



## Smart-PDU Branch Circuit Power & Energy Metering



Installation and User's Manual

## **System Overview**

Smart-PDU is a modular branch circuit power and energy metering system that provides circuit metering for 2 to 42 electric circuits that share a common voltage source. Smart-PDU is designed to work on both 120/240 or 208Y/120 3Ø distribution systems.

Smart-PDU supports a wide range of network reading options. You can daisy-chain multiple Smart-PDU cabinets together and read them automatically from a host computer through a Serial Port Adapter or USB Port Adapter. With the addition of a Smart-Net Gateway you can remotely read a group of daisy-chained Smart-PDUs across a TCP/IP network. The Smart-Net Gateway supports obtaining power and energy readings via XML based Web Services or can automatically log reading data as comma delimited text files to a remote FTP Server.

## **DANGER!**

### **HAZARD OF ELECTRICAL SHOCK, BURN, OR EXPLOSION**

- **This equipment must be installed and serviced only by qualified personnel.**
- **Turn off all power supplying this equipment before working on or inside equipment.**
- **Always use a properly rated voltage sensing device to confirm that power is off.**
- **Replace all device doors and covers before turning on power to this equipment.**

**Failure to observe this instruction will result in death or serious injury.**

## **Installation Overview**

The system installation is usually done in the following order:

1. Mount Smart-PDU Cabinet.
2. Wire Voltage Inputs to Voltage Input Terminals (Figure #1, Ref #1).
3. Install desired number of Split-Core Current Transformers for the circuits to be monitored and terminate at CT Terminal Block (Figure#1, Ref #4).
4. Install desired number of BladeMeters for the circuits to be monitored (Figure #1, Ref #6).
5. Set Voltage Input jumpers to appropriate settings for each circuit to be monitored (Figure #1, Ref #1).
6. Confirm each meters is functioning properly by viewing status LEDs.
7. Connect to PC via Smart-Net RJ11 jack to configure meters and obtain readings.

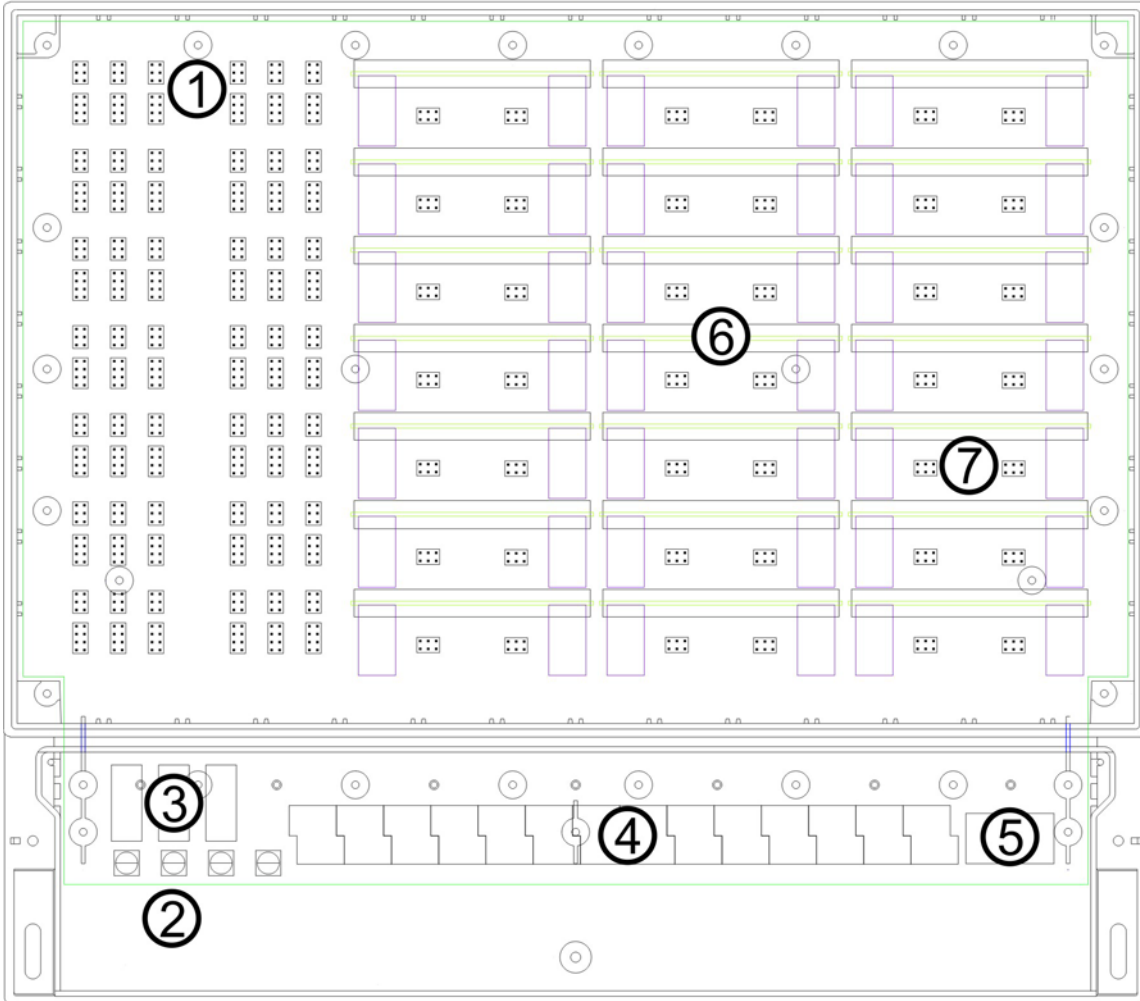


Figure #1: Smart-PDU Cabinet Layout

#	Item	Description
1	Voltage Input Jumpers	Jumpers used to set the input voltage sources for each meter. (See Page #)
2	Voltage Input Terminals	Line and Neutral Connections for common voltage inputs.
3	Fuse Holders	Three 250 VAC, 3.15 Amp Fuse for circuit protection.
4	CT Terminal Block	Current Transformer Terminal Block for inputs 1 – 42.
6	BladeMeter Sockets	21 Sockets for BladeMeter Boards. Each BladeMeter provides power and energy metering for two circuits.
7	CT and Resolution Jumpers	CT jumpers support for multiple CT models. Resolution jumpers change watt-hour resolution. (See Page #)

### **Mounting Smart-PDU Cabinet**

It is usually best to locate the Smart-PDU cabinet as close to the distribution panel to be monitored as practical. The split-core current transformers have 8' long output wires, so placing the cabinet in a location where the furthest CT is within 8' of the CT Terminal Block (see Figure #1, Ref #4) will eliminate the need to splice the CT wires.

### **Voltage Connections**

A switch or circuit breaker shall be included in the building installation; shall be in close proximity to the Smart-PDU cabinet and within easy reach of the operator; and it shall be marked as the disconnecting device for the Smart-PDU cabinet.

If you will be monitoring circuits in a 208Y/120 Volt 3Ø system, use the provided voltage input wires to connect Phase 1 using BLACK, Phase 2 using RED, Phase 3 using BLUE, and Neutral using WHITE to the terminals labeled L1, L2, L3, and N respectively in the Smart-PDU cabinet (See Figure1, reference #3).

If you will be monitoring circuits in a 120/240 Volt system, use the provided voltage input wires to connect Phase 1 using BLACK, Phase 2 using RED, and Neutral using WHITE to the terminals labeled L1, L2, and N respectively in the Smart-PDU cabinet (See Figure1, reference #3). L3 will remain un-connected.

When attaching voltage input wires to Voltage Input Terminals (See Figure1, reference #2) secure the screws with a torque of 8 ft-lbs.

### **Split-Core CT Installation**

You will need one split-core transformer on each circuit to be monitored. Open up the CT and clamp it around the conductor of the desired circuit. The polarity of the CT matters. When clamping the CT around the circuit the output wires of the CT should point toward the source (breaker). In most cases you will locate the CT reasonably close to the circuit breaker although this isn't necessary.

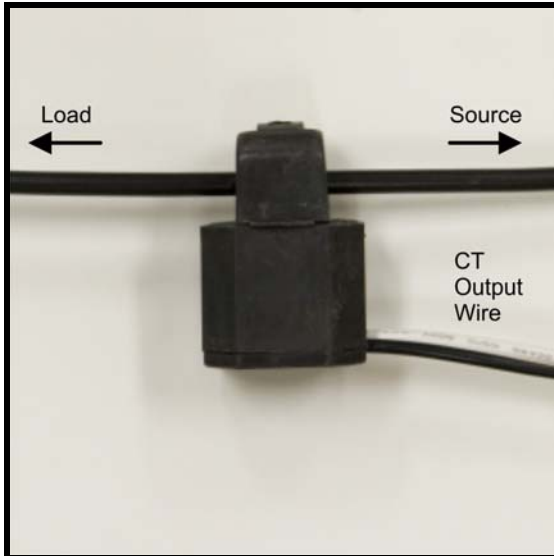


Figure #2: Current Transformer Polarity

### **Terminating CT Wires**

Each CT output wire pair will be routed to the Smart-PDU cabinet and terminated at the CT Terminal Block (Figure #1, Ref #4). Each CT wire pair is black and white. You locate the meter number desired for the specific CT on the terminal block and terminate the white wire to the upper terminal and the black wire to the lower terminal.

### **Inserting BladeMeters**

Each BladeMeter is shipped in an anti-static bag. You should take appropriate ESD prevention measures before handling the BladeMeter. You should populate the meters starting at the first open socket and proceeding without skipping sockets. The bottom edge of the BladeMeter is pressed into the socket at an angle and then rocked into a latching mechanism on each side of the board. To remove a BladeMeter it is necessary to press the latches on both sides of the socket to allow the BladeMeter to pivot on its edge and be removed from its socket. The BladeMeters need to be populated in order from the lowest meter to highest and removed in reverse order.

### **Voltage Jumpers**

The Voltage Jumpers allow you to input the appropriate voltage to each metered circuit (Figure #1, Ref #1).

On a 208Y/120 3Ø system there are six (6) possible voltage settings for each circuit.

- There are three (3) 120 volt settings:
  1. Line 1 to Neutral (L1 – N)
  2. Line 2 to Neutral (L2 – N)
  3. Line 3 to Neutral (L3 – N)

- There are three (3) 208 volt settings:
  1. Line 1 to Line 2 (L1 – L2)
  2. Line 2 to Line 3 (L2 – L3)
  3. Line 3 to Line 1 (L3 – L1)

On a 120/240 volt system there are four (4) possible voltage settings for each circuit.

- There are two (2) 120 volt settings:
  1. Line 1 to Neutral (L1 – N)
  2. Line 2 to Neutral (L2 – N)
- There are two (2) 240 volt settings:
  1. Line 1 to Line 2 (L1 – L2)
  2. Line 1 to Line 2 (L2 – L1)

EXAMPLE 1: Your first meter is going to monitor a 120 volt circuit that is powered by Phase 1 (BLACK).

The voltage jumpers for meter one should be set to (L1 – N) which means the top jumper is positioned on the pins labeled “L1” and the bottom jumper is positioned on the pins labeled “N”.

EXAMPLE 2: Your third meter is going to monitor a 208 volt circuit that is powered by a two-pole breaker on Line 2 (RED) and Line 3 (BLUE).

The voltage jumpers for meter three should be set to (L2 – L3) which means the top jumper is positioned on the pins labeled “L2” and the bottom jumper is positioned on the pins labeled “L3”.

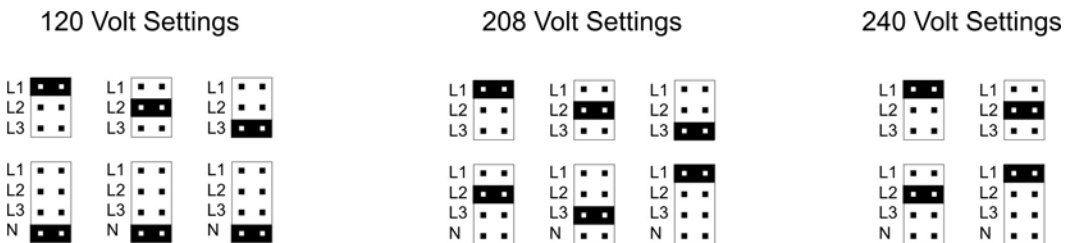


Figure # 3: Voltage jumper settings examples

### CT Jumpers

The standard position for the CT jumper is position 1 for use with normally provided 60-amp split-core CT.

### Resolution Jumpers

There are two resolution jumper settings. The standard setting is in the “H” position, which stands for “high resolution”. This sets the meter associated with

this jumper to increment its digital counter every 0.1 watt-hours. The “L” settings stand for “low resolution”. This sets the meter associated with this jumper to increment every 1.0 watt-hours.

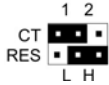


Figure #4: CT and Resolution Jumpers

### **BladeMeter LED Indicators**

Each BladeMeter has two status LED indicators to assist with troubleshooting. There is one GREEN LED and one RED LED.

**GREEN LED:** The GREEN LED flashes proportionally to the current being metered. Circuits with high current will result in rapid flashing. Circuits with low current will result in slow flashing. Circuits with no load will result in the LED being left in the ON or OFF state.

**RED LED:** The RED LED is used to detect a CT that has been installed incorrectly. As discussed above in the section entitled “Split-Core CT Installation” the CTs must be installed with the correct orientation. If are installed incorrectly, the RED LED will be displayed.

**NOTE:** The RED LED will always come on when a BladeMeter is powered up for the first time. Until the circuit has a load on it the BladeMeter cannot determine if the CT is correctly oriented. The RED LED will remain lit until the circuit has a load on it AND the CT is correctly oriented.

### **Smart-Net Connection**

The Smart-Net RJ11 (Figure #1, Ref #5) jack provides a network interface to read each BladeMeter within a Smart-PDU cabinet.

Smart-PDU supports a wide range of network reading options. You can daisy-chain multiple Smart-PDU cabinets together and read them automatically from a host computer through a Serial Port Adapter or USB Port Adapter. With the addition of a Smart-Net Gateway you can remotely read a group of daisy-chained Smart-PDUs across a TCP/IP network. The Smart-Net Gateway supports obtaining power and energy readings via XML based Web Services or can automatically log reading data as comma delimited text files to a remote FTP Server.

### **Fuse Replacement**

Fuse replacement should only be done when all voltage inputs have been disconnected from Smart-PDU. Use standard 5x20mm fuses rated for 250 VAC at 3.15 Amps. (Figure #1, Ref #3)