



**POWER  
MEASUREMENT**

*creator of ION® technology*

## Installation Guide

**ION®**  
**6100**



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## 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 6100 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

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

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- ◆ During normal operation of the ION 6100 meter, hazardous voltages are present inside its case and on associated wiring. Follow standard safety precautions while performing any installation or service work (e.g. opening fuses/breakers).
- ◆ There are no user-serviceable parts inside the ION 6100.

### CAUTION

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

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- ◆ The ION 6100 meter is powered from the line it is monitoring, and has different hardware options that affect voltage input ratings. The ION 6100 meter's serial number label lists all equipped options. Applying voltage levels incompatible with the input ratings will permanently damage the meter.
- ◆ The ION 6100 meter's ground wire must be properly connected to earth ground for the noise and surge protection circuitry to function correctly. Failure to do so will void the warranty.

## FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ◆ Reorient or relocate the receiving antenna
- ◆ Increase the separation between the equipment and receiver. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Modifications: Modifications to this device which are not approved by Power Measurement may void the authority granted to the user by the FCC to operate this equipment.

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# Standards Compliance



Certified to UL 916

## Limitation of Liability

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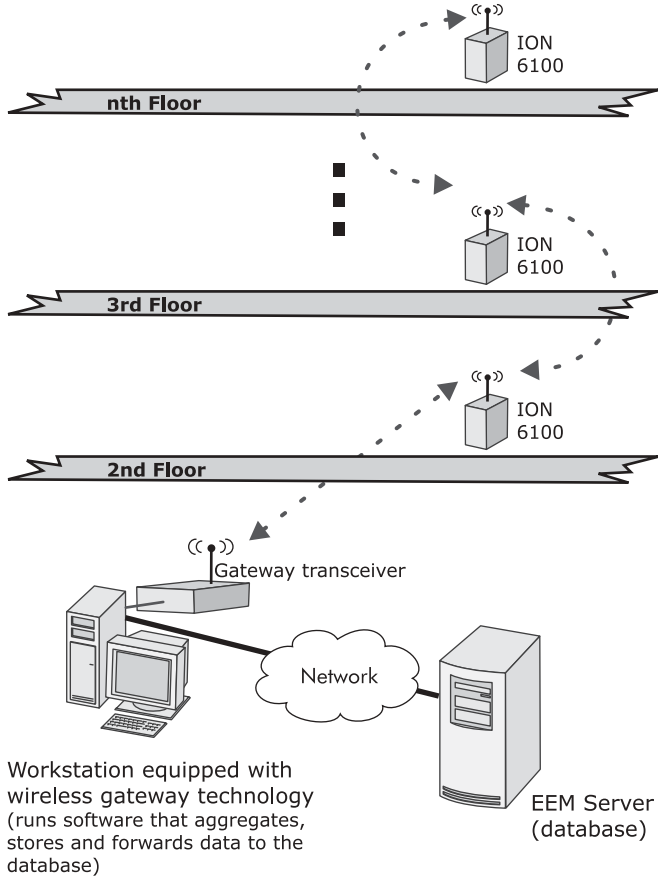
Covered by one or more of the following patents:

U.S. Patent No's 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.

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# ION 6100 Wireless Energy Meter

The ION<sup>®</sup> 6100 is a metering and data transmitting component of your ION enterprise energy management (EEM) system that features a compact design, pre-wired split-core low-voltage output CTs, and wireless communications, for quick and easy installation.



Each ION 6100 meter measures power and calculates energy use at its installed location (load point) inside your building. The data is periodically sent and transmitted through the other ION 6100 meters in the building, towards the wireless gateway. The gateway collects and stores the data, then forwards the data to the EEM server for processing and storage.

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## Limitations on Wireless Communications

<b>Operating frequency</b>	License-free 900 MHz ISM radio band
<b>Operating range</b>	Typical 30 meter (100 ft) range to other routers (indoor, line of sight)

The range of wireless communication is reduced when transmitting through building materials such as concrete or steel. Test results in modern skyscrapers displayed the ability to communicate reliably from one to three floors distance between two ION 6100 meters. Ranges up to 50 feet are typical when transmitting through walls constructed with wood or drywall. Communication ranges depend on the environment the device is installed in.

## Before You Begin

1. Check to ensure you received the correct meter options, compatible with the electrical system that your meter will be monitoring. Refer to the "Available Options" section for details.



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### CAUTION

Connecting a meter with Voltage Input option "2" (208-240 V) to a 480 V system will permanently damage the meter.

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2. Read this manual in its entirety. Follow the warnings presented in the "Installation Considerations" section.
3. Review the building plans. Check that the wiring/installation plans for the ION 6100 meters conform to the requirements of the building's electrical system.
4. Coordinate the installation of the ION 6100 meters with the installation of the gateway. The gateway should be installed first so that the ION 6100s are able to provide communications diagnostics (via the LEDs) immediately after they are installed.



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### NOTE

Use the Location ID on the ION 6100 meter label to see where the meter should be installed (e.g. floor number, panel number).

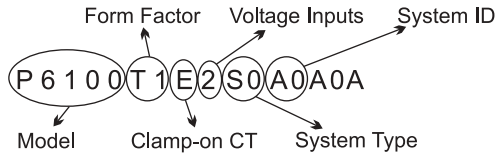
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5. Recommended tools:
  - ◆ 3/8" flat-head screwdriver
  - ◆ Locking pliers
  - ◆ Wire cutter/stripper

## Getting More Information

Additional material related to the ION 6100 and other Power Measurement™ products are available online at [www.pwr.com](http://www.pwr.com). This manual is also available in PDF format and can be downloaded from our website.

# Available Options



## Form Factor Options

Option code	Description
T1	For mounting inside the electrical panel
U1	For mounting outside the electrical panel

## Split-Core CT Options

Option code*	Description
E	200 A, 0.75" window, low voltage output
F	400 A, 1.25" window, low voltage output
G	800 A, 2.00" window, low voltage output
H	1500 A, 2.00" window, low voltage output

\* For other CT options, contact Power Measurement.

## Voltage Input Options

Option code	Description
2	208-240 VLL +/-10%
4	480 VLL +/-10%

## System Type

Option code	Description
S0	WYE, 3 or 4 Wire (comes with 3 CTs)
T0	DELTA, 3 Wire (comes with 3 CTs)
U0	Single Phase (comes with 2 CTs)

## System ID\*\*

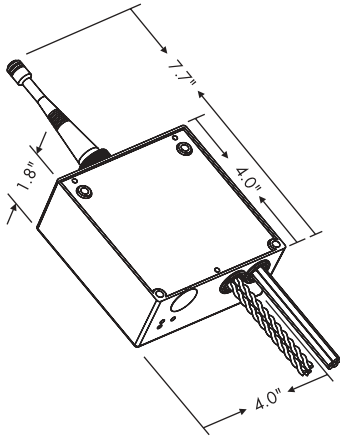
Option code	Description
A0	System ID #1 (Default gateway transceiver ID)
A1	System ID #2 (Second gateway transceiver ID)
A2	System ID #3 (Third gateway transceiver ID)

\*\* System ID is the radio ID the meter uses to communicate to the gateway. Typically, option code A0 is used for single gateway applications.

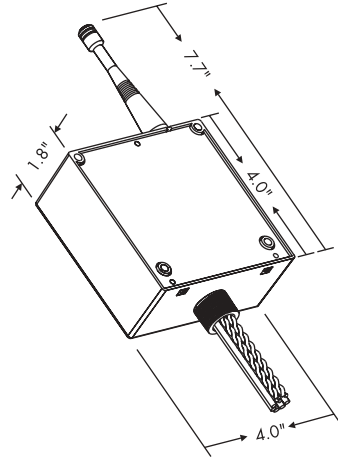
## Form Factor Options

The ION 6100 case has the same length/width dimension as a standard 4" square electrical box. It is designed to be flush mounted to the electrical panel or wall.

### Option code T1: Inside Mount Style



### Option code U1: Outside Mount Style



## Split-Core CT Specifications

Rated Inputs	see "Available Options" section
Inputs	Ia, Ib, Ic: split core, low-voltage output CTs
Wire	22 AWG (0.33 mm <sup>2</sup> ) 600 V rated
Wire length	6 ft (180 cm)
Energy accuracy compliance	ANSI C12.16 Class 1
Installation compliance	Pollution Degree 3, Overvoltage Category III
CT Dielectric Withstand	2000 VAC rms, 60 Hz for 1 minute
CT voltage output	less than 0.5 V full-scale

### Using the Split-Core CTs

- ◆ The split-core CTs measure the current flow through the conductors and transform these measured quantities into equivalent low-voltage values for the ION 6100.
- ◆ CTs are UL recognized.
- ◆ The ION 6100 performs calculations based on the assumption that energy is always delivered, so the energy totals are correct regardless of CT polarity. However, we recommend the CTs be oriented in a consistent manner; see "Mounting the Split-Core CTs".
- ◆ CTs have an internal burden so shorting blocks are not required.



## Voltage Input Specifications

Rated Inputs	see "Available Options" section
Inputs	Va (Red), Vb (Yellow), Vc (Black), Neutral (White), Ground (Green)
Wire	14 AWG (2.1 mm <sup>2</sup> ) 600 V rated
Wire length	6 ft (180 cm)
Compliance	Installation Category III (Distribution) Pollution Degree 3
Overload	1500 VAC RMS continuous
Dielectric Withstand	2500 VAC RMS, 60 Hz for 1 second

## Meter Label

POWER MEASUREMENT ION 6100

SERIAL NUMBER \_\_\_\_\_

ORDER NUMBER \_\_\_\_\_

MANUFACTURE DATE \_\_\_\_\_ FREQ. \_\_\_\_\_

VOLTAGE RATING \_\_\_\_\_

CT RATING \_\_\_\_\_

LOCATION ID \_\_\_\_\_

**⚡ DANGER**

HAZARD OF ELECTRIC SHOCK, BURN, OR DEATH  
1) DISCONNECT AND LOCKOUT ALL POWER SOURCES, AND  
2) CONSULT INSTALLATION INSTRUCTIONS PRIOR TO INSTALLATION

CONSULT INSTALLATION GUIDE FOR WIRING INSTRUCTIONS

Location ID contains useful information for the installer, such as Floor# and Breaker Panel#.

## Installation

The ION 6100 can be mounted against a flat surface, or mounted onto the side of an electrical panel (inside or outside). In all situations, make sure your method of installation conforms to the local electrical code.

### Environmental Conditions

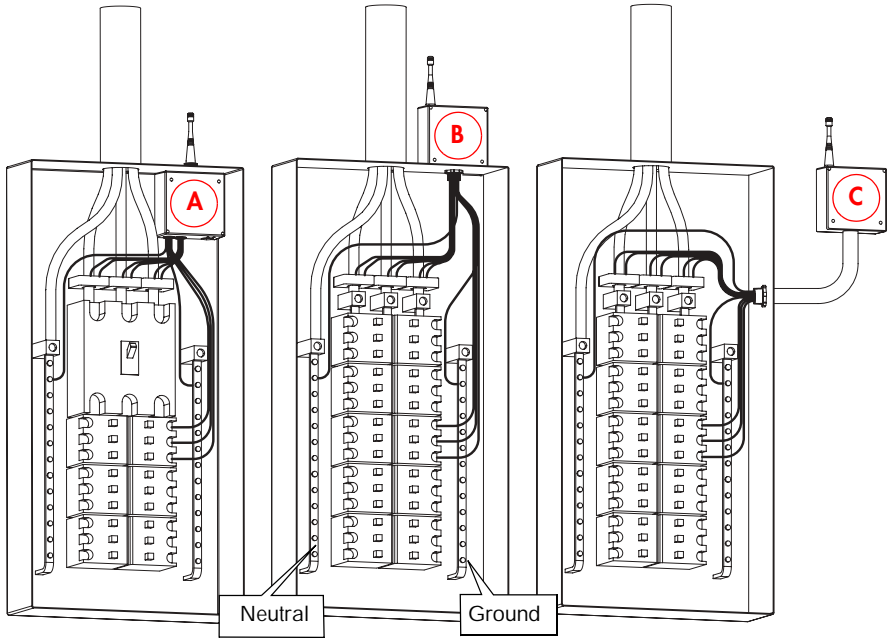
Mounting location	Indoor
Operating temperature	32°F to 122°F (0°C to 50°C)
Storage temperature	-40°F to 158°F (-40°C to 70°C)
Relative humidity	5% to 95%, non-condensing

# Mounting the ION 6100

The following describe typical installation scenarios for the ION 6100. Note that the drawings are not to scale.

## DANGER

Mounting and installation of the ION 6100 should be performed only by licensed electricians, and must conform to the local electrical codes. Disconnect power and lock out all power sources. Do not attempt to connect voltage input leads when the electrical circuits are live.



(A) is an example of inside panel mounting, (B) is outside panel mounting, and (C) is outside panel mounting with the wires fed through a conduit.

## CAUTION

On smaller panels, installation (A) may invalidate fill allowances. Check with the local electrical code before performing this installation scenario.

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## Mounting the Split-Core CTs

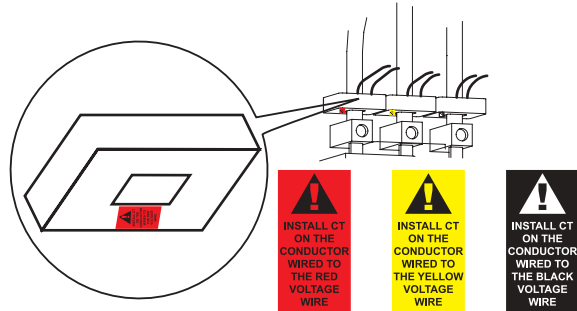
To maintain measurement accuracy for the split-core CTs:

- ◆ Use only the CTs supplied with the ION 6100
- ◆ Do not swap CTs between phases or meters
- ◆ Do not swap the removable section from one CT to another CT

### NOTE

The pluggable wire harness is polarized and color-coded (Red, Yellow, Black) with the CTs to ensure correct wiring during re-connection.

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### CAUTION

The removable section fits only one way onto the CT. If it does not fit easily, make sure that it is not backwards. To prevent damage, do not force the removable section onto the CT. When opening or closing the CTs, be careful not to bend the metal strips.

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1. Orient the split-core CTs so the labels are facing towards the load.
2. Secure the supplied cable ties around the perimeter of each CT to prevent the CT from opening up.
3. When the meter is powered up, verify that the Heart Beat / Diagnostic LED blinks green (see "Verify Meter Operation and Communications" section).

### NOTE

The conductors, tubing and PVC jackets on the CT wires are all rated to 600 V, and are UL approved to be field installed in panels up to 600 V.

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# System Wiring Diagrams

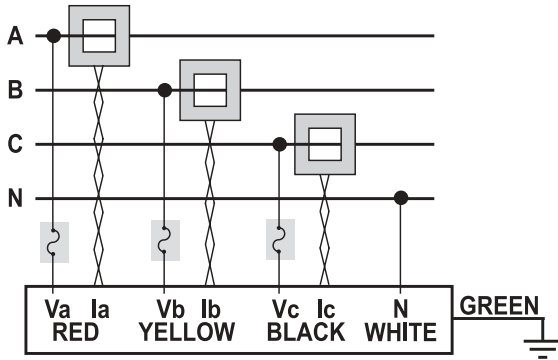
Voltage input wires are color-coded to match the corresponding CT labels.

## ⚠ CAUTION

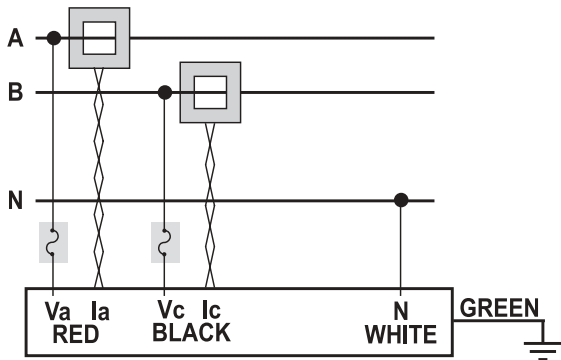
Electrical inspection authorities may require the voltage inputs to be protected by fuses/circuit breakers. Connecting to a circuit that is protected by a 15 A breaker is recommended. Make sure your installation complies with local electrical codes.

### Wye and Delta Connection Diagram

FOR DELTA OR 3-WIRE WYE, CONNECT N (WHITE) TO GROUND



### Single Phase Connection Diagram



## 📖 NOTE

In the above wiring diagrams, the specific colors of the leads do not need to match the phases (i.e. phase A does not need to be RED). However, each phase must have the same color CT and voltage input lead.

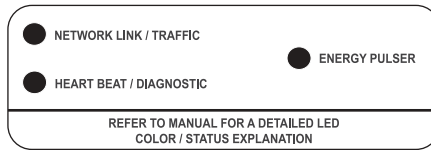
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## Powering the ION 6100

No additional wiring is needed to power up the ION 6100. The ION 6100 is powered from the electrical system it is monitoring (i.e. voltage inputs Va and Vc).

## Verify Meter Operation and Communications

The LEDs on the ION 6100 provide communications diagnostics for proper meter operation and communications.



### Communications Diagnostics

The Network Link/Traffic LED is a two-color LED that provides information when the meter is transmitting or receiving information.

LED Activity	Description
Steady Green (continuously ON)	Radio is properly identified in the wireless network
Blinking Green (once per second)	Radio is not identified in the wireless network
Flashing Red (four times/second)	Radio is transmitting/receiving information (the Red LED blinks once per packet received)

### Meter Diagnostics

The Heart Beat/Diagnostics LED is a two-color LED that indicates whether or not the meter is functioning properly.

When the meter is initially powered up (from the Va and Vc voltage input leads), the Heart Beat/Diagnostics LED flashes green (4 times/second). The meter then performs diagnostic checks, and upon successful completion the LED blinks green at a slow steady pace (once per second).

LED Activity	Description
Flashing Green (four times/second)	Startup check
Blinking Green (once per second)	Startup check passed. Meter is operating properly. Voltage and current connections are correct.
Flashing Red (four times/second)	Meter is unable to measure energy properly due to incorrect wiring — check the CT and voltage connections

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### **Energy Pulser**

The Energy Pulser LED is intended to be used for testing purposes. It blinks once per accumulated 0.1 kWh.

## **Meter Troubleshooting**

### **Heart Beat/Diagnostics LED does not blink**

- ◆ Check power connections to meter (voltage input leads Va and Vc).
- ◆ Check that supply power is turned on for Va and Vc.

### **Heart Beat/Diagnostics LED flashes red**

This typically indicates incorrect voltage and/or current connections:

- ◆ Check that the color of the voltage input leads matches that of the CTs, and that the voltage input leads are connected as shown in the "System Wiring Diagrams".
- ◆ Check that the split-core CTs Ia (Red), Ib (Yellow) and Ic (Black) are connected as shown in the "System Wiring Diagrams".
- ◆ Check that all the split-core CTs are oriented properly (sticker faces towards the load).
- ◆ Check that there is more than 0.2 A flowing on the wires the CTs are installed on.

After fixing the incorrect connections, the LED should return to a slow blinking green.

### **Heart Beat/Diagnostics LED flashes green**

If the LED continuously flashes green (4 times/second) and does not change from this state, it indicates the meter has encountered an internal error. Contact Power Measurement for assistance.



For further assistance  
please contact us at:



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