

# PowerLogic™ E5600

## Socket-Based Energy Meter

Installation and operation guide





# Hazard Categories and Special Symbols

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 manual 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 an imminently hazardous situation which, if not avoided, will result in death or serious injury.

## **WARNING**

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

## **CAUTION**

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

## **CAUTION**

**CAUTION** used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, can result in property damage.



Provides additional information to clarify or simplify a procedure.

### **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.

## FCC Notices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This Class A digital apparatus complies with Canadian ICES-003.

Modifications: Modifications to this device which are not approved by Schneider Electric may void the authority granted to the user by the FCC to operate this equipment.

Made by Power Measurement Ltd.

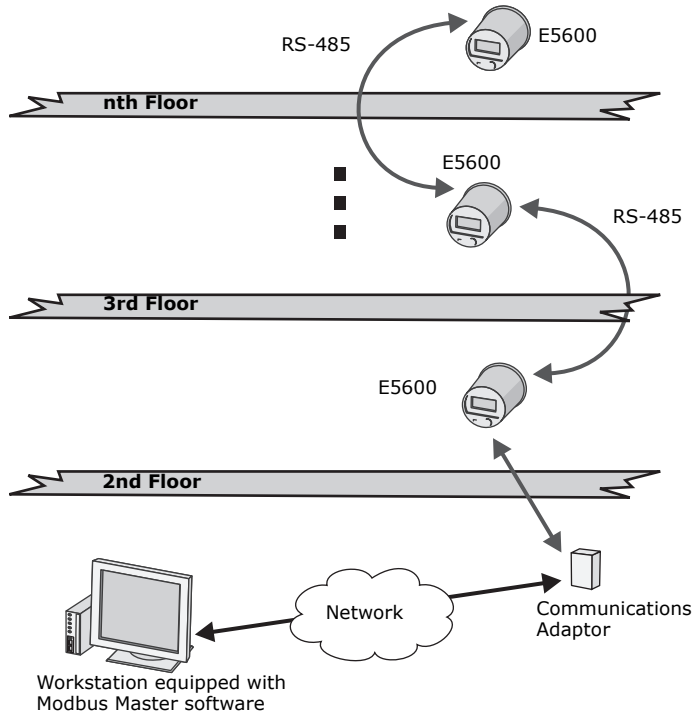
Covered by one or more of the following patents:

U.S. Patent No's 7010438, 7006934, 6990395, 6988182, 6988025, 6983211, 6961641, 6957158, 6944555, 6871150, 6853978, 6825776, 6813571, 6798191, 6798190, 6792364, 6792337, 6751562, 6745138, 6737855, 6694270, 6687627, 6671654, 6671635, 6615147, 6611922, 6611773, 6563697, 6493644, 6397155, 6236949, 6186842, 6185508, 6000034, 5995911, 5828576, 5736847, 5650936, D505087, D459259, D458863, D443541, D439535, D435471, D432934, D429655, D427533.

# PowerLogic™ E5600 Socket-Based Energy Meter

The E5600, with industry-standard Modbus™ communications, is an essential metering component of your energy management system, featuring compact design and a variety of socket mounting options for quick and easy installation.

## The Meter as part of a Modbus System



Each E5600 meter measures power and energy used at its installed location (load point) inside your building. A maximum of 32 meters can be connected on a single serial bus. The data is transmitted over an RS-485 network using Modbus RTU protocol.

# Before You Begin

1. Review the building plans to confirm that the wiring/installation for your meters conforms to the building's electrical system and monitoring requirements.
2. Read and understand this entire manual.

## Additional Information

### Configuration Software

The E5600 meter is configured using PowerLogic ION Setup.

Refer to the *ION Setup Device Configuration Guide* for more information on configuring your meter using ION Setup.



### NOTE

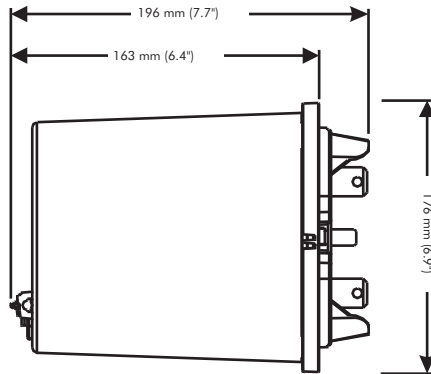
---

The ION Setup software application and latest user documentation are available from [www.powerlogic.com](http://www.powerlogic.com).

---

# Meter Dimensions and Specifications

The E5600 has the following dimensions:



## Voltage Input Specifications

Nameplate Voltage	120 - 480 L-L VAC RMS
Operating Voltage	80% to 115% of Nameplate Voltage
Temporary Overvoltage Withstand (0.5 seconds)	150% of Nameplate Voltage
Continuous Overvoltage Withstand (5 hours)	130% of Nameplate Voltage
Surge Withstand	Oscillatory = 3 kV (1 MHz; 100 Hz, 10 seconds) Fast Transient = 5 kV (50 pulses/sec, 20 seconds)
Frequency	60 Hz $\pm$ 5%

## Current Input Ratings

Meter Class	Starting Load	Continuous Max. (5 hours)	Temporary Max. (6 line cycles)
Class 20	0.005 Amps	30 Amps	400 Amps
Class 200	0.050 Amps	250 Amps	7000 Amps

## Communication Cable Specifications

Cable	<ul style="list-style-type: none"> <li>• 7 twisted pairs (14 wires) 24 AWG stranded</li> <li>• Stranded tinned copper drain 24 AWG (0.20 mm<sup>2</sup>)</li> <li>• 300 V isolated UL listed</li> <li>• -20°C to 105°C (-4°F to 122°F)</li> <li>• 100% shield</li> </ul>
Connector	20-pin (2x10)

## RS-485 Communication Port Specifications

Isolation	4 kV RMS, 60 Hz, 60 seconds
Baud Rate	9600 or 19200 bps

# Meter Overview



<b>RESET SWITCH</b>	Initiates a demand reset, resetting the demand values in the meter, storing the current demand values and starting a new demand interval. Only accessible on physically unsealed meters.
<b>REED SWITCH</b>	The reed switch is found near the 12 o'clock position (on top of the meter), and is used for entering: <ul style="list-style-type: none"> <li>◆ the alternate display sequence (swipe with a strong magnet).</li> <li>◆ the diagnostic display sequence (hold the magnet at this position, diagnostic display sequence starts after three seconds).</li> </ul>



## Installation Considerations

Installation and maintenance of the E5600 meter should only be performed by qualified, competent personnel that have appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

### Environmental Conditions

## CAUTION

### HAZARD OF METER TO SOCKET MISMATCH

The meter form must match the socket base form (for example 9S to 9S, 36S to 36S).

**Failure to follow these instructions can result in equipment damage.**

Mounting location	Indoor/outdoor <sup>1</sup>
Operating temperature	-40°C to 85°C (-40°F to 185°F) inside cover
Relative humidity	≤ 95%, non-condensing humidity

<sup>1</sup> Enclosure meets ANSI C12.1 standard.

# Safety Precautions

Carefully observe these safety instructions before installing, repairing, servicing or maintaining your meter.

## **DANGER**

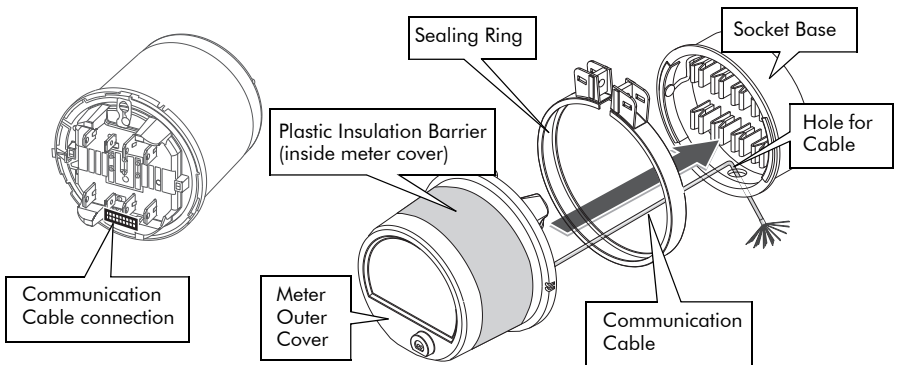
### **HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this device and the equipment in which it is installed before working on it.
- Turn off all power supplying this device before replacing battery.
- Always use a properly rated voltage sensing device to confirm power is off.
- Do not remove the plastic insulation barrier, to prevent exposing live circuits.
- Replace cover before putting meter into service.

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

## Step 1: Mount the Meter

1. Turn off all power to the socket.
2. For transformer rated applications, close the CT shorting blocks and open the PT connections (or direct voltage connections).
3. Use a properly rated voltage sensing device to confirm power is off.
4. If required, attach an anti-tamper seal through the outer cover of the meter to seal the outer cover to the backplate.
5. Connect the communications cable to the meter.
6. Feed the communications cable through the hole at the six o'clock position on the socket base. Hold the communication cable to the side of the meter to prevent crushing or pinching the cable before pushing the meter into the socket base. Make sure the blades are pushed in firmly.



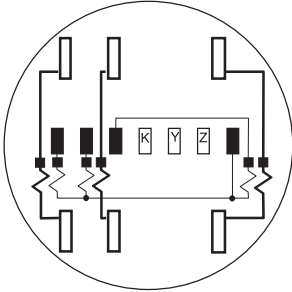
### NOTE

Leave sufficient slack in the communications cable to make it easy to disconnect your meter at a later date.

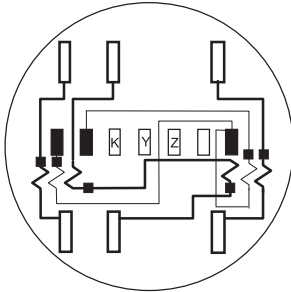
7. Attach the sealing ring, if required (not included with meter).
8. Seal the demand reset switch (if required).

# Meter Forms

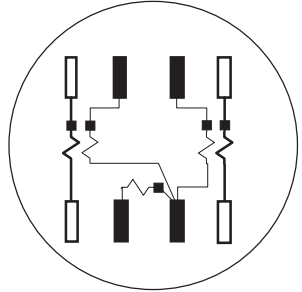
## S-Base Forms



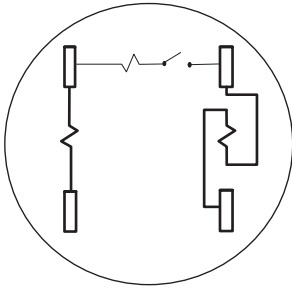
3-Element  
4-Wire  
FORM 9/8S  
Class 20



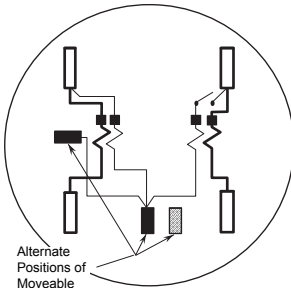
2-Element  
3-Wire  
FORM 36S  
Class 20



2-Element  
4-Wire  
FORM 45S  
Class 20

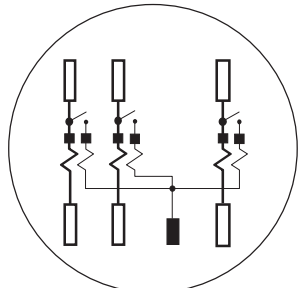


2-Element  
3-Wire  
FORM 2S  
Class 200



Alternate  
Positions of  
Moveable  
Terminal

2-Element  
3-Wire  
FORM 12S  
Class 200

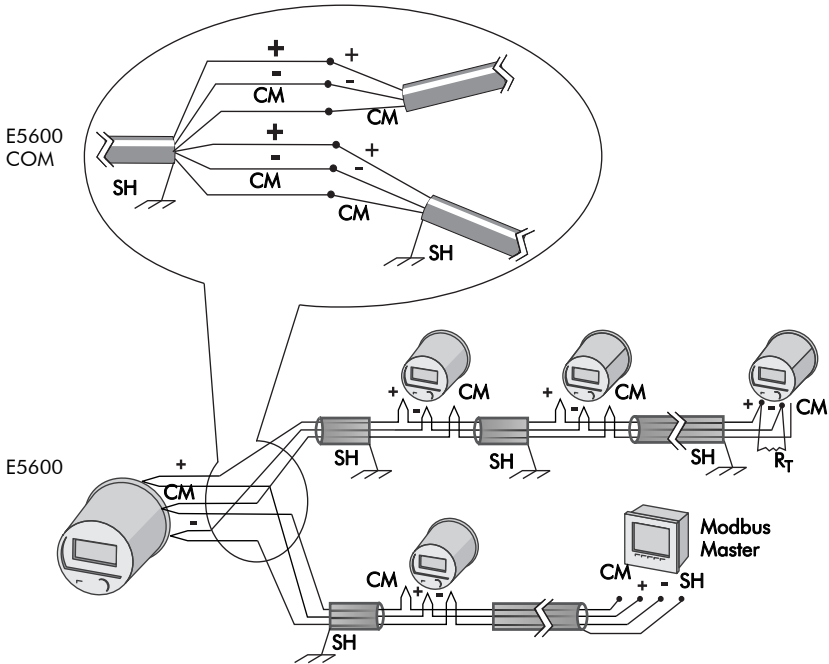


2/3-Element  
4-Wire  
FORM 16/15S  
Class 200

## Step 2: Wire the Communications

Connect the meter to your Modbus network using the RS-485 wires attached to the rear of the meter.

For direct connection to the Modbus master, use 4 wires (one data plus, one data minus, common and shield). As part of a bus, use the two data plus, data minus and common wires to prevent a T (tee) or star connection.



### General Bus Wiring Considerations

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

- ◆ Connect the shield (SH) of each cable segment to local earth ground at one end only.
- ◆ Connect the common (CM) of each cable segment.
- ◆ Isolate cables as much as possible from sources of electrical noise.
- ◆ Install a  $\frac{1}{4}$  Watt termination resistor ( $R_T$ ) between the (+) and (-) terminals at the end of the straight-line bus. The resistor should match the characteristic impedance of a standard RS-485 cable (typically 120 Ohms).
- ◆ Maximum 32 devices per bus.

### RS-485 Specifications

Wire	Shielded twisted pair RS-485 cable, 24 AWG (0.2 mm <sup>2</sup> )
Maximum Cable Length	1219 m (4000 ft) total for entire bus
Data Rate	9600 bps or 19200 bps
Maximum Devices (per bus)	32
Isolation	Optical
Duplex	Half
Protocol	Modbus RTU

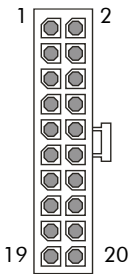
### Communication Cable Description

# CAUTION

## HAZARD OF ELECTRICAL INTERFERENCE

- All unused conductors must be individually insulated using electrical tape or similar material.
- Do not connect unused pins.

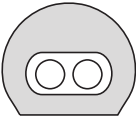
**Failure to follow this instruction can result in increased communication error rates and intermittent operation of input/output ports.**



Communications cable connector

Wire Pairs	Wire Colors	Pin	Function
Pair 1	White	1	RS-485 In Data +
	Black	2	RS-485 In Data -
Pair 2	Red	1	RS-485 Out Data +
	Black	2	RS-485 Out Data -
Pair 3	Orange	3	RS-485 Common
	Black	3	RS-485 Common
Pair 4	Blue	13	Digital Out 1
	Black	14	
Pair 5	Green	11	Digital Out 2
	Black	12	
Pair 6	Yellow	18	Digital In 1
	Black	20	Digital In 1 Common
Pair 7	Brown	19	Digital In 2
	Black	20	Digital In 2 Common
Not paired	Clear	4	Shield

## Optical Connection



To initially configure your Modbus communication settings, connect a computer running ION Setup software to your meter's front panel optical port using an optical probe.

Interface	ANSI C12.18 Type II optical port
Location	Front of meter
Data Rate	9600 bps
Duplex	Half
Protocol	ANSI C12.19

Refer to "Step 6: Configure the Meter using ION Setup" on page 21.

# Step 3: Wire the I/O

Your meter comes with two Form A optically-coupled pulse-counting digital outputs and two pulse counter inputs that are load profile entries.

Refer to “Communication Cable Description” on page 14 for wire designations.

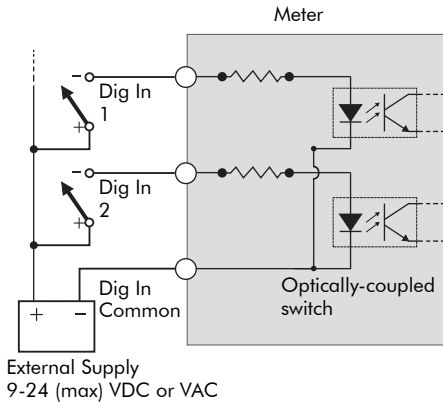
Refer to the *ION Setup Device Configuration Guide* for I/O configuration.

## Inputs

### Digital Input Specifications

Type	External excitation
Guaranteed ON Range	9-24 (max) VDC or VAC RMS
Isolation	4 kV RMS, 60 Hz, 60 seconds
Input Impedance	2 kΩ
Maximum Input Frequency	15 Hz at 50% duty cycle

### Connection Diagram





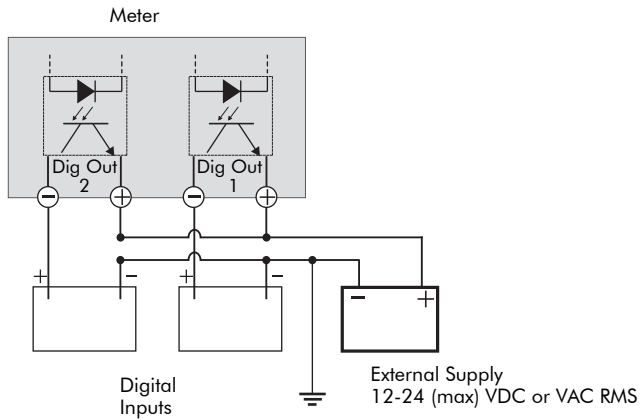
## Outputs

The digital outputs are rated for energy pulse counting.

### Digital Output Specifications

Type	Form A, external excitation
Load Voltage Range	12-24 (max) VDC or VAC RMS
Max Load Current	60 mA
Isolation	4 kV RMS, 60 Hz, 60 seconds
Max Output Transition	5 transitions per second

### Connection Diagram



## Step 4: Power Up the Meter

The E5600 is powered from the line it is monitoring. Ensure voltage levels are compatible with the input ratings of your meter.

1. For transformer rated applications, open the CT shorting blocks and close the PT connections (or direct voltage connections).
2. Apply power to the socket.

The meter automatically detects the service type and voltage, displaying the information on the front panel and performing a diagnostic check of the installation. This diagnostic confirms if the service matches the meter form type (for example, a 9S meter form will not function as a 36S meter form). If the meter cannot determine the service type upon initial power up, the meter will continue to scan the voltage and phase information every minute until correctly identifying the service type.



### NOTE

---

An E5600 can be re-installed as a different service type (i.e. 120 V service changing to 277 V service) without needing to be re-programmed.

---

Refer to “Error Codes” on page 33 for information on displayed errors and resolutions.



### NOTE

---

Before adding your meter to your Modbus network, it must be configured. Refer to “Step 6: Configure the Meter using ION Setup” on page 21 for configuration requirements.

---

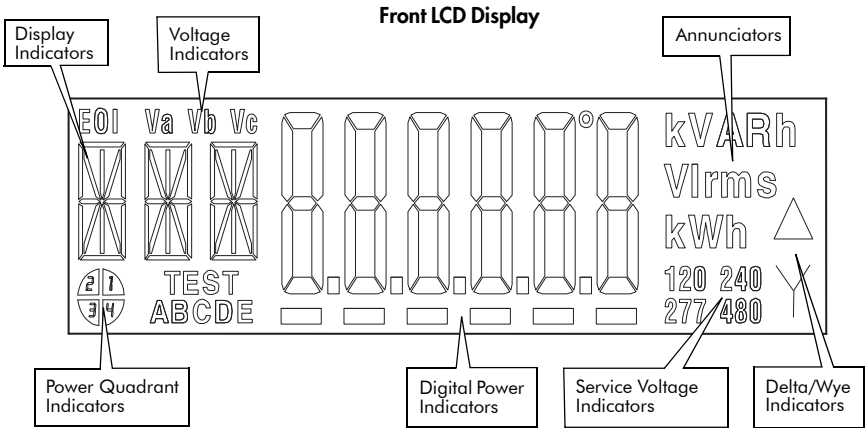
## Step 5: Verify Meter Operation

After installation and power up, confirm the meter's operation from the front panel display and the communication/status LEDs.

### Front Panel Display

Use the front panel display to confirm the meter is operating and displaying energy values and diagnostics information. Refer to "Appendix B: E5600 Default Displays" on page 33 for display sequence and default display screen information.

You can customize your front panel display using ION Setup. Refer to the *ION Setup Device Configuration Guide* for details.



**Voltage Indicators (Va, Vb, Vc)** indicate if voltage is applied to the respective phase.

**Annunciators (kVARh, Vrms, kW, etc.)** are pre-programmed for display.

**Service Voltage Indicator (120, 240, 277, 480)** indicate the service voltage being applied to the meter.

**Power Quadrant Indicator** flashes the quadrant in which power is presently applied.

**Delta/Wye Indicator** displays the service type of the meter. The triangle indicates Delta mode, while the "Y" indicates Wye mode.

**Digital Power Indicator** scrolls across the bottom of the display. If the indicator is scrolling from left to right, there is positive (delivered) energy flow; if the indicator is scrolling from right to left, there is negative (received) energy flow.

Refer to "Default Display Screens" on page 34 for information on default display screens.

Refer to "Error Codes" on page 36 for information on displayed error codes.

## Communication/Status LEDs

The communication and status LEDs are visible through the meter cover. The LEDs are located on the communications circuit board, which is mounted on the underside of the meter.

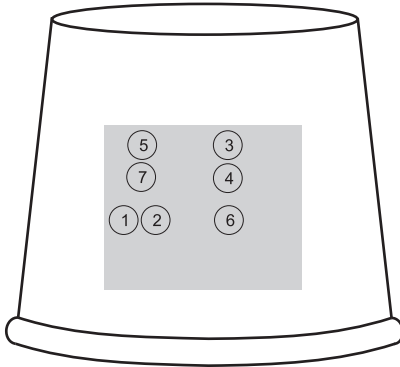
The LEDs indicate communications information and meter status as follows:

Location	LED	Action	Status
1	RS-485 Rx	Flashing Amber	Meter is receiving data from RS-485 (Modbus) network
2	RS-485 Tx	Flashing Amber	Meter is transmitting data to RS-485 (Modbus) network
3	Internal Activity 1	Flashing Amber	Meter is operating
4	Internal Activity 2	Flashing Amber	
5	Internal Activity 3	Flashing Green	
6	Power	Steady Green	Meter is connected to electrical power
7	Error Indicator	Steady Red	*Meter is in error state.

\* Please contact Technical Support if this error condition occurs.

### LED Locations

Bottom of meter



## Step 6: Configure the Meter using ION Setup

Before adding the meter into your Modbus network, you must configure the following parameters through an initial connection to ION Setup software via the optical port.

- ◆ Modbus ID
- ◆ Baud rate
- ◆ Parity
- ◆ PT and CT ratios

To initially connect ION Setup via the optical port:

1. Put the meter into diagnostic mode by placing a strong magnet over the reed switch. Refer to “Appendix B: E5600 Default Displays” on page 33 for diagnostic mode information.
2. With the magnet in place, connect a computer running ION Setup software to the meter’s optical port with an optical probe.
3. Start ION Setup software for initial configuration as described in the *ION Setup Device Configuration Guide*.

### NOTE

While the meter is communicating via the front optical port, RS-485 (Modbus) data will not be updated.

Use ION Setup software for all meter configuration. Ensure you have the latest features by downloading the latest version of ION Setup from [www.powerlogic.com](http://www.powerlogic.com).

Once basic communications settings have been set via the optical port, you can use ION Setup to configure the meter over the RS-485 network. Configurable aspects of the E5600 include:

- ◆ Front panel display
- ◆ User information
- ◆ Demand interval and type

You can also upload firmware updates to the meter using ION Setup. Refer to the *ION Setup Device Configuration Guide* for details.

## Step 7: Modbus Network Integration

The meter communicates serially to the Modbus network via RS-485 wiring. Communication adapters are required for distances greater than 1219 meters (4000 feet). The Modbus connection is active when the meter is wired into the Modbus network with an active master device. Modbus data will not update while the front optical port is in use, but will be updated as soon as the front optical port is no longer in use.

Read-only Modbus registers provide Device Information, Energy and Demand, Meter Phase, Power Factor and Frequency (per phase voltage and current values, overall power factor and frequency measured values), Diagnostics details and Configuration information.

Read/Write Modbus registers allow you to view and modify your meter's Date/Time and Digital output parameters.

Modbus data is stored and transmitted as follows:

- ◆ 16-bit Modbus registers are transmitted high-order byte first.
- ◆ 32-bit Modbus registers are transmitted first register first, for example:  
40101 = kW total (UINT32)  
40101 = most significant word of the data, 40102 = least significant word.

Refer to the *ION Setup Device Configuration Guide* for information on how to set up and configure your meter.

## Time Synchronization Considerations

Time syncing the meter causes the demand interval to be reset, which creates artificially low real-time demand values. Only time sync the meter during periods of low demand, or at the beginning of the demand interval.

The meter supports UTC or local time, with no Daylight Savings Time correction applied.

### Time Synchronization Day of Week (Modbus register 44207) Values

Day	Value
Sunday	0
Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6

## Watt-hour Pulse Configuration

If you require third-party verification of meter measurement accuracy, please contact Technical Support.

## Load Profile

The meter logs load profile data for integration into your energy management software. Please contact Technical Support for assistance when integrating the E5600 into energy management software that does not provide E5600 support.

## Meter Event Log

The meter's event log is available for integration into your energy management software. Please contact Technical Support for assistance when integrating the E5600 into energy management software that does not provide E5600 support.

## Modbus Protection

Your meter is protected against being configured by any tool other than ION Setup. Password security can be configured using ION Setup, refer to the *ION Setup Device Configuration Guide*.

## Modbus Commands

Command	Description	Values
0x2B (Subfunction code 0x0E)	Read device identification BASIC implementation (0x00, 0x01, 0x02 data) conformity level 1.	0x01: Vendor name <ul style="list-style-type: none"> <li>• 0 = SquareD</li> <li>• 1 = Schneider Electric</li> </ul>
		0x02: Product <ul style="list-style-type: none"> <li>• 0 = E5600</li> </ul>
		0x03: Version and revision <ul style="list-style-type: none"> <li>• V310</li> </ul>
0x03	Read holding registers.	Refer to Modbus protocol specifications available from <a href="http://www.modbus-ida.org">www.modbus-ida.org</a> .
0x10	Write multiple registers.	

# Modbus Registers

## Data Formats

Format	Description
UINT16	Unsigned 16-bit Integer, range -32767 to +32767
UINT32	Unsigned 32-bit Integer, corresponds to 2 UINT16
INT32	Signed 32-bit Integer
FLOAT32	IEEE-754 float format

## Read Only Registers

	Modbus Register	E5600 Parameter Read-only	Format	Scale	Description
Device Information	40001	Serial Number (0,1)	UINT16	x1	ASCII text serial number, indicating the device type and firmware revision.
	40002	Serial Number (2,3)	UINT16	x1	
	40003	Serial Number (4,5)	UINT16	x1	
	40004	Serial Number (6,7)	UINT16	x1	
	40005	Serial Number (8,9)	UINT16	x1	
	40006	Serial Number (10,11)	UINT16	x1	
	40007	Serial Number (12, 13)	UINT16	x1	
	40008	Serial Number (14, 15)	UINT16	x1	
	40009	Volts Mode	UINT16	x1	Volts Mode settings: 0=4-Wire Wye, 1=Delta, 2= Single Phase, 3=4-Wire Delta, 4=3-Wire Network, 5=Polyphase Form Factor in Single Phase, 255=Error (Service type unknown).
	40010	Meter Security Access Level	UINT16	x1	5 = unsealed meter 4 = sealed meter
Meter Date/Time	40051	Year	UINT16	x1	Meter's present date and time.
	40052	Month	UINT16	x1	
	40053	Day	UINT16	x1	
	40054	Hour	UINT16	x1	
	40055	Minute	UINT16	x1	
	40056	Second	UINT16	x1	



	Modbus Register	E5600 Parameter Read-only	Format	Scale	Description
Inputs/Outputs	40061	KY Output 1 Relay Status	UINT16	x1	0 = off (default) Non-zero = on
	40062	KY Output 2 Relay Status	UINT16	x1	
	40063	Input 1 Status	UINT16	x1	
	40064	Input 2 Status	UINT16	x1	
Meter Energy and Demand	40101	kW total	UINT32	x1000	Instantaneous kW over all phases
	40103	kW demand	UINT32	x100	kW demand from most recently completed interval
	40105	kW peak demand	UINT32	x100	
	40107	kWh total	INT32	x1	kWh total = kWh del - kWh rec Rollover at 10 <sup>6</sup>
	40109	kWh del	UINT32	x1	
	40111	kWh rec	UINT32	x1	
	40113	kVAR total	UINT32	x1000	Instantaneous kVAR over all phases
	40115	kVAR demand	UINT32	x100	kVAR demand from most recently completed interval
	40117	kVAR peak demand	UINT32	x100	
	40119	kVARh total	INT32	x1	kVARh total = kVARh del - kVARh rec Rollover at 10 <sup>6</sup>
	40121	kVARh del	UINT32	x1	
	40123	kVARh rec	UINT32	x1	
	40125	kVA demand	UINT32	x100	kVA demand from most recently completed interval
	40127	kVA peak demand	UINT32	x100	
	40129	kVAh total	UINT32	x1	Rollover at 10 <sup>6</sup>

	<b>Modbus Register</b>	<b>E5600 Parameter Read-only</b>	<b>Format</b>	<b>Scale</b>	<b>Description</b>
<b>Meter Phase, Power Factor, Frequency</b>	40401	V1 Secondary	UINT16	x10	RMS values displayed on meter front panel. Voltage Modes: Delta: line-line values Wye: line-neutral values
	40402	V2 Secondary	UINT16	x10	
	40403	V3 Secondary	UINT16	x10	
	40404	I1 Secondary	UINT16	x10	RMS values displayed on meter front panel.
	40405	I2 Secondary	UINT16	x10	
	40406	I3 Secondary	UINT16	x10	
	40407	Line Frequency	UINT16	x10	
	40408	True Power Factor total	INT16	x100	Follows IEEE sign convention
	40409	V1Angle	UINT16	x10	V1 angle = 0 All other angles are referenced from V1.
	40410	V2 Angle	UINT16	x10	
	40411	V3 Angle	UINT16	x10	
	40412	I1 Angle	UINT16	x10	
	40413	I2 Angle	UINT16	x10	
	40414	I3 Angle	UINT16	x10	
	40415	V1 Primary	UINT32	x10	RMS values. Voltage Modes: Delta: line-line voltage Wye: line-neutral voltage
	40417	V2 Primary	UINT32	x10	
	40419	V3 Primary	UINT32	x10	
	40421	I1 Primary	UINT32	x10	
	40423	I2 Primary	UINT32	x10	
40425	I3 Primary	UINT32	x10		
40427	V AVG Primary	UINT32	x10		
40429	I AVG Primary	UINT32	x10		
<b>Internal Communication Diagnostics</b>	41001	Received Packets Counter	UINT16	x1	
	41002	Malformed Received Packets Counter	UINT16	x1	
	41003	Received Packet Length Error Counter	UINT16	x1	
	41004	Received Packet CRC Error Counter	UINT16	x1	
	41005	Received Packet Nonzero Response code Counter	UINT16	x1	
	41006	Packets Transmitted Counter	UINT16	x1	
	41007	Retries Transmitted Counter	UINT16	x1	
	41008	Timeouts	UINT16	x1	

	<b>Modbus Register</b>	<b>E5600 Parameter Read-only</b>	<b>Format</b>	<b>Scale</b>	<b>Description</b>
<b>RS-485 Communication Diagnostics</b>	41009	Received Packets Counter	UINT16	x1	
	41010	Malformed Received Packets Counter	UINT16	x1	
	41011	Received Packet CRC Error Counter	UINT16	x1	
	41012	Packets Transmitted Counter	UINT16	x1	
	41013	Interbyte Timeouts	UINT16	x1	

	<b>Modbus Register</b>	<b>E5600 Parameter Read-only</b>	<b>Format</b>	<b>Scale</b>	<b>Description</b>
<b>Configuration</b>	44001	PT Ratio	UINT16	x1	Equals PT Primary / PT Secondary Use ION Setup for configuration.
	44002	CT Ratio	UINT16	x1	Equals CT Primary / CT Secondary Use ION Setup for configuration.
	44003	Transformer Factor	UINT16	x1	Automatically calculated by multiplying PT and CT values. The Transformer Factor does not affect pulse values or raw data.
	44004	k Factor	UINT32	x1000	Meter k factor Use ION Setup for configuration.
	44006	Demand type	UINT16	x1	0= block (default) Non-zero = sliding window Use ION Setup for configuration.
	44007	Demand Interval Length	UINT16	x1	Meter supports demand interval lengths of 1, 5, 15 (default), 30, or 60 minutes. N/A for sliding window Use ION Setup for configuration.
	44008	Demand Sub Intervals	UINT16	x1	Meter supports demand interval length / sub-interval length: 60/30, 60/20, 60/15, 60/10, 60/5, 30/15, 30/10, 30/5, 15/3, 15/1, 5/1. N/A for block demand Use ION Setup for configuration.
	44009	Demand # Sub Intervals	UINT16	x1	Demand # Sub Intervals equals demand interval length / demand sub-interval. N/A for block demand
	44010	Modbus Baud Rate	UINT16	x1	3 = 9600 bps 4 = 19200 bps (default) Use ION Setup for configuration.
	44011	Parity	UINT16	x1	0 = no parity (default) 2 = even parity Use ION Setup for configuration.
44012	Modbus Unit ID	UINT16	x1	Range 1-247 Use ION Setup for configuration.	

## Read/Write Registers

	Modbus Register	E5600 Parameter Read/Write	Format	Scale	Description
<b>KY Output Registers</b>	44101	KY Relay Output 1 Enable	UINT16	x1	0 = disabled (default) Non-zero = enabled
	44102	KY Relay Output 1 Source	UINT16	x1	KY relay output sources: 0 = kWh Del, 1 = kWh Rec, 3 = kVAh RMS, 6 = kVARh Del, 7 = kVARh Rec.
	44103	KY Relay Output 1 Ke Value	FLOAT32	x1	IEEE-754 float formatting, Ke=energy (kW) per pulse Minimum value of Ke is Kh/12, maximum 16. Refer to meter front label for Kh.
	44105	KY Relay Output 2 Enable	UINT16	x1	0 = disabled (default) Non-zero = enabled
	44106	KY Relay Output 2 Source	UINT16	x1	KY relay output sources: 0 = kWh Del, 1 = kWh Rec, 3 = kVAh RMS, 6 = kVARh Del, 7 = kVARh Rec.
	44107	KY Relay Output 2 Ke Value	FLOAT32	x1	IEEE-754 float formatting, Ke=energy (kW) per pulse Minimum value of Ke is Kh/12, maximum 16. Refer to meter front label for Kh.
<b>Time Sync Configuration</b>	44201	Year	UINT16	x1	Refer to "Time Synchronization Considerations" on page 22.
	44202	Month	UINT16	x1	
	44203	Day	UINT16	x1	
	44204	Hour	UINT16	x1	
	44205	Minute	UINT16	x1	Use ION Setup for configuration.
	44206	Second	UINT16	x1	
	44207	Day of Week	UINT16	x1	

# Appendix A: Replacing the Battery

The battery in the E5600 keeps the real time clock running when primary power is lost (loss of three phases). Replace the battery if the meter has been stored for an extended period of time without power (longer than two years). If the meter will be without power for an extended length of time, follow the steps below to disconnect the battery cable so that the battery maintains its 10-year shelf life.

 **NOTE**

Replacing the battery resets the internal clock and may affect revenue parameters.

## CAUTION

**HAZARD OF EQUIPMENT DAMAGE**

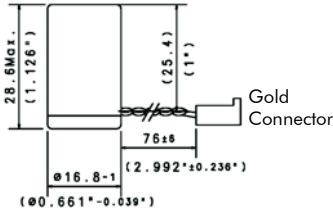
Only use batteries that match battery dimensions and specifications.

**Failure to follow these instructions can result in equipment damage.**

**Battery Specifications**

Type	Lithium LiSOCl <sub>2</sub>
Nominal Capacity	1.0 Ah
Rated Voltage	3.6 V
Connector	Gold

**Battery Dimensions**





# DANGER

## HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

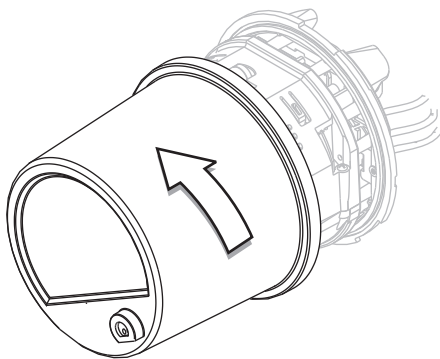
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this device and the equipment in which it is installed before working on it.
- Turn off all power supplying this device before replacing battery.
- Always use a properly rated voltage sensing device to confirm power is off.
- Do not remove the plastic insulation barrier to prevent exposing live circuits.
- Replace cover before putting meter into service.

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

1. Turn off all power to the meter.
2. Use a properly rated voltage sensing device to confirm power is off.
3. Remove the meter's cover.

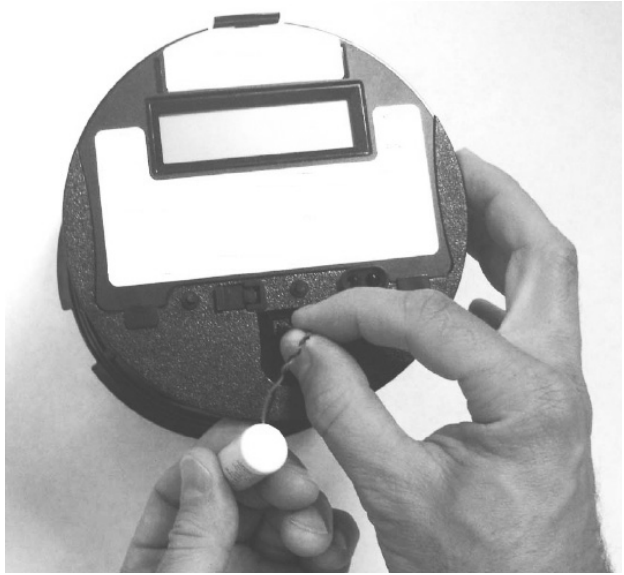
Rotate the meter's cover  $\frac{1}{4}$  turn counter-clockwise; pull cover off.

Do not remove the plastic insulation barrier to prevent exposing live circuits. Refer to "Safety Precautions" on page 10.



4. Carefully disconnect the old battery's wire connector from the meter and remove the old battery from the housing.

5. Plug the new battery's two-pin connector into the matching two-pin slot, which is located in the six o'clock position on the meter assembly housing. See below.



6. Place the battery in the round cavity.
7. Position the battery wires in the cavity to prevent them from interfering with cover installation or meter functions.
8. Replace the meter cover and restore power to the meter.
9. Dispose of the old battery in accordance with battery manufacturer directions and local environmental/electrical regulations.



## Appendix B: E5600 Default Displays

You can customize the E5600 display using ION Setup. These are standard displays provided with every meter. Refer to “Front Panel Display” on page 19 for a diagram of the front LCD display.

### Accessing the Display Sequences

There are three display sequences: Normal, Alternate, and Diagnostic.

#### Normal Display Sequence

The meter automatically scrolls through the normal display sequence under normal operating conditions.

#### Alternate Display Sequence

The alternate display sequence includes more screens than the normal sequence. To activate the alternate display sequence, swipe a strong magnet over the meter in the 12 o'clock position; this activates the reed switch. The word “Alt” appears on the display before the alternate display sequence starts.

The meter automatically exits back to the normal display sequence after one pass through the alternate displays.

#### Diagnostic Display Sequence

This sequence is designed to facilitate troubleshooting problems in the meter installation. All normal meter functions continue while in the diagnostic display sequence. To activate the diagnostic display sequence, hold the magnet over the reed switch. After three seconds the display will go blank briefly, which indicates the beginning of the sequence.

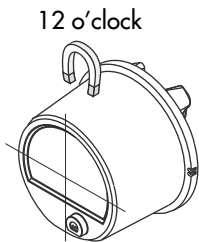
To exit, remove the magnet; the meter returns to the normal display sequence.

When the meter is in diagnostic mode, Modbus communications are suspended. All other meter functions continue without interruption.

Refer to “Diagnostic Screens” on page 35 for more information.

#### Error Codes

Refer to “Error Codes” on page 36 for a listing of the front panel error codes and their resolutions.



## Default Display Screens

Sequence	Scroll Sequence	Display Indicator	Description
Normal Displays	1	888	All segments
	2	UID	Modbus Unit ID
	3	001	Total kWh
	4	002	Total kVARh
	5	003	Total kVAh
	6	004	Max kW demand
Alternate Displays	1	888	All segments
	2	UID	Modbus Unit ID
	3	A03	Demand interval
	4	A04	kWh received
	5	A05	Neutral current
	6	A06	Kh of operation
	7	A07	Date/Time
	8	A08	Voltage phase A RMS magnitude
	9	A09	Voltage phase A angle
	10	A10	Voltage phase B RMS magnitude
	11	A11	Voltage phase B angle
	12	A12	Voltage phase C RMS magnitude
	13	A13	Voltage phase C angle
	14	A14	Current phase A RMS magnitude
	15	A15	Current phase A angle
	16	A16	Current phase B RMS magnitude
	17	A17	Current phase B angle
	18	A18	Current phase C RMS magnitude
	19	A19	Current phase C angle
	20	D1	Diagnostic counter 1 (see note 1)
	21	D2	Diagnostic counter 2 (see note 1)
	22	D3	Diagnostic counter 3 (see note 1)
	23	D4	Diagnostic counter 4 (see note 1)
	24	D6	Diagnostic counter 6 (see notes 1 and 2)
	25	D7	Diagnostic counter 7 (see note 1)

<sup>1</sup> Refer to “Diagnostic Screens” on page 35 for more information.

<sup>2</sup> Diagnostic counter 5 does not exist (reserved for future use).

### NOTE

If a voltage or current phase is not present, the corresponding screens will not appear in the sequence.

## Diagnostic Screens

### D1 (Polarity and Cross-phase)

The D1 diagnostic checks for proper phase relationships of voltage, incorrect polarity of voltage, internal meter measurement malfunction, and faulty site wiring. The envelope of the voltage phasors is fixed at  $\pm 10$ . If the voltage phasor values measure more than  $\pm 10$  from their nameplate value position, an error will be detected. This check is not performed when phase A voltage is missing.

### D2 (Phase Voltage Deviation Check)

The Phase Voltage Deviation Check verifies loss of phase voltage, incorrect phase voltage, shorted voltage transformer windings, or incorrect voltage transformer ratio by detecting differences between phase voltage magnitudes. This check uses the nameplate voltage per phase as a reference. The tolerance range of the voltage deviation (10%) is pre-programmed.

### D3 (Inactive Phase Current Check)

The Inactive Phase Current Check verifies that the service is maintaining an acceptable current level and is expected to detect current diversion and an open or shorted CT circuit. The low current value is pre-programmed into the register and will have a limit starting at the creep level of the meter and up to 200 A in increments of 1 mA (default 5 mA). Each phase can have a separate threshold. The error flag will trip if one or more currents fall below its threshold and at least one current remains above this value for more than 15 seconds. The error flag will not trip if all phase currents fall below their thresholds.

### D4 (Phase Angle Displacement Check)

The Phase Angle Displacement Check diagnostic verifies that the elements are sensing and receiving the correct current for each phase of the service and indicates poor load power factor system conditions and reversed CT's. The phase displacement angle (default 90°) is pre-programmed. Angles for leading and lagging loads are separately programmable. The current phasors must be within this programmable phase with respect to their voltage phasor to pass this diagnostic check. This is calculated with respect to its respective voltage phasor, not necessarily phase A's voltage phasor. The check is not performed if Diagnostic #3 did not pass or if phase A voltage is missing.

### D6 (Current Magnitude Imbalance Check)

This diagnostic compares the current of each phase with the other phases in the installation. If the ratio between any phase current and the average of all phase currents exceeds the user programmable percentage (default 10%), then this diagnostic flag is tripped. The check is not performed if Diagnostic #3 did not pass, if the average current is below 0.5% of class, or if phase A voltage is missing.

### D7 (Energy Polarity Check)

The D7 diagnostic checks for reverse energy flow of one or more phases. If the energy polarity (watts) for any phase is negative, this flag will be tripped. This check is not performed if phase A voltage is missing.

## Error Codes

Error codes are shown on the meter's front panel display.

### Non-scrolling Errors

Non-scrolling errors are flagged with the number 1, and cause the error code byte to lock at the end of the display sequence. Activating the reed switch will cause auto-scrolling to continue for one more pass in the alternate display mode.

### Scrolling Errors

Scrolling errors are flagged with the number 2, and allow auto-scrolling to continue with the error code byte inserted at the end of the display sequence.

Error Condition	Non-Scrolling Error Display	Scrolling Error Display
Low Battery Voltage	ERR 000001	ERR 000002
Unprogrammed Register*	ERR 000010	N/A
Memory/Load Profile*	ERR 000100	N/A
Phase	N/A	ERR 000200
Stuck Switch	ERR 010000	ERR 020000
Unsafe Power Fail*	ERR 100000	N/A
Measurement Diagnostics Failure*	N/A	ERR 200000

\* Contact Technical Support if these error conditions occur.

**Low Battery Voltage:** Error displays when voltage drops to 2.5 V. To clear this error, install a new battery. Refer to "Appendix A: Replacing the Battery" on page 30.

**Stuck Switch:** Error displays when either the Reset, Test Mode or Scroll switches are active for four (4) minutes. To clear this error, deactivate the switch.

**Phase Error:** Error displays when phase voltage drops below 50% of nameplate voltage. The corresponding voltage indicator on the front panel display will flash. Internal error flags indicate the source of error.

Bit	Error
0	Phase C Out
1	Load Profile Parity
6	Serial EEPROM
7	SRAM board malfunction*

\* Contact Technical Support if this error condition occurs.







# PowerLogic™ E5600

## Installation and operation guide

For further assistance  
please contact us at:

### **Schneider Electric**

Power Monitoring and Control  
2195 Keating Cross Road  
Saanichton, BC  
Canada V8M 2A5  
Tel: 1-250-652-7100

295 Tech Park Drive, Suite 100  
Lavergne, TN 37086  
USA  
Tel: 1-615-287-3400

Electropole (38 EQI)  
31, rue Pierre Mendès France  
F - 38050 Grenoble Cédex 9  
Tel : + 33 (0) 4 76 57 60 60

Getting technical support:  
Contact your local Schneider Electric sales  
representative for assistance or go to the  
[www.powerlogic.com](http://www.powerlogic.com) website.

ION, ION Enterprise, Modbus, Power Measurement,  
PowerLogic, Schneider Electric and Square D are either  
trademarks or registered trademarks of Schneider Electric  
in France, the USA and other countries. All other  
trademarks are property of their respective owners.

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.

70002-0295-00  
© 2009 Schneider Electric. All rights reserved.  
03/2009