IQ 250/260
High Performance
Multifunction Electricity Meter

Installation & Operation Manual

EATON
Powering Business Worldwide

IB02601006E Rev. 1.5

Table of Contents

1 Introduction

About This Manual

This document is the user manual for the installation, operation, and maintenance of the Eaton IQ 250/260 Meter. It is intended for authorized and qualified personnel who use the IQ 250/260 Meter. Please refer to the specific WARNINGS and CAUTIONS in this section before proceeding. For Technical Support and after hour emergencies, contact our Power Quality Technical Support team at 1-800-809-2772, option 4 / sub-option 1 or by email at PQSUPPORT@EATON.COM. For those outside the United States and Canada, call 414-449-7100 option 4 / sub-option 1. You can also visit us on the web at http://www.eaton.com and follow the Products link.

Warranty and Liability Information

NO WARRANTIES EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OF MERCHANTABILITY, OR WARRANTIES ARISING FROM COURSE OR DEALING OR USAGE OF TRADE ARE MADE REGARDING THE INFORMATION, RECOMMENDATIONS, AND DESCRIPTIONS CONTAINED HEREIN.

In no event will Eaton be responsible to the purchaser or user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental, or consequential damage or loss of use of equipment, plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information and descriptions contained herein.

Eaton disclaims liability for any modifications or interfaces with other equipment that are not in conformity with the specifications and information contained within this manual. Any unauthorized action of this kind can jeopardize operation, safety, or reliability.

The information contained in this document is believed to be accurate at the time of publication, however, Eaton assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice.

Safety Precautions

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this device.

WARNINGS refer to instructions that, if not followed, can result in death or injury.

CAUTIONS refer to instructions that, if not followed, can result in equipment damage.

WARNINGS

SHOCK HAZARDS:

IMPROPER INSTALLATION CAN CAUSE DEATH, INJURY, AND/OR EQUIPMENT DAMAGE. Follow all Warnings and Cautions. Completely read and understood the information in this document before attempting to install or operate the equipment. Improper wiring could cause death, injury, or equipment damage. Only qualified personnel are to service the IQ 250/260 Meter.

TROUBLESHOOTING PROCEDURES MAY REQUIRE PROXIMITY TO EXPOSED ENERGIZED (LIVE) ELECTRICAL WIRING AND/OR PARTS WHERE THE HAZARD OF FATAL ELECTRIC SHOCK IS PRESENT. Exercise extreme care to avoid injury or death. Always disconnect, lock-out, and tag the current and voltage sources and the control power supply circuit before touching the connections or components on the rear face of the meter base unit.

FAILURE TO GROUND THE IQ 250/260 METER MAY RESULT IN INJURY, DEATH, OR EQUIPMENT DAMAGE. Properly ground the IQ 250/260 Meter during installation.

Covered by one or more of the following patents:
US Patent Numbers D526920, D525893, 6751563, 6735535, 6636030.

2 Overview and Specifications

IQ 250/260 Overview

The IQ 250/260 is a multifunction power and energy meter designed to be used in electrical substations, panel boards, and as a primary revenue meter, due to its high performance measurement capability. The unit provides multifunction measurement of all electrical parameters and makes the data available in multiple formats via display, communication systems, and through analog signal transmission. In addition, the IQ 250/260 meter has optional data logging capability.

Figure 2.1: IQ 250/260 Meter

The IQ 250/260 meter is designed with advanced meaurement capabilities, allowing it to achieve high performance accuracy. It is specified as a 0.2% class energy meter for billing applications as well as a highly accurate panel indication meter.

The IQ 250/260 provides additional capabilities, including standard RS485, Modbus and DNP 3.0 Protocols, and Option cards that can be added at any time.

Features of the IQ 250/260 include:

- 0.2% Class revenue certifiable energy and demand metering
- Meets ANSI C12.20 (0.2%) and IEC 687 (0.2%) classes
- Multifunction measurement including voltage, current, power, frequency, energy, power factor, etc.
- Power quality measurements (%THD and Alarm Limits) IQ 260
- Optional 128 kiloBytes of memory for data logging - IQ 250/260 with L option
- Percentage of Load Bar for analog meter reading
- Easy to use faceplate programming
- RS485 communication
- Optional I/O Cards - field upgradeable without removing installed meter

In addition to the IQ 250/260M - meter with integral display/transducer configuration, an IQ 250/260T transducer configuration is available. The IQ 250/260T is a digital transducer only unit (without a display), providing RS485 communication via Modbus RTU, Modbus ASCII or DNP 3.0 protocols.

The IQ 250/260T is designed to install using DIN Rail mounting. (See Chapter 3 of this manual for IQ 250/260T mounting information.)

Figure 2.2: IQ 250/260T

Voltage and Current Inputs

Universal Voltage Inputs

Voltage Inputs allow measurement up to 480VAC (Phase to Reference) and 600VAC (Phase to Phase). This insures proper meter safety when wiring directly to high voltage systems. One unit will perform to specification on 69 Volt, 120 Volt, 230 Volt, 277 Volt, and 347 Volt power systems.

NOTE: Higher voltages require the use of potential transformers (PTs).

Current Inputs

The unit supports a 5 Amp or a 1 Amp secondary for current measurements.
NOTE: The **s**econdary current must be specified and ordered with the meter.

The IQ 250/260 Current Inputs use a unique dual input method:

Method 1: CT Pass Through

The CT passes directly through the meter without any physical termination on the meter. This insures that the meter cannot be a point of failure on the CT circuit. This is preferable for utility users when sharing relay class CTs. No Burden is added to the secondary CT circuit.

Method 2: Current "Gills"

This unit additionally provides ultra-rugged Termination Pass Through Bars that allow CT leads to be terminated on the meter. This, too, eliminates any possible point of failure at the meter. This is a preferred technique for insuring that relay class CT integrity is not compromised (the CT will not open in a fault condition).

Ordering Information

IQ - 260 - M - A - 6 - 5 - 1 - 1 - 0

1 2 3 4 5 6 7 8

1. Model:
250 = Power Meter
260 = Power Quality Meter

2. Meter Type
M = Meter (with integral display)
T = Transducer Only (no display)

3. Data Logging:
A= None
L= On-board data logging

4. Frequency:
5 = 50 Hz System
6 = 60 Hz System

5. Current Input:
5 = 5 Amp Secondary
1 = 1 Amp Secondary

6. Power Supply:
1 = Universal, (90 - 265) VAC @50/60Hz or (100-370) VDC
4 = (18 - 60) VDC

7. I/O Slot 1: (See Chapter 7 for I/O Card Specifications.)
0 = None
1 = 2 Relay Outputs/2 Status Inputs
2 = 4 KYZ Pulses/4 Status Inputs
3 = 4 Analog Outputs - 0-1 mA
4 = 4 Analog Outputs - 4-20 mA

8. I/O 2: (See Chapter 7 for I/O Card Specifications.)
0 = None
1 = 2 Relay Outputs/2 Status Inputs
2 = 4 KYZ Pulses/4 Status Inputs
3 = 4 Analog Outputs - 0-1 mA
4 = 4 Analog Outputs - 4-20 mA

Example: IQ 260-M-A-6-5-1-1-0

(IQ 260 Power Quality Meter with no data logging, a 60 Hz System, 5 Amp Secondary, 90-265 VAC/100-370 VDC Power Supply, 2 Relay Outputs/2 Status Inputs I/O Card in Card Slot 1 and no card in Card Slot 2)

Measured Values

The IQ 250/260 provides the following Measured Values all in Real-Time Instantaneous, and some additionally as Average, Maximum and Minimum values.

IQ 250/260 Measured Values

Measured Values	Instantaneous	Avg	Max	Min
Voltage L-N	X		X	X
Voltage L-L	X		X	X
Current per Phase	X	X	X	X
Current Neutral	X	X	X	X
WATT(A,B,C,Tot.)	X	X	X	X
VAR (A,B,C,Tot.)	X	X	X	X
VA (A,B,C,Tot.)	X	X	X	X
PF (A,B,C,Tot.)	X	X	X	X
+Watt-Hour (A,B,C,Tot.)	X			
-Watt-Hour (A,B,C,Tot.)	X			
Watt-Hour Net	X			
+VAR-Hour (A,B,C,Tot.)	X			
-VAR-Hour (A,B,C,Tot.)	X			
VAR-Hour Net (A,B,C,Tot.)	X			
VA-Hour (A,B,C,Tot.)	X			
Frequency	X		X	X
%THD (IQ 260)	X		X	X
Voltage Angles	X			
Current Angles	X			
% of Load Bar	X			

Utility Peak Demand

The IQ 250/260 provides user-configured Fixed Window or Sliding Window Demand modes. This feature enables you to set up a customized Demand profile. Fixed Window Demand mode records the average demand for time intervals that you define (usually 5, 15 or 30 minutes). Sliding Window Demand mode functions like multiple, overlapping Fixed Window Demands. You define the subintervals at which an average of demand is calculated. An example of Sliding Window Demand mode would be a 15-minute Demand block using 5-minute subintervals, thus providing a new demand reading every 5 minutes, based on the last 15 minutes.

Utility Demand Features can be used to calculate Watt, VAR, VA and PF readings. Voltage provides an Instantaneous Max and Min reading which displays the highest surge and lowest sag seen by the meter. All other parameters offer Max and Min capability over the selectable averaging period.

Specifications

Power Supply

Range:	1 Option: Universal, (90 - 265)VAC @50/60 Hz or (100-370)VDC 4 Option: (18 - 60)VDC
Power Consumption:	(5 to 10)VA, (3.5 to 7)W - depending on the meter's hardware configuration

Voltage Inputs (Measurement Category III) (See Accuracy Specifications, later in this chapter.

Range:	Universal, Auto-ranging: Phase to Reference (Va, Vb, Vc to Vref): (20 to 576)VAC Phase to Phase (Va to Vb, Vb to Vc, Vc to Va): (0 to 721)VAC
Supported hookups:	3 Element Wye, 2.5 Element Wye, 2 Element Delta, 4 Wire Delta
Input Impedance:	1M Ohm/Phase
Burden:	0.36VA/Phase Max at 600 Volts; 0.014VA at 120 Volts
Pickup Voltage:	20VAC
Connection:	7 Pin 0.400" Pluggable Terminal Block AWG#12 -26/ (0.129 -3.31) mm^2
Fault Withstand:	Meets IEEE C37.90.1
Reading:	Programmable Full Scale to any PT Ratio

Current Inputs(See Accuracy Specifications, later in this chapter.)

Class 10:	5A Nominal, 10A Maximum
Class 2:	1A Nominal, 2A Maximum
Burden:	0.005VA Per Phase Max at 11 Amps
Pickup Current:	0.1% of nominal
Connections:	O Lug or U Lug Electrical Connection (Figure 4.1) Pass-through Wire, 0.177" / 4.5mm Maximum Diameter (Figure 4.2) Quick Connect, 0.25" Male Tab (Figure 4.3)
Fault Withstand (at 23º C):	100A/10sec., 300A/3sec., 500A/1sec.
Reading:	Programmable Full Scale to any CT Ratio
Continuous Current Withstand:	20 Amps for Screw Terminated or Pass Through Connections

KYZ/RS485 Port Specifications

RS485 Transceiver; meets or exceeds EIA/TIA-485 Standard:

Type:	Two-wire, half duplex
Min. Input Impedance:	96kΩ
Max. Output Current:	±60mA

Wh Pulse

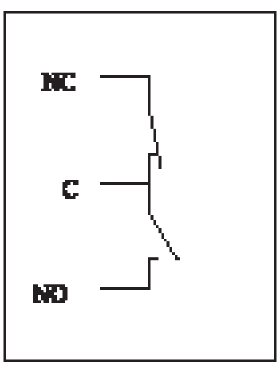
KYZ output contacts (and infrared LED light pulses through face plate):
(See Chapter 6 for Kh values.)

Pulse Width:	90ms
Full Scale Frequency:	~3Hz
Contact type:	Solid State – SPDT (NO – C – NC)
Relay type:	Solid state
Peak switching voltage:	DC ±350V
Continuous load current:	120mA
Peak load current:	350mA for 10ms
On resistance, max.:	35Ω
Leakage current:	1µA@350V
Isolation:	AC 3750V
Reset State:	(NC - C) Closed; (NO - C) Open

Infrared LED:

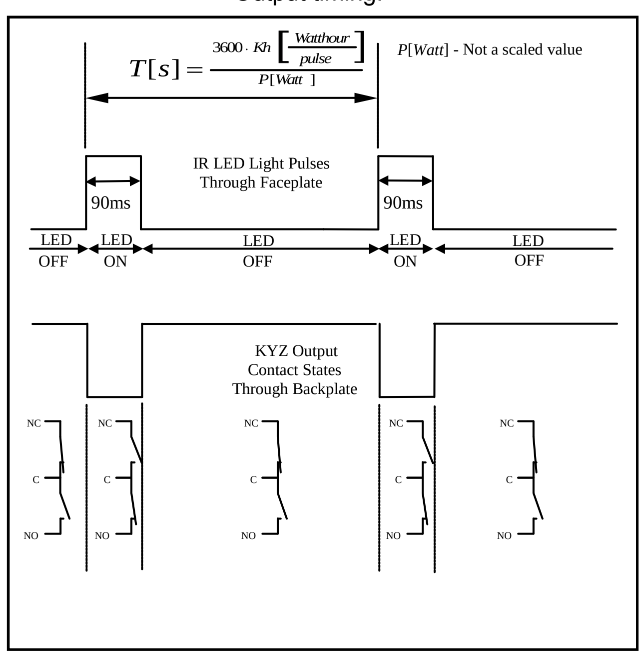
Peak Spectral Wavelength:	940nm
Reset State:	Off

Internal Schematic:



(De-energized State)

Output timing:



Isolation

All Inputs and Outputs are galvanically isolated to 2500 Vac

Environmental Rating

Storage:	$(-20 \text{ to } +70)^0$ C
Operating:	$(-20 \text{ to } +70)^0$ C
Humidity:	to 95% RH Non-condensing
Faceplate Rating:	NEMA12 (Water Resistant), Mounting Gasket Included

Measurement Methods

Voltage, Current:	True RMS
Power:	Sampling at over 400 Samples per Cycle on All Channels

Update Rate

Watts, VAR and VA:	Every 6 cycles (e.g., 100 ms @ 60 Hz)
All other parameters:	Every 60 cycles (e.g., 1 s @ 60 Hz) 1 second for current only measurement, if reference voltage is not available

Communication

Standard:
1. RS485 Port through Back Plate
2. Energy Pulse Output through Back Plate

Protocols:	Modbus RTU, Modbus ASCII, DNP 3.0
Com Port Baud Rate:	9,600 to 57,600 bps
Com Port Address:	001-247
Data Format:	8 Bit, No Parity
IQ 250/260T	Default Initial Communication Baud 9600 (See Chapter 5)

Mechanical Parameters

Dimensions: see Chapter 3.

Weight:	2 pounds/ 0.9kg (ships in a 6"/152.4mm cube container) (Without Option Card)

Compliance

- UL Listing: USL/CNL E185559
- CE Compliant
- IEC 62053-22(0.2% Accuracy)
- ANSI C12.20 (0.2% Accuracy)
- ANSI C62.41 (Burst)
- IEC 1000-4-2 - ESD

Accuracy (See full Range specifications earlier in this chapter.)

For 23º C, 3 Phase balanced Wye or Delta load, at 50 or 60 Hz (as per order), 5A (Class 10) nominal unit:

Parameter	Accuracy	Accuracy Input Range[1]
Voltage L-N [V]	0.1% of reading	(69 to 480)V
Voltage L-L [V]	0.2% of reading [2]	(120 to 600)V
Current Phase [A]	0.1% of reading[3]	(0.15 to 5) A
Current Neutral (calculated) [A]	2% of Full Scale	(0.15 to 5) A @ (45 to 65) Hz
Active Power Total [W]	0.2% of reading [1, 2]	(0.15 to 5) A @ (69 to 480) V @ +/- (0.5 to 1) lag/lead PF
Active Energy Total [Wh]	0.2% of reading [1, 2]	(0.15 to 5) A @ (69 to 480) V @ +/- (0.5 to 1) lag/lead PF
Reactive Power Total [VAR]	0.2% of reading [1, 2]	(0.15 to 5) A @ (69 to 480) V @ +/- (0 to 0.8) lag/lead PF
Reactive Energy Total [VARh]	0.2% of reading [1, 2]	(0.15 to 5) A @ (69 to 480) V @ +/- (0 to 0.8) lag/lead PF
Apparent Power Total [VA]	0.2% of reading [1, 2]	(0.15 to 5) A @ (69 to 480) V @ +/- (0.5 to 1) lag/lead PF
Apparent Energy Total [VAh]	0.2% of reading [1, 2]	(0.15 to 5) A @ (69 to 480) V @ +/- (0.5 to 1) lag/lead PF
Power Factor	0.2% of reading [1, 2]	(0.15 to 5) A @ (69 to 480) V @ +/- (0.5 to 1) lag/lead PF
Frequency [Hz]	+/- 0.03 Hz	(45 to 65) Hz
Total Harmonic Distortion [%]	+/- 2%	(0.5 to 10)A[4] or (69 to 480)V, measurement range (1 to 99.99)%
Load Bar	+/- 1 segment	(0.005 to 6) A

1 • For 2.5 element programmed units, degrade accuracy by an additional 0.5% of reading.
  • For 1A (Class 2) Nominal, degrade accuracy by an additional 0.5% of reading.
  • For 1A (Class 2) Nominal, the input current range for accuracy specification is 20% of the values listed in the table.

2 For unbalanced voltage inputs where at least one crosses the 150V autoscale threshold (for example, 120V/120V/208V system), degrade the accuracy to 0.4% of reading.

3 With reference voltage applied (VA, VB, or VC). Otherwise, degrade accuracy to 0.2%. See hookup diagrams 8, 9, and 10 in Chapter 4.

4 At least one voltage input (minimum 20 Vac) must be connected for THD measurement on current channels.

3 Mechanical Installation

Introduction

The IQ 250/260 meter can be installed using a standard ANSI C39.1 (4" Round) or an IEC 92mm DIN (Square) form. In new installations, simply use existing DIN or ANSI punches. For existing panels, pull out old analog meters and replace them with the IQ 250/260. The various models use the same installation. See Chapter 4 for wiring diagrams.

NOTE: The drawings shown below and on the next page give you the meter dimensions in inches and millimeters (mm shown in brackets). Tolerance is +/- 0.1" [2.54 mm].

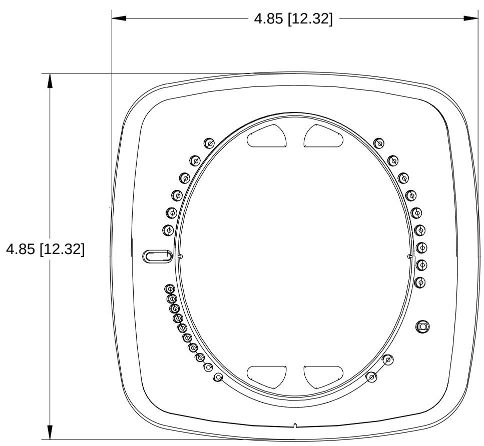


Figure 3.1: IQ 250/260 Face

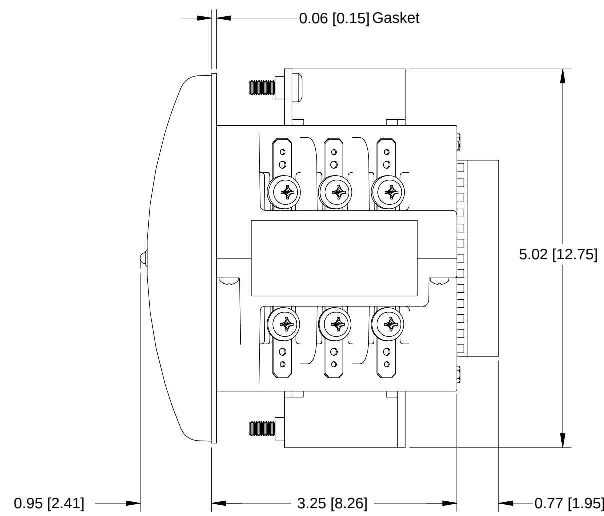


Figure 3.2: IQ 250/260 Dimensions

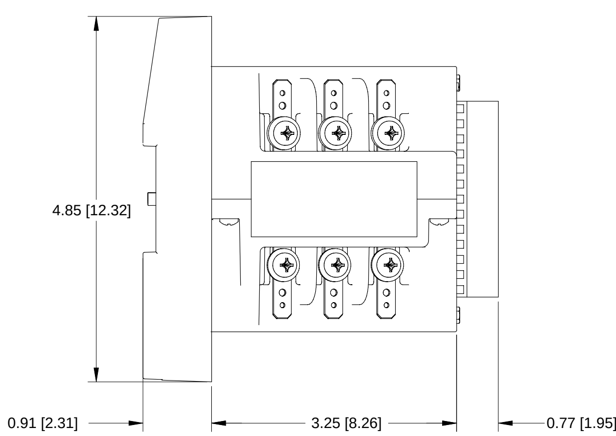


Figure 3.3: IQ 250/260T Dimensions

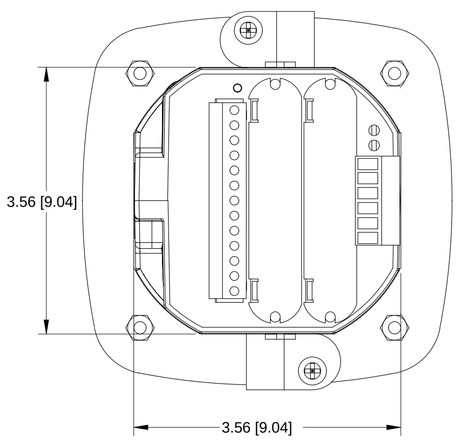


Fig. 3.4: IQ 250/260 Back Face

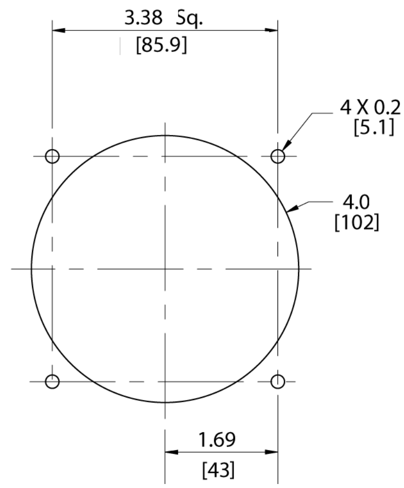


Figure 3.5: ANSI Mounting Panel Cutout

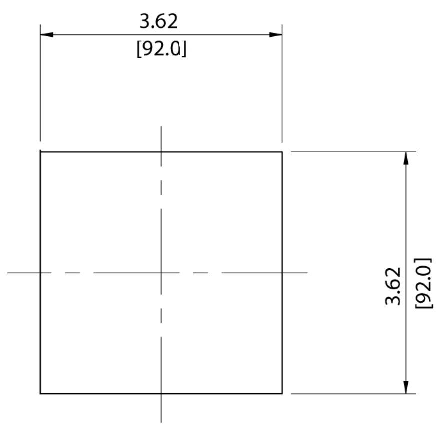


Figure 3.6: DIN Mounting Cutout

ANSI Installation Steps

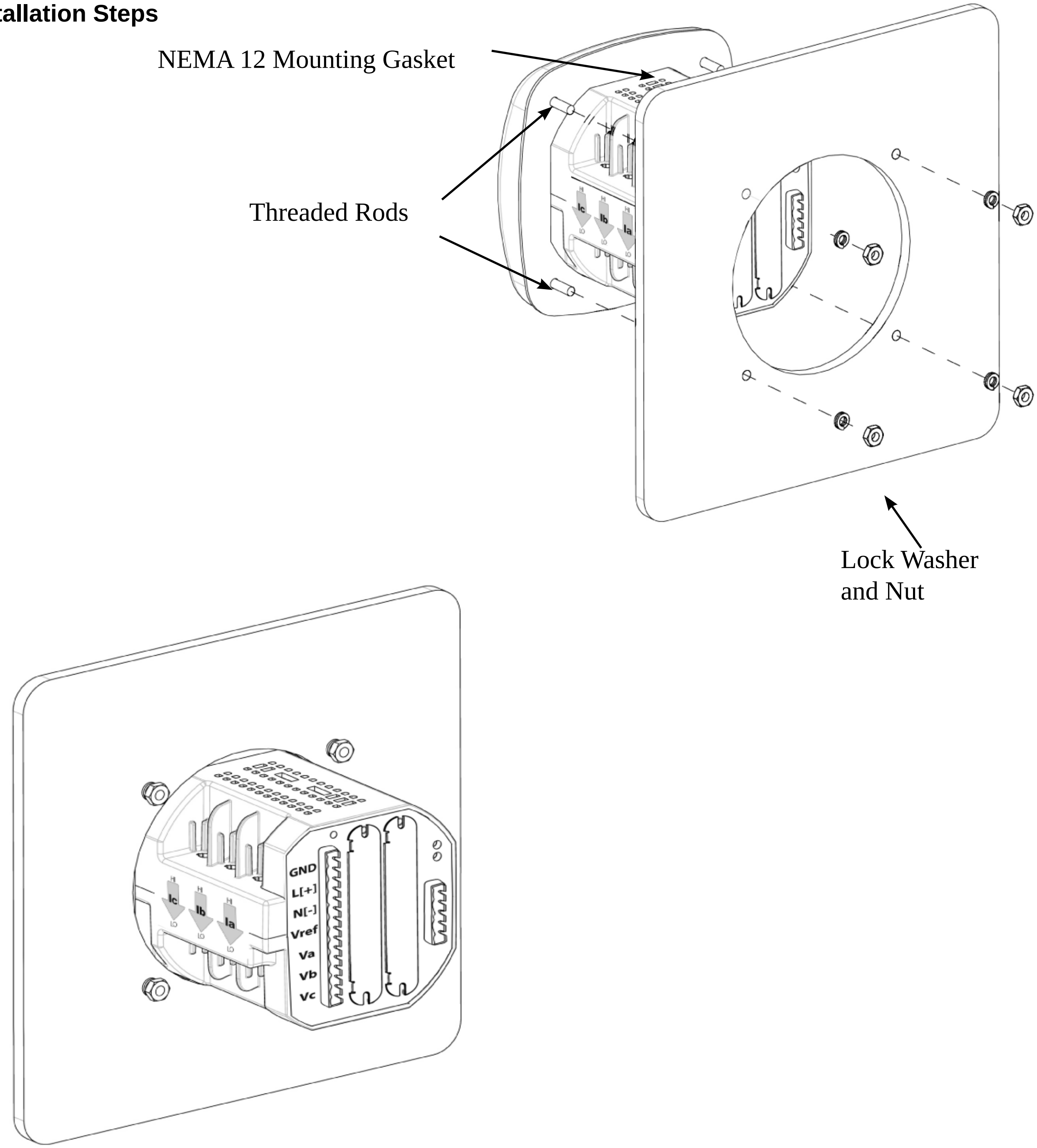


Figure 3.7: ANSI Mounting Procedure

1. Insert 4 threaded rods by hand into the back of meter. Twist until secure.
2. Slide NEMA 12 Mounting Gasket onto back of meter with rods in place.
3. Slide meter with Mounting Gasket into panel.
4. Secure from back of panel with lock washer and nut on each threaded rod. Use a small wrench to tighten. Do not overtighten. **The maximum installation torque is 0.4 Newton-Meter.**

DIN Installation Steps

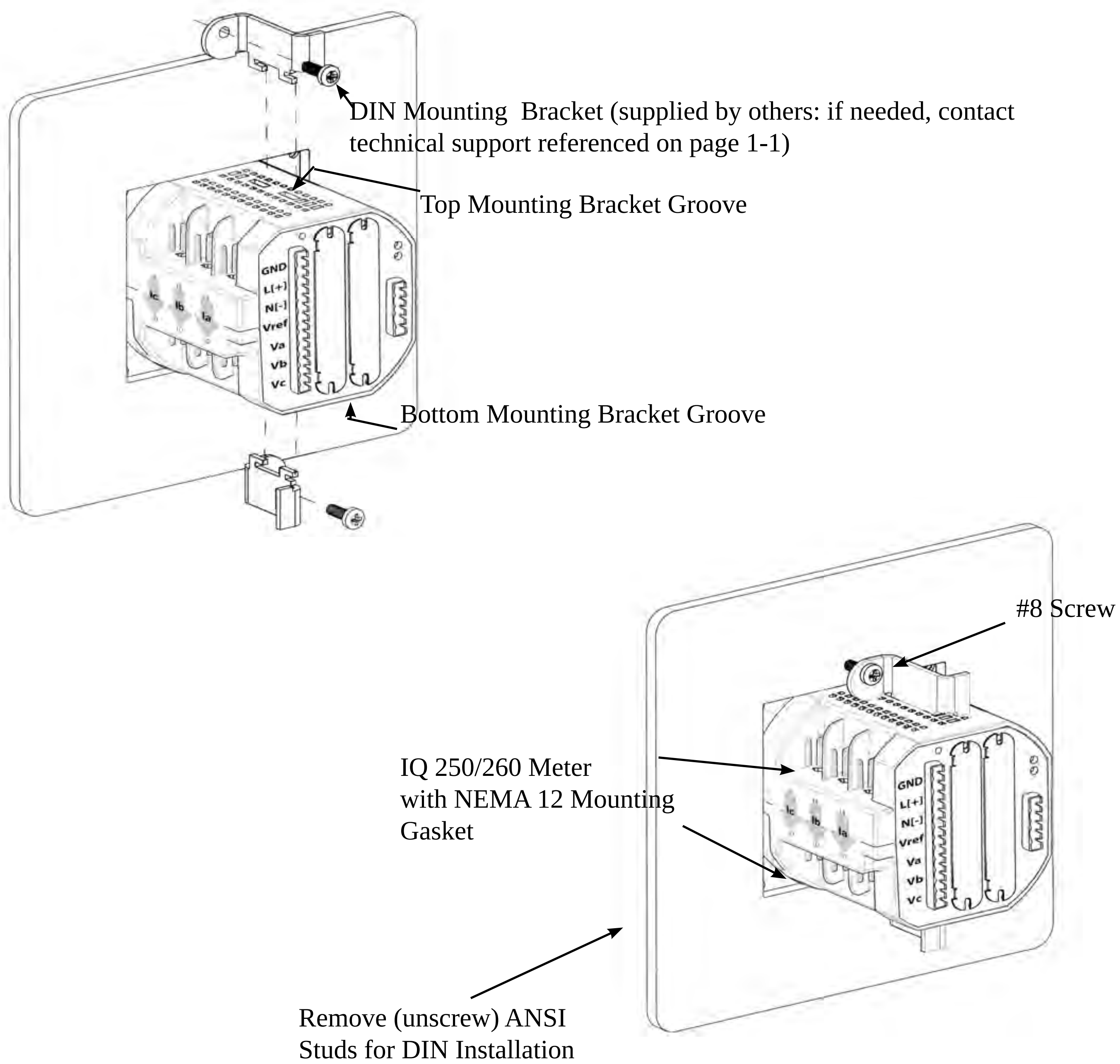


Figure 3.8: DIN Mounting Procedure

1. Slide meter with NEMA 12 Mounting Gasket into panel. (Remove ANSI Studs, if in place.)
2. From back of panel, slide 2 DIN Mounting Brackets into grooves in top and bottom of meter housing. Snap into place.
3. Secure meter to panel with lock washer and a #8 screw through each of the 2 mounting brackets. Tighten with a #2 Phillips screwdriver. Do not overtighten. **The maximum installation torque is 0.4 Newton-Meter.**

IQ 250/260T Transducer Installation

The IQ 250/260T Transducer model is installed using DIN Rail Mounting.

Specs for DIN Rail Mounting:	International Standards DIN 46277/3
DIN Rail (Slotted) Dimensions:	0.297244” x 1.377953” x 3” (inches) 7.55mm x 35mm x 76.2mm (millimeters)

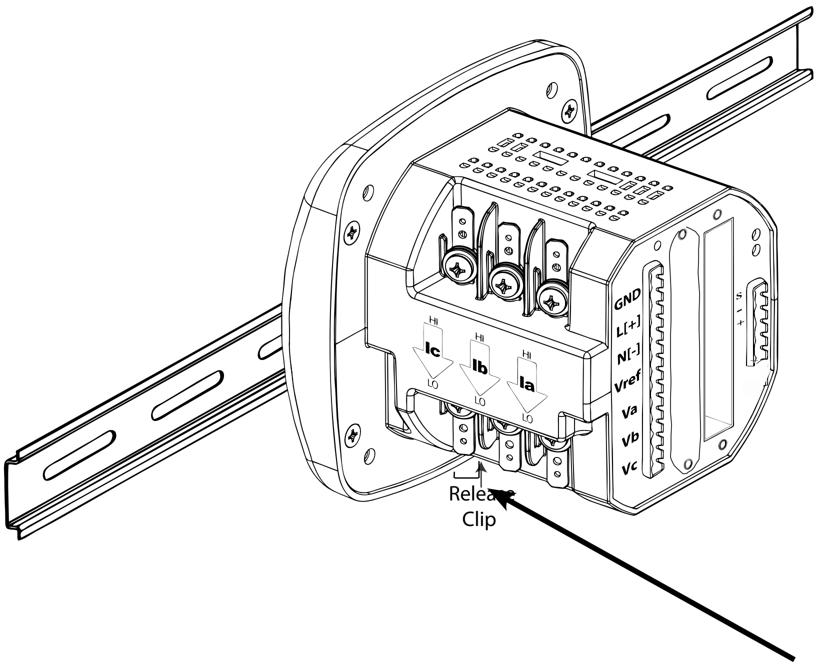
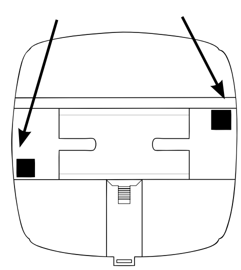


Figure 3.9: DIN Rail Mounting Procedure

1. Slide top groove of meter onto the DIN Rail.
2. Press gently until the meter clicks into place.

NOTES:

- To remove the meter from the DIN Rail, pull down on the Release Clip to detach the unit from the rail.
- If mounting with the DIN Rail provided, use the Black Rubber Stoppers (also provided). See figure on the right.



NOTE ON DIN RAILS:
DIN Rails are commonly used as a mounting channel for most terminal blocks, control devices, circuit protection devices and PLCs. DIN Rails are made of cold rolled steel electrolitically plated and are also available in aluminum, PVC, stainless steel and copper.

4 Electrical Installation

Considerations When Installing Meters

Installation of the IQ 250/260 Meter must be performed **only by** qualified personnel who follow standard safety precautions during all procedures. Those personnel should have appropriate training and experience with high voltage devices. Appropriate safety gloves, safety glasses and protective clothing is recommended.

During normal operation of the IQ 250/260 Meter, dangerous voltages flow through many parts of the meter, including: Terminals and any connected CTs (Current Transformers) and PTs (Potential Transformers), all I/O Modules (Inputs and Outputs) and their circuits. All Primary and Secondary circuits can, at times, produce lethal voltages and currents. Avoid contact with any current-carrying surfaces.

Do not use the meter or any I/O Output Device for primary protection or in an energy-limiting capacity. The meter can only be used as secondary protection. Do not use the meter for applications where failure of the meter may cause harm or death. Do not use the meter for any application where there may be a risk of fire.

All meter terminals should be inaccessible after installation.

Do not apply more than the maximum voltage the meter or any attached device can withstand. Refer to meter and/or device labels and to the Specifications for all devices before applying voltages. Do not HIPOT/Dielectric test any Outputs, Inputs or Communications terminals.

Eaton recommends the use of Shorting Blocks and Fuses for voltage leads and power supply to prevent hazardous voltage conditions or damage to CTs, if the meter needs to be removed from service. CT grounding is optional.

NOTES:

- IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.

- THERE IS NO REQUIRED PREVENTIVE MAINTENANCE OR INSPECTION NECESSARY FOR SAFETY. HOWEVER, ANY REPAIR OR MAINTENANCE SHOULD BE PERFORMED BY THE FACTORY.

DISCONNECT DEVICE: The following part is considered the equipment disconnect device. A SWITCH OR CIRCUIT-BREAKER SHALL BE INCLUDED IN THE END-USE EQUIPMENT OR BUILDING INSTALLATION. THE SWITCH SHALL BE IN CLOSE PROXIMITY TO THE EQUIPMENT AND WITHIN EASY REACH OF THE OPERATOR. THE SWITCH SHALL BE MARKED AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT.

CT Leads Terminated to Meter

The IQ 250/260 is designed to have Current Inputs wired in one of three ways. Diagram 4.1 shows the most typical connection where CT Leads are terminated to the meter at the Current Gills. This connection uses Nickel-Plated Brass Studs (Current Gills) with screws at each end. This connection allows the CT wires to be terminated using either an "O" or a "U" lug. Tighten the screws with a #2 Phillips screwdriver.

Other current connections are shown in Figures 4.2 and 4.3. Voltage and RS485/KYZ Connection is shown in Figure 4.4

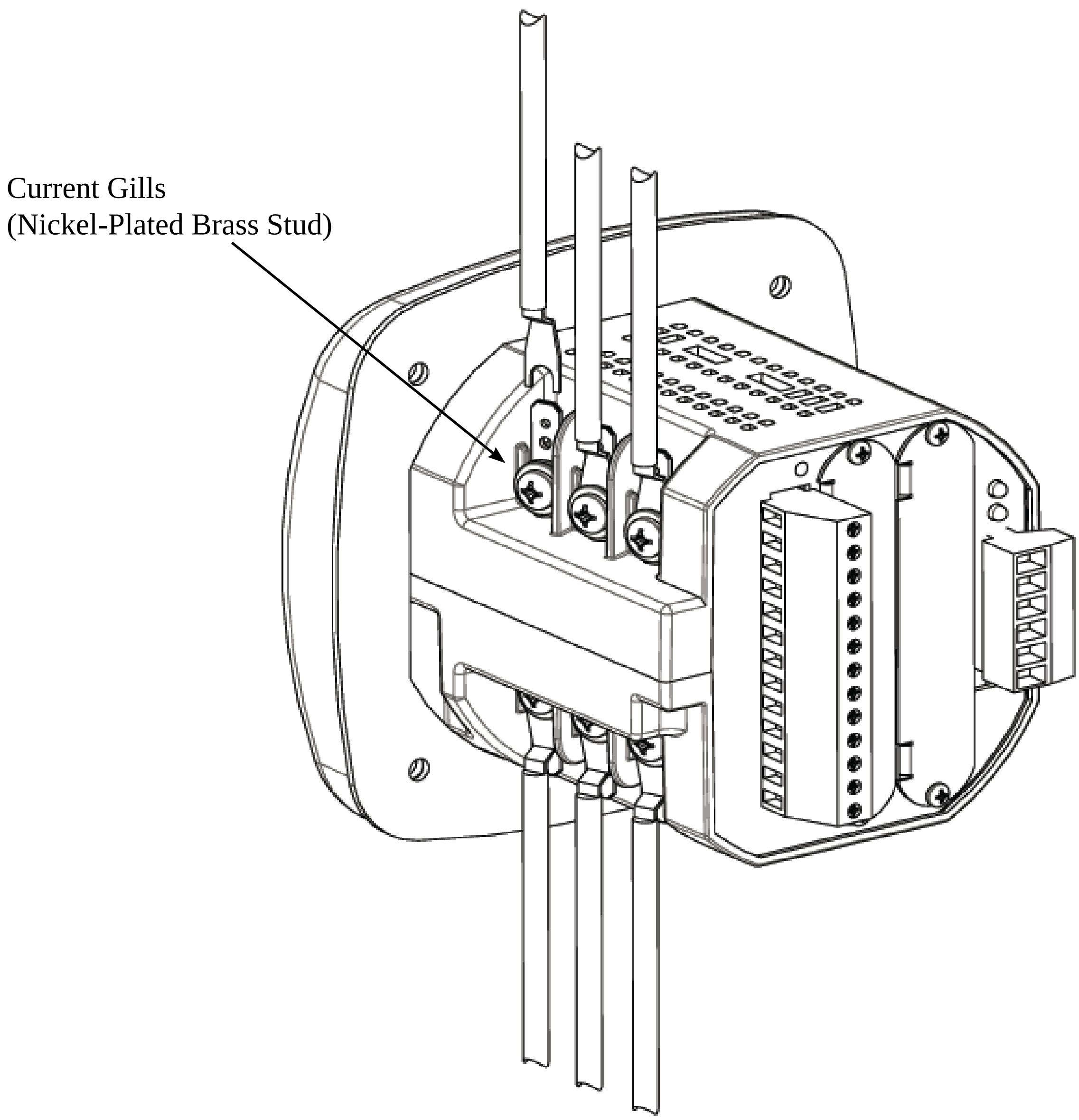


Figure 4.1: CT Leads terminated to Meter, #8 Screw for Lug Connection

Wiring Diagrams are shown later in this chapter.

Communications Connections are detailed in Chapter 5.

CT Leads Pass Through (No Meter Termination)

The second method allows the CT wires to pass through the CT Inputs without terminating at the meter. In this case, remove the Current Gills and place the CT wire directly through the CT opening. The opening will accomodate up to 0.177" / 4.5mm maximum diameter CT wire.

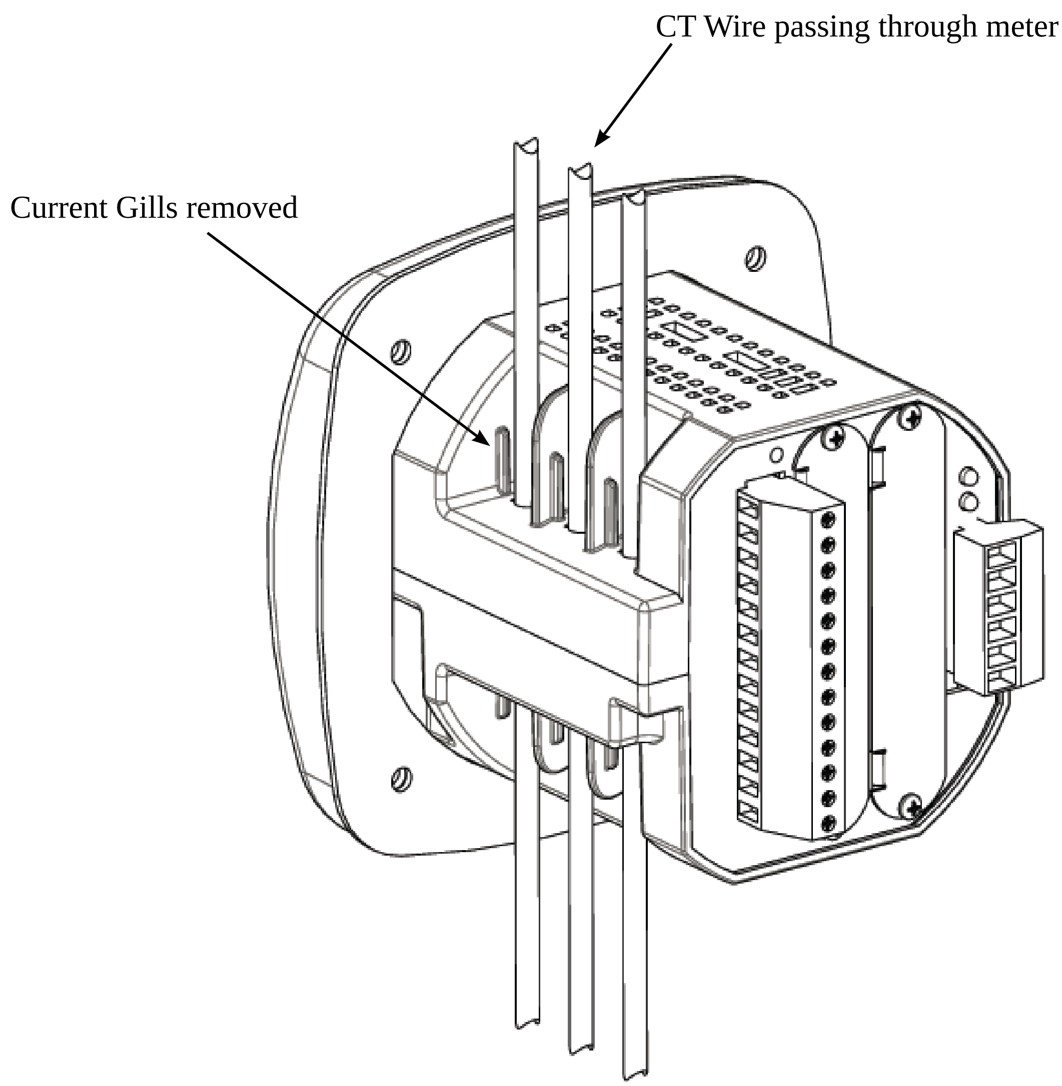


Figure 4.2: Pass-Through Wire Electrical Connection

Quick Connect Crimp-on Terminations

For Quick Termination or for Portable Applications, a 0.25” Quick Connect Crimp-on Connectors can also be used.

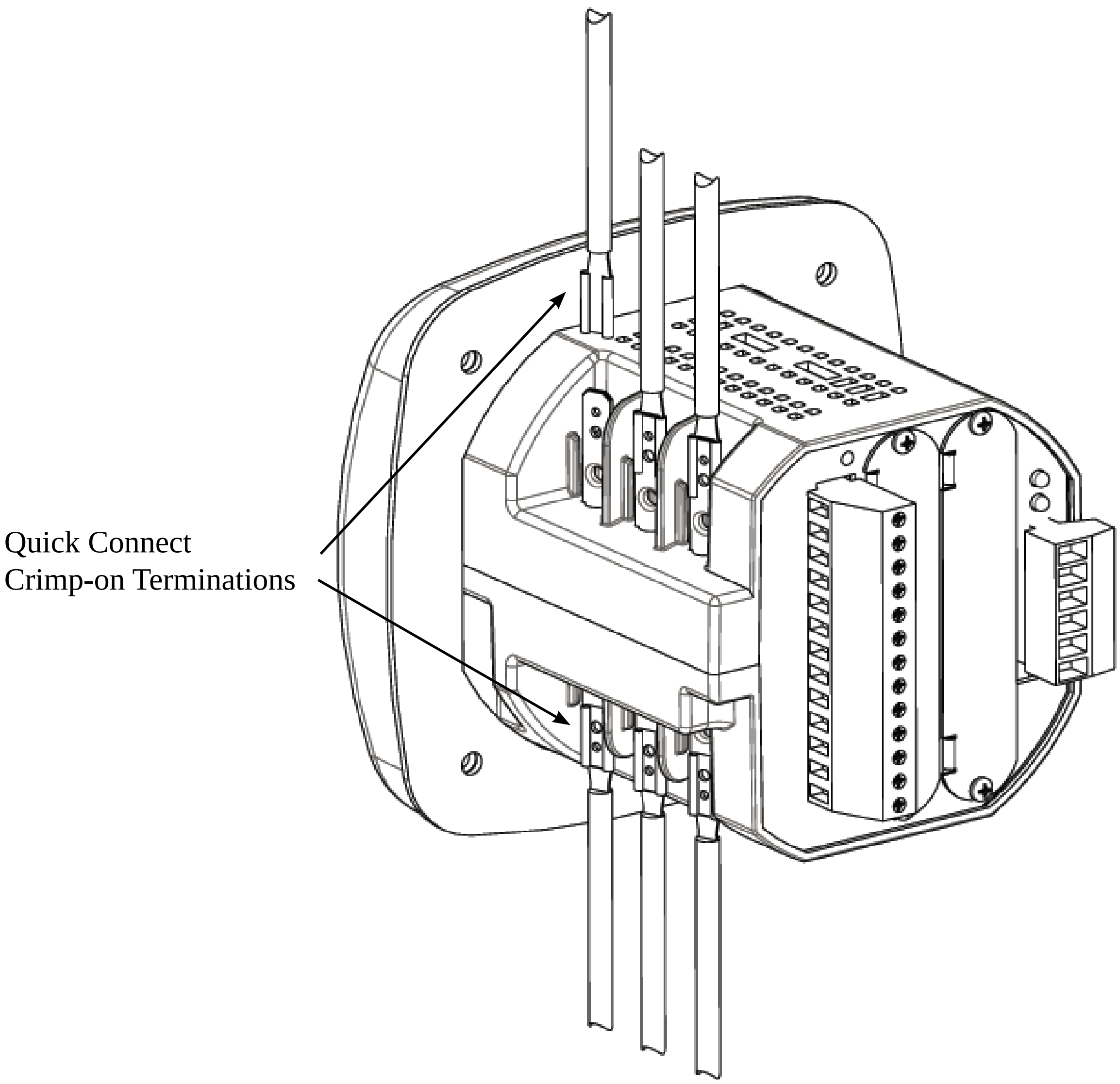


Figure 4.3: Quick Connect Electrical Connection

Voltage and Power Supply Connections

Voltage Inputs are connected to the back of the unit via a optional wire connectors. The connectors accomodate AWG# 12 -26/ (0.129 - 3.31)mm^2.

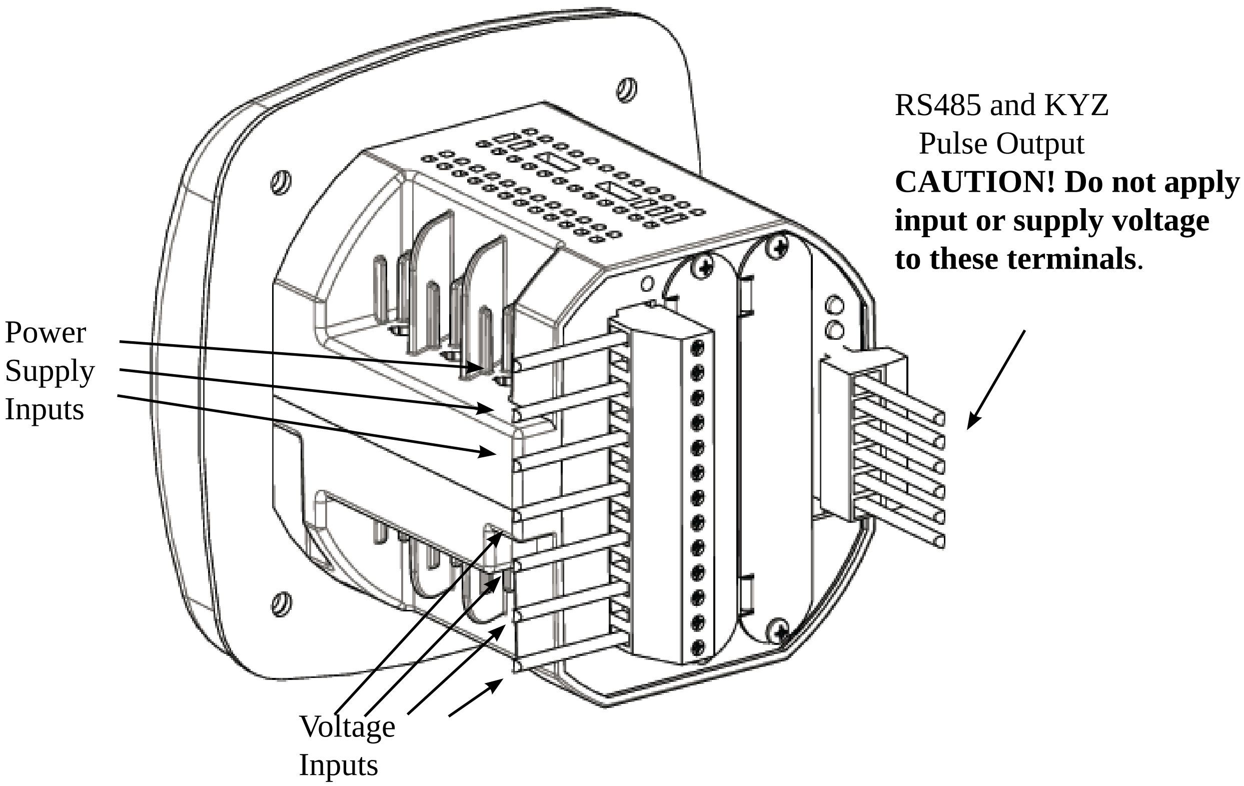


Figure 4.4: Voltage Connection

Ground Connections

The meter's Ground Terminals should be connected directly to the installation's protective earth ground. Use AWG# 12/2.5 mm^2 wire for this connection.

Voltage Fuses

Eaton recommends the use of fuses on each of the sense voltages and on the control power, even though the wiring diagrams in this chapter do not show them.

Use a 0.1 Amp fuse on each voltage input.
Use a 3 Amp Slow Blow fuse on the power supply.

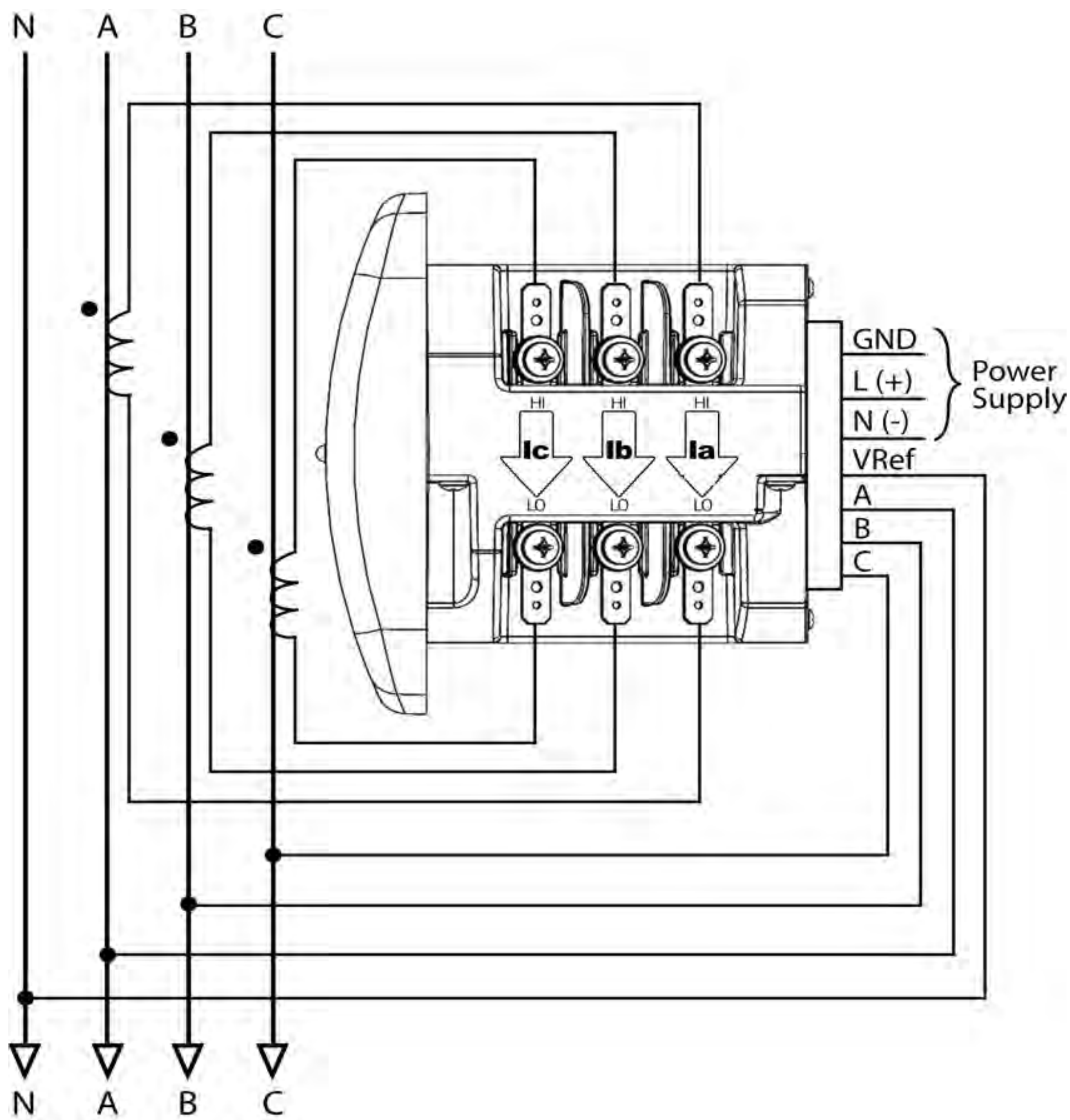
Electrical Connection Diagrams

The following pages contain electrical connection diagrams for the IQ 250/260 meter. Choose the diagram that best suits your application. Be sure to maintain the CT polarity when wiring.

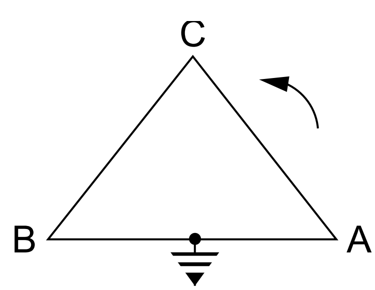
The diagrams are presented in the following order:

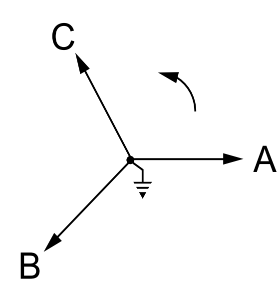
1. Three Phase, Four-Wire System Wye/Delta with Direct Voltage, 3 Element
   a. Example of Dual Phase Hookup
   b. Example of Single Phase Hookup
2. Three Phase, Four-Wire System Wye with Direct Voltage, 2.5 Element
3 Three-Phase, Four-Wire Wye/Delta with PTs, 3 Element
4. Three-Phase, Four-Wire Wye with PTs, 2.5 Element
5. Three-Phase, Three-Wire Delta with Direct Voltage
6. Three-Phase, Three-Wire Delta with 2 PTs
7. Three-Phase, Three-Wire Delta with 3 PTs
8. Current Only Measurement (Three Phase)
9. Current Only Measurement (Dual Phase)
10. Current Only Measurement (Single Phase)

1. Service: WYE/Delta, 4-Wire with No PTs, 3 CTs

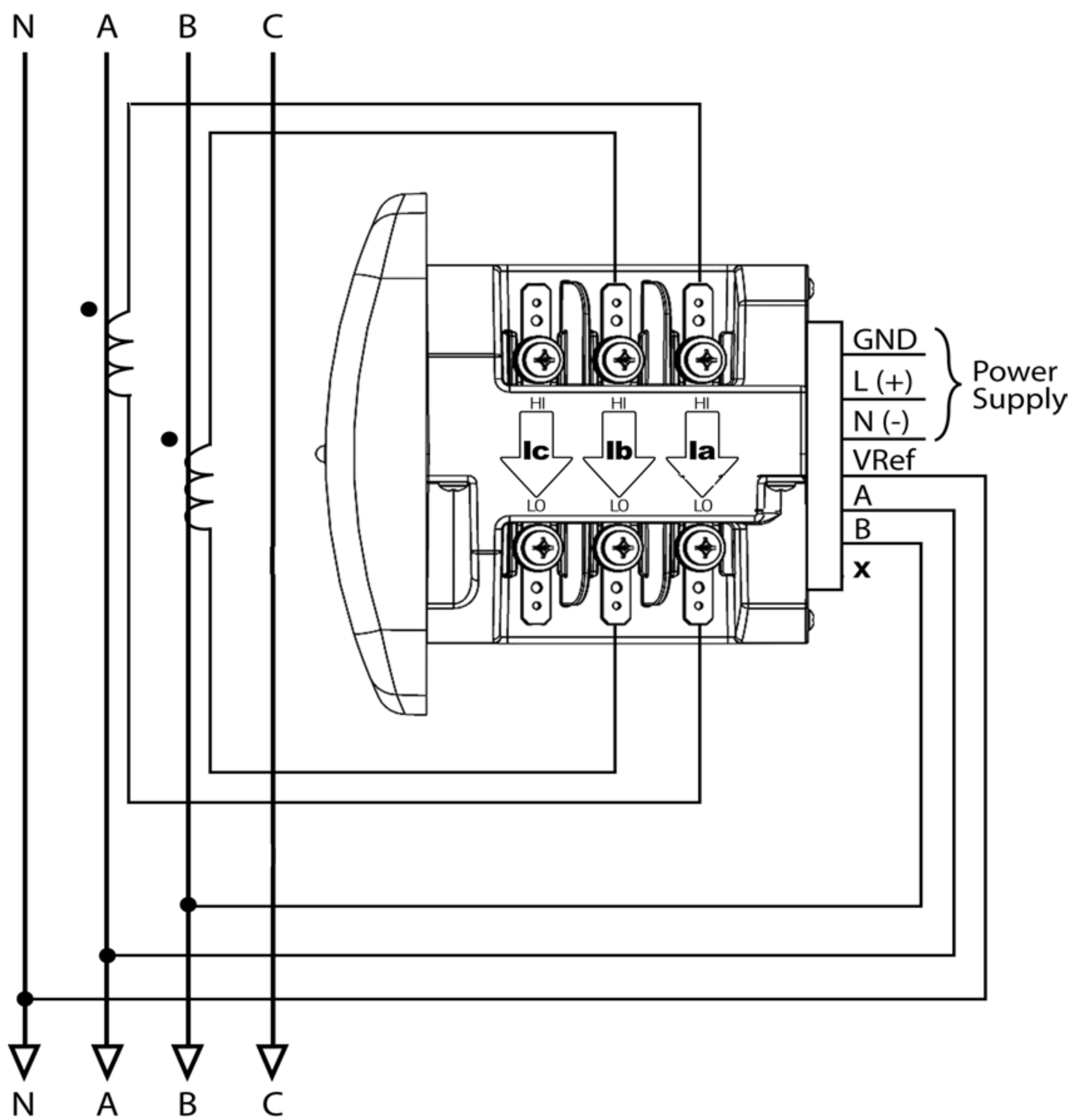


Select: “ 3 EL WYE ” (3 Element Wye) from the IQ 250/260’s Front Panel Display. (See Chapter 6.)

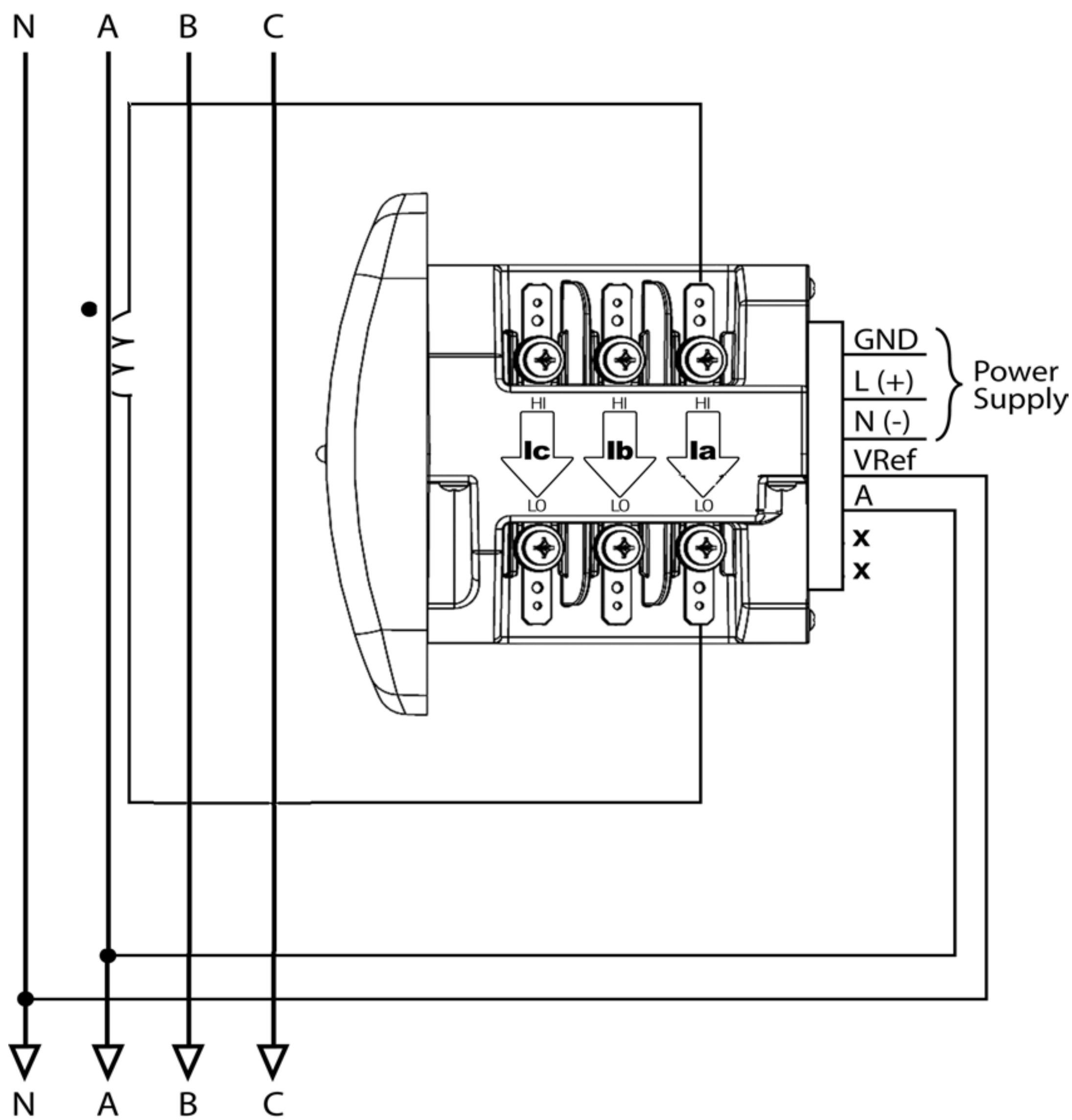




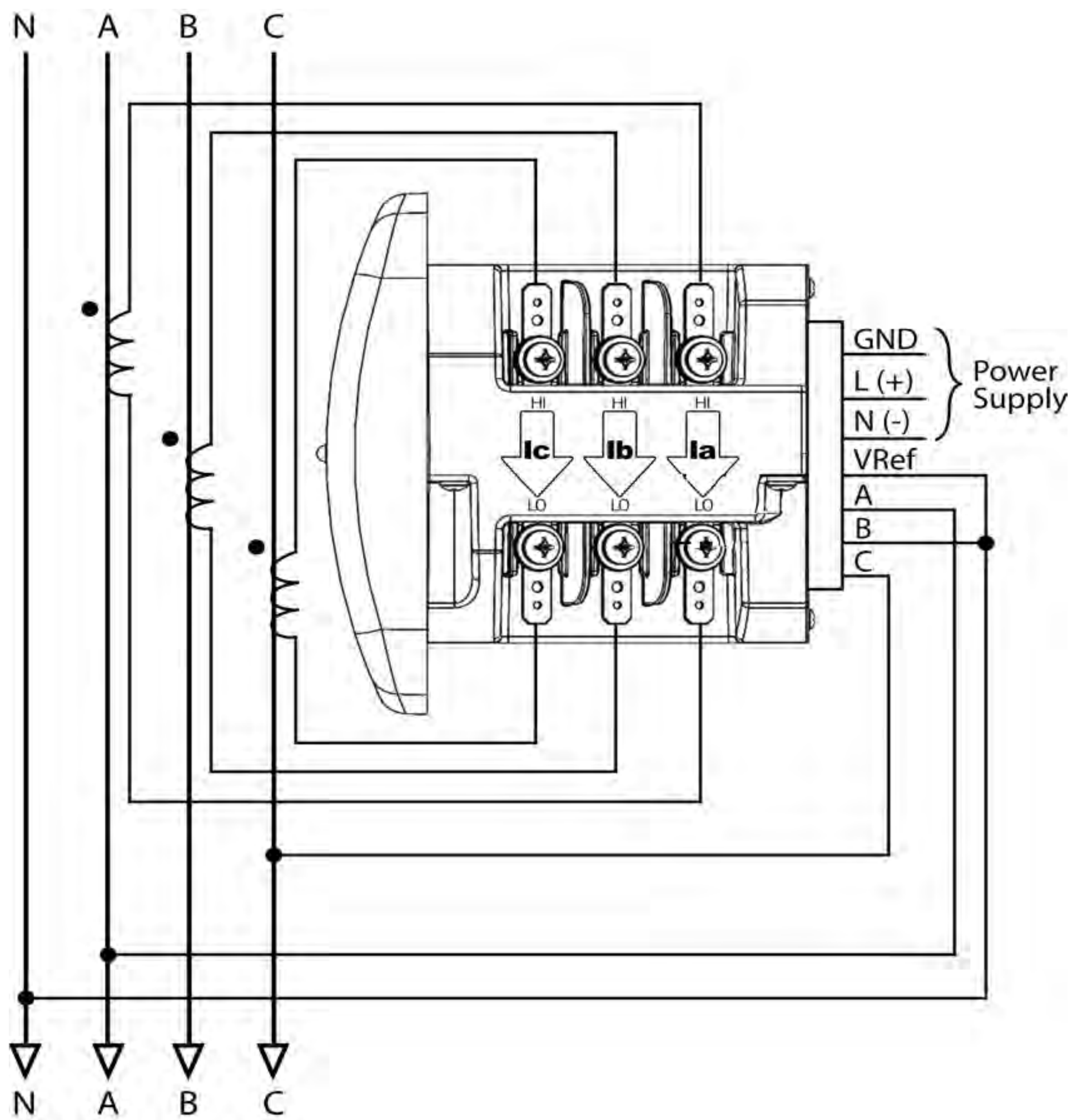
1a. Example of Dual Phase Hookup

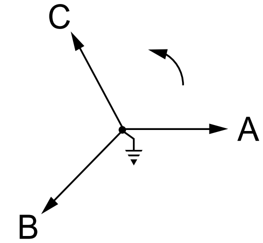


1b. Example of Single Phase Hookup



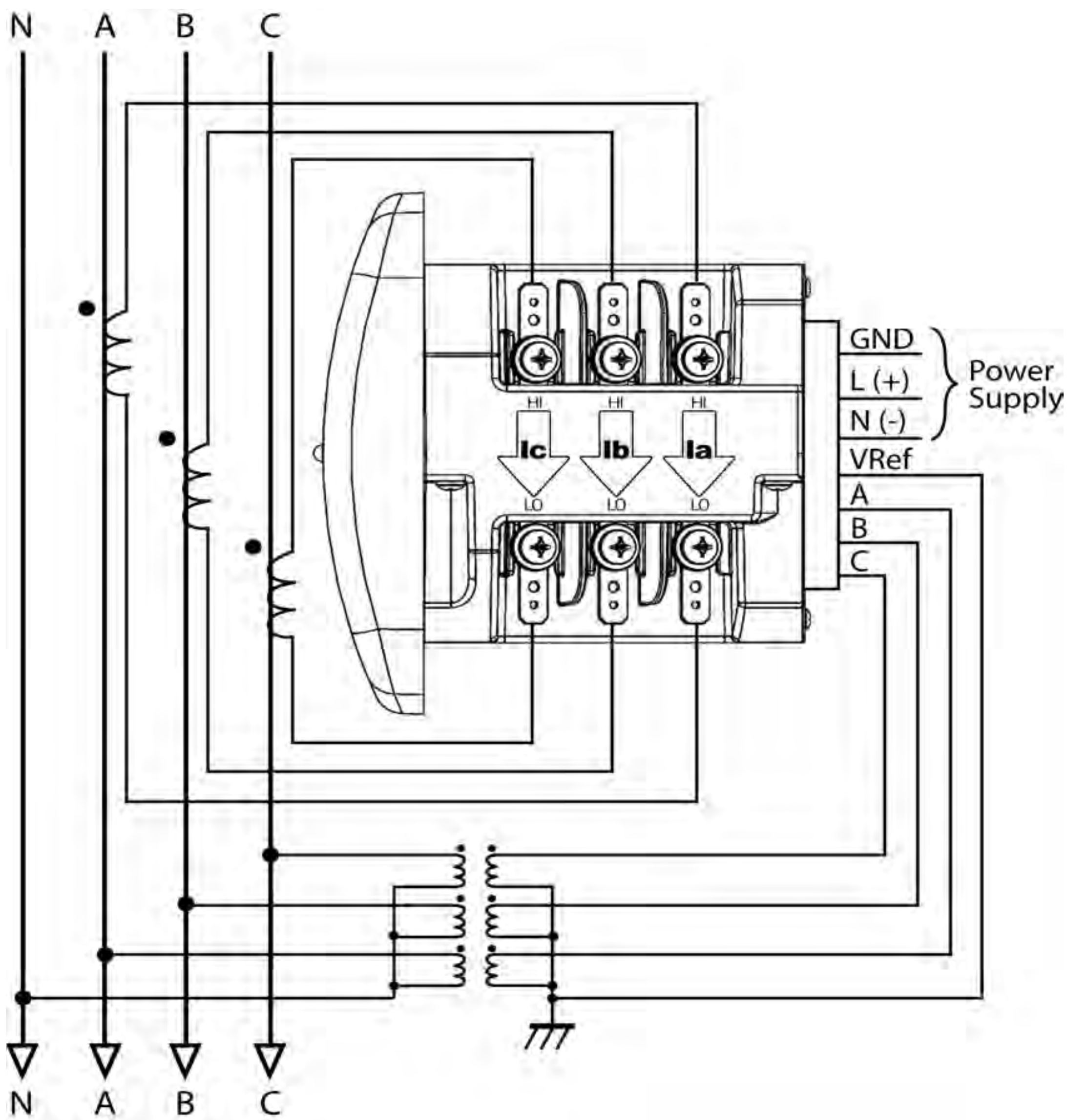
2. Service: 2.5 Element WYE, 4-Wire with No PTs, 3 CTs

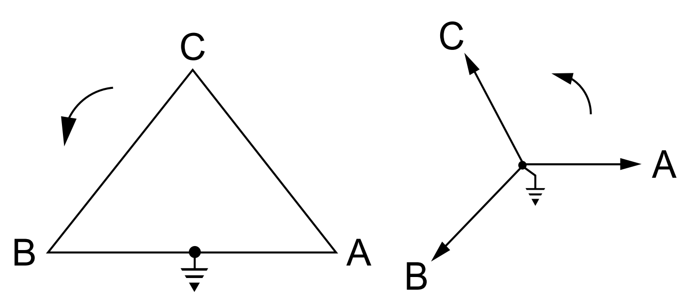




Select: “ 2.5 EL WYE ” (2.5 Element Wye) from the IQ 250/260’s Front Panel Display. (See Chapter 6.)

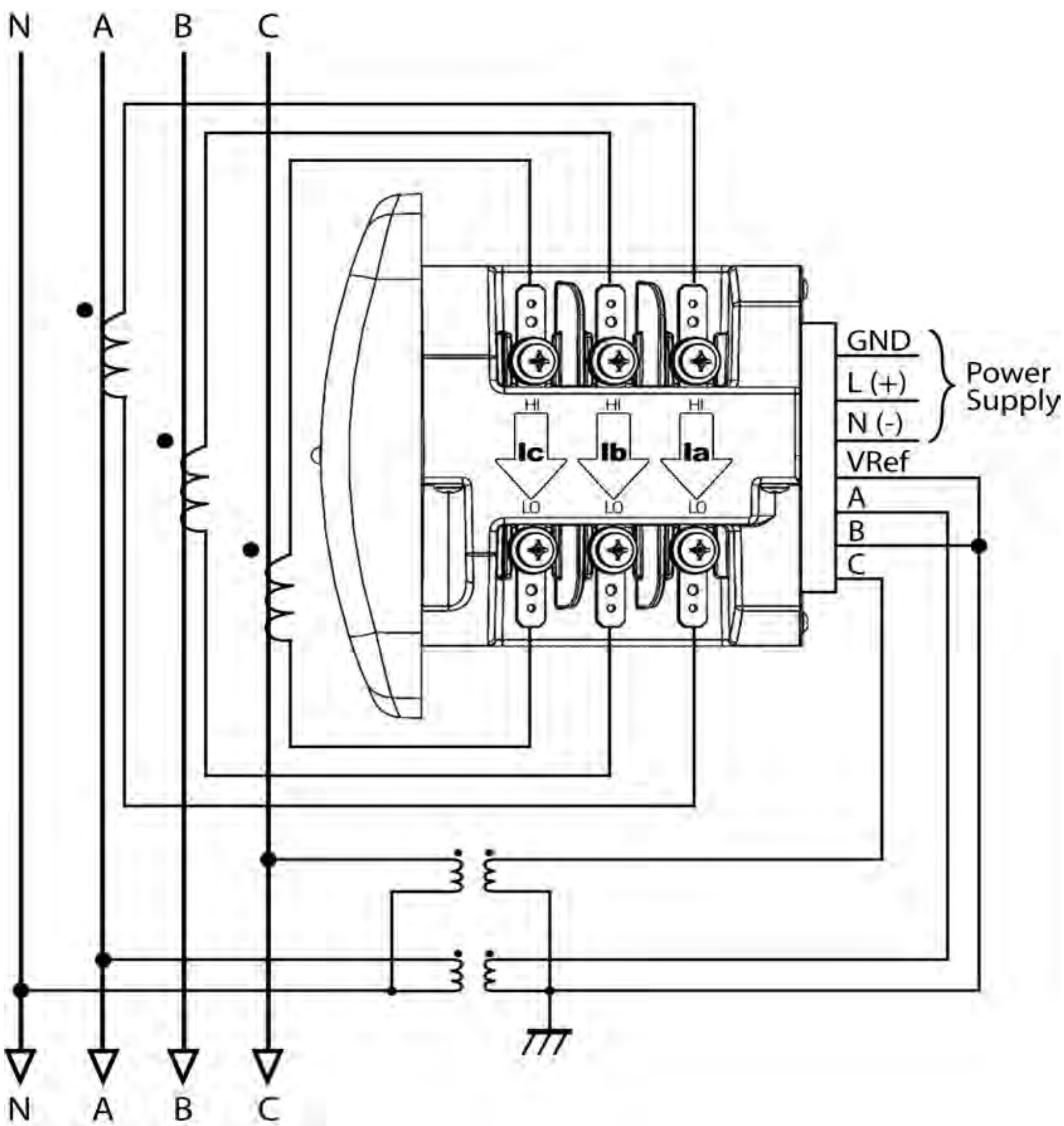
3. **Service: WYE/Delta, 4-Wire with 3 PTs, 3 CTs**

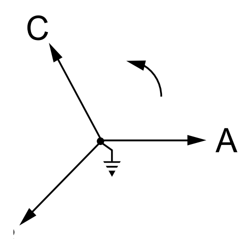




Select: " 3 EL WYE " (3 Element Wye) from the IQ 250/260's Front Panel Display. (See Chapter 6.)

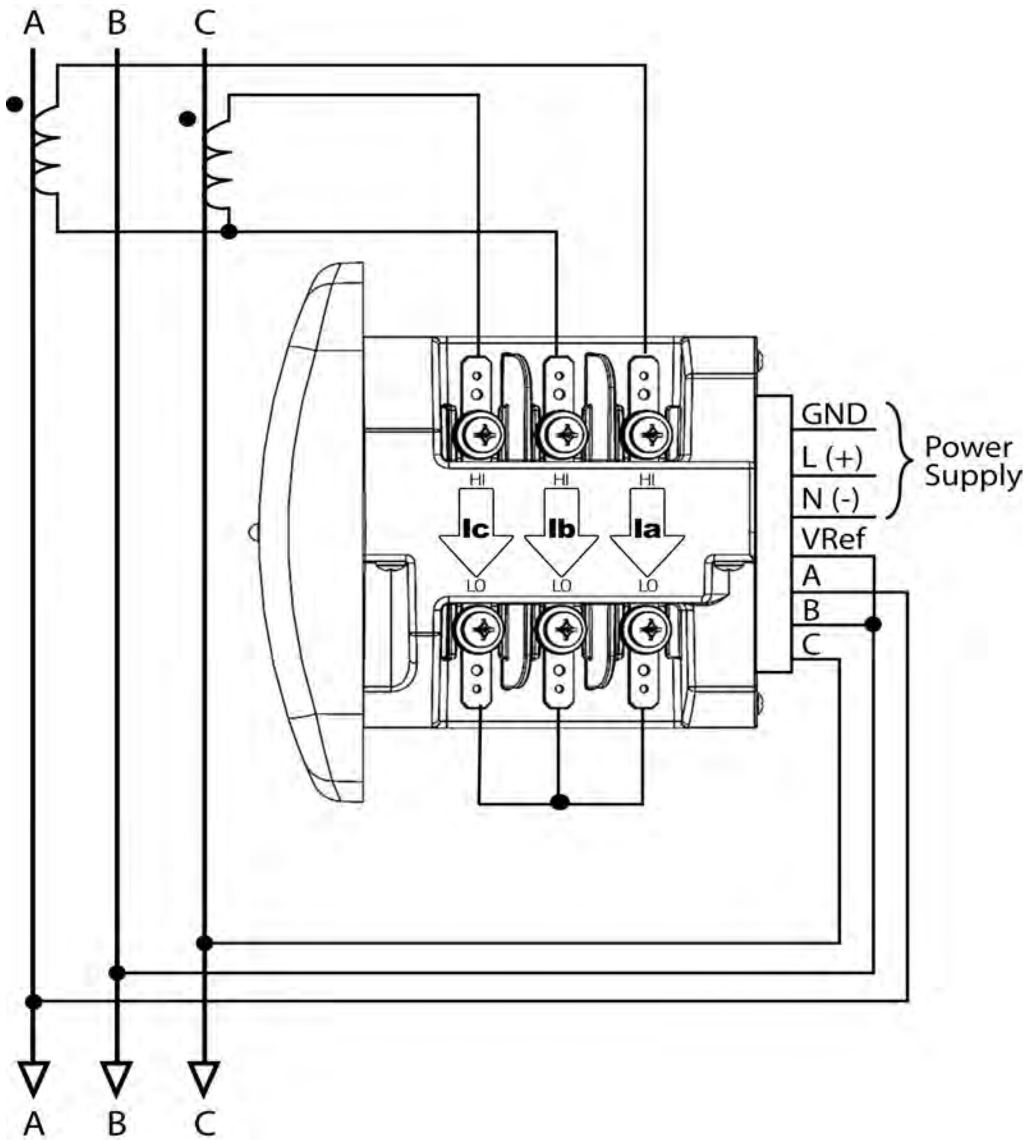
4. Service: 2.5 Element WYE, 4-Wire with 2 PTs, 3 CTs

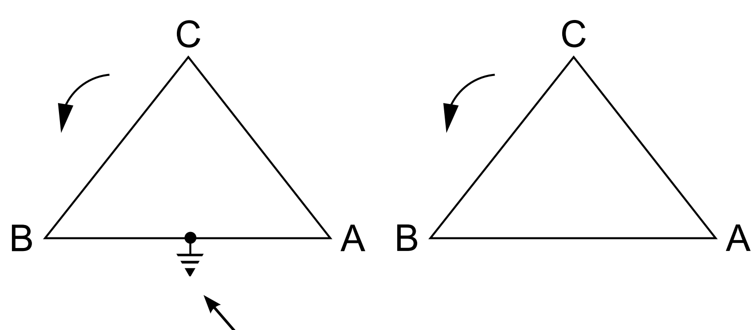




Select: " 2.5 EL WYE " (2.5 Element Wye) from the IQ 250/260's Front Panel Display. (See Chapter 6.)

5. Service: Delta, 3-Wire with No PTs, 2 CTs

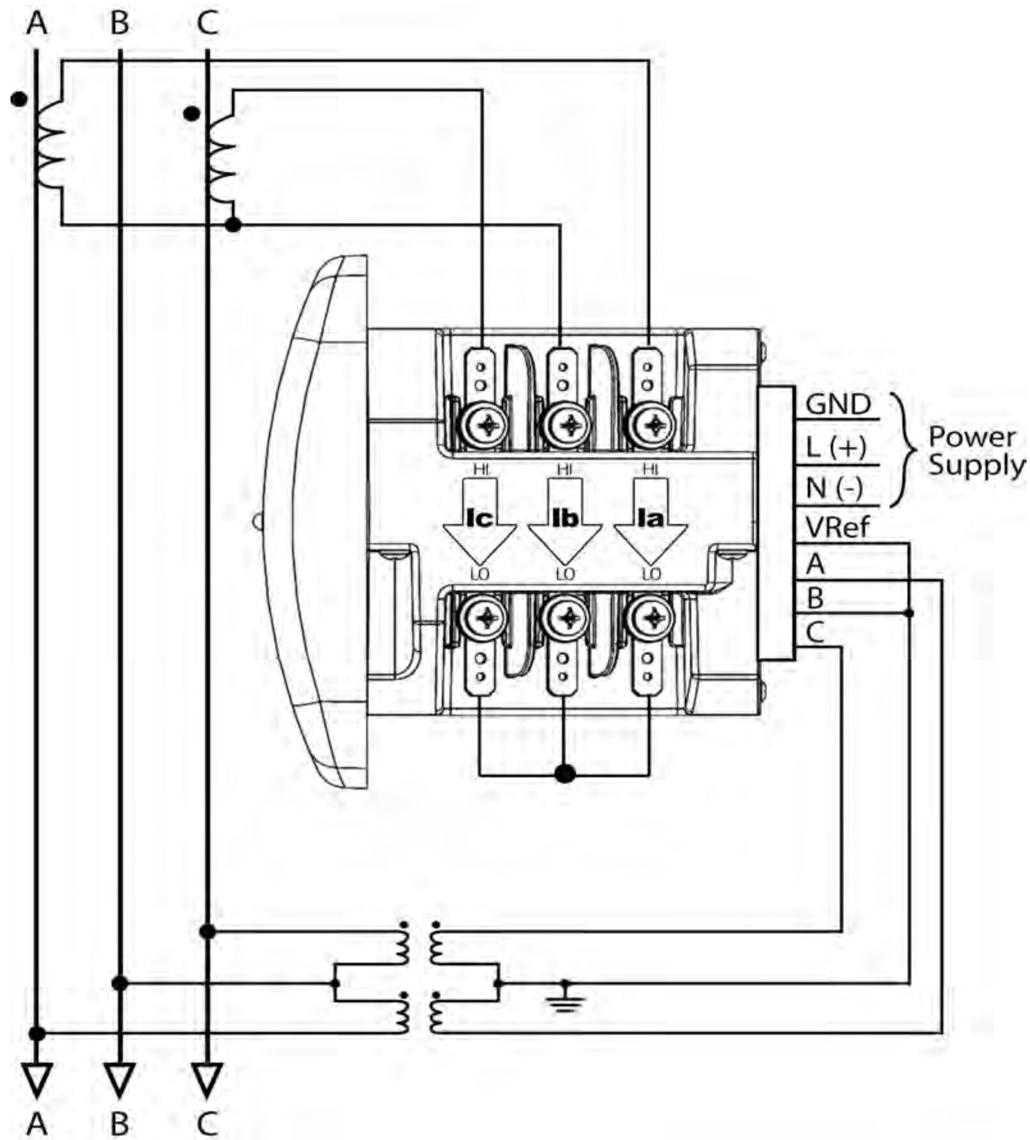


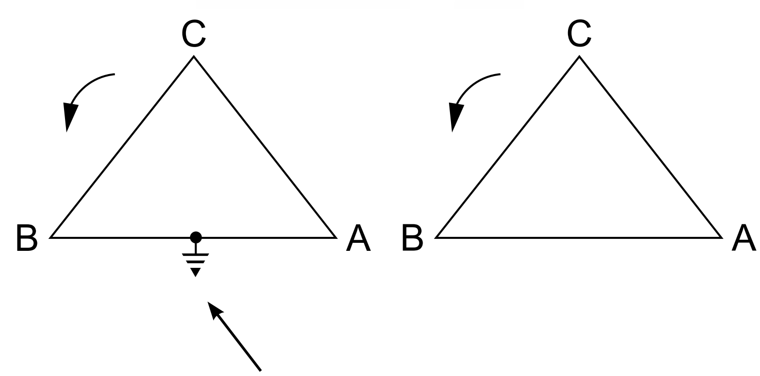


Select: " 2 CT DEL " (2 CT Delta) from the IQ 250/260's Front Panel Display. (See Chapter 6.)

Not connected to meter

6. Service: Delta, 3-Wire with 2 PTs, 2 CTs

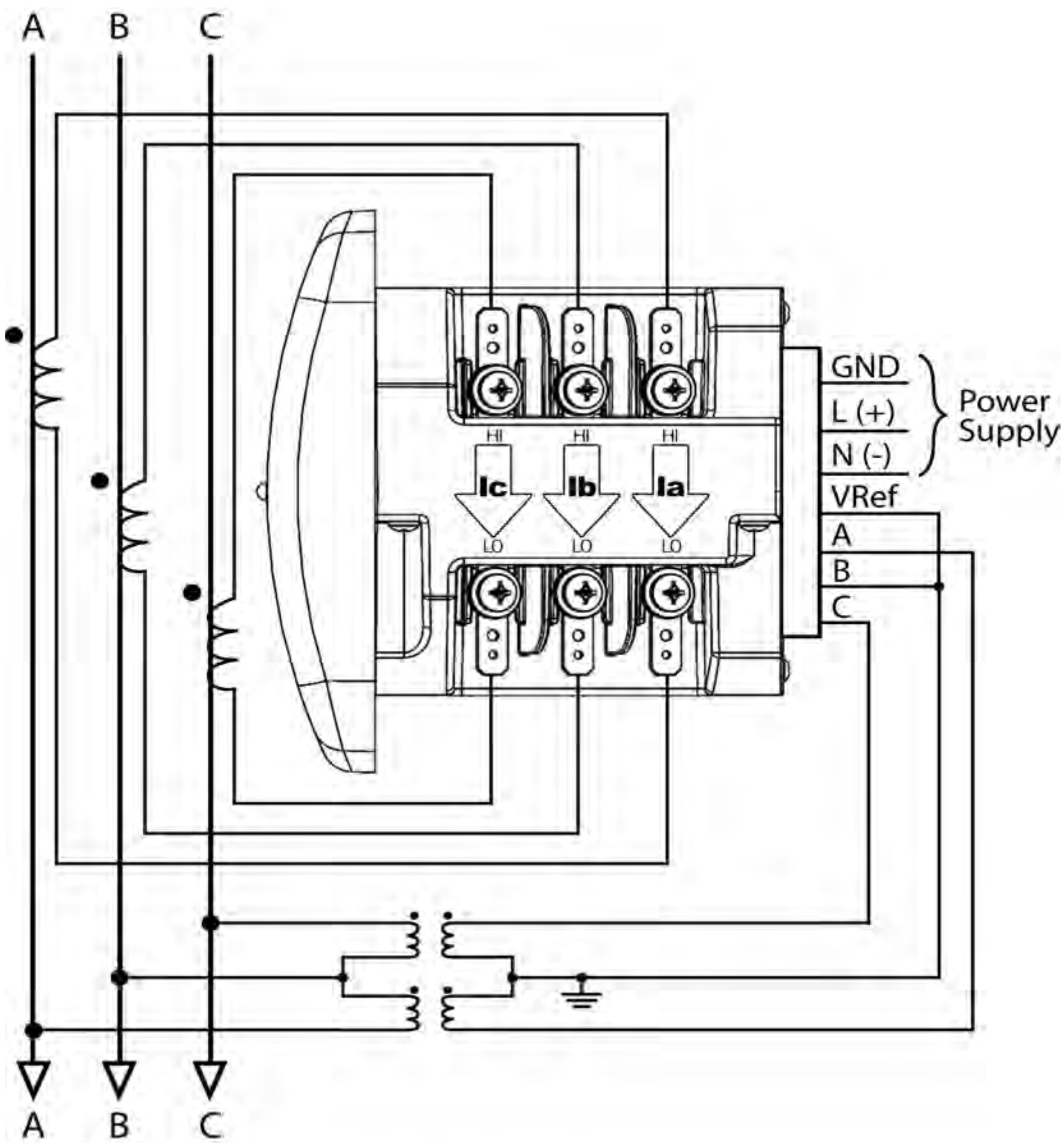


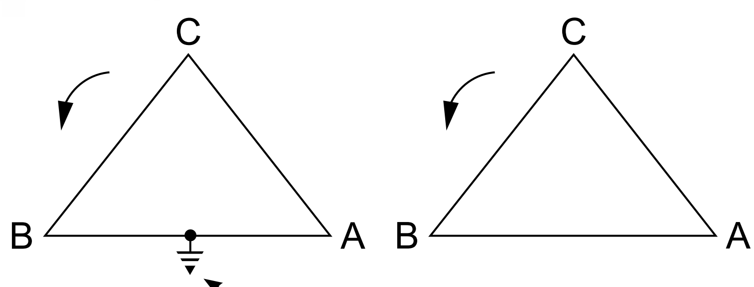


Select: " 2 CT DEL " (2 CT Delta) from the IQ 250/260's Front Panel Display. (See Chapter 6.)

Not connected to meter

7. Service: Delta, 3-Wire with 2 PTs, 3 CTs



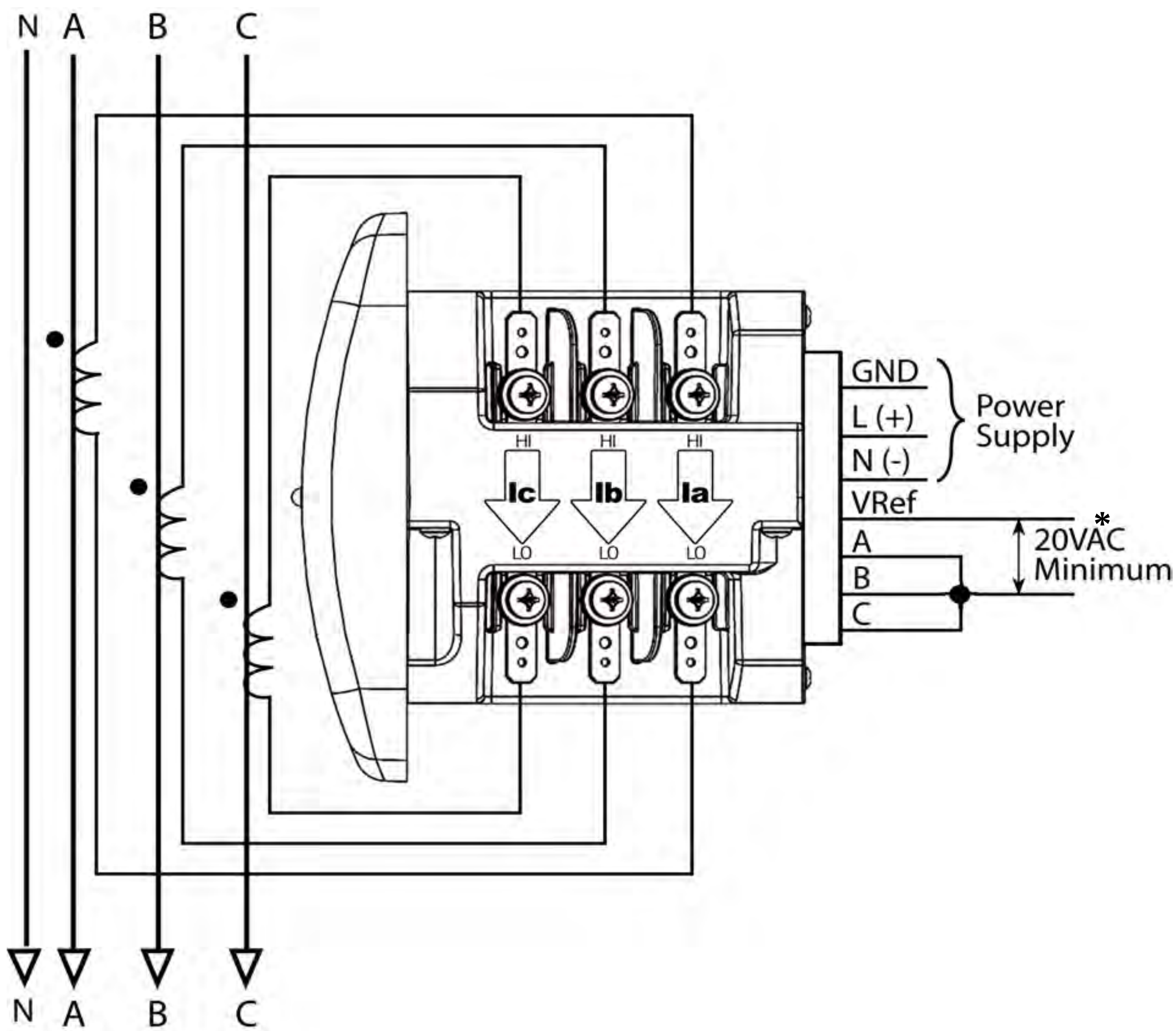


Select: " 2 CT DEL " (2 CT Delta) from the IQ 250/260's Front Panel Display. (See Chapter 6.)

Not connected to meter

NOTE: The third CT for hookup is optional and is for Current Measurement only.

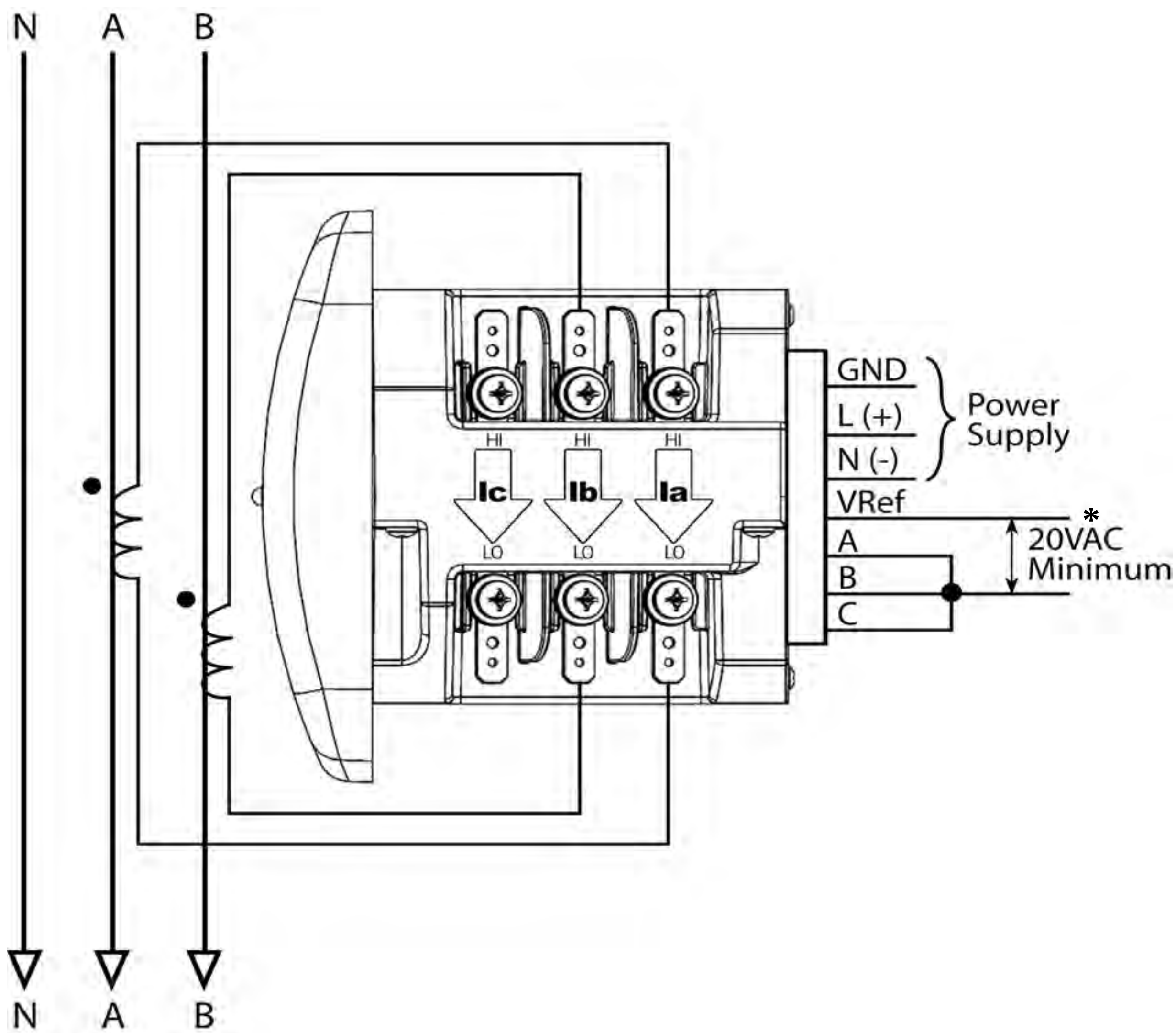
8. Service: Current Only Measurement (Three Phase)



Select: " 3 EL WYE " (3 Element Wye) from the IQ 250/260's Front Panel Display. (See Chapter 6.)

* For improved accuracy, this connection is recommended, but not required.

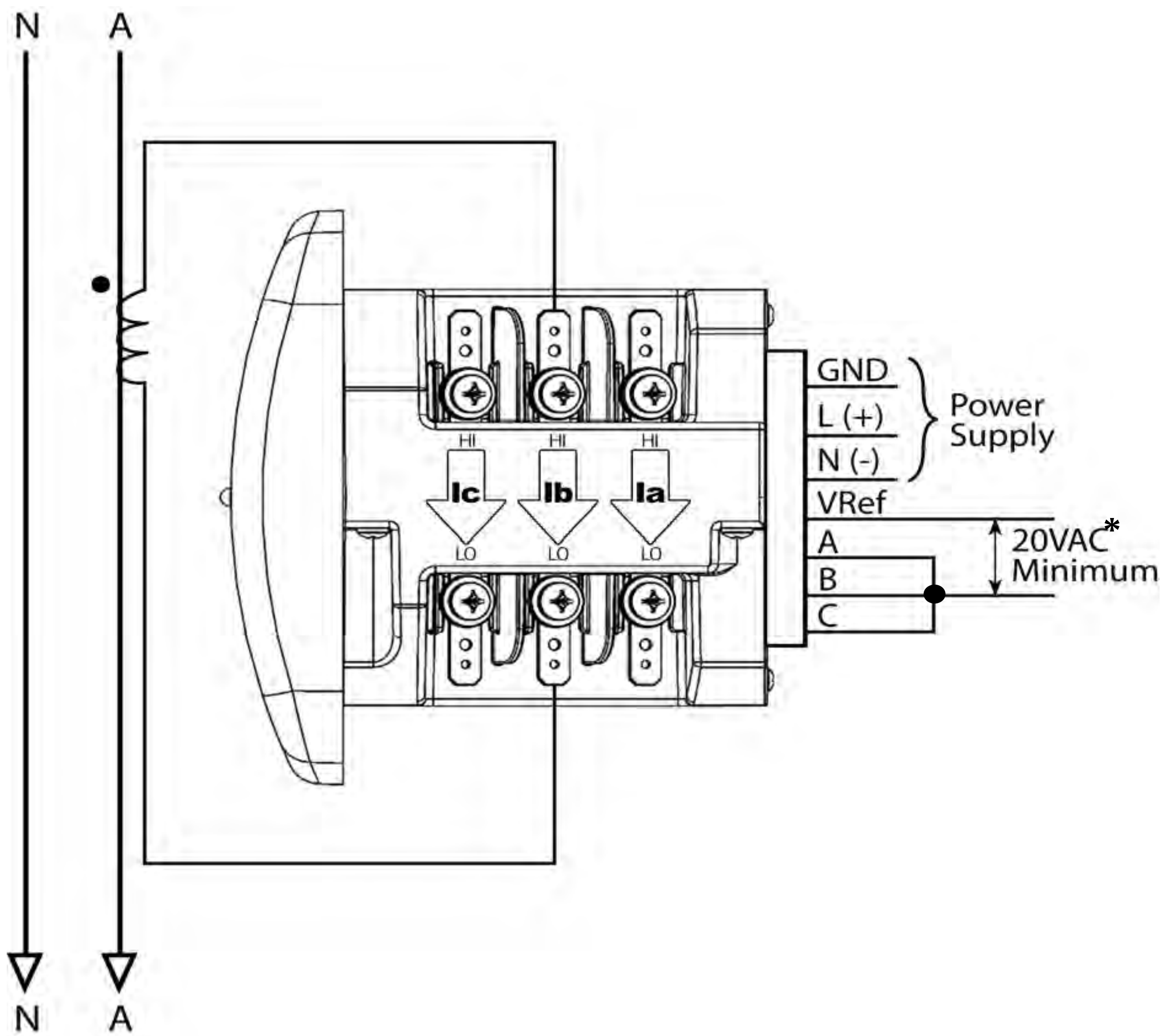
9. Service: Current Only Measurement (Dual Phase)



Select: " 3 EL WYE " (3 Element Wye) from the IQ 250/260's Front Panel Display. (See Chapter 6.)

* For improved accuracy, this connection is recommended, but not required.

10. Service: Current Only Measurement (Single Phase)



Select: " 3 EL WYE " (3 Element Wye) from the
IQ 250/260's Front Panel Display. (See Chapter 6.)

* For improved accuracy, this connection is recommended, but not required.

5 Communication Installation

IQ 250/260 Communication

The IQ 250/260 Meter provides RS485 communication speaking Modbus ASCII, Modbus RTU, and DNP 3.0 protocols.

RS485 / KYZ Output (Com 2)

Com 2 provides a combination RS485 and an Energy Pulse Output (KYZ pulse). See Chapter 2 for the KYZ Output Specifications; see Chapter 6 for Pulse Constants.

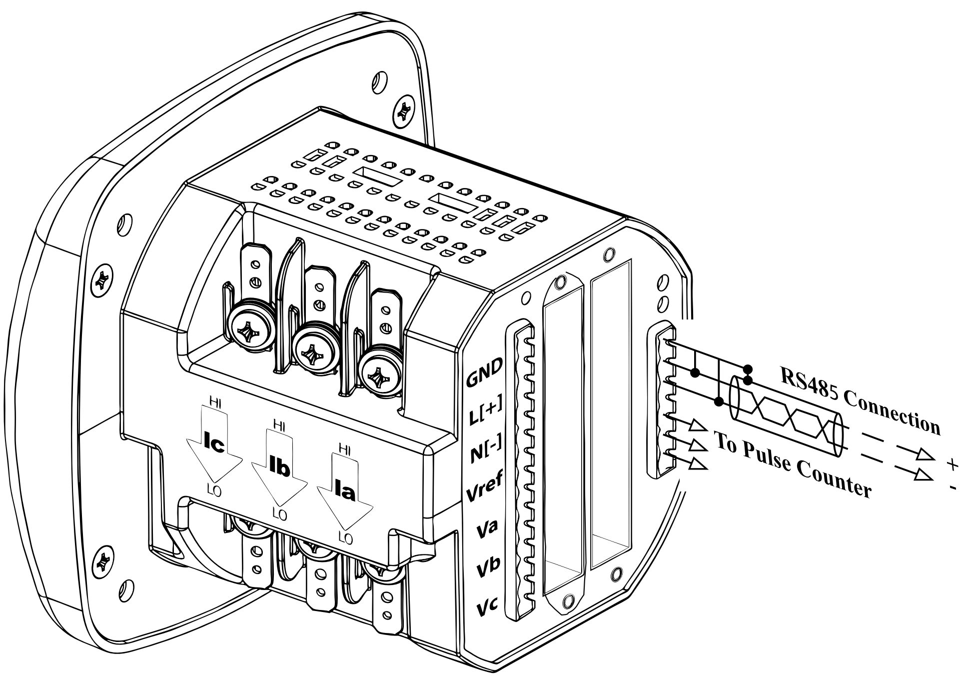


Figure 5.1: IQ 250/260 Back with RS485 Communication Installation

RS485 allows you to connect one or multiple IQ 250/260 meters to a PC or other device, at either a local or remote site. All RS485 connections are viable for up to 4000 feet (1219.20 meters).

Figure 5.2 shows the detail of a 2-wire RS485 connection.

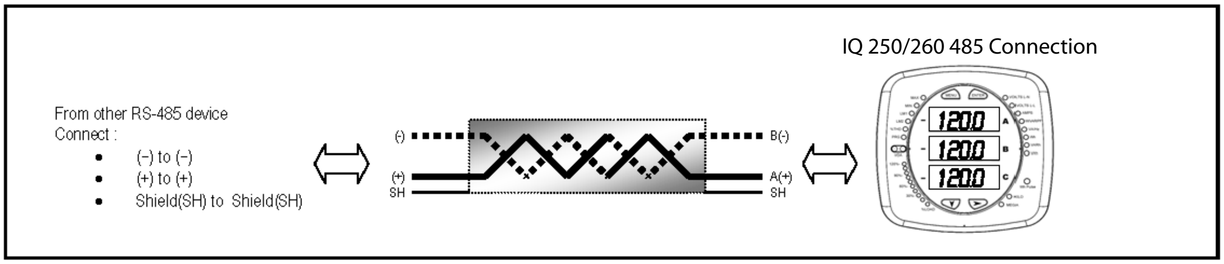


Figure 5.2: 2-wire RS485 Connection

NOTES:

For All RS485 Connections:

- Use a shielded twisted pair cable 22 AWG (0.33 mm^2) or thicker, and ground the shield, preferably at one location only.
- Establish point-to-point configurations for each device on a RS485 bus: connect (+) terminals to (+) terminals; connect (-) terminals to (-) terminals.
- You may connect up to 31 meters on a single bus using RS485. Before assembling the bus, each meter must have a unique address: refer to Chapter 8 for instructions.
- Protect cables from sources of electrical noise.
- Avoid both "Star" and "Tee" connections (see Figure 5.4).
- **No more than two cables** should be connected **at any one point** on an RS485 network, whether the connections are for devices, converters, or terminal strips.
- Include all segments when calculating the total cable length of a network. If you are **not** using an RS485 repeater, the maximum length for cable connecting all devices is 4000 feet (1219.20 meters).
- Connect shield to RS485 Master and individual devices as shown in Figure 5.3. You may also connect the shield to earth-ground at one point.
- **Termination Resistors** (**R_T**) may be needed on both ends for longer length transmission lines. However, since the meter has some level of termination internally, Termination Resistors may not be needed. When they are used, the value of the Termination Resistors is determined by the electrical parameters of the cable.

Figure 5.3 shows a representation of an RS485 Daisy Chain connection.

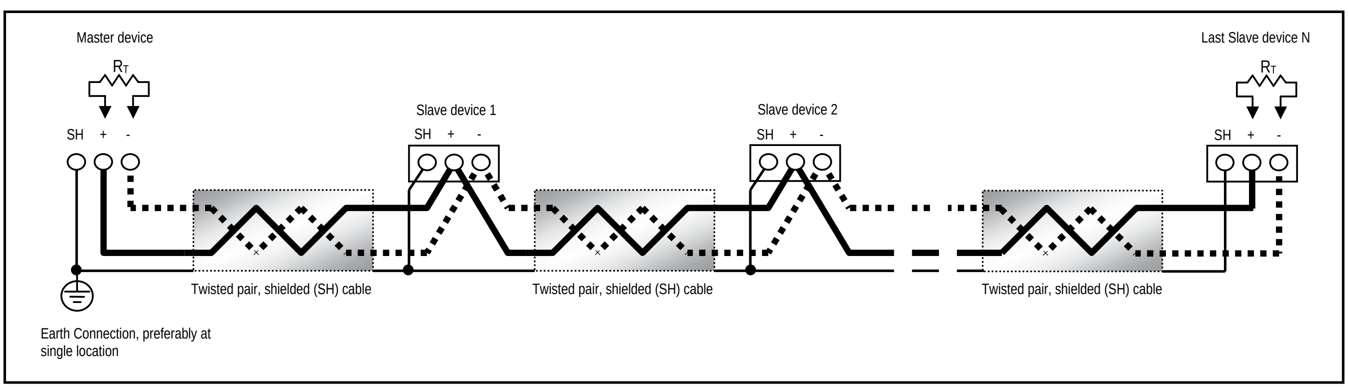


Figure 5.3: RS485 Daisy Chain Connection

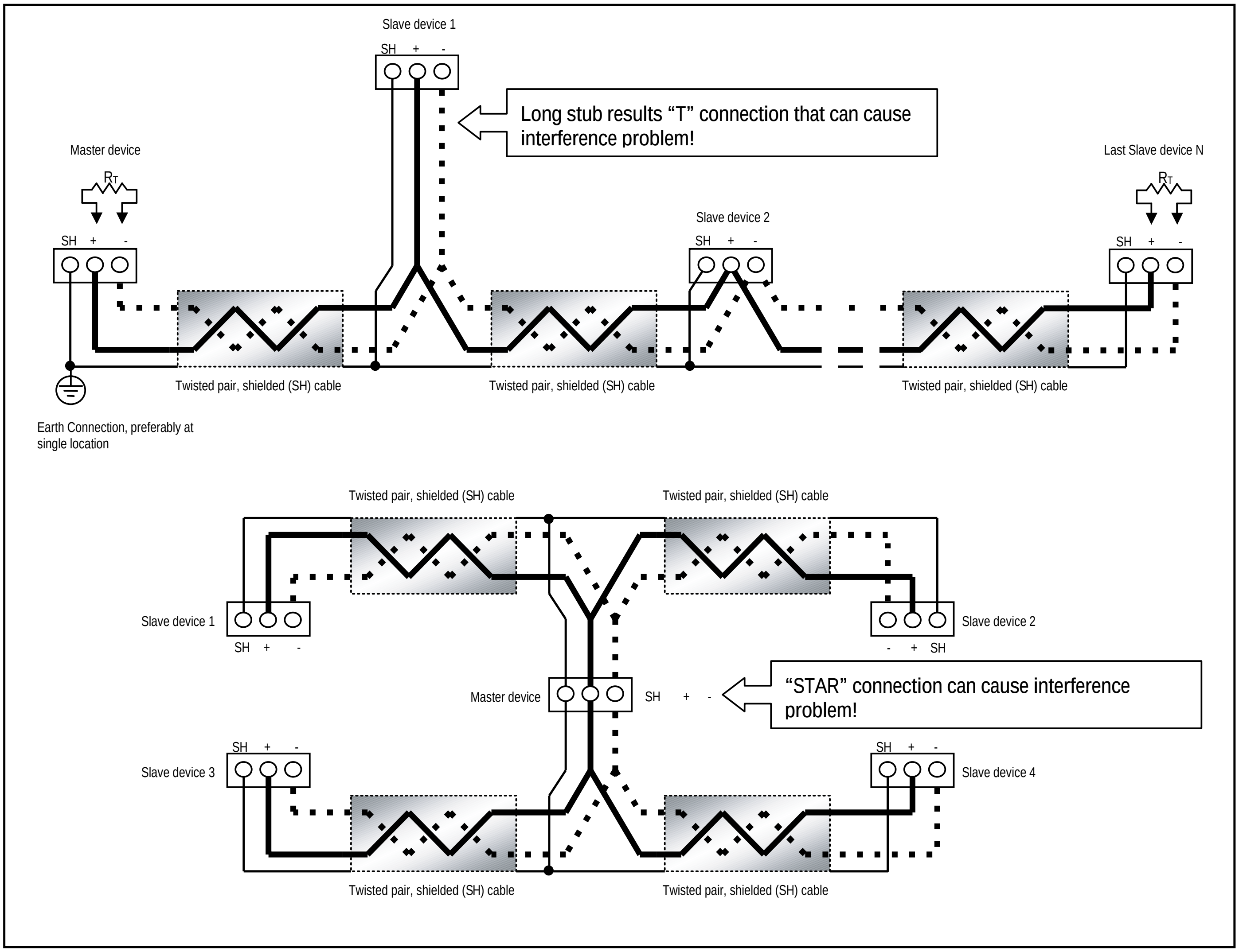


Figure 5.4: Incorrect “T” and “Star” Topologies

Using the Power Xpert® Gateway

The Power Xpert® Gateway allows an IQ 250/260 to communicate with a PC through a standard web browser. See the *Power Xpert®Gateway User Guide*, document number 164201670, for additional information.

IQ 250/260T Communication Information

The IQ 250/260T Transducer model does not include a display or buttons on the front face of the meter. Programming and communication utilize the RS485 connection on the back face of the meter shown in section 5.1.2. Once a connection is established, Eaton Meter Configuration Software can be used to program the meter and communicate to IQ 250/260T slave devices. Refer to chapter 8 for instructions on using the software to program the meter.

Meter Connection

To provide power to the meter, attach an **Aux cable** to GND, L(+) and N(-) Refer to Chapter 4, Figure 1.
The **RS485 cable** attaches to SH, B(-) and A(+) as shown in Figure 5.3 of this chapter.

6 Using the IQ 250/260

Introduction

You can use the **Elements** and **Buttons** on the IQ 250/260 meter's face to view meter readings, reset and/or configure the IQ 250/260, and perform related functions. The following sections explain the Elements and Buttons and detail their use.

Understanding Meter Face Elements

The meter face features the following elements:
- **Reading Type Indicator:**
  Indicates Type of Reading
- **Parameter Designator:**
  Indicates Reading Displayed
- **Watt-Hour Test Pulse:**
  Energy Pulse Output to Test Accuracy
- **Scaling Factor:**
  Kilo or Mega multiplier of Displayed Readings
- **% of Load Bar:**
  Graphic Display of Amps as % of the Load

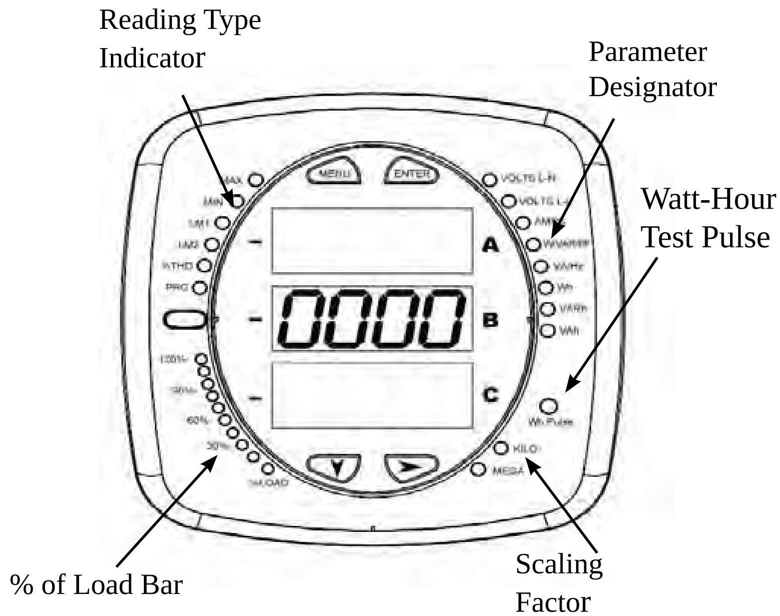


Figure 6.1: Face Plate of IQ 250/260 with Elements

Understanding Meter Face Buttons

The meter face has **Menu**, **Enter**, **Down** and **Right** buttons, which allow you to perform the following functions:
- View Meter Information
- Enter Display Modes
- Configure Parameters (may be Password Protected)
- Perform Resets (may be Password Protected)
- Perform LED Checks
- Change Settings
- View Parameter Values
- Scroll Parameter Values
- View Limit States

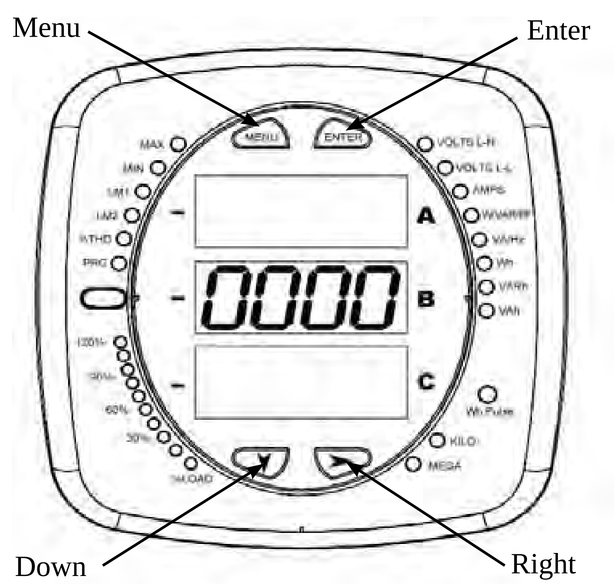


Figure 6.2: Face Plate of IQ 250/260 with Buttons

Using the Front Panel

You can access **four** modes using the IQ 250/260 front panel buttons:
- **Operating Mode** (Default)
- **Reset Mode**
- **Configuration Mode**
- **Information Mode**. **Information Mode** displays a sequence of screens that show model information, such as **Frequency** and **Amps**.

Use the **Menu**, **Enter**, **Down** and **Right** buttons to navigate through each mode and its related screens.

NOTES:
- *Appendix A* contains the complete **Navigation Map** for the front panel display modes and their screens.
- The meter can also be configured using **software**; see Chapter 8 for instructions.

Understanding Startup and Default Displays

Upon Power Up, the meter displays a sequence of screens:
- **Lamp Test Screen** where all LEDs are lit
- **Lamp Test Screen** where all digits are lit
- **Firmware Screen** showing build number
- **Error Screen** (if an error exists).

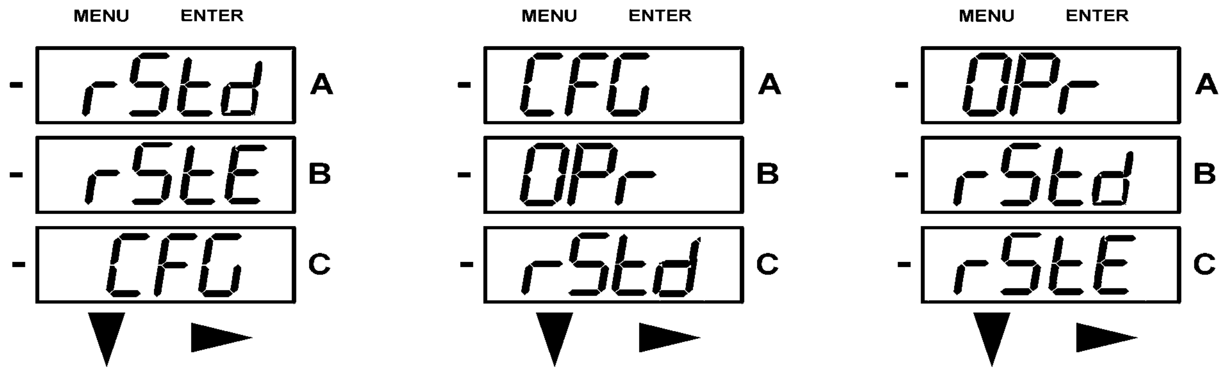
After startup, if auto-scrolling is enabled, the IQ 250/260 scrolls the parameter readings on the right side of the front panel. The Kilo or Mega LED lights, showing the scale for the Wh, VARh and VAh readings. Figure 6.3 shows an example of a Wh reading.

The IQ 250/260 continues to provide scrolling readings until one of the buttons on the front panel is pressed, causing the meter to enter one of the other Modes.

Figure 6.3: Wh Reading

Using the Main Menu

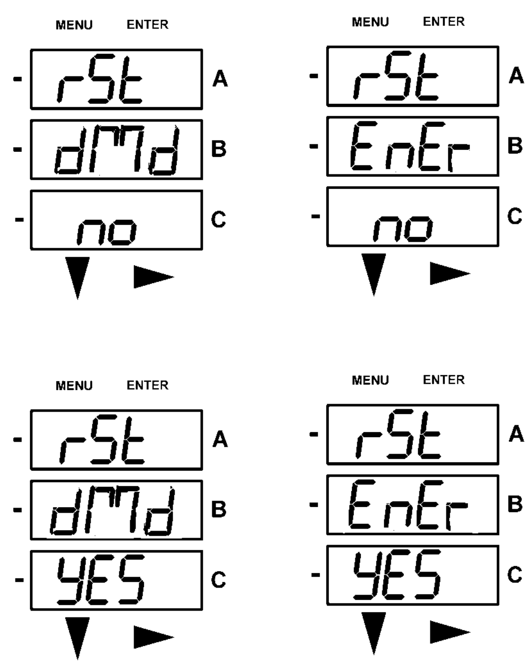
1. Press the **Menu** button. The Main Menu screen appears.
   - The **Reset: Demand** mode (**rStd**) appears in the A window. Use the **Down** button to scroll, causing the **Reset: Energy** (**rStE**), **Configuration** (**CFG**), **Operating** (**OPr**), and **Information (InFo)** modes to move to the **A window**.
   - The mode that is currently flashing in the **A** window is the "**Active**" mode, which means it is the mode that can be configured.



For example: Press **Down Twice-** **CFG** moves to A window. Press **Down** Twice - **OPr** moves to A window.

2. Press the **Enter** button from the Main Menu to view the Parameters screen for the mode that is currently active.

Using Reset Mode



Reset Mode has **two options:**
- **Reset: Demand** (**rStd**): resets the Max and Min values.
- **Reset: Energy** (**rStE**): resets the energy accumulator fields.

Press the **Enter** button while either **rStd** or **rStE** is in the A window. The **Reset Demand No or Reset Energy No** screen appears.

- If you press the **Enter** button again, the Main Menu appears, with **the next mode** in the A window. (The **Down** button does not affect this screen.)

- If you press the **Right** button, the **Reset Demand YES** or **Reset Energy YES** screen appears.
  Press **Enter** to perform a reset.
  NOTE: If Password Protection is enabled for Reset, you must enter the four digit Password before you can reset the meter. (See Chapter 8 for information on Password Protection.)
  To enter a password, follow the instructions on the next page.

CAUTION! Reset Demand YES resets **all** Max and Min values.

Once you have performed a reset, the screen displays either "**rSt dMd donE**" or "**rSt EnEr donE**"and then resumes auto-scrolling parameters.

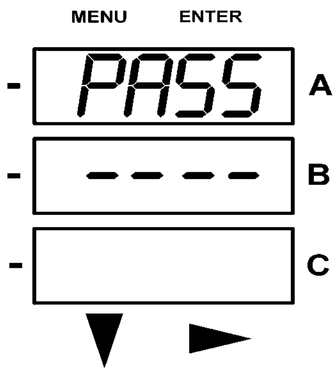
Entering a Password

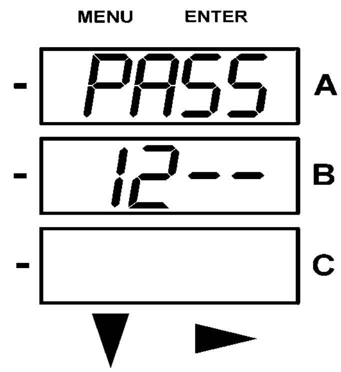
If Password Protection has been enabled in the software for Reset and/or Configuration (see Chapter 8 for information), a screen appears requesting a Password when you try to reset the meter and/or configure settings through the front panel.

- **PASS** appears in the A window and 4 dashes appear in the B window. The leftmost dash is flashing.

1. Press the **Down** button to scroll numbers from 0 to 9 for the flashing dash. When the correct number appears for that dash, use the the **Right** button to move to the next dash.

   Example: The left screen, below, shows four dashes. The right screen shows the display after the first two digits of the password have been entered.

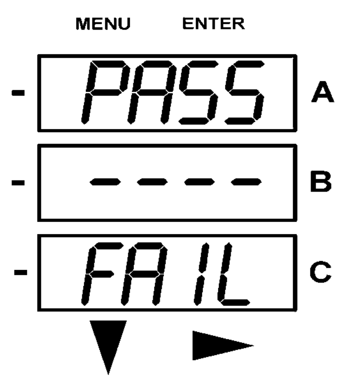




2. When all 4 digits of the password have been selected, press the **Enter** button.

- If you are in **Reset Mode** and the correct Password has been entered, "**rSt dMd donE**" or "**rSt EnEr donE**"appears and the screen resumes auto-scrolling parameters.
- If you are in **Configuration Mode** and the correct Password has been entered, the display returns to the screen that required a password.

- If an incorrect Password has been entered, "**PASS ---- FAIL**" appears, and:
  - The previous screen is redisplayed, if you are in **Reset Mode**.
  - The previous Operating Mode screen is redisplayed, if you are in **Configuration Mode**.

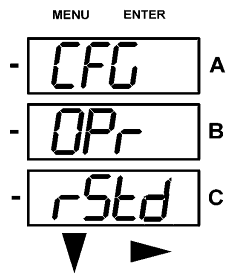


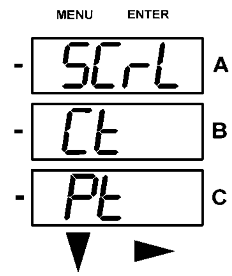
Using Configuration Mode

Configuration Mode follows Reset: Energy on the Main Menu.

To access **Configuration Mode**:

1. Press the **Menu** button while the meter is auto-scrolling parameters.
2. Press the **Down** button until the Configuration Mode option (**CFG**) is in the A window.
3. Press the **Enter** button. The **Configuration Parameters** screen appears.
4. Press the **Down** button to scroll through the configuration parameters: **Scroll (SCrL)**, **CT**, **PT**, **Connection (Cnct)** and **Port**. The parameter currently 'Active," i.e., configurable, flashes in the A window.
5. Press the **Enter** button to access the Setting screen for the currently active parameter.
   NOTE: **You can use the Enter button to scroll through all of the Configuration parameters and their Setting screens, in order.**



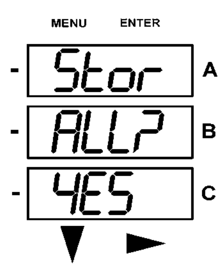


Press **Enter** when CFG is in A window - Parameter screen appears - Press **Down**-
Press **Enter** when Parameter you want is in A window

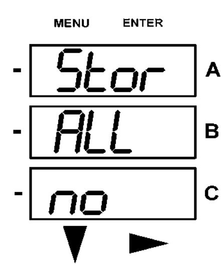
6. The parameter screen appears, showing the current settings. To change the settings:
   • Use either the **Down** button or the **Right** button to select an option.
   • To enter a number value, use the **Down** button to select the number value for a digit and the **Right** button to move to the next digit.

   NOTE: When you try to change the current setting and Password Protection is enabled for the meter, the Password screen appears. **See the previous page for instructions on entering a password**.

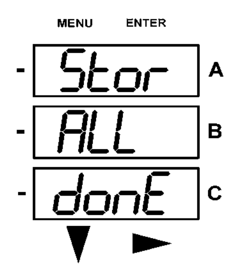
7. Once you have entered the new setting, press the **Menu** button twice.
8. The **Store ALL YES** screen appears. You can either:
   • Press the **Enter** button to **save** the new setting.
   • Press the **Right** button to access the **Store ALL no** screen; then press the Enter button to **cancel** the Save.
9. If you have saved the settings, the **Store ALL done** screen appears and the meter resets.



Press the Enter button to save the settings



Press the Enter button to



The settings have been saved

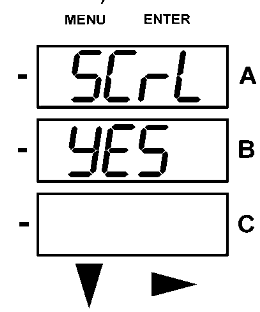
Configuring the Scroll Feature

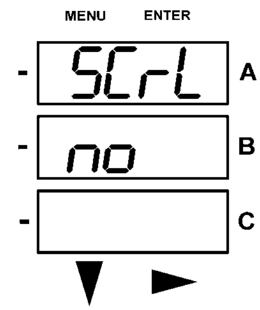
When in **Auto Scroll** mode, the meter performs a scrolling display, showing each parameter for 7 seconds, with a 1 second pause between parameters. The parameters that the meter displays are determined by the following conditions:

- They have been selected through software. (Refer to Chapter 8 for instructions.)
- Whether your meter model is an IQ 250 or IQ 260.

To enable or disable Auto-scrolling:

1. Press the **Enter** button when **SCrl** is in the A window.
   The **Scroll YES** screen appears.





2. Press either the **Right** or **Down** button if you want to access the **Scroll no** screen.
   To return to the **Scoll YES** screen, press either button.

3. Press the **Enter** button on either the **Scroll YES** screen (to enable auto-scrolling) or the **Scroll no** screen (to disable auto-scrolling).
   The **CT- n** screen appears (this is the next Configuration mode parameter).

NOTE:

- To exit the screen without changing scrolling options, press the **Menu** button.
- To return to the Main Menu screen, press the **Menu** button twice.
- To return to the scrolling (or non-scrolling) parameters display, press the **Menu** button three times.

Configuring CT Setting

The CT Setting has three parts: **Ct-n** (numerator), **Ct-d** (denominator), and **Ct-S** (scaling).

1. Press the **Enter** button when Ct is in the A window.
   The **Ct-n** screen appears. You can either:
   - Change the value for the CT numerator.
   - Access one of the other CT screens by pressing the Enter button: press Enter once to access the **Ct-d** screen, twice to access the **Ct-S** screen.

   NOTE: The Ct-d screen is preset to a 5 amp or 1 amp value at the factory and cannot be changed.

   a. **To change the value for the CT numerator**

   From the Ct-n screen:
   - Use the **Down** button to select the number value for a digit.
   - Use the **Right** button to move to the next digit.

   b. **To change the value for CT scaling**

   From the Ct-S screen:
   Use the **Right** button or the **Down** button to choose the scaling you want. The Ct-S setting can be **1**, **10**, or **100**.

   NOTE: If you are prompted to enter a password, refer to the instructions earlier in the chapter.

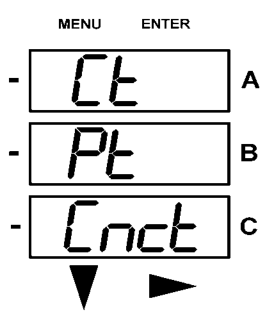
2. When the new setting is entered, press the **Menu** button twice.

3. The **Store ALL YES** screen appears. Press **Enter** to save the new CT setting.

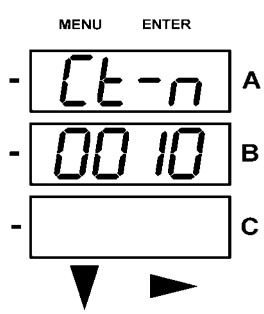
Example CT Settings:

200/5 Amps:	Set the Ct-n value for 200 and the Ct-S value for 1.
800/5 Amps:	Set the Ct-n value for 800 and the Ct-S value for 1.
2,000/5 Amps:	Set the Ct-n value for 2000 and the Ct-S value for 1.
10,000/5 Amps:	Set the Ct-n value for 1000 and the Ct-S value for 10.

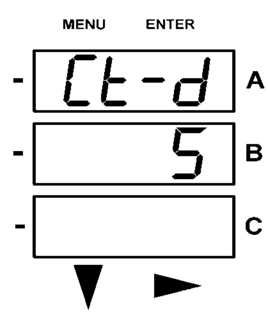
NOTES:
- The value for Amps is a product of the Ct-n value and the Ct-S value.
- Ct-n and Ct-S are dictated by primary current; Ct-d is secondary current.



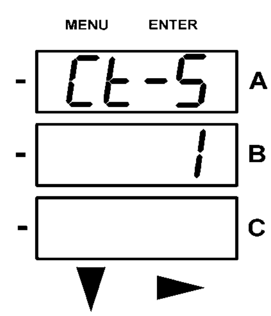
Press **Enter**



Use buttons to set Ct-n value



The Ct-d cannot be changed



Use buttons to select scaling

Configuring PT Setting

The PT Setting has three parts: **Pt-n** (numerator), **Pt-d** (denominator), and **Pt-S** (scaling).

1. Press the **Enter** button when Pt is in the A window.
   The **PT-n** screen appears. You can either:
   - Change the value for the PT numerator.
   - Access one of the other PT screens by pressing the **Enter** button: press **Enter** once to access the **Pt-d** screen, twice to access the **Pt-S** screen.

   a. **To change the value for the PT numerator or denominator**

   From the Pt-n or Pt-d screen:
   - Use the **Down** button to select the number value for a digit.
   - Use the **Right** button to move to the next digit.

   b**. To change the value for the PT scaling**

   From the Pt-S screen:
   Use the **Right** button or the **Down** button to choose the scaling you want. The Pt-S setting can be **1**, **10**, **100, or 1000**.

   NOTE: If you are prompted to enter a password, refer to the instructions earlier in this chapter.

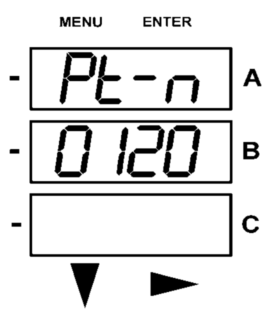
2. When the new setting is entered, press the **Menu** button twice.

3. The **STOR ALL YES** screen appears. Press Enter to save the new PT setting.

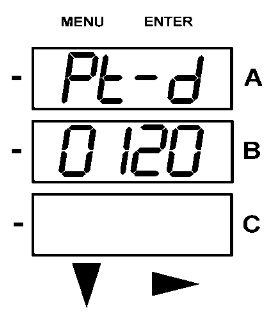
Example Settings:

277/277 Volts:	Pt-n value is 277, Pt-d value is 277, Pt-S value is 1.
14,400/120 Volts:	Pt-n value is 1440, Pt-d value is 120, Pt-S value is 10.
138,000/69 Volts:	Pt-n value is 1380, Pt-d value is 69, Pt-S value is 100.
345,000/115 Volts:	Pt-n value is 3450, Pt-d value is 115, Pt-S value is 100.
345,000/69 Volts:	Pt-n value is 345, Pt-d value is 69, Pt-S value is 1000.

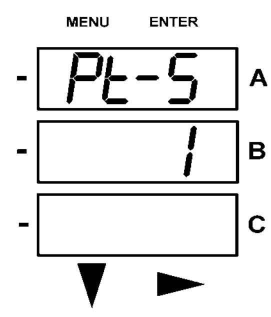
NOTE: Pt-n and Pt-S are dictated by primary voltage; Pt-d is secondary voltage.



Use buttons to set Pt-n value



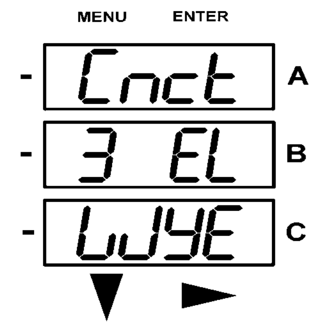
Use buttons to set Pt-d value



Use buttons to select scaling

Configuring Connection Setting

1. Press the **Enter** button when **Cnct** is in the A window. The **Cnct** screen appears.
2. Press the **Right** button or **Down** button to select a configuration.
   The choices are:
   • 3 Element Wye (**3 EL WYE**)
   • 2.5 Element Wye (**2.5EL WYE**)
   • 2 CT Delta (**2 Ct dEL**)
   NOTE: If you are prompted to enter a password, refer to the instructions earlier in this chapter.
3. When you have made your selection, press the **Menu** button twice.
4. The **STOR ALL YES** screen appears. Press **Enter** to save the setting.



Use buttons to select configuration

Configuring Communication Port Setting

Port configuration consists of : **Address** (a three digit number), **Baud Rate** (9600; 19200; 38400; or 57600), and **Protocol** (DNP 3.0; Modbus RTU; or Modbus ASCII).

1. Press the **Enter** button when **POrt** is in the A window.
   The **Adr** (address) screen appears. You can either:
   • Enter the address.
   • Access one of the other Port screens by pressing the **Enter** button: press **Enter** once to access the **bAUd** screen (Baud Rate); press **Enter** twice to access the **Prot** screen (Protocol).

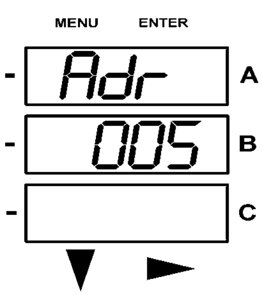
   a. **To enter the Address, from the Adr screen:**
      • Use the **Down** button to select the number value for a digit.
      • Use the **Right** button to move to the next digit.

   b. **To select the Baud Rate, from the bAUd screen:**
      Use the **Right** button or the **Down** button to select the setting you want.

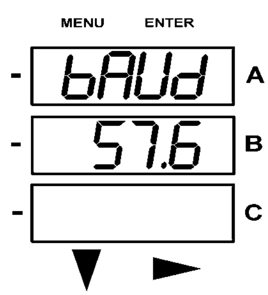
   c. **To select the Protocol, from the Prot screen:**
      Press the **Right** button or the **Down** button to select the setting you want.

   NOTE: If you are prompted to enter a password, refer to the instructions earlier in this chapter.

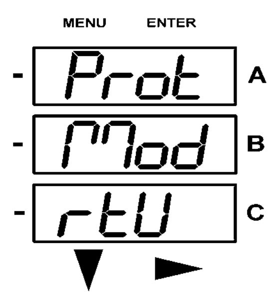
2. When you have finished making your selections, press the **Menu** button twice.
3. The **STOR ALL YES** screen appears. Press **Enter** to save the settings.



Use buttons to enter Address



Use buttons to select Baud Rate



Use buttons to select Protocol

Using Operating Mode

Operating Mode is the IQ 250/260 meter's default mode, that is, the standard front panel display. After Startup, the meter automatically scrolls through the parameter screens, if scrolling is enabled. Each parameter is shown for 7 seconds, with a 1 second pause between parameters. Scrolling is suspended for 3 minutes after any button is pressed.

1. Press the **Down** button to scroll all the parameters in **Operating Mode**. The currently "Active," i.e., displayed, parameter has the Indicator light next to it, on the right face of the meter.
2. Press the **Right** button to view additional readings for that parameter. The table below shows possible readings for Operating Mode. **Sheet 2** in *Appendix A* shows the Operating Mode Navigation Map.
   NOTE: Readings or groups of readings are skipped if not applicable to the meter type or hookup, or if they are disabled in the programmable settings.

OPERATING MODE PARAMETER READINGS

POSSIBLE READINGS

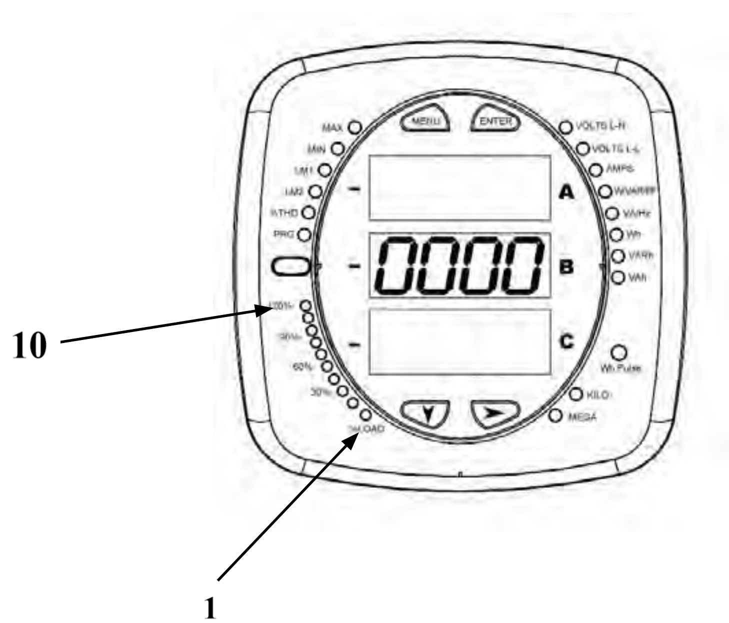
VOLTS L-N	VOLTS_LN	VOLTS_LN_MAX	VOLTS_LN_MIN			VOLTS_LN_THD
VOLTS L-L	VOLTS_LL	VOLTS_LL_MAX	VOLTS_LL_MIN			
AMPS	AMPS	AMPS_NEUTRAL	AMPS_MAX	AMPS_MIN		AMPS_THD
W/VAR/PF	W_VAR_PF	W_VAR_PF_MAX_POS	W_VAR_PF_MIN_POS	W_VAR_PF_MIN_NEG		
VA/Hz	VA_FREQ	VA_FREQ_MAX	VA_FREQ_MIN			
Wh	KWH_REC	KWH_DEL	KWH_NET	KWH_TOT		
VARh	KVARH_POS	KVARH_NEG	KVARH_NET	KVARH_TOT		
VAh	KVAH					

Understanding the % of Load Bar

The 10-segment LED bar graph at the bottom left of the IQ 250/260 front panel provides a graphic representation of Amps. The segments light according to the load, as shown in the % Load Segment Table below.
When the Load is over 120% of Full Load, all segments flash "On" (1.5 secs) and "Off" (0.5 secs).

% of Load Segment Table

Segments	Load >= % Full Load
none	no load
1	1%
1-2	15%
1-3	30%
1-4	45%
1-5	60%
1-6	72%
1-7	84%
1-8	96%
1-9	108%
1-10	120%
All Blink	>120%



Performing Watt-Hour Accuracy Testing (Verification)

To be certified for revenue metering, power providers and utility companies must verify that the billing energy meter performs to the stated accuracy. To confirm the meter's performance and calibration, power providers use field test standards to ensure that the unit's energy measurements are correct. Since the IQ 250/260 is a traceable revenue meter, it contains a utility grade test pulse that can be used to gate an accuracy standard. This is an essential feature required of all billing grade meters.

- Refer to Figure 6.5 for an example of how this process works.
- Refer to Table 6.1 for the Wh/Pulse Constants for Accuracy Testing.

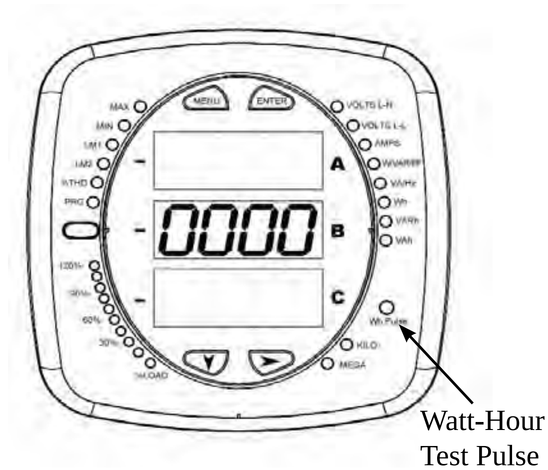


Figure 6.4: Watt-Hour Test Pulse

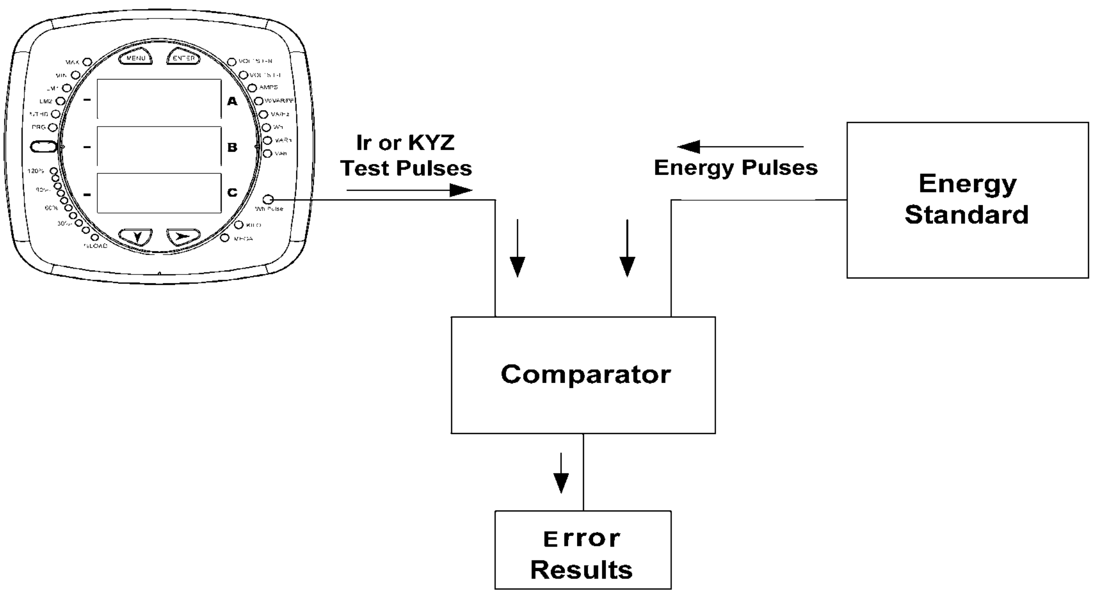


Figure 6.5: Using the Watt-Hour Test Pulse

Table 6.1: Infrared & KYZ Pulse Constants for Accuracy Testing - Kh Watthour per pulse

Input Voltage Level	Class 10 Models	Class 2 Models
Below 150V	0.500017776	0.1000035555
Above 150V	2.000071103	0.400014221

NOTE: Minimum pulse width is 90 milliseconds.

7 Using the I/O Option Cards

Overview

The IQ 250/260 offers extensive **I/O expandability.** Using the two universal Option Card slots, the unit can be easily configured to accept new I/O Option cards even after installation, without your needing to remove it from the installation. The IQ 250/260 auto-detects any installed Option cards. Up to 2 modules of any type outlined in this chapter can be used per meter.

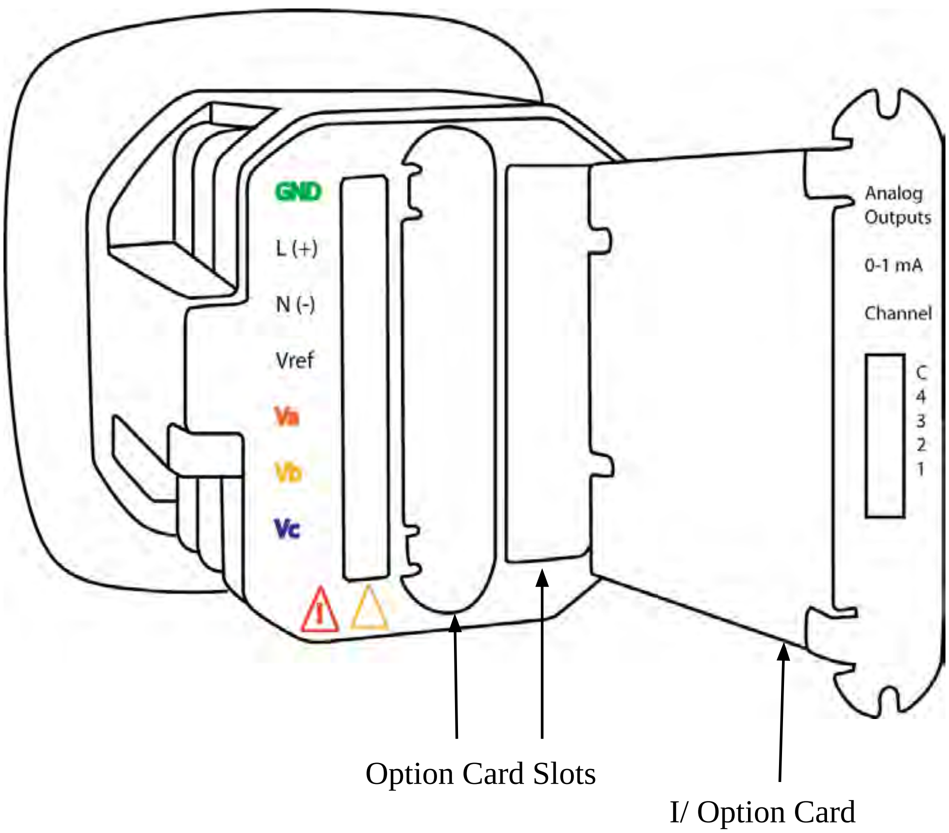


Figure 7.1: IQ 250/260 Back Showing Option Card Slots and I/O Card

Installing Option Cards

The Option Cards are inserted in one of the two Option Card slots in the back of the IQ 250/260.
Note: Remove Voltage Inputs and power supply terminal to the IQ 250/260 before performing card installation.
1. Remove the screws at the top and the bottom of the Option Card slot covers.
2. There is a plastic “track” on the top and the bottom of the slot. The Option card fits into this track.

**WARNING!
For safety, remove these connections before installing Option Cards (GND, L, N, Vref, Va, Vb, Vc)**

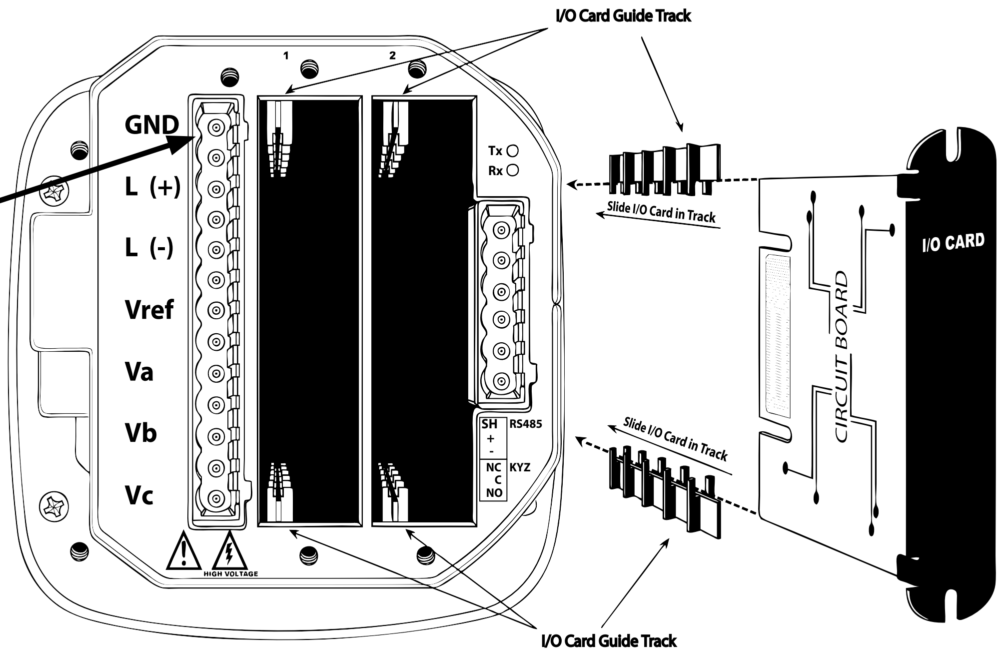


Figure 7.2: Detail of Guide Tracks

3. Slide the card inside the plastic track and insert it into the slot. You will hear a click when the card is fully inserted. **Be careful**, it is easy to miss the guide track.

CAUTIONS!
- Make sure the I/O card is inserted properly into the track to avoid damaging the card’s components.
- For proper fit of cards, and to avoid damaging the unit, insert components in the following order:
    1. Option Card 1
    2. Option Card 2
    3. Detachable terminal block 1
    4. Detachable terminal block 2
    5. Communication connection for RS485 Port

Configuring Option Cards

CAUTION! FOR PROPER OPERATION, RESET ALL PARAMETERS IN THE UNIT AFTER HARDWARE MODIFICATION.

The IQ 250/260 auto-detects any Option cards installed in it. You configure the Option cards through software. Refer to Chapter 8 for instructions.

The following sections describe the available Option cards.

Digital Output (Relay Contact) / Digital Input Card (IQ250/260-IO1)

The Digital Output/Input card is a combination of relay contact outputs for load switching and dry/wet contact sensing digital inputs. The outputs are electrically isolated from the inputs and from the main unit.

Specifications

The technical specifications at 25 °C are as follows:

Power consumption:	0.320W internal
Relay outputs.	
Number of outputs:	2
Contact type:	Changeover (SPDT)
Relay type:	Mechanically latching
Switching voltage:	AC 250V / DC 30V
Switching power:	1250VA / 150W
Switching current:	5A
Switching rate max.:	10/s
Mechanical life:	5×10^7 switching operations
Electrical life:	10^5 switching operations at rated current
Breakdown voltage:	AC 1000V between open contacts
Isolation:	AC 3000V / 5000V surge system to contacts
Reset/Power down state:	No change - last state is retained
Inputs.	
Number of Inputs:	2
Sensing type:	Wet or dry contact status detection
Wetting voltage:	DC 12V, internally generated
Input current:	2.5mA – constant current regulated
Minimum input voltage:	0V (input shorted to common)
Maximum input voltage:	DC 150V (diode protected against polarity reversal)
Filtering:	De-bouncing with 50ms delay time
Detection scan rate:	100ms
Isolation:	AC 2500V system to inputs

The general specifications are as follows:

Operating temperature:	(-20 to +70) °C
Storage temperature:	(-40 to +80) °C
Relative air humidity:	Maximum 95%, non-condensing
EMC - Immunity Interference:	EN61000-4-2
Weight:	1.5oz
Dimensions (inch) W x H x L:	0.72 x 2.68 x 3.26
External Connection:	AWG 12-26/(0.129 - 3.31)mm^2 9 pin, 0.200” pluggable terminal block

Wiring Diagram

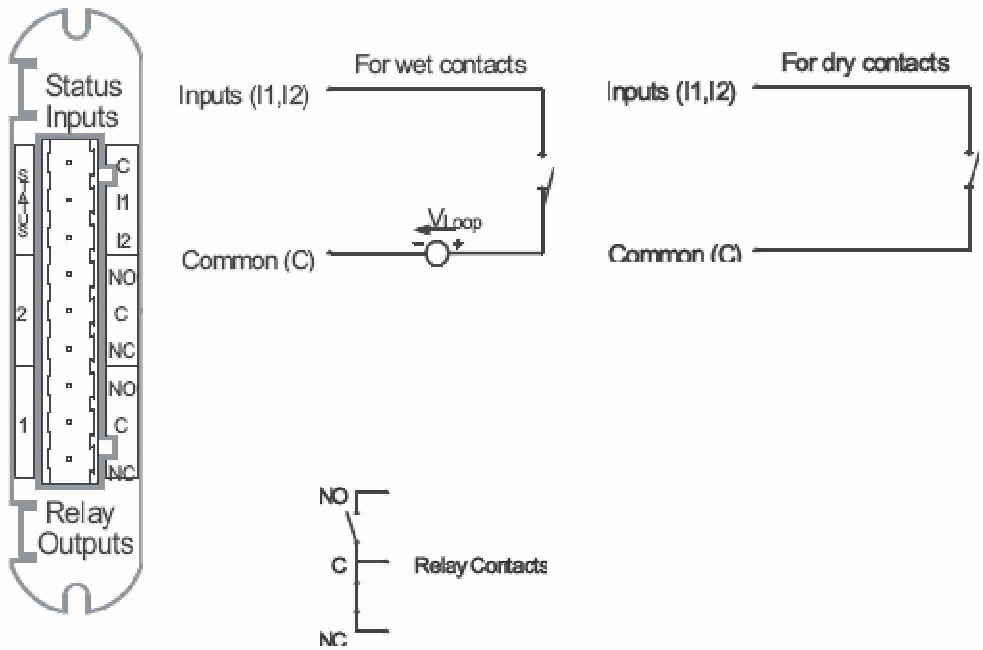


Fig. 7.3: Relay Contact (2) / Status Input (2) Card

Pulse Output (Solid State Relay Contacts) / Digital Input Card (IQ250/260-IO2)

The Pulse Output/Digital Input card is a combination of pulse outputs via solid state contacts and dry/wet contact sensing digital inputs. The outputs are electrically isolated from the inputs and from the main unit.

Specifications

The technical specifications at 25 °C are as follows:

Power consumption:	0.420W internal
Relay outputs	
Number of outputs:	4
Contact type:	Closing (SPST - NO)
Relay type:	Solid state
Peak switching voltage:	DC ±350V
Continuous load current:	120mA
Peak load current:	350mA for 10ms
On resistance, max.:	35Ω
Leakage current:	1μA@350V
Switching Rate max.:	10/s
Isolation:	AC 3750V system to contacts
Reset/Power down state:	Open contacts
Inputs	
Number of inputs:	4
Sensing type:	Wet or dry contact status detection
Wetting voltage:	DC 12V, internally generated
Input current:	2.5mA – constant current regulated
Minimum input voltage:	0V (input shorted to common)
Maximum input voltage:	DC 150V (diode protected against polarity reversal)
Filtering:	De-bouncing with 50ms delay time
Detection scan rate:	100ms
Isolation:	AC 2500V system to inputs

The general specifications are as follows:

Operating Temperature:	(-20 to +70) °C
Storage Temperature:	(-40 to +80) °C
Relative air humidity:	Maximum 95%, non-condensing
EMC - Immunity Interference:	EN61000-4-2
Weight:	1.3oz
Dimensions (inch) W x H x L:	0.72 x 2.68 x 3.26
External Connection:	AWG 12-26/(0.129 - 3.31)mm^2
	13 pin, 3.5mm pluggable terminal block

Default Configuration:

The IQ 250/260 automatically recognizes the installed option card during Power Up. If you have not programmed a configuration for the card, the unit will default to the following outputs:

Status Inputs	Defaulted to Status Detect
Pulse Outputs	Defaulted to Energy Pulses
Pulse Channel 1	1.8 +Watt-hrs per pulse
Pulse Channel 2	1.8 -Watt-hrs per pulse
Pulse Channel 3	1.8 +VAR-hrs per pulse
Pulse Channel 4	1.8 -VAR-hrs per pulse

Wiring Diagram

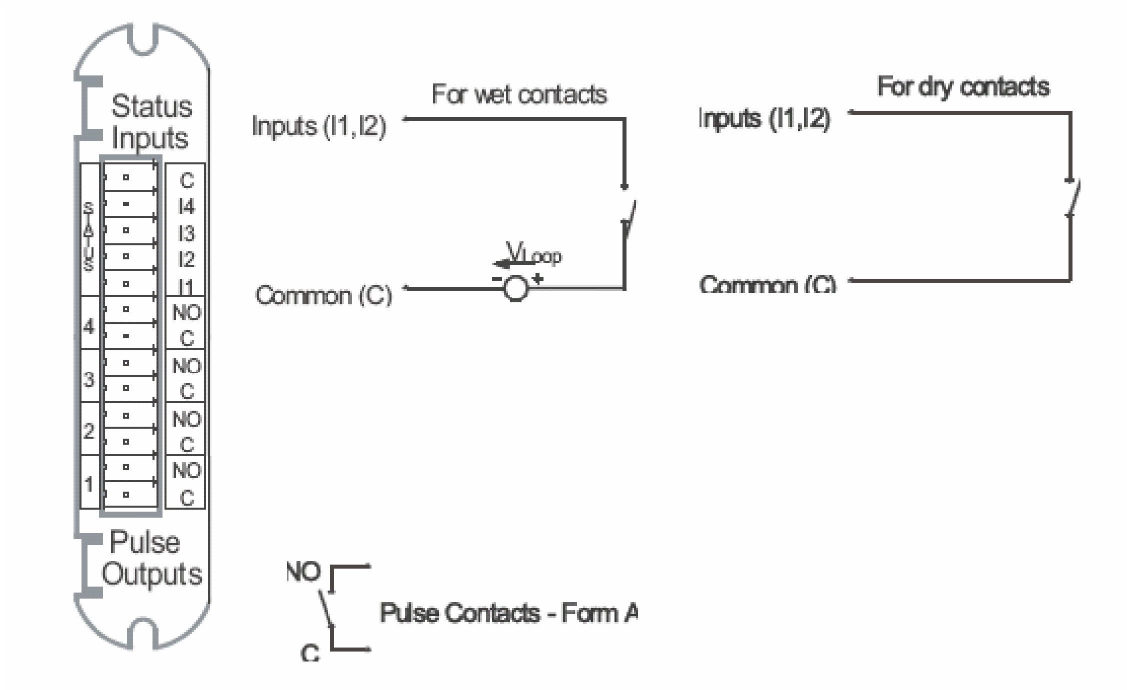


Fig. 7.4: Pulse Output (4) / Status Input (4) Card

1mA Output Card (IQ250/260-IO3)

The 1mA card transmits a standardized bi-directional 0-1mA signal. This signal is linearly proportional to real-time quantities measured by the IQ 250/260 meter. The outputs are electrically isolated from the main unit.

Specifications:

The technical specifications at 25° C at 5kΩ load are as follows:

Number of outputs:	4 single ended
Power consumption:	1.2W internal
Signal output range:	(-1.2 to +1.2)mA
Max. load impedance:	10kΩ
Hardware resolution:	12 bits
Effective resolution:	14 bits with 2.5kHz PWM
Update rate per channel:	100ms
Output accuracy:	± 0.1 % of output range (2.4mA)
Load regulation	± 0.06 % of output range (2.4mA) load step of 5kΩ @ ± 1mA
Temperature coefficient	± 30nA/°C
Isolation:	AC 2500V system to outputs
Reset/Default output value:	0mA

The general specifications are as follows:

Operating temperature:	(-20 to +70) °C
Storage temperature:	(-40 to +80) °C
Relative air humidity:	Maximum 95%, non-condensing
EMC - Immunity Interference:	EN61000-4-2
Weight:	1.6oz
Dimensions (inch) W x H x L:	0.72 x 2.68 x 3.26
External connection:	AWG 12-26/(0.29 - 3.31) mm^2
	5 pin, 0.200” pluggable terminal block

Default Configuration:

The IQ 250/260 automatically recognizes the installed option card during Power Up. If you have not programmed a configuration for the card, the unit will default to the following outputs:

Channel 1 +Watts, +1800 Watts => +1mA
-Watts, - 1800 Watts => -1mA

Channel 2 +VARs, +1800 VARs => +1mA
- VARs, -1800 VARs => -1mA

Channel 3 Phase A Voltage WYE, 300 Volts => +1mA
Phase A Voltage Delta, 600 Volts => +1mA

Channel 4 Phase A Current, 10 Amps => +1mA

Wiring Diagram

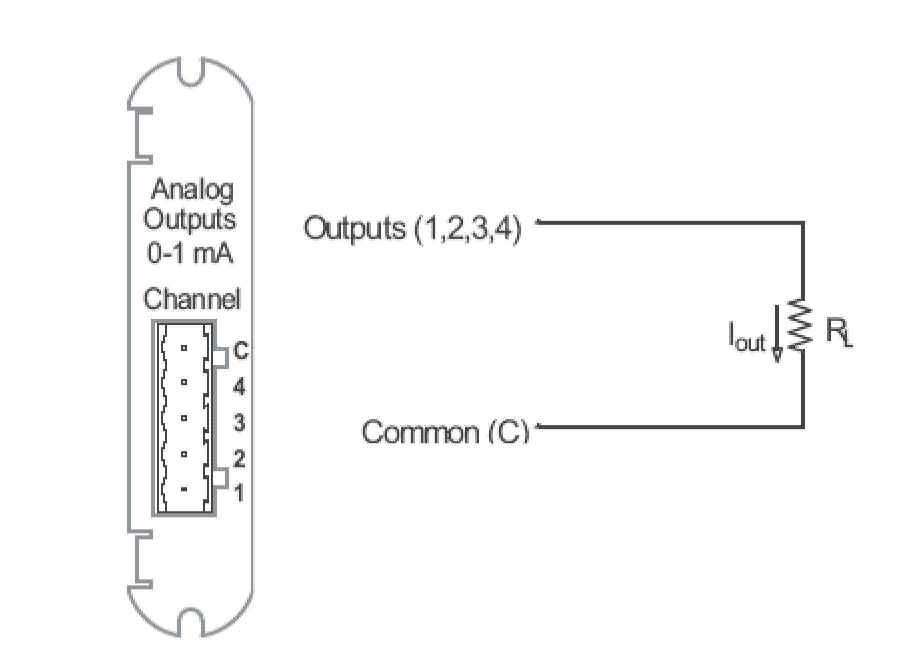


Fig 7.5: 4-Channel 0 - 1mA Output Card

20mA Output Card (IQ250/260-IO4)

The 20mA card transmits a standardized 0-20 mA signal. This signal is linearly proportional to real-time quantities measured by the IQ 250/260. **The current sources need to be loop powered.** The outputs are electrically isolated from the main unit.

Specifications

The technical specifications at 25° C at 500Ω load are as follows:

Number of outputs:	4 single ended
Power consumption:	1W internal
Signal output range:	(0 to 24)mA
Max. load impedance:	850 Ω @ 24VDC
Hardware resolution:	12 bits
Effective resolution:	14 bits with 2.5kHz PWM
Update rate per channel:	100ms
Output accuracy:	± 0.1 % of output range (24mA)
Load regulation:	± 0.03 % of output range (24mA) load step of 200Ω @ 20mA
Temperature coefficient	± 300n A/°C
Isolation:	AC 2500V system to outputs
Maximum loop voltage:	28Vdc max
Internal voltage drop:	3.4VDC @ 24mA
Reset/Default output value:	12mA

The general specifications are as follows:

Operating temperature:	(-20 to +70) °C
Storage temperature:	(-40 to +80) °C
Relative air humidity:	Maximum 95%, non-condensing
EMC - Immunity interference:	EN61000-4-2
Weight:	1.6oz
Dimensions (inch) W x H x L:	0.72 x 2.68 x 3.26
External connection:	AWG 12-26/(0.129 - 3.31)mm^2 5 pin, 0.200” pluggable terminal block

Default Configuration:

The IQ 250/260 automatically recognizes the installed option card during Power Up. If you have not programmed a configuration for the card, the unit will default to the following outputs:

Channel 1+Watts, +1800 Watts => 20mA
-Watts, -1800 Watts => 4mA
0 Watts => 12mA

Channel 2+VARs, +1800 VARs => 20mA
- VARs, -1800 VARs => 4mA
0 VARs => 12mA

Channel 3 Phase A Voltage WYE, 300 Volts => 20mA
0 Volts => 4 mA
Phase A Voltage Delta, 600 Volts => 20mA

Channel 4 Phase A Current, 10 Amps => 20mA
0 Phase A Current, 0 Amps => 4 mA

Wiring Diagram

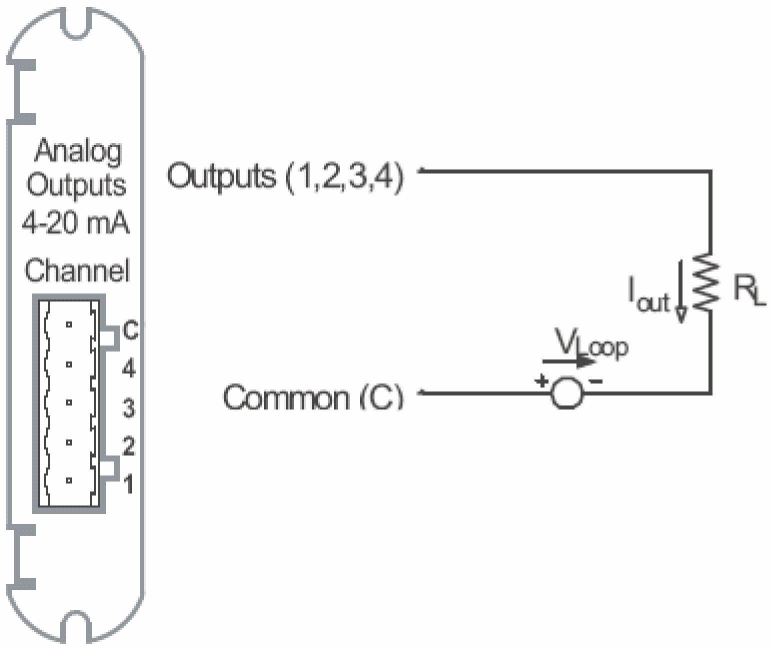


Fig. 7.6: 4-Channel 4 - 20mA Output Card

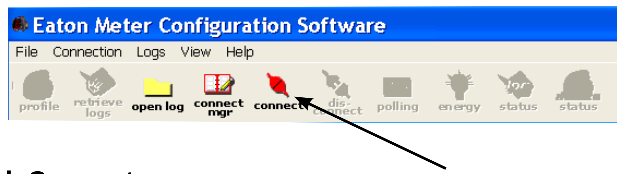
8 Programming the IQ 250/260

Overview

The IQ 250/260 Meter can be configured using either the meter Face Buttons (Menu, Enter, Down and Right) or Eaton Meter Configuration Software. To connect to the meter for software configuration, use the RS485 port (Com 2) on the back panel of the meter.

The 250/260T must be configured with the Eaton Meter Configuration Software, using the RS485 port, since it does not have a front panel.

This chapter contains instructions for programming the IQ 250/260 Meter and Transducer using the Eaton Meter Configuration Software.

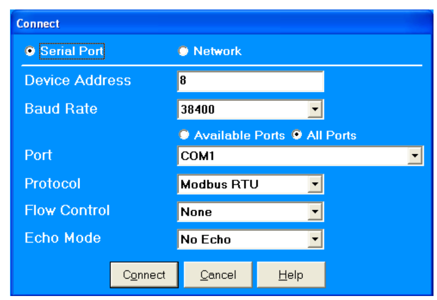


Connecting to the IQ 250/260

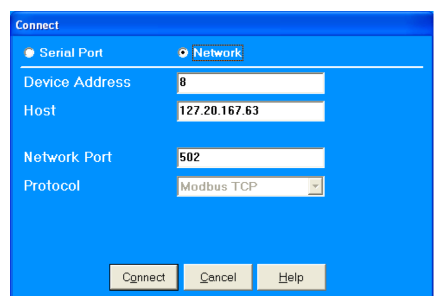
1. Open Eaton Meter Configuration Software.

2. Click the **Connect** icon on the Title bar or **Connection>Quick Connect**.

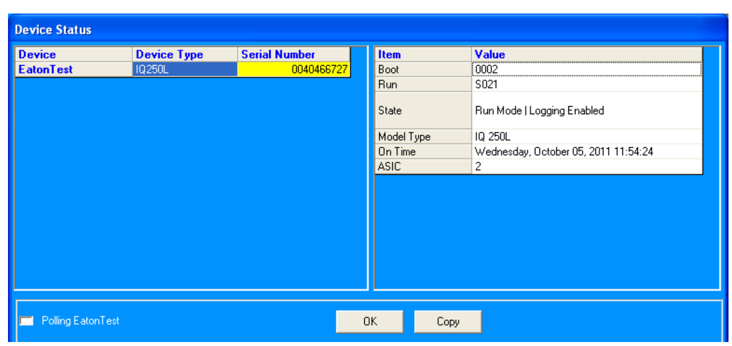
3. **<u>If you are connecting to the IQ 250/260 through your PC</u>**:
   a. Make sure the **Serial Port** radio button is selected.
   b. Enter **Device Address** (1-247).
   c. Select **Baud Rate** from the pull-down menu.
   d. Select the port you are using from the pull-down menu. The **Available Ports/All Ports** radio buttons determine which port selections the menu displays.
   e. Select **Modbus RTU** from the **Protocol** pull-down menu.
   f. Select **Flow Control**: **None** or **Hardware**.
   g. Select **Echo Mode**: **No Echo** or **Static Echo**.



   <u>If you are connecting to the Meter through the Power Xpert® Gateway</u>:
   a. Make sure the **Network** radio button is selected.
   b. Enter **Device Address** (1-247).
   c. Enter the Gateway's **IP Address**.
   d. Enter **Network Port**.
   e. **Protocol** defaults to **Modbus TCP**.



4. Click the **Connect** button. You will see the **Device Status** screen, shown on the right.



NOTE for IQ 250/260 Transducer:
When the **IQ 250/260T** is powered up, for **10 seconds** you can connect to the meter using the Factory Initial Default Settings (even if the Device Profile has been changed). After 10 seconds, the Device Profile reverts to the actual Device Profile in use.

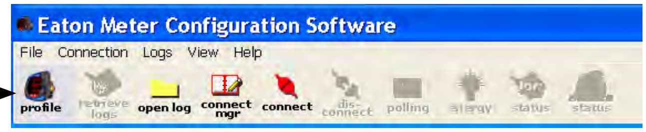
Factory Initial Default Settings

Baud Rate:	9600
Port:	COM1
Protocol:	Modbus RTU

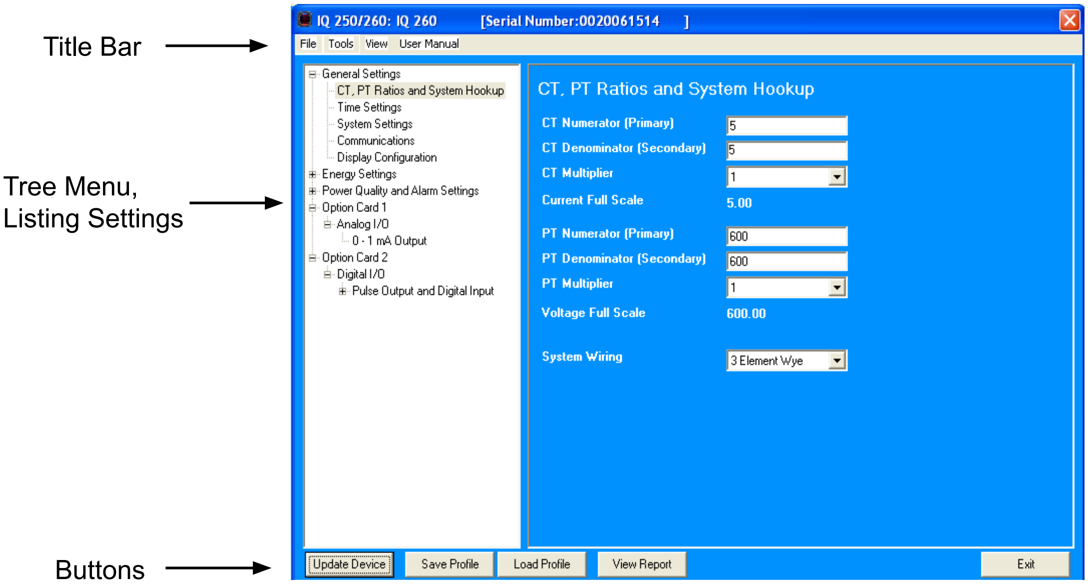
Accessing the IQ 250/260 Device Profile

1. Click the **Profile** icon in the Title Bar.

   You will see the **IQ 250/260 Device Profile** screen. The Menu on the left side of the screen allows you to navigate between settings screens (see below).



   The **Device Profile** screen features a **Tree Menu** for Settings navigation, and **Buttons** and a **Title Bar** that allow you to perform tasks, for example, updating the Device Profile.



IMPORTANT! Modification to the Device Profile may cause improper Option Card operation due to changed Scaling, etc. **Verify** or **update Programmable Settings** related to any **Option Cards** installed in the meter.

Selecting Settings

- The **Tree Menu** on the left side of the screen allows you to navigate between Settings. The example screen pictured above shows the Tree Menu you will see when you first open the screen. Click on the **+** next to a Setting (for example, Power Quality and Alarms Settings) to see additional Setting options.

- From the **Tree Menu**, click on the **Setting** you want to configure (for example, Energy Settings) to display its screen in the right side of the **Device Profile** screen.

NOTES:

- The **Tree Menu** you see may look different from that shown in the example screen, because the **Option Card** sections of the menu depend on the connected meter's configuration. That is, if you have Option cards in your meter, the Settings for those particular Option cards appear in the Tree Menu.
- This example screen is for an IQ 260 Meter. The Tree Menu for an IQ 250 Meter does not have **Power Quality and Alarm Settings**.
- If your meter has the data logging option (see Chapter 2), you will see a **Trending Profiles** setting.

Performing Tasks

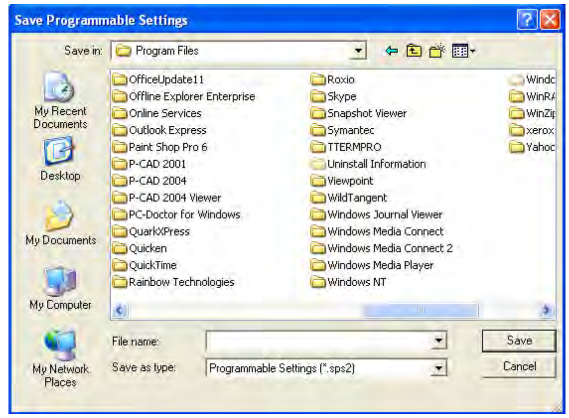
You can perform tasks from either the **Device Profile** screen **Buttons** or from the **Title Bar**.

- The screen **Buttons** and their functions are as follows:

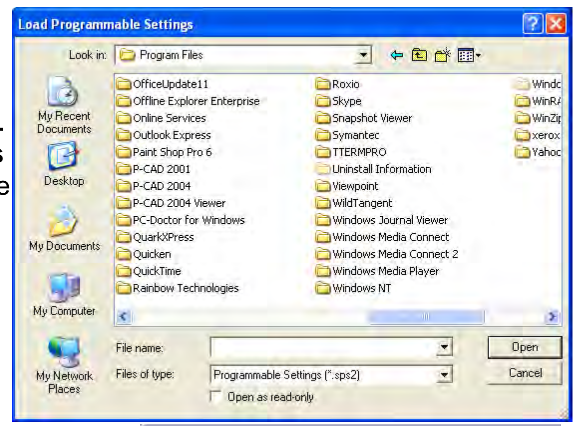
  - **Update Device**: Click to send the current settings to the meter.

    NOTE: You must click the Update Device button after making changes to the Settings screens, if you want to update the connected meter's settings.

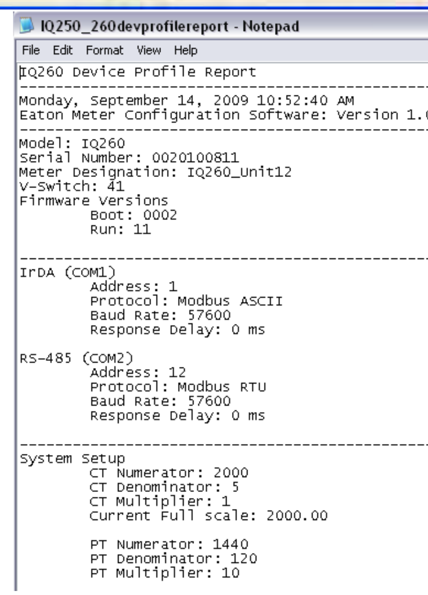
  - **Save Profile**: Click to save the **Device Profile** settings to a file. You will see the **Save Programmable Settings** window, shown on the right. Give a name to the Device Profile and click **Save**.



  - **Load Profile**: Click to load a previously saved Device Profile Settings file. You will see the **Load Programmable Settings** window, shown on the right. Select the saved Device Profile you want and click **Open**. The settings from that file will now appear in the **Settings** screens; **for example**, the CT and PT Ratios will be those from the saved Device Profile, rather than from the currently connected meter.



  - **View Report**: Click to open a **Notepad** window containing the Device Profile settings in a text file. See the example window, shown on the right.
    - **Print** the text file by selecting **File**>**Print** from the **Notepad Title Bar**.
    - **Save** the text file by selecting **File**>**Save** from the **Notepad Title Bar**.



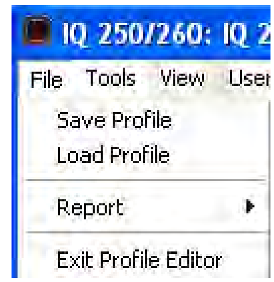
IQ250_260devprofilereport - Notepad

File Edit Format View Help

```
IQ260 Device Profile Report
-----------------------------------------------
Monday, September 14, 2009 10:52:40 AM
Eaton Meter Configuration Software: Version 1.0
-----------------------------------------------
Model: IQ260
Serial Number: 0020100811
Meter Designation: IQ260_Unit12
V-Switch: 41
Firmware Versions
        Boot: 0002
        Run: 11

-----------------------------------------------
IrDA (COM1)
        Address: 1
        Protocol: Modbus ASCII
        Baud Rate: 57600
        Response Delay: 0 ms

RS-485 (COM2)
        Address: 12
        Protocol: Modbus RTU
        Baud Rate: 57600
        Response Delay: 0 ms

-----------------------------------------------
System Setup
        CT Numerator: 2000
        CT Denominator: 5
        CT Multiplier: 1
        Current Full Scale: 2000.00

        PT Numerator: 1440
        PT Denominator: 120
        PT Multiplier: 10
```

  - **Exit**: Click to leave the **Device Profile Editor**.

- Three items in the **Title Bar** - **File**, **Tools**, and **View** - open menus that allow you to perform functions. These menus and functions are described below.
  When you click **User Manual** from the **Title Bar** a pdf file of this manual opens, with instructions for whichever **Device Profile Setting** is active at the current time. For example, if you are on the **Display Configuration** screen and you click **User Manual**, the instructions for setting display configuration are shown.



  - Click **File** from the **Title Bar** to see the menu shown on the right.
    The **File** menu allows you to perform functions that can also be performed using the screen **Buttons**, described on the previous page: **Save Profile**, **Load Profile**, **Report**, and **Exit Profile Editor**.

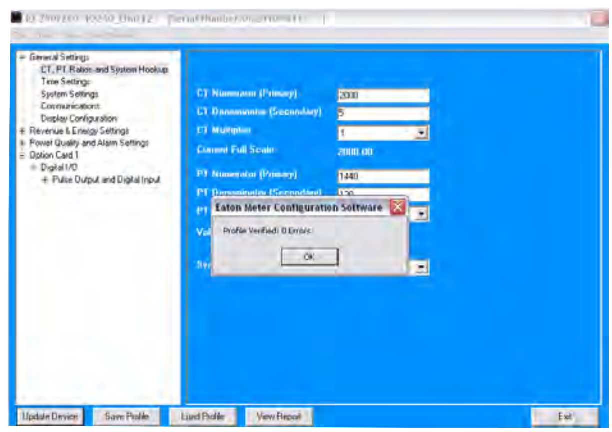
  - Click **Tools** from the **Title Bar** to see the menu shown on the right.
    The **Tools** menu allows you to:

    o **Update Device**: Functions the same as the **Update Device** button. See previous page for instructions and Note.

    o **Verify Profile**: Click to perform a verification of the current Device Profile settings. You will see a window like the one shown below, on the right.

    NOTE: If there are any errors, the number of errors and type are listed in the window. Click **View>Output Logs>Errors** to see more information about any errors (refer to the **View** menu section on the next page for additional information).

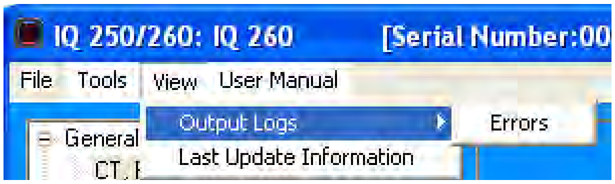
    o **Load from Device**: Click to load the Settings fields with values from the currently connected meter.



IMPORTANT! If you have made changes to the settings and have not saved them to a file or updated the device, the changes are lost.

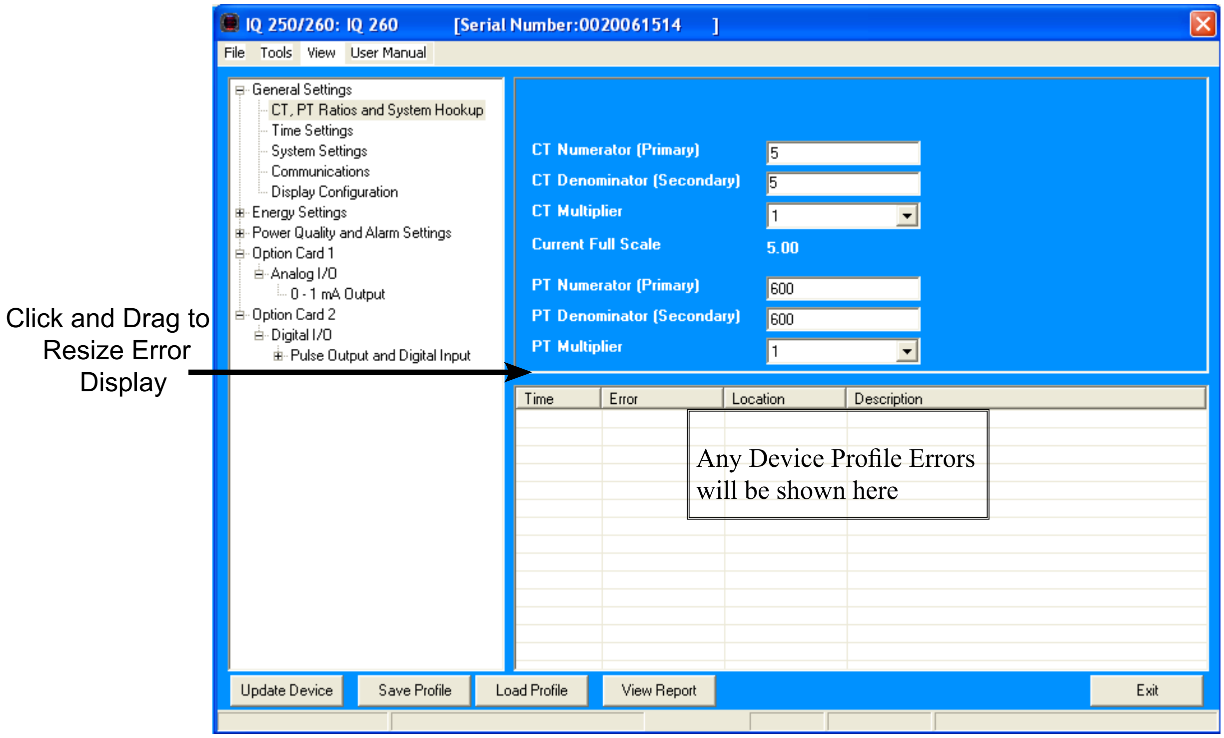
- Click **View** from the **Title Bar** to see the menu shown on the right. The **View** menu allows you to:

  o **View Output Logs/Errors**: View the Errors Log.
  o **View Last Update Information**: View Update information for this Device Profile.



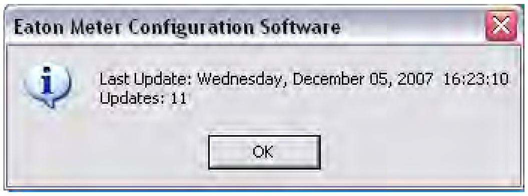
NOTE: The instructions for these two functions follow.

Viewing Errors Output Log: Click **Output Logs>Errors** from the **View** menu to open a display on the bottom of the screen, detailing any errors, the time they occurred, the location of the error, and a description of the error. See the screen example below.



You can **resize** the display by clicking and dragging on the line above the **Errors** display. Click **View Output Log>Errors** a second time to remove the Errors display from the screen.

Viewing Last Update Information: click **Last Update Information** from the **View** menu to open a window displaying the time and date of the last update, and the total number of updates, for this Device Profile.



Click **OK** to close the window.

Configuring Settings

The following sections contain detailed instructions for configuring the **Device Profile** settings. All of the settings are reached from the **Tree Menu** of the **Device Profile** screen.

Configuring CT, PT Ratios and System Hookup

Use this setting to configure **Current Transformer** and **Potential Transformer** ratios and to select the **System Hookup**.

❖ **Functional Overview of CT and PT Ratios**:

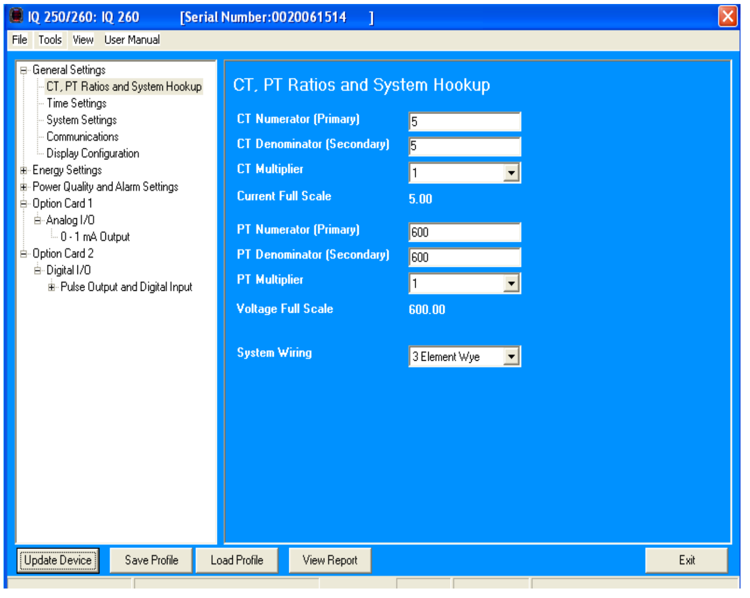
Current and **Potential Transformers** are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits
- To change the primary voltage and current to standard values and sizes that the meter can measure.

The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

From the **Tree Menu,** click **General Settings**>**CT, PT, Ratios and System Hookup**.

The screen **fields** and acceptable **entries** are as follows:



CT Ratios

CT Numerator (Primary): **1 - 9999**
CT Denominator (Secondary): **5 or 1 Amp**
NOTE: This field is display only.
CT Multiplier (Scaling): **1, 10 or 100**
Current Full Scale: **Display only**.

PT Ratios
PT Numerator (Primary): **1 - 9999**
PT Denominator (Secondary): **40 - 600**
PT Multiplier (Scaling): **1, 10, 100, or 1000**
Voltage Full Scale: **Display only**.

System Wiring
3 Element Wye; 2.5 Element Wye; 2 CT Delta

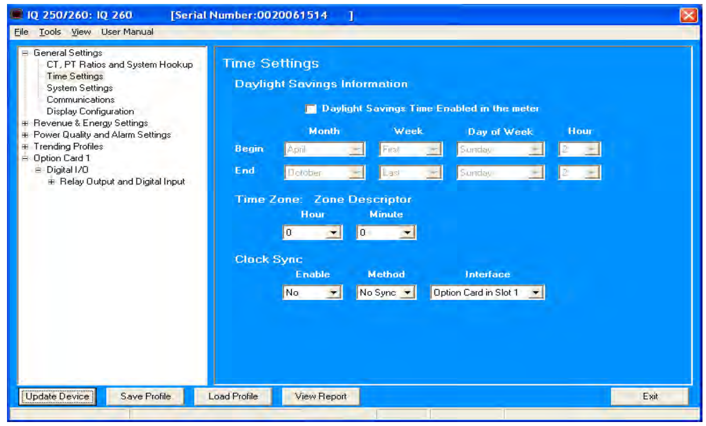
Example Settings:

For a **CT** of **2000/5A**, set the following **CT Ratios** in the entry fields:
CT Numerator (Primary) **2000**
CT Denominator (Secondary) **5**
CT Multiplier **1**
The **Current Full Scale** field will read **2000**.

NOTE: You can obtain the same **Current Full Scale** by entering a CT Numerator of 200 and a CT Multiplier of 10.

For a system that has **14400V** primary with a **120V** secondary line to neutral (PT Ratio of 120:1), set the following **PT Ratios** in the entry fields:
PT Numerator (Primary)   **1440**
PT Denominator (Secondary   **120**
PT Multiplier   **10**
The **Voltage Full Scale** field will read **14400**.

Configuring Time Settings



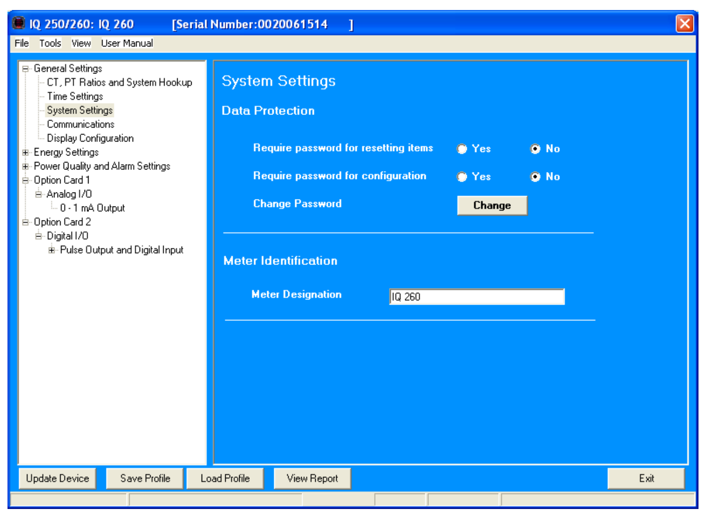
Use this setting to **enable** or **disable Daylight Savings Time** for the IQ 250/260, and to set the beginning and ending times for Daylight Savings Time. You can also set the Time Zone and enable Clock Sync if supported by your meter. From the **Tree Menu**, click **General Settings>Time Settings**.

Check or uncheck the box to **Enable** or **Disable Daylight Savings time**.
Use the **entry fields** to set the **start** and **end** times for the **Daylight Savings Time** feature, if enabled. Select the values you want from the Month, Week, Day of the Week, and Hour fields.

Select the time Zone and Clock Sync options from the pull-down menus,

NOTE: The **Hour** field uses a **24-Hour clock**.

Configuring System Settings



From the **Tree Menu**, click **General Settings>System Settings**.

From this screen, you can do the following:

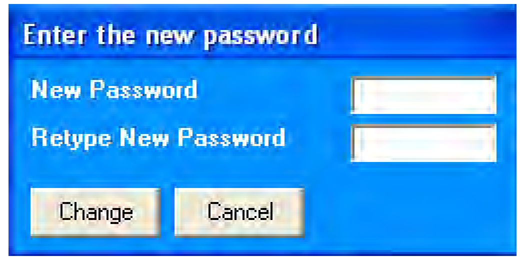
- **Enable** or **Disable Password** for **Resetting** and/or **Configuration**: click the **radio button** next to **Yes** or **No**.
  Enabling Password protection prevents unauthorized tampering with devices.

IMPORTANT! You must set up a password before enabling Password Protection. Click the **Change** button next to **Change Password** if you have not already set up a password.

- **Change** the **Password**: click the **Change** button.

- **Change** the **Device Designation**: input a new designation into this field.

When you click the **Change** button next to **Change Password** in the **Settings** screen, you will see the **Enter the New Password** screen.



1. Type in the new password (0 - 9999).

2. Retype the password.

3. Click **Change**. The new password will be saved and the meter will restart.

NOTE: If **Password Protection** has already been **enabled** for **configuration** and you attempt to change the password, you will see the **Enter Password** screen (shown below) after you click Change. Enter the old password and click **OK** to proceed with the password change.

You can enable or disable a Password for Resetting (Reset Max/Min Energy Settings, Energy Accumulators, and the Individual Logs) and Configuration (Device Profile) in the Systems Settings screen (see previous page).

NOTE: If you enable a Password for Resetting, you must also enable it for Configuration.

IMPORTANT! You must set up a password before enabling Password Protection. Click the Change button next to Change Password if you have not already set up a password and follow the above instructions.

When anyone attempts to make a change that is under **Password protection**, the **Enter Password** screen opens. (See the example screen on the right.) If the correct Password is not entered, the change will not take place.

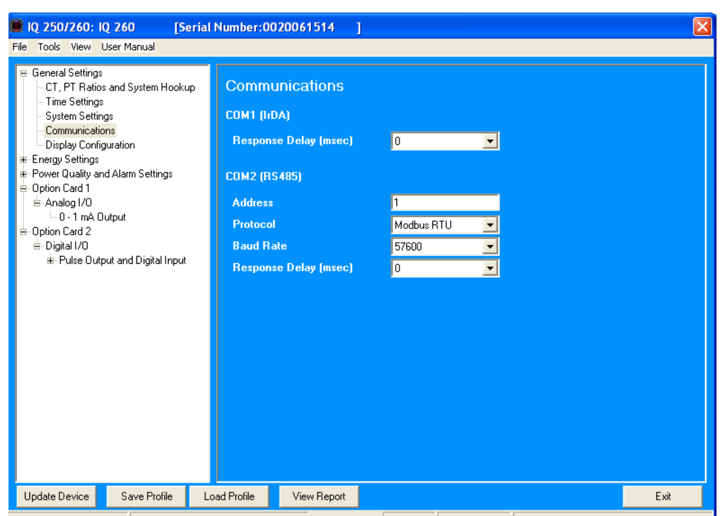
Configuring Communications Settings

Use this screen to enter **communication settings** for the meter's **RS485 Port (Com 2).**

NOTES:

- The settings on this screen are the **current settings** for **communication.**
- **Any changes may affect communication between the meter and your PC.**

From the **Tree Menu,** click
General Settings>Communications.
The screen fields and acceptable entries are as follows:



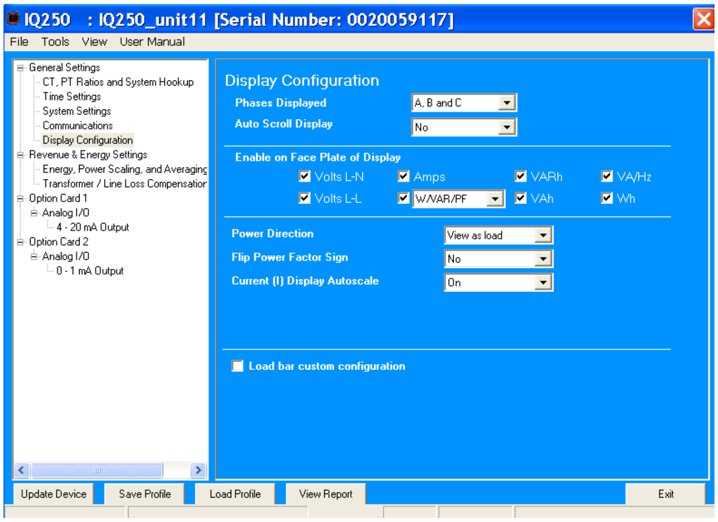
COM 2 (RS-485)
Address: **1 - 247**
Protocol: **Modbus RTU, Modbus ASCII** or **DNP 3.0**

NOTE: Response Delay is the delay the meter should use before responding to queries. If your connecting device requires a delay before receiving information, use response delay to program the time to wait before the meter starts responding to queries.

Setting Display Configuration

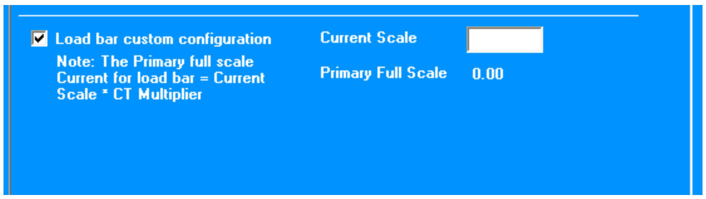
Use this screen to set the **display** of the meter's **faceplate**. Refer to Chapter 6 of this manual for additional information and instructions on using the faceplate.

From the **Tree Menu**, click **General Settings>Display Configuration.**



The screen fields and acceptable entries are as follows:

- Phases Displayed: **A; A and B; A, B**, and **C**. This field determines which phases display on the faceplate. **For example**, if you select A and B, only those two phases will be displayed on the faceplate.
- Auto Scroll Display: **Yes** or **No**. This field **enables** or **disables** the **scrolling** of selected readings on the faceplate. If **enabled**, the readings scroll every **5 seconds**.
- Enable on Face Plate of Display: Check the **boxes** of the **Readings** you want displayed on the faceplate of the meter. **You must select at least one reading.**
- Power Direction: **View as Load** or **View as Generator**
- Flip Power Factor Sign: **Yes** or **No**.
- Current Display Auto-Scale: **On** or **Off** (no decimal places)
- Load Bar Custom Configuration: Click this bar to add Current scaling. Additional fields open on the screen - see the figure below.



Enter the Current scale you want to use, The Primary Full Scale field will reflect your entry (as it says on the screen, Primary Full Scale Current for the Load Bar is equal to the Current Scale multiplied by the CT multiplier).

Configuring Energy, Power Scaling, and Averaging

Use this setting to configure:
- The display of Power in the meter
- The display and storage of Energy in the meter
- The interval over which Average values are computed.

❖ **Functional Overview of Energy Settings and Averaging**:

■ Energy Scaling

Energy Setting includes:
- **Digits** (the number of digits in the reading)
- **Decimals** (the number of decimal places in the reading)
- **Energy Scale**: the scale of the reading – unit; kilo (number times 1000); Mega (number times 1 million).

Energy settings allow you to balance the resolution (or accuracy) of the energy stored, with the interval over which energy rollover occurs. **For example**, the maximum resolution for a k scale reading is: 99999.999k.
To calculate the speed at which the energy will rollover, you must know the **Energy Full Scale**, which is computed from the CT and PT Full Scale values (see Section 9.2.4.1). The **formula** for calculating **Energy Full Scale** is:
Wye system: CT Full Scale x PT Full Scale x 3
Delta system: CT Full Scale x PT Full Scale x 3 x √3

For example, for a CT Full Scale of 2000, PT Full Scale of 14400, Wye system:
2000 x 14400 x 3=86400000
In this example, the energy will increment at 86400000 Watts per hour, or 24000 Watts per second.

This value allows you to determine the number of digits, decimal places, and energy scale you want to configure for the Energy settings, when you take into account the rollover time. To determine the number of hours before rollover, use this **formula**:
[Max Resolution]/[Full Scale] = #Hours, where Max Resolution = maximum digits and decimals for the Energy scale in use.

Using the **example** from above, with an energy scale of Mega, the formula would be:
99999.999 M/86.4 M = 1157.4074 hours or about 48 days until rollover.

NOTE: **To increase the number of days until rollover,** you can:
- Increase the number of digits (to 8)
- Decrease the number of decimal places (to 0)
- Increase the Energy Scale (to M).

■ Demand Averaging

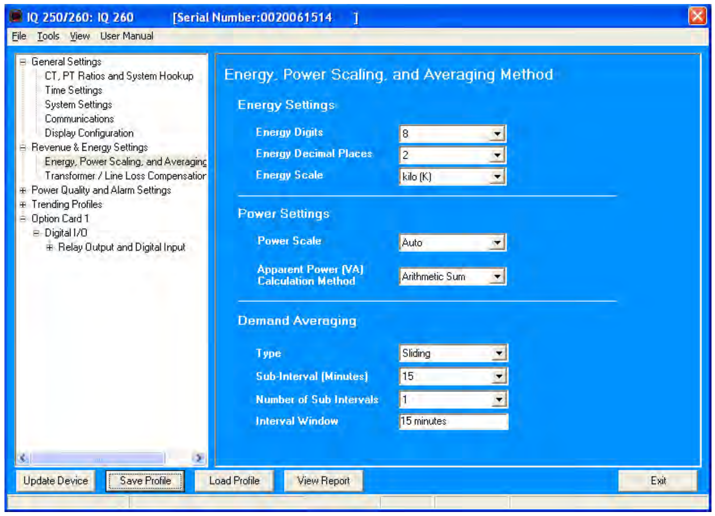
Demand is the average rate of energy use over time. The IQ 250/260 supports two types of demand averaging: **Fixed demand** and **Sliding demand**:

- **Fixed demand** records the average demand for time intervals that you define (usually **5**, **15** or **30** minutes).

- **Sliding demand** functions like multiple, overlapping Fixed demand. You define the subintervals at which an average of demand is calculated. **An example** of Sliding demand would be a **15-minute Demand block** using **5-minute subintervals**, thus providing a new demand reading every 5 minutes, based on the last 15 minutes.

From the **Tree Menu**, click **Energy Settings> Energy, Power Scaling, and Averaging**.

The screen fields and acceptable entries are as follows:



- **Energy Settings**
  Energy Digits: **5; 6; 7; 8**
  Energy Decimal Places: **0 - 6**
  Energy Scale: **unit**; **kilo** (**K**); **Mega** (**M**)
  For example: a reading for Digits: 8; Decimals: 3; Scale: K would be formatted: **00123.456k**

NOTES:

❖ Your selection in the **Energy Settings** fields determines the **precision** of energy stored for **display** and **polling**. Refer to the **Functional Overview** at the beginning of this section for more information.

❖ If you are **changing** the **energy settings**, we recommend you first **reset** the **Energy Accumulators**, in order to prevent erroneous counts. See instructions for resetting the meter's Energy Accumulators, later in this chapter.

- **Power Settings**:
  Power Scale: **Auto**; **unit**; **kilo** (**K**); **Mega** (**M**)
  Apparent Power (VA) Calculation Method: Arithmetic Sum or Vector Sum

- **Demand Averaging**:
  Type: **Fixed** or **Sliding**
  Interval (Fixed demand) **or** Sub-Interval (Sliding demand) in minutes: **5; 15; 30; 60**
  Number of Subintervals: **1; 2; 3; 4**
  Interval Window: This field is display only. It is the product of the values entered in the **Sub-Interval** and **Number of Subintervals** fields.
  NOTE: You will only see the **Number of Subintervals** and **Interval Window** fields if you select **Sliding Demand**.

  NOTE: If you have set an Input to trigger End of Interval (EOI) demand averaging (using either a Relay Output/ Digital Input or a Pulse Output/Digital Input Option card) any entry you make in the Demand Averaging field will be ignored. A message to that effect appears on the screen. See the Relay Card and Pulse Output Card instructions later in this chapter.

Configuring Limits (IQ 260 Only)

Use this screen to assign **Limits** for the meter.

❖ **Functional Overview for Limits**:

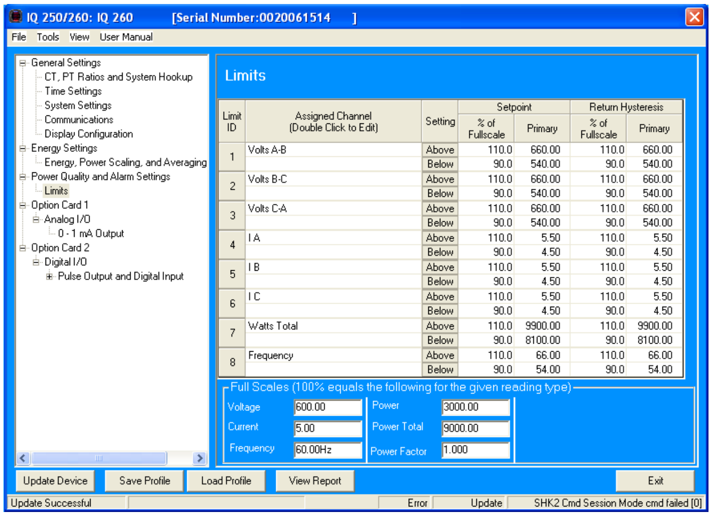
Limits are **transition points** used to divide **acceptable** and **unacceptable** measurements. When a value goes above or below the limit, an **out-of-limit condition** occurs. You can set and configure up to **eight Limits** for the IQ 260 meter.

Once they are configured, you can **view** the **out-of-Limits** (or **Alarm**) **conditions** in the **Limits Polling** screen. You can assign the **eight limits** to readings from **three groups** of parameters:

- **Readings** (Instantaneous Voltage; Instantaneous Current; Total and Per Phase Power and Power Factor; Frequency; and Neutral Current)
- **Demand** (Current; Per Phase, Total Power and Power Factor)
- **THD** (For IQ 260, voltage and current)

From the **Tree Menu**, click **Power Quality and Alarm Settings>Limits**.

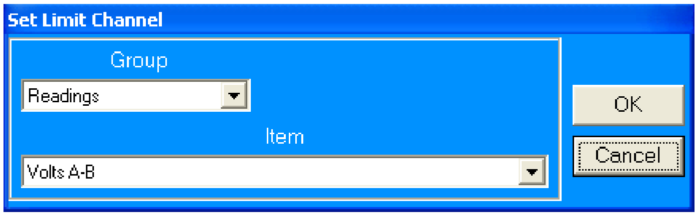
The **current settings** for **Limits** are shown in the screen.



The bottom of the screen shows the **Full Scale** values for:

- Voltage
- Current
- Frequency
- Power
- Power Total
- Power Factor
- THD
- Phase Angles

1. Select a limit by double-clicking on the **Assigned Channel** field.
2. You will see the screen on the right. Select a **Group** and an **Item** for the **Limit**.
3. Click **OK**.



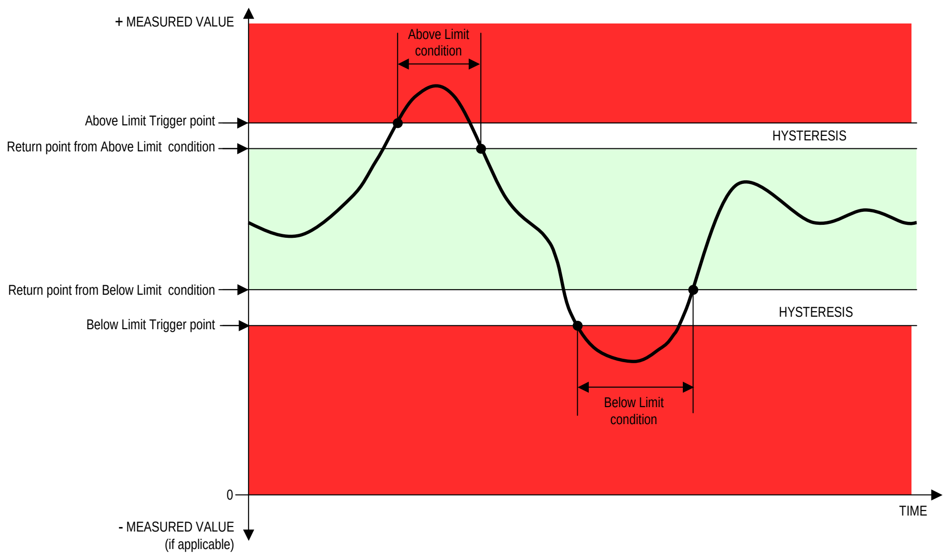
To **Configure** a **Limit**:

Double-click on the **Field** to set the following values:

Above and **Below Set Point**: % of Full Scale (the point at which the reading goes out of limit)
Examples: 100% of 120V Full Scale = 120V
90% of 120V Full Scale = 108V

Above and **Below Return Hysteresis**: (the point at which the reading goes back within limit)
Examples: Above Set Point = 110%
(Out of Limit above 132V)
Above Return Hysteresis = 105%
(Stay Out of Limit until below 126V)

Below Set Point = 90%
(Out of Limit below 108V)
Below Return Hysteresis = 95%
(Stay Out of Limit until above 114V)

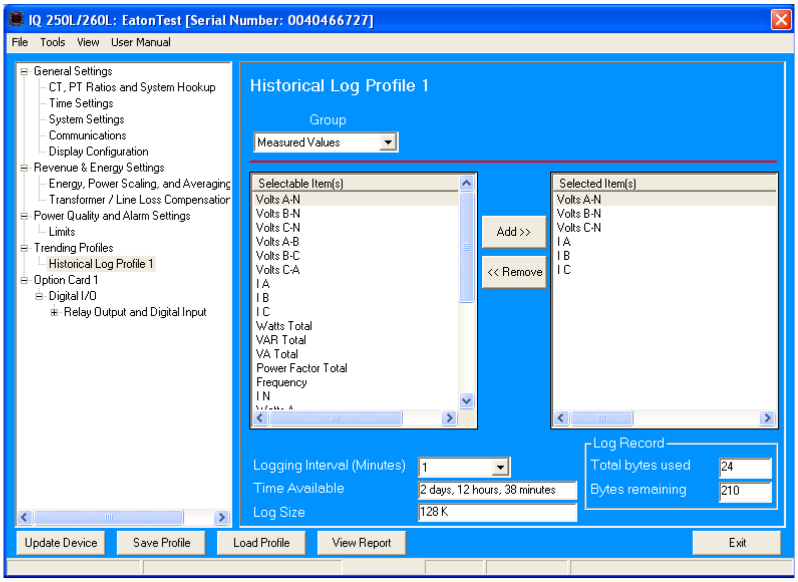


The **Primary** fields are **display only**. They show what the set point and return hysteresis value are for each limit.

NOTES:
- If you are entering **negative limits**, be aware that the negative value affects the way the above and below limits function, since negative numbers are processed as **signed values**.
- If the Above Return Hysteresis is greater than the Above Set Point, the Above Limit is Disabled; if the Below Return Hysteresis is less than the Below Set Point, the Below Limit is Disabled. You may want to use this feature to disable either Above or Below Limit conditions for a reading.

Configuring Trending Profile (Data logging option)

If your meter has the data logging option (see Chapter 2) you will see the Trending Profiles setting in the Tree Menu. Click on **Trending Profiles>Historical Log Profile 1** to display the screen shown below. (The screen shown here is for an IQ 260 meter with the L option. If you are connected to an IQ250 with the L option, you won't see the Power Quality and Alarm menu options.)



This screen lets you select the data values for the Historical log. Depending on your meter model, Historical log parameters can be selected from up to eleven groups:

- Measured Values (Instantaneous Voltage; Instantaneous Current; Total and Per Phase Power and Power Factor; Frequency; Neutral Current; Symmetrical Components and Voltage Unbalances)
- Demand (Current; Per Phase, Total Power and Power Factor)
- Maximums (Maximum values for all of the readings listed above, including THD (IQ 260 only), Voltage and currents)
- Minimums (Minimum values for all of the readings listed above, including THD (IQ 260 only), Voltage and currents)
- Energy (Watt-hours, VA-hours, VAR-hours)
- Accumulators (Input and Output Accumulator values)
- Short Term Min (Min value within the Demand Interval)
- Short Term Max (Max value within the Demand Interval)
- Uncompensated ((Watt-hours, VA-hours, VAR-hours)
- THD (For voltage and current) - IQ 260 with the L option only
- Harmonic Magnitudes (For voltage and current up to the 40th order) - IQ 260 with the L option only

1. Select a Group.
   NOTE: If you select Harmonic Magnitudes, another field opens on the screen allowing you to select one of the following for Harmonic Magnitude: Volts A; Volts B; Volts C; I A; I B; I C.

2. Select items for your log. The Group field determines the items that are available for selection.
   a. Highlight the item(s) you want in the Selectable Items box.
   b. Click **Add**. The item(s) are added to the Selected Items box.
   c. To remove item(s), highlight them in the Selected Items box and click **Remove**.

3. Set the Logging Interval (Minutes). The available choices are: 1, 3, 5, 10, 15, 30, 60, EOI (End of Interval) Pulse. The Logging Interval determines when the meter takes a snapshot.

NOTES:
- Only one Option Card input or output can be set to trigger an EOI pulse.
- The maximum rate for EOI Pulse used to trigger a log is once per minute.
- When you choose EOI Pulse, the meter takes a snapshot on the End of Interval Pulse condition, rather than on a time interval. Below are two examples of using EOI Pulse for log recording.

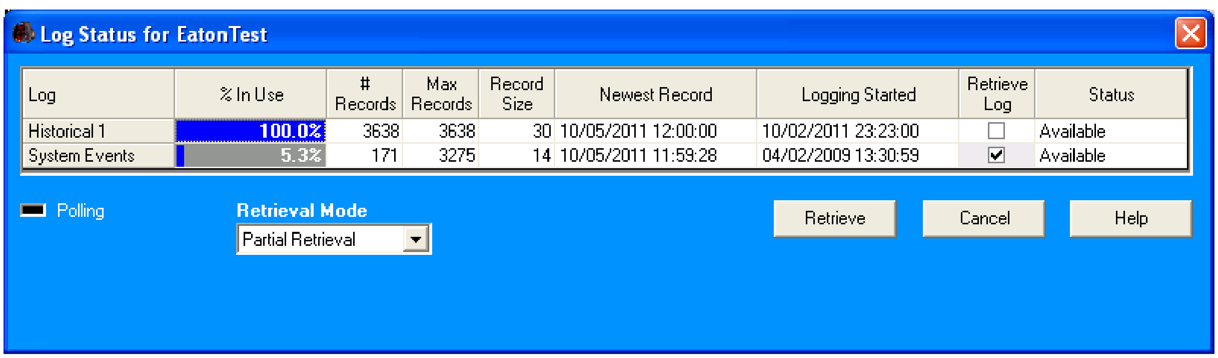
Examples of EOI Pulse Recording:
- A Relay Option Card is installed in your meter and set to trigger on a state change. You can use EOI pulse to take a snapshot upon that state change.
- An IQ 260 meter is connected on each side of a load. You want to take a snapshot of both sides of the load at the same time. You can do this by connecting a Relay card in each of the meters to a device that will trigger them. Then set the EOI pulse to take a snapshot when the devices are triggered.

NOTE: There are two display fields at the bottom of the Historical Log Profile screen. They show the Total Bytes Used and the Bytes Remaining for this historical log. These fields are updated as you make selections on the screen.

Viewing Log Status/Retrieving Logs (Data logging option, Option L)

For an IQ 250/IQ 260 meter, follow these steps to view Log status and/or retrieve logs.

1. Click **Logs>Statistics or Logs>Retrieve Log(s) from Device** from the Title bar (or click the **Log Status** or **Retrieve Logs** icons). You will see the screen shown below.



2. This screen shows the following information for the Historical log (Historical 1) and the System Events log:
- % in Use - the amount of the log that is currently being used
- # of Records - the number of records currently in the log
- Max Records - the maximum number of records the log can hold
- Record Size - the current record size in Bytes
- Newest Record - the date and time stamp of the most recent record in the log
- Logging Started - the date and time that logging began
- Retrieve Log - a checkbox that lets you select log retrieval
- Status - whether the log is Available or Not Available for retrieval

3. To retrieve the Historical log, click its Retrieve Log checkbox.
   NOTE: The System Events log is always retrieved when the Historical log is retrieved: its box is always checked.

4. Use the pull-down menu for Retrieval Mode to select one of two options:
- Partial Retrieval (this is the default Retrieval mode)
- Time Range Retrieval

NOTES:
In Partial Retrieval mode, only the newest records are retrieved. This increases retrieval speed, since records that have previously been retrieved are ignored. When the log is full, it will roll over. Partial Retrieval mode should be used for Billing and continuous logging.

The Time Range Retrieval mode is useful if you want to retrieve specific events. If you select Use Time Range from the pull-down menu, date range fields will display, allowing you to select the time range for data retrieval. Only records (within the specified time range) that are newer than the latest records in the log database can be retrieved for any selected logs. For this reason, Time Range Retrieval should not be used for Billing or continuous logging purposes. The only way to retrieve earlier records using Time Range Retrieval is to delete the existing log database(s) before retrieving the log(s).

5. Click Retrieve.
   a. You will see a screen that shows the percent retrieved for each log, the time elapsed since retrieval began, and any messages.
   b. After the logs have been retrieved, you will see a screen which shows you the Mode, Start time, and Status of Log Conversion.
   c. The Log Viewer opens.

NOTES:

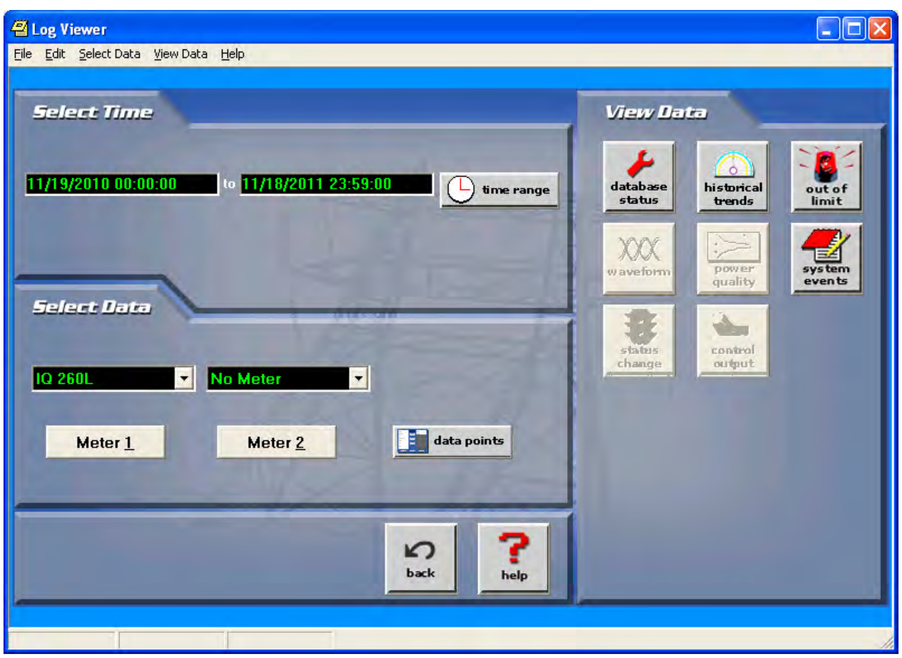
- Only one person at a time can download a log. If someone else is downloading a log, it will be unavailable until the download is complete.
- Retrieve logs as often as you want. Each time you retrieve a log file, Eaton Meter Configuration Software appends only the newest records and captures to the existing database.

Using the Log Viewer

To access Log Viewer, either:

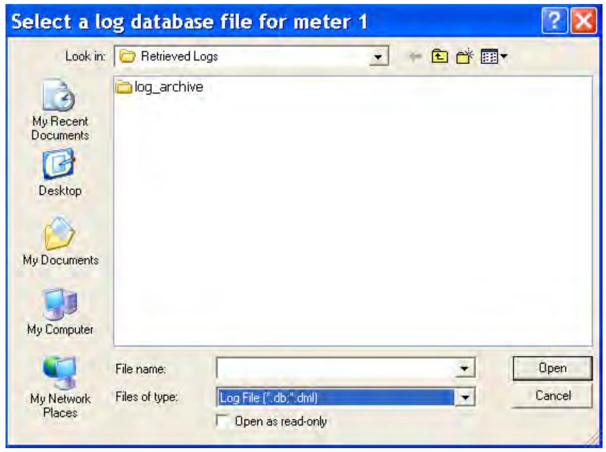
- Retrieve logs from a connected meter, as shown in the previous section.
- Click the Open Log icon from the Eaton Meter Configuration Software's Main screen. The Retrieved Logs directory opens, allowing you to pick a previously stored log file.
- Run Log Viewer from the Windows® Start menu.

You will see the Log Viewer's main screen, shown below.



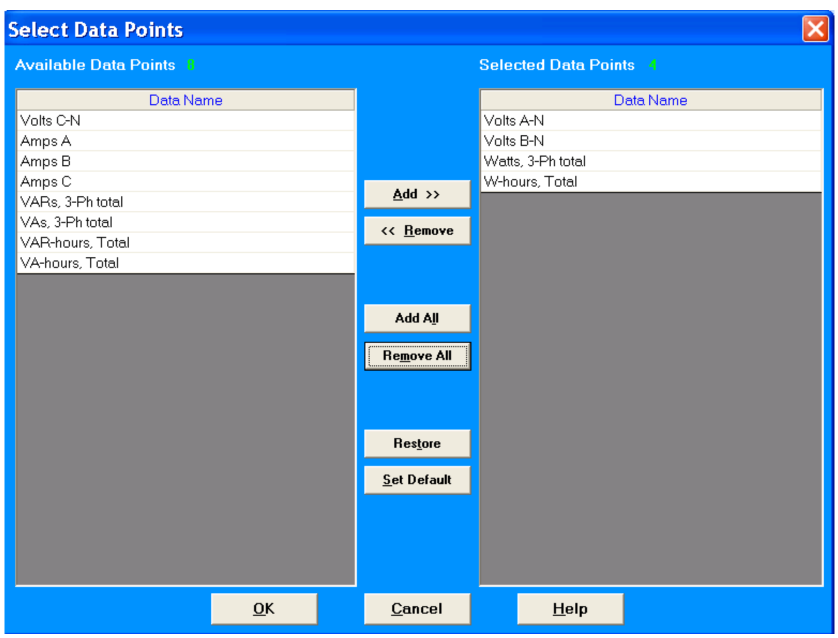
1. Choose the log data file(s) you want to view in either of the following ways:

- If you have retrieved logs through Eaton Meter Configuration Software, the meter's designated label is shown in the field above the Meter 1 button. Click the Log's button on the right side of the screen to view a log. (The buttons of unavailable logs are grayed out and unselectable.)
- If you want to view a previously retrieved log, click either Meter button (1 or 2). Log Viewer opens a window prompting you to select a log database (.db). See the example screen below.



2. Select the file you want and click Open.
   NOTE: You can choose a different log file (.db) for Meter 1 and for Meter 2.

3. Select the data points you want to view by clicking the Data Points button in Log Viewer's Main screen. You will see the screen shown below. Note that the number of data points you see reflects the number of parameters in the log.

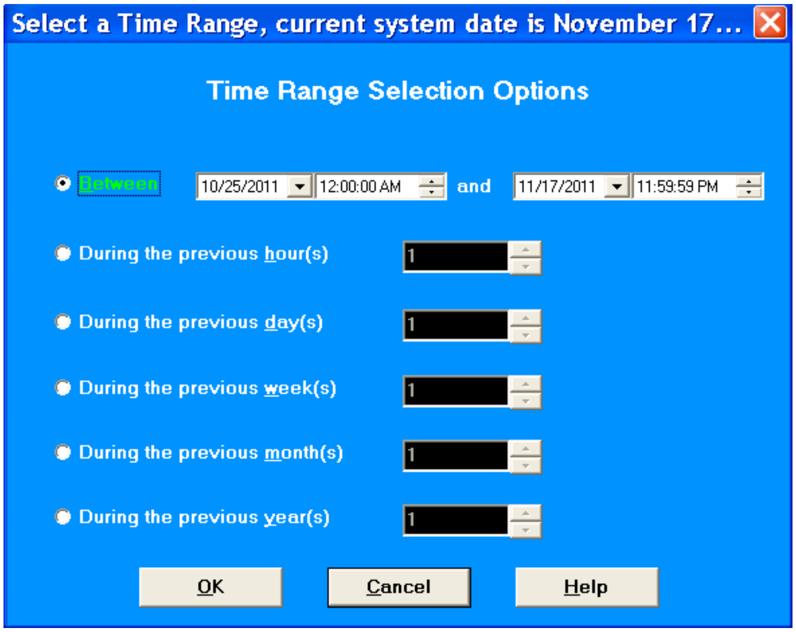


4. From the Available Data Points column, click on the data points you want to include when viewing the log file. To select multiple points, hold down the Ctrl key while clicking. To select points in sequence, hold down the Shift key while clicking.

- Click the Add button to move the Data Points to the Selected Data Points column.
- Click the Restore button to return the selection to its previous setting.

5. When you finish your selection, click OK to return to Log Viewer's main screen.

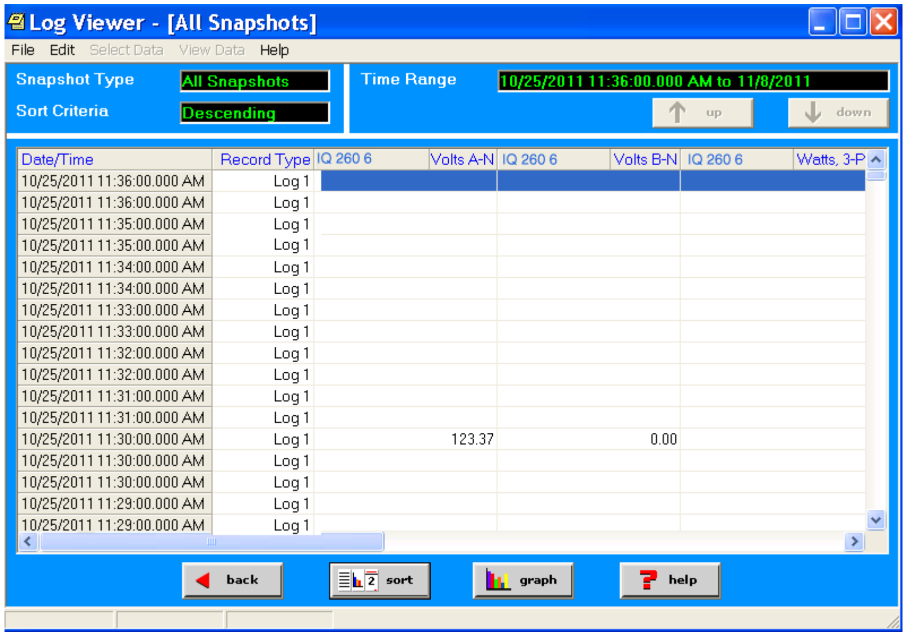
6. Select the portion of the log you want to view by specifying a time range. Log Viewer bases its time/date format on your computer's Regional Settings (Windows® Control Panel). Click the Time Range button. You will see the following screen:



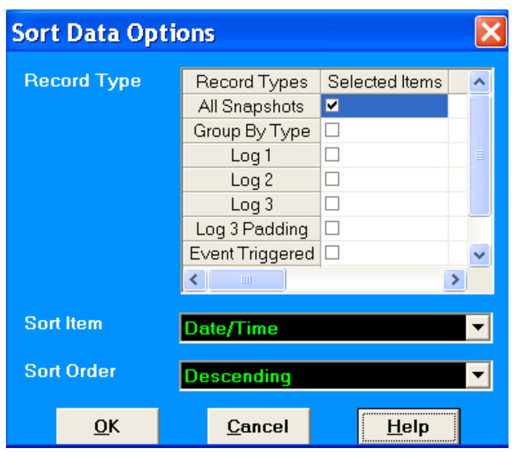
- To select a specific time range, click the Between radio button and enter a date and time in each field. You can also the arrows to open a calendar for the date and to increment the time field.
- To select a range of hours, days, months or years only, click the appropriate radio button and use the arrows to select the range.

7. Click OK. The time range you selected is displayed in the Log Viewer's main screen.

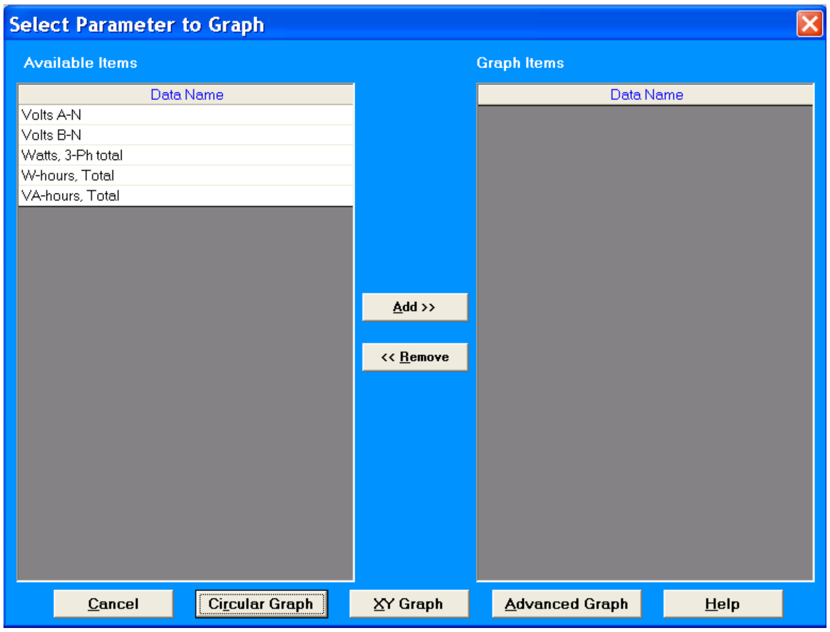
8. Click on the Historical Trends button or View Data>Snapshots. Log Viewer displays trending data for the selected log file based on the time range and data points you chose. See the example screen on the next page.



- The name of the log file and the type of data point are listed in the top row.
- You can move the columns, so that the most important data is most accessible. Right-click on the column title and drag it to the desired location on the table.
- To save the data to your clipboard, right-click with the cursor positioned anywhere in the table.
- To sort the data by Date/Time or data point, in either ascending or descending order, click the Sort button and use the pull-down menus to make your selection. See the screen shown below.



9. To display Trending data as either an XY, Circular, or Advanced graph, click the Graph button. You will see the following screen.

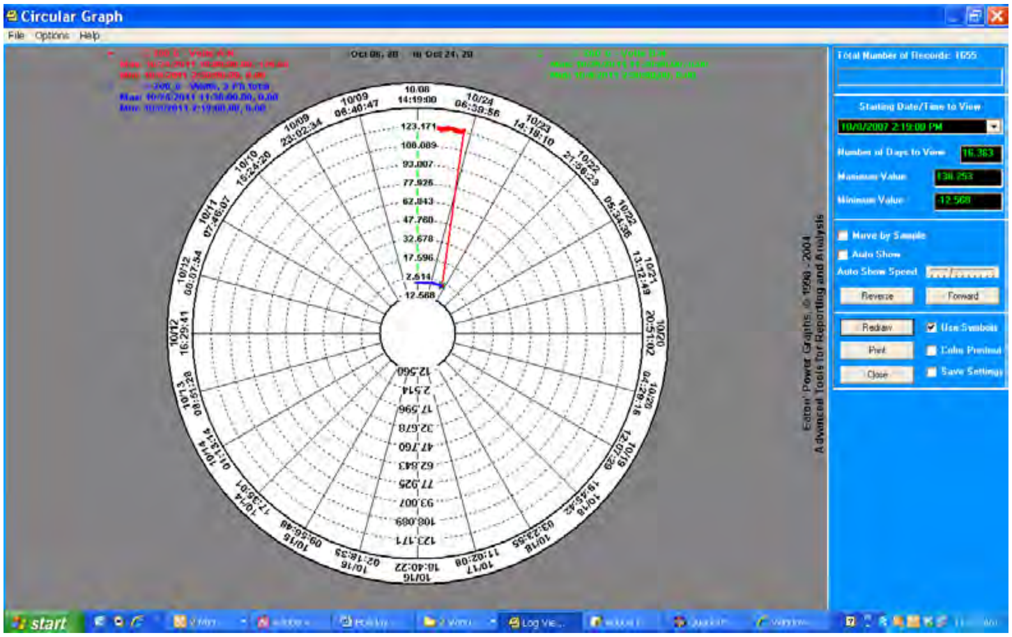


The Available Items column lists the log's data points. (To add a new data point, return to Log Viewer's main screen and click the Data Points button.)

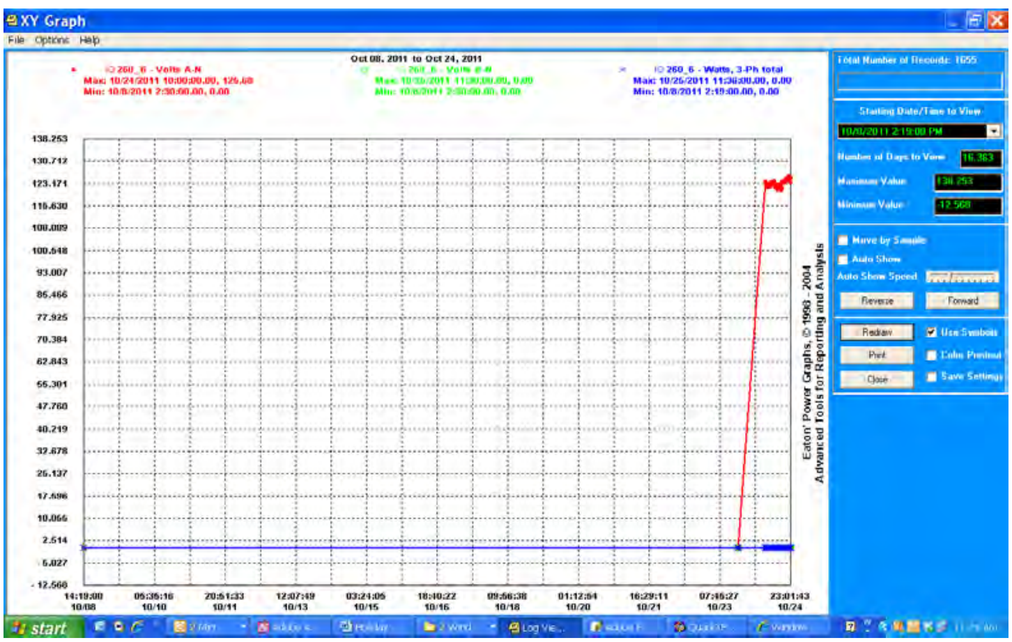
a. Click on the data points you want to graph.
b. Click the Add button. The items appear in the Graph Items column. To select multiple data points, hold down the Ctrl key while clicking. To select data points in sequence, hold down the Shift key while clicking.

NOTE: Only six data points in total can be graphed at one time. If there are two open log files, you can only select three data points per file.

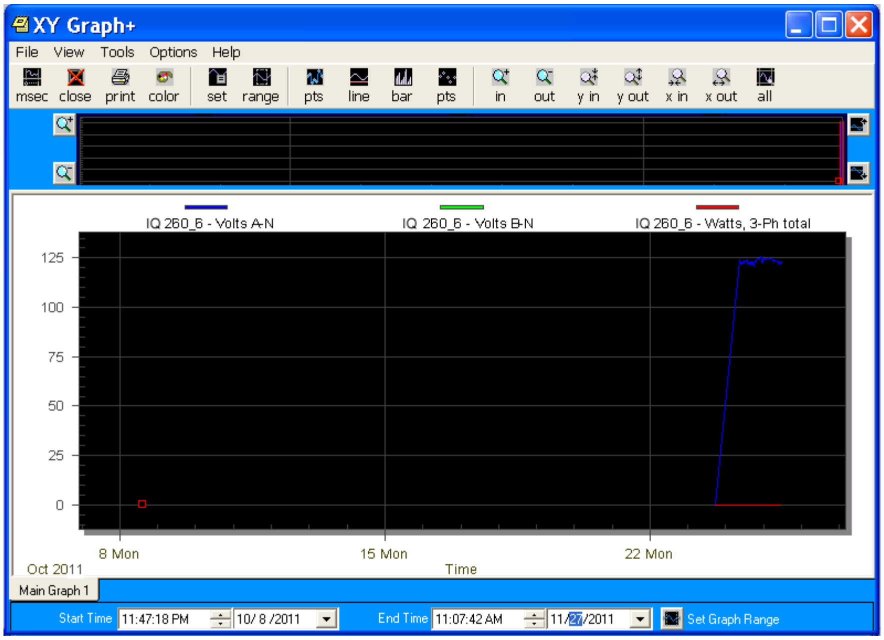
c. To view the graph, click either the Circular, XY, or Advanced Graph buttons. See the example graphs on the next two pages.



Circular Graph



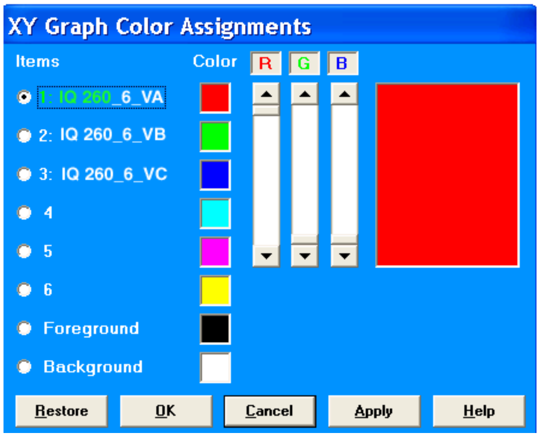
XY Graph



Advanced Graph

The following instructions pertain to all of the graphs:

- To change the starting point of the graph, choose a new date/time segment from the Starting Date/Time to View pull-down menu.
- To change the amount of time represented on the graph, enter a value in the Number of Days to View field and press Enter or click on the Redraw button.
- To change the scale of the graph, enter a value in the Minimum Value and Maximum Value fields and press Enter or the Redraw button.
- To view one sample at a time, click in the Move by Sample box; then click on the Forward or Reverse buttons each time you would like to view the next (or previous) sample.
- To view a continuous, sample-by-sample rendering of the graph, click the Move by Sample box and the Auto Show box. Select a speed by sliding the Auto Show Speed bar left or right; click on the Forward or Reverse buttons to determine the direction of the Auto Show. To stop Auto Show, deselect the Auto Show box.
- To print the graph on a color printer, check the Color Printout box and click Print.
- To print the graph on a black-and-white printer, click the Use Symbols box and click Print.
- To copy the graph data to the computer's clipboard, select Copy from the File menu. Paste the data into aspread sheet, such as Excel®.
- To export the graph's data, select Export Data from the File menu.
- To change the graph's color assignments, select Select Colors from the Options menu. You will see the screen shown on the next page.



NOTES:
- The Advanced Graph also has a Color button which opens the Color Assignments screen.
- The Color Assignments screen is slightly different for the Advanced Graph.

The small squares under the Color heading represent the color currently assigned to each component of the graph. To make adjustments to an Item's color, click the radio button beside it and create a new color by moving the red, green and blue sliders. Create black by moving all sliders down, white by moving all sliders up. The large square on the right shows the color you have created.

Click OK to return to the graph; Log Viewer redraws the graph using the new color scheme. Click the Restore button to return all color schemes to their default values.

10. When you are finished using the Log Viewer, click the X button or File>Exit to close the screen.

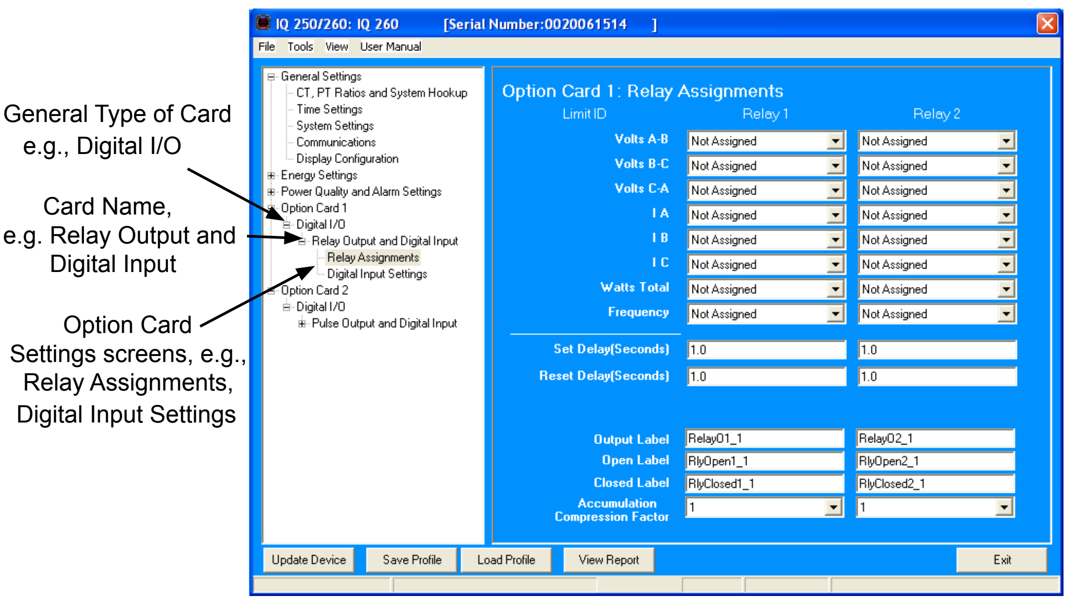
Configuring I/O Option Cards

The IQ 250/260 Meter **automatically detects** the presence of any **Option cards** installed in it. You will see the installed card(s) listed in the **Tree Menu** (see figure below). Up to **two Option cards** can be installed in the meter. Refer to Chapter 7 of this manual for additional information concerning Option cards, including installation procedures.

You must **configure** an **Option card** before using it. The following sections provide you with instructions for configuring each of the available Option cards.

<u>Option Card Screens</u>:

The **type** of **Option card** installed in the meter determines the **settings** you need to configure, and so, the screens you will see. Click on the **selectable lines** under your Option card in the **Tree** menu. See the example below.



Configuring a Relay Output/Digital Input Card (IQ250/260-IO1):

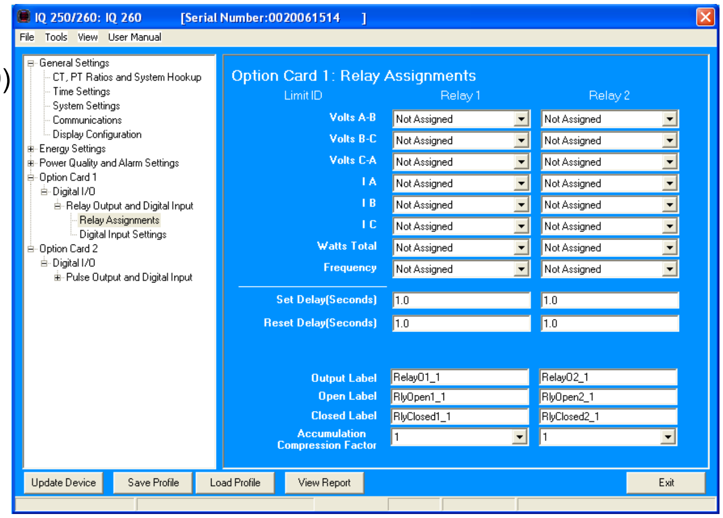
The **Relay Output/Digital Input Option Card** has:
· Two relay contact outputs for load switching
· Two wet/dry contact sensing digital inputs.
Accumulators in the software count the transitions of the Inputs and Outputs.
For technical specifications and hardware installation, refer to Chapter 7 of this manual.

NOTE: When installing a Relay Output/Digital Input card, we recommend you **reset the accumulators** for the card, in order to prevent erroneous counts. See instructions on using the Reset Device Information screen to reset card accumulators, later in this chapter.

An **example** use of the optional Relay Card is in monitoring the status of circuit breakers or relays in your electrical system. The two status inputs could be used to monitor two circuit breakers, and the two relay outputs could be used to sound an alarm upon the occurrence of a programmed out of limit condition (IQ 260, only). Relay outputs on IQ 250/260 can be manually triggered: see the "Performing Manual Relay Control" section, later in this chapter.

Click **Relay Assignments** to set the **limits/alarm conditions** (IQ 260, only) and **labeling and compression options** for the card's **Relay Outputs**. From the **Relay Assignments** screen, you can:

- Configure up to **8 limits** for each of the two Relay Outputs (IQ 260)
- Set a **Delay** and **Reset Delay** for the Outputs (IQ 260)
- Assign each Output an **Output Label, Open Label,** and **Closed Label**
- Assign an **Accumulation Compression Factor** for each output



IMPORTANT! First use the Limits screen to set up the limits you want to assign to an Output. See instructions earlier in this chapter.

NOTE: The Limits functionality is only available for the IQ 260. If you are connected to an IQ 250, you will only see the Label and Accumulation Compression Factor fields in this screen.

1. The **available Limits** appear in the **Limit ID** column.
   To **assign** a **Limit** to an Output Relay:
   Select the **Alarm trigger** from the **pull-down menu** next to the **Limit ID**. The options are:
   - **Above Limit** (the Output is triggered when the Above Limit condition occurs)
   - **Below Limit** (the Output is triggered when the Below Limit condition occurs).

   You can assign the limit to one or both (or neither) of the Relay Outputs.

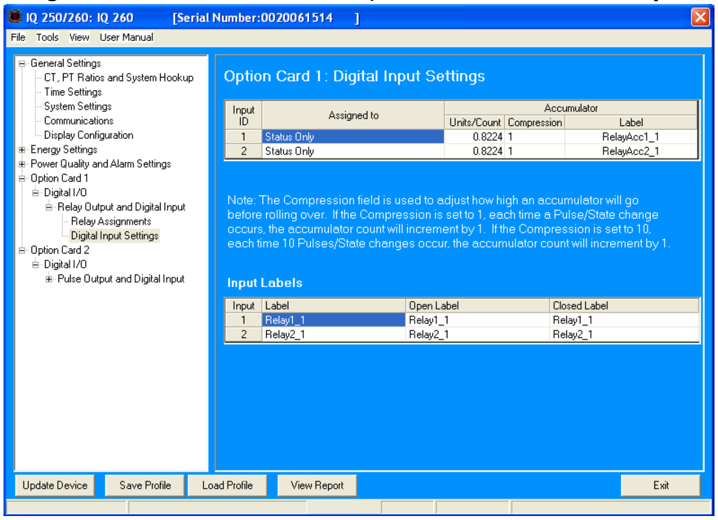
   NOTE: A Relay operates when any one assigned Limit is tripped, and stays in the Set condition as long as one Limit is in the Alarm state.

2. You can enter **Set Delay** and/or **Reset Delay**. These values are the delay before the Output is changed: **Set** is when the common is shorted to **Normal Open** (this is the **Set Condition**).

3. The **current Output Labels** are displayed in the screen. These labels are used for Logging. To **change** the Output labels, click in the Labels field you want to change, and enter a new label. The fields that can be changed are:
   - **Output Label** – Label ID
   - **Open Label** – Open state ID
   - **Closed Label** – Closed state ID

4. You can specify an **Accumulation Compression Factor.** The Compression Factor is used to adjust how high an accumulator will go before rolling over. Because of this, it is useful in **delaying rollover.**
   For example, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count will increment by 1. The **available Compression Factors** are: **1, 10, 100, 1000, 10000**, and **100000**. The **default** Compression Factor is **1**.

5. To **configure** the **Relay Inputs**, click **Digital Input Settings**. Use this screen to set up **Accumulators** and **Input Labels.**



- You can set up to **two Input IDs** for your Relay Card, and assign a **Label**, **Open Label**, and **Closed Label** for each.
- You can assign **labels** and other information for **Accumulators** for the Inputs.

   a. Make a selection in the **Assigned to** field. The **available selections** are:
   - **Status Only**
   - **EOI Pulse, Trigger on Contact Closing**
   - **EOI Pulse, Trigger on Contact Opening**
   - **EOI Pulse, Trigger on Contact Change**
   - **Accumulator, Increment on Contact Closing**
   - **Accumulator, Increment on Contact Opening**
   - **Accumulator, Increment on Contact Change**

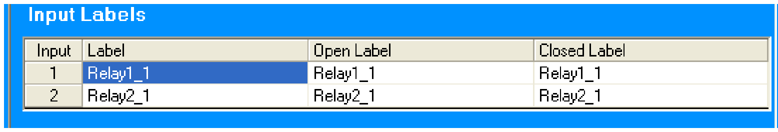
   NOTES on End of Interval (EOI):
   - EOI is triggered when the selected condition is met.
   - EOI is used as a **trigger** for **demand averaging**: when the selected condition is met, the EOI delineates an interval that results in demand averaging being performed.
   - The minimum interval between EOI Pulses used to trigger demand averaging should be 5 minutes.
   - **Only one Option Card input or output can be set to trigger an EOI pulse**.

   b. Enter **Units/Count**. The Units/Count is the **output ratio** from the device that is being input into the meter. **For example**, if you have a KYZ module that is outputting a pulse every 1.8 kWh, with the input set to Accumulator, Increment on Contact Opening, you would set the Units/Count to be the value of the KYZ; in this case either 1.8 or a ratio of that number.

c. Enter **Compression**. The Compression Factor is used to **adjust how high** an accumulator will go **before rolling over. For example**, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count will increment by 1.
The **available Compression Factors** are: **1, 10, 100, 1000, 10000,** and **100000**. The default Compression Factor is 1.

d. Enter a **Label** for the **Accumulator**.

e. The **current Input Labels** are displayed in the screen. To **change** the Input Labels, click in the **Labels** field you want to change, and enter a new label. The fields that can be changed are:
- Input Label – Input ID
- Open Label – Open state ID
- Closed Label – Closed state ID



Configuring a Pulse Output/Digital Input Card (IQ250/260-IO2):

The **Pulse Output/Digital Input Option Card** has:
- Four Pulse Outputs via solid state contacts
- Four wet/dry contact sensing digital inputs.

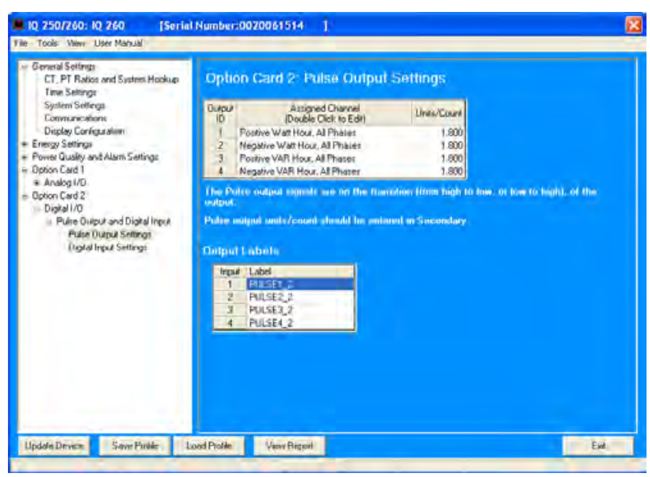
Accumulators in the software count the pulses of the Inputs and Outputs. For technical specifications and hardware installation, refer to Chapter 7 of this manual.

NOTE: When installing a **Pulse Output/Digital Input card**, we recommend you **reset the accumulators for the card**, in order to prevent erroneous counts. See instructions on using the Reset Device Information screen to reset card accumulators, later in this chapter.

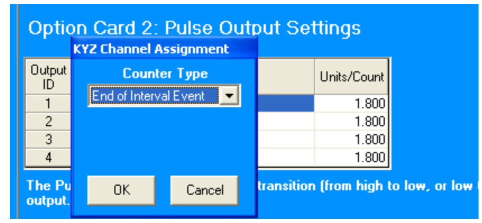
An **example use** of the **Pulse Output/Digital Input Card** is in a sub-metering application where a pulse output is needed. The Input Accumulators allow you to count the pulses from another device, for example, a KYZ module or another meter. The Output Accumulators allow you to count the pulses being output by the card.

The **Pulse Output and Digital Input Card** has two screens for configuration: the **Pulse Output Settings** screen and the **Digital Input Settings** screen.

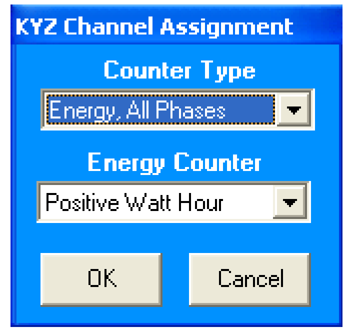
1. Click **Pulse Output Settings**.
   - You can set up to **four Output IDs** for your Card.
   - Each Output has a **Label**, an **Assigned Channel**, and a **Unit/Count**.



2. Double-click an **Assigned Channel** field to **add** or **edit** an Output ID. You will see the window shown on the right.



3. Select the Counter Type. The available selections are:
   - **Energy, All Phases**
   - **End of Interval Event** – this counter is triggered by a **Demand Averaging Interval**
   - **Energy, Phase A**
   - **Energy, Phase B**
   - **Energy, Phase C**
   - **None.**



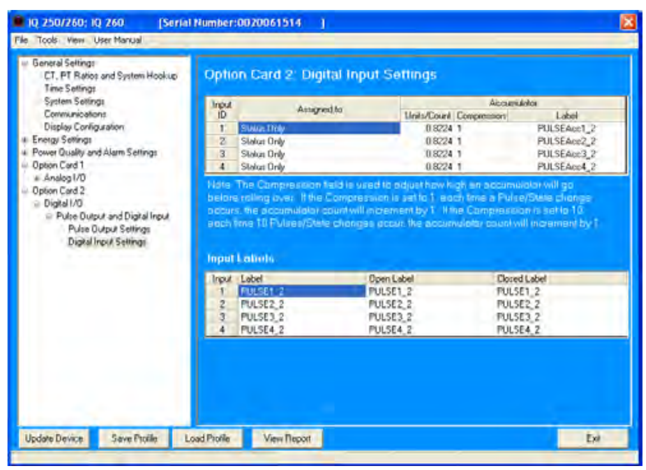
NOTE: If you select one of the **Energy Counter Types**, you will see the **Energy Counter** field, shown on the right. The available selections are: **Total Watt Hour; Positive Watt Hour; Negative Watt Hour; Total VAR Hour; Positive VAR Hour; Negative VAR Hour; VA Hour; Received Watt Hour; Delivered Watt Hour; Inductive VAR Hour; Capacitive VAR Hour.**

4. Click **OK**. The **Counter Type** you selected displays in the **Assigned Channel** field of the **Pulse Output Settings** screen.

5. When you select the **Assigned Channel**, a value is entered for it in the **Units/Count** field. You can edit this field by double-clicking in it. The Units/Count is determined by the **Secondary** (the readings in the meter).

6. The **current Output Labels** are displayed on the screen. To **change** the Output labels, click in the Labels field you want to change, and enter a new label.

7. Click **Digital Input Settings**.



- You can set up to **four Input IDs** for your Card, and assign a Label, Open Label, and Closed Label for each.
- You can assign labels and other information for Accumulators for the Inputs.
  a. Make a selection in the **Assigned to** field. The available selections are:
     - **Status Only**
     - **EOI Pulse, Trigger on Contact Closing**
     - **EOI Pulse, Trigger on Contact Opening**
     - **EOI Pulse, Trigger on Contact Change**
     - **Accumulator, Increment on Contact Closing**
     - **Accumulator, Increment on Contact Opening**
     - **Accumulator, Increment on Contact Change**

NOTES on End of Interval (EOI):

- EOI is triggered when the selected condition is met.
- EOI is used as a **trigger** for **demand averaging**: when the selected condition is met, the EOI delineates an interval that results in demand averaging being performed.
- The minimum interval between EOI Pulses used to trigger demand averaging should be 5 minutes.
- **Only one Option Card input or output can be set to trigger an EOI pulse**.

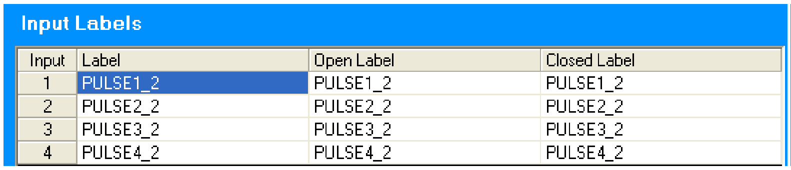
b. Enter **Units/Count**. The Units/Count is the **output ratio** from the device that is being input into the meter. **For example**, if you have a KYZ module that is outputting a pulse every 1.8 kWh, with the input set to Accumulator, Increment on Contact Opening, you would set the Units/Count to be the value of the KYZ; in this case either 1.8 or a ratio of that number.

NOTE: When EOI is chosen for the Assigned to, a pulse is generated on the selected EOI Event. When this option is chosen, you do not need to set **Units/Count**.

c. Enter **Compression**. The **Compression Factor** is used to adjust how high an accumulator will go before rolling over. Because of this, it is useful for **delaying rollover**. **For example**, if you select a Compression Factor of 10, each time 10 Pulse/State changes occur, the accumulator count will increment by 1. The **available Compression Factors** are: **1, 10, 100, 1000, 10000**, and **100000**. The default Compression Factor is 1.

d. Enter a **Label** for the **Accumulator**.

· The current Input Labels are displayed on the screen. To change the Input Labels, click in the Labels field you want to change, and enter a new label.


Input Labels

Input	Label	Open Label	Closed Label
1	PULSE1_2	PULSE1_2	PULSE1_2
2	PULSE2_2	PULSE2_2	PULSE2_2
3	PULSE3_2	PULSE3_2	PULSE3_2
4	PULSE4_2	PULSE4_2	PULSE4_2

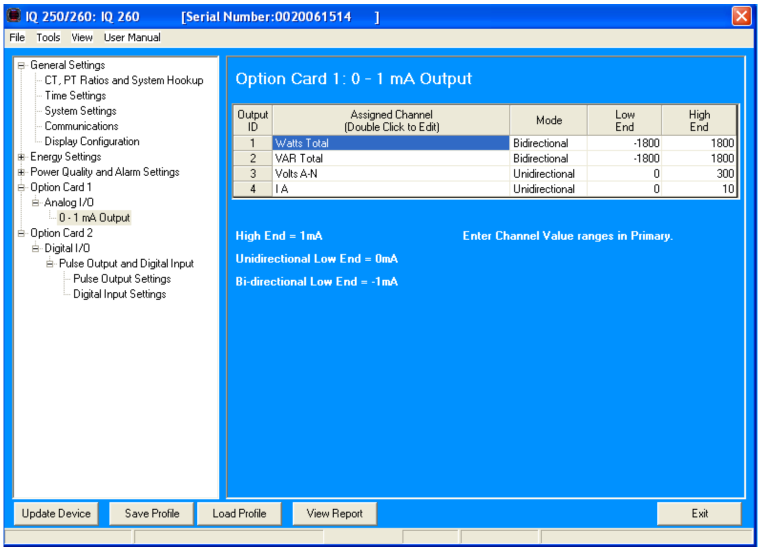
Configuring a 0-1 mA Output Card (IQ250/260-IO3):

The **0-1mA Output Option Card** is an **analog communication card**, which transmits a standard, bi-directional 0-1 milliamp signal. For technical specifications and hardware installation, see Chapter 7 of this manual.

An **example use** of the optional 0-1mA Output Card is in enabling the meter to communicate with an RTU (Remote Terminal Unit).

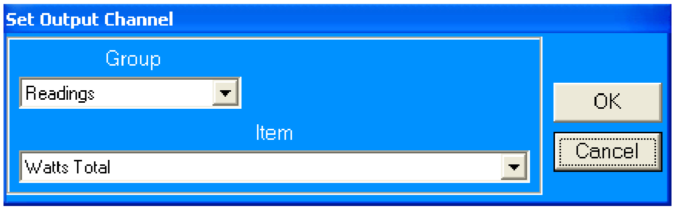
1. Click **0-1 mA Output**.
· You can set up to four Output IDs for your Output Card.

2. Double-click an **Assigned Channel field** to **add** or **edit** an **Output ID**. You will see the window shown on the next page.



3. Select **Group** for your **Output Channel**. The available selections are as follows:

- **Readings**
- **Demand**
- **Maximums**
- **Minimums**
- **Phase Angles**
- **THD**
- **Not Assigned.**



4. Select **Item** for your **Output Channel**. The items are the available readings for the group you selected. **For example**, as shown in the window above, Volts A-N is an item you can select when you have selected Readings as the Group.

5. Click **OK**. The Output Channel you selected is displayed in the Assigned Channel field.

6. Enter **Low End** and **High End** for the channel.

NOTE: For the Item selected for the Assigned Channel, the Output Card takes the value in the meter and outputs a DC current within its range. The Low End is the lowest value, and the High End is the highest value. For example, for VOLTS A-N and Bidirectional Mode, at Full Scale of 120V, the Low End is 115V and the High End is 125V. The Analog Output Card will output –1 mA when the reading is 115V, 0 mA when the reading is 120V, and 1 mA when the reading is 125V.

7. You can select either **Unidirectional** or **Bidirectional** for **Mode**.

8. Enter an **Update Rate**. The **suggested rate** is between 100 and 200 msec.

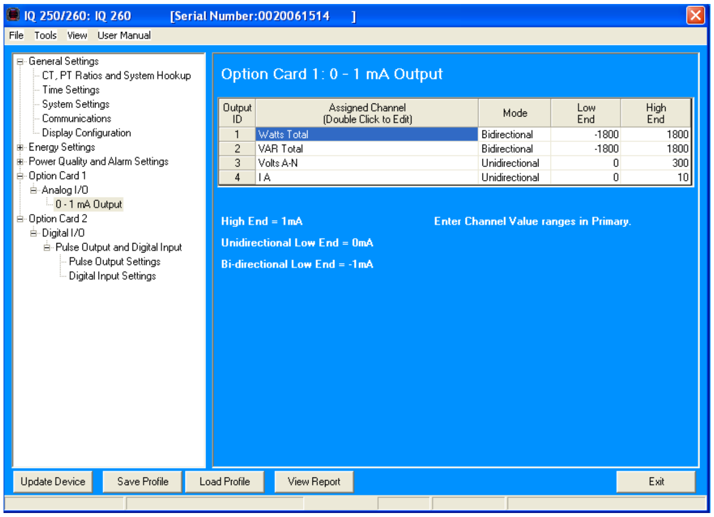
Configuring a 4-20 mA Output Card (IQ250/260-IO4):

The **4-20mA Output Option Card** is an **analog communication card**, which transmits a standard, uni-directional 4-20 milliamp signal.For technical specifications and hardware installation, see Chapter 7 of this manual.

An example use of the optional 4-20mA Output Card is in enabling the meter to communicate with an RTU (Remote Terminal Unit).

Click **4-20 mA Output**.

Follow the instructions for configuring the 0-1 mA Card. The configuration of a 4-20 mA Card is the same as a 0-1 mA Card, except that this card can only be unidirectional.



Polling the IQ 250/260 Meter

- The **Real Time Poll** features of the Eaton Meter Configuration Software are used to continuously view **instantaneous values** within an IQ 250/260 Meter. The software provides tabular views of metered values, circuit measurements, interval data, Power Quality values, Pulse data and Input/Output status and accumulations.

  The **Real Time Poll** features are divided into three groups, accessed by clicking the **Real Time Poll** menu in the **Title Bar**:

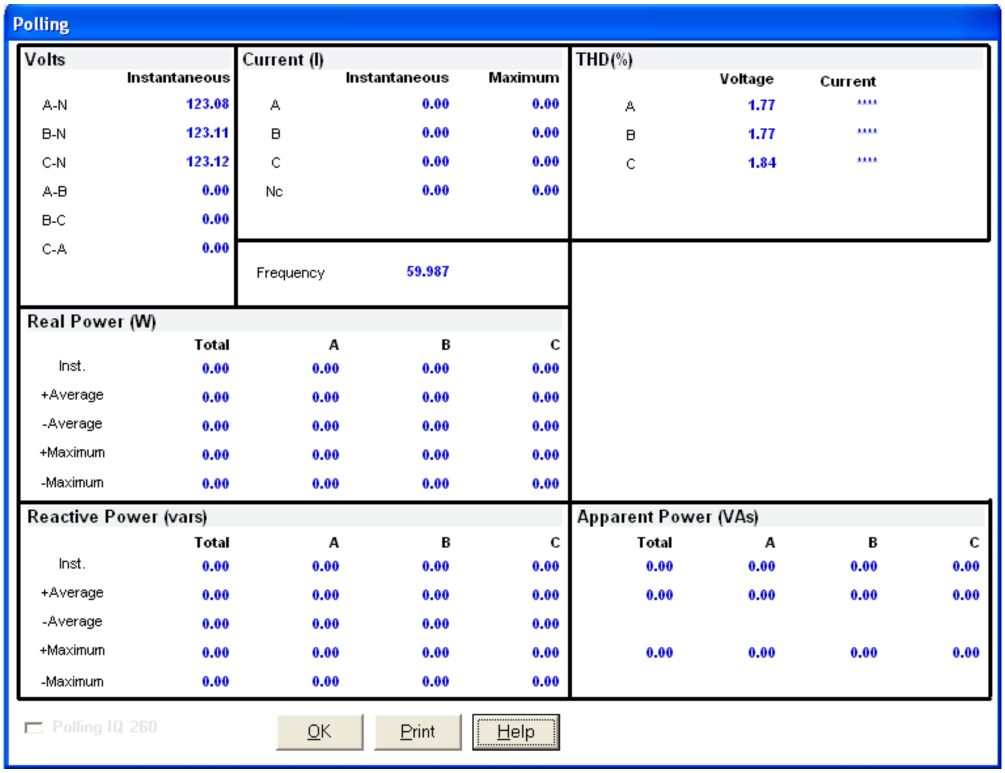
  - Real Time Readings
  - Revenue, Energy and Demand Readings
  - Power Quality and Alarms

  When you click **Real Time Readings**; **Revenue, Energy and Demand Readings**; and **Power Quality and Alarms,** you will see a sub-menu that allows you to select individual polling screens.

- **NOTE**: Clicking the **Polling Icon** on the **Title Bar** is the same as selecting **Instantaneous Polling** from the **Real-Time Poll>Real Time Readings** menu; clicking the **Phasors Icon** on the **Title Bar** is the same as selecting **Phasors** from the **Real-Time Poll>Power Quality and Alarms** menu.

Instantaneous Polling

- Click **Real-Time Poll>Real Time Readings>Instantaneous Polling**. You will see the screen shown below.
  NOTE: You will only see the THD Readings if you are connected to an IQ 260.

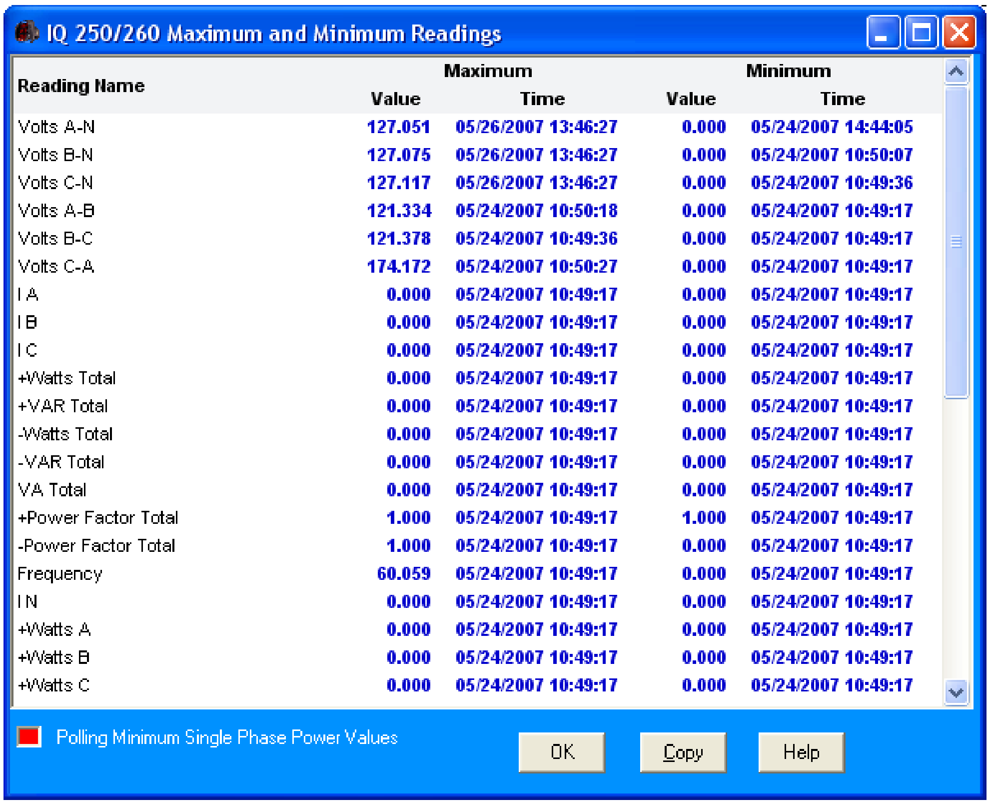


- Click **Print** to print a copy of the screen.
- Click **Help** to view instructions for this screen.
- Click **OK** to return to the main screen.

Poll Max and Min Readings

Click **Real-Time Poll**>**Real Time Readings**>**Poll Max and Min Readings**. You will see the screen shown below.

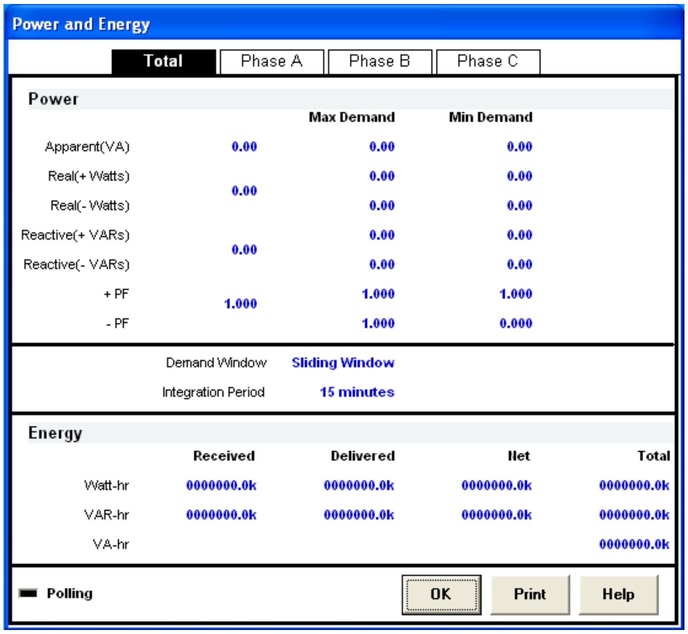
This screen displays the maximum and minimum values and the time of their occurrence for all of the IQ 250/260 Real-Time readings. Use the scroll bar to view readings not displayed on the screen.



- Click Copy to copy the readings to the clipboard. You can then paste them into another document, for example, an Excel file.
- Click OK to close the screen.

Poll Power and Energy

■ Click **Real-Time Poll>Revenue, Energy and Demand Readings>Power and Energy**. You will see the screen shown below.



This screen displays the **power** and **energy** for **Total Power** and all three **phases**.

1. Click the **tabs** at the top of the screen to select the view you want:
   - **Total**
   - **Phase A**
   - **Phase B**
   - **Phase C**
2. Click **Print** to print the readings.
3. Click **OK** to close the screen.

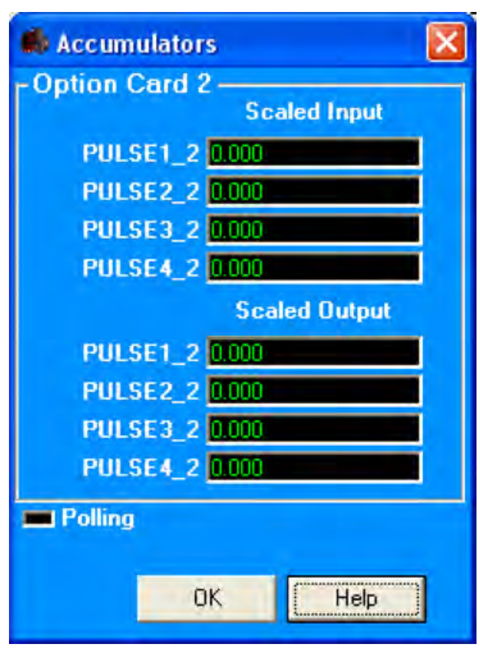
Poll Accumulators

■ Click **Real-Time Poll>Revenue, Energy and Demand Readings> Accumulations**. You will see the screen shown on the right.

This screen displays the current readings for the Input and Output **Accumulators** of any installed Relay Ouput/Digital Input and Pulse Output/Digital Input Option cards.

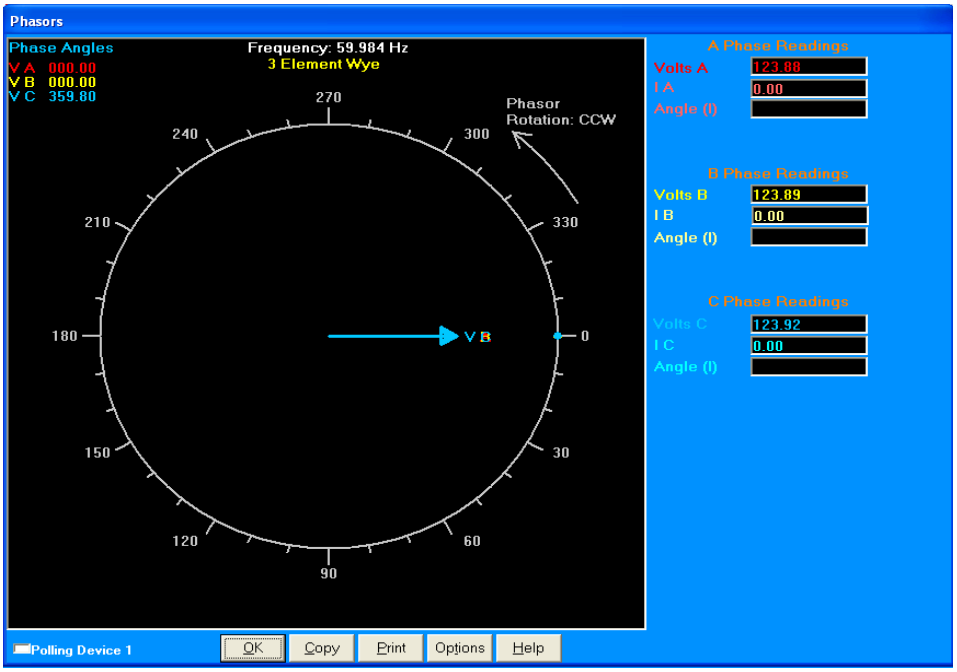
The readings are shown after the configured Compression and Units/Count have been applied. For information on setting Compression and Units/Counts for Accumulators, refer to the instructions for configuring Relay Output/Digital Input and Pulse Output/Digital Input Cards, earlier in this chapter.

Click **OK** to close the screen.



Poll Phasors

1. Click **Real Time Poll>Power Quality and Alarms>Phasors**. You will see the screen shown below.

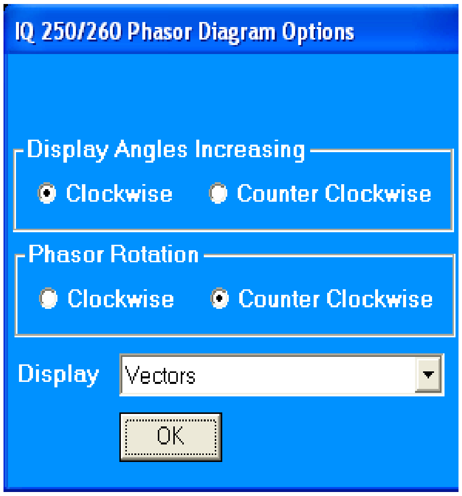


The **Phasors** screen displays the Phase relationships of the currently connected IQ 250/260. If you have an **auxiliary voltage** reading (i.e. generator and bus where the V Aux is the generator), Aux box and the V Aux phaser are displayed. The V Aux phasor is referenced to V A phase.

2. To adjust the Phasor **display**, click **Options** at the bottom of the screen. You will see the screen shown on the right.

   a. In the **Display Angles Increasing** and **Phasor Rotation** boxes, select either **Clockwise** or **Counter Clockwise**.

   b. From the **pull-down menu** at the bottom of the screen, select **Vectors**, **Triangles** or **Vectors and Triangles** to change the graphic representation of the data.



3 Click **OK** to save your selections and return to the **Phasors** screen.

- Click **Copy** to save a copy of the screen to the clipboard.
- Click **Print** to send a copy of the graph to a printer.
- Click **Help** to view instructions for this screen.
- Click **OK** to return to the main screen.

Poll Status Inputs

1. Click **Real Time Poll>Power Quality and Alarms>Poll Status Inputs**. You will see the screen shown below.

This screen displays the status (**Open** or **Closed**) of the **Digital Inputs** of any installed **Relay Output/Digital Input** or **Pulse Output/Digital Input** Option cards.

2. Click **Close** to close the screen.

Poll Limits (IQ 260 Only)

Click **Real-Time Poll>Power Quality and Alarms>Limits**. You will see the screen shown below.

Limit ID	Label	Value	Status		Limit 1			Limit 2		
			Limit 1	Limit 2	Setting	Point	Hysteresis	Setting	Point	Hysteresis
Limit 1	Volts A-B	0.00	In	Out	Above	660.000	660.000	Below	540.000	540.000
Limit 2	Volts B-C	0.00	In	Out	Above	660.000	660.000	Below	540.000	540.000
Limit 3	Volts C-A	0.00	In	Out	Above	660.000	660.000	Below	540.000	540.000
Limit 4	I A	0.00	In	Out	Above	5.500	5.500	Below	4.500	4.500
Limit 5	I B	0.00	In	Out	Above	5.500	5.500	Below	4.500	4.500
Limit 6	I C	0.00	In	Out	Above	5.500	5.500	Below	4.500	4.500
Limit 7	Watts Total	0.00	In	Out	Above	9900.000	9900.000	Below	8100.000	8100.000
Limit 8	Frequency	59.99	In	In	Above	66.000	66.000	Below	54.000	54.000

This screen shows the current **status** of any **Limits** programmed in the **Device Profile**.

NOTE: See instructions for configuring Limits, earlier in this chapter.

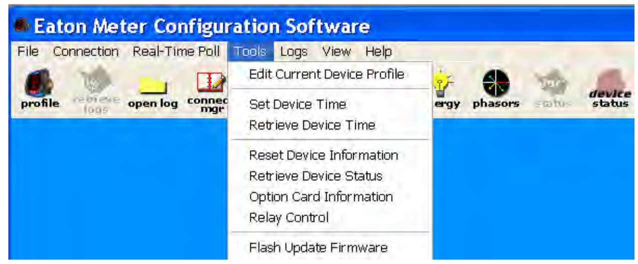
1. The **displayed fields** are:

- **Limit ID** – the identification of the limit.
- **Label** - the item the Limit is set for.
- **Value** – the current reading for this item.
- **Status/Limit1/Limit2** – whether the current reading is “In” or “Out” for the Above (Limit 1) and Below (Limit 2) Setpoints.
- **Limit 1/Setting/Point/Hysteresis** – Above: the point above which the reading goes out of limit (Setpoint) and the point at which it returns to within limit (Hysteresis).
- **Limit 2/Setting/Point/Hysteresis** – Below: the point below which the reading goes out of limit (Setpoint) and the point at which it returns to within limit (Hysteresis).

2. Click **Print** to print the screen.

3. Click **OK** to close the screen.

Using the IQ 250/260 Tools Menu

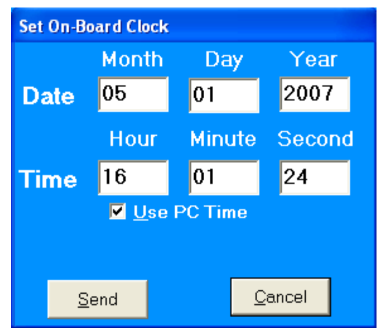


The **Tools Menu** allows you to access specific functions for the IQ 250/260 Meter. Click **Tools** from the **Title Bar** to display the Tools Menu.

Accessing the Device Profile Screen

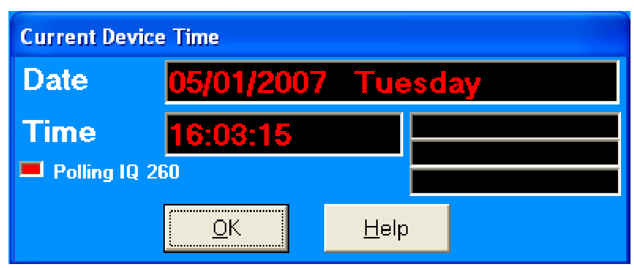
Click the first option, **Edit Current Device Profile**, to open the **Device Profile** screen. This menu option performs the same function as clicking the **Profile** icon in the **Title Bar**.

Setting Device Time



1. Click **Tools>Set Device Time**. You will see the screen shown on the right. This screen allows you to **set** the meter's **internal clock** and/or **synchronize** it to your **PC's** time. The meter's clock is used for logging and other time retrieval purposes.
2. You can enter a new Month, Day, and Year in the **Date** fields.
3. Check the box next to **Use PC Time** to synchronize the meter to your PC; uncheck the box if you want to **reset** the time **manually**. You can then enter the Hour, Minute, and Seconds you want in the **Time** fields.
4. Click **Send** to send the new date and/or time to the meter; click **Cancel** to close the screen.

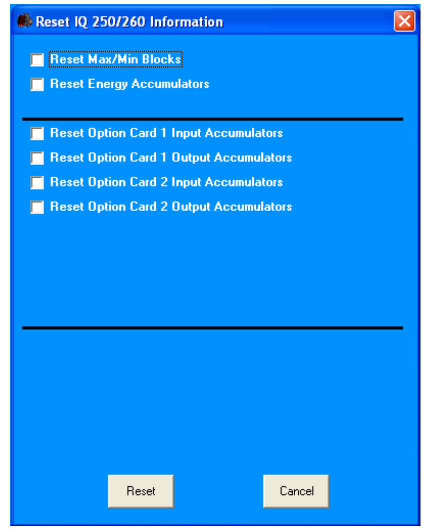
Retrieving Device Time



1. Click **Tools>Retrieve Device Time**. You will see the screen shown on the right.

   This screen **displays** the meter's **internal time**. If **Daylight Savings Time** is enabled, '**DST**' will display in one of the fields to the right of the **Time** field.
2. Click **OK** to close the screen.

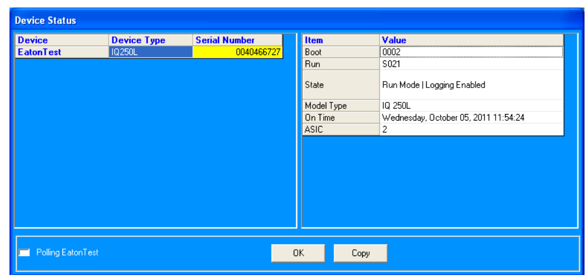
Resetting Device Information



1. Click **Tools>Reset Device Information**. You will see the screen shown on the right.
2. Select the items you want to reset and click **Reset**.

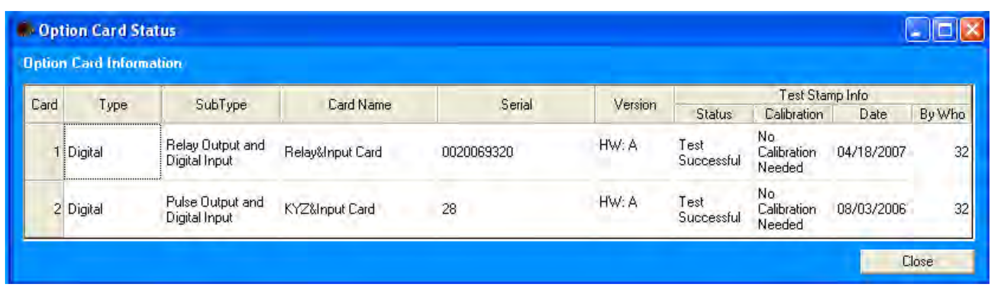
NOTES:
- You can reset **Max/Min Blocks**, **Energy Accumulators**, and **Option Card Accumulators**.
- When installing a **Pulse Output/Digital Input** card or a **Relay Output/Digital Input** card, we recommend you reset the accumulators for the card, in order to prevent erroneous counts.
- This feature requires a **Password** if **Password for Reset** is **enabled** for the meter.

Retrieving Device Status



1. Click **Tools>Retrieve Device Status**. you will see the screen shown on the right.
   NOTE: This is the same screen that opens when you first c onnect to the meter.
2. This screen shows the **status** of any **connected devices**. If more than one meter is displayed, **click** on a **device** to display detailed information for it on the right side of the scren.
3. Click **OK** to close the screen.

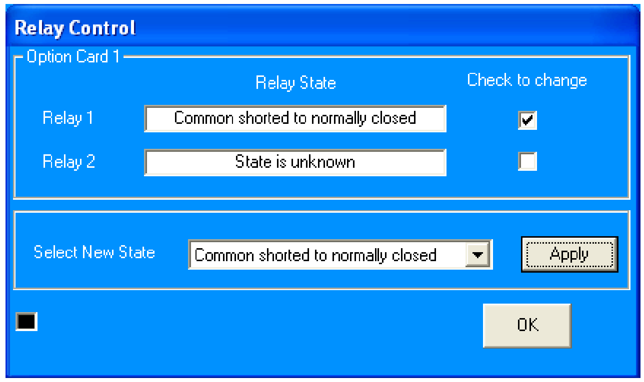
Viewing Option Card Information



1. Click **Tools>Option Card Information**. You will see the screen shown on the right.

   This screen displays detailed information about any Option cards installed in the meter:
   - Type
   - Sub Type
   - Card Name
   - Serial Number
   - Version
   - Test Information.
2. Click **Close** to close the screen.

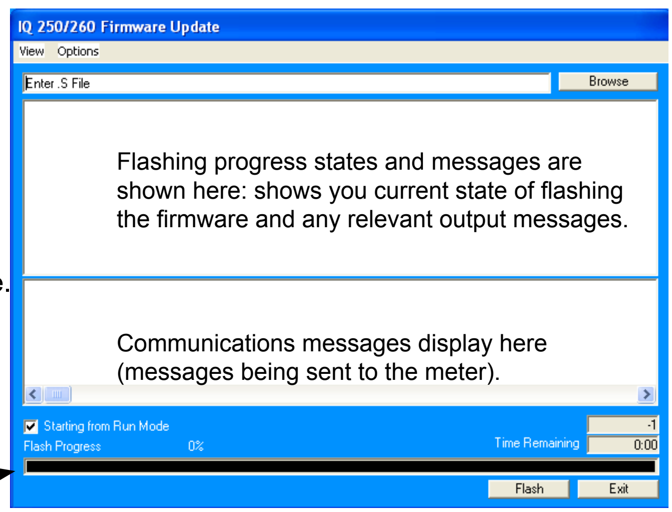
Performing Manual Relay Control



1. Click **Tools>Relay Control**. You will see the screen shown on the right.
   This screen allows you to **manually set** the **state** of any installed **Relay Output/Digital Input** cards.
2. The screen displays the **current** Relay state. To change the state:
   a. Select the state you want in the **Select New State** field.
   b. **Click** the **checkbox** next to the **Relays** you want to **change** to the new state.
   c. Click **Apply**.
   NOTE: If this feature is **Password Protected**, the **Enter Password** screen opens.
3. Click **OK** to close the screen.

NOTES:
- A Relay **cannot be manually controlled** if a **Limit** has been assigned to it. See the instructions for configuring a Relay Output/Digital Input Card, earlier in this chapter. (This only applies to the IQ 260 meter.)
- If the **Relay State** field is "**State is Unknown**," verify that the **Relay configuration** is correct. You may also see this message after you have performed a **Reset**. Select a **New State** for the Relay and click **Apply**.

Performing Firmware Flash Update



This Bar Shows Flashing Progress

1. Click **Tools>Flash Me**. You will see the screen shown on the right.
   This function allows you to update the IQ 250/260's firmware.
2. Click **Browse** to locate the flash file.
3. Click **Flash** to update the firmware with the flash file.
4. When Flash is complete, click **Exit** to close the screen.

NOTE: If Flash Update fails, you will see a message to that effect. Check **Device Status** (see instructions on the previous page) to see if your meter is in **Boot Mode**.
- If the meter is in Boot Mode, **uncheck** the **Starting from Run Mode** box in the Flash Me screen and try flash updating the firmware again.
- If the meter's status is not displayed in the **Device Status** screen, the meter may be stuck in Boot Mode. If you are certain the communication settings are correct for the meter, try connecting to the meter using the following defaults:

Address	001
Baud Rate	9600
Protocol	Modbus RTU

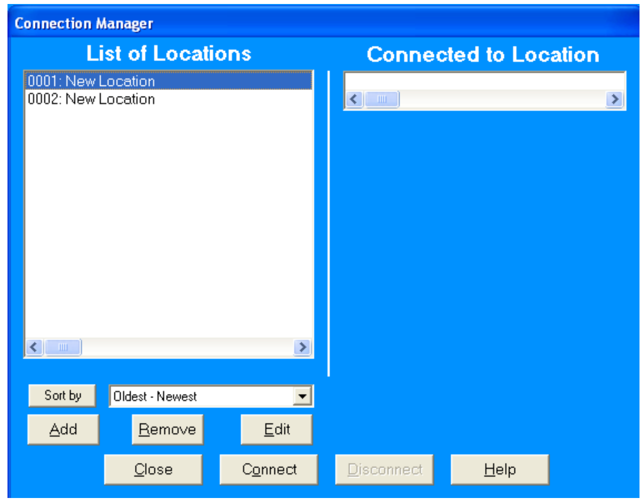
Once you connect to the meter, you can try flash upgrading again.

Performing Additional Tasks with Eaton Meter Configuration Software

The following sections contain instructions for other tasks you can perform with the Eaton Meter Configuration Software.

Using Connection Manager

Use **Connection Manager** to **Add** or **Remove** Connection **Locations** and/or **Devices** at Locations.



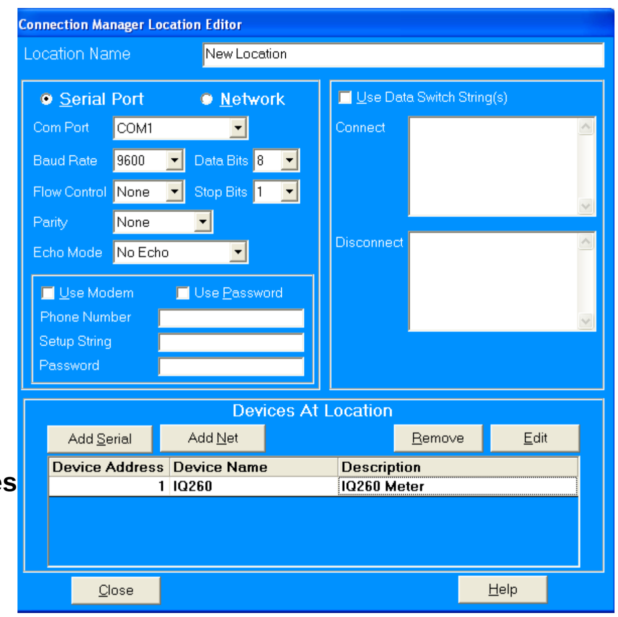
1. Click **Connection>Connection Manager** or click on the **Connect Mgr** icon. You will see the screen, shown on the right.

<u>**List of Locations**</u>:

On the left side of the **Connection Manager** screen is a **List of Locations**. These are the locations of one or more meters to which you can connect. You can **Add a Location** and/or a **Device**; **Edit a Location** and/or **Device**; or **Remove a Location** and/or **Device**.

- **To Add a Location**:
  a. Click on the **Add** button. You will see the **Connection Manager Location Editor** screen. On this screen, you program the **Communication settings** for each **New Location**.
  b. Type a **Name** for the **New Location**.
  c. Click **Serial Port** or **Network**.
  d. Enter **Communications Settings**:

Com Port:	COM 1 - 99
Baud Rate:	1200 - 115200
Flow Control:	None or Hardware
Data Bits:	8 (or 7)
Parity:	None (Even, Odd)

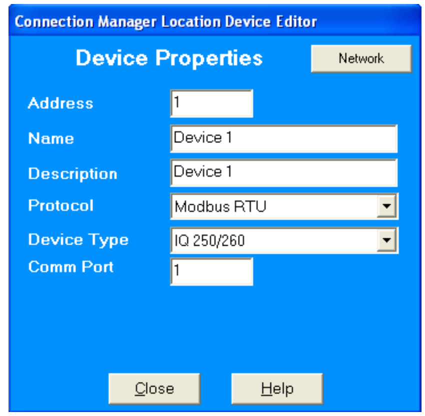


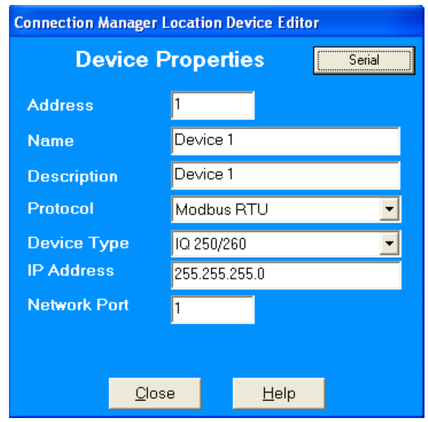
  e. **To Add a Device**:
    - Click **Add Serial** (to add a Serial Port Connected Device) or **Add Net** (to add a Network Connected Device) in the **Devices at Location** box. You can add up to **255 Devices** (Serial Port and/or Network connected) at one **Location**.

NOTES:
- All devices must have the same connection parameters: Baud, Parity and Flow Control.
- Multiple Devices slow down polling.
- If you are connecting to a device through the Power Xpert® Gateway, the protocol must be Modbus TCP.

f. **To Edit a Device**:
- Select the Device from the **Devices at Location** box. (Scroll down to find all devices.)
- Click **Edit**. You will see the **Connection Manager Location Device Editor** screen, shown on the right.
- Use this screen to program the **Device Properties** for each device at a Location.
  - If the Device has a **Serial Port Device Connection**, you will see the first (top) example screen.
  - If the Device has a **Network Device Connection**, you will see the second example screen.

  Click the **Network** or **Serial** button at the top of the screen to **switch** connection **screens**.





- Enter **Device Properties**:

  Address: 1 - 247 (Unique Address)
  Name: Device Name
  Description: (Type and Number, for example)
  Protocol: Modbus RTU, ASCII, or Modbus TCP (if connecting to this device via the Power Xpert® Gateway, the protocol must be Modbus TCP)
  Device Type: IQ 250/260
  Comm Port: 1 or 2 (Serial Port Only)
  IP Address: 100.10.10.10 (for example) (Network Only)
  Port Number: 502 (Default) (Network Only)

- Click **Close** to save settings and return to the **Connection Manager Location Editor** screen.

g. To **Remove a Device**, select the **Device** from the Devices at Location box and click **Remove**.
h. Click **Close** to return to the **Connection Manager** screen.

- **To Edit a Location**:
  a. Select a **Location** from the **List of Locations** box.
  b. Click the **Edit** button. The **Connection Manager Location Editor** screen appears, displaying the current settings for the location.
  c. Make any **changes** to settings and/or devices at the location.
  d. Click **Close** to exit the screen.

- **To Remove a Location**:
  a. Select a **Location** from the **List of Locations** box.
  b. Click **Remove**.
  c. Click **Yes** in the **Confirmation** window.

- **To Sort List of Locations**:
  a. Select a **sort method** (A-Z, Z-A, Newest-Oldest or Oldest-Newest) from the pull-down menu.
  b. Click **Sort By**.

• **To Connect to a Location**:

a. Select the **Location** you want to connect to from the **List of Locations** box.

NOTE: **You may only connect to one location at a time**. To change to a different location, you must **disconnect** from the **current location** by selecting it and clicking **Disconnect**.

b. Click **Connect**. When the connection is made, the selected location appears in the **Connected To Locations** section of the screen.

c. Click **Close**. The **Device Status** screen opens, confirming the connection. The **Computer Status Bar** at the bottom of the screen also confirms the computer's connection parameters.

NOTE: If the connection fails, a popup screen will alert you. Check that all cables are secure, that the RS-232 cable is connected to the correct Com Port on the computer, and that the computer is set to use the same baud rate and protocol as the meter to which the computer is connected.

Disconnecting from an IQ 250/260

To **disconnect** from an IQ 250/260 Meter or from a location, do one of the following:

- Click on the **Disconnect** icon in the **Title Bar**.
- Select **Connection**>**Disconnect** from the **Title Bar**.
- From the **Connection Manager** screen, select the location from the **Connected to Location** field and click the **Disconnect** button.

Changing the Primary Device/Address

Use this feature to select another meter as the primary device.

1. Click **Connect>Change Primary Device/Address**. You will see the scree on the right.

2. Enter the **address** of the device you want to designate as the new **Primary Device**.

3. Click **OK**.

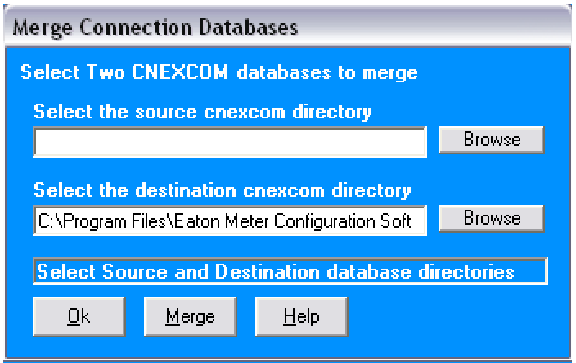
Merging Connection Databases

Use this feature to combine two sets of cnexcom databases.

1. Click **Connection>Merge Connection Databases**. You will see the screen on the right. It allows you to select the two databases to merge.

2. Click the **Browse** button next to each field to pick the databases. The **Source** cnexcom database will be merged into the **Destination** cnexcom database.

3. Click the **Merge** button to proceed with the merge; click **OK** to exit the screen.

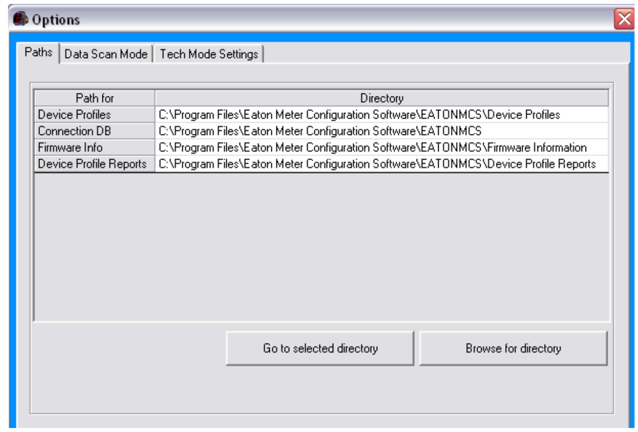


Using the Options Screen

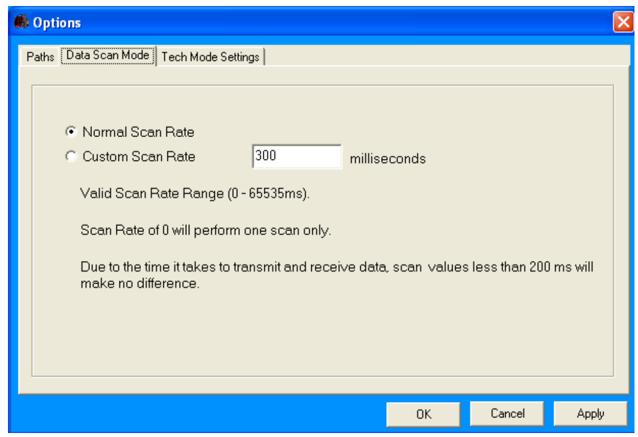
1. Click **View>Options**. You will see the screen shown on the right.
   Use this screen to access the following features:
   - Paths for Eaton Meter Configuration Software files
   - Data Scan Mode
   - Tech Mode Settings

   Use the tabs at the top of the screen to access the features.

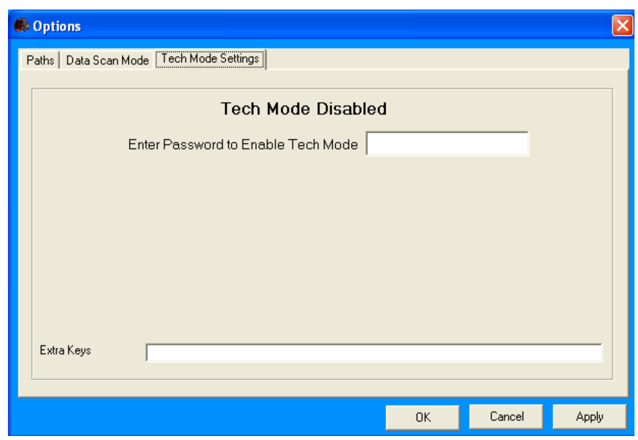
2. The first **Options** screen is the **Paths** screen, shown on the right. Use this screen to view or change the paths the Eaton Meter Configuration Software uses for data.



3. Click the **Data Scan Mode** tab to see the second screen on the right. Use this screen to select **Normal Scan rate** or to enter a **custom Scan rate**.



4. Click the **Tech Mode** tab to see the third screen on the right. Use this screen to access Tech Mode, by entering a valid password.



5. Click:
- **Apply** to apply your selection(s) and keep the Options screen open.
- **Okay** to apply your selection and close the Options screen.
- **Cancel** to close the Options screen without saving any selections that have not been applied (using the Apply button).

Using the Help Menu

The **Help** menu, accessed by clicking **Help** in the **Title Bar**, allows you to:
- View this manual online: click **Help>User Manual**.
- View information about the Eaton Meter Configuration Software, including version number: click **Help>About Eaton Meter Configuration Software.**

App. A IQ 250/260 Navigation Maps

Introduction

You can configure the IQ 250/260 and perform related tasks using the buttons on the meter face.
• Chapter 6 contains a decription of the buttons on the meter face and instructions for programming the meter using them.
• The meter can also be programmed using software. See Chapter 8 for instructions on programming the meter using the Eaton Meter Configuration Software.

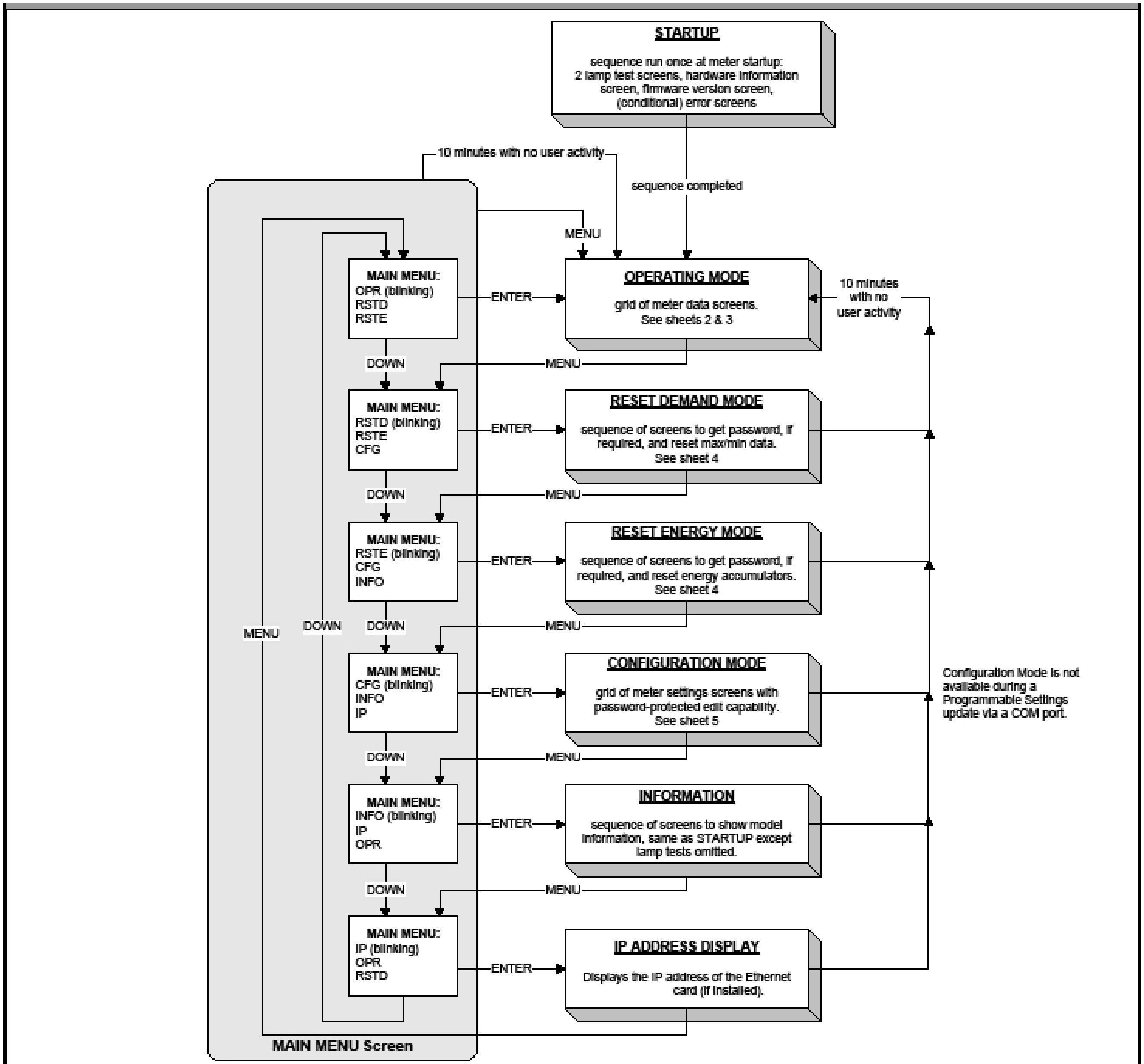
Navigation Maps (Sheets 1 to 4)

The IQ 250/260 Navigation Maps begin on the next page. The maps show in detail how to move from one screen to another and from one Display Mode to another using the buttons on the face of the meter. All Display Modes will automatically return to Operating Mode after 10 minutes with no user activity.

IQ 250/260 Navigation Map Titles:

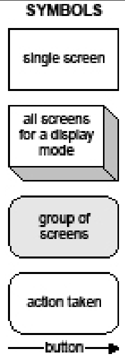
• Main Menu Screens (Sheet 1)
• Operating Mode Screens (Sheet 2)
• Reset Mode Screens (Sheet 3)
• Configuration Mode Screens (Sheet 4)

Main Menu Screens (Sheet 1)



MAIN MENU screen scrolls through 6 choices, showing 3 at a time. The top choice is always the "active" one, which is indicated by blinking the legend.

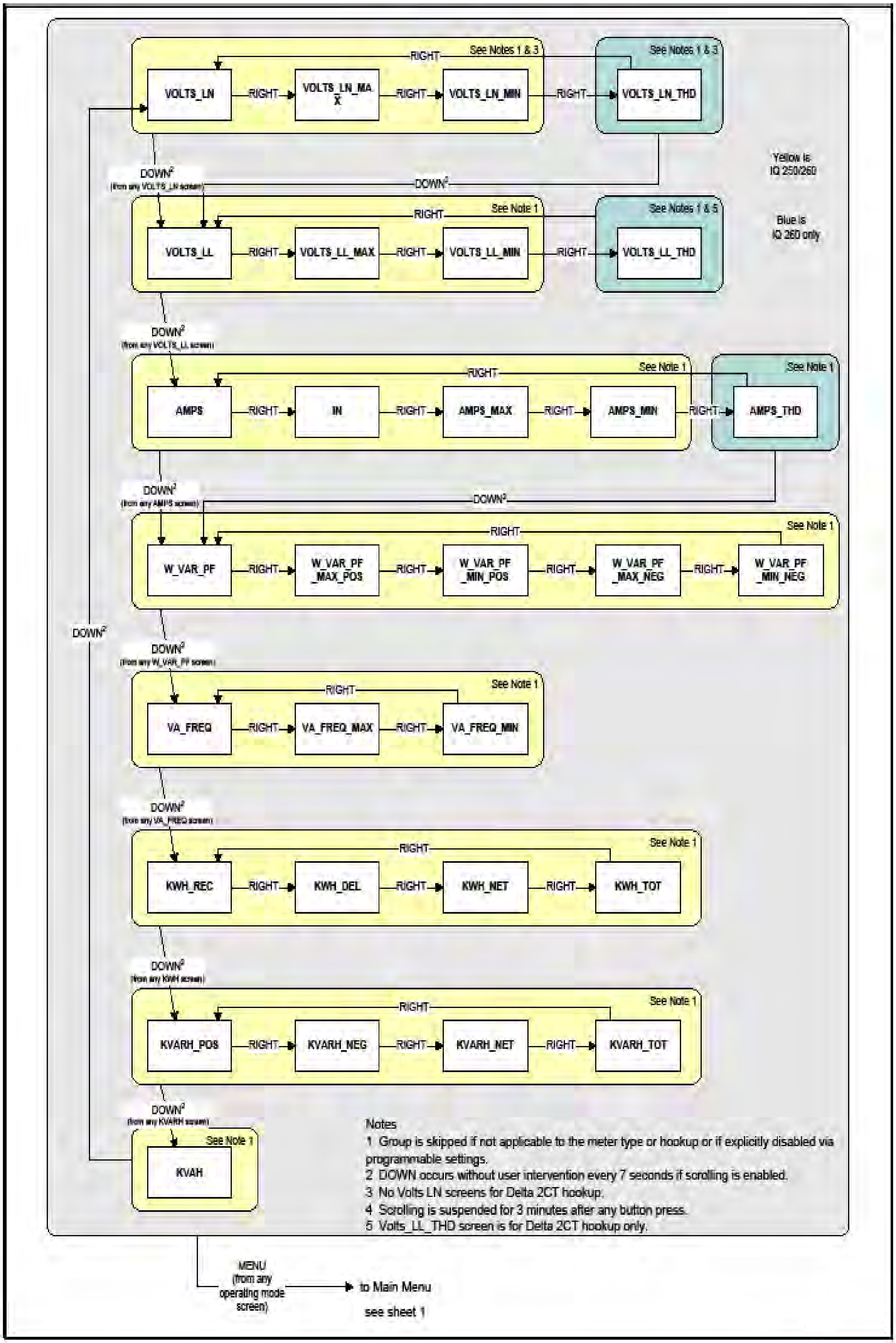
SYMBOLS



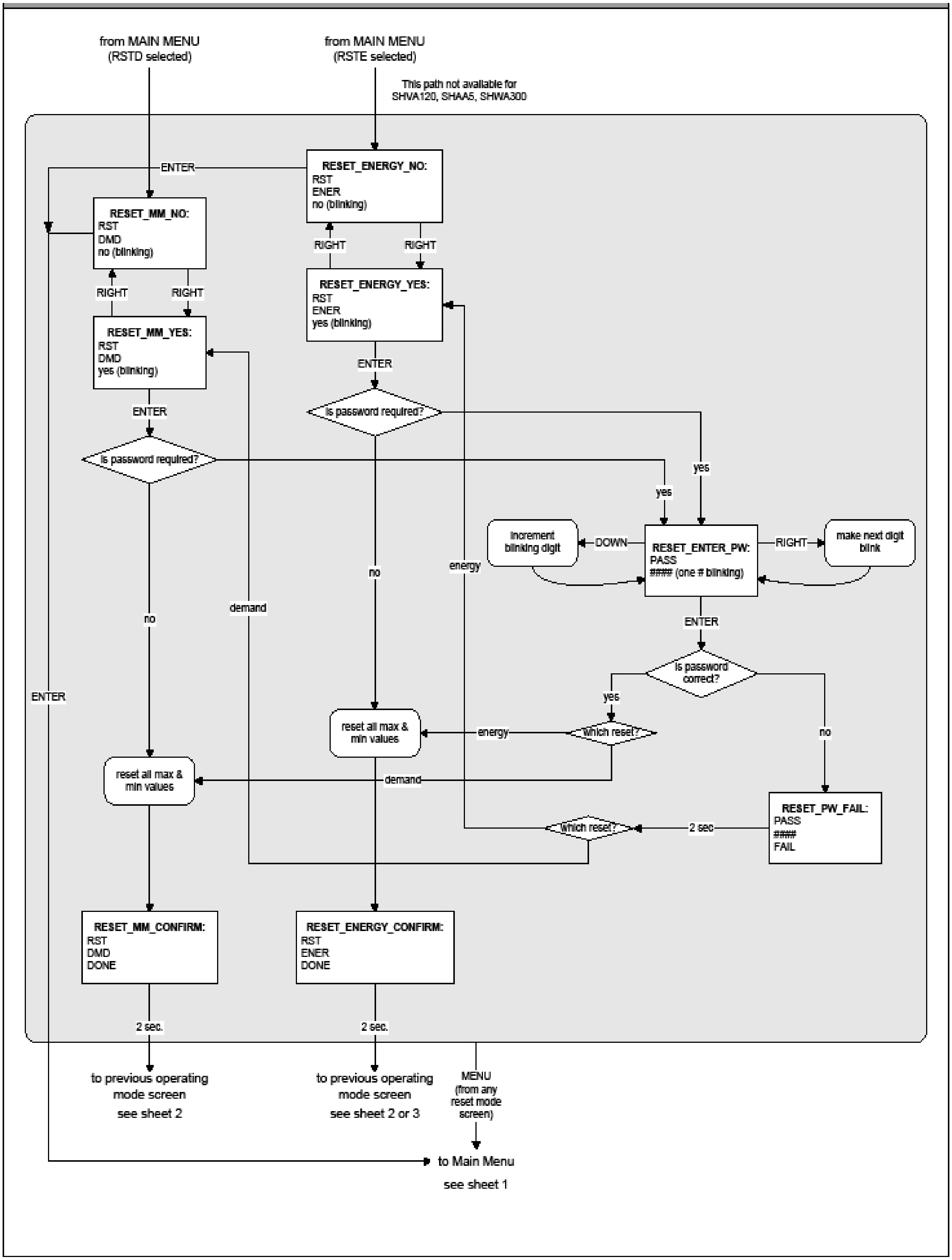
BUTTONS

MENU	Returns to previous menu from any screen in any mode
ENTER	Indicates acceptance of the current screen and advances to the next one
DOWN, RIGHT	Navigation and edit buttons
Navigation:	No digits or legends are blinking. On a menu, down advances to the next menu selection, right does nothing. In a grid of screens, down advances to the next row, right advances to the next column. Rows, columns, and menus all navigate circularly.
Editing:	A digit or legend is blinking to indicate that it is eligible for change. When a digit is blinking, down increases the digit value, right moves to the next digit. When a legend is blinking, either button advances to the next choice legend.

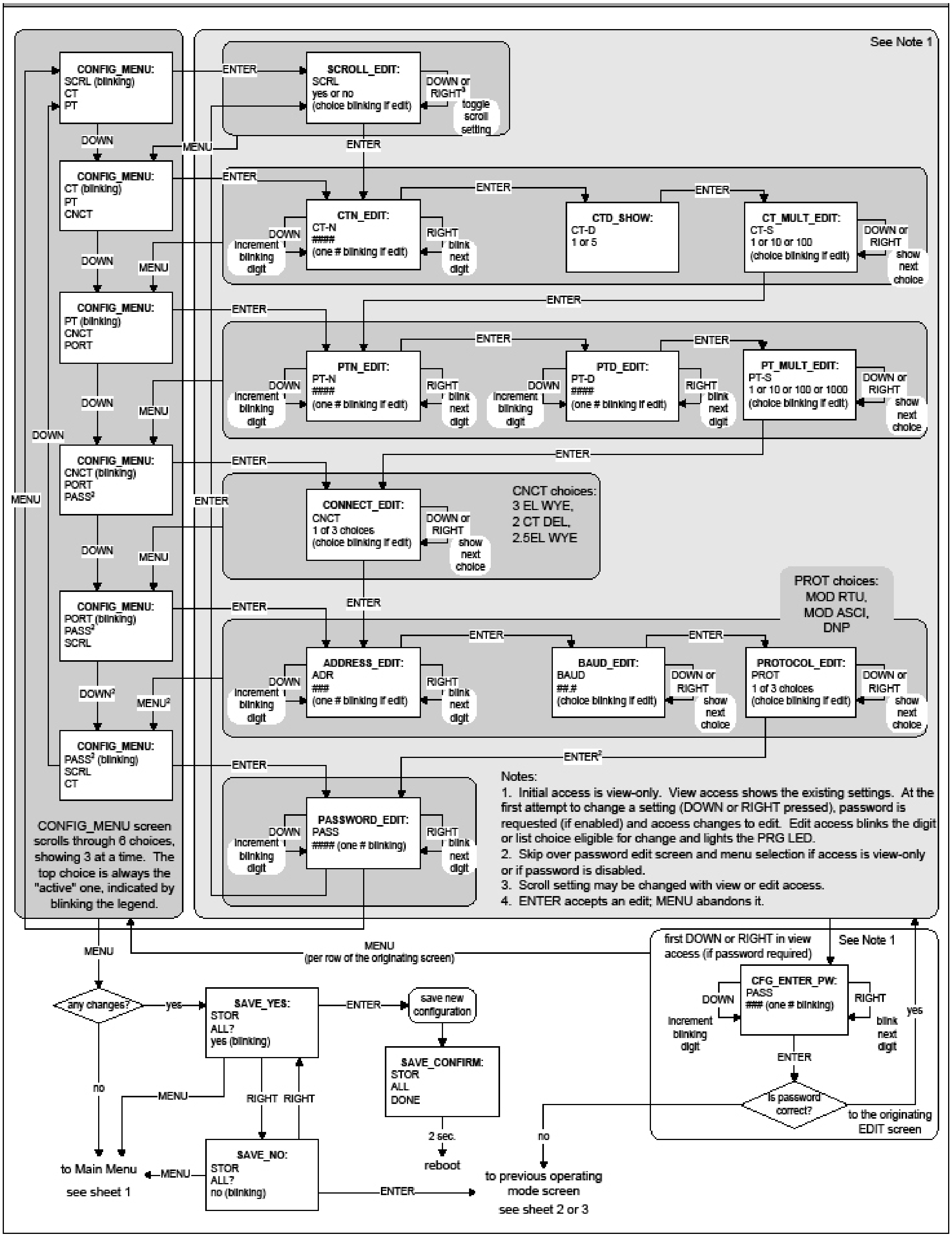
Operating Mode Screens (Sheet 2)



Reset Mode Screens (Sheet 3)



Configuration Mode Screens (Sheet 4)



App.B IQ 250/260 Modbus Map

Introduction

The Modbus Map for the IQ 250/260 Meter gives details and information about the possible readings of the meter and its programming. The IQ 250/260 can be programmed using the buttons on the face of the meter (Chapter 6) or with the Eaton Meter Configuration Software (Chapter 8).

Modbus Register Map Sections

The IQ 250/260 Modbus Register Map includes the following sections:

Fixed Data Section, Registers 1- 47, details the Meter's Fixed Information.

Meter Data Section, Registers 1000 - 12031, details the Meter's Readings, including Primary Readings, Energy Block, Demand Block, Phase Angle Block, Status Block, THD Block, Minimum and Maximum in Regular and Time Stamp Blocks, Option Card Blocks, and Accumulators. Operating Mode readings are described in Chapter 6 of this manual.

Commands Section, Registers 20000 - 26011, details the Meter's Resets Block, Programming Block, Other Commands Block and Encryption Block.

Programmable Settings Section, Registers 30000 - 33575, details all the setups you can program to configure your meter.

Secondary Readings Section, Registers 40001 - 40100, details the Meter's Secondary Readings.

Data Formats

ASCII: ASCII characters packed 2 per register in high, low order and without any termination characters.

SINT16/UINT16: 16-bit signed/unsigned integer.

SINT32/UINT32: 32-bit signed/unsigned integer spanning 2 registers. The lower-addressed register is the high order half.

FLOAT: 32-bit IEEE floating point number spanning 2 registers. The lower-addressed register is the high order half (i.e., contains the exponent).

Floating Point Values

Floating Point Values are represented in the following format:

Register	**0**																**1**															
Byte	0								1								0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Meaning	s	e	e	e	e	e	e	e	e	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	sign	exponent								mantissa																						

The formula to interpret a Floating Point Value is: $-1^{sign} \times 2^{exponent-127} \times 1.mantissa$ = 0x0C4E11DB9

$-1^{sign} \times 2^{137-127} \times 1\cdot 10000100011101101111001$

$-1 \times 2^{10} \times 1.75871956$

-1800.929

Register	**0x0C4E1**																**0x01DB9**															
Byte	0x0C4								0x0E1								0x01D								0x0B9							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	1	1	0	0	0	1	0	0	1	1	1	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	1	1	0	0	1
Meaning	s	e	e	e	e	e	e	e	e	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	sign	exponent								mantissa																						
	1	0x089 + 137								0b011000010001110110111001																						

Formula Explanation:

C4E11DB9 (hex)   11000100 11100001 00011101 10111001 (binary)

The sign of the mantissa (and therefore the number) is 1, which represents a negative value.

The Exponent is 10001001 (binary) or 137 decimal.
The Exponent is a value in excess 127. So, the Exponent value is 10.

The Mantissa is 11000010001110110111001 binary.
With the implied leading 1, the Mantissa is (1).C23B72 (hex).

The Floating Point Representation is therefore -1.75871956 times 2 to the 10.

Decimal equivalent: -1800.929

NOTES:

- Exponent = the whole number before the decimal point.
- Mantissa = the positive fraction after the decimal point.

Important Note Concerning the IQ 250/260 Meter's Modbus Map

In depicting Modbus Registers (Addresses), the IQ 250/260 meter's Modbus map uses Holding Registers only.

Hex Representation

The representation shown in the table below is used by developers of Modbus drivers and libraries, SEL 2020/2030 programmers and Firmware Developers. The IQ 250/260 meter's Modbus map also uses this representation.

Hex	Description
0008 – 000F	Meter Serial Number

Decimal Representation

The IQ 250/260 meter's Modbus map defines Holding Registers as (4X) registers. Many popular SCADA and HMI packages and their Modbus drivers have user interfaces that require users to enter these Registers starting at 40001. So instead of entering two separate values, one for register type and one for the actual register, they have been combined into one number.

The IQ 250/260 meter's Modbus map uses a shorthand version to depict the decimal fields -i.e., not all of the digits required for entry into the SCADA package UI are shown.

For Example:

You need to display the meter's serial number in your SCADA application. The IQ 250/260 meter's Modbus map shows the following information for meter serial number:

Decimal	Description
9 – 16	Meter Serial Number

In order to retrieve the meter's serial number, enter 40009 into the SCADA UI as the starting register, and 8 as the number of registers.

- In order to work with SCADA and Driver packages that use the 40001 to 49999 method for requesting holding registers, take 40000 and add the value of the register (Address) in the decimal column of the Modbus Map. Then enter the number (e.g., 4009) into the UI as the starting register.
- For SCADA and Driver packages that use the 400001 to 465536 method for requesting holding registers take 400000 and add the value of the register (Address) in the decimal column of the Modbus Map. Then enter the number (e.g., 400009) into the UI as the starting register. The drivers for these packages strip off the leading four and subtract 1 from the remaining value. This final value is used as the starting register or register to be included when building the actual modbus message.

Retrieving Logs Using the IQ 250/260 Meter with Option L's Modbus Map

This section describes the log interface system of the IQ 250/260 meters with the logging option from a programming point of view. It is intended for Programmers implementing independent drivers for Log Retrieval from the meter. It describes the meaning of the meter's Modbus Registers related to Log Retrieval and Conversion, and details the procedure for retrieving a log's records.

NOTES:

- All references assume the use of Modbus function codes 0x03, 0x06, and 0x10, where each register is a 2 byte MSB (Most Significant Byte) word, except where otherwise noted.
- The caret symbol (^) notation is used to indicate mathematical "power." **For example**, 2^8 means 2^8; which is 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2, which equals 256.

Data Formats

Timestamp: Stores a date from 2000 to 2099. Timestamp has a Minimum resolution of 1 second.

Byte	0	1	2	3	4	5
Value	Year	Month	Day	Hour	Minute	Second
Range	0-99 (+2000)	1-12	1-31	0-23	0-59	0-59
Mask	0x7F	0x0F	0x1F	0x1F	0x3F	0x3F

The high bits of each timestamp byte are used as flags to record meter state information at the time of the timestamp. These bits should be masked out, unless needed.

IQ 250/260 Meter Logs

The IQ 250/260 meter has 2 logs: System Event and 1 Historical log. Each log is described below.

1) **System Event** (**0**) : The System Event log is used to store events which happen in, and to, the meter. Events include Startup, Reset Commands, Log Retrievals, etc.
The System Event Log Record takes 20 bytes, 14 bytes of which are available when the log is retrieved.

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Value	timestamp						Group	Event	Mod	Chan	Param1	Param2	Param3	Param4

2) **Historical Log** (**2**) : The Historical Log records the values of its assigned registers at the programmed interval.

NOTE: See Block Definitions (on the next page) for details on programming and interpreting the log.

Byte	0	1	2	3	4	5	6	.	.	N
Value	timestamp						values . . .			

Block Definitions

This section describes the Modbus Registers involved in retrieving and interpreting an IQ 250/260 meter's log. Other sections refer to certain 'values' contained in this section. See the corresponding value in this section for details.

NOTES:

- **Register** is the Modbus Register Address in 0-based Hexadecimal notation. To convert it to 1-based decimal notation, convert from hex_{16} to $decimal_{10}$ and add 1.
  For example: 0x03E7 = 1000.
- **Size** is the number of Modbus Registers (2 byte) in a block of data.

1) **Historical Log Programmable Settings**:

The Historical log is programmed using a list of Modbus Registers that will be copied into the Historical Log record. In other words, the Historical Log uses a direct copy of the Modbus Registers to control what is recorded at the time of record capture.

To supplement this, the programmable settings for the Historical Logs contain a list of descriptors, which group registers into items. Each item descriptor lists the data type of the item, and the number of bytes for that item. By combining these two lists, the Historical Log record can be interpreted.

For example: Registers 0x03E7 and 0x03E8 are programmed to be recorded by the Historical log. The matching descriptor gives the data type as float, and the size as 4 bytes. These registers program the log to record "Primary Readings Volts A-N."

Historical Log Blocks:
Start Register: 0x7917 (Historical Log 1)

Block Size: 192 registers per log (384 bytes)

The Historical log programmable settings are comprised of 3 blocks. Each Historical log block is composed of 3 sections: The header, the list of registers to log, and the list of item descriptors.

i. **Header:**

Registers: 0x7917 – 0x7918
Size: 2 registers

Byte	0	1	2	3
Value	# Registers	# Sectors		Interval

- # **Registers**: The number of registers to log in the record. The size of the record in memory is [12 + (# Registers x 2)]. The size during normal log retrieval is [6 + (# Registers x 2)]. If this value is 0, the log is disabled. Valid values are {0-117}.

- # **Sectors**: The number of Flash Sectors allocated to this log. Each sector is 64kb, minus a sector header of 20 bytes. If this value is 0, the log is disabled. Valid values are {0-15}.

- **Interval**: The interval at which the Historical log's Records are captured. This value is an enumeration:

0x01	1 minute
0x02	3 minute
0x04	5 minute
0x08	10 minute
0x10	15 minute
0x20	30 minute
0x40	60 minute

0 End of Interval (EOI) Pulse: Setting the interval to EOI causes a record to be logged whenever an EOI pulse event is generated. This is most commonly used in conjunction with the Digital I/O Option Cards.

NOTE: The interval between records will not be even (fixed), and thus should not be used with programs that expect a fixed interval.

ii. **Register List**:

Registers:	0x7919 – 0x798D
Size:	1 register per list item, 117 list items

The Register List controls what Modbus Registers are recorded in each record of the Historical log. Since many items, such as Voltage, Energy, etc., take up more than 1 register, multiple registers need to be listed to record those items.
For example: Registers 0x03E7 and 0x03E8 are programmed to be recorded by the historical log. These registers program the log to record "Primary Readings Volts A-N."

- Each unused register item should be set to 0x0000 or 0xFFFF to indicate that it should be ignored.
- The actual size of the record, and the number of items in the register list which are used, is determined by the # registers in the header.
- Each register item is the Modbus Address in the range of 0x0000 to 0xFFFF.

iii. **Item Descriptor List**:

Registers:	0x798E – 0x79C8
Size:	1 byte per item, 117 bytes (59 registers)

While the Register List describes what to log, the Item Descriptor List describes how to interpret that information. Each descriptor describes a group of register items, and what they mean.

Each descriptor is composed of 2 parts:

- **Type**: The data type of this descriptor, such as signed integer, IEEE floating point, etc. This is the high nibble of the descriptor byte, with a value in the range of 0-14. If this value is 0xFF, the descriptor should be ignored.

ASCII: An ASCII string, or byte array

1	Bitmap:	A collection of bit flags
2	Signed	Integer: A 2's Complement integer
3	Float:	An IEEE floating point
4	Energy: Special Signed Integer, where the value is adjusted by the energy settings in the meter's Programmable Settings.	

5	Unsigned Integer
6	Signed Integer 0.1 scale: Special Signed Integer, where the value is divided by 10 to give a 0.1 scale.
7-14	Unused
15	Disabled: used as end list marker.

- **Size**: The size in bytes of the item described. This number is used to determine the pairing of descriptors with register items.
  For example: If the first descriptor is 4 bytes, and the second descriptor is 2 bytes, then the first 2 register items belong to the 1st descriptor, and the 3rd register item belongs to the 2nd descriptor.
  NOTE: As can be seen from the example, above, there **is not** a 1-to-1 relation between the register list and the descriptor list. A single descriptor may refer to multiple register items.

Register Items	Descriptors
0x03C7 } 0x03C8	Float, 4 byte
0x1234	Signed Int, 2 byte

NOTE: The sum of all descriptor sizes must equal the number of bytes in the data portion of the Historical Log record.

2) **Log Status Block**:
The Log Status Block describes the current status of the log in question. There is one header block for each of the logs. Each log's header has the following base address:

Log	Base Address
System:	0xC747
Historical 1:	0xC757

Bytes	Value	Type	Range	# Bytes
0 - 3	Max Records	UINT32	0 to 4,294,967,294	4
4 - 7	Number of Records Used	UINT32	1 to 4,294,967,294	4
8 - 9	Record Size in Bytes	UINT16	4 to 250	2
10 - 11	Log Availability	UINT16		2
12 - 17	Timestamp, First Record	TSTAMP	1Jan2000 - 31Dec2099	6
18 - 23	Timestamp, Last Record	TSTAMP	1Jan2000 - 31Dec2099	6
24 - 31	Reserved			8

- **Max Records**: The maximum number of records the log can hold given the record size, and sector allocation. The data type is an unsigned integer from 0 – 2^32.

- **# Records Used**: The number of records stored in the log. This number will equal the Max Records when the log has filled. This value will be set to 1 when the log is reset. The data type is an unsigned integer from 1 – 2^32.

NOTE: The first record in every log before it has rolled over is a "dummy" record, filled with all 0xFF's. When the log is filled and rolls over, this record is overwritten.

- **Record Size**: The number of bytes in this record, including the timestamp. The data type is an unsigned integer in the range of 14 – 242.

- **Log Availability**: A flag indicating if the log is available for retrieval, or if it is in use by another port.

0	Log Available for retrieval
1	Not used
2	In use by COM2 (RS485)
3	In use by COM3 (Option Card 1)
4	In use by COM4 (Option Card 2)
0xFFFF	Log Not Available - the log cannot be retrieved. This indicates that the log is disabled.

NOTE: To query the port by which you are currently connected, **use the Port ID register:**

Register:	0x1193
Size:	1 register
Description:	A value from 1-4, which enumerates the port that the requestor is currently connected on.

NOTES:

- When Log Retrieval is engaged, the Log Availability value will be set to the port that engaged the log. The Log Availability value will stay the same until either the log has been disengaged, or 5 minutes have passed with no activity. It will then reset to 0 (available).
- Each log can only be retrieved by one port at a time.
- Only one log at a time can be retrieved.

- **First Timestamp**: Timestamp of the oldest record.

- **Last Timestamp**: Timestamp of the newest record.

3) **Log Retrieval Block**:
The Log Retrieval Block is the main interface for retrieving logs. It is comprised of 2 parts: the header and the window. The **header** is used to program the particular data the meter presents when a log window is requested. The **window** is a sliding block of data that can be used to access any record in the specified log.

- **Session Com Port**: The IQ 250/260 meter's Com Port which is currently retrieving logs. Only one Com Port can retrieve logs at any one time.

Registers:	0xC34E – 0xC34E
Size:	1 register

0	No Session Active
1	Not used
2	COM2 (RS485)
3	COM3 (Communications Capable Option Card 1)
4	COM4 (Communications Capable Option Card 2)

To get the current Com Port, see the **NOTE** on querying the port, on the previous page.

i. The **Log Retrieval Header** is used to program the log to be retrieved, the record(s) of that log to be accessed, and other settings concerning the log retrieval.
Registers: 0xC34F – 0xC350
Size: 2 registers

Bytes	Value	Type	Format	Description	# Bytes
0 - 1	Log Number, Enable, Scope	UINT16	nnnnnnnn esssssss	nnnnnnnn - log to retrieve e - retrieval session enable sssssss - retrieval mode	2
2 - 3	Records per Window, Number of Repeats	UINT16	wwwwwwww nnnnnnnn	wwwwwwww - records per window nnnnnnnn - repeat count	2

- **Log Number**: The log to be retrieved. Write this value to set which log is being retrieved.
  0 System Events
  1 Alarms
  2 Historical Log

- **Enable**: This value sets if a log retrieval session is engaged (locked for retrieval) or disengaged (unlocked, read for another to engage). Write this value with 1(enable) to begin log retrieval. Write this value with 0(disable) to end log retrieval.
  0 Disable
  1 Enable

- **Scope**: Sets the amount of data to be retrieved for each record. The default should be 0 (normal).
  0 Normal
  1 Timestamp Only
  2 Image

  - **Normal [0]**: The default record. Contains a 6-byte timestamp at the beginning, then N data bytes for the record data.

  - **Timestamp [1]**: The record only contains the 6-byte timestamp. This is most useful to determine a range of available data for non-interval based logs, such as System Events.

  - **Image [2]**: The full record, as it is stored in memory. Contains a 2-byte checksum, 4-byte sequence number, 6-byte timestamp, and then N data bytes for the record data.

- **Records Per Window**: The number of records that fit evenly into a window. This value is settable, as less than a full window may be used. This number tells the retrieving program how many records to expect to find in the window.
  (RecPerWindow x RecSize) = #bytes used in the window.
  This value should be ((123 x 2) \ recSize), rounded down.

For example, with a record size of 30, the RecPerWindow = ((123 x 2) \ 30) = 8.2 ~= 8

- **Number of Repeats**: Specifies the number of repeats to use for the Modbus Function Code 0x23 (35) (See next page for more information on this Function Code). Since the meter must pre-build the response to each log window request, this value must be set once, and each request must use the same repeat count. Upon reading the last register in the specified window, the record index will increment by the number of repeats, if auto-increment is enabled.

0	Disables auto-increment
1	No Repeat count, each request will only get 1 window.
2-8	2-8 windows returned for each Function Code 0x23 request.

Bytes	Value	Type	Format	Description	# Bytes
0 - 3	Offset of First Record in Window	UINT32	ssssssss nnnnnnnn nnnnnnnn nnnnnnnn	ssssssss - window status nn…nn - 24-bit record index number.	4
4 - 249	Log Retrieve Window	UINT16			246

ii. The **Log Retrieval Window** block is used to program the data you want to retrieve from the log. It also provides the interface used to retrieve that data.

Registers:	0xC351 - 0xC3CD
Size:	125 registers

- **Window Status**: The status of the current window. Since the time to prepare a window may exceed an acceptable modbus delay (1 second), this acts as a state flag, signifying when the window is ready for retrieval. When this value indicates that the window is not ready, the data in the window should be ignored. Window Status is **Read-only**, any writes are ignored.

0	Window is Ready
0xFF	Window is Not Ready

- **Record Number**: The record number of the first record in the data window. Setting this value controls which records will be available in the data window.

  - When the log is engaged, the first (oldest) record is “latched.” This means that record number 0 will always point to the oldest record at the time of latching, until the log is disengaged (unlocked).
  - To retrieve the entire log using auto-increment, set this value to 0, and retrieve the window repeatedly, until all records have been retrieved.

NOTES:

- When **auto-increment** is **enabled**, this value will automatically increment so that the window will “page” through the records, increasing by **RecordsPerWindow** each time that the last register in the window is read.
- When **auto-increment** is **not enabled**, this value must be written-to manually, for each window to be retrieved.

- **Log Retrieval Data Window**: The actual data of the records, arranged according to the above settings.

Log Retrieval

Log Retrieval is accomplished in 3 basic steps:

1. Engage the log.
2. Retrieve each of the records.
3. Disengage the log.

Auto-Increment

- In the traditional Modbus retrieval system, you write the index of the block of data to retrieve, then read that data from a buffer (window). To improve the speed of retrieval, the index can be automatically incremented each time the buffer is read.
- In the **IQ 250/260**, when the last register in the data window is read, the record index is incremented by the Records per Window.

Modbus Function Code 0x23

QUERY

Field Name	Example (Hex)
Slave Address	01
Function	23
Starting Address Hi	C3
Starting Address Lo	51
# Points Hi	00
# Points Lo	7D
Repeat Count	04

Function Code 0x23 is a user defined Modbus function code, which has a format similar to Function Code 0x03, except for the inclusion of a "repeat count." The repeat count (RC) is used to indicate that the same N registers should be read RC number of times. (See the **Number of Repeats** bullet on the previous page.)

NOTES:

- By itself this feature would not provide any advantage, as the same data will be returned RC times. However, when used with auto-incrementing, this function condenses up to 8 requests into 1 request, which decreases communication time, as fewer transactions are being made.
- In the **IQ 250/260 meter** repeat counts are limited to 8 times for Modbus RTU, and 4 times for Modbus ASCII.

The **response** for Function Code 0x23 is the same as for Function Code 0x03, with the data blocks in sequence.

IMPORTANT: Before using function code 0x23, always check to see if the current connection supports it. Some relay devices do not support user defined function codes; if that is the case, the message will stall. Other devices don't support 8 repeat counts.

Log Retrieval Procedure

The following procedure documents how to retrieve a single log from the oldest record to the newest record, using the "normal" record type (see Scope). **All logs are retrieved using the same method**. See following section for a Log Retrieval example.

NOTES:

- This example uses auto-increment.
- In this example, Function Code 0x23 is **not** used
- You will find referenced topics in the Block Definitions section.
- Modbus Register numbers are listed in brackets.

1. **Engage the Log**:
   a) **Read the Log Status Block**.
      i. Read the contents of the specific logs' status block [0xC737+, 16 reg] (see Log Headers).
      ii. Store the # of Records Used, the Record Size, and the Log Availability.
      iii. If the Log Availability is not 0, stop Log Retrieval; this log is not available at this time. If Log Availability is 0, proceed to step 1b (Engage the log).

      This step is done to ensure that the log is available for retrieval, as well as retrieving information for later use.

   b) **Engage the log.**
      Write log to engage to Log Number, 1 to Enable, and the desired mode to Scope (default 0 (Normal)) [0xC34F, 1 reg]. This is best done as a single-register write.
      This step will latch the first (oldest) record to index 0, and lock the log so that only this port can retrieve the log, until it is disengaged.

   c) **Verify the log is engaged**.
      Read the contents of the specific logs' status block [0xC737+, 16 reg] again to see if the log is engaged for the current port (see Log Availability).
      If the Log is not engaged for the current port, repeat step 1b (Engage the log).

   d) **Write the retrieval information**.
      i. Compute the number of records per window, as follows:
         RecordsPerWindow = (246 \ RecordSize)
         - If using 0x23, set the repeat count to 2-8. Otherwise, set it to 1.
         - Since we are starting from the beginning for retrieval, the first record index is 0.
      ii. Write the Records per window, the Number of repeats (1), and Record Index (0) [0xC350, 3 reg].

      This step tells the meter what data to return in the window.

2. **Retrieve the records:**
   a) **Read the record index and window.**
      Read the record index, and the data window [0xC351, 125 reg].
      - If the meter Returns a Slave Busy Exception, repeat the request.
      - If the Window Status is 0xFF, repeat the request.
      - If the Window Status is 0, go to step 2b (Verify record index).

      NOTES:
      - We read the index and window in 1 request to minimize communication time, and to ensure that the record index matches the data in the data window returned.

- Space in the window after the last specified record (RecordSize x RecordPerWindow) is padded with 0xFF, and can be safely discarded.

b) **Verify that the record index incremented by Records Per Window**.
The record index of the retrieved window is the index of the first record in the window. This value will increase by Records Per Window each time the window is read, so it should be 0, N, N x 2, N x 3 . . . for each window retrieved.
- If the record index matches the expected record index, go to step 2c (Compute next expected record index).
- If the record index does not match the expected record index, then go to step 1d (Write the retrieval information), where the record index will be the same as the expected record index. This will tell the meter to repeat the records you were expecting.

c) **Compute next Expected Record Index**.
- If there are no remaining records after the current record window, go to step 3 (Disengage the log).
- Compute the next expected record index by adding Records Per Window, to the current expected record index.
If this value is greater than the number of records, resize the window so it only contains the remaining records and go to step 1d (Write the retrieval information), where the Records Per Window will be the same as the remaining records.

3. Disengage the log:
Write the Log Number (of log being disengaged) to the Log Index and 0 to the Enable bit [0xC34F, 1 reg].

Log Retrieval Example

The following example illustrates a log retrieval session. The example makes the following assumptions:

- Log Retrieved is Historical Log (Log Index 2).
- Auto-Incrementing is used.
- Function Code 0x23 is not used (Repeat Count of 1).
- The Log contains Volts-AN, Volts-BN, Volts-CN (12 bytes).
- 100 Records are available (0-99).
- COM Port 2 (RS-485) is being used (see Log Availability).
- There are no Errors.
- Retrieval is starting at Record Index 0 (oldest record).
- Protocol used is Modbus RTU. The checksum is left off for simplicity.
- The IQ 250/260 meter is at device address 1.
- No new records are recorded to the log during the log retrieval process.

1) **Read [0xC757, 16 reg], Historical Log Header Block**.
Send: 0103 C757 0010
Command:
-Register Address: 0xC757
-# Registers: 16

Receive: 010320 00000100 00000064 0012 0000 060717101511 060718101511 0000000000000000
Data:
-Max Records: 0x100 = 256 records maximum.
-Num Records: 0x64 = 100 records currently logged.
-Record Size: 0x12 = 18 bytes per record.
-Log Availability: 0x00 = 0, not in use, available for retrieval.
-First Timestamp: 0x060717101511 = July 23, 2006, 16:21:17
-Last Timestamp: 0x060717101511 = July 24, 2006, 16:21:17

NOTE: This indicates that Historical Log 1 is available for retrieval.

2) **Write 0x0280 -> [0xC34F, 1 reg], Log Enable**.
Send: 0106 C34F 0280
Command:
-Register Address: 0xC34F
-# Registers: 1 (Write Single Register Command)
Data:
-Log Number: 2 (Historical Log 1)
-Enable: 1 (Engage log)
-Scope: 0 (Normal Mode)

Receive: 0106C34F0280 (echo)

NOTE: This engages the log for use on this COM Port, and latches the oldest record as record index 0.

3) **Read [0xC757, 16 reg], Availability is 0**.
Send: 0103 C757 0010
Command:
-Register Address: 0xC757
-# Registers: 16

Receive: 010320 00000100 00000064 0012 0002 060717101511 060718101511 0000000000000000
Data:
-Max Records: 0x100 = 256 records maximum.
-Num Records: 0x64 = 100 records currently logged.
-Record Size: 0x12 = 18 bytes per record.
-Log Availability: 0x02 = 2, In use by COM2, RS485 (the current port)
-First Timestamp: 0x060717101511 = July 23, 2006, 16:21:17
-Last Timestamp: 0x060717101511 = July 24, 2006, 16:21:17

NOTE: This indicates that the log has been engaged properly in step 2. Proceed to retrieve the log.

4) **Compute #RecPerWin as (246\18)=13. Write 0x0D01 0000 0000 -> [0xC350, 3 reg] Write Retrieval Info. Set Current Index as 0.**
Send: 0110 C350 0003 06 0D01 00 000000
Command:

-Register Address:	0xC350
-# Registers:	3, 6 bytes
Data:	
-Records per Window:	13. Since the window is 246 bytes, and the record is 18 bytes, 246\18 = 13.66, which means that 13 records evenly fit into a single window. This is 234 bytes, which means later on, we only need to read 234 bytes (117 registers) of the window to retrieve the records.
-# of Repeats:	1. We are using auto-increment (so not 0), but not function code 0x23.
-Window Status:	0 (ignore)
-Record Index:	0, start at the first record.

Receive:	0110C3500003 (command ok)

NOTES:

- This sets up the window for retrieval; now we can start retrieving the records.
- As noted above, we compute the records per window as 246\18 = 13.66, which is rounded to 13 records per window. This allows the minimum number of requests to be made to the meter, which increases retrieval speed.

5) **Read [0xC351, 125 reg], first 2 reg is status/index, last 123 reg is window data. Status OK**.

Send:	0103 C351 007D
Command:	
-Register Address:	0xC351
-# Registers:	0x7D, 125 registers

Receive:	0103FA 00000000 060717101511FFFFFFFFFFFFFFFFFFFFFFFF 06071710160042FAAACF42FAAD1842FAA9A8 . . .
Data:	
-Window Status:	0x00 = the window is ready.
-Index:	0x00 = 0, The window starts with the 0'th record, which is the oldest record.
-Record 0:	The next 18 bytes is the 0'th record (filler).
-Timestamp:	0x060717101511, = July 23, 2006, 16:21:17
-Data:	This record is the "filler" record. It is used by the meter so that there is never 0 records. It should be ignored. It can be identified by the data being all 0xFF. NOTE: Once a log has rolled over, the 0'th record will be a valid record, and the filler record will disappear.
-Record 1:	The next 18 bytes is the 1'st record.
-Timestamp:	0x060717101600 July 23, 2006, 16:22:00
-Data:	
-Volts AN:	0x42FAAACF, float = 125.33~
-Volts BN:	0x42FAAD18, float = 125.33~
-Volts CN:	0x42FAA9A8, float = 125.33~
. . . 13 records	

NOTES:

- This retrieves the actual window. Repeat this command as many times as necessary to retrieve all of the records when auto-increment is enabled.
- Note the filler record. When a log is reset (cleared) in the meter, the meter always adds a first "filler" record, so that there is always at least 1 record in the log. This "filler" record can be identified by the data being all 0xFF, and it being index 0.

If a record has all 0xFF for data, the timestamp is valid, and the index is NOT 0, then the record is legitimate.

- When the "filler" record is logged, its timestamp may not be "on the interval." The next record taken will be on the next "proper interval," adjusted to the hour.
  For example, if the interval is 1 minute, the first "real" record will be taken on the next minute (no seconds). If the interval is 15 minutes, the next record will be taken at :15, :30, :45, or :00 - whichever of those values is next in sequence.

6) **Compare the index with Current Index**.

NOTES:

- The Current Index is 0 at this point, and the record index retrieved in step 5 is 0: thus we go to step 8.
- If the Current Index and the record index do not match, go to step 7. The data that was received in the window may be invalid, and should be discarded.

7) Write the Current Index to [0xC351, 2 reg].

Send:	0110 C351 0002 04 00 00000D
Command:	
-Register Address:	0xC351
-# Registers:	2, 4 bytes
Data:	
-Window Status:	0 (ignore)
-Record Index:	0x0D = 13, start at the 14th record.

Receive:	0110C3510002 (command ok)

NOTES:

- This step manually sets the record index, and is primarily used when an out-of-order record index is returned on a read (step 6).
- The example assumes that the second window retrieval failed somehow, and we need to recover by requesting the records starting at index 13 again.

8) For each record in the retrieved window, copy and save the data for later interpretation.

9) Increment Current Index by RecordsPerWindow.

NOTES:

- This is the step that determines how much more of the log we need to retrieve.
- On the first N passes, Records Per Window should be 13 (as computed in step 4), and the current index should be a multiple of that (0, 13, 26, . . .). This amount will decrease when we reach the end (see step 10).
- If the current index is greater than or equal to the number of records (in this case 100), then all records have been retrieved; go to step 12. Otherwise, go to step 10 to check if we are nearing the end of the records.

10) If number records – current index < RecordsPerWindow, decrease to match.

NOTES:

- Here we bounds-check the current index, so we don't exceed the records available.
- If the number of remaining records (#records – current index) is less than the Records per Window, then the next window is the last, and contains less than a full window of records. Make records per window equal to remaining records (#records-current

index). In this example, this occurs when current index is 91 (the 8'th window). There are now 9 records available (100-91), so make Records per Window equal 9.

11) Repeat step 5 through 10.

NOTES:

- Go back to step 5, where a couple of values have changed.

Pass	CurIndex	FirstRecIndex		RecPerWindow	
0	0	0		13	
1	13	13		13	
2	26	26		13	
3	39	39		13	
4	52	52		13	
5	65	65		13	
6	78	78		13	
7	91	91		9	
8	100	--	----	--	-----

- At pass 8, since Current Index is equal to the number of records (100), log retrieval should stop; go to step 12 (see step 9 Notes).

12) No more records available, clean up.

13) Write 0x0000 -> [0xC34F, 1 reg], disengage the log.

Send: 0106 C34F 0000
Command:
  -Register Address: 0xC34F
  -# Registers: 1 (Write Single Register Command)
Data:
  -Log Number: 0 (ignore)
  -Enable: 0 (Disengage log)
  -Scope: 0 (ignore)

Receive: 0106C34F0000 (echo)

NOTES:

- This disengages the log, allowing it to be retrieved by other COM ports.
- The log will automatically disengage if no log retrieval action is taken for 5 minutes.

Log Record Interpretation

The records of each log are composed of a 6 byte timestamp, and N data. The content of the data portion depends on the log.

1. **System Event Record**:

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Value	timestamp						Group	Event	Mod	Chan	Param1	Param2	Param3	Param4

Size: 14 bytes (20 bytes image).
Data: The System Event data is 8 bytes; each byte is an enumerated value.

- **Group**: Group of the event.
- **Event**: Event within a group.
- **Modifier**: Additional information about the event, such as number of sectors or log number.
- **Channel**: The Port of the meter that caused the event.

0	Firmware
1	Not used
2	COM 2 (RS485)
3	COM 3 (Option Card 1)
4	COM 4 (Option Card 2)
7	User (Face Plate)

- **Param** 1-4: These are defined for each event (see table on the next page).

NOTE: The System Log Record is 20 bytes, consisting of the Record Header (12 bytes) and Payload (8 bytes). The Timestamp (6 bytes) is in the header. Typically, software will retrieve only the timestamp and payload, yielding a 14-byte record. The table on the next page shows all defined payloads.

Group (Event group)	Event (Event within group)	Mod (Event modifier)	Channel (1-4 for COMs, 7 for USER, 0 for FW)	Parm1	Parm2	Parm3	Parm4	Comments
0								Startup
	0	0	0	FW version				Meter Run Firmware Startup
	1	slot#	0	class ID	card status	0xFF	0xFF	Option Card Using Default Settings
1								Log Activity
	1	log#	1-4	0xFF	0xFF	0xFF	0xFF	Reset
	2	log#	1-4	0xFF	0xFF	0xFF	0xFF	Log Retrieval Begin
	3	log#	0-4	0xFF	0xFF	0xFF	0xFF	Log Retrieval End
2								Clock Activity
	1	0	1-4	0xFF	0xFF	0xFF	0xFF	Clock Changed
	2	0	0	0xFF	0xFF	0xFF	0xFF	Daylight Time On
	3	0	0	0xFF	0xFF	0xFF	0xFF	Daylight Time Off
3								System Resets
	1	0	0-4, 7	0xFF	0xFF	0xFF	0xFF	Max & Min Reset
	2	0	0-4, 7	0xFF	0xFF	0xFF	0xFF	Energy Reset
	3	slot#	0-4	1 (inputs) or 2 (outputs)	0xFF	0xFF	0xFF	Accumulators Reset
4								Settings Activity
	1	0	1-4, 7	0xFF	0xFF	0xFF	0xFF	Password Changed
	2	0	1-4	0xFF	0xFF	0xFF	0xFF	V-switch Changed
	3	0	1-4, 7	0xFF	0xFF	0xFF	0xFF	Programmable Settings Changed
	4	0	1-4, 7	0xFF	0xFF	0xFF	0xFF	Measurement Stopped
5								Boot Activity
	1	0	1-4	FW version				Exit to Boot
6								Error Reporting & Recovery
	4	log #	0	0xFF	0xFF	0xFF	0xFF	Log Babbling Detected
	5	log #	0	# records discarded		time in seconds		Babbling Log Periodic Summary
	6	log #	0	# records discarded		time in seconds		Log Babbling End Detected
	7	sector#	0	error count		stimulus	0xFF	Flash Sector Error
	8	0	0	0xFF	0xFF	0xFF	0xFF	Flash Error Counters Reset
	9	0	0	0xFF	0xFF	0xFF	0xFF	Flash Job Queue Overflow
0x88								
	1	sector#	0	log #	0xFF	0xFF	0xFF	acquire sector
	2	sector#	0	log #	0xFF	0xFF	0xFF	release sector
	3	sector#	0	erase count				erase sector
	4	log#	0	0xFF	0xFF	0xFF	0xFF	write log start record

- **log# values**: 0 = system log, 1 = alarms log, 2-4 = historical logs 1-3, 5 = I/O change log
- **sector# values**: 0-63
- **slot# values**: 1-2

NOTES:

- Stimulus for a flash sector error indicates what the flash was doing when the error occurred: **1** = acquire sector, **2** = startup, **3** = empty sector, **4** = release sector, **5** = write data

- Flash error counters are reset to zero in the unlikely event that both copies in EEPROM are corrupted.
- A "babbling log" is one that is saving records faster than the meter can handle long term. Onset of babbling occurs when a log fills a flash sector in less than an hour. For as long as babbling persists, a summary of records discarded is logged every 60 minutes. Normal logging resumes when there have been no new append attempts for 30 seconds.
- Logging of diagnostic records may be suppressed via a bit in programmable settings.

2. **Historical Log Record**:

Byte	0	1	2	3	4	5	6	.	.	N
Value	timestamp						values . . .			

Size: 6+2 x N bytes (12+2 x N bytes), where N is the number of registers stored.
Data: The Historical Log Record data is 2 x N bytes, which contains snapshots of the values of the associated registers at the time the record was taken. Since the meter uses specific registers to log, with no knowledge of the data it contains, the Programmable Settings need to be used to interpret the data in the record. See Historical Log Programmable Settings for details.

Examples

a) Log Retrieval Section:

```
send:  01 03 75 40 00 08 - Meter designation
recv:  01 03 10 4D 65 74 72 65 44 65 73 69 6E 67 5F 20 20 20 20 00 00

send:  :01 03 C7 57 00 10 - Historical Log status block
recv:  :01 03 20 00 00 05 1E 00 00 05 1E 00 2C 00 00 06 08 17 51 08
        00 06 08 18 4E 39 00 00 00 00 00 00 00 00 00 00 00

send:  :01 03 79 17 00 40 - Historical Log PS settings
recv:  :01 03 80 13 01 00 01 23 75 23 76 23 77 1F 3F 1F 40 1F 41 1F
        42 1F 43 1F 44 06 0B 06 0C 06 0D 06 0E 17 75 17 76 17 77 18
        67 18 68 18 69 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00

send:  :01 03 79 57 00 40 - ""
recv:  :01 03 80 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 62 62 62 34 34 34 44
        44 62 62 62 62 62 62 00 00 00 00 00 00

send:  :01 03 75 35 00 01 - Energy PS settings
recv:  :01 03 02 83 31 00 00

send:  :01 03 11 93 00 01 - Connected Port ID
recv:  :01 03 02 00 02 00 00
```

```
send:  :01 03 C7 57 00 10 - Historical Log status block
recv:  :01 03 20 00 00 05 1E 00 00 05 1E 00 2C 00 00 06 08 17 51 08
        00 06 08 18 4E 39 00 00 00 00 00 00 00 00 00 00 00

send:  :01 03 C3 4F 00 01 - Log Retrieval header
recv:  :01 03 02 FF FF 00 00

send:  :01 10 C3 4F 00 04 08 02 80 05 01 00 00 00 00 - Engage the log
recv:  :01 10 C3 4F 00 04

send:  :01 03 C7 57 00 10 - Historical Log status block
recv:  :01 03 20 00 00 05 1E 00 00 05 1E 00 2C 00 02 06 08 17 51 08
        00 06 08 18 4E 39 00 00 00 00 00 00 00 00 00 00 00

send:  :01 10 C3 51 00 02 04 00 00 00 00 - Set the retrieval index
recv:  :01 10 C3 51 00 02

send:  :01 03 C3 51 00 40 - Read first half of window
recv:  :01 03 80 00 00 00 00 06 08 17 51 08 00 00 19 00 2F 27 0F 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 03
        E8 00 01 00 05 00 00 00 00 00 00 06 08 17 51 09 00 00 19 00
        2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 03 E8 00 01 00 04 00 00 00 00 00 00 06 08 17 51 0A
        00 00 19 00 2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 03 E8 00 00 00 00

send:  :01 03 C3 91 00 30 - Read second half of window
recv:  :01 03 60 00 05 00 00 00 00 00 00 06 08 17 51 0B 00 00 19 00
        2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 03 E8 00 01 00 04 00 00 00 00 00 00 06 08 17 51 0C
        00 00 19 00 2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 03 E8 00 01 00 04 00 00 00 00 00 00 00
        00

send:  :01 03 C3 51 00 40 - Read first half of last window
recv:  :01 03 80 00 00 05 19 06 08 18 4E 35 00 00 19 00 2F 27 0F 00
        00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 03
        E8 00 01 00 04 00 00 00 00 00 00 06 08 18 4E 36 00 00 19 00
        2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 03 E8 00 01 00 04 00 00 00 00 00 00 06 08 18 4E 37
        00 00 19 00 2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 03 E8 00 00 00 00

send:  :01 03 C3 91 00 30 - Read second half of last window
recv:  :01 03 60 00 05 00 00 00 00 00 00 06 08 18 4E 38 00 00 19 00
        2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 03 E8 00 01 00 04 00 00 00 00 00 00 06 08 18 4E 39
        00 00 19 00 2F 27 0F 00 00 00 00 00 00 00 00 00 00 00 00 00
        00 00 00 00 00 00 00 03 E8 00 00 00 05 00 00 00 00 00 00 00
        00

send:  :01 06 C3 4F 00 00 - Disengage the log
recv:  :01 06 C3 4F 00 00
```

b) **Sample Historical Log Record**:

Historical Log Record and Programmable Settings

```
13|01|00 01|23 75|23 76|23 77|1F 3F 1F 40|1F 41
1F 42|1F 43 1F 44|06 0B 06 0C|06 0D 06 0E|17 75|
17 76|17 77|18 67|18 68|18 69|00 00 . . . . . .
62 62 62 34 34 34 44 44 62 62 62 62 62 62 . . .
```

These are the Item Values:	These are the Type and Size:	These are the Descriptions:
13		- # registers
01		- # sectors
01		- interval
23 75	6 2	- (SINT 2 byte) Volts A THD Maximum
23 76	6 2	- (SINT 2 byte) Volts B THD Maximum
23 77	6 2	- (SINT 2 byte) Volts C THD Maximum
1F 3F 1F 40	3 4	- (Float 4 byte) Volts A Minimum
1F 41 1F 42	3 4	- (Float 4 byte) Volts B Minimum
1F 43 1F 44	3 4	- (Float 4 byte) Volts C Minimum
06 0B 06 0C	4 4	- (Energy 4 byte) VARhr Negative Phase A
06 0D 06 0E	4 4	- (Energy 4 byte) VARhr Negative Phase B
17 75	6 2	- (SINT 2 byte) Volts A 1st Harmonic Magnitude
17 76	6 2	- (SINT 2 byte) Volts A 2nd Harmonic Magnitude
17 77	6 2	- (SINT 2 byte) Volts A 3rd Harmonic Magnitude
18 67	6 2	- (SINT 2 byte) Ib 3rd Harmonic Magnitude
18 68	6 2	- (SINT 2 byte) Ib 4th Harmonic Magnitude
18 69	6 2	- (SINT 2 byte) Ib 5th Harmonic Magnitude

Sample Record

```
06 08 17 51 08 00|00 19|00 2F|27 0F|00 00 00 00|00
00 00 00|00 00 00 00|00 00 00 00|00 00 00 00|03 E8|
00 01|00 05|00 00|00 00|00 00 . . .
```

06 08 17 51 08 00	- August 23, 2006 17:08:00
00 19	- 2.5%
00 2F	- 4.7%
27 0F	- 999.9% (indicates the value isn't valid)
00 00 00 00	- 0
00 00 00 00	- 0
00 00 00 00	- 0
00 00 00 00	- 0
00 00 00 00	- 0
03 E8	- 100.0% (Fundamental)
00 01	- 0.1%
00 05	- 0.5%
00 00	- 0.0%
00 00	- 0.0%
00 00	- 0.0%

Modbus Register Map (MM-1 to MM-32)

The IQ 250/260 meter's Modbus Register Map begins on the following page.

Modbus Address Hex		Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
			Fixed Data Section					
Identification Block							**read-only**	
0000	- 0007	1 - 8	Meter Name	ASCII	16 char	none		8
0008	- 000F	9 - 16	Meter Serial Number	ASCII	16 char	none		8
0010	- 0010	17 - 17	Meter Type	UINT16	bit-mapped	------st -----vvv	t = transducer model (1=yes, 0=no), s= submeter model(1=yes,0=no), vvv = IQ Model: V40 = IQ 250, V41 = IQ 260, V48 = IQ 250L (with logging), V49 = IQ 260L (with logging)	1
0011	- 0012	18 - 19	Firmware Version	ASCII	4 char	none		2
0013	- 0013	20 - 20	Map Version	UINT16	0 to 65535	none		1
0014	- 0014	21 - 21	Meter Configuration	UINT16	bit-mapped	-----ccc --ffffff	ccc = CT denominator (1 or 5), ffffff = calibration frequency (50 or 60)	1
0015	- 0015	22 - 22	ASIC Version	UINT16	0-65535	none		1
0016	- 0017	23 - 24	Boot Firmware Version	ASCII	4 char	none		2
0018	- 0018	25 - 25	Option Slot 1 Usage	UINT16	bit-mapped	same as register 10000 (0x270F)		1
0019	- 0019	26 - 26	Option Slot 2 Usage	UINT16	bit-mapped	same as register 11000 (0x2AF7)		1
001A	- 001D	27 - 30	Meter Type Name	ASCII	8 char	none		4
001E	- 0026	31 - 39	Reserved				Reserved	9
0027	- 002E	40 - 47	Reserved				Reserved	8
002F	- 0115	48 - 278	Reserved				Reserved	231
0116	- 0130	279 - 305	Integer Readings Block occupies these registers, see below					
0131	- 01F3	306 - 500	Reserved				Reserved	194
01F4	- 0203	501 - 516	Reserved				Reserved	16

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
				Meter Data Section (Note 2)					
Readings Block (Integer values)								**read-only**	
0116	-	0116	279 - 279	Volts A-N	UINT16	0 to 9999	volts	1.Use the settings from Programmable settings for scale and decimal point location. (see User Settings Flags) 2. Per phase power and PF have values only for WYE hookup and will be zero for all other hookups. 3. If the reading is 10000 that means that the value is out of range. Please adjust the programmable settings in that case. The display will also show '----' in case of over range.	1
0117	-	0117	280 - 280	Volts B-N	UINT16	0 to 9999	volts		1
0118	-	0118	281 - 281	Volts C-N	UINT16	0 to 9999	volts		1
0119	-	0119	282 - 282	Volts A-B	UINT16	0 to 9999	volts		1
011A	-	011A	283 - 283	Volts B-C	UINT16	0 to 9999	volts		1
011B	-	011B	284 - 284	Volts C-A	UINT16	0 to 9999	volts		1
011C	-	011C	285 - 285	Amps A	UINT16	0 to 9999	amps		1
011D	-	011D	286 - 286	Amps B	UINT16	0 to 9999	amps		1
011E	-	011E	287 - 287	Amps C	UINT16	0 to 9999	amps		1
011F	-	011F	288 - 288	Neutral Current	UINT16	-9999 to +9999	amps		1
0120	-	0120	289 - 289	Watts, 3-Ph total	SINT16	-9999 to +9999	watts		1
0121	-	0121	290 - 290	VARs, 3-Ph total	SINT16	-9999 to +9999	VARs		1
0122	-	0122	291 - 291	VAs, 3-Ph total	UINT16	0 to +9999	VAs		1
0123	-	0123	292 - 292	Power Factor, 3-Ph total	SINT16	-1000 to +1000	none		1
0124	-	0124	293 - 293	Frequency	UINT16	0 to 9999	Hz		1
0125	-	0125	294 - 294	Watts, Phase A	SINT16	-9999 M to +9999	watts		1
0126	-	0126	295 - 295	Watts, Phase B	SINT16	-9999 M to +9999	watts		1
0127	-	0127	296 - 296	Watts, Phase C	SINT16	-9999 M to +9999	watts		1
0128	-	0128	297 - 297	VARs, Phase A	SINT16	-9999 M to +9999 M	VARs		1
0129	-	0129	298 - 298	VARs, Phase B	SINT16	-9999 M to +9999 M	VARs		1
012A	-	012A	299 - 299	VARs, Phase C	SINT16	-9999 M to +9999 M	VARs		1
012B	-	012B	300 - 300	VAs, Phase A	UINT16	0 to +9999	VAs		1
012C	-	012C	301 - 301	VAs, Phase B	UINT16	0 to +9999	VAs		1
012D	-	012D	302 - 302	VAs, Phase C	UINT16	0 to +9999	VAs		1
012E	-	012E	303 - 303	Power Factor, Phase A	SINT16	-1000 to +1000	none		1
012F	-	012F	304 - 304	Power Factor, Phase B	SINT16	-1000 to +1000	none		1
0130	-	0130	305 - 305	Power Factor, Phase C	SINT16	-1000 to +1000	none		1
								Block Size:	27
Primary Readings Block								**read-only**	
03E7	-	03E8	1000 - 1001	Volts A-N	FLOAT	0 to 9999 M	volts		2
03E9	-	03EA	1002 - 1003	Volts B-N	FLOAT	0 to 9999 M	volts		2
03EB	-	03EC	1004 - 1005	Volts C-N	FLOAT	0 to 9999 M	volts		2
03ED	-	03EE	1006 - 1007	Volts A-B	FLOAT	0 to 9999 M	volts		2
03EF	-	03F0	1008 - 1009	Volts B-C	FLOAT	0 to 9999 M	volts		2
03F1	-	03F2	1010 - 1011	Volts C-A	FLOAT	0 to 9999 M	volts		2
03F3	-	03F4	1012 - 1013	Amps A	FLOAT	0 to 9999 M	amps		2
03F5	-	03F6	1014 - 1015	Amps B	FLOAT	0 to 9999 M	amps		2
03F7	-	03F8	1016 - 1017	Amps C	FLOAT	0 to 9999 M	amps		2
03F9	-	03FA	1018 - 1019	Watts, 3-Ph total	FLOAT	-9999 M to +9999 M	watts		2

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
03FB - 03FC	1020 - 1021	VARs, 3-Ph total	FLOAT	-9999 M to +9999 M	VARs		2
03FD - 03FE	1022 - 1023	VAs, 3-Ph total	FLOAT	-9999 M to +9999 M	VAs		2
03FF - 0400	1024 - 1025	Power Factor, 3-Ph total	FLOAT	-1.00 to +1.00	none		2
0401 - 0402	1026 - 1027	Frequency	FLOAT	0 to 65.00	Hz		2
0403 - 0404	1028 - 1029	Neutral Current	FLOAT	0 to 9999 M	amps		2
0405 - 0406	1030 - 1031	Watts, Phase A	FLOAT	-9999 M to +9999 M	watts		2
0407 - 0408	1032 - 1033	Watts, Phase B	FLOAT	-9999 M to +9999 M	watts		2
0409 - 040A	1034 - 1035	Watts, Phase C	FLOAT	-9999 M to +9999 M	watts		2
040B - 040C	1036 - 1037	VARs, Phase A	FLOAT	-9999 M to +9999 M	VARs		2
040D - 040E	1038 - 1039	VARs, Phase B	FLOAT	-9999 M to +9999 M	VARs		2
040F - 0410	1040 - 1041	VARs, Phase C	FLOAT	-9999 M to +9999 M	VARs	Per phase power and PF have values only for WYE hookup and will be zero for all other hookups.	2
0411 - 0412	1042 - 1043	VAs, Phase A	FLOAT	-9999 M to +9999 M	VAs		2
0413 - 0414	1044 - 1045	VAs, Phase B	FLOAT	-9999 M to +9999 M	VAs		2
0415 - 0416	1046 - 1047	VAs, Phase C	FLOAT	-9999 M to +9999 M	VAs		2
0417 - 0418	1048 - 1049	Power Factor, Phase A	FLOAT	-1.00 to +1.00	none		2
0419 - 041A	1050 - 1051	Power Factor, Phase B	FLOAT	-1.00 to +1.00	none		2
041B - 041C	1052 - 1053	Power Factor, Phase C	FLOAT	-1.00 to +1.00	none		2
041D - 041E	1054 - 1055	Symmetrical Component Magnitude, 0 Seq	FLOAT	0 to 9999 M	volts		2
041F - 0420	1056 - 1057	Symmetrical Component Magnitude, + Seq	FLOAT	0 to 9999 M	volts		2
0421 - 0422	1058 - 1059	Symmetrical Component Magnitude, - Seq	FLOAT	0 to 9999 M	volts	Voltage unbalance per IEC6100-4.30	2
0423 - 0423	1060 - 1060	Symmetrical Component Phase, 0 Seq	SINT16	-1800 to +1800	0.1 degree		1
0424 - 0424	1061 - 1061	Symmetrical Component Phase, + Seq	SINT16	-1800 to +1800	0.1 degree	Values apply only to WYE hookup and will be zero for all other hookups.	1
0425 - 0425	1062 - 1062	Symmetrical Component Phase, - Seq	SINT16	-1800 to +1800	0.1 degree		1
0426 - 0426	1063 - 1063	Unbalance, 0 sequence component	UINT16	0 to 65535	0.01%		1
0427 - 0427	1064 - 1064	Unbalance, -sequence component	UINT16	0 to 65535	0.01%		1
0428 - 0428	1065 - 1065	Current Unbalance	UINT16	0 to 20000	0.01%		1
						Block Size:	66

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Primary Energy Block						**read-only**	
05DB - 05DC	1500 - 1501	W-hours, Received	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format	* Wh received & delivered always have opposite signs	2
05DD - 05DE	1502 - 1503	W-hours, Delivered	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format	* Wh received is positive for "view as load", delivered is positive for "view as generator"	2
05DF - 05E0	1504 - 1505	W-hours, Net	SINT32	-99999999 to 99999999	Wh per energy format	* 5 to 8 digits	2
05E1 - 05E2	1506 - 1507	W-hours, Total	SINT32	0 to 99999999	Wh per energy format		2
05E3 - 05E4	1508 - 1509	VAR-hours, Positive	SINT32	0 to 99999999	VARh per energy format	* decimal point implied, per energy format	2
05E5 - 05E6	1510 - 1511	VAR-hours, Negative	SINT32	0 to -99999999	VARh per energy format		2
05E7 - 05E8	1512 - 1513	VAR-hours, Net	SINT32	-99999999 to 99999999	VARh per energy format	* resolution of digit before decimal point = units, kilo, or mega, per energy format	2
05E9 - 05EA	1514 - 1515	VAR-hours, Total	SINT32	0 to 99999999	VARh per energy format	* see note 10	2
05EB - 05EC	1516 - 1517	VA-hours, Total	SINT32	0 to 99999999	VAh per energy format		2
05ED - 05EE	1518 - 1519	W-hours, Received, Phase A	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
05EF - 05F0	1520 - 1521	W-hours, Received, Phase B	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
05F1 - 05F2	1522 - 1523	W-hours, Received, Phase C	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
05F3 - 05F4	1524 - 1525	W-hours, Delivered, Phase A	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
05F5 - 05F6	1526 - 1527	W-hours, Delivered, Phase B	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
05F7 - 05F8	1528 - 1529	W-hours, Delivered, Phase C	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
05F9 - 05FA	1530 - 1531	W-hours, Net, Phase A	SINT32	-99999999 to 99999999	Wh per energy format		2
05FB - 05FC	1532 - 1533	W-hours, Net, Phase B	SINT32	-99999999 to 99999999	Wh per energy format		2
05FD - 05FE	1534 - 1535	W-hours, Net, Phase C	SINT32	-99999999 to 99999999	Wh per energy format		2
05FF - 0600	1536 - 1537	W-hours, Total, Phase A	SINT32	0 to 99999999	Wh per energy format		2
0601 - 0602	1538 - 1539	W-hours, Total, Phase B	SINT32	0 to 99999999	Wh per energy format		2
0603 - 0604	1540 - 1541	W-hours, Total, Phase C	SINT32	0 to 99999999	Wh per energy format		2
0605 - 0606	1542 - 1543	VAR-hours, Positive, Phase A	SINT32	0 to 99999999	VARh per energy format		2
0607 - 0608	1544 - 1545	VAR-hours, Positive, Phase B	SINT32	0 to 99999999	VARh per energy format		2
0609 - 060A	1546 - 1547	VAR-hours, Positive, Phase C	SINT32	0 to 99999999	VARh per energy format		2
060B - 060C	1548 - 1549	VAR-hours, Negative, Phase A	SINT32	0 to -99999999	VARh per energy format		2
060D - 060E	1550 - 1551	VAR-hours, Negative, Phase B	SINT32	0 to -99999999	VARh per energy format		2
060F - 0610	1552 - 1553	VAR-hours, Negative, Phase C	SINT32	0 to -99999999	VARh per energy format		2
0611 - 0612	1554 - 1555	VAR-hours, Net, Phase A	SINT32	-99999999 to 99999999	VARh per energy format		2
0613 - 0614	1556 - 1557	VAR-hours, Net, Phase B	SINT32	-99999999 to 99999999	VARh per energy format		2
0615 - 0616	1558 - 1559	VAR-hours, Net, Phase C	SINT32	-99999999 to 99999999	VARh per energy format		2
0617 - 0618	1560 - 1561	VAR-hours, Total, Phase A	SINT32	0 to 99999999	VARh per energy format		2
0619 - 061A	1562 - 1563	VAR-hours, Total, Phase B	SINT32	0 to 99999999	VARh per energy format		2
061B - 061C	1564 - 1565	VAR-hours, Total, Phase C	SINT32	0 to 99999999	VARh per energy format		2
061D - 061E	1566 - 1567	VA-hours, Phase A	SINT32	0 to 99999999	VAh per energy format		2
061F - 0620	1568 - 1569	VA-hours, Phase B	SINT32	0 to 99999999	VAh per energy format		2
0621 - 0622	1570 - 1571	VA-hours, Phase C	SINT32	0 to 99999999	VAh per energy format		2
						Block Size:	72

Modbus Address Hex			Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Primary Demand Block								**read-only**	
07CF	-	07D0	2000 - 2001	Amps A, Average	FLOAT	0 to 9999 M	amps		2
07D1	-	07D2	2002 - 2003	Amps B, Average	FLOAT	0 to 9999 M	amps		2
07D3	-	07D4	2004 - 2005	Amps C, Average	FLOAT	0 to 9999 M	amps		2
07D5	-	07D6	2006 - 2007	Positive Watts, 3-Ph, Average	FLOAT	-9999 M to +9999 M	watts		2
07D7	-	07D8	2008 - 2009	Positive VARs, 3-Ph, Average	FLOAT	-9999 M to +9999 M	VARs		2
07D9	-	07DA	2010 - 2011	Negative Watts, 3-Ph, Average	FLOAT	-9999 M to +9999 M	watts		2
07DB	-	07DC	2012 - 2013	Negative VARs, 3-Ph, Average	FLOAT	-9999 M to +9999 M	VARs		2
07DD	-	07DE	2014 - 2015	VAs, 3-Ph, Average	FLOAT	-9999 M to +9999 M	VAs		2
07DF	-	07E0	2016 - 2017	Positive PF, 3-Ph, Average	FLOAT	-1.00 to +1.00	none		2
07E1	-	07E2	2018 - 2019	Negative PF, 3-PF, Average	FLOAT	-1.00 to +1.00	none		2
07E3	-	07E4	2020 - 2021	Neutral Current, Average	FLOAT	0 to 9999 M	amps		2
07E5	-	07E6	2022 - 2023	Positive Watts, Phase A, Average	FLOAT	-9999 M to +9999 M	watts		2
07E7	-	07E8	2024 - 2025	Positive Watts, Phase B, Average	FLOAT	-9999 M to +9999 M	watts		2
07E9	-	07EA	2026 - 2027	Positive Watts, Phase C, Average	FLOAT	-9999 M to +9999 M	watts		2
07EB	-	07EC	2028 - 2029	Positive VARs, Phase A, Average	FLOAT	-9999 M to +9999 M	VARs		2
07ED	-	07EE	2030 - 2031	Positive VARs, Phase B, Average	FLOAT	-9999 M to +9999 M	VARs		2
07EF	-	07F0	2032 - 2033	Positive VARs, Phase C, Average	FLOAT	-9999 M to +9999 M	VARs		2
07F1	-	07F2	2034 - 2035	Negative Watts, Phase A, Average	FLOAT	-9999 M to +9999 M	watts		2
07F3	-	07F4	2036 - 2037	Negative Watts, Phase B, Average	FLOAT	-9999 M to +9999 M	watts		2
07F5	-	07F6	2038 - 2039	Negative Watts, Phase C, Average	FLOAT	-9999 M to +9999 M	watts		2
07F7	-	07F8	2040 - 2041	Negative VARs, Phase A, Average	FLOAT	-9999 M to +9999 M	VARs		2
07F9	-	07FA	2042 - 2043	Negative VARs, Phase B, Average	FLOAT	-9999 M to +9999 M	VARs		2
07FB	-	07FC	2044 - 2045	Negative VARs, Phase C, Average	FLOAT	-9999 M to +9999 M	VARs		2
07FD	-	07FE	2046 - 2047	VAs, Phase A, Average	FLOAT	-9999 M to +9999 M	VAs		2
07FF	-	0800	2048 - 2049	VAs, Phase B, Average	FLOAT	-9999 M to +9999 M	VAs		2
0801	-	0802	2050 - 2051	VAs, Phase C, Average	FLOAT	-9999 M to +9999 M	VAs		2
0803	-	0804	2052 - 2053	Positive PF, Phase A, Average	FLOAT	-1.00 to +1.00	none		2
0805	-	0806	2054 - 2055	Positive PF, Phase B, Average	FLOAT	-1.00 to +1.00	none		2
0807	-	0808	2056 - 2057	Positive PF, Phase C, Average	FLOAT	-1.00 to +1.00	none		2
0809	-	080A	2058 - 2059	Negative PF, Phase A, Average	FLOAT	-1.00 to +1.00	none		2
080B	-	080C	2060 - 2061	Negative PF, Phase B, Average	FLOAT	-1.00 to +1.00	none		2
080D	-	080E	2062 - 2063	Negative PF, Phase C, Average	FLOAT	-1.00 to +1.00	none		2
								Block Size:	64
Uncompensated Readings Block								**read-only**	
0BB7	-	0BB8	3000 - 3001	Watts, 3-Ph total	FLOAT	-9999 M to +9999 M	watts		2
0BB9	-	0BBA	3002 - 3003	VARs, 3-Ph total	FLOAT	-9999 M to +9999 M	VARs		2
0BBB	-	0BBC	3004 - 3005	VAs, 3-Ph total	FLOAT	-9999 M to +9999 M	VAs		2
0BBD	-	0BBE	3006 - 3007	Power Factor, 3-Ph total	FLOAT	-1.00 to +1.00	none		2

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
0BBF - 0BC0	3008 - 3009	Watts, Phase A	FLOAT	-9999 M to +9999 M	watts	Per phase power and PF have values only for WYE hookup and will be zero for all other hookups.	2
0BC1 - 0BC2	3010 - 3011	Watts, Phase B	FLOAT	-9999 M to +9999 M	watts		2
0BC3 - 0BC4	3012 - 3013	Watts, Phase C	FLOAT	-9999 M to +9999 M	watts		2
0BC5 - 0BC6	3014 - 3015	VARs, Phase A	FLOAT	-9999 M to +9999 M	VARs		2
OBC7 - 0BC8	3016 - 3017	VARs, Phase B	FLOAT	-9999 M to +9999 M	VARs		2
0BC9 - 0BCA	3018 - 3019	VARs, Phase C	FLOAT	-9999 M to +9999 M	VARs		2
0BCB - 0BCC	3020 - 3021	VAs, Phase A	FLOAT	-9999 M to +9999 M	VAs		2
0BCD - 0BCE	3022 - 3023	VAs, Phase B	FLOAT	-9999 M to +9999 M	VAs		2
0BCF - 0BD0	3024 - 3025	VAs, Phase C	FLOAT	-9999 M to +9999 M	VAs		2
0BD1 - 0BD2	3026 - 3027	Power Factor, Phase A	FLOAT	-1.00 to +1.00	none		2
0BD3 - 0BD4	3028 - 3029	Power Factor, Phase B	FLOAT	-1.00 to +1.00	none		2
0BD5 - 0BD6	3030 - 3031	Power Factor, Phase C	FLOAT	-1.00 to +1.00	none		2
0BD7 - 0BD8	3032 - 3033	W-hours, Received	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format	* Wh received & delivered always have opposite signs	2
0BD9 - 0BDA	3034 - 3035	W-hours, Delivered	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format	* Wh received is positive for "view as load", delivered is positive for "view as generator"	2
0BDB - 0BDC	3036 - 3037	W-hours, Net	SINT32	-99999999 to 99999999	Wh per energy format	* 5 to 8 digits	2
0BDD - 0BDE	3038 - 3039	W-hours, Total	SINT32	0 to 99999999	Wh per energy format	* decimal point implied, per energy format	2
0BDF - 0BE0	3040 - 3041	VAR-hours, Positive	SINT32	0 to 99999999	VARh per energy format		2
0BE1 - 0BE2	3042 - 3043	VAR-hours, Negative	SINT32	0 to -99999999	VARh per energy format	* resolution of digit before decimal point = units, kilo, or mega, per energy format	2
0BE3 - 0BE4	3044 - 3045	VAR-hours, Net	SINT32	-99999999 to 99999999	VARh per energy format		2
0BE5 - 0BE6	3046 - 3047	VAR-hours, Total	SINT32	0 to 99999999	VARh per energy format	* see note 10	2
0BE7 - 0BE8	3048 - 3049	VA-hours, Total	SINT32	0 to 99999999	VAh per energy format		2
0BE9 - 0BEA	3050 - 3051	W-hours, Received, Phase A	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
0BEB - 0BEC	3052 - 3053	W-hours, Received, Phase B	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
0BED - 0BEE	3054 - 3055	W-hours, Received, Phase C	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
0BEF - 0BF0	3056 - 3057	W-hours, Delivered, Phase A	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
0BF1 - 0BF2	3058 - 3059	W-hours, Delivered, Phase B	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
0BF3 - 0BF4	3060 - 3061	W-hours, Delivered, Phase C	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format		2
0BF5 - 0BF6	3062 - 3063	W-hours, Net, Phase A	SINT32	-99999999 to 99999999	Wh per energy format		2

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
0BF7	-	0BF8	3064 - 3065	W-hours, Net, Phase B	SINT32	-99999999 to 99999999	Wh per energy format		2
0BF9	-	0BFA	3066 - 3067	W-hours, Net, Phase C	SINT32	-99999999 to 99999999	Wh per energy format		2
0BFB	-	0BFC	3068 - 3069	W-hours, Total, Phase A	SINT32	0 to 99999999	Wh per energy format		2
0BFD	-	0BFE	3070 - 3071	W-hours, Total, Phase B	SINT32	0 to 99999999	Wh per energy format		2
0BFF	-	0C00	3072 - 3073	W-hours, Total, Phase C	SINT32	0 to 99999999	Wh per energy format		2
0C01	-	0C02	3074 - 3075	VAR-hours, Positive, Phase A	SINT32	0 to 99999999	VARh per energy format		2
0C03	-	0C04	3076 - 3077	VAR-hours, Positive, Phase B	SINT32	0 to 99999999	VARh per energy format		2
0C05	-	0C06	3078 - 3079	VAR-hours, Positive, Phase C	SINT32	0 to 99999999	VARh per energy format		2
0C07	-	0C08	3080 - 3081	VAR-hours, Negative, Phase A	SINT32	0 to -99999999	VARh per energy format		2
0C09	-	0C0A	3082 - 3083	VAR-hours, Negative, Phase B	SINT32	0 to -99999999	VARh per energy format		2
0C0B	-	0C0C	3084 - 3085	VAR-hours, Negative, Phase C	SINT32	0 to -99999999	VARh per energy format		2
0C0D	-	0C0E	3086 - 3087	VAR-hours, Net, Phase A	SINT32	-99999999 to 99999999	VARh per energy format		2
0C0F	-	0C10	3088 - 3089	VAR-hours, Net, Phase B	SINT32	-99999999 to 99999999	VARh per energy format		2
0C11	-	0C12	3090 - 3091	VAR-hours, Net, Phase C	SINT32	-99999999 to 99999999	VARh per energy format		2
0C13	-	0C14	3092 - 3093	VAR-hours, Total, Phase A	SINT32	0 to 99999999	VARh per energy format		2
0C15	-	0C16	3094 - 3095	VAR-hours, Total, Phase B	SINT32	0 to 99999999	VARh per energy format		2
0C17	-	0C18	3096 - 3097	VAR-hours, Total, Phase C	SINT32	0 to 99999999	VARh per energy format		2
0C19	-	0C1A	3098 - 3099	VA-hours, Phase A	SINT32	0 to 99999999	VAh per energy format		2
0C1B	-	0C1C	3100 - 3101	VA-hours, Phase B	SINT32	0 to 99999999	VAh per energy format		2
0C1D	-	0C1E	3102 - 3103	VA-hours, Phase C	SINT32	0 to 99999999	VAh per energy format		2
								Block Size:	104
Phase Angle Block								**read-only**	
1003	-	1003	4100 - 4100	Phase A Current	SINT16	-1800 to +1800	0.1 degree		1
1004	-	1004	4101 - 4101	Phase B Current	SINT16	-1800 to +1800	0.1 degree		1
1005	-	1005	4102 - 4102	Phase C Current	SINT16	-1800 to +1800	0.1 degree		1
1006	-	1006	4103 - 4103	Angle, Volts A-B	SINT16	-1800 to +1800	0.1 degree		1
1007	-	1007	4104 - 4104	Angle, Volts B-C	SINT16	-1800 to +1800	0.1 degree		1
1008	-	1008	4105 - 4105	Angle, Volts C-A	SINT16	-1800 to +1800	0.1 degree		1
								Block Size:	6
Status Block								**read-only**	
1193	-	1193	4500 - 4500	Port ID	UINT16	1 to 4	none	Identifies which COM port a master is connected to; 1 for COM1, 2 for COM2, etc.	1
1194	-	1194	4501 - 4501	Meter Status	UINT16	bit-mapped	mmmpch-- tffeeccc	mmm = measurement state (0=off, 1=running normally, 2=limp mode, 3=warmup, 6&7=boot, others unused) See note 16. pch = NVMEM block OK flags (p=profile, c=calibration, h=header), flag is 1 if OK t - CT PT compensation status. (0=Disabled,1=Enabled) ff = flash state (0=initializing, 1=logging disabled by model option, 3=logging) ee = edit state (0=startup, 1=normal, 2=privileged command session, 3=profile update mode) ccc = port enabled for edit(0=none, 1-4=COM1-COM4, 7=front panel)	1

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
1195 - 1195	4502 - 4502	Limits Status	UINT16	bit-mapped	87654321 87654321	high byte is setpt 1, 0=in, 1=out low byte is setpt 2, 0=in, 1=out see notes 11, 12, 17	1
1196 - 1197	4503 - 4504	Time Since Reset	UINT32	0 to 4294967294	4 msec	wraps around after max count	2
1198 - 119A	4505 - 4507	Meter On Time	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
119B - 119D	4508 - 4510	Current Date and Time	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
119E - 119E	4511 - 4511	Clock Sync Status	UINT16	bit-mapped	mmm0 0ppe 0000 000s	mmm00ppe = configuration per programmable settings (see register 30011, 0x753A) s = status: 1=working properly, 0=not working	1
119F - 119F	4512 - 4512	Current Day of Week	UINT16	1 to 7	1 day	1=Sun, 2=Mon, etc.	1
						Block Size:	13
THD Block (Note 13)						**read-only**	
176F - 176F	6000 - 6000	Volts A-N, %THD	UINT16	0 to 10000	0.01%		1
1770 - 1770	6001 - 6001	Volts B-N, %THD	UINT16	0 to 10000	0.01%		1
1771 - 1771	6002 - 6002	Volts C-N, %THD	UINT16	0 to 10000	0.01%		1
1772 - 1772	6003 - 6003	Amps A, %THD	UINT16	0 to 10000	0.01%		1
1773 - 1773	6004 - 6004	Amps B, %THD	UINT16	0 to 10000	0.01%		1
1774 - 1774	6005 - 6005	Amps C, %THD	UINT16	0 to 10000	0.01%		1
1775 - 179C	6006 - 6045	Phase A Voltage harmonic magnitudes	UINT16	0 to 10000	0.01%	In each group of 40 registers, the first register represents the fundamental frequency or first harmonic, the second represents the second harmonic, and so on up to the 40th register which represents the 40th harmonic. Harmonic magnitudes are given as % of the fundamental magnitude. Thus the first register in each group of 40 will typically be 9999. A reading of 10000 indicates invalid.	40
179D - 17C4	6046 - 6085	Phase A Voltage harmonic phases	SINT16	-1800 to +1800	0.1 degree		40
17C5 - 17EC	6086 - 6125	Phase A Current harmonic magnitudes	UINT16	0 to 10000	0.01%		40
17ED - 1814	6126 - 6165	Phase A Current harmonic phases	SINT16	-1800 to +1800	0.1 degree		40
1815 - 183C	6166 - 6205	Phase B Voltage harmonic magnitudes	UINT16	0 to 10000	0.01%		40
183D - 1864	6206 - 6245	Phase B Voltage harmonic phases	SINT16	-1800 to +1800	0.1 degree		40
1865 - 188C	6246 - 6285	Phase B Current harmonic magnitudes	UINT16	0 to 10000	0.01%		40
188D - 18B4	6286 - 6325	Phase B Current harmonic phases	SINT16	-1800 to +1800	0.1 degree		40
18B5 - 18DC	6326 - 6365	Phase C Voltage harmonic magnitudes	UINT16	0 to 10000	0.01%		40
18DD - 1904	6366 - 6405	Phase C Voltage harmonic phases	SINT16	-1800 to +1800	0.1 degree		40
1905 - 192C	6406 - 6445	Phase C Current harmonic magnitudes	UINT16	0 to 10000	0.01%		40
192D - 1954	6446 - 6485	Phase C Current harmonic phases	SINT16	-1800 to +1800	0.1 degree		40
1955 - 1955	6486 - 6486	Wave Scope scale factor for channel Va	UINT16	0 to 32767		Convert individual samples to volts or amps: V or A = (sample * scale factor) / 1,000,000 Samples update in conjunction with THD and harmonics; samples not available (all zeroes) if THD not available.	1
1956 - 1956	6487 - 6487	Wave Scope scale factors for channel Ib	UINT16	0 to 32767			1
1957 - 1958	6488 - 6489	Wave Scope scale factors for channels Vb and Ib	UINT16	0 to 32767			2
1959 - 195A	6490 - 6491	Wave Scope scale factors for channels Vc and Ic	UINT16	0 to 32767			2
195B - 199A	6492 - 6555	Wave Scope samples for channel Va	SINT16	-32768 to +32767			64
199B - 19DA	6556 - 6619	Wave Scope samples for channel Ia	SINT16	-32768 to +32767			64
19DB - 1A1A	6620 - 6683	Wave Scope samples for channel Vb	SINT16	-32768 to +32767			64
1A1B - 1A5A	6684 - 6747	Wave Scope samples for channel Ib	SINT16	-32768 to +32767			64
1A5B - 1A9A	6748 - 6811	Wave Scope samples for channel Vc	SINT16	-32768 to +32767			64
1A9B - 1ADA	6812 - 6875	Wave Scope samples for channel Ic	SINT16	-32768 to +32767			64
						Block Size:	876

Modbus Address Hex	Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Short term Primary Minimum Block						**read-only**	
1F27 - 1F28	7976 - 7977	Volts A-N, previous Demand interval Short Term Minimum	FLOAT	0 to 9999 M	volts	Minimum instantaneous value measured during the demand interval before the one most recently completed.	2
1F29 - 1F2A	7978 - 7979	Volts B-N, previous Demand interval Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F2B - 1F2C	7980 - 7981	Volts C-N, previous Demand interval Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F2D - 1F2E	7982 - 7983	Volts A-B, previous Demand interval Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F2F - 1F30	7984 - 7985	Volts B-C, previous Demand interval Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F31 - 1F32	7986 - 7987	Volts C-A, previous Demand interval Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F33 - 1F34	7988 - 7989	Volts A-N, Short Term Minimum	FLOAT	0 to 9999 M	volts	Minimum instantaneous value measured during the most recently completed demand interval.	2
1F35 - 1F36	7990 - 7991	Volts B-N, Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F37 - 1F38	7992 - 7993	Volts C-N, Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F39 - 1F3A	7994 - 7995	Volts A-B, Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F3B - 1F3C	7996 - 7997	Volts B-C, Short Term Minimum	FLOAT	0 to 9999 M	volts		2
1F3D - 1F3E	7998 - 7999	Volts C-A, Short Term Minimum	FLOAT	0 to 9999 M	volts		2
						Block Size:	24
Primary Minimum Block						**read-only**	
1F3F - 1F40	8000 - 8001	Volts A-N, Minimum	FLOAT	0 to 9999 M	volts		2
1F41 - 1F42	8002 - 8003	Volts B-N, Minimum	FLOAT	0 to 9999 M	volts		2
1F43 - 1F44	8004 - 8005	Volts C-N, Minimum	FLOAT	0 to 9999 M	volts		2
1F45 - 1F46	8006 - 8007	Volts A-B, Minimum	FLOAT	0 to 9999 M	volts		2
1F47 - 1F48	8008 - 8009	Volts B-C, Minimum	FLOAT	0 to 9999 M	volts		2
1F49 - 1F4A	8010 - 8011	Volts C-A, Minimum	FLOAT	0 to 9999 M	volts		2
1F4B - 1F4C	8012 - 8013	Amps A, Minimum Avg Demand	FLOAT	0 to 9999 M	amps		2
1F4D - 1F4E	8014 - 8015	Amps B, Minimum Avg Demand	FLOAT	0 to 9999 M	amps		2
1F4F - 1F50	8016 - 8017	Amps C, Minimum Avg Demand	FLOAT	0 to 9999 M	amps		2
1F51 - 1F52	8018 - 8019	Positive Watts, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	watts		2
1F53 - 1F54	8020 - 8021	Positive VARs, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	VARs		2
1F55 - 1F56	8022 - 8023	Negative Watts, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	watts		2
1F57 - 1F58	8024 - 8025	Negative VARs, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	VARs		2
1F59 - 1F5A	8026 - 8027	VAs, 3-Ph, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
1F5B - 1F5C	8028 - 8029	Positive Power Factor, 3-Ph, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
1F5D - 1F5E	8030 - 8031	Negative Power Factor, 3-Ph, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2

Modbus Address Hex			Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
1F5F	-	1F60	8032 - 8033	Frequency, Minimum	FLOAT	0 to 65.00	Hz		2
1F61	-	1F62	8034 - 8035	Neutral Current, Minimum Avg Demand	FLOAT	0 to 9999 M	amps		2
1F63	-	1F64	8036 - 8037	Positive Watts, Phase A, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
1F65	-	1F66	8038 - 8039	Positive Watts, Phase B, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
1F67	-	1F68	8040 - 8041	Positive Watts, Phase C, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
1F69	-	1F6A	8042 - 8043	Positive VARs, Phase A, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
1F6B	-	1F6C	8044 - 8045	Positive VARs, Phase B, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
1F6D	-	1F6E	8046 - 8047	Positive VARs, Phase C, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
1F6F	-	1F70	8048 - 8049	Negative Watts, Phase A, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
1F71	-	1F72	8050 - 8051	Negative Watts, Phase B, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
1F73	-	1F74	8052 - 8053	Negative Watts, Phase C, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
1F75	-	1F76	8054 - 8055	Negative VARs, Phase A, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
1F77	-	1F78	8056 - 8057	Negative VARs, Phase B, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
1F79	-	1F7A	8058 - 8059	Negative VARs, Phase C, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
1F7B	-	1F7C	8060 - 8061	VAs, Phase A, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
1F7D	-	1F7E	8062 - 8063	VAs, Phase B, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
1F7F	-	1F80	8064 - 8065	VAs, Phase C, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
1F81	-	1F82	8066 - 8067	Positive PF, Phase A, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
1F83	-	1F84	8068 - 8069	Positive PF, Phase B, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
1F85	-	1F86	8070 - 8071	Positive PF, Phase C, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
1F87	-	1F88	8072 - 8073	Negative PF, Phase A, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
1F89	-	1F8A	8074 - 8075	Negative PF, Phase B, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
1F8B	-	1F8C	8076 - 8077	Negative PF, Phase C, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
1F8D	-	1F8D	8078 - 8078	Volts A-N, %THD, Minimum	UINT16	0 to 9999	0.01%		1
1F8E	-	1F8E	8079 - 8079	Volts B-N, %THD, Minimum	UINT16	0 to 9999	0.01%		1
1F8F	-	1F8F	8080 - 8080	Volts C-N, %THD, Minimum	UINT16	0 to 9999	0.01%		1
1F90	-	1F90	8081 - 8081	Amps A, %THD, Minimum	UINT16	0 to 9999	0.01%		1
1F91	-	1F91	8082 - 8082	Amps B, %THD, Minimum	UINT16	0 to 9999	0.01%		1
1F92	-	1F92	8083 - 8083	Amps C, %THD, Minimum	UINT16	0 to 9999	0.01%		1
1F93	-	1F94	8084 - 8085	Symmetrical Component Magnitude, 0 Seq, Minimum	FLOAT	0 to 9999 M	volts		2
1F95	-	1F96	8086 - 8087	Symmetrical Component Magnitude, + Seq, Minimum	FLOAT	0 to 9999 M	volts		2
1F97	-	1F98	8088 - 8089	Symmetrical Component Magnitude, - Seq, Minimum	FLOAT	0 to 9999 M	volts		2
1F99	-	1F99	8090 - 8090	Symmetrical Component Phase, 0 Seq, Minimum	SINT16	-1800 to +1800	0.1 degree		1
1F9A	-	1F9A	8091 - 8091	Symmetrical Component Phase, + Seq, Minimum	SINT16	-1800 to +1800	0.1 degree		1
1F9B	-	1F9B	8092 - 8092	Symmetrical Component Phase, - Seq, Minimum	SINT16	-1800 to +1800	0.1 degree		1

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
1F9C	-	1F9C	8093 - 8093	Unbalance, 0 sequence, Minimum	UINT16	0 to 65535	0.01%		1
1F9D	-	1F9D	8094 - 8094	Unbalance, -sequence, Minimum	UINT16	0 to 65535	0.01%		1
1F9E	-	1F9E	8095 - 8095	Current Unbalance, Minimum	UINT16	0 to 20000	0.01%		1
								Block Size:	96
Primary Minimum Timestamp Block								**read-only**	
20CF	-	20D1	8400 - 8402	Volts A-N, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20D2	-	20D4	8403 - 8405	Volts B-N, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20D5	-	20D7	8406 - 8408	Volts C-N, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20D8	-	20DA	8409 - 8411	Volts A-B, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20DB	-	20DD	8412 - 8414	Volts B-C, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20DE	-	20E0	8415 - 8417	Volts C-A, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20E1	-	20E3	8418 - 8420	Amps A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20E4	-	20E6	8421 - 8423	Amps B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20E7	-	20E9	8424 - 8426	Amps C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20EA	-	20EC	8427 - 8429	Positive Watts, 3-Ph, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20ED	-	20EF	8430 - 8432	Positive VARs, 3-Ph, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20F0	-	20F2	8433 - 8435	Negative Watts, 3-Ph, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20F3	-	20F5	8436 - 8438	Negative VARs, 3-Ph, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20F6	-	20F8	8439 - 8441	VAs, 3-Ph, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20F9	-	20FB	8442 - 8444	Positive Power Factor, 3-Ph, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20FC	-	20FE	8445 - 8447	Negative Power Factor, 3-Ph, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
20FF	-	2101	8448 - 8450	Frequency, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2102	-	2104	8451 - 8453	Neutral Current, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2100	1 sec		3
2105	-	2107	8454 - 8456	Positive Watts, Phase A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2108	-	210A	8457 - 8459	Positive Watts, Phase B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
210B	-	210D	8460 - 8462	Positive Watts, Phase C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
210E	-	2110	8463 - 8465	Positive VARs, Phase A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2111	-	2113	8466 - 8468	Positive VARs, Phase B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2114	-	2116	8469 - 8471	Positive VARs, Phase C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2117	-	2119	8472 - 8474	Negative Watts, Phase A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
211A	-	211C	8475 - 8477	Negative Watts, Phase B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
211D	-	211F	8478 - 8480	Negative Watts, Phase C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2120	-	2122	8481 - 8483	Negative VARs, Phase A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2123	-	2125	8484 - 8486	Negative VARs, Phase B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2126	-	2128	8487 - 8489	Negative VARs, Phase C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
2129 - 212B	8490 - 8492	VAs, Phase A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
212C - 212E	8493 - 8495	VAs, Phase B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
212F - 2131	8496 - 8498	VAs, Phase C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2132 - 2134	8499 - 8501	Positive PF, Phase A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2135 - 2137	8502 - 8504	Positive PF, Phase B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2138 - 213A	8505 - 8507	Positive PF, Phase C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
213B - 213D	8508 - 8510	Negative PF, Phase A, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
213E - 2140	8511 - 8513	Negative PF, Phase B, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2141 - 2143	8514 - 8516	Negative PF, Phase C, Min Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2144 - 2146	8517 - 8519	Volts A-N, %THD, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2147 - 2149	8520 - 8522	Volts B-N, %THD, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
214A - 214C	8523 - 8525	Volts C-N, %THD, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
214D - 214F	8526 - 8528	Amps A, %THD, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2150 - 2152	8529 - 8531	Amps B, %THD, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2153 - 2155	8532 - 8534	Amps C, %THD, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2156 - 2158	8535 - 8537	Symmetrical Comp Magnitude, 0 Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2159 - 215B	8538 - 8540	Symmetrical Comp Magnitude, + Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
215C - 215E	8541 - 8543	Symmetrical Comp Magnitude, - Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
215F - 2161	8544 - 8546	Symmetrical Comp Phase, 0 Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2162 - 2164	8547 - 8549	Symmetrical Comp Phase, + Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2165 - 2167	8550 - 8552	Symmetrical Comp Phase, - Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2168 - 2170	8553 - 8555	Unbalance, 0 Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2171 - 2173	8556 - 8558	Unbalance, - Seq, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2174 - 2176	8559 - 8561	Current Unbalance, Min Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
						Block Size:	162

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Short term Primary Maximum Block						**read-only**	
230F - 2310	8976 - 8977	Volts A-N, previous Demand interval Short Term Maximum	FLOAT	0 to 9999 M	volts	Maximum instantaneous value measured during the demand interval before the one most recently completed.	
2311 - 2312	8978 - 8979	Volts B-N, previous Demand interval Short Term Maximum	FLOAT	0 to 9999 M	volts		
2313 - 2314	8980 - 8981	Volts C-N, previous Demand interval Short Term Maximum	FLOAT	0 to 9999 M	volts		
2315 - 2316	8982 - 8983	Volts A-B, previous Demand interval Short Term Maximum	FLOAT	0 to 9999 M	volts		
2317 - 2318	8984 - 8985	Volts B-C, previous Demand interval Short Term Maximum	FLOAT	0 to 9999 M	volts		
2319 - 231A	8986 - 8987	Volts C-A, previous Demand interval Short Term Maximum	FLOAT	0 to 9999 M	volts		
231B - 231C	8988 - 8989	Volts A-N, Maximum	FLOAT	0 to 9999 M	volts	Maximum instantaneous value measured during the most recently completed demand interval.	2
231D - 231E	8990 - 8991	Volts B-N, Maximum	FLOAT	0 to 9999 M	volts		2
232F - 2320	8992 - 8993	Volts C-N, Maximum	FLOAT	0 to 9999 M	volts		2
2321 - 2322	8994 - 8995	Volts A-B, Maximum	FLOAT	0 to 9999 M	volts		2
2323 - 2324	8996 - 8997	Volts B-C, Maximum	FLOAT	0 to 9999 M	volts		2
2325 - 2326	8998 - 8999	Volts C-A, Maximum	FLOAT	0 to 9999 M	volts		2
						Block Size:	12
Primary Maximum Block						**read-only**	
2327 - 2328	9000 - 9001	Volts A-N, Maximum	FLOAT	0 to 9999 M	volts		2
2329 - 232A	9002 - 9003	Volts B-N, Maximum	FLOAT	0 to 9999 M	volts		2
232B - 232C	9004 - 9005	Volts C-N, Maximum	FLOAT	0 to 9999 M	volts		2
232D - 232E	9006 - 9007	Volts A-B, Maximum	FLOAT	0 to 9999 M	volts		2
232F - 2330	9008 - 9009	Volts B-C, Maximum	FLOAT	0 to 9999 M	volts		2
2331 - 2332	9010 - 9011	Volts C-A, Maximum	FLOAT	0 to 9999 M	volts		2
2333 - 2334	9012 - 9013	Amps A, Maximum Avg Demand	FLOAT	0 to 9999 M	amps		2
2335 - 2336	9014 - 9015	Amps B, Maximum Avg Demand	FLOAT	0 to 9999 M	amps		2
2337 - 2338	9016 - 9017	Amps C, Maximum Avg Demand	FLOAT	0 to 9999 M	amps		2
2339 - 233A	9018 - 9019	Positive Watts, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	watts		2
233B - 233C	9020 - 9021	Positive VARs, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	VARs		2
233D - 233E	9022 - 9023	Negative Watts, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	watts		2
233F - 2340	9024 - 9025	Negative VARs, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	VARs		2
2341 - 2342	9026 - 9027	VAs, 3-Ph, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
2343 - 2344	9028 - 9029	Positive Power Factor, 3-Ph, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
2345 - 2346	9030 - 9031	Negative Power Factor, 3-Ph, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
2347 - 2348	9032 - 9033	Frequency, Maximum	FLOAT	0 to 65.00	Hz		2
2349 - 234A	9034 - 9035	Neutral Current, Maximum Avg Demand	FLOAT	0 to 9999 M	amps		2
234B - 234C	9036 - 9037	Positive Watts, Phase A, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
234D	-	234E	9038 - 9039	Positive Watts, Phase B, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
234F	-	2350	9040 - 9041	Positive Watts, Phase C, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
2351	-	2352	9042 - 9043	Positive VARs, Phase A, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
2353	-	2354	9044 - 9045	Positive VARs, Phase B, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
2355	-	2356	9046 - 9047	Positive VARs, Phase C, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
2357	-	2358	9048 - 9049	Negative Watts, Phase A, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
2359	-	235A	9050 - 9051	Negative Watts, Phase B, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
235B	-	235C	9052 - 9053	Negative Watts, Phase C, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	watts		2
235D	-	235E	9054 - 9055	Negative VARs, Phase A, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
235F	-	2360	9056 - 9057	Negative VARs, Phase B, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
2361	-	2362	9058 - 9059	Negative VARs, Phase C, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VARs		2
2363	-	2364	9060 - 9061	VAs, Phase A, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
2365	-	2366	9062 - 9063	VAs, Phase B, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
2367	-	2368	9064 - 9065	VAs, Phase C, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
2369	-	236A	9066 - 9067	Positive PF, Phase A, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
236B	-	236C	9068 - 9069	Positive PF, Phase B, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
236D	-	236E	9070 - 9071	Positive PF, Phase C, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
236F	-	2370	9072 - 9073	Negative PF, Phase A, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
2371	-	2372	9074 - 9075	Negative PF, Phase B, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
2373	-	2374	9076 - 9077	Negative PF, Phase C, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
2375	-	2375	9078 - 9078	Volts A-N, %THD, Maximum	UINT16	0 to 9999	0.01%		1
2376	-	2376	9079 - 9079	Volts B-N, %THD, Maximum	UINT16	0 to 9999	0.01%		1
2377	-	2377	9080 - 9080	Volts C-N, %THD, Maximum	UINT16	0 to 9999	0.01%		1
2378	-	2378	9081 - 9081	Amps A, %THD, Maximum	UINT16	0 to 9999	0.01%		1
2379	-	2379	9082 - 9082	Amps B, %THD, Maximum	UINT16	0 to 9999	0.01%		1
237A	-	237A	9083 - 9083	Amps C, %THD, Maximum	UINT16	0 to 9999	0.01%		1
237B	-	237C	9084 - 9085	Symmetrical Component Magnitude, 0 Seq, Maximum	FLOAT	0 to 9999 M	volts		2
237D	-	237E	9086 - 9087	Symmetrical Component Magnitude, + Seq, Maximum	FLOAT	0 to 9999 M	volts		2
237F	-	2380	9088 - 9089	Symmetrical Component Magnitude, - Seq, Maximum	FLOAT	0 to 9999 M	volts		2
2381	-	2381	9090 - 9090	Symmetrical Component Phase, 0 Seq, Maximum	SINT16	-1800 to +1800	0.1 degree		1
2382	-	2382	9091 - 9091	Symmetrical Component Phase, + Seq, Maximum	SINT16	-1800 to +1800	0.1 degree		1
2383	-	2383	9092 - 9092	Symmetrical Component Phase, - Seq, Maximum	SINT16	-1800 to +1800	0.1 degree		1
2384	-	2384	9093 - 9093	Unbalance, 0 Seq, Maximum	UINT16	0 to 65535	0.01%		1
2385	-	2385	9094 - 9094	Unbalance, - Seq, Maximum	UINT16	0 to 65535	0.01%		1
2386	-	2386	9095 - 9095	Current Unbalance, Maximum	UINT16	0 to 20000	0.01%		1
								Block Size:	96

Modbus Address Hex	Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Primary Maximum Timestamp Block						**read-only**	
24B7 - 24B9	9400 - 9402	Volts A-N, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24BA - 24BC	9403 - 9405	Volts B-N, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24BD - 24BF	9406 - 9408	Volts C-N, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24C0 - 24C2	9409 - 9411	Volts A-B, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24C3 - 24C5	9412 - 9414	Volts B-C, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24C6 - 24C8	9415 - 9417	Volts C-A, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24C9 - 24CB	9418 - 9420	Amps A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24CC - 24CE	9421 - 9423	Amps B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24CF - 24D1	9424 - 9426	Amps C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24D2 - 24D4	9427 - 9429	Positive Watts, 3-Ph, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24D5 - 24D7	9430 - 9432	Positive VARs, 3-Ph, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24D8 - 24DA	9433 - 9435	Negative Watts, 3-Ph, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24DB - 24DD	9436 - 9438	Negative VARs, 3-Ph, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24DE - 24E0	9439 - 9441	VAs, 3-Ph, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24E1 - 24E3	9442 - 9444	Positive Power Factor, 3-Ph, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24E4 - 24E6	9445 - 9447	Negative Power Factor, 3-Ph, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24E7 - 24E9	9448 - 9450	Frequency, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24EA - 24EC	9451 - 9453	Neutral Current, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2100	1 sec		3
24ED - 24EF	9454 - 9456	Positive Watts, Phase A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24F0 - 24F2	9457 - 9459	Positive Watts, Phase B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24F3 - 24F5	9460 - 9462	Positive Watts, Phase C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24F6 - 24F8	9463 - 9465	Positive VARs, Phase A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24F9 - 24FB	9466 - 9468	Positive VARs, Phase B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24FC - 24FE	9469 - 9471	Positive VARs, Phase C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
24FF - 2501	9472 - 9474	Negative Watts, Phase A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2502 - 2504	9475 - 9477	Negative Watts, Phase B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2505 - 2507	9478 - 9480	Negative Watts, Phase C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2508 - 250A	9481 - 9483	Negative VARs, Phase A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
250B - 250D	9484 - 9486	Negative VARs, Phase B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
250E - 2510	9487 - 9489	Negative VARs, Phase C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2511 - 2513	9490 - 9492	VAs, Phase A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2514 - 2516	9493 - 9495	VAs, Phase B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
2517 - 2519	9496 - 9498	VAs, Phase C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3
251A - 251C	9499 - 9501	Positive PF, Phase A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec		3

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Com
251D	-	251F	9502 - 9504	Positive PF, Phase B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2520	-	2522	9505 - 9507	Positive PF, Phase C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2523	-	2525	9508 - 9510	Negative PF, Phase A, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2526	-	2528	9511 - 9513	Negative PF, Phase B, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2529	-	252B	9514 - 9516	Negative PF, Phase C, Max Avg Dmd Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
252C	-	252E	9517 - 9519	Volts A-N, %THD, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
252F	-	2531	9520 - 9522	Volts B-N, %THD, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2532	-	2534	9523 - 9525	Volts C-N, %THD, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2535	-	2537	9526 - 9528	Amps A, %THD, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2538	-	253A	9529 - 9531	Amps B, %THD, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
253B	-	253D	9532 - 9534	Amps C, %THD, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
253E	-	2540	9535 - 9537	Symmetrical Comp Magnitude, 0 Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2541	-	2543	9538 - 9540	Symmetrical Comp Magnitude, + Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2544	-	2546	9541 - 9543	Symmetrical Comp Magnitude, - Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2547	-	2549	9544 - 9546	Symmetrical Comp Phase, 0 Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
254A	-	254C	9547 - 9549	Symmetrical Comp Phase, + Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
254D	-	254F	9550 - 9552	Symmetrical Comp Phase, - Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2550	-	2552	9553 - 9555	Unbalance, 0 Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2553	-	2555	9556 - 9558	Unbalance, - Seq, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	
2556	-	2558	9559 - 9561	Current Unbalance, Max Timestamp	TSTAMP	1Jan2000 - 31Dec2099	1 sec	

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Option Card 1 Section									
Card Identification and Configuration Block (Note 14)								**read-only**	
270F	-	270F	10000 - 10000	Class ID and card status	UINT16	bit-mapped	undv-----cccctttt	Flags active if bit is set: u=unsupported card; n=card need configuration; d=card is using default configuration; v=communication with card is ok Field: cccc=class of installed card. Field tttt=type of card. See note 22	1
2710	-	2710	10001 - 10001	Reserved				Reserved	1
2711	-	2718	10002 - 10009	Card name	ASCII	16 char	none	ASCII name of the installed card	8
2719	-	2720	10010 - 10017	Serial number	ASCII	16 char	none	Serial Number in ASCII of the installed card	8
2721	-	2722	10018 - 10019	Version	ASCII	4 char	none	Version in ASCII of the hardware of the installed card.	2
2723	-	2746	10020 - 10055	Reserved				Reserved	36
2747	-	2748	10056 - 10057	Firmware Version	ASCII	4 char	none	Version of the BOOT firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
2749	-	274A	10058 - 10059	Firmware Version	ASCII	4 char	none	Version of the RUN firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
274B	-	274E	10060 - 10063	Reserved				Reserved	4
								Block Size:	64
Current Communication Settings for Option Card 1								**Read-only**	
274F	-	274F	10064 - 10064	Current speed and format	UINT16	bit-mapped	-abcde-- fghijklm	Bps: a=57600; b=38400; c=19200; d=14400; e=9600 Stop bits 'f': cleared 1 stop bit, set 2 stop bits Parity: g=even; h=odd; i=none Data bits: j=8; k=7; l=6; m=5	1
2750	-	2750	10065 - 10065	Reserved	UINT16	bit-mapped		Reserved	1
2751	-	2751	10066 - 10066	Current protocol	UINT16	bit-mapped	-------- -----ppp-	ppp=protocol 100=DNP3; 010=Ascii Modbus; 001=Rtu Modbus	1
2752	-	2752	10067 - 10067	Current reply delay	UINT16	0 to 65535	milliseconds	Delay to reply to a Modbus transaction after receiving it.	1
2753	-	2756	10068 - 10071	Reserved				Reserved	4
								Block Size:	8
Data and Control Blocks for Option Card 1								**read-only**	
2757	-	2790	10072 - 10129	Data and Control Block for Option Card 1. Meaning of registers depends on installed card. -- see below				Register assignments depend on which type of card is in the slot. See overlays below.	58
								Block Size:	66

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Expansions for Data and Control Block for Option Card 1									
Data and Control Block -- Digital I/O Relay Card Overlay (Note 15)								**read-only except as indicated**	
2757	-	2757	10072 - 10072	Digital Input States	UINT16	bit-mapped	-------- 22221111	Two nibble fields: (2222) for input#2 and (1111) for input #1. Lsb in each nibble is the current state of the input. Msb in each nibble is the oldest registered state.	1
2758	-	2758	10073 - 10073	Digital Relay States	UINT16	bit-mapped	-------- --ab--cd	If "a" is 1 then state of Relay#2 is unknown, otherwise state of Relay#2 is in "c": (1=tripped, 0=released). If "b" is 1 then state of Relay#1 is unknown, otherwise state of Relay#1 is in "d": (1=tripped, 0=released).	1
2759	-	2759	10074 - 10074	Turn relay on	UINT16	bit-mapped	-------- ------21	Writing a 1 in bit N turns relay N+1 ON (this register is writeable only in privileged session)	1
275A	-	275A	10075 - 10075	Turn relay off	UINT16	bit-mapped	-------- ------21	Writing a 1 in bit N turns relay N+1 OFF (this register is writeable only in privileged session)	1
275B	-	275B	10076 - 10076	Trip/Release delay timer for Relay 1	UINT16	0 to 9999	0.1 sec	time to trip or release	1
275C	-	275C	10077 - 10077	Trip/Release delay timer for Relay 2	UINT16	0 to 9999	0.1 sec	time to trip or release	1
275D	-	275E	10078 - 10079	Reserved				Reserved	2
275F	-	275F	10080 - 10080	Input 1 Accumulator, Scaled	UINT16	0 to 9999	resolution is 1, 10, 100, 1000, 10000, or 100000 counts	Disabled accumulators always read 0.	1
2760	-	2760	10081 - 10081	Input 2 Accumulator, Scaled	UINT16	0 to 9999			1
2761	-	2762	10082 - 10083	Reserved				Reserved	2
2763	-	2763	10084 - 10084	Relay 1 Accumulator, Scaled	UINT16	0 to 9999	resolution is 1, 10, 100, 1000, 10000, or 100000 counts	Disabled accumulators always read 0.	1
2764	-	2764	10085 - 10085	Relay 2 Accumulator, Scaled	UINT16	0 to 9999			1
2765	-	2790	10086 - 10129	Reserved				Reserved	44
								Block Size:	58

Modbus Address Hex	Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Data and Control Block -- Digital I/O Pulse Output Card Overlay (Note 15)						**read-only except as indicated**	
2757 - 2757	10072 - 10072	Digital Input States	UINT16	bit-mapped	dddd cccc bbbb aaaa	Nibble "dddd" for input#4, "cccc" for input#3, "bbbb" for input#2 and "aaaa" for input#1. Within each field, rightmost bit is the current state (1=closed, 0=open), and bits at left are the older states 100ms apart. (historical states) Example: xxxx xxxx xxxx 0011 Current state of input#1 is closed, before that it was closed too, before that it was open and the oldest state known is open.	1
2758 - 2758	10073 - 10073	Digital Output States	UINT16	bit-mapped	-------- ----4321	One bit for each output. Bit 4 is for output #4, and bit 1 is for output #1. If a bit is set the output is closed, otherwise it is opened.	1
2759 - 2759	10074 - 10074	Pulse Output Test Select	UINT16	bit-mapped	-------- ----4321	Write 1 to a bit to set its corresponding Pulse Output into test mode. Write 0 to restore it to normal operation. A privileged session is required to write the bits. Reading this register reports the mode for each output (1=under test, 0=normal).	1
275A - 275A	10075 - 10075	Pulse Output Test Power	UINT16	bit-mapped	ddvvvvvv vvvvvvvv	This register is Writeable in privileged session only. Simulates constant Power for the Pulse Output under test. Format is same as Kt settings for Pulse Output. "V" is raw value in Wh/pulse from 0 to 9999. "dd"=decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= XXX.X	1
275B - 275E	10076 - 10079	Reserved				Reserved	4
275F - 275F	10080 - 10080	Input 1 Accumulator, Scaled	UINT16	0 to 9999	resolution is 1, 10, 100, 1000, 10000, or 100000 counts	Disabled accumulators always read 0.	1
2760 - 2760	10081 - 10081	Input 2 Accumulator, Scaled	UINT16	0 to 9999			1
2761 - 2761	10082 - 10082	Input 3 Accumulator, Scaled	UINT16	0 to 9999			1
2762 - 2762	10083 - 10083	Input 4 Accumulator, Scaled	UINT16	0 to 9999			1
2763 - 2763	10084 - 10084	Output 1 Accumulator, Scaled	UINT16	0 to 9999			1
2764 - 2764	10085 - 10085	Output 2 Accumulator, Scaled	UINT16	0 to 9999			1
2765 - 2765	10086 - 10086	Output 3 Accumulator, Scaled	UINT16	0 to 9999			1
2766 - 2766	10087 - 10087	Output 4 Accumulator, Scaled	UINT16	0 to 9999			1
2767 - 2790	10088 - 10129	Reserved				Reserved	42
						Block Size:	58
Data and Control Block--Analog Out 0-1mA / Analog Out 4-20mA (Note 15)						**read-only**	
2757 - 2757	10072 - 10072	Status of card	UINT16	bit-mapped	----cf-- --------	Flag fields: c=calibration not good; f=configuration error	1
2758 - 2790	10073 - 10129	Reserved				Reserved	57
						Block Size:	58

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Data and Control Block -- Network Card Overlay (Note 15)								**read-only**	
2757	-	2757	10072 - 10072	Card and Network Status	UINT16	bit-mapped	rhp----- sfw-m-ii	Flags: r=run mode; h=card is healthy; p=using last good known programmable settings Server flags: s=smtp ok; f=ftp ok; w=web server ok; m=modbus tcp/ip ok. IP Status ii: 00=IP not valid yet, 01=IP from p.settings; 10=IP from DHCP;11=using last good known IP.	1
2758	-	2758	10073 - 10073	Reserved				Reserved	1
2759	-	275B	10074 - 10076	MAC address in use by the network card	UINT16	bit-mapped	6 bytes	These 3 registers hold the 6 bytes of the card's ethernet MAC address	3
275C	-	275F	10077 - 10080	Current IP Address	UINT16			These 4 registers hold the 4 numbers (1 number each register) that make the IP address used by the card.	4
2760	-	2760	10081 - 10081	Current IP Mask Length	UINT16	0 to 32		Number of bits that are set in the IP address mask, starting from the Msb of the 32 bit word. Example 24 = 255.255.255.0; a value of 2 would mean 192.0.0.0	1
2761	-	2762	10082 - 10083	Firmware Version	ASCII	4 char	none	Version of the BOOT firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
2763	-	2764	10084 - 10085	Firmware Version	ASCII	4 char	none	Version of the RUN firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
2765	-	2790	10086 - 10129	Reserved				Reserved for Extended Nw Status	44
								Block Size:	58
Option Card 2 Section									
Card Identification and Configuration Block (Note 14)								**read-only**	
2AF7	-	2AF7	11000 - 11000	Class ID and card status	UINT16	bit-mapped	undv-----cccctttt	Flags active if bit is set: u=unsupported card; n=card need configuration; d=card is using default configuration; v=communication with card is ok Field: cccc=class of installed card. Field tttt=type of card. See note 22	1
2AF8	-	2AF8	11001 - 11001	Reserved				Read only	1
2AF9	-	2B00	11002 - 11009	Card name	ASCII	16 char	none	ASCII name of the installed card	8
2B01	-	2B08	11010 - 11017	Serial number	ASCII	16 char	none	Serial Number in ASCII of the installed card	8
2B09	-	2B0A	11018 - 11019	Version	ASCII	4 char	none	Version in ASCII of the hardware of the installed card.	2
2B0B	-	2B28	11020 - 11055	Reserved				Reserved	36
2B2F	-	2B30	11056 - 11057	Firmware Version	ASCII	4 char	none	Version of the BOOT firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
2B31	-	2B32	11058 - 11059	Firmware Version	ASCII	4 char	none	Version of the RUN firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
2B33	-	2B36	11060 - 11063	Reserved				Reserved	4
								Block Size:	64

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Current Communication Settings for Option Card 2								**Read-only**	
2B37	-	2B37	11064 - 11064	Current speed and format	UINT16	bit-mapped	-abcde-- fghijklm	Bps: a=57600; b=38400; c=19200; d=14400; e=9600 Stop bits 'f': cleared 1 stop bit, set 2 stop bits Parity: g=even; h=odd; i=none Data bits: j=8; k=7; l=6; m=5	1
2B38	-	2B38	11065 - 11065	Reserved	UINT16	bit-mapped		Reserved	1
2B39	-	2B39	11066 - 11066	Current protocol	UINT16	bit-mapped	-------- -----ppp-	ppp=protocol 100=DNP3; 010=Ascii Modbus; 001=Rtu Modbus	1
2B3A	-	2B3A	11067 - 11067	Current reply delay	UINT16	0 to 65535	milliseconds	Delay to reply a Modbus transaction after receiving it.	1
2B3B	-	2B3E	11068 - 11071	Reserved				Reserved	4
								Block Size:	8
Data and Control Blocks for Option Card 2								**read-only**	
2B3F	-	2B78	11072 - 11129	Data and Control Block for Option Card 2 Meaning of registers depend on installed card. -- see below				Register assignments depend on which type of card is in the slot. See overlays below.	58
								Block Size:	66
Expansions for Data and Control Block for Option Card 2									
Data and Control Block -- Digital I/O Relay Card Overlay (Note 15)								**read-only except as indicated**	
2B3F	-	2B3F	11072 - 11072	Digital Input States	UINT16	bit-mapped	-------- 22221111	Two nibble fields: (2222) for input#2 and (1111) for input #1. Lsb in each nibble is the current state of the input. Msb in each nibble is the oldest registered state.	1
2B40	-	2B40	11073 - 11073	Digital Relay States	UINT16	bit-mapped	-------- --ab--cd	If "a" is 1 then state of Relay#2 is unknown, otherwise state of Relay#2 is in "c": (1=tripped, 0=released). If "b" is 1 then state of Relay#1 is unknown, otherwise state of Relay#1 is in "d": (1=tripped, 0=released).	1
2B41	-	2B41	11074 - 11074	Turn relay on	UINT16	bit-mapped	-------- ------21	Writing a 1 in bit N turns relay N+1 ON (this register is writeable only in privileged session)	1
2B42	-	2B42	11075 - 11075	Turn relay off	UINT16	bit-mapped	-------- ------21	Writing a 1 in bit N turns relay N+1 OFF (this register is writeable only in privileged session)	1
2B43	-	2B43	11076 - 11076	Trip/Release delay timer for Relay 1	UINT16	0 to 9999	0.1 sec	time to trip or release	1
2B44	-	2B44	11077 - 11077	Trip/Release delay timer for Relay 2	UINT16	0 to 9999	0.1 sec	time to trip or release	1
2B45	-	2B46	11078 - 11079	Reserved				Reserved	2
2B47	-	2B47	11080 - 11080	Input 1 Accumulator, Scaled	UINT16	0 to 9999	resolution is 1, 10, 100, 1000, 10000, or 100000 counts	Disabled accumulators always read 0.	1
2B48	-	2B48	11081 - 11081	Input 2 Accumulator, Scaled	UINT16	0 to 9999			1
2B49	-	2B4A	11082 - 11083	Reserved				Reserved	2
2B4B	-	2B4B	11084 - 11084	Relay 1 Accumulator, Scaled	UINT16	0 to 9999	resolution is 1, 10, 100, 1000, 10000, or 100000 counts	Disabled accumulators always read 0.	1
2B4C	-	2B4C	11085 - 11085	Relay 2 Accumulator, Scaled	UINT16	0 to 9999			1
2B4D	-	2B78	11086 - 11129	Reserved				Reserved	44
								Block Size:	58

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Data and Control Block -- Digital I/O Pulse Output Card Overlay (Note 15)								**read-only except as indicated**	
2B3F	-	2B3F	11072 - 11072	Digital Input States	UINT16	bit-mapped	dddd cccc bbbb aaaa	Nibble "dddd" for input#4, "cccc" for input#3, "bbbb" for input#2 and "aaaa" for input#1. Within each field, right most bit is the current state (1=closed, 0=open), and bits at left are the older states 100ms apart. (historical states) Example: xxxx xxxx xxxx 0011 Current state of input#1 is closed, before that it was closed too, before that it was open and the oldest state known is open.	1
2B40	-	2B40	11073 - 11073	Digital Output States	UINT16	bit-mapped	-------- ----4321	One bit for each output. Bit 4 is for output #4, and bit 1 is for output #1. If a bit is set the output is closed, otherwise it is opened.	1
2B41	-	2B41	11074 - 11074	Pulse Output Test Select	UINT16	bit-mapped	-------- ----4321	Write 1 to a bit to set its corresponding Pulse Output into test mode. Write 0 to restore it to normal operation. A privileged session is required to write the bits. Reading this register reports the mode for each output (1=under test, 0=normal).	1
2B42	-	2B42	11075 - 11075	Pulse Output Test Power	UINT16	bit-mapped	ddvvvvvv vvvvvvvv	This register is Writeable in privileged session only. Simulates constant Power for the Pulse Output under test. Format is same as Kt settings for Pulse Output. "V" is raw value in Wh/pulse from 0 to 9999. "dd"=decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= XXX.X	1
2B43	-	2B46	11076 - 11079	Reserved				Reserved	4
2B47	-	2B47	11080 - 11080	Input 1 Accumulator, Scaled	UINT16	0 to 9999	resolution is 1, 10, 100, 1000, 10000, or 100000 counts	Disabled accumulators always read 0.	1
2B48	-	2B48	11081 - 11081	Input 2 Accumulator, Scaled	UINT16	0 to 9999			1
2B49	-	2B49	11082 - 11082	Input 3 Accumulator, Scaled	UINT16	0 to 9999			1
2B4A	-	2B4A	11083 - 11083	Input 4 Accumulator, Scaled	UINT16	0 to 9999			1
2B4B	-	2B4B	11084 - 11084	Output 1 Accumulator, Scaled	UINT16	0 to 9999			1
2B4C	-	2B4C	11085 - 11085	Output 2 Accumulator, Scaled	UINT16	0 to 9999			1
2B4D	-	2B4D	11086 - 11086	Output 3 Accumulator, Scaled	UINT16	0 to 9999			1
2B4E	-	2B4E	11087 - 11087	Output 4 Accumulator, Scaled	UINT16	0 to 9999			1
2B4F	-	2B78	11088 - 11129	Reserved				Reserved	42
								Block Size:	58
Data and Control Block--Analog Out 0-1mA / Analog Out 4-20mA (Note 15)								**read-only**	
2B3F	-	2B3F	11072 - 11072	Status of card	UINT16	bit-mapped	----cf-- --------	Flag fields: c=calibration not good; f=configuration error	1
2B40	-	2B78	11073 - 11129	Reserved	UINT16			Reserved	57
								Block Size:	58

Modbus Address							#
Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	Reg
Data and Control Block -- Network Card Overlay (Note 15)						**read-only**	
2B3F - 2B3F	11072 - 11072	Card and Network Status	UINT16	bit-mapped	rhp----- sfw-m-ii	Flags: r=run mode; h=card is healthy; p=using last good known programmable settings Server flags: s=smtp ok; f=ftp ok; w=web server ok; m=modbus tcp/ip ok. IP Status ii: 00=IP not valid yet, 01=IP from p.settings; 10=IP from DHCP;11=using last good known IP.	1
2B40 - 2B40	11073 - 11073	Reserved				Reserved	1
2B41 - 2B43	11074 - 11076	MAC address in use by the network card	UINT16	bit-mapped	6 bytes	These 3 registers hold the 6 bytes of the card's Ethernet MAC address.	3
2B44 - 2B47	11077 - 11080	Current IP Address	UINT16			These 4 registers hold the 4 numbers (1 number each register) that make the IP address used by the card.	4
2B48 - 2B48	11081 - 11081	Current IP Mask Length	UINT16	0 to 32		Number of bits that are set in the IP address mask, starting from the Msb of the 32 bit word. Example 24 = 255.255.255.0; a value of 2 would mean 192.0.0.0	1
2B49 - 2B4A	11082 - 11083	Firmware Version	ASCII	4 char	none	Version of the BOOT firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
2B4B - 2B4C	11084 - 11085	Firmware Version	ASCII	4 char	none	Version of the RUN firmware of the card, left justified and padded with spaces. Blank for boards without embedded firmware.	2
2B4D - 2B78	11086 - 11129	Reserved				Reserved for Extended Nw Status	44
						Block Size:	58
Accumulators Block						**read-only**	
2EDF - 2EE0	12000 - 12001	Option Card 1, Input 1 Accumulator	UINT32	0 to 999999999	number of transitions	These are unscaled counts. See option card section for scaled versions. Input accumulators count either or both transitions; output accumulators count both transitions. Unused accumulators always read 0.	2
2EE1 - 2EE6	12002 - 12007	Option Card 1, Inputs 2-4 Accumulators	UINT32	0 to 999999999	number of transitions		6
2EE7 - 2EE8	12008 - 12009	Option Card 1, Output or Relay 1 Accumulator	UINT32	0 to 999999999	number of transitions		2
2EE9 - 2EEE	12010 - 12015	Option Card 1, Output or Relays 2-4	UINT32	0 to 999999999	number of transitions		6
2EEF - 2EF6	12016 - 12023	Option Card 2 Inputs Accumulators	UINT32	0 to 999999999	number of transitions		8
2EF7 - 2EFE	12024 - 12031	Option Card 2 Outputs Accumulators	UINT32	0 to 999999999	number of transitions		8
						Block Size:	32

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
				Commands Section (Note 4)					
Resets Block (Note 9)								**write-only**	
4E1F	-	4E1F	20000 - 20000	Reset Max/Min Blocks	UINT16	password (Note 5)			1
4E20	-	4E20	20001 - 20001	Reset Energy Accumulators	UINT16	password (Note 5)			1
4E21	-	4E21	20002 - 20002	Reset Alarm Log (Note 21)	UINT16	password (Note 5)		Reply to a reset log command indicates that the command was accepted but not necessarily that the reset is finished. Poll log status block to determine this.	1
4E22	-	4E22	20003 - 20003	Reset System Log (Note 21)	UINT16	password (Note 5)			1
4E23	-	4E23	20004 - 20004	Reset Historical Log 1 (Note 21)	UINT16	password (Note 5)			1
4E24	-	4E24	20005 - 20005	Reserved					1
4E25	-	4E25	20006 - 20006	Reserved					1
4E26	-	4E26	20007 - 20007	Reset I/O Change Log (Note 21)	UINT16	password (Note 5)			1
4E27	-	4E27	20008 - 20008	Reset Power Quality Log	UINT16	password (Note 5)			1
4E28	-	4E28	20009 - 20009	Reset Waveform Capture Log	UINT16	password (Note 5)			1
4E29	-	4E2A	20010 - 20011	Reserved				Reserved	2
4E2B	-	4E2B	20012 - 20012	Reset Option Card 1 Input Accumulators	UINT16	password (Note 5)			1
4E2C	-	4E2C	20013 - 20013	Reset Option Card 1 Output Accumulators	UINT16	password (Note 5)			1
4E2D	-	4E2D	20014 - 20014	Reset Option Card 2 Input Accumulators	UINT16	password (Note 5)			1
4E2E	-	4E2E	20015 - 20015	Reset Option Card 2 Output Accumulators	UINT16	password (Note 5)			1
								Block Size:	16
Privileged Commands Block								**conditional write**	
5207	-	5207	21000 - 21000	Initiate Meter Firmware Reprogramming	UINT16	password (Note 5)			1
5208	-	5208	21001 - 21001	Force Meter Restart	UINT16	password (Note 5)		causes a watchdog reset, always reads 0	1
5209	-	5209	21002 - 21002	Open Privileged Command Session	UINT16	password (Note 5)		meter will process command registers (this register through 'Close Privileged Command Session' register below) for 5 minutes or until the session is closed, whichever comes first.	1
520A	-	520A	21003 - 21003	Initiate Programmable Settings Update	UINT16	password (Note 5)		meter enters PS update mode	1
520B	-	520B	21004 - 21004	Calculate Programmable Settings Checksum (Note 3)	UINT16	0000 to 9999		meter calculates checksum on RAM copy of PS block	1
520C	-	520C	21005 - 21005	Programmable Settings Checksum (Note 3)	UINT16	0000 to 9999		read/write checksum register; PS block saved in nonvolatile memory on write (Note 8)	1
520D	-	520D	21006 - 21006	Write New Password (Note 3)	UINT16	0000 to 9999		write-only register; always reads zero	1
520E	-	520E	21007 - 21007	Terminate Programmable Settings Update (Note 3)	UINT16	any value		meter leaves PS update mode via reset	1
520F	-	5211	21008 - 21010	Set Meter Clock	TSTAMP	1Jan2000 - 31Dec2099	1 sec	saved only when 3rd register is written	3
5212	-	5212	21011 - 21011	Reserved				Reserved	1
5213	-	5219	21012 - 21018	Reserved				Reserved	7
521A	-	521A	21019 - 21019	Close Privileged Command Session	UINT16	any value		ends an open command session	1
								Block Size:	20
Encryption Block								**read/write**	
658F	-	659A	26000 - 26011	Perform a Secure Operation	UINT16			encrypted command to read password or change meter type	12
								Block Size:	12

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Programmable Settings Section									
Basic Setups Block								**write only in PS update mode**	
752F	-	752F	30000 - 30000	CT multiplier & denominator	UINT16	bit-mapped	dddddddd mmmmmmmm	high byte is denominator (1 or 5, read-only), low byte is multiplier (1, 10, or 100)	1
7530	-	7530	30001 - 30001	CT numerator	UINT16	1 to 9999	none		1
7531	-	7531	30002 - 30002	PT numerator	UINT16	1 to 9999	none		1
7532	-	7532	30003 - 30003	PT denominator	UINT16	1 to 9999	none		1
7533	-	7533	30004 - 30004	PT multiplier & hookup	UINT16	bit-mapped	mmmmmmmm mmmmhhhh	mm…mm = PT multiplier (1, 10, 100, or 1000) hhhh = hookup enumeration (0 = 3 element wye[9S], 1 = delta 2 CTs[5S], 3 = 2.5 element wye[6S])	1
7534	-	7534	30005 - 30005	Averaging Method	UINT16	bit-mapped	--iiiiii b----sss	iiiiii = interval (5,15,30,60) b = 0-block or 1-rolling sss = # subintervals (1,2,3,4)	1
7535	-	7535	30006 - 30006	Power & Energy Format	UINT16	bit-mapped	ppppiinn feee-ddd	pppp = power scale (0-unit, 3-kilo, 6-mega, 8-auto) ii = power digits after decimal point (0-3), applies only if f=1 and pppp is not auto nn = number of energy digits (5-8 --> 0-3) eee = energy scale (0-unit, 3-kilo, 6-mega) f = decimal point for power (0=data-dependant placement, 1=fixed placement per ii value) ddd = energy digits after decimal point (0-6) See note 10.	1
7536	-	7536	30007 - 30007	Operating Mode Screen Enables	UINT16	bit-mapped	-------x eeeeeeee	eeeeeeee = op mode screen rows on/off, rows top to bottom are bits low order to high order x = set to suppress PF on W/VAR/PF screens	1
7537	-	7537	30008 - 30008	Daylight Saving On Rule	UINT16	bit-mapped	hhhhhwww -dddmmmm	applies only if daylight savings in User Settings Flags = on; specifies when to make changeover hhhhh = hour, 0-23 www = week, 1-4 for 1st - 4th, 5 for last ddd = day of week, 1-7 for Sun - Sat mmmm = month, 1-12 Example: 2AM on the 4th Sunday of March hhhhh=2, www=4, ddd=1, mmmm=3	1
7538	-	7538	30009 - 30009	Daylight Saving Off Rule	UINT16	bit-mapped	hhhhhwww -dddmmmm		1
7539	-	7539	30010 - 30010	Time Zone UTC offset	UINT16	bit-mapped	z000 0000 hhhh hhmm	mm = minutes/15; 00=00, 01=15, 10=30, 11=45 hhhh = hours; -23 to +23 z = Time Zone valid (0=no, 1=yes) i.e. register=0 indicates that time zone is not set while register=0x8000 indicates UTC offset = 0	1
753A	-	753A	30011 - 30011	Clock Sync Configuration	UINT16	bit-mapped	0000 0000 mmm0 0ppe	e = enable automatic clock sync (0=no, 1=yes) pp = port performing synchronization (2-3 = COM3-COM4) mmm = sync method (1=NTP, all other values=no sync)	1

Modbus Address							
Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
753B - 753B	30012 - 30012	Reserved				Reserved	1
753C - 753C	30013 - 30013	User Settings 2	UINT16	bit-mapped	`-------- -------s`	s = display secondary volts (1=yes, 0=no)	1
753D - 753D	30014 - 30014	DNP Options	UINT16	bit-mapped	`-------- ww-i-vvp`	p selects primary or secondary values for DNP voltage, current and power registers (0=secondary, 1=primary) vv sets divisor for voltage scaling (0=1, 1=10, 2=100) i sets divisor for current scaling (0=1, 1=10) ww sets divisor for power scaling in addition to scaling for Kilo (0=1, 1=10, 2=100, 3=1000) Example: 120KV, 500A, 180MW p=1, vv=2, i=0, and ww=3 voltage reads 1200, current reads 500, watts reads 180	1
753E - 753E	30015 - 30015	User Settings Flags	UINT16	bit-mapped	`vvkgeinn srpdywfa`	vv = number of digits after decimal point for voltage display. 0 - For voltage range (0 - 9999V) 1 - For voltage range (100.0kV - 999.9 kV) 2 - For voltage range (10.00kV - 99.99 kV) 3 - For voltage range (0kV - 9.999 kV) This setting is used only when k=1. k = enable fixed scale for voltage display. (0=autoscale, 1=unit if vv=0 and kV if vv=1,2,3) g = enable alternate full scale bar graph current (1=on, 0=off) e = enable ct pt compensation (0=Disabled, 1=Enabled). i = fixed scale and format current display 0=normal autoscaled current display 1=always show amps with no decimal places nn = number of phases for voltage & current screen (3=ABC, 2=AB, 1=A, 0=ABC) s = scroll (1=on, 0=off) r = password for reset in use (1=on, 0=off) p = password for configuration in use (1=on, 0=off) d = daylight saving time changes (0=off, 1=on) y = diagnostic events in system log (1=yes, 0=no) w = power direction (0=view as load, 1=view as generator) f = flip power factor sign (1=yes, 0=no) a = apparent power computation method	1
753F - 753F	30016 - 30016	Full Scale Current (for load % bar graph)	UINT16	0 to 9999	none	If non-zero and user settings bit g is set, this value replaces CT numerator in the full scale current calculation. (See Note 12)	1
7540 - 7547	30017 - 30024	Meter Designation	ASCII	16 char	none		8
7548 - 7548	30025 - 30025	COM1 setup	UINT16	bit-mapped	`----dddd -0100110`	dddd = reply delay (* 50 msec)	1
7549 - 7549	30026 - 30026	COM2 setup	UINT16	bit-mapped	`----dddd -ppp-bbb`	ppp = protocol (1-Modbus RTU, 2-Modbus ASCII, 3-DNP) bbb = baud rate (1-9600, 2-19200, 4-38400, 6-57600)	1
754A - 754A	30027 - 30027	COM2 address	UINT16	1 to 247	none		1
754B - 754B	30028 - 30028	Limit #1 Identifier	UINT16	0 to 65535		use Modbus address as the identifier (see notes 7, 11, 12)	1
754C - 754C	30029 - 30029	Limit #1 Out High Setpoint	SINT16	-200.0 to +200.0	0.1% of full scale	Setpoint for the "above" limit (LM1), see notes 11-12.	1

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
754D - 754D	30030 - 30030	Limit #1 In High Threshold	SINT16	-200.0 to +200.0	0.1% of full scale	Threshold at which "above" limit clears; normally less than or equal to the "above" setpoint; see notes 11-12.	1
754E - 754E	30031 - 30031	Limit #1 Out Low Setpoint	SINT16	-200.0 to +200.0	0.1% of full scale	Setpoint for the "below" limit (LM2), see notes 11-12.	1
754F - 754F	30032 - 30032	Limit #1 In Low Threshold	SINT16	-200.0 to +200.0	0.1% of full scale	Threshold at which "below" limit clears; normally greater than or equal to the "below" setpoint; see notes 11-12.	1
7550 - 7554	30033 - 30037	Limit #2	SINT16	same as Limit #1	same as Limit #1	same as Limit #1	5
7555 - 7559	30038 - 30042	Limit #3	SINT16				5
755A - 755E	30043 - 30047	Limit #4	SINT16				5
755F - 7563	30048 - 30052	Limit #5	SINT16				5
7564 - 7568	30053 - 30057	Limit #6	SINT16				5
7569 - 756D	30058 - 30062	Limit #7	SINT16				5
756E - 7572	30063 - 30067	Limit #8	SINT16				5
7573 - 7582	30068 - 30083	Reserved				Reserved	16
7583 - 75C2	30084 - 30147	Reserved				Reserved	64
75C3 - 75C3	30148 - 30148	watts loss due to iron when watts positive	UINT16	0 to 99.99	0.01%		1
75C4 - 75C4	30149 - 30149	watts loss due to copper when watts positive	UINT16	0 to 99.99	0.01%		1
75C5 - 75C5	30150 - 30150	var loss due to iron when watts positive	UINT16	0 to 99.99	0.01%		1
75C6 - 75C6	30151 - 30151	var loss due to copper when watts positive	UINT16	0 to 99.99	0.01%		1
75C7 - 75C3	30152 - 30152	watts loss due to iron when watts negative	UINT16	0 to 99.99	0.01%		1
75C8 - 75C48	30153 - 30153	watts loss due to copper when watts negative	UINT16	0 to 99.99	0.01%		1
75C9 - 75C9	30154 - 30154	var loss due to iron when watts negative	UINT16	0 to 99.99	0.01%		1
75CA - 75CA	30155 - 30155	var loss due to copper when watts negative	UINT16	0 to 99.99	0.01%		1
75CB - 75CB	30156 - 30156	transformer loss compensation user settings flag	UINT16	bit-mapped	-------- ----cfwv	c - 0 disable compensation for losses due to copper, 1 enable compensaion for losses due to copper f - 0 disable compensation for losses due to iron, 1 enable compensaion for losses due to iron w - 0 add watt compensation, 1 subtract watt compensation v - 0 add var compensation, 1 subtract var compensation	1
75CC - 75E5	30157 - 30182	Reserved				Reserved	26
75E6 - 75E6	30183 - 30183	Programmable Settings Update Counter	UINT16	0-65535		Increments each time programmable settings are changed; occurs when new checksum is calculated.	1
75E8 - 7607	30184 - 30215	Non-voltaile registers for use by system integrators	SINT16				32
7608 - 7626	30216 - 30247	Reserved for Software Use				Reserved	32
7627 - 7627	30248 - 30248	A phase PT compensation @ 69V (% error)	SINT16	-15 to 15	0.01%		1
7628 - 7628	30249 - 30249	A phase PT compensation @ 120V (% error)	SINT16	-15 to 15	0.01%		1
7629 - 7629	30250 - 30250	A phase PT compensation @ 230V (% error)	SINT16	-15 to 15	0.01%		1
762A - 762A	30251 - 30251	A phase PT compensation @ 480V (% error)	SINT16	-15 to 15	0.01%		1
762B - 762B	30252 - 30255	B phase PT compensation @ 69V, 120V, 230V, 480V (% error)	SINT16	-15 to 15	0.01%		4
762F - 762F	30256 - 30259	C phase PT compensation @ 69V, 120V, 230V, 480V (% error)	SINT16	-15 to 15	0.01%		4

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
7633 - 7633	30260 - 30260	A phase CT compensation @ c1 (% error)	SINT16	-15 to 15	0.01%	For Class 10 unit c1=0.25A c2=0.5A c3=1A c4=5A For Class 2 unit c1=0.05A c2=0.1A c3=0.2A c4=1A	1
7634 - 7634	30261 - 30261	A phase CT compensation @ c2 (% error)	SINT16	-15 to 15	0.01%		1
7635 - 7635	30262 - 30262	A phase CT compensation @ c3 (% error)	SINT16	-15 to 15	0.01%		1
7636 - 7636	30263 - 30263	A phase CT compensation @ c4 (% error)	SINT16	-15 to 15	0.01%		1
7637 - 7637	30264 - 30267	B phase CT compensation @ c1, c2, c3, c4 (% error)	SINT16	-15 to 15	0.01%		4
763B - 763E	30268 - 30271	C phase CT compensation @ c1, c2, c3, c4 (% error)	SINT16	-15 to 15	0.01%		4
763F - 7642	30272 - 30275	A phase PF compensation @ c1, c2, c3, c4	SINT16	-50 to 50			4
7643 - 7646	30276 - 30279	B phase PF compensation @ c1, c2, c3, c4	SINT16	-50 to 50			4
7647 - 764A	30280 - 30283	C phase PF compensation @ c1, c2, c3, c4	SINT16	-50 to 50			4
						Block Size:	284
Log Setups Block						**write only in PS update mode**	
7917 - 7917	31000 - 31000	Historical Log #1 Sizes	UINT16	bit-mapped	eeeeeeee ssssssss	high byte is number of registers to log in each record (0-117), low byte is number of flash sectors for the log (see note 19) 0 in either byte disables the log	1
7918 - 7918	31001 - 31001	Historical Log #1 Interval	UINT16	bit-mapped	00000000 hgfedcba	only 1 bit set: a=1 min, b=3 min, c=5 min, d=10 min, e=15 min, f=30 min, g=60 min, h=EOI pulse	1
7919 - 7919	31002 - 31002	Historical Log #1, Register #1 Identifier	UINT16	0 to 65535		use Modbus address as the identifier (see note 7)	1
791A - 798D	31003 - 31118	Historical Log #1, Register #2 - #117 Identifiers	UINT16	0 to 65535		same as Register #1 Identifier	116
798E - 79D6	31119 - 31191	Historical Log #1 Software Buffer				Reserved for software use.	73
79D7 - 7A96	31192 - 31383	Reserved					192
7A97 - 7B56	31384 - 31575	Reserved					192
7B57 - 7B57	31576 - 31607	Reserved				. .	1
7B58 - 7B58	31577 - 31577	Reserved				. .	
7B59 - 7B59	31578 - 31578	Reserved				. .	1
7B5A - 7B5A	31579 - 31579	Reserved				. .	1
7B5B - 7B5B	31580 - 31580	Reserved				Reserved	1
7B5C - 7B5C	31581 - 31581	Channel A Voltage Surge Threshold	UINT16	0 to 3276.7	0.1% of full scale	Thresholds are % of full scale, see note 12	1
7B5D - 7B5D	31582 - 31582	Channel A Current Surge Threshold	UINT16	0 to 3276.7	0.1% of full scale		1
7B5E - 7B5E	31583 - 31583	Channel A Voltage Sag Threshold	UINT16	0 to 3276.7	0.1% of full scale		1
7B5F - 7B61	31584 - 31586	Reserved				Reserved	3
7B62 - 7B67	31587 - 31592	Channel B Surge & Sag Thresholds	same as Channel A				6
7B68 - 7B6D	31593 - 31598	Channel C Surge & Sag Thresholds	same as Channel A				6
7B6E - 7B76	31599 - 31607	Reserved				Reserved	9
						Block Size:	608

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
		Programmable Settings for Option Card 1					
Option Card 1 Setups Block						**write only in PS update mode**	
7CFF - 7CFF	32000 - 32000	Class ID of the Option Card 1 Settings	UINT16	bit-mapped	-------- cccctttt	Which class (cccc) and type(tttt) of card the Option Settings for Card 1 apply to. See note 22.	1
7D00 - 7D3E	32001 - 32063	Settings for Option Card 1, First Overlay -- see below	Register assignments depend on which type of card is in the slot. See overlays below.				63
7D3F - 7F3E	32064 - 32575	Settings for Option Card 1, Second Overlay -- see below	Register assignments depend on which type of card is in the slot. See overlays below.				512
						Block Size:	576
		Overlays for Option Card 1 Programmable Settings					
Settings Registers for any communication capable card, including network and analog cards					**First Overlay**	**write only in PS update mode**	
7D00 - 7D00	32001 - 32001	Slave address	UINT16	1~247 (for Modbus) 1~65534 (for DNP)	none	Slave address of the unit. The communication capable card is always a master. Set to 0 when an analog board is installed.	1
7D01 - 7D01	32002 - 32002	Speed and format	UINT16	bit-mapped	-abcde--fghijklm	Bps: a=57600; b=38400; c=19200; d=14400; e=9600 Stop bits 'f': cleared 1 stop bit, set 2 stop bits Parity: g=even; h=odd; i=none Data bits: j=8; k=7; l=6; m=5 Set to 0 when an analog board is installed.	1
7D02 - 7D02	32003 - 32003	Reserved				Reserved	1
7D03 - 7D03	32004 - 32004	Protocol	UINT16	bit-mapped	-------- -----ppp-	ppp= 100 =DNP3; 010=Ascii Modbus; 001=Rtu Modbus Set to 0 when an analog board is installed.	1
7D04 - 7D04	32005 - 32005	Reply delay	UINT16	0 to 65535	milliseconds	Delay to reply to a Modbus transaction after receiving it. Set to 0 when an analog board is installed	1
7D05 - 7D3E	32006 - 32063	Reserved				Reserved	58
						Block Size:	63
Settings Registers for Digital I/O Relay Card					**First Overlay**	**write only in PS update mode**	
7D00 - 7D00	32001 - 32001	Input#1 - 2 bindings & logging enables	UINT16	bit-mapped	-------- 2222 1111	One nibble for each input. Assuming "abcc" as the bits in each nibble: "a": select this input for EOI (End Of Interval)pulse sensing. "b": log this input when pulse is detected "cc": Input event trigger mode - Contact sensing method; 00 = none; 01 = open to close; 10 = close to open; 11 = any change. Every input has an associated internal accumulator (See input Accumulator Scaling), which is incremented every time the input changes according with the trigger mode crieteria "cc"	1
7D01 - 7D01	32002 - 32002	Relay #1 Delay to Operate	UINT16	0.1 second units		Delay to operate the relay since request.	1
7D02 - 7D02	32003 - 32003	Relay #1 Delay to Release	UINT16	0.1 second units		Delay to release the relay since request.	1
7D03 - 7D08	32004 - 32009	Reserved	UINT16			Set to 0.	6
7D09 - 7D09	32010 - 32010	Relay #2 Delay to Operate	UINT16	0.1 second units		Delay to operate the relay since request.	1
7D0A - 7D0A	32011 - 32011	Relay #2 Delay to Release	UINT16	0.1 second units		Delay to release the relay since request.	1
7D0B - 7D20	32012 - 32033	Reserved	UINT16			Set to 0.	22
7D21 - 7D21	32034 - 32034	Input Accumulators Scaling	UINT16	bit-mapped	-------- 22221111	4 bits per input or output accumulator	1

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
7D22 - 7D22	32035 - 32035	Relay Accumulators Scaling	UINT16	bit-mapped	-------- 22221111	The nibble informs what should be the scaling of the accumulator 0=no-scaling, 1=0.1, 2=0.01, 3= 1m, 4=0.1m, 5=0.01m, 6=1u, 7=0.1u; the value 15 disable the accumulator. Example: suppose that the internal input accumulator #1 is 12345, and its corresponding scaling setting is “0011” (3 decimal). Then, the accumulator will be read as: Scaling 3, means 1m or 0.001. Scaled accumulator = 12345 * 0.001 = 12 (Twelve).	1
7D23 - 7D23	33036 - 33036	Fast pulse input selector	UINT16	bit-mapped	p------- -----nnn	When value 'nnn' is non-zero, it determines which of the card inputs will be a fast pulse detection input. The polarity bit 'P' tells the event to be detected: 1=open-to-close; 0=close-to-open. There is no “any-change” detection mode	1
7D24 - 7D3E	32037 - 32063	Reserved				Set to 0.	27
						Block Size:	63
Settings Registers for Digital I/O Pulse Output Card					**First Overlay**	**write only in PS update mode**	
7D00 - 7D00	32001 - 32001	Input#1 - 4 bindings & logging enables	UINT16	bit-mapped	44443333 22221111	One nibble for each input. Assuming "abcc" as the bits in each nibble: "a": select this input for EOI (End Of Interval)pulse sensing. "b": log this input when pulse is detected "cc": Input event trigger mode - Contact sensing method; 00 = none; 01 = open to close; 10 = close to open; 11 = any change. Every input has an associated internal accumulator (See input Accumulator Scaling), which is incremented every time the input changes according with the trigger mode crieteria “cc”	1
7D01 - 7D01	32002 - 32002	Source for Pulse Ouput#1	UINT16	enumeration	-----ppp ----vvvv	“ppp” (Phase) : 000 = none, 001 = Phase A, 010 = Phase B, 011 = Phase C, 100 = All Phases, 101 = Pulse from EOI(End Of Interval). "vvvv"(Value) : 0000= none, 0001 = Wh, 0010 = +Wh, 0011 = -Wh, 0100= Varh, 0101 = +Varh, 0110 = -Varh, 0111 = VAh, 1000= Received Wh, 1001= Delivered Wh, 1010= Inductive Varh, 1011 = Capacitive Varh	1

Modbus Address Hex	Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
7D02 - 7D02	32003 - 32003	Kt [Wh/pulse] factor for Pulse Output#1	UINT16	bit-mapped	ddVVVVVV VVVVVVVV	"V…V" = not scaled energy value per pulse, from 0 to 9999. "dd"= decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= X.XXX.	1
7D03 - 7D04	32004 - 32005	Output#2 Assignment and Kt	UINT16	same as Output #1			2
7D05 - 7D06	32006 - 32007	Output#3 Assignment and Kt	UINT16	same as Output #1			2
7D07 - 7D08	32008 - 32009	Output#4 Assignment and Kt	UINT16	same as Output #1			2
7D09 - 7D09	32010 - 32010	Input Accumulators Scaling	UINT16	bit-mapped	44443333 22221111	see Relay Card above	1
7D0A - 7D0A	32011 - 32011	Output Accumulators Scaling	UINT16	bit-mapped	44443333 22221111		1
7D0B - 7D0B	32012 - 32012	Fast pulse input selector	UINT16	bit-mapped	p------- -----nnn	When value 'nnn' is non-zero, it determines which of the card inputs will be a fast pulse detection input. The polarity bit 'P' tells the event to be detected: 1=open-to-close; 0=close-to-open. There is no "any-change" detection mode.	1
7D0C - 7D3E	32013 - 32063	Reserved				Reserved	51
						Block Size:	63
Settings Registers for Digital I/O Relay Card					**Second Overlay**	**write only in PS update mode**	
7D3F - 7D46	32064 - 32071	Input#1 Label	ASCII	16 char			8
7D47 - 7D4E	32072 - 32079	Input#1 Low State Name	ASCII	16 char			8
7D4F - 7D56	32080 - 32087	Input#1 High State Name	ASCII	16 char			8
7D57 - 7D6E	32088 - 32111	Input#2 Label and State Names	same as Input#1				24
7D6F - 7D9E	32112 - 32159	Reserved				Reserved	48
7D9F - 7DA6	32160 - 32167	Relay#1 Label	ASCII	16 char			8
7DA7 - 7DAE	32168 - 32175	Relay#1 Open State Name	ASCII	16 char			8
7DAF - 7DB6	32176 - 32183	Relay#1 Closed State Name	ASCII	16 char			8
7DB7 - 7DCE	32184 - 32207	Relay#2 Label and State Names	same as Relay#1				24
7DCF - 7DFE	32208 - 32255	Reserved				Reserved	48
7DFF - 7E06	32256 - 32263	Input#1 Accumulator Label	ASCII	16 char			8
7E07 - 7E0E	32264 - 32271	Input#2 Accumulator Label	ASCII	16 char			8
7E0F - 7E1E	32272 - 32287	Reserved				Reserved	16
7E1F - 7E1F	32288 - 32288	Input#1 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV	KT power factor for the Pulse Output "V" is raw power value in Wh/pulse from 0 to 9999. "dd"=decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= X.XXX.	1
7E20 - 7E20	32289 - 32289	Input#2 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV		1
7E21 - 7F3E	32290 - 32575	Reserved				Reserved	286
						Block Size:	512
Settings Registers for Digital I/O Pulse Output Card					**Second Overlay**	**write only in PS update mode**	
7D3F - 7D46	32064 - 32071	Input#1 Label	ASCII	16 char			8
7D47 - 7D4E	32072 - 32079	Input#1 Low State Name	ASCII	16 char			8
7D4F - 7D56	32080 - 32087	Input#1 High State Name	ASCII	16 char			8
7D57 - 7D6E	32088 - 32111	Input#2 Label and State Names	same as Input#1				24
7D6F - 7D86	32112 - 32135	Input#3 Label and State Names	same as Input#1				24
7D87 - 7D9E	32136 - 32159	Input#4 Label and State Names	same as Input#1				24

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
7D9F - 7DA6	32160 - 32167	Output#1 Label	ASCII	16 char			8
7DA7 - 7DAE	32168 - 32175	Output#1 Open State Name	ASCII	16 char			8
7DAF - 7DB6	32176 - 32183	Output#1 Closed State Name	ASCII	16 char			8
7DB7 - 7DCE	32184 - 32207	Output#2 Label and State Names	same as Output#1				24
7DCF - 7DE6	32208 - 32231	Output#3 Label and State Names	same as Output#1				24
7DE7 - 7DFE	32232 - 32255	Output#4 Label and State Names	same as Output#1				24
7DFF - 7E06	32256 - 32263	Input#1 Accumulator Label	ASCII	16 char			8
7E07 - 7E0E	32264 - 32271	Input#2 Accumulator Label	ASCII	16 char			8
7E0F - 7E16	32272 - 32279	Input#3 Accumulator Label	ASCII	16 char			8
7E17 - 7E1E	32280 - 32287	Input#4 Accumulator Label	ASCII	16 char			8
7E1F - 7E1F	32288 - 32288	Input#1 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV	KT power factor for the accumulator input "V" is raw power value in Wh/pulse from 0 to 9999. "dd"=decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= X.XXX.	1
7E20 - 7E20	32289 - 32289	Input#2 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV		1
7E21 - 7E21	32290 - 32290	Input#3 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV		1
7E22 - 7E22	32291 - 32291	Input#4 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV		1
7E23 - 7F3E	32292 - 32575	Reserved				Reserved	284
						Block Size:	512
Settings Registers for Analog Out 0-1mA / Analog Out 4-20mA Cards					**Second Overlay**	**write only in PS update mode**	
7D3F - 7D3F	32064 - 32064	Update rate	UINT16	0 to 65535	milliseconds	Fixed -- see specifications.	1
7D40 - 7D40	32065 - 32065	Channel direction - 1mA Card only!	UINT16	bit-mapped	-------- ----4321	Full range output for 0-1mA card only: A bit set(1) means full range (-1mA to +1mA); a bit cleared(0) means source only (0mA to +1mA).	1
7D41 - 7D41	32066 - 32066	Format parameter for output #1	UINT16	bit-mapped	-------- ---f suwb	Format of the polled register:f=float 32; s=signed 32 bit int; u=unsigned 32 bit int; w=signed 16 bit int; b=unsigned 16 bit int.	1
7D42 - 7D42	32067 - 32067	Source register for Output#1	UINT16	0 to 65535		This register should be programmed with the address of the register whose value is to be used for current output. In different words, the current level output of analog board will follow the value of the register addressed here.	1
7D43 - 7D44	32068 - 32069	High value of source register for output#1	Depends on the format parameter			Value read from the source register at which High nominal current will be output. Example: for the 4-20mA card, if this register is programmed with 750, then the current output will be 20mA when the value read from the source register is 750.	2
7D45 - 7D46	32070 - 32071	Low value of source register for output#1	Depends on the format parameter			Value read from the source register at which Low nominal current will be output. Example: for the 4-20mA card, if this register is programmed with 0, then the current output will be 4mA when the value read from the source register is 0.	2
7D47 - 7D4C	32072 - 32077	Analog output#2 format, register, max & min	Same as analog output#1				6

Modbus Address Hex	Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
7D4D - 7D52	32078 - 32083	Analog output#3 format, register, max & min	Same as analog output#1				6
7D53 - 7D58	32084 - 32089	Analog output#4 format, register, max & min	Same as analog output#1				6
7D59 - 7F3E	32090 - 32575	Reserved				Reserved	486
						Block Size:	512
Settings Registers for Network Cards					**Second Overlay**	**write only in PS update mode**	
7D3F - 7D3F	32064 - 32064	General Options		bit-mapped	-------- ---s cwme	Servers enable(1) or disable(0) flags: s=Modbus_TCP_server; c=Modbus_TCP_client; w=Web server ; m=HTTP Modbus RTU for diagnostics. Sleep enabled e=0; sleep disabled e=1.	1
7D40 - 7D40	32065 - 32065	DHCP enable		bit-mapped	-------- -------d	DHCP: d=1 enabled, d=0 disabled (user must provide IP configuration).	1
7D41 - 7D48	32066 - 32073	Host name label	ASCII			16 bytes (8 registers)	8
7D49 - 7D4C	32074 - 32077	IP card network address	UINT16	0 to 255 (IPv4)		These 4 registers hold the 4 numbers (1 number each register) that make the IP address used by the card.	4
7D4D - 7D4D	32078 - 32078	IP network address mask length	UINT16	0 to 32		Number of bits that are set in the IP address mask, starting from the Msb of the 32 bit word. Example 24 = 255.255.255.0; a value of 2 would mean 192.0.0.0	1
7D4E - 7D51	32079 - 32082	IP card network gateway address	UINT16	0 to 255 (IPv4)		These 4 registers hold the 4 numbers that make the IP gateway address on network.	4
7D52 - 7D55	32083 - 32086	IP card network DNS #1 address	UINT16	0 to 255 (IPv4)		IP address of the DNS#1 on the network.	4
7D56 - 7D59	32087 - 32090	IP card network DNS #2 address	UINT16	0 to 255 (IPv4)		IP address of the DNS#2 on the network.	4
7D5A - 7E62	32091 - 32355	Reserved				Write this with 0 to keep future compatibility.	265
7E63 - 7E63	32356 - 32356	FTP Client Flags		bit-mapped	-------- -----u-e	General FTP flags: u: 0=FTP remote address is an URL address; 1=FTP remote address is an IP address. e: 0=FTP disabled; 1=Enabled.	1
7E64 - 7E64	32357 - 32357	Reserved				Set to 0	1
7E65 - 7E84	32358 - 32389	FTP remote server address	ASCII or UINT16			The type of the data in these registers depend on bit 'u' in the FTP Client Flags register. IP address (4 numbers) or URL (64-characters) of the FTP server	32
7E85 - 7E85	32390 - 32390	FTP remote port	UINT16			IP port of the remote FTP server	1
7E86 - 7EC5	32391 - 32454	FTP remote directory	ASCII	128 characters		Remote directory where the files to be retrieved are.	64
7EC6 - 7ED5	32455 - 32470	FTP remote username	ASCII	32 characters		Username to access remote FTP	16
7ED6 - 7EE5	32471 - 32485	FTP remote password	ASCII	32 characters		Password to for previous username account.	16
7EE6 - 7F3E	32486 - 32575	Reserved				Set to 0	89
						Block Size:	512

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Programmable Settings for Option Card 2									
Option Card 2 Setups Block								**write only in PS update mode**	
80E7	-	80E7	33000 - 33000	Class ID of the Option Card 2 Settings	UINT16	bit-mapped	-------- cccctttt	Which class (cccc) and type(tttt) of card the Option Settings for Card 2 apply to. See note 22	1
80E8	-	8126	33001 - 33063	Settings for Option Card 2, First Overlay -- see below	Register assignments depend on which type of card is in the slot. See overlays below.				63
8127	-	8326	33064 - 33575	Settings for Option Card 2, Second Overlay -- see below	Register assignments depend on which type of card is in the slot. See overlays below.				512
								Block Size:	576
Overlays for Option Card 2 Programmable Settings									
Settings Registers for any communication capable card, including network and analog cards							**First Overlay**	**write only in PS update mode**	
80E8	-	80E8	33001 - 33001	Slave address	UINT16	1~247 (for Modbus) 1~65534 (for DNP)	none	Slave address of the unit. The communication capable card is always a master. Set to 0 when an analog board is installed.	1
80E9	-	80E9	33002 - 33002	Speed and format	UINT16	bit-mapped	-abcde--fghijklm	Bps: a=57600; b=38400; c=19200; d=14400; e=9600 Stop bits 'f': cleared 1 stop bit, set 2 stop bits Parity: g=even; h=odd; i=none Data bits: j=8; k=7; l=6; m=5 Set to 0 when an analog board is installed.	1
80EA	-	80EA	33003 - 33003	Reserved	UINT16	bit-mapped		Reserved	1
80EB	-	80EB	33004 - 33004	Protocol	UINT16	bit-mapped	-------- -----ppp-	ppp= 100 =DNP3; 010=Ascii Modbus; 001=Rtu Modbus Set to 0 when an analog board is installed.	1
80EC	-	80EC	33005 - 33005	Reply delay	UINT16	0 to 65535	milliseconds	Delay to reply to a Modbus transaction after receiving it. Set to 0 when an analog board is installed	1
80ED	-	8126	33006 - 33063	Reserved				Reserved	58
								Block Size:	63

Modbus Address Hex			Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Settings Registers for Digital I/O Relay Card							**First Overlay**	**write only in PS update mode**	
80E8	-	80E8	33001 - 33001	Input#1 - 2 bindings & logging enables	UINT16	bit-mapped	-------- 2222 1111	One nibble for each input. Assuming "abcc" as the bits in each nibble: "a": select this input for EOI (End Of Interval)pulse sensing. "b": log this input when pulse is detected "cc": Input event trigger mode - Contact sensing method; 00 = none; 01 = open to close; 10 = close to open; 11 = any change. Every input has an associated internal accumulator (See input Accumulator Scaling), which is incremented every time the input changes according with the trigger mode crieteria "cc"	1
80E9	-	80E9	33002 - 33002	Relay #1 Delay to Operate	UINT16	0.1 second units		Delay to operate the relay since request.	1
80EA	-	80EA	33003 - 33003	Relay #1 Delay to Release	UINT16	0.1 second units		Delay to release the relay since request.	1
80EB	-	80F0	33004 - 33009	Reserved	UINT16			Set to 0.	6
80F1	-	80F1	33010 - 33010	Relay #2 Delay to Operate	UINT16	0.1 second units		Delay to operate the relay since request.	1
80F2	-	80F2	33011 - 33011	Relay #2 Delay to Release	UINT16	0.1 second units		Delay to release the relay since request.	1
80F3	-	8108	33012 - 33033	Reserved	UINT16			Set to 0.	22
8109	-	8109	33034 - 33034	Input Accumulators Scaling	UINT16	bit-mapped	-------- 22221111	4 bits per input or output accumulator	1
810A	-	810A	33035 - 33035	Relay Accumulators Scaling	UINT16	bit-mapped	-------- 22221111	The nibble informs what should be the scaling of the accumulator 0=no-scaling, 1=0.1, 2=0.01, 3= 1m, 4=0.1m, 5=0.01m, 6=1u, 7=0.1u; the value 15 disable the accumulator. Example: suppose that the internal input accumulator #1 is 12345, and its corresponding scaling setting is "0011" (3 decimal). Then, the accumulator will be read as: Scaling 3, means 1m or 0.001. Scaled accumulator = 12345 * 0.001 = 12 (Twelve).	1
810B	-	810B	33036 - 33036	Fast pulse input selector	UINT16	bit-mapped	p------- -----nnn	When value 'nnn' is non-zero, it determines which of the card inputs will be a fast pulse detection input. The polarity bit 'P' tells the event to be detected: 1=open-to-close; 0=close-to-open. There is no "any-change" detection mode.	1
810C	-	8126	33037 - 33063	Reserved				Reserved	27
								Block Size:	63

Modbus Address Hex	Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Settings Registers for Digital I/O Pulse Output Card					**First Overlay**	**write only in PS update mode**	
80E8 - 80E8	33001 - 33001	Input#1 - 4 bindings & logging enables	UINT16	bit-mapped	44443333 22221111	One nibble for each input. Assuming "abcc" as the bits in each nibble: "a": select this input for EOI (End Of Interval)pulse sensing. "b": log this input when pulse is detected "cc": Input event trigger mode - Contact sensing method; 00 = none; 01 = open to close; 10 = close to open; 11 = any change. Every input has an associated internal accumulator (See input Accumulator Scaling), which is incremented every time the input changes according with the trigger mode crieteria "cc"	1
80E9 - 80E9	33002 - 33002	Source for Pulse Ouput#1	UINT16	enumeration	-----ppp ----vvvv	"ppp" (Phase) : 000 = none, 001 = Phase A, 010 = Phase B, 011 = Phase C, 100 = All Phases, 101 = Pulse from EOI(End Of Interval). "vvvv"(Value) : 0000= none, 0001 = Wh, 0010 = +Wh, 0011 = -Wh, 0100= Varh, 0101 = +Varh, 0110 = -Varh, 0111 = VAh, 1000= Received Wh, 1001= Delivered Wh, 1010= Inductive Varh, 1011 = Capacitive Varh	1
80EA - 80EA	33003 - 33003	Kt [Wh/pulse] factor for Pulse Output#1	UINT16	bit-mapped	ddVVVVVV VVVVVVVV	"V…V" = not scaled energy value per pulse, from 0 to 9999. "dd"= decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= X.XXX.	1
80EB - 80EC	33004 - 33005	Output#2 Assignment and Kt	UINT16	same as Output #1			2
80ED - 80EE	33006 - 33007	Output#3 Assignment and Kt	UINT16	same as Output #1			2
80EF - 80F0	33008 - 33009	Output#4 Assignment and Kt	UINT16	same as Output #1			2
80F1 - 80F1	33010 - 33010	Input Accumulators Scaling	UINT16	bit-mapped	44443333 22221111	see Relay Card above	1
80F2 - 80F2	33011 - 33011	Output Accumulators Scaling	UINT16	bit-mapped	44443333 22221111		1
80F3 - 80F3	33012 - 33012	Fast pulse input selector	UINT16	bit-mapped	p------- -----nnn	When value 'nnn' is non-zero, it determines which of the card inputs will be a fast pulse detection input. The polarity bit 'P' tells the event to be detected: 1=open-to-close; 0=close-to-open. There is no "any-change" detection mode.	1
80F4 - 8126	33013 - 33063	Reserved				Reserved	51
						Block Size:	63

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Settings Registers for Digital I/O Relay Card					**Second Overlay**	**write only in PS update mode**	
8127 - 812E	33064 - 33071	Input#1 Label	ASCII	16 char			8
812F - 8136	33072 - 33079	Input#1 Low State Name	ASCII	16 char			8
8137 - 813E	33080 - 33087	Input#1 High State Name	ASCII	16 char			8
813F - 8156	33088 - 33111	Input#2 Label and State Names	same as Input#1				24
8157 - 8186	33112 - 33159	Reserved					48
8187 - 818E	33160 - 33167	Relay#1 Label	ASCII	16 char			8
818F - 8196	33168 - 33175	Relay#1 Open State Name	ASCII	16 char			8
8197 - 819E	33176 - 33183	Relay#1 Closed State Name	ASCII	16 char			8
819F - 81B6	33184 - 33207	Relay#2 Label and State Names	same as Relay#1				24
81B7 - 81E6	33208 - 33255	Reserved					48
81E7 - 81EE	33256 - 33263	Input#1 Accumulator Label	ASCII	16 char			8
81EF - 81F6	33264 - 33271	Input#2 Accumulator Label	ASCII	16 char			8
8208 - 8208	33289 - 33289	Input#2 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV	KT power factor for the Pulse Output "V" is raw power value in Wh/pulse from 0 to 9999. "dd"=decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= X.XXX.	1
8209 - 8326	33290 - 33575	Reserved					286
						Block Size:	512
Settings Registers for Digital I/O Pulse Output Card					**Second Overlay**	**write only in PS update mode**	
8127 - 812E	33064 - 33071	Input#1 Label	ASCII	16 char			8
812F - 8136	33072 - 33079	Input#1 Low State Name	ASCII	16 char			8
8137 - 813E	33080 - 33087	Input#1 High State Name	ASCII	16 char			8
813F - 8156	33088 - 33111	Input#2 Label and State Names	same as Input#1				24
8157 - 816E	33112 - 33135	Input#3 Label and State Names	same as Input#1				24
816F - 8186	33136 - 33159	Input#4 Label and State Names	same as Input#1				24
8187 - 818E	33160 - 33167	Output#1 Label	ASCII	16 char			8
818F - 8196	33168 - 33175	Output#1 Open State Name	ASCII	16 char			8
8197 - 819E	33176 - 33183	Output#1 Closed State Name	ASCII	16 char			8
819F - 81B6	33184 - 33207	Output#2 Label and State Names	same as Output#1				24
81B7 - 81CE	33208 - 33231	Output#3 Label and State Names	same as Output#1				24
81CF - 81E6	33232 - 33255	Output#4 Label and State Names	same as Output#1				24
81E7 - 81EE	33256 - 33263	Input#1 Accumulator Label	ASCII	16 char			8
81EF - 81F6	33264 - 33271	Input#2 Accumulator Label	ASCII	16 char			8
81F7 - 81FE	33272 - 33279	Input#3 Accumulator Label	ASCII	16 char			8
81FF - 8206	33280 - 33287	Input#4 Accumulator Label	ASCII	16 char			8
8207 - 8207	33288 - 33288	Input#1 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV	KT power factor for the accumulator input "V" is raw power value in Wh/pulse from 0 to 9999. "dd"=decimal point position: 00=0.XXXX, 01=X.XXX, 10=XX.XX, 11= X.XXX.	1
8208 - 8208	33289 - 33289	Input#2 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV		1
8209 - 8209	33290 - 33290	Input#3 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV		1
820A - 820A	33291 - 33291	Input#4 Accumulator Kt	UINT16	bit-mapped	ddVVVVVV VVVVVVVV		1
820B - 8326	33292 - 33575	Reserved				Reserved	284
						Block Size:	512

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Settings Registers for Analog Out 0-1mA / Analog Out 4-20mA Cards					**Second Overlay**	**write only in PS update mode**	
8127 - 8127	33064 - 33064	Update rate	UINT16	0 to 65535	milliseconds	Fixed -- see specifications.	1
8128 - 8128	33065 - 33065	Channel direction - 1mA Card only!	UINT16	bit-mapped	-------- ----4321	Full range output for 0-1mA card only: A bit set(1) means full range (-1mA to +1mA); a bit cleared(0) means source only (0mA to +1mA).	1
8129 - 8129	33066 - 33066	Format parameter for output #1	UINT16	bit-mapped	-------- ---f suwb	Format of the polled register:f=float 32; s=signed 32 bit int; u=unsigned 32 bit int; w=signed 16 bit int; b=unsigned 16 bit int.	1
812A - 812A	33067 - 33067	Source register for Output#1	UINT16	0 to 65535		This register should be programmed with the address of the register whose value is to be used for current output. In different words, the current level output of analog board will follow the value of the register addressed here.	1
812B - 812C	33068 - 33069	High value of source register for output#1	Depends on the format parameter			Value read from the source register at which High nominal current will be output. Example: for the 4-20mA card, if this register is programmed with 750, then the current output will be 20mA when the value read from the source register is 750.	2
812D - 812E	33070 - 33071	Low value of source register for output#1	Depends on the format parameter			Value read from the source register at which Low nominal current will be output. Example: for the 4-20mA card, if this register is programmed with 0, then the current output will be 4mA when the value read from the source register is 0.	2
812F - 8134	33072 - 33077	Analog output#2 format, register, max & min	Same as analog output#1				6
8135 - 813A	33078 - 33083	Analog output#3 format, register, max & min	Same as analog output#1				6
813B - 8140	33084 - 33089	Analog output#4 format, register, max & min	Same as analog output#1				6
8141 - 8326	33090 - 33575	Reserved				Reserved	486
						Block Size:	512

Modbus Address Hex			Modbus Address Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
Settings Registers for Network Cards							Second Overlay	write only in PS update mode	
8127	-	8127	33064 - 33064	General Options		bit-mapped	-------- ---s cwme	Servers enable(1) or disable(0) flags: s=Modbus_TCP_server; c=Modbus_TCP_client; w=Web server ; m=HTTP Modbus RTU for diagnostics. Sleep enabled e=0; sleep disabled e=1.	1
8128	-	8128	33065 - 33065	DHCP enable		bit-mapped	-------- -------d	DHCP: d=1 enabled, d=0 disabled (user must provide IP configuration).	1
8129	-	8130	33066 - 33073	Host name label	ASCII			16 bytes (8 registers)	8
8131	-	8134	33074 - 33077	IP card network address	UINT16	0 to 255 (IPv4)		These 4 registers hold the 4 numbers (1 number each register) that make the IP address used by the card.	4
8135	-	8135	33078 - 33078	IP network address mask length	UINT16	0 to 32		Number of bits that are set in the IP address mask, starting from the Msb of the 32 bit word. Example 24 = 255.255.255.0; a value of 2 would mean 192.0.0.0	1
8136	-	8139	33079 - 33082	IP card network gateway address	UINT16	0 to 255 (IPv4)		These 4 registers hold the 4 numbers that make the IP gateway address on network.	4
813A	-	813D	33083 - 33086	IP card network DNS #1 address	UINT16	0 to 255 (IPv4)		IP address of the DNS#1 on the network.	4
813E	-	8141	33087 - 33090	IP card network DNS #2 address	UINT16	0 to 255 (IPv4)		IP address of the DNS#2 on the network.	4
8142	-	824A	33091 - 33355	Reserved				Write this with 0 to keep future compatibility.	265
824B	-	824B	33356 - 33356	FTP Client Flags		bit-mapped	-------- -----u-e	General FTP flags: u: 0=FTP remote address is an URL address; 1=FTP remote address is an IP address. e: 0=FTP disabled; 1=Enabled.	1
824C	-	824C	33357 - 33357	Reserved				Reserved	1
824D	-	826C	33358 - 33389	FTP remote server address	ASCII or UINT16			The type of the data in these registers depend on bit 'u' in the FTP Client Flags register. IP address (4 numbers) or URL (64-characters) of the FTP server	32
826D	-	826D	33390 - 33390	FTP remote port	UINT16			IP port of the remote FTP server	1
826E	-	82AD	33391 - 33454	FTP remote directory	ASCII	128 characters		Remote directory where the files to be retrieved are.	64
82AE	-	82BD	33455 - 33470	FTP remote username	ASCII	32 characters		Username to access remote FTP	16
82BE	-	82CC	33471 - 33485	FTP remote password	ASCII	32 characters		Password to for previous username account.	16
82CD	-	8326	33486 - 33575	Reserved				Reserved	89
								Block Size:	512

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
		Secondary Readings Section					
Secondary Block						**read-only except as noted**	
9C40 - 9C40	40001 - 40001	System Sanity Indicator	UINT16	0 or 1	none	0 indicates proper meter operation	1
9C41 - 9C41	40002 - 40002	Volts A-N	UINT16	2047 to 4095	volts	2047= 0, 4095= +150	1
9C42 - 9C42	40003 - 40003	Volts B-N	UINT16	2047 to 4095	volts	volts = 150 * (register - 2047) / 2047	1
9C43 - 9C43	40004 - 40004	Volts C-N	UINT16	2047 to 4095	volts		1
9C44 - 9C44	40005 - 40005	Amps A	UINT16	0 to 4095	amps	0= -10, 2047= 0, 4095= +10	1
9C45 - 9C45	40006 - 40006	Amps B	UINT16	0 to 4095	amps	amps = 10 * (register - 2047) / 2047	1
9C46 - 9C46	40007 - 40007	Amps C	UINT16	0 to 4095	amps		1
9C47 - 9C47	40008 - 40008	Watts, 3-Ph total	UINT16	0 to 4095	watts	0= -3000, 2047= 0, 4095= +3000	1
9C48 - 9C48	40009 - 40009	VARs, 3-Ph total	UINT16	0 to 4095	VARs	watts, VARs, VAs =	1
9C49 - 9C49	40010 - 40010	VAs, 3-Ph total	UINT16	2047 to 4095	VAs	3000 * (register - 2047) / 2047	1
9C4A - 9C4A	40011 - 40011	Power Factor, 3-Ph total	UINT16	1047 to 3047	none	1047= -1, 2047= 0, 3047= +1 pf = (register - 2047) / 1000	1
9C4B - 9C4B	40012 - 40012	Frequency	UINT16	0 to 2730	Hz	0= 45 or less, 2047= 60, 2730= 65 or more freq = 45 + ((register / 4095) * 30)	1
9C4C - 9C4C	40013 - 40013	Volts A-B	UINT16	2047 to 4095	volts	2047= 0, 4095= +300	1
9C4D - 9C4D	40014 - 40014	Volts B-C	UINT16	2047 to 4095	volts	volts = 300 * (register - 2047) / 2047	1
9C4E - 9C4E	40015 - 40015	Volts C-A	UINT16	2047 to 4095	volts		1
9C4F - 9C4F	40016 - 40016	CT numerator	UINT16	1 to 9999	none	CT = numerator * multiplier / denominator	1
9C50 - 9C50	40017 - 40017	CT multiplier	UINT16	1, 10, 100	none		1
9C51 - 9C51	40018 - 40018	CT denominator	UINT16	1 or 5	none		1
9C52 - 9C52	40019 - 40019	PT numerator	UINT16	1 to 9999	none	PT = numerator * multiplier / denominator	1
9C53 - 9C53	40020 - 40020	PT multiplier	UINT16	1, 10, 100, 1000	none		1
9C54 - 9C54	40021 - 40021	PT denominator	UINT16	1 to 9999	none		1
9C55 - 9C56	40022 - 40023	W-hours, Positive	UINT32	0 to 99999999	Wh per energy format	* 5 to 8 digits	2
9C57 - 9C58	40024 - 40025	W-hours, Negative	UINT32	0 to 99999999	Wh per energy format	* decimal point implied, per energy format	2
9C59 - 9C5A	40026 - 40027	VAR-hours, Positive	UINT32	0 to 99999999	VARh per energy format	* resolution of digit before decimal point = units, kilo, or mega, per energy format	2
9C5B - 9C5C	40028 - 40029	VAR-hours, Negative	UINT32	0 to 99999999	VARh per energy format		2
9C5D - 9C5E	40030 - 40031	VA-hours	UINT32	0 to 99999999	VAh per energy format	* see note 10	2
9C5F - 9C60	40032 - 40033	W-hours, Positive, Phase A	UINT32	0 to 99999999	Wh per energy format		2
9C61 - 9C62	40034 - 40035	W-hours, Positive, Phase B	UINT32	0 to 99999999	Wh per energy format		2
9C63 - 9C64	40036 - 40037	W-hours, Positive, Phase C	UINT32	0 to 99999999	Wh per energy format		2
9C65 - 9C66	40038 - 40039	W-hours, Negative, Phase A	UINT32	0 to 99999999	Wh per energy format		2
9C67 - 9C68	40040 - 40041	W-hours, Negative, Phase B	UINT32	0 to 99999999	Wh per energy format		2
9C69 - 9C6A	40042 - 40043	W-hours, Negative, Phase C	UINT32	0 to 99999999	Wh per energy format		2
9C6B - 9C6C	40044 - 40045	VAR-hours, Positive, Phase A	UINT32	0 to 99999999	VARh per energy format		2
9C6D - 9C6E	40046 - 40047	VAR-hours, Positive, Phase B	UINT32	0 to 99999999	VARh per energy format		2
9C6F - 9C70	40048 - 40049	VAR-hours, Positive, Phase C	UINT32	0 to 99999999	VARh per energy format		2
9C71 - 9C72	40050 - 40051	VAR-hours, Negative, Phase A	UINT32	0 to 99999999	VARh per energy format		2
9C73 - 9C74	40052 - 40053	VAR-hours, Negative, Phase B	UINT32	0 to 99999999	VARh per energy format		2
9C75 - 9C76	40054 - 40055	VAR-hours, Negative, Phase C	UINT32	0 to 99999999	VARh per energy format		2
9C77 - 9C78	40056 - 40057	VA-hours, Phase A	UINT32	0 to 99999999	VAh per energy format		2
9C79 - 9C7A	40058 - 40059	VA-hours, Phase B	UINT32	0 to 99999999	VAh per energy format		2
9C7B - 9C7C	40060 - 40061	VA-hours, Phase C	UINT32	0 to 99999999	VAh per energy format		2

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
9C7D - 9C7D	40062 - 40062	Watts, Phase A	UINT16	0 to 4095	watts		1
9C7E - 9C7E	40063 - 40063	Watts, Phase B	UINT16	0 to 4095	watts		1
9C7F - 9C7F	40064 - 40064	Watts, Phase C	UINT16	0 to 4095	watts		1
9C80 - 9C80	40065 - 40065	VARs, Phase A	UINT16	0 to 4095	VARs	0= -3000, 2047= 0, 4095= +3000	1
9C81 - 9C81	40066 - 40066	VARs, Phase B	UINT16	0 to 4095	VARs	watts, VARs, VAs =	1
9C82 - 9C82	40067 - 40067	VARs, Phase C	UINT16	0 to 4095	VARs	3000 * (register - 2047) / 2047	1
9C83 - 9C83	40068 - 40068	VAs, Phase A	UINT16	2047 to 4095	VAs		1
9C84 - 9C84	40069 - 40069	VAs, Phase B	UINT16	2047 to 4095	VAs		1
9C85 - 9C85	40070 - 40070	VAs, Phase C	UINT16	2047 to 4095	VAs		1
9C86 - 9C86	40071 - 40071	Power Factor, Phase A	UINT16	1047 to 3047	none	1047= -1, 2047= 0, 3047= +1	1
9C87 - 9C87	40072 - 40072	Power Factor, Phase B	UINT16	1047 to 3047	none	pf = (register - 2047) / 1000	1
9C88 - 9C88	40073 - 40073	Power Factor, Phase C	UINT16	1047 to 3047	none		1
9C89 - 9CA2	40074 - 40099	Reserved	N/A	N/A	none	Reserved	26
9CA3 - 9CA3	40100 - 40100	Reset Energy Accumulators	UINT16	password (Note 5)		write-only register; always reads as 0	1
						Block Size:	100
Log Retrieval Section							
Log Retrieval Block						**read/write except as noted**	
C34C - C34D	49997 - 49998	Log Retrieval Session Duration	UINT32	0 to 4294967294	4 msec	0 if no session active; wraps around after max count	2
C34E - C34E	49999 - 49999	Log Retrieval Session Com Port	UINT16	0 to 4		0 if no session active, 1-4 for session active on COM1 - COM4	1
C34F - C34F	50000 - 50000	Log Number, Enable, Scope	UINT16	bit-mapped	nnnnnnnn esssssss	high byte is the log number (0-system, 2-history . . e is retrieval session enable(1) or disable(0) sssssss is what to retrieve (0-normal record, 1-timestamps only, 2-complete memory image (no data validation if image)	1
C350 - C350	50001 - 50001	Records per Window or Batch, Record Scope Selector, Number of Repeats	UINT16	bit-mapped	wwwwwwww snnnnnnn	high byte is records per window if s=0 or records per batch if s=1, low byte is number of repeats for function 35 or 0 to suppress auto-incrementing; max number of repeats is 8 (RTU) or 4 (ASCII) total windows, a batch is all the windows	1
C351 - C352	50002 - 50003	Offset of First Record in Window	UINT32	bit-mapped	ssssssss nnnnnnnn nnnnnnnn nnnnnnnn	ssssssss is window status (0 to 7-window number, 0xFF-not ready); this byte is read-only. nn…nn is a 24-bit record number. The log's first record is latched as a reference point when the session is enabled. This offset is a record index relative to that point. Value provided is the relative index of the whole or partial record that begins the window.	2
C353 - C3CD	50004 - 50126	Log Retrieve Window	UINT16	see comments	none	mapped per record layout and retrieval scope, read-only	123
						Block Size:	130

Modbus Address Hex	Decimal	Description (Note 1)	Format	Range (Note 6)	Units or Resolution	Comments	# Reg
						read only	
C738 - C747	51000 - 51015	Reserved					16
C748 - C749	51016 - 51017	System Log Log Size in Records	UNIT32	0 to 4,294,967,294	record		2
C74a - C74b	51018 - 51019	Number of Records Used	UNIT32	1 to 4,294,967,294	record		2
C74c - C74c	51020 - 51020	Record Size in Bytes	UNIT16	14 to 242	byte		1
C74d - C74d	51021 - 51021	Log Availability	UNIT16		none .	0=unavailable	1
C74e - C750	51022 - 51024	Timestamp, First Record	TSTAMP	Jan2000 - 31Dec2099	1 sec .		3
C751 - C753	51025 - 51027	Timestamp, Last Record	TSTAMP	Jan2000-31Dec2099	1 sec ..		3
					.	.	
C754 - C757	51028 - 51031	Reserved			.		4
C758 - C767	51032 - 51047	Historical Log Status		same as system log block			16
C768 - C7b7	51048 - 51127	Reserved					
						Block Size:	128

End of Map

Data Formats	
ASCII	ASCII characters packed 2 per register in high, low order and without any termination characters.
SINT16 / UINT16	16-bit signed / unsigned integer.
SINT32 / UINT32	32-bit signed / unsigned integer spanning 2 registers. The lower-addressed register is the high order half.
FLOAT	32-bit IEEE floating point number spanning 2 registers. The lower-addressed register is the high order half (i.e., contains the exponent).
TSTAMP	3 adjacent registers, 2 bytes each. First (lowest-addressed) register high byte is year (0-99), low byte is month (1-12). Middle register high byte is day(1-31), low byte is hour (0-23 plus DST bit). DST (daylight saving time) bit is bit 6 (0x40). Third register high byte is minutes (0-59), low byte is seconds (0-59). For example, 9:35:07AM on October 12, 2049 would be 0x310A, 0x0C49, 0x2307, assuming DST is in effect.

Notes	
1	All registers not explicitly listed in the table read as 0. Writes to these registers will be accepted but won't actually change the register (since it doesn't exist).
2	Meter Data Section items read as 0 until first readings are available or if the meter is not in operating mode. Writes to these registers will be accepted but won't actually change the register.
3	Register valid only in programmable settings update mode. In other modes these registers read as 0 and return an illegal data address exception if a write is attempted.
4	Meter command registers always read as 0. They may be written only when the meter is in a suitable mode. The registers return an illegal data address exception if a write is attempted in an incorrect mode.
5	If the password is incorrect, a valid response is returned but the command is not executed. Use 5555 for the password if passwords are disabled in the programmable settings.
6	M denotes a 1,000,000 multiplier.
7	Each identifier is a Modbus register. For entities that occupy multiple registers (FLOAT, SINT32, etc.) all registers making up the entity must be listed, in ascending order. For example, to log phase A volts, VAs, voltage THD, and VA hours, the register list would be 0x3E7, 0x3E8, 0x411, 0x412, 0x176F, 0x61D, 0x61E and the number of registers (0x7917 high byte) would be 7.
8	Writing this register causes data to be saved permanently in nonvolatile memory. Reply to the command indicates that it was accepted but not whether or not the save was successful. This can only be determined after the meter has restarted.
9	Reset commands make no sense if the meter state is LIMP. An illegal function exception will be returned.
10	Energy registers should be reset after a format change.
11	Entities to be monitored against limits are identified by Modbus address. Entities occupying multiple Modbus registers, such as floating point values, are identified by the lower register address. If any of the 8 limits is unused, set its identifier to zero. If the indicated Modbus register is not used or is a nonsensical entity for limits, it will behave as an unused limit.
12	There are 2 setpoints per limit, one above and one below the expected range of values. LM1 is the "too high" limit, LM2 is "too low". The entity goes "out of limit" on LM1 when its value is greater than the setpoint. It remains "out of limit" until the value drops below the in threshold. LM2 works similarly, in the opposite direction. If limits in only one direction are of interest, set the in threshold on the "wrong" side of the setpoint. Limits are specified as % of full scale, where full scale is automatically set appropriately for the entity being monitored: current FS = CT numerator * CT multiplier voltage FS = PT numerator * PT multiplier 3 phase power FS = CT numerator * CT multiplier * PT numerator * PT multiplier * 3 [* SQRT(3) for delta hookup] single phase power FS = CT numerator * CT multiplier * PT numerator * PT multiplier [* SQRT(3) for delta hookup] frequency FS = 60 (or 50) power factor FS = 1.0 percentage FS = 100.0 angle FS = 180.0
13	THD not available shows 10000 in all THD and harmonic magnitude and phase registers for the channel. THD may be unavailable due to low V or I amplitude, delta hookup (V only), or meter model.
14	Option Card Identification and Configuration Block is an image of the EEPROM on the card.
15	A block of data and control registers is allocated for each option slot. Interpretation of the register data depends on what card is in the slot.
16	Measurement states: Off occurs during programmable settings updates; Run is the normal measuring state; Limp indicates that an essentail non-volatile memory block is corrupted; and Warmup occurs briefly (approximately 4 seconds) at startup while the readings stabilize. Run state is required for measurement, historical logging, demand interval processing, limit alarm evaluation, min/max comparisons, and THD calculations. Resetting min/max or energy is allowed only in run and off states; warmup will return a busy exception. In limp state, the meter reboots at 5 minute intervals in an effort to clear the problem.
17	Limits evaluation for all entites except demand averages commences immediately after the warmup period. Evaluation for demand averages, maximum demands, and minimum demands commences at the end of the first demand interval after startup.
18	Not applicable to IQ 250/260 meters.

19 Depending on the meter model, there are 15, 29, or 45 flash sectors available in a common pool for distribution among the historical and waveform logs. The pool size, number of sectors for each log, and the number of registers per record together determine the maximum number of records a log can hold.

S = number of sectors assigned to the log,
H = number of Modbus registers to be monitored in each historical record (up to 117),
R = number of bytes per record = (12 + 2H) for historical logs
N = number of records per sector = 65516 / R, rounded down to an integer value (no partial records in a sector)
T = total number of records the log can hold = S * N
.

20 Only 1 input on all digital input cards may be specified as the end-of-interval pulse.

21 Logs cannot be reset during log retrieval. Busy exception will be returned.

22 Combination of class and type currently defined are:

0x23 = Fiber cards
0x24 = Network card
0x41 = Relay card
0x42 = Pulse card
0x81 = 0-1mA analog output card
0x82 = 4-20mA analog output card.

App. C Using DNP Mapping for IQ 250/260

Overview

This Appendix describes the functionality of the IQ 250/260 meter's version of the DNP protocol. A DNP programmer needs this information to retrieve data from the meter. The DNP version used by the IQ 250/260 is a reduced set of the Distributed Network Protocol Version 3.0 subset 2; it gives enough functionality to get critical measurements from the meter.
This DNP version supports Class 0 object/qualifiers 0,1,2,6, only. No event generation is supported. The IQ 250/260 meter always acts as a secondary device (slave) in DNP communication.

Physical Layer

The IQ 250/260 meter's DNP version uses serial communication. It can be assigned to Port 2 (RS485 compliant port) or any communication capable option board. Speed and data format is transparent: they can be set to any supported value.

Data Link Layer

The IQ 250/260 can be assigned with a value from 1 to 65534 as the target device address for. The data link layer follows the standard frame FT3 used by the DNP Version 3.0 protocol, but only 4 functions are implemented: Reset Link, Reset User, Unconfirmed User Data, and Link Status, as depicted in following table.

Function	Function Code
Reset Link	0
Reset User	1
Unconfirmed User Data	4
Link Status	9

Table C.1: Supported Link Functions

.[dst] and [src] are the device address of the IQ 250/260 and Master device, respectively.

In order to establish optimal communication with the meter, we recommend that you perform the Reset Link and Reset User functions. The Link Status is not mandatory, but can be performed as well. The inter-character time-out for DNP is 1 second. If this amount of time, or more, elapses between two consecutive characters within a FT3 frame, the frame will be dropped.
The inter-character **time-out** for DNP Lite is **1 second**. If this amount of time, or more, elapses between two consecutive characters within a FT3 frame, the frame will be dropped.

Application Layer

The IQ 250/260 meter's DNP version supports the **Read** function, **Write** Function, the **Direct Operate** function and the **Direct Operate Unconfirmed** function.

- The **Read** function (**code 01**) provides a means for reading the critical measurement data from the IQ 250/260 meter. This function should be posted to read object 60 variation 1, which will read all the available Class 0 objects from the DNP register map. See register map in following section. In order to retrieve all objects with their respective variations, the qualifier must be set to ALL (0x06). See the DNP Message Layouts for an example showing a read Class 0 request data from the IQ 250/260.

- The **Write** function (**code 02**) provides a mean for clearing the Device restart bit in the Internal Indicator register only. This is mapped to Object 80, point 0 with variation 1. When clearing the restart device indicator use qualifier 0. The DNP Message Layouts section shows the supported frames for this function.

- The **Direct Operate** function (**code 05**) is intended for resetting the energy counters and the demand counters (minimum and maximum energy registers). These actions are mapped to Object 12, point 0 and point 2, that are seen as a control relay.
  The relay must be operated (On) in 0 msec and released (Off) in 1 msec only. Qualifiers 0x17 or x28 are supported for writing the energy reset. Sample frames are shown in the DNP Message Layouts section.

- The **Direct Operate Unconfirmed** (or **Unacknowledged**) function (**code 06**) is intended for asking the communication port to switch to Modbus RTU protocol from DNP Lite. This switching is seen as a control relay mapped into Object 12, point 1 in the IQ 250/260. The relay must be operated with qualifier 0x17, code 3 count 0, with 0 millisecond on and 1 millisecond off, only. After sending this request the current communication port will accept Modbus RTU frames only. To make this port go back to DNP protocol, the unit must be power-recycled. The DNP Message Layouts section shows the constructed frame to perform DNP to Modbus RTU protocol change.

Error Reply

In the case of an unsupported function, or any other recognizable error, an error reply will be generated from the IQ 250/260 to the Primary station (the requester). The Internal Indicator field will report the type of error: unsupported function or bad parameter.

The broadcast acknowledge and restart bit, are also signaled in the internal indicator but they do not indicate an error condition.

DNP Register Map

Object 10 – Binary Output States

Object	Point	Var	Description	Format	Range	Multiplier	Units	Comments
10	0	2	Reset Energy Counters	BYTE	Always 1	N/A	None	Read by Class 0 or with qualifier 0, 1, 2 or 6
10	1	2	Change to Modbus RTU Protocol	BYTE	Always 1	N/A	None	Read by Class 0 or with qualifier 0, 1, 2 or 6
10	2	2	Reset Demand Cntrs (Max / Min)	BYTE	Always 1	N/A	None	Read by Class 0 or with qualifier 0, 1, 2 or 6

Object 12 – Control Relay Outputs

Object	Point	Var	Description	Format	Range	Multiplier	Units	Comments
12	0	1	Reset Energy Counters	N/A	N/A	N/A	none	Responds to Function 5 (Direct Operate), Qualifier Code 17x or 28x, Control Code 3, Count 0, On 0 msec, Off 1 msec ONLY.
12	1	1	Change to Modbus RTU Protocol	N/A	N/A	N/A	none	Responds to Function 6 (Direct Operate - No Ack), Qualifier Code 17x, Control Code 3, Count 0, On 0 msec, Off 1 msec ONLY.
12	2	1	Reset Demand Counters (Max / Min)	N/A	N/A	N/A	none	Responds to Function 5 (Direct Operate), Qualifier Code 17x or 28x, Control Code 3, Count 0, On 0 msec, Off 1 msec ONLY.

Object 20 – Binary Counters (Primary Readings) - Read via Class 0 or with qualifier 0, 1, 2, or 6

Object	Point	Var	Description	Format	Range	Multiplier	Units	Comments
20	0	5	W-hours, Positive	UINT32	0 to 99999999	Multiplier = 10(n-d), where n and d are derived from the energy format. n = 0, 3, or 6 per energy format scale and d = number of decimal places.	W hr	example: energy format = 7.2K and W-hours counter = 1234567 n=3 (K scale), d=2 (2 digits after decimal point), multiplier = 10(3-2) = 101 = 10, so energy is 1234567 * 10 Whrs, or 12345.67 KWhrs
20	1	5	W-hours, Negative	UINT32	0 to 99999999		W hr	
20	2	5	VAR-hours, Positive	UINT32	0 to 99999999		VAR hr	
20	3	5	VAR-hours, Negative	UINT32	0 to 99999999		VAR hr	
20	4	5	VA-hours, Total	UINT32	0 to 99999999		VA hr	

Object 30 – Analog Inputs (Secondary Readings) - Read via Class 0 or with qualifier 0, 1, 2, or 6

Object	Point	Var	Description	Format	Range	Multiplier	Units	Comments
30	0	4	Meter Health	sint16	0 or 1	N/A	None	0 = OK
30	1	4	Volts A-N	sint16	0 to 32767	(150 / 32768)	V	Values above 150V secondary read 32767.
30	2	4	Volts B-N	sint16	0 to 32767	(150 / 32768)	V	
30	3	4	Volts C-N	sint16	0 to 32767	(150 / 32768)	V	
30	4	4	Volts A-B	sint16	0 to 32767	(300 / 32768)	V	Values above 300V secondary read 32767.
30	5	4	Volts B-C	sint16	0 to 32767	(300 / 32768)	V	
30	6	4	Volts C-A	sint16	0 to 32767	(300 / 32768)	V	
30	7	4	Amps A	sint16	0 to 32767	(10 / 32768)	A	Values above 10A secondary read 32767.
30	8	4	Amps B	sint16	0 to 32767	(10 / 32768)	A	
30	9	4	Amps C	sint16	0 to 32767	(10 / 32768)	A	
30	10	4	Watts, 3-Ph total	sint16	-32768 to +32767	(4500 / 32768)	W	
30	11	4	VARs, 3-Ph total	sint16	-32768 to +32767	(4500 / 32768)	VAR	
30	12	4	VAs, 3-Ph total	sint16	0 to +32767	(4500 / 32768)	VA	
30	13	4	Power Factor, 3-Ph total	sint16	-1000 to +1000	0.001	None	
30	14	4	Frequency	sint16	0 to 9999	0.01	Hz	
30	15	4	Positive Watts, 3-Ph, Maximum Avg Demand	sint16	-32768 to +32767	(4500 / 32768)	W	
30	16	4	Positive VARs, 3-Ph, Maximum Avg Demand	sint16	-32768 to +32767	(4500 / 32768)	VAR	
30	17	4	Negative Watts, 3-Ph, Maximum Avg Demand	sint16	-32768 to +32767	(4500 / 32768)	W	
30	18	4	Negative VARs, 3-Ph, Maximum Avg Demand	sint16	-32768 to +32767	(4500 / 32768)	VAR	
30	19	4	VAs, 3-Ph, Maximum Avg Demand	sint16	-32768 to +32767	(4500 / 32768)	VA	
30	20	4	Angle, Phase A Current	sint16	-1800 to +1800	0.1	degree	
30	21	4	Angle, Phase B Current	sint16	-1800 to +1800	0.1	degree	
30	22	4	Angle, Phase C Current	sint16	-1800 to +1800	0.1	degree	
30	23	4	Angle, Volts A-B	sint16	-1800 to +1800	0.1	degree	
30	24	4	Angle, Volts B-C	sint16	-1800 to +1800	0.1	degree	
30	25	4	Angle, Volts C-A	sint16	-1800 to +1800	0.1	degree	
30	26	4	CT numerator	sint16	1 to 9999	N/A	none	CT ratio =
30	27	4	CT multiplier	sint16	1, 10, or 100	N/A	none	(numerator * multiplier) / denominator
30	28	4	CT denominator	sint16	1 or 5	N/A	none	
30	29	4	PT numerator	SINT16	1 to 9999	N/A	none	PT ratio =
30	30	4	PT multiplier	SINT16	1, 10, or 100	N/A	none	(numerator * multiplier) / denominator
30	31	4	PT denominator	SINT16	1 to 9999	N/A	none	
30	32	4	Neutral Current	SINT16	0 to 32767	(10 / 32768)	A	For 1A model, multiplier is (2 / 32768) and values above 2A secondary read 32767

.

Object 80 – Internal Indicator

Object	Point	Var	Description	Format	Range	Multiplier	Units	Comments
80	0	1	Device Restart Bit	N/A	N/A	N/A	none	Clear via Function 2 (Write), Qualifier Code 0.

DNP Message Layouts

Legend

All numbers are in hexadecimal base. In addition the following symbols are used.

dst	16 bit frame destination address
src	16 bit frame source address
crc	DNP Cyclic redundant checksum (polynomial $x^{16}+x^{13}+x^{12}+x^{11}+x^{10}+x^{7}+x^{6}+x^{5}+x^{2}+1$)
x	transport layer data sequence number
y	application layer data sequence number

Link Layer related frames

Reset Link

Request	05	64	05	C0	dst	src	crc
Reply	05	64	05	00	src	dst	crc

Reset User

Request	05	64	05	C1	dst	src	crc
Reply	05	64	05	00	src	dst	crc

Link Status

Request	05	64	05	C9	dst	src	crc

Reply	05	64	05	0B	src	dst	crc

Application Layer related frames

Clear Restart

Request	05	64	0E	C4	dst	src	crc			
	Cx	Cy	02	50	01	00	07	07	00	crc

Reply	05	64	0A	44	src	dst	crc
	Cx	Cy	81	int. ind.	crc		

Class 0 Data

Request	05	64	0B	C4	dst	src	crc
	Cx	Cy	01	3C	01	06	crc

Request	05	64	14	C4	dst	src	crc									
(alternate)	Cx	Cy	01	3C	02	06	3C	03	06	3C	04	06	3C	01	06	crc

Reply	05	64	72	44	src	dst	crc					
(same for either request)	Cx	Cy	81	int. ind.	14	05	00	00	04	pt 0	pt 1	crc
	pt 1	pt 2	pt 3	pt 4	1E	04	crc					
	00	00	20	pt 0	pt 1	pt 2	pt 3	pt 4	pt 5	pt6	crc	
	pt6	pt 7	pt 8	pt 9	pt 10	pt 11	pt 12	pt 13		crc		
		pt 15	pt 16	pt 17	pt 18	pt 19	pt 20	pt 21		crc		
		pt 23	pt 24	pt 25	pt 26	pt 27	pt 28	pt 29		crc		
		pt 31	pt 32	0A	02	00	00	02	pt0	pt1	pt2	crc

Reset Energy

Request	05	64	18	C4	dst	src	crc										
	Cx	Cy	05	0C	01	17	01	00	03	00	00	00	00	00	01	00	crc
	00	00	00	crc													

Reply	05	64	1A	44	src	dst	crc										
	Cx	Cy	81	int. ind.	0C	01	17	01	00	03	00	00	00	00	00	crc	
	01	00	00	00	00	crc											

Request	05	64	1A	C4	dst	src	crc										
(alternate)	Cx	Cy	05	0C	01	28	01	00	00	00	03	00	00	00	00	00	crc
	01	00	00	00	00	crc											

Reply	05	64	1C	44	src	dst	crc										
	Cx	Cy	81	int. ind.	0C	01	28	01	00	00	00	03	00	00	00	crc	
	00	00	01	00	00	00	00	crc									

Switch to Modbus

Request	05	64	18	C4	dst	src	crc										
	Cx	Cy	06	0C	01	17	01	01	03	00	00	00	00	00	01	00	crc
	00	00	00	crc													

No Reply

Reset Demand (Maximums & Minimums)

Request	05	64	18	C4	dst	src	crc										
	Cx	Cy	05	0C	01	17	01	02	03	00	00	00	00	00	01	00	crc
	00	00	00	crc													

Reply	05	64	1A	44	src	dst	crc										
	Cx	Cy	81	int. ind.	0C	01	17	01	02	03	00	00	00	00	00	crc	
	01	00	00	00	00	crc											

Request	05	64	1A	C4	dst		src		crc								
(alternate)	Cx	Cy	05	0C	01	28	01	02	00	00	03	00	00	00	00	00	crc
	01	00	00	00	00	crc											

Reply	05	64	1C	44	src		dst		crc								
	Cx	Cy	81	int. ind.		0C	01	28	01	02	00	00	03	00	00	00	crc
	00	00	01	00	00	00	00	crc									

Error Reply

Reply	05	64	0A	44	src		dst		crc	
	Cx	Cy	81	int. ind.		crc				

Internal Indication Bits

Bits implemented in the IQ 250/260 meter are listed below. All others are always reported as zeroes.

Bad Function

Occurs if the function code in a User Data request is not Read (0x01), Write (0x02), Direct Operate (0x05), or Direct Operate, No Ack (0x06).

Object Unknown

Occurs if an unsupported object is specified for the Read function. Only objects 10, 20, 30, and 60 are supported.

Out of Range

Occurs for most other errors in a request, such as requesting points that don't exist or direct operate requests in unsupported formats.

Buffer Overflow

Occurs if a read request or a read response is too large for its respective buffer. In general, if the request overflows, there will be no data in the response while if the response overflows at least the first object will be returned. The largest acceptable request has a length field of 26, i.e. link header plus 21 bytes more, not counting checksums. The largest possible response has 7 blocks plus the link header.

Restart
All Stations

These 2 bits are reported in accordance with standard practice.