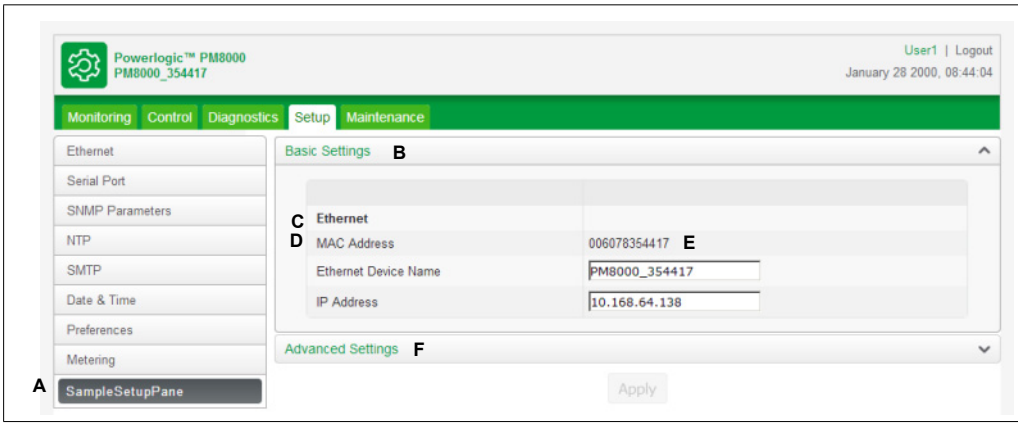
The PM8000 ION handles document is packaged with the meter firmware file which is available for download from www.schneider-electric.com.

Custom setup webpages must be stored on your meter's internal FTP site in the folder for Setup. The custom webpage is viewed by selecting the Setup main menu tab on your meter's webpage.

Configuring the HTML code other than where described is an advanced procedure and should only be performed by those with an advanced understanding of webpages and how your meter processes them.

Sample webpage setup result

NOTE: This graphic is representative only, and your meter's webpages may appear different than shown.



A	HTML filename
B	Content pane title
C	Sub-heading
D	Row heading
E	Named register value
F	Second content pane title

Sample setup webpage content

Line #	Sample HTML
1	SampleSetupPane.html
2	
3	
4	<form id="formSampleSettings">
5	
6	
7	<h3 target="sample-basic">$%localizedString(Basic Settings)#$</h3>
8	
9	<table class="formtable">
10	<tr>
11	<th> </th>
12	<th> </th>
13	</tr>
14	<tr>
15	<td>$%localizedString(Ethernet)#$</td>
16	<td> </td>
17	</tr>
18	<tr class="minor">
19	<td>$%localizedString(MAC Address)#$</td>
20	<td regname="MAC Address"></td>
21	</tr>
22	<tr class="minor">
23	<td>$%localizedString(Ethernet Device Name)#$</td>
24	<td><input name="Ethernet Device Name" type="text" /></td>
25	</tr>
26	<tr class="minor">
27	<td>$%localizedString(IP Address)#$</td>
28	<td><input name="IP Address" type="text" /></td>
29	</tr>
30	</table>
31	
32	
33	
34	<h3 target="sample-advanced">$%localizedString(Advanced Settings)#$</h3>

Line #	Sample HTML
35	
36	<table class="formtable" id="frameFormatDropdownContainer">
37	<tr>
38	<th> </th>
39	<th> </th>
40	</tr>
41	<tr>
42	<td>$%localizedString(TCP Keep Alive Minutes)#$</td>
43	<td><input type="text" name="TCP Keep Alive Minutes" class="small" /> </td>
44	</tr>
45	<tr>
46	<td>$%localizedString(Enable Web Server)#$</td>
47	<td><select name="Enable Web Server"></select> </td>
48	</tr>
49	</table>
50	
51	
52	
53	
54	<input type="submit" class="apply" value='$%localizedString(Apply)#$' />
55	
56	</form>
57	
58	
59	<script type="text/javascript">
60	
61	SetupPane.init('formSampleSettings');
62	formChangeDetection.initFormChangeDetection('#formSampleSettings', '#dialogFormChanges');
63	
64	</script>
65	

Sample setup webpage content description

Line #	Description
1	SampleSetupPane.html The HTML filename, including the HTML extension (.html). This filename must comply with FTP filename conventions (no spaces or special characters). The filename (without the HTML extension) is the name shown on the webpage menu.
4	<form id="formSampleSettings"> “formSampleSettings” is the name of the webpage content. This name must be unique
7	<h3 target="sample-basic"> This creates the first webpage content pane. “sample-basic” is the name of the webpage content. This name must be unique. $%localizedString(Basic Settings)#$</h3> Basic Settings is the title of the webpage content pane. This title is translated if possible.
8	 This must match the name of the webpage content in line 7.
15	<td>$%localizedString(Ethernet)#$</td> Ethernet is the subheading. This heading is translated if possible.

Line #	Description
19	`<td>$%localizedString(MAC Address)#$</td>` MAC Address is the row heading. This heading is translated if possible.
20	`<td regname="MAC Address"></td>` This displays the value of the read-only named register MAC Address.[1]
23	`<td>$%localizedString(Ethernet Device Name)#$</td>` Ethernet Device Name is the row heading. This heading is translated if possible.
24	`<td><input name="Ethernet Device Name" type="text" /></td>` This displays the instantaneous value of the configurable named register Ethernet Device Name in a text-edit field.[1] The type must match the named register type, in this case, an alphanumeric string.
27	`<td>$%localizedString(IP Address)#$</td>` IP Address is the row heading. This heading is translated if possible.
28	`<td><input name="IP Address" type="text" /></td>` This displays the instantaneous value of the configurable named register IP Address in a text-edit field.[1] The type must match the named register type, in this case, an alphanumeric string.

34	`<h3 target="sample-advanced">`
	This creates the second webpage content pane. Sample-advanced is the name of the webpage content. This name must be unique.
	`$%localizedString(Advanced Settings)#$</h3>`
	Advanced Settings is the title of the webpage content pane. This title is translated if possible.

35	`<div id="sample-advanced">` This must match the name of the webpage content in line 34.
42	`<td>$%localizedString(TCP Keep Alive Minutes)#$</td>` TCP Keep Alive Minutes is the row heading. This heading is translated if possible.

43	`<td><input type="text" name="TCP Keep Alive Minutes" class="small" />`
	This displays the instantaneous value of the configurable named register TCP Keep Alive Minutes in a text-edit field.[1]
	The type must match the named register type, in this case, an alphanumeric string.
	`<span unitsreg="TCP Keep Alive Minutes"></span></td>`
	This displays the units that the meter has defined for the named register TCP Keep Alive Minutes.
	NOTE: There are no defined units for TCP Keep Alive Minutes, so no units are displayed.

46	`<td>$%localizedString(Enable Web Server)#$</td>` Enable Web Server is the row heading. This heading is translated if possible.
47	`<td><select name="Enable Web Server"></select> </td>` Enable Web Server is the named register that is displayed. Named registers are listed in the PM8000 registers map. The type must match the named register type, in this case, an enumerated value that is displayed as a drop-down list.
61	`SetupPane.init('formSampleSettings');` This must match the webpage content name from line 4.
62	`formChangeDetection.initFormChangeDetection('#formSampleSettings', '#dialogFormChanges');` This must match the webpage content name from line 4. This HTML code updates all of the webpage's values.

[1] Named registers are listed in the PM8000 registers map. If the desired value is not listed, you can reference the value by its ION handle, using the following format: <td regname="_0x####"></td>, where #### is the hexadecimal value of the ION handle.

Chapter 14 Trending and forecasting

Trending and forecasting overview

Trending and forecasting is a feature on your device that predicts the next set of measured or calculated data by plotting and analyzing trends in historical data.

Trending and forecasting data is a useful tool to help analyze changes in load and power quality and forecasting values such as demand. For your meter's trending and forecasting feature to work, you only need to give the meter time to accumulate data.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for detailed information about the Trending and Forecasting module.

Trending and forecasting implementation

Data used for trending and forecasting is logged for the following intervals:

- Every hour for the last 24 hours
- Every day for the last month
- Every week for the last 8 weeks
- Every month for the last 12 months

The following parameters are configured for trending and forecasting by default:

kW sd del-rec (demand)	Freq (frequency)
Vll ab	I a mean
Vll bc	I b mean
Vll ca	I c mean
Vll avg	I avg mean

You can configure the start day of the week for trending and forecasting using ION Setup.

Related topics

- See "Accessing the meter's webpages" on page 116 for instructions on how to access your meter's webpages.
- See "Viewing trending and forecasting data on your meter's webpages" on page 127 for instructions on how to view trending and forecasting data.
- See "Configuring time and time synchronization using ION Setup" on page 96 for instructions on how to reset your meter's start day of the week.

Viewing trending and forecasting data on your meter's webpages

You can select data for forecasting and trending and view the resulting information using your meter's webpages.

For trending and forecasting to operate, your meter must have accumulated data for at least two of the specified intervals; for example, if you want to view a daily graph, your meter must have accumulated data for at least two previous days before the present day.

1. Log in to your meter's webpages.

2. Click **Monitoring** > **Trending & Forecasting**.
3. Select the **Target** and **Interval**. The graph for the selected data is displayed.

Chapter 15 Data, waveform and event logging

Overview

This section describes the meter's logging features. Your meter can support up to 50 logs (data recorders) which can each record up to 16 different parameters.

Your meter has a number of onboard default logs (also called data recorders) that are used to store data related to:

- Power quality and compliance
- Trending and forecasting
- Energy/revenue metering
- Meter events

Your meter also logs voltage and current waveform data when a sag or swell is detected. You must enter your power system's nominal values and configure your meter so that it can identify sags and swells. You can configure your meter's setpoint learning feature to learn your power system's normal operating values and use that information to help identify voltage sags and swells.

Logged data can be retrieved by energy management software.

Related topics

- See "Minimum configuration requirements for basic metering" on page 37 for information on entering your nominal values through the meter's display.

Default logging capacity

The following table summarizes the default logging depths and intervals for your meter's onboard data and waveform recorders:

Data recorder number	Log name	Depth	Interval
1	Revenue Log	3360 (35 days)	900 seconds (15 minutes)
9	Loss Log	3360 (35 days)	900 seconds (15 minutes)
2, 3, 4	Historic Logs	3360 (35 days)	900 seconds (15 minutes)
39	Daily Nominal Log	450	Triggered on demand
7, 8	Harmonics Logs	840 (35 days)	3600 seconds (1 hour)
N/A	Waveform recorders (6 total)	30	Triggered on demand
N/A	COMTRADE records	1	Triggered by waveform recording
10	Energy/Demand (EgyDmd Log)	3360 (35 days)	900 seconds (15 minutes)
5	Sag/Swell Log	100	Triggered on demand
N/A	Event Log	500	Triggered on demand
11, 12, 17, 19 - 26, 28, 29, 32, 35	EN50160 Logs	varies	EN50160 intervals
6, 16, 37, 38, 40	4-30 Logs	varies	IEC61000-4-30 intervals

Changing the log depths

Use ION Setup to change the number of records (depth) stored in the log. Changing how log records information (circular, or stop-when-full) is an advanced procedure to change the *RecordMode* setup register in the Data Recorder and Waveform Recorder modules.

Data logs and circular format waveform recorders have a minimum depth of 2 records.

Changing the log intervals

You can use ION Setup to change the logging intervals for the revenue and energy demand log.

Changing the interval for other data logs is an advanced procedure to modify the Periodic Timer module's *Period* setup register, which triggers the data log's recording.

Do not change the Periodic Timer module's *Sync Mode* setup register.

The default Periodic Timer modules that control the frequency of different data recording are as follows:

- Revenue Log Trg: controls the frequency of the logging of revenue values
- Loss Log Trg: controls the frequency of Loss Compensation Data logging
- EgyDmd Log Trg: controls the frequency of logging for the Energy and Demand Log (this log is used by ION Enterprise software to generate reports.
- Hist Log Trg: controls the frequency of Historic Data logging
- Harm Log Trg: controls the frequency of Harmonics logging

Programming your meter to write to any data recorder at continuous intervals shorter than 60 seconds (heavy logging configuration) can cause loss of data in the event of a power failure.

NOTICE

DATA LOSS

Use an uninterruptible power supply (UPS) if you program your meter for heavy logging.

Failure to follow these instructions can result in data loss.

Data log memory calculations

The amount of memory required to store data and event logs depends on the number of parameters being logged and the frequency with which these parameters are logged. The memory required is calculated as follows:

Memory consumption for each record (in Bytes) = [(number of parameters x 5) + 8]

For example, a data log recording three parameters consumes 23 Bytes of data. If the data is recorded every 15 minutes for 35 days, the data log requires approximately 80 kiloBytes of logging memory.

Waveform record memory calculations

The meter can simultaneously capture waveforms triggered by events on all channels to a maximum of 96 cycles for each waveform record. The memory required is calculated as follows:

Memory consumption for each waveform (in Bytes) = [2 x number of samples per cycle + 12] x [number of cycles in waveform x 2] + 32.

A single waveform record requires approximately 8 kB of memory.

Related topics

- See the ION Setup online help, available from www.schneider-electric.com, for more information about the logging memory allocations and other meter logging memory information displayed by the ION Setup Assistant.

Data logging overview

Your meter has data logging capabilities, including a special type of data log which is an event log, which logs prioritized events.

Data logs are recorded by your meter and stored in the meter's memory inside configurable data logs. Your meter's data logs are retained if the meter loses power.

Logged data can be used by energy management software. Logs can be configured to either overwrite the oldest data when full (circular), or to stop writing data to the log when the number of logged records reaches the maximum log depth (stop-when-full).

Your meter ships with a comprehensive data-logging configuration consisting of data logs set up to record values at specific intervals or on conditions. Your meter's default data logging configuration should be sufficient for most applications, but you can also reconfigure existing logs or create new logs for custom applications if needed.

Your meter can also be configured to email data log information.

Related topics

- See "Default logging capacity" on page 129 for details about your meter's default logging configuration.
- See the *Internal email client feature* technical note, available from www.schneider-electric.com, for instructions on how to configure your meter to email logged data.

Default data logging configuration

The default data logging configuration might be used by other components of your power monitoring system. Do not change the default configuration of any of the logs, unless you understand the impact of the change on these power monitoring system components and the data they use and on your meter's memory.

Revenue log

The Revenue Log is configured for use with UTS MV-90 billing software. The default values logged by the Revenue Log are as follows:

Parameter	Description
kWh del int	Interval kWh delivered
kWh rec int	Interval kWh received

Parameter	Description
kVARh del int	Interval kVARh delivered
kVARh rec int	Interval kVARh received

Historic data logs

Three historic data logs are used to record standard power system quantities, such as phase current, phase voltage and power factor. These logs are labeled Hist Mean Log, Hist High Log, and Hist Low Log. By default, they log the following values:

Hist Mean Log	
Vll ab mean	I avg mean
Vll bc mean	I 4 mean
Vll ca mean	kW tot mean
Vll avg mean	kVAR tot mean
V unbal mean	kVA tot mean
Ia mean	PF lag mean
Ib mean	PF lead mean
Ic mean	Freq mean

Hist High Log	
Vll ab high	I avg high
Vll bc high	I 4 high
Vll ca high	kW tot high
Vll avg high	kVAR tot high
V unbal high	kVA tot high
Ia high	PF lag high
Ib high	PF lead high
Ic high	Freq high

Hist Low Log	
Vll ab low	I avg low
Vll bc low	I 4 low
Vll ca low	kW tot low
Vll avg low	kVAR tot low
V unbal low	kVA tot low
Ia low	PF lag low
Ib low	PF lead low
Ic low	Freq low

Loss log

The Loss Log is configured to record loss values. By default, it logs the following values:

Parameter	Description
MU Ia^2h int	Phase A interval current squared hours
MU Ib^2h int	Phase B interval current squared hours
MU Ic^2h int	Phase C interval current squared hours
MU Vllab^2h int	Phase A interval voltage Line-to-Line squared hours
MU Vllbc^2h int	Phase B interval voltage Line-to-Line squared hours
MU Vllca^2h int	Phase C interval voltage Line-to-Line squared hours
MU Vln a^2h int	Phase A interval voltage Line-to-Neutral squared hours
MU Vln b^2h int	Phase B interval voltage Line-to-Neutral squared hours
MU Vln c^2h int	Phase C interval voltage Line-to-Neutral squared hours

Harmonics logs

Two harmonics logs record various harmonics data, including K-factor and Total Harmonic Distortion (THD). These recorders are labeled Harm Mean Log and Harm High Log. By default, they log the following values:

Harm Mean Log	
V1 THD mean	I1 K Fac mean
V2 THD mean	I2 K Fac mean
V3 THD mean	I3 K Fac mean
I1 THD mean	
I2 THD mean	
I3 THD mean	

Harm High Log	
V1 THD high	I1 K Fac high
V2 THD high	I2 K Fac high
V3 THD high	I3 K Fac high
I1 THD high	
I2 THD high	
I3 THD high	

Energy/Demand log

The Energy/Demand log records energy and demand data used by energy management software to generate reports. Changing the logged data can prevent the generation of reports that use this data.

Sag/swell log

The Sag/swell Log provides details of power quality events. By default, it logs the following values:

SS1 DistDur	SS1 DistV1Min	SS1 DistV1Max	SS1 DistV1Avg
SS1 DistV1Engy	SS1 DistV2Min	SS1 DistV2Max	SS1 DistV2Avg
SS1 DistV2Engy	SS1 DistV3Min	SS1 DistV3Max	SS1 DistV3Avg
SS1 DistV3Engy	SS1 DistNominal	SS1 Swell Lim	SS1 Sag Lim

EN50160 compliance logs

The EN50160 compliance logs are used to record EN50160 compliance parameters:

Data recorder	EN50160 component logged
EN50160 Frq/Mg	Power frequency and supply magnitude
EN50160 Hrm Vlt	Harmonics
EN50160 Intrp	Short/log interruptions
EN50160 Ovrvlt1	Temporary overvoltage
EN50160 Ovrvlt2	
EN50160 Prm-f/V	Parameter data (disabled by default)
EN50160 Prm-Vlr	
EN50160 Vunbal	Voltage unbalance

Data recorder	EN50160 component logged
EN50160 PrmHrm1	Parameter data (disabled by default)
EN50160 PrmHrm2	
EN50160 Vlt Dp1	Supply voltage dips
EN50160 Vlt Dp2	
EN50160 Vlt Dp3	
EN50160 Vlt Dp4	
EN50160 Vlt Dp5	

The meter logs EN50160 counter data for present and previous observation periods as well as EN51060 events.

4-30 compliance logs

Four 4-30 compliance logs are used to log parameters related to the International Electrotechnical Commission's IEC 61000-4-30 standards' power quality compliance and to create reports:

Data recorder	4-30 parameters logged
4-30 10m Log	• PqFlag • V1 • V2 • V3 • V1 THD (Total Harmonic Distortion) • V2 THD • V3 THD • NegSeqComp (Vneg/Vpos) • ZeroSeqComp (Vzero/Vpos) • Power Freq
4-30 10s Freq	• Power Frequency • PqFlag
4-30 2hr Log	• PqFlag • V1 • V2 • V3 • V1 THD (Total Harmonic Distortion) • V2 THD • V3 THD • NegSeqComp (Vneg/Vpos) • ZeroSeqComp (Vzero/Vpos) • Power Freq

Data recorder	4-30 parameters logged
4-30 3s Log	• PqFlag • V1 • V2 • V3 • V1 THD (Total Harmonic Distortion) • V2 THD • V3 THD • NegSeqComp (Vneg/Vpos) • ZeroSeqComp (Vzero/Vpos)
4-30 V Intrp DrtnAll	• Voltage interruption duration (all voltages)

Related topics

- See the *4-30 Compliance and ION Meters* technical note, available from www.schneider-electric.com, for more information about your meter's 4-30 compliance.
- See the *EN50160 2010 compliance and ION meters* technical note, available from www.schneider-electric.com, for more information about your meter's EN50160 compliance.

Advanced logging configuration

Adding or deleting data logs or their parameters outside of the ION Setup Assistant should only be undertaken by those with an advanced understanding of ION architecture and their meter's template.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for more information about ION Architecture and ION modules.

Event log overview

Your meter records events produced by the meter's ION modules or external meter events.

Meter events, such as meter configuration or changes to I/O state, have priority values associated with them, so you can control what events are logged. Each event has a priority based on its type and severity, and for most events you can configure the priority. The event log records the date and time of the event, along with relevant details about the event.

Your meter's event log can be viewed through the meter's display and ION Setup.

Event log data example:

Date/Time	Cause	Value	Effect	Value
11/10/2014 11:21:13.577 AM	Ethernet	FTP	Front Panel	Auth FAIL
11/10/2014 11:21:43.000 AM	Front Panel	Remote Display	Front Panel	File received on RMD
11/10/2014 11:24:45.000 AM	Front Panel	Remote Display	Front Panel	RMD firmware upgrade successful
11/10/2014 11:24:48.135 AM	Front Panel	Remote Display	Front Panel	RMD disconnected
11/10/2014 11:25:15.820 AM	Front Panel	Remote Display	Front Panel	RMD connected
11/10/2014 11:29:27.316 AM	Ethernet	FTP	Front Panel	Auth FAIL

NOTE: This example is representative only, and your meter's event log may appear different than shown.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Event Log Controller module and other ION modules.
- See “Viewing data using your meter’s display” on page 30 for instructions on how to view your meter’s event log through the display.
- See “Default event log configuration” on page 135 for more information about your meter’s events and priorities.

Default event log configuration

Your meter’s event log might be used by other components of your power monitoring system. Do not change the default event log configuration unless you understand the impact of the change on the power monitoring system components and the data they use and on your meter’s memory.

Changing the default event log configuration should only be undertaken by those with an advanced understanding of ION architecture and their meter’s template.

By default, your meter logs all configuration changes, meter access events, and power system events. You can configure certain features, such as the digital inputs, so an event is logged when the feature changes state (for example, the digital input changes from off to on).

The event log is controlled by the Event Log Controller module, which allows you to set a priority cutoff for event logging. Events with a priority number greater than the cutoff value are logged, and events with lower priorities are discarded. By default, this value is set so that all relevant events are recorded in the meter’s event log. Event priority values range from 0 to 255 with a typical cutoff value of 5.

NOTE: Alarms are generated by events from certain ION modules. The alarm level is determined by the priority of the associated event. To disable the alarm but still record the associated event, set the alarm priority to info only. To disable the alarm and the event, set the alarm priority to none.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Event Log Controller module and event priorities for specific ION modules.
- See “Alarms overview” on page 147 for details of alarm operation and configuration.

Waveform recording overview

Your meter is able to record voltage and current waveform information.

Waveform information is used to help identify power system disturbances, which are an increasing concern for industrial plants, hospitals, data centers and other facilities where the equipment is sensitive to voltage or current sags, swells, and momentary interruptions. Waveform information is also used to help ensure compliance with power quality standards.

In addition to measuring and recording numerical values for voltage and current, your meter can also capture the sinusoidal waveform data. The current and voltage waveform data provides additional information for analysis of the system’s power quality or a power quality event.

You can manually trigger waveform recordings or configure them to trigger automatically when there is a power quality or power system event. For waveform recording to trigger automatically, you must enter your system's nominal (normal) voltage and current values, and then the amount of deviation from the nominal required to trigger waveform recording.

Your meter's waveform data storage format is defined by:

- Cycles: the number of cycles (based on your power system's frequency) included in the waveform (its duration).
- Samples: samples per cycle, which is the number of waveform data points collected in each cycle.

This gives you the option to record a lot of information for a very short duration or less information over a longer duration. You can also configure a delay in starting waveform recording which allows you to record pre- and post-event data.

You can use your meter to detect ITI (CBEMA) - type disturbances, and can determine information regarding the magnitude and duration of each disturbance. This information can be used by your energy management system to plot the disturbance on a CBEMA curve.

COMTRADE waveform data is available from your meter.

NOTE: If you are generating COMTRADE waveform information, the associated waveform recorders cannot be modified unless COMTRADE is disabled. If the waveform recorders are not configured identically, COMTRADE waveform information will not be generated.

Key terms

Term	Definition
COMTRADE	COMmon format for TRAnsient Data Exchange (COMTRADE) is a common format for waveform data.
ITI (CBEMA)	A curve that graphically describes an AC input voltage envelope which can be typically tolerated by information technology equipment. Meter waveform information is plotted on this curve to help evaluate power quality.
Nominal	The normal or usual parameter value. For example, the nominal voltage for many power systems is 120 V.
Sag	A power event where the voltage or current drops below the nominal value.
Swell	A power event where the voltage or current rises above the nominal value.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for more information on the Waveform Recorder module and its settings.
- See "COMTRADE" on page 71 for more information about COMTRADE waveform data.
- See "Minimum configuration requirements for basic metering" on page 37 for information on the values that must be configured for your meter to perform power quality calculations.
- See "Setpoint learning overview" on page 137 for information about configuring your meter to learn your power system's normal acceptable range of values.

Default waveform recording configuration

Your meter's waveform recording operates once your nominal values are configured.

Your meter has the following default waveform recorders:

Waveform recorder	Description
Wfm Rc V1-Sg/Sw	V1 voltage waveforms recorded during a defined sag or swell event.
Wfm Rc V2-Sg/Sw	V2 voltage waveforms recorded during a defined sag or swell event.
Wfm Rc V3-Sg/Sw	V3 voltage waveforms recorded during a defined sag or swell event.
Wfm Rc I1-Sg/Sw	I1 current waveforms recorded during a defined sag or swell event.
Wfm Rc I2-Sg/Sw	I2 current waveforms recorded during a defined sag or swell event.
Wfm Rc I3-Sg/Sw	I3 current waveforms recorded during a defined sag or swell event.

Setpoint learning overview

Your meter can detect disturbances or values that are outside of a defined acceptable range. If you do not know what that acceptable range is or what threshold constitutes a voltage disturbance, your meter can learn these values by monitoring normal operating values to determine what constitutes a voltage sag or swell in order to help identify high and low setpoints.

NOTE: To help your meter learn the most accurate values possible, it is important that learning occur during a period of normal operation. Do not schedule learning during a period of unusual operations in your system. Do not modify your meter's configuration during the learning period as it may stop the learning process.

You can configure the meter so that learned values are applied automatically once the learning period is complete or require that they are reviewed and manually applied. If a learned value is invalid, the learned values are not automatically applied, but logged for review.

Setpoint learning can be used to identify the following values:

Feature	Values
Setpoints (Alarms)	High limit Low limit Sustain until ON Sustain until OFF
Sag	Voltage sag limit
Swell	Voltage swell limit

Learning installation mode and learning duration

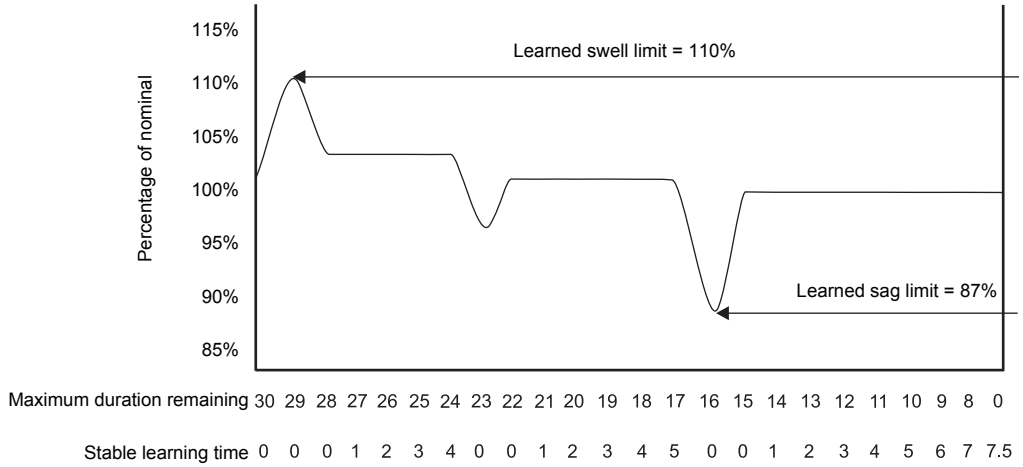
There are two learning installation modes:

- Manual: the meter learns the applicable values but does not begin using the learned values. The learned values are recorded for review, and you can decide to use the learned values or adjust them as required before manually implementing the learned values.
- Automatic: the meter learns the applicable values and begins using those learned values automatically at the end of the learning period. If a learned value is invalid, the meter does not apply the value, but the value is recorded in the event log.

You can configure the maximum learning duration. The actual learning duration may vary, depending on the stability of the system. If the system is stable for a period equal to one quarter of the maximum learning duration, learning is complete; otherwise, the learning period will be the maximum learning duration.

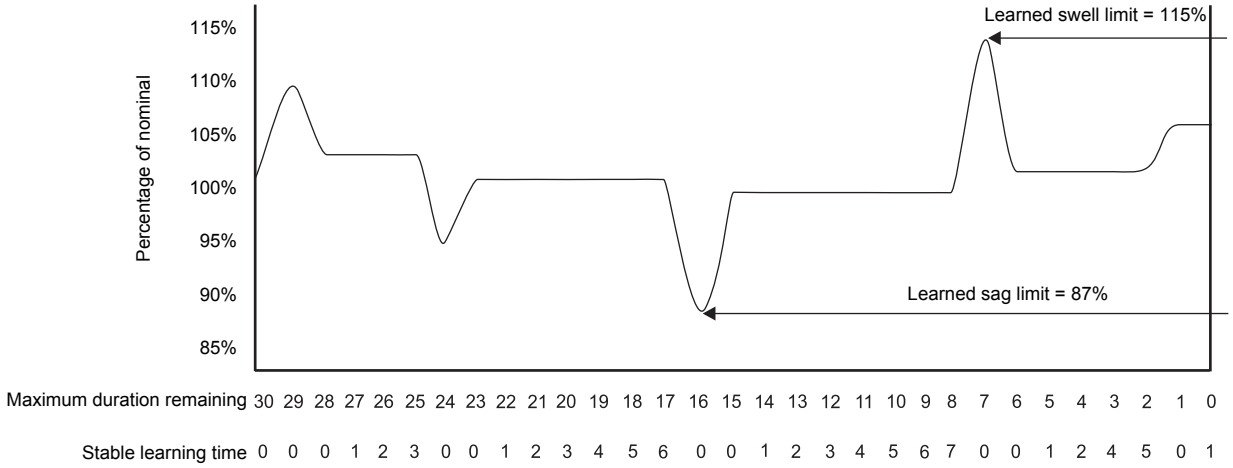
Example: Setpoint learning duration in a stable system

In this example, the learning duration is 30 days. When the system is stable for 7.5 days (one quarter of 30 days) learning is complete.



Example: Setpoint learning duration in an unstable system

In this example, the learning duration is 30 days. Because the system is not stable for 7.5 days (one quarter of 30 days) learning is complete at the end of the maximum learning duration.



Related topics

- See “Implementing sag/swell limit learning using ION Setup” on page 108 for instructions on how to configure learning for determination of sags or swells.
- See “Implementing alarm setpoint learning using ION Setup” on page 108 for instructions on how to configure learning for determination of power system events.
- See the *ION Reference,* available from www.schneider-electric.com, for more information on Sag/Swell, Setpoint and Relative Setpoint modules.

Chapter 16 Inputs/outputs

Inputs/outputs overview

Your meter has onboard digital I/O which can be increased by adding optional digital and analog I/O modules to expand your meter's I/O capabilities.

Your meter's digital and analog outputs may change state when being configured, during an option module reset or power cycle, or during firmware or framework upgrade.

⚠ WARNING

UNINTENDED OPERATION

Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Your meter's inputs are used to monitor and receive signals from external sources, and its outputs are used to send signals to external sources.

Example:

- You can use a digital input to monitor a breaker to verify how many times the breaker trips. When the breaker reaches its limit for the number of trips, you can use the digital output to light an LED next to the breaker to help remind maintenance personnel know it is due to be replaced.
- You can use a digital output to pulse based on energy measurements.
- You can use an analog input to monitor an analog flowmeter to measure how much water flows through a pipe, and use the meter's analog output to send a signal to an analog-controlled valve to modify the valve position and change the flow rate.

Your PM8000 meter base has:

- 3 digital inputs
- 1 form A digital output
- 2 energy pulsing LEDs (one visible, one infrared)

You can view information about your meter's I/O through the display and webpages, and configure your meter's I/O using ION Setup.

NOTE: The digital outputs can handle voltages less than their specified maximum. For higher voltage applications, use an external relay in the switching circuit.

Related topics

- See your device's installation instructions, available from www.schneider-electric.com, for I/O wiring and installation instructions.

Input/output ION modules

You need to configure the following ION modules in order to use the meter's digital or analog I/O.

- Digital input: uses the Digital Input module, which tells the meter how to interpret incoming signals.
- Digital output: uses one of three ION modules depending on the application.
  - Digital Output module: monitors a change of state to control relay operation via a hardware output device.
  - Pulser module: transfers high-speed pulses to a hardware pulse counting device that is used to track energy usage.
  - Calibration Pulser module: integrates instantaneous power inputs, then outputs high-speed pulses to an LED that can be monitored for energy accuracy verification.

  NOTE: All of these modules can act as intermediaries between the physical hardware port and the other modules in the meter. They define the characteristics of the outgoing signals.
- Analog input: uses the Analog Input module, which tells the meter how to interpret an incoming analog voltage or current signal from transducers.
- Analog output: uses the Analog Output module to deliver a continuous direct voltage or current analog signal to transducers.

Input/output ION modules, ports and labels

You can configure the Digital Output, Digital Input, Analog Input, Analog Output, Pulser and Calibration Pulser ION modules to specify which port handles the outgoing or incoming signals. To assign a port to one of these modules, simply modify the *Port* setup register by picking a port from the enumerated list.

The following tables describe the ports that can be configured to handle outgoing or incoming signals:

ION module type	ION module name	Hardware port (device label)	Port name (ION label)	Description
Onboard digital output port				
Digital Output	Port D1	D1	Port D1	Form A output
Calibration Pulser	Wh Pulser -LED	N/A	kWh Pulse LED	Energy pulsing
Onboard digital input ports				
Digital Input	Port S1	S1	Port S1	Externally excited
	Port S2	S2	Port S2	Externally excited
	Port S3	S3	Port S3	Externally excited

ION module type	ION module name	Hardware port (device label)	Port name (ION label)	Description
Option module(s) digital input ports				
Digital Input	Port A/B/C/D-S1-S6	S1 - S6	Port A S1 - S6 Port B S1 - S6 Port C S1 - S6 Port D S1 - S6	Option module digital inputs
Option module(s) digital output ports				
Digital Output	Port A/B/C/D D1 - D2	Relay 1 - Relay 2	Port A D1 - D2 Port B D1 - D2 Port C D1 - D2 Port D D1 - D2	Option module digital output
Option module(s) analog input ports				
Analog Input	Port A/B/C/D A1 - A4	A1 - A4	Port A A1 - A4 Port B A1 - A4 Port C A1 - A4 Port D A1 - A4	Option module analog input
Option module(s) analog output ports				
Analog Output	Port A/B/C/D Q1 - Q2	Q1 - Q2	Port A Q1 - Q2 Port B Q1 - Q2 Port C Q1 - Q2 Port D Q1 - Q2	Option module analog output

NOTE: When configuring your meter, the configuration interface may show all of the possible ports, regardless of what is physically available on your meter.

Related topics

- See “Option modules” on page 43 for a description of how the ports are named based on the option module location with respect to the meter base.

IRIG-B time synchronization

You can connect an IRIG-B time source to one of meter’s digital inputs for IRIG-B time synchronization; for improved accuracy use the digital inputs on the meter base. For IRIG-B time synchronization, you must configure both the meter’s digital input and the meter’s clock.

Related topics

- See “Configuring onboard digital inputs using ION Setup” on page 101 for instructions on how to set your meter’s digital inputs for IRIG-B time synchronization.
- See “Configuring time and time synchronization using ION Setup” on page 96 for instructions on how to configure your meter’s time synchronization settings for IRIG-B time synchronization.

Analog inputs/outputs

Your meter’s analog I/O option modules can measure and output either low voltage or current using standard analog transducers such as 4 - 20 mA current transducers.

For analog input operation, your meter takes an analog input signal and provides the resulting scaled value. For analog output operation, your meter takes an input value and scales it to the appropriate signal value to send out the physical analog output port.

You can view analog I/O values from your meter’s display or webpages.

Analog input voltage and current mode

In current mode, the analog inputs have a low input resistance while the meter is powered on, and a high input resistance when the meter is powered off. In voltage mode, the analog inputs have a high input resistance regardless of whether the meter is powered or not.

NOTE: When unpowered, your meter's analog inputs act like they are in voltage mode (high input resistance).

When connected to a current output transducer, this high resistance can create a high voltage. Standard (i.e., 4 to 20 mA) current transducers have open circuit protection and are able to handle a high input resistance; however, if non-standard transducers are used high voltages may be generated. Your meter's analog input has circuitry to limit this voltage, but it may not be sufficient with a very high-power current source.

NOTICE

EQUIPMENT DAMAGE

- Ensure the analog input is configured for the correct voltage or current mode before connecting or activating the current transducer.
- Do not exceed the device's ratings for maximum limits.

Failure to follow these instructions will result in equipment damage.

Related topics

- See "Option modules" on page 184 for your option module's analog voltage and current range specifications.

Analog input behavior

Analog inputs may show a value below zero scale if an open circuit is detected on the input port.

Analog output behavior

Your meter's analog output, once configured, outputs voltage or current signals. If your meter's analog output source becomes unavailable (N/A) the analog output level should go to zero (0 V / 0 mA) under most conditions.

When your meter is powered off or configured to send voltage, the meter registers as a high impedance.

The electrical signal on the analog output is DC; make sure proper polarity is observed when wiring external devices to the analog output ports.

An unexpected change of state of the analog outputs can result when the supply power to the meter is interrupted, during an upgrade of the meter's firmware or framework or option module firmware or a during an option module reset.

⚠ WARNING

UNINTENDED OPERATION

Do not use this meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Related topics

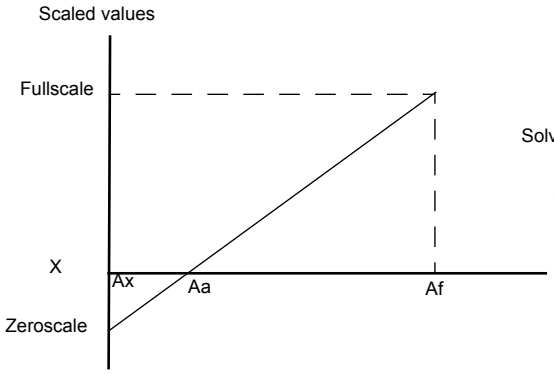
- See “Configuring I/O option module analog inputs using ION Setup” on page 103 and “Configuring option module analog outputs using ION Setup” on page 104 for instructions on how to configure your analog inputs and outputs using ION Setup.
- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Analog Input and Analog Output module settings.

How to calculate analog I/O zero scale and full scale values

Your meter receives an analog signal through its analog input port and scales it before displaying or logging the value. Your meter can also output a scaled analog signal based on measured values such as power. You must calculate the zero scale and full scale values to help ensure the scaled values are correctly interpreted.

Analog inputs will show a value below zero scale if an open circuit is detected on the input port.

The relationship between the analog source range, the zero and full scale values, and the final value provided by your meter, is as follows:



$$\frac{Af - Aa}{Af - Ax} = \frac{Fullscale - X}{Fullscale - Zeroscale}$$

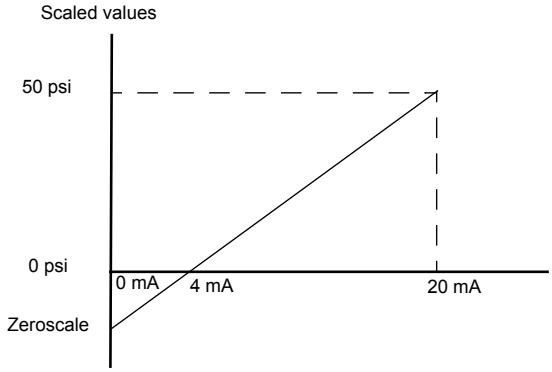
Solving for Zeroscale:

$$Zeroscale = Fullscale - \frac{Fullscale - X}{Af - Aa}(Af - Ax)$$

- Aa = the lowest reading in the nominal operating range that is measured by the meter’s analog input port or produced by the meter’s analog output port
- Af = the highest reading in the nominal operating range that is measured by the meter’s analog input port or produced by the meter’s analog output port
- Ax = the analog input source minimum value or the external analog receiver’s minimum value
- X = the scaled equivalent of Ax

Example (analog input)

The meter's analog input port can measure from 4 - 20 mA, and you need to monitor a steam pressure sensor which measures between 0 - 50 psi of steam. The steam pressure sensor's output ranges from 4 - 20 mA.



$$Zeroscale = Fullscale - \frac{Fullscale - X}{Af - Aa}(Af - Ax)$$

$$Zeroscale = 50 - \frac{50 - 0}{20 - 4}(20 - 0)$$

$$Zeroscale = 50 - 62.5 = -12.5 \text{ psi}$$

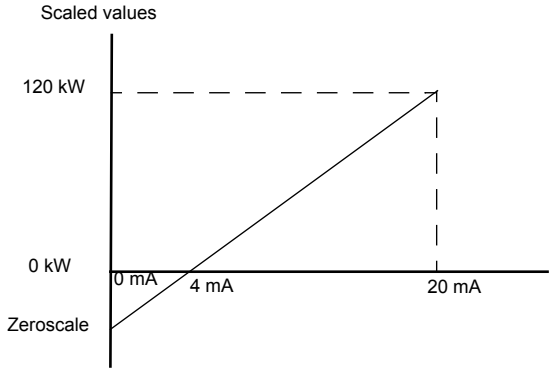
- Af = 20 mA
- Aa = 4 mA
- Ax = 0 mA
- Fullscale = 50 psi

Calculating the Zeroscale value from the equation above gives -12.5 psi.

Configuring the meter's analog input with Fullscale = 50 psi and Zeroscale = -12.5 psi produces an output value ranging from 0 - 50 psi represented by a 4 - 20 mA signal.

Example (analog output)

The meter is monitoring a 0 to 120 kW system and outputs the real power over a 4 to 20 mA analog output. The receiving device is expecting the 0 to 120 kW signal to be represented by the 4 to 20 mA signal.



$$Zeroscale = Fullscale - \frac{Fullscale - X}{Af - Aa}(Af - Ax)$$

$$Zeroscale = 120 - \frac{120 - 0}{20 - 4}(20 - 0)$$

$$Zeroscale = 120 - 150 = -30 \text{ kW}$$

- Af = 20 mA
- Aa = 4 mA
- Ax = 0 mA
- Fullscale = 120 kW
- X = 0 kW

Calculating the Zeroscale value from the equation above gives -30 kW.

Configuring the meter's analog output with Fullscale = 120 kW and Zeroscale = -30 kW produces an output value ranging from 0 - 120 kW represented by a 4 - 20 mA signal.

Digital inputs/outputs

Your meter has three digital inputs and one digital output, and you can add digital I/O option modules to increase your meter's capabilities.

Digital I/O allows the meter to send and receive digital signals, including sending energy pulse information that can be used for verifying accuracy or receiving IRIG-B information for time synchronization. You can view the digital I/O values from your meter's display or webpages.

For high-accuracy applications like IRIG-B time synchronization or verifying accuracy, use the meter's onboard digital I/O.

Your meter's digital inputs can be used for input metering and incremental energy applications.

An unexpected change of state of the digital outputs can result when the supply power to the meter is interrupted, during an upgrade of the meter's firmware or framework or option module firmware or a during an option module reset.

⚠ WARNING

UNINTENDED OPERATION

Do not use this meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Related topics

- See "Conditional energy" on page 167 for details about your meter's conditional energy feature.
- See "Input metering overview" on page 168 for details about your meter's input metering feature.
- See "IRIG-B time synchronization" on page 141 for information about IRIG-B time synchronization.
- See "Configuring onboard digital inputs using ION Setup" on page 101 for instructions on how to configure your digital inputs.
- See "Configuring onboard digital outputs using ION setup" on page 102 for instructions on how to configure your digital outputs.

Energy pulsing overview

You can use your meter's digital output or energy pulsing LEDs for energy pulsing.

Energy pulsing is when the meter sends a readable pulse or signal based on the measured energy. This pulse can be used for accuracy verification or as an input to another energy monitoring system. You must calculate your pulse values as either pulses per kWh or as kWh per pulse, as defined by your meter, and set the energy value as active, reactive, or apparent delivered, received, or delivered plus received.

For applications where energy pulsing accuracy is required, use the meter's onboard digital output.

Related topics

- See “Verifying accuracy” on page 175 for instructions on how to perform accuracy verification testing on your meter.
- See the *ION Reference*, available from www.schneider-electric.com, for more information about Calibration Pulser and Pulser modules.

Calculate your maximum kWh/pulse (pulse weight) value

To calculate the kWh/pulse (pulse weight) value, divide the highest kW value you can expect by the required pulse rate. Make sure the required pulse rate does not exceed the maximum pulse rate for the digital output.

NOTE: To convert from kWh/pulse to pulse/kWh you must invert (take the reciprocal) of the value. For example, 1.8 kWh/pulse becomes 0.556 pulse/kWh.

Example

For a maximum load of 1600 kW and a pulse rate of 2 pulses per second, calculate the kWh/pulse value as follows:

1. Convert 1600 kW load into kWh/second:

   (1600 kW)*(1hr) = 1600 kWh

   (1600 kWh)/(3600 sec) = (X kWh)/(1sec)

   X = 0.444 kWh/sec

2. Calculate the kWh required per pulse:

   (0.444 kWh/sec)/(2 pulses per second) = 0.222 kWh/pulse

3. Adjust for the KY giving one pulse per 2 transitions if necessary.

   (0.222 kWh/pulse)/(2) = 0.111 kWh/pulse

Chapter 17 Alarms and alerts

Your meter can display various alarms through the display, and can be configured to send an alert.

⚠ WARNING

INACCURATE DATA RESULTS

Confirm your alarm is properly configured.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Alarms overview

An alarm is a notification of a specific event that is annunciated through the display, and can be viewed and acknowledged using your meter's display.

You can configure your meter to generate and display alarms when predefined events are detected in the meter's measured values or operating states. Your meter also records and stores meter events in the meter's onboard event log.

Your meter comes with many alarms. Some are preconfigured, while others need to be configured before your meter can generate alarms. Your meter's default alarms can be customized, as needed, such as changing the priority. You can create custom alarms using the advanced features of your meter.

NOTE: To stop an alarm from being displayed without impacting other metering features, set its alarm priority to info only.

Related topics

- See "Event log overview" on page 134 for more information about your meter's on-board event log.
- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Setpoint module.

Alarm types

Your meter has the following types of alarms:

Type	Description
Setpoint (standard)	Setpoint alarms define an alarm by comparing the actual value of a parameter to a specified limit or range of values. These include measured voltage and current values and calculated power quality values. Some setpoint alarms use high-speed measurements for up to 1 millisecond resolution.
Digital	Digital alarms define an alarm condition based on a digital input's on/off state.
Disturbance (sag/swell)	Disturbance alarms define an alarm based on a measured sag or swell.
Unary	Unary alarms are not configurable, and generate an alarm based on the meter's state, for example, the meter powering up.

Alarms have two states:

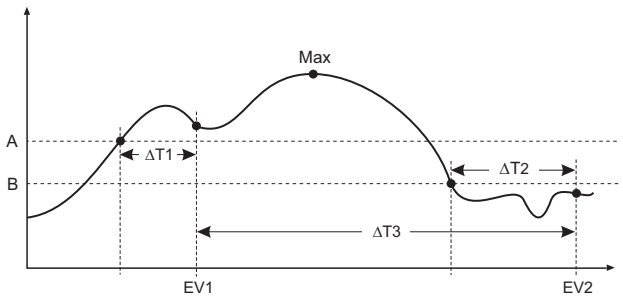
- Active: the meter detects the alarm condition is met.
- Historical: the alarm condition previously existed but the condition has since returned to a non-alarm state.

Setpoint (standard) alarms

You must define the pickup, dropout and set the time delay for these alarms. You can define the pickup and dropout values as actual values, or as a percentage of the nominal value, and set the time delay to minimize nuisance alarms.

The setpoint alarms operate as either over or under alarms, or as bounding alarms (both over and under values are alarmed).

Example of over setpoint alarm operation



A	Pickup
B	Dropout
ΔT1	Pickup time delay
ΔT2	Dropout time delay
ΔT3	Alarm duration
EV1	Start of alarm
MAX	Maximum value for alarm
EV2	End of alarm

When the monitored value rises above the pickup (A) and remains there long enough to satisfy the pickup time delay period (ΔT1), the setpoint alarm is active. When the value falls below the dropout (B) and remains there long enough to satisfy the dropout time delay period (ΔT2), the alarm is no longer active and becomes a historic alarm.

The meter records the date and time when the alarm event starts (EV1) and when it ends (EV2). The meter records the maximum value (Max) during the alarm period.

Disturbance (sag/swell) alarms

You must configure nominal voltage and current for these alarms to function. For voltage disturbances, enter the percentage deviation from the nominal that defines a sag or swell. For current disturbances, enter the percentage deviation from the nominal that defines the pickup and dropout points for a current sag or a current swell.

Digital alarms

These alarms are triggered when the associated digital input changes state. You can configure the alarm to be active when the digital input is on or off, depending on the alarm's purpose.

For example, if you used a digital input to monitor a breaker that is always supposed to be on, you would set the alarm to be active when the breaker has tripped.

NOTE: To stop a digital alarm from being displayed, set the alarm priority to info only. Disabling (force off) the digital alarm off will disable all functions of the associated digital input.

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for more information about the Setpoint and Relative Setpoint module, Digital Input module, Sag/Swell module and Disturbance Analyzer modules.
- See "Configuring setpoint/standard alarms using ION Setup" on page 106 for instructions on how to configure alarms on your meter using ION Setup.

Alarm event priorities

Your meter's alarm priorities correspond to the following event priority ranges:

Alarm priority	Event priority
High (red)	192 - 255
Medium (yellow)	128 - 191
Low (blue)	64 - 127
Info only (no alarm)[1]	1 - 63
None (no alarm or event)[1]	0

[1] Alarms with priority of info only or none are not indicated or displayed.

Info only and none event priority

Alarms with a priority of info only or none are not shown on the meter's display, and do not function as alarms. If the alarm's priority is set to info only, and the event priority is greater than the event log cutoff value, the associated event is recorded in the meter's event log. If the alarm's priority is set to none, the event priority is automatically set to zero, and no associated event is logged in the meter's event log.

For events that you want to log for future reference or troubleshooting, but don't want alarm functions, set the alarm priority to info only.

For nuisance events that frequently occur and you have no desire to log for reference or troubleshooting, set the alarm priority to none.

Related topics

- See "Event log overview" on page 134 for more information about event priority and the meter's event log.

Alarm indicators

Your meter's display has an alarm indicator to show you what alarm levels have been detected (active or historic) and whether they have been acknowledged. For active high priority alarms, the meter's display will also flash until the alarm is acknowledged. There is also an alarm LED to indicate the meter's alarm condition.

Alarm	Alarm icon	Alarm icon flash	Alarm LED	Meter display
Active high	Red solid bell	Flash if not acknowledged	• Flash if not acknowledged • Steady if acknowledged	Flash if not acknowledged
Active medium	Yellow solid bell	Flash if not acknowledged	• Flash if not acknowledged • Steady if acknowledged	No flash
Active low	Blue solid bell	Flash if not acknowledged	• Flash if not acknowledged • Steady if acknowledged	No flash
Historic high	Red outline bell	Flash if not acknowledged	• Flash if not acknowledged • Steady if acknowledged	No flash
Historic medium	Yellow outline bell	Flash if not acknowledged	• Flash if not acknowledged • Steady if acknowledged	No flash
Historic low	Blue outline bell	Flash if not acknowledged	• Flash if not acknowledged • Steady if acknowledged	No flash

Alarm	Alarm icon	Alarm icon flash	Alarm LED	Meter display
No active or unacknowledged alarms	Gray solid bell	No flash	Off	No flash

If there are multiple active alarms, the meter displays the alarm condition associated with the most important active alarm. If there are multiple unacknowledged historic alarms, the meter displays the alarm condition associated with the most important unacknowledged historic alarm.

NOTE: To stop an alarm from being displayed without impacting other metering features, set the alarm priority to info only.

Default alarms

Your meter comes with the following default alarms.

NOTE: Some alarms require configuration in order to operate.

Name	Priority	Description
Current Sag Ph1 - 3	High	Current sag alarms for phase 1, 2, 3
Current Swell Ph1 - 3	High	Current swell alarms for phase 1, 2, 3
Sag/Swell	High	Voltage sag/swell alarm
Over I unbal	Medium	Over unbalanced current alarm
Over V unbal	Medium	Over unbalanced voltage alarm
Over THD V1 - 3	Medium	Over total harmonic distortion (THD) voltage alarms
Over kW (P) sd	Medium	Over kW sliding demand alarm
Over I a - c, (1 -3) 4	Medium	Over current alarms
V1 - V3 Setpoint	Medium	Voltage setpoint alarms
Freq Setpoint	Medium	Frequency setpoint alarm
4-30 Volt Intrp Ph1 - 3	Low	4-30 voltage interruption power quality alarms
Digital In	Info only	Digital input alarms Number of alarms determined by the total number of available digital inputs **NOTE:** These alarms are not displayed by default.

Alarm information

You can view the following information about an alarm from your meter's display. Only alarms with a priority of low, medium or high are displayed.

Parameter	Description
Alarm	The name of the alarm (for example, Over THD V1).
Priority	Low, medium or high alarm priority.
Date	The date and time the alarm was triggered.
Duration	The duration of the alarm (only applies to inactive alarms).
Ack	The date and time when the alarm was acknowledged (only applies to acknowledged alarms).
Value	Active alarm: The maximum value detected when the alarm was triggered. Historic alarm: The maximum value detected during the duration of the alarm.

Disabling alarms through your meter's display

You can disable alarms through the meter's display when you are performing maintenance tasks on your system and want to prevent nuisance alarms.

NOTE: To stop an alarm from being displayed without impacting other metering features, set the alarm priority to info only.

⚠ WARNING

INACCURATE DATA RESULTS

Confirm your alarm is properly configured.

Failure to follow these instructions can result in death, serious injury or equipment damage.

1. Navigate to **Setup Menu > Alarm Setup**. Press the edit button to access the enable/disable screen. Use the up and down arrows to scroll through the available alarms. Simultaneously press the up and down arrow to enable or disable the highlighted alarm.
2. Press the select button to confirm your settings.
3. Complete the system maintenance tasks.
4. Enable the alarms you disabled in step 1.

Related topics

- See “Setting up your meter using the display” on page 34 for instructions on how to navigate and use your meter’s display.

Alerting

An alert is an external notification produced by the meter to indicate changes, for example, a change of state for a digital input, or a power quality event such as a sag or swell.

Alerts are generated when a pulse or trigger that is configured to indicate the alert condition activates. You can configure alerts to send notification emails or messages to your energy management system through your meter’s existing Ethernet communications connections. You can configure alert messages as a simple text string or you can also include device information. You can configure the alert’s priority so that alerts are also recorded in the meter’s event log.

You can configure multiple alerts on a single meter, each having different activation triggers, messages and/or transmission types. For instance, you can have two alerts, one generating an email, the other sending a message to your energy management system, but using the same trigger conditions; or you can have two alerts with different conditions that send two unique emails to two different email addresses. You can also generate alerts based on triggers from devices connected to your meter.

Creating alerts is an advanced feature that requires familiarity with ION architecture and your power system and communications network. To create an alert, you must configure the Alert module using a configuration tool. You must also configure your device’s communications as needed to send the alerts, such as configuring your meter’s SMTP settings and connecting it via Ethernet to an SMTP mail server in order to send an alert by email.

Related topics

- See the *ION meter alerts* technical note, available from www.schneider-electric.com, for detailed information on creating and configuring alerts.
- See the *ION Reference*, available from www.schneider-electric.com, for detailed information about the Alert module and its operation.

Chapter 18 Resets

Resets overview

Resets allow you to clear various accumulated parameters stored on your meter or re-initialize meter accessories.

Meter resets clear your meter's onboard data logs and other related information. Resets are typically performed after you make changes to the meter's basic setup parameters (such as PT/CT settings) to clear obsolete or invalid data in preparation for putting the meter into active service.

You must enter a valid password in order to perform a reset.

NOTE: Revenue-locked meters must be unlocked to perform meter resets that affect revenue data.

Related topics

- See "Revenue locking" on page 173 for more information locking and unlocking revenue locked meters.

Meter resets

You can perform various meter resets through the meter's display or ION Setup.

Your meter's digital and analog outputs may change state or may not function during resets.

⚠ WARNING

HAZARD OF UNINTENDED OPERATION

Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Meter resets clear the meter's onboard data logs and other related information.

NOTICE

DATA LOSS

Ensure all important data from the device has been retrieved before performing a reset.

Failure to follow these instructions can result in data loss.

Reset	Description
Master Reset	• Clears all the cumulative and derived quantities from the meter (including demand, peak demand, energy and revenue parameters). • Clears meter event and waveform logs. • Clears COMTRADE waveform records from the meter's internal FTP server. • Clears the meter's data logs.
Peak Demand Reset	Clears the peak demand values logged in the meter. **NOTE:** The peak demand reset has a lockout period that sets the minimum time allowed between consecutive resets.
Min/Max Reset	Clears all accumulated maximum and minimum values stored in the meter.
Digital Input Count Reset	Clears the digital input status change counters.
Harmonics Min/Max Reset	Clears all accumulated maximum and minimum harmonics values stored in the meter.
Disturbance Count Reset	Clears the sag/swell event counter. The sag/swell event counter counts the number of sag/swells that have occurred since power-up or the last reset, to provide power quality information to energy management systems.
EN50160 Reset	Clears all EN50160 parameters and statistics accumulated in the meter.
Option modules reset	Resets communications to the meter's expansion modules.
Conditional energy reset[1]	Clears the conditional energy values stored in the meter.
Input metering reset[1]	Clears the input metering values stored in the meter.

[1] These resets are only available through ION Setup.

Related topics

- See "Peak demand reset lockout" on page 172 for more information about the peak demand reset lockout.

Performing meter resets using the display

You can perform meter resets from the display after entering a valid password.

Revenue-locked meters must be unlocked to perform resets that impact revenue data.

Your meter's digital and analog outputs may change state or may not function during resets.

⚠ WARNING

HAZARD OF UNINTENDED OPERATION

Do not use the meter for critical control or protection applications where human or equipment safety relies on the operation of the control circuit.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Meter resets clear the meter's onboard data logs and other related information.

NOTICE

DATA LOSS

Ensure all important data from the device has been retrieved before performing a reset.

Failure to follow these instructions can result in data loss.

1. Navigate to **Setup Menu > Resets**.
2. Press the edit button to access the configuration menu and use the up and down buttons to navigate through and select the resets you want to perform. Press the select button to perform the resets.

Related topics

- See “Revenue locking” on page 173 for more information on revenue locked meters.

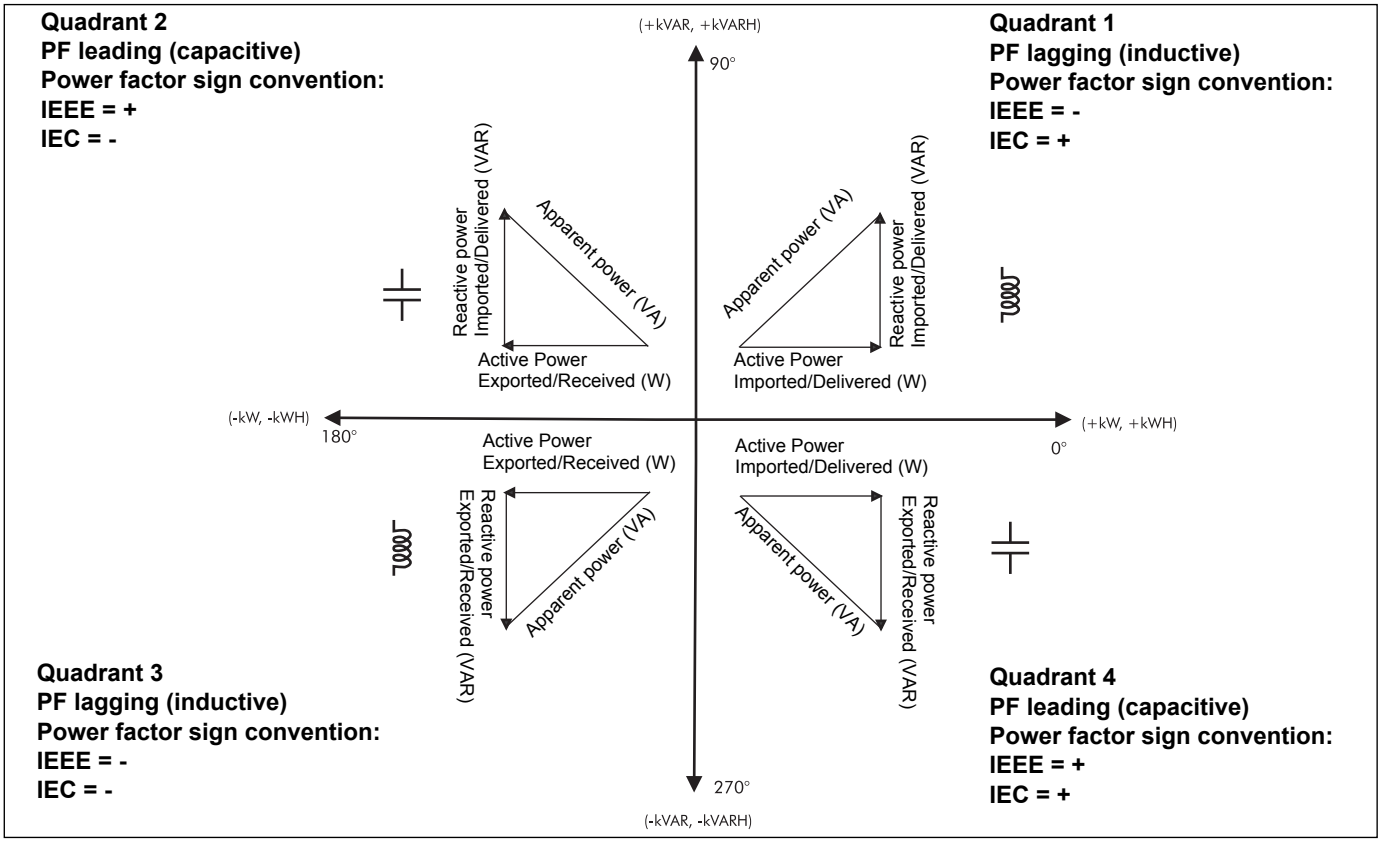
Chapter 19 Power and power factor

This section describes how the meter interprets and calculates power and power factor.

NOTE: The descriptions in this section assume that you are an electrical energy consumer, not a supplier.

Power and power factor conventions

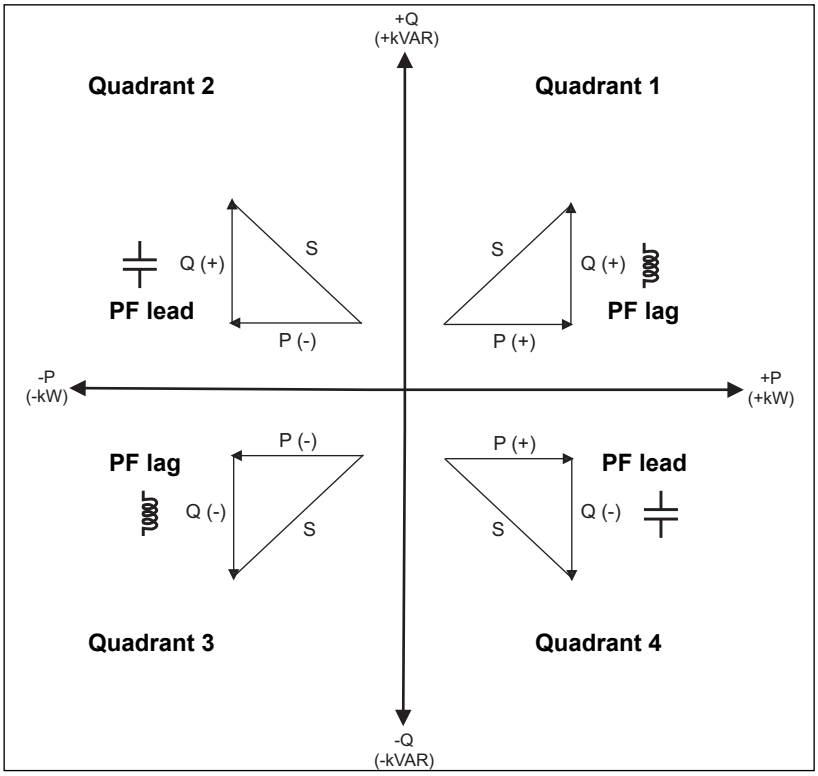
Values for power and power factor are interpreted according to the conventions shown in the diagram below.



Apparent, active and reactive power (PQS)

A typical AC electrical system load has both resistive and reactive (inductive or capacitive) components. Resistive loads consume real power (P). Reactive power (Q) is either consumed (inductive loads) or generated (capacitive loads).

Apparent power (S) is the capacity of your measured power system to provide real and reactive power.



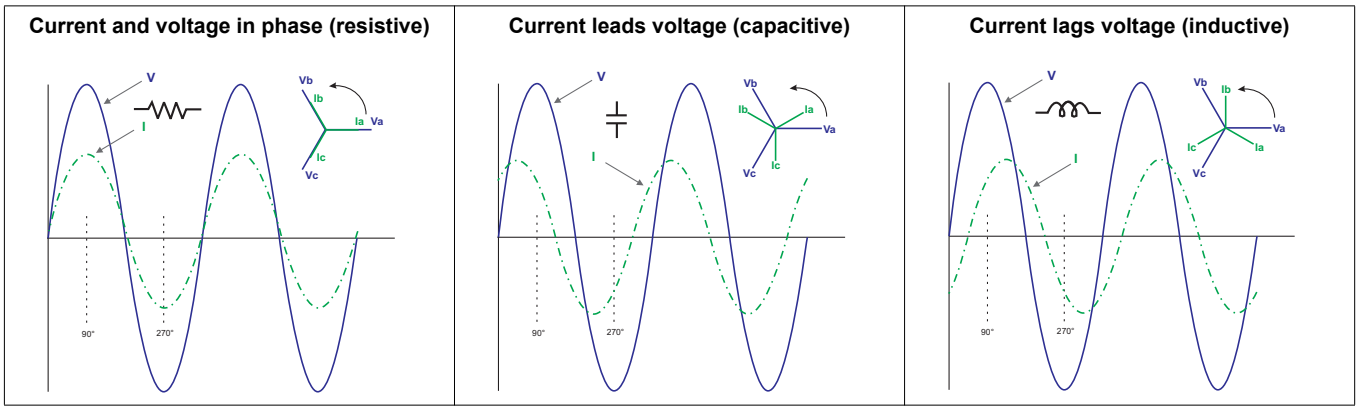
The units for power are watts (W or kW) for real power P, vars (VAR or kVAR) for reactive power Q, and volt-amps (VA or kVA) for apparent power S.

Positive real power P(+) flows from source to load, and negative real power P(-) flows from the load to the power source.

Current phase shift from voltage

For purely resistive loads, the current waveform is in phase with the voltage waveform. For capacitive loads, current leads voltage. For inductive loads, current lags voltage. The following diagram shows how voltage and current waveforms shift based on load type under ideal (laboratory) conditions.

Current lead / lag and load type



Power factor (PF)

Power factor (PF) is the ratio of real power (P) to apparent power (S) and is provided as a number between -1 and 1 or as a percentage from -100% to 100%, where the sign is determined by convention.

$$PF = \frac{P}{S}$$

An ideal, purely resistive load has no reactive components, so its power factor is one (PF = 1, or unity power factor). Inductive or capacitive loads introduce a reactive power (Q) component to the circuit which causes the PF to become closer to zero.

Related topic

- See “Power and power factor conventions” on page 157 for power factor sign convention information.

True PF and displacement PF

The meter supports true power factor and displacement power factor values:

- True power factor includes harmonic content.
- Displacement power factor only considers the fundamental frequency.

NOTE: Unless specified, the power factor displayed by the meter is true power factor.

PF min/max convention

The meter uses the following convention for power factor minimums and maximums.

For negative PF readings:

- The minimum PF value is the measurement closest to -0.
- The maximum PF value is the measurement closest to -1.

For positive PF readings:

- The maximum PF value is the measurement closest to +1.
- The minimum PF value is the measurement closest to +0.

Chapter 20 Power quality

Your meter measures voltage and current harmonics up to the 63rd harmonic, and calculates several harmonic distortion values as well as K-factor and crest factor values.

You must configure your meter with nominal values for voltage, current and frequency for the power system being monitored in order for the meter to perform power quality calculations. Your meter also creates a phasor diagram, including numeric values for magnitude and angle, to represent your power system.

Related topics

- See “Minimum configuration requirements for basic metering” on page 37 for instructions on setting basic metering values through your meter’s display.
- See ““Specifications” on page 181 for the power quality standards your meter is compliant to.
- See the *Power quality: ION meters and EN50160:2010* technical note, available from www.schneider-electric.com, for a detailed description of the EN50160 data and statics measured by your meter to monitor compliance to the EN50160 standard.
- See the *4-30 compliance and ION meters* technical note, available from www.schneider-electric.com, for details on how your meter complies with the 4-30 standard.

Sag/swell overview

Your meter monitors your power system’s voltage and current for sags and swells (INCITS (CBEMA) Type 2 and Type 3 disturbances); it then reports the disturbance’s magnitude and duration.

You can manually enter the limits (criteria) used by the meter to identify a sag or swell, or you can have your meter learn sag/swell limits by monitoring your power system.

Related topics

- See “Configuring waveform recording using ION Setup” on page 109 for instructions on how to manually enter sag/swell limits.
- See“Implementing sag/swell limit learning using ION Setup” on page 108 for instructions on to start setpoint learning and have the learned values used by your meter to identify sags/swells.
- See “Waveform recording overview” on page 135 for details on how your meter records voltage and current waveform information.

Harmonics overview

Voltage and current harmonics are measured or calculated by your device, for use in standards compliance and power quality analysis.

Harmonics are integer multiples of the fundamental frequency of your monitored power system. Harmonics information is valuable for power quality analysis, determining properly rated transformers, maintenance and troubleshooting, and is required for compliance to system power quality standards such as EN50160 and meter power quality standards such as IEC 61000-4-30.

Harmonics measurements include per-phase magnitudes and angles (relative to the fundamental frequency of the phase A voltage) for the fundamental and higher harmonics. The device's power system configuration determines which phases are present, and how line-to-line or line-to-neutral voltage harmonics and current harmonics are calculated.

Harmonics are used to identify whether the supplied system power meets required power quality standards, or if non-linear loads are affecting your power system. Power system harmonics can cause current flow on the neutral conductor, and damage to equipment such as increased heating in electric motors. Power conditioners or harmonic filters can be used to minimize unwanted harmonics.

Your meter provides harmonic information up to the 63rd harmonic. Harmonic information can be viewed on the meter's display, and is recorded by your meter.

Related topics

- See "Viewing harmonics information using the display" on page 164 for information on how to view harmonics values on your meter's display.
- See the *ION Reference,* available from www.schneider-electric.com, for details about the Harmonics Measurement and Harmonics evaluation modules.
- See "Default data logging configuration" on page 131 for information on how harmonic information is logged on your meter.

Crest factor and K-factor overview

Crest factor is the ratio of peak to RMS values, and is available for both voltage and current. For a pure sinusoidal waveform, crest factor is equal to the square root of 2. The meter uses the following equation to calculate crest factor:

$$\text{Crest factor} = \frac{V_{peak}}{V_{RMS}}$$

$$\text{Crest factor} = \frac{I_{peak}}{I_{RMS}}$$

K-factor relates to the heating effect of a distorted current in a transformer to a sinusoidal current with the same RMS magnitude: it describes a transformer's ability to serve non-linear loads with out exceeding rated temperature rise limits. The K-factor is equal to the sum of the squares of the harmonic currents multiplied by the squares of the harmonic order. The meter uses the following equation to calculate K-factor:

$$\text{K-factor} = \frac{\sum_{h=1}^{63} (I_h^2 \times h^2)}{\sum_{h=1}^{63} (I_h^2)}$$

Where "h" is the harmonic order and "I_h" is the RMS current of harmonic order "h".

Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for details about the Harmonics Measurement module.
- See "Harmonics logs" on page 132 for information on how K-factor information is logged on your meter.

Total harmonic distortion overview

Total Harmonic Distortion (THD) is a measure of the total per-phase voltage or current harmonic distortion present in the power system. It provides a general indication of the quality of a waveform. THD is calculated for each phase of both voltage and current.

The meter uses the following series of equations to calculate THD.

Harmonic content calculations

Harmonic content (H_C) is equal to the RMS value of all the non-fundamental harmonic components in one phase of the power system, and this value is used in THD calculations. The meter uses the following equation to calculate H_C:

$$H_C = \sqrt{(H_2)^2 + (H_3)^2 + (H_4)^2 \ldots}$$

THD calculations

THD is a quick measure of the total distortion present in a waveform and is the ratio of harmonic content (H_C) to the fundamental harmonic (H_1). The meter uses the following equation to calculate THD:

$$THD = \frac{H_C}{H_1} x 100 percent$$

thd and TDD

Your meter can be configured to provide thd (total harmonic distortion using the total RMS value for the content rather than the fundamental content) and TDD (total demand distortion, the harmonic current distortion against the maximum demand of the electrical system.

$$thd = \frac{H_C}{RMS} x 100 percent$$

$$TDD = \frac{H_C}{Demand_{Max}} x 100 percent$$

This is an advanced procedure that should only be performed by users with an advanced knowledge of power quality, ION architecture, and the power system being monitored.

Related topics

- See “Viewing data using your meter’s display” on page 30 for information on how to view total harmonic distortion values on your meter’s display.
- See the *ION Reference,* available from www.schneider-electric.com, for details about the Harmonics Measurement module.

Phasor overview

Phasors are used to represent the voltage and current relative magnitude and angles. They can be viewed through your meter’s display or webpages.

The length of the lines in the phasor diagram represent the relative magnitude of the voltages with respect to the other phase voltages, and the currents with respect to the other phase currents. All angles are measured with respect to the Va/V1 phase. The Va/V1 phasor is fixed to the right-hand horizontal axis (positive x-axis). Positive angles are measured counterclockwise.

Numeric values are provided for the magnitude and relative angle for each voltage and current phase.

Phasor information can be used to troubleshoot incorrect connections on the meter's voltage and current inputs, if you know how the phasors should be oriented for your power system.

Related topics

- See "Viewing data using your meter's display" on page 30 for instructions on how to navigate and use your meter's display.

Viewing harmonics information using the display

You can view detailed harmonics data through your meter's display.

1. Navigate to **Power Quality** > **Harmonics**. The total harmonic distortion (THD) screens are displayed.
2. Press the more button, and select the desired harmonics. The per-phase harmonics are graphically displayed.
3. Press the left and right buttons to move to individual harmonics. The harmonic number, magnitude and angle are displayed.

Related topics

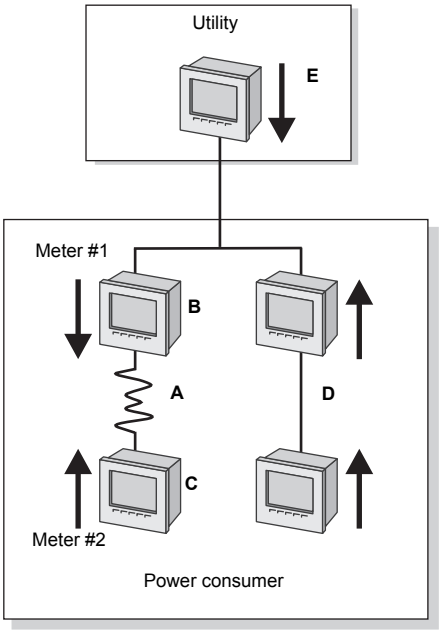
- See "Viewing data using your meter's display" on page 30 for instructions on how to navigate and use your meter's display.

Disturbance direction detection overview

Your meter has disturbance direction detection capabilities to help you determine the location of a power system disturbance. When a disturbance occurs, the meter analyzes the disturbance information to determine the direction of the disturbance relative to the meter. This analysis includes a confidence level indicating the level of certainty that the disturbance is in the determined direction, and is stored in your meter's event log.

Disturbance direction detection is enabled on your meter by default and does not require any additional configuration beyond setting the nominal voltage and nominal frequency.

Disturbance direction detection can help locate the source of a disturbance when used in a system of disturbance direction detection devices, as shown in the diagram below.



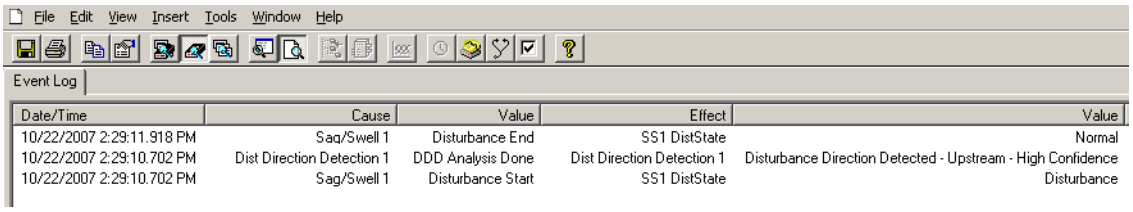
A	Disturbance location
B	Meter #1 reports downstream disturbance
C	Meter #2 reports upstream disturbance
D	Meters report upstream disturbance
E	Meter reports downstream disturbance

The arrows show the direction the meters have determined for the disturbance. With this information, you can determine that the disturbance occurred between meter #1 and meter #2, and can focus on that section of your system to find the cause of the disturbance.

Viewing disturbance direction detection events

The results of the disturbance direction detection algorithm appear in the meter's event log. The image below shows an example of how the Disturbance Direction Detection event appears in your meter's event log when viewed using ION Setup.

NOTE: You can view your meter's event log through the display and ION Setup.



Related topics

- See the *ION Reference,* available from www.schneider-electric.com, for more detailed information about the Disturbance Direction Detection module.
- See "Event log overview" on page 134 for more information about your meter's event log.

Chapter 21 Energy and demand

This section includes information on the energy monitoring features of your meter, conditional energy and WAGES (water, air, gas, electricity, steam) input metering. It also provides information on the different power demand calculation methods you can configure on your meter.

Conditional energy

Conditional energy allows you to define an accumulation period for real and reactive energy using one of your meter's digital inputs.

You can use conditional energy to track four-quadrant accumulated energy during a specific period; for example you may want to track accumulated energy values during a particular process controlled using a programmable logic controller (PLC).

Conditional energy is accumulated until it is reset. The conditional energy reset date and time information is stored in the meter's event log.

Related topics

- See "Configuring conditional energy using ION Setup" on page 98 for instructions on how to enable and trigger conditional energy accumulation.
- See "Power and power factor conventions" on page 157 for a detailed description of four-quadrant energy values.

WAGES monitoring overview

Water, air, gas, electric and steam (WAGES) monitoring allows you to monitor and analyze of your energy system's energy sources and utilities usage.

Your meter's digital inputs can be used to count pulses from transducers and convert the pulses to energy measurements for WAGES applications.

This can help you:

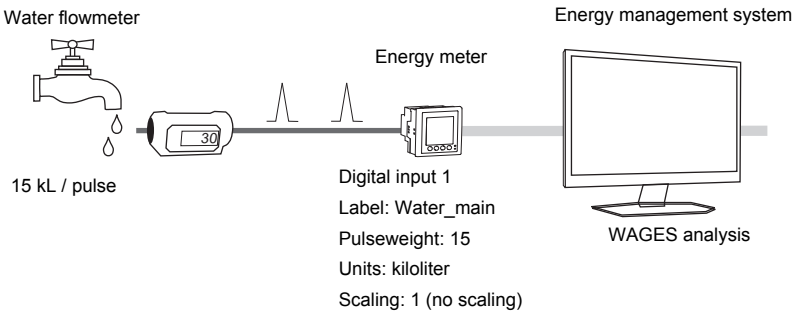
- Identify losses or inefficiencies.
- Modify demand to reduce costs.
- Optimize energy source usage.

Your energy system may use several different types of energy. You may consume steam or compressed air for industrial processes, electricity for lights and computers, water for cooling and natural gas for heating. WAGES collects the usage information from all these different energy sources for a more complete energy analysis.

WAGES example

You can connect your meter's digital input to a transducer that sends a pulse for every 15 kiloliters (4000 US Gal) of water. This information is then labeled, scaled, given a

unit of measure and logged in the meter's onboard memory for subsequent loading into your energy management system.



Related topics

- See "Input metering overview" on page 168 for a description of how your meter supports WAGES information.

Input metering overview

Your meter's digital inputs can be used to count pulses from transducers and convert the pulses to energy measurements for WAGES applications.

Your meter's input metering channels count pulses received from the digital inputs assigned to each channel. The incoming pulses are used in calculating and measuring consumption data (e.g. BTU, kWh, L, kg). Each channel must have the following values configured to match the pulse data:

- Pulse weight: the value per pulse.
- Units: the unit of measure associated with the metered quantity.
- Rate: the time base associated with input metering accumulations. For units with a defined rate, this value is used for scaling.
- Demand period: how frequently the input metering data is calculated in your energy management system.

You can use standard units and rates to configure input metering, or you can create custom input metering parameters for specialized applications.

Standard input metering example

Your meter's onboard digital input S1 is monitoring a flow meter (identified as FL3) that sends one pulse for every 100 liters of water. Your energy management system has a demand period of 15 minutes, and calculates the input metering data using an hourly rate.

Parameter	Value
Assigned Input	S1
Standard quantity	Selected
Pulse Weight	100
Units	L
Rate	l/hr
Demand period	15 minutes
Source ID	FL3

Custom input metering example

Your meter's onboard digital input S1 is monitoring a flowmeter (BF5) installed inside bottle-filling equipment. The desired measurement quantity is bottles/shift (numbers of bottles filled during an eight-hour shift). Each bottle takes 0.4 liters of liquid, and the flowmeter pulses once for every 100 liters. Your energy management system has a demand period of 15 minutes, and calculates the input metering data using an hourly rate.

Pulse weight calculation:

$$\frac{100 \text{ (liters/pulse)}}{0.4 \text{ (liters/bottle)}} = 250 \text{ (bottles/pulse)}$$

Parameter	Value
Assigned Input	S1
Standard quantity	Cleared
Pulse Weight	250
Units	Bottles@BF5
Rate	Bottles/shift
Demand period	15 minutes
Scaling	1
Time Base	8 hours

Incremental energy

Incremental energy allows you to define a start time, end time, and the time interval (increments) for incremental energy accumulation. At the end of each interval, the energy accumulated during that period is stored. By default, the meter only records the previous interval's incremental energy and the instantaneous energy accumulations in the active interval.

The first interval of incremental energy accumulation begins at the specified start time. Incremental energy ends at the specified end time, which may result in a truncated interval if the interval duration does not divide evenly into the overall incremental energy duration (for example, an interval duration of three hours with an overall duration of five hours truncates the last interval duration to two hours). The latest value for the specified end time is midnight (24:00).

Your start time must be before the end time and after midnight, and the period over which incremental energy is accumulated cannot include midnight. This is because your meter's start and end times are defined relative to midnight.

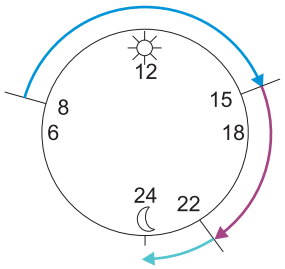
Start: 6am, End: 12am, interval: 3hrs	Incremental energy accumulates from 6am to midnight in intervals of 3 hours.
Start: 6am, End: 2am, interval: 3hrs	Incremental energy will not function. End time must be after start time and before or equal to midnight.

Incremental energy helps provide information for analyzing energy and power usage against present or future utility rates, and is useful for comparing different time-of-use rate structures.

When configuring incremental energy, shorter incremental energy periods provide more granular data which can make the data easier to use for comparison purposes.

Incremental energy example

- Start time: 8 am or 08:00
- End time: 12 am or 24:00
- Interval: 420 minutes (7 hours)



A	First interval (08:00 to 15:00)
B	Second interval (15:00 to 22:00)
C	Third interval (22:00 to 24:00)

The first incremental energy interval is from 8 am (start time) to 3 pm, and is seven hours long. The second incremental energy interval is from 3 pm to 10 pm, and is also seven hours long. The third interval is from 10 pm to 12 am, and is only 2 hours long because 12 am is the specified end time. These intervals repeat every 24 hours until the configuration is changed or incremental energy feature is disabled.

Related topics

- See “Configuring incremental energy using ION Setup” on page 100 for instructions on how to configure your meter’s start and end times and interval values.

Demand

Demand (also referred to as power demand) is a measure of average power consumption over a fixed time interval. Peak (or maximum) demand is the highest demand level recorded over the billing period. Your meter calculates the average current demand and kW, kVAR and kVA demand using sliding window demand methods.

The meter supports coincident demand values when a peak demand is detected.

Your meter’s default configuration is suitable for most applications, or you can customize it for your specific application.

You can configure the minimum time between consecutive demand resets.

NOTE: If not specified, references to “demand” are assumed to mean “power demand”.

Related topics

- See “Peak demand reset lockout” on page 172 for information about your meter’s peak demand reset lockout feature.
- See the ION Setup online help for instructions on how to configure demand on your meter.
- See the *ION Reference,* available from www.schneider-electric.com, for detailed information on how Sliding Window Demand modules measure and calculate demand values.
- See“Viewing data using your meter’s display” on page 30 for instructions on how to navigate and use your meter’s display.

Sliding window demand

To calculate demand values, your meter uses the sliding window averaging (or rolling interval) method which divides the demand interval into a set number of subintervals of specified duration.

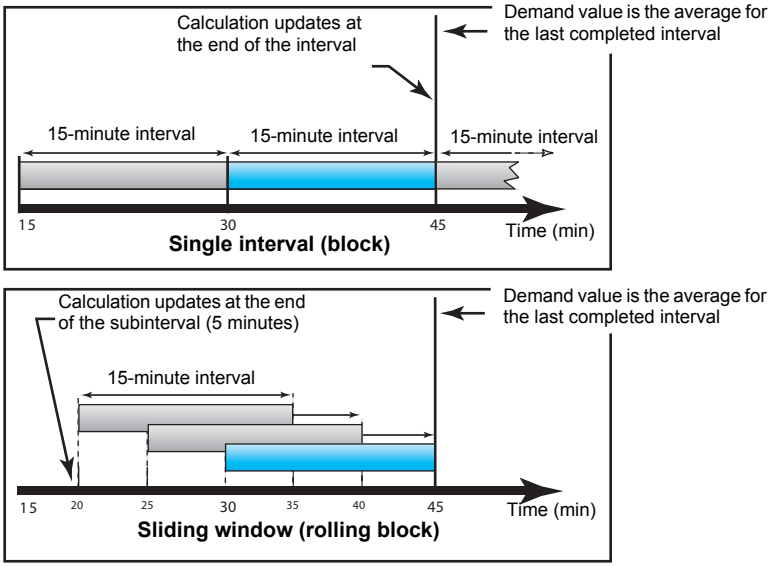
The demand is measured electronically based on the average load level over the most recent set of subintervals.

Sliding window demand also provides predicted demand values.

Examples of sliding window demand

This example shows two different ways of configuring a 15-minute demand interval:

- Single interval (also called block or timed block): the 15-minute demand interval is defined as a single subinterval with a duration of 15 minutes.
- Sliding window (also called rolling block): the 15-minute demand interval is defined as three subintervals with a duration of 5 minutes each. This method offers better response time than a single interval.



Peak demand

Power utilities generally bill commercial customers based on their peak usage levels, called peak demand (in kW) and energy consumption (in kWh). Peak (or maximum) demand is the highest demand level recorded over the billing period. You can view peak demand values on your meter’s display.

Peak demand reset lockout

The demand reset lockout time sets the minimum time allowed between consecutive demand resets; the meter ignores any attempts to reset demand that occur within the lockout period.

The peak demand reset lockout period is user-configurable, with a default value of 25 days.

Related topics

- See the ION Setup online help, available from www.schneider-electric.com, for instructions on how to configure the peak demand reset lockout period.
- See “Meter resets” on page 153 for more information about the resets available on your meter.

Chapter 22 Revenue

Revenue overview

This section describes your meter's revenue-related features: revenue locking, time of use, PT/CT (potential transformer/current transformer) correction and the recommended process for verifying the accuracy of your meter.

Revenue locking

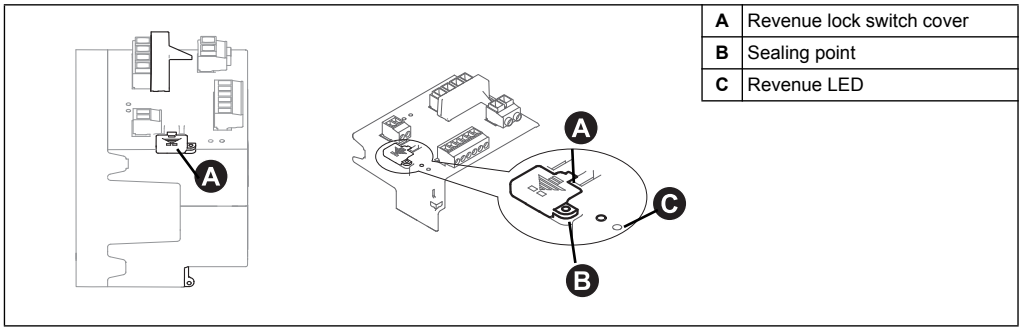
Revenue locking your meter helps prevent modifications to revenue-related settings and data on your meter, or tampering with your meter's voltage and current connections. Revenue locking may be required to help meet government regulations and utility security requirements, or can be used to help ensure the validity of revenue data.

Related topics

- See the PM8000 catalog pages, available from www.schneider-electric.com, or consult your local Schneider Electric representative for information about your device, its options and accessories.
- Download the *ION Device Template Reference*, available from www.schneider-electric.com, to view a complete listing of revenue-locked parameters and data.
- See "Revenue lock LED behavior" on page 22 for revenue lock LED behavior.

Revenue lock switch

You can revenue lock your meter using the revenue lock switch located on the meter base. This switch is accessed through a sealable cover.



A	Revenue lock switch cover
B	Sealing point
C	Revenue LED

Revenue locking your meter

You can revenue lock and unlock your meter using the revenue lock switch located on the meter base.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA or applicable local standards.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Always use a properly rated voltage sensing device to confirm that all power is off.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
2. Always use a properly rated voltage sensing device to confirm that all power is off.
3. Open the revenue lock switch cover.
4. Locate the revenue lock switch. Click the switch to toggle revenue locking on or off.
5. Close the revenue lock switch cover and make sure it is firmly in place.
6. Seal the revenue lock switch cover if required.

Time of use

Time of use (TOU) is often used when a utility has set up schedules with different rates based on time of day, type of day and date when energy is consumed.

You can view the TOU active rates and seasons through your meter's display.

Related topics

- See "Viewing data using your meter's display" on page 30 for instructions on how to view the TOU active rate and seasons through the meter's display.
- See the ION Setup online help, available from www.schneider-electric.com, for instructions on how to configure time of use on your meter.
- See the *ION Reference,* available from www.schneider-electric.com, for a description of the Time of Use module and its settings.

PT/CT correction

The primary application for PT/CT (potential transformer / current transformer) correction is to apply correction factors for ratio errors and phase angle errors to instrument transformers. PT/CT correction, also called instrument transformer correction, can help reduce the need to replace transformers in installations where high accuracy is required.

PT/CT correction is done for each current and voltage input to the meter and only affects 1-second power meter data and values derived from it, such as energy or demand. No high-speed, harmonics or waveform values are affected by the correction.

NOTE: For those familiar with ION architecture, the relevant 1-second Power Meter module outputs are compensated using the Instr Xformer (ITC) Correction module, and therefore so are all other modules that use that Power Meter module's data.

Related topics

- See the ION Setup online help, available from www.schneider-electric.com, for instructions on how to configure PT/CT correction on your device.
- See the *ION Reference,* available from www.schneider-electric.com, for detailed information about the Instr Xformer Correction (ITC) module and how it applies PT/CT correction to your device.

Verifying accuracy

All meters are tested and verified at the factory in accordance with International Electrotechnical Commission (IEC) and American National Standards Institute (ANSI) standards.

Your digital power meter typically does not require re-calibration. However, in some installations, a final accuracy verification of the meter is required, especially if the meter is used for revenue or billing applications.

Testing overview

The most common method for testing meter accuracy is to apply test voltages and currents from a stable power source and compare the meter's readings with readings from a reference device or energy standard.

Accuracy test requirements

Signal and power source

The meter maintains its accuracy during voltage and current signal source variations but its energy pulsing output needs a stable test signal to help produce accurate test pulses. The meter's energy pulsing mechanism needs approximately 10 seconds to stabilize after every source adjustment.

The meter must be connected to control power in order to conduct accuracy verification testing.

Control equipment

Control equipment is required for counting and timing the pulse outputs from the energy pulsing LED or the digital output.

- Most standard test benches have an arm equipped with optical sensors to detect LED pulses (the photodiode circuitry converts detected light into a voltage signal).
- The reference device or energy standard typically has digital inputs that can detect and count pulses coming from an external source (for example, the meter's digital output).

NOTE: The optical sensors on the test bench can be disrupted by strong sources of ambient light (such as camera flashes, florescent tubes, sunlight reflections, floodlights, etc). This can cause test errors. Use a hood, if necessary, to block out ambient light.

Environment

The meter should be tested at the same temperature as the testing equipment. The ideal temperature is about 23 °C (73 °F). Make sure the meter is warmed up sufficiently before testing.

A warm-up time of 30 minutes is recommended before beginning energy accuracy verification testing. At the factory, the meters are warmed up to their typical operating temperature before calibration to help ensure that the meters reach their optimal accuracy at operating temperature.

Most high precision electronic equipment requires a warm up time before it reaches its specified performance levels. Energy meter standards allow the manufacturers to specify meter accuracy derating due to ambient temperature changes and self-heating.

Your meter complies with and meets the requirements of these energy metering standards.

Reference device or energy standard

To help ensure the accuracy of the test, it is recommended that you use a reference device or reference energy standard with a specified accuracy that is 6 to 10 times more accurate than the meter under test. Before you start testing, the reference device or energy standard should be warmed up as recommended by its manufacturer.

Verify the accuracy and precision of all measurement equipment used in accuracy testing (for example, voltmeters, ammeters, power factor meters).

Energy pulsing

Your meter has two energy pulsing LEDs, one visible light and one infrared, located on the meter base. These LEDs emit pulses that are then used to determine the accuracy of the meter's energy measurements. The pulses of light indicate accumulated energy; the meter's accumulations are compared with the reference/standard's accumulated energy in order to help determine the meter's accuracy.

Your meter also has a digital output that can be used for energy pulsing. The relay closes (low impedance) and then opens (high impedance) to represent a pulse. If the accuracy testing equipment has a voltage requirement, a current-limited wetting supply voltage must be provided.

NOTE: Digital outputs on option modules should not be used meter accuracy testing.

Related topics

- See “Electrical characteristics” on page 181 for your device's power supply, measurement accuracy and other specifications.
- See “LED locations” on page 21 for the location of the energy pulsing LEDs
- See“Energy pulsing overview” on page 145 for instructions on how to configure your meter's digital output for energy pulsing.

Verifying accuracy test

The following are guidelines for testing the meter; your meter shop may have specific testing methods.

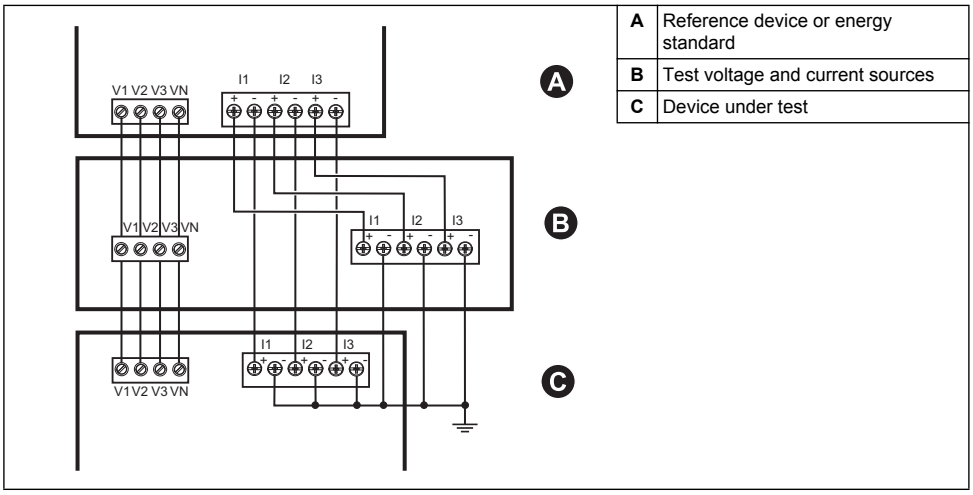
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E in the USA or applicable local standards.
- Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Do not exceed the device's ratings for maximum limits.
- Verify the device's power source meets the specifications for your device's power supply.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power supplying this device and the equipment in which it is installed before working on the device or equipment.
2. Use a properly rated voltage sensing device to confirm power is off.
3. Connect the test voltage and current source to the reference device or energy standard. Ensure all voltage inputs to the meter under test are connected in parallel and all currents inputs are connected in series.



A	Reference device or energy standard
B	Test voltage and current sources
C	Device under test

4. Connect the control equipment used for counting the standard output pulses using one of these methods:

Energy pulsing LED	Align the red or infrared light sensor on the standard test bench armature over the corresponding energy pulsing LED.
Digital output	Connect the meter's onboard digital output to the standard test bench pulse counting connections.

NOTE: When selecting which method to use, be aware that the energy pulsing LEDs and digital output may have different pulse rate limits.

5. Before performing the verification test, let the test equipment power up the meter and apply voltage for at least 30 seconds. This helps stabilize the internal circuitry of the meter.

6. Set the meter's volts mode to 4W-Wye (4 wire Wye).
7. Disable PT/CT correction unless you want the correction included in the verification test.
8. Depending on the method selected for counting the energy pulses, configure the meter's energy pulsing LEDs or the digital output to perform energy pulsing. Set the meter's energy pulse constant so it is synchronized with the reference test equipment.
9. Perform accuracy verification on the test points. Run each test point for at least 30 seconds to allow the test bench equipment to read an adequate number of pulses. Allow 10 seconds of dwell time between test points.

Related topics

- See "PT/CT correction" on page 174 for details of how PT/CT corrections (also called instrument transformer correction) affects your meter's measurements.

Calculate the number of required pulses

The reference test equipment typically requires you to specify the number of pulses required for a test duration of "t" seconds. Normally, the number of pulses required is at least 25 pulses, and the test duration is greater than 30 seconds.

Use the following formula to calculate the required number of pulses:

$$\text{Number of pulses} = \frac{Ne * V * I * PF * t}{3600 * Kt}$$

Where:

- Ne = number of metering elements used
- V = test point voltage in line-to-neutral volts [V] per phase
- I = test point current in amps [A] per phase
- t = test duration in seconds [s] which must be longer than 30 seconds
- PF = power factor
- Kt = pulse constant programmed in the meter under test in Wh/pulse

Round up the result of the calculation to the nearest integer number of pulses.

Example calculation for number of required pulses

This example calculates the number of pulses required for an inductive load 3-phase test point with a test duration of 60s; the source is configured to use V = 120V, I = 5A, PF = -0.5; the pulse constant of the meter under test is Kt = 1.8 Wh/pulse.

$$8.3 = \frac{3 * 120V * 5A * 0.5 * 60\ s}{3600 * 1.8}$$

Round the number up to the nearest integer: Number of pulses = 9

Calculate the percentage error

For every test point:

$$\text{Energy Error} = \frac{EM - ES}{ES} * 100\%$$

Where:

- EM = energy measured by the meter under test
- ES = energy measured by the reference device or energy standard.

If accuracy verification indicates that there may be inaccuracies with your meter, they may be caused by typical sources of test errors. If there are no sources of test errors present, please contact your local Schneider Electric representative.

Related topics

- See “Typical sources of test errors” on page 179 for possible causes of test errors.
- See “Power factor (PF)” on page 159 for information on how the meter calculates power factor.

Test points

The meter should be tested at full and light loads and at lagging (inductive) power factors to help ensure testing over the entire range of the meter. The test amperage and voltage input rating are labeled on the meter. Refer to the installation sheet or data sheet for your meter’s nominal current, voltage and frequency specifications.

Sample Watt-hour test points

Watt-hour test point	Sample accuracy verification test point
Full load	100% to 200% of the nominal current, 100% of the nominal voltage and nominal frequency at unity power factor or one (1).
Light load	10% of the nominal current, 100% of the nominal voltage and nominal frequency at unity power factor or one (1).
Inductive load (lagging power factor)	100% of the nominal current, 100% of the nominal voltage and nominal frequency at 0.50 lagging power factor (current lagging voltage by 60° phase angle).

Sample Var-hour test points

Var-hour test point	Sample accuracy verification test point
Full load	100% to 200% of the nominal current, 100% of the nominal voltage and nominal frequency at zero power factor (current lagging voltage by 90° phase angle).
Light load	10% of the nominal current, 100% of the nominal voltage and nominal frequency at zero power factor (current lagging voltage by 90° phase angle).
Inductive load (lagging power factor)	100% of the nominal current, 100% of the nominal voltage and nominal frequency at 0.87 lagging power factor (current lagging voltage by 30° phase angle).

Typical sources of test errors

If excessive errors are observed during accuracy testing, examine your test setup and test procedures to eliminate typical sources of measurement errors:

- Loose connections of voltage or current circuits, often caused by worn-out contacts or terminals. Inspect terminals of test equipment, cables, test harness and the meter under test.

- Device ambient temperature is significantly different than 23 °C (73 °F).
- Floating (ungrounded) neutral voltage terminal in any configuration with unbalanced phase voltages.
- Inadequate device control power, resulting in the device resetting during the test procedure.
- Ambient light interference or sensitivity issues with the optical sensor.
- Unstable power source causing energy pulsing fluctuations.
- Incorrect test setup: not all phases connected to the reference device or the energy standard. All phases connected to the device under test should also be connected to the reference meter/standard.
- Moisture (condensing humidity), debris or pollution present in the device under test.

Chapter 23 Specifications

The information contained in this section is subject to change without notice. You can download updated documentation from www.schneider-electric.com or contact your local Schneider Electric representative for the latest updates.

This section provides additional specifications for your meter and accessories. See your device's installation sheet for specifications related to installation, such as measured voltage and current ranges, inputs/outputs and control power information.

See your product's technical datasheet at www.schneider-electric.com for the most up-to-date and complete specifications.

Mechanical characteristics

<table>
<tr><th>Model</th><th>Characteristic</th><th>Specification</th></tr>
<tr><td rowspan="8">Panel mount</td><td>Mounting position</td><td>Vertical</td></tr>
<tr><td>IP</td><td>IP30 meter body (except connectors), IP54 front display</td></tr>
<tr><td>Display type</td><td>¼ VGA color graphic TFT LCD 320 x 240 resolution</td></tr>
<tr><td>Display backlight</td><td>White LED</td></tr>
<tr><td>Viewable area</td><td>70.6 x 52.9 mm (2.78 x 2.08 in)</td></tr>
<tr><td>Keypad</td><td>5 button</td></tr>
<tr><td>Maximum number of option modules</td><td>4 (based on mechanical stress and required IP rating)</td></tr>
<tr><td>Operating temperature</td><td>-25 °C to Max temp (-13 °F to Max temp)
Maximum operation temperature is based on the quantity and type of attached option modules.
<table><tr><th>Max temp</th><th>Digital (2 out, 6 in)</th><th>Analog (2 out, 4 in)</th></tr><tr><td>70 °C (158 °F)</td><td>0 - 4</td><td>0, 1</td></tr><tr><td>70 °C (158 °F)</td><td>0</td><td>2</td></tr><tr><td>60 °C (140 °F)</td><td>1, 2</td><td>2 - 4</td></tr></table></td></tr>
<tr><td rowspan="4">DIN meter</td><td>Mounting position</td><td>Horizontal TS35 DIN rail</td></tr>
<tr><td>IP</td><td>IP30 (except connectors)</td></tr>
<tr><td>Maximum number of option modules</td><td>4</td></tr>
<tr><td>Operating temperature</td><td>-25 °C to Max temp (-13 °F to Max temp)
Maximum operation temperature is based on the quantity and type of attached option modules.
<table><tr><th>Max temp</th><th>Digital (2 out, 6 in)</th><th>Analog (2 out, 4 in)</th></tr><tr><td>70 °C (158 °F)</td><td>0 - 4</td><td>0, 1</td></tr><tr><td>70 °C (158 °F)</td><td>0</td><td>2</td></tr><tr><td>60 °C (140 °F)</td><td>1, 2</td><td>2 - 4</td></tr></table></td></tr>
</table>

Mechanical compliance

Vibration	IEC 60068-2-6
Shock	IEC 60068-2-27

Electrical characteristics

Type of measurement: RMS up to the 63rd harmonic on three-phase systems, 128 samples per cycle, zero blind.

NOTE: Reactive energy and demand values are based on the fundamental, and do not include higher harmonics. Other energy and demand values are measured using the entire signal including harmonics. Contact Technical Support for more information.

Accuracy

Measurement accuracy	IEC 62053-22 - active energy	Class 0.2S
	IEC 62053-24 - reactive energy	Class 0.5S
	IEC 61557-12	PMD/SD/K70/0.2 and PMD/SS/K70/0.2
	Active power	± 0.2% IEC 61557-12 Class 0.2
	Reactive power	± 1% IEC 61557-12 Class 1
	Apparent power	± 0.5% IEC 61557-12 Class 0.5
	Current (per phase)	± 0.2% IEC 61557-12 Class 0.2
	Voltage (L-N)	± 0.2% IEC 61557-12 Class 0.2
	Frequency	± 0.02% IEC 61557-12 Class 0.02
Power quality accuracy	IEC 61000-4-30	Class S
	IEC 62586-1	PQI-S-FI1
	Voltage unbalance	± 0.5% IEC 61557-12 Class 0.5
	Voltage harmonics	± 2% IEC 61557-12 Class 2
	Voltage THD	± 2% IEC 61557-12 Class 2
	Current harmonics	± 2% IEC 61557-12 Class 2
	Current THD	± 2% IEC 61557-12 Class 2

Voltage and current inputs

Voltage inputs	VT (PT) primary	1.0 MV AC max
	Specified accuracy voltage	57 to 400 V L-N / 100 to 690 V L-L (Wye) or 100 to 600 V L-L (Delta)
	Specified accuracy frequency	42 to 69 Hz (50/60 Hz nominal)
Current inputs	Specified accuracy current range	50 mA to 10A

Control power

AC/DC control power	Operating range	50/60 Hz ± 10%: 90 to 415 V AC L-N ± 10% 400 Hz: 90 to 120 V AC ± 10% 120 to 300 V DC ± 10%
	Ride-through time	100 ms (6 cycles at 60 Hz) min., any condition 200 ms (12 cycles at 60 Hz) typ., 120 V AC 500 ms (30 cycles at 60 Hz) typ., 415 V AC

Inputs/outputs

Digital output	Number/type	1 Form A Solid State max 30 V AC / 60 V DC / 75mA
	On resistance	13 to 40 Ω at 25 °C (77 °F)
	Pulse frequency	≤ 25 Hz
	Signal type	Continuous or pulse

Digital inputs	Number/type	3 externally excited max 30 V AC / 60 V DC
	Frequency	≤ 25 Hz
	Minimum pulse width	20 ms
	Response time	20 ms
	Current draw	ON: ≤ 2.5 mA OFF: ≤ 0.5 mA
	Event timestamp accuracy	± 1 ms
	IRIG-B	IRIG-B00x format (unmodulated IRIG-B time code) • Coded expressions 0 to 7 are supported but the year data is not used.

Communications

RS-485 communications

Number of ports	1
Maximum cable length	1200 m (4000 ft)
Maximum number of devices (unit loads)	32
Parity	None, even, odd
Baud rate	2400 - 115200, recommend 19200

Ethernet communications

Number of ports	2 (the second connector functions as an Ethernet switch for networking devices)
Cable type	CAT5/5e UTP (use unshielded cable only)
Connector type	RJ45 modular jack (2)
Maximum cable length	100 m (328 ft) per TIA/EIA 568-5-A
Mode	10Base-T, 100Base-TX, auto-MDIX
Data rate	up to 100 Mbps
FTP	Maximum simultaneous transfer connections (sessions): 2 Default timeout period: 90 seconds
IEC 61850 maximum simultaneous client connections	4

EMC (electromagnetic capability)

Product standards	IEC 62052-11 IEC 61326-1
Immunity to electrostatic discharge	IEC 61000-4-2
Immunity to radiated fields	IEC 61000-4-3
Immunity to fast transients	IEC 61000-4-4
Immunity to surges	IEC 61000-4-5
Immunity to conducted disturbances	IEC 61000-4-6
Immunity to power frequency magnetic fields	IEC 61000-4-8
Immunity to conducted disturbances, 2 - 150 kHz	CLC/TR 50579
Immunity to voltage dips and interruptions	IEC 61000-4-11
Immunity to ring waves	IEC 61000-4-12
Radiated and conducted emissions	FCC part 15 ICES-003 EN55022, EN55011
Surge withstand capability (SWC)	ANSI C37.90.1

Safety

Safety construction	IEC/EN 61010-1 ed.3, CAT III, 400 VLN / 690 V LL UL 61010-1 ed.3 and CSA-C22.2 No. 61010-1 ed.3, CATIII, 347 V LN / 600 V LL IEC/EN 62052-11, Protective Class II

General characteristics

Clock

Characteristic	Specifications
Clock drift	20 ppm max at 25 °C (77 °F)
Battery backup time	Minimum 7 years under specified storage conditions

LEDs

LED	Characteristic	Specifications
Energy pulsing LEDs (visible and infrared)	Type	Visible orange, infrared
	Wavelength	600 - 609 nm (orange) 825 - 925 nm (infrared)
	Maximum pulse rate	42 - 69 Hz (based on line frequency)

Other

Characteristic	Specification
Meter start time	Typical 18 seconds (power up to measurement)
Meter memory	512 MB
Data update rate	Regular data: 1 second
	High-speed: 50 - 60 Hz half-cycle
Advanced security users	Up to 16 users

Remote display

Characteristic	Specification
IP degree of protection (IEC 60529)	Front: IP54 Rear: IP30
Cable	CAT5/5e UTP (use unshielded cable only)
Mounting position	Vertical
Display type	¼ VGA color graphic TFT LCD 320 x 240 resolution
Display backlight	White LED
Viewable area	70.6 x 52.9 mm (2.78 x 2.08 in)
Keypad	5 button

Option modules

Model	Characteristic	Specification
METSEPM89M0024 Analog (2 out, 4 in)	Max analog input current/voltage	20 mA / 30 V DC
	Input resistance	< 300 Ω (current mode) > 500 kΩ (voltage mode)
METSEPM89M0024 Analog (2 out, 4 in) and METSEPM89M2600 Digital (2 out, 6 in)	Modules per PM8000 series meter	Up to 4
	Operating temperature for PM8000 series meter	-25 °C to Max temp (-13 °F to Max temp) Maximum operating temperature is based on the quantity and type of attached option modules.

Max temp	Digital	Analog
70 °C (158 °F)	0 - 4	0, 1
70 °C (158 °F)	0	2
60 °C (140 °F)	1, 2	2 - 4

Related topics

- Visit the website at www.schneider-electric.com and search for “PM8000 technical datasheet” for the most up-to-date and complete specifications.
- See your remote meter display’s installation sheet for remote meter display specifications.
- See your option module’s installation sheet for option module specifications.
- Visit the company website at www.schneider-electric.com and search for “PM8000” to get additional or updated documentation.

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