

# WATTNODE® MODBUS

## Quick Install Guide

### Precautions

	Read, understand, and follow all instructions in the "Installation and Operation Manual" including all warnings, cautions, and precautions before installing and using the product.
	Potential Shock Hazard from Dangerous High Voltage.

Different WattNode models measure circuits with voltages from 120 Vac single-phase to 600 Vac three-phase. **These voltages are lethal!** Always adhere to the following checklist:

- 1) CCS recommends that a **licensed electrician** install metering equipment.
- 2) The terminal block screws are **not** insulated. Do not contact metal tools to the screw terminals if the circuit is live!
- 3) If the meter is installed incorrectly, the safety protections may be impaired.

### Mounting

- Protect the meter from moisture, direct sunlight, high temperatures, and conductive pollution (salt spray, metal dust, etc.), using a NEMA rated enclosure if necessary.
- Do not install the meter where temperatures fall below -30°C or above 55°C (-22°F to 131°F).
- The meter must be installed in an electrical service panel, a junction box, or a limited access electrical room.
- **Do not drill mounting holes with the meter in the mounting position** because the drill bit or chuck may damage the meter and leave drill shavings in the connectors.

The meter has two mounting holes spaced 136.6 mm (5.375") apart (center to center). These mounting holes are normally obscured by the detachable screw terminals. Remove the screw terminals to mark the hole positions and mount the meter.

Self tapping #8 sheet metal screws are included. Don't over-tighten the screws, as long term stress on the case can cause cracking.

### Electrical Service Types

**Table 1** above lists the WattNode models and common circuit types. In the "Electrical Service Types" column, when two voltages are listed with a slash between them, they indicate the line-to-neutral / line-to-line voltages.

**Figure 1** above shows the connections for a three-phase wye circuit. Other circuit types are similar, but with fewer connections (no neutral for delta, no phase C for single-phase three-wire 120V/240V). See the full manual for more diagrams.

### Connect Current Transformers

- Use only UL recognized current transformers (CTs) with built-in burden resistors that generate 0.333 Vac (333 millivolts AC) at rated current.
- **Do not** use ratio or current output CTs such as 1 amp or 5 amp output models! See the manual for the maximum input current ratings.
- To minimize current measurement noise, avoid extending the CT wires, especially in noisy environments. If it is necessary to extend the wires, use shielded twisted pair wire 22 - 14 AWG, rated for 300 V or 600 V.
- You may shorten the CT wires.

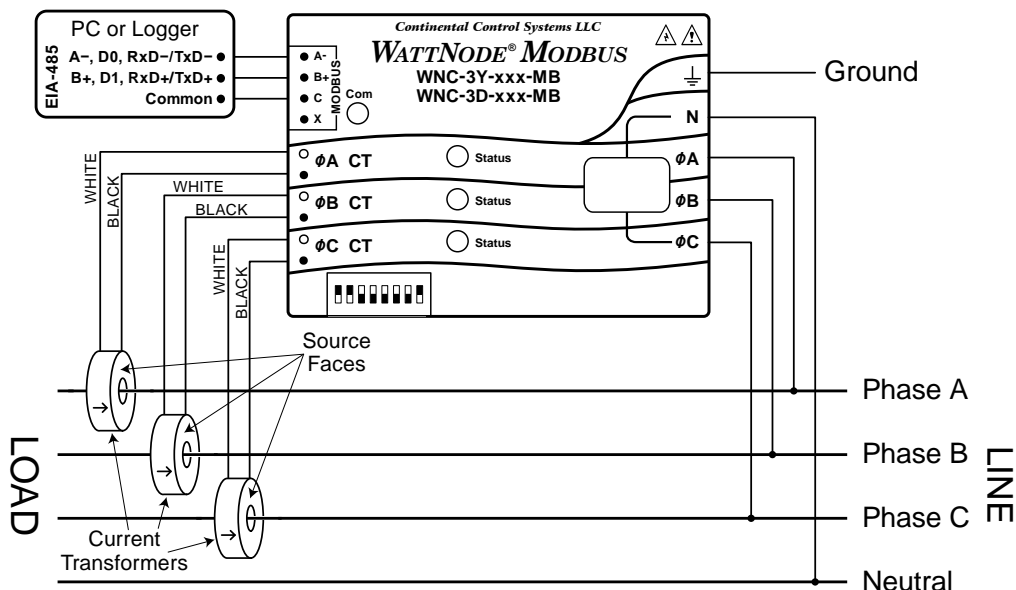


Figure 1: WattNode Wiring Diagram

Model	Type	Line-to-Neutral Vac	Line-to-Line Vac	Electrical Service Types
WNC-3Y-208-MB	Wye	120 Vac	208-240 Vac	1 Phase 2 Wire 120V with neutral 1 Phase 3 Wire 120V/240V with neutral 3 Phase 4 Wire Wye 120V/208V with neutral
WNC-3Y-400-MB	Wye	230 Vac	400 Vac	1 Phase 2 Wire 230V with neutral 3 Phase 4 Wire Wye 230V/400V with neutral
WNC-3Y-480-MB	Wye	277 Vac	480 Vac	3 Phase 4 Wire 277V/480V with neutral 1 Phase 2 Wire 277V with neutral
WNC-3Y-600-MB	Wye	347 Vac	600 Vac	3 Phase 4 Wire 347V/600V with neutral
WNC-3D-240-MB	Delta (or Wye)	120-140 Vac	208-240 Vac	1 Phase 2 Wire 208V (no neutral) 1 Phase 2 Wire 240V (no neutral) 1 Phase 3 Wire 120V/240V with neutral 3 Phase 3 Wire Delta 208V (no neutral) 3 Phase 4 Wire Wye 120V/208V with neutral 3 Phase 4 Wire Delta 120/208/240V with neut.
WNC-3D-400-MB	Delta (or Wye)	230 Vac	400 Vac	3 Phase 3 Wire Delta 400V (no neutral) 3 Phase 4 Wire Wye 230V/400V with neutral
WNC-3D-480-MB	Delta (or Wye)	277 Vac	480 Vac	3 Phase 3 Wire 480V (no neutral) 3 Phase 4 Wire 277V/480V

Table 1: WattNode Models

- Put jumper wires across unused CT inputs.
- Find the arrow or label "THIS SIDE TOWARD SOURCE" on the CT and face toward the current source: generally the circuit breaker.

To install the CTs, pass the conductor to be measured through the CT and connect the CT leads to the meter. **Always remove power before disconnecting any live wires.** Put the line conductors through the CTs as shown in **Figure 1** above.

CTs are directional. If they are mounted backwards or with their white and black wires swapped the measured power will be negative. The meter indicates negative measured power with flashing red LEDs.

Split-core CTs can be opened for installation around a conductor. A nylon cable tie can be secured around the CT to prevent inadvertent opening.

### Wiring

Connect the white and black CT wires to the meter. Excess length may be trimmed from the wires if desired. Strip or trim the wires to expose 1/4" (6 mm) of bare wire. The current transformers connect to the six position black screw terminal block. Connect each CT with the white wire aligned with the white dot on the label, and the black wire aligned with the black dot. Note the order in which the phases are

connected, as the line voltage phases **must** match the current phases for accurate power measurement.

Finally record the CT rated current as part of the installation record for each meter.

### Connect Voltage Terminals

#### Circuit Protection

The meter must be installed with a disconnect (circuit breaker, switch, or disconnect) and overcurrent protection (fuse or circuit breaker).

The meter only draws 10-30 milliamps, so the rating of any switches, disconnects, fuses, and/or circuit breakers is determined by the wire gauge, the mains voltage, and the current interrupting rating required.

- The switch, disconnect, or circuit breaker must be as close as practicable to the meter.
- Use circuit breakers or fuses rated for 20 amps or less.
- The circuit breakers or fuses must protect the mains terminals labeled **φA**, **φB**, and **φC**. If neutral is also protected, then the overcurrent protection device must interrupt both neutral and the ungrounded conductors simultaneously.
- The circuit protection / disconnect system must meet IEC 60947-1 and IEC 60947-3, as well as all national and local electrical codes.

## Wiring

- For the line voltage wires, CCS recommends 16 to 12 AWG stranded wire, type MTW, THWN, or THHN, 600 V.
- Do not place more than one voltage wire in a screw terminal; use separate wire nuts or terminal blocks if needed.
- Verify that the line voltages match the line-to-line  $\phi$ - $\phi$  and line-to-neutral  $\phi$ -N values printed in the white box on the front label.
- The meter is powered from the line voltage inputs:  $\phi$ A (phase A) to N (neutral), or  $\phi$ A to  $\phi$ B for delta models.

**Always disconnect power** before connecting the line voltage inputs to the meter. Connect each line voltage to the appropriate phase; also connect ground and neutral (if applicable). The neutral connection "N" is not required on models starting with **WNC-3D**, but we recommend connecting it to ground if neutral is not present.

The screw terminals handle wire up to 12 AWG. Prepare the voltage wires by stripping the wires to expose 1/4" (6 mm) of bare wire. Connect each voltage line to the green terminal block as shown in **Figure 1** above. Verify that the line voltage phases match the CT phases. After the voltage lines have been connected, make sure both terminal blocks are securely installed on the meter.

When power is first applied, check that the LEDs behave normally: if you see the LEDs flashing red-green-red-green (see **Figure 7** below), then disconnect the power immediately! This indicates the line voltage is too high for this model.

## Connect Modbus (RS-485) Outputs

- RS-485 wiring can be complex when multiple devices are connected, when running wires for long distances, and when using termination and biasing resistors. If you have any questions, consult the full "Installation and Operation Manual".
- The outputs are isolated from dangerous voltages, so you can connect them at any time.
- If the output wiring is near line voltage wiring, use wires or cables with a 300 V or 600 V rating.
- If the cable is near bare conductors, like bus-bars, it should be double insulated or jacketed.
- Be sure to connect the **A-**, **B+**, and **C** terminals. The **X** terminal is normally not used. You may use the cable shield for the **C** connection.
- For long distances, use shielded twisted-pair cable to prevent interference. With shielded cable, connect the shield to earth ground at one end.

The WattNode Modbus meter can be connected to PCs with RS-485 interfaces and to data loggers or other devices that accept RS-485 Modbus devices.

## Configure DIP Switches

Use DIP switches 1-7 to select the Modbus address (1 to 127) and switch 8 to select the baud rate (OFF = 9600, ON = 19200).

## Installation Summary

- Mount the WattNode meter.
- Turn off power** before installing toroidal CTs or making voltage connections.
- Mount the CTs around the line conductors. Take care to orient the CTs facing the source.
- Connect the twisted white and black wires from the CT to the black terminal block on the meter, matching the wire colors to the white and black dots on the meter label.
- Install or connect appropriate circuit breakers or fuses and disconnects.
- Connect the line voltage wires to the green

terminal block of the meter, and check that the CT phases match the line voltage phases.

- Connect the output terminals of the WattNode meter to the monitoring equipment.
- Check that all the wires are securely installed in the terminal blocks by tugging on each wire.
- Apply power to the meter.
- Verify that the LEDs light correctly and don't indicate an error condition.

## Register Configuration

For a full list of registers and settings, see the "Installation and Operation Manual". At a minimum, the **CtAmps** register must be programmed with the rated amps of the attached current transformers.

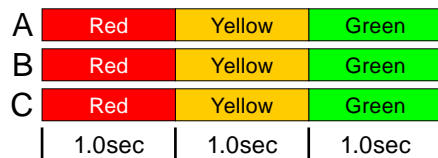
## Modbus Com Diagnostic LED

Near the upper left corner, there is a Modbus diagnostic LED that can indicate the following:

- Green** A short green flash indicates a good packet addressed to this device.
- Yellow** A short yellow flash indicates a good packet addressed to a different device.
- Red** A one second red flash indicates an invalid packet: bad baud rate, bad parity, bad CRC, noise, etc.
- Red** Solid red indicates the address is set to zero: an invalid choice.
- R Y R Y R Y** Rapid red/yellow flashing indicates a possible Modbus address conflict.

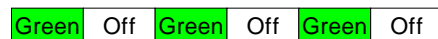
## Power Diagnostic LEDs

The three status LEDs on the front of the meter can help indicate correct operation. The "A", "B", and "C" on the diagrams indicate the three phases.



**Figure 2: Normal Startup**

The meter displays this startup sequence whenever power is first applied.



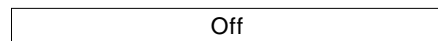
**Figure 3: Positive Power**

Any phase with the LEDs flashing green is indicating normal positive power.



**Figure 4: No Power**

Any phase with a solid green LED indicates no power, but line voltage is present.



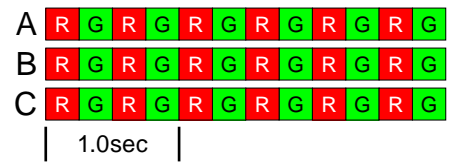
**Figure 5: No Power - Zero Vac**

Any phase LED that is off indicates no voltage on that phase.



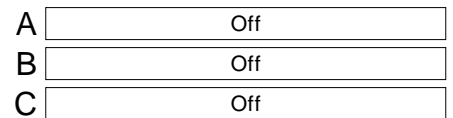
**Figure 6: Negative Power**

Red flashing indicates negative power for that phase. Reversed CTs, swapped CT wires, or CTs not matched with line voltage phases can cause this.



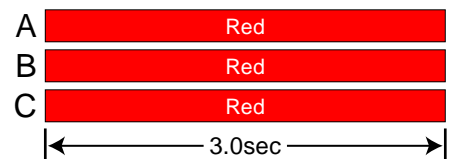
**Figure 7: LED Overvoltage Warning**

The line voltage is too high for this model. Disconnect power immediately! Check the line voltages and the meter ratings (in the white box on the label).



**Figure 8: Meter Not Operating**

If none of the LEDs light, then check that the correct line voltages are applied to the meter. If the voltages are correct, call customer service for assistance.



**Figure 9: WattNode Error**

If the meter experiences an internal error, it will light all LEDs red for three or more seconds. If you see this happen repeatedly, return the meter for service.

For other LED patterns, see the "Installation and Operation Manual" or contact support for assistance.

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