

miniQloset™

Multi-Channel Electric Meter

User Manual



Read Me

Read this user manual carefully before installing, operating, or maintaining the miniQloset multi-channel electric meter. Safety must be the priority when reviewing all installation guidelines described in this document. Installation, operation, and maintenance of the miniQloset multi-channel electric meter must be performed by qualified and trained professionals with experience in high voltage and current devices and metering equipment. Quadlogic Controls Corporation is not responsible or liable for any injuries caused by improper meter installation, operation, or maintenance.

De-energize and ground the meter prior to any repair or maintenance.

Observe the following guidelines before installing or using the meter:

1. Verify that the power supply meets the specifications of the miniQloset, and that the power supply wiring conforms to all applicable electrical codes.
2. Terminate the secondary conductors of all CTs before allowing current to flow in the CT primaries. To prevent dangerous voltages and damage to the CTs, CT leads must be shorted together when not connected to the meter.
3. Dangerous voltage levels are exposed when the meter cover flaps are open. Use caution when working with the meter under these conditions.
4. Verify that line voltages are connected ONLY to the V-PWR and V-REF terminals of the meter.
5. Ensure all communication signal (RS-485) terminals are protected from any line voltage or current.
6. Verify that all instrument wiring (e.g., CT wiring) is consistent with the internal system settings and specifications of the miniQloset.

Table of Contents

	Page
1. PACKAGE CONTENTS	4
2. OVERVIEW	4
2.1 Features	5
3. SPECIFICATIONS	7
4. INSTALLATION	9
4.1 Mounting	10
4.2 Connection Terminal Access	11
4.3 Hardware Tamper Protection	11
4.4 Meter Layout	12
4.5 Communication Wiring Installation	13
4.6 Reference Voltage (V-REF) Input Installation	13
4.7 CT Inputs Installation	14
4.8 Installing Auxiliary Power Supply	15
4.9 Final Steps	15
4.10 Connecting Multiple miniQloset Units Together	16
5. DISPLAY & OPERATION	17
6. TROUBLESHOOTING	17
7. MAINTENANCE	17
Appendix A - Wiring Diagrams	18
Appendix B - Menu Tree Navigation	21
Appendix C - MODBUS Register Map	25
MODBUS © Protocol	25
Appendix D – MODBUS Functions	26
Appendix E – Meter configuration, read and write (read “03H”, write “06H/10H”	32
Appendix F – Interval record retrieval, “03H”to read; “06H” or “10H”to write	34
Appendix G- SOE record, read only, “03” code to read	38
Appendix H- Additional registers	40

1. PACKAGE CONTENTS

- 1 **miniQloset meter** (QBRICK-MQ-2P24M or QBRICK-MQ-3P16M)
- 1 **miniQloset Service Kit** (1 per installation site, P/N 76-MQ-SERVICEKIT)
 - 2 CT Shorting PCBs
 - 20 Lead Sealing Screws
 - 20 Current Transformer Replacement Plugs
 - 1 Phillips/Flathead Screwdriver (pull bit shaft to switch drivers)
 - 1 Small Flathead Screwdriver (for CT terminals)
 - 1 Storage Case

2. OVERVIEW

The miniQloset multi-channel electric meter is a revenue-grade residential meter in a compact, rugged housing. The miniQloset is the ideal solution for multi-tenant metering applications in residential buildings. The miniQloset provides:

- Low installation cost per metering point
- High reliability
- Storage for up to 180 days of metering records at 5 min intervals (15 min readings provided by QTao Meter Data Hub)
- Backlit display with real-time power diagnostics on each phase

The miniQloset is offered in two configurations:

- 2 Element (2EL) with 24 metering points - 2P3W, p/n QBRICK-MQ-2P24M
- 3 Element (3EL) with 16 metering points - 3P4W, p/n QBRICK-MQ-3P16M

The miniQloset is UL (UL61010-1-2012, UL61010-2-030:2012), CSA (CSA C22.2 NO 61010-1, CSA C22.2 NO 61010-2-030), and ANSI approved (ANSI-C12.20:2015).

The miniQloset is designed for use with ANSI 0.1 class 100:0.1 Amp and 200:0.1 Amp current transformers (CTs).

2.1 Features

Table 1: Measurement Functions

Function	Parameter	Per Metering Point	Per Channel	Unit
Real-Time Parameters	Voltage	/	•	V
	Current	/	•	A
	Active Power	•	•	kW
	Reactive Power	•	•	kVAr
	Apparent Power	•	•	kVA
	Power Factor	•	•	/
	Frequency	•	/	Hz
Accumulated Energy Data	Active Energy +	•	•	kWh
	Active Energy -	•	•	kWh
	Inductive Reactive Energy +	•	•	kVArh
	Capacitive Reactive Energy -	•	•	kVArh
	Inductive Reactive Energy -	•	•	kVArh
	Capacitive Reactive Energy +	•	•	kVArh
	Apparent Energy +	•	•	kVAh
	Apparent Energy -	•	•	kVAh
Interval Data (5 min records)	Active Energy +	•	•	kW
	Active Energy -	•	•	kW
	Inductive Reactive Energy +	•	•	kVAr
	Capacitive Reactive Energy -	•	•	kVAr
	Inductive Reactive Energy -	•	•	kVAr
	Capacitive Reactive Energy +	•	•	kVAr
	Apparent Energy +	•	•	kVA
	Apparent Energy -	•	•	kVA

Event Log

The miniQloset meter records up to 1000 event logs. These logs are stored as Sequence of Events (SOE) records for meter diagnostics and troubleshooting. See Appendix G for additional information about SOE records.

Pulse Output Port

The miniQloset features pulse output ports for external accuracy verification. Contact Quadlogic for detailed usage instructions.

Communication

MODBUS RTU/RS-485 protocol

2 Wire RS-485 In/Out connections for easy installation

Optional 900 MHz wireless radio (QRadio) for remote meter locations.

Display and Button Navigation

The miniQloset has an integrated 1.7inch LCD screen to display metering and troubleshooting information. Four directional arrow keys and a central selection button allow for data navigation and setting configurations. See Section 5 for navigation instructions.

Connectivity Options

The miniQloset may be connected to a Quadlogic meter data hub by RS-485. The meter data hub seamlessly pushes meter data to the QuadQloud database for easy customer access. The data hub collects meter data over a hardwired network connection (wireless options available). Multiple QFamily devices can be daisy chained to a single data hub. See QTao spec sheet for data hub device qty limits.

Alternatively, the miniQloset may be connected to an existing building management system by MODBUS/RS-485 or BACnet system with 3rd party RS-485 to BACnet converter (provided by customer). Contact Quadlogic Customer Support for information about implementing these options.

3. SPECIFICATIONS

Reference Standards	Meter Accuracy:	ANSI-C12.20:2015
	Safety:	UL61010-1-2012 UL61010-2-030:2012 CSA C22.2 NO 61010-1 CSA C22.2 NO 61010-2-030
Reference Voltage and Current Input Ratings	Ref Voltage Range:	ANSI tested for 120 VAC (L-N) (+/- 10% tolerance)
	Current Inputs:	0-100 mA
	Frequency:	60 Hz
	Measurement Category:	CAT III 300 V
	Measurement Burden:	< 1 VA
Service Configurations	miniQloset 3EL:	120 VAC Wye (3P4W)
	miniQloset 2EL:	120 VAC Wye (2P3W)
Overload Capacity	Current:	1.2 times the rated current - continuous 10 times the rated current - 5 seconds
	Voltage:	2 times the rated voltage - 30 seconds
Dielectric Strength	4 kVAC RMS 1 minute (between input / output / case / power supply)	
Working Conditions	Temperature:	-20 °C to +55 °C
	Pollution Degree:	2
	Humidity:	RH 0% to 95% (non-condensing)
	Altitude:	Up to 2000 m
Storage Conditions	Temperature:	-25 °C to +70 °C
	Humidity:	RH 0% to 95% (non-condensing)
Working Power Supply	120-240 VAC +/-10%, 60 Hz Power required: <15 W	
Memory Size	Flash:	512 MB
	EPROM:	256 kB
	FRAM:	64 kB
Dimensions	L × H × D = 295 mm × 145 mm × 70 mm	
Mounting Options (For installation inside electrical panels only)	35 mm DIN Rail	
	Pivoting feet for wall mounting	

Figure 1: MiniQloset Dimensions

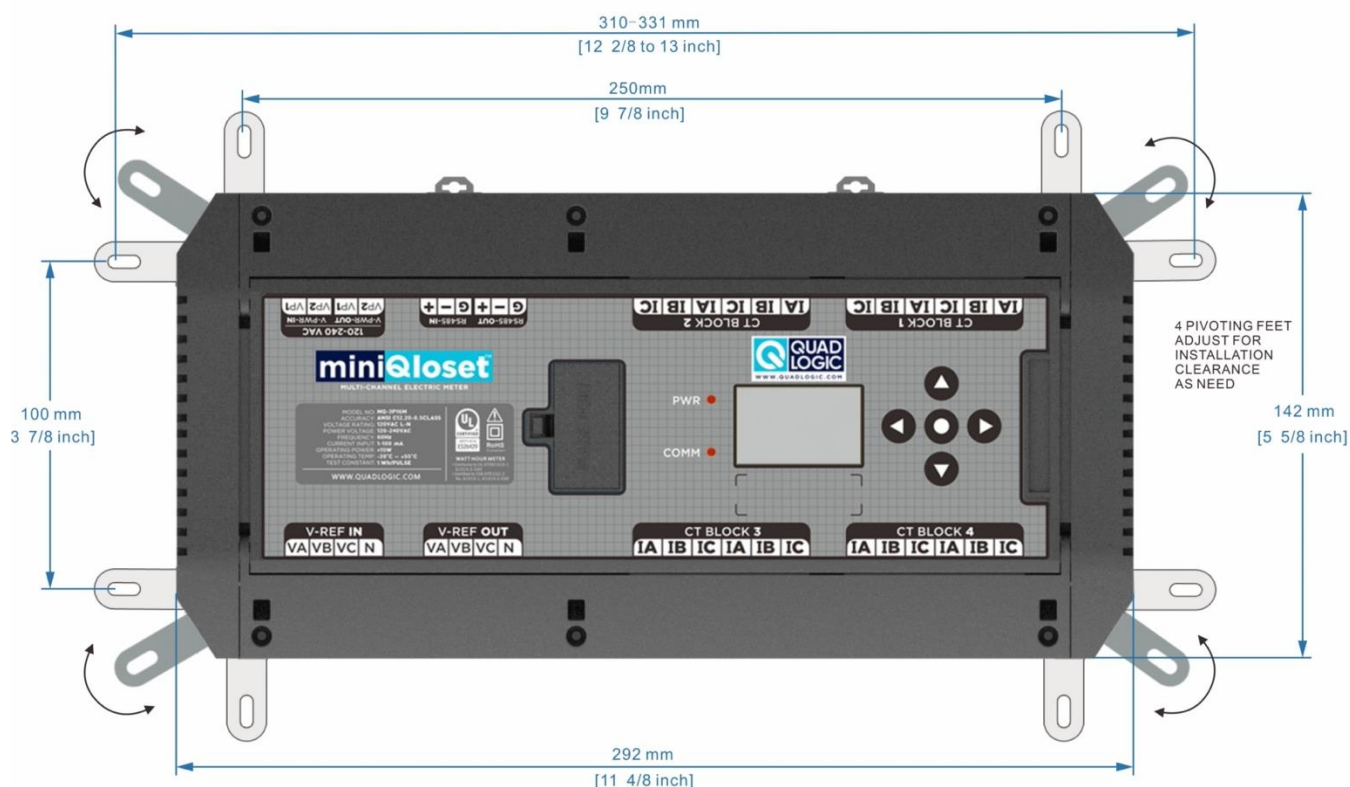


Table 2: Accuracy Specifications*

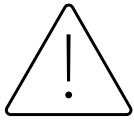
Parameter	Accuracy (+/-)	Resolution (Primary side)
Voltage	0.2%	0.01 V
Current	0.2%	0.01 A
Active Power	0.5%	0.01 W
Reactive Power	0.5%	0.01 VAR
Apparent Power	0.5%	0.01 VA
Power Factor	0.3%	0.001
Active Energy	0.5%	0.001 kWh
Reactive Energy	0.5%	0.001 kVARh
Apparent Energy	0.5%	0.001 kVAh
Frequency	0.05%	0.01 Hz

* Meter accuracy is only guaranteed when meter is installed per this manual

4. INSTALLATION INSTRUCTIONS

This chapter details the installation procedures for the miniQloset. There are general and configuration-specific instructions for the miniQloset. Configuration-specific instructions are stated as such.

Critical: Use wiring instructions that correspond to the configuration of the meter under installation.



Follow instructions and warnings to ensure proper operation of equipment and to reduce the risk of electric shock or other hazardous conditions.

Installation Table of Contents:

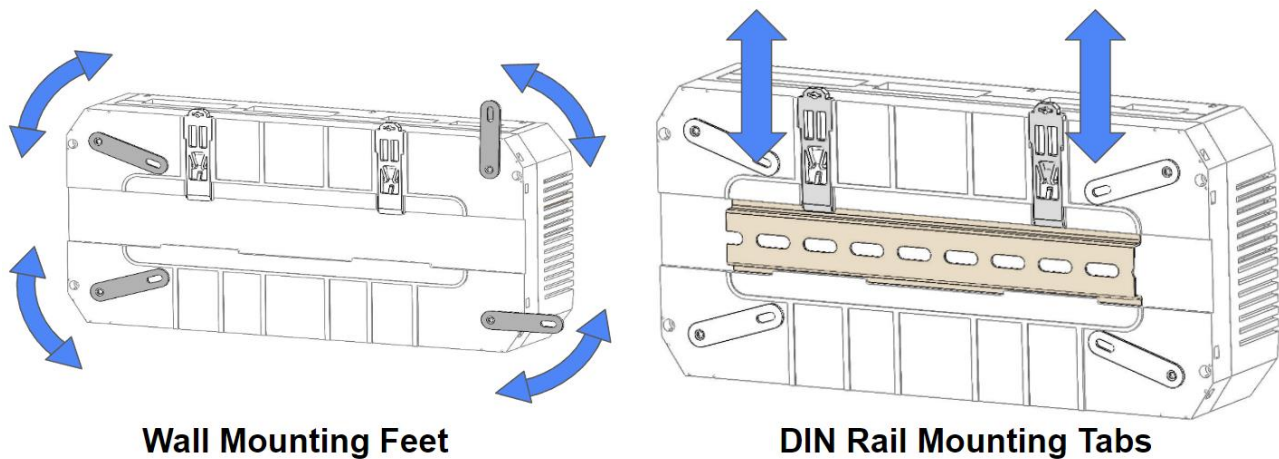
- 4.1 Mounting 10
- 4.2 Connection Terminal Access 11
- 4.3 Hardware Tamper Protection 11
- 4.4 Meter Layout 12
- 4.5 Communication Wiring Installation 13
- 4.6 Reference Voltage (V-REF) Input Installation 13
- 4.7 CT Inputs Installation 14
- 4.8 Installing Auxiliary Power Supply 15
- 4.9 Final Steps 15
- 4.10 Connecting Multiple miniQloset Units Together 16

Note: Use only Copper conductors for all installation wiring.

4.1 Mounting

The miniQloset meter has two mounting options (Figure 2). The meter can be directly fastened onto a wall or panel by using the integrated fold-out feet, or the meter can be mounted on a 35 mm DIN rail with the meter's integrated DIN rail clip.

Figure 2: MiniQloset Mounting Options



Choose a mounting option and mount the meter:

Wall Mounting (Left Diagram, Figure 2)

1. Rotate the 4 mounting feet on the rear corners of the meter.
2. Arrange the feet so that they can be fastened inside the electrical panel.
3. Secure the feet to the mounting surface with appropriate hardware (not included). Mounting feet holes are compatible with #8 machine screws.
4. Verify that the meter is securely fastened to the wall.

DIN Rail Mounting (Right Diagram, Figure 2)

1. Fasten a section of 35 mm DIN rail (at least 8 inches long) to the inside of the electrical panel with appropriate hardware (DIN rail and hardware not included).
2. Clip the miniQloset onto the rail with the plastic clips located on the rear of the meter.
3. Verify the meter is securely fastened to the DIN rail.

Note:

- The miniQloset must be mounted inside an electrical panel.
- Optionally, seal the 4 lead screws on the rear of the miniQloset before mounting the unit.

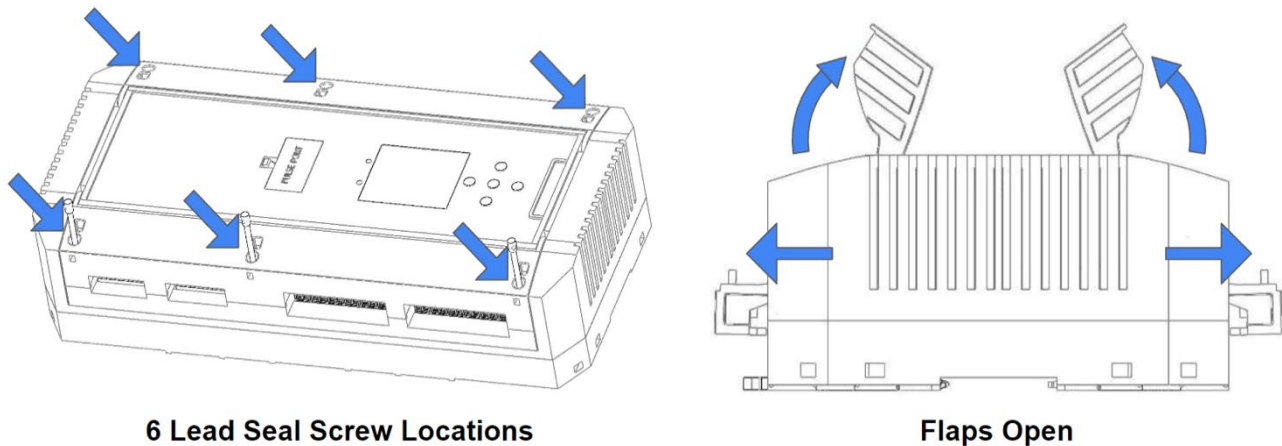
4.2 Connection Terminal Access

The miniQloset wiring terminals are protected by four plastic flaps. Each side of the meter has an upper and lower flap, as shown in Figure 3 below.

MiniQloset terminal access instructions:

1. Unscrew the six (6) lead seal screws on top of the meter. Screw locations are shown below.
2. Open the upper and lower flaps to access the connection terminals and switches.

Figure 3: Connection Terminal Access

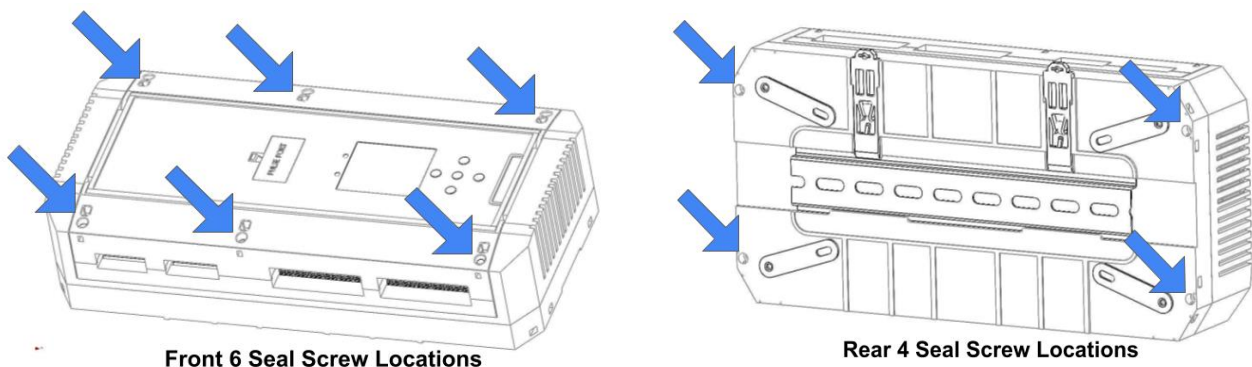


4.3 Hardware Tamper Protection (Optional)

The miniQloset shell uses lead seal screws to prevent tampering. When the flaps are closed and the screws are secure, a lead seal can be used across each screw hole to lock/seal the screw position.

Terminals on the meter are protected with six (6) lead seal screws. See diagram below for locations.

Figure 8: Tamper Protection Screw Locations



The back of the unit has four (4) seal lead screws to prevent access to the inside of the miniQloset. These four lead screws can be sealed before mounting the miniQloset.

4.4 Meter Layout

Figure 4: Front Face Layout

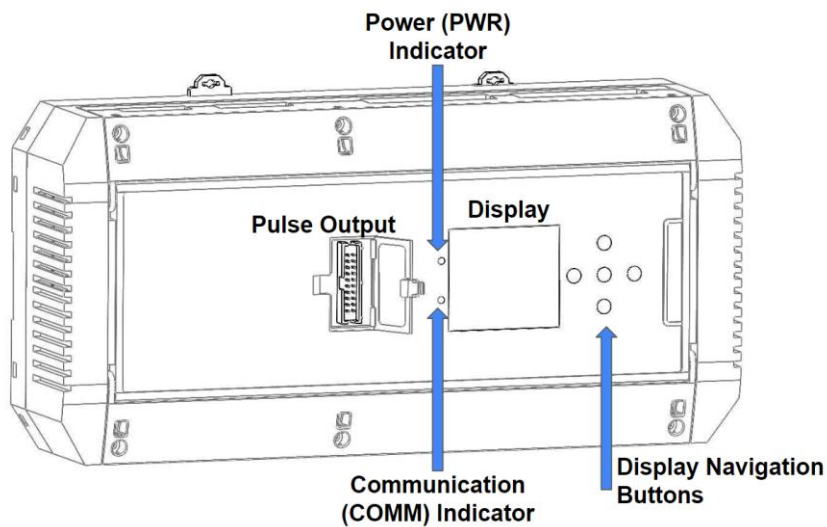


Figure 5: V-REF Side Terminals

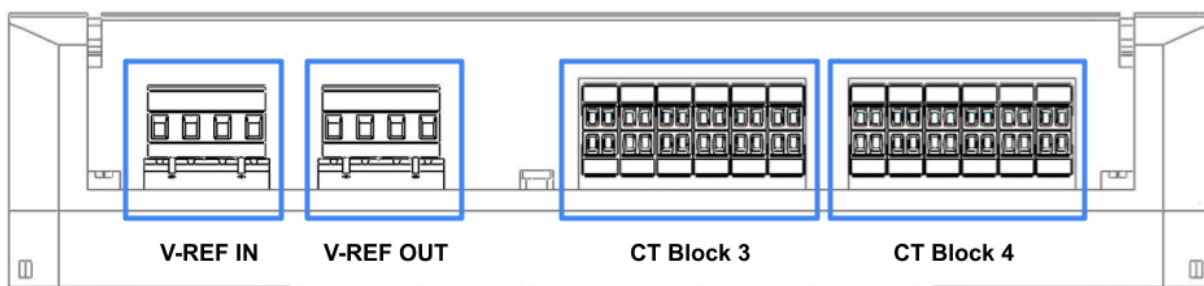
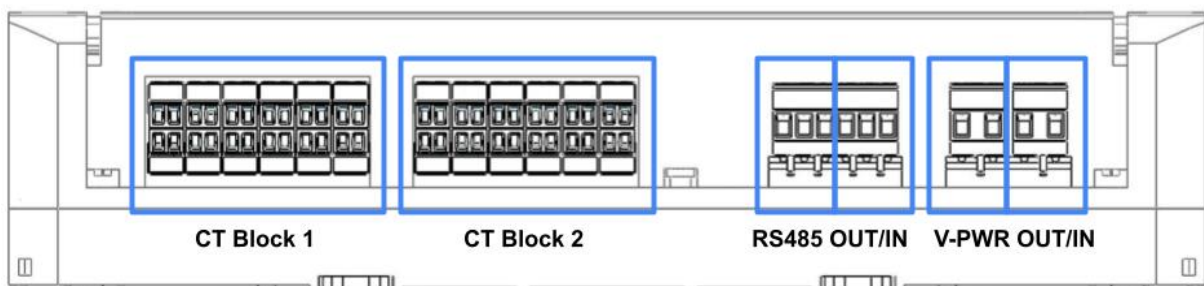


Figure 6: V-PWR Side Terminals



4.5 Communication Wiring Installation

For remote data access the miniQloset can be connected to a QTao meter data hub or third-party building management system via the RS-485 header. See *QFamily RS-485 Wiring Guidelines* (available at www.quadlogic.com) for detailed wiring specs and instructions.

WARNING: Power must be off when connecting communication wires. Refer to QTao installation manuals for detailed instructions.

Communication Wiring Installation Steps:

1. Verify that the power is off.
2. Verify that the communication wires meet the specifications listed in *QFamily RS-485 Wiring Guidelines* (available at www.quadlogic.com).
3. Locate the RS-485 header plug on the miniQloset.
4. Use the appropriate wiring diagram for your configuration (Appendix A) as a guideline for connecting the RS-485 wires to the RS-485 headers on the meter.

Note: If connecting multiple miniQloset units on the same RS-485 BUS, refer to section 4.10

4.6 Reference Voltage (V-REF) Input Installation

Reference voltage (V-REF) input **requirements:**

- Follow all applicable local and national electrical codes when wiring the reference voltage inputs. Install fuses and disconnects where necessary.
- V-REF wires must be between 14-20 AWG and rated for the appropriate voltage.
- The meter must be installed with a local disconnect (switch, breaker, etc.) and branch service protection (fuse, breaker, etc.) on V-REF lines. The disconnect and service protection may be provided by the same device. The service protection should be rated for a minimum of 4 Amps at 240 V. The disconnect rating should be determined by wire gauge and local electrical code.
- V-REF terminal block torque specification: 4.5 in-lb. to 5.3 in-lb.
- The miniQloset is intended for true 3-phase 120 VAC L-N Wye metering.

WARNING: Verify power is OFF when connecting V-REF wires.

Reference Voltage Installation Steps:

1. Verify that the power is off.
2. Locate the V-REF terminal plug on the miniQloset.
3. Locate the incoming reference voltage wires in the distribution panel.
 - If connecting multiple units, see section 4.10 for details.
4. Use the appropriate wiring diagram for your configuration in Appendix A as a guideline for connecting the incoming voltage wires to the V-REF terminals on the meter.

4.7 CT Inputs Installation

Current input requirements:

- The standard input current for the miniQloset is 100 mA.
- Use class 0.1 CTs to maintain ANSI class 0.5-meter accuracy.
- For NY residential installations the NYPSC requires CT models CT162W or CT163W (available from Quadlogic Controls Corp.)
- CT terminals are rated for 16 AWG to 20 AWG wire.
- CTs must meet or exceed the following safety guidelines: UL 61010-1, 61010-2-032, CSA C22.2# 61010-1, 61010-2-032, CAT III 300V.
- CT terminal block screw torque specification: 2 in-lb. to 2.2 in-lb.



This meter requires UL listed energy monitoring and utility grade CTs rated for the maximum installation voltage.

Safety Guidelines:

- Always open or disconnect circuit from power-distribution system (or service) of building before installing or servicing current sensors.
- Do not install current transformers in an area where it would block ventilation openings.
- Do not install current transformers in or near an area of breaker arc venting.
- Secure current transformers and route conductors so that the conductors do not directly contact live terminals or BUS. This instruction is optional if the integrated field wiring lead or associated cable insulation of the current sensor is rated for 105°C (221°F) or greater. Current transformers with terminals (where the conductors are supplied during installation) are still subject to this requirement.
- Do not install current transformers in a wiring space of enclosures for switches or overcurrent devices if the area of all current transformers, conductors, splices, taps, and equipment at any cross section of the wiring space exceeds 75 percent of the cross-sectional area of that space.
- Not suitable for Class 2 wiring methods.
- Not intended for connection to Class 2 equipment.
- Current transformers marked “BASIC INSULATION” shall be installed on insulated conductors only and should never contact live parts.

WARNING: To reduce the risk of electric shock, always open or disconnect the circuit from the power-distribution system (or service) of a building before installing or servicing current transformers.

Current Transformer Installation Requirements:

- Never install a CT on the live feeder wire with open secondary leads. Use the provided CT shorting PCB to short secondary CT leads during the installation process.
- Always observe the physical orientation of CT (LINE/LOAD) when installing on the feeder wire.
- Always pay attention to wiring polarity and phasing when terminating the CT leads to the miniQloset.
- Follow the table below if extending the CT lead wires is necessary.
- If extending CT lead length, always use the same lead color as the original.
- Always label the CT leads near the CT and at the end of the lead to avoid confusion when terminating to the miniQloset.

**** Failure to follow the termination procedure outlined in this manual may result in incorrect readings, damage to the metering equipment, and/or physical harm to the installer. ****

Table 4: CT Wiring Extension Specifications

CT secondary wire size (AWG)	Total CT secondary wire length (ft)
# 20	88
# 18	140
# 16	223

Note: CT wiring diagram is different for 2EL and 3EL configurations. See Appendix A for detailed diagrams.

CT Inputs Installation Steps:

1. Verify that the power is off.
2. Locate the wiring diagram that corresponds to your meter configuration. See Appendix A
3. Locate the branch load hot wires that supply current from the distribution panel to the metered loads.
4. For each CT, the secondary wires should be shorted together until the CT installation is complete.
Warning: Failure to short CTs during installation may result in damage to CTs or harm the installer.
5. For solid core CTs, disconnect the load wires one (or two) at a time. Run each phase wire (or pair of wires) through a CT.
6. For split core CTs, place the two halves of the core around the load wire and close them together.
7. Follow direction indicators on the CTs to ensure CT is in the correct orientation.
8. Reconnect each branch load wire after the CT is installed.
9. Run CT secondary wires to miniQloset.
10. Connect the secondary wires to the terminal plugs on the current inputs of the miniQloset. Use the appropriate wiring diagram in Appendix A as a reference for making these connections.
Note: It is important that the 2 wires from an individual CT go to the proper terminals on the meter.
11. If necessary, restore power to the branch load wires. Otherwise, keep the power off until installation is complete.

4.8 Installing Auxiliary Power Supply

Installation Requirements:

- The miniQloset operates from power supplied to the V-PWR terminals. The meter requires a power source with the following specifications: 120-240 VAC, 60 Hz, >15 W. V-PWR may be the same as the power connected to the voltage inputs (V-REF), or it can be from a separate source.
- When daisy chaining multiple miniQlosets on the same V-PWR BUS, ensure that the power supply is rated for at least 5 W per miniQloset.
- The meter must be installed with some type of local disconnect (switch, breaker, etc.) and branch service protection (fuse, breaker, etc.) on the V-PWR lines. The disconnect and service protection may be provided by the same device. The service protection should be rated for a minimum of 4 Amps at 240V. The maximum rating is determined by wire gauge and local electrical code.
- V-PWR terminal screw torque specification: 4.5 in-lb. to 5.3 in-lb.

Installation instructions:

1. Verify that the power is off.
2. Locate source of power (120-240 VAC, 60 Hz, >15 W).
 - a. If connecting multiple units, see 10 for details.
3. Connect the power source wires to the terminals on the V-PWR meter plug. Note: the polarity of these connections does not matter.

4.9 Final Steps

1. Verify that all wiring has been installed correctly.
2. Restore power to the metered loads and to the V-PWR terminal on the meter.
3. The PWR LED should be illuminated.
4. Close the meter terminal covers and secure with screws. Optionally: Seal the six (6) lead screws securing the terminal covers.

4.10 Wiring Multiple miniQloset Units

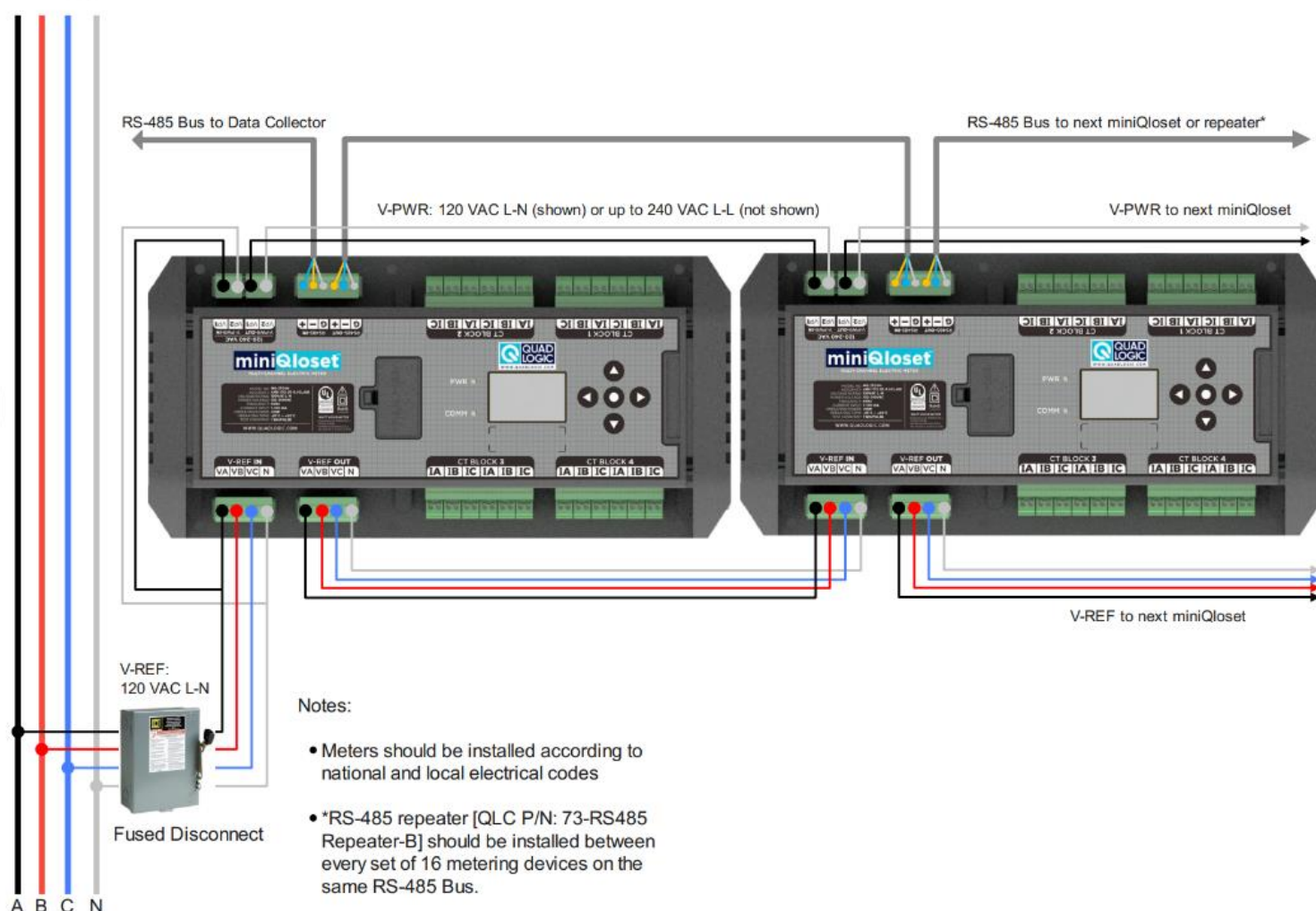
The miniQloset has in/out terminals for V-REF, V-PWR, and RS-485 communication. Use the following diagrams to daisy chain multiple miniQloset together.

WARNING: Verify power is OFF when connecting wires.

Note:

- **IN/OUT** terminals for V-PWR, V-REF, AND RS-485 ports are used to daisy chain miniQloset meters.
- **RS-485**
 - The Quadlogic metering system allows for a maximum of 16 units to connect on one RS-485 BUS without any additional hardware.
 - If more than 16 units need to be daisy chained on the same BUS, an RS-485 repeater must be installed between each set of 16 devices. Contact Quadlogic for purchasing repeaters.
- **V-PWR**
 - Ensure that the power supply is rated for at least 5 W per miniQloset.

Figure 7: V-PWR, V-REF, and COMM Daisy Chaining for Multiple MiniQlosets



5. DISPLAY & BUTTON OPERATION

The miniQloset has a 32 x 23 mm LCD screen for viewing metering parameters and meter configuration. Some configuration options may be changed from the display.

After powering up, the miniQloset will show a welcome screen and perform a self-check.

Four directional arrow keys and a central selection button are located to the right of the LCD screen. These buttons are used to navigate through the metering parameter displays and configuration menus. Button functions are shown in Table 5 below.

Detailed display tree diagrams can be found in Appendix B.

6. TROUBLESHOOTING

Meter Does Not Power On

1. Ensure the V-PWR terminals are wired according to Section 4.1
2. Verify that fuses or disconnects (max 4 A) on V-PWR lines are intact.
3. Measure the voltage connections at the V-PWR terminal. Contact Quadlogic Technical Support if the proper voltage is present, the PWR LED indicator is OFF, and the screen has no response.

Issues Communicating with Meter

1. Check the red "COMM indicator" LED. It should blink when a MODBUS master/reader device sends commands.
2. If the "COMM indicator" LED does not blink when the MODBUS master is sending commands, contact Quadlogic Technical Support.
3. Make sure that the RS-485 wires are connected properly at the meter COMM port.
4. Check that the RS-485 system has been wired according to the specifications and recommendations in the *QFamily RS-485 Wiring Guidelines* document available on the Quadlogic website.
5. If issues persist, contact Quadlogic Technical Support.

Incorrect Meter Readings

1. If the meter is reading zero (0) Volts:
 - a. Measure the voltage connections at the voltage input terminals (V-REF)
 - b. If the measured voltage is zero, determine why the reference voltage is off, and turn it on in a safe manner. Verify that this solves the meter reading issue.
 - c. If the voltage on the V-REF terminals is non-zero and the meter is still reading zero Volts, contact Quadlogic Technical Support for help.
2. If the meter is reading negative Watts and/or has a power factor below 0.87 on each CT / phase:
 - a. Verify proper connection of CT secondaries.
 - b. Verify that the CT polarity is correct.
 - c. Verify that the CT is installed on the correct phase.
 - d. If metering large inductive loads (such as Elevators, HVAC equipment, and pumps), phase diagnostics may not be an accurate verification of proper meter operation.
 - e. Contact Quadlogic Technical Support for further diagnostic assistance.

7. MAINTENANCE

The miniQloset does not require routine maintenance. Power off the meter if the system infrastructure requires maintenance.

Contact QLC customer support for any issues with the miniQloset.

Appendix A - Wiring Diagrams

Figure 1: Voltage and Communication Wiring Diagrams

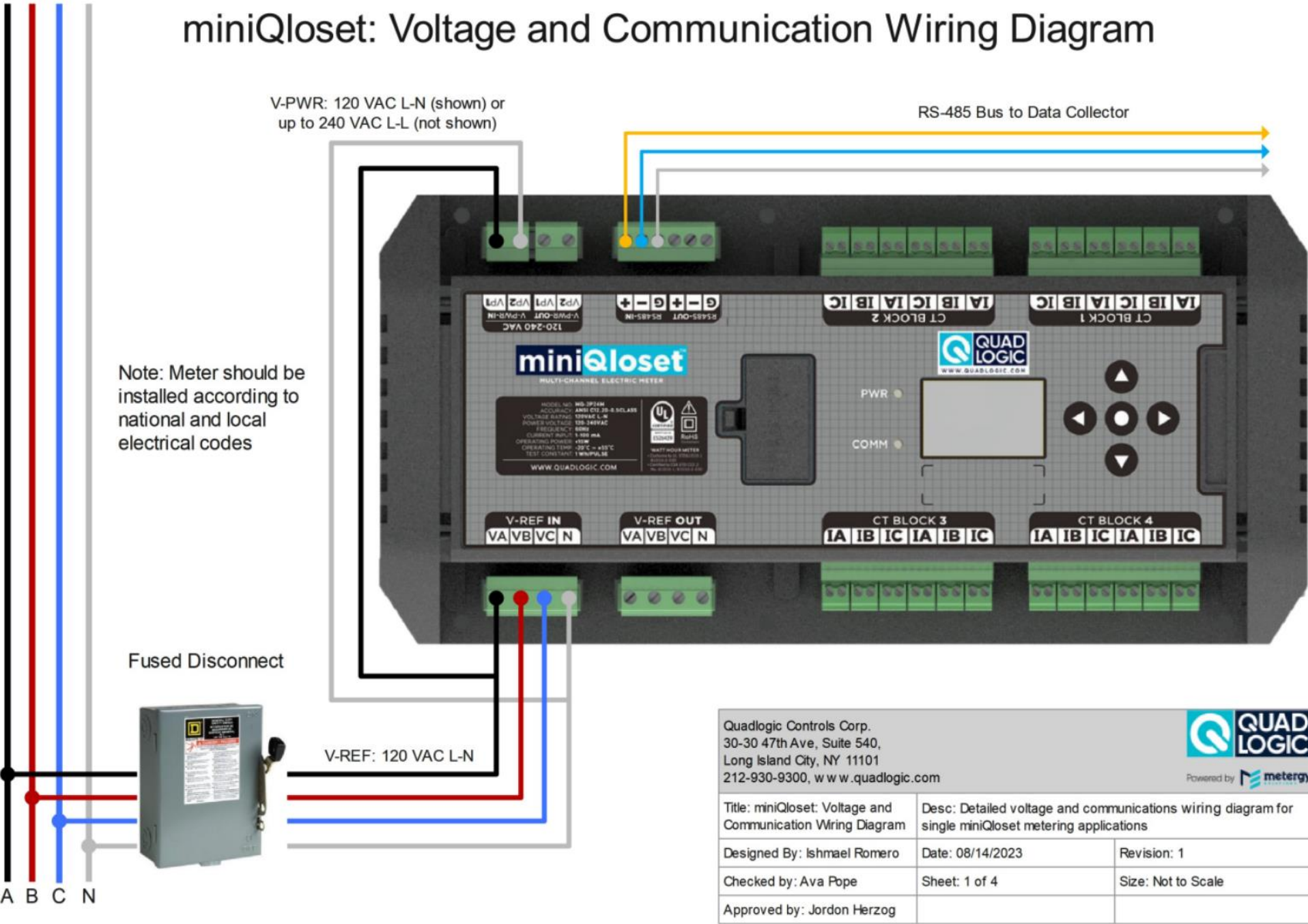
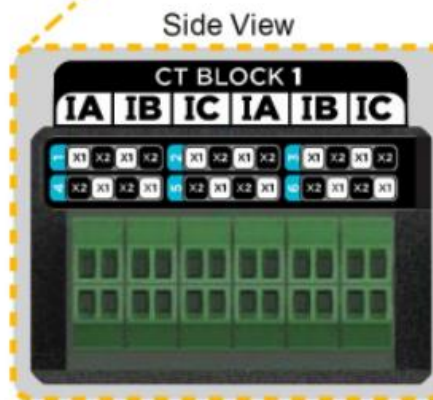
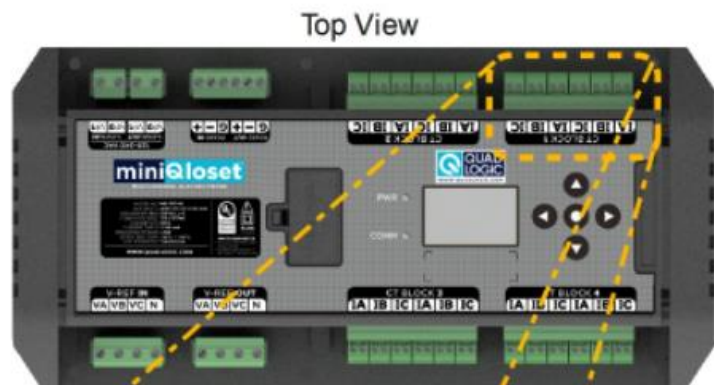
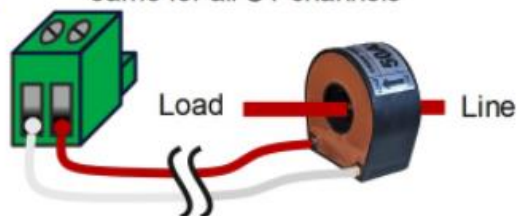


Figure 2: MiniQloset 2EL – CT Connections to Metering Points 1 - 6

miniQloset 2EL: CT Connection Wiring Diagram

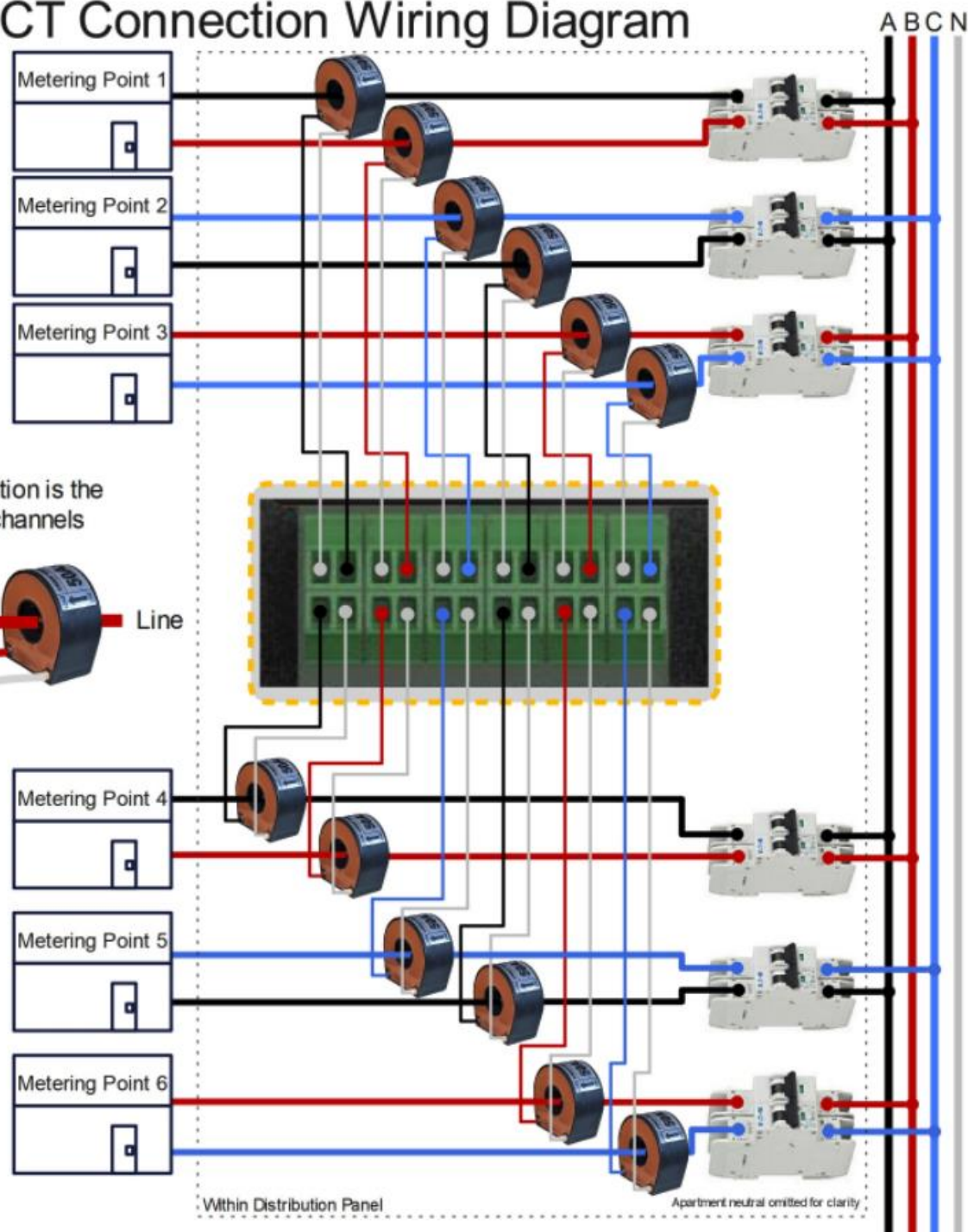


Connector termination is the same for all CT channels



Notes:

- A single miniQloset 2EL supports a maximum of 24 metering points.
- Refer to manual for CT lead extension specs.
- All CT blocks follow the same CT termination pattern.



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Title: miniQloset 2EL: CT
Connection Wiring Diagram

Desc: Detailed miniQloset 2EL CT wiring diagram

Designed By: Ishmael Romero

Date: 08/14/2023

Revision: 1

Checked by: Ava Pope

Sheet: 3 of 4

Size: Not to Scale

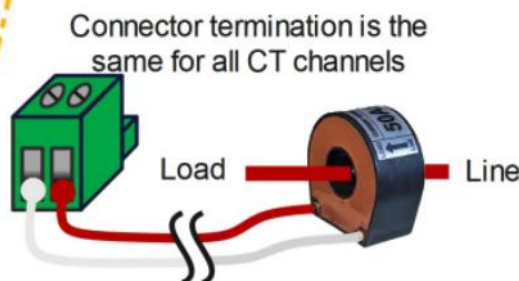
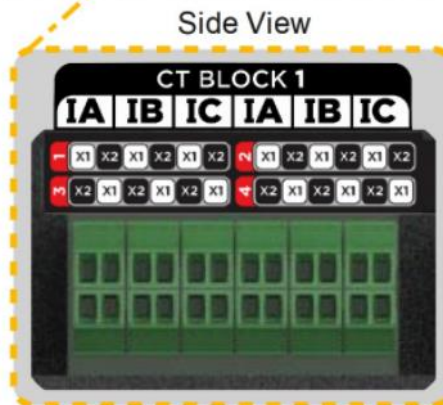
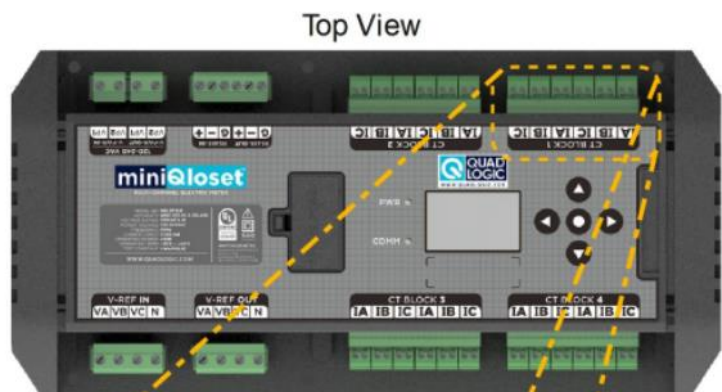
Approved by: Jordon Herzog

Within Distribution Panel

Apartment neutral omitted for clarity

Figure 3: MiniQloset 3EL CT Connections to Metering Points

miniQloset 3EL: CT Connection Wiring Diagram



Notes:

- A single miniQloset 3EL supports a maximum of 16 metering points.
- Refer to manual for CT lead extension specs.
- All CT blocks follow the same CT termination pattern.

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Title: miniQloset 3EL: CT
Connection Wiring Diagram

Desc: Detailed miniQloset 3EL CT wiring diagram..

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Date: 08/14/2023

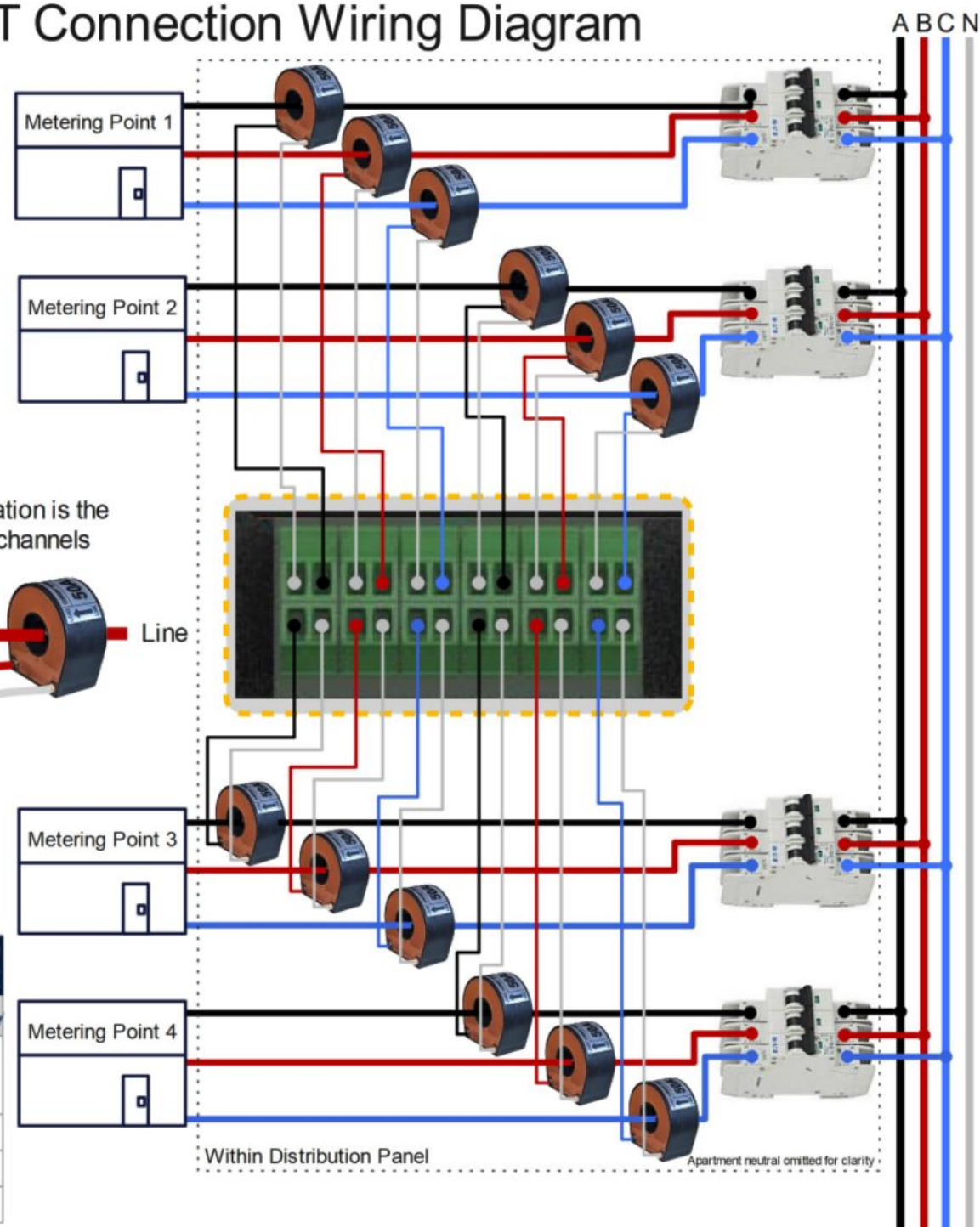
Revision: 1

Checked by: Ava Pope

Sheet: 4 of 4






Size: Not to Scale

Approved by: Jordon Herzog



Appendix B - Menu Tree Navigation

Table 1: Display Navigation Button Functions

	<ol style="list-style-type: none"> 1. Scroll up through menu rows (see display tree). 2. Scroll up through metering pts when a meter pt. parameter is displayed 3. Increment value or select different setting when in configuration mode
	<ol style="list-style-type: none"> 1. Scroll down through menu rows (see display tree). 2. Scroll down through metering pts when a meter pt. parameter is displayed. 3. Decrement value or select different setting when in configuration mode
	<ol style="list-style-type: none"> 1. Cycle through columns (see display tree). 2. When the left button is pressed on the first screen in the row, it will navigate to the next higher layer of menu
	<ol style="list-style-type: none"> 1. Cycle through the columns (see display tree). 2. When the right button is pressed on the last screen in the row, it will navigate to the first screen in the same layer.
	<p>Short press:</p> <ol style="list-style-type: none"> 1. Takes the screen up one level in the display tree. 2. The display will not change if the display is at the top level of either the "Main" or the "Config" tree. 3. If pressed while the display is in an "Edit" screen, then the "Edit" function is canceled. <p>Press and hold for 5 seconds:</p> <ol style="list-style-type: none"> 1. This will switch between the "Main" and the "Config" menus. This change always goes to the "Home" screen for the "Main" or the "Config" menus. 2. When the display is in an "edit" screen, then the "edit" function is canceled as if "exit" or "no" was selected from the "edit" screen.

Note:

- Edit mode is indicated with a down arrow symbol in the upper right corner of the display.

Figure 1: Main Menu - 3EL Model

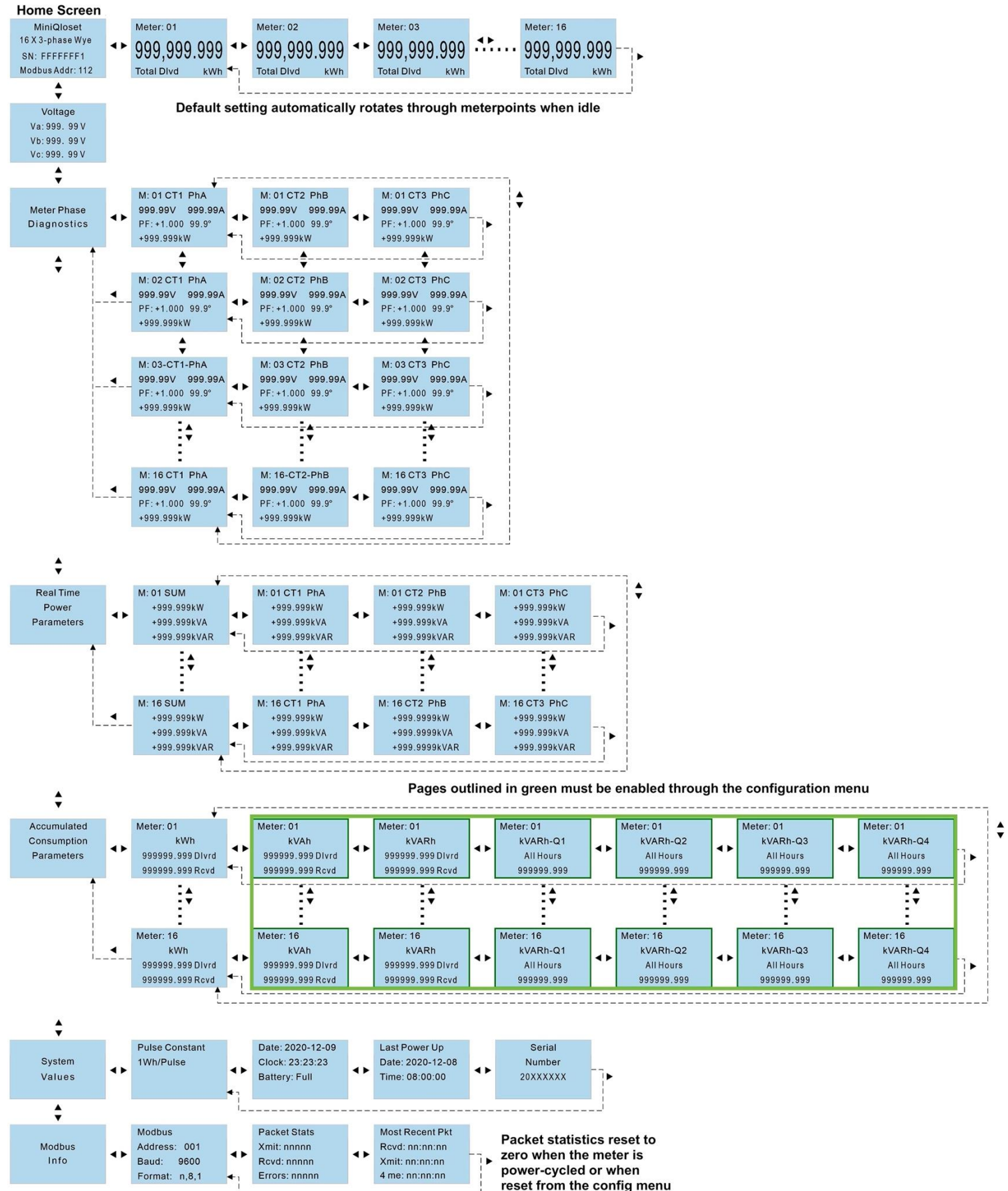


Figure 2: Main Menu - 2EL Model

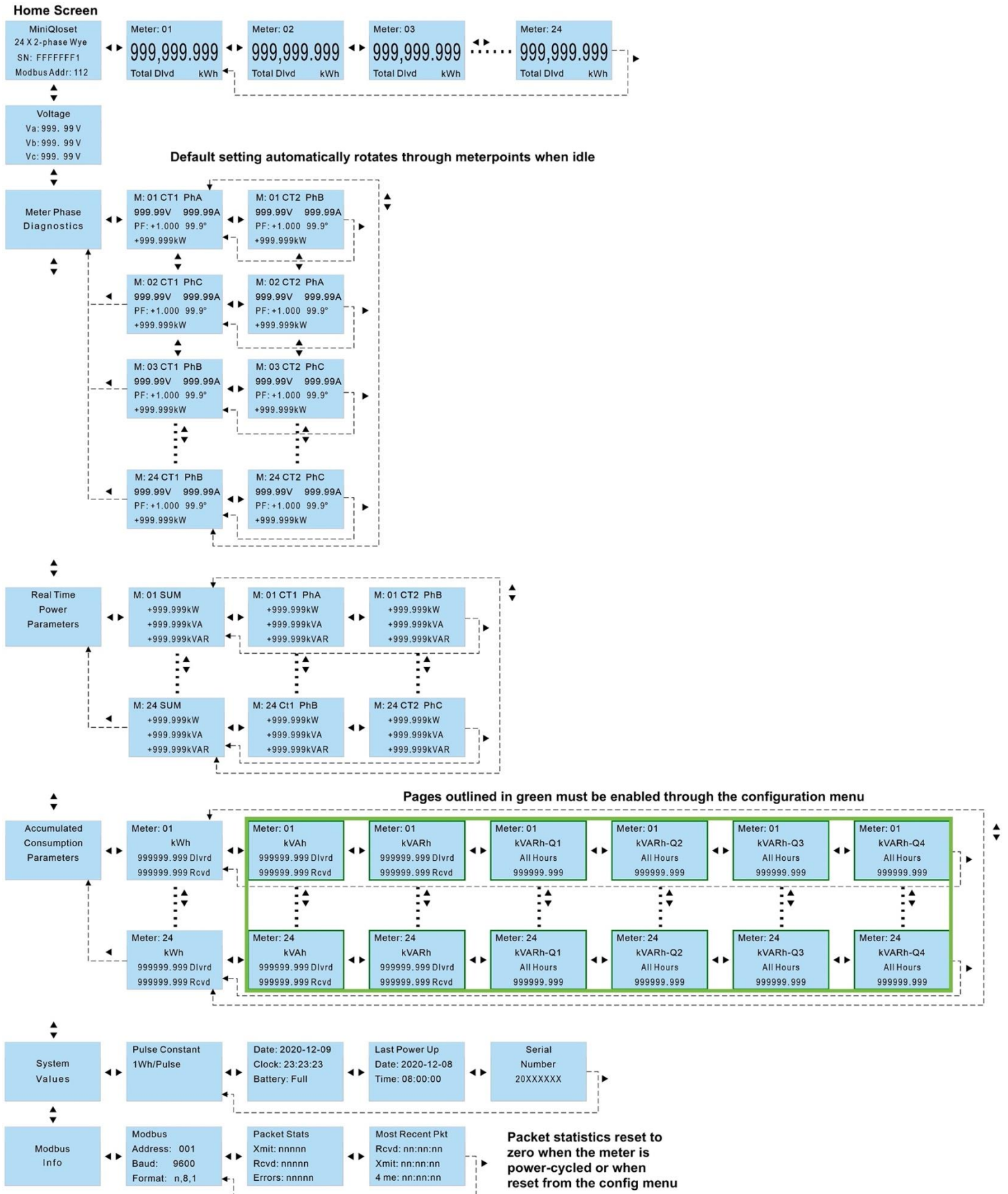
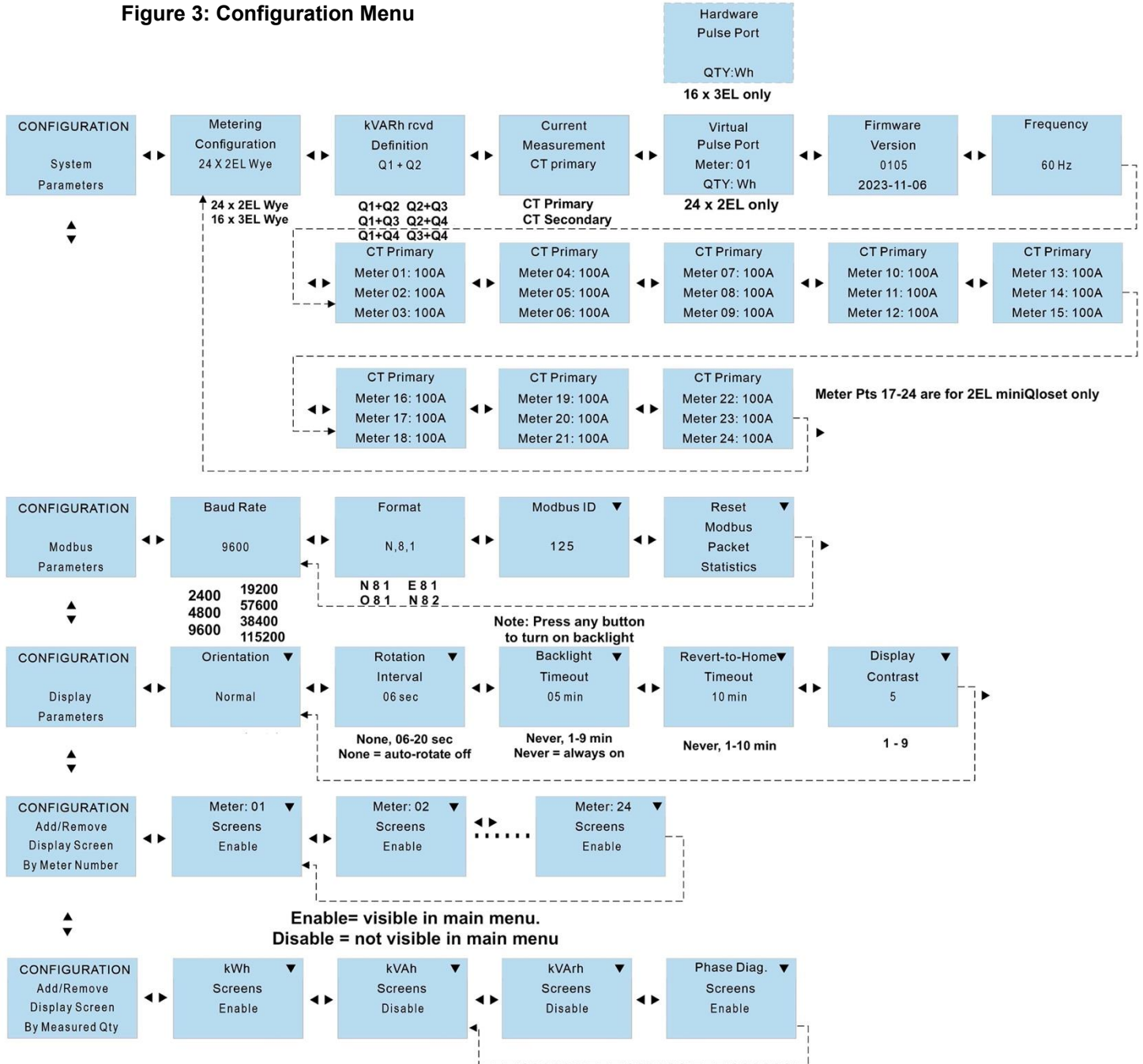


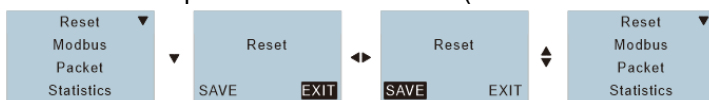
Figure 3: Configuration Menu



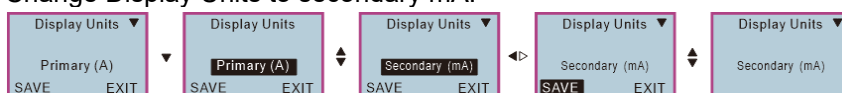
- For screens that allow changes (down arrow in upper right corner) push the down button to enter edit mode.
- Some configuration parameters may be locked by default. Contact Quadlogic if you have any issues.

Using the Configuration Menu - examples:

Reset Modbus packet statistics record (Main menu under Modbus Debugging)



Change Display Units to secondary mA:



Appendix C - MODBUS Register Map Usage

MODBUS © Protocol

Table 1: MODBUS RTU Frame Format

Address code	1 BYTE	MODBUS device address 1-247
Function code	1 BYTE	Indicates the function code
Data code	4 BYTES	Starting address, high byte Starting address, low byte Number of registers, high byte Number of registers, low byte
Error Check code	2 BYTES	Cyclic Redundancy Check (CRC)

Table 2: MODBUS Functions

Code:	Meaning:	Description:
FUNCTION 03H	Reading single or multiple registers	<i>This function is used to read register values</i>
FUNCTION 06H	Writing to a single register	<i>Write value into the relevant register (s)</i>
FUNCTION 10H	Writing to multiple registers	

Note:

- The default data values (Not Energy Data) use the IEEE754 standard single precision float format, little endian (lower byte first)
- Example MODBUS read default data value: 19H 9AH 43H 5CH
Bytes re-ordered before conversion: 435C199A (HEX)
Converted to an IEEE754 float: 220.100006(DEC)
- Energy data is stored as a value precise to three decimal places shifted to the left (multiplied by 1000). Essentially, the value is stored as Wh, VARh, VAh in a 4 byte “long” integer. To convert back to kWh, kVARh, or kVAh, this value must be divided by 1000.

Appendix D – MODBUS Meter Data Registers

Table 3: Basic Parameters (per channel/CT), Read Only, “03H” Code to Read

Reg Addr.	Parameter	Data	# of regs	Description
0	U1	float	2	Phase to line voltage, unit V
2	U2	float	2	
4	U3	float	2	
...	
94	U48	float	2	
96	I1	float	2	Current, unit A
98	I2	float	2	
100	I3	float	2	
...	
190	I48	float	2	
192	P1	float	2	Active power, unit kW
194	P2	float	2	
196	P3	float	2	
...	
286	P48	float	2	
288	Q1	float	2	Reactive power, unit kVAR
290	Q2	float	2	
292	Q3	float	2	
...	
382	Q48	float	2	
384	S1	float	2	Apparent power, unit KVA
386	S2	float	2	
388	S3	float	2	
...	
478	S48	float	2	
480	PF1	float	2	Power factor, 0~1.000 (Follows IEC convention)
482	PF2	float	2	
484	PF3	float	2	
...	
574	PF48	float	2	
576	Ep1+	Long	2	Active energy delivered, unit 0.001 kWh
578	Ep2+	Long	2	
580	Ep3+	Long	2	
...	
670	Ep48+	Long	2	
672	Ep1-	Long	2	Active energy received, unit 0.001 kWh
674	Ep2-	Long	2	
676	Ep3-	Long	2	
...	
766	Ep48-	Long	2	
768	Eq1_1	Long	2	Quadrant 1 reactive energy, unit 0.001 kVARh
770	Eq2_1	Long	2	
772	Eq3_1	Long	2	
862	Eq48_1	Long	2	
864	Eq1_2	Long	2	Quadrant 2 reactive energy,

Reg Addr.	Parameter	Data	# of regs	Description
866	Eq2_2	Long	2	unit 0.001 kVARh
868	Eq3_2	Long	2	
...	
958	Eq48_2	Long	2	
960	Eq1_3	Long	2	Quadrant 3 reactive energy, unit 0.001 kVARh
962	Eq2_3	Long	2	
964	Eq3_3	Long	2	
...	
1054	Eq48_3	Long	2	
1056	Eq1_4	Long	2	Quadrant 4 reactive energy, unit 0.001 kVARh
1058	Eq2_4	Long	2	
1060	Eq3_4	Long	2	
...	
1150	Eq48_4	Long	2	
1152	Es1+	Long	2	Apparent energy delivered, unit 0.001 kVAh
1154	Es2+	Long	2	
1156	Es3+	Long	2	
...	
1246	Es48+	Long	2	
1248	Es1-	Long	2	Apparent energy received, unit 0.001 kVAh
1250	Es2-	Long	2	
1252	Es3-	Long	2	
...	
1342	Es48-	Long	2	

Table 4: Real-time Parameters per Metering Point (primary side value)

Reg Addr.	Parameter	Data	# of regs	Description
1344	P Σ 1	float	2	Active power, unit kW
1346	P Σ 2	float	2	
1348	P Σ 3	float	2	
...	
1390	P Σ 24	float	2	
1392	Q Σ 1	float	2	Reactive power, unit kVAR
1394	Q Σ 2	float	2	
1396	Q Σ 3	float	2	
...	
1438	Q Σ 24	float	2	
1440	S Σ 1	float	2	Apparent power, unit kVA
1442	S Σ 2	float	2	
1444	S Σ 3	float	2	
...	
1486	S Σ 24	float	2	
1488	PF Σ 1	float	2	Power factor, 0~1.000 (Follows IEC Convention)
1490	PF Σ 2	float	2	
1492	PF Σ 3	float	2	
...	
1534	PF Σ 24	float	2	
1536	FR1	float	2	Frequency, unit 0.01 Hz
1538	FR2	float	2	
1540	FR3	float	2	
...	
1582	FR24	float	2	
1584	Epz1+	Long	2	Active energy delivered, unit 0.001 kWh
1586	Epz2+	Long	2	
1588	Epz3+	Long	2	
...	
1630	Epz24+	Long	2	
1632	Epz1-	Long	2	Active energy received, unit 0.001 kWh
1634	Epz2-	Long	2	
1636	Epz3-	Long	2	
...	
1678	Epz24-	Long	2	
1680	Eqz1_1	Long	2	Quadrant 1 reactive energy, unit 0.001 kVARh
1682	Eqz2_1	Long	2	
1684	Eqz3_1	Long	2	
...	
1726	Eqz24_1	Long	2	
1728	Eqz1_2	Long	2	Quadrant 2 reactive energy, unit 0.001 kVARh
1730	Eqz2_2	Long	2	
1732	Eqz3_2	Long	2	
...	
1774	Eqz24_2	Long	2	
1776	Eqz1_3	Long	2	Quadrant 3 reactive energy unit 0.001 kVARh
1778	Eqz2_3	Long	2	

Reg Addr.	Parameter	Data	# of regs	Description
1780	Eqz3_3	Long	2	Quadrant 3 reactive energy unit 0.001 kVARh
...	
1822	Eqz24_3	Long	2	
1824	Eqz1_4	Long	2	Quadrant 4 reactive energy, unit 0.001 kVARh
1826	Eqz2_4	Long	2	
1828	Eqz3_4	Long	2	
...	
1870	Eqz24_4	Long	2	
1872	Esz1+	Long	2	Apparent energy delivered, unit 0.001 kVAh
1874	Esz2+	Long	2	
1876	Esz3+	Long	2	
...	
1918	Esz24+	Long	2	
1920	Esz1-	Long	2	Apparent energy received, unit 0.001 kVAh
1922	Esz2-	Long	2	
1924	Esz3-	Long	2	
...	
1966	Esz24-	Long	2	

Note: For the 3EL x 16 miniQloset, meter points 17-24 can be ignored

Table 5: Each CT Channel Real-time Fundamental Parameters (primary side value)

Reg Addr.	Parameter	Data	# of regs	Description
28000	U1	float	2	Phase to line voltage, unit V
28002	U2	float	2	
28004	U3	float	2	
...	
28094	U48	float	2	
28096	I1	float	2	Current, unit A
28098	I2	float	2	
28100	I3	float	2	
...	
28190	I48	float	2	
28192	P1	float	2	Active power, unit kW
28194	P2	float	2	
28196	P3	float	2	
...	
28286	P48	float	2	
28288	Q1	float	2	Reactive power, unit kVAR
28290	Q2	float	2	
28292	Q3	float	2	
...	
28382	Q48	float	2	
28384	S1	float	2	Apparent power, unit kVA
28386	S2	float	2	
28388	S3	float	2	
...	
28478	S48	float	2	
28480	PF1	float	2	Power factor, 0~1.000 (Follows IEC convention)
28482	PF2	float	2	
28484	PF3	float	2	
...	
28574	PF48	float	2	

Table 6: Metering Point Real-Time Fundamental Parameters (primary side values)

Reg Addr.	Parameter	Data	# of regs	Description
28576	P Σ 1	float	2	Active power, unit kW
28578	P Σ 2	float	2	
28580	P Σ 3	float	2	
...	
28622	P Σ 24	float	2	
28624	Q Σ 1	float	2	Reactive power, unit kVAR
28626	Q Σ 2	float	2	
28628	Q Σ 3	float	2	
...	
28670	Q Σ 24	float	2	
28672	S Σ 1	float	2	Apparent power, unit kVA
28674	S Σ 2	float	2	
28676	S Σ 3	float	2	
...	
28718	S Σ 24	float	2	
28720	PF Σ 1	float	2	Power factor, 0~1.000 (Follows IEC convention)
28722	PF Σ 2	float	2	
28724	PF Σ 3	float	2	
...	
28766	PF Σ 24	float	2	

Table 7: Meter Status and Info, read only, "03H" code to read

Reg Addr.	Parameter	Data	# of regs	Description
4120	Battery status	Int	1	Normal (>2.7 V): 0 Low voltage (<2.7 V): 1
4121	K-485 switch status	Int	1	0: locked (protected registers cannot be modified) 1: un-locked (protected registers may be modified)
4122	Internal memory status	Int	1	0: normal 1: abnormal Bit 0- FRAM, Bit 1- EEPROM, Bit 2- Flash
4123	Record interval	Int	1	Fixed at 5 min
4124	Active flash page ID	Int	1	The flash page and segment number that is currently being used to store data Bit 7-0: Segments range:1-16 Bit 15-8: Page range: 1-180
4125	Firmware published year	Int	1	Decimal value: 4 digits
4126	Firmware published month	Int	1	Decimal value range: 1-12
4127	Firmware published day	Int	1	Decimal value range: 1-31
4128	Software version	Int	1	High byte for major version update, low byte for minor version change
4129	Serial number	Long	2	8-digit (hex) model and serial number, format mm-xxxxxx
4131	RTC Clock Counter	Int	1	Counter of the number of times the RTC has been modified. This counter is reset to zero when the interval energy record is erased by writing to modbus register 4301
4132	CTEP	Int	1	N/A
4133	MC	Int	1	N/A
4199	Manufacturer's code	int	1	Default: 06

Appendix E – Modbus Map: Meter configuration, read and write (read “03H”, write “06H/10H”)

Table 1: Read and Write Registers (NOT write-protected by K-485 switch)

Reg Addr.	Item	Data	# of regs	Description
4020	RS485 address	Int	1	1-247
4021	RS485 baud rate	Int	1	0: 2400 4: 38400 1: 4800 5: 57600 2: 9600 6: 115200 3: 19200
4022	RS485 data format	Int	1	0: n.8.1 2: e.8.1 1: o.8.1 3: n.8.2
4023	Year & Month	Int	1	Bit 15-8: Year range: 0-99 Bit 7-0: Month range: 1-12
4024	Day & Hour	Int	1	Bit 15-8: Day range: 1-31 Bit 7-0: Hour range: 0-23
4025	Minute & Second	Int	1	Bit 15-8: Minute range: 0-59 Bit 7-0: Second range: 0-59
4026	Day of the Week	Int	1	Bit 15-8: Day of week range: 1-7 Bit 7-0: reserved
4028	Pulse output signal type	Int	1	0: Wh 1: VARh 2: VAh
4029	MCU virtual pulse metering point	Int	1	Range: 1-24 (Only valid for 2P3W)
4030	kVARh Divd Definition	Int	1	0: Q1+Q2 3: Q2+Q3 1: Q1+Q3 4: Q2+Q4 2: Q1+Q4 5: Q3+Q4
4031	Display kWh?	Int	1	0: Disable kWh screen 1: Enable kWh screen
4032	Display kVAh?	Int	1	0: Disable kVAh screen 1: Enable kVAh screen
4033	Display kVARh?	Int	1	0: Disable kVARh screen 1: Enable kVARh screen
4034	Display phase diagnostics?	Int	1	0: Disable Phase Diag. screen 1: Enable Phase Diag. screen
65000	User register_1	Int	1	Range: 0-65535
65001	User register_2	Int	1	Range: 0-65535
.....
65013	User register_14	Int	1	Range: 0-65535
65014	User register_15	Int	1	Range: 0-65535

Note: The Year, Month, Day, Week, and Time registers are used to set the time in the RTC. The firmware limits the modification of the RTC to a maximum of 3 times every 24 hours to prevent loss of historical data.

Table 2: Read and Write Registers (write-protected by the K-485 switch).

Reg Addr.	Item	Data	# of regs	Description
4027	Pulse constant	Int	1	Default 1000 Range: 100-65535 (per Wh, VARh, VAh)
4040	Energy counter value mode	Int	1	0: Total wave energy value 1: Fundamental wave energy value Note: global setting; all energy counters are either total wave value or fundamental wave value. If this setting is changed, all the energy counters in the meter are reset to zero.
4041	System wiring mode	Int	1	0: 3P4W-3EL Wye - 16 3-ph metering points 3: 2P3W-2EL Wye - 24 2-ph metering points
4042	Voltage range	Int	1	N/A
4043	Connected CT type	Int	1	0: .../100mA CT 1: .../0.333V CT (not a current option)
4044	PT ratio	Int	1	Range: 1-9999
4045	Metering point_1 Primary Amps	Int	1	Range: 1-9999
4046	Metering point_2 Primary Amps	Int	1	Range: 1-9999
4047	Metering point_3 Primary Amps	Int	1	Range: 1-9999
4048	Metering point_4 Primary Amps	Int	1	Range: 1-9999
4049	Metering point_5 Primary Amps	Int	1	Range: 1-9999
4050	Metering point_6 Primary Amps	Int	1	Range: 1-9999
4051	Metering point_7 Primary Amps	Int	1	Range: 1-9999
4052	Metering point_8 Primary Amps	Int	1	Range: 1-9999
4053	Metering point_9 Primary Amps	Int	1	Range: 1-9999
4054	Metering point_10 Primary Amps	Int	1	Range: 1-9999
4055	Metering point_11 Primary Amps	Int	1	Range: 1-9999
4056	Metering point_12 Primary Amps	Int	1	Range: 1-9999
4057	Metering point_13 Primary Amps	Int	1	Range: 1-9999
4058	Metering point_14 Primary Amps	Int	1	Range: 1-9999
4059	Metering point_15 Primary Amps	Int	1	Range: 1-9999
4060	Metering point_16 Primary Amps	Int	1	Range: 1-9999
4061	Metering point_17 Primary Amps	Int	1	Range: 1-9999
4062	Metering point_18 Primary Amps	Int	1	Range: 1-9999
4063	Metering point_19 Primary Amps	Int	1	Range: 1-9999
4064	Metering point_20 Primary Amps	Int	1	Range: 1-9999
4065	Metering point_21 Primary Amps	Int	1	Range: 1-9999
4066	Metering point_22 Primary Amps	Int	1	Range: 1-9999
4067	Metering point_23 Primary Amps	Int	1	Range: 1-9999
4068	Metering point_24 Primary Amps	Int	1	Range: 1-9999
4300	Erase energy counter (Set registers 576-1342 to zero)	Int	1	Write code for reset: 0x0A0A, (2570 in dec) These registers are used only during manufacturing and testing.
4301	Erase interval energy record (Clear all records in the flash)	Int	1	
4302	Erase SOE records (All SOE registers [30000-36999] are cleared)	Int	1	

Note: If the K-485 switch is locked, the register write will not succeed, the meter will respond with the present value in the register

Appendix F – Modbus Map Interval record retrieval, “03H”to read; “06H” or “10H”to write

The meter records the most recent **180 days** of energy interval data in flash memory. The **ReadyGo** command is used to get data from the Flash memory into the modbus registers, then MODBUS commands are used to read this data.

Note: The data from each one-day interval record is stored as a page. Each page is divided into 16 segments. Each segment contains data for a 90-minute period. When the ReadyGo command is used to retrieve the data, one of these 90-minute segments will be retrieved.

Table 1: Flash Page Date Index Registers

Reg Addr.	Item	Data	# of regs	Description
4400	Date info for present operated Page (Page_1)	Int	1	Bit 15-8: Year range:0-99 Bit 7-0: Month range:1-12
4401		Int	1	Bit 15-8: Day range:1-31 Bit 7-0: Hour range:0-23
4402		Int	1	Bit 15-8: Min range:0-59 Bit 7-0: page range:1-180
4403		Int	1	Clock change counter
4404-4407	Date info for previous operated page (Page_2)	Int	4	Refer to registers 4400-4403 (Page_1)
4408-4411	Date info for next previous operated page (Page_3)	Int	4	
	...			
5116-5119	Date info of the oldest operated page (Page_180)	Int	4	

Note: There are index registers containing information about each of the 180 pages in the flash. Each flash page contains the data for one day. By reading the following index registers, the date of the data in each page can be determined.

Cautions:

1. If the RTC was modified to a past time, the meter will create a new page to record interval data starting at that time point. This may result in duplicate pages for certain dates.
2. If the RTC was modified to a future time point on the same day, then:
 - The “recording interval” is the time interval defined in modbus register 4123 (5 min). Data is written to the Interval Record at each recording interval.
 - If the time change does not cross the boundary to the next recording interval, there is no special handling, and the interval record proceeds normally.
 - If the time change crosses the boundary to the next recording interval, the meter will automatically create a new page for that day, and record data will start from the new recording point.
3. When the RTC is modified to another day (past or future), the meter will automatically create a new page for that day and will record interval data on that page.
4. If there is no data in an interval energy register, the register is filled with the value 0xFF.
5. The firmware limits the modification of the RTC to a maximum of 3 times every 24 hours to prevent loss of historical data.

Using ReadyGo command to retrieve interval records by page number:

The saved interval record data in flash can be accessed by page number or by date. The user can determine the desired page number by checking the flash page index to locate interval record data for a certain date.

Use **06H** code to write the desired page number and data segment into register **5500**. This tells the meter to retrieve the interval data for the specified page and segment. After issuing the ReadyGo command, check register 5512 for the status of the request (see below). If the request is successful, check register 5510 and 5511 for the date and segment number of the data that was retrieved.

Table 2: ReadyGo Record Retrieval by Page Number

Reg Addr.	Item	Data	# of regs	Description
5500	ReadyGo page and segment number	Int	1	Bit 15-8: Page range: 1-180 Bit 7-0: Segment range: 1-16 Default value: 1

Example:

Send command 01 06 15 7C 03 02 CD 2F

Meter response 01 06 15 7C 03 02 CD 2F

This shows that the data was retrieved from Flash page 3, segment 2.

If there is no response, that means the write failed and the ReadyGo command needs to be re-sent.

Using ReadyGo command to retrieve interval records by date:

As a shortcut, the meter can retrieve the saved interval pages by specifying the desired date instead of page. Use **10H** code to write to the registers **5510-5511** to tell the meter to retrieve the data for the specified date and segment. After issuing the ReadyGo command, check register 5512 (see details below) for the status of the request. If the request is successful, read register 5500 to determine the page number and segment that were retrieved.

Table 3: ReadyGo Record Retrieval by Date

Reg Addr.	Item	Data	# of regs	Description
5510	ReadyGo requested date and segment number	Int	1	Bit 15- 8: Year Bit 7-0: Month
5511		Int	1	Bit 15-8: Day Bit 7-0: Segment

Table 4: ReadyGo Command Example:

Example value	Definition	Value description
01H	Address	Meter RS485 address
10H	Write operation	Write command code
15 86H	Register start	Write from 5510
00 02H	Write register length	2 registers
04H	Number of bytes	4 bytes of data to write
15H	Year of the specified date	Range 0-99, Year 2021
0CH	Month of the specified date	Range 1-12, Month December
1CH	Day of the specified date	Range 1-31. Date 28th
01H	Segment of record interval	Range 1-16. Segment 1, from 00:00 to 01:30
84H	CRC	High byte of CRC
7AH		Low byte of CRC

Table 5: MiniQloset ReadyGo Response Example:

Example value	Definition	Value description
01H	Address	Meter RS485 address
10H	Write operation	Write command code
15 86H	Register start	Write from 5510
00 02H	Write register length	2 registers
A4H	CRC	High bit of CRC
2DH		Low bit of CRC

Caution: If an RTC change causes Flash memory to have multiple records for the same date, the meter will automatically retrieve the Interval record with the latest modified RTC date record. Register **5512** provides detailed info about which page was read, and how many pages with the same date info are in the flash.

Table 6: Ready Go Status and Info

Reg Addr.	Item	Data	# of regs	Description
5512	ReadyGo retrieval status and info	Int	1	FF FF: Ready-go retrieval was not successful. Otherwise: High byte is the page number prepared by the meter. Low byte is the number of pages with the same ReadyGo date.

Example:

Send command 01 03 15 88 00 01 00 2C

Meter response 01 03 02 06 01 7A 24

This means that the meter prepared data from Flash page 6. There is only 1 data page with the requested date.

Table 7: ReadyGo Requested Interval Record Registers

Reg Addr.	Item	Data	# of regs	Description
6000-6047	Epz1+ to Epz24+ Interval record_1	long	48	Metering point_1 to Metering point_24, Active energy delivered, unit 0.001 kWh
6048-6095	Epz1- to Epz24- Interval record_1	long	48	Metering point_1 to Metering point_24, Active energy received, unit 0.001 kWh
6096-6143	Eqz1_1 to Eqz24_1 Interval record_1	long	48	Metering point_1 to Metering point_24, Quadrant_1 reactive energy, unit 0.001 kVARh
6144-6191	Eqz1_2 to Eqz24_2 Interval record_1	long	48	Metering point_1 to Metering point_24, Quadrant_2 reactive energy, unit 0.001 kVARh
6192-6239	Eqz1_3 to Eqz24_3 Interval record_1	long	48	Metering point_1 to Metering point_24, Quadrant_3 reactive energy, unit 0.001 kVARh
6240-6287	Eqz1_4 to Eqz24_4 Interval record_1	long	48	Metering point_1 to Metering point_24, Quadrant_4 reactive energy, unit 0.001 kVARh
6288-6335	Eqs1+ to Eqs24+ Interval record_1	long	48	Metering point_1 to Metering point_24, Apparent energy delivered, unit 0.001 kVAh
6336-6383	Eqs1- to Eqs24- Interval record_1	long	48	Metering point_1 to Metering point_24, Apparent energy received, unit 0.001 kVAh
6384-6479	Ep1+ to Ep48+ Interval record_1	long	96	CT_1 to CT_48 active energy delivered, unit 0.001 kWh
6480-6575	Ep1- to Ep48- Interval record_1	long	96	CT_1 to CT_48 active energy received, unit 0.001kWh
6576-6671	Eq1_1 to Eq48_1 Interval record_1	long	96	CT_1 to CT_48, Quadrant_1 reactive energy, unit 0.001 kVARh
6672-6767	Eq1_2 to Eq48_2 Interval record_1	long	96	CT_1 to CT_48, Quadrant_2 reactive energy, unit 0.001 kVARh
6768-6863	Eq1_3 to Eq48_3 Interval record_1	long	96	CT_1 to CT_48, Quadrant_3 reactive energy, unit 0.001 kVARh
6864-6959	Eq1_4 to Eq48_4 Interval record_1	long	96	CT_1 to CT_48, Quadrant_4 reactive energy, unit 0.001 kVARh
6960-7055	Eqs1+ to Eqs48+ Interval record_1	long	96	CT_1 to CT_48 apparent energy delivered, unit 0.001kVAh
7056-7151	Eqs1- to Eqs48- Interval record_1	long	96	CT_1 to CT_48 apparent energy received, unit 0.001 kVAh
7152	Time point of Interval record_1	Int	1	Bit 15-8: Hour range: 0-23 Bit 7-0: Minute range: 0-59
7153-8305	Interval record_2	...	...	Refer to Interval record_1
8306-9458	Interval record_3	...	...	Refer to Interval record_1
9459-10611	Interval record_4	...	...	Refer to Interval record_1
...
...
25601-26753	Interval record_18	...	...	Refer to Interval record_1

Note: Use **03H** code to read the interval registers. A maximum of 125 registers can be read with a single '03H' command.

Appendix G- Sequence of Events Record, read only, “03” code to read

Table 1: SOE Records and Event Codes

Reg Addr.	Item	Data	# of regs	Description
30000	SOE record_1, (most recent event)	Int	1	Event code, (see below)
30001		Int	1	Serious failures counter, (see below) Bit 15-8: Serious failure count range:0-255 Bit 7-0: Daily counter range: 1-20
30002		Int	1	Event data, content depends on event type
30003		Int	1	Event counter, range 0~65535
30004		Int	1	Bit 15-8: Year range: 0-99 Bit 7-0: Month range: 1-12
30005		Int	1	Bit 15-8: Day range: 1-31 Bit 7-0: Hour range: 0-23
30006		Int	1	Bit 15-8: Minute range: 0-59 Bit 7-0: Seconds range: 0-59
30007-30013	SOE record_2	Int	6	Same structure as 30000~30007
30014-30020	SOE record_3	Int	6	
...	...	Int	6	
36993-36999	SOE record_1000, oldest event	Int	6	

Note:

1. The oldest record will be discarded when the SOE records > 1000.
2. When counters pass the maximum value, the counter resets to 0 and counting continues.

Event Codes

There are 8 basic event types (1-8) and 2 event types per CT (48 Total CT event types)

- 1 Power Dns
- 2 Power Ups
- 3 Watchdog
- 4 No Battery
- 5 TimechnngFrom
- 6 TimechnngTo
- 7 StoreConfig
- 8 Login
- 9-19 Reserved
- 20 CT_1 ChngFrom
- 21 CT_1 ChngTo
- 22 CT_2 ChngFrom
- 23 CT_2 ChngTo
- 24 CT_3 ChngFrom
- 25 CT_3 ChngTo
- 26 CT_4 ChngFrom
- 27 CT_4 ChngTo
- ...
- 67 CT_24

Serious failures counter

If the same event happens more than 20 times in a natural day [00:00:00 to 23:59:59]:

1. The “Serious failures counter” for that event will increase by 1.
2. The “Event counter” will be frozen at the value where the daily limit (20) was reached.
3. The “Event counter” will resume counting the next day.

Sequence of Events (SOE) Status: Reading and Resetting Status Flags

The meter provides a 32-bit flag register to indicate the occurrence of certain events. Each flag is one bit, there are a total of 32 flag bits accessed through 2 modbus registers.

A given flag bit is set by the meter firmware when the listed event occurs.

The flag bits can be reset by writing to the modbus registers.

The value for the register is: (old_value) AND (the inverse of the written value from the modbus).

This allows selective clearing of flag bits in the bitmap.

Use 03H to read, 06H to write to clear the flags.

Table 2: SOE Status Flags

Reg Addr.	Parameter	Data	# of regs	Description
4038	SOE status low 16bit	Int	1	Bit 0- Battery state change Bit 1- K-485 lock state change Bit 2- MODBUS address change Bit 3- MODBUS baudrate change Bit 4- MODBUS packet format change Bit 5- Reserved Bit 6- Reserved Bit 7- Reserved Bit 8- RTC change Bit 9- Clock index increment
4039	SOE status high 16bit	Int	1	Bit 10- Power Up Bit 11- Power Down Bit 12- CT configuration change Bit 13- Energy accumulators reset Bit 14- Reserved Bit 15- Events reset Bit 16- Reserved Bit 17- Reserved Bit 18- Record pages reset

Appendix H: Additional Registers

Copy of accumulated energy data from the 6 most recent recording intervals.

Read only, "03H" code to read.

The meter automatically maintains a copy of the accumulated energy data for the 6 most recent recording intervals in the following modbus registers. This allows quick polling of recent data over the modbus.

Table 3: Copy of Recent Record Intervals

Reg Addr.	Item	Data	# of regs	Description
40000	Time stamp of Interval copy 1	Int	1	Bit 15-8: Hour range: 0-23 Bit 7-0: Minute range: 0-59
40001		Int	1	Bit 15-8: Month range: 1-12 Bit 7-0: Date range: 1-31
40002		Int	1	Bit 7-0: Year range: 0-99
Reserved	/	/	/	/
40004-40051	Epz1+ to Epz24+ Interval copy 1	long	48	Metering point_1 to Metering point_24, Active energy delivered, unit 0.001 kWh
40052-40099	Epz1- to Epz24- Interval copy 1	long	48	Metering point_1 to Metering point_24, Active energy received, unit 0.001 kWh
40100-40147	Eqz1_1 to Eqz24_1 Interval copy 1	long	48	Metering point_1 to Metering point_24, Quadrant_1 reactive energy, unit 0.001 kVARh
40148-40195	Eqz1_2 to Eqz24_2 Interval copy 1	long	48	Metering point_1 to Metering point_24, Quadrant_2 reactive energy, unit 0.001 kVARh
40196-40243	Eqz1_3 to Eqz24_3 Interval copy 1	long	48	Metering point_1 to Metering point_24, Quadrant_3 reactive energy, unit 0.001 kVARh
40244-40291	Eqz1_4 to Eqz24_4 Interval copy 1	long	48	Metering point_1 to Metering point_24, Quadrant_4 reactive energy, unit 0.001 kVARh
40192-40339	Eqs1+ to Eqs24+ Interval copy 1	long	48	Metering point_1 to Metering point_24, Apparent energy delivered, unit 0.001 kVAh
40340-40387	Eqs1- to Eqs24- Interval copy 1	long	48	Metering point_1 to Metering point_24, Apparent energy received, unit 0.001 kVAh
40388-40775	Interval copy_2	/	388	Refer to Interval copy_1
40776-41163	Interval copy_3	/	388	
41164-41521	Interval copy_4	/	388	
41522-41939	Interval copy_5	/	388	
41940-41327	Interval copy_6	/	388	

Note: Interval copy_1 is the most recent record data.

The meter will automatically erase the oldest record (Interval copy_6) when it generates a new record.

This part of the data cannot be cleared manually.

Aliases of Device Info, read only, “03H” code to read.

Table 4: Aliases of Device Info

Reg Addr.	Item	Data	# of regs	Description
65500	Serial number low 16bit	Int	1	/
65501	Serial number high 16bit	Int	1	/
65502	Software version	Int	1	/
65503	System wiring mode	Int	1	0: 3P4W-3EL Wye (16 3ph metering points) 3: 2P3W-2EL Wye (24 2ph metering points)
65504	SOE status low 16bit	Int	1	Bit 0- Battery state change Bit 1- K-485 lock state change Bit 2- MODBUS address change Bit 3- MODBUS baud rate change Bit 4- MODBUS format change Bit 5- Reserved Bit 6- Reserved Bit 7- Reserved
65505	SOE status high 16bit	Int	1	Bit 8- RTC change Bit 9- Clock index increment Bit 10- Power Up Bit 11- Power Down Bit 12- CT configuration change Bit 13- Energy accumulators reset Bit 14- Reserved Bit 15- Events reset Bit 16- Reserved Bit 17- Reserved Bit 18- Record pages reset

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