GE Energy
Industrial Solutions

EPM 4500

SUB METER

Instruction Manual

Manual P/N: 1601-0157-A9
Manual Order Code: GEK-106555I

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EPM4500 Sub Meter

Chapter 1: Overview

1.1 Getting Started

1.1.1 Description

Thank you for purchasing the GE Energy EPM4500 24-point sub-meter to monitor energy for your residential, commercial, or industrial applications. At GE Energy, we pride ourselves by providing our customers with best-in-class products, which have been carefully selected by GE to best serve your solution needs.

The EPM4500 is sold in KWh or Demand meter versions and is available for 120/208V and 277/480V applications. An integrated liquid crystal display (LCD) is standard on all versions, providing local access to real-time and historical data. The meter provides two standard communication modes: power line communications (PLC), which utilizes existing AC power lines as the communication medium, eliminating dedicated wiring, and Modbus (RS232, RS485, and modem).

The EPM4500 is packaged with either solid or split-core CTs in various amperages to suit both new construction and retrofit applications.

NOTE

The EPM4500 is primarily used for commercial and industrial applications and is available in voltages ranging from 120 to 600 V in both wye and delta forms. The following installation instructions are applicable to the EPM4500 meter only.

1.2 Applications

1.2.1 Stand-Alone Meter

The GE Energy EPM4500 can be installed as a stand-alone device that is locally accessed via the LCD or remotely accessed via modem. A modem can be installed in each meter allowing the meter(s) to be read remotely.

1.2.2 Metering System

The GE Energy EPM4500 family of meters are ideally designed to comprise a metering system within a residential/commercial building or industrial site. This metering system can measure electrical usage for each tenant, cost center, or common area space and communicate this information over the building's power wires or dedicated communication wiring (RS485). A metering system is comprised of two or more EPM4500 meters and at least one communication transponder (see figure below). The transponder collects metering data from multiple meters via AC power lines. For larger sites, additional transponders may be required. Multiple transponders can communicate via a data link network using RS485 or via a wireless network.

The metering data can be accessed from the transponder or network of transponders using a telephone modem or local RS232 connection to a PC for data transfers.

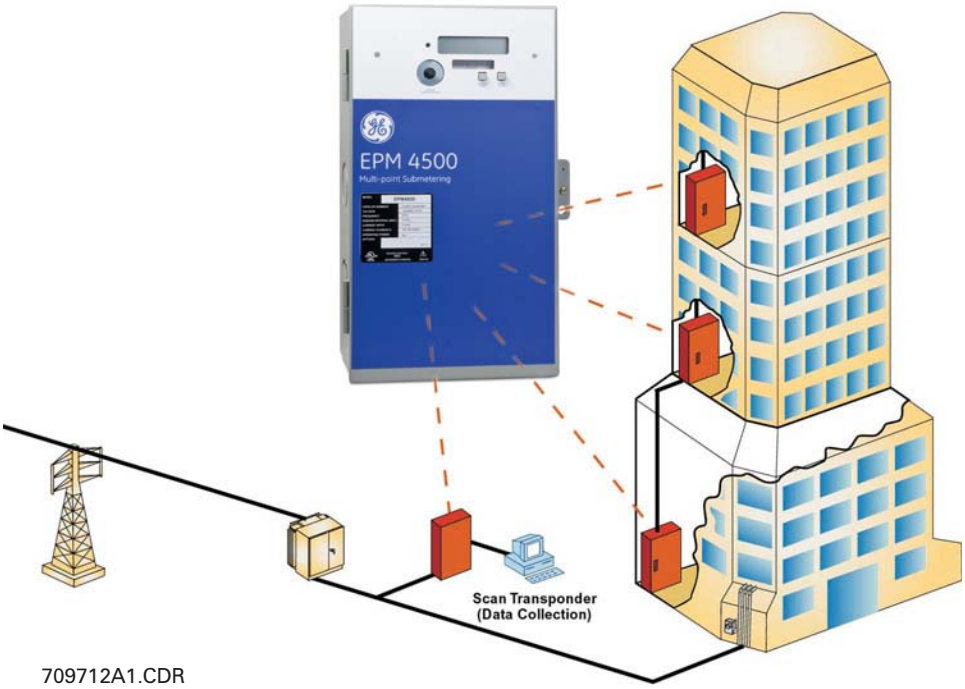

FIGURE 1–1: Overview of Scan Transponder Functionality

1.2.3 Interior View

The interior of the EPM4500 is shown below.

FIGURE 1–2: Interior View of the EPM4500

NOTE

Where the ⚠ and ⏚ symbols are seen on the EPM4500 meter, the manual must be consulted to determine the nature of any potential hazard and/or actions to be taken.

1.2.4 Cautions and Warnings

CAUTION WARNING

- Do not install if the device is damaged. Inspect the housing for obvious defects such as cracks in the housing.
- If the device is installed or used in a manner not specified by accompanying documents, the protection of the device may be impaired.
- If the device functions abnormally, proceed with caution. The protection of the device may be impaired.
- Do not install the meter around combustible gas or gas vapor.
- Do not install the meter in an electrical service with current or voltage outside of the specified limit of the device.
- Do not operate the meter with the cover removed.
- To avoid electric shock, disconnect mains before replacing fuses!
- See instructions for connection diagram.
- Risk of electric shock. Beware of working around this meter when the voltage is live.
- For continued protection against fire, replace only with fuses of specified voltage and current rating.

1.2.5 Protective Conductor Terminal

Securely fasten one end of the earthing wire so that the screw cuts the paint on the back box. Securely fasten other end of the wire to a true earth ground connection. When earthing to the electrical conduit, use continuous pipes, bending when necessary instead of using couplers.

1.2.6 Preventive Maintenance

There are no necessary preventative maintenance or inspection.

A Toshiba CR2032 coin battery is used in each device and is intended to be good for decades before replacement. Return to manufacturer for replacement.

1.3 Specifications

1.3.1 Monitoring

DEMAND

Consumption and demand: ..... kW and kWh
Demand reset: ..... allows local reset of peak demand register

INTERVAL DATA AND PEAK DEMAND

Commercial: ..... 15 minute block demand interval and peak demand with date and time stamp
Residential: ..... 1 hour block demand interval

DATA LOGGER

Duration: ..... 120 days with kW and kWh
Battery: ..... internal battery maintains time and current interval metering data during power outage only

1.3.2 Power Supply

CONTROL POWER

Input: ..... 120 V phase A to neutral
277 V phase A to neutral
480 V phase to phase
(internally powered through metered voltage; no external source is required)
Frequency: ..... 50 to 60 Hz
Operating power: ..... 2 watts for 120 V
5 watts for 277 V and 480 V
Fuses: ..... 1 - Buss fuse 250 V / 500 V 0.25 A / 0.125 A slow-acting
3 - Buss fuse 250 V /600 V 4.0 A fast-acting

1.3.3 Metering

MEASURED VALUES

Real time per phase: ..... voltage, current, kW, kvar, kVA, power factor, frequency, phase angle
Data logging: ..... kWh, kW demand

METER ACCURACY

Accuracy: ..... 0.5 class accuracy
±0.5% unity and 50% power factor, 1 to 100% of full-scale
Standards: ..... meets revenue certifiable ANSI C12.1 and C12.16 accuracy standards

LIQUID CRYSTAL DISPLAY (LCD)

Display size: ..... 32-digit LCD, 16 digits in two rows
Data digit height: ..... 0.31"
Consumption register: ..... 6 digits

1.3.4 Inputs

AC CURRENT INPUTS

CT input: ..... 50 to 800 A primary available
Secondary inputs: ..... 0.1 A or 5 A

AC VOLTAGE INPUTS

Metered voltage: ..... 120/208 V wye, 277/480 V wye, or 600 V delta at 50 to 60 Hz
Rated voltage: ..... 90 to 110%

PULSE INPUTS

Inputs: ..... up to 48 form-A pulse inputs logged in programmable intervals also count during power outage
Minimum wire gauge: ..... 20 AWG
Maximum wire length: ..... 300 ft.
Maximum rate: ..... 5 transitions/second
Minimum pulse width: ..... 100 ms

1.3.5 Communications

EPM4500 COMMUNICATIONS

Protocols: ..... Power line communications (PLC)
RS485 Modbus (2-wire, half-duplex, isolated)
Ports: ..... IEC front optical point-of-access (POA) port

1.3.6 Physical

ENVIRONMENT

Usage: ..... For indoor use only
Enclosure: ..... NEMA 1 rated
Temperature: ..... –20°C to +60°C
Humidity: ..... 0 to 95% relative humidity (non-condensing)
Pollution degree: 1
Maximum altitude: ..... 2000 m

DIMENSIONS

Meter enclosure: ..... 13.5"H × 8.5"W × 4.5"D
CT terminal board enclosure: 13.5"H × 8.5"W × 4.5"D

SHIPPING

Shipping weight: ..... 1 meter assembly 34 lbs. (total weight)
Shipping dimensions: ..... 2 enclosures, each 13.5"H × 8.5"W × 4.5"D

1.3.7 Type Tests and Approvals

TYPE TESTS

Transient/surge suppression: ANSI C37.90.1-1989
Installation category: ..... III. This product falls under Installation Category III because of its distribution level, fixed installation and has smaller transient overvoltages than an Installation Category IV.

APPROVALS

ANSI: .....C12.1 and C12.16 accuracy
UL and CUL: .....recognized under E204142
Industry Canada:.....MC#AE-1148

1.4 Ordering

1.4.1 Enclosure

Step 1: Select Enclosure

Family	Back Box	Voltage	Options	Description
PL4500	BBA	*	*	Back Box Assembly
		120V		120/208V 3 phase, 4 wire
		208V		208V 3 phase 3 wire
		240V		120/240V, 1 phase, 3 wire
		277V		277/480V 3 phase, 4 wire
		347V		347/600V 3 phase, 4 wire
		480V		480V 3 phase 3 wire
			E	Future Communications Provision

1.4.2 EPM 4500 Residential

The EPM 4500 residential package is available in single-phase 120/208 V or 120/240 V connections. Residential use measures kWh only (no demand measurement).

Step 2: Select required meter head

Residential								
Family	Voltage	Phase	Wires	Application	Metering Points	CTs	Options	Description
PL4500	*	*	*	*	*	*	*	
	120	3	4	R				120/208V 3 phase, 4 wire
					03			3 Points
					06			6 Points
					09			9 Points
					12			12 Points
					24			24 Points
						L		0.1 Amps Secondary Input
						H		5 Amps Secondary Input
							P	Pulse Data Input Module
	240	1	3	R				120/240V, 1 phase, 3 wire
					12			12 Points
					24			24 Points
						L		0.1 Amps Secondary Input
						H		5 Amps Secondary Input
							P	Pulse Data Input Module
	277							277/480V 3 phase, 4 wire
	347							347/600V 3 phase, 4 wire
		3	4	R	24	L		24 points, 0.1 secondary CTs

1.4.3 EPM 4500 Commercial 4-Wire

The EPM 4500 commercial package is available in three-phase 120/208 V, 277/480 V, or 347/600 V connections (delta optional). Commercial use measures kWh and kW demand.

Commercial 4-Wire								
Family	Voltage	Phase	Wires	Application	Metering Points	CTs	Options	Description
PL4500	*	*	*	*	*	*	*	
	120							120/208V 3 Phase
	277							277/480V 3 Phase
	347							347/600V 3 Phase
		3	4	C				3 Phase 4 wire Commercial
					06			6 Points
					08			8 Points
						L		0.1 Amps Secondary Input
						H		5 Amps Secondary Input
							P	Pulse Data Input Module
							M	Modem
							RS	RS485 Connection
							MOD	Modbus Communication

1.4.4 EPM 4500 Commercial 3-Wire

Commercial 3-Wire								
Family	Voltage	Phase	Wires	Application	Metering Points	CTs	Options	Description
PL4500	*	*	*	*	*	*	*	
	208							208V 3 phase 3 wire
	480							480V 3 phase 3 wire
		3	3	C	12			12 points
						L		0.1 Amps Secondary Input
							P	Pulse Data Module
							M	Modem
							RS	RS485 Connection
							MOD	Modbus Communication

1.4.5 Current Transformers (0.1 A Secondary)

CTs

Type	Description	Cat. No.
Solid Core - 0.1 A Secondary	CT-50 (50/0.1A)	PLSUBCTSL050
	CT-1 (100/0.1A)	PLSUBCTSL101
	CT-2 (200/0.1A)	PLSUBCTSL201
	CT-4 (400/0.1A)	PLSUBCTSL401
Solid Core - Canadian	CT-2/5DARL (200A/5A)	PLSUBCTSL201CDN
Split Core - 0.1 A Secondary	CTSP-50 (50/0.1A)	PLSUBCTSP050
	CTSP-1 (100/0.1A)	PLSUBCTSP101
	CTSP-2 (200/0.1A)	PLSUBCTSP201
	CTSP-4 (400/0.1A)	PLSUBCTSP401
	CTSP-8 (800/0.1A)	PLSUBCTSP801
	CTSP-12 (1200/0.1A)	PLSUBCTSP1201
	CTSP-20 (2000/0.1A)	PLSUBCTSP2001
	CTSP-30 (3000/0.1A)	PLSUBCTSP3001
	CTSP-40 (4000/0.1A)	PLSUBCTSP4001

1.4.6 Transponder Models

To order: Select Back Box, then select transponder model with options.

1. Order Back Box

Description	Cat. No.
120V service back box	TRANS BBA 120V
277V service back box	TRANS BBA 277V
347V service back box	TRANS BBA 347V

2. Order Transponder Model with options

Description	Cat. No.
120/208V with modem	TRANS120M
120/208V with RS485 and RS2332 connections	TRANS120RS
277/480V with modem	TRANS277M
277/480V with RS485 and RS232 connections	TRANS277RS
347/600V with modem	TRANS347M
347/600V with RS485 and RS 232 connections	TRANS347RS

1.4.7 Pulse Inputs

The order codes for the pulse inputs are indicated below.

Cat. No.
PL4500PULSINA
PL4500PULSINB
PL4500PULSINC
PL4500PULSIND

For additional information on pulse inputs, please contact GE Energy.

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EPM4500 Sub Meter

Chapter 2: Installation

2.1 Getting Ready

2.1.1 Determination of Metering System Requirements

Determine if the application is for a metering system or for a stand-alone meter. If the application is for a stand-alone meter, please read *Overview of Meter Wiring* on page 2–2. If the application is for a metering system, then also read *Installing the Scan Transponder* on page 2–18.

2.1.2 Phase Association

As shown in Table 2–1: *Wiring Diagram / Model Reference* on page 2–3, there are four wiring types for the EPM4500 meter. Each wiring type has a specific phase association table to ensure that current transformers are in-phase with the reference voltage. These phase association tables must be followed for the meter to function properly with the chosen wiring type.

WARNING

The phase association of the current transformers must be followed or meter will not be installed correctly.

2.2 Wiring

2.2.1 Overview of Meter Wiring

Although this document treats the installation and certification stages separately, this does not imply that the recommended procedure is to install the entire system at once and then proceed to certification.

The recommended procedure is to install and certify the system in stages. By doing this, systematic error can be corrected before it propagates through the entire installation. To follow the recommended procedure, divide the job up into manageable stages and install and certify at each stage before proceeding to the installation of the next stage.

For the purposes of this discussion, the colors black, red and blue have been chosen to distinguish among the three phases of a three-phase network. White is the designated color of neutral and green is the color of earth ground. Please substitute the correct color according to local electrical code. For a two-phase installation, ignore the third phase (the blue phase in the following description).

WARNING

Failure to follow the proper procedures and reference the correct wiring diagram can result in damage to the equipment and/or physical harm.

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FIGURE 2–1: Vertical Mounting Option

2.2.2 Wiring Overview

Review the following wiring types and select the one that matches your installation requirements and part number using the following table.

Table 2–1: Wiring Diagram / Model Reference

Section
Three-Phase Four-Wire Wye Wiring on page 2–3
Single-Phase, Three-Wire 120 V Wiring on page 2–6
Three-Phase, Three-Wire Delta Wiring on page 2–9
Single-Phase, Three-Wire Wiring on page 2–12

2.2.3 Three-Phase Four-Wire Wye Wiring

The phase association and polarity of the current transformers must be followed or the meter will not be correctly installed.

1. Current transformers must be in-phase with the reference voltage. The MCI board runs in an A-B-C phase rotation (see table below) and each of the three CT connections repeat an A-B-C order.
   For example, a current transformer installed in-phase with reference voltage A must be installed on CT1, CT4, CT7, etc. Current transformers installed in-phase with reference voltage B must be installed on CT2, CT5, CT8, etc. Likewise, current transformers installed in-phase with reference voltage C must be installed on CT3, CT6, CT9, etc.
2. For the "C" or commercial 3-phase/4-wire model, each A-B-C combination is a single meter point (see the following table for full listing). That is,
3. – Meter 1 (M#1) is CT1, CT2, and CT3
   – Meter 2 (M#2) is CT4, CT5, and CT6
   – Repeated for M#3 to M#8
4. After completing all current transformer terminations, connect four (4) current connectors and then remove the twenty-four (24) shorting links.
5. Follow all local codes for installation requirements; e.g. conduit, fused disconnect, distance, and wiring.
6. Installation of "L" (0.1 A inputs) and "H" (CL10 or 5A inputs) are the same. For 6 point models, use meter points M#1 to M#6; M#7 and M#8 are not functional.

If breakers are energized, shorting links must be installed before:

1. disconnecting the CT headers
2. replacing or installing meter heads on the panel.

Bodily injury may result if shorting links are not installed!

Table 2–2: Phase Association Table for 3-Phase 4-Wire Wye Wiring

Meter	MCI Board CT	Voltage Phase
1	1	A
	2	B
	3	C
2	4	A
	5	B
	6	C
3	7	A
	8	B
	9	C
4	10	A
	11	B
	12	C
5	13	A
	14	B
	15	C
6	16	A
	17	B
	18	C
7	19	A
	20	B
	21	C
8	22	A
	23	B
	24	C

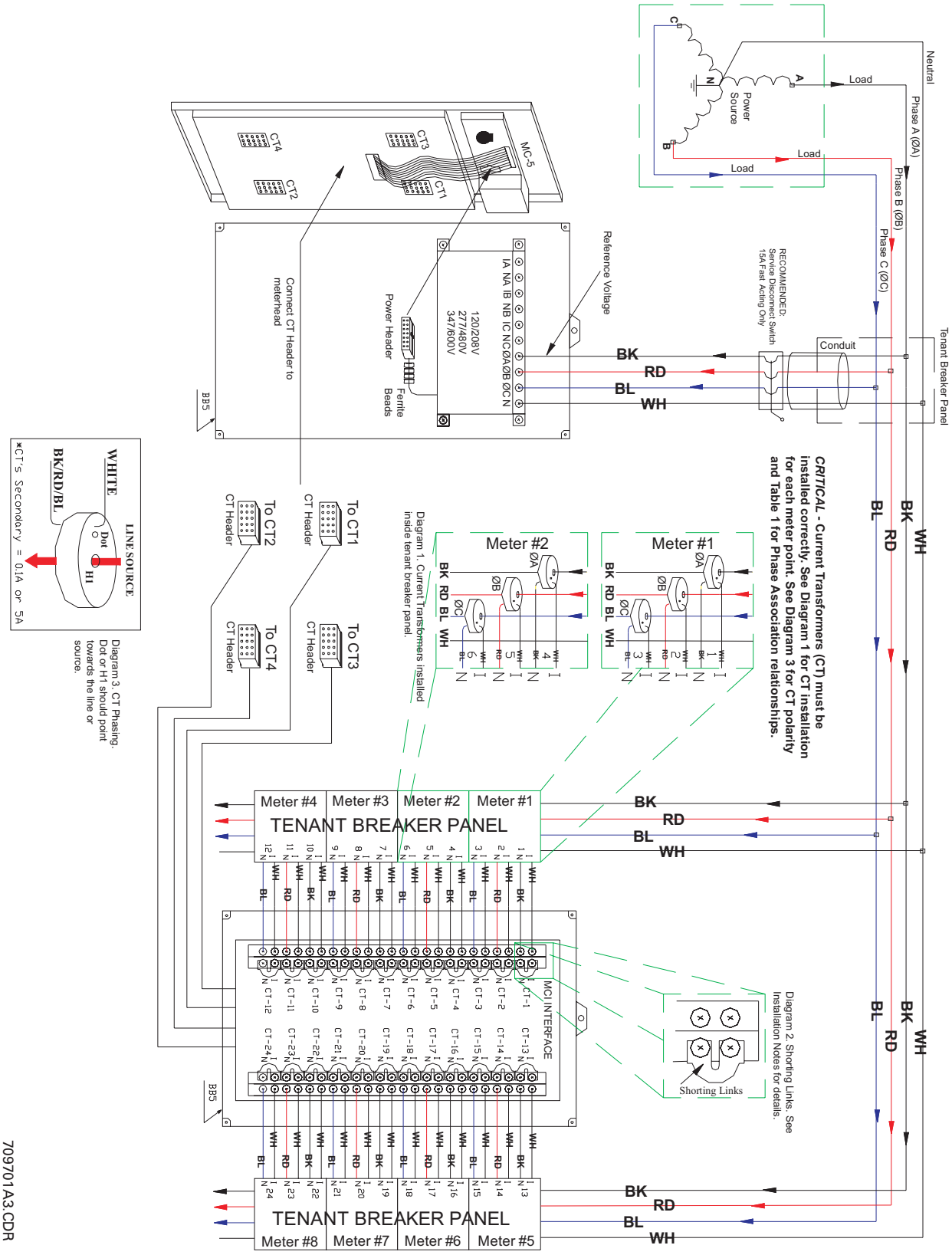

FIGURE 2–2: 3-Phase 4-Wire Wye Wiring

2.2.4 Single-Phase, Three-Wire 120 V Wiring

The phase association and polarity of the current transformers must be followed or the meter will not be correctly installed.

1. Current transformers must be in-phase with the reference voltage. The MCI board runs in an A-B-C phase rotation (see table below) and each of the three CT connections repeat an A-B-C order.
   For example, a current transformer installed in-phase with reference voltage A must be installed on CT1, CT4, CT7, etc. Current transformers installed in-phase with reference voltage B must be installed on CT2, CT5, CT8, etc. Likewise, current transformers installed in-phase with reference voltage C must be installed on CT3, CT6, CT9, etc.
2. For the "R" or residential 3-phase/3-wire model, each A-B, C-A, and B-C combination is a single meter point (see the table below for full listing). That is,
3. – Meter 1 (M#1) is CT1 and CT2
   – Meter 2 (M#2) is CT3 and CT4
   – Repeated for M#3 to M#12
4. After completing all current transformer terminations, connect four (4) current connectors and then remove the twenty-four (24) shorting links.
5. Follow all local codes for installation requirements; e.g. conduit, fused disconnect, distance, and wiring.
6. Installation of "L" (0.1 A inputs) and "H" (CL10 or 5 A inputs) are the same. For the 3, 6 and 9 point models, use meter points M#1 to M#3, M#1 to M#6, and M#1 to M#9, respectively. M#4 to M#12, M#7 to M#12, and M#10 to M#12 are not functional for the 3, 6 and 9 point models, respectively.

If breakers are energized, shorting links must be installed before:

1. disconnecting the CT headers
2. replacing or installing meter heads on the panel.

Bodily injury may result if shorting links are not installed!

Table 2–3: Phase Association Table for 1-Phase 3-Wire 120 V Wiring

Meter	MCI Board CT	Voltage Phase
1	1	A
	2	B
2	3	C
	4	A
3	5	B
	6	C
4	7	A
	8	B
5	9	C
	10	A
6	11	B
	12	C

Meter	MCI Board CT	Voltage Phase
7	13	A
	14	B
8	15	C
	16	A
9	17	B
	18	C
10	19	A
	20	B
11	21	C
	22	A
12	23	B
	24	C

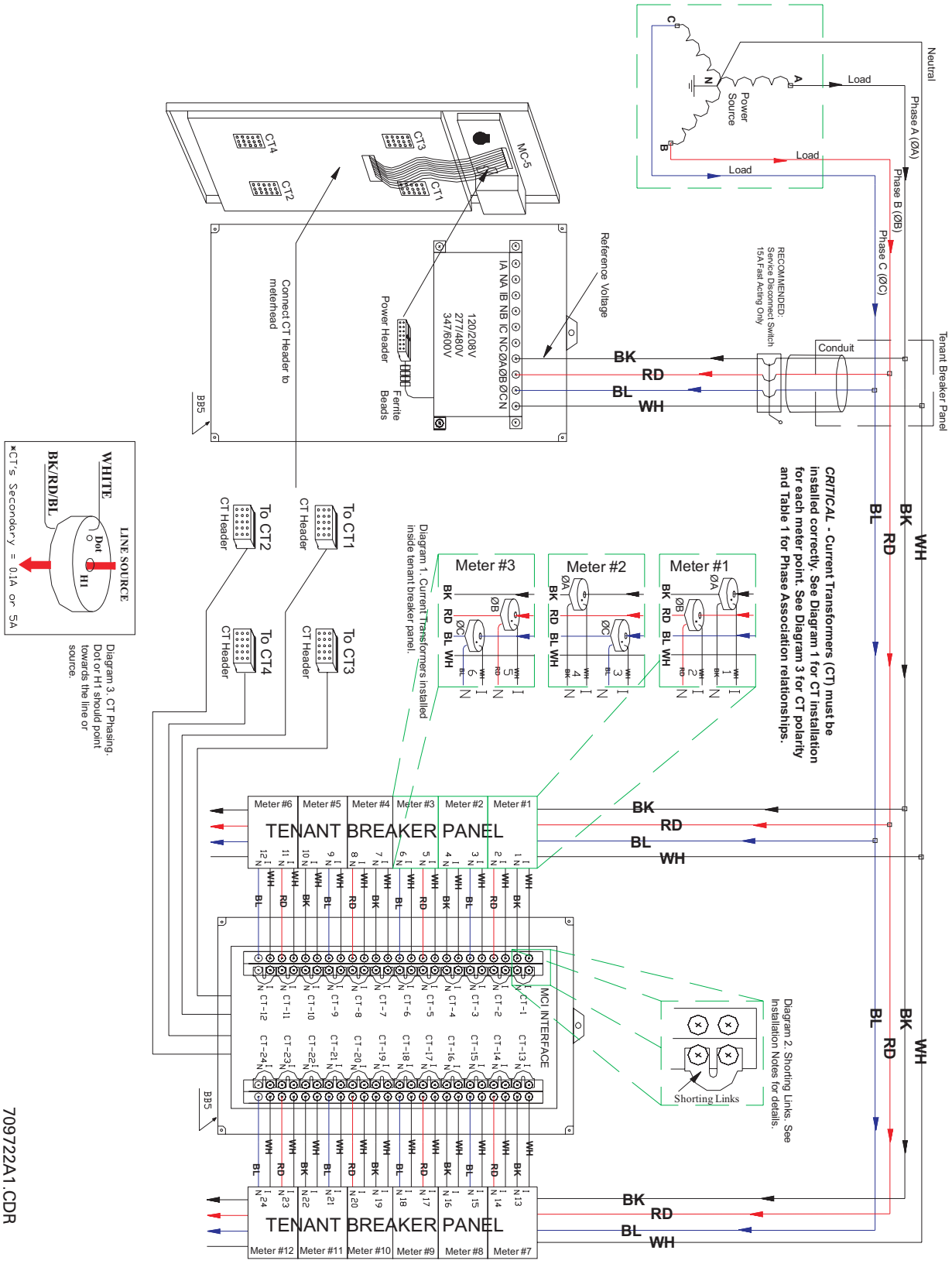

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FIGURE 2–3: 1-Phase 3-Wire 120 V Wiring (Network)

2.2.5 Three-Phase, Three-Wire Delta Wiring

The phase association and polarity of the current transformers must be followed or the meter will not be correctly installed.

1. Current transformers must be in-phase with the reference voltage. The MCI board runs in an A-C phase rotation (see table below) and every two CT connections repeat an A-C order.

   For example, a current transformer installed in-phase with reference voltage A must be installed on CT1, CT3, CT5, etc. Current transformers installed in-phase with reference voltage C must be installed on CT2, CT4, CT6, etc.

2. For the "C" or commercial 3-phase/3-wire model, each A-C combination is a single meter point (see the table below for full listing). That is,

   – Meter 1 (M#1) is CT1 and CT2
   – Meter 2 (M#2) is CT3 and CT4
   – Repeated for M#3 to M#12

3. After completing all current transformer terminations, connect four (4) current connectors and then remove the twenty-four (24) shorting links.
4. Follow all local codes for installation requirements; e.g. conduit, fused disconnect, distance, and wiring.
5. Installation of "L" (0.1 A inputs) and "H" (CL10 or 5 A inputs) are the same.

If breakers are energized, shorting links must be installed before:

1. disconnecting the CT headers
2. replacing or installing meter heads on the panel.

Bodily injury may result if shorting links are not installed!

Table 2–4: Phase Association Table for 3-Phase 3-Wire Delta Wiring

Meter	MCI Board CT	Voltage Phase	Meter	MCI Board CT	Voltage Phase
1	1	A	7	13	A
	2	C		14	C
2	3	A	8	15	A
	4	C		16	C
3	5	A	9	17	A
	6	C		18	C
4	7	A	10	19	A
	8	C		20	C
5	9	A	11	21	A
	10	C		22	C
6	11	A	12	23	A
	12	C		24	C

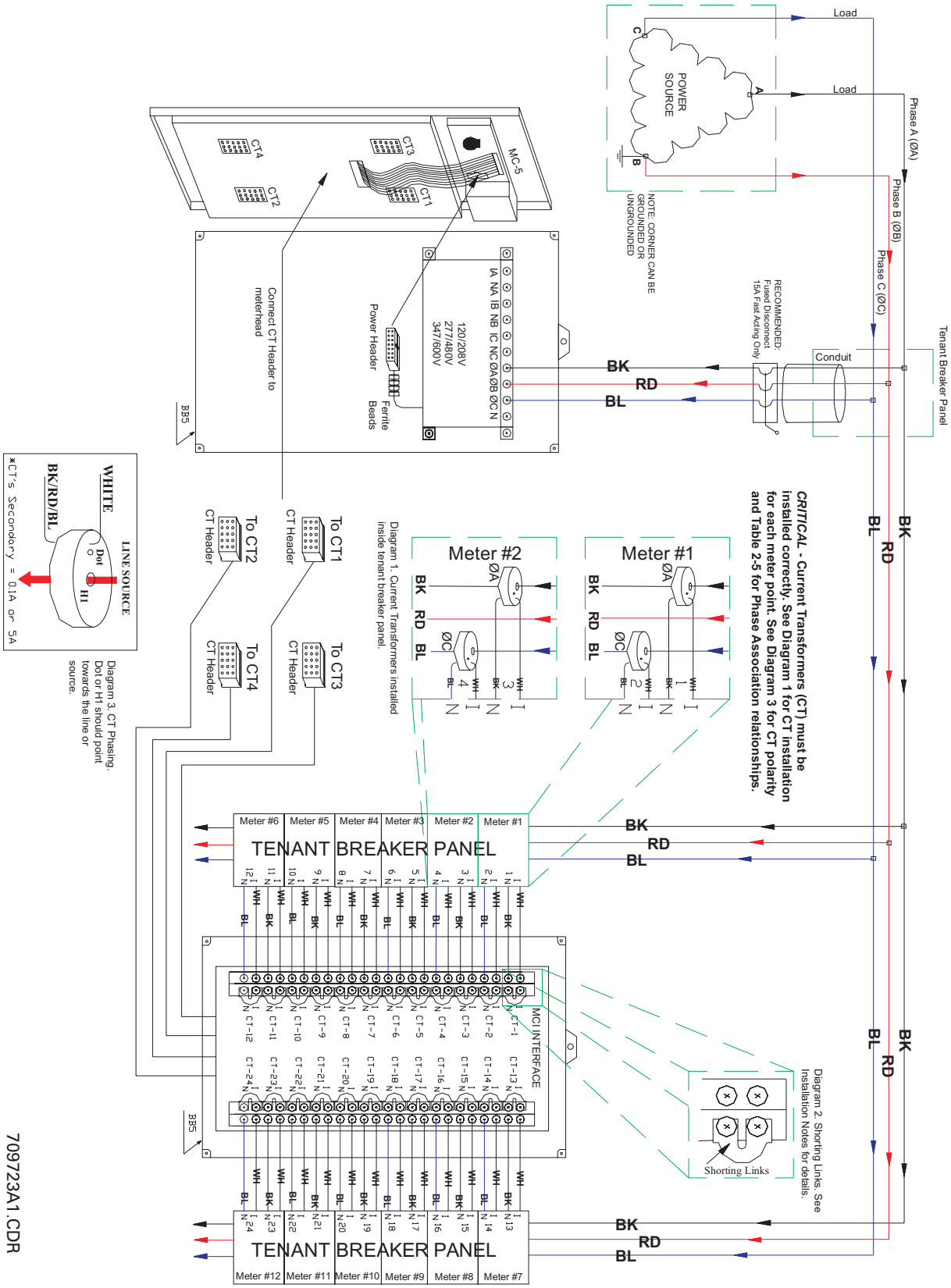

FIGURE 2–4: 3-Phase 3-Wire Delta Wiring

2.2.6 Single-Phase, Three-Wire Wiring

The line association and polarity of the current transformers must be followed or the meter will not be correctly installed.

1. Line sources Line 1 and Line 2 are fed through the current transformers (CTs). Line 1 points towards the 'dot' or H1 of the CT while Line 2 points away from the 'dot' or H1 of the CT. The MCI board runs CT terminals CT#1 to CT#24 with each terminal connected to Meter 1 (M#1) to Meter 24 (M#24). The number of CT terminal and meter connections is dependent on the number of suites available. For example:

   – Meter 1 (M#1) connects to CT#1
   – Meter 2 (M#2) connects to CT#2
   – Repeated for M#3 to M#24

2. After completing all current transformer terminations, connect four (4) current connectors and then remove the twenty-four (24) shorting links.

3. Follow all local codes for installation requirements; e.g. conduit, fused disconnect, distance, and wiring.

6. Installation of "L" (0.1 A inputs) and "H" (CL10 or 5 A inputs) are the same. For 12, 18 and 24 point models, use meter points M#1 to M#12, M#1 to M#18, and M#1 to M#24, respectively.

If breakers are energized, shorting links must be installed before:

1. disconnecting the CT headers
2. replacing or installing meter heads on the panel.

Bodily injury may result if shorting links are not installed!

Table 2–5: Line Association Table for 1-Phase 3-Wire Wiring

Meter	MCI Board CT	Reference Voltage Line	Meter	MCI Board CT	Reference Voltage Line
1	1	L#1(+) and L#2(–)	13	13	L#1(+) and L#2(–)
2	2	L#1(+) and L#2(–)	14	14	L#1(+) and L#2(–)
3	3	L#1(+) and L#2(–)	15	15	L#1(+) and L#2(–)
4	4	L#1(+) and L#2(–)	16	16	L#1(+) and L#2(–)
5	5	L#1(+) and L#2(–)	17	17	L#1(+) and L#2(–)
6	6	L#1(+) and L#2(–)	18	18	L#1(+) and L#2(–)
7	7	L#1(+) and L#2(–)	19	19	L#1(+) and L#2(–)
8	8	L#1(+) and L#2(–)	20	20	L#1(+) and L#2(–)
9	9	L#1(+) and L#2(–)	21	21	L#1(+) and L#2(–)
10	10	L#1(+) and L#2(–)	22	22	L#1(+) and L#2(–)
11	11	L#1(+) and L#2(–)	23	23	L#1(+) and L#2(–)
12	12	L#1(+) and L#2(–)	24	24	L#1(+) and L#2(–)

In the above table:

- L#1(+) indicates that Line 1 points towards the 'dot' or H1 of the CT
- L#2(–) indicates that Line 2 points away from the 'dot' or H1 of the CT

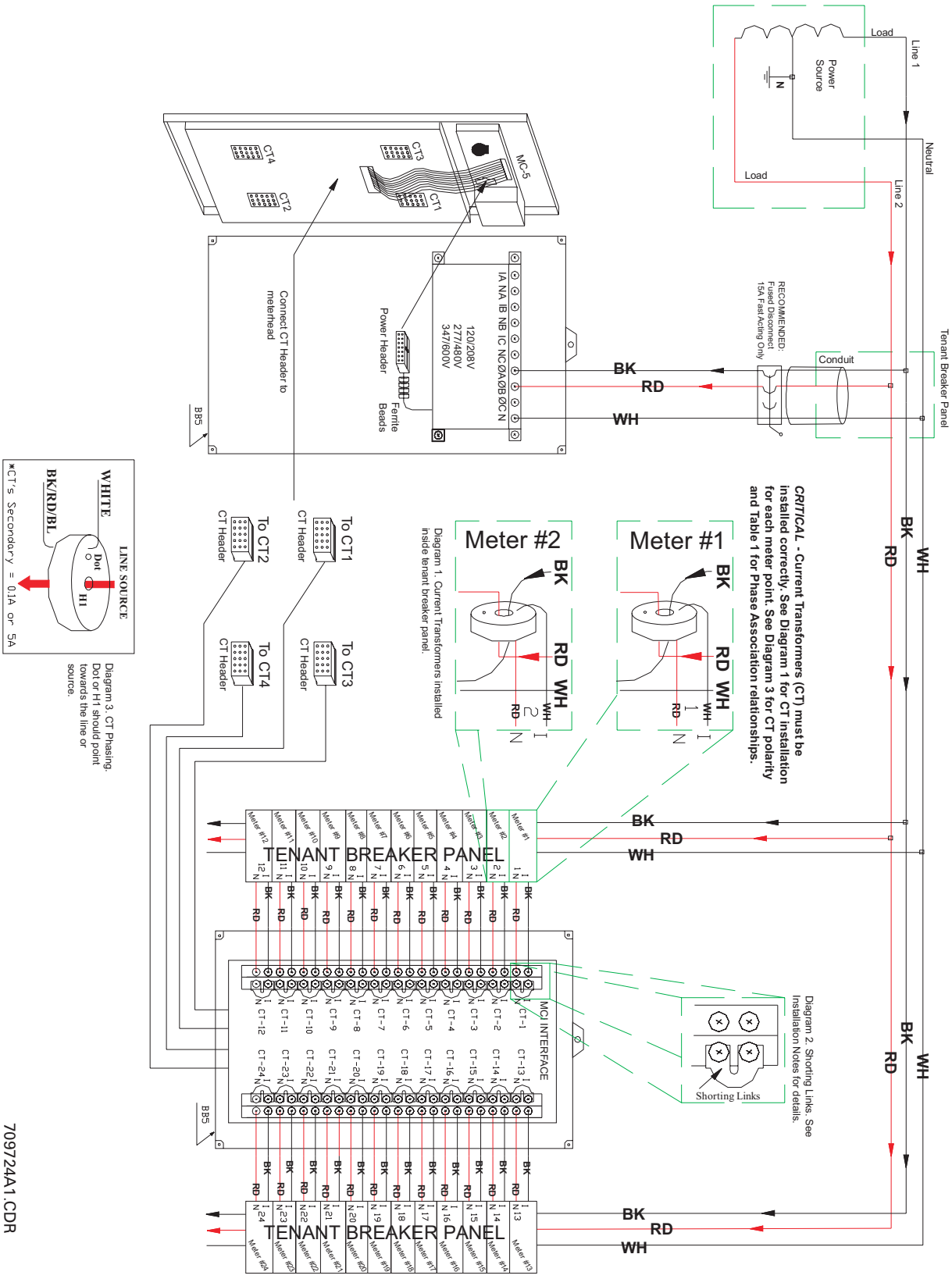

FIGURE 2–5: 1-Phase 3-Wire Wiring

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2.3 Installation of Meter, MCI Board, and CTs

2.3.1 Procedure

NOTE

The use of the following procedure is mandatory. Certification requires a visual inspection of the current transformers and the voltage taps on the incoming feeder phase wires.

▷ **Locate a section of wall to mount the EPM4500 back box and the MCI board box.**
Keep in mind that the metal conduit must be mounted between the two boxes to allow the four large block connectors on the MCI board to connect to the meter head. The conduit is 2 inches long.

▷ **Determine how the back box and the MCI board box will be oriented on the wall.**

- Remove the square punch-outs from the side of the back box that will be interfacing with the MCI board box.

▷ **Mount the metal conduit to the side opening of the back box prior to mounting the box to the wall to ease the spacing between boxes when mounting the MCI board box.**

▷ **Mount the back box to the wall, or in the wall for flush mount installations.**

- Connect the breaker panel box to the back box of the meter with a metal conduit through which the 3 or 4 feeder phase voltage taps will be run.
- Make sure to use at least a ¾-inch diameter conduit to allow for all wires to pass easily.

▷ **Screw the corresponding opening on the MCI board box to the conduit and mount the box to the wall.**

▷ **Locate the incoming feeder phase (hot) wires at the top of the breaker panel.**

- Tape the incoming feeder wires according to phase with black, red and blue electrical tape for identification purposes.

▷ **Extend the CT wires with AWG #16 stranded with black, red and blue jackets so as to be the correct length to pass through the conduit and reach the MCI board.**

- Extend the white wire of each CT with a white wire, but place a black, red or blue electrical tape on the end of the extended wire to identify the correct neutral.
- Refer to these CT white wires with tape as white/black, white/red and white/blue respectively.

WARNING

Refer to the Phase Association tables in *Wiring* on page 2–2 when wiring the MCI board. Failure to improperly observe proper phase association will result in incorrect metering data.

▷ **Remove the incoming feeder hot wires one at a time and place each CT over the proper feeder wire.**

- Ensure that the colors of the CT leads correspond to the color of the tape on the phase feeder.
- Make certain that the white wire from the CT is closest to the line side of the feed, away from the top of the breaker panel.
- For split-core CTs, ensure that the X1 is toward the line side.
- Run the CT secondary wires through conduit to the back box of the meter.

▷ **Tap the feeder wires with AWG #12 stranded wire with black, red and blue jackets taking care to match the color of the insulation of the #12 wires to correspond to the color of the tape on the feeder wire.**

▷ **If the service is 4-wire, tap the neutral connection with a #12 AWG stranded wire with a white jacket.**

▷ **Run the current transformer wires black, white/black, red, white/red and blue, white/blue to terminals CT-1 (I, N), CT-2 (I, N), CT-3 (I, N), etc. on the MCI board (see the following figure).**

WARNING

The shorting links MUST remain in place while wiring the CTs to the MCI board. Failure to do could result in severe injury and equipment damage.

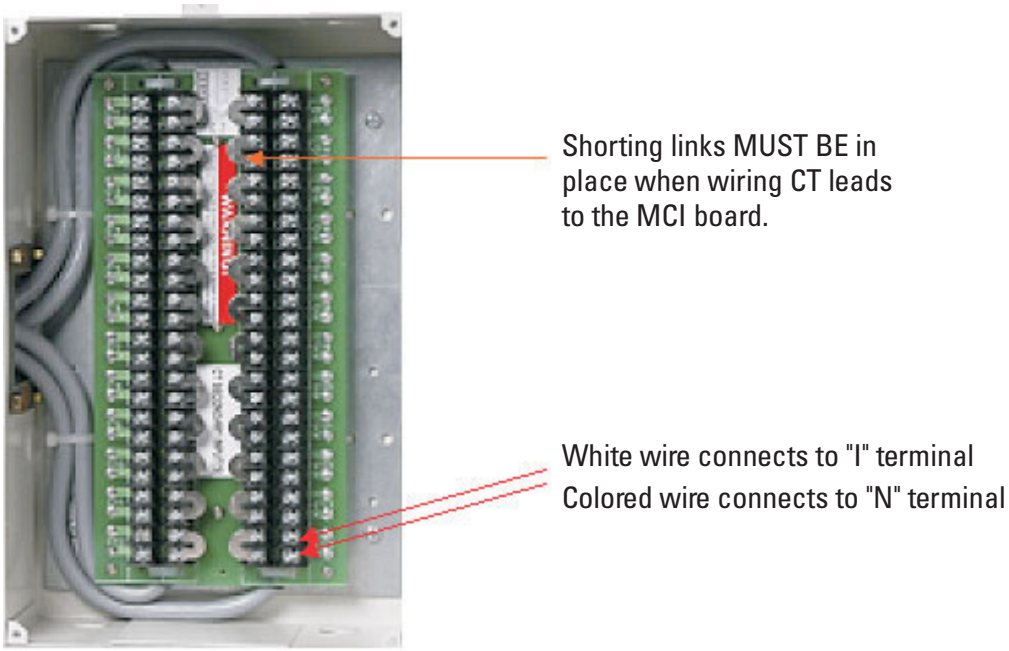

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FIGURE 2–6: Wiring of the MCI Board

▷ **Take the black, red, blue and white (if available) #12 AWG feeder phase tap wires and run them to VA, VB, VC and N (if available) respectively (see the following figure).**

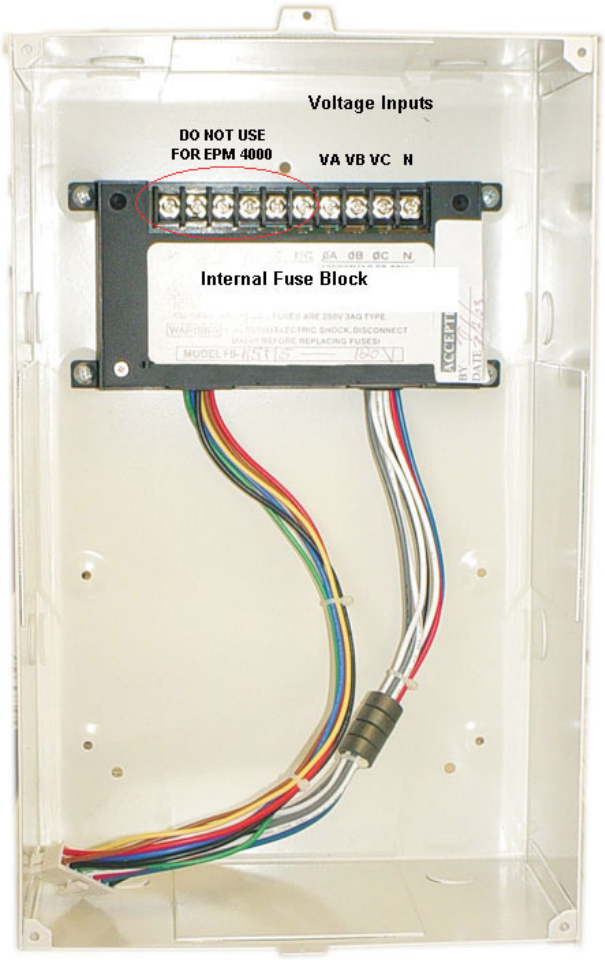

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FIGURE 2–7: Internal Fuse Block

▷ Plug the fuse block into the meter head and hang the meter head on the back box.

2.4 Installing the Scan Transponder

2.4.1 Procedure

If your application is for a metering system, use the following procedure to install the scan transponder.

▷ **Plan for the transponders.**

- Determine the number of services in order to determine the number of transponders.
- Do not rely solely on the memory of the local engineers or of the existing drawings.
  Drawings may not have been properly updated to reflect as-built conditions and memories are not always accurate. Use these as guidelines and then perform a survey.
- Open electrical cabinets as necessary and locate every master meter from the utility.
- Make careful note of the voltages of the various transponders.

▷ **Determine the number of tenant spaces.**

- In residential applications, this number should be fixed.
  Often apartments are laid out on a grid, such as by floor and by line. In this case, the number of meters is simply the number of floors times the number of lines. This information is needed before any meters are installed or entered into the transponders.
- Determine which service feeds each metering point. This information is vital to proper system operation.
  Without this information, a laborious process of trial and error is necessary to determine which transponder must be used for each meter. This will increase the cost of certification and commissioning of the system.

▷ **Determine the service size and type of meter for each metering point.**

- In residential applications, this is probably a constant amperage across the entire job (either 50 A or 100 A with Series 10 meters).

▷ **Determine the number of telephone lines required and ensure the lines are installed before the installation of any metering equipment.**

▷ **Determine the number of independent services.**

- Typically there is one service per distribution transformer that feeds the property, unless distribution transformers have parallel secondaries, which is rare.

▷ **Determine the best location for each transponder.**

- This is the closest point to the first point at which the feeders for the service branch out into sub-feeders.
  To find this point, follow the feeders from the secondary of the distribution transformer (or the service entrance if the transformer is off the property) and place the transponder at the last point before the feeder breaks into multiple feeders.

▷ Determine which of the transponders should have a telephone modem, and order a telephone line to terminate at that point. Do not proceed with the installation until the telephone line is installed.

▷ After the telephone line is installed, install the scan transponder with the modem next to the telephone line.
Install all three phases and the neutral to the transponder (see *Installation of Meter, MCI Board, and CTs* on page 2–15 for details).

▷ If there is more than one transponder, install the other transponders and the interconnecting RS485 line, if required, which links all of the transponders (go directly to *Installation of Meter, MCI Board, and CTs* on page 2–15 if there is only one transponder in the system or if each transponder in the system has a modem and telephone line connection).

- An RS485 line is a pair of wires, AWG #20 or larger in diameter, which begins at one transponder where a terminator is placed.
- The RS485 line runs from transponder to transponder ending at the final transponder, where another terminator is placed.
- It is ***critically important*** that there should ***never*** be three RS485 pairs entering or leaving a transponder box.
- For the two transponders which have terminators, only one RS485 pair leaves each box.
- For the other transponders, if there are more than two, exactly two RS485 lines should leave the box: each line goes to another transponder in the daisy-chain.
  Only one modem should be installed in a data link system. If there are two or more modems in a data link system, the transponders will not communicate with each other.
- There may be no more than 32 transponders on a daisy-chain. If there are more than 32, special care must be taken, which is beyond the scope of these instructions.

▷ If possible, run the RS485 lines in a conduit to protect them from damage.

▷ It is *critically important* to observe the polarity of the wires. The RS485 data link uses a black and yellow color code. Match black to black and yellow to yellow; otherwise the data link will not work.

▷ To test the data link, measure the DC voltage across the yellow to black wire.
This should measure between 0.1 and 0.3 V. If it is negative or outside of that range, re-check all of the transponder boxes according to the above specifications.

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EPM4500 Sub Meter

Chapter 3: Using the Meter

3.1 Menu Navigation

3.1.1 User Interface

The following figure shows the EPM4500 user interface located on the front panel of the meter. It is easy to navigate the various sub-menus to read metering data, reset values and view configuration data.

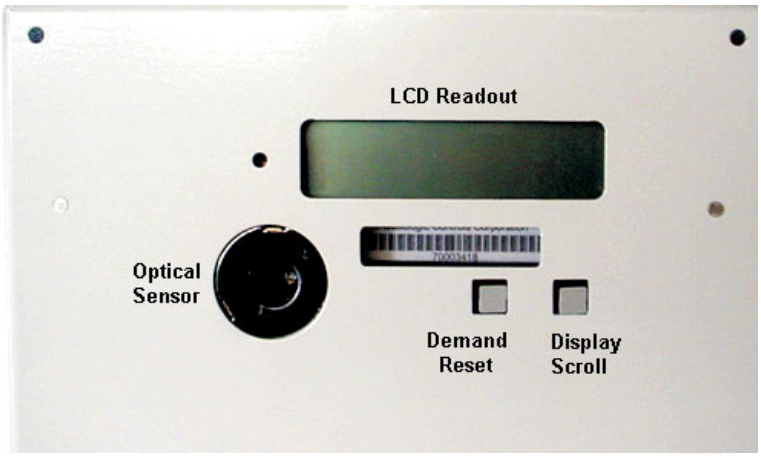

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FIGURE 3–1: EPM4500 User Interface

Press and hold the "Display Scroll" button. After two seconds, the LCD will display the **REVERSE** message. Two seconds later, the LCD will display **FORWARD**. Two seconds later, a different sub-menu register heading as shown on the following page (the top row) in will be displayed in two-second intervals. Note that the EPM4500 defaults to the kWh register.

Releasing the display scroll button at a given submenu heading will allow you to cycle through the registers listed under the selected submenu heading. Pressing and releasing the display button will advance to the next block of registers in the sub-menu.

To reverse scrolling direction at either the heading level or within a submenu, press and hold the display scroll button. When **REVERSE** is displayed after two seconds, release the display scroll button. You can now go backwards through the menu selections by pressing and releasing the display scroll button.

To go back to the forward scrolling option, follow the same procedure, except release the display scroll button when **FORWARD** is displayed.

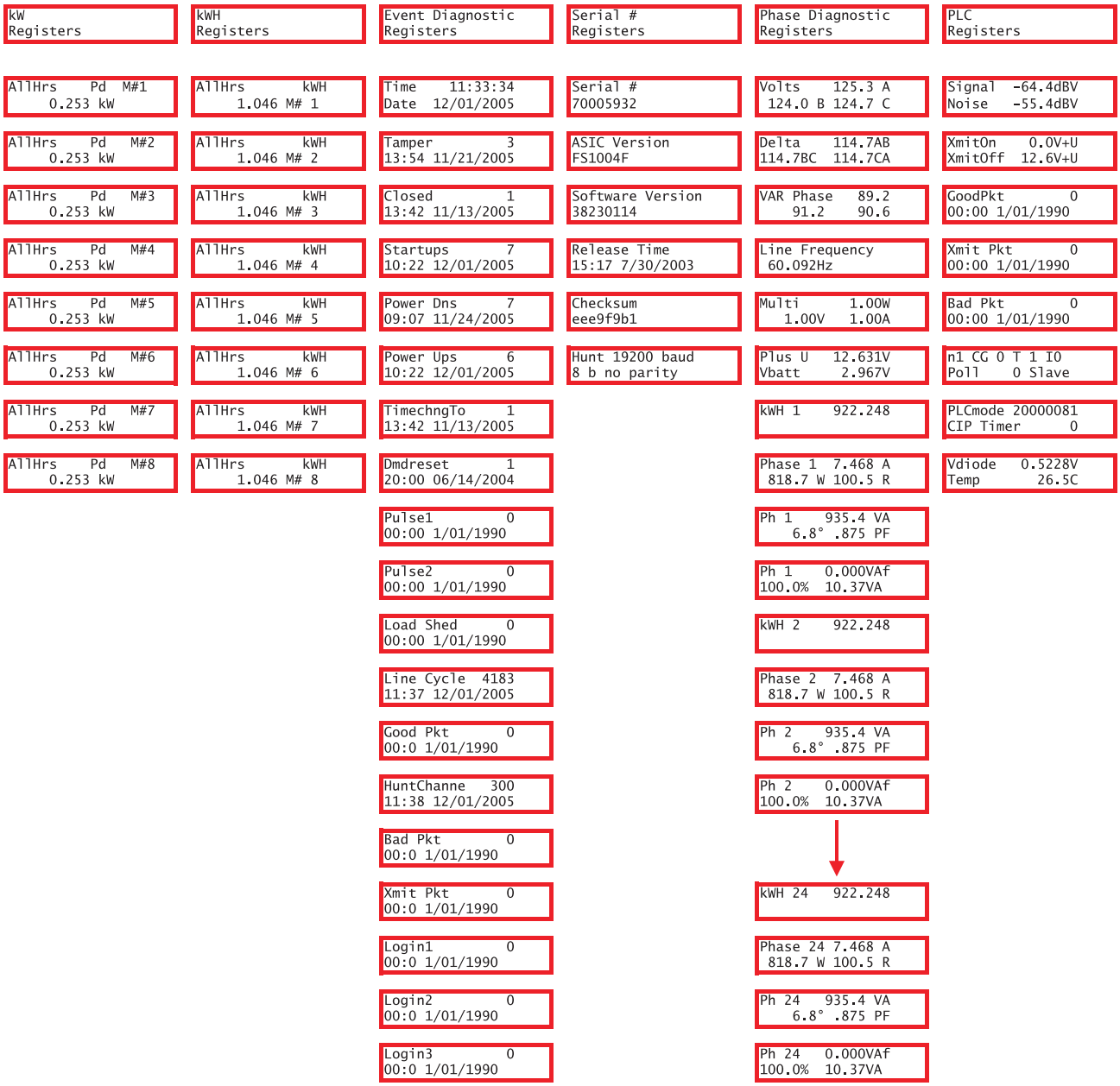

Figure 3–2: EPM4500 Display Structure

3.2 CT Multiplier Table

3.2.1 CT Multipliers

NOTE

The following table MUST BE used to verify the correct current readings, based on the rating of the CT installed.

Table 3–1: CT Multiplier Tables

For "L" or 0.1 A models	
CT Size	**Multiplier**
50 A	× 0.5
100 A	× 1
200 A	× 2
400 A	× 4
800 A	× 8

For "H" or 5 A models	
CT Size	**Multiplier**
200 A	× 40
400 A	× 80

NOTE

The multiplier that corresponds with the CT rating MUST BE applied to the current reading shown on the display of the EPM4500 by multiplying that reading by the multiplier shown above. The multiplier MUST also be applied in the same manner when calculating kW and kWh. Failure to use the appropriate multiplier will result in an incorrect diagnosis of the meter's functionality and incorrect revenue billing.

3.3 Verifying Meter Functionality

3.3.1 Overview

Once you have familiarized yourself with the EPM4500 menu structure, *it is critical* to verify that the meter and CTs are properly installed.

To correctly diagnose the meter, there must be loads on all three phases of the meter.

3.3.2 Verifying Voltage

▷ Press and hold the Display Scroll button until the following menu heading is displayed:

```
Phase Diagnostic
Registers
```

▷ Release the Display Scroll button.

- Scroll down by pressing and releasing the Display Scroll Button until one of the following sub-menus are displayed (examples shown for 120 V, 277 V, and 347 V, respectively):

```
Volts          125.3 A   |   Volts          276.3 A
124.0 B        124.7 C   |   277.0 B        277.7 C

              Volts          348.5 A
              347.1 B        347.7 C
```

▷ Verify that phases A, B and C are displaying voltages; i.e., for a 120 V AC, the reading should be 117 V +10%/–15%.

3.3.3 Verifying kWh Reading

▷ Press and hold the Display Scroll button until the following menu heading is displayed:

```
kW
Registers
```

▷ Release the Display Scroll button. Scroll down by pressing and releasing the Display Scroll button until the following sub-menu is displayed:

```
AllHrs              kWH
     1.046 M# 1
```

▷ Verify that the kWh value increases as you view the LCD.

▷ To view screens for Meters 2 to 8 (M#2 to M#8), repeat the above steps.

3.3.4 Verifying Current and Energy

▷ Press and hold the Display Scroll button until the following menu heading is displayed:

```
Phase Diagnostic
Registers
```

▷ Release the Display Scroll button.
Scroll down by pressing and releasing the Display Scroll button until the following submenu is displayed:

```
Phase 1      7.468 A
818.7 W      100.5 R
```

The A(mperage) reading in the display above will always be a positive number, even if the CT was incorrectly installed. Check the reading to see if it indicates the approximate expected current. Remember that this applies to Phase 1 *only*. If all the numbers on the multiplier screen were 1.00 and the current transformers are 100:0.1, your multiplier is 1 and the readings are the actual values. If the CTs are 200:0.1, multiply the current reading by 2.

The W(att) reading will also count forward as your view the LCD. A negative power reading is indicative of an incorrectly installed CT, or one that is cross-phased with the wrong voltage (phase) leg. The R(eactive) reading can be negative, depending on the nature of the load. Negative values indicate a capacitive load while positive values indicate an inductive load.

▷ Scroll down by pressing and releasing the Display Scroll Button until the following submenu is displayed:

```
Ph 1         935.4 VA
6.8°          .875 PF
```

Under normal conditions the phase angle (x.x°) should be close to 0° and the power factor should be a number close to 1. Resistive loads will have a power factor close to 1, while inductive loads will typically reflect a power factor between 0.80 to 0.95, or even lower.

If the phase angle on the lower left is a number close to 180°, it indicates the CT was installed backwards, or 180° out-of-phase. If the number is close to 120°, at least two CTs have been cross-phased, and a similar number will appear in the phase angle data in Phase 2.

To view screens for Phases 2 to 24, repeat above steps.

3.4 Resetting the Demand Values

3.4.1 Procedure

Use the following procedure to reset the Demand registers to zero:

▷ **Press and hold the Demand Reset button.**

- The LCD will initially display the **GE Copyright** message.
- The LCD will then display the **Dmdreset** event screen:

```
Dmdreset            1
20:00       06/14/2003
```

▷ **Keep the Demand Reset button depressed until the screen updates and displays the current date and time.**
This signifies that the demand has been reset.

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EPM4500 Sub Meter

Chapter 4: Communications

4.1 Modbus Communications

4.1.1 RS485 Wiring for Modbus

The wiring for Modbus communications for two-wire and four-wire RS485 is indicated below.

For two-wire RS-485:

Color	Function	DB-9 Pinout
Yellow	RX (+)	2
Black	TX (–)	8

For four-wire RS-485:

Color	Function	DB-9 Pinout
Yellow (A)	RX (+)	2
Black (B)	RX (–)	3
Green (Y)	TX (+)	7
Red (Z)	TX (–)	8

FIGURE 4–1: RS-485 Serial Connections

NOTE

The EPM4500 optical port is disabled for units with 2-wire RS485 connections.

4.1.2 RS232 Wiring for Modbus

The wiring for Modbus communications for RS232 is indicated below.

Color	Function	DB-9 Pinout
Black	TX	2
Red	RX	3
Green	GND	5

4.1.3 Modbus Commands

The EPM4500 is capable of acting as a remote slave unit to a Modbus master device via modem, RS232, RS485, or PLC. Up to 32 EPM4500 meters (or other RS485 devices) can be daisy-chained together on a single LAN.

The EPM4500 communicates at a default baud rate of 19200, with no parity and 1 stop bit. The default Modbus address is 100. Changes to the default baud rate or address can be accomplished through the configuration file upload.

The following Modbus commands are supported by the EPM4500:

- 03: Read R4 type register(s)
- 06: Write single register; address “0” is used as the broadcast address
- 16: Write multiple registers; address “0” is used as the broadcast address

4.1.4 Fixed Modbus Values

The EPM4500 provides fixed register values indicating the meter's serial number, the meter's version number, and the Modbus addresses.

4.1.5 Modbus Data Register (R4 Type) Groups

The EPM4500 has divided the supported register map (see following pages) into the following register groups for various fixed and dynamic data values:

- Setup Information
- Interval
- Average Interval Data
- Instantaneous Data
- Three-Phase Data
- Real Time Data
- Meter Configuration Data

The EPM4500 provides access to stored-interval data channels via Modbus command. The data items as defined in the following register map are based on default data channels that include the following 3-phase-totaled values (interval average) per meter:

- Real Power in kW
- Reactive Power in kvar
- Apparent Power in kVA
- Power Factor

Data is logged per the configurable time interval value. The default log interval is 15 minutes.

The Modbus master can request stored interval data by writing the interval date and time to the appropriate registers and by setting the data status register to 1. Upon the data ready flag (address 67) being written to 1, the interval data registers (addresses 100 to 107) are simultaneously updated with the appropriate values for the requested interval. The data ready flag returns a 0 for “data is ready”, or “2” for “invalid time interval requested.”

The EPM4500 also provides registers that constantly hold the oldest stored-interval (addresses 58 to 60) and most recent stored-interval time and date stamps (addresses 61 to 63).

4.1.6 Instantaneous Data Items

The EPM4500 provides registers for per-phase instantaneous values (see below). Instantaneous register values are updated once per second.

- Frequency
- Total Harmonic Distortion (% for volts)
- Voltage
- Current
- Real Power in kW
- Reactive Power in kvar
- Apparent Power in kVA

The EPM4500 provides one-second updated inputs, including the following 3-phase-totaled values per 3-phase-meter:

- Energy: kWh and kvarh

- Power: kW, kvar, and kVA
- Power Factor

4.1.7 32-bit Long and Float Data Formats

The EPM4500 supports standard format for 32-bit Long (signed or unsigned). The first of the two 16-bit Modbus register set contains the HIGH order 16 bits of the 32-bit Long data. The second of the two 16-bit Modbus register set contains the LOW order 16 bits of the 32-bit Long data.

The EPM4500 supports Intel 32 bit (IEEE) FLOAT format. That means, unlike the standard Long format, the first of the two 16-bit Modbus register set contains the LOW order 16 bits of the 32-bit Float data. The second of the two 16-bit Modbus register set contains the HIGH order 16 bits of the 32-bit Float data.

4.2 Modbus Activation

4.2.1 Overview

The EPM4500 is shipped with Modbus not activated. To activate the Modbus protocol, it is necessary to use the Hilgraeve HyperTerminal Private Edition software. This software is available from the following website:

http://www.hilgraeve.com/htpe

Once Modbus is activated, the meter will ignore the following ASCII commands unless the login string is sent using the "Key Macros" function within HyperTerminal. Set up "Key Macros" to send the login string (see *Logging into the Meter* on page 4–6) followed by [ENTER].

NOTE

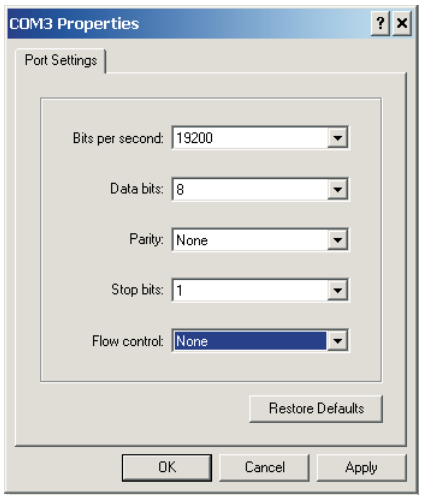
IMPORTANT: The log in string must be sent without breaking up packets. A direct connection from a serial port to the EPM4500 RS485 port (via RS232/485 converter) is highly recommended. GE's Ethernet Gateway will break up this login string into packets and prevent login.

The EPM4500 only allows login at 9600, 19200 or 38400 baud when NOT in Modbus mode. This is displayed as **HUNT** in the meter display under **Serial # Registers**. Once in Modbus, the EPM4500 only responds at the programmed baud rate.

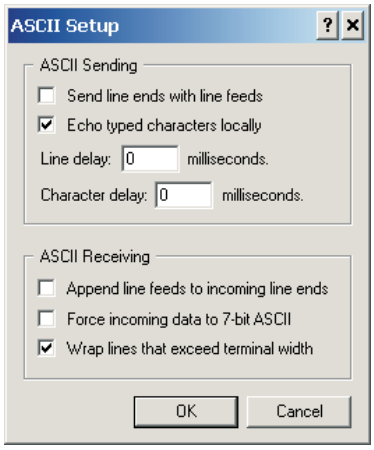
4.2.2 Configuring a New HyperTerminal Session

Use the following procedure to configure a new HyperTerminal session.

- ▷ **Enter the New Connection Name.**
- ▷ **Select the COM port to connect to the meter.**
- ▷ **Select the COM port properties. The following window will appear. Use the setting shown below.**



▷ Select the **File > Properties > Settings > ASCII Setup** menu item. Check the **Echo typed characters locally** option, as shown below.



4.2.3 Confirming Connection to the EPM4500

To confirm a proper RS485 connection to the EPM4500, enter the following command:

`attn -D` (followed by the [ENTER] key)

If meter is properly connected, it will respond with a serial number and poll address. Once in Modbus mode, this command will no longer work.

For example, entering the command

```
attn -D
```

followed by the [ENTER] key returns:

```
60005866 256
```

for a meter with serial number 60005866 and poll address 256.

4.2.4 Logging into the Meter

Use the following procedure to login to the EPM4500.

▷ Setup a 'key macro' in HyperTerminal by selecting the **View > Key Macros** menu item.

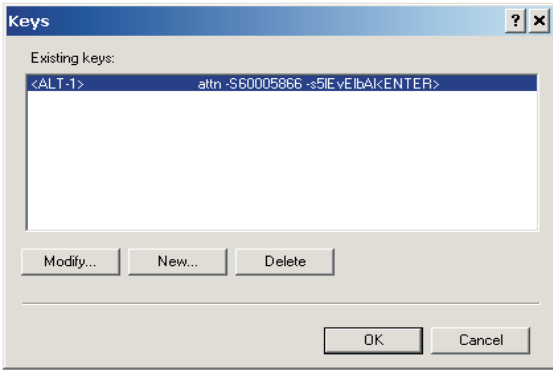
▷ Click **New** and select an appropriate macro key sequence (ALT-1 is used the example below.

▷ Enter the following command in the **Action** area:

`attn -S[serialNumber] -5lEvElbAl<ENTER>`

▷ The password is `-s5` followed by the `LABLEVEL` text spelled backwards, with the vowels in upper case.
This login string must be followed by the ENTER command within the key macro.

For example, for a unit with serial number 60005866, enter the following text:



4.2.5 Activating Modbus Communications

Use the following procedure to activate Modbus communications.

- ▷ **Enter the following command to activate Modbus:**

  `stty -M1` (followed by [ENTER] twice)

- ▷ **Select the baud rate by entering the following command. The baud rate options for Modbus communication are 9600, 19200, and 38400.**

  `stty 19200` (followed by [ENTER] twice)

- ▷ **Save Modbus activation by entering:**

  `stty -W1234`

- ▷ **Display Modbus activation by entering:**

  `stty`

- ▷ **This command displays meter port setting, baud rate, etc. If Modbus is active, it returns "Modbus"; if Modbus is not active, it returns "no Modbus".**

For example, consider the following set of commands sets the activates Modbus, sets the baud rate to 19200, and saves the Modbus activation. The text returned by the meter is also indicated.

```
CIP#stty
hunt 19200 baud 8 bits no parity no echo no modem no modbus
CIP#stty -M1
CIP#stty 19200
CIP#stty -W1234
CIP#stty
hold 19200 baud 8 bits no parity no echo no modem modbus
```

4.2.6 Changing Modbus Settings

Use the following procedure to change the Modbus address setting:

▷ **Enter the following command to set the Modbus address:**

`attn -p#`
where **#** is replaced by the actual address desired (for example, `attn -p100`).

▷ **Save the Modbus address as follows**

`attn -W1234`

▷ **Enter the following command to display and verify the Modbus address:**

`attn -d`

This command displays the meter serial number and the poll/Modbus number.

4.2.7 Logging Out

▷ **Use one of the following commands to logout of the meter:**

`attn` or `exit`

Once Modbus is set, it is best to type [HALT] followed by [ENTER] or cycle power to the meter. Otherwise, Modbus will become active one minute after logout.

To log into meter once Modbus is active, use hot keys to program the login sequence. The login sequence must include either the serial number or the Modbus address.

Example hot key sequences are shown below:

```
attn -S60005866 -3Super3

attn 256 -3Super3
```

4.2.8 Disabling Modbus Communications

Use the following procedure to disable Modbus communications:

▷ **Turn off Modbus with the following command:**

`stty -M0`

▷ **Save Modbus settings:**

`stty -W1234`

4.3 Modbus Memory Map

4.3.1 Memory Map

The Modbus memory map is shown below.

Table 4–1: Modbus Memory Map (Sheet 1 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
	Fixed Value Registers (Read Only)				
0000+	0000	Meter Serial Number	R	hex digits	
0002+	0002	Meter Serial Number Extension	R	hex digits	Returns same value as address 0000
0004+	0004	Meter Version Number	R	hex digits	
0006+	0006	Meter Version Number Extension	R	hex digits	Returns same value as address 0000
0008	0008	Meter Modbus Address	R	---	8-bit Modbus Address in LSB
	Setup Information				
0009	0009	Baud Rate	R		
000C	0012	Meter Status	R	---	Always 1 for Modbus.
000D	0013	Meter Ready	R	---	Always 1 for Modbus.
000E	0014	Number of Meters Configured	R	---	Always 1 for EPM4500
000F	0015	Number of Real-Time Points Configured	R		
0010	0016	Number of Interval Points Configured	R		Returns 0 if intervals are disabled
0011	0017	Number of Max/Min Points Configured	R		Always returns 0
0012	0018	Maximum Number of Intervals That Can Be Recorded	R		Dependent upon the number of parameters optioned and the number of meters returned in address 0015
0013	0019	Number of slots configured for Scan Transponder	R		
0014	0020	Current slot being read in Scan Transponder	W		
	Interval Setup				
0031	0049	Store Interval Length	R	minutes	Interval length in minutes must be evenly divisible into 60 (1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60)
	Read Clock				
0032	0050	Internal Time - Hours/Minutes	R	hours/minutes	16-bit, Hours: 0-23 (bitmask = FF00) Minutes: 0-59 (bitmask = 00FF
0033	0051	Internal Time - Seconds	R	seconds	
0034	0052	Internal Date - Month/Day	R	month/day	
0035	0053	Interval Date - Year	R	year	
0036	0054	Internal Time - Hours/Minutes	W	hours/minutes	16-bit, Hours: 0-23 (bitmask = FF00) Minutes: 0-59 (bitmask = 00FF
0037	0055	Internal Time - Seconds	W	month/day	
0038	0056	Internal Date - Month/Day	W	Year	16-bit Unsigned Integer
0039	0057	Interval Date - Year	W		16-bit Unsigned Integer

Table 4–1: Modbus Memory Map (Sheet 2 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
003A	0058	Date/Time of Oldest Interval - Hours/Minutes	R	Hours/Minutes	16-bit, Hours: 0-23 (bitmask = FF00) Minutes: 0-59 (bitmask = 00FF) DDE Data is COM Compatible, Date/Time Numeric
003B	0059	Date/Time of Oldest Interval - Month/Day	R	Month/Day	16-bit Month: 1=Jan., 12=Dec. (bitmask = FF00) Day: 1-31 (bitmask = 00FF) DDE Data is COM Compatible, Date/Time Numeric
003C	0060	Date/Time of Oldest Interval - Year	R	Year	16-bit Unsigned Integer
003D	0061	Date/Time of Newest Interval - Hours/Minutes	R	Hours/Minutes	16-bit, Hours: 0-23 (bitmask = FF00) Minutes: 0-59 (bitmask = 00FF)
003E	0062	Date/Time of Newest Interval - Month/Day	R	Month/Day	16-bit Month: 1=Jan., 12=Dec. (bitmask = FF00) Day: 1-31 (bitmask = 00FF) DDE Data is COM Compatible, Date/Time Numeric
003F	0063	Date/Time of Newest Interval - Year	R	Year	16 Bit Unsigned Integer
0040	0064	Date/Time of Currently Selected Interval - Hours/ Minutes	RW	Hours/Minutes	16-bit, Hours: 0-23 (bitmask = FF00) Minutes: 0-59 (bitmask = 00FF
0041	0065	Date/Time of Currently Selected Interval - Month/Day	RW	Month/Day	16-bit Month: 1=Jan., 12=Dec. (bitmask = FF00) Day: 1-31 (bitmask = 00FF) DDE Data is COM Compatible, Date/Time Numeric
0042	0066	Date/Time of Currently Selected Interval - Year	RW	Year	16 Bit Unsigned Integer
0043	0067	Data Ready Flag	RW		16 Bits: Mask out/ignore Bit 15. 0=Data is ready for read 1=Populate registers with timestamp data 2=Invalid Timestamp Requested Stored Dynamic Data Ready for Read
	Average Interval Data				
0063	0099	Interval Data Qualifying Register	R		16-bit Unsigned Integer, 8 = Invalid Interval
0064*	0100	Meter #1 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #1
0066*	0102	Meter #1 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #1
0068*	0104	Meter #1 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #1
006A*	0106	Meter #1 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #1
006C*	0108	Meter #2 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #2
006E*	0110	Meter #2 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #2
0070*	0112	Meter #2 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #2
0072*	0114	Meter #2 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #2
0074*	0116	Meter #3 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #3
0076*	0118	Meter #3 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #3
0078*	0120	Meter #3 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #3
007A*	0122	Meter #3 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #3
007C*	0124	Meter #4 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #4
007E*	0126	Meter #4 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #4
0080*	0128	Meter #4 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #4

Table 4–1: Modbus Memory Map (Sheet 3 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
0082*	0130	Meter #4 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #4
0084*	0132	Meter #5 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #5
0086*	0134	Meter #5 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #5
0088*	0136	Meter #5 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #5
008A*	0138	Meter #5 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #5
008C*	0140	Meter #6 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #6
008E*	0142	Meter #6 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #6
0090*	0144	Meter #6 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #6
0092*	0146	Meter #6 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #6
0094*	0148	Meter #7 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #7
0096*	0150	Meter #7 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #7
0098*	0152	Meter #7 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #7
009A*	0154	Meter #7 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #7
009C*	0156	Meter #8 Three-Phase Total kW	R	kW	Stored Interval 1 for Meter #8
009E*	0158	Meter #8 Three-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #8
00A0*	0160	Meter #8 Three-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #8
00A2*	0162	Meter #8 Three-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #8
00A4*	0164	Meter #9 Two-Phase Total kW	R	kW	Stored Interval 1 for Meter #9
00A6*	0166	Meter #9 Two-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #9
00A8*	0168	Meter #9 Two-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #9
00AA*	0170	Meter #9 Two-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #9
00AC*	0172	Meter #10 Two-Phase Total kW	R	kW	Stored Interval 1 for Meter #10
00AE*	0174	Meter #10 Two-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #10
00B0*	0176	Meter #10 Two-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #10
00B2*	0178	Meter #10 Two-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #10
00B4*	0180	Meter #11 Two-Phase Total kW	R	kW	Stored Interval 1 for Meter #11
00B6*	0182	Meter #11 Two-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #11
00B8*	0184	Meter #11 Two-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #11
00BA*	0186	Meter #11 Two-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #11
00BC*	0188	Meter #12 Two-Phase Total kW	R	kW	Stored Interval 1 for Meter #12
00BE*	0190	Meter #12 Two-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #12
00C0*	0192	Meter #12 Two-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #12
00C2*	0194	Meter #12 Two-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #12
00C4*	0196	Meter #13 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #13
00C6*	0198	Meter #13 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #13

Table 4–1: Modbus Memory Map (Sheet 4 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
00C8*	0200	Meter #13 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #13
00CA*	0202	Meter #13 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #13
00CC*	0204	Meter #14 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #14
00CE*	0206	Meter #14 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #14
00D0*	0208	Meter #14 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #14
00D2*	0210	Meter #14 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #14
00D4*	0212	Meter #15 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #15
00D6*	0214	Meter #15 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #15
00D8*	0216	Meter #15 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #15
00DA*	0218	Meter #15 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #15
00DC*	0220	Meter #16 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #16
00DE*	0222	Meter #16 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #16
00E0*	0224	Meter #16 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #16
00E2*	0226	Meter #16 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #16
00E4*	0228	Meter #17 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #17
00E6*	0230	Meter #17 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #17
00E8*	0232	Meter #17 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #17
00EA*	0234	Meter #17 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #17
00EC*	0236	Meter #18 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #18
00EE*	0238	Meter #18 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #18
00F0*	0240	Meter #18 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #18
00F2*	0242	Meter #18 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #18
00F4*	0244	Meter #19 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #19
00F6*	0246	Meter #19 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #19
00F8*	0248	Meter #19 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #19
00FA*	0250	Meter #19 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #19
00FC*	0252	Meter #20 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #20
00FE*	0254	Meter #20 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #20
0100*	0256	Meter #20 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #20
0102*	0258	Meter #20 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #20
0104*	0260	Meter #21 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #21
0106*	0262	Meter #21 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #21
0108*	0264	Meter #21 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #21
010A*	0266	Meter #21 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #21
010C*	0268	Meter #22 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #22

Table 4–1: Modbus Memory Map (Sheet 5 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
010E*	0270	Meter #22 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #22
0110*	0272	Meter #22 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #22
0112*	0274	Meter #22 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #22
0114*	0276	Meter #23 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #23
0116*	0278	Meter #23 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #23
0118*	0280	Meter #23 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #23
011A*	0282	Meter #23 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #23
011C*	0284	Meter #24 Single-Phase Total kW	R	kW	Stored Interval 1 for Meter #24
011E*	0286	Meter #24 Single-Phase Total kvar	R	kvar	Stored Interval 2 for Meter #24
0120*	0288	Meter #24 Single-Phase Total kVA	R	kVA	Stored Interval 3 for Meter #24
0122*	0290	Meter #24 Single-Phase Total Power Factor	R	%	Stored Interval 4 for Meter #24
	Metered Values (Instantaneous Data)				
0162*	0354	Frequency (Phase A)	R	Hz	Phase-to-Ground Instantaneous Frequency
016A*	0362	Voltage (A-N)	R	V	Phase-to-Ground Instantaneous Voltage
016C*	0364	Voltage (B-N)	R	V	Phase-to-Ground Instantaneous Voltage
016E*	0366	Voltage (C-N)	R	V	Phase-to-Ground Instantaneous Voltage
0170*	0368	Voltage (CT01)	R	V	CT #1 Instantaneous Voltage
0172*	0370	Amps (CT01)	R	A	CT #1 Instantaneous Current
0174*	0372	kW (CT01)	R	kW	CT #1 Instantaneous Power
0176*	0374	kvar (CT01)	R	kvar	CT #1 Instantaneous Reactive Power
0178*	0376	kVA (CT01)	R	kVA	CT #1 Instantaneous Apparent Power
017A*	0378	Voltage (CT02)	R	V	CT #2 Instantaneous Voltage
017C*	0380	Amps (CT02)	R	A	CT #2 Instantaneous Current
017E*	0382	kW (CT02)	R	kW	CT #2 Instantaneous Power
0180*	0384	kvar (CT02)	R	kvar	CT #2 Instantaneous Reactive Power
0182*	0386	kVA (CT02)	R	kVA	CT #2 Instantaneous Apparent Power
0184*	0388	Voltage (CT03)	R	V	CT #3 Instantaneous Voltage
0186*	0390	Amps (CT03)	R	A	CT #3 Instantaneous Current
0188*	0392	kW (CT03)	R	kW	CT #3 Instantaneous Power
018A*	0394	kvar (CT03)	R	kvar	CT #3 Instantaneous Reactive Power
018C*	0396	kVA (CT03)	R	kVA	CT #3 Instantaneous Apparent Power
018E*	0398	Voltage (CT04)	R	V	CT #4 Instantaneous Voltage
0190*	0400	Amps (CT04)	R	A	CT #4 Instantaneous Current
0192*	0402	kW (CT04)	R	kW	CT #4 Instantaneous Power
0194*	0404	kvar (CT04)	R	kvar	CT #4 Instantaneous Reactive Power

Table 4–1: Modbus Memory Map (Sheet 6 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
0196*	0406	kVA (CT04)	R	kVA	CT #4 Instantaneous Apparent Power
0198*	0408	Voltage (CT05)	R	V	CT #5 Instantaneous Voltage
019A*	0410	Amps (CT05)	R	A	CT #5 Instantaneous Current
019C*	0412	kW (CT05)	R	kW	CT #5 Instantaneous Power
019E*	0414	kvar (CT05)	R	kvar	CT #5 Instantaneous Reactive Power
01A0*	0416	kVA (CT05)	R	kVA	CT #5 Instantaneous Apparent Power
01A2*	0418	Voltage (CT06)	R	V	CT #6 Instantaneous Voltage
01A4*	0420	Amps (CT06)	R	A	CT #6 Instantaneous Current
01A6*	0422	kW (CT06)	R	kW	CT #6 Instantaneous Power
01A8*	0424	kvar (CT06)	R	kvar	CT #6 Instantaneous Reactive Power
01AA*	0426	kVA (CT06)	R	kVA	CT #6 Instantaneous Apparent Power
01AC*	0428	Voltage (CT07)	R	V	CT #7 Instantaneous Voltage
01AE*	0430	Amps (CT07)	R	A	CT #7 Instantaneous Current
01B0*	0432	kW (CT07)	R	kW	CT #7 Instantaneous Power
01B2*	0434	kvar (CT07)	R	kvar	CT #7 Instantaneous Reactive Power
01B4*	0436	kVA (CT07)	R	kVA	CT #7 Instantaneous Apparent Power
01B6*	0438	Voltage (CT08)	R	V	CT #8 Instantaneous Voltage
01B8*	0440	Amps (CT08)	R	A	CT #8 Instantaneous Current
01BA*	0442	kW (CT08)	R	kW	CT #8 Instantaneous Power
01BC*	0444	kvar (CT08)	R	kvar	CT #8 Instantaneous Reactive Power
01BE*	0446	kVA (CT08)	R	kVA	CT #8 Instantaneous Apparent Power
01C0*	0448	Voltage (CT09)	R	V	CT #9 Instantaneous Voltage
01C2*	0450	Amps (CT09)	R	A	CT #9 Instantaneous Current
01C4*	0452	kW (CT09)	R	kW	CT #9 Instantaneous Power
01C6*	0454	kvar (CT09)	R	kvar	CT #9 Instantaneous Reactive Power
01C8*	0456	kVA (CT09)	R	kVA	CT #9 Instantaneous Apparent Power
01CA*	0458	Voltage (CT10)	R	V	CT #10 Instantaneous Voltage
01CC*	0460	Amps (CT10)	R	A	CT #10 Instantaneous Current
01CE*	0462	kW (CT10)	R	kW	CT #10 Instantaneous Power
01D0*	0464	kvar (CT10)	R	kvar	CT #10 Instantaneous Reactive Power
01D2*	0466	kVA (CT10)	R	kVA	CT #10 Instantaneous Apparent Power
01D4*	0468	Voltage (CT11)	R	V	CT #11 Instantaneous Voltage
01D6*	0470	Amps (CT11)	R	A	CT #11 Instantaneous Current
01D8*	0472	kW (CT11)	R	kW	CT #11 Instantaneous Power
01DA*	0474	kvar (CT11)	R	kvar	CT #11 Instantaneous Reactive Power

Table 4–1: Modbus Memory Map (Sheet 7 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
01DC*	0476	kVA (CT11)	R	kVA	CT #11 Instantaneous Apparent Power
01DE*	0478	Voltage (CT12)	R	V	CT #12 Instantaneous Voltage
01E0*	0480	Amps (CT12)	R	A	CT #12 Instantaneous Current
01E2*	0482	kW (CT12)	R	kW	CT #12 Instantaneous Power
01E4*	0484	kvar (CT12)	R	kvar	CT #12 Instantaneous Reactive Power
01E6*	0486	kVA (CT12)	R	kVA	CT #12 Instantaneous Apparent Power
01E8*	0488	Voltage (CT13)	R	V	CT #13 Instantaneous Voltage
01EA*	0490	Amps (CT13)	R	A	CT #13 Instantaneous Current
01EC*	0492	kW (CT13)	R	kW	CT #13 Instantaneous Power
01EE*	0494	kvar (CT13)	R	kvar	CT #13 Instantaneous Reactive Power
01F0*	0496	kVA (CT13)	R	kVA	CT #13 Instantaneous Apparent Power
01F2*	0498	Voltage (CT14)	R	V	CT #14 Instantaneous Voltage
01F4*	0500	Amps (CT14)	R	A	CT #14 Instantaneous Current
01F6*	0502	kW (CT14)	R	kW	CT #14 Instantaneous Power
01F8*	0504	kvar (CT14)	R	kvar	CT #14 Instantaneous Reactive Power
01FA*	0506	kVA (CT14)	R	kVA	CT #14 Instantaneous Apparent Power
01FC*	0508	Voltage (CT15)	R	V	CT #15 Instantaneous Voltage
01FE*	0510	Amps (CT15)	R	A	CT #15 Instantaneous Current
200*	0512	kW (CT15)	R	kW	CT #15 Instantaneous Power
0202*	0514	kvar (CT15)	R	kvar	CT #15 Instantaneous Reactive Power
0204*	0516	kVA (CT15)	R	kVA	CT #15 Instantaneous Apparent Power
0206*	0518	Voltage (CT16)	R	V	CT #16 Instantaneous Voltage
0208*	0520	Amps (CT16)	R	A	CT #16 Instantaneous Current
020A*	0522	kW (CT16)	R	kW	CT #16 Instantaneous Power
020C*	0524	kvar (CT16)	R	kvar	CT #16 Instantaneous Reactive Power
020E*	0526	kVA (CT16)	R	kVA	CT #16 Instantaneous Apparent Power
0210*	0528	Voltage (CT17)	R	V	CT #17 Instantaneous Voltage
0212*	0530	Amps (CT17)	R	A	CT #17 Instantaneous Current
0214*	0532	kW (CT17)	R	kW	CT #17 Instantaneous Power
0216*	0534	kvar (CT17)	R	kvar	CT #17 Instantaneous Reactive Power
0218*	0536	kVA (CT17)	R	kVA	CT #17 Instantaneous Apparent Power
021A*	0538	Voltage (CT18)	R	V	CT #18 Instantaneous Voltage
021C*	0540	Amps (CT18)	R	A	CT #18 Instantaneous Current
021E*	0542	kW (CT18)	R	kW	CT #18 Instantaneous Power
0220*	0544	kvar (CT18)	R	kvar	CT #18 Instantaneous Reactive Power

Table 4–1: Modbus Memory Map (Sheet 8 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
0222*	0546	kVA (CT18)	R	kVA	CT #18 Instantaneous Apparent Power
0224*	0548	Voltage (CT19)	R	V	CT #19 Instantaneous Voltage
0226*	0550	Amps (CT19)	R	A	CT #19 Instantaneous Current
0228*	0552	kW (CT19)	R	kW	CT #19 Instantaneous Power
022A*	0554	kvar (CT19)	R	kvar	CT #19 Instantaneous Reactive Power
022C*	0556	kVA (CT19)	R	kVA	CT #19 Instantaneous Apparent Power
022E*	0558	Voltage (CT20)	R	V	CT #20 Instantaneous Voltage
0230*	0560	Amps (CT20)	R	A	CT #20 Instantaneous Current
0232*	0562	kW (CT20)	R	kW	CT #20 Instantaneous Power
0234*	0564	kvar (CT20)	R	kvar	CT #20 Instantaneous Reactive Power
0236*	0566	kVA (CT20)	R	kVA	CT #20 Instantaneous Apparent Power
0238*	0568	Voltage (CT21)	R	V	CT #21 Instantaneous Voltage
023A*	0570	Amps (CT21)	R	A	CT #21 Instantaneous Current
023C*	0572	kW (CT21)	R	kW	CT #21 Instantaneous Power
023E*	0574	kvar (CT21)	R	kvar	CT #21 Instantaneous Reactive Power
0240*	0576	kVA (CT21)	R	kVA	CT #21 Instantaneous Apparent Power
0242*	0578	Voltage (CT22)	R	V	CT #22 Instantaneous Voltage
0244*	0580	Amps (CT22)	R	A	CT #22 Instantaneous Current
0246*	0582	kW (CT22)	R	kW	CT #22 Instantaneous Power
0248*	0584	kvar (CT22)	R	kvar	CT #22 Instantaneous Reactive Power
024A*	0586	kVA (CT22)	R	kVA	CT #22 Instantaneous Apparent Power
024C*	0588	Voltage (CT23)	R	V	CT #23 Instantaneous Voltage
024E*	0590	Amps (CT23)	R	A	CT #23 Instantaneous Current
0250*	0592	kW (CT23)	R	kW	CT #23 Instantaneous Power
0252*	0594	kvar (CT23)	R	kvar	CT #23 Instantaneous Reactive Power
0254*	0596	kVA (CT23)	R	kVA	CT #23 Instantaneous Apparent Power
0256*	0598	Voltage (CT24)	R	V	CT #24 Instantaneous Voltage
0258*	0600	Amps (CT24)	R	A	CT #24 Instantaneous Current
025A*	0602	kW (CT24)	R	kW	CT #24 Instantaneous Power
025C*	0604	kvar (CT24)	R	kvar	CT #24 Instantaneous Reactive Power
025E*	0606	kVA (CT24)	R	kVA	CT #24 Instantaneous Apparent Power

Table 4–1: Modbus Memory Map (Sheet 9 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
	Three-Phase Metered Values (Fast Poll)				
0288*	0648	Meter #1 Three-Phase kWh	R	kWh	Meter #1 Real Time Input 1
028A*	0650	Meter #1 Three-Phase kvarh	R	kvarh	Meter #1 Real Time Input 2
028C*	0652	Meter #1 Three-Phase kW	R	kW	Meter #1 Real Time Input 3
028E*	0654	Meter #1 Three-Phase kvar	R	kvar	Meter #1 Real Time Input 4
0290*	0656	Meter #1 Three-Phase kVA	R	kVA	Meter #1 Real Time Input 5
0292*	0658	Meter #1 Three-Phase Power Factor	R	%	Meter #1 Real Time Input 6
0294*	0660	Meter #2 Three-Phase kWh	R	kWh	Meter #2 Real Time Input 1
0296*	0662	Meter #2 Three-Phase kvarh	R	kvarh	Meter #2 Real Time Input 2
0298*	0664	Meter #2 Three-Phase kW	R	kW	Meter #2 Real Time Input 3
029A*	0666	Meter #2 Three-Phase kvar	R	kvar	Meter #2 Real Time Input 4
029C*	0668	Meter #2 Three-Phase kVA	R	kVA	Meter #2 Real Time Input 5
029E*	0670	Meter #2 Three-Phase Power Factor	R	%	Meter #2 Real Time Input 6
02A0*	0672	Meter #3 Three-Phase kWh	R	kWh	Meter #3 Real Time Input 1
02A2*	0674	Meter #3 Three-Phase kvarh	R	kvarh	Meter #3 Real Time Input 2
02A4	0676	Meter #3 Three-Phase kW	R	kW	Meter #3 Real Time Input 3
02A6*	0678	Meter #3 Three-Phase kvar	R	kvar	Meter #3 Real Time Input 4
02A8*	0680	Meter #3 Three-Phase kVA	R	kVA	Meter #3 Real Time Input 5
02AA*	0682	Meter #3 Three-Phase Power Factor	R	%	Meter #3 Real Time Input 6
02AC*	0684	Meter #4 Three-Phase kWh	R	kWh	Meter #4 Real Time Input 1
02AE*	0686	Meter #4 Three-Phase kvarh	R	kvarh	Meter #4 Real Time Input 2
02B0*	0688	Meter #4 Three-Phase kW	R	kW	Meter #4 Real Time Input 3
02B2*	0690	Meter #4 Three-Phase kvar	R	kvar	Meter #4 Real Time Input 4
02B4*	0692	Meter #4 Three-Phase kVA	R	kVA	Meter #4 Real Time Input 5
02B6*	0694	Meter #4 Three-Phase Power Factor	R	%	Meter #4 Real Time Input 6
02B8*	0696	Meter #5 Three-Phase kWh	R	kWh	Meter #5 Real Time Input 1
02BA*	0698	Meter #5 Three-Phase kvarh	R	kvarh	Meter #5 Real Time Input 2
02BC*	0700	Meter #5 Three-Phase kW	R	kW	Meter #5 Real Time Input 3
02BE*	0702	Meter #5 Three-Phase kvar	R	kvar	Meter #5 Real Time Input 4
02C0*	0704	Meter #5 Three-Phase kVA	R	kVA	Meter #5 Real Time Input 5
02C2*	0706	Meter #5 Three-Phase Power Factor	R	%	Meter #5 Real Time Input 6
02C4	0708	Meter #6 Three-Phase kWh	R	kWh	Meter #6 Real Time Input 1
02C6*	0710	Meter #6 Three-Phase kvarh	R	kvarh	Meter #6 Real Time Input 2
02C8*	0712	Meter #6 Three-Phase kW	R	kW	Meter #6 Real Time Input 3
02CA*	0714	Meter #6 Three-Phase kvar	R	kvar	Meter #6 Real Time Input 4

Table 4–1: Modbus Memory Map (Sheet 10 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
02CC*	0716	Meter #6 Three-Phase kVA	R	kVA	Meter #6 Real Time Input 5
02CE*	0718	Meter #6 Three-Phase Power Factor	R	%	Meter #6 Real Time Input 6
02D0*	0720	Meter #7 Three-Phase kWh	R	kWh	Meter #7 Real Time Input 1
02D2*	0722	Meter #7 Three-Phase kvarh	R	kvarh	Meter #7 Real Time Input 2
02D4*	0724	Meter #7 Three-Phase kW	R	kW	Meter #7 Real Time Input 3
02D6*	0726	Meter #7 Three-Phase kvar	R	kvar	Meter #7 Real Time Input 4
02D8	0728	Meter #7 Three-Phase kVA	R	kVA	Meter #7 Real Time Input 5
02DA*	0730	Meter #7 Three-Phase Power Factor	R	%	Meter #7 Real Time Input 6
02DC*	0732	Meter #8 Three-Phase kWh	R	kWh	Meter #8 Real Time Input 1
02DE*	0734	Meter #8 Three-Phase kvarh	R	kvarh	Meter #8 Real Time Input 2
02E0*	0736	Meter #8 Three-Phase kW	R	kW	Meter #8 Real Time Input 3
02E2*	0738	Meter #8 Three-Phase kvar	R	kvar	Meter #8 Real Time Input 4
02E4*	0740	Meter #8 Three-Phase kVA	R	kVA	Meter #8 Real Time Input 5
02E6*	0742	Meter #8 Three-Phase Power Factor	R	%	Meter #8 Real Time Input 6
02E8*	0744	Meter #9 Phase kWh	R	kWh	Meter #9 Real Time Input 1
02EA*	0746	Meter #9 Phase kvarh	R	kvarh	Meter #9 Real Time Input 2
02EC*	0748	Meter #9 Phase kW	R	kW	Meter #9 Real Time Input 3
02EE*	0750	Meter #9 Phase kvar	R	kvar	Meter #9 Real Time Input 4
02F0*	0752	Meter #9 Phase kVA	R	kVA	Meter #9 Real Time Input 5
02F2*	0754	Meter #9 Phase Power Factor	R	%	Meter #9 Real Time Input 6
02F4*	0756	Meter #10 Phase kWh	R	kWh	Meter #10 Real Time Input 1
02F6*	0758	Meter #10 Phase kvarh	R	kvarh	Meter #10 Real Time Input 2
02F8*	0760	Meter #10 Phase kW	R	kW	Meter #10 Real Time Input 3
02FA*	0762	Meter #10 Phase kvar	R	kvar	Meter #10 Real Time Input 4
02FC*	0764	Meter #10 Phase kVA	R	kVA	Meter #10 Real Time Input 5
02FE*	0766	Meter #10 Phase Power Factor	R	%	Meter #10 Real Time Input 6
0300*	0768	Meter #11 Phase kWh	R	kWh	Meter #11 Real Time Input 1
0302*	0770	Meter #11 Phase kvarh	R	kvarh	Meter #11 Real Time Input 2
0304*	0772	Meter #11 Phase kW	R	kW	Meter #11 Real Time Input 3
0306*	0774	Meter #11 Phase kvar	R	kvar	Meter #11 Real Time Input 4
0308*	0776	Meter #11 Phase kVA	R	kVA	Meter #11 Real Time Input 5
030A*	0778	Meter #11 Phase Power Factor	R	%	Meter #11 Real Time Input 6
030C*	0780	Meter #12 Phase kWh	R	kWh	Meter #12 Real Time Input 1
030E*	0782	Meter #12 Phase kvarh	R	kvarh	Meter #12 Real Time Input 2
0310*	0784	Meter #12 Phase kW	R	kW	Meter #12 Real Time Input 3

Table 4–1: Modbus Memory Map (Sheet 11 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
0312*	0786	Meter #12 Phase kvar	R	kvar	Meter #12 Real Time Input 4
0314*	0788	Meter #12 Phase kVA	R	kVA	Meter #12 Real Time Input 5
0316*	0790	Meter #12 Phase Power Factor	R	%	Meter #12 Real Time Input 6
0318*	0792	Meter #13 Phase kWh	R	kWh	Meter #13 Real Time Input 1
031A*	0794	Meter #13 Phase kvarh	R	kvarh	Meter #13 Real Time Input 2
031C*	0796	Meter #13 Phase kW	R	kW	Meter #13 Real Time Input 3
031E*	0798	Meter #13 Phase kvar	R	kvar	Meter #13 Real Time Input 4
0320*	0800	Meter #13 Phase kVA	R	kVA	Meter #13 Real Time Input 5
0322*	0802	Meter #13 Phase Power Factor	R	%	Meter #13 Real Time Input 6
0324*	0804	Meter #14 Phase kWh	R	kWh	Meter #14 Real Time Input 1
0326*	0806	Meter #14 Phase kvarh	R	kvarh	Meter #14 Real Time Input 2
0328*	0808	Meter #14 Phase kW	R	kW	Meter #14 Real Time Input 3
032A*	0810	Meter #14 Phase kvar	R	kvar	Meter #14 Real Time Input 4
032C*	0812	Meter #14 Phase kVA	R	kVA	Meter #14 Real Time Input 5
032E*	0814	Meter #14 Phase Power Factor	R	%	Meter #14 Real Time Input 6
0330*	0816	Meter #15 Phase kWh	R	kWh	Meter #15 Real Time Input 1
0332*	0818	Meter #15 Phase kvarh	R	kvarh	Meter #15 Real Time Input 2
0334*	0820	Meter #15 Phase kW	R	kW	Meter #15 Real Time Input 3
0336*	0822	Meter #15 Phase kvar	R	kvar	Meter #15 Real Time Input 4
0338*	0824	Meter #15 Phase kVA	R	kVA	Meter #15 Real Time Input 5
033A*	0826	Meter #15 Phase Power Factor	R	%	Meter #15 Real Time Input 6
033C*	0828	Meter #16 Phase kWh	R	kWh	Meter #16 Real Time Input 1
033E*	0830	Meter #16 Phase kvarh	R	kvarh	Meter #16 Real Time Input 2
0340*	0832	Meter #16 Phase kW	R	kW	Meter #16 Real Time Input 3
0342*	0834	Meter #16 Phase kvar	R	kvar	Meter #16 Real Time Input 4
0344*	0836	Meter #16 Phase kVA	R	kVA	Meter #16 Real Time Input 5
0346*	0838	Meter #16 Phase Power Factor	R	%	Meter #16 Real Time Input 6
0348*	0840	Meter #17 Phase kWh	R	kWh	Meter #17 Real Time Input 1
034A*	0842	Meter #17 Phase kvarh	R	kvarh	Meter #17 Real Time Input 2
034C*	0844	Meter #17 Phase kW	R	kW	Meter #17 Real Time Input 3
034E*	0846	Meter #17 Phase kvar	R	kvar	Meter #17 Real Time Input 4
0350*	0848	Meter #17 Phase kVA	R	kVA	Meter #17 Real Time Input 5
0352*	0850	Meter #17 Phase Power Factor	R	%	Meter #17 Real Time Input 6
0354*	0852	Meter #18 Phase kWh	R	kWh	Meter #18 Real Time Input 1
0356*	0854	Meter #18 Phase kvarh	R	kvarh	Meter #18 Real Time Input 2

Table 4–1: Modbus Memory Map (Sheet 12 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
0358*	0856	Meter #18 Phase kW	R	kW	Meter #18 Real Time Input 3
035A*	0858	Meter #18 Phase kvar	R	kvar	Meter #18 Real Time Input 4
035C*	0860	Meter #18 Phase kVA	R	kVA	Meter #18 Real Time Input 5
035E*	0862	Meter #18 Phase Power Factor	R	%	Meter #18 Real Time Input 6
0360*	0864	Meter #19 Phase kWh	R	kWh	Meter #19 Real Time Input 1
0362*	0866	Meter #19 Phase kvarh	R	kvarh	Meter #19 Real Time Input 2
0364*	0868	Meter #19 Phase kW	R	kW	Meter #19 Real Time Input 3
0366*	0870	Meter #19 Phase kvar	R	kvar	Meter #19 Real Time Input 4
0368*	0872	Meter #19 Phase kVA	R	kVA	Meter #19 Real Time Input 5
036A*	0874	Meter #19 Phase Power Factor	R	%	Meter #19 Real Time Input 6
036C*	0876	Meter #20 Phase kWh	R	kWh	Meter #20 Real Time Input 1
036E*	0878	Meter #20 Phase kvarh	R	kvarh	Meter #20 Real Time Input 2
0370*	0880	Meter #20 Phase kW	R	kW	Meter #20 Real Time Input 3
0372*	0882	Meter #20 Phase kvar	R	kvar	Meter #20 Real Time Input 4
0374*	0884	Meter #20 Phase kVA	R	kVA	Meter #20 Real Time Input 5
0376*	0886	Meter #20 Phase Power Factor	R	%	Meter #20 Real Time Input 6
0378*	0888	Meter #21 Phase kWh	R	kWh	Meter #21 Real Time Input 1
037A*	0890	Meter #21 Phase kvarh	R	kvarh	Meter #21 Real Time Input 2
037C*	0892	Meter #21 Phase kW	R	kW	Meter #21 Real Time Input 3
037E*	0894	Meter #21 Phase kvar	R	kvar	Meter #21 Real Time Input 4
0380*	0896	Meter #21 Phase kVA	R	kVA	Meter #21 Real Time Input 5
0382*	0898	Meter #21 Phase Power Factor	R	%	Meter #21 Real Time Input 6
0384*	0900	Meter #22 Phase kWh	R	kWh	Meter #22 Real Time Input 1
0386*	0902	Meter #22 Phase kvarh	R	kvarh	Meter #22 Real Time Input 2
0388*	0904	Meter #22 Phase kW	R	kW	Meter #22 Real Time Input 3
038A*	0906	Meter #22 Phase kvar	R	kvar	Meter #22 Real Time Input 4
038C*	0908	Meter #22 Phase kVA	R	kVA	Meter #22 Real Time Input 5
038E*	0910	Meter #22 Phase Power Factor	R	%	Meter #22 Real Time Input 6
0390*	0912	Meter #23 Phase kWh	R	kWh	Meter #23 Real Time Input 1
0392*	0914	Meter #23 Phase kvarh	R	kvarh	Meter #23 Real Time Input 2
0394*	0916	Meter #23 Phase kW	R	kW	Meter #23 Real Time Input 3
0396*	0918	Meter #23 Phase kvar	R	kvar	Meter #23 Real Time Input 4
0398*	0920	Meter #23 Phase kVA	R	kVA	Meter #23 Real Time Input 5
039A*	0922	Meter #23 Phase Power Factor	R	%	Meter #23 Real Time Input 6
039C*	0924	Meter #24 Phase kWh	R	kWh	Meter #24 Real Time Input 1

Table 4–1: Modbus Memory Map (Sheet 13 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
039E*	0926	Meter #24 Phase kvarh	R	kvarh	Meter #24 Real Time Input 2
03A0*	0928	Meter #24 Phase kW	R	kW	Meter #24 Real Time Input 3
03A2*	0930	Meter #24 Phase kvar	R	kvar	Meter #24 Real Time Input 4
03A4*	0932	Meter #24 Phase kVA	R	kVA	Meter #24 Real Time Input 5
03A6*	0934	Meter #24 Phase Power Factor	R	%	Meter #24 Real Time Input 6
	Real Time Data				
03E8*	1000	Meter #1 THD Phase A	R	%	Meter #1 Total Harmonic Distortion
03EA*	1002	Meter #1 Phase Angle A	R	degrees	Meter #1 Phase Angle
03EC*	1004	Meter #1 Phase-to-Phase Voltage A	R	V	Meter #1 Instantaneous Voltage
03EE*	1006	Meter #1 THD Phase B	R	%	Meter #1 Total Harmonic Distortion
03F0*	1008	Meter #1 Phase Angle B	R	degrees	Meter #1 Phase Angle
03F2*	1010	Meter #1 Phase-to-Phase Voltage B	R	V	Meter #1 Instantaneous Voltage
03F4*	1012	Meter #1 THD Phase C	R	%	Meter #1 Total Harmonic Distortion
03F6*	1014	Meter #1 Phase Angle C	R	degrees	Meter #1 Phase Angle
03F8*	1016	Meter #1 Phase-to-Phase Voltage C	R	V	Meter #1 Instantaneous Voltage
03FA*	1018	Meter #2 THD Phase A	R	%	Meter #2 Total Harmonic Distortion
03FC*	1020	Meter #2 Phase Angle A	R	degrees	Meter #2 Phase Angle
03FE*	1022	Meter #2 Phase-to-Phase Voltage A	R	V	Meter #2 Instantaneous Voltage
0400*	1024	Meter #2 THD Phase B	R	%	Meter #2 Total Harmonic Distortion
0402*	1026	Meter #2 Phase Angle B	R	degrees	Meter #2 Phase Angle
0404*	1028	Meter #2 Phase-to-Phase Voltage B	R	V	Meter #2 Instantaneous Voltage
0406*	1030	Meter #2 THD Phase C	R	%	Meter #2 Total Harmonic Distortion
0408*	1032	Meter #2 Phase Angle C	R	degrees	Meter #2 Phase Angle
040A*	1034	Meter #2 Phase-to-Phase Voltage C	R	V	Meter #2 Instantaneous Voltage
040C*	1036	Meter #3 THD Phase A	R	%	Meter #3 Total Harmonic Distortion
040E*	1038	Meter #3 Phase Angle A	R	degrees	Meter #3 Phase Angle
0410*	1040	Meter #3 Phase-to-Phase Voltage A	R	V	Meter #3 Instantaneous Voltage
0412*	1042	Meter #3 THD Phase B	R	%	Meter #3 Total Harmonic Distortion
0414*	1044	Meter #3 Phase Angle B	R	degrees	Meter #3 Phase Angle
0416*	1046	Meter #3 Phase-to-Phase Voltage B	R	V	Meter #3 Instantaneous Voltage
0418*	1048	Meter #3 THD Phase C	R	%	Meter #3 Total Harmonic Distortion
041A*	1050	Meter #3 Phase Angle C	R	degrees	Meter #3 Phase Angle
041C*	1052	Meter #3 Phase-to-Phase Voltage C	R	V	Meter #3 Instantaneous Voltage
041E*	1054	Meter #4 THD Phase A	R	%	Meter #4 Total Harmonic Distortion
0420*	1056	Meter #4 Phase Angle A	R	degrees	Meter #4 Phase Angle

Table 4–1: Modbus Memory Map (Sheet 14 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
0422*	1058	Meter #4 Phase-to-Phase Voltage A	R	V	Meter #4 Instantaneous Voltage
0424*	1060	Meter #4 THD Phase B	R	%	Meter #4 Total Harmonic Distortion
0426*	1062	Meter #4 Phase Angle B	R	degrees	Meter #4 Phase Angle
0428*	1064	Meter #4 Phase-to-Phase Voltage B	R	V	Meter #4 Instantaneous Voltage
042A*	1066	Meter #4 THD Phase C	R	%	Meter #4 Total Harmonic Distortion
042C*	1068	Meter #4 Phase Angle C	R	degrees	Meter #4 Phase Angle
042E*	1070	Meter #4 Phase-to-Phase Voltage C	R	V	Meter #4 Instantaneous Voltage
0430*	1072	Meter #5 THD Phase A	R	%	Meter #5 Total Harmonic Distortion
0432*	1074	Meter #5 Phase Angle A	R	degrees	Meter #5 Phase Angle
0434*	1076	Meter #5 Phase-to-Phase Voltage A	R	V	Meter #5 Instantaneous Voltage
0436*	1078	Meter #5 THD Phase B	R	%	Meter #5 Total Harmonic Distortion
0438*	1080	Meter #5 Phase Angle B	R	degrees	Meter #5 Phase Angle
043A*	1082	Meter #5 Phase-to-Phase Voltage B	R	V	Meter #5 Instantaneous Voltage
043C*	1084	Meter #5 THD Phase C	R	%	Meter #5 Total Harmonic Distortion
043E*	1086	Meter #5 Phase Angle C	R	degrees	Meter #5 Phase Angle
0440*	1088	Meter #5 Phase-to-Phase Voltage C	R	V	Meter #5 Instantaneous Voltage
0442*	1090	Meter #6 THD Phase A	R	%	Meter #6 Total Harmonic Distortion
0444*	1092	Meter #6 Phase Angle A	R	degrees	Meter #6 Phase Angle
0446*	1094	Meter #6 Phase-to-Phase Voltage A	R	V	Meter #6 Instantaneous Voltage
0448	1096	Meter #6 THD Phase B	R	%	Meter #6 Total Harmonic Distortion
044A*	1098	Meter #6 Phase Angle B	R	degrees	Meter #6 Phase Angle
044C*	1100	Meter #6 Phase-to-Phase Voltage B	R	V	Meter #6 Instantaneous Voltage
044E*	1102	Meter #6 THD Phase C	R	%	Meter #6 Total Harmonic Distortion
0450*	1104	Meter #6 Phase Angle C	R	degrees	Meter #6 Phase Angle
0452*	1106	Meter #6 Phase-to-Phase Voltage C	R	V	Meter #6 Instantaneous Voltage
0454*	1108	Meter #7 THD Phase A	R	%	Meter #7 Total Harmonic Distortion
0456*	1110	Meter #7 Phase Angle A	R	degrees	Meter #7 Phase Angle
0458*	1112	Meter #7 Phase-to-Phase Voltage A	R	V	Meter #7 Instantaneous Voltage
045A*	1114	Meter #7 THD Phase B	R	%	Meter #7 Total Harmonic Distortion
045C*	1116	Meter #7 Phase Angle B	R	degrees	Meter #7 Phase Angle
045E*	1118	Meter #7 Phase-to-Phase Voltage B	R	V	Meter #7 Instantaneous Voltage
0460*	1120	Meter #7 THD Phase C	R	%	Meter #7 Total Harmonic Distortion
0462*	1122	Meter #7 Phase Angle C	R	degrees	Meter #7 Phase Angle
0464*	1124	Meter #7 Phase-to-Phase Voltage C	R	V	Meter #7 Instantaneous Voltage
0466*	1126	Meter #8 THD Phase A	R	%	Meter #8 Total Harmonic Distortion

Table 4–1: Modbus Memory Map (Sheet 15 of 15)

Hex Addr	Addr	Description	R/W	Units	Notes
0468*	1128	Meter #8 Phase Angle A	R	degrees	Meter #8 Phase Angle
046A*	1130	Meter #8 Phase-to-Phase Voltage A	R	V	Meter #8 Instantaneous Voltage
046C*	1132	Meter #8 THD Phase B	R	%	Meter #8 Total Harmonic Distortion
046E*	1134	Meter #8 Phase Angle B	R	degrees	Meter #8 Phase Angle
0470*	1136	Meter #8 Phase-to-Phase Voltage B	R	V	Meter #8 Instantaneous Voltage
0472*	1138	Meter #8 THD Phase C	R	%	Meter #8 Total Harmonic Distortion
0474*	1140	Meter #8 Phase Angle C	R	degrees	Meter #8 Phase Angle
0476*	1142	Meter #8 Phase-to-Phase Voltage C	R	V	Meter #8 Instantaneous Voltage
	Counters				
07D0	2000	Number of phases offset	R		16-bit Unsigned Integer 1, 2, 3, or 24 phases available
07D1	2001	Demand Window Offset	R		16-bit Unsigned Integer 5, 15, or 30 minutes available
07D2	2002	I Multiplier Type Offset	R		16-bit Unsigned Integer Internal calibration value
07D3	2003	Number of Pulse Counters Offset	R		16-bit Unsigned Integer Number of external pulse inputs installed
07D4	2004	Overlap Offset	R		16-bit Unsigned Integer Number of adjacent demand windows that are averaged to determine peak demand
07D5	2005	Number TOU's Offset	R		16-bit Unsigned Integer Number of different TOU periods defined in the time-of-use table
07D6	2006	MDT_M_TABLE_REG_START	R		16-bit Unsigned Integer
07D7	2007	NUM_MDT_M_TABLE_COLUMNS	R		16-bit Unsigned Integer
07D8	2008	NUM_MDT_M_TABLE_REGS	R		16-bit Unsigned Integer
07D9	2009	MDT_M_TABLE_REG_END	R		16-bit Unsigned Integer

* 32-bit floating point register.

+ 32-bit long integer - Range: 00000000h to FFFFFFFFh

1. 32-bit floating point numbers are as per the IEEE 754-1985 standard.
2. Registers 0X0063 to 0X025E are all read-only and cannot be modified. They break down as follows:
    - Registers 0X0064 to 0X0122 are not real-time, but are populated with stored interval data based on user inputs to registers 0X0040 to 0X0043.
    - Registers 0X0162 to 0X025E are all real-time data registers.

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EPM4500 Sub Meter

Chapter 5: Miscellaneous

5.1 Revision History

5.1.1 Release Dates

Table 5–1: Release Dates

MANUAL	GE PART NO.	EPM4500 REVISION	RELEASE DATE
GEK-106555	1601-0157-A1	1.0x	10 June 2004
GEK-106555A	1601-0157-A2	1.0x	18 October 2004
GEK-106555B	1601-0157-A3	1.0x	1 December 2004
GEK-106555C	1601-0157-A4	1.0x	5 January 2005
GEK-106555D	1601-0157-A5	1.0x	14 February 2005
GEK-106555E	1601-0157-A6	1.0x	08 April 2005
GEK-106555F	1601-0157-A7	1.0x	20 February 2006
GEK-106555G	1601-0157-A8	1.0x	30 June 2006
GEK-106555H	1601-0157-A9	1.0x	22 November 2007

5.1.2 Changes to the Manual

Table 5–2: Major Updates for 1601-0157-A9

PAGE (A8)	PAGE (A9)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A9
4-9	4-9	Update	Modbus Memory Map - inserted hex addresses and notes.

Table 5–3: Major Updates for 1601-0157-A8

PAGE (A7)	PAGE (A8)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A8
4-1	4-1	Update	Updated RS485 WIRING FOR MODBUS section
---	4-2	Add	Added RS232 WIRING FOR MODBUS section

Table 5–4: Major Updates for 1601-0157-A7

PAGE (A6)	PAGE (A7)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A7
3-2	3-2	Update	Updated EPM4500 DISPLAY STRUCTURE diagram

Table 5–5: Major Updates for 1601-0157-A6

PAGE (A5)	PAGE (A6)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A6
4-3	4-3	Update	Updated MODBUS ACTIVATION section

Table 5–6: Major Updates for 1601-0157-A5

PAGE (A4)	PAGE (A5)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A5
---	4-1	Add	Added RS485 WIRING FOR MODBUS section

Table 5–7: Major Updates for 1601-0157-A4

PAGE (A3)	PAGE (A4)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A4
4-6	4-6	Update	Updated MODBUS MEMORY MAP to include additional registers

Table 5–8: Major Updates for 1601-0157-A3

PAGE (A2)	PAGE (A3)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A3
4-3	4-3	Update	Updated MODBUS ACTIVATION section

Table 5–9: Major Updates for 1601-0157-A2

PAGE (A1)	PAGE (A2)	CHANGE	DESCRIPTION
Title	Title	Update	Manual part number to 1601-0157-A2
---	2-2	Replace	Replaced PHASE ROTATION section and example with updated PHASE ASSOCIATION section. Phase rotation information is now included with the wiring types.
---	2-4	Replace	Updated the WIRING section to include new wiring diagrams and wiring procedures
---	4-1	Add	Added MODBUS COMMUNICATIONS chapter

5.2 Warranty

5.2.1 GE Energy Warranty

General Electric Energy (GE Energy) warrants each device it manufactures to be free from defects in material and workmanship under normal use and service for a period of 24 months from date of shipment from factory.

In the event of a failure covered by warranty, GE Energy will undertake to repair or replace the device providing the warrantor determined that it is defective and it is returned with all transportation charges prepaid to an authorized service centre or the factory. Repairs or replacement under warranty will be made without charge.

Warranty shall not apply to any device which has been subject to misuse, negligence, accident, incorrect installation or use not in accordance with instructions nor any unit that has been altered outside a GE Energy authorized factory outlet.

GE Energy is not liable for special, indirect or consequential damages or for loss of profit or for expenses sustained as a result of a device malfunction, incorrect application or adjustment.

For complete text of Warranty (including limitations and disclaimers), refer to GE Energy Standard Conditions of Sale.

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