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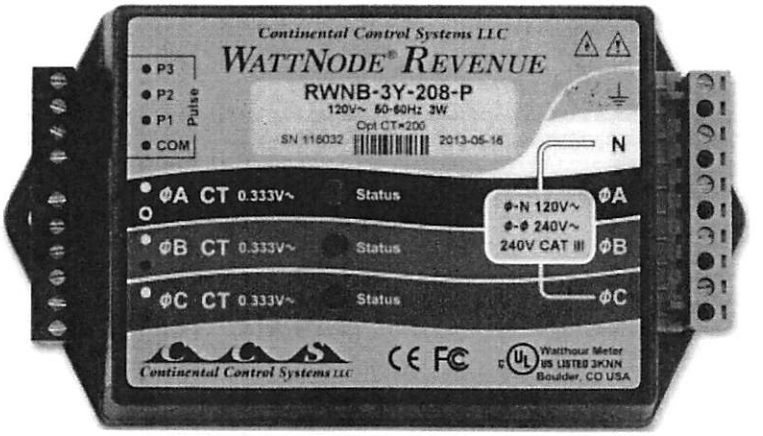
WattNode® Pulse and WattNode® Revenue

Electric Power Meter - Installation Manual



WattNode Pulse Models	WattNode Revenue Pulse Models
WNB-3Y-208-P	RWNB-3Y-208-P
WNB-3Y-400-P	RWNB-3Y-400-P
WNB-3Y-480-P	RWNB-3Y-480-P
WNB-3Y-600-P	RWNB-3Y-600-P
WNB-3D-240-P	RWNB-3D-240-P
WNB-3D-400-P	RWNB-3D-400-P
WNB-3D-480-P	RWNB-3D-480-P

Continental Control Systems LLC

www.ccontrolsys.com

Contents

1 Precautions

1.1 Only qualified personnel or **licensed electricians** should install the WattNode meter. The mains voltages of 120 to 600 Vac can be lethal!

1.2 Follow all applicable local and national electrical and safety codes.

1.3 The terminal block screws are **not** insulated. Do not contact metal tools to the screw terminals if the circuit is live!

1.4 Verify that circuit voltages and currents are within the proper range for the meter model.

1.5 Use only UL listed or UL recognized current transformers (CTs) with built-in burden resistors, that generate 0.333 Vac (333 millivolts AC) at rated current. **Do not use current output (ratio) CTs such as 1 amp or 5 amp output CTs: they will destroy the meter and may create a shock hazard.**

1.6 Protect the line voltage conductors to the meter with fuses or circuit breakers (not needed for the neutral or ground wires). See **3.3.1** below.

1.7 Equipment must be disconnected from the HAZARDOUS LIVE voltages before access.

1.8 If the meter is not installed correctly, the safety protections may be impaired.

1.9 Symbols

	Read, understand, and follow all instructions including warnings and precautions before installing and using the product.
	Potential Shock Hazard from Dangerous High Voltage.
	Functional ground; should be connected to earth ground if possible, but is not required for safety grounding.
	UL Listing mark. This shows the UL and cUL (Canadian) listing mark.
	FCC Mark. This logo indicates compliance with part 15 of the FCC rules.
	Complies with the regulations of the European Union for Product Safety and Electro-Magnetic Compatibility. • Low Voltage Directive – EN 61010-1: 2001 • EMC Directive – EN 61327: 1997 + A1/1998 + A2/2001
	This indicates an AC voltage.

2 Overview

Congratulations on your purchase of the WattNode® Pulse or WattNode® Revenue for Pulse watt/watt-hour transducer. The WattNode meter enables you to make power and energy measurements within electric service panels avoiding the costly installation of subpanels and associated wiring. It is designed for use in demand side management (DSM), submetering, energy monitoring, billing and renewable energy applications.

The WattNode Revenue version meets the ANSI C12.1 standard for revenue metering when used with IEEE C57.13 class 0.6 current transformers, such as the Accu-CT®.

2.1 Additional Literature

See the Continental Control Systems, LLC website (**www.ccontrolsys.com**) for product pages, datasheets, and support pages for all WattNode meter models and current transformers. Each WattNode model has an **Operating and Reference Guide** with detailed information on the available measurements and interface.

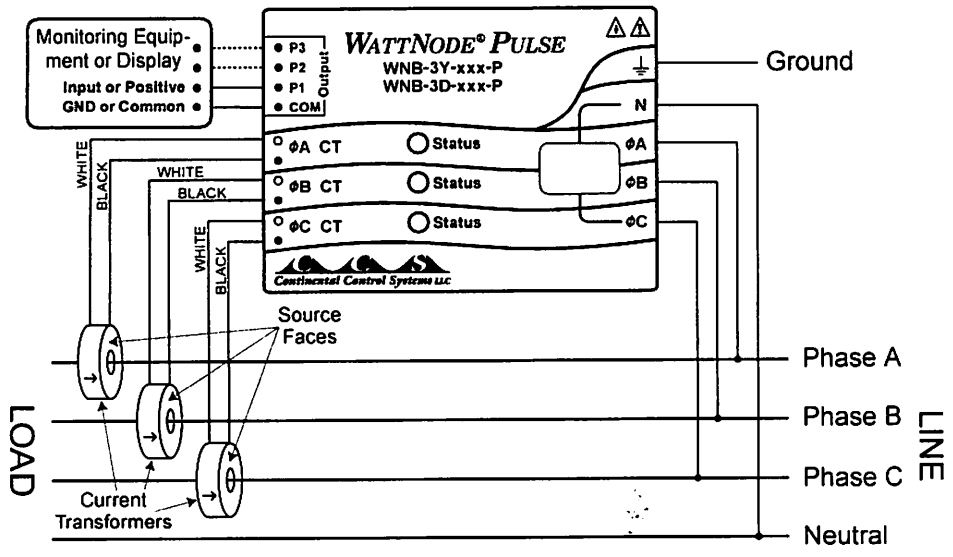


Figure 1: WattNode Wiring Diagram

2.2 Electrical Service Types

Electrical Service (or Load) Types	Line-to-Neutral (Vac)	Line-to-Line (Vac)	Meter Service Type	Meter Powered by
1 Phase 2 Wire 120V with neutral	96 – 138	n.a.	3Y-208	N and ΦA
1 Phase 2 Wire 230V with neutral (non-U.S.)	184 – 264	n.a.	3Y-400	N and ΦA
1 Phase 2 Wire 277V with neutral	222 – 318	n.a.	3Y-480	N and ΦA
1 Phase 2 Wire 208V no neutral	n.a.	166 – 276	3D-240	ΦA and ΦB
1 Phase 2 Wire 240V no neutral	n.a.	166 – 276	3D-240	ΦA and ΦB
1 Phase 3 Wire 120V/240V with neutral	96 – 138	166 – 276	3Y-208	N and ΦA
			3D-240	ΦA and ΦB
3 Phase 3 Wire Delta 208V no neutral	n.a.	166 – 276	3D-240	ΦA and ΦB
3 Phase 3 Wire Delta 400V no neutral (non-U.S.)	n.a.	320 – 460	3D-400	ΦA and ΦB
3 Phase 3 Wire Delta 480V no neutral	n.a.	384 – 552	3D-480	ΦA and ΦB
3 Phase 4 Wire Wye 120V/208V with neutral	96 – 138	166 – 276	3Y-208	N and ΦA
			3D-240	ΦA and ΦB
3 Phase 4 Wire Delta 120/208/240V with neutral	96 – 138	166 – 276	3D-240	ΦA and ΦB
3 Phase 4 Wire Wye 230V/400V with neutral (non-U.S.)	184 – 264	320 – 460	3Y-400	N and ΦA
			3D-400	ΦA and ΦB
3 Phase 4 Wire Wye 277V/480V with neutral	222 – 318	384 – 552	3Y-480	N and ΦA
			3D-480	ΦA and ΦB
3 Phase 4 Wire Delta 240/415/480V with neutral	222 – 318	384 – 552	3D-480	ΦA and ΦB
3 Phase 4 Wire Wye 347V/600V with neutral	278 – 399	480 – 690	3Y-600	N and ΦA

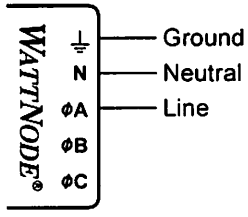
Table 1: WattNode Models

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. The "Line-to-Neutral" and "Line-to-Line" columns show the operating ranges for the WattNode meters.

Connect the line voltages to the meter inputs as shown in the following figures for each service type. See **Figure 1** above for an overview.

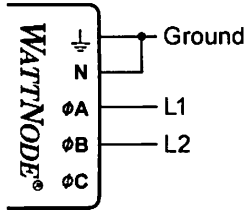
2.2.1 Single-Phase Two-Wire with Neutral

This is a common residential and branch circuit connection. Up to three such circuits may be monitored with one meter by also using the **ΦB** and **ΦC** inputs.



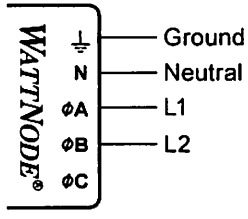
2.2.2 Single-Phase Two-Wire No Neutral

This circuit occurs in residential (commonly 120/240 Vac) and some commercial applications. The meter is powered from the **ΦA** and **ΦB** terminals. We recommend connecting the **N** terminal to ground to provide a clean voltage reference for the measurement circuitry (no current will flow through this terminal).



2.2.3 Single-Phase Three-Wire with Neutral

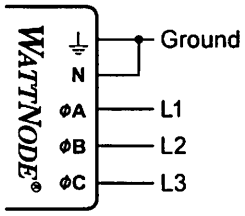
This is a common residential service at 120/240 Vac.



2.2.4 Three-Phase Three-Wire Delta No Neutral

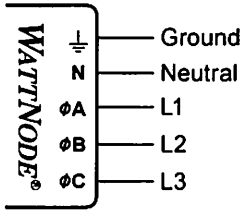
This is common in commercial and industrial settings. In some cases, the service may be four-wire, wye but the load may only be three wire (no neutral).

Occasionally, a load will only be connected to two of the three lines (say **L1** and **L2**). For this case, connect the two active lines to the **ΦA** and **ΦB** terminals and connect two CTs for the two lines.



2.2.5 Three-Phase Four-Wire Wye with Neutral

This is a common commercial and industrial service.

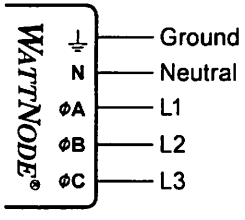


2.2.6 Three-Phase Four-Wire Delta with Neutral (Wild Leg)

The uncommon four-wire delta electrical service is a three-phase delta service with a center-tap on one of the transformer windings to create a neutral for single-phase loads.

The high-leg or phase with the higher voltage as measured to neutral has traditionally been designated "Phase B". A change to the 2008 NEC now allows the high leg of a four-wire three-phase delta service to be labeled as the "C" phase instead of the "B" phase. The WattNode meter will work correctly with the high-leg connected to **ΦA**, **ΦB**, or **ΦC**.

See the web article **Four Wire Delta Circuits** for more information.



2.2.7 Grounded Leg Service

In rare cases with delta services or single-phase two-wire services without neutral, one of the phases may be grounded.

The WattNode meter will correctly measure services with a grounded leg, but the measured voltage and power for the grounded phase will be zero and the status LEDs will not light for the grounded phase, because the voltage is near zero. Also, this type of service may result in unusual power factors.

See the web article **Grounded Leg Services** for more information.

3 Installation

3.1 Installation Checklist

See the sections referenced below for installation details.

- ☐ **Turn off power** before making line voltage connections.
- ☐ Mount the WattNode meter (see **3.2**).
- ☐ Connect circuit breakers or fuses and disconnects (see **3.3.1**).
- ☐ Connect the line voltage wires to the meter's green terminal block (see **3.3.2**).
- ☐ Mount the CTs around the line conductors. Make sure the CTs face the **source** (see **3.4**).
- ☐ Connect the twisted white and black wires from the CTs to the black terminal block on the meter, matching the wire colors to the white and black dots on the meter label (see **3.4.1**).
- ☐ Check that the CT phases match the line voltage phases (see **3.4**).
- ☐ Record the CT rated current for each meter, because it will be required during commissioning.
- ☐ Connect the output terminals of the WattNode meter to the monitoring equipment (see **3.5**).
- ☐ Check that all the wires are securely installed in the terminal blocks by tugging on each wire.
- ☐ Turn on power to the meter.
- ☐ Verify that the LEDs indicate correct operation (see **4.2**).

3.2 Mounting

- Protect the meter from temperatures below –30°C (-22°F) or above 55°C (131°F), excessive moisture, dust, salt spray, or other contamination, using a NEMA rated enclosure if necessary. The meter requires an environment no worse than pollution degree 2 (normally only non-conductive pollution; occasionally, a temporary conductivity caused by condensation).
- The meter must be installed in an electrical service panel, an enclosure, or a limited access electrical room.
- **Do not** use the meter as a drilling guide; the drill chuck can damage the screw terminals and metal shavings may fall into the connectors.

The meter has two mounting holes spaced 5.375 in. (137 mm) 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.

3.3 Connect Voltage Terminals

3.3.1 Circuit Protection

The WattNode meter is considered "permanently connected equipment" and requires a disconnect means (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 within sight and as close as practicable to the meter, and must be easy to operate.
- Use circuit breakers or fuses rated for 20 amps or less.
- Use ganged circuit breakers when monitoring more than one line voltage.
- The circuit breakers or fuses must protect the mains terminals labeled **ΦA**, **ΦB**, and **ΦC**. In the rare cases where neutral has overcurrent protection, 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.

3.3.2 Line Wiring

- **Always turn off power** before connecting the line voltage inputs to the meter.
- For the line voltage wires, CCS recommends 16 to 12 AWG stranded wire, type THHN, MTW, or THWN, 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 **Φ-Φ** and line-to-neutral **Φ-N** values printed in the white box on the front label.

Connect each line voltage to the appropriate phase; also connect ground and neutral (if applicable). The neutral connection "**N**" is not required on delta models (3D-240, 3D-400, and 3D-480), but we recommend connecting it to ground if neutral is not present.

The screw terminals handle wire up to 12 AWG. Connect each voltage line to the green terminal block as shown in **Figure 1** above. After the voltage lines have been connected, make sure both terminal blocks are fully seated in the meter.

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

3.3.3 Grounding

The WattNode uses a plastic enclosure, insulation, and internal isolation barriers instead of protective earthing. The ground terminal on the green screw terminal block is a functional ground, designed to improve the measurement accuracy and noise immunity. If necessary, this terminal may be left disconnected on wye models (**-3Y**).

3.4 Connect Current Transformers

To meet the UL listing requirements, the WattNode meter may only be used with these UL listed or recognized current transformer models. These all generate 333.33 millivolts AC at rated current. See the current transformer datasheets for CT ratings.

ACT-0750-**xxx**	CTS-2000-**xxxx**	CTT-0750-**xxx**
CTL-1250-**xxx**	CTB-**WxL**-**xxxx**	CTT-1000-**xxx**
CTM-0360-**xxx**	CTBL-**WxL**-**xxxx**	CTT-1250-**xxx**
CTS-0750-**xxx**	CTT-0300-**xxx**	CTRC-**yyyyy**-**xxxx**
CTS-1250-**xxx**	CTT-0500-**xxx**	

- "**xxx**" indicates the full scale current rating.
- "**WxL**" indicates the opening width (**W**) and leg length (**L**) in inches.
- "**dddd**" indicates the opening diameter of the loop for flexible Rogowski CTs.
- "**yyyyy**" indicates the opening size in mils (thousandths of inches).

See the web article **Selecting Current Transformers** for information on selecting appropriate current transformers (CTs).

- **Do not** use ratio or current output CTs such as 1 amp or 5 amp output models!
- See the CT datasheets for the maximum input current ratings.
- Be careful to match the CTs with the voltage phases. Make sure the **ΦA CT** is measuring the current on the same phase being monitored by the **ΦA** voltage input, and the same for phases B and C. Use the supplied colored labels or colored tape to identify the CT leads.
- To minimize current measurement noise, avoid extending the CT wires, especially in noisy environments. If it is necessary to extend the wires, use twisted pair wire 22 to 14 AWG, rated for 300 V or 600 V (not less than the service voltage) and shielded if possible.
- Find the source arrow or label "THIS SIDE TOWARD SOURCE" on the CT and face/point toward the source of current.
- OPTIONAL: if you see spurious readings on unused phases, jumper the unused CT inputs: for each unused CT, connect a short wire from the terminal marked with a white dot to the terminal marked with a black dot.

Install the CTs around the conductor to be measured and connect the CT leads to the meter. **Always turn off power before disconnecting any live conductors.** 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 status LEDs indicate negative measured power by flashing red.

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

When installing WattNode Revenue models, be sure to only use IEEE C57.13 class 0.6 current transformers, such as the Accu-CT; other CTs are less accurate and may not provide revenue accuracy. Contact sales for more information on appropriate CTs.

3.4.1 CT Wiring

The current transformers connect to the six position black screw terminal block. Connect the white and black CT wires to the meter terminals marked **ΦA CT**, **ΦB CT** , and **ΦC CT** (see **Figure 1** above). Excess length may be trimmed from the wires if desired. 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.

3.5 Connect the Output Signals

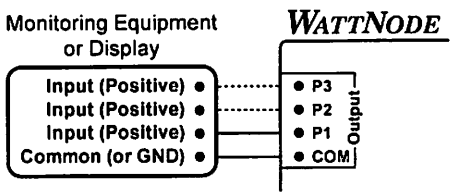
- The meter outputs are electrically isolated from dangerous voltages.
- If the output wiring is near line voltage wiring, use wires or cables with a 300 V or 600 V rating (not less than the service voltage).
- If the output wiring is near bare conductors, it should be double insulated or jacketed.
- You may install two wires into each screw terminal by twisting the wires together, inserting them into terminal, and securely tightening. Note: a loose wire can disable an entire network section.
- Use shielded twisted-pair cable to prevent interference. If there is no common conductor, connect the shield to the C terminal.

3.5.1 WattNode Pulse Outputs

Use the following directions when connecting the pulse outputs of a WattNode Pulse meter.

- The outputs **P1**, **P2**, and **P3** should not be connected to negative voltages, or to voltages greater than +60 Vdc. For reliable operation, limit the current to 5 mA.
- For long distances, use shielded twisted-pair cable to prevent interference. With shielded cable, connect the shield to earth ground at one end.
- If you need to add pull-up resistors, see the **Operating and Reference Guide**.

The WattNode pulse outputs may be connected to most devices that expect a contact closure or relay input. See the **Operating and Reference Guide** for more complex connection information.



The following table shows the pulse output channel assignments for the standard bidirectional outputs and for optional output configurations. See the website article **WattNode Pulse - Options** for more details on available options.

Pulse Outputs	P1 Output	P2 Output	P3 Output
Standard Outputs - Bidirectional	Positive energy - all phases	Negative energy - all phases	Not used
Option P3 Per-Phase Outputs	Phase A positive energy	Phase B positive energy	Phase C positive energy
Option PV Photovoltaic	Phase A+B pos. energy	Phase A+B neg. energy	Phase C positive energy
Option DPO Dual Positive Outputs	Positive energy - all phases	Negative energy - all phases	Positive energy - all phases

Table 2: Pulse Output Assignments

4 Operation

4.1 Initial Configuration

For WattNode Pulse meters, the only required configuration will be in the data logger or pulse counting device, which must be configured with the correct scale factors to convert from pulses to energy (kWh).

For details on configuring the WattNode meter, see the appropriate **Operating and Reference Guide** for your model.

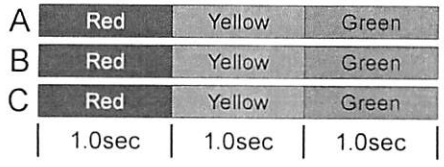
The meter does not include a display or buttons, so it is not possible to configure or monitor the meter directly, other than the basic LED diagnostics described below.

4.2 Power Status LEDs

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

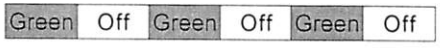
4.2.1 Normal Startup

The meter displays the following startup sequence whenever power is first applied.



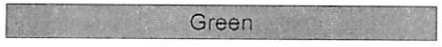
4.2.2 Positive Power

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



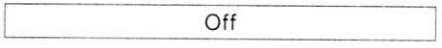
4.2.3 No Power

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



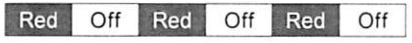
4.2.4 No Voltage

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



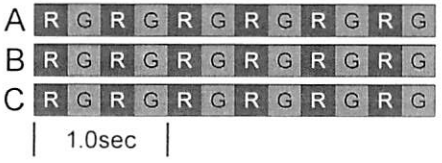
4.2.5 Negative Power

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



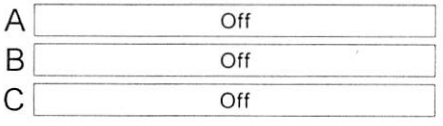
4.2.6 Overvoltage Warning

The following indicates that 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).



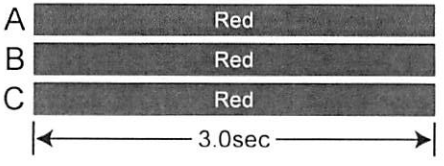
4.2.7 Meter Not Operating

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.



4.2.8 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 **Operating and Reference Guide** or contact support for assistance.

4.3 Monitoring

The WattNode Pulse models uses optoisolator outputs that simulate contact closures. These are generally connected to a data logger or similar monitoring device which can count pulses to measure energy.

4.4 Pulse Scale Factors

See the **Operating and Reference Guide** for full details with equations to scale pulse counts and frequencies to energy and power. The following describes simple scaling that works for common situations using the variable ***WHpPpA*** (watt-hours per pulse per CT rated amp). If you multiply the ***WHpPpA*** by the amp rating of your CTs, the result will be the watt-hours measured each time the meter generates a pulse.

$$EnergyPerPulse\ (WH) = WHpPpA \cdot CtAmps$$

The standard ***WHpPpA*** values are listed in the following table. These only apply for models with the standard 4.00 Hz full-scale pulse frequency. For other full-scale output frequencies (specified with ***Option Hz*** or ***Option Kh***), see the **Operating and Reference Guide** or contact support.

WattNode Models [1]	Watt-Hours per Pulse per CT Rated Amp (FSHz = 4.00)	
	Standard and *Option DPO* Outputs	*Option P3*: Per-Phase Outputs
WNB-3Y-208-P	0.02500	0.008333
WNB-3Y-400-P	0.04792	0.01597
WNB-3Y-480-P	0.05771	0.01924
WNB-3Y-600-P	0.07229	0.02410
WNB-3D-240-P	0.02500	0.008333
WNB-3D-400-P	0.04792	0.01597
WNB-3D-480-P	0.05771	0.01924

Table 3: Watt-Hours per Pulse per CT Rated Amp (*WHpPpA*)

[1] Note: the same scale factors also apply for revenue models starting with "RWNB".

For example: a WNB-3Y-208-P with a full-scale pulse frequency of 4.00 Hz has a ***WHpPpA*** value of 0.0250. With 15 amp CTs, it will output one pulse for every 0.375 watt-hours.

$$(0.025) \cdot (15.0 \text{ amps}) = 0.375 \text{ watt-hours}$$

It is easy to use the ***WHpPpA*** value to compute energy over a time interval, where ***PulseCount*** is the total count of pulses during the time interval (could be an hour, day, month, etc.):

$$Energy\ (Wh) = WHpPpA \cdot CtAmps \cdot PulseCount$$

4.5 Maintenance and Repair

The WattNode meter requires no maintenance. It is not user serviceable and there are no replaceable parts except the pluggable screw terminals. There are no diagnostic tests that can be performed by the user, other than checking for errors via the status LEDs.

In the event of any failure, the meter must be returned for service (contact CCS for an RMA). For a new installation, follow the troubleshooting instructions in the **Operating and Reference Guide** before returning the meter for service, to ensure that the problem is not connection related.

The WattNode meter should not normally need to be cleaned, but if cleaning is desired, power must be disconnected first and a dry or damp cloth or brush should be used.

5 Specifications

The following is a list of basic specifications. For extended specifications, see the **Operating and Reference Guide**.

5.1 Accuracy

The following accuracy specifications do not include errors caused by the current transformer accuracy or phase angle errors. "Rated current" is the current that generates a CT output voltage of 0.33333 Vac.

Normal Operation:

- **Line voltage**: -20% to +15% of nominal
- **Power factor**: 1.0
- **Frequency**: 48 - 62 Hz
- **Ambient Temperature**: 23°C ± 5°C
- **CT Current**: 5% - 100% of rated current

Accuracy: ±0.5% of reading

For accuracy at other conditions, see the reference guide.

WattNode Revenue Models:

- Meets the ANSI C12.1-2008 standard for revenue metering when used with IEEE C57.13 class 0.6 current transformers.

5.2 Measurement

Update Rate: ~200 milliseconds. Internally, all measurements are performed at this rate.

Start-Up Time: ~500 milliseconds. The meter starts measuring energy and generating pulses this long after AC voltage is applied.

Default CT Phase Angle Correction: 0.0 degrees.

5.3 Models and Electrical

Meter Service Type	Nominal Vac Line-to-Neutral	Nominal Vac Line-to-Line	Phases	Wires
3Y-208	120	208–240	1 or 3	2 - 4
3Y-400	230	400	1 or 3	2 - 4
3Y-480	277	480	1 or 3	2 - 4
3Y-600	347	600	1 or 3	2 - 4
3D-240	120*	208–240	1 or 3	2 - 4
3D-400	230*	400	3	2 - 4
3D-480	277*	480	3	2 - 4

Table 4: WattNode Model Service Types

*Note: the delta models have an optional neutral connection that may be used for measuring wye circuits. In the absence of neutral, voltages are measured with respect to ground. Delta WattNode models use the phase A and phase B connections for power.

Over-Voltage Limit: 125% of nominal Vac. Extended over-voltage operation can damage the WattNode and void the warranty.

Over-Current Limit: 120% of rated current. Exceeding 120% of rated current will not harm the WattNode meter but the current and power will not be measured accurately.

Maximum Surge: 4kV according to EN 61000-4-5, 6kV for WattNode Revenue models.

Power Consumption: The following table shows maximum volt-amperes, the power supply ranges, typical power consumption, and typical power factors with all three phases powered at nominal line voltages. The power supply consumes most of the total power, while the measurement circuitry draws 1-10% of the total (6-96 milliwatts per phase, depending on the model). Due to the design of the power supply, WattNode meters draw slightly more power at 50 Hz.

Meter Service Type	Real Power (60 Hz)	Real Power (50 Hz)	Power Factor	Rated VA [1]	Power Supply Range (Vac)	Power Supply Terminals
3Y-208	1.6 W	1.8 W	0.75	4 VA	96 – 138	N and ϕA
3Y-400	1.6 W	1.8 W	0.64	4 VA	184 – 264	N and ϕA
3Y-480	2.1 W	2.4 W	0.63	4 VA	222 – 318	N and ϕA
3Y-600	1.2 W	1.2 W	0.47	4 VA	278 – 399	N and ϕA
3D-240	1.7 W	1.9 W	0.63	4 VA	166 – 276	ϕA and ϕB
3D-400	1.4 W	1.5 W	0.47	3 VA	320 – 460	ϕA and ϕB
3D-480	1.8 W	2.2 W	0.53	3 VA	384 – 552	ϕA and ϕB

Table 5: Power Consumption and Supply Voltage

[1] Note: The **Rated VA** is the maximum at 115% of nominal Vac at 50 Hz. This is the same as the value that appears on the front label of the meter.

Maximum Power Supply Voltage Range: -20% to +15% of nominal (see table above). For the 3D-240 service, this is -20% of 208 Vac (166 Vac) to +15% of 240 Vac (276 Vac).

Operating Frequencies: 50/60 Hz

Measurement Category: CAT III

Measurement category III is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

The line voltage measurement terminals on the meter are rated for the following CAT III voltages (these ratings appear on the front label):

Meter Service Type	CAT III Voltage Rating
3Y-208 3D-240	240 Vac
3Y-400 3D-400	400 Vac
3Y-480 3D-480	480 Vac
3Y-600	600 Vac

Table 6: WattNode CAT III Ratings

Current Transformer Inputs:

Nominal Input Voltage (At CT Rated Current): 0.33333 Vac RMS

Absolute Maximum Input Voltage: 5.0 Vac RMS

Input Impedance at 50/60 Hz: 23 kΩ

5.4 Pulse Outputs

Full-Scale Pulse Frequencies:

Standard (All Models): 4.00 Hz

Custom (Bidirectional): 0.01 Hz to 600 Hz

Custom (Option P3, Option PV, Option DPO): 0.01 Hz to 150 Hz

Absolute Maximum Pulse Output Frequencies:

Standard Models (Bidirectional): 900 Hz

Option P3, Option PV, Option DPO: 200 Hz

Output Waveform: square-wave, ~50% duty cycle

Option PW: programmable pulse **ON** (closed or conducting period, 1 to 65535 milliseconds

Optoisolator Outputs:

Isolation: 5000 Vac RMS

Breakdown Voltage (collector–emitter): 60 V (exceeding this may destroy the outputs)

Maximum Reverse Voltage (emitter-collector): 5 Vdc (exceeding may destroy the outputs)

Maximum Leakage (OFF) Current (collector–emitter): 100 nA

Recommended Load Current (collector–emitter): 1 µA (microamp) to 5 mA (milliamp)

Maximum Load Current: ~8 mA

5.5 Certifications

Safety:

- UL 61010-1
- CAN/CSA-C22.2 No. 61010-1-04
- IEC 61010-1

Immunity: EN 61326: 2002 (Industrial Locations)

Electrostatic Discharge: EN 61000-4-2

Radiated RF Immunity: EN 61000-4-3

Electrical Fast Transient / Burst: EN 61000-4-4

Surge Immunity: EN 61000-4-5

Conducted RF Immunity: EN 61000-4-6

Voltage Dips, Interrupts: EN 61000-4-11

Emissions:

- FCC Part 15, Class B
- EN 55022: 1994, Class B

5.6 Environmental

Operating Temperature: -30°C to +55°C (-22°F to 131°F)

Altitude: Up to 2000 m (6560 ft)

Operating Humidity: non-condensing, 5 to 90% relative humidity (RH) up to 40°C, decreasing linearly to 50% RH at 55°C.

Pollution: POLLUTION DEGREE 2 - Normally only non-conductive pollution; occasionally, a temporary conductivity caused by condensation must be expected.

Indoor Use: Suitable for indoor use.

Outdoor Use: Suitable for outdoor use if mounted inside an electrical enclosure (Hammond Mfg., Type EJ Series) rated NEMA 3R or 4 (IP 66).

5.7 Mechanical

Enclosure: High impact, ABS/PC plastic

Flame Resistance Rating: UL 94V-0, IEC FV-0

Size: 6.02 in. × 3.35 in. × 1.50 in. (153 mm × 85 mm × 38 mm)

Connectors: Euroblock pluggable terminal blocks

Green: up to 12 AWG (2.5 mm^2), 600 V

Black: up to 12 AWG (2.5 mm^2), 300 V

5.8 FCC Information

This equipment has been tested and complies with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The FCC 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 instructions, 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 to a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

5.9 Warranty

All products sold by Continental Control Systems, LLC (CCS) are guaranteed against defects in material and workmanship for a period of five years from the original date of shipment. CCS's responsibility is limited to repair, replacement, or refund, any of which may be selected by CCS at its sole discretion. CCS reserves the right to substitute functionally equivalent new or serviceable used parts.

This warranty covers only defects arising under normal use and does not include malfunctions or failures resulting from: misuse, neglect, improper application, improper installation, water damage, acts of nature, lightning, product modifications, alterations or repairs by anyone other than CCS.

Except as set forth herein, CCS makes no warranties, expressed or implied, and CCS disclaims and negates all other warranties, including without limitation, implied warranties of merchantability and fitness for a particular purpose.

5.10 Limitation of Liability

In no event shall CCS be liable for any indirect, special, incidental, punitive or consequential damages of any kind or nature arising out of the sale or use of its products whether such liability is asserted on the basis of contract, tort or otherwise, including without limitation, lost profits, even if CCS has been advised of the possibility of such damages.

Customer acknowledges that CCS's aggregate liability to Customer relating to or arising out of the sale or use of CCS's products, whether such liability is asserted on the basis of contract, tort or otherwise, shall not exceed the purchase price paid by Customer for the products in respect of which damages are claimed. Customer specifically acknowledges that CCS's price for the products is based upon the limitations of CCS's liability set forth herein.

Document Number: WN-Inst-P-2.10
Revision Date: May 28, 2014
Continental Control Systems, LLC
3131 Indian Rd., Boulder, CO 80301, U.S.A.
(303) 444-7422, **http://www.ccontrolsys.com**

(M5)
Rev 2.10

EcoChirp PulseTransmitter Quick Start Guide

This guide covers only the most basic operations. For other features and more details, see www.fluidconservation.com

Fluid Conservation Systems
502 TechneCenter Drive
Suite B
Milford
Ohio
45150

FCS Fluid Conservation Systems

1-800-531-5465

www.fluidconservation.com

WARNING: - LITHIUM BATTERIES

If batteries are exposed - do not short circuit, re-charge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. **Risk of fire or explosion.** These batteries are sealed units which are not hazardous when used according to the recommendations of the manufacturer.

If further support or assistance is required, please contact FCS Technical Support on 1-800-531-5465 or e-mail sales@fluidconservation.com

Part number

1. EcoChirp Quick Start Guide

This guide covers only the most basic operations including connections and commissioning.

INTRODUCTION

The EcoChirp transmitter is a low cost, easy to install, durable pulse transmitter that counts pulses from meter-head or reed switch type output utility meters. The market leading transmitter is designed to provide consumption data for billing, monitoring and targeting.

HWM reserves the right to change any product specification without prior notice.

2. CONNECTIONS

The connections for the single channel pulse and dual channel pulse transmitters are shown in the table below.

Single Channel Pulse Tx	Dual Channel Pulse Tx
Red – Pulse Ch1 +ve	Red – Pulse Ch1 +ve
Black – Pulse Ch1 –ve	Black – Pulse Ch1 –ve
Yellow – Tamper +ve (if fitted)	Yellow – Pulse Ch2 +ve
Blue – Tamper –ve (if fitted)	Blue – Pulse Ch2 –ve

3. INSTALLATION

Optimum operating temperature should be below +50°C. We cannot guarantee the maximum life; therefore it is recommended to keep within the optimum operation temperature range for maximum battery performance.

If monitoring hot water systems it is not advisable to mount the transmitter directly on the pipe without intervening insulation.

For maximum transmission range the antenna of the transmitter should point upward (vertical polarization) and should be kept clear of obstructions, particularly metallic surfaces. Mounting brackets are available, to fit the cavity at the rear of the transmitter.

Operating in extreme environmental conditions will degrade the life-time of the battery.

4. OPERATION

The reed switch is located on the front right of the unit. The unit will normally be transmitting out of the box. If a restart is required or the unit doesn't appear to transmit, use the reed switch to initiate transmission. Hold a magnet to close the reed switch and cause the firmware reset. A click from the reed switch may be heard followed by a transmission burst.

Reed switch operation can be verified using an RF scanner tuned to the transmission frequency, when transmitting a burst or blip can be heard.

5. COMMISSIONING

The transmitter ID/serial number should be noted along with the corresponding meter number, the meters current reading and the initial transmitter pulse count and/or site location.

The current count value held in the transmitter should be used as an offset as for future readings. The offset value will need adjusting if the pulse count value exceeds 16777215 (24 -bit number) as the pulse count value will return back to zero.

This value will vary from unit to unit. Note for reasons of fraud prevention it is intentionally not possible to reset transmitter pulse counter to zero.

FCC warning statement:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

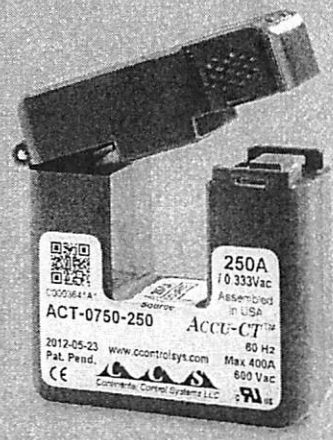
(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment

ACCU-CT® REVENUE
SPLIT-CORE CURRENT TRANSFORMERS

Revenue-Grade Accuracy, Unprecedented Linearity



Patent pending

0.75 Inch Window, 15 to 250 Rated Amps

The Accu-CT Revenue provides revenue-grade accuracy in a split-core design... ideal for use with ANSI C12-class meters.

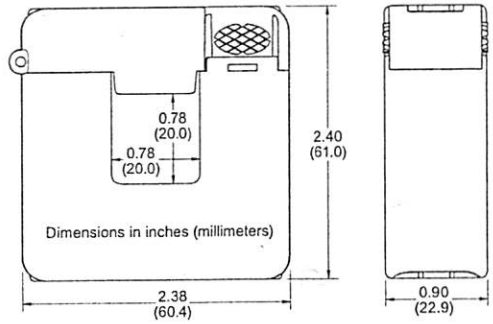
- **Exceptionally low phase angle error:** Essential for accurate power and energy measurements
- **IEEE/ANSI C57.13 and IEC 60044-1:** Accuracy over full temperature range and down to 1% of rated current
- **Glove-friendly:** Operation with one hand
- **Serialized:** Certificate of calibration provided

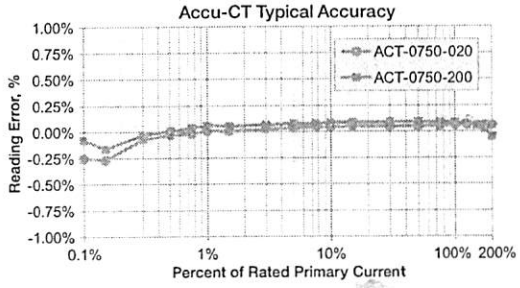
Specifications

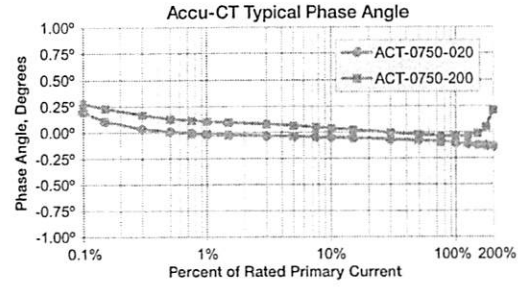
- **Accuracy:** ±0.59 1% to 120% of rated primary current
- **Phase angle:** ±0.25 0.25 degrees from 1% to 120% ±0.50 degrees below 0°C from 1% to 10% of rated current
- **Accuracy standards:** Exceeds IEEE C57.13 class 0.6 and IEC 60044-1 Class 0.5
- **Primary rating:** 15 to 250 Amps, 600 Vac, 60 Hz nominal
- **Output:** 1.0 Vac (with Option V) at rated current
- **Operating temperature:** -30°C to 55°C
- **Safe:** Integral burden resistor, no shorting block needed
- **Standard lead length:** 8 ft (2.4 m), 18 AWG
- **UL recognized,** CE mark, RoHS
- **Assembled in USA:** Qualified under Buy American provision in ARRA of 2009

Models	Amps	MSRP
ACT-0750-015 Opt C0.6	15	$57.00
ACT-0750-020 Opt C0.6	20	$57.00
ACT-0750-050 Opt C0.6	50	$57.00
ACT-0750-100 Opt C0.6	100	$57.00
ACT-0750-200 Opt C0.6	200	$57.00
ACT-0750-250 Opt C0.6	250	$57.00

- **Non-stock:** 30, 70, and 150 amp
- **Option 1V:** 1.00 Vac full-scale output
- **Option 50Hz:** Calibrate for 50 Hz operation







- Graphs show typical performance at 23°C, 60 Hz
- Graph shows a positive phase angle when the output leads the primary current.

Continental Control Systems LLC

3131 Indian Road • Boulder, CO 80301 USA
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ACCU-CT® STANDARD
SPLIT-CORE CURRENT TRANSFORMERS

Wide Range, Unprecedented Linearity

Patent pending

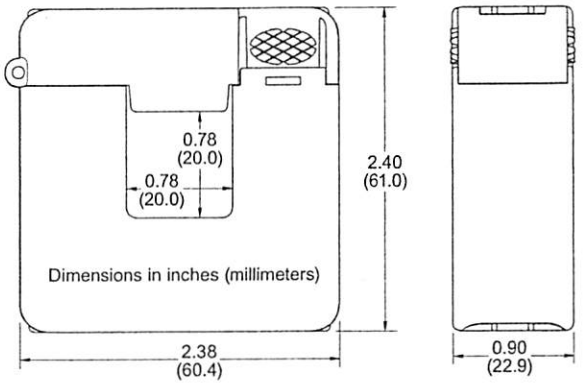
0.75 Inch Window, 5 to 250 Rated Amps

The Accu-CT Standard provides 0.75% accuracy and easy install features... a great value for energy management applications.

- **Low phase angle error:** Essential for accurate power and energy measurements
- **IEEE/ANSI C57.13 and IEC 60044-1:** Accuracy over full temperature range and down to 1% of rated current
- **Glove-friendly:** Operation with one hand

Features

- **Accuracy:** ±0.75 from 1% to 120% of rated primary current
- **Phase angle:** ±0.5 degrees (30 minutes) from 1% to 120% of rated current
- **Accuracy:** IEEE C57.13 class 1.2 and IEC 60044-1 Class 1.0
- **Primary ratings:** 5 to 250 Amps, 600 Vac, 60 Hz nominal
- **Output:** 333.33 mVac or 1.0 Vac (with Option 1V)
- **Operating temperature:** -30°C to 55°C
- **Safe:** Integral burden resistor, no shorting block needed
- **Standard lead length:** 8 ft (2.4 m)
- **UL recognized,** CE mark, RoHS
- **Patent pending**
- **Assembled in USA:** Qualified under Buy American provision in ARRA of 2009



Models	Amps	MSRP
ACT-0750-005	5	$43.50
ACT-0750-020	20	$43.50
ACT-0750-050	50	$43.50
ACT-0750-100	100	$43.50
ACT-0750-200	200	$43.50
ACT-0750-250	250	$43.50

- **Non-stock:** 15, 30, 70, and 150 amp
- **Option 1V:** 1.0 Vac full-scale output
- **Option 50Hz:** Calibrate for 50 Hz operation

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ACT-6.13.13: Specifications are subject to change

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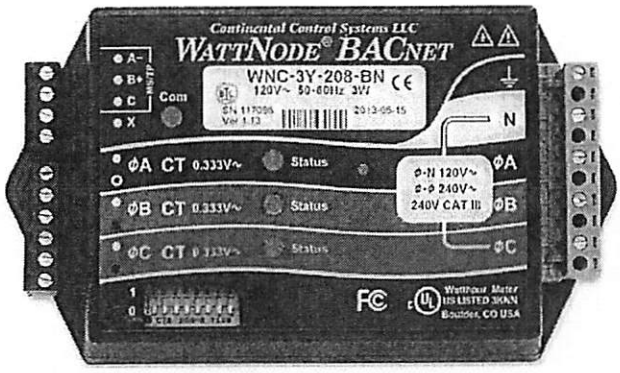
WattNode® BACnet®

AC Power Measurement for BACnet Networks, True Power, kWh Reactive Power, VARs, Power Factor, Individual Phase Measurements



WattNode BACnet

The WattNode BACnet (MS/TP) is a multi-function electric kilowatt-hour (kWh) energy and power meter that communicates on a EIA RS -485 network, measures 1, 2, or 3 phases with voltages from 120 to 600 volts Vac and currents from 5 to 6,000 amps in delta (phase to phase) and wye (phase to neutral) configurations.

- Specifications
- Models & Pricing
- Downloads
- Options
- WattNode Revenue for BACnet

Listed by BACnet Testing Laboratories

BACnet is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of the BACnet International. BTL is a registered trademark of the BACnet International.

Diagnostic LEDs

Our diagnostic LEDs provide a per-phase indication of power (green flashing) and negative power (red flashing) to help troubleshoot connection problems, like reversed CTs, or excessive line voltage. The WattNode BACnet meter also has a red/yellow/green communication LED to indicate traffic, configuration problems, bus contention and other conditions. See the manual for full descriptions.

Measurements

- True RMS Power: Watts (Phase A, B, C, and sum of all phases)
- Reactive Power: VARs (Phase A, B, C, and sum of all phases)
- Power Factor: (Phase A, B, C, and average of all phases)
- True RMS Energy: Kilo-Watthours kWh (Phase A, B, C, and sum of all phases)
- Reactive Energy: kVAR-hours (Phase A, B, C)
- AC Line Frequency
- RMS Voltage: (Average and Phase A, B, C; line-to-line and line-to-neutral)
- Computed RMS Current: (Phase A, B, C)
- Demand

- Peak Demand

Features

- Small form factor for easy installation inside most electrical panels, see a sample installation diagram
- Pluggable screw terminals for easy wiring
- 0.5% accuracy nominal (see manual for details)
- Revenue grade version available: WattNode Revenue for BACnet
- True RMS power even with leading or lagging power factor and chopped or distorted waveforms
- Measure variable speed drive pumps and motors
- Uses safe CT's (current transformers), producing 0.333 Vac at rated current.
  - Split core CTs for quick installation
  - Solid core CTs are less expensive and prevent tampering
  - Bus bar CTs for high current applications (standard and custom sizes)
- UL, cUL Listed, CE Mark - Designed and tested for safety and use throughout North America and the European Union.
- **Assembled in USA**, qualified under the Buy American provision in the American Recovery and Reinvestment Act of 2009 (ARRA).
- Five year warranty

Safety Note

Warning: Hazardous Voltages - Only qualified personnel or licensed electricians should install the WattNode meter and current transformers.

Categories: Products | WattNode BACnet

Page updated 13 June 2013

RADIO-TECH

the complete solution

Quick Start Guide for OmniColl Pulse Transmitter

When connecting the wires to a pulse meter the polarisation does not matter unless the meter output is a semiconductor device such as a transistor or opto-coupler. In these cases the Red lead should be connected to the positive and the black to the negative, for channel 1 and the yellow to the positive and the blue to the negative for channel 2.

Channel 1	Channel 2** (Optional)
Red +Ve	Yellow +Ve
Black –Ve	Blue – Ve
Yellow Tamper	NOT USED
Blue –Ve	NOT USED

OPERATION:

On versions with a serial number > 2000, the unit incorporates a hidden transmitter enable/disable switch. This switch is operated by a magnet to turn the transmitter on and off for transit and service etc.

To switch-on the transmitter, hold the North or South pole of a strong bar magnet just above where the cable enters the plastic housing for a nominal 2 seconds. To switch off, hold the magnet in place for approx 10 seconds. Reed switch operation can be verified by carefully listening for a faint click whenever the magnet is brought in close proximity to the reed switch.

Please note that pulse counting is not interrupted at any time. Further, the transmitters counter, address / serial number cannot be altered through this process. Both of these values are fixed at manufacture.

In the case where the transmit function has been inadvertently switched off, switching the unit back on will enable the transmitter, transmitting the accumulated total.

COMMISSIONING

The transmitter address should be noted along with its corresponding meter, the meters initial reading, the initial transmitter reading and/or customer address.

The initial value of the pulse counter register should also be recorded. This initial value will vary from unit to unit. Note for reasons of fraud prevention it is intentionally not possible to reset the counters to zero.

Robert Thompson <thompsrd@morris.umn.edu>

Fwd: Quick Start Guide - OmniColl Pulse Transmitters v1 1.pdf

1 message

Lowell Rasmussen <rasmuslc@morris.umn.edu> Mon, May 12, 2014 at 3:03 PM
To: Robert Thompson <thompsrd@morris.umn.edu>, mike vangstad <vangsmd@umn.edu>, William Eiler <eilerwd@morris.umn.edu>

FYI.

---------- Forwarded message ----------
From: **Graham Mattison** <GMattison@hwm-water.com>
Date: Mon, May 12, 2014 at 1:17 PM
Subject: Quick Start Guide - OmniColl Pulse Transmitters v1 1.pdf
To: "rasmuslc@morris.umn.edu" <rasmuslc@morris.umn.edu>

Hi Lowell,
I've attached a quick start guide for wiring the transmitters. It's pretty basic. They will need to write down which serial number is associated with each device. I believe the wires were labeled, so they just need to make sure we have a record of each transmitter input (serial #) and the device it's getting connected to specifically. By themselvers, the transmitters will count the pulses without knowing what it's connected too. That association needs to be made in the software. A unique ID will need to be catalogued for each metering device. Likely, each metering device will have a serial number that can be used for this purpose.

Let me know as you need further assistance. I am happy to help.
Best regards,

Graham Mattison
****

****

Quick Start Guide - OmniColl Pulse Transmitters v1 1.pdf
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Operating, Maintenance & Warranty Instructions

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U of M Morris GPL & L Community Meters
600 East 4th Street
Morris, MN 56267
Uhl Company's Project No. 013TC059
(Operation & Maintenance Manual – 9/17/13)

Owner	**Architect**
U of MN – Facilities MGMT Purchasing	
319 15th Avenue SE 400 Donhowe Building	
Minneapolis, MN 55455-0199	
Phone: 612-625-5554	Phone:
Fax: 612-624-5796	Fax:

Mechanical Engineer	**Contractor**
LKPB	Lowell Rasmussen
250 Third Avenue North Ste 450	McGough Construction
Minneapolis, MN 55401	2737 Fairview Ave. N.
Phone: 612-338-2088	St. Paul, MN 55113
Fax:	Phone: 651-633-5050
	Fax: 651-633-5673

UHL COMPANY CONTACTS

Salesmen	**Uhl Engineer**
Russ Enright	Gary Sadecki
Uhl Company, Inc.	Uhl Company, Inc.
9065 Zachary Lane North	9065 Zachary Lane North
Maple Grove, MN 55369	Maple Grove, MN 55369
Phone: 763.425.7226	Phone: 763.425.7226
Fax: 763.425.7336	Fax: 763.425.7336

U of M Morris GPL&L Community Meters Job # 013TC059 Material List

PART NUMBER	DESCRIPTION	VENDOR
4450 Energy Meter Heating/Cooling	w/ pulse output 6 Meter Sensor Cable	Controls & Meters
MJHR-075-1G	3/4"Hotwater,Reed switch(Dry Contract)	Seametrics
MJR-100-1G	1"Coldwater,Reed Switch (Dry Contact)	Seametrics
T-208	TRANSFORMER 96 VA 120P-24VS U	Schneider Electric

ISTEC
Flow Measurement & Control

Installation and User Guide
Compact Meter
Heat: Model 4440
Cooling & Heat: Model 4450

This installation guide is intended for trained personnel and therefore does not include basic working steps.

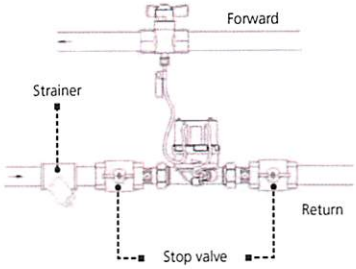
IMPORTANT

The seal on the meter must not be damaged! A damaged seal immediately invalidates the factory warranty and calibration / conformity.

The temperature sensor cables must not be shortened or changed in any other way.

NOTES
· The requirements of EN 1434-6 for the installation must be observed
· Medium: water without additives·

INSTALLATION OF THE METER



4440 HEAT METER
Install the meter in the return pipe (cooler line) of a conventional heating system.

4450 COOLING & HEAT METER
Install the meter in the return pipe of a heating, cooling or combination heating/cooling system (see special note about solar installation).

SPECIAL INSTRUCTIONS FOR A SOLAR SYSTEM
Install the meter on the pipe running from the storage tank to the collector (cooler line). Install the loose sensor (Red Banded on 4440, Blue Banded on 4450) in the well provided on the pipe running from the collector to the tank (hotter line). Doing this will cause the energy value to be recorded in the heating register. Failure to do so may damage the meter.

Ensure that the volume measuring component is always filled with liquid on completion of installation.

The meter must be mounted so that the arrow on the housing points in the same direction as the flow.

Marking of cooling & heat meter
This symbol indicates that this version is fully encapsulated and reliable against condensation on the integrator board.
Protection class IP 68.

INSTALLATION OF TEMPERATURE SENSORS

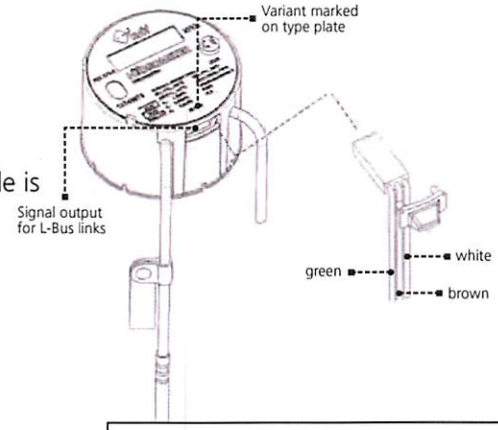
MODEL 4440
Install the RED banded sensor in the well provided on the SUPPLY pipe (Heating System) or Return Pipe (Solar System). The BLUE banded sensor fits directly in the meter body of the 4440.

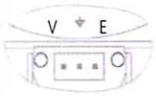
MODEL 4450
Install the BLUE banded sensor in the well provided on the SUPPLY pipe (Heating System) or Return Pipe (Solar System). The RED banded sensor fits directly in the meter body of the 4450.

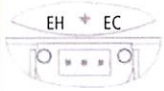
PIN ASSIGNMENT

A 3-pole, 3-m connecting cable with plug is supplied with the system variants.

Attention: Always connect the plug so that the green cable is on the left.







Pulse outputs

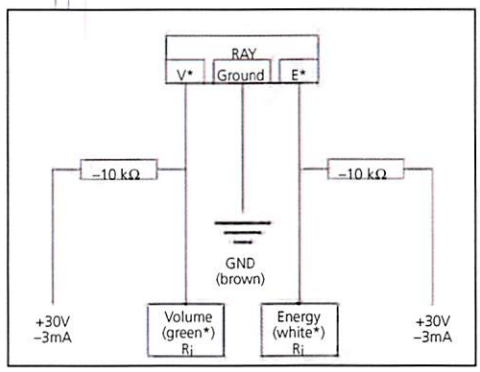
Heat meter: **4440**
- V –> Volume pulse (green)
- E –> Energy pulse (white)
- Ground (brown)

Cooling & heat meter: **4450**
- EH –> Energy pulse heat (green)
- EC –> Energy pulse cold (white)
- Ground (brown)

The pulse outputs are open-collector circuits. The collector branch contains only 0 ohm resistance, i.e. there is no internal current limiting. If required, this must be provided by an external collector resistance

(see example).

Example **4440**

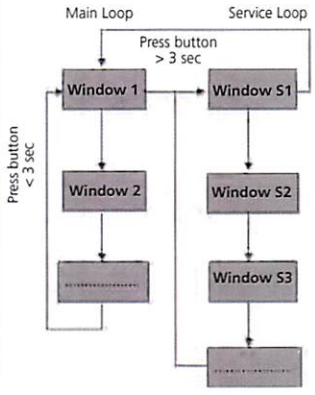


$R_i > 5 \times R_V$

$R_V = \frac{U}{I}$ $R_V = \frac{30V}{3mA} = 10\ k\Omega$

NOTE:
Cooling & heat meter: 4450
***EH –> Energy pulse heat (green)**
***EC –> Energy pulse cold (white)**

READ LOOP 4440 / 4450



The LC display has a power save mode. The display is activated by pressing a button and showes the accumulated energy since initial operation ->basic display

Next display -> press button < 3 sec

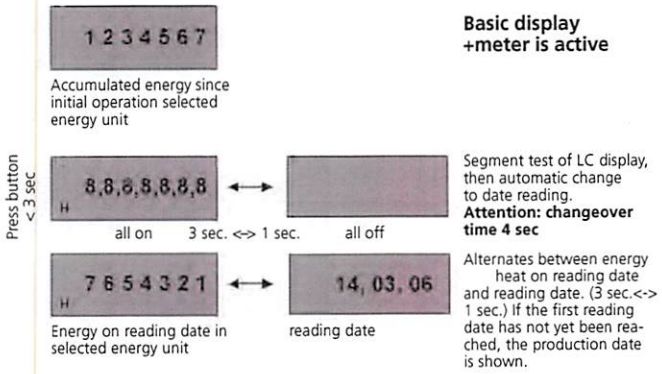
Switch from main loop to service loop ->press button < 3sec

Display switches off automatically and changes to the power save mode if the button is not pressed for 5 minutes

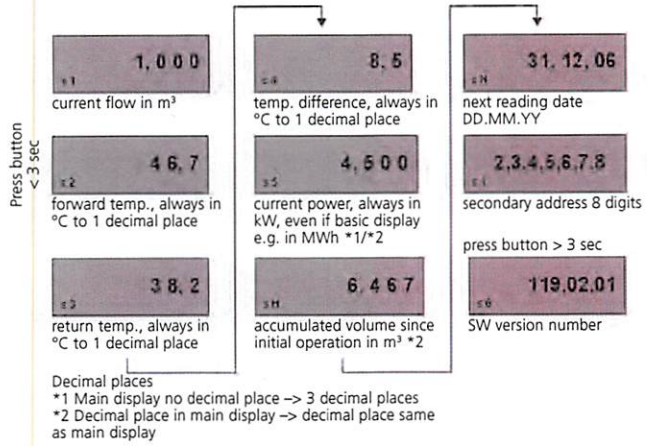
DIAGNOSTIC DISPLAY
Attention: Activate LCD with button

Display	Fault description
C 1	Basic parameter part of RAM damaged.
F 1	Sensor short-circuit, sensor break.
F 3	Return sensor registers a higher temperature than forward sensor. Check if the heat meter/temperature sensors are located in the correct lines (4440 Only).
F 4	Flow sensors defective.
F 5	Heat meter operating correctly. Optical communication is temporarily out of operation to save power.
F 6	Volume measuring component is installed opposite to the direction of flow.

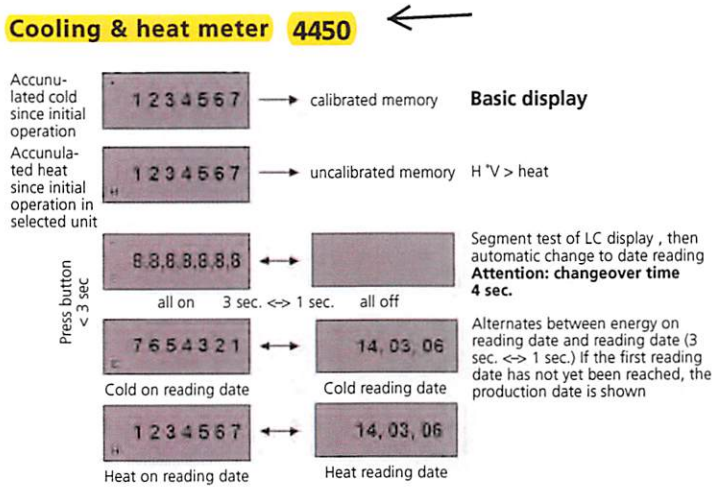
MAIN LOOP
Heat meter 4440



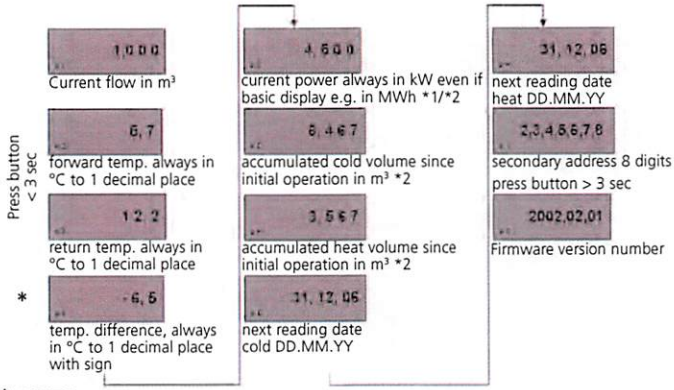
SERVICE LOOP
Heat meter 4440



Cooling & heat meter 4450



Cooling & heat meter 4450



*** NOTE**

A positive △T indicates the system is in the cooling mode, a negative△ indicates the system is in the heating mode.

CHECK THE FOLLOWING POINTS BEFORE LOOKING FOR A FAULT IN THE HEAT METER ITSELF

- Is the heating system in operation?
- Is the circulating pump running?
- Are the stop valves fully open?
- Is the pipe clear (clean strainers)?
- Are all the seals intact (tampering)?
- Is the meter rating correct?

FAULT CLEARANCE

Display shows temperatures but no flow rate:

- Check direction of meter and correct if necessary
- Remove meter, blow into meter and check that the impeller turns or the + sign (active flow) flashes in the display.

If this does not help: Replace the meter

DECLARATION OF CONFORMITY FOR DEVICES

EMC-Directive (2004/108/EG)

R&TTE-Directive (1999/5/EG)

MID-Directive (2004/22/EG)

DE-07-MI004-PTB030 EC type examination certificate number

Seametrics

MJ-SERIES Pulse Meter

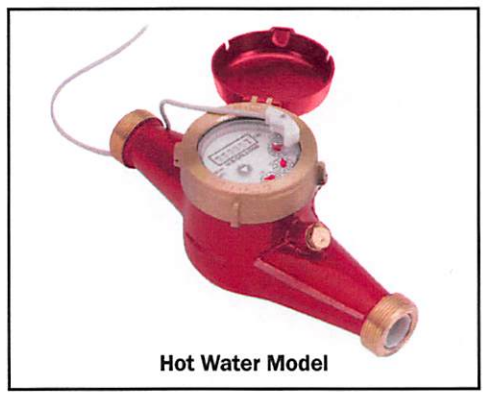
ISO 9001:2008 CERTIFIED COMPANY

FEATURES

- Dry top multi-jet design
- Tolerates low quality water
- Simple pulse output
- Cold or hot water models

APPLICATIONS

- Cooling tower chemical control
- Industrial water treatment
- Deduct metering



Hot Water Model

GENERAL INFORMATION

MJ-Series meters use the multi-jet principle, which has been an internationally-accepted standard for many years. This type of meter is known for its wide range, simplicity, and accuracy in low-quality water. Seametrics offers cold or hot water models. The impeller is centered in a ring of jets, with inlet jets on one level and outlet jets on another. A gear train drives the register totalizer dials. For pulse output, one of the pointers is replaced by a magnet, which is detected by an encapsulated sensor attached to the outside of the lens. Pulse rate is determined by the dial on which the magnet is placed, and by the number of sensors (single or double).

Changing the pulse rate requires no special tools and can be done in the field.

Mechanically, all MJ-Series meters are the same. The difference among *MJE/MJHE, *MJR/MJHR and *MJT/MJHT meters is in the sensor. MJE/MJHE meters use a solid-state, long-lasting Hall-effect sensor, which requires power. It is suited for use with Seametrics controls and metering pumps (LMI for instance) that have sensor power. MJR/MJHR meters use a two-wire reed switch. They provide a dry contact closure and do not require power. MJT/MJHT meters totalize only and do not have a sensor.

***Note on Nomenclature:** Meter names that include "H" are hot water models. Without the "H" = cold water models.

Seametrics

MJ-SERIES Pulse Meter

FEATURES

Available in cold or hot water models

SPECIFICATIONS*

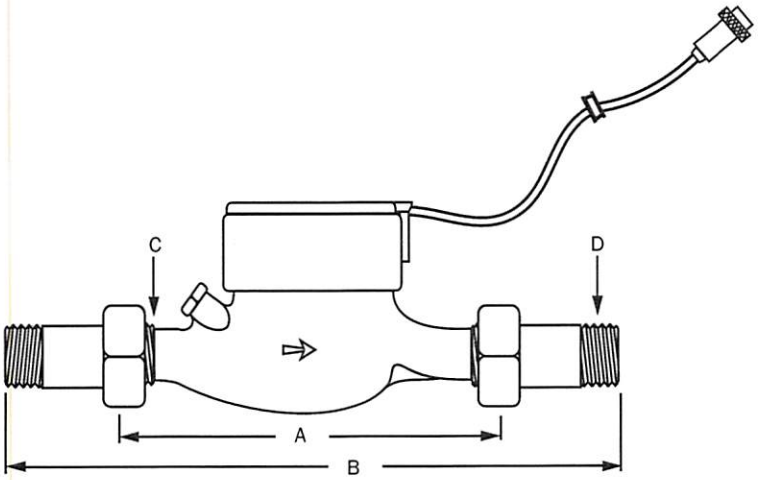
Power		6 mA at 12 Vdc (MJE/MJHE only)			
Temperature	**Cold Water Model**	105˚ F (40˚ C) max			
	Hot Water Model	194˚ F (90˚ C) max			
Pressure		150 psi operating			
Materials	**Body**	Cast bronze, epoxy powder coated inside and out			
	Internals	Engineered thermoplastic			
	Magnet	Alnico			
Accuracy		+/- 1.5% of reading			
Pulse Output		**MJE/MJHE**	**MJR/MJHR**		**MJT/MJHT**
	Sensor	Hall-effect device	Reed switch		Totalizer only
	Max Current	20 mA	20mA		n/a
	Max Voltage	24 Vdc	24 Vdc or Vac		n/a
Cable Length		12' (4 m) standard (2000' maximum run)			
Flow Rates (GPM)		**3/4"**	**1"**	**1-1/2"**	**2"**
	Minimum	0.22	0.44	0.88	1.98
	Maximum	22	52	88	132

**Specifications subject to change • Please consult our website for current data (www.seametrics.com).*

Seametrics

MJ-SERIES Pulse Meter

DIMENSIONS



	3/4"	1"	1-1/2"	2"
A (body)	7-1/2"	10-1/4"	11-3/4"	11-3/4"
B (w/couplings)	12-5/8"	15-5/8"	17-5/8"	17-5/8"
C (IPS thread)	1"	1-1/4"	2"	2-1/2"
D (NPT thread)	3/4"	1"	1-1/2"	2"

PULSE RATES

	3/4"	1"	1-1/2"	2"
Pulses per Gallon	20* 10 4† 2* 1	 4† 2* 1	 4† 2* 1	 4† 2* 1
Gallons per Pulse	1 5* 10 50* 100	1 5* 10 50* 100	1 5* 10 50* 100	1 5* 10 50* 100
Cubic Feet per Pulse	1 5* 10	1 5* 10	1 5* 10	1 5* 10

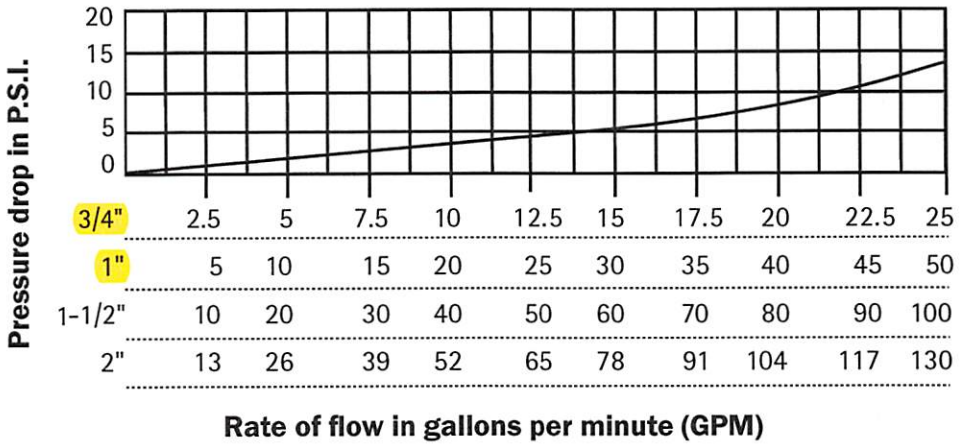
*These pulse rates available in MJR and MJHR dual reed switch meters only.

†This pulse rate available in MJR and MJHR single reed switch meters only.

FLOW RATES (GPM)

	3/4"	1"	1-1/2"	2"
Minimum	0.22	0.44	0.88	1.98
Maximum	22	52	88	132

PRESSURE DROP CURVE



MJ-SERIES
Pulse Meter

HOW TO ORDER

MODEL

Cold water, Reed switch = **MJR**
Cold water, Hall-effect sensor = **MJE**
Cold water, Totalizer only = **MJT**

Hot water, Reed switch = **MJHR**
Hot water, Hall-effect sensor = **MJHE**
Hot water, Totalizer only = **MJHT**

SIZE

3/4" = **-075**
1" = **-100**
1-1/2" = **-150**
2" = **-200**

PULSE RATE

†*20 Pulse/Gal = **20P**
†10 Pulse/Gal = **10P**
*4 Pulse/Gal = **4P**
*2 Pulse/Gal = **2P**
1 Gal/Pulse = **1G**
*5 Gal/Pulse = **5G**
10 Gal/Pulse = **10G**
*50 Gal/Pulse = **50G**
100 Gal/Pulse = **100G**
1 CF/Pulse = **1CF**
*5 CF/P = **5CF**
10 CF/P = **10CF**

†3/4" Only
*MJR and MJHR Meters Only

OPTIONS

LMI pump connector = **-06**
Seametrics control connector = **-07**

ACCESSORIES

Pulse divider = **PD10**
Pulse splitter = **PS40**
Pulse timer = **PT35**

CONTACT YOUR SUPPLIER

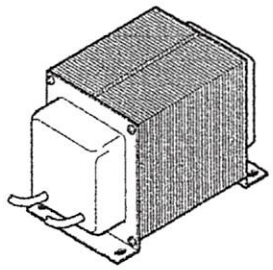
Seametrics Incorporated • 19026 72nd Avenue South • Kent, Washington 98032 • USA
(P) 253.872.0284 • (F) 253.872.0285 • 1.800.975.8153 • www.seametrics.com

LT-65650059-C
6/7/10

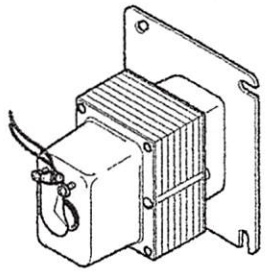
T-200 Series Transformers

Application

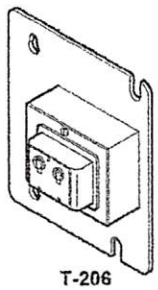
For supplying low voltage power to operate control equipment. Primarily for mounting in control centers in conjunction with disconnect switch and overload circuit breaker. T-206, T-201, T-255, and T-249 are each provided with a plate for mounting on to a standard four inch outlet box. The secondary connection is screw terminals on the T-206 and provision for flexible conduit connection on T-249. 85 VA and 170 VA transformers are provided with mounting feet for panel mounting, and wire leads.



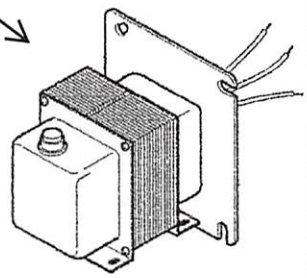
T-202
T-203
T-204
T-205
T-223



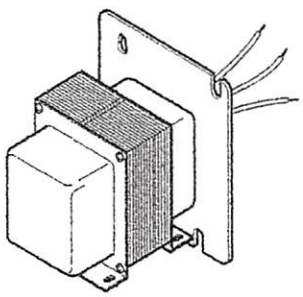
T-249



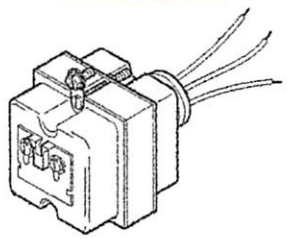
T-206



T-207
T-208
(Plate Optional)



T-201
T-240
T-255



T-255-24

T-200 Series (Continued)

Specifications

Siebe Model No.	Cap. VA	Primary Voltage	Secondary Voltage	Freq. (Hz)	Dimensions in. (mm)	Mounting
T-201-1 [a]	50	120	24	50/60	4-3/8 H x 4-3/16 W x 4-3/16 D (111 x 106 x 106)	4x4 Plate
T-202	85			60	3-1/4 H x 3-3/4 W x 3-1/8 D (83 x 95 x 80)	Foot
T-203	170				4-1/4 H x 3-3/4 W x 3-1/8 D (108 x 95 x 80)	Foot
T-204	240				4-5/8 H x 4-1/2 W x 3-3/4 D (118 x 115 x 95)	Foot
T-205	375				5-7/8 H x 4-1/2 W x 3-3/4 D (150 x 115 x 95)	Foot
T-206[a]	10				1-7/8 H x 4-3/16 W x 4-3/16 D (48 x 106 x 106)	Plate
T-207 [b c]	75	120			3-7/8 H x 3 W x 2-1/2 D (98 x 76 x 64)	Universal
T-208 [b]	96				3 H x 2-1/2 W x 4-1/2 D (76 x 64 x 114)	Universal
T258 [b]	50	208/240		50/60	4-1/4 H x 4-1/4 W x 2-9/16 (108 x 108 x 65)	Plate
T-223	170	208, 240		60	4-1/4 H x 3-3/4 W x 3-1/8 D (108 x 95 x 80)	Foot
T-224	240	208, 240	24		4-5/8 H x 4-1/2 W x 3-3/4 D (118 x 115 x 95)	Foot
T-249	50	480, 240, 277, 208	120		4-3/8 H x 4-3/16 W x 4-3/16 D (111 x 106 x 106)	Plate
T-255-120[b]	20	120	24	50/60	2-1/8 H x 4-3/16 W x 4-3/16 D (54 x 106 x 106)	Plate
T-255-24	8	24		60		Hub
T-255-277 [b]	30	277		50/60		Plate
T-240b	50	277	24	60	2-1/2 H x 3 W x 2-7/8 D	Universal

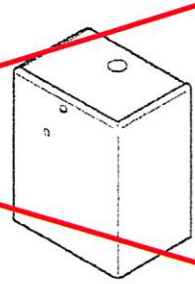
[a] CSA and UL approved.

[b] ...

T-PB202 Power Box

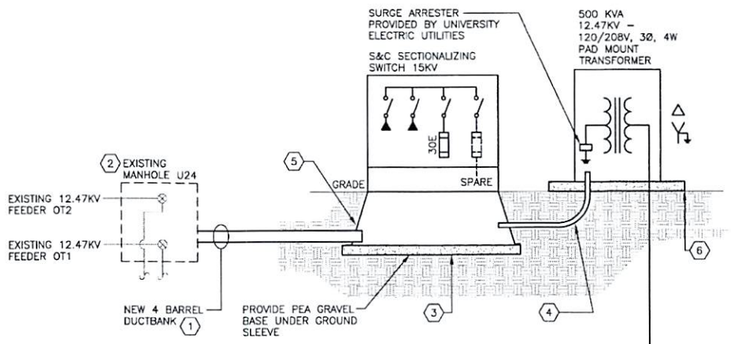
Application

The T-PB202 may be used to power up to two GCMs or LCMs, as well as one or two other devices, for a total of 96 VA.



Specifications

- T-PB202 contains a 120 volt primary, 24 volt secondary, 96 VA transformer.
- T-PB202 has a DPDT disconnect switch, a 4 amp circuit breaker, and a power indication lamp.
- Packaged in a 6-1/8 H x 5-1/8 W x 4-1/2 D in. (0.15 x 0.12 x 0.09 mm) enclosure with 2-1/2 in. knock outs.



ELECTRICAL CONSTRUCTION NOTES:

A. ALL 15KV CABLES TO BE PROVIDED, INSTALLED AND TERMINATED BY THE UNIVERSITY OF MINNESOTA. COORDINATE 15KV EQUIPMENT INSTALLATION WITH THE UNIVERSITY OF MINNESOTA.

ELECTRICAL KEYED NOTES:

(1) DUCTBANK BY CONTRACTOR, ALL MEDIUM VOLTAGE CABLE AND TERMINATIONS BY THE UNIVERSITY OF MINNESOTA.

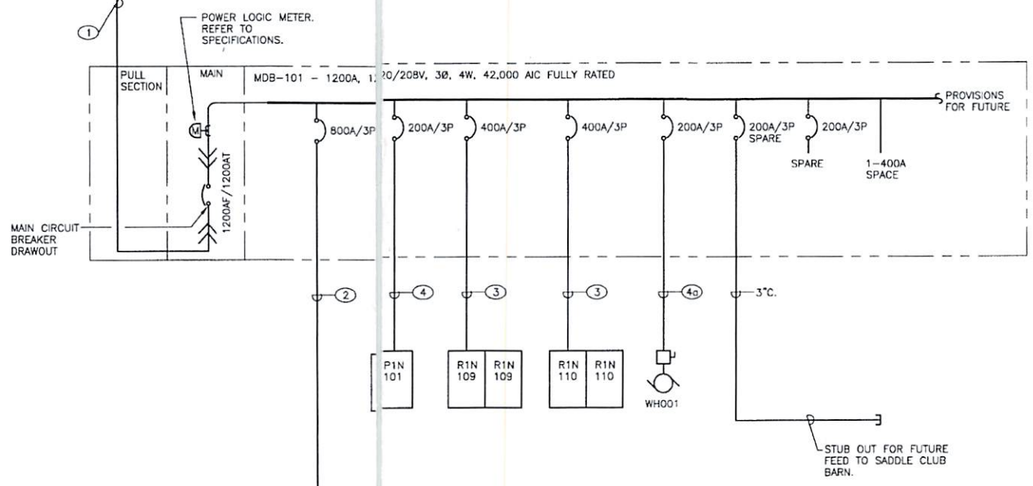
(2) CONTRACTOR MUST HAVE AN ESCORT FROM THE UNIVERSITY OF MINNESOTA–MORRIS CAMPUS TO OPEN AND ENTER EXISTING MANHOLE.

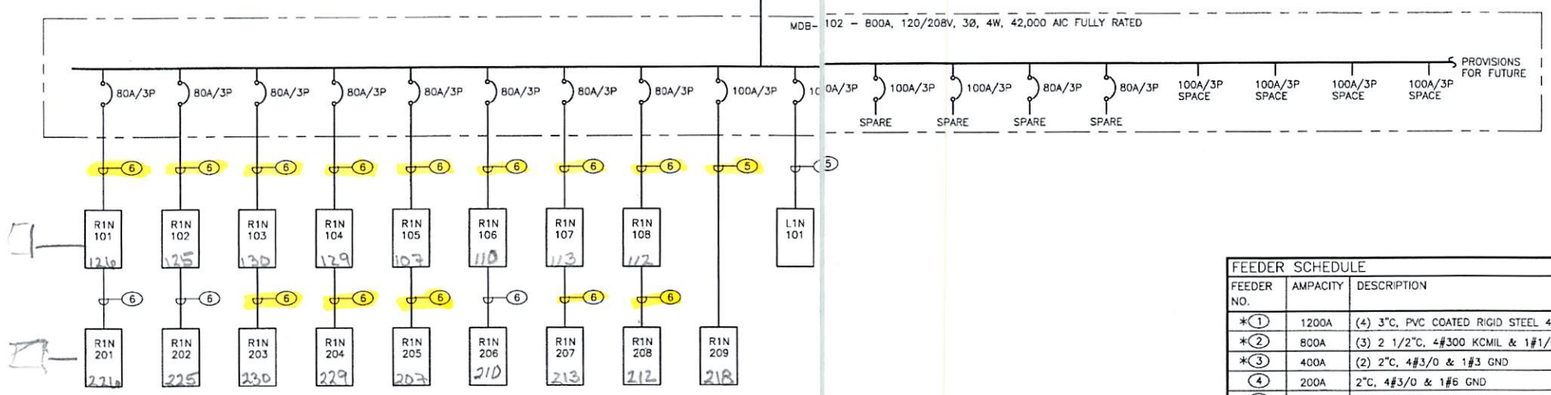
(3) CONCRETE PAD TO BE 4 INCH HIGH WITH 3000 PSI CONCRETE WITH #2 REBAR 12 INCHES ON CENTER EACH WAY.

(4) PROVIDE 4–5" PVC ~~COATED RIGID STEEL~~ CONDUIT FROM GROUND SLEEVE TO PRIMARY SIDE OF TRANSFORMER FOR PRIMARY CABLES. ALL CONDUITS ENTERING THE TRANSFORMER SHALL BE CENTERED IN THE WINDOWS INDICATED IN THE SHOP DRAWINGS. ELBOWS SHALL BE PVC ~~COATED RIGID STEEL~~ WITH 60" RADIUS.

(5) PROVIDE A FIBERGLASS MOLDED GROUND SLEEVE AS MANUFACTURED BY NORDIC FIBERGLASS INC. OR EQUAL. PROVIDE SLEEVE TO MATCH SECTIONALIZING SWITCH. MOUNT SECTIONALIZING SWITCH TO GROUND SLEEVE. MOUNT GROUND SLEEVE TO PAD. REFER TO DUCTBANK PROFILE ON SHEET C7.3. PROVIDE GROUND SLEEVE DEEP ENOUGH TO ACCEPT DUCTBANK IN THE SIDE. GROUND SLEEVE TO EXTEND A MAXIMUM OF 12 INCH ABOVE FINISHED GRADE.

(6) CONCRETE PAD TO BE 4" HIGH WITH 3000 PSI CONCRETE WITH #2 REBAR 12" ON CENTER EACH WAY. PAD TO EXTEND 4" OUT FROM TRANSFORMER FOOTPRINT.





1 ELECTRICAL ONE-LINE DIAGRAM
NOT TO SCALE

FEEDER SCHEDULE		
FEEDER NO.	AMPACITY	DESCRIPTION ~~500 KMIL AL~~
*(1)	1200A	(4) 3"C, PVC COATED RIGID STEEL 4~~#350 KCMIL~~ & 1#3/0 GND
*(2)	800A	(3) 2 1/2"C, 4#300 KCMIL & 1#1/0 GND
*(3)	400A	(2) 2"C, 4#3/0 & 1#3 GND
(4)	200A	2"C, 4#3/0 & 1#6 GND
(4a)	200A	2"C, 3#3/0 & 1#6 GND
(5)	100A	1 1/4"C, 4#3 & 1#8 GND
(6)	80A	1 1/4"C, 4#4 & 1#8 GND

* CONTRACTOR MAY USE EQUIVALENT AMPACITY ALUMINUM CONDUCTORS FOR THESE FEEDERS WITH INCREASED CONDUIT SIZES AS REQUIRED.

07.11.13 – 9:27:38 AM Larkin, Gaelle
J:\2011\2011082200\E1\Value Engineering Drawings (use these)\E5.01-1E-201108200.dwg

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UNIVERSITY OF MINNESOTA MORRIS
600 East 4th Street
Morris, MN 56267

THIS SQUARE APPEARS 1/2"x1/2" ON FULL SIZE SHEETS

NO	DATE	ISSUED FOR

NO	DATE	REVISION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA

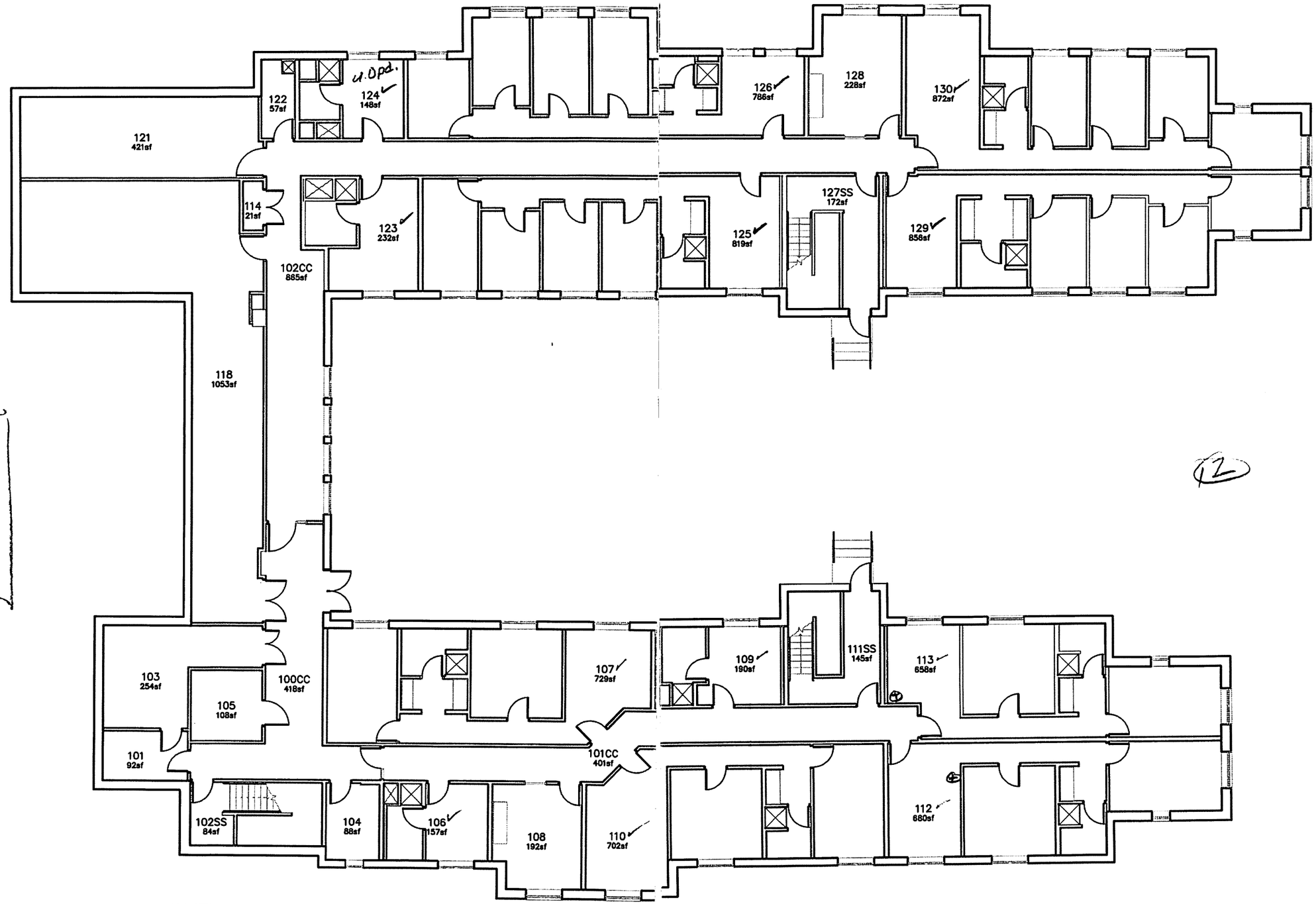
DATE: 12/21/2012 REG. No.: 11698

GAYLAND J. BENDER

PROJECT NAME:
GREEN PRAIRIE LIVING & LEARNING COMMUNITY
University of Minnesota Project #04-769-08-1144
Alumni Drive
Morris, MN 56267

DRAWING TITLE:
ELECTRICAL ONE-LINE DIAGRAM

FILE:
DRAWN BY: GML
CHECKED BY: DEZ
PROJ. NO: 2011.082.00
DRAWING NO: **E5.01**



BUILDING NAME	GREEN PRAIRIE LIVING & LEARNING COMMUNITY
BUILDING NUMBER	700
FLOOR NUMBER	FIRST FLOOR

N

FILE NAME	0476901
DATE	11/06/2013
SHEET NO.	1 OF 2

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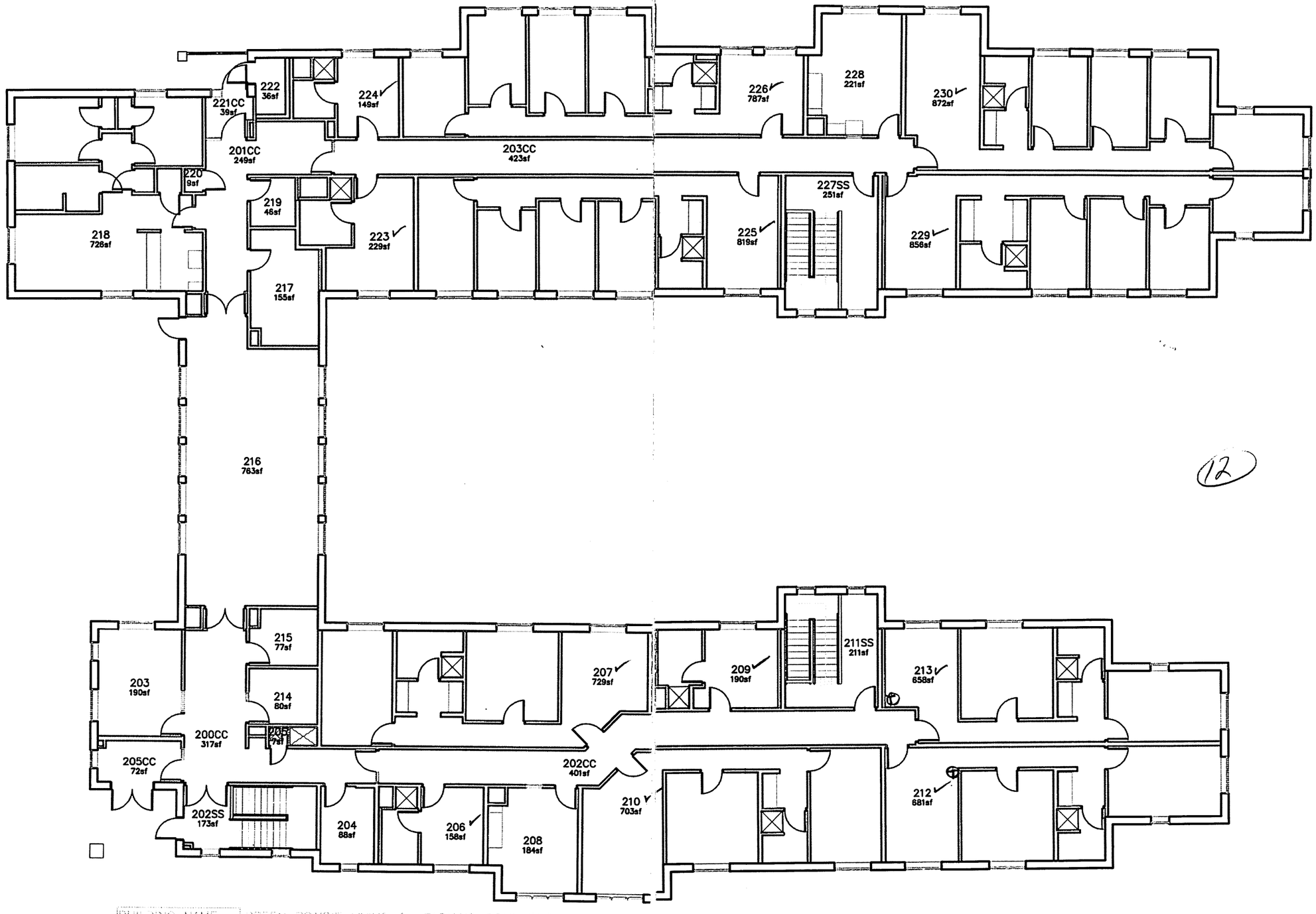

12

BUILDING NAME	GREEN PRAIRIE LIVING & LEARNING COMMUNITY
BUILDING NUMBER	769
FLOOR NUMBER	SECOND FLOOR

FILE NAME	0476902
DATE	11/06/2013
SHEET NO.	2 OF 2

N

0 8 16 32
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