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OMB-NET6222
12-Channel Ethernet-Based Thermocouple Input Module

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Table of Contents

About this User's Guide

What you will learn from this user's guide

This user's guide describes the Omega Engineering OMB-NET6222 data acquisition device and lists device specifications.

Conventions in this user's guide

For more information on

Text presented in a box signifies additional information and helpful hints related to the subject matter you are reading.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

bold text — **Bold** text is used for the names of objects on the screen, such as buttons, text boxes, and check boxes.

italic text — *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase.

Where to find more information

Additional information about OMB-NET6222 hardware is available on our website at www.omega.com. You can also contact Omega Engineering by phone, fax, or email with specific questions.

- Phone: (203) 359-1660
- Fax: (203) 359-7700
- Email: info@omega.com

Introducing the OMB-NET6222

Overview: OMB-NET6222 features

The OMB-NET6222 is 24-bit resolution thermocouple measurement device that connects to an Ethernet port on a host computer, and can be synchronized with other OMB-NET6000 Series devices.

The OMB-NET6222 provides the following features:

- Up to 12 thermocouple input channels
- Up to eight lines of digital I/O and four 32-bit counters
- A thermocouple input range of ±80 mV

Thermocouple input can be connected to the removable screw-terminals on the front panel. Each channel has a TC+ and TC– connection.

Software requirements

- Windows 7 (32- or 64-bit)
- Windows Vista (32- or 64-bit)
- Windows XP SP2 (32-bit)
- Windows 2000 SP4
- Encore Software for OMB-NET6000 Series CD

Hardware requirements

Verify that you have the following items and meet or exceed the minimum requirements listed.

- OMB-NET6222
- OMB-NET-TR-60U power supply and cable
- Ethernet crossover cable

  Use the provided Ethernet crossover cable when connecting an OMB-NET6000 device directly to the PC. Use a standard Ethernet cable when connecting via a hub/switch. Use a gigabit switch when connecting multiple devices.
- PC requirements:

  Minimum:
  - CPU: Intel® Pentium® 4, 3.0 GHz or equivalent
  - RAM: 1 GB
  - Monitor: 1024 × 768 screen resolution

  Recommended:
  - CPU: Intel® Core™ 2 Duo family
  - RAM: at least 2 GB
  - Monitor: 1024 × 768 screen resolution

OMB-NET6222 block diagram

The 12 thermocouple input channels on the OMB-NET6222 are set up in three distinct isolated sections. Channels 1 through 4 share 'section 1 common' and an isolator; channels 5 through 8 share 'section 2 common' and an isolator; and channels.9 through 12 share 'section 3 common' and an isolator.

OMB-NET6222 functions are illustrated in Figure 1.

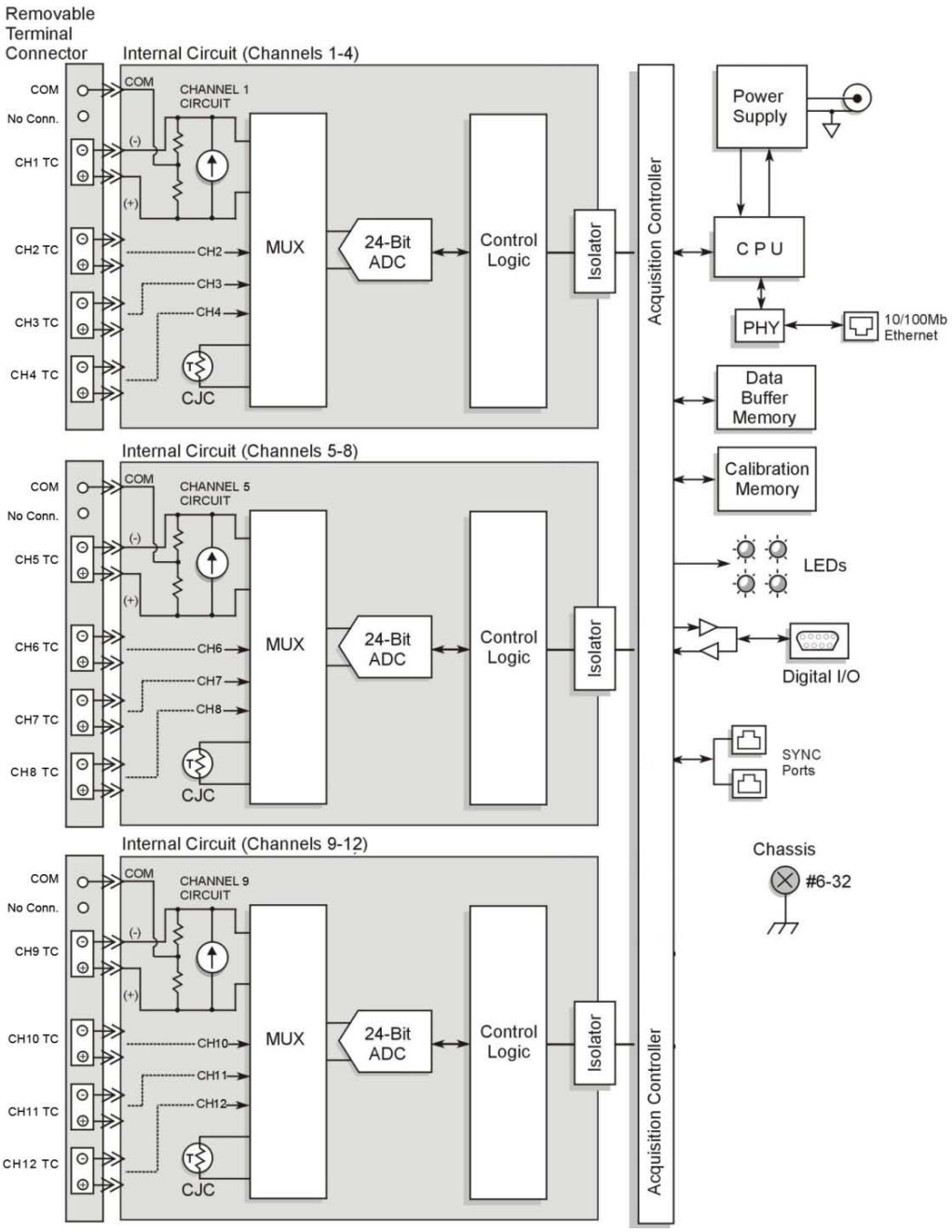


Figure 1. OMB-NET6222 functional block diagram

What comes with your OMB-NET6222 shipment?

The following items are shipped with the OMB-NET6222.

Hardware

- OMB-NET6222

- OMB-NET-TR-60U external power supply, 90 VAC to 264 VAC
- Either a OMB-CA-1 cable (U.S. version) or a OMB-CA-216 cable (European version) for use with OMB-NET-TR-60U
- Backshell connector kit for OMB-NET6222

Software

Encore Software for OMB-NET6000 Series installation CD

Documentation

In addition to this hardware user's guide, a *Quick Start* booklet is included with the OMB-NET6222 shipment. This booklet explains how to install and connect the OMB-NET6222 and install the Encore software.

Unpacking the OMB-NET6222

As with any electronic device, take care while handling to avoid damage from static electricity. Before removing the OMB-NET6222 device from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

If any components are missing or damaged, notify Omega Engineering immediately by phone, fax, or e-mail.

- Phone: (203) 359-1660
- Fax: (203) 359-7700
- Email: info@omega.com

Installing the hardware and software

Refer to the *OMB-NET6222 Quick Start* for instructions on connecting your OMB-NET6222 and configuring it using the Encore software.

Installing connector backshells and ferrules

You can fit connector backshells as protective casings onto the OMB-NET6222 removable screw terminal connectors. The backshells provide a thermal shield to reduce the effect of short-term ambient temperature changes, and to ensure the accuracy of the cold junction measurement. They also provide mechanical relief and protection for the thermocouple wires and screw terminal connections.

Accuracy specifications are only valid when using provided connectors and properly installed backshells.

Terminating thermocouple wires with ferrules will also help maintain good connections in vibration applications, but unless a backshell is used, there will be no protection to the screw-terminal connectors or to the wires at the point of connection.

Each OMB-NET6222 is shipped with three screw-terminal connectors and three backshells. Extra connector/backshell kits can be ordered from the factory. Each kit contains one connector and one backshell.

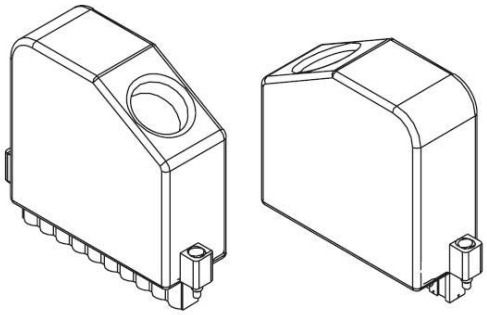


Figure 2. OMB-NET6222 connector backshell (two views)

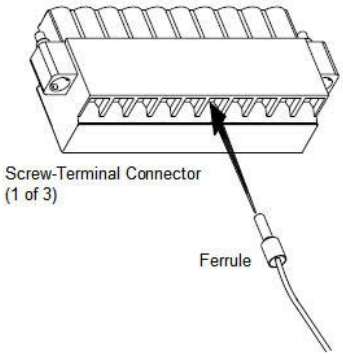


Figure 3. Using a ferrule

Maintenance guidelines

OMB-NET6000 Series devices are essentially maintenance-free and need only a minimal amount of care. They should be treated much like any other high-tech piece of equipment. In general:

- Operate the units in ventilated and relatively dust-free environments.
- Keep the units clear of harsh chemicals and abrasive elements.
- Avoid exposing the products to extreme heat – for example, avoid placing the units near boilers and furnaces.
- Avoid extreme shock and vibration.
- Avoid subjecting the device to liquids and extremely fine air particulate, such as silica dust.
- Never open the device. The device should only be opened by qualified service technicians.
- Use lint-free rags and rubbing alcohol to clean the outer surfaces of an OMB-NET6000 Series device.

Functional Details

Front panel screw terminal connector

The front panel has three removable screw-terminal connectors. Each connector contains 10 terminals to support COM and three thermocouple channels. Each channel has two connection points, the odd numbered terminals are the negative (–) input and the even numbered terminals are positive (+). Refer to Figure 4 for channel designations on the screw terminals.

Refer to the Thermocouple input section on page 14 and the Analog input section on page 19 for more information about these screw terminals.

Connector backshells can be fitted over the terminal connectors to protect them and the thermocouple connections. Refer to *Installing connector backshells and ferrules* on page 8 for instructions about installing connector backshells.

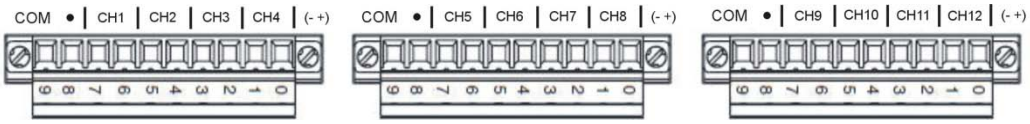


Figure 4. OMB-NET6222 front panel connector channel designations

Rear panel components

OMB-NET6222 rear panel components are shown in Figure 5.

1	Cable tie mounts	4	Chassis ground	7	Power input connector
2	Ethernet connector	5	Status LEDs	8	Power switch
3	Digital I/O D-SUB connector	6	SYNC ports		

Figure 5. OMB-NET6222 rear panel components

Cable tie mounts

Use the two cable tie mounts for cable strain relief.

Ethernet connector

Connect the 10/100BaseT Ethernet port to the Ethernet port of the host computer or to an Ethernet network. The Ethernet connector has two built in LEDs that indicate traffic flow on the network.
Refer to *Accessories* in the *Specifications* chapter for Ethernet cables available from Omega Engineering.

When connecting the OMB-NET6222 directly to a computer (not to a network hub), use an Ethernet crossover cable. The Ethernet cable length must be less than 3 m (9.8 ft) long in order for the system to be CE compliant.

Digital I/O D-SUB connector

Eight digital I/O lines are accessible via a 9-pin, female D-SUB connector (refer to the Digital input/output specifications on page 20 for more information).

Chassis ground

Provides a connection point for chassis ground through a #6-32 machine screw.

Status LEDs

Power—LED is *on* when the device is connected to a sufficient power source, and the power switch is in the **I** (on) position.

Boot— When you power on the device, the **Boot** LED turns on to indicate the first stage of the boot process. When this process completes successfully, the **Boot** LED turns off. If an internal error occurs during this first stage boot process, this LED blinks. Contact Omega Engineering to arrange repair service.

Active—When you power on the device, the **Active** LED is off while the device boots, including network configuration. This LED blinks quickly when the boot process is complete, and then remains on.

When both the **Power** and **Active** are on, the OMB-NET6222 is in the *ready* state. When the **Active** LED blinks slowly, it indicates communication with a host computer.

Data—The **Data** LED turns on any time the device is acquiring channel data that is available to the host computer control software.

When you power on the OMB-NET6222, the device can take up to two minutes to reach ready state, depending on network settings. Use the following LED sequence to determine when the device is ready:

1. **Power** LED turns on and remains on
2. **Boot** LED turns on, then off
3. **Active** LED blinks, then remains on
4. Device is ready

SYNC connectors

The two synchronization ports can synchronize the pre-trigger data and post-trigger scanning of up to nine OMB-NET6000 Series devices. Use Encore to designate any OMB-NET6000 Series device as a *master unit*, *slave unit*, or *terminating slave unit*.

Up to nine OMB-NET6000 Series devices can be synchronized. The total combined length of the SYNC cables cannot exceed 2.438 m (8 ft).

Refer to the following section, *Synchronization*, for details. Refer to *Accessories* in the *Specifications* chapter for SYNC cables available from Omega Engineering.

Power input connector

Connect to 19 VDC to 30 VDC power supply, such as the OMB-NET-TR-60U, 24 VDC universal power supply.

Power switch

Switch to power on (**|**) and power off (**0**) the device.

Synchronization

To synchronize up to nine OMB-NET6000 Series devices, connect them with synchronization cables as shown in Figure 6. The first device added to the synchronization group is the master, and the last device added is the terminating slave.

Unplug sync cables from devices that are not intended to be part of a Synchronized Device Group. Leaving a sync cable connected to an independent device may cause errors.

Channel-to-channel phase relationships in a multi-device configuration are not necessarily fixed.

Figure 6. OMB-NET6000 Series devices connected for synchronization

After connecting the devices with the sync cables, configure them as a *synchronized device group* using Encore. Each synchronized group consists of one master device and at least one slave device.

The sampled data phase relationship among channels among multiple devices depends on the Channel Sync Skew specification for each device. When using different models in a multi-device system, any differences in the ADC filter delay (*input delay*) should be added.

Refer to the *Synchronizing Devices* topic of the *OMB-NET6000 Series Encore Help* for more information on synchronizing devices.

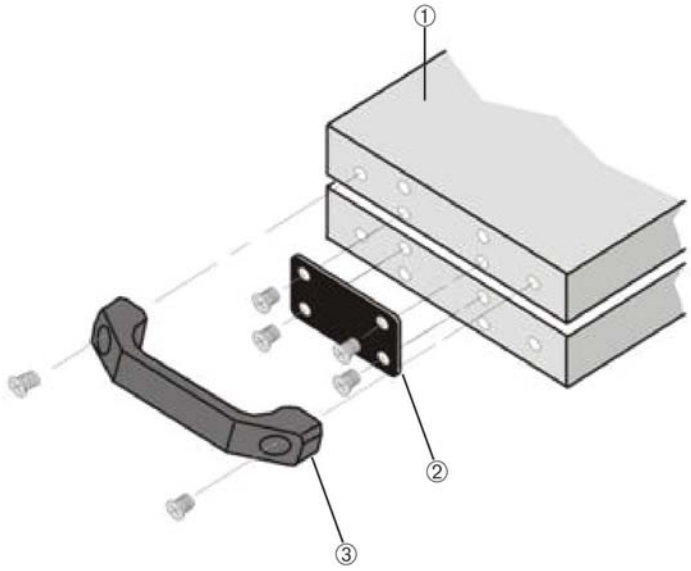
Caution! Leaving an un-terminated sync cable on a synchronized device can lead to errors.

Stacking plate and handle options

Each OMB-NET6000 Series device chassis is equipped with feet on the lower panel and dimples on the upper panel for quick stacking of units.

To secure units together, use the optional stacking plate kits (OMB-NET-SPK). Each kit contains two stacking plates and eight screws (8-32 × .500 in., Phillips Flat, 82 Degree).

An optional handle kit (OMB-NET-HK) is available to provide a convenient way of carrying a single OMB-NET6000 Series device or a secured stacked set of devices. Each handle kit includes one black molded plastic handle and two mounting screws (1/4-20 x 7/8 in., Phillips Pan Head).



1 OMB-NET6000 Series devices 2 Stacking plate 3 Handle

Figure 7. OMB-NET6222 stacking plate assembly

To attach OMB-NET6000 Series devices to each other using stacking plates, complete the following steps:

1. With the hole tapers facing out, align the bottom two holes of a plate with the top two center holes of the lower OMB-NET6000 Series device.
2. Secure the plate with the two #8-32 × .500 in. Phillips screws (provided). Tighten the screws snug, but do not over-tighten.
3. Repeat steps 1 and 2 for the second plate on the other side of the OMB-NET6000 Series device.
4. Attach the second device using the remaining four screws.
5. Repeat steps 1 through 4for each additional device and stacking plate kit and device.

To mount a handle to an OMB-NET6000 Series device, attach the handle to a device using the two outer holes on the device and the two 1/4-20 ×7/8 in. Phillips pan head screws (provided). Tighten the screws snug, but do not over-tighten.

Thermocouple input

The OMB-NET6222 has three, 10-connector detachable screw terminals. Each screw terminal supports four thermocouple input channels. Each channel connector pair has a terminal to connect the positive thermocouple lead (TC+) and negative thermocouple lead (TC–).

If you are unsure which of the thermocouple leads is positive and which is negative, check the thermocouple documentation or the thermocouple wire spool.

For each set of four channels—channels 1 through 4, channels 5 through 8, and channels 9 through 12— the OMB-NET6222 has a common terminal (COM) that is internally connected to the isolated ground reference of the device. Refer to Figure 8 for the terminal assignments for each channel. Odd numbered terminals are negative (-) and even numbered terminals are positive (+).

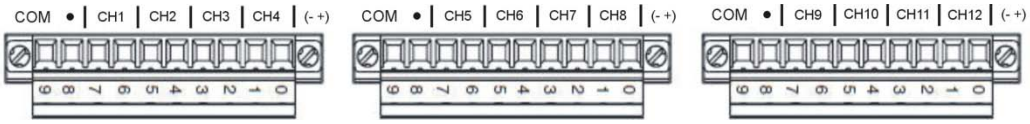


Figure 8. OMB-NET6222 thermocouple connector channel designations

If you are using shielded wiring, connect one end of the shield to the COM terminal as indicated in Figure 9.

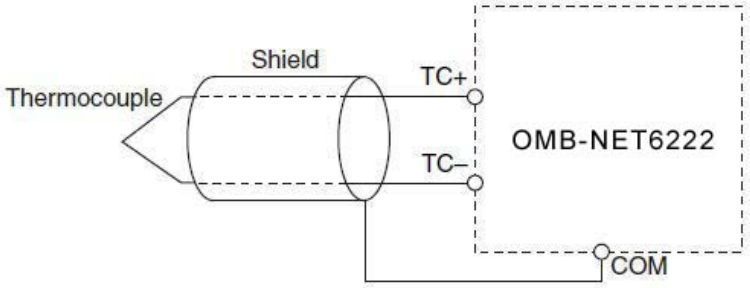


Figure 9. OMB-NET6222 thermocouple connection using shielded wiring

Figure 10 represents a circuit for one channel. The two 10 MΩ resistors produce input impedance at the positive and negative terminals of the channel. The gain and offset errors that result from the thermocouple source impedance are negligible for most applications. Other voltage sources with higher source impedance can introduce more significant error. Refer to Specifications on page 19 for more information about errors that result from source impedance.

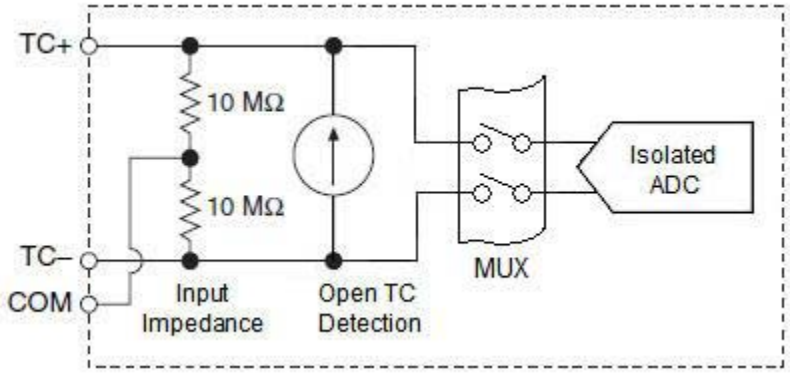


Figure 10. Analog input circuit for one channel

Thermocouple accuracy

The following factors have an effect on temperature measurement error:

- the type of thermocouple being used
- the temperature being measured
- the accuracy of the thermocouple
- the cold-junction temperature.

Accuracy for different thermocouple types

Figure 11 through Figure 15 show the typical and maximum errors for the different thermocouple types when used with the OMB-NET6222 over the full temperature range and at room temperature (15°C to 35°C). The figures account for gain errors, offset errors, differential and integral nonlinearity, quantization errors, noise errors, and isothermal errors. *The figures do not account for the accuracy of the thermocouple itself.*

Temperature gradients across the OMB-NET6222 terminals affect the cold-junction temperature accuracy. Refer to Cold-Junction temperature accuracy on page 17 for more information about temperature gradients.

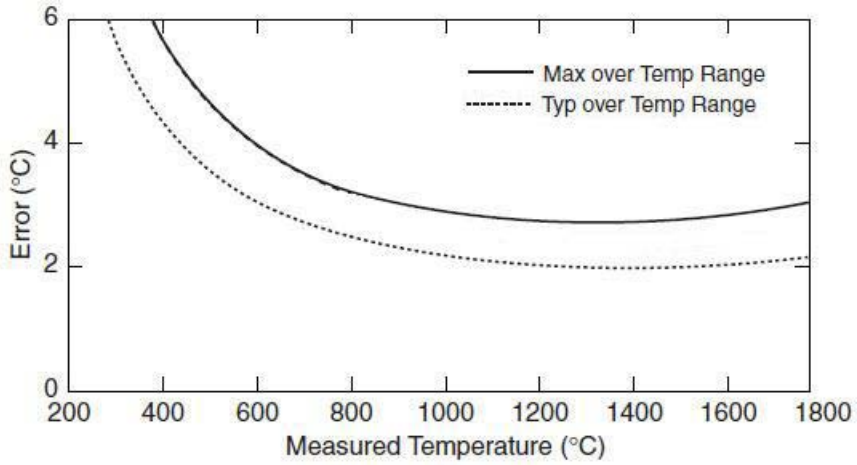


Figure 11. Type B thermocouple errors

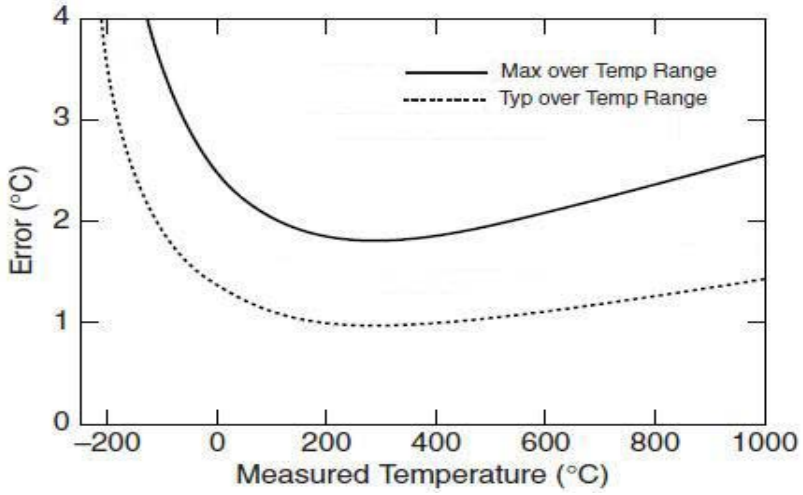


Figure 12. Type E and type T thermocouple errors

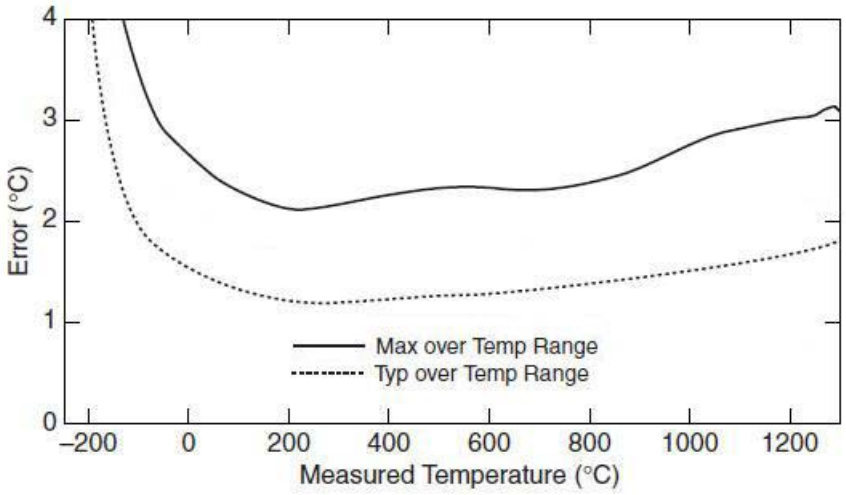


Figure 13. Type J and type N thermocouple errors

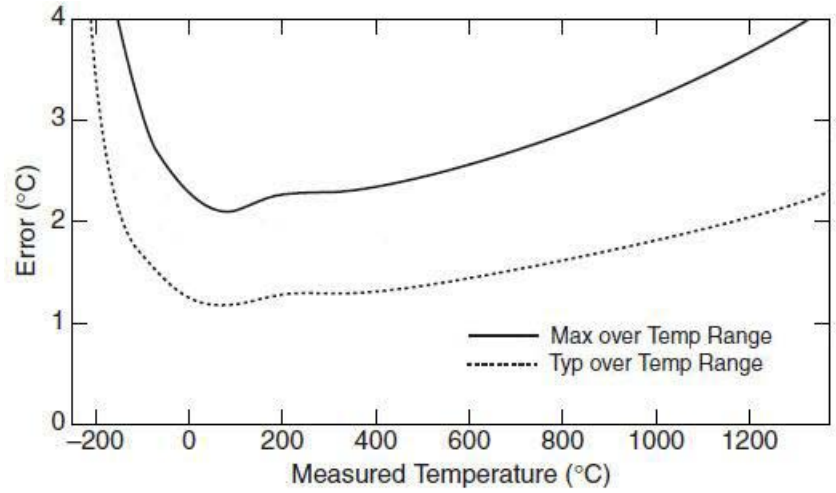


Figure 14. Type K thermocouple errors

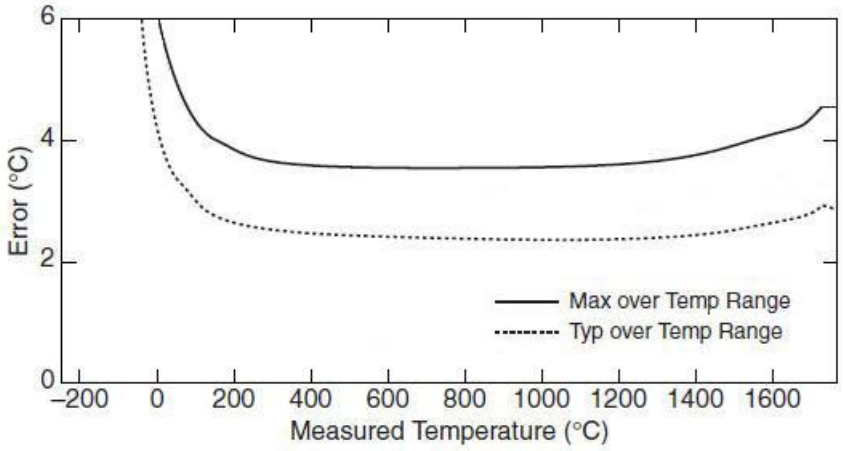


Figure 15. Type R and type S thermocouple errors

Cold-Junction temperature accuracy

Heat dissipated by internal circuitry of the OMB-NET6222 and other nearby heat sources can heat up device terminals, placing them at a different temperature than that of the cold-junction compensation sensor. The thermal gradient generated across the terminals can cause terminals of different channels to be at different temperatures. The resulting measurement creates errors not only in absolute accuracy but also in the relative accuracy between channels.

The accuracy specifications on page 19 include the errors caused by the gradient across the module terminals, and assume the use of properly installed connector backshells.

Minimizing thermal gradients

Thermocouple wire can be a significant source of thermal gradients if it conducts heat or cold directly to the terminal junctions. To minimize these errors follow these guidelines:

- Use small-gage thermocouple wire. Smaller wire transfers less heat to or from the measuring junction.
- Run thermocouple wiring together near the screw-terminal connector to keep the wires at the same temperature.
- Avoid running thermocouple wires near hot or cold objects.
- If you connect any extension wires to thermocouple wires, use wires made of the same conductive material.
- Install connector backshells.

Counter input

The OMB-NET6222 has four 32-bit counter inputs that accept frequency inputs up to 20 MHz. The counter inputs are software-configurable for counter or encoder measurements.

Use Encore to configure the following counter settings:

- **Counter Source**—Select **Internal Clock**, **Timer 1**, **Timer 2**, or **Digital Line 0** through **Digital Line 7** as the source used for the counter. One source can be used in multiple counters.
- **Counter Gate**—Select **Unused** (do not gate the counter), **Internal Clock**, **Timer 1**, **Timer 2**, or **Digital Line 0** through **Digital Line 7** as the gate used for the counter. One gate can be used in multiple counters.
- **Count**—Select from the following settings:
  - **Clear on Read**—The counter counts up and is cleared after each read. By default, the counter counts up and only clears the counter at the start of a new scan command. The value of the counter before it is cleared is latched and returned.
  - **Totalize**—The counter counts up and is cleared at the start of a new scan.
  - **Start Count**–The value used to start counting. The default is *zero*.
  - **Stop Count**—The value used to stop counting. The default is *65535*.
  - **Rollover**—The count rolls over upon reaching the start or stop value.
- **Direction**—Select either **Increment** (count up) or **Decrement** (count down).
- **Detection**—Select **Rising Edge** to detect the count when the signal goes from low to high, or **Falling Edge** to detect the count when the signal goes from high to low.

Encoder settings

Select **Encoder** from the **Measurement Type** list to configure the following encoder settings:

- **Resolution**—Select the encoder resolution—the number of full quadrature cycles per full shaft revolution (360 mechanical degrees) —from the following options:
  - **X1** —One count per cycle (default)
  - **X2**—Two counts per cycle
  - **X4**— Four counts per cycle
- **Sources**—Select one of the digital lines—**Digital Line 0** through **Digital Line 7**— for encoder **Source A**, **Source B**, and **Source C**.

When configured for encoder measurements, the OMB-NET6222 can count *negative* values. When counting down, the encoder continues counting down below 0. This feature is useful to calculate the position of an encoder.

Specifications

All specifications are subject to change without notice.
Typical for –40 °C to 50 °C unless otherwise specified.

Analog input

Table 1. Analog input specifications

Parameter	Specification
A/D converter type	Delta-Sigma
Number of channels	12 thermocouple channels Three internal cold-junction compensation channels
A/D resolution	24 bits
Voltage measurement range	±80 mV typ
Common mode range	▪ Channel-to-COM: 95 dB ▪ Common-to-earth ground: >170 dB
Temperature measurement ranges	Works over ranges defined by NIST for J, K, R, S, T, N, E, and B thermocouple types
Cold-junction compensation accuracy	▪ 0 °C to 50°C: 0.6°C (1.1°F) typ, 1.3°C (2.3°F) max ▪ -40 °C to 50°C: 1.7°C (3.1°F) max
Single device, channel-to-channel matching (calibrated)	100 ns typ
Data rate (*fs*)	2 S/s
Multiple device, channel sync skew	1 sample period
Input bandwidth (–3 dB)	15 Hz
Noise rejection	85dB min at 50/60 Hz
Overvoltage protection	±30 V between any input and common
Differential input impedance	20 MΩ
Input current	50 nA
Input noise	$1\mu V_{rms}$
Gain error (Note 1)	▪ 0.05% max at 25 °C ▪ 0.06% typ at -40 °C to 50 °C ▪ 0.1% max at -40 °C to 50 °C
Offset error (Note 1)	15 µV typ, 20 µV max
Gain error from source impedance	0.05 ppm per Ω source impedance due to input impedance
Offset error from source impedance	0.05 µV typ, 0.07 µV max per Ω source impedance due to input current

Note 1: Accuracy specifications are only valid when using provided connectors and properly installed backshells.

Digital input/output

Table 2. Digital I/O specifications

Parameter	Specification
Number of I/O	8 channels programmable as a single port or as individual lines
Power on mode	Inputs pulled low
Connector	DB-9 female (see Figure 16)
Programmable input scanning modes	▪ Asynchronous: Under program control at any time relative to analog scanning. ▪ Synchronous: Data captured synchronously with the analog channels.
Input levels	▪ Low: 0 V to 0.8 V ▪ High: 2.0 V to 5.0 V
Input voltage range without damage	–0.6 V to 5.6 V max
Input pull-down resistor	10 kΩ
Output voltage range	0 V to +3.0 V Can be externally pulled up to 5.6 V without damage
Output resistance	40 Ω
Output levels	See Figure 17
Sampling	1 MHz max continuous
Output timing	Outputs are always written asynchronously

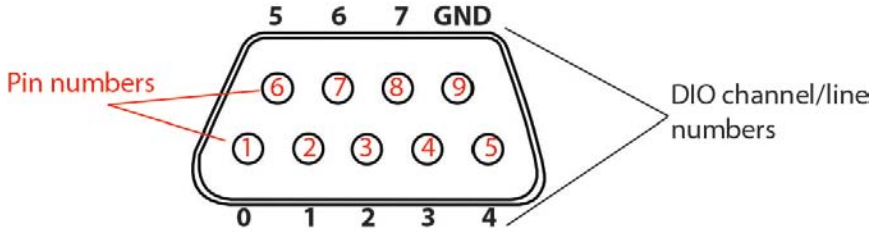


Figure 16. DB9 connector as viewed from the rear panel

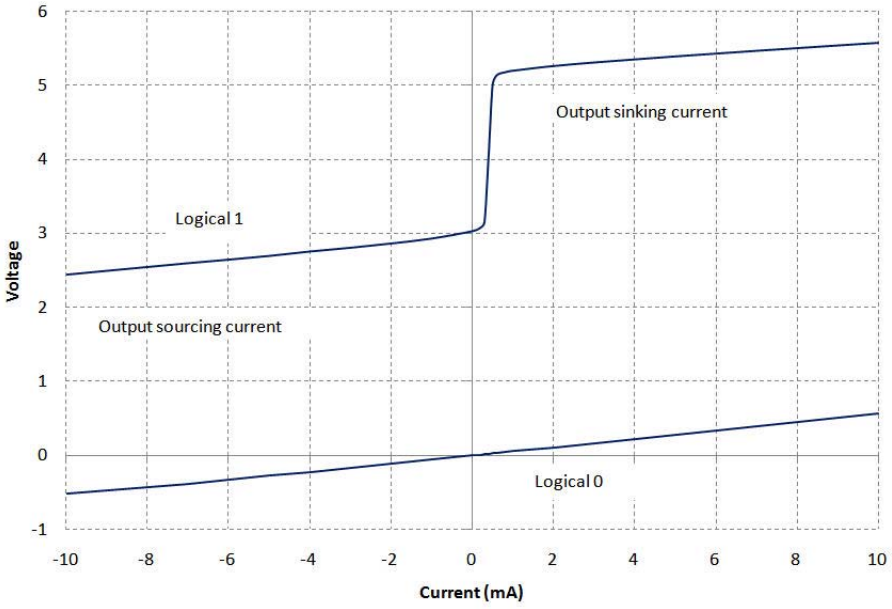


Figure 17. OMB-NET6222 digital output

Counter input

Table 3. Counter specifications

Parameter	Specification
Channels	Up to 4 independent
Resolution	32-bit
Input frequency	20 MHz max
Input characteristics	10 kΩ pull-down
Trigger level	TTL
Minimum pulse width	25 ns high, 25 ns low
Programmable modes	Counter, Encoder
Encoder resolution	x1 (default), x2, and x4
Encoder sources	A, B, and Z; can be assigned to any digital pin x.
Counter source	Internal Clock, Timer 1, Timer 2, and digital pin x. One source can be used in multiple counters.
Counter mode options	Totalize, Clear on Read, Rollover, Stop at the Top, Increment, Decrement, Rising Edge, Falling Edge
Counter gate options	Unused, Internal Clock, Timer 1, Timer 2, and Digital pin x. One gate can be used in multiple counters.

Safety voltages

Table 4. Safety voltage specifications

Parameter	Specification
Only connect voltages that are within these limits	Channel-to-COM: ±30 V max

Isolation voltages

Table 5. Isolation voltage specifications

Parameter	Specification
Channel-to-channel (Note 2)	▪ Within each four-channel internal module: no isolation between channels ▪ Between each four-channel internal module: 250 V isolation
Channel-to-earth ground, continuous (Note 3)	250 Vrms, Measurement Category II

Note 2: There is no isolation between channels 1, 2, 3, and 4; no isolation between channels 5, 6, 7, and 8, and no isolation between channels 9, 10, 11, and 12.

Note 3: Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet (for example, 115 V for U.S. or 230 V for Europe). Do not connect to signals or use for measurements within Measurement Categories III or IV.

Power

Table 6. Power specifications

Parameter	Specification
Power consumption	4.1 W max
Power jack	Barrel type: 5.5 mm O.D.; 2.1 mm I.D.

Mechanical

Table 7. Mechanical specifications

Parameter	Specification
Weight	1.22 Kg (2.7 lb)
Dimensions (L × W × H)	276.9 × 169.8 × 30.5 mm (10.9 × 6.685 ×1.2 in.)
Removable screw-terminal blocks	3 blocks, 4 channels per block, 10 terminals per block
Screw-terminal wiring	12 to 24 AWG wire with 10 mm (0.39 in.) section of insulation stripped from connection end
Torque for screw terminals	0.5 N·m to 0.6 N·m (4.4 lb·in.to 5.3 lb·in.)
Ferrules (optional, not supplied)	.25 mm to 2.5 mm

Environmental

The OMB-NET6222 is intended for indoor use only, but can be used outdoors if installed in a suitable enclosure.

Table 8. Environmental specifications

Parameter	Specification
Operating temperature	–40 °C to 50 °C
Storage temperature	–40 °C to 85 °C
Ingress protection	IP 40
Operating humidity	10% to 90% RH, noncondensing
Storage humidity	5% to 95% RH, noncondensing
Maximum altitude	2,000 m (6562 ft)
Pollution degree	2

Calibration

The following calibration information applies to hardware calibration, not to be confused with *user* or *software* calibration. When calibrating the OMB-NET6222 with Encore, keep in mind that sample rate affects both the gain and offset of the device, and therefore the device should be software-calibrated at the same sample rate that is intended for measurements.

Table 9. Calibration specifications

Parameter	Specification
Calibration interval	1 year

Contact Omega Engineering for information regarding calibration service.

Accessories

Table 10. OMB-NET6222 accessories

Accessory	Description
OMB-NET-TR-60U	24 VDC @ 0.8 A (max) universal power supply
OMB-CA-1	120 V IEC AC Mains cable (US)
OMB-CA-216	220 V IEC Mains Cable (EU)
OMB-CA-74-1	RJ12 shielded cable, 6-conductor, sync, 0.3 m (1 ft); refer to Note 1
OMB-NET-SPK	Stacking plate kit; includes: ▪ 2 stacking plates ▪ 8 screws (#8-32x0.5 in, Phillips Flat, 82 degree)
OMB-NET-CN-271	Backshell connector kit; includes: ▪ 1 plastic backshell connector ▪ 1 screw-terminal connector
OMB-NET-HK	Handle kit; Includes: ▪ A molded black plastic handle ▪ Two screws (#1/4-20x7/8 in, Phillips Pan Head)
OMB-CA-192-7C	Ethernet crossover cable, 2.133 m (7 ft);refer to Notes 5 and 6
OMB-CA-242	Ethernet patch cable, 0.457 m (1.5 ft);refer to Note 5
OMB-CA-242-7	Ethernet patch cable, 2.133 m (7 ft);refer to Note 5

Note 4: Up to nine units can be synchronized. The total combined length of the SYNC cables cannot exceed 2.438 m (8 ft).

Note 5: Ethernet cable length must be <3 m (9.8 ft) in order for the system to be CE Compliant.

Note 6: Ethernet crossover cables should only be used for direct network connections. In particular, attempting to connect a device to a Hub using a crossover cable may prevent that network link from functioning. Some modern routers have become an exception by including logic to detect the crossover cable and allow the network link to function.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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