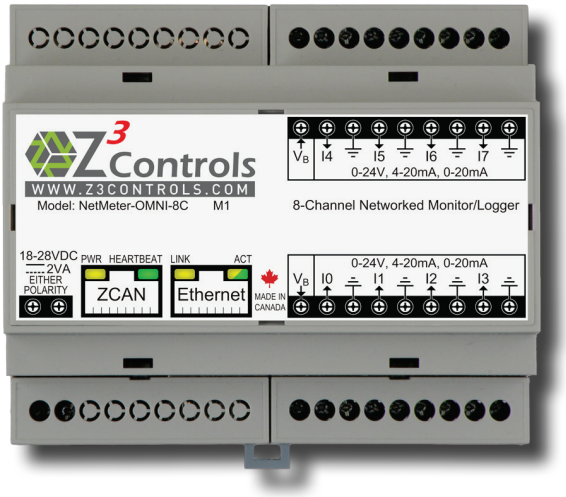
Z3 Controls
WWW.Z3CONTROLS.COM

Online Support Portal:
help.z3controls.com



NetMeter-OMNI-8C

8 Channel Universal Commercial/Industrial Meter/Monitor with Integrated Networking

Installation and Instruction Manual

1 Important Notice

The NetMeter-OMNI should not be used with voltages above 28V (24V nominal). All sources of power must be current-limiting, in order to prevent the unit from overheating in any case where a malfunction or a sustained short might occur.

In no event will Z^3 Controls be responsible or liable for any damages, whether indirectly or consequentially incurred, resulting from the use or application of this equipment. The examples and diagrams in this manual are included solely for illustrative purposes.

Owing to the many 'possible use' scenarios and varying requirements associated with any particular installation, Z^3 Controls cannot assume responsibility for, or liability from, actual use based on the examples and diagrams offered in this manual.

Any installation and/or specific application of the NetMeter-OMNI system should be inspected and approved according to your local area practices, standards and regulations.

No patent liability is assumed by Z^3 Controls with respect to use of information, circuits, equipment or software described in this manual.

2 Safety Practices

Though the NetMeter-OMNI is not intended to be used with lethal voltage, it may be possible for a fault condition to occur in some applications, leading to such lethal voltage being present. Therefore it is recommended that a qualified professional, such as a licensed electrician, perform the installation, and a local electrical authority perform an inspection of the installation, in order to safeguard the installation against such hazards.

In the case where the NetMeter-OMNI will be used with meters/sensors for combustible, volatile or dangerous materials, such as gases, an isolation barrier must be installed and approved by the appropriate authority.

WARNING

The NetMeter-OMNI module contains sensitive electronic components that can be damaged by electrostatic discharge. The NetMeter-OMNI module contains no user-serviceable parts. Do not open the NetMeter-OMNI case. Opening of the NetMeter-OMNI case will automatically void any warranty applicable to the module.

ESD WARNING

Electrostatic discharge can damage the semiconductor components inside the NetMeter-OMNI module. When handling the unit, please follow these guidelines:

- Touch a grounded object to discharge any static potential from the body *before* touching the NetMeter unit.
- Wear an approved wrist-strap grounding device.
- Do not open the module or attempt to service any internal components.
- Use a static-safe workstation where possible.
- Keep the module in its shipping container when not in use.

3 Overview

The Z^3 Controls NetMeter-OMNI is a sophisticated yet simple-to-use tool intended for the monitoring and measuring of sensors, pulse meters, and other devices that produce a voltage (0V up to 24V), current (0-20mA, 4-20mA) or a pulse (i.e. as KYZ contacts, a voltage, or current pulse).

There are two parts to a NetMeter-OMNI installation:

1. Physical installation of the hardware.
2. Setting up network communication and configuring the NetMeter-OMNI through the web interface.

The NetMeter-OMNI may be configured prior to its installation in an enclosure. This allows the user to establish initial network communication, to configure the unit, and to become familiar with the NetMeter-OMNI web-based user interface while the unit is still accessible for minor adjustments.

If this is the preferred procedure for your installation, Section 8 is the place to start.

4 Preparing for Installation

Each NetMeter-OMNI is shipped with the following items:

- The NetMeter-OMNI itself
- 1 – RJ45 plug specially wired for use in restoring network (LAN) defaults (Reset Plug)
- 1 – Ethernet Cable
- 1 – Installation Manual (this document)

In order to install the NetMeter-OMNI, additional materials may be required.

These may include:

- A power supply to power the NetMeter-OMNI. The type of power supply intended for use will determine how it should be installed:

- Industrial style DIN mount power supply: The use of an industrial supply like this is recommended as the most reliable solution. A 24V DIN mounted supply may be dedicated to the NetMeter-OMNI or be shared with other 24V loads in an enclosure. An example would be the DSP10-24 from TDK Lambda. Please note that the power supply chosen must meet the regulatory requirements of your jurisdiction. This type of power supply will require an electrician for installation. See the NetMeter-OMNI specifications (Section 13) for more details on the power supply requirements.
- Modular power supply: these are the CSA/UL approved power supplies that are sealed and can plug directly into a wall receptacle. Since their output is low voltage (24V), there is no shock hazard and an electrician is typically not required for installation. However, please note that these power supplies are not robust in most industrial applications, making them less preferable to the DIN mounted option above.

- An enclosure that can accommodate DIN rails to mount the NetMeter-OMNI and other circuits. This may be part of a large enclosure or a smaller enclosure dedicated to the NetMeter-OMNI. If mains voltage is used in the enclosure for the 24V power supply, then the enclosure should be NEMA-rated and approved for such use.
- An Ethernet connection: When a single NetMeter-OMNI is used, a single Ethernet drop is needed. Multiple NetMeter-OMNI units will require multiple Ethernet drops or may share a single Ethernet drop using an Ethernet switch (Ethernet Switches are available for sale through Z^3 Controls, see our website at www.Z3controls.com for more information). For harsher environments, the Bulgin IP68 rated Buccaneer series is recommended as a connector for use on the NEMA enclosure.

5 Mounting Considerations

Mount the NetMeter-OMNI module in a suitable protective enclosure. This enclosure must protect against any personal contact with energized circuits.

Select an enclosure that also protects the module against any atmospheric contaminants (i.e. water, oils, dust, moisture or corrosive vapours and any other potentially harmful airborne substances that may be present within the operating environment). The ambient temperature within the enclosure must remain within the specified limits. Select an enclosure that provides adequate clearance for proper ventilation and wiring for the NetMeter-OMNI module and any other equipment to be installed within the enclosure.

Please refer to Page 26, Figure 17, for the NetMeter-OMNI module dimensions.

6 Selecting Suitable Sensors for the NetMeter-OMNI

The NetMeter-OMNI may be used with almost any sensor capable of outputting one of the following:

- 4-20mA Current loop[1]: this is a common sensor type as it has good noise immunity and provides power to the sensor using only 2 wires (signal and power over the same wires).
- Voltage output: such as 0-5V, 0-10V, 0-24V or anything in between. Sensors that produce small mV signals, such as thermocouples, will require a pre-amplifier that produces either a higher voltage output (as above) or a 4-20mA current loop.
- Pulse output: this can be an electrical switch or a mechanical switch (such as a KYZ output or dry contact switch), a voltage pulse, or a current mode pulse (in the 4-20mA range).

7 System Connection

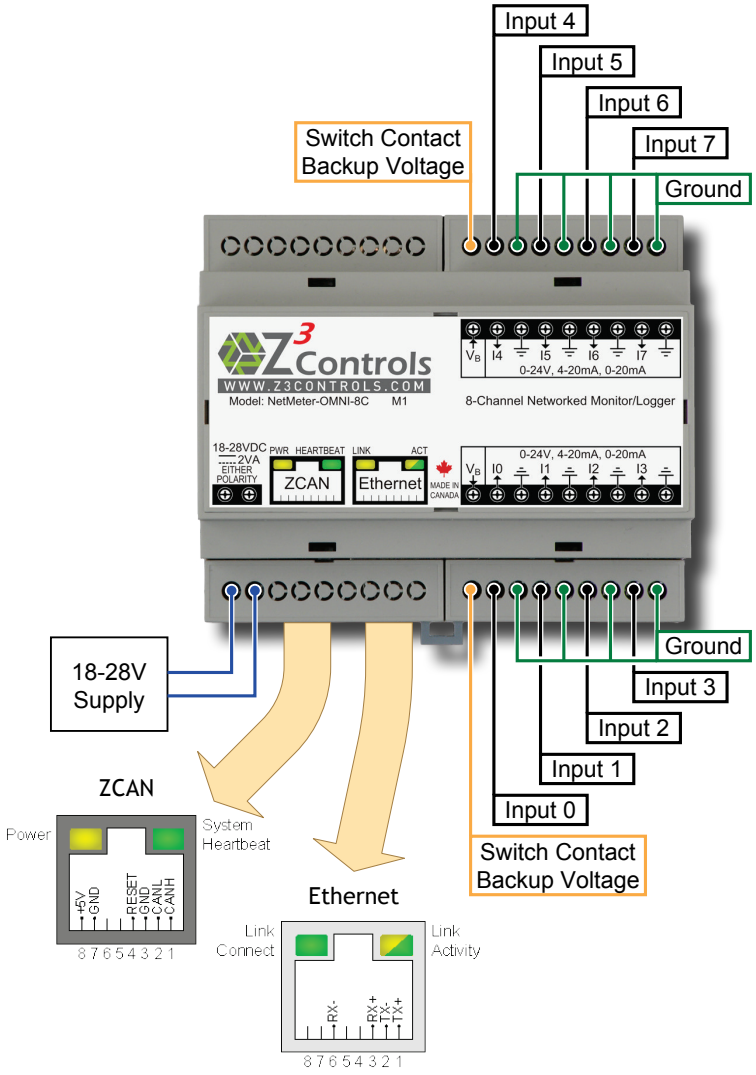


Figure 1: NetMeter-OMNI Connection Diagram

[1] The NetMeter-OMNI can measure currents as low as 0mA (0-20mA). However, sensors typically use the 4-20mA range. The offset and scale used to translate mA into the desired units (eg. CFM, °C, °F) is fully programmable in the NetMeter-OMNI.

The input/output connectors of the NetMeter-OMNI are depicted in Figure 1 above.

The connectors are:

- Supply Voltage
    - A low voltage DC power supply (18-28V) provides the power required to operate the NetMeter-OMNI.
    - The supply voltage terminals will work with either polarity.
- ZCAN Connector
    - Provides expansion capabilities for the NetMeter-OMNI to communicate with any additional Z^3 accessories that may be projected in future.
- Ethernet Connector
    - This is a standard 10/100 Mb RJ45 Ethernet port that should be connected to an Ethernet switch/router using a standard (CAT5/CAT5e/CAT6) network cable.
- Switch Contact Backup Voltage Terminals
    - For use with dry contact switches or KYZ contacts from pulse devices that may pulse even during power outages. The VB terminals output a current-limited small voltage that exists even during power failure.
- Input 0 – Input 7 Terminals
    - These are the input terminals for each of the 8 sensor channels. Each input can be individually configured as voltage or current mode.
- Ground Terminals
    - Common ground across all inputs.

7.1 Voltage Input Mode

When channel inputs are used to measure voltage, then the voltage is measured between the input and ground, as in Figure 2 below:

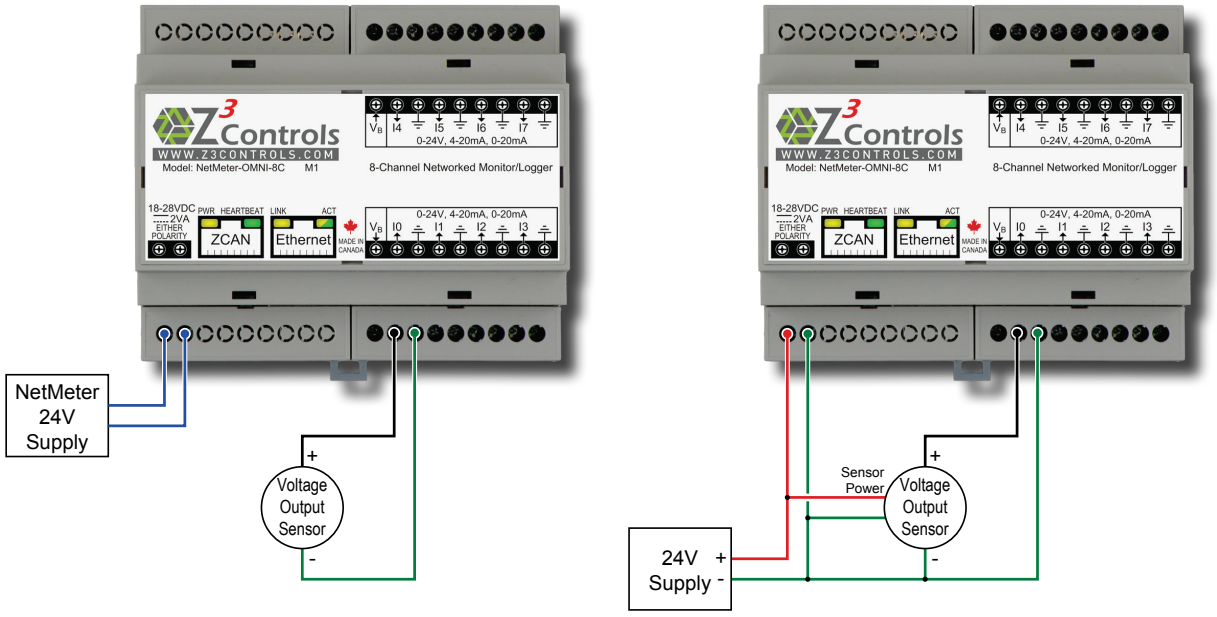


Figure 2: Connection of Voltage Output Sensors for Self-Powered/Separately-Powered Sensor (left) or Common NetMeter-OMNI/Sensor Power Supply (right)

Figure 2 depicts the use of only channel 0. Other channels may be used in the same way.

For voltage mode, the sensors' negative terminal should be connected to a ground terminal on the NetMeter-OMNI. One of the ground terminals should also be connected to the chassis ground when a metal enclosure is used.

It is possible to use the same 24V power supply to power both the NetMeter and the sensor. This is illustrated in Figure 2 above, on the diagram to the right.

7.2 Current Loop Input Mode

Current loop sensors are connected as depicted in Figure 3 below:

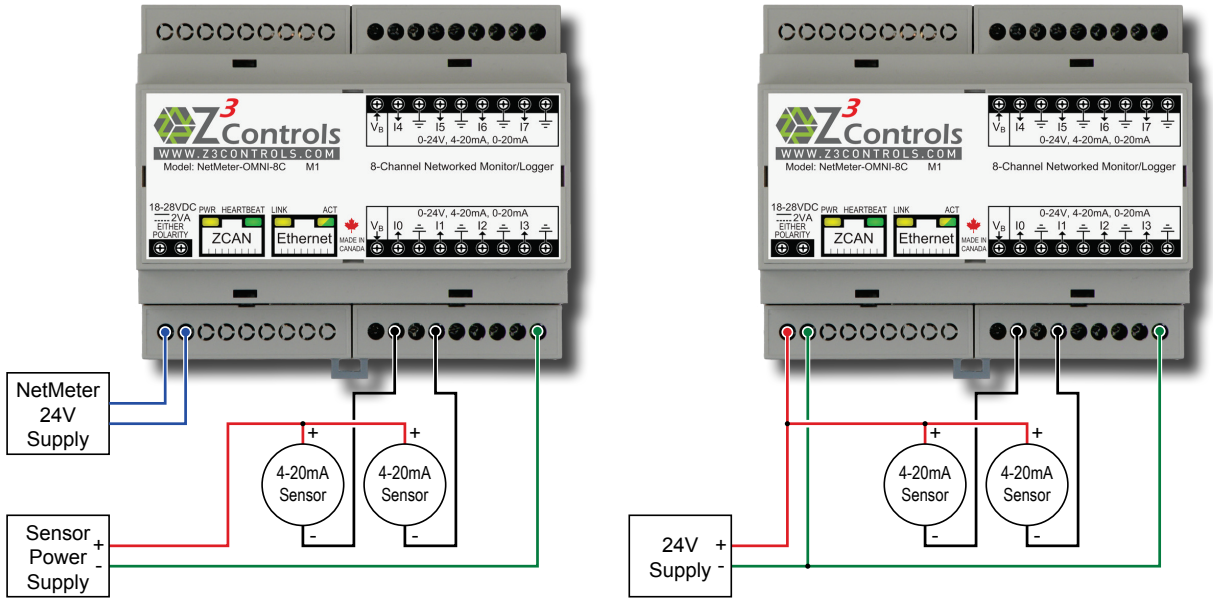


Figure 3: Connection of 4-20mA Current Loop Sensor for Separately Powered Sensor (left) or Common NetMeter-OMNI/Sensor Power Supply (right)

Since the NetMeter-OMNI's current mode input is at near ground potential, the current loop sensor needs to be connected so that current flows from the sensor's power supply positive terminal into the NetMeter-OMNI input as shown. The ground terminal on the NetMeter-OMNI provides the current return path. Any of the ground terminals may be used for this purpose.

Only 2 of the 8 channels are shown. Other channels are connected in the same way.

7.3 KYZ and Dry Contact Devices

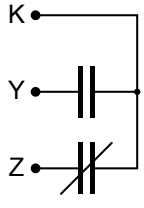
Many pulse output devices such as gas meters, water meters, and other types of flow meters, employ either a mechanical or electronic contact closure to assert a pulse, rather than outputting a voltage or current as depicted in the previous sections.

Pulse devices that output either a current or voltage pulse should be connected in the manner described in the previous sections. The following description applies only to contact closure (dry contact or KYZ) devices:

KYZ devices are a form of contact closure that offer both a normally-open and normally-closed option. This is depicted below:

The terminals are:

- K for common
- Y for Normally Open
- Z for Normally Closed



The method of connecting KYZ contacts to the NetMeter-OMNI must produce current or voltage depending on the input configuration. The current or voltage produced between the open and closed states must be sufficient to safely distinguish between them. It is recommended that at least a 2V or 2mA closed/open differential be produced in order to safely detect the on/off state and to reject noise. Higher differences between the off voltage/current compared to the on voltage/current will result in higher noise immunity.

There are a several choices for connecting contact devices to the NetMeter-OMNI. The method chosen will depend on the following considerations:

- Does the contact require a wetting current?
- Is backup power required?

7.3.1 Non-Backup Circuit

The simplest ways to attach a contact to the NetMeter-OMNI is shown in Figure 4 below:

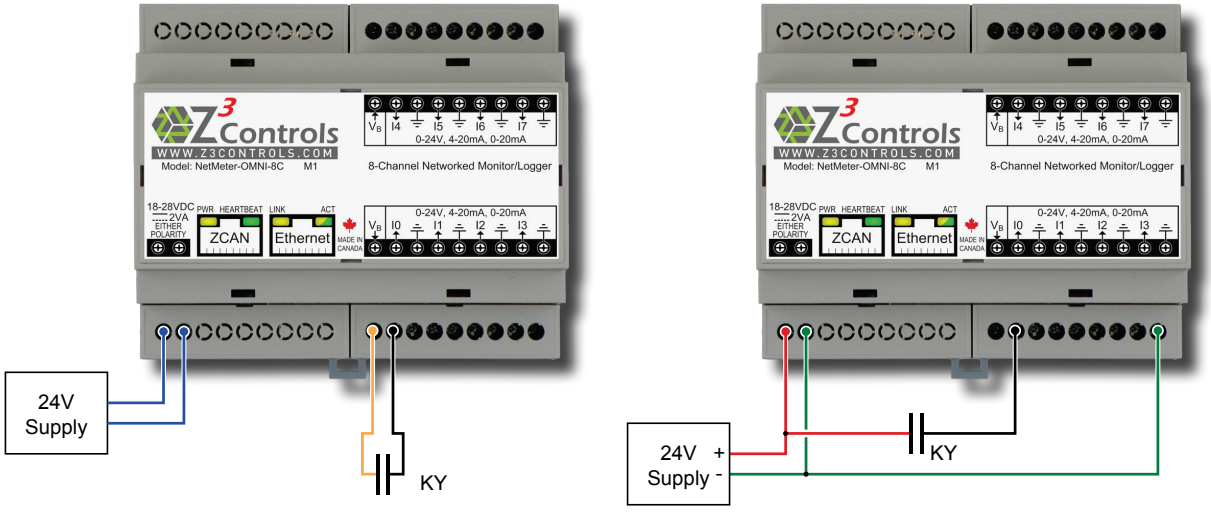


Figure 4: Connection Options for a KYZ Pulse Device, Backup Powered (left), Non-backup Powered (right)

The circuit on the right shows how a KY contact may be used to apply 24V to the channel 0 input (configured for voltage input mode) whenever the contact is closed. In its quiescent state, the voltage at I0 will be 0V ± some small noise voltage.

The large 0V (off) to 24V (on) range provides high noise immunity so that noise will not trigger a pulse, and only a true closing of the KY contact will result in an incrementation of the pulse count value.

The noise immunity of the input is also determined by the threshold settings that are located in the Sensor Configuration screen of the web-based user interface. This should be set up initially when the NetMeter-OMNI is first commissioned and can be adjusted for further optimization later if necessary. The effect of the threshold settings is pictured in Figure 5 below:

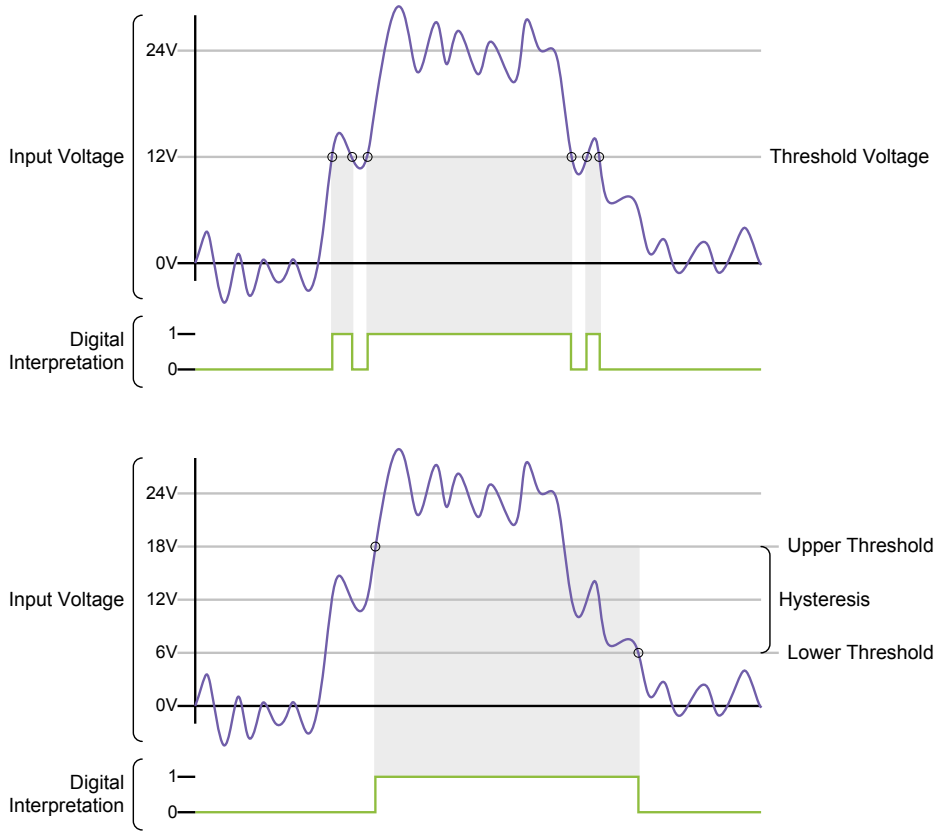


Figure 5: The Effect of Threshold Settings on the Digital Interpretation of a Noisy Analog Signal

The top graph in Figure 5 above shows a noisy pulse signal that is digitally interpreted by the NetMeter-OMNI using a single threshold voltage. Noise causes the signal to cross the threshold and produces 3 pulses instead of 1.

The bottom graph in Figure 5 above shows the same pulse signal digitally interpreted by using a lower and upper threshold with sufficient separation (hysteresis) to reject the noise and produce a single pulse.

As a rule of thumb, be sure that both the upper and lower thresholds are chosen such that the hysteresis (the difference between the upper and lower values) is at least 25% of the total swing of the signal.

Note that a normally closed (KZ) contact may also be used with Figure 4. In this case the pulse will be inverted in polarity. Settings on the 'Sensor Configuration' screen of the interface allow the polarity of each pulse input to be determined as either the low-to-high transition or alternately the high-to-low transition. Normally open (KY) contacts are typically configured for low-to-high transitions. Normally closed (KZ) contacts are typically configured to trigger from high-to-low transitions.

7.3.2 Backup Circuit

The circuit to the left in Figure 4 illustrates the connection of a KY contact using the back-up power port (V_B). This circuit is intended to be used when the meter/sensor produces pulses while utility power is absent, such that these pulses can still be captured.

When the contact is open (Figure 4 left), the voltage at I0 will be 0V ± some small noise voltage. When V_B is applied to a single input channel, it can produce approximately 2.2V. V_B will continue to produce a voltage even when power to the NetMeter-OMNI is temporarily lost.

7.3.3 Wetting Current

In some cases, mechanical conductors require a wetting current in order to function reliably. Wetting current is the minimum electric current needed to flow through a contact to break through the surface film resistance. Figure 6 below provides two examples:

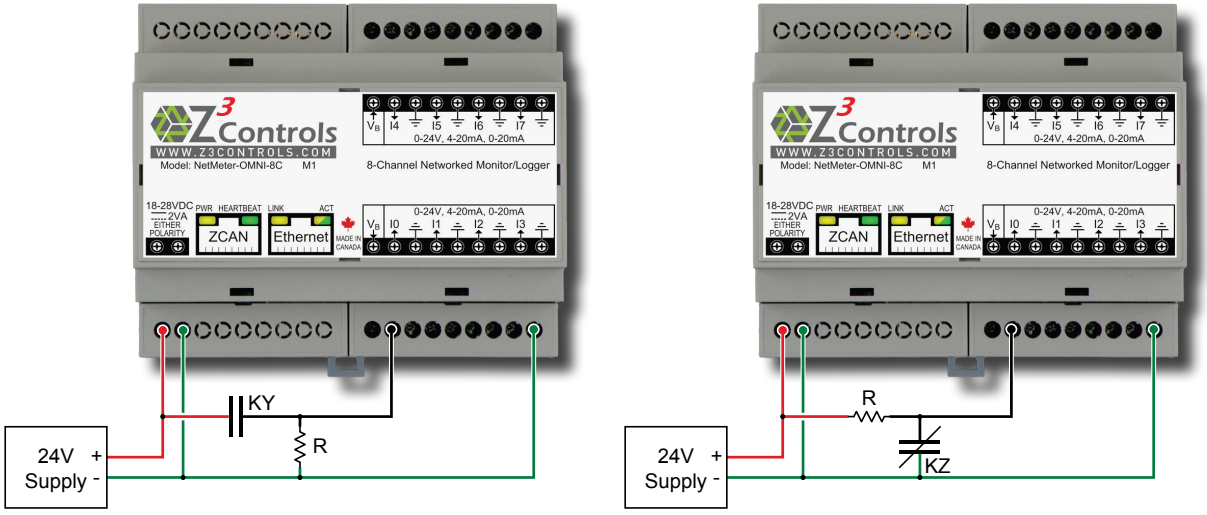


Figure 6: Connection Options for a KYZ Pulse Device that Provides a Wetting Current

For either of the circuits illustrated in Figure 6 above, the resistor value (R) should be chosen such that enough current flows through the switch to generate the desired wetting current. When configured for voltage mode, the input impedance of the NetMeter-OMNI will have negligible effect on the circuit such that R can be calculated as follows:

$R = \frac{V_{PSU}}{I}$ Where V_{PSU} is the power supply voltage and I is the wetting current.

Here are some examples for a 24V power supply:

Current (mA)	R (Ohm)	Closest Standard Value (Ohm)
1	24KΩ	22KΩ
5	4.8KΩ	4.7KΩ
10	2.4KΩ	2.2KΩ
20	1.2KΩ	1.2KΩ

Note that normally closed (KZ) or normally open (KY) contacts may be used in either case depicted in Figure 6. The case is shown using the default polarity of low-to-high pulse edge. The opposite switch polarity may be chosen by selecting the high-to-low edge setting in the 'Sensor Configuration' screen.

8 Network Setup

It is recommended that the NetMeter-OMNI unit be configured prior to the installation of the unit into any panel containing voltages. This may be done by connecting a small 12V or 24V power supply to the NetMeter-OMNI and by connecting the NetMeter-OMNI to an Ethernet network or small WiFi router. An example setup is depicted in Figure 7 below:

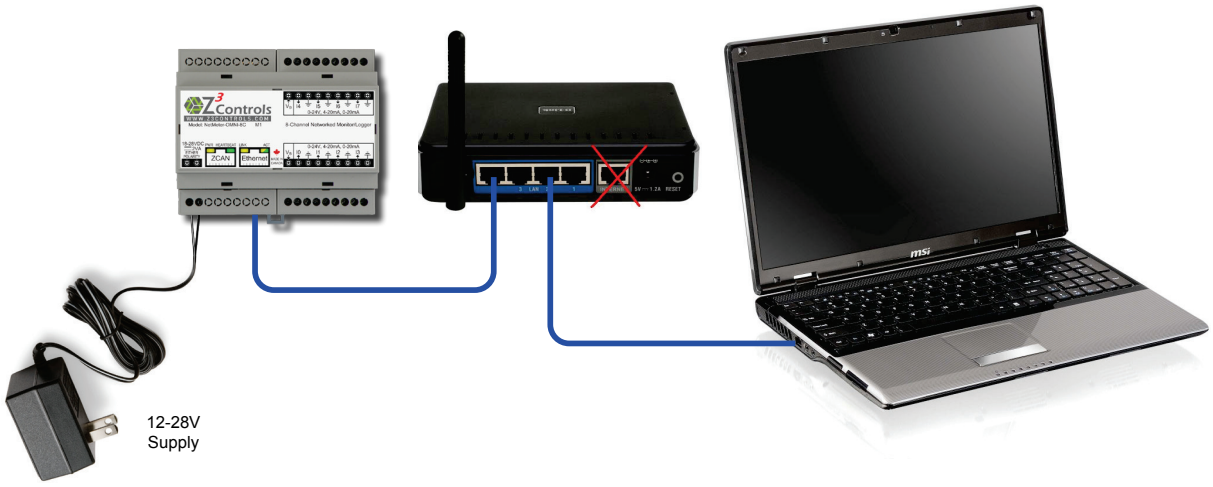


Figure 7: NetMeter-OMNI Setup Used to Perform Initial Configuration

In order to test for network connectivity, the following materials will be required in addition to the NetMeter-OMNI unit:

- Power supply (such as the EPS240025-P5P available at www.digikey.com) or other wall-mount supply in the 12V - 24V range,
- Ethernet Cables (2),
- A small 'home style' router,
- A laptop computer with a current version of Internet Explorer (V9 or higher), FireFox, Chrome, Safari, Opera or other W3C compliant browser[2] installed.

Step 1: First establish communication between the computer and the WiFi router (see manual for the WiFi router). Verify that the router is configured to provide DHCP services on the LAN (local area network).

IMPORTANT NOTE: You must establish communications with the router before proceeding. If you are not connected through either WiFi or the Ethernet cable, you will be unable to communicate with the NetMeter-OMNI unit. Please consult the documentation provided with your router for any additional setup requirements.

Step 2: Connect the NetMeter-OMNI to one of the LAN ports on the router and power up the NetMeter-OMNI from the power adapter. The green 'hearbeat' LED on the

[2] To check for browser compatibility, visit http://www.z3controls.com/browserchk.html

NetMeter-OMNI should start to blink and the other green 'Link Connect' LED should switch on to indicate that network connection has been established.

Step 3: The default host name of the NetMeter-OMNI is NETMETER[3]. Open your web browser on the laptop and enter the following address:

HTTP://netmeter/

Once connected, the NetMeter-OMNI will show a screen indicating that the unit requires setup or initialization. The screen will look similar to that of Figure 8 below:

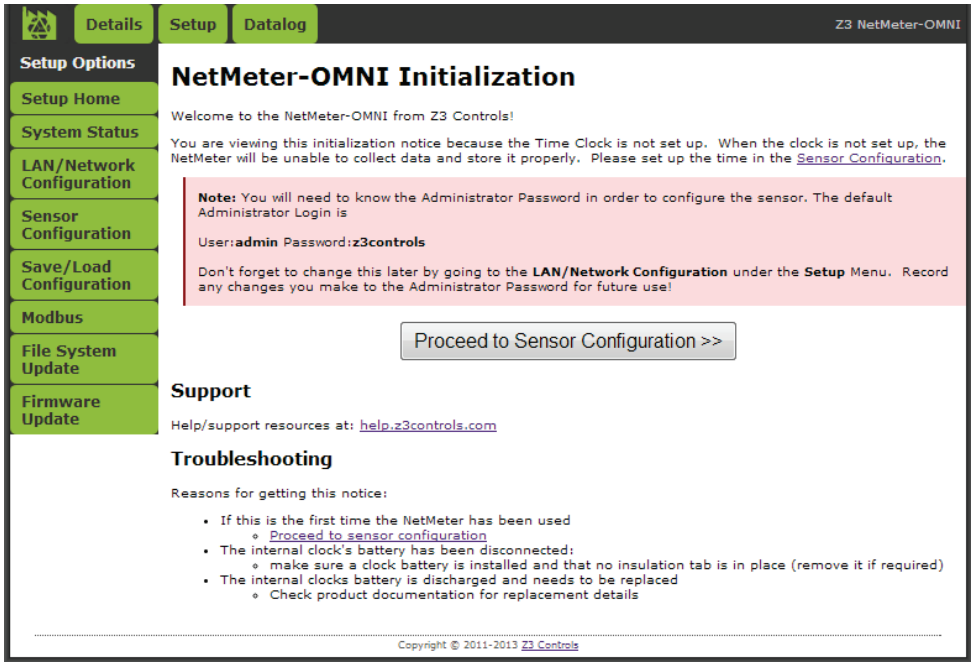
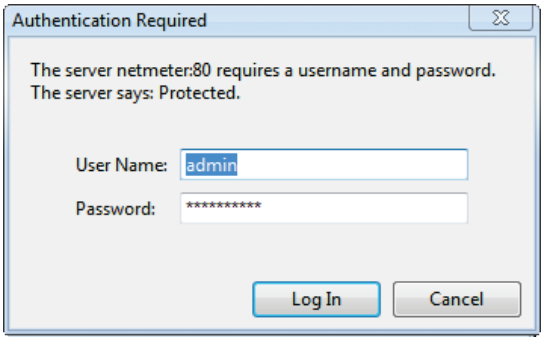


Figure 8: Initialization Webpage Displayed by the NetMeter-OMNI on First Use

Step 4: Click on 'Proceed to Sensor Configuration', then enter the default login indicated:

User Name: admin

Password: z3controls



Successful login should lead to the Sensor Setup window as depicted in Figure 9 below:

[3] The 'host name' is published on the network using the NetBIOS protocol. The Windows operating system supports NetBIOS but other platforms do not directly support NetBIOS. As a result, a Windows based PC is recommended for use during the installation process.

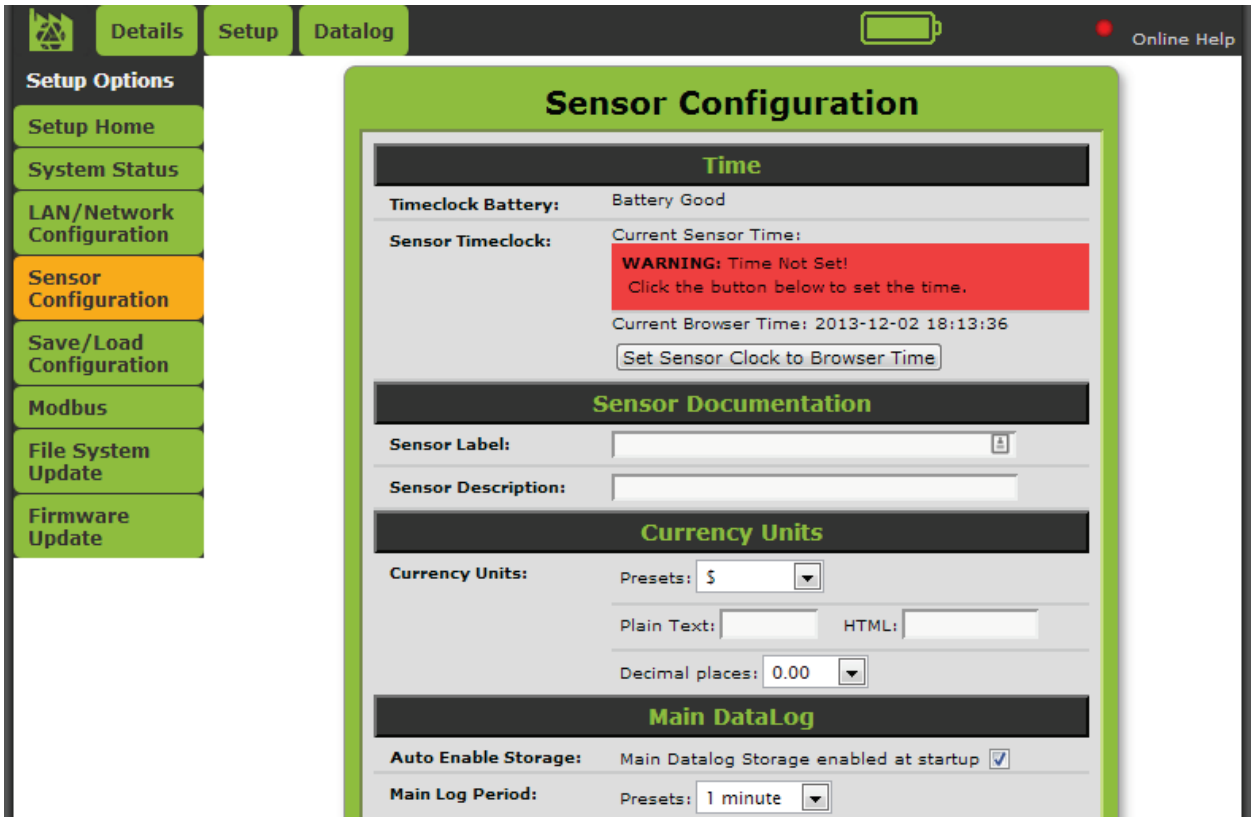
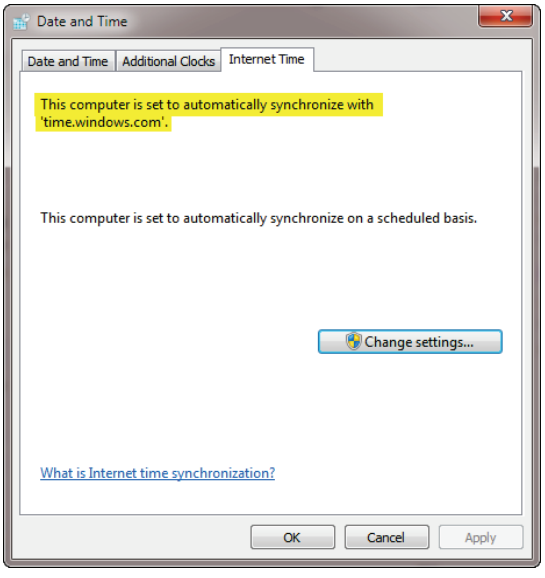


Figure 9: NetMeter-OMNI Sensor Configuration tab

Step 5: Set the Timeclock. Before proceeding, please verify that your computer's time clock setting is accurate. For best results, ensure that your computer is configured for automatic Internet time synchronization. Under the Windows 7 OS, this can be done through the 'Change date and time settings' link in the time panel. Be sure that it shows 'This computer is set to automatically synchronize with…':



If the computer's time is set correctly, then click on 'Set Sensor Clock to Browser Time' as shown in Figure 9.[4]

Step 6: Sensor Configuration:

- In the designated text fields, enter an appropriate label (Sensor Label) and description (Sensor Description) for your NetMeter-OMNI unit,
- Select the units to be used for currency,
- Under the Main DataLog: set the 'Auto Enable Storage' checkbox to 'on' (active checkmark) to ensure that data will be recorded into the data logger. Also select a specific time 'Period' for data storage. Shorter log update periods will result in shorter storage durations. A value of 1m will normally approximate 1 year of storage.
- Input configuration is covered under Section 9. Please note that this information can be changed at any time and can remain unchanged for the time being.
- Save the new configuration.

Step 7: Network Configuration: How the NetMeter-OMNI communicates via the LAN is configured through the Lan/Network Configuration as shown in Figure 10 below.

- Host Name: If a single NetMeter-OMNI is present on the network, the default value of NETMETER is sufficient. If more than one NetMeter-OMNI is intended to be used on a particular network, then each unit will require its own unique IP address.
- Enable DHCP: When enabled (checkmarked), the NetMeter-OMNI will obtain its IP address automatically from a DHCP server. Disabling this function will allow the IP configuration to be set up manually (recommended only for advanced users).
- The admin password can be changed on the LAN/Network Configuration tab.
- Click the 'Online Help' link in the upper righthand corner of the screen for more information or for additional help in configuring the unit.

[4] The NetMeter-OMNI device internally stores time based on the universal timecode (UTC). When accessing the NetMeter-OMNI through the web interface, the NetMeter-OMNI's internal time is converted and displayed as local time according to your browser's time zone settings.

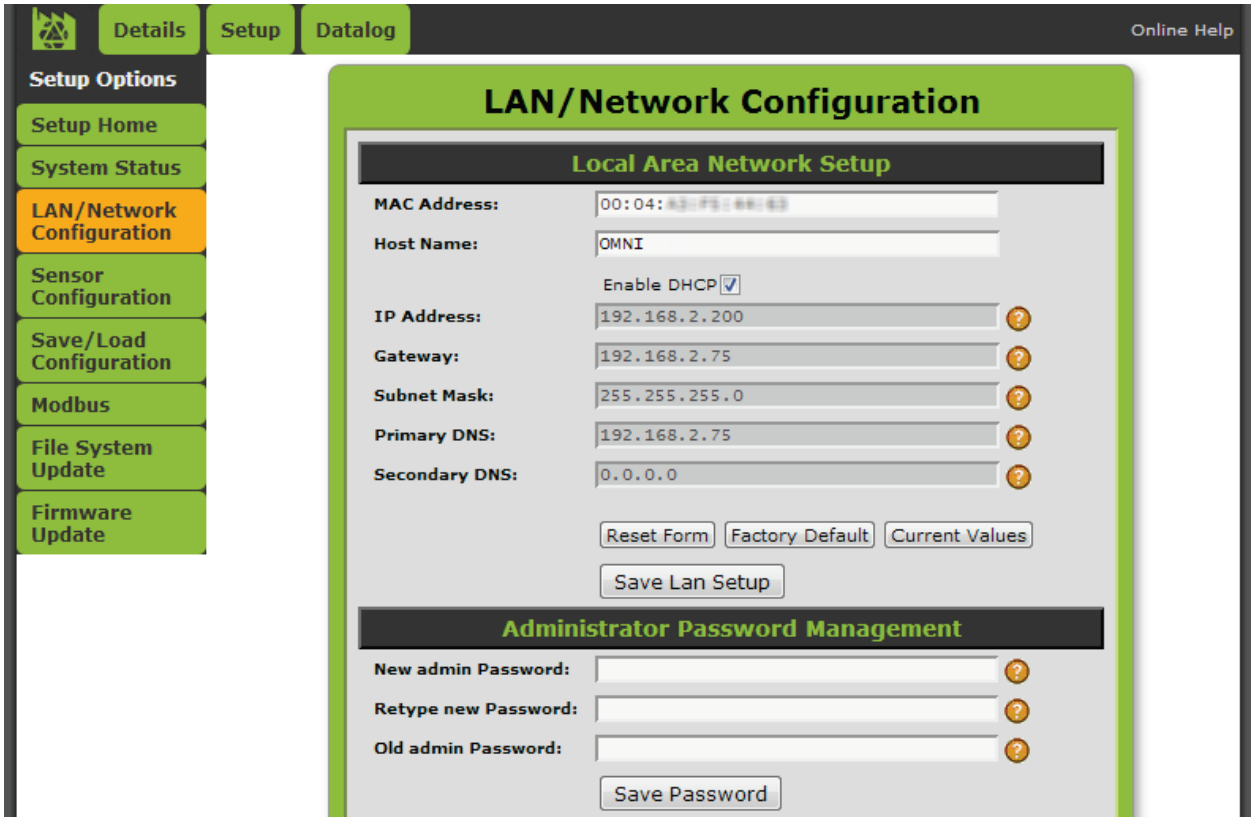


Figure 10: LAN/Network Configuration tab

IMPORTANT NOTE: Be sure to document any changes that you have made to the unit's network settings for future reference.

Step 8: The NetMeter-OMNI must be reset in order for the new values to be applied to the unit. This can be done by manually power cycling (rebooting) the unit.

8.1 Network Default Recovery

Communication with the NetMeter-OMNI may fail if the network parameters are set up incorrectly. It is possible to temporarily restore the default values of the network configuration.

WARNING: Please disconnect all power sources and confirm that they are de-energized and locked out BEFORE proceeding with the network default recovery. Failing to follow this procedure could result in personal injury or death, property damage, or economic loss.

The following steps are used to temporarily restore the default network configuration:

1. Power off the NetMeter-OMNI and disconnect all potential sources of voltages,
2. With the POWER OFF, briefly ground the RESET pin on the ZCAN connector by connecting pin 3 to pin 4 of the ZCAN connector. Z^3 Controls provides a special RJ45 plug for this purpose (called a 'Reset Plug'),
3. Remove the connection between ZCAN pin 3 and pin 4 (unplug the Reset Plug),

4. Safely power on the NetMeter-OMNI and reconnect using the factory default network parameters,
5. Enter the new (revised) information into the LAN/Network Configuration Page,
6. Reset or Power cycle the NetMeter-OMNI to invoke the revised network parameters.

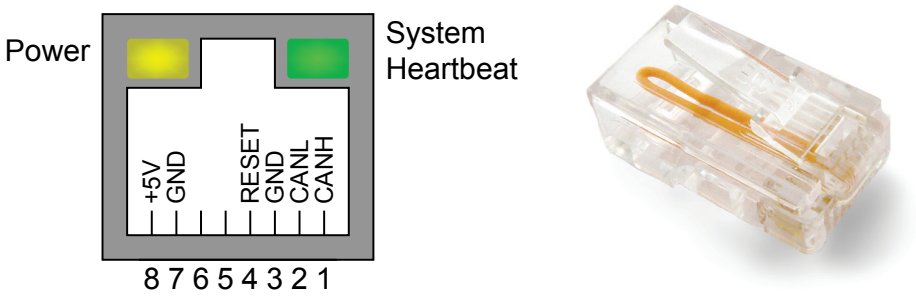


Figure 11: ZCAN Connector Pinout (left) and the Reset Plug (right)

9 Configuration and Use

9.1 Input Configuration

The functional model of each input is depicted below:

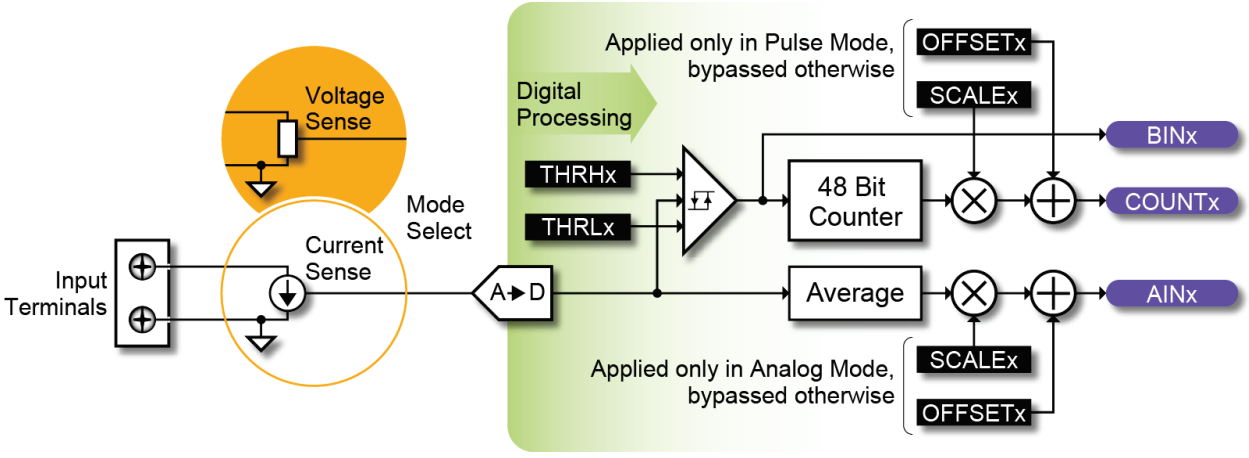


Figure 12: Functionality of each Input Channel of the NetMeter-OMNI

Referring to Figure 12 above:

- The physical inputs can be configured for either Current mode or Voltage mode
- An analog to digital converter (A→D) converts the current/voltage to a digital value
- When the Analog Function is chosen (AINx), the A→D output is averaged over multiple samples, multiplied by a scale factor (SCALEx), then has an offset added (OFFSETx) to produce the value that is displayed.

- In Pulse or Binary mode, a threshold detector is used to convert the output of the A→D converter to a binary (1/0) value. When the binary value transitions from 0→1 or 1→0 (depending on the polarity setting) the counter is incremented. A user-defined scale (SCALEx) and offset (OFFSETx) is applied to the counter value to generate the final result for display.

Each of the 8 inputs can be configured from the Setup→Sensor Configuration webpage. The configuration options for channel 0 are shown in Figure 13. The same options are available for all channels.

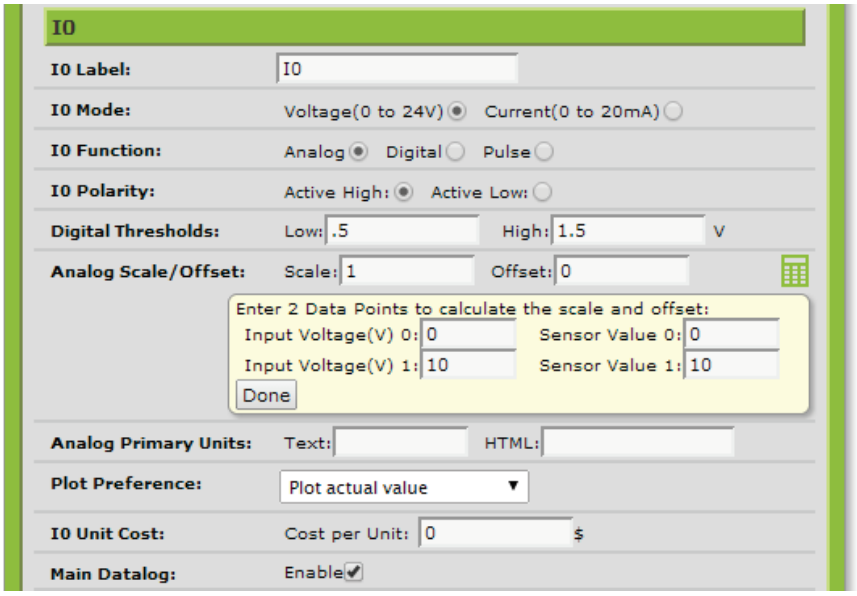


Figure 13: Input Configuration for a Single Input Channel Showing the Default Settings

The configuration fields are:

- Label: This is the way the input will be named in any graphs or reports produced. The Label for each channel should be unique and clear.
- Mode: This is the physical input configuration – either voltage or current.
- Function: This is how the incoming physical signal will be processed for display and logging:
    - Analog: the incoming voltage or current will be scaled and then displayed as an analog value. This is used with transducers for values such as temperature, pressure, etc.
    - Digital: this input will be used to detect a logical state (on/off).
    - Pulse: this input will be used to count pulses.
- Polarity: Used for Pulse/Digital input mode.
  Active High: Pulse counter is incremented when the voltage/current transitions from low-to-high. *Active Low*: Pulse counter is incremented on high-to-low transitions.
- Digital Thresholds: Sets the voltage/current corresponding to an on/off (High/Low) state. A voltage/current less than 'Low' defines a low (0) input. A voltage/current

greater than 'High' defines a high (1) input. The value of the High Threshold should always be higher than the low Threshold value. The gap between the low and high Thresholds is the hysteresis.

- Analog/Pulse Scale and Offset: Set the scale factor and offset for the Input function. The reported value is the raw value multiplied by 'Scale' and then added to 'Offset'. In mathematical terms: the final value y = m*x + b where m is the scale factor applied to x (the original value) and b is the offset.
    - The calculator icon ( ) may be clicked to reveal the helper widget shown in Figure 13 ('Enter 2 Data Points to calculate the scale and offset'). The widget allows the scale factor and offset to be calculated from 2 data points. Enter the data for the 2 points and then press 'Done' to close the widget.
- Analog/Pulse Primary Units: These are the units of measure for the input function chosen. There are 2 types available: Text and HTML. Text is the units in standard ASCII text with no interpretation while HTML may include special character sequences displayed as HTML markup (see Section 9.1.2). Leaving the HTML field blank will revert to the Text field being displayed.
- Plot Preference: Controls the default for the data display on some screens. There are 5 options:
    - Plot actual value: This is the default mode where data is displayed as the actual value of current/voltage/pulse count after it has had the scale and offset applied. This is typically used for everything except the pulse count mode.
    - Plot as units per second: This and the following three modes are designed to allow cumulative pulse count values to be converted to a flow rate for display. In this case, a quantity such as cubic feet or cubic meters can be converted to ft^3 or M^3 per second. The flow rate at time *t* is defined as:
      $$FlowRate(t) = \frac{\Delta data}{\Delta t} = \frac{data(t) - data(t-1)}{\Delta t}$$
      Where $\Delta data$ is the change in the data value between 2 successive samples and Δt is the time interval between the 2 samples.
      For example: if the counter shows 1030L of water at time *t* and 1000L of water 1 minute prior, we have a flow rate of 30L per minute or 0.5L per second flow rate.
    - Plot as units per minute: Same as above except the flow rate is converted to units per *minute*.
    - Plot as units per hour: Same as above except the flow rate is converted to units per *hour*.
    - Plot as units per day: Same as above except the flow rate is converted to units per *day*.
- Secondary Units: This option is available when a plot preference other than 'Plot actual value' is chosen. These are the units of measure for the input function when

a rate is displayed rather than an absolute value. As in the case of the Primary Units, both Text and HTML versions of the units may be entered. Suppose that gas is being measured in the primary units of cubic feet. This could be entered as 'CF' for the primary text units and 'CFM' for the secondary text units ('Plot as units per minute' should be selected for the Plot Preference). This will allow cumulative values of gas to be displayed with the units 'CF' and the cubic feet per minute flow rate to be displayed with the units 'CFM'.

- Unit Cost: Where applicable, a cost per unit may be entered. Examples of this might be the cost per litre of water or per cubic foot of gas. Leave this field blank for quantities where cost is not applicable (i.e. for temperature measurements).
- Main Datalog: When this option is enabled, the data values from the selected functions will be stored in the data log. When disabled, data for this channel will not be stored. In order to maximize memory usage, unused channels should be disabled.

9.1.1 Scale Factor and Offset Configuration

The scale factor and offset for each input should be set such that, depending on the chosen function, the analog voltage/current or pulse counter value is converted into the desired units. A simple example will help illustrate:

Suppose you have a current loop temperature sensor with the following characteristics:

- 4mA at 0°C
- 20mA at 1000°C

$$\text{Scale (°C per mA)} = \frac{1000°C - 0°C}{20mA-4mA} = 62.5°C \text{ per mA}$$

$$\text{Offset (°C)} = -4mA * 62.5°C \text{ per mA} = -250°C$$

This same calculation may also be done using the built-in widget (click on the calculator icon). This is illustrated in Figure 14.

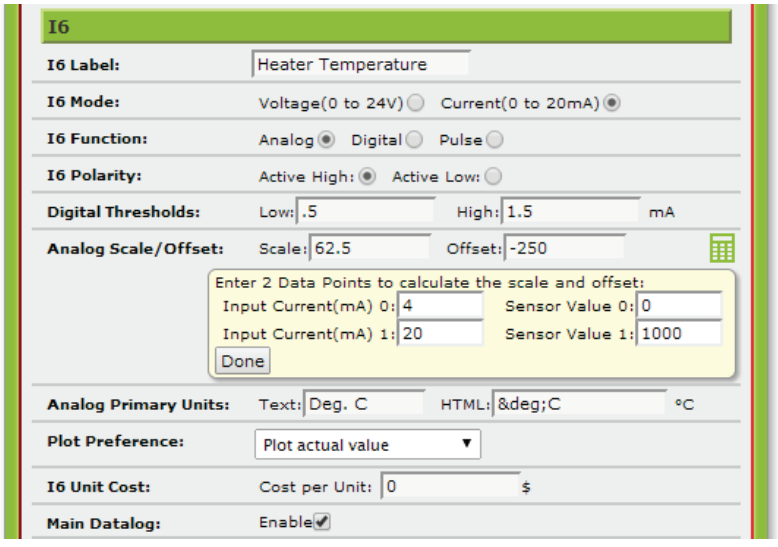


Figure 14: Example Configuration for a 4-20mA Temperature Probe

9.1.2 HTML Formatted Units

In many on-screen displays, the units of measure are taken using the HTML version of the defined units. If not defined, the Text units are shown instead.

The use of HTML for units display has the advantage of being able to display special characters such as italics, subscripts, superscripting and the like. Here are some examples:

Text Units (as entered and displayed)	HTML (as entered)	HTML (as displayed)
CFM	Ft.³/m	Ft.^{3}/m
CFM	Ft.³/m	Ft.^{3}/m
Deg. C	°C	°C

The first example above uses the superscript tag: . In the second example, the superscript 3 is generated using the special HTML tag ³ and is an alternate to using ³.

The third example uses the HTML tag for the degree symbol (°):°

Here are some examples of tags that may be useful:

Tag	Description	Displayed As
¢	cent	¢
£	pound	£
¥	yen	¥
°	degree	°
±	plus-or-minus	±
²	superscript two - squared	²
³	superscript three - cubed	³
µ	micro	μ

A complete list of special HTML codes may be found at http://www.ascii.cl/htmlcodes.htm

9.2 Using the NetMeter-OMNI

This manual only describes the steps required for basic setup of the NetMeter-OMNI unit.

For information on using the NetMeter-OMNI unit, consult the online help at help.z3controls.com, where you will find the most current information.

10 Maintenance

10.1 Battery Replacement

The real-time clock inside the NetMeter-OMNI uses a small CR2032 lithium battery for keeping time during power outages. It may need to be replaced after roughly 5 years of use. The need for a replacement will be indicated on the Setup screen of the unit's interface. As demonstrated in Figure 14 below, the red battery icon will be actively displayed on the top bar should the battery require replacement.

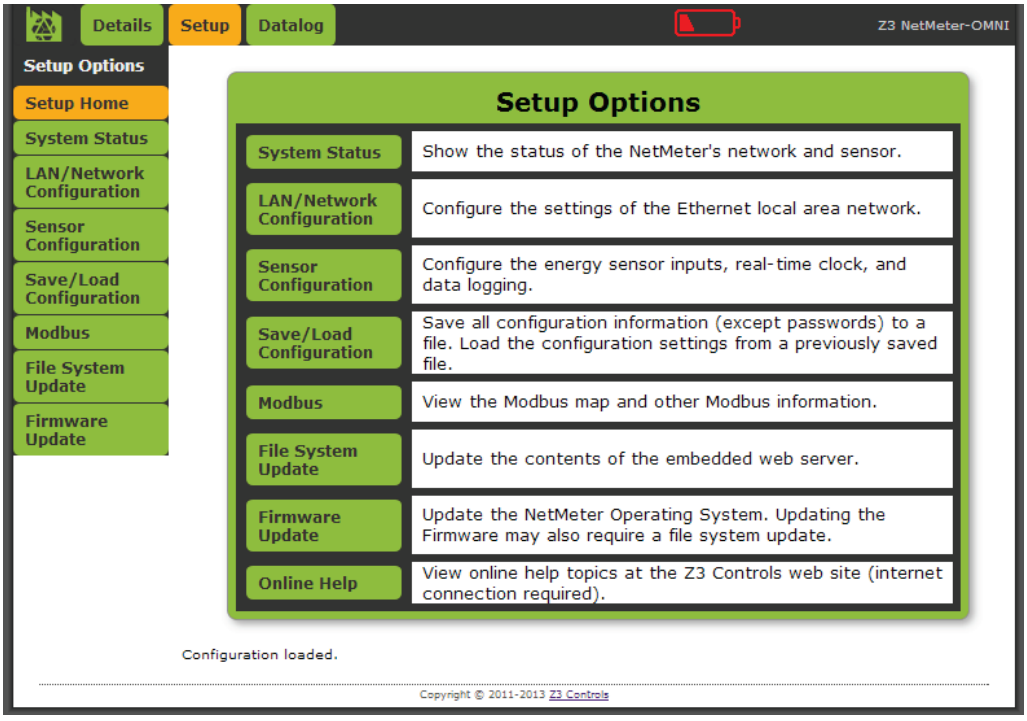


Figure 15: Setup Screen Showing Battery Replacement Indicator

When the NetMeter-OMNI has no power and the battery is removed, the state of the meter will be erased.

> WARNING: Please disconnect all power sources and confirm that they are de-energized and locked out BEFORE proceeding with the battery replacement. Failing to follow this procedure could result in personal injury or death, property damage, or economic loss.

After disconnecting all power sources to the NetMeter-OMNI, the clock battery can be accessed through a snap-out cover as illustrated in Figure 16 below. Push gently on the NetMeter-OMNI housing at ① to release the cover and carefully pry up the battery access cover and remove it. Insert a small flat screwdriver into the slot between the main chassis and the access cover to make its' removal easier.

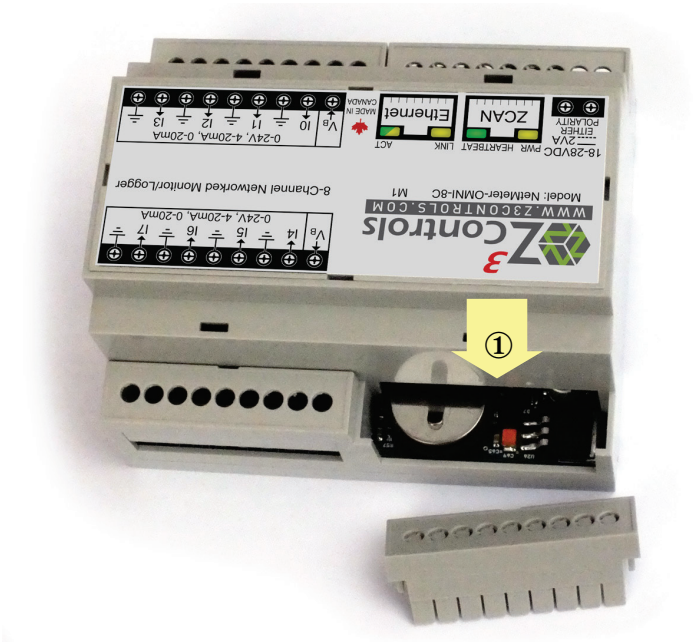


Figure 16: Battery Access Cover

Remove the battery by prying it up gently by hand. Replace the battery with a similar CR2032 battery by carefully inserting it under the retention tab. The battery must be inserted with the Positive terminal up.

Once the battery has been replaced, carefully snap the battery access cover back into place. Then safely restore the NetMeter-OMNI to its previous operational state.

10.2 General Maintenance and Cleaning

The NetMeter-OMNI requires no maintenance or cleaning beyond replacement of the battery as described above. Proper installation should prevent any contaminants from affecting the NetMeter-OMNI. Any NetMeter-OMNI unit having accumulated a substantial amount of damage from contaminants, such as from oils, water/moisture damage, dust or corrosive substances is recommended to be taken out of service or replaced.

Do not apply cleaning agents to the NetMeter-OMNI unit.

11 Support

The Z^3 Controls website provides many useful resources including video tutorials, FAQs, and Online Help:

- Online Support Portal: help.z3controls.com

Technical support is also available by contacting Z^3 controls at:

- Email: support@z3controls.com
- Phone: 1-877-454-4436

12 Product Dimensions

The NetMeter-OMNI unit has been designed to snap on to standard 35 mm top-hat DIN-rail (EN 50022) directly, as specified in Figure 17 below.

Dimensions for the NetMeter-OMNI module itself are provided in Figure 18 below.

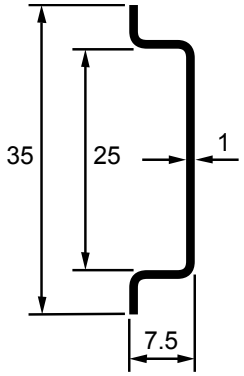


Figure 17: DIN Rail Cross Section Dimensions (Units in mm)

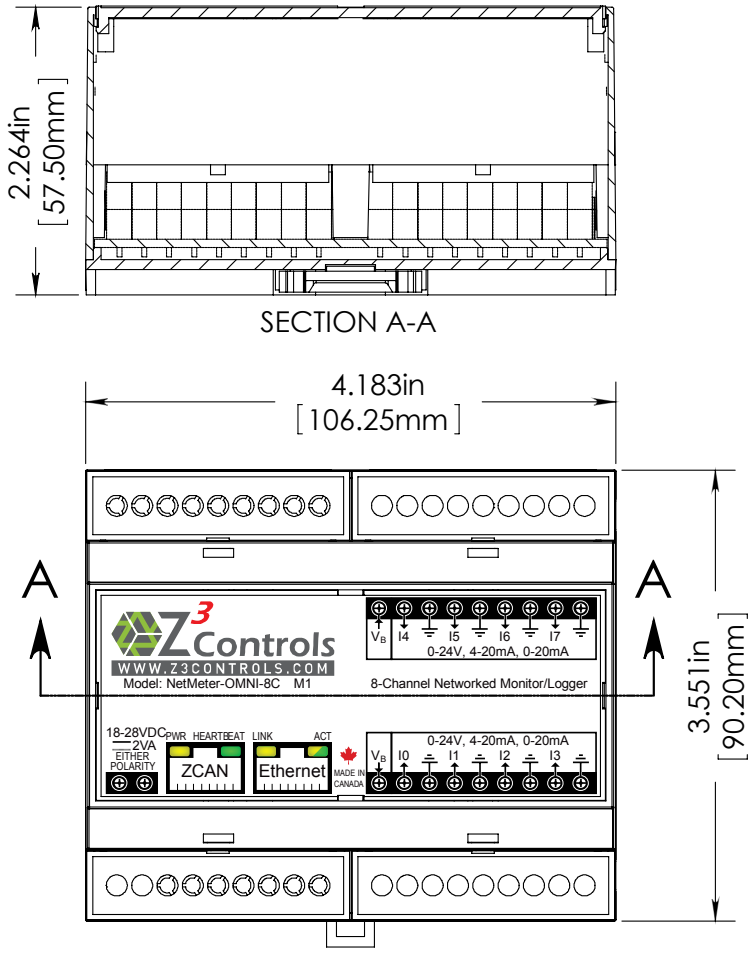


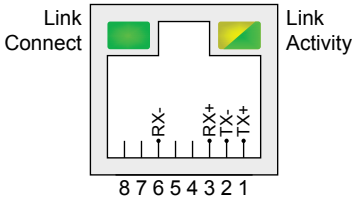
Figure 18: NetMeter-OMNI Chassis Dimensions

13 Product Specifications

Measurement Range and Accuracy

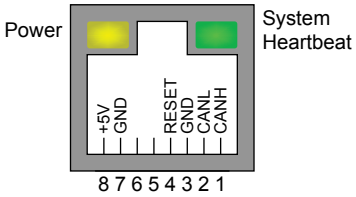
Parameter		Value
Inputs (Voltage Mode) (I0, I1, I2, I3, I4, I5, I6, I7)	Maximum Input Voltage Tolerance	28V
	Input Measurement Voltage Range	0-24V
	Voltage Accuracy	±1% of full scale
	Voltage Resolution	1mV (0.000V – 24.000V)
	Input Impedance	26KΩ
	Wire Gauge	26-14 AWG
	Torque	0.5-0.6 Nm
Inputs (Current Mode) (I0, I1, I2, I3, I4, I5, I6, I7)	Input Measurement Current Range	0-20mA
	Current Accuracy	±1% of full scale
	Current Resolution	1μA (0.000mA – 20.000mA)
	Built-in current limiting	22-32mA
	Voltage drop	2V max at 20mA[5]
	Isolation	All inputs share a common ground
Pulse Accumulation	Channels	Pulse counting available on each channel. Can be used with the input mode set to either voltage or current
	Counter Range	48 Bit
	Pulse width	1.2ms minimum when the module is powered. 40ms minimum during backup operation (loss of module power).

[5] Voltage between the input pin and ground.

Parameter		Value
	Pulse rate	400Hz maximum when the module is powered. 25Hz maximum during backup operation (loss of module power).
	Hysteresis	Fully programmable across the voltage/current range.
	Backup	Pulse counting continues during loss of module power. 12hr typical backup time.
Power Supply	Minimum Voltage	18VDC[6]
	Maximum Voltage	28VDC
	Power Consumption	2W typical with no ZCAN accessories attached
	Wire Gauge	26-14 AWG[7]
	Torque	0.5→0.6 Nm
Physical	Dimensions	See Figure 18 above
	Weight	~200g
Environmental	Operating Temperature	-20→60 °C
	Storage Temperature	-40→80 °C
	Humidity	5-95%, noncondensing
Ethernet Network	Data Rate	10/100 Mb/s (fast Ethernet), compatible with 10Mb/100Mb/1Gb switches and routers
	Connector	RJ45 with shield and G/Y LEDs 
	Galvonic isolation	1000V

[6] Power Supply may operate down to 12VDC when the ZCAN connector is not used.

[7] Will accommodate wire gauge plus ferrule.

Parameter		Value
ZCAN Network	Data Rate	1Mb/s CAN2.0b
	Connector	RJ45 with Y/G LEDs 
Non-volatile Data Storage	Memory Size	32MB
	Log capacity	Between about 400,000 and 2,000,000 entries for the 8 channels using lossless data compression
	Log capture rate	Programmable: 5s, 10s, 15s, 30s, 1m, 5m, 10m, 15m
Firmware	Operating system	Can be field upgraded
	TCP Protocols	HTTP/HTTPS server/client, DHCP client, NetBIOS, ICMP server, SSL, SMTP client, Modbus TCP
	User Interface	Standard Web browser interface with tabs for real-time data, historical data, interactive plotting, network and sensor setup. Web content can be field upgraded.
	Developer API	Standard HTTP query (POST and GET) returning JSON or CSV formatted data Queries for: gateway configuration, sensor configuration, and sensor data (real-time and historical)
Standards		IEEE 802.3-2008 RFC 675, RFC 793, RFC 2131, RFC 5321, RFC 3986

14 Warranty

Z3 Controls warrantees equipment manufactured by it to be free from defects in materials and workmanship for twenty four (24) months from date of invoice from Z3 Controls or its authorized sales channels. If within the applicable warranty period the purchaser discovers such item was not as warrantied and promptly notifies Z3 Controls in writing of this situation, Z3 Controls shall either repair or replace the items, or refund the full purchase price to the purchaser, solely at the discretion of Z3 Controls.

These warranties shall not apply (a) to equipment not manufactured by Z3 Controls, (b) to equipment which shall have been repaired or altered by those not authorized to do so by Z3 Controls, (c) to equipment which shall have been subjected to negligence, accident, or damage by circumstances beyond the control of Z3 Controls, or to improper operation, maintenance or storage, or to other than normal use or service.

With respect to equipment sold but not manufactured by Z3 Controls, the warranty obligations of Z3 Controls shall, in all respects, conform and be limited to the warranty actually extended to Z3 Controls by its supplier. The foregoing warranties do not cover reimbursement for labour, transportation, removal, installation, or other expenses which may be incurred in connection with repair or replacement.

Z3 Controls
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