POWER MEASUREMENT

creator of ION® technology

Installation and Basic Setup Instructions

ION® 7700

Notices

For further assistance
please contact us at:

POWER MEASUREMENT

Worldwide Headquarters
2195 Keating Cross Road
Saanichton, BC
Canada V8M 2A5
Tel: 1-250-652-7100
Fax: 1-250-652-0411
Email: support@pwrm.com

www.pwrm.com

Printed in Canada
Revision Date: Mar. 7, 2006
70000-0108-06

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 7700 ION 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 7700 ION 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 7700 ION 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 7700 ION meter for the maximum voltage level the device can withstand.

⚠ CAUTION

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

- The 7700 ION meter offers a range of hardware options that affect input ratings. The 7700 ION 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 7700 ION 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 7700 ION optional internal modem is 0.6. Connection to the 7700 ION internal modem should be made via an FCC Part 68 compliant telephone cord (not supplied). The 7700 ION 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 Services

Standards Compliance

International	The 7700 ION is operable under Pollution Degree II Measuring inputs comply with Installation Category III Power Supply inputs comply with Installation Category II All inputs pass ANSI/IEEE C37.90-1989 surge withstand and fast transient tests
UL	UL listed UL 3111-1
CSA	CAN/CSA-C22.2 No.142-M1987 and CAN/SCSA-C22.2 No.1010.1-95
LVD	Registered under CB Scheme to EN61010-1:1995
EMC	EN50081-2:1994 and EN50082-2:1995
FCC	Part 15 of FCC Rules for a Class A Digital Device

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.

Regardless of whether any remedy set forth herein fails of its essential purpose, except to the extent the following limitation is prohibited by applicable law, Power Measurement shall not, in any event or under any legal claim or theory (whether based on contract, indemnity, warranty, tort (including negligence and strict liability) or otherwise), be liable to the original purchaser or any other person or entity for special, indirect, incidental, punitive, liquidated, special or consequential damages whatsoever with respect to any purchased product, including, without limitation, business interruption, loss of use, profit or revenue, even if Power Measurement has been advised of the possibility of such damages. To the extent that a limitation or exclusion of consequential damages are prohibited by applicable law, then Power Measurement's liability shall be limited to twice the amount of the relevant purchased product.

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

For product or service warranty information, please refer to the applicable "Power Measurement Terms and Conditions of Sale - Equipment" or "Power Measurement Terms and Conditions of Sale - Services" at the following internet address:

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

Covered by one or more of the following patents:

U.S. Patent No's 6825776, 6813571, 6798191, 6798190, 6792364, 6792337, 6751562, 6745138, 6737855, 6694270, 6687627, 6671654, 6671635, 6615147, 6611922, 6611773, 6563697, 6493644, 6397155, 6186842, 6185508, 6000034, 5995911, 5828576, 5736847, 5650936, D459259, D458863, D443541, D439535, D435471, D432934, D429655, D429533, D427533.

Document Revision History

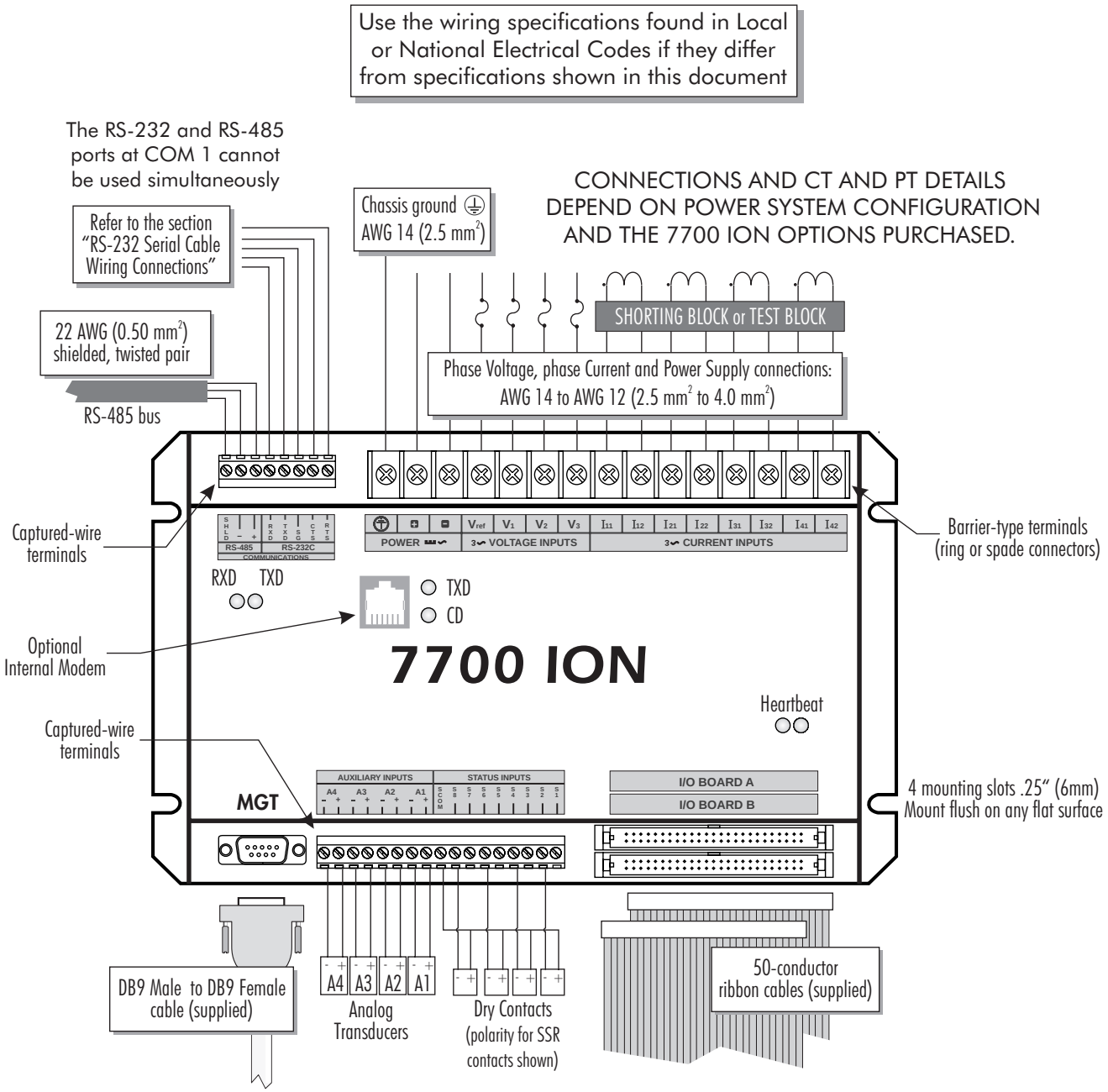
Revision	Date	Description of Changes
02	February 17, 2000	Minor corrections to front matter
03	June 27, 2002	Operating spec change, page 4
04	August 11, 2003	Wiring diagram format change
05	February 22, 2005	Operating spec correction, page 4
06	March 7, 2006	Updated Direct Connection wiring diagrams

Contents

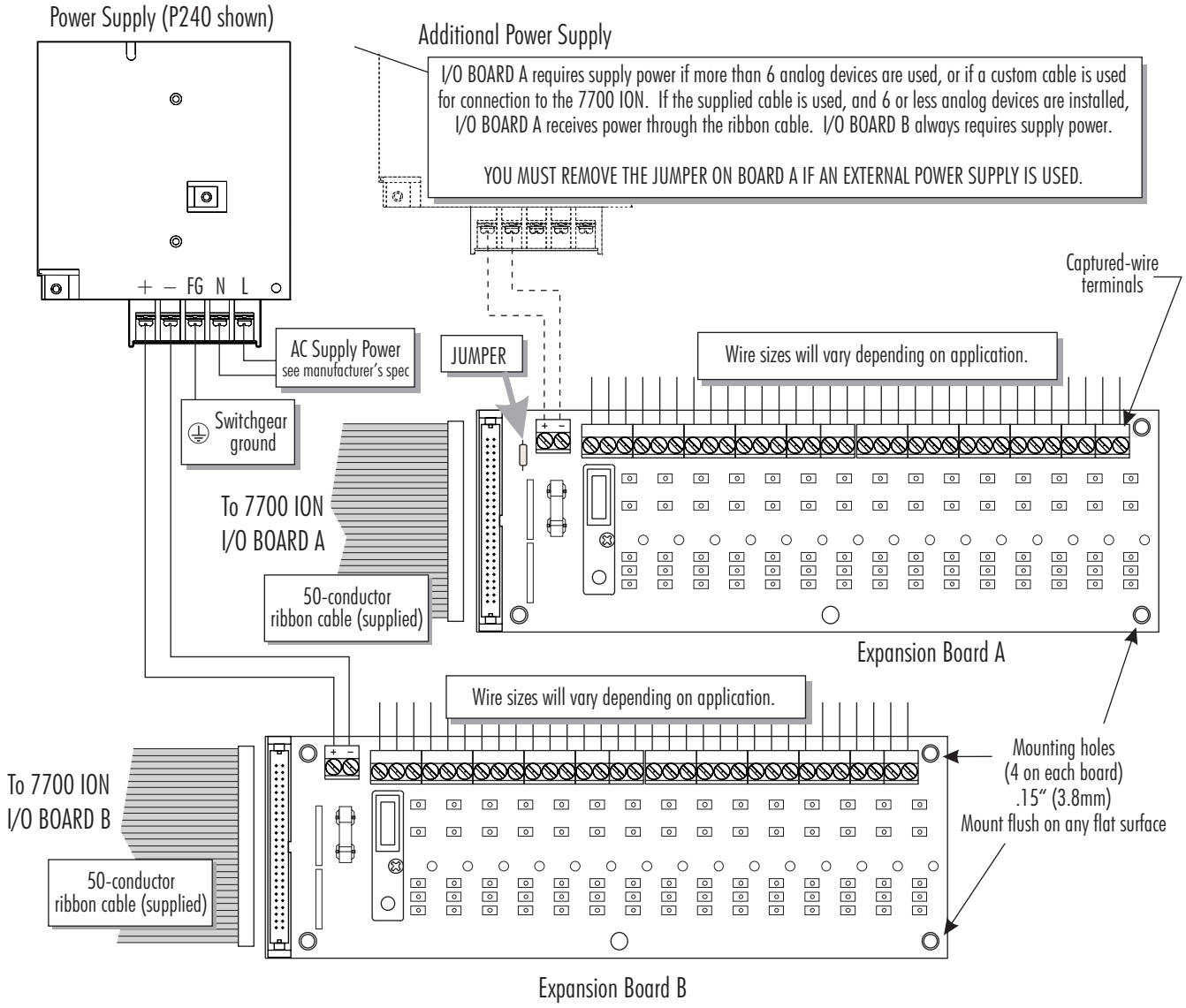
POWER START

The following pages present a quick reference for experienced installers. Details on each procedure are included later in this guide. A list of reference literature is provided on page 3.

Base Unit Wiring Connections

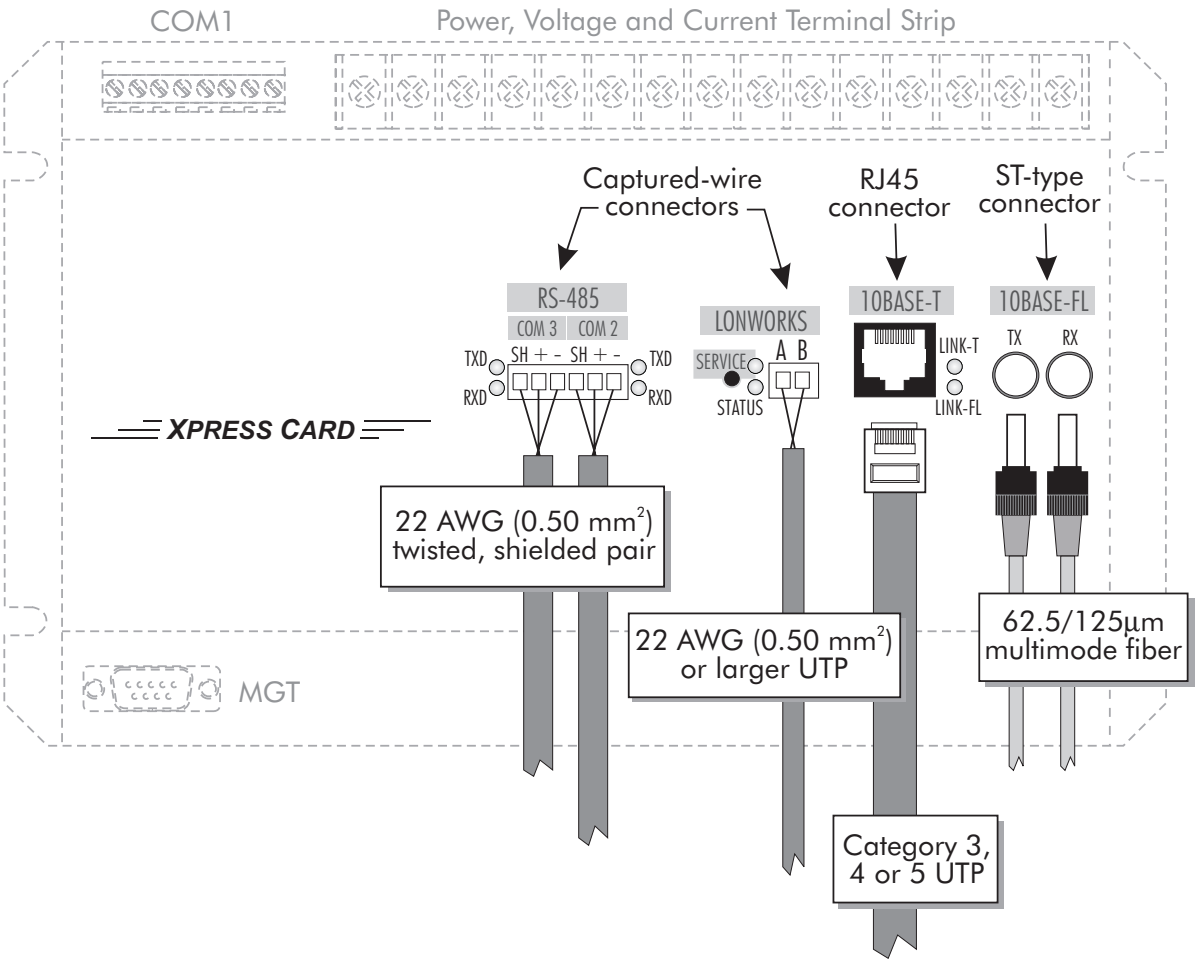


Expansion Board Connections



XPRESS CARD Connections

Note that the XPRESS CARD is an optional component. Refer to the XPRESS CARD Retrofit Installation Instructions for instructions on installing the XPRESS CARD into a 7700 ION.



Getting More Information

7700 ION User's Guide	7700 ION operation and usage details: displaying data, making configuration changes; customizing operation; using outputs and relays; using advanced communications features; technical specifications; revenue metering details
ION Reference	Introduction to the ION architecture; implementation; using ION Designer software; complete reference to all ION modules

Location & Mounting

The 7700 ION should be mounted in a dry, dirt free location. Once installed, no cleaning of the device is necessary. To operate properly and effectively, environmental conditions should fall within the guidelines listed below.

Environmental Condition	Acceptable Range
Operating Temperature	-20°C (-4°F) to 50°C (122°F)
Storage Temperature	-30°C (-22°F) to +70°C (158°F)
Relative Humidity	5 to 95% non-condensing

Enclosure Considerations

The enclosure the 7700 ION is mounted in (typically a switchgear cabinet) should protect the devices from atmospheric contaminants such as oil, moisture, dust, and corrosive vapors, or other harmful airborne substances.

The mounting enclosure should be positioned such that the doors may be opened fully for easy access to the 7700 ION wiring and related components. When choosing the enclosure size, allow for extra space for all wiring, intermediate terminal strips, shorting blocks, or any other required components. The mounting enclosure should not impede ventilation.

Mounting the Base Unit

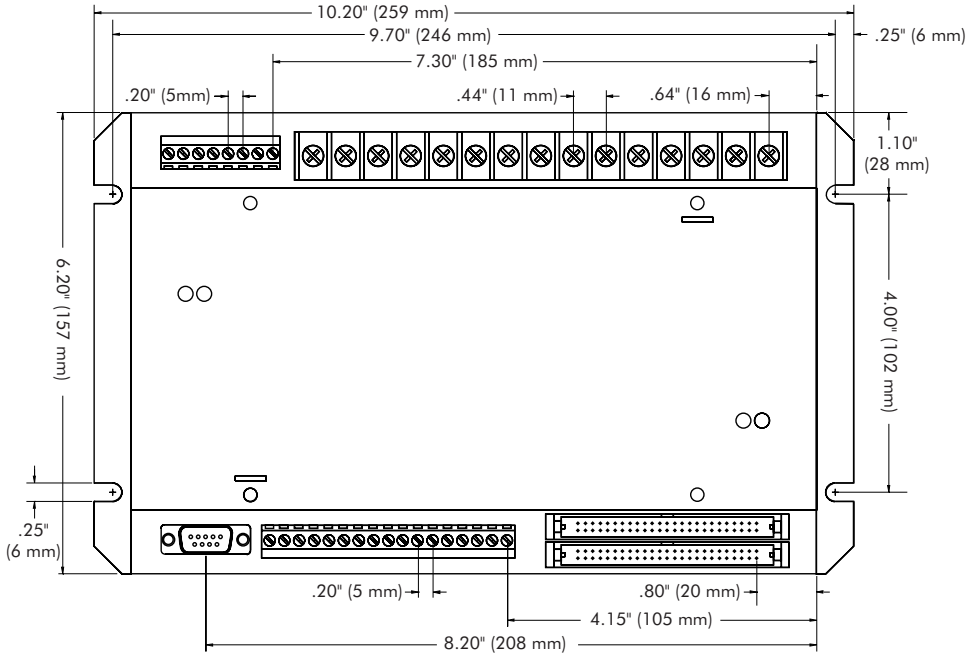
CAUTION

A switch or circuit breaker should be included in the installation, in close proximity to the unit and within easy reach to the operator. This switch or circuit breaker should be marked as the disconnecting device for the unit.

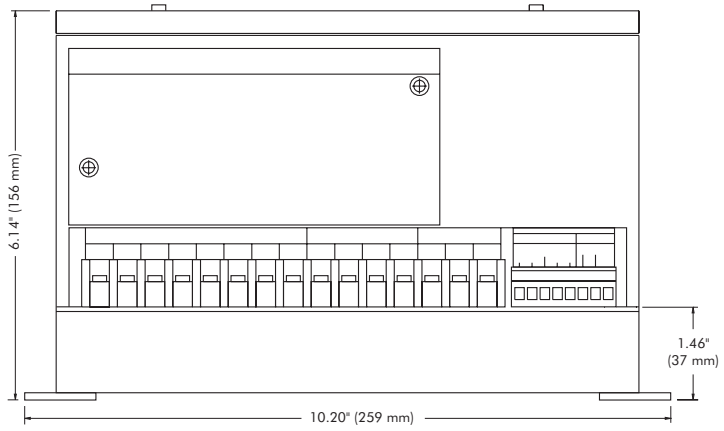
The 7700 ION base unit can be mounted flush against any flat surface. The unit provides four slots on its mounting flange for this purpose. The 7700 ION is typically mounted inside the switchgear cabinet. It can be mounted in whichever orientation is most convenient.

The 7700 ION can also be mounted on the door of the switchgear cabinet; however, some electrical codes may prohibit extending voltages greater than 120 VAC line-to-neutral or 208 VAC line-to-line to the door. If this is the case, for higher system voltages a 7700 ION equipped with 120 VAC inputs (120 option) can be used with PTs that provide 120 VAC secondaries.

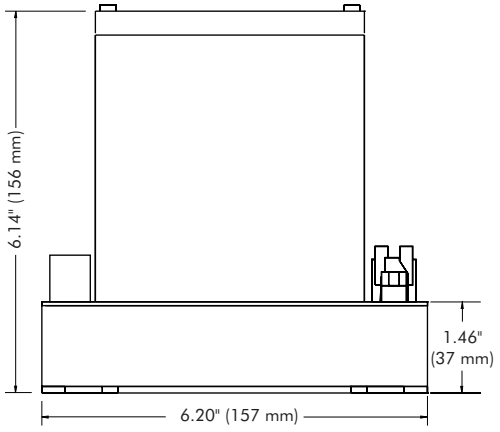
Top View with Mounting Slot Locations



Side View



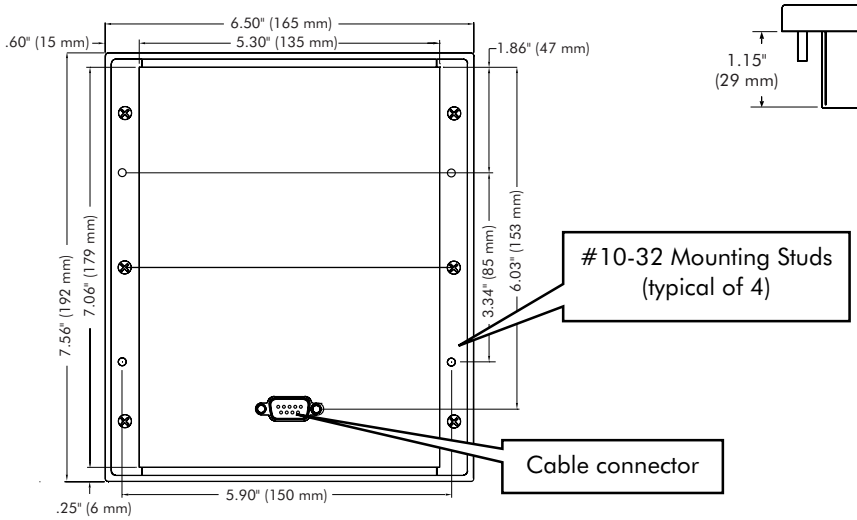
End View



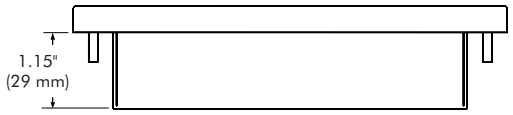
Mounting the MGT

The MGT can be panel mounted for easy access and viewing. It is typically mounted on the switchgear cabinet door. Panel mounting requires four holes and one cutout. A minimum of 10 cm (4 in.) depth of clearance is required behind the panel to allow for cable connection. The length of the interconnecting cable supplied limits the distance between the mounting locations of the MGT and the base unit. The maximum cable length is 61 m (200 ft.)

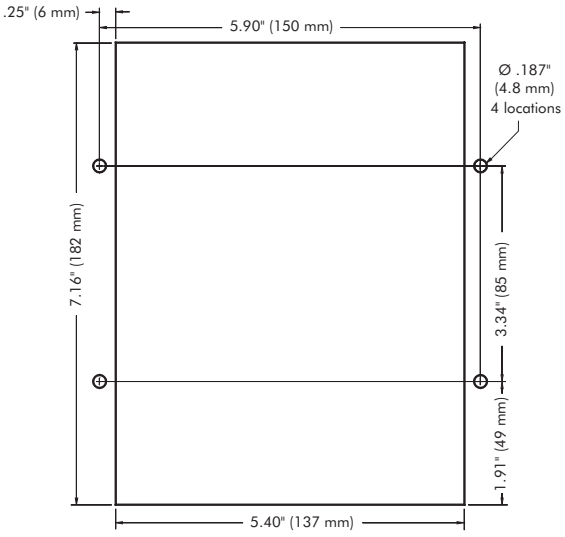
Rear View



Top View



Mounting Holes and Panel Cutout



NOTE

Refer to the last page of this guide for a full size MGT mounting hole/panel cutout template.

Mounting the I/O Expansion Boards

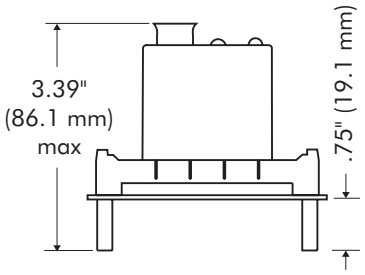
CAUTION

The I/O expansion boards and their associated power supply equipment are external devices to the 7700 ION. It is your responsibility to ensure installation takes local codes and standards into account.

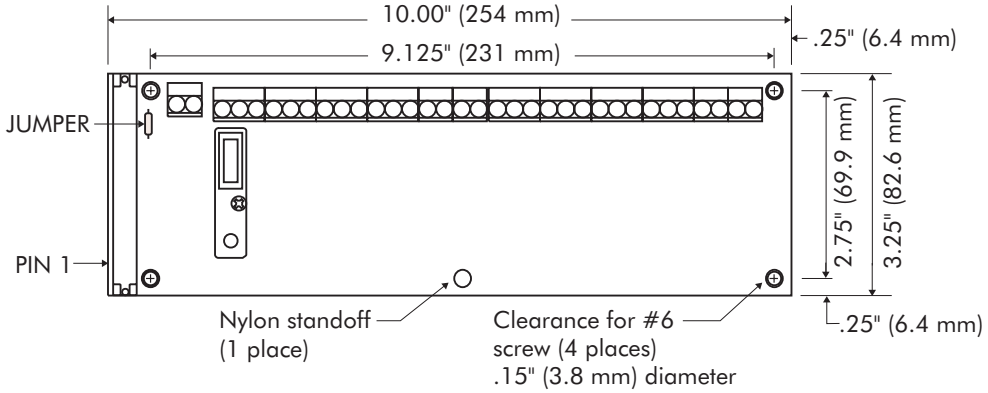
The I/O expansion boards should be mounted against a flat surface to provide easy access for plugging in or removing the I/O devices. If you are installing two boards, or you are installing one board with a custom cable, ensure there is enough space to mount the external power supply.

Mounting requires four holes (no cutout is necessary). A minimum depth of 3.4 inches (8.6 cm) clearance is required behind the board to allow for cable connection and for the I/O devices. Refer to the following mounting diagram:

End View



Top View



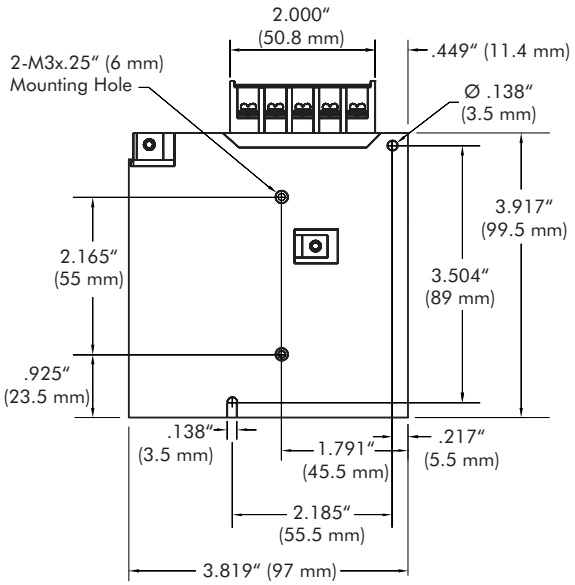
Mounting the Expansion Board Power Supply

Depending on the I/O options supplied with the 7700 ION, you may have one or two external power supplies. Mount the power supply options as shown below.

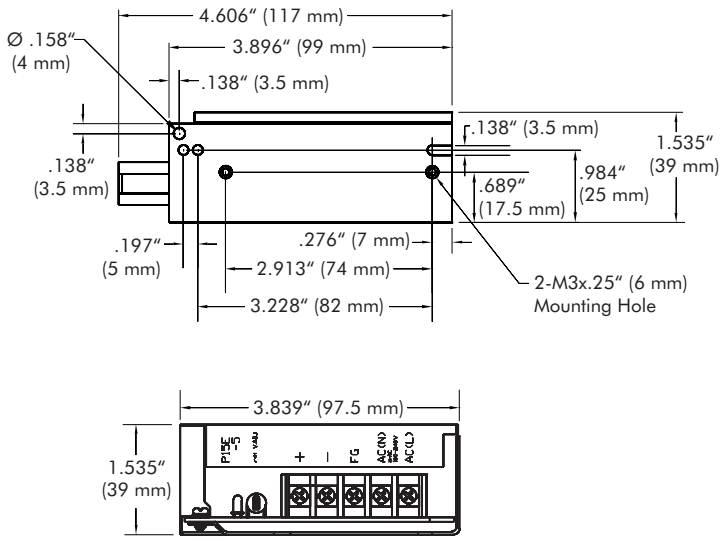
P240 Option

The P240 external power supply must be mounted within 5.5 inches (14 cm) of the external I/O board. The following diagrams illustrates all the dimensions required for mounting:

Top View



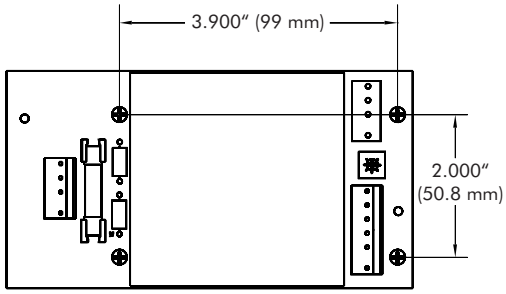
Side and End Views



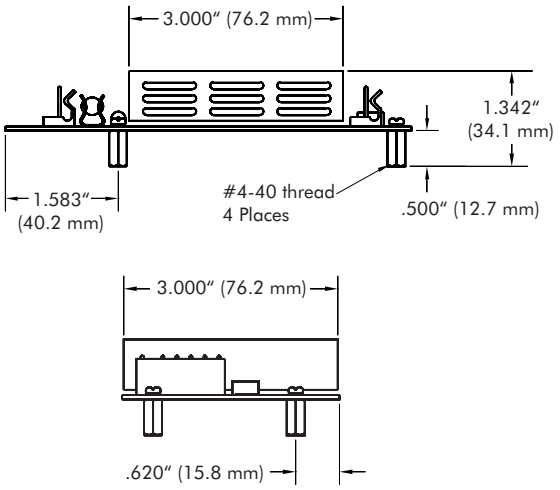
P24/48 Option

The P24/48 external power supply must be mounted within 18 inches (45 cm) of the external I/O board.

Top View



Side and End Views

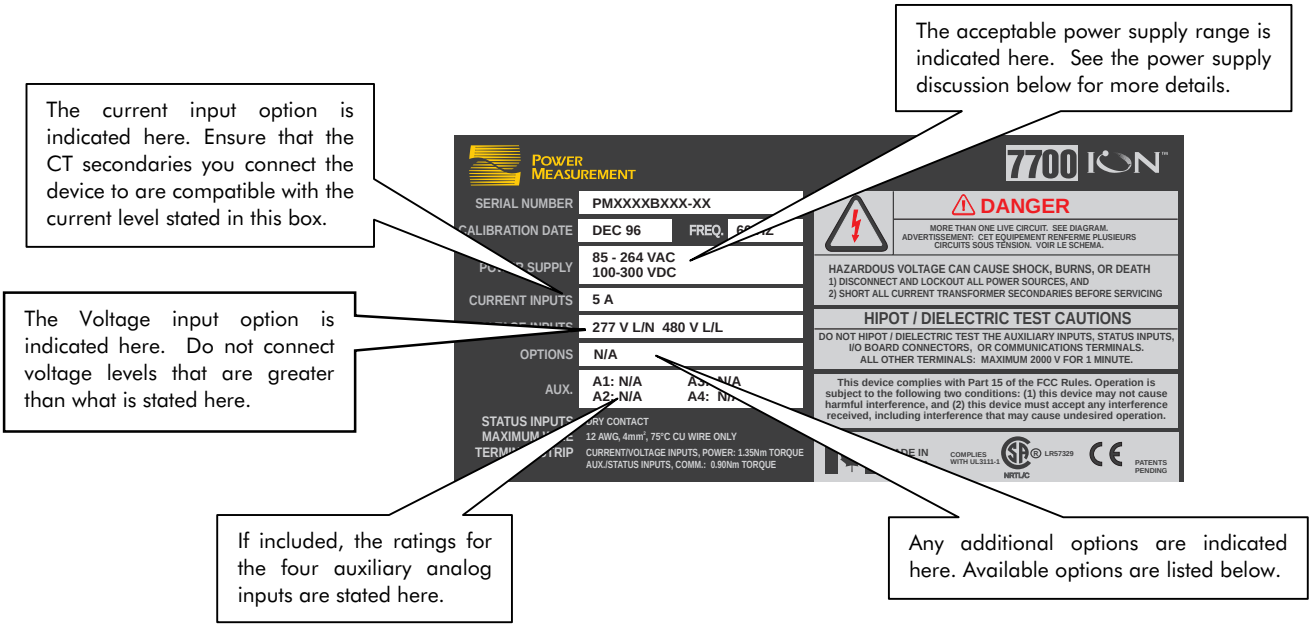


Field Wiring Connections

Be familiar with the warnings presented at the beginning of this document before proceeding with the installation of the 7700 ION.

The 7700 ION's Label

The 7700 ION is available with several different options, and some of these options require special installation procedures. Refer to the label on the 7700 ION (located above the phase voltage and current input terminal strip) to see which options are included on the device you are installing.



The options box on the above label can contain any of the codes shown in the table on the following page. Note that the -TRAN option never appears on the device label.

The optional analog input board, the I/O expansion boards, additional power supplies, MGT accessories, and the revenue meter key are all ordered as separate items. They do not appear in the options box on the 7700 ION's label.

Ordering Option Codes

Code	Option
-TROP	conformal coating for high humidity installations
-XMEM	additional 512kB of internal memory
-RMICAN	meets Canadian revenue metering standards, rated for 0.1 to 10A
-RMANSI	meets ANSI C12.16 revenue metering standard, rated for 0.1 to 10A
-XPRESS	additional two RS-485 and one 10Base-T Ethernet ports installed
-FL	additional two RS-485 and one 10Base-FL Ethernet ports installed
-1MEG	additional 1 MB of memory (on XPRESS CARD)
-2MEG	additional 2 MB of memory (on XPRESS CARD)
-3MEG	additional 3 MB of memory (on XPRESS CARD)

Field Service Considerations

If the 7700 ION requires servicing or field upgrading, you may need to disconnect and remove the unit from its mounting. The initial installation should be done in a way which makes this as convenient as possible:

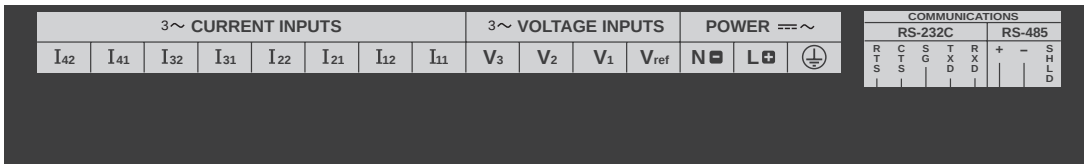
- All phase voltage sense leads should be protected by breakers or fuses at their source such that the 7700 ION can be safely disconnected.
- A CT shorting block should be provided so that the 7700 ION current inputs can be safely disconnected without open circuiting the CT's. The shorting block should be wired so that protective relaying is not affected.
- All wiring should be routed to allow easy removal of the connections to the 7700 ION terminal strips, the 7700 ION cover, and the 7700 ION itself.
- If control relays are used with the external I/O modules, there should be a bypass mechanism installed.

Terminal Strips

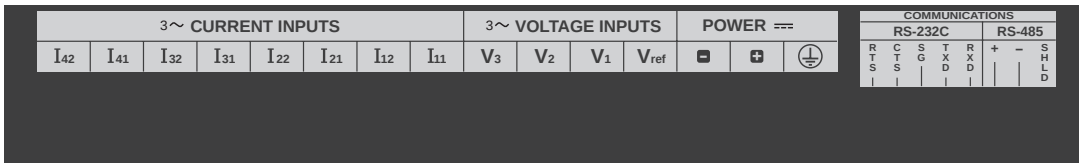
All connections to the 7700 ION base unit are made to terminal strips and cable headers at either side of the unit. The terminal strip for phase *voltage/current* and supply *power* input is a barrier-type for which ring or spade terminals may be used to simplify connection. The *status/auxiliary input* terminal strip and communications terminal strip are both captured-wire type which accept stripped wire ends.

The terminal strip labels for phase voltage/current, power supply and serial communications differ slightly depending on the power supply option used:

P240 (basic) model



P24/48 option



Connecting the Base Unit's Chassis Ground Connection

CAUTION

Failure to properly connect the 7700 ION's chassis ground will void the unit's warranty.

The ⏚ terminal of the 7700 ION provides the chassis ground connection. A good, low impedance chassis ground connection is essential for the 7700 ION surge and transient protection circuitry to function effectively. It should be made to the switchgear earth ground using a dedicated AWG 14 (2.5 mm^2) or larger wire to a point where there will be no voltage error due to distribution voltage drops. Do not rely on metal door hinges as a ground path. Ensure that the ⏚ terminal screw is tightened down securely onto the ground wire.

Connecting the Base Unit's Power Supply

The 7700 ION can be powered either from the voltage source it is monitoring, or from an independent supply (note that the P24/48 option must be powered from a dedicated fused feed — see below). The 7700 ION requires a constant power supply to maintain monitoring, analysis, data logging, control and communications operations. Powering the device from the voltage source it is monitoring is not suitable for applications where these operations must be maintained in the event of a power outage.

If the 7700 ION is used to perform control functions or monitor power quality and power disruption events, an Uninterruptable Power Supply (UPS) should be used to ensure constant supply power.

P240 (Basic) Model

NOTE

Do not power the 7700 ION from the voltage source it is monitoring if the frequency is less than 50 Hz. Use a dedicated power supply that conforms to the power supply specifications listed in the Technical Specification section of the 7700 ION User's Guide.

The basic model can be powered from a dedicated feed, or from the voltage source it is monitoring, as long as it is within the supply range. The basic model has a nominal power supply range of 100 to 240 VAC, but will operate correctly from 85 VAC up to 264 VAC. Applying power above 264 VAC can cause permanent damage to the power supply. The unit can also be powered by 110 to 300 VDC. Supply current can be as high as 1 Amp (56 W), dependent on whether an MGT unit and/or one or more external I/O expansion boards have been connected.

If an AC power supply is being used, connect the line supply wire to the 7700 ION L/+ terminal and the neutral supply wire to the N/- terminal. If a DC power supply is being used, connect the positive supply wire to the 7700 ION L/+ terminal and the negative (ground) supply wire to the N/- terminal.

P24/48 Option

The P24/48 option must be powered from a dedicated fused feed. This option can be powered by 20 to 60 VDC. Supply current can be as high as 1.5 Amp (30 W), dependent on whether an MGT unit and/or one or more external I/O expansion boards have been connected. The label on the 7700 ION indicates if the unit is equipped with this option.

Connect the positive supply wire to the 7700 ION + terminal and the negative (ground) supply wire to the - terminal.

Protective Fuses

The 7700 ION is internally protected on the L/+ or + terminal by a 3A IEC Type T slow-blow fuse. If the power is supplied from a grounded source, installation of a 3A slow-blow fuse on the L/+ or + terminal is recommended. If power is supplied from an ungrounded source, installation of 3A slow-blow fuses on both L/+ or + and N/- or – terminals is recommended.

Connecting the MGT

-TRAN

The -TRAN option does not include an MGT.

The MGT is connected to the 7700 ION by the supplied DB9 cable. The cable connects to the single connector on the rear panel of the MGT, and to the MGT connector on the 7700 ION. Hand-tighten the securing screws on each cable connector. Refer to the 7700 ION User's Guide for MGT configuration details.

Connecting the Phase Voltage Inputs

120 VAC L-N, 208 VAC L-L
277 VAC L-N, 480 VAC L-L
347 VAC L-N, 600 VAC L-L

Refer to the 7700 ION's label for the voltage input option purchased.

AWG 12 to 14 wire (2.5 to 4.0 mm^2) is recommended for all phase voltage connections. Phasing and polarity of the AC voltage inputs and their relationship is critical to the correct operation of the unit. All phase voltage sense leads should be protected by breakers or fuses at their source.

Voltage Input Specifications

Voltage input ranges are defined by ordering options (see "Direct Connection"). Voltage input overload withstand rating is 1500 VAC RMS continuous and 2500 VAC RMS for one second, non-recurring. Input impedance is 2 MΩ.

Direct Connection

IMPORTANT

Ensure that the voltage level between each phase input (V1, V2 or V3) and the V_{REF} input does not exceed the input range:
- 120 volts for the –120 option
- 277 volts for the –277 option
- 347 volts for the –347 option

Whether or not potential transformers (PTs) are required depends on the nature of the system being monitored, the voltage levels to be monitored, and the phase voltage input option of the 7700 ION. The 7700 ION can be directly connected to voltage levels shown in the table below (no PTs are required).

Voltage Option	Direct Connection to Wye Systems up to:	Direct Connection to Single Phase Systems up to:
-120	120 VAC line-to-neutral, 208 VAC line-to-line	120 VAC line-to-neutral or 240 VAC line-to-line
-277	277 VAC line-to-neutral, 480 VAC line-to-line	277 VAC line-to-neutral or 554 VAC line-to-line
-347	347 VAC line-to-neutral, 600 VAC line-to-line	

PTs are required for all Delta systems. PTs are required for all Wye and Single Phase systems with voltage levels greater than those indicated in the table above.

Using Potential Transformers

The inputs of devices equipped with the 120 option can be used with PTs that have secondaries rated at 120 VAC or less. This can include 100/√3, 110/ √3, 100, 110, or 120 VAC secondaries. Devices equipped with the 277 option can be used with PTs that have secondaries rated up to 277 VAC, such as 220 VAC.

V1 Input Connection

The 7700 ION uses the V1 input as the reference for frequency for all power and energy related measurements. For any system configuration, the V1 input must be connected to ensure accurate readings and correct operation of the 7700 ION.

Voltage Reference (Vref) Input Connection

The voltage reference terminal, Vref, of the 7700 ION serves as the zero voltage reference for voltage readings. A good, low impedance Vref connection is essential for accurate measurement. Connection should be made using a dedicated 14 AWG (4.0 mm^2) wire.

Connecting the Phase Current Inputs

-1A | -5A (standard)

10A (-RMANSI or -RMICAN)

Refer to the 7700 ION's label for the current input option purchased.

The 7700 ION uses CTs to sense the current in each phase of the power feed and (optionally) in the neutral or ground conductor. AWG 14 (4.0 mm^2) wire is recommended for all phase current connections. CTs should be connected to the device via a shorting block or test block to facilitate the safe connection and disconnection of the CTs.

Current Input Specifications

Specification	Value
Overload	15 Amps continuous, 300 Amps for 1 second, non-recurring
Impedance	2 mΩ
Burden	0.0625 VA @ 6.25 Amps

Overrange Capability

The 1 Amp and 5 Amp phase current inputs provide 25% overrange capability which allows current readings to be accurately displayed up to 125% of full scale. For example, if the CT Primary setup register in the Power Meter module has been set at 2000A full scale, the 7700 ION allows for readings up to 2500A. The 10 Amp phase current inputs (provided on –RMANSI and –RMICAN revenue models only) do not provide current overrange capability.

The 1 Amp and 5 Amp phase current inputs also allows for up to 2000% of full scale for a maximum duration of 1 second (note that this does not apply to the I4 current input). This provides a 20X fault capture capability. The 10 Amp phase current inputs on revenue meters allow for up to 1000% of full scale for a maximum duration of 1 second, providing a 10X fault capture capability.

Using Current Transformers

NOTE

Refer to the 7700 ION User's Guide for Revenue Metering CT and PT selection.

The 7700 ION is compatible with CTs with 1 Amp, 5 Amp or 10 Amp full scale secondaries (depending on the options purchased). The current input ratings of all three-phase inputs and the I4 input are equivalent.

The CT secondary should have a burden capacity greater than 3 VA. The length of the CT cabling should be minimized because long cabling contributes to inaccuracy. Also, the CT burden rating must exceed the combined burden of the 7700 ION plus cabling plus any other connected devices (burden is the amount of load being fed by the CT, measured in Volt-Amps).

Overall accuracy depends on the combined accuracies of the 7700 ION, the CT, and the PTs (if used).

I4 Current Input Connection

I4 is typically used to measure the current flow in the neutral or ground conductor. Connection is optional. The secondary rating of the CT connected to the I4 input must be identical to that of the three phase current inputs.

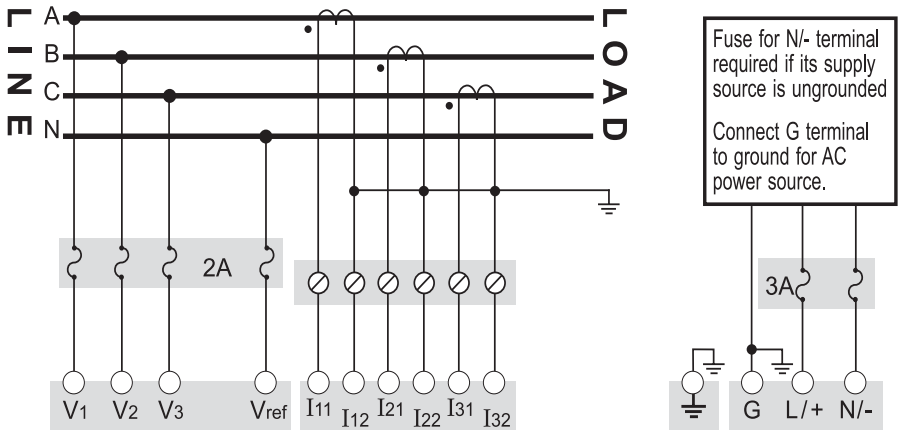
The primary rating for the CT connected to the I4 input can be different from the three phase inputs, since the I4 input scaling can be programmed independently.

Overrange Capability

For the –5A (standard) and –1A options, the I4 current input provides 25% overrange capability which allows current readings to be accurately displayed up to 125% of full scale. For the –RMANSI or –RMICAN options, the I4 current input does not provide overrange capability.

The I4 input does not provide additional fault capture (10X or 20X) capabilities.

4-Wire Wye, 3-Element, Direct Connection Diagram

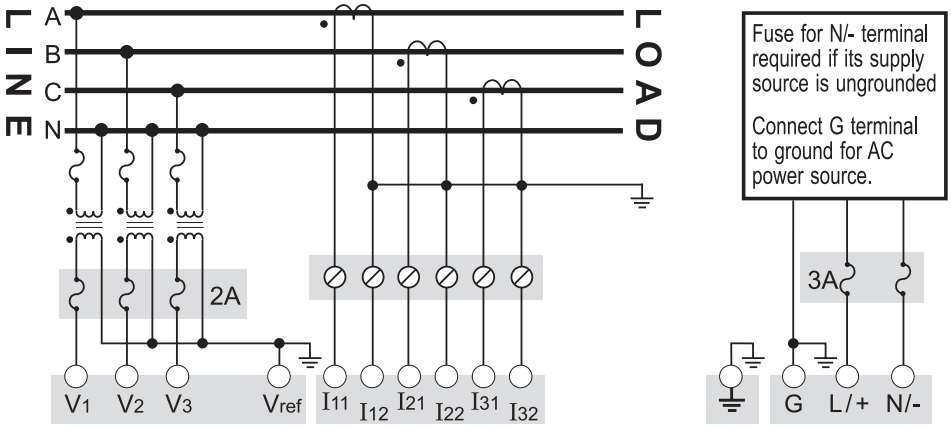


NOTE

The meter senses the line-to-neutral (or ground) voltage and current for each phase, creating an equivalent 3 element metering configuration.

VOLTS MODE should be set to 4W-WYE.

4-Wire Wye, 3-Element, 3 PT Connection Diagram

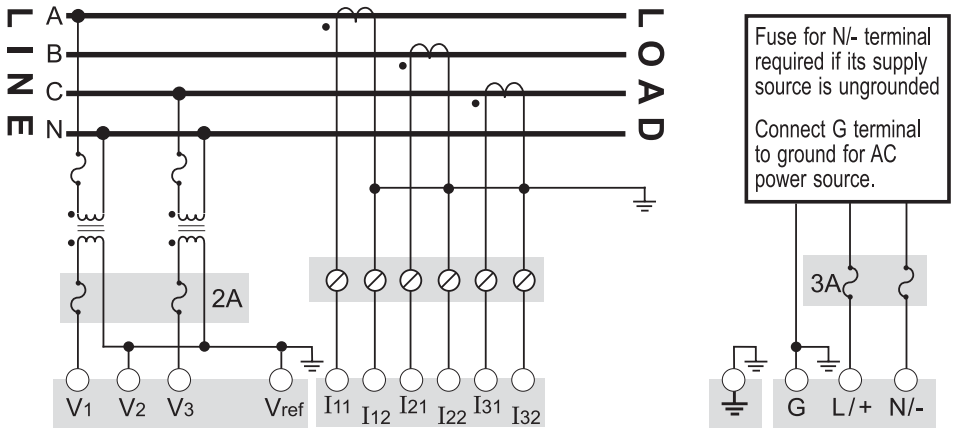


NOTE

PTs must be used for 4-wire Wye systems with voltages over 347 VAC line-to-neutral / 600 VAC Line-to-line. Both the PT primary and secondary must be wired in a WYE (star) configuration. PT primary and secondary circuits should be protected by breakers or fuses at their source. Wiring must be exactly as shown for correct operation.

VOLTS MODE should be set to 4W-WYE.

4-Wire Wye, 2½-Element, 2 PT Connection Diagram

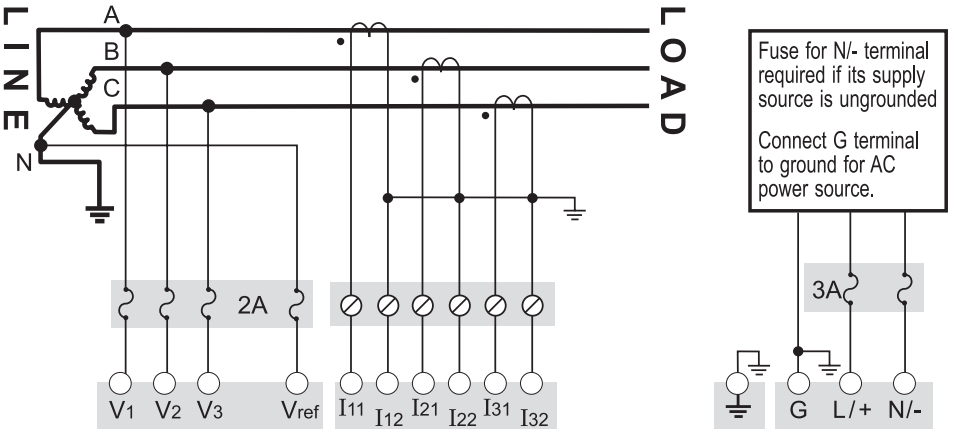


NOTE

This 2½-element scheme requires only 2 PTs. In this configuration, the phase B voltage displayed by the meter is derived from the phase A and C voltages. If the voltages are unbalanced, the power readings may not meet the meter's accuracy specifications.

VOLTS MODE should be set to 3W-WYE.

3-Wire Grounded Wye, 3-Element, Direct Connection Diagram

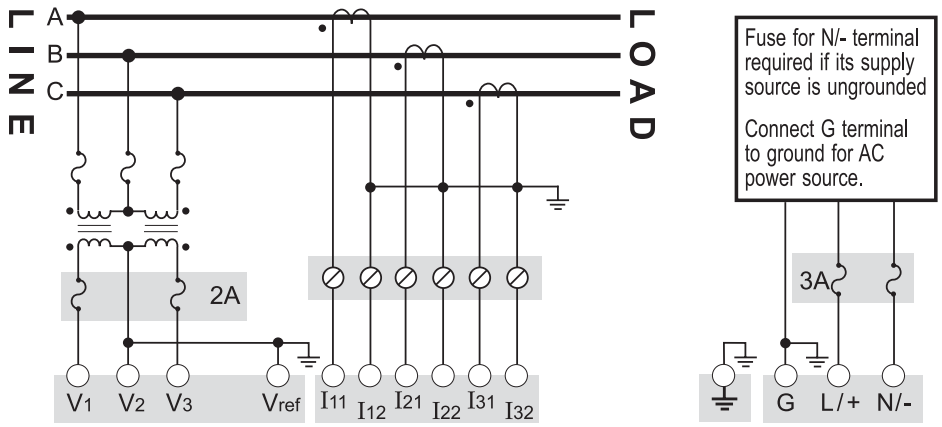


NOTE

When the common or star point of a 3-wire Wye system is grounded, the meter may be connected directly without the use of PTs, provided the phase voltages are within the device's range.

VOLTS MODE should be set to 4W-WYE.

3-Wire Delta, 2½-Element, 2 PT & 3 CT Connection Diagram

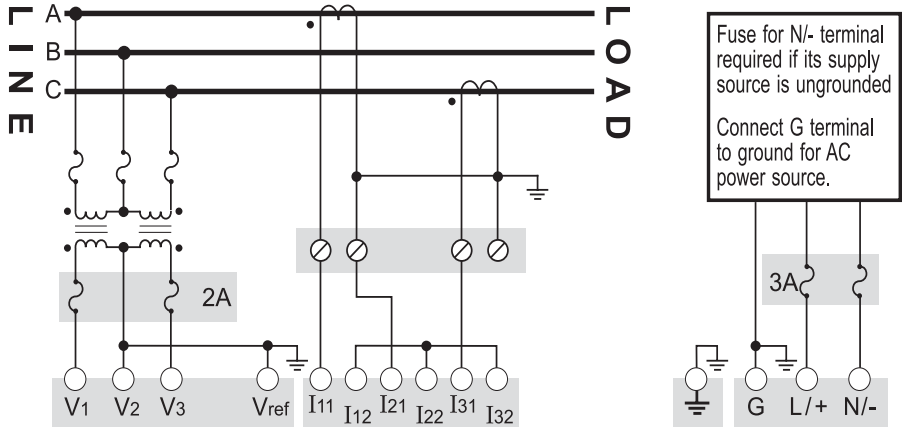


NOTE

The meter requires PTs for ungrounded 3-wire systems above 600 V. In this configuration, the meter senses the line-to-line voltages between each of the phases.

VOLTS MODE should be set to DELTA.

3-Wire Delta, 2-Element, 2 PT & 2 CT Connection Diagram



NOTE

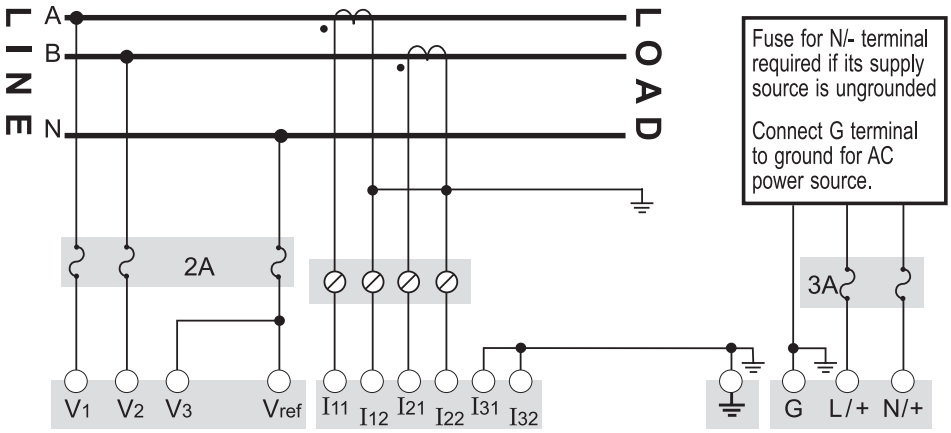
The meter requires PTs for ungrounded 3-wire systems above 600 V. In this configuration, the meter senses the line-to-line voltages between each of the phases.

VOLTS MODE should be set to DELTA.

Single Phase Connection Diagram

CAUTION

For this configuration ONLY, the 208 VAC line-to-line voltage inputs can be used with 240 VAC line-to-line systems. Contact Power Measurement Technical Services if you intend to connect to a single phase system that differs from that shown here.



NOTE

Connect the two voltage phases (each at 180 degrees with respect to each other) to the V1 and V2 inputs of the meter, and the outputs of the two corresponding CTs to the I1 and I2 input pairs. V3, I31 and I32 are unused and should be grounded.

VOLTS MODE should be set to SINGLE.

Connecting the Status Inputs

The 7700 ION provides eight status inputs, S1 to S8. Specifications are as follows:

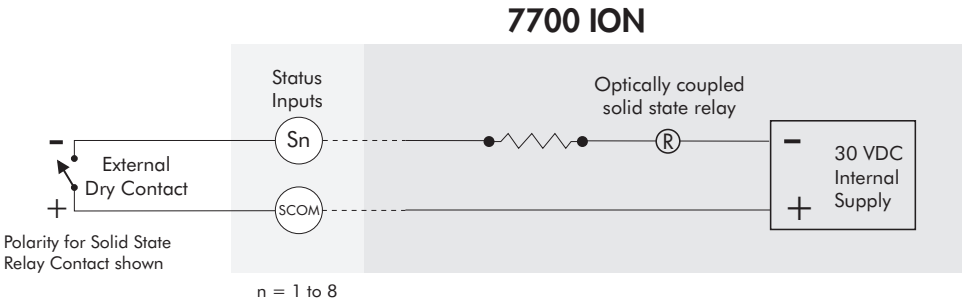
Specification	Value
Min Pulse Width	1 millisecond
Max Pulse Rate	20 pulses/second
Scan Time	1 millisecond for all inputs (minimum)

Connection

Connections to the status inputs are made via a captured-wire type terminal block on the 7700 ION. Use a wire size that is appropriate for your application and complies with local electrical codes.

The 7700 ION uses a current sensing technique to monitor contact status by providing an internal 30 VDC supply for *self-excitation*. These inputs can be used for *dry* contact sensing applications, but **not** for voltage sensing applications. Note that no ground or external voltage connections are required.

The assignment and configuration of each input is user-programmable via the 7700 ION's Digital Input modules. Refer to the *7700 ION User's Guide* or the *ION Reference* for details about these modules.



Connecting the Auxiliary Analog Inputs

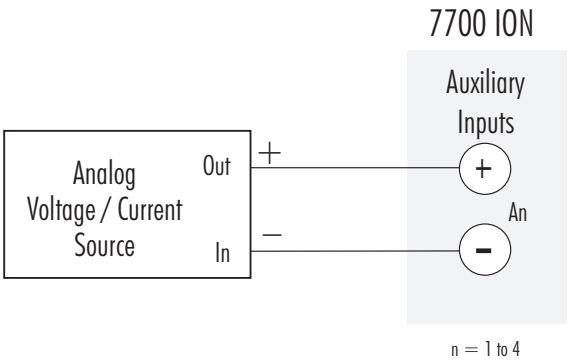
CAUTION

Ground all unused inputs to prevent incorrect readings.

The optional internal analog input board provides four double-ended current or voltage inputs for direct interface with transducers or thermocouples. The option ordered determines the configuration and maximum input range for all four analog input pairs (refer to the label on the 7700 ION for the AUX rating).

Connections to the analog inputs are made via a captured-wire type terminal block on the 7700 ION. Use a wire size that is appropriate for your application and complies with local electrical codes. Assignment and input scaling for each input is user-programmable via the ION Analog Input modules. See the *7700 ION User's Guide* for details.

Typical AUX Input Connection



AUX Option	Input Impedance	Overload Rating
0 - 1mA	49.9 Ω	50 mA continuous; 100 mA for 1 second non-recurring
0 - 20mA	100 Ω	35 mA continuous; 70 mA for 1 second non-recurring
0 - 1V	>= 50 kΩ	20 VAC/VDC continuous; 40 VAC/VDC for 1 second non-recurring
0 - 10V	>= 50 kΩ	20 VAC/VDC continuous; 40 VAC/VDC for 1 second non-recurring

Connecting I/O Expansion Boards to the 7700 ION

NOTE

An external power supply is required if you are using Expansion Board A with a custom cable. See 'Using Custom Cables with I/O Expansion Boards' below.

Connections between the 7700 ION and the optional I/O expansion boards are made via 50-conductor ribbon cables to two lockable, 50-pin headers on the 7700 ION named I/O BOARD A and I/O BOARD B. The connectors are keyed to protect against incorrect orientation.

If only one expansion board is used, it must be connected to the I/O BOARD A port. If you use a second expansion board, it must be connected to the I/O BOARD B port.

Connecting Supply Power for I/O Expansion Boards

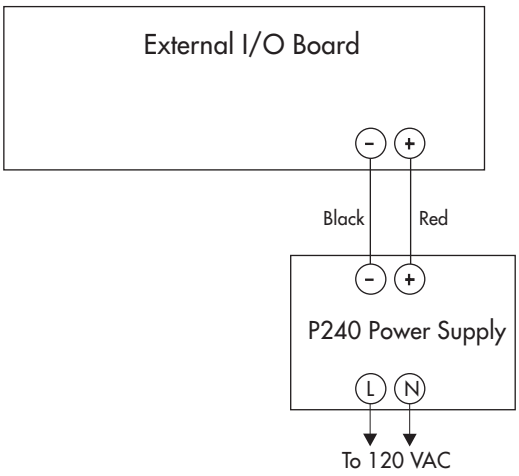
If a single expansion board and the supplied cable are used, power to the board can be supplied entirely by the 7700 ION and no external power supply is necessary. An external power supply is required in many situations; refer to the section "Connecting I/O Devices to the Expansion Boards" on the next page for details on power requirements for analog I/O devices.

NOTE

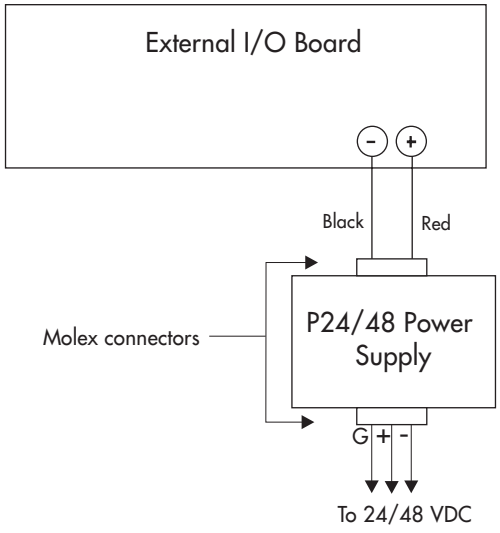
If possible, the same power source should be used to power the 7700 ION and the external I/O board so that external I/O devices and the meter all react the same way if the system is powered down.

Like the 7700 ION itself, there are two power supply options for the external I/O board; the P240 and the P24/48 option.

The P240 external power supply can be powered by 100 to 240 VAC, but will operate correctly from 85 VAC up to 264 VAC. Applying power above 264 VAC can cause permanent damage to the power supply. The unit can also be powered by 110 to 300 VDC. This can be with a dedicated fused feed or the same voltage source that powers the 7700 ION. Refer to the following:



The P24/48 external power supply can be powered by 20 to 60 VDC. It must be a dedicated fused feed. Refer to the following wiring diagram:



Using Custom Cables with I/O Expansion Boards

CAUTION

Power Measurement does not guarantee correct operation of I/O boards if a custom cable longer than 3 feet (0.9m) is used.

When using Expansion Board A with a custom connecting cable longer than the standard 3 feet (0.9m), you cannot use any analog I/O modules unless you use an external power supply. The power supply options available are the same as those listed for Expansion Board B.

When using an external power supply with Expansion Board A, you must remove the jumper (JMPR) on the board (see the diagram on page 2). Failure to do so will void the 7700 ION warranty.

Connecting I/O Devices to the Expansion Boards

To install an I/O device, simply plug it in to an appropriate slot and tighten the fastening screw.

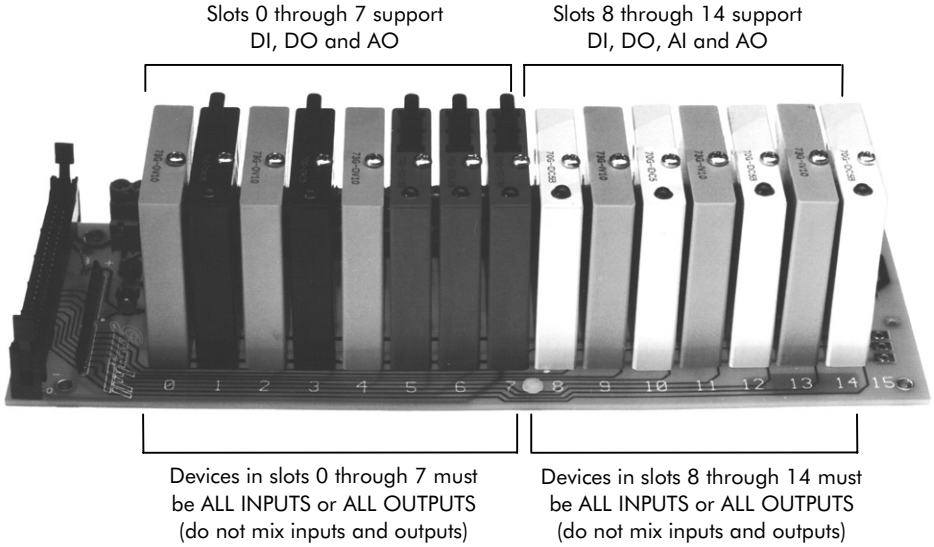
There are several restrictions governing the use of the Expansion I/O Boards. Read the section below detailing I/O device restrictions before connecting any devices to the expansion boards. Further details are provided in the section "I/O Expansion Boards" in the *7700 ION User's Guide*.

Expansion Board I/O Device Restrictions

CAUTION

Do not use digital output modules on I/O Expansion Board 'B' for control applications, as false triggers may result when the supply power to I/O Board 'B' is interrupted.

Each expansion board offers 15 slots you can plug I/O devices into. Slots 0 through 7 support digital input, digital output and analog output devices only (analog input devices are not supported). Slots 8 through 14 support digital input, digital output, analog input and analog output devices. Slot 15 is not supported. Other restrictions apply to the use of analog I/O devices, as discussed below.



Analog Device Restrictions — Power Supplies

The allowable number of analog devices the 7700 ION can support increases significantly when two external power supplies are used to power the expansion boards. The default configuration of Expansion Board A does not include a power supply; it has to be purchased separately. If Expansion Board A is powered directly from the 7700 ION, then a maximum of six analog devices can be installed on it. (A separate power supply is required for Expansion Board B in any configuration.)

To use the maximum number of analog I/O devices, two power supplies must be used (one for each expansion board). Note that if a separate power supply is used with Expansion Board A, then the jumper (JMPR) must be removed from the board. Failure to remove the jumper will void the 7700 ION's warranty.

Analog Device Restrictions — Direction (Input or Output)

The direction of all of the devices in slots 0 through 7 and slots 8 through 14 must be the same. You cannot mix inputs and outputs within these two groups of slots; however, you can have all inputs in slots 0 through 7, and all outputs in slots 8 through 14 (or vice versa).

As noted on the graphic on the previous page, only slots 8 through 14 support analog input devices, thereby limiting the maximum number of these devices to seven per board. Analog Output devices can populate both slot groups on the expansion board, so a maximum of 15 of these devices can be used per board.

If Expansion Board A is used without a separate power supply, only six analog devices can be used in total, regardless of direction restrictions. The following table summarizes the restrictions on analog I/O devices.

	Max # of Analog Inputs	Max # of Analog Outputs	Max # of Analog Devices	Possible Maximum Configurations
Board A WITHOUT Optional Power Supply (default configuration)	6	6	6	Any combination up to 6 total
Board A WITH Optional Power Supply	7	15	15	Board full
Board A WITHOUT Optional Power Supply (default configuration) + Board B	13	21	21	A: 6 AI; B: 7 AI, 8 AO A: 6 AO; B: 7 AI, 8 AO A: 6 AO; B: 15 AO A: 6 AI; B: 15 AO
Board A WITH Optional Power Supply + Board B	14	30	30	Both boards full

I/O Device Connections

Expansion boards provide captured-wire type terminal strips for connection to the individual I/O devices. Use a wire size that is appropriate for your application and complies with local electrical codes. Assignment and scaling for each device is programmable via the Analog Input, Analog Output, Digital Input and Digital Output ION modules (described in the *ION Reference*).

NOTE

All digital output devices supplied by Power Measurement are asserted low.

For detailed information about the specifications of each I/O device option, refer to the *7700 ION User's Guide*.

The I/O device slots and the captured-wire terminals on the expansion board are numbered. Slot numbers correspond to terminal numbers as follows:

Slot Number	Input Terminals + & –
0	1 & 2
1	3 & 4
2	5 & 6
3	7 & 8
4	9 & 10
5	11 & 12
6	13 & 14
7	15 & 16

Slot Number	Input Terminals + & –
8	17 & 18
9	19 & 20
10	21 & 22
11	23 & 24
12	25 & 26
13	27 & 28
14	29 & 30
** DO NOT USE SLOT 15	

NOTE

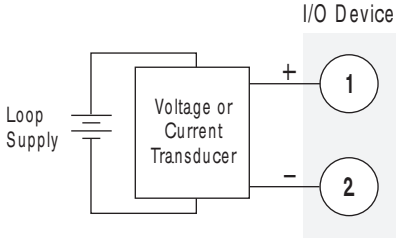
The external I/O devices are color-coded as follows:

Analog Inputs	Blue
Analog Outputs	Orange
Digital Inputs (AC)	Yellow
Digital Inputs (DC)	White
Digital Outputs (AC)	Black
Digital Outputs (DC)	Red

In the connection diagrams that follow, the I/O device input terminals shown are input 1 and input 2. For connection to modules in other slots, substitute the *odd* numbered input for input 1 and the *even* numbered input for input 2. (For example, if you are connecting to a module in slot 6, substitute input 13 for input 1 in the diagram, and input 14 for input 2 in the diagram).

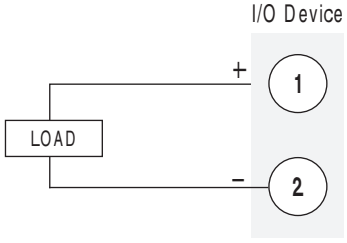
Analog Inputs

GAIVDC1, GAIVDC5, GAIVDC10, GAIIDC420, GAIVDC5B, GAIVDC10B, GAITCR, GAITCT, GAITCJ, GAITCK, GAIRTD, GAIVDC100M



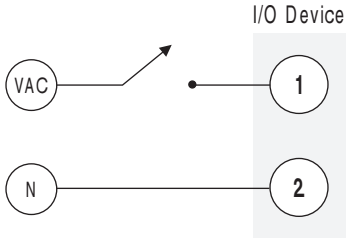
Analog Outputs

GAOVDC5, GAOVDC10, GAOIDC1, GAOIDC420, GAOVDC5B, GAOVDC10B, GAIVDC50M



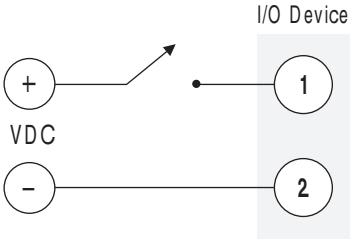
Digital Inputs (AC)

GDIAC120, GDIAC240

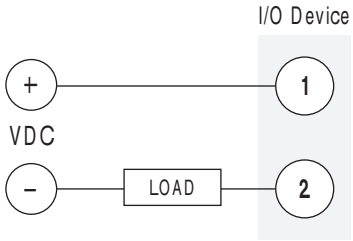


Digital Inputs (DC)

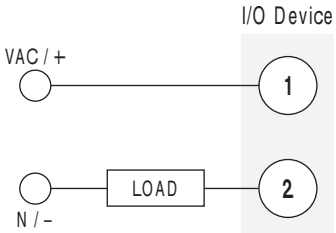
GDIDC32, GDIDC32H, GDICC



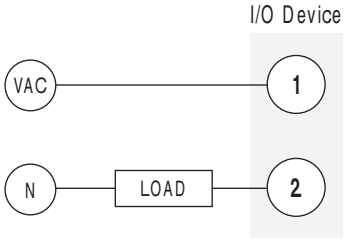
Digital Outputs (DC) - Solid State
GDODC60, GDODC200, GDODC60L, GDODC60MO,



Digital Outputs (DC) - Mechanical
GDODC100M



Digital Outputs (AC)
GDOAC120, GDOAC240, GDOAC120MO, GDOAC240MO



Relay Application Precautions

In applications where the digital output devices are used to perform critical equipment control operations (for example, breaker trip, etc.):

1. Make connections to the external equipment via an intermediate mechanism which allows relay control to be completely disabled for commissioning and servicing (for example, firmware upgrades).

2. Anytime the 7700 ION has powered down and powered back up, test the digital outputs of the 7700 ION to ensure that all your control condition(s) are occurring as expected.

3. When you have verified all control operations, relay control of the external equipment can be used.

4. Do not use digital output modules on I/O Expansion Board 'B' for control applications, as false triggers may result when the supply power to I/O Board 'B' is interrupted. Digital output modules can be used on I/O Board 'B', provided that field equipment is protected in the event of false triggers described above. Contact Power Measurement Customer Service for assistance if you want to use digital output modules on I/O Board 'B' for control purposes.

Communications Connections

The 7700 ION basic model includes one selectable RS-232/RS-485 port capable of baud rates up to 19,200 bps.

The optional XPRESS CARD provides 2 additional RS-485 ports, capable of baud rates up to 115,200 bps, as well as one 10Base-T Ethernet port capable of baud rates up to 10Mbps. The XPRESS CARD can also be ordered with a 10Base-FL Ethernet port (10Mbps). If the XPRESS CARD is ordered separately, refer to *the XPRESS Card Installation & Basic Setup Instructions* supplied with the card.

RS-232 Connections

NOTE

The RS-232 and RS-485 ports at COM 1 are multiplexed – you cannot use both ports simultaneously

The 7700 ION's communications card includes optical coupling that provides full isolation between the RS-232 communication lines and the 7700 ION internal circuitry. This circuitry provides protection from common mode voltages and incorrect connection. All inputs pass the ANSI/IEEE C37.90-1989 surge withstand and fast transient tests.

Specification	Value
Baud Rates	300 to 19, 200 bps
Duplex	Full
Supported Protocols	ION, Modbus RTU, GPS:TRUETIME/DATUM, GPS:ARBITER
Isolation	Optical isolation from all other inputs and outputs (excluding the COM 1 RS-485 port); isolation voltage is 750 V peak for 10 seconds @ 60 Hz.

Serial Cable Wiring Connections

NOTE

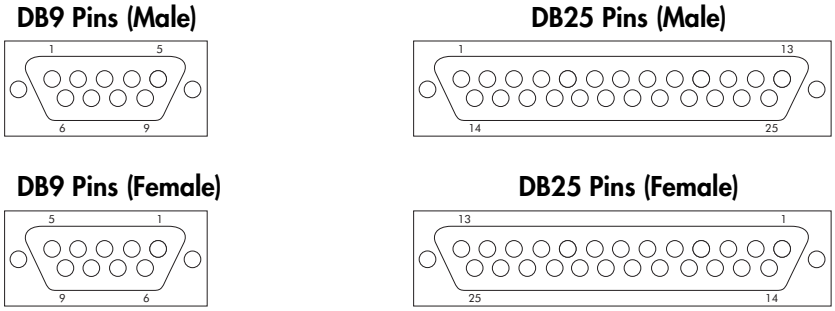
Use of the RTS and CTS lines is optional. Some types of modems (i.e. radio modems) may require the use of these lines.

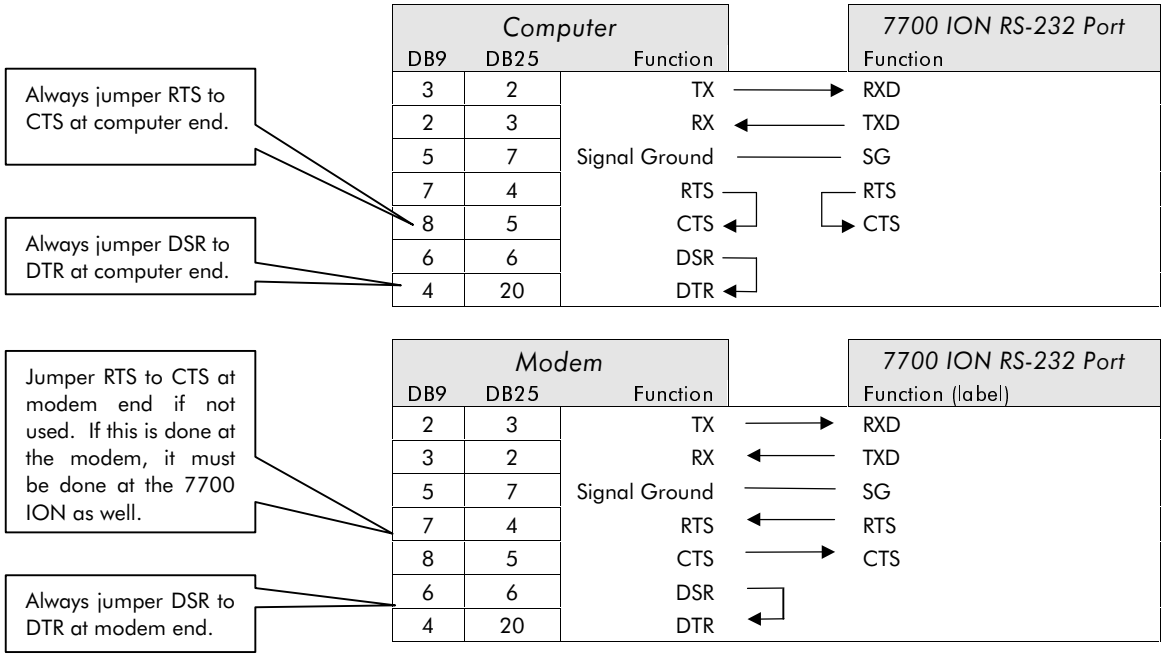
RS-232 connections are made at COM 1 via captured-wire terminal strips on the 7700 ION adjacent to the phase and power supply connections (refer to the diagram on page 1). Terminal connections are marked as follows:

Marking	Terminal Function
RXD	RS-232 Receive Data (i.e. data into device)
TXD	RS-232 Transmit Data (i.e. data out of device)
SG	RS-232 Signal Ground (isolated)
RTS	RS-232 Request To Send
CTS	RS-232 Clear To Send

The cables used between a computer or modem and the 7700 ION are custom RS-232 cables. In each case, one end is equipped with a DB25 or DB9, male or female connector. The connector required depends on the mating connector of the computer or modem serial port. The other end of the cable consists of discrete wires that connect to the RS-232 terminals of the 7700 ION. Cable length is 50 feet (15.2 m) maximum.

RS-232 Serial Cable Pin Assignments





Computer Connections

The cable used between a computer and external modem (if used) is a standard straight-through RS-232 communications cable with a maximum length of 50 feet (15.2 m). Refer to the installation manuals for both the computer and modem for cable requirements.

RS-485 Connections

The 7700 ION's communications card includes optical coupling that provides full isolation between the RS-485 communication lines and the 7700 ION internal circuitry. This circuitry provides protection from common mode voltages and incorrect connection. All inputs pass the ANSI/IEEE C37.90-1989 surge withstand and fast transient tests. Specifications are as follows:

NOTE

The RS-232 and RS-485 ports at COM 1 are multiplexed – you cannot use both ports simultaneously.

Specification	Value (COM 1)	Value (COM 2 and COM 3)
Baud Rates	300 to 19, 200 bps	300 to 115, 200 bps
Duplex	Half	Half
Supported Protocols	ION, GPS:TRUETIME/DATUM, GPS:ARBITER, Modbus RTU	ION, Modbus RTU, DNP 3.0, PML EtherGate, GPS:TRUETIME/DATUM, GPS:ARBITER
Isolation	Optical isolation from all other inputs and outputs (the COM 1 RS-485 port is not isolated from the COM 1 RS-232 port); isolation voltage is 750 V peak for 10 seconds @ 60 Hz.	

Connection

COM 1 RS-485 connections are made via captured-wire terminal strips on the 7700 ION adjacent to the power supply connections. The optional XPRESS CARD COM 2 and COM 3 RS-485 connections are made on the top of the unit (refer to the diagram on page 3). Terminal connections are marked as follows:

Marking	Terminal Function
SHLD	RS-485 Shield (electrically connected to chassis ground)
-	RS-485 Data Minus
+	RS-485 Data Plus

Up to 32 devices can be connected on a single RS-485 bus. Use a good quality shielded twisted pair cable recommended for RS-485 application. The overall length of the RS-485 cable connecting all devices cannot exceed 4000 ft. (1219 m).

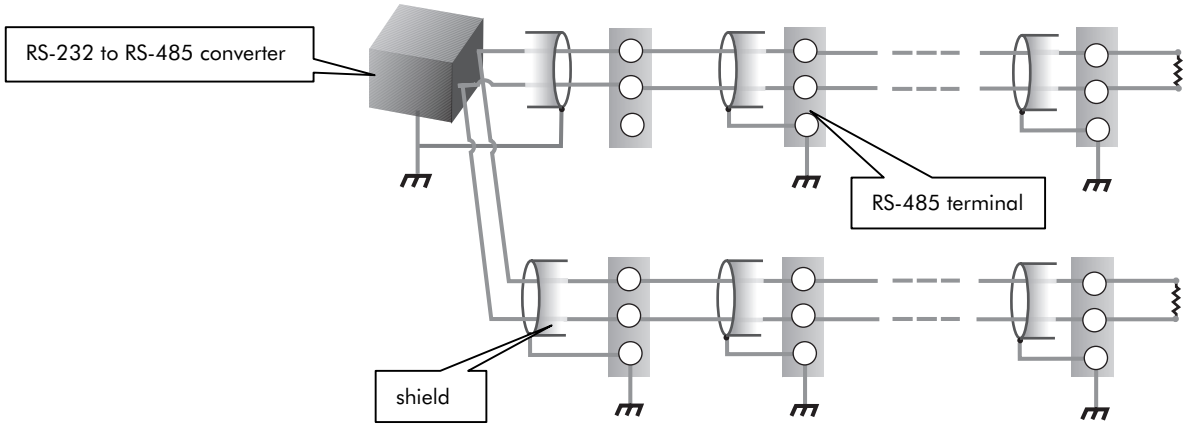
General Bus Wiring Considerations

CAUTION

Do not connect ground to the shield at both ends of an RS-485 segment. Doing so allows ground loop currents to flow in the shield, inducing noise into the communications cable.

Devices connected on the bus, including the 7700 ION, converter(s) and other instrumentation, must be wired as follows:

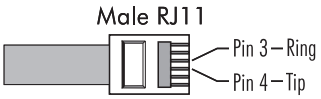
- The shield of each segment of the RS-485 cable must be connected to ground at *one end only*.
- Isolate cables as much as possible from sources of electrical noise.
- Use an intermediate terminal strip to connect each device to the bus. This allows for easy removal of a device for servicing if necessary.
- Install a ¼ Watt termination resistor (R_t) between the (+) and (-) terminals of the device at each end point of a straight-line bus. The resistor should match the nominal impedance of the RS-485 cable (typically 120 ohms – consult the manufacturer's documentation for the cable's impedance value).



RS-485 Connection Methods to Avoid

Any device connection that causes a branch in the main RS-485 bus should be avoided. This includes *star* and *tee (T)* methods. These wiring methods cause signal reflections that may cause interference. At any connection point on the RS-485 bus, no more than two cables should be connected. This includes connection points on instruments, converters, and terminal strips. Following this guideline ensures that both star and tee connections are avoided.

Wiring the Internal Modem Option



Connection to the internal modem is made via the RJ-11 jack (labeled MODEM) located on the top of the meter. Connect the meter to the telephone network with an FCC Part 68 compliant telephone cord (that has two male RJ-11 plugs).

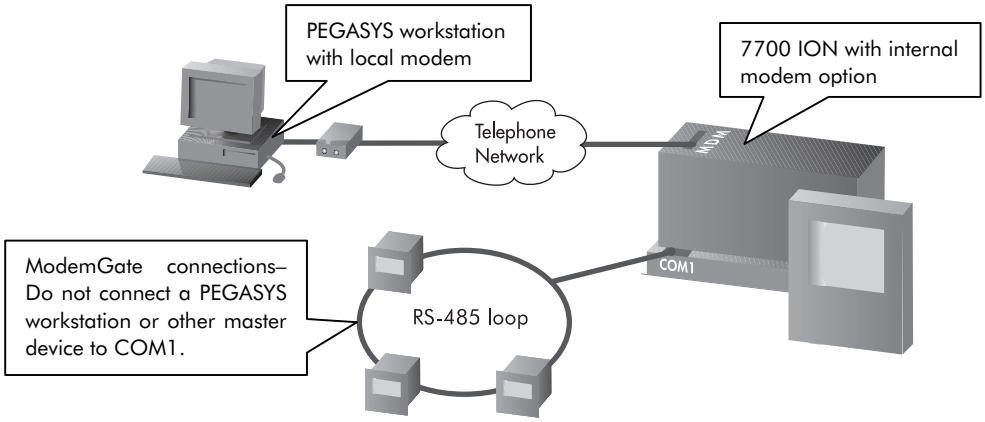
If you have the captured-wire connector option (-MDMC) connect the meter to the telephone system with the (bare wire to RJ-11) cable provided. Fasten the bare wires into the modem port's captured wire connectors. The wires of this six foot cable are inter-changeable for most telephone systems.

Wiring "ModemGate" Connections to COM1

If applicable, wire a serial connection between one or more meters and COM 1 of the 7700 ION. You can make ModemGate connections through an RS-232 cable to a single device, or through an RS-485 shielded twisted pair cable to multiple devices.

NOTE

The ModemGate feature creates a communications connection between the telephone network the devices connected to COM 1. All data received by the internal modem is automatically transferred to the RS-485 loop.



Once all power system connections and communications wiring are completed, power up the 7700 ION and the devices connected via ModemGate.

Configuring the Devices Connected to the ModemGate

For all devices connected to the ModemGate (COM 1 of the 7700 ION) configure the communications settings of their serial ports so that...

- The baud rates of their serial communications ports match the baud rate of the 7700 ION's COM 1 port.
- They all have **unique** Unit ID numbers. Make a record of your changes.
- The RS-485 serial protocol is selected for connections to multiple devices along the same bus.

In order to configure the dial-in connection, the system administrator will require the serial baud rate of the modem site as well as a record of the Unit ID numbers for every device. Refer to "7700 ION Basic Setup" on page 32 for instructions on how to make changes to the settings.

Ethernet Connections (XPRESS CARD Only)

If you purchased the optional XPRESS CARD, one 10Base-T and/or one 10Base-FL Ethernet port will be available, depending on ordering options specified. Specifications are as follows:

NOTE

The 10Base-T and 10Base-FL Ethernet ports cannot be used simultaneously. If both are connected, only the 10Base-T port will function.

Specification	Value
Type (10 Base-T)	IEEE 802.3 10Base-T for 10 Mbps base band CSMA/CD LANs
Type (10Base-FL)	IEEE 802.3 10Base-FL fiber link
Baud Rate	10 Mbps
Duplex	Half
Supported Protocols	ION, Modbus RTU
Isolation	Transformer isolated to 1500 VAC RMS

Connection

Use high quality Category 3, 4 or 5 UTP (unshielded twisted pair) cable with a male RJ45 modular connector for connection to the 10Base-T port, or 62.5/125µm multimode fiber cable with ST-type connectors for connection to the 10Base-FL port.

Refer to 7700 ION Basic Setup later in this document for instructions on configuring the Ethernet communications link from the MGT.

7700 ION Basic Setup

To commission the 7700 ION you must setup the Power Meter module and the Communications module. These modules control how the 7700 ION measures data from the power system it is connected to and how it communicates with connected networks or workstations.

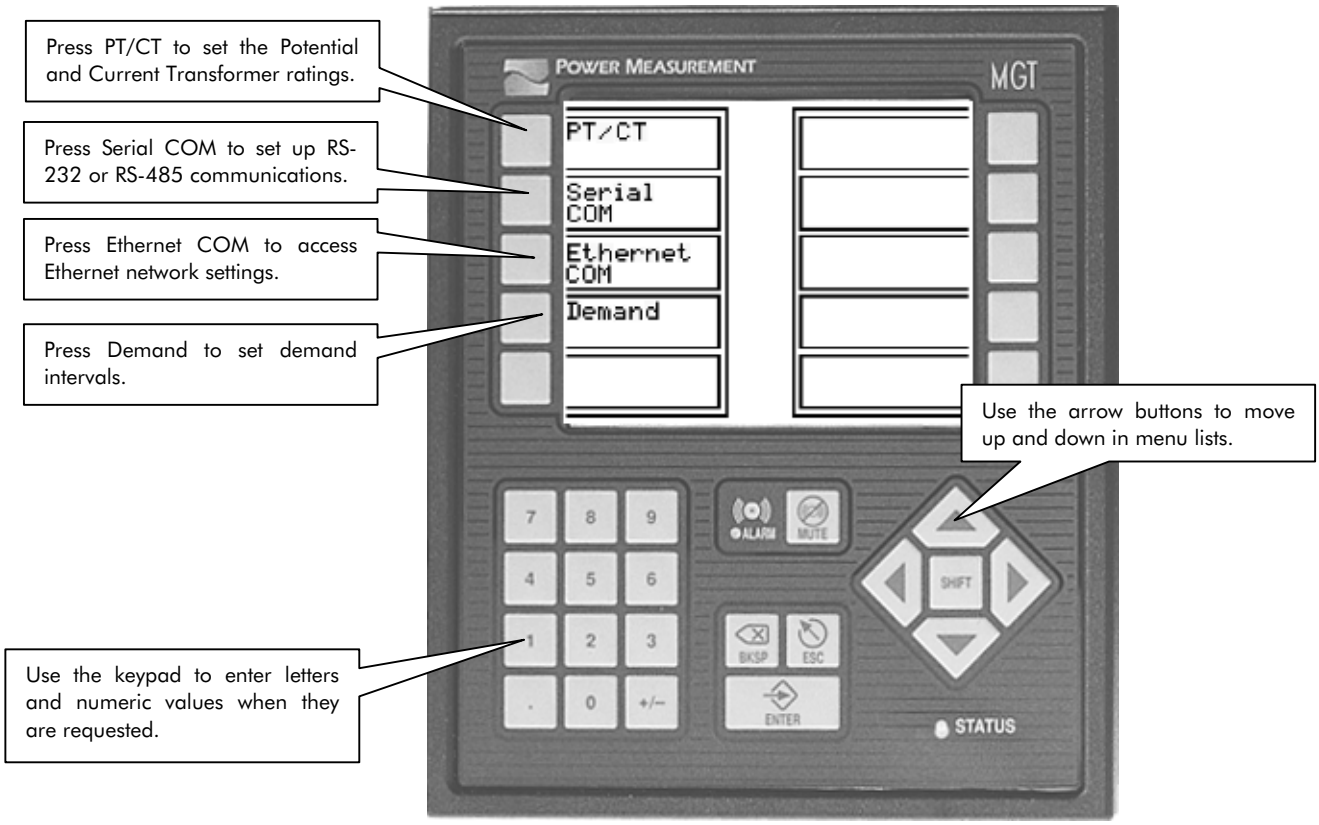
The MGT is typically used for basic setup. Basic setup can be performed using a properly configured workstation, provided the workstation's setup matches the 7700 ION's default communications settings.

Using the MGT to Configure the 7700 ION

The MGT interface is ideal for field installation, quick device adjustments, and use by maintenance personnel while at the installed location of the device. The MGT provides a Quick Setup feature for basic setup operations.

To perform basic setup through the MGT, press the button labeled SETUP, and then the button labeled QUICK SETUP. The following menu appears:

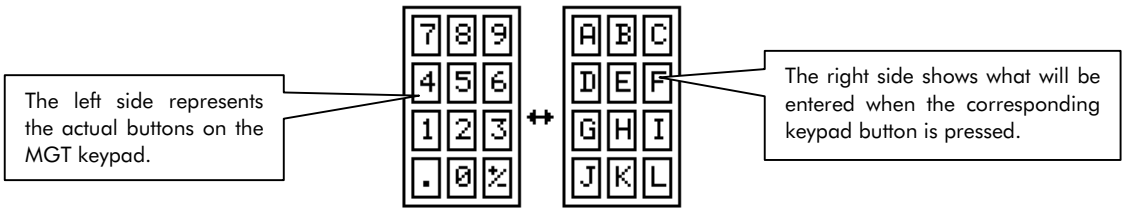
Press the QUICK SETUP button to access the basic setup options.



Entering Your Password

You must enter the user password before you can change any settings. The password is factory set at 'zero' (0).

The first time you attempt to change a setup register's value, you will be presented with the keypad screen where you enter your password.



In the keypad screen, the left-hand keypad graphic represents the MGT's actual keypad, and the keypad graphic on the right shows the current value assigned to each keypad button. The left and right arrow buttons on the MGT allow you to scroll through different key assignments until you find the one that contains the value you want to enter. In the example keypad screen shown above, pressing '0' will enter 'K'.

NOTE

The MGT's user password is factory set at 0. Scroll through the keypad assignments until 0 appears on both left and right keypad graphics.

Using the MGT's left or right arrow buttons, scroll through the different keypad configurations until you find the one with the zero character (0). Using the keypad, enter 0, then press the MGT's ENTER button. Note that the value you are entering appears on the MGT screen, so you can verify that you have entered the correct password before you hit ENTER.

PT/CT Settings

Press the button labeled PT/CT to set basic operating parameters. The following setup registers and their current settings are displayed:

Setup Register	Factory Default	Function
Volts Mode	4W-WYE	The power system's configuration – WYE, DELTA, Single, etc
PT Prim	120/277/347 *	The Potential Transformer's primary winding rating for V1, V2 and V3
PT Sec	120/277/347 *	The Potential Transformer's secondary winding rating for V1, V2 and V3
CT Prim	5000	The Current Transformer's primary winding rating for I1, I2 and I3
CT Sec	5	The Current Transformer's secondary winding rating for I1, I2 and I3
I4 CT Prim	5000	The Current Transformer's primary winding rating for I4
I4 CT Sec	5	The Current Transformer's secondary winding rating for I4
NomVolts	0 **	The nominal power system voltage (used for power quality calculations)
Phase Lbls	ABC	The phase label format assigned to the outputs (ABC, RST, XYZ, RYB or 123)

* *PT Prim* and *PT Sec* are set to 120, 277 or 347 depending on the voltage input ordering option specified. Both *PT Prim* and the *PT Sec* are factory set to the same value.

** NomVolts is factory-set to zero, disabling all Power Quality functions of the meter. Set it to your nominal system voltage to enable Power Quality functions (i.e. Transient and Sag/Swell detection).

Other Power Meter Module Settings

The remaining setup registers in the Power Meter module are given in the *7700 ION User's Guide*. In most cases you can leave them at their default settings and the 7700 ION will function properly. Refer to the *7700 ION User's Guide* for additional settings.

Serial COM Settings

The Serial COM menu accesses the Communications modules that control the 7700 ION's serial ports. The following setup registers and their current settings are displayed:

Setup Register	Factory Default	Function
Comm Mode	RS-485	Sets the Com 1 serial port's communications mode (RS-232 or RS-485)
Baud Rate	9600	Sets the communications speed, in bits/second, for the serial port
Unit ID	*	Sets the 7700 ION's Unit ID — a unique Unit ID is required for each device
Protocol	ION	Sets the communications protocol for the serial port

* The factory set Unit ID for Com 1 is based on the serial number of the meter, using the last four numbers before the dash. For example, serial number: PA-9709B263-01; Unit ID: 9263. The default Unit ID values for Com 2 and Com 3 are 101 and 102, respectively.

Settings for Different Serial Ports

NOTE

Each meter connected to a com port must have a unique Unit ID. Check the Unit ID register when setting up your meter to ensure its value is unique on the network.

The Baud Rate, Unit ID and Protocol setup registers are available for each installed serial port. The MGT displays CM1, CM2 or CM 3 to indicate communications ports 1, 2 or 3 (note that CM2 and CM3 settings will appear even if the optional communications ports are not present).

Module	Function
CM 1	Settings for the standard RS-232/RS-485 port (Com 1) or optional internal modem
CM 2	Settings for the first optional XPRESS CARD high-speed RS-485 port (Com 2)
CM 3	Settings for the second optional XPRESS CARD high-speed RS-485 port (Com 3)

Other Communications Module Settings

The remaining setup registers in the Communications module are given in the *7700 ION User's Guide*. In most cases you can leave them at their default settings and the 7700 ION will function properly.

Ethernet COM Settings

The Ethernet COM menu accesses the Ethernet module's setup registers. The Ethernet module controls the 10Base-T and 10Base-FL ports on the optional XPRESS CARD.

Setup Register	Factory Default	Function
Protocol	ION	Sets the communications protocol for the Ethernet ports
IP Address *	none	Sets the IP Address for the 7700 ION
Subnet Mask *	none	Used if subnetting applies to your network – see your Network Administrator
Gateway *	none	Used in multiple network configurations – see your Network Administrator

* The MGT displays <ENTER> beside these setup registers if they hold a setting. Scroll down the menu until the register is highlighted, the press the ENTER key to view and edit the register.

Typically your Network Administrator will provide you with the appropriate IP Address for the 7700 ION. The Subnet Mask and Gateway settings are only required if you have communications between multiple Ethernet networks, and if subnetting is implemented.

Demand Settings

The Demand menu accesses some of the setup registers in the factory-configured Sliding Window Demand and Thermal Demand modules. These registers control the timing of demand calculations. The following setup registers and their current settings are displayed:

Setup Register (module)	Factory Default	Function
Sub Intvl (Sliding Window) *	900	The time, in seconds, in the sliding window demand sub-interval
# SubIntvls (Sliding Window) *	1	The number of sub-intervals in the sliding window
Interval (Thermal) *	1800	The time, in seconds, in the thermal demand interval

* These setup registers are available for each demand module. The MGT displays SD1 to SD4 to indicate Sliding Window Demand modules 1 through 4, and TD1 through TD4 to indicate Thermal Demand modules 1 through 4. Some of the remaining demand modules are used for different functions, and have different settings.

Other Demand Settings

The remaining setup registers in the Sliding Window Demand module and the Thermal Demand module are given in the *7700 ION User's Guide*. In most cases you can leave them at their default settings and the 7700 ION will function properly.

Verifying 7700 ION Operation

Two pairs of LEDs on the top of the 7700 ION are used to verify operation and communications. Referring to the diagram on page 1, the "heartbeat" LEDs blink slowly to indicate that the 7700 ION's CPU and DSP are operational. If the heartbeat LEDs do not blink after the meter is installed and powered, the device is not operating properly. Contact Power Measurement Customer Service.

Verifying Communications

The Rx and Tx LEDs on the unit's lid (refer to the diagram on page 1) will blink when the 7700 ION is receiving and transmitting data on the COM 1 port. These LEDs are not a direct indication that the device is operational, as communications may not occur until the device is fully configured. These LEDs indicate communications activity on COM 1 only.

The XPRESS CARD indicates communications activity for the COM 2 and COM 3 ports using Rx and Tx LEDs located on either side of the COM 2 / COM 3 captured-wire connector (refer to the diagram on page 3). These LEDs blink when the unit is receiving or transmitting data on COM 2 or COM 3.

Connection to the Ethernet network is indicated using the Link-T and Link-FL LEDs located between the Ethernet ports on the XPRESS CARD (refer to the diagram on page 3). The Link-T LEDs is illuminated when the 10Base-T port is connected, and the Link-FL LED is illuminated when the 10Base-FL port is connected.

The CD and TXD LEDs on the unit's lid (refer to the diagram on page 1) are associated with the optional internal modem on COM 1. CD indicates the presence of a carrier signal– it should stay on as long as there is an active connection to the modem. TXD flashes to indicate the presence of signals transmitted out on the phone line.

Upgrading Firmware

ION devices are upgraded using the Firmware Upgrade Utility shipped with PEGASYS. Refer to the *PEGASYS Administrator's Guide* for usage details. 7700 ION firmware versions are available from Power Measurement.

MRP: 70000-0108-06
Revision Date: Mar. 7, 2006