Power Meter PM-2104

User Manual

1. Overview

Power Meter PM-2104 is designed by Intech 21, Inc. for the purpose of accurate metering of electrical power, voltage, consumed active energy, and demand in a two- or three-phase power distribution system, particularly in apartment or commercial buildings. The PM-2104 contains the 916.5 MHz Transceiver Module I21RU4A, which connects PM-2104 to the Intech21 Wireless Control Network.

The PM can be configured to work with different types of Current Transformers. This feature allows to measure electrical currents in the wide range: from tens milliamperes to thousands amperes, depending on application (e.g. apartment meter 100A, commercial space meter 800A, building master meter 10.000A).

916.5 MHz Transceiver Module I21RU4A is configured as a Wireless Network Node, allowing the Power Meter to participate in the Intech21 Wireless Control Network.

The Wireless Control Network is designed to simplify deployment and reduce cost of installation of the Building Monitoring and Control System, which standard operation is to perform a variety of Data Acquisition and Control functions, e.g. Power Meter reading, Smoke Detector monitoring, Temperature Sensor reading, Electrical Heating/Cooling control, and operating the Electrical Power Load Control devices for power savings etc. The system is WEB-enabled, with the purpose of easy user access via the Internet to the building's real-time data as well as to the information stored in the Central Database.

As the Wireless Network has self-configuring features with an intrinsic structural hierarchical organization, the network units do not require hardware preprogramming prior to or during installation and the units are easily interchangeable, which reduces the possibility of installation errors by personnel.

The Wireless Network operates in 902-928MHz frequency band dedicated for non-licensed Industrial Scientific Medical (ISM) applications in the USA. Versions for other frequency bands are also available.

The Power Meter's LCD display shows measured real-time data and capable of displaying text messages provided by the System, e.g. billing information to the tenants. The LCD backlight can be turned on/off remotely to attract attention to a new message.

Green, Yellow, and Red LED annunciators on the PM's front panel are remotely controlled. Each of the LEDs can be independently set to Off, Steady On, or Blinking state. This feature can be used to announce special conditions (e.g. cost of electricity at the moment: high [red], medium [yellow] and low [green]).

Fig 1. PM-2104. Front view

2. Specifications

Power Meter Type (Configurable)	Solid-State Meter with External Current Transformers: • Three-Phase Four Wire, Three-Element meter • Two-Phase Three Wire, Two-Element meter
Baseline Standards and Approvals	ANSI C12.1, ANSI C12.16, ANSI C12.16, UL3111-1, CSA22.2 NO. 1010-1 UL Listed Power Meter 36NB
Voltage and Frequency Rating	120 V, 60 Hz
Test Current for Base Configuration	15 A RMS
Voltage Input Configurations	• Three-phase, 4-wire: Line A, Line B, Line C and Neutral • Two-phase, 3-wire: Line A, Line B and Neutral
Voltage Input	120 V RMS +30%, -50% Connection type: 20AWG to 16AWG wires, color coded
Transient Overvoltages	According to ANSI standard INSTALLATION CATEGORIES II
Current Inputs (Configurable)	• 100 A RMS max per element. TZ105 Current Transformers, choice of 2000:1 or 1000:1 • 200 A RMS to 10.000 A RMS. External Standard Current Transformers with 0.1A secondary. Connection: two wires per phase, color coded
Load Power Factor	-0.5 to +0.5
Measured Parameters	• Accumulated Active Energy in the range from: 000000.000 kWh to 999999.999 kWh for 100A configuration 00000000.0 kWh to 99,999,999.9 kWh for 200A and higher • Lines A,B(C) Voltage in the range from 0 V RMS to 255 V RMS • Lines A,B(C) Active Power in the range from 0 W to 2000 kW • Temperatures in the range: 13°F to 185°F (-10°C to +85°C). Accuracy: ±0.5°F (±0.25°C)
Energy Measurement Error	<0.5% at Test Current (Active Load), other Loads in accordance with ANSI C12
Internal Temperature Sensor	Digital. Accuracy ±0.5°F.
Data Retention	During a Power Outage the Measured Energy and Settings are stored in EEPROM
Power Consumption	< 0.6W (<0.9VA)
Display	LCD alphanumeric display 16x2 characters with optional remotely controlled backlight. Displays Measured Parameters, status information and text messages.
LED Annunciators	Red, Yellow, and Green LEDs on the PM's front panel. Independently remote-controlled. States: On, Off, Blink.
Wireless Interface	Built-In Wireless Network Communication Device. ISM License-Free Frequency Band: 902 MHz - 928 MHz This device contains 916.5 MHz Transceiver Module FCC ID: P8A-I21RU4A. RF Transmitted Power: 0 dBm (1 mW)
Size	5 x 5.7 x 1.4 inches
Weight	< 10 oz

Environmental Conditions	• Indoors use. • Placement: Power Distribution Panel, Wall-Mount, Flush-Mount • Temperature Range: 5°C to +50°C • Altitude up to 2000m • Maximum relative humidity 85% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C • POLLUTION DEGREE 2 in accordance with IEC664

3. PM-2104 Installation

The Power Meter can be installed inside a power distribution panel or wall-mounted by a qualified technician. After being energized the Power Meter needs no maintenance. Following examples illustrate installation steps for the most common PM configurations. Make sure the Power Meter works properly after installation (see Intech21 Document "PM-2104 Installation Mistakes").

3.1 Two-phase installation (100A configuration)

1. Switch off all circuit breakers in the panel.
2. Put on the external current transformers (CTA and CTB on Fig 2) on the power line cables.
3. Remove the lid of the Power Meter's junction compartment.
4. Pull the Current Transformers' and three AWG18 wires (White, Black, Blue) through the 1/2" conduit. Insert and secure fitting of the conduit in the backside opening of the PM's junction compartment.
5. Secure the Power Meter using the mounting holes located inside the junction compartment.
6. Connect the current transformer wires (twisted pairs) to the appropriate current sensor wires of the Power Meter: AWG20 black-white pair for CTA, AWG20 orange-blue pair for CTB.
7. Connect White, Black, Blue wires to the corresponding Power Meter's voltage input wires.
8. Put the wires inside the junction compartment and cover it with the lid.
9. Connect wires in the panel: White to Neutral, Black to the Line A voltage through the 3A in-line fuse, Blue to the Line B voltage through the 3A in-line fuse.
10. Turn on the circuit breakers.

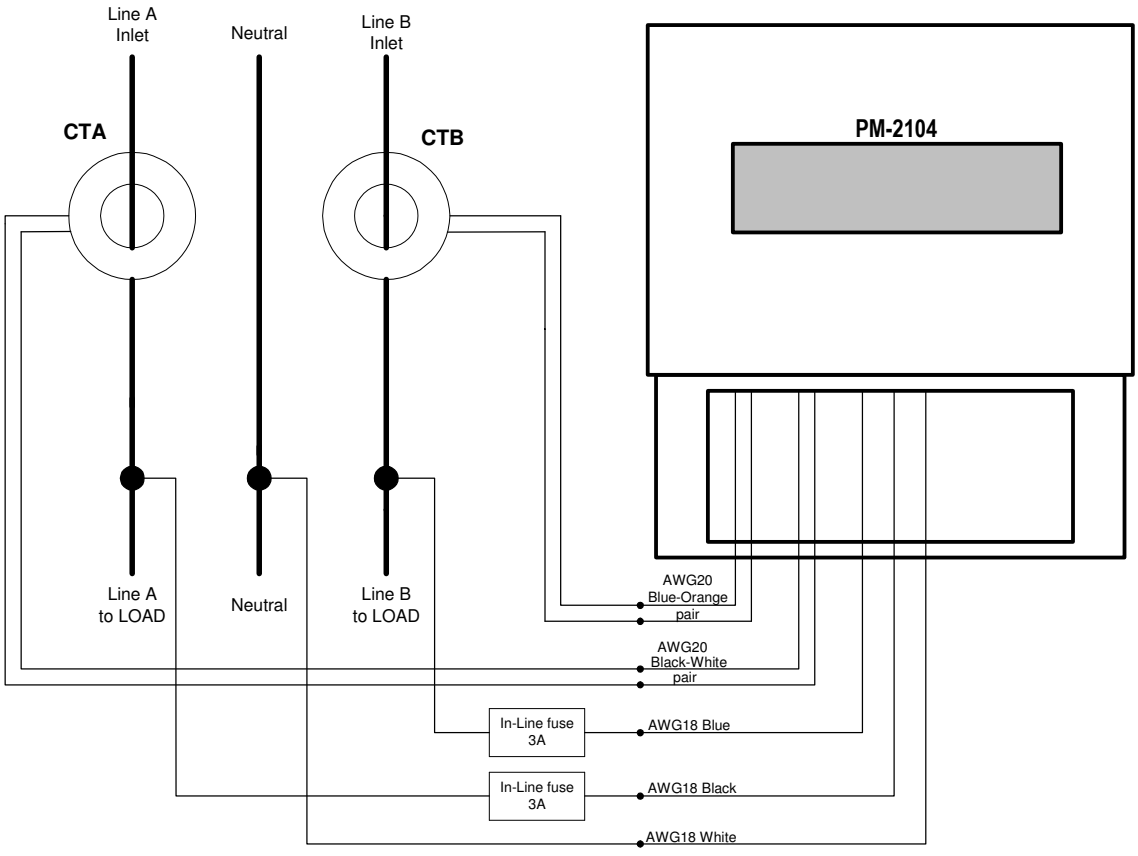

Fig 2. PM-2104 Two-phase Connection Diagram.
Solid-core CTA and CTB 2000:1 or 1000:1

3.2 Three-phase installation

1. Installation can be made on live power lines.
2. Connect the Power Meter wires to the Terminal Board.
3. Connect the Current Transformers' wires (twisted pairs) to the appropriate terminals of the Terminal Board.
4. Install and lock split core CTs on the corresponding power lines (bus bars).
5. Connect to the appropriate terminals of the Terminal Board the Neutral wire first, then Line A and Line B voltage wires through the 3A in-line fuses.

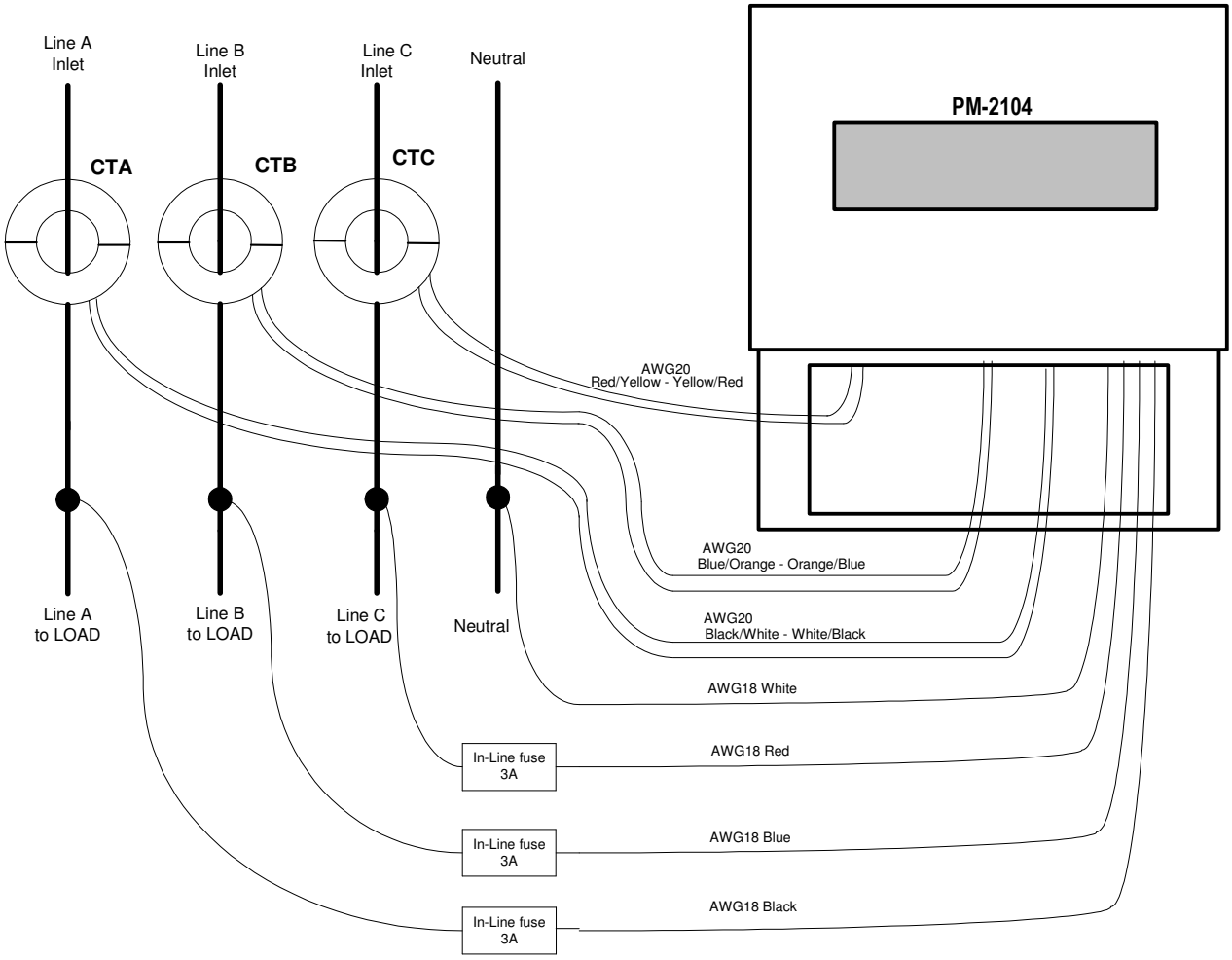

Fig 3. PM-2104 Three-phase Connection Diagram.
CTA, CTB, CTC 200:0.1 and higher ratios

4. LCD Display Data Representation

Power Meter's two-line LCD Display shows various data depending on the current PM configuration and status of the device.

4.1 Upper Line

- Power Meter model and Company name. Shown once on power-up.

```
PM-2104 Intech21
```

- Current Inputs Configuration. Shown once on power-up.

  Example1: Two-phase meter, 2000:1 CT, Internal burden resistor.

```
2Φ 2000:1  Rint
```

  Example2: Three-phase meter, 800:5 CT, External burden resistor 50 milliohms.

```
3Φ 800:5   R50
```

- Channels 1 and 2 Configuration. Shown once on power-up. (Not used in current version)

```
Ch1:NA Ch2:NA
```

- Voltage, active power, and power factor for the phase A.

  Example:

```
A123V 1.23kW .93
```

- Voltage, active power, and power factor for the phase B.

  Example: There's no consumption on phase B, and the Power Factor is not calculated.

```
B121V 0W
```

- Voltage, active power, and power factor for the phase C (if PM configured as 3-phase meter).

  Example:

```
C122V 22.1kW .88
```

- Power Meter Communication ID and Communication Status Code:

  Example:

```
ID:0279/0117 OK
```

Communication Status Codes

Communication Status	Description
OK	This Network Node is registered in the Network. The Power Meter is communicating with the System.
NC	No Communication to the Network, e.g. because of the Network Access Point is off, or due to the radio interference or propagation problems.
NL	Internal Communications Fault. If this code shows up persistently then the device must be replaced.
WD	The Power Meter receives incomprehensible or corrupted data from the Network. Check data communication path.

- A text message(s) may be displayed in the upper line of display when the Building Monitoring and Control System switch PM to the Text Messages Display Mode. The displayed message may consist of up to 16 lines of 16 characters text showing up line by line every second. Then a breaking empty line follows and message displaying cycle repeats.

4.2 Lower Line

- PM Serial Number and firmware version. This line is displayed during first 15 minutes after powering-up. It can be turned on again for another 15 minutes remotely.

  Example:

  ```
  s/n 1573-7C59 6.2
  ```

- Accumulated Active Energy in kWh

  Example: PM with 100A CT scale

  ```
  000021.684 kWh
  ```

  Example: PM with 200A and more CT scale

  ```
  00,022,568.3 kWh
  ```

- At the moment when the Power Meter is turned off, the lower line displays "Power Off" for a short period of time. It indicates that current values of the counters and status data are stored in the Power Meter's non-volatile memory. If this message doesn't show up, then the PM needs to be replaced.

  ```
  Power Off
  ```

5. Technical Support

For technical support please contact Intech 21, Inc. When requesting technical support for the PM-2104 please provide following information:

- Power Meter Serial Number and Communication ID.
- Meter's configuration.
- Type of the Current Transformers used.