

ION® 8300/ION® 8400/ION® 8500



Installation Guide



**POWER
MEASUREMENT**

Danger



This symbol indicates the presence of dangerous voltage within and outside the product enclosure that may constitute a risk of electric shock, serious injury or death to persons if proper precautions are not followed.

Caution



This symbol alerts the user to the presence of hazards that may cause minor or moderate injury to persons, damage to property or damage to the device itself, if proper precautions are not followed.

Note



This symbol directs the user's attention to important installation, operating and maintenance instructions.

Installation Considerations

Installation and maintenance of the ION 8000 series meter should only be performed by qualified, competent personnel that have appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all Local and National Electrical Codes.

DANGER

Failure to observe the following instructions may result in severe injury or death.

- ◆ During normal operation of the ION 8000 series meter, hazardous voltages are present on its terminal strips, and throughout the connected potential transformer (PT), current transformer (CT), digital (status) input, control power and external I/O circuits. PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuit energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries, etc).
- ◆ The terminal strips on the meter base should not be user-accessible after installation.
- ◆ Do not use digital output devices for primary protection functions. These include applications where the devices perform energy limiting functions or provide protection of people from injury. Do not use the ION 8000 series in situations where failure of the devices can cause injury or death, or cause sufficient energy to be released that can start a fire. The meter can be used for secondary protection functions.
- ◆ Do not HIPOT/Dielectric test the digital (status) inputs, digital outputs, or communications terminals. Refer to the label on the ION 8000 series meter for the maximum voltage level the device can withstand.

CAUTION

Observe the following instructions, or permanent damage to the meter may occur.

- ◆ The ION 8000 series meter offers a range of hardware options that affect input ratings. The ION 8000 series meter's serial number label lists all equipped options. Applying current levels incompatible with the current inputs will permanently damage the meter. This document provides installation instructions applicable to each hardware option.
- ◆ The ION 8000 series meter's chassis ground must be properly connected to the switchgear earth ground for the noise and surge protection circuitry to function correctly. Failure to do so will void the warranty.
- ◆ Terminal screw torque: Barrier-type (current, voltage, and relay terminal screws: 1.35 Nm (1.00 ft-lbf) max. Captured-wire type (digital inputs/outputs, communications, power supply: 0.90 Nm (0.66 ft.lbf) max.

FCC Notice

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

The Ringer Equivalence Number (REN) for the ION 8000 series optional internal modem is 0.6. Connection to the ION 8000 series internal modem should be made via an FCC Part 68 compliant telephone cord (not supplied). The ION 8000 series cannot be used on a public coin phone service or party line services.

Network Compatibility Notice for the Internal Modem

The internal modem in meters equipped with this option is compatible with the telephone systems of most countries in the world, with the exception of Australia and New Zealand. Use in some countries may require modification of the internal modem's initialization strings. If problems using the modem on your phone system occur, please contact Power Measurement Technical Support

Standards Compliance



Limitation of Liability

Power Measurement reserves the right to make changes in the device or its specifications identified in this document without notice. Power Measurement advises customers to obtain the latest version of the device specifications before placing orders to verify that the information being relied upon by the customer is current.

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<http://www.pwrm.com/buy/terms/>

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

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ION 8000 Series Models

Socket Meter

The socket meter is designed to fit into S-Base meter sockets and A-to-S Base adapters. The meter supports a number of different form factors including 9S, 35S, 36S, 39S, and 76S.

Switchboard Meter

The switchboard meter eliminates the need for shorting blocks. All voltage and current connections are made via terminals located on the rear of the switchboard case. When removed from the draw-out case, current inputs are automatically short circuited.

RMICAN Model

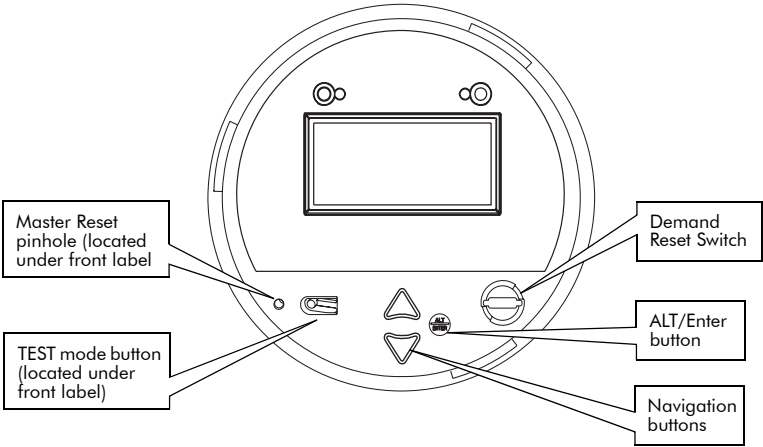
A socket or switchboard meter that is Industry Canada certified for revenue metering in Canada. Different security options are available, including a factory-sealed version.

In this Guide

This guide contains the following sections. Your workflow may not specifically align with the steps outlined below:

- ◆ “Meter Overview” on page 6
- ◆ “Meter Labels” on page 7
- ◆ “Step 1: Mount the Meter” on page 9
- ◆ “Step 2: Wire the Ground Terminal” on page 11
- ◆ “Step 3: Wire the Onboard I/O” on page 12
- ◆ “Step 4: Wire the Voltage and Current Inputs” on page 16
- ◆ “Step 5: Wire the Communications” on page 26
- ◆ “Step 6: Wire the Power Supply” on page 30
- ◆ “Step 7: Power Up the Meter” on page 31
- ◆ “Step 8: Set Up Meter Using the Front Panel” on page 31
- ◆ “Step 9: Verify Meter Operation” on page 35
- ◆ “Step 10: View Meter Data” on page 40

Meter Overview



DEMAND RESET SWITCH:

Resets the peak demand values logged in the meter. Can be activated with the cover on or off.



ALT/ENTER BUTTON:

Toggles between NORM and ALT display modes. Hold for 3 seconds to access Setup menu.



MASTER RESET BUTTON:

Recessed to prevent accidental activation. You must remove the meter cover and its label to access.



TEST MODE BUTTON:

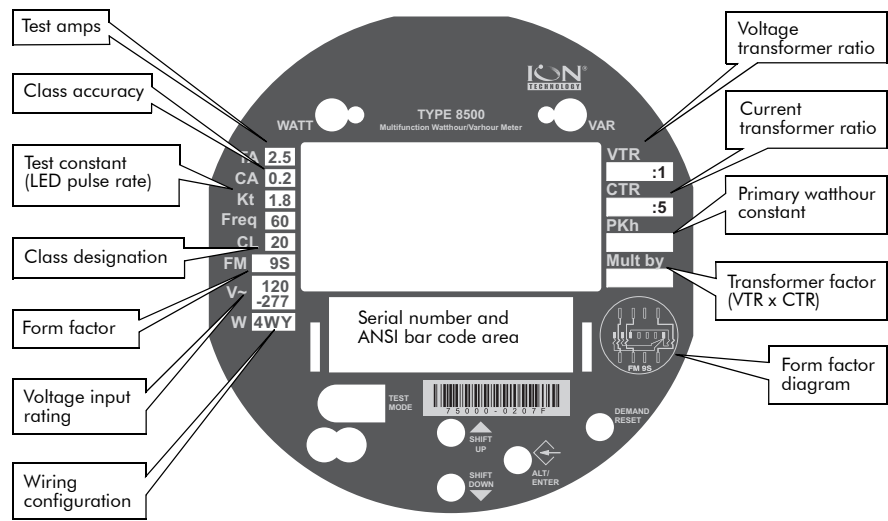
Places the meter into TEST mode, ceasing accumulation of billable quantities.



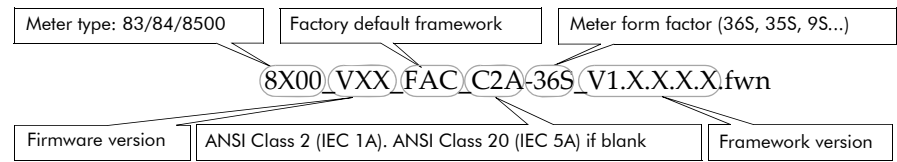
NAVIGATION BUTTONS:

Press the UP/DOWN buttons to highlight menu items, or increment/decrement numbers.

Meter Labels



Framework File Naming Convention



Before You Begin

Familiarize yourself with the steps in this guide and read the safety precautions presented on the “Installation Considerations” page.

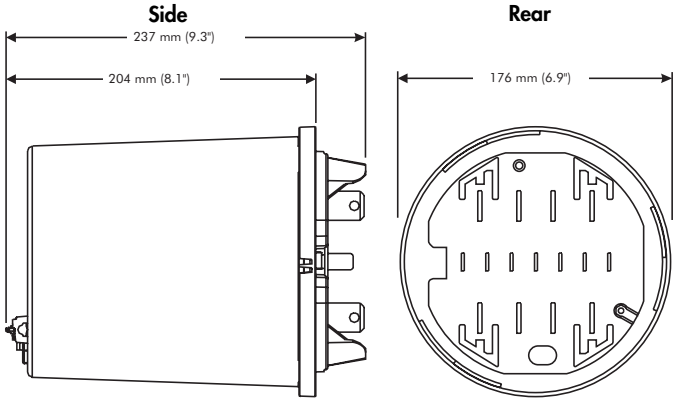


Do not power up the meter until the current and voltage wiring is completed.

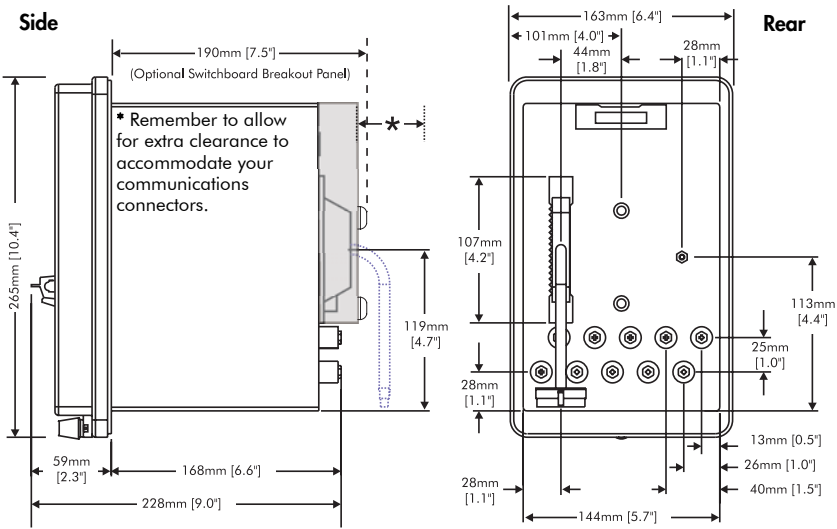
Recommended Tools

- ◆ #1 and #2 Phillips screwdrivers
- ◆ Precision flat-head screwdriver
- ◆ Wire cutters / stripper

Socket Meter Dimensions



Switchboard Meter Dimensions



Step 1: Mount the Meter

Review the steps in this section before installing the meter, and determine the types of revenue sealing devices that you want to use before installing the meter. Examine the meter's label to verify its service type matches your intended application.

CAUTION

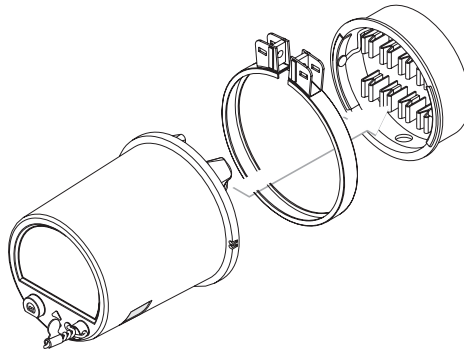
Include a switch or circuit breaker in the installation in close proximity to the unit and within easy reach of the operator. Mark it as the disconnecting device for the unit.

Environmental Considerations

Location	Outdoor use
Operating Range	-40 to 85°C (-40 to 185°F)
Humidity	5% to 95% non-condensing humidity

Socket Meter Mounting

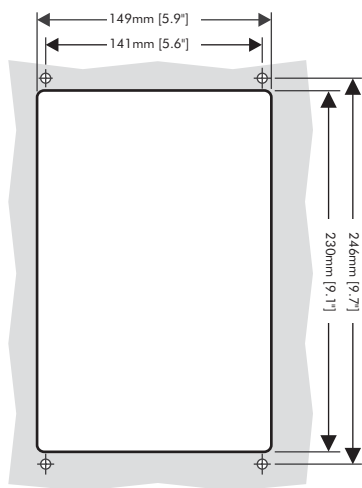
1. If required, attach an anti-tamper seal through the outer cover of the meter to seal the outer casing to the backplate.



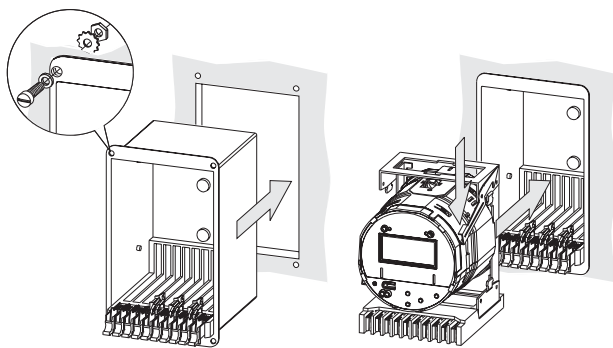
2. Align the meter so that the chassis ground strap will contact the ground source on the socket.
3. Feed communications wiring through the socket's opening from the back of the unit. If your socket is the "OPEN" type, hold the wiring to the side of the meter before pushing it into the socket.
4. Attach the socket-sealing ring and seal the Demand Reset switch (if required).

Switchboard Meter Mounting

1. Prepare a mounting hole for the switchboard case.



2. Place the switchboard case into the prepared mounting hole. Attach the mounting washers and nuts.



3. Place the case cover into position and tighten the thumbscrew. Apply anti-tamper sealing if required.

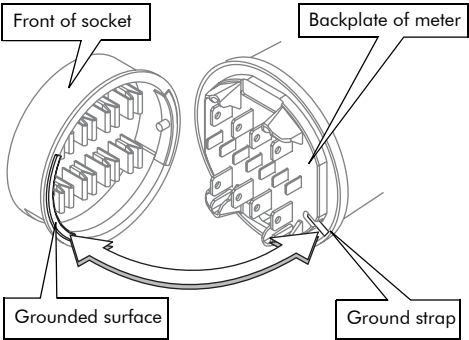
Step 2: Wire the Ground Terminal

 CAUTION

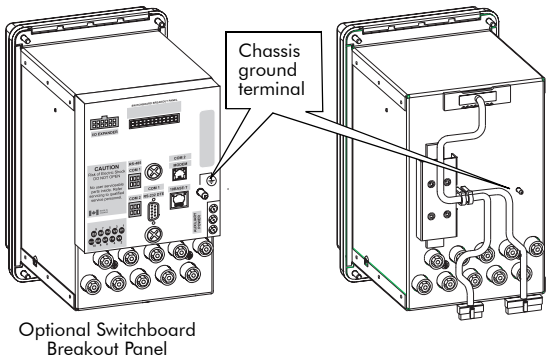
The meter must be installed with an adequate chassis ground connection. Failure to properly connect the meter chassis ground voids the meter warranty. Do not use metal door hinges as a ground path.

Meter Type	Chassis Ground Connection	Wire Size
Socket	Contact to a clean, unpainted earth grounded surface on the socket front flange.	AWG 12 (3.31 mm ²)
Switchboard	Ground terminal on the rear of the meter.	AWG 14 (2.5 mm ²)

Socket Meter Ground Connection



Switchboard Meter Ground Connection



Step 3: Wire the Onboard I/O

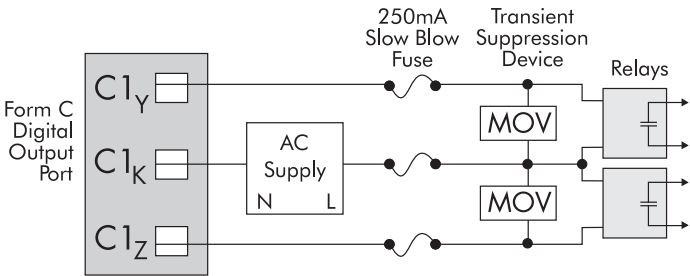
Form C Digital Outputs (Ordering Option)

Internal Digital Input Excitation

Type	Form C outputs (4) C-1, C-2, C-3, C-4 supported through meter
Max Load Voltage	200 VAC/VDC
Max Load Current	100 mA
ON Resistance	30 Ω typical, 50 Ω maximum
OFF Resistance	400M Ω minimum
Isolation	3250 V rms, 60 Hz for 1 minute (to meter) 1000 V rms, 60 Hz for 1 minute (btwn outputs)
Update Rate	20 ms (accuracy = +/- 7 ms) ¹
Signal Type	Continuous or pulse
Precautions	Use a clamping diode for DC supplies Use an MOV for AC supplies Protect with 250 mA slow-blow fuse
Max Output Transition	50 per second
Lifetime	No load = 10,000,000 operations Rated voltage and load = 100,000 operations

¹ Not including communication lag time; state changes occur within 20 ms.

Typical Form C Digital Output Connections



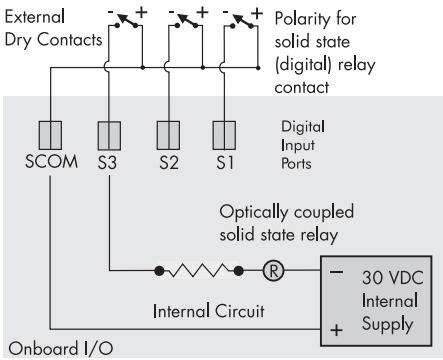
Wire Designation for Digital Outputs

Output	K (Common)	Y (NO)	Z (NC)
C1	Black	Green	White
C2	Blue	Orange	Red
C3	White wire Black marking	Orange wire Black marking	Red wire Black marking
C4	Black wire White marking	Blue wire Black marking	Green wire Black marking

Form A Digital Inputs (Ordering Option)

Internal Digital Input Excitation

Type	Self-excited (internal 30 Vdc supply)
Wire	Use wiring appropriate for the application.
Min. Pulse Width	20 ms
Max. Input Transition Rate	50 per second
Scan Time	20 ms
Timing Resolution	1 ms, with 2 ms accuracy
Inputs	ON for external resistance of 2 k Ω or less OFF for external resistance of 4 M Ω or greater

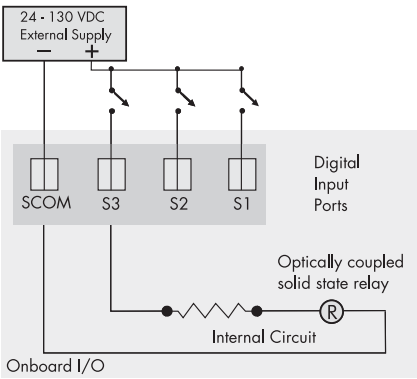


Wire Designation

S1	Green wire White marking
S2	Red wire White marking
S3	Black wire Red marking
SCOM	Blue wire White marking

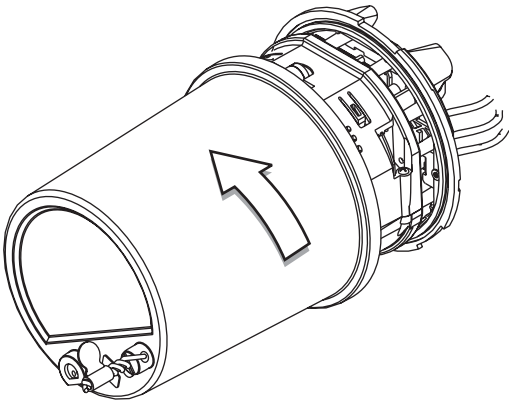
External Digital Input Excitation

Voltage Range	24 to 130 Vdc (external)
Min. Pulse Width	20 ms
Max. Input Transition Rate	50 per second
Scan Time	20 ms
Timing Resolution	1 ms, with 2 ms accuracy
Inputs	ON for external resistance of 2 kΩ or less OFF for external resistance of 20 MΩ or greater

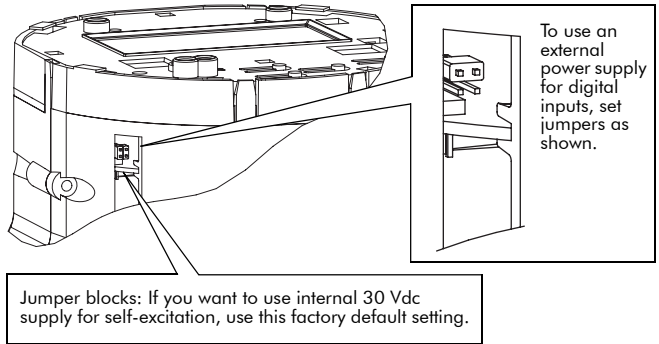


Setting Jumper for External Digital Input Excitation

1. Ensure power supply to meter is not connected.
2. Remove meter cover; remove any anti-tamper sealing devices located at meter's base.
3. Rotate plastic cover 1/4 turn counter-clockwise; pull cover off.



4. Remove one jumper block, and place the other jumper block on pins 2 and 3 of the four-pin header (as shown in diagram).



5. Replace the plastic cover and any anti-tamper sealing.
Onboard I/O internal excitation is now disabled; an external supply can be used for external contacts.

Precautions

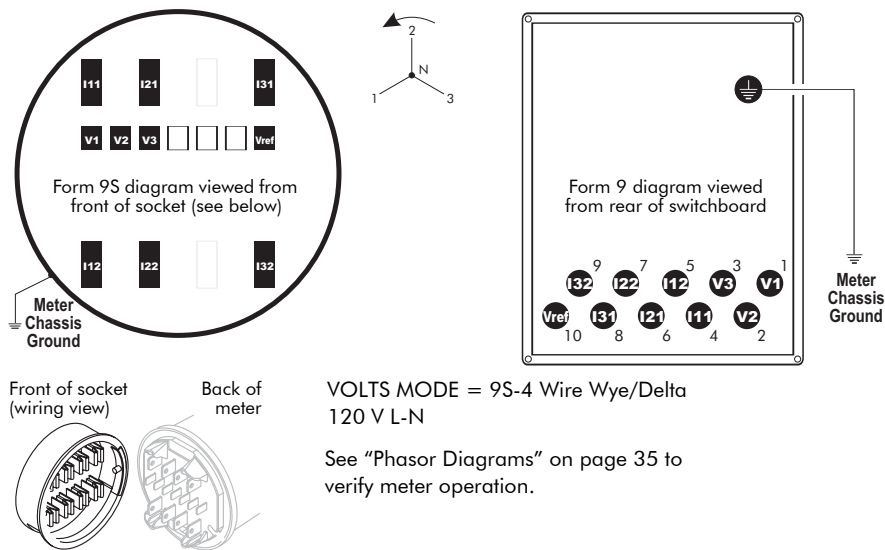
State change latency20 ms (digital output)

40 ms (digital input modules)

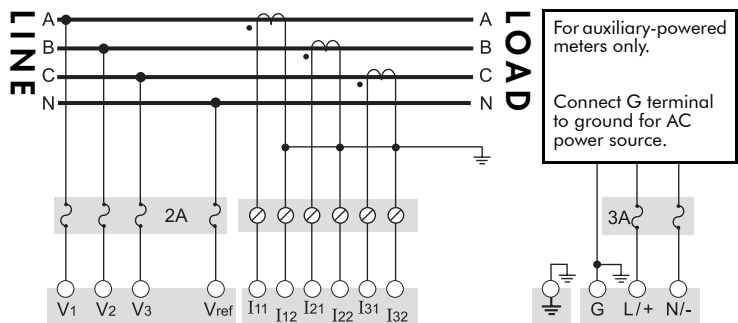
Critical control schemesUse intermediate mechanisms so relay control can be disabled for servicing.

Step 4: Wire the Voltage and Current Inputs

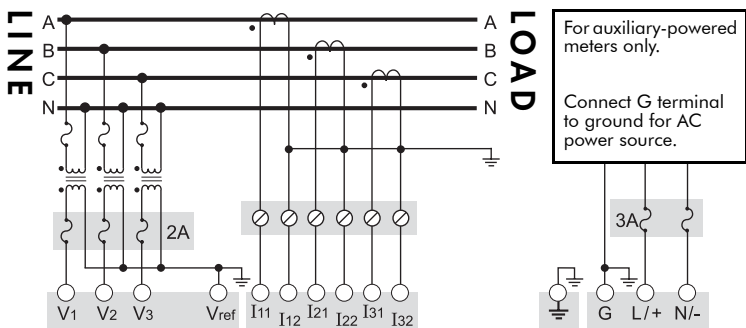
Form 9 and 9S (3 element)



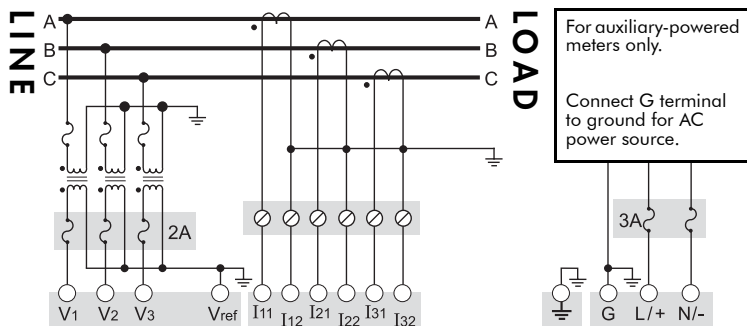
Form 9 and 9S, 4-Wire Wye, no PTs, 3 CTs



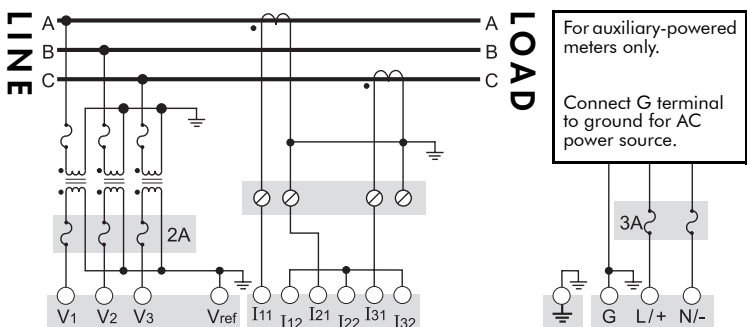
Form 9 and 9S 4-Wire Wye, 3 PTs, 3 CTs



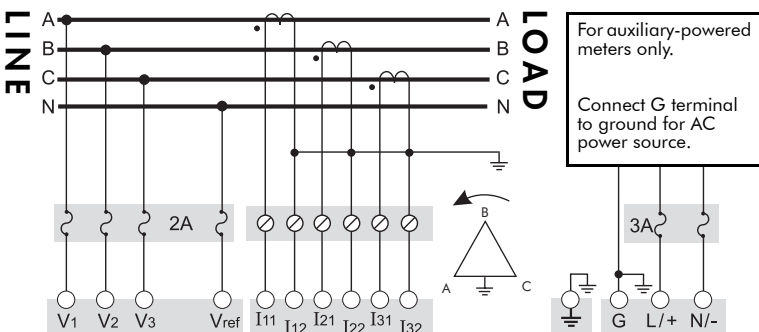
Form 9 and 9S, 3-Wire Wye, 3 PTs, 3 CTs



Form 9 and 9S, 3-Wire Wye, 3 PTs, 2 CTs



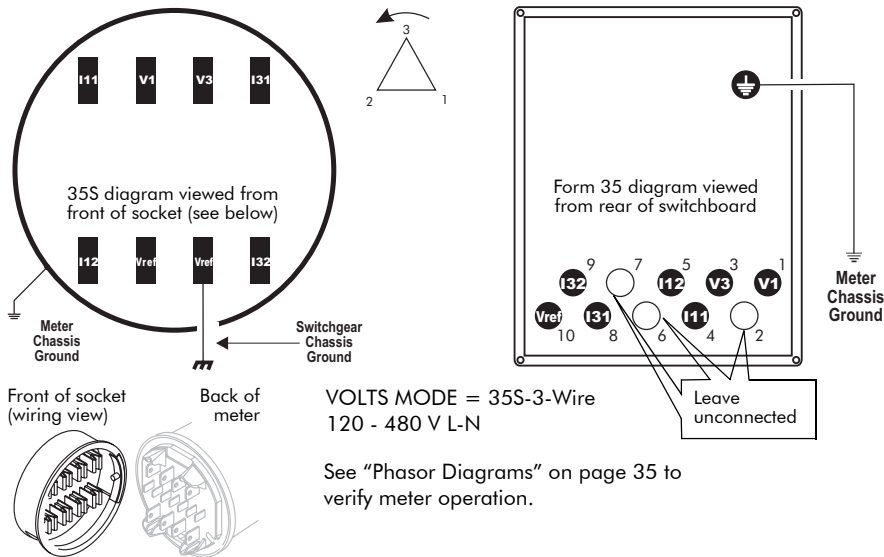
Form 9 and 9S 4-Wire Delta, no PTs, 3 CTs (Red/High Leg Delta)



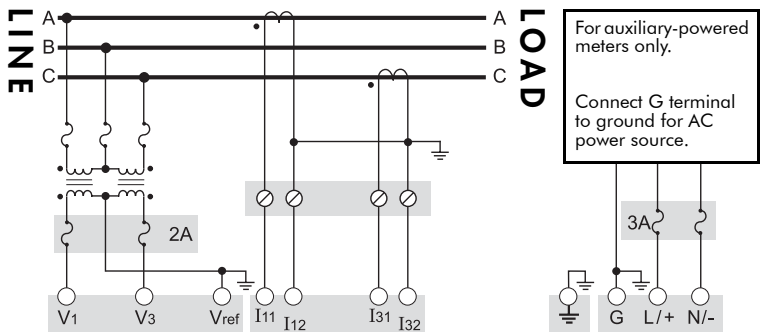
⚠ CAUTION

BEFORE performing an installation using the above 9S, 4-Wire Delta wiring configuration, see the Red/High Leg Delta technical note (available for download from the Power Measurement website) for important details.

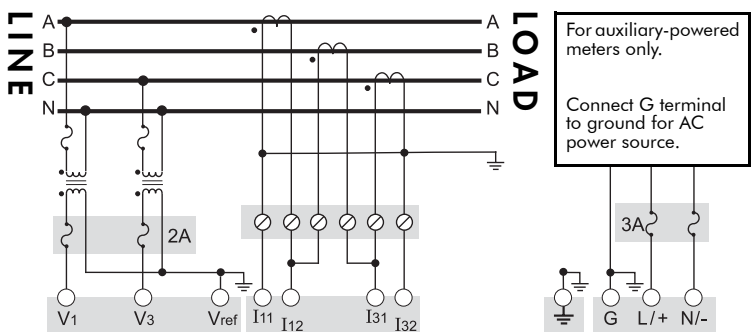
Form 35S (2-element)



Form 35 and 35S 3-Wire Delta, 2 PTs, 2 CTs



Form 35 and 35S, 4-Wire Wye, 2 PTs, 3 CTs*

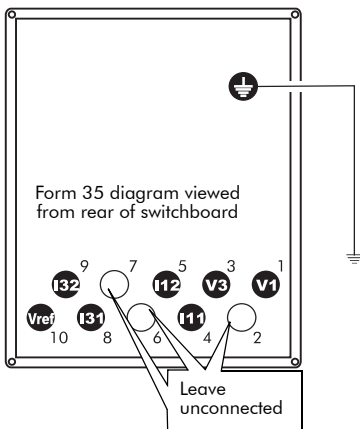
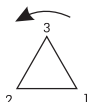
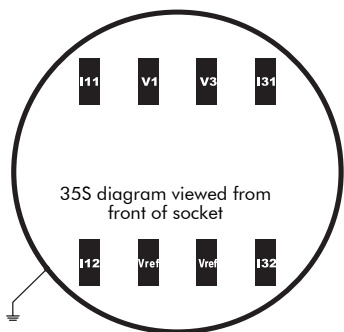


* This configuration can affect some of the meter's parameter calculations. Contact Power Measurement for details.

Form 35 and 35S, 3-Wire Delta, No PTs, 2 CTs

CAUTION

The pinout silhouette below is specific to **Form 35S, 3-Wire Delta, No PTs, 2 CTs**. Ensure Vref is **not** connected to ground.

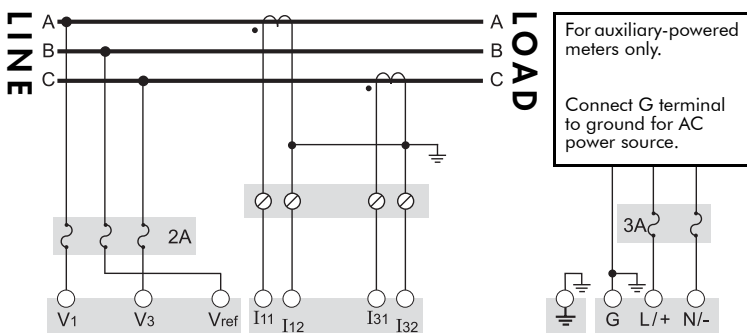


See "Phasor Diagrams" on page 35 to verify meter operation.

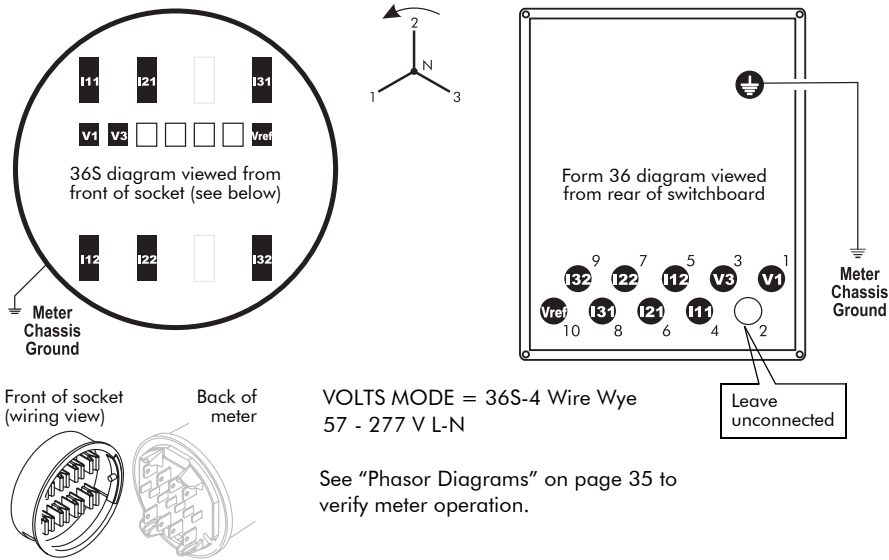
VOLTS MODE = 35S-3-Wire
120 - 480 V L-N

NOTE

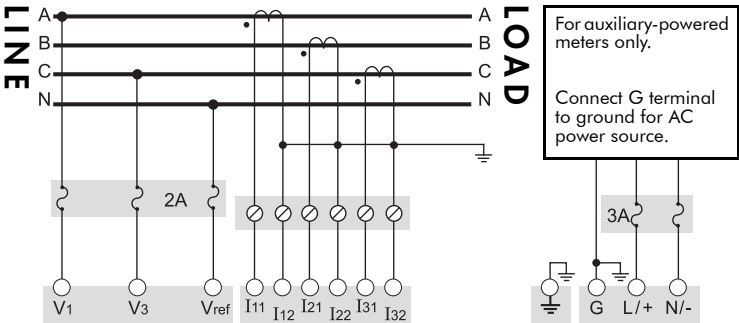
This configuration can be used without PTs **provided voltage specifications are within the acceptable range**. Acceptable values differ for blade powered and auxiliary powered meters. See "Step 6: Wire the Power Supply" on page 30 for these values.



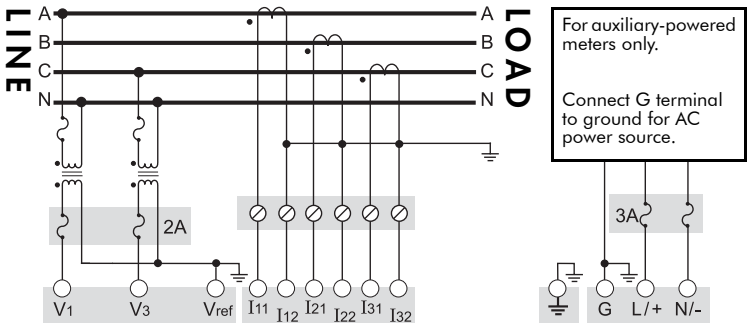
Form 36 and 36S (2½-element)



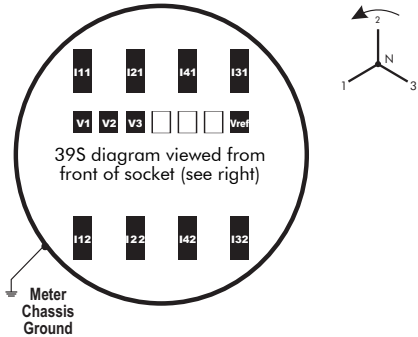
Form 36 and 36S, 4-Wire Wye, no PTs, 3CTs



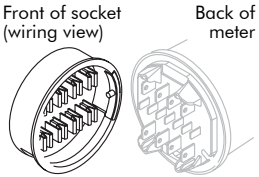
Form 36 and 36S 4-Wire Wye, 2 PTs, 3 CTs



Form 39S (3 element; I4 optional)

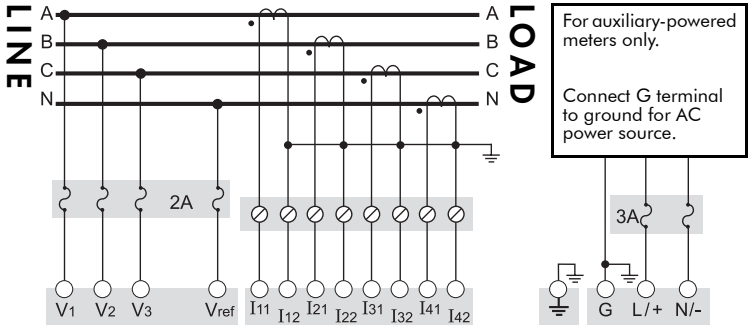


See “Phasor Diagrams” on page 35 to verify meter operation.

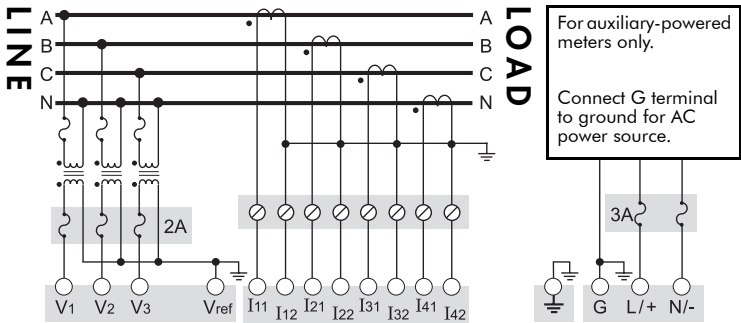


VOLTS MODE = 9S 4 Wire Wye/Delta
57 - 277 V L-N
I4 optional input for ION 8400 / ION 8500 meters only

Form 39S 4-Wire Wye, no PTs, 4 CTs

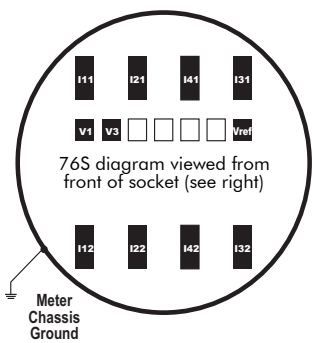


Form 39S 4-Wire Wye, 3 PTs, 4 CTs

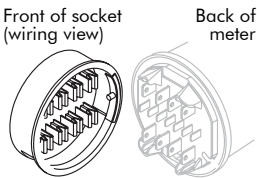


VOLTS MODE = 9S 4 Wire Wye/Delta
I4 optional input for ION 8400 / ION 8500 meters only

Form 76S

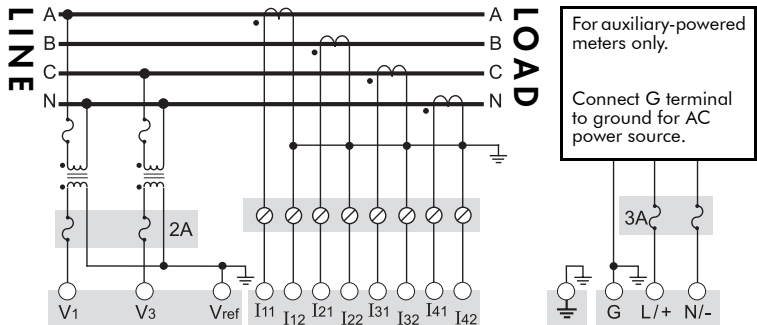


See “Phasor Diagrams” on page 35 to verify meter operation.



VOLTS MODE = 36S 4 Wire Wye
57 - 277 V L-N
I4 optional input for ION 8400 / ION 8500 meters only

Form 76S 4-Wire Wye, 2 PTs, 4 CTs



Protect all phase voltage sense leads by breakers or fuses at the source. All voltage connections to the meter must be fused with a 2A slow-blow fuse.

Voltage Inputs

Inputs (9S/39S)	Va, Vb, Vc, Vref
(35S)	Vab, Vcb, Vref
(36S/76S)	Va, Vc, Vref
Connector Type	Ring or split ring connector
Wire	3.3 to 2.1 mm ² (12 to 14 AWG)
Steady Ste (9S/36S/39S/76S)	Standard 57-277 (+/-15%) VLN rms ¹
Overload (9S/36S/39S/76S)	120 - 277 (+/-20%) VLN rms (standard) for 6 hours max ¹ 57.7 - 69.3 (+/- 20%) VLN rms (low voltage) for 6 hours max ¹
Steady State (35S)	120 - 480 (+/-15%) VLL rms ¹
Overload (35S)	120 - 480 (+/- 20%) VLL rms for 6 hours max ¹
Dielectric Withstand	2500 Vrms, 60 Hz for 60 s
Surge Withstand	6 kV peak (1.2/50 uS) voltage surge L-L and L-GND
Input Impedance	5 MΩ per phase (phase - Vref)

¹ Specifications are limited by the operating range of the power supply if a non-aux power supply is used.

Current Inputs: Low Current Option

Inputs	Ia, Ib, Ic, (I neutral - 39S/76S only)
Connector Type	Ring or split ring connector
Wire Gauge	3.3 to 2.1 mm ² (12 to 14 AWG)
Starting Current	0.001 A RMS
Input Rating	1/10A RMS (In= 1A or 2A, Imax=10A)
Overload	50 A RMS for 1 s, non-recurring
Max. Voltage	600 V RMS (CAT III IEC61010-1)
Surge Withstand	6kV peak (1.2/50 uS) voltage surge L-L and L-GND Common and Transverse modes
Burden	0.05 VA per phase at 1 A (switchboard)

Current Inputs: Standard

Inputs	Ia, Ib, Ic, I neutral (39S/76S only)
Connector Type	Ring or split ring connector
Wire Gauge	3.3 to 2.1 mm ² (12 to 14 AWG)
Starting Current	0.005 A RMS (I _n =1 A; I _{max} =20 A)
Overrange	to 50A RMS
Input Rating	0.05/20A RMS
Overload	500 A RMS for 1 s, non-recurring
Surge Withstand	6 kV peak (1.2/50 μ S) voltage surge L-L and L-GND Common and Transverse modes
Burden	0.20 VA per phase at 5 A (switchboard) 0.05 VA per phase at 5 A (all socket mounts)

Current Inputs: Extended Current Range Option

Inputs	Ia, Ib, Ic (I neutral - 39S/76S only)
Connector Type	Ring or split ring connector
Wire Gauge	3.3 to 2.1 mm ² (12 to 14 AWG)
Starting Current	0.001 A RMS (I _n =1A, 2A or 5A; I _{max} =20A)
Overrange	to 50 A RMS
Input Rating	0.01/24 A RMS
Overload	500 A RMS for 1 s, non-recurring
Surge Withstand	6 kV peak (1.2/50 μ S) voltage surge L-L and L-GND Common and Transverse modes
Burden	0.05 VA per phase at 5 A (all socket mounts)



NOTE

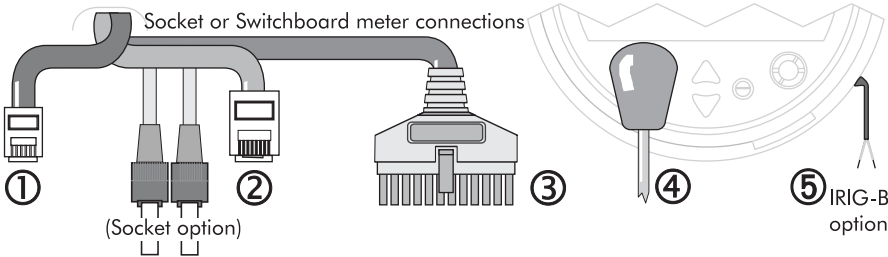
Set up for Volts Mode is included with each wiring diagram. Refer to “Step 8: Set Up Meter Using the Front Panel” on page 31 to learn how to set up Volts Mode on the meter.

Using Potential Transformers

System Mode	Voltage Range	Requires PTs
Wye	120 VAC L-N or 208 VAC L-L	no
	277 VAC L-N or 480 VAC L-L	no
	347 VAC L-N or 600 VAC L-L	no
	over 347 VAC L-N or 600 VAC L-L	yes
Single Phase	120 VAC L-N or 240 VAC L-L	no
	277 VAC L-N or 554 VAC L-L	no
	over 277 VAC L-N or 554 VAC L-L	yes
Delta	up to 600 VAC L-L	no ¹
	over 600 VAC L-L	yes

¹ See “Form 35 and 35S, 3-Wire Delta, No PTs, 2 CTs” on page 19 for details.

Step 5: Wire the Communications



① RJ11 or RJ31
Optional Modem RJ11 or RJ31 on COM2
FCC part 68 telephone cord

RJ11 (6 pin)
Pin 3 = Ring (RJ11)
Pin 4 = Tip (RJ11)

RJ31 (8 pin)
Pin 1 = Ring (out): connect to other device
Pin 4 = Ring (in): from telephone co.
Pin 5 = Tip (in): from telephone co.
Pin 8 = Tip (out): connect to other device

② RJ45
10Base-T (RJ45) Category 3 UTP (min.)
Pin 1 = Transmit Data +
Pin 2 = Transmit Data -
Pin 3 = Receive Data +
Pin 6 = Receive Data -
IP Service Ports:
ION = 7700
Modbus RTU = 7701
Modbus TCP = 502
EtherGate COM1 = 7801
EtherGate COM2 = 7802
DNP/TCP = 20,000

③

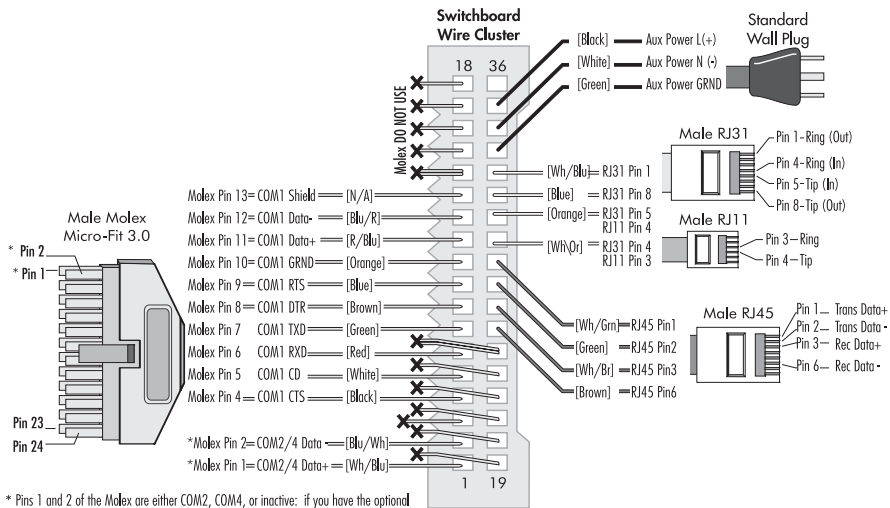
PIN	DCE	Description
1	--	Not connected
2	TXD	Transmit (out)
3	RXD	Receive (in)
4	--	Not connected
5	GND	Ground
6	DTR	Terminal Ready
7	CTS	Clear to send
8	RTS	Request to send
9	--	Not connected

COM1: RS-232 or RS-485
COM2/4: RS-485
Pair (COM1)
White = RS-485 COM1 Data +
Black = RS-485 COM1 Data -
Pair 2 (COM2/4)
Red = RS-485 COM2/4 Data +
Black = RS-485 COM2/4 Data -
Both pairs share shield

④
Optical port on COM3
Unit ID = 102
BAUD default = 9600 bps
RTS delay = 0.010 (interval)
Default protocol = ION

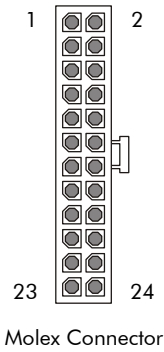
⑤ 10Base-FL (Fiber)
BLUE (Tx) → TO Rx (female)
BLACK (Rx) → TO Tx (female)
Wire = 62.5/125 multimode fiber optic
Length = 68.6mm (27 in)
Connector type = ST (male)
Max Length = 2000m (6562 ft)
Data Rate = 10 Mbps
Isolation = Optical
Attach male blue (Tx) to receive (Rx)
Attach male black (Rx) to transmit (Tx)
Optional IRIG-B
Red = + Black = -
Wire = twisted pair
22 AWG (0.33 mm²)
Nom Voltage = 5Vdc ±10%
Max Voltage = 8 Vdc

Switchboard Meter Wire Cluster



* Pins 1 and 2 of the Molex are either COM2, COM4, or inactive: if you have the optional COM4 port, these pins are COM4; if you do not have the optional COM4 port, and have the internal modem, these pins are inactive; otherwise, these pins are COM2. Check the Communications LEDs on the side of your Type 8500 to see which options are on your meter.

Molex Pin Assignments



Pin	Wire Colors	Function
1	White/Blue	COM 2 Data+ or COM 4 Data+ or inactive
2	Blue/White	COM 2 Data- or COM 4 Data- or inactive
3	Black/Blue	For I/O Expander—Do not Use
4	Black	COM 1 RS-232 CTS
5	White	COM 1 RS-232 CD
6	Red	COM 1 RS-232 RXD
7	Green	COM 1 RS-232 TXD
8	Brown	COM 1 RS-232 DTR
9	Blue	COM 1 RS-232 RTS
10	Orange	COM 1 RS-232 Ground (isolated)
11	Red/Blue	COM 1 RS-485 Data+
12	Blue/Red	COM 1 RS-485 Data -
13	N/A	Common RS-485 Shield
14	Two wires: Black/Orange, Black/Green	N/A – Do not Use
15	White/Orange	
16	Orange/White	
17	White/Green	
18	Green/White	
19	White/Brown	
20	Brown/White	
21	White/Grey	
22	Grey/White	
23	Red/Blue	
24	Two wires: Red/Orange, Red/Green	

Communications Options

Standard = Selectable RS-232 or RS-485 (COM1), High Speed RS-485 (COM2), ANSI 12.13 Type II Optical (COM3)

Socket meters are available with either Fiber **or** Ethernet, not both.

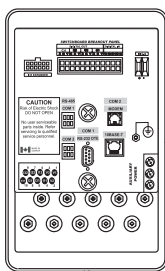
ION 8500/ION 8400

	COM1	COM2	COM3	COM4	Network	IRIG-B
RS-232	•					
RS-485 ¹	•	Not available if the internal modem option is present on this port.		– Only available if the internal modem is ordered for COM 2. – Not available with Ethernet.		• available on all ION 8000 series meters.
Optical Port			•			
Ethernet					Not available if the RS-485 option is present on COM 4.	
Fibre ²					Available with Onboard I/O provided no Outage Dialback is present.	
EtherGate	•	Not available if the internal modem option is present on this port.				
Internal Modem		•				
Modem-Gate	•			•		

¹ Screw terminal blocks.

² Socket only.

Optional Switchboard Breakout Panel



Connector Type	Available	Comments
RS-485 ¹	Yes	Captured wire
RS-232	Yes	DB9
RJ31 Modem (option)	No	
Modem	Yes	
Ethernet	Yes	
Fiber	No	Socket option only
Onboard I/O expansion	Yes	If meter has optional onboard expansion I/O card
IRIG-B	Yes	If meter has optional IRIG-B feature
Auxiliary Power	Yes	If meter includes one of the Auxiliary Power Options

¹ Spring cage terminal blocks. Push a small screwdriver into the smaller hole of the terminal to create access for the incoming wire. Insert the wire and remove the screwdriver to clamp the spring on the wire.

NOTE

COMs on the I/O box are not connected. Use the RS-485 and RS-232 provided on the breakout panel.

ION 8300

	COM 1	COM 2	COM 3	Network	IRIG-B
RS-232	Not available if Ethernet ordered with internal modem option on COM 2 (Ethernet uses COM1)				
RS-485	Not available if Ethernet ordered with internal modem option on COM2 (Ethernet uses COM1)	– Not available if internal modem option on this port – Not available if Ethernet option ordered with selectable RS-232 and RS-485 on COM 1 (Ethernet uses COM2)			• available on all ION 8000 series meters.
Optical Port			•		
Ethernet				• Uses COM1 when internal modem option on COM 2 – Uses COM2 when selectable RS-232 and RS-485 on COM1	

	COM 1	COM 2	COM 3	Network	IRIG-B
Fibre ¹				Available with Onboard I/O provided no Outage Dialback is present.	
EtherGate		Not available if internal modem option on this port			
Internal Modem					
Modem-Gate					

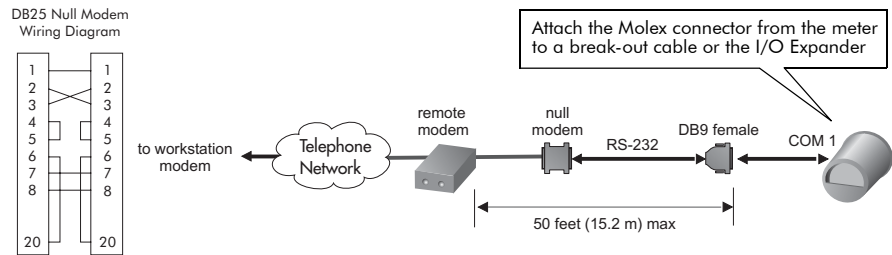
¹ Socket meter only.

Optional IRIG-B GPS Time Synchronization

IRIG-B cannot be configured via the meter’s front panel. See the IRIG-B Product Option document for configuration procedures.

External Modem Connections

Connect COM 1 (RS-232) to a remote modem connected to a PC. Use a null-modem RS-232 cable to connect meter to an external modem. One end of the cable must be equipped with a Micro-Fit 3.0 Molex female connector for mating with the meter’s Molex male connector.



Use an RS-232 to RS-485 converter (such as COM32 or COM128) to connect multiple meter COM1 ports (selected as RS-485) to remote modem.

Step 6: Wire the Power Supply

Type	Captured wire connector
Wire	3.3 to 2.1 mm ² (12 to 14 AWG)
Rated Inputs	85-240 VAC ±10% (47-63 Hz), or 110-330 VDC ±10%
Dielectric Withstand	2500 VAC RMS, 60 Hz for 60 s
Burden	20 VA max. (10 VA typical)
Ride-through	100 ms (6 cycles @ 60 Hz) min.

Power Supply Specifications

Standard power supply (120 to 277 VAC): the meter is powered up when the voltage inputs are applied in Step #7.

Standard low voltage power supply (57 to 70 VAC): the meter is powered up when the voltage inputs are applied in Step #7.

Regular auxiliary power pigtail (160 to 277 VAC): connect the power plug to the 160 to 277 VAC source or the 200 to 350 VDC source.

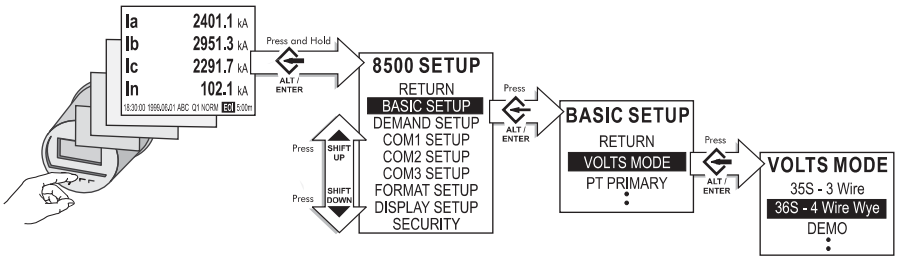
Low voltage auxiliary pigtail (65 to 120 VAC): connect the power plug to the 65 to 120 VAC source or the 80 to 160 VDC source.

Step 7: Power Up the Meter

1. Close the PT fuses (or direct voltage input fuses).
2. Open the CT shorting blocks.
3. Apply power to the meter.

Step 8: Set Up Meter Using the Front Panel

Press and hold the **Alt/Enter** button for three (3) seconds to access Basic Setup. This example shows volts mode setup using the meter front panel.



Set up the following:

Menu	Setting	Description	Range (Values)	Default
Basic Setup	Volts Mode	The power system's configuration – WYE, DELTA, etc.	9S 4W-WYE/DELTA 35S 3 Wire 36S 4 W-WYE DEMO	4W-WYE
	PT Primary	The Potential Transformer's primary winding voltage rating	1 to 999,999,999	120
	PT Secondary	The Potential Transformer's secondary winding voltage rating	1 to 999,999,999	120
	CT Primary	The Current Transformer's primary winding current rating	1 to 999,999,999	5
	CT Secondary	The Current Transformer's secondary winding current rating	1 to 999,999,999	5
	I4 CT Primary	Primary rating for the I4 current transformer (if available)	1.0 - 999,999.00	5
	I4 CT Secondary	Secondary rating for the I4 current transformer (if available)	1.0 - 999,999.00	5
	VA Polarity	The polarity of the Potential Transformer on VA	Normal or Inverted	Normal
	VB Polarity	The polarity of the Potential Transformer on VB	Normal or Inverted	Normal
	VC Polarity	The polarity of the Potential Transformer on VC	Normal or Inverted	Normal
	IA Polarity	The polarity of the Current Transformer on IA	Normal or Inverted	Normal
	IB Polarity	The polarity of the Current Transformer on IB	Normal or Inverted	Normal
	IC Polarity	The polarity of the Current Transformer on IC	Normal or Inverted	Normal
	I4 Polarity	The polarity of the Current Transformer on I4	Normal or Inverted	Normal
	Phase Rotation	Power system's phase rotation	ABC, ACB	ABC
Demand	SWD Subinterval	Intervals used to compute your Sliding Window Demand values	1 - 5940	600
	SWD # Subintervals	The number of SWD periods in use	10 -15	3
	SWD Pred Resp		0.00 - 99.00	70
	TD Interval		60 - 5940	900
	TD time const		1.00 - 99.00	90

Menu	Setting	Description	Range (Values)	Default
COM1	Protocol	Specifies which protocol is active	ION, Modbus RTU, Modbus Master, DNP v3.00, ModemGate, GPS: Truetime/Datum GPS: Arbiter GPS: Arbiter/Vorne Factory EtherGate	ION
	Baud Rate	Specifies COM port baud rate during serial communications	300 - 115200	9600
	Transmit Delay	Specifies the meter's transmit delay setting	0 - 1.0	0.01
	Unit ID	Identifies the meter during serial communications	1 to 9999	From serial number ¹
	RS-232 or RS-485	Specifies RS-232 or RS-485	RS-232, RS-485	RS-232
	Handshake	Specifies if hardware flow control is used during RS-232 communication	RTS with delay RTS/CTS	RTS with delay
COM2	Protocol	Specifies which protocol is active	ION, Modbus RTU, Modbus Master, DNP v3.00, ModemGate, GPS: Truetime/Datum GPS: Arbiter GPS: Arbiter/Vorne Factory EtherGate	ION
	Unit ID	Identifies the meter during serial communications	1 to 9999	From serial number ¹
	Baud Rate	Specifies COM port baud rate during serial communications	300 - 115200	9600
	Transmit Delay	Specifies the meter's transmit delay setting	0 - 1.0	0.01
COM3	Protocol	Specifies the active communications protocol	ION, Modbus RTU, Modbus Master, DNP v3.00, GPS: Truetime/Datum GPS: Arbiter GPS: Arbiter/Vorne Factory	ION
	Unit ID	Identifies the meter during communications	1 to 9999	
	Baud Rate	Specifies baud rate during serial communications	300 - 115200	9600
COM4 ²	Protocol	Specifies the active communications protocol	ION, Modbus RTU, Modbus Master, ModemGate, DNP v3.00, GPS: Truetime/Datum GPS: Arbiter GPS: Arbiter/Vorne Factory	ION
	Unit ID	Identifies the meter during communications	1 to 9999	
	Baud Rate	Specifies baud rate during serial communications	300 - 115200	9600

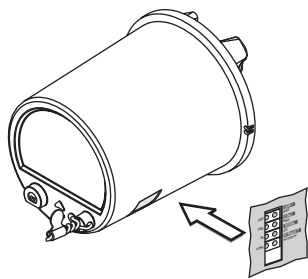
Menu	Setting	Description	Range (Values)	Default
Network Setup	IP Address	Specifies TCP/IP Ethernet address	000.000.000.000 to 999.999.999.999	None
	Subnet Mask	Specifies Subnet Mask	0.0.0.0 to 255.255.255.0	None
	Gateway	Specifies Ethernet gateway (if used)	000.000.000.000 to 999.999.999.999	None
	IP Boot Option	Specifies IP Boot Option	Manual, BootP	Manual
	SMTP Server	Specifies location of SMTP Server	000.000.000.000 to 999.999.999.999	None
	SMTP Timeout	Specifies connection timeout for the SMTP Server	1 - 60 minutes	1 minute
Security	Modify Passwd	Modifies standard password	0 - 999,999,999	0
	Disable Security	Disables meter security	Proceed	Enabled
	Web Config	Allow configuration through webserver interface	Disabled, Enabled	Enabled

Notes

- ¹ The factory set Unit ID for this port is based on the serial number of the meter. For example: Serial number: PABC-0009A263-10; Unit ID: 9263.
- ² ION 8400, ION 8500 only.

Step 9: Verify Meter Operation

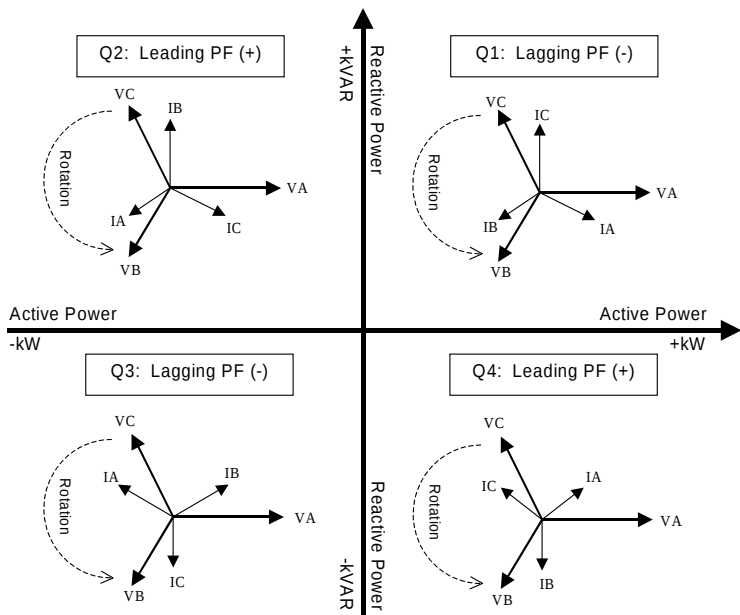
The LEDs on the side of the meter flash during communications.



Phasor Diagrams

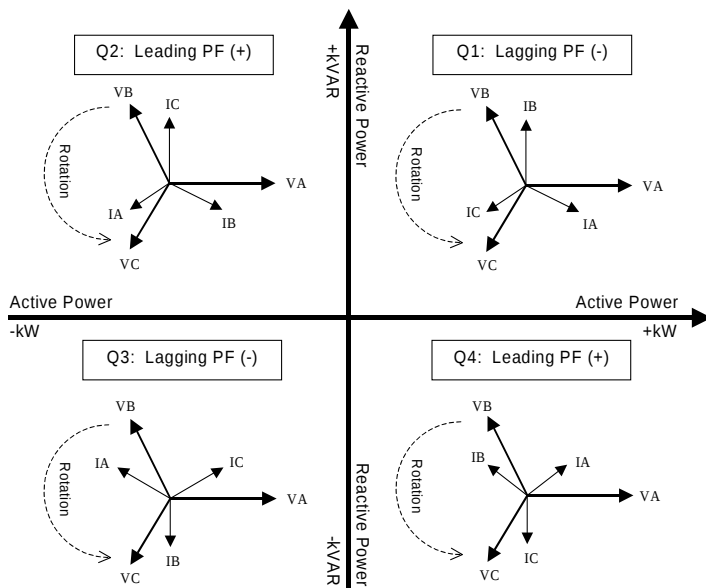
WYE - ABC Rotation

Applicable Volts Mode: 9S, 4W Wye/Delta and 36S, 4W Delta



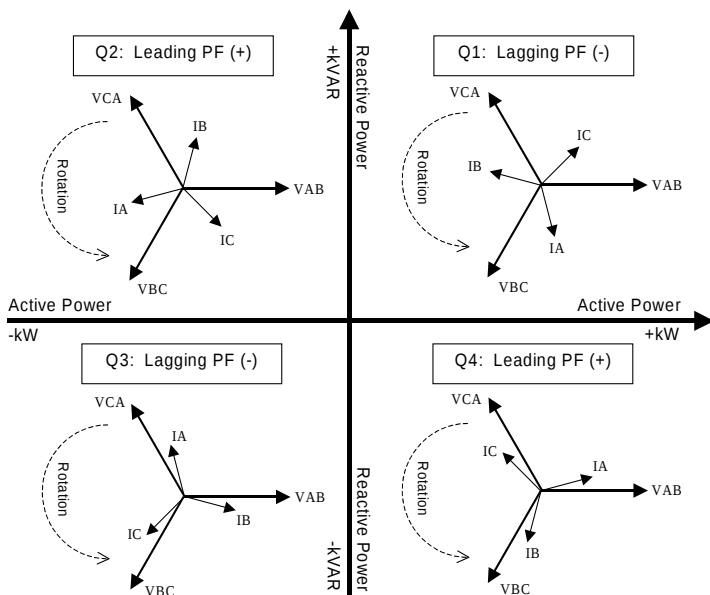
WYE - ACB Rotation

Applicable Volts Mode = 9S 4W Wye/Delta and 36S 4W WYE



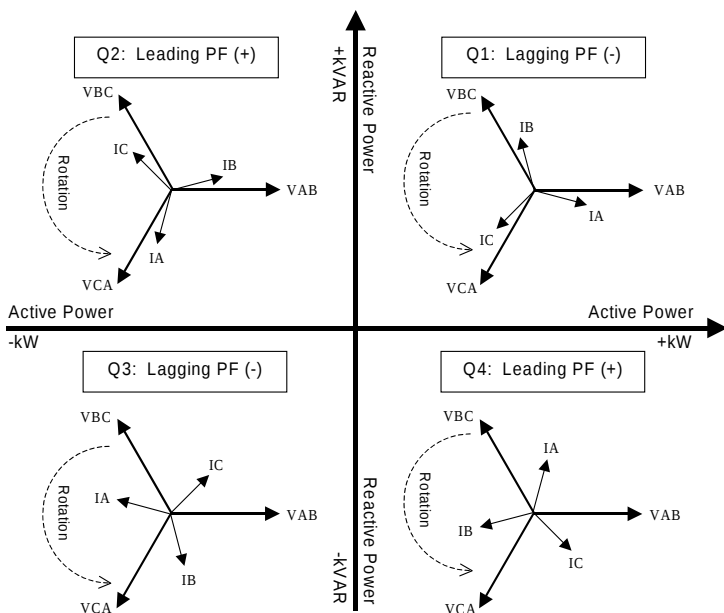
3 Wire Delta - ABC Rotation

Applicable Volts Mode = 35S 3Wire



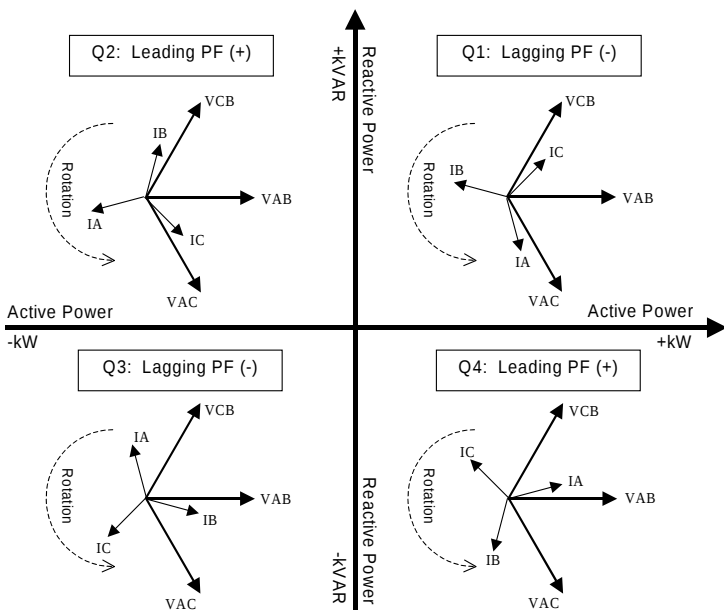
3 Wire Delta - ACB Rotation

Applicable Volts Mode = 35S 3-Wire



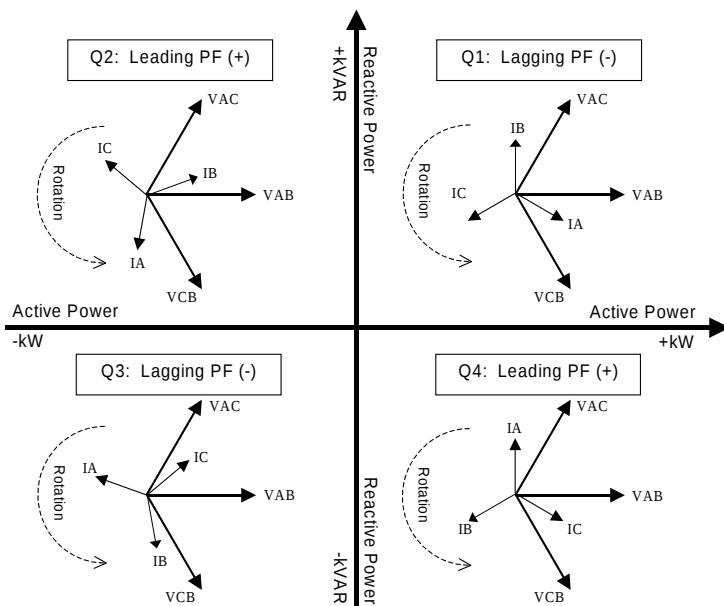
2 Element (3 Wire) Delta - ABC Rotation (2 PT, 3CT)

Applicable Volts Mode = 35S 3 Wire (firmware versions v22x to v24x)



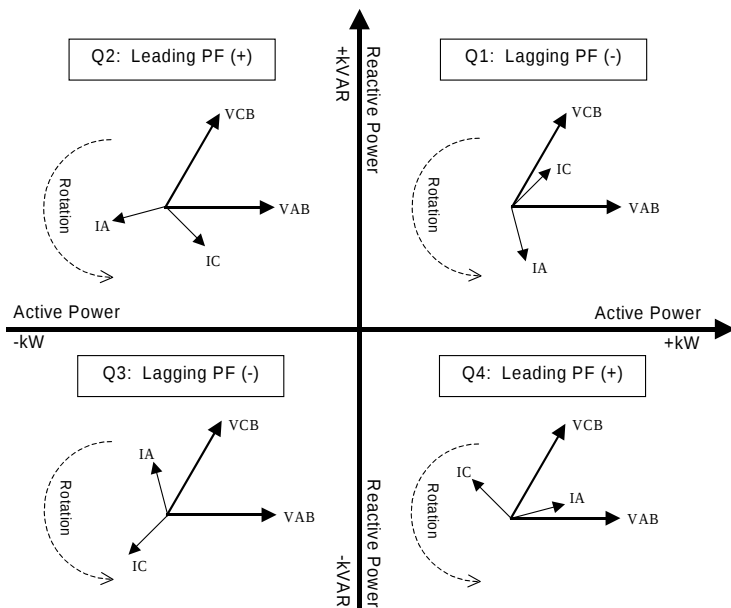
2 Element (3 Wire) Delta - ACB Rotation (2 PT, 3CT)

Applicable Volts Mode = 35S 3 Wire (firmware versions v22x to v24x)



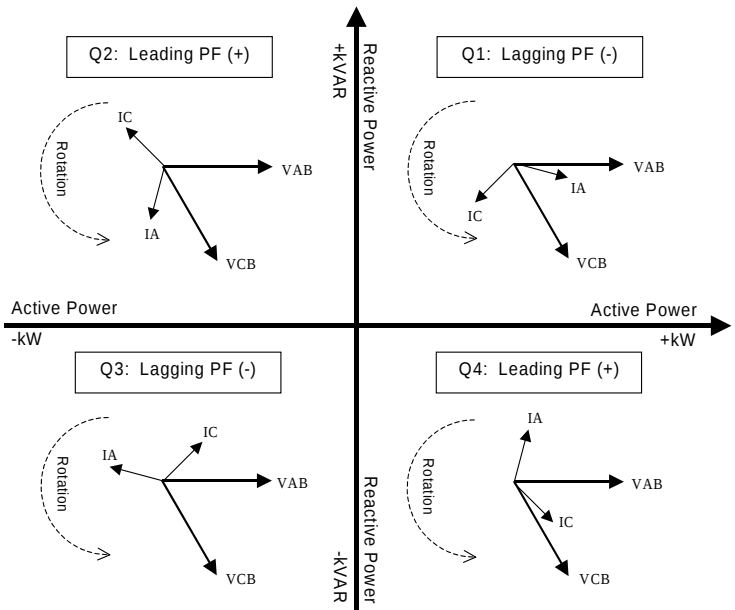
2 Element (3 Wire) Delta - ABC Rotation (2 PT, 2CT)

Applicable Volts Mode = 35S 3 Wire (firmware versions previous to v22x)

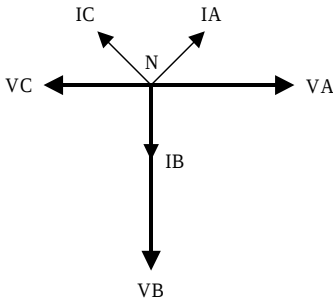


2 Element (3 Wire) Delta - ACB Rotation (2 PT, 2CT)

Applicable Volts Mode = 35S 3 Wire

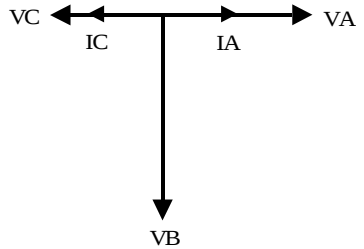


4 Wire Delta (High/Red Leg Delta)



ION Meter Phasor diagram in 9S / 4WYE mode at UNITY PF.

Assuming 3PH phase load is dominant.



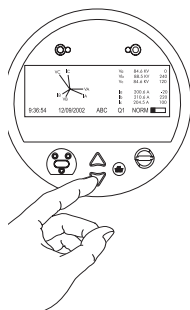
ION Meter Phasor diagram in 9S / 4WYE mode at UNITY PF.

3PH DELTA load is off. Only single phase load.

Step 10: View Meter Data

NORM mode

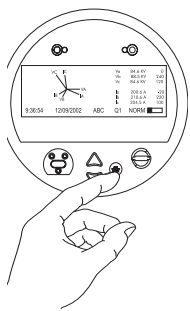
Use the **Up** and **Down** buttons to scroll through **NORM** mode display screens.



NORM Screen	Contents
kWh	kWh delivered/received
kVARh	kVARh delivered/received
kVAh	kVAh delivered/received
Peak Demand Delivered	Maximum delivered kW value (timestamped)
Peak Demand Received	Maximum received kW value (timestamped)
Peak Demand Reset	Number of Demand Resets (timestamped)
Q Metering	Approximated VARh measurements
Disk Simulator	Simulates mechanical watt-hour meter disk
All Segments	Black screen to indicate functioning display

ALT mode

Press the **Alt/Enter** button once for **ALT** display modes. Press the **Up** or **Down** buttons to scroll through displays.



ALT Screen	Contents
Name Plate 1	Owner, firmware version, TAG 1 & 2
Name Plate 2	Sliding window, thermal demand settings
Event Log	Most recent high priority (255) events
Vector Diagram	Phasors and values for phase current/voltage
Instantaneous Voltage	Average voltage, L-N or L-L
Instantaneous Current	Phase current, average current
Instantaneous Power	kW total, kVAR total, kVA total, power factor
Instantaneous Demand	kW delivered/received
Voltage Harmonics (3 screens)	Per-phase voltage harmonic histograms
Current Harmonics (3 screens)	Per-phase current harmonic histograms
Availability	Number of nines measurement
Instantaneous Demand	kW td delivered/received

	TOU Display Screens	Contents
	TOU Energy by Rate	kWh delivered values for each TOU rate
	kW Peak Demand	Maximum kW delivered for each TOU rate
	Previous Billing Energy	kWh delivered in PB
	Prev Billing Peak Demand	Maximum kW delivered in PB
	Previous Season Energy	kWh delivered for each TOU rate in PB
	Prev Season Peak Demand	Max kW delivered for each TOU rate in PB
	Prev Billing/Season Energy	kWh delivered/received in PB & billing season
	Prev Bill/Season Pk Dem	Max kW sd received from PB & billing season
	Prev Billing/Season Energy	kVARh del/rec in PB & billing season
	Prev Bill/Season Pk Demand	kVAR del/rec in PB & billing season
	Prev Billing/Season Energy	kVAh del/rec from PB & billing season
	Pre Bill/Season Pk Demand	kVA del/rec in PB & billing season
	Active TOU Rate	Active TOU billing rate
	Active TOU Season	Active TOU billing season
	Flicker	Flicker measurements from V1, V2 & V3
	Frequency	Frequency information



NOTE

PB = Previous Billing period.

TEST Mode

TEST Screen	Contents
kWh Test	TEST mode kWh delivered/received
kVARh/KVAh Test	TEST mode kVARh/KVAh delivered/received
Instantaneous Demand Test	TEST mode kW delivered/received

To Enter TEST Mode

Meter Type	Method
Standard Meter (no hardware lock)	Use ION software
	Remove outer cover and press TEST mode button (see "Meter Overview" on page 6)
Hardware Locked Meter	Remove outer cover and press TEST mode button (see "Meter Overview" on page 6)



NOTE

The meter always returns to NORM mode after exiting TEST mode.

For further assistance
please contact us at:



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