PowerLogic™ Enercept Meter

Z205397-0C

Installation Guide

Schneider Electric

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 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 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.

NOTE: 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 NOTICE

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.

For use in a Pollution Degree 2 or better environment only. A Pollution Degree 2 environment must control conductive pollution and the possibility of condensation or high humidity. Consider the enclosure, the correct use of ventilation, thermal properties of the equipment, and the relationship with the environment. Installation category: CAT II or CAT III

INTRODUCTION

The PowerLogic™ Enercept® meter is the ideal cost-effective solution for standard energy metering applications. It combines easy-to-install split-core CTs and highly accurate digital metering and communications electronics in the same package. This unique design eliminates the need for a separate meter enclosure or to disconnect conductors, and it greatly reduces installation costs.

There are two models of the Enercept meter: basic and enhanced. These application specific meters differ in the amount of information they report. The basic model reports power and energy, while the enhanced model provides multiple parameters, including power, demand, energy, amps, volts, power factors, and reactive power.

The Enercept meter uses the Modbus RTU 2-wire communications protocol and can be networked with PowerLogic™ devices. Using System Manager™ software, you can present information from the Enercept meter in tabular or graphic formats, as well as generate alarms, historical logs, trends, and reports.

The Enercept meter provides ANSI C12.1 metering accuracy and is UL and cUL listed, making it ideal for many applications, including:

- Departmental costing in commercial and industrial facilities
- Real time power monitoring
- Energy management and performance contracting

SAFETY PRECAUTIONS

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices.

- This equipment must be installed and serviced only by qualified personnel.

- Turn off all power supplying this equipment before working on or inside equipment.

- Always use a properly rated voltage sensing device to confirm that power is off.

- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to observe this instruction will result in death or serious injury.

HARDWARE DESCRIPTION

1. **Voltage Leads**
   Figures 3–6 on pages 5 and 6 show how to connect the leads to the source to be monitored. Input range is 208 to 480 V line-to-line.

2. **Mandatory Fuse Per NEC**
   Maximum current draw is 60 mA. Fuses provided by factory are rated 1/2 A. 200 K AIC. Replace only with fuses of same type and rating.

3. **Modbus RS-485 Connector**
   Connect to Modbus network. Figure 8 on page 7 shows how to connect RS-485 communication wires.

4. **Status LED**
   The LED blinks green when the product is functioning normally. It blinks slowly, approximately one second on, then one second off. If the LED is red and blinking slowly, it may indicate incorrect wiring or a power factor that is less than 0.5. If the LED is red and blinking quickly, the CT's maximum current rating has been exceeded.

5. **Address Selection Switches**
   Each Modbus device on a communication string must have a unique address. Set these switches before connecting the device.

   NOTE: If an address is selected that conflicts with another device, both devices will be unable to communicate.

6. **External CTs**
   External CTs are permanently attached and must not be disconnected or used with other meters.
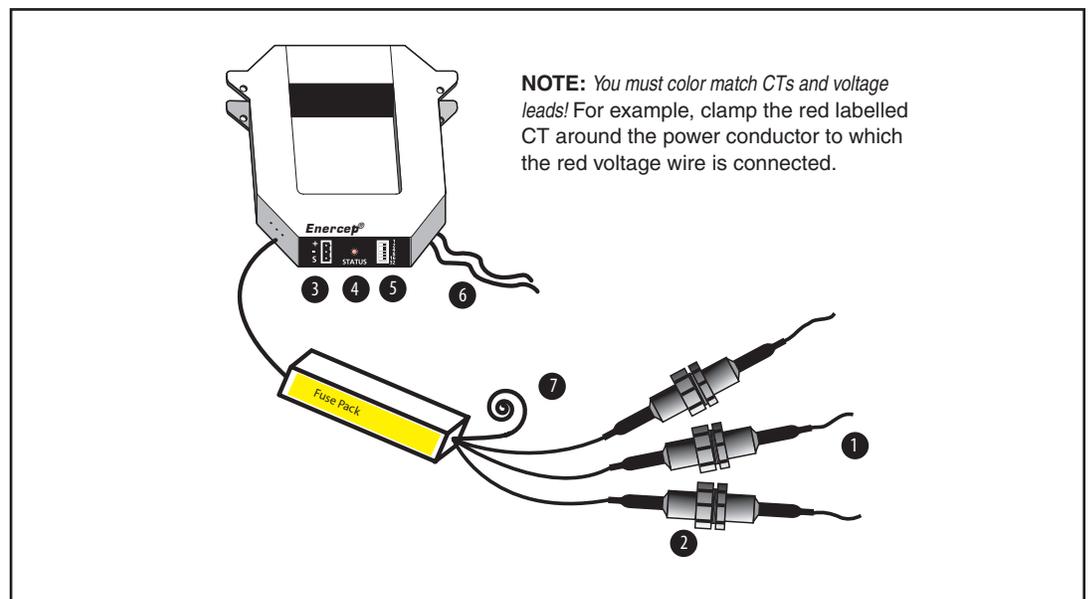
7. **Neutral lead**

NOTE: *You must color match CTs and voltage leads!* For example, clamp the red labelled CT around the power conductor to which the red voltage wire is connected.

Figure 1   Diagram of typical Enercept meter

INSTALLING AND WIRING THE 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 be installed and serviced only by qualified personnel.

• Turn off all power supplying this equipment before working on or inside equipment.

• Always use a properly rated voltage sensing device to confirm that power is off.

• Replace all devices, doors, and covers before turning on power to this equipment.

Failure to observe this instruction will result in death or serious injury.

The Enercept meter, including the current transformers (CTs), voltage connection fuses, and fuse pack, is permitted within electrical distribution equipment including but not limited to panelboards, switchboards, motor control centers, and transformers. Carefully review the equipment in which the Enercept meter will be installed. The following installation conditions should be considered during the installation process:

A) Review the equipment enclosure for ventilation openings. Wires will cross many of these openings in a normal installation, however, do not install the Enercept where it will substantially block ventilation openings in the enclosure.

B) The Enercept meter and the wiring installed within a wiring space or gutter should not exceed 75 percent cross sectional fill at the Enercept meter parts as addressed in the NEC. Improper installation of Enercept meter in the wire gutter of equipment may affect the thermal performance of the equipment.

C) The arrangement of CTs within the equipment must also be considered to ensure the bending radius of conductors is not adversely affected.

D) Review the arrangement and location of the CTs within the equipment. The CT must not create undue strain on the conductor. A CT may require appropriate support in order to address such a condition.

To install the Enercept meter, complete the following steps:

1. Each Modbus device on a communication string must have a unique address. Before connecting the meter to the RS-485 communication wires, choose an address that is not in use, and set the switches as shown in Figure 2 on page 4. If the address conflicts with another device, neither device will communicate.

2. Turn off all power to the equipment into which the Enercept meter is to be installed, verify power is off with a properly rated voltage sensing device, and lock-out all power sources during installation.

3. Connect the voltage leads to the phase conductors, based on system type, as shown in Figures 3–6 on pages 5 and 6. Connect the red lead to Phase A, the black lead to Phase B, and the yellow lead to Phase C.

---

4. For 4–wire systems, remove the end cap of the white wire before connecting to the neutral conductor. For 3–wire systems, leave the white wire capped and coiled.

   NOTE: The meter does not communicate on the network bus without power. Without power to the meter, PowerLogic software will report a communication error, and the Sub-Meter display will not display values for that particular meter.

5. Install CTs on conductors. Each CT must be installed on the same conductor as the correspondingly-colored voltage lead. (See wiring diagrams on pages 6 and 7.) The unit will automatically detect phase reversal, so it is not important to orient a particular side of each CT toward the load.

   NOTE: In any application in which fault currents can exceed 20 times rated current of CT rating, use wire ties to secure the I-bar to the CT housing. Use ties on each side of all three CTs (see Figure 7 on page 7). Secure CTs using wire ties or brackets. If the I-bar is removed, re-orient it according to the markings on the surface of the core surface, then re-attach it.

6. Attach the RS-485 communication wires to the terminal block as shown in Figure 8 on page 7, then plug the terminal block into the red CT. ("Appendix C—Communications" on page 11 for additional communications information.)

7. Insulate any exposed wiring. Ensure that insulation complies with local and national electrical codes.
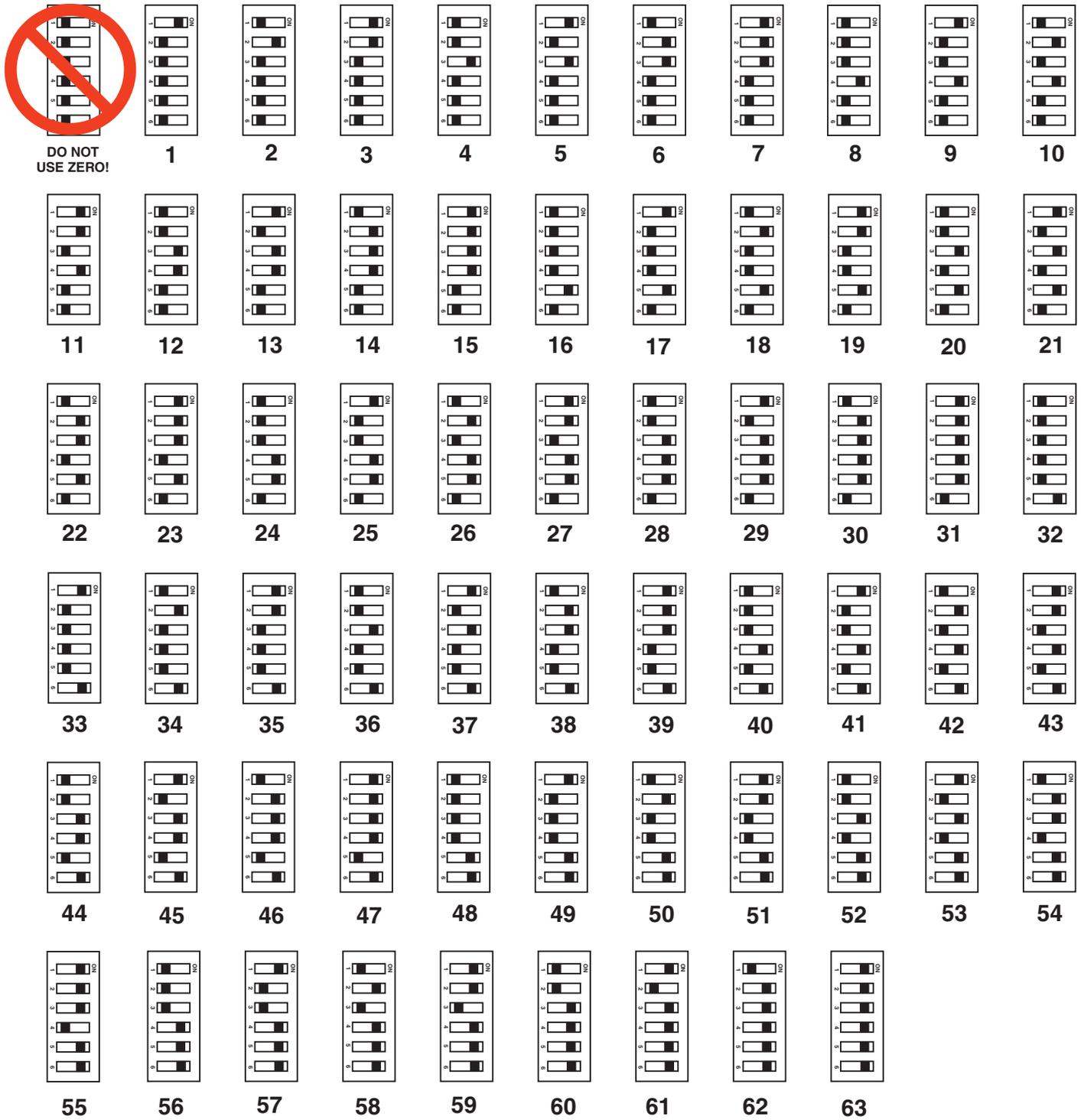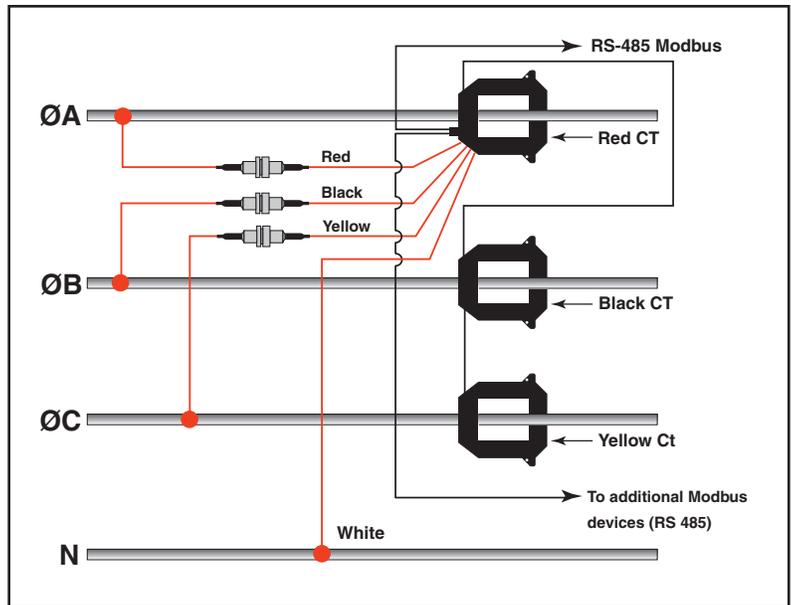
Figure 2   Address selection switches

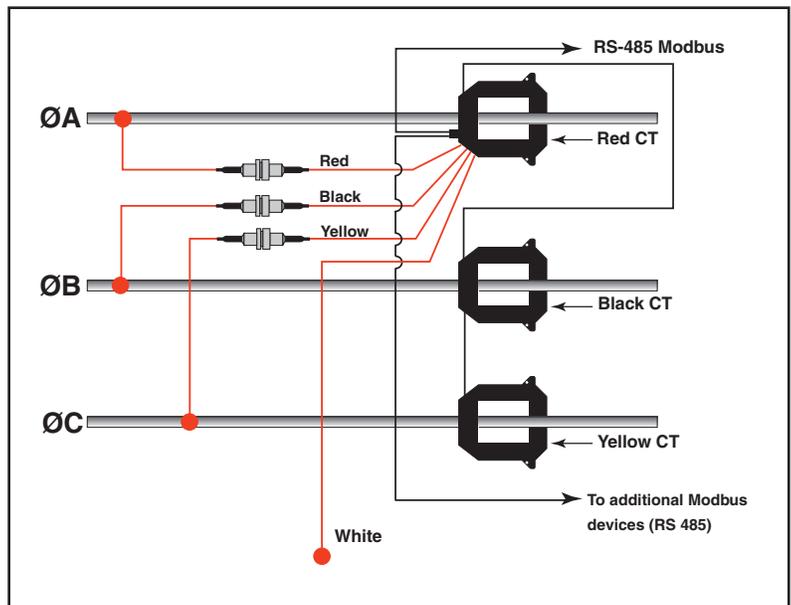Figure 3   Typical 480 Vac max., 3Ø, 4-wire installation

Figure 4   Typical 480 Vac max., 3Ø, 3-wire installation

CAUTION

HAZARD OF OVERHEATING

• Do not install the Enercept meter on the line or load side of a VFD unit.

Failure to follow these instructions can result in equipment damage.

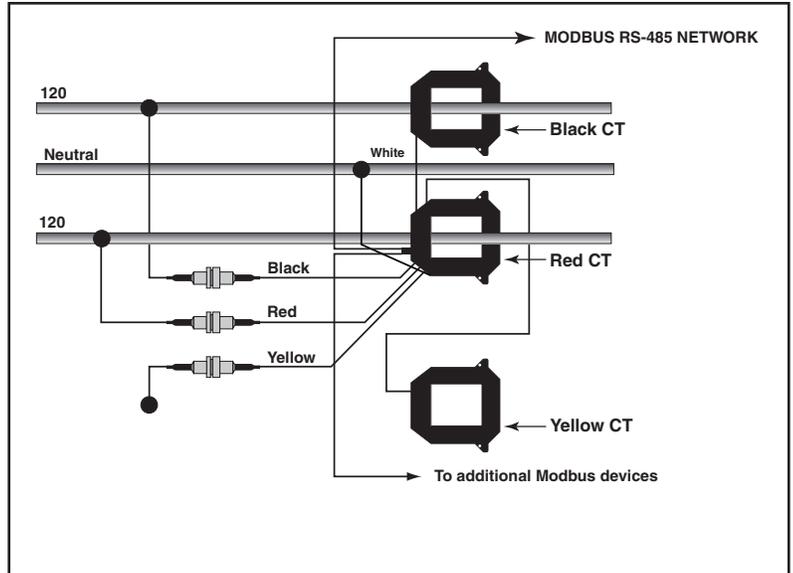For information on using the Enercept meter on a circuit that contains a VFD, contact technical support.
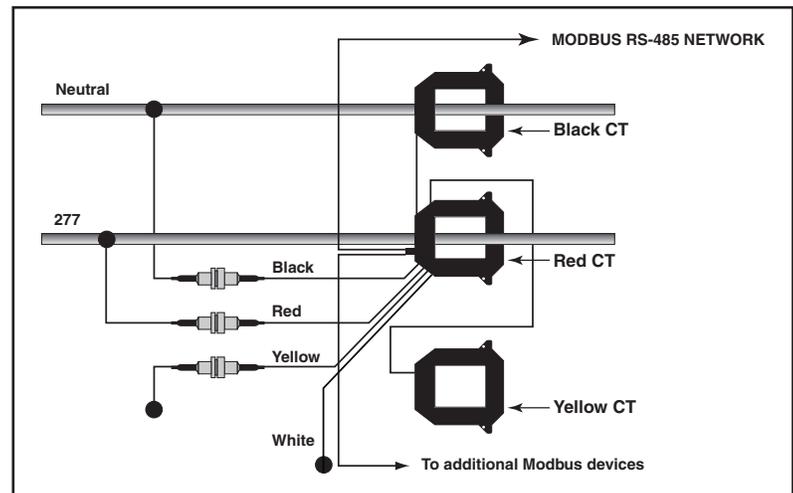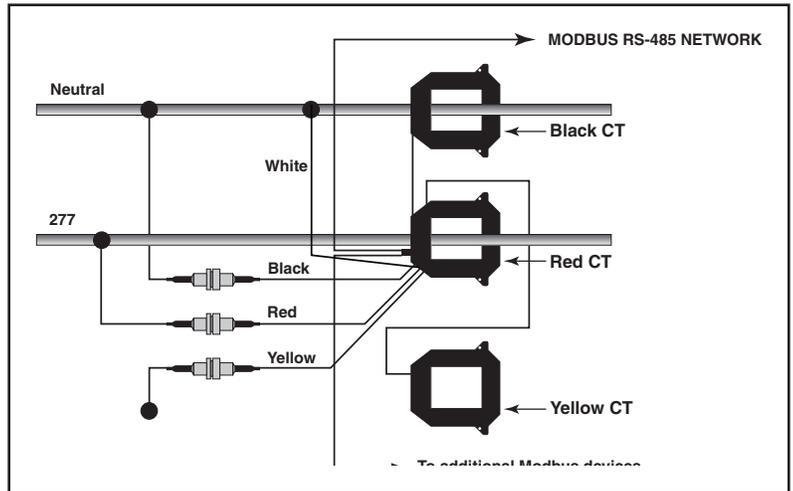
Figure 5   Typical 240/120 VAC 1Ø, 3-wire installation

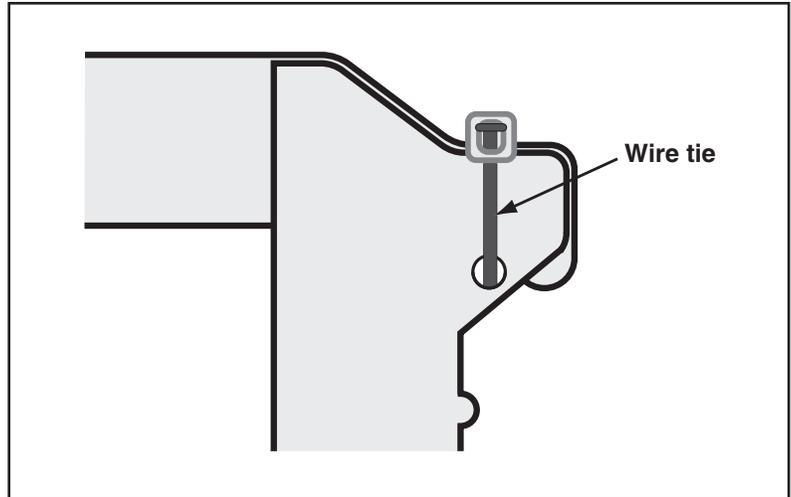**Figure 6   Typical 277 VAC 1Ø, 2-wire installation (2 options)**

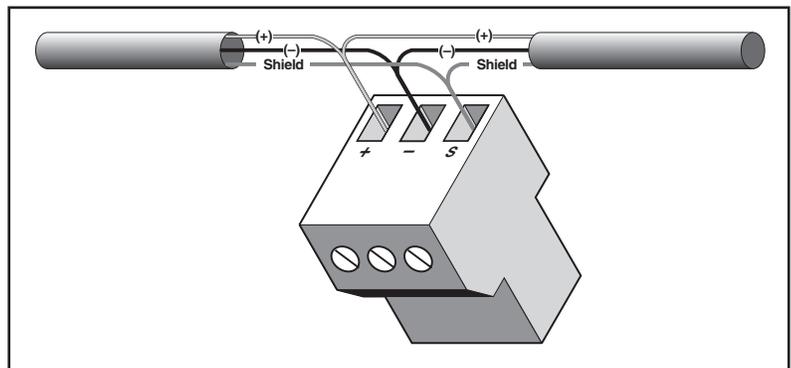**Figure 7   Wire tie used to secure I-Bar**

Figure 8   Wiring the RS-485 terminal block

8. Do not ground the shield inside the electrical panel. Isolate all Modbus wires, including the shield.

   NOTE: All Enercept wiring is Class 1, with the exception of the data cable which is a Class 2 wire and must be isolated from Class 1 wire, as per UL508.

9. Secure the Modbus cable where it enters the electrical panel.

10. Connect all Modbus devices together in a daisy chain.

11. Use a shielded, twisted pair wire (e.g., BELDEN 1120A) or similar type wire for Modbus cables.

12. Up to 32 Modbus devices can be connected together on a daisy chain. Additional devices may be connected to the daisy chain if an RS-485 repeater is used.

13. See "Appendix C—Communications" on page 11 for additional communications information.

TROUBLESHOOTING

Problem	Possible Solution
STATUS LED does not illuminate.	Check the fuses and voltage connections. The STATUS LED should blink regardless of CTs, Modbus connections and DIP switch settings.
STATUS LED does not illuminate, and the unit is wired on the load side of an adjustable frequency drive.	The unit must not be installed on the load side of an adjustable frequency drive. The thermal fuse inside the potted assembly has blown and this has caused the meter to lose functionality.
Enercept meter interferes with another Modbus device on the communication string.	Set DIP switches to a Modbus address that is not in use.
Readings seem highly inaccurate.	• Check that each CT is installed on the conductor with the corresponding color voltage input lead attached. In most cases, incorrect wiring will cause the STATUS LED to blink RED (slowly). However, a power factor lower than 0.5 could cause the LED to blink this way, even if the unit is installed properly. • It does not matter which side of the CTs faces toward the load. • Check actual current with a clamp-on ammeter. Expected power is: 　kW = Volts x Amps x 1.732 x PF ÷ 1000 　kW = Horsepower x .746 　PF is usually 0.7 to 0.95, depending on the nature of the load. • Compare this to the kW. • If current is below 1–2% of full scale maximum for the CT, an Enercept meter with a smaller CT rating is probably needed.
Meter is off-line when load is switched off.	The Enercept meter cannot communicate without voltage. The meter is powered from the measured line and requires the load to be switched on to operate.
STATUS LED blinks red.	• If the LED blinks quickly, approximately 5 blinks in 2 seconds, the CT current rating is too small. A larger CT current rating is required. • If the LED blinks slowly (approximately 1 blink in 2 seconds), the CTs are not installed on the correct conductors, or the load's power factor is less than 0.5. The meter can measure these low power factors, but few loads normally operate at such a low power factor.

　　9

APPENDIX A—SPECIFICATIONS

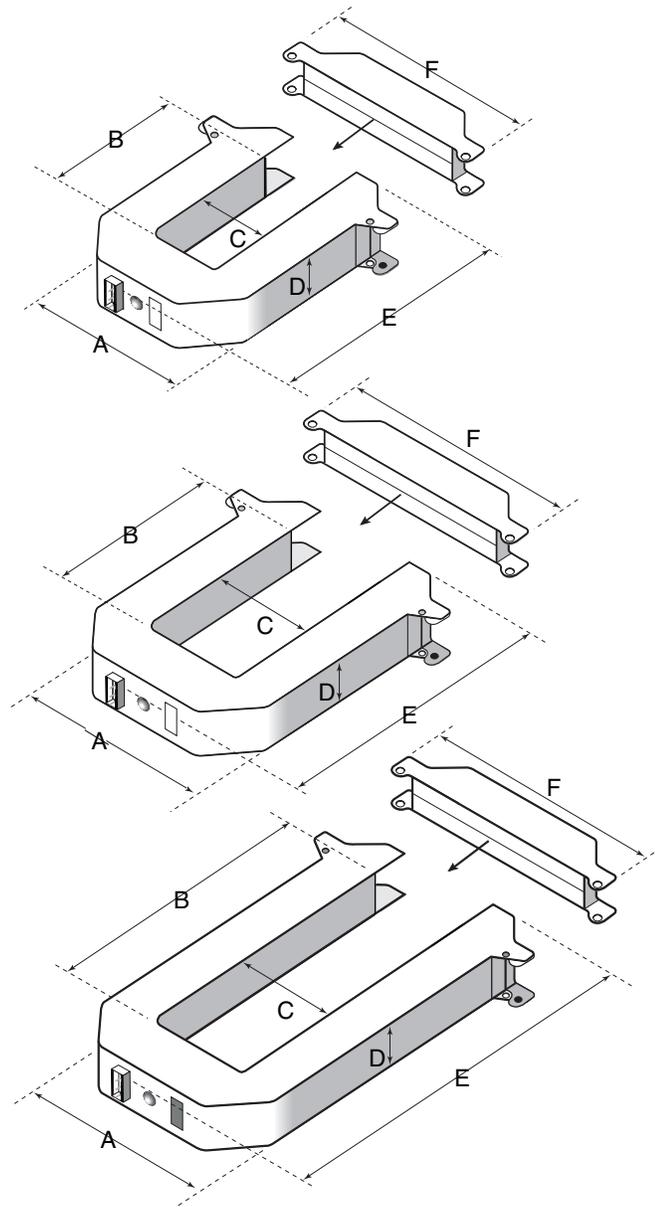| Basic Enercept Meter	
Type	**Description**
Input primary voltage	208–480 Vac line-to-line
Number of phases monitored	One or Three
Frequency	50/60 Hz
Maximum primary current	2400 A cont. per phase
AIC rating	100,000 kAIC
Internal isolation	2000 Vac rms
Case insulation	600 Vac
Operating Temperature Range	0°C/32°F to 60°C/140°F, 0–95% relative humidity, non-condensing)
Accuracy	±1.0%
Communications	RS–485, 2-wire plus shield, 9600 Baud, no parity
Protocol	Modbus RTU
Data for output	Energy, kWH Real Power, kW, total
Current transformer	Split-core, 100, 300, 400, 800, 1600, or 2400 amps
Enhanced Enercept Meter	
Type	**Description**
Input primary voltage	208–480 Vac line-to-line
Number of phases monitored	One or Three
Frequency	50/60 Hz
Maximum primary current	2400 A continuous per phase
AIC rating	100,000 kAIC
Internal isolation	2000 Vac rms
Case insulation	600 Vac
Operating Temperature Range	0°C/32°F to 60°C/140°F, 0–95% relative humidity, non-condensing)
Accuracy	±1.0%
Communications	RS–485, 2-wire plus shield, 9600 Baud, no Parity
Protocol	Modbus RTU
Data for output	Energy, kWH Real Power, kW, per phase and total Demand, kWD Reactive Power, kVAR Apparent Power, kVA Power Factor, per phase and total Current, A, per phase and average Voltage, V, line-to-neutral, per phase and average Voltage, V, line-to-line, per phase and average
Current transformer	Split-core, 100, 300, 400, 800, 1600, or 2400 amps

APPENDIX B—DIMENSIONAL DRAWINGS

Figure 9   Enercept meter dimensions

	Small Meter	**Medium Meter**	**Large Meter**
	100 Amp **300 Amp**	**400 Amp** **800 Amp**	**800 Amp** **1600 Amp** **2400 Amp**
A	3.75 in. (95 mm)	4.90 in. (124 mm)	4.90 in. (124 mm)
B	1.51 in. (38 mm)	2.89 in. (73 mm)	5.50 in. (140 mm)
C	1.25 in. (32 mm)	2.45 in. (62 mm)	2.45 in. (62 mm)
D	1.13 in. (29 mm)	1.13 in. (29 mm)	1.13 in. (29 mm)
E	3.91 in. (99 mm)	5.20 in. (124 mm)	7.88 in. (200 mm)
F	4.75 in. (121 mm)	5.91 in. (150 mm)	5.92 in. (150 mm)

APPENDIX C—COMMUNICATIONS
Connect

Enercept meters can be connected to a serial communications port on a personal computer (see Figure 10 below). To do this, connect the meters to an RS-232 to RS-422/RS-485 converter, which is connected to the personal computer.

Connect up to 32 2-wire Modbus devices. See "Length of the Communications Link" below for limitations on the length of the daisy-chain. Terminate the last device on the daisy-chain. See "Terminating the Communications Link" on page 12.
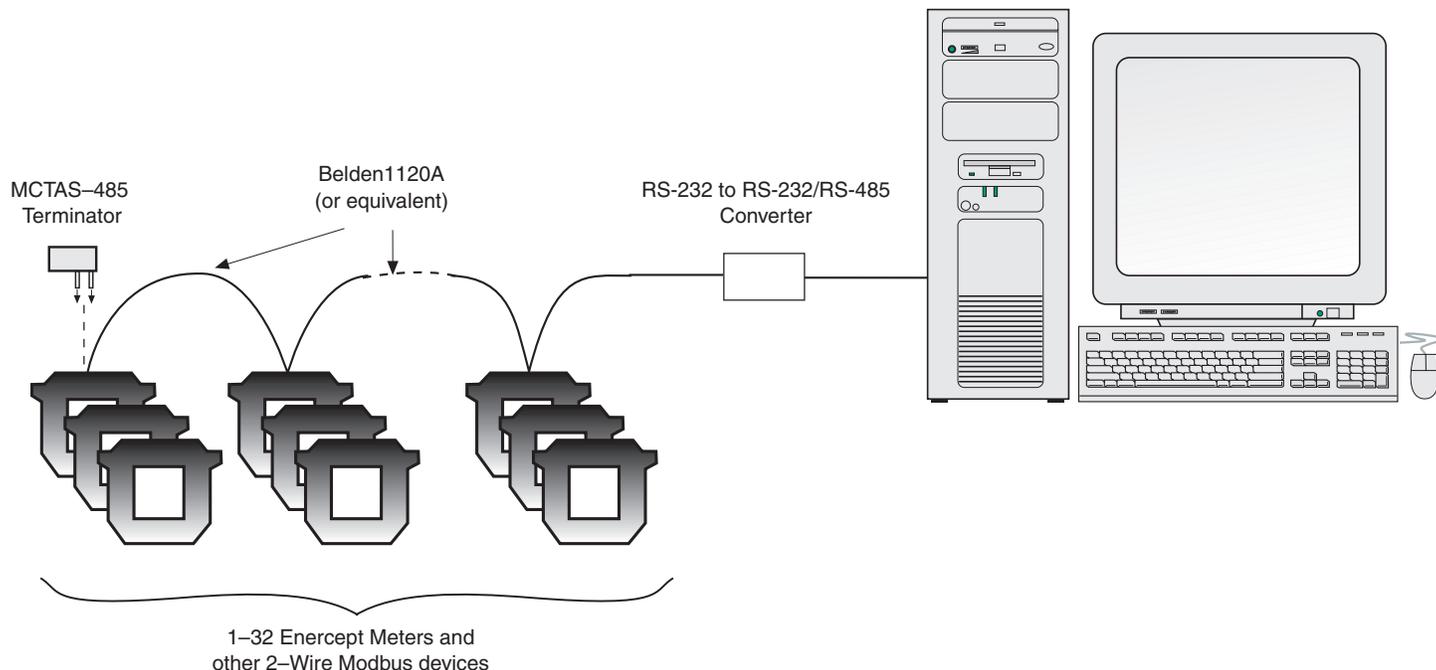
MCTAS–485
Terminator

Belden1120A
(or equivalent)

RS-232 to RS-232/RS-485
Converter

1–32 Enercept Meters and
other 2–Wire Modbus devices

Figure 10 Enercept meters connected to a PC's serial port.

Length of the Communications Link

The length of the communications link—that is, the total length of the communications cable from the personal computer or interface to the last device on the daisy-chain—depends on the number of devices on the daisy-chain. For a daisy-chain with 1–16 devices operating at 9600 baud, the maximum length is 10,000 ft. (3,048 m). For a daisy-chain with 17–32 devices, the maximum length is 4,000 ft. (1,219 m).

Daisy-Chaining Devices

Each Enercept meter has a 3-position plug-in RS-485 terminal block (Figure 12 on page 12) for connection to a 2-wire Modbus communications link. On the Enercept meter, the communications connections are labeled +, –, and S (shield). To create the communications link, daisy-chain devices using a twisted, shielded pair wire such as Belden 1120A.

> **NOTE:** Enercept meters communicate via 2-wire RS-485 communications with no parity. PowerLogic circuit monitors and power meters communicate via 4-wire RS-485 communications with even parity. You can add Enercept meters to a PowerLogic communications link using a 4-wire to 2-wire converter (see Figure 11 on page 13).
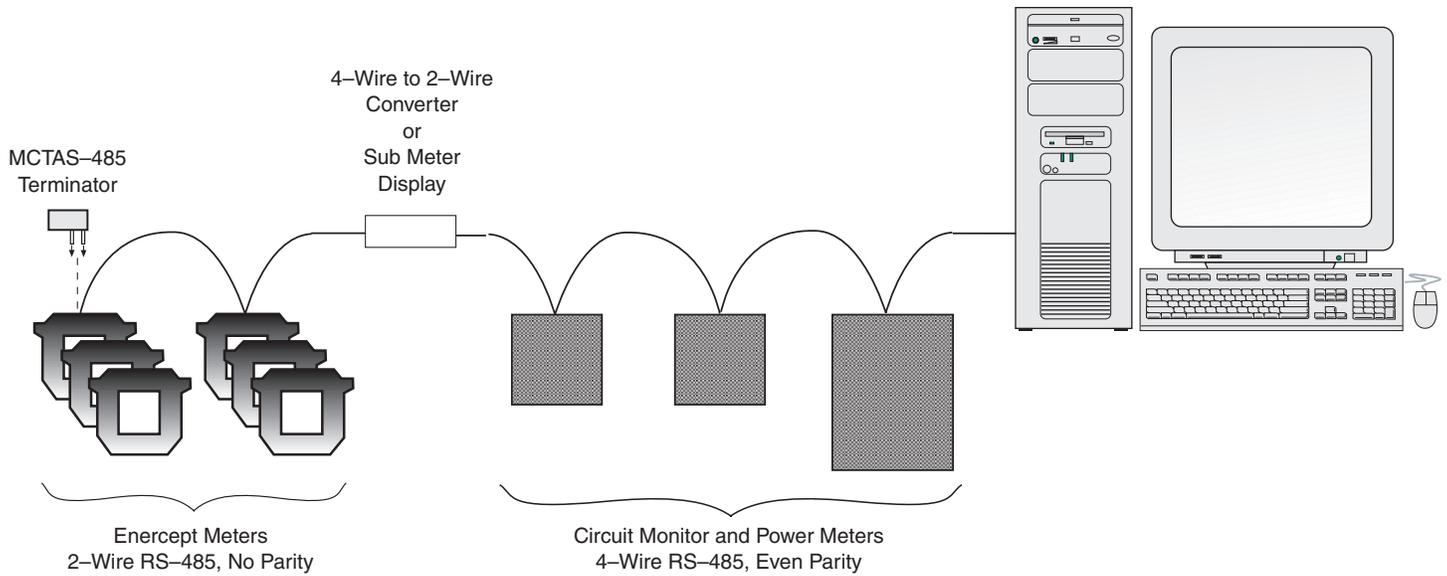
Figure 11 Enercept meters added to a 4-wire communications link with a 4-wire to 2-wire converter or a Sub Meter Display (SMD).

To daisy-chain an Enercept meter to another Enercept meter or 2-wire Modbus device, do the following:

1. Strip back the cable sheath 2" (51 mm) on each end of the cable, and strip back the insulation 0.25" (6 mm) from the end of each wire.

2. Wire the + terminal of the Enercept meter to the + terminal of the next device, wire the – terminal to the – terminal, and wire shield to shield (see Figure 12 below).
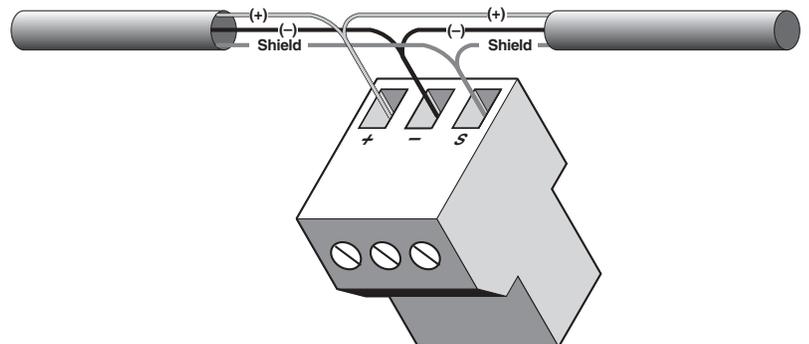
Figure 12 Connecting communications wires to the RS-485 terminal block.

Terminating the Communications Link

To ensure reliable communications, terminate the last device on the RS-232 communications link (see Figure 10 on page 11 and Figure 11 on page 12). If an Enercept meter is the last device on the communications link, terminate it as follows:

1. Using a wire clipper, clip off two of the four wires on the MCTAS-485 terminator (Figure 13 on page 13, B). It does not matter whether you clip the left pair or right pair.

2. Insert the two remaining wires into the + and – holes on the Enercept meter's removable RS-485 terminal block (Figure 13 below, A).

3. Using a small flat blade screwdriver, tighten the connector's screws.

4. Plug the communications connector into the communications port of the last meter on the daisy-chain.
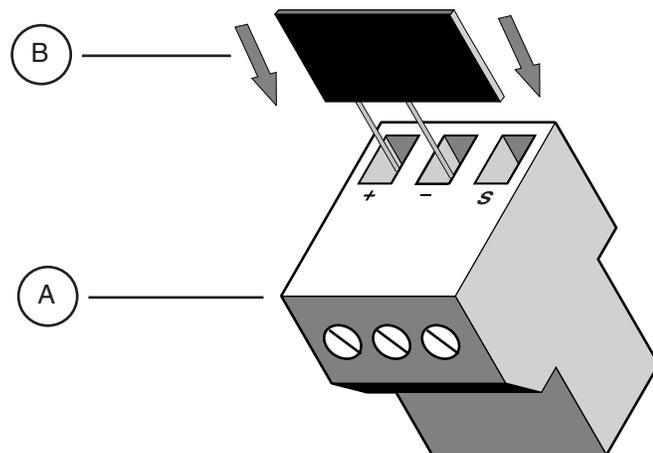
Figure 13 Installing the MCTAS-485 terminator.

Using Enercept Meters with PowerLogic System Manager Software (SMS)

The Enercept Meter Device Support Install is available for SMS 3.1 and newer versions. This device support provides communications setup and viewing capabilities within tables, meters, bar charts, and trending.

The following rules apply when using Enercept in an SMS system:

1. When using the Enercept meter on the same daisy chain as the device using PowerLogic protocol (circuit monitors and power meters), address 16 must not be used for the Enercept meters, and address 0 or 1 must not be used for the PowerLogic protocol devices.

2. PowerLogic circuit monitors on the same daisy chain as Enercept meters must have firmware version 17.008 or above.

3. The Enercept meter provides an unsigned value for power factor. Since the "Instantaneous Readings" table recognizes only a signed register for power factor, the value for Enercept meters will be shown as "N/A." An "Enercept Power Factor Summary" table is available.

4. To reset kWH or Peak Demand (kWD), go to Read/Write Registers (Control > Diagnostics > Read/Write Registers). To reset kWh, choose the Enercept meter that you want to reset. Input register #39 and a value of 2, then click on the "Write" button. To reset peak demand, input register #39 and a value of 4, then click on the "Write" button.
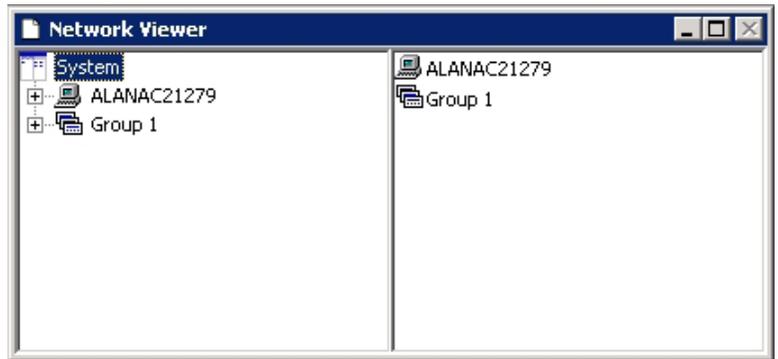
APPENDIX D—ION SETUP

This section provides basic instructions for using ION Setup to configure the Enercept.

Configuring System Type

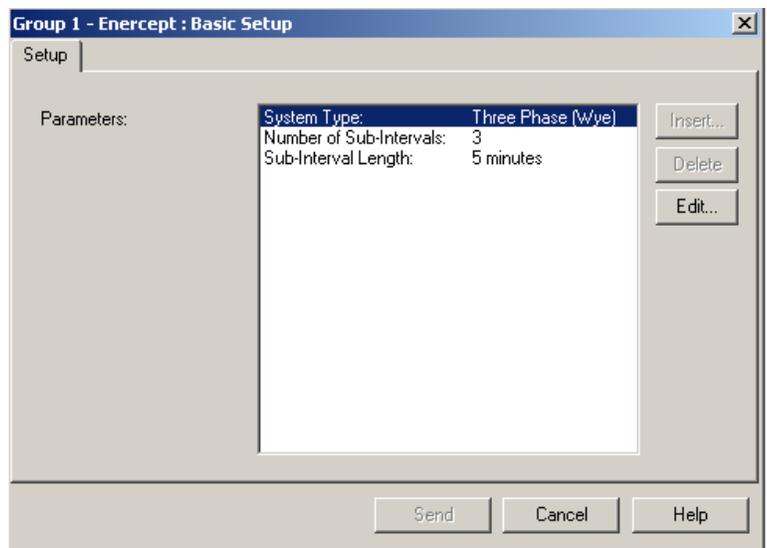To use ION Setup to configure the Enercept:

1. Start ION Setup.

Figure 14 ION Setup start page

2. Click View > Setup Screens.

3. Select the Enercept from the list in the left pane. The Basic Setup icon will display in the right pane. Double click on the Basic Setup icon to display the set up parameters dialog box.
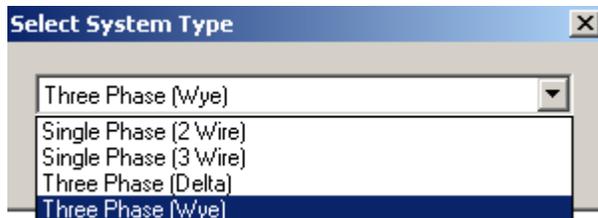
Figure 15 Enercept ION Setup Parameters

4. Double-click the "System Type" icon in the dialog box. The System Type dialog box will appear.

   NOTE: System Type is only available on Enercept Enhanced version meters.

Figure 16 System Type Dialog Box

5. Select "Single Phase (2 Wire)", "Single Phase (3 Wire)", "Three Phase (Delta)", or "Three Phase (Wye)" from the drop-down list, then click "OK."

6. When you finish making Basic Setup changes, click "Send" in the Basic Setup dialog box to save the changes.

Configuring Demand Setup

Demand Setup is only available on Enercept Enhanced version meters.

To configure Enercept demand in ION Setup:

1. Double-click "Number of Sub-Intervals" in the setup parameters dialog box..

2. To configure the number of sub-intervals, select "Number of Sub-intervals" in the "Parameters" list, then click "Edit." The dialog box for the setting you selected will appear.

Figure 17 Number of Sub-intervals Configuration Dialog Box
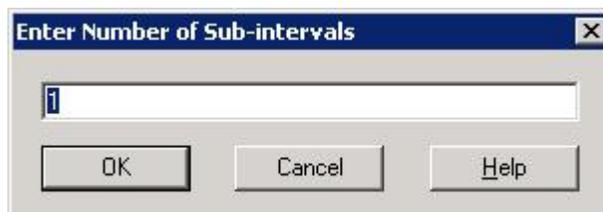
3. Enter the number of sub-intervals you require, then click "OK."

4. To configure the length of sub-intervals, select "Sub-interval Length" in the "Parameters" list, then click "Edit." The dialog box for the setting you selected will appear.

Figure 18 Sub-interval Length Configuration Dialog Box
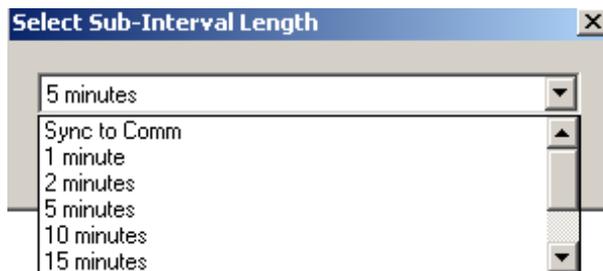
5. Select the desired sub-interval length from the drop down box and click "OK."

6. After setting the setting(s), click "Send" in the Demand Setup dialog box to save the changes.

Resetting Demand and Energy Values

To reset demand or energy on the Enercept meter:

1. Select View > Data Screens, then double-click the "Real Time" icon. The real time measurements screen will appear..

Figure 19 Real Time Measurements

2. To reset the demand or energy, click "Demand Period Reset," "Peak Demand Reset," or "kWH Reset" on the measurements screen. You will be prompted for your ION Setup Login password to perform the desired reset.

    NOTE: The "Begin new demand sub-interval" and "Reset Peak Demand" options are only available on Enercept Enhanced version meters.

APPENDIX E—REGISTER LIST

Enercept Meter Enhanced Version, Point Map:

Configuration Registers	
Register	**Description**
36	System Type 20 = Single Phase, 2–Wire 21 = Single Phase, 3–Wire 30 = Three Phase Delta 40 = Three Phase Wye
37	Sub–Interval Length Sets the length of a sub–interval. Value is the number of seconds times 5 (for example, 15 minutes is 4500). For sync–to–comms, set this to zero.
38	Number of sub-intervals per demand interval. Sets the number of sub-intervals that make a single demand interval. Legal values are 1 to 6. For block demand, set this to 1.
39	Command (bit mapped). bit 0 (mask 1) = Begin new demand sub-interval bit 1 (mask 2) = Clear kWH accumulator bit 2 (mask 3) = Reset peak demand

Floating Point Register	Description	Units
257–258	Energy Consumption	kWH
261–262	Real Power	kW
263–264	Reactive Power	kVAR
265–266	Apparent Power	kVA
267–268	Total Power Factor	
269–270	Voltage, line–to–line, average of 3	Volts
271–272	Voltage, line–to–neutral, average of 3	Volts
273–274	Current, average of 3	Amps
275–276	Real Power, Phase A	kW

277–278	Real Power, Phase B	kW
279–280	Real Power, Phase C	kW
281–282	Power Factor, Phase A	
283–284	Power Factor, Phase B	
285–286	Power Factor, Phase C	
287–288	Voltage, Phase A–B	Volts
289–290	Voltage, Phase B–C	Volts
291–292	Voltage, Phase A–C	Volts
293–294	Voltage, Phase A–N	Volts
295–296	Voltage, Phase B–N	Volts
297–298	Voltage, Phase C–N	Volts
299–300	Current, Phase A	Amps
301–302	Current, Phase B	Amps
303–304	Current, Phase C	Amps
305–306	Present Demand Sub–Interval	kW
307–308	Minimum Demand	kW
309–310	Maximum Demand	kW
311–312	Present Demand	kW
313–314	Peak Demand	kW
317–318	CT Size (100, 300, etc.)	Amps
319–320	Count of kWH Resets	
321–322	Count of Peak Demand Resets	
323–324	Count of Sub Intervals	
325–326	Count of Number Readings in Present Sub–Interval	

Enercept Meter Basic Version, Point Map:

The Basic Version is the "energy-only" version of the meter, which provides only energy consumption and real power.

Configuration Registers		
Register	**Description**	
39	Command (bit mapped) bit 1 (mask 2) = Clear kWH accumulator	
Floating–Point Register	**Description**	**Units**
257–258	Energy Consumption	kWH
261–263	Real Power	kW
317–318	CT Size	Amps
319–320	Count of kWH Resets	—