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High Performance Multi-Function I/O USB Data Acquisition Modules



OMB-DAQ-2416-4AO shown smaller than actual size.

OMB-DAQ-2416 Series

1 YEAR WARRANTY

- 16 Differential or 32 Single-Ended Analog Inputs, Expandable to 32 Differential/ 64 Single-Ended Channels
- 24-Bit Resolution
- Thermocouple or Voltage Input
- Nine Software-Selectable Voltage Ranges: ±20V, ±10V, ±5V, ±2.5V, ±1.25V, ±0.625V, ±0.312V, ±0.156V, and ±0.078V
- Analog Inputs Can be Configured for Thermocouples (Up to 16 Differential Inputs)
- 1000 Samples/Sec Aggregate Throughput
- Built-In Cold Junction Compensation and Open Thermocouple Detection
- Eight Lines of High-Drive Digital I/O
- Two 32-Bit Counters
- 500V Isolation Between Signal I/Os and the Host Computer
- OMB-DAQ-2416-4AO Also Includes 4 Analog Outputs

The OMB-DAQ-2416 and the OMB-DAQ-2416-4AO are highly accurate, multi-function measurement and control modules for the USB bus. These modules are 24-bit analog input devices for voltage or temperature, with eight digital I/O lines and two counters. In addition to the features listed, the OMB-DAQ-2416-4AO also includes four analog output channels with 16-bit resolution, ±10V output range, and an aggregate 1000 Hz update rate.

System Expansion

With the addition of an optional OMB-AI-EXP32 analog input expansion module, the number of analog input channels on the OMB-DAQ-2416 or OMB-DAQ-2416-4AO can be doubled—increasing from 16 differential/32 single-ended inputs, to 32 differential/64 single-ended inputs. The expansion module also provides an additional 16 channels of DIO, bringing the total DIO count of the mated pair to 24.

All features of the OMB-DAQ-2416 series module are included when the OMB-AI-EXP32 is attached, including the ability to accommodate thermocouples on any input channel, built-in cold junction compensation, and open thermocouple detection. The OMB-AI-EXP32 can be plugged directly into a OMB-DAQ-2416 series module. The packaging for the OMB-DAQ-2416 series and the OMB-AI-EXP32 ensures ease of use in a variety of applications. Detachable screw terminals facilitate attaching and removing without re-wiring. The modules can easily be DIN-rail mounted for rack applications.

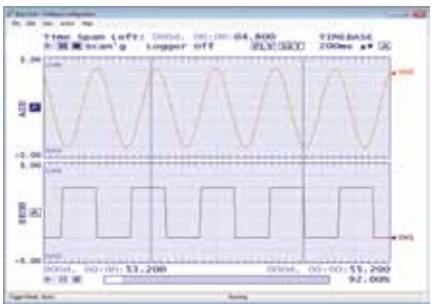
Software

The OMB-DAQ-2416 Series modules ship with an impressive array of software, including TracerDAQ®, a full-featured, out-of-the-box data logging, viewing, and analysis application. Driver support and detailed example programs are included for Universal Library programming libraries for Microsoft® Visual Studio® programming languages, and other languages, including DASYLab®, and ULx for NI LabVIEW® (comprehensive library of VIs and example programs compatible with 32-bit and 64-bit LabVIEW 2010 or later) and InstaCal™ installation, calibration and test utility-powerful solutions for programmers and nonprogrammers alike. These modules operate under Microsoft Windows® VISTA/7/8/10 (32-bit and 64-bit) operating systems.

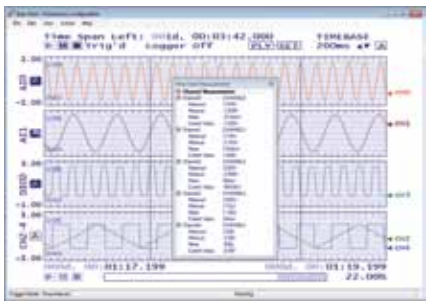
The OMB-DAQ-2416 data acquisition module is supplied with TracerDAQ software which is a collection of four virtual instrument applications used to graphically display and store input data and generate output signals:

- Strip Chart—Log and graph values acquire from analog inputs, digital inputs, temperature inputs and counter inputs
- Oscilloscope—Display values acquired from analog inputs
- Function Generator—Generate waveforms for analog outputs
- Rate Generator—Generate waveforms for counter outputs

TracerDAQ PRO is an enhanced version of TracerDAQ and is available as a purchased upgrade (SWD-TRACERDAQ-PRO). A comparison of some of the features included in TracerDAQ vs TracerDAQ PRO is shown below.



TracerDAQ Strip Chart.



TracerDAQ Pro Strip Chart with Measurements.

Features Comparison

Strip Chart

Feature	TracerDAQ	TracerDAQ Pro
Channel Types	Analog input, temperature input, digital input, event counter	Analog input, temperature input, digital input, event counter
Number of Channels	8	48
Number of Lanes	2	8
Maximum Samples per Channel	32,000	1 million
Alarm Conditions	No	Yes
Measurements Window	No	Yes
Enter Annotations	No	Yes
Software Triggering	No	Yes
Hardware Triggering	No	Yes
Time-of-Day Triggering	No	Yes
Linear Scaling	No	Yes

Oscilloscope

Feature	TracerDAQ	TracerDAQ Pro
Channel Type	Analog input	Analog input
Number of Channels	2	4
Measurements Window	No	Yes
Reference Channel	No	Yes
Math Channel	No	Yes

Function Generator

Feature	TracerDAQ	TracerDAQ Pro
Channel Type	Analog output	Analog output
Number of Channels	1	16
Waveform Types	Sine	Sine, square, triangle, flat, pulse, ramp, random, arbitrary
Duty Cycle	No	Yes
Phase	No	Yes
Gate Ratio	No	Yes
Rate Multiplier	No	Yes
Sweep (Linear and Exponential)	No	Yes

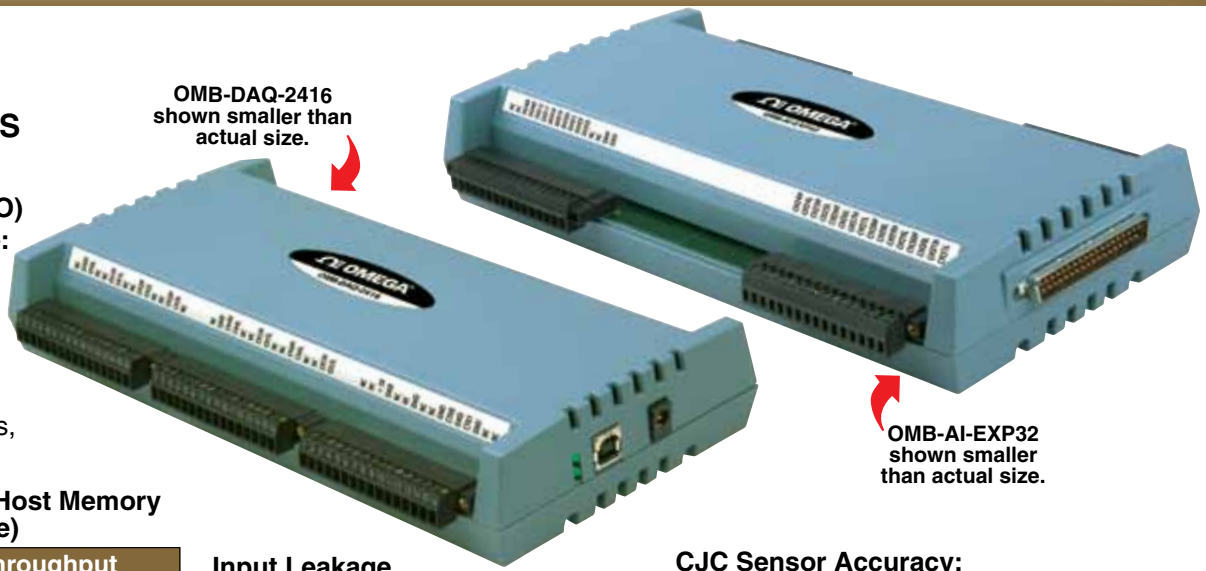
Rate Generator

Feature	TracerDAQ	TracerDAQ Pro
Channel Type	Counter output	Counter output
Number of Channels	1	20

SPECIFICATIONS

A/D CONVERTER (OMB-DAQ-2416, OMB-DAQ-2416-4AO)

A/D Converter Type: 24-bit sigma delta
A/D Data Rates: 3750 samples/sec (S/s), 2000 S/s, 1000 S/s, 500 S/s, 100 S/s, 60 S/s, 50 S/s, 25 S/s, 10 S/s, 5 S/s, 2.5 S/s



A/D Throughput to Host Memory (Software Selectable)

Number of Channels	Throughput (Hz)
1	2.50 to 1102.94
2	1.25 to 551.47
3	0.83 to 367.65
4	0.62 to 275.74
5	0.50 to 220.59
6	0.42 to 183.82
7	0.36 to 157.56
8	0.31 to 137.87
9	0.28 to 122.55
10	0.25 to 110.29
11	0.23 to 100.27
12	0.21 to 91.91
13	0.19 to 84.84
14	0.18 to 78.78
15	0.17 to 75.53
16	0.16 to 68.93

Input Isolation: 500 Vdc min between field wiring and USB interface
Common Mode Rejection: Thermocouple mode, 110 dB; voltage mode, 90 dB

ANALOG INPUTS (OMB-DAQ-2416, OMB-DAQ-2416-4AO, OMB-AI-EXP32)

Number of Channels: 16 differential/32 single-ended (thermocouples require differential mode) on OMB-DAQ-2416 or OMB-DAQ-2416-4AO. The OMB-AI-EXP32 is a multiplexer-based channel expansion module that adds an additional 16 differential/32 single ended channels.
Maximum Input Voltage: ±30V (power on), ±10V (power off)
Input Impedance: 2 GΩ (power on), 390 Ω (power off)

Input Leakage Current: ±10.6 nA (OMB-DAQ-2416, OMB-DAQ-2416-AO); ±20 nA (OMB-AI-EXP32);±1µA max for input voltage >±30V
Input Capacitance: 590 pF
Crosstalk: 100 dB adjacent channels
Channel Gain Queue: Up to 64 elements, software configurable channel and range
Warm-Up Time: 45 minutes max (OMB-DAQ-2416, OMB-DAQ-2416-4AO); 15 minutes max (OMB-AI-EXP32)
Open Thermocouple Detect: Automatically enable when a channel is configured for a thermocouple sensor.

CJC Sensor Accuracy: ±0.15°C typical (15 to 35°C); ±0.5°C max (0 to 55°C)

DC Voltage Input Ranges

Range	Accuracy* (Absolute, µV)
± 20V	857.600
± 10V	421.600
± 5V	210.800
± 2.5V	83.000
± 1.25V	48.050
± 0.625V	28.775
± 0.3125V	24.500
± 0.15625V	15.856
± 0.078125V	33.547

** Dependent on A/D data rate.*

Compatible Thermocouple Input Types

Type	Temperature Range	Accuracy* (Typical, °C)
J	±1.416 @ -210°C -210 to 1200°C (-346 to 2192°F)	±0.469 @ 0°C ±1.456 @ 1200°C
K	-270 to 1372°C (-454 to 2502°F)	±1.699 @ -210°C ±0.526 @ 0°C ±2.022 @ 1372°C
T	-270 to 400°C (-454 to 752°F)	±1.676 @ -200°C ±0.558 @ 0°C ±0.595 @ 400°C
E	-270 to 1000°C (-454 to 1832°F)	±1.352 @ -200°C ±0.551 @ 0°C ±1.211 @ 1000°C
R	-50 to 1768°C (-58 to 3214°F)	±3.133 @ -50°C ±1.424 @ 250°C ±2.347 @ 1768°C
S	-50 to 1768°C (-58 to 3214°F)	±2.930 @ -50°C ±1.468 @ 250°C ±2.597 @ 1768°C
B	0 to 1820°C (32 to 3308°F)	±3.956 @ 250°C ±1.743 @ 700°C ±1.842 @ 1820°C
N	-270 to 1300°C (-454 to 2372°F)	±2.030 @ -200°C ±0.659 @ 0°C ±1.600 @ 1300°C

** Includes CJC measurement error. Dependent on A/D data rate.*



OMB-DAQ-2416-4AO shown smaller than actual size.

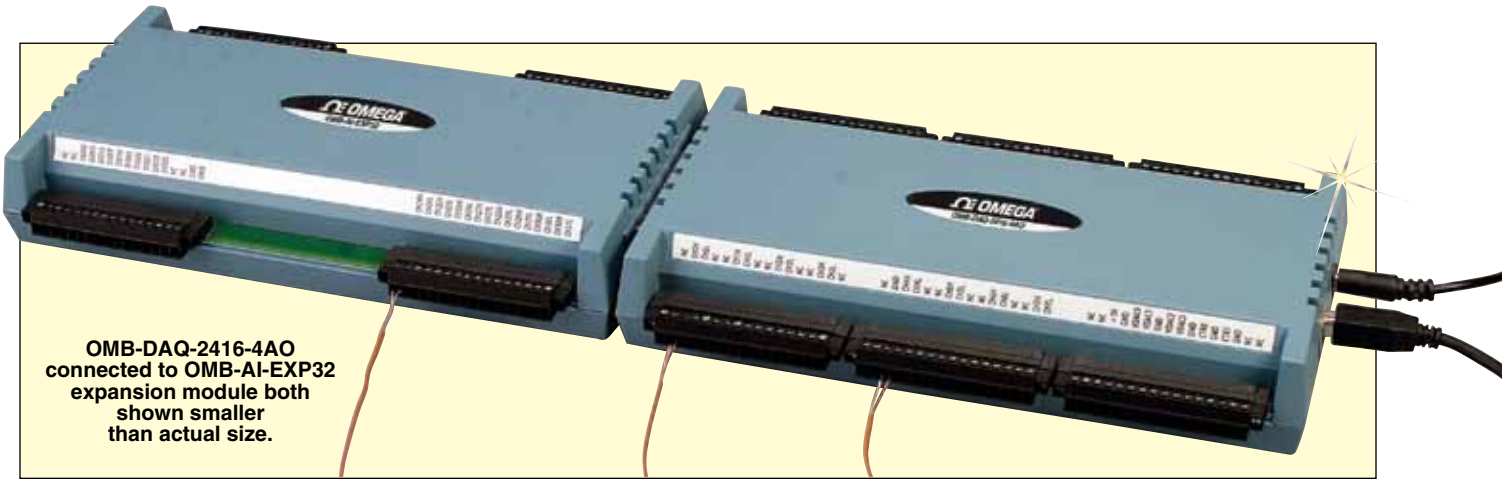
ANALOG OUTPUT (OMB-DAQ-2416-4AO ONLY)
Number of Channels: 4
Resolution: 16-bit
Range: ±10 Vdc
Absolute Accuracy: ±16.0 LSB
Relative Accuracy: ±4.0 LSB
Differential Non-Linearity: ±0.25 LSB typical; ±1 LSB max
Current: ±3.5 mA max
Power On and Reset State: DACs cleared to zero scale, 0V ± 50 mV
Noise: 30 µVRMS
Settling Time: 45 µs
Slew Rate: 1.0 V/µs
Throughput: Single channel, 1000 S/s (max, system dependent); multiple channels, 1000 S/s divided by the number of channels (max, system dependent)

ANALOG INPUT/OUTPUT CALIBRATION
Recommended Warm-Up Time: 45 minutes max
Calibration: Firmware calibration
Calibration Interval: 1 year
Calibration Reference: 10.000V, ±5 mV max; actual measured values stored in EEPROM
Tempco: 5 ppm/°C max
Long Term Stability: 30 ppm/1000 hrs

DIGITAL INPUTS (OMB-DAQ-2416, OMB-DAQ-2416-4AO, OMB-AI-EXP32)
Number of Digital I/O Channels: 8 (OMB-DAQ-2416, OMB-DAQ-2416-4AO); 16 (OMB-AI-EXP32)
Configuration: Each DIO bit can be independently read from (DIN) or written to (DOUT). The DIN bits can be read at any time whether the DOUT is active or tri-stated.
Voltage Range: 0 to 15 Vdc
Type: CMOS (Schmitt trigger)
Characteristics: 47 kΩ pull-up/pull-down resistor, 28 kΩ series resistor
Maximum Input Voltage Range: 0 to 20 Vdc max (power on/off, relative to DGND)
Pull-Up/Pull-Down Configuration: All pins pulled up to 5V via individual 47 kΩ resistors (default configuration); pull-down capability is available by moving internal jumper
Transfer Rate (Software Paced): 500 port reads or single bit reads per second typical
Input High Voltage: 1.3V min, 2.2V max
Input Low Voltage: 1.5V max, 0.6V min
Schmitt Trigger Hysteresis: 0.4V min, 1.2V max

DIGITAL OUTPUTS (OMB-DAQ-2416, OMB-DAQ-2416-4AO, OMB-AI-EXP32)
Number of Digital I/O Channels: 8 (OMB-DAQ-2416, OMB-DAQ-2416-4AO); 16 (OMB-AI-EXP32)
Configuration: Each DIO bit can be independently read from (DIN) or written to (DOUT). The DIN bits can be read at any time whether the DOUT is active or tri-stated.
Characteristics: 47 kΩ pull-up, open drain DMOS transistor
Pull-Up Configuration: All pins pulled up to 5V via individual 47 kΩ resistors by default
Transfer Rate (Software Paced): 500 port writes or single bit writes per second typical
Output Voltage Range: 0 to 5V (no external pull-up resistor, internal 47 kΩ resistors connected to 5V by default); 0 to 15V max
Drain to Source Breakdown Voltage: 50V min
Off-State Leakage Current: 0.1 µA
Sink Current Capability: 150 mA max continuous per output pin; 150 mA max continuous for all eight channels
DMOS Transistor On-Resistance (Drain to Source): 4 Ω

COUNTERS (OMB-DAQ-2416, OMB-DAQ-2416-4AO)
Number of Channels: 2
Resolution: 32-bit
Counter Type: Event counter
Input Type: Schmitt trigger, rising edge triggered
Counter Read/Write Rates (Software Paced): 500 reads or writes per second (system dependent)
Input Characteristics: 562 kΩ pull-up resistor to 5V, 10 kΩ series resistor
Input Voltage Range: ±15V max
Maximum Input Voltage Range: ±20V max (power on/off)
Input High Voltage: 1.3V min, 2.2V max
Input Low Voltage: 1.5V max, 0.6V min
Schmitt Trigger Hysteresis: 0.4 min, 1.2V max
Input Bandwith (-3dB): 1 MHz
Input Capacitance: 25 pf
Input Leakage Current: ±120 nA
Input Frequency: 1 MHz max
High Pulse Width: 500 ns min
Low Pulse Width: 500 ns min



OMB-DAQ-2416-4AO connected to OMB-AI-EXP32 expansion module both shown smaller than actual size.

GENERAL
OMB-DAQ-2416,
OMB-DAQ-2416-4AO
DATA ACQUISITION MODULES
Memory: EEPROM
Microcontroller:
One high-performance 8-bit RISC microcontroller with USB interface (non-isolated); one high-performance 16-bit RISC microcontroller for measurements (isolated)
Power: 5V ±5%, 340 mA supplied by included AC adaptor (OMB-DAQ-2416-ADAP)
User Output Voltage: 5V, 10 mA max available (pin 35)
Isolation: 500 Vdc min measurement system to PC
USB Device Type: USB 2.0 (full-speed)
Device Compatibility:
USB 1.1, USB 2.0
USB Cable Length: 5 m (16') max
Dimensions:
245 L x 146 W x 50 mm H
(9.6 x 5.7 x 2.0")
Input Connections: Detachable screw terminal blocks (accept 16 to 30 AWG wire)
Operating Temperature:
0 to 50°C (32 to 122°F),
0 to 90% RH non-condensing
Storage Temperature:
-40 to 85°C (-40 to 185°F)
Weight: 463 g (16.3 oz)
OMB-AI-EXP32
EXPANSION MODULE
User Output Voltage:
+5 V, 10 mA max available (pin 19)
Dimensions:
245 L x 146 W x 50 mm H
(9.6 x 5.7 x 2.0")
Input Connections: Detachable screw terminal blocks (accept 16 to 30 AWG wire)
Operating Temperature:
0 to 50°C (32 to 122°F),
0 to 90% RH non-condensing
Storage Temperature:
-40 to 85°C (-40 to 185°F)
Weight: 400 g (14.1 oz)

OMEGA CARE℠ Extended Warranty Program

OMEGACARE℠ extended warranty program is available for models shown on this page. Ask your sales representative for full details when placing an order. OMEGACARE℠ covers parts, labor and equivalent loaners.

To Order

Model No.	Description
OMB-DAQ-2416	Multi-function I/O USB data acquisition module
OMB-DAQ-2416-4AO	Multi-function I/O USB data acquisition module with 4 analog outputs
OMB-AI-EXP32	Expansion module with frequency measurement and digital I/O
OMB-DAQ-2416-ADAP	Spare USA AC adaptor
OMB-DAQ-2416-PL-AU	Spare Australian plug for AC adaptor
OMB-DAQ-2416-PL-EU	Spare European plug for AC adaptor
OMB-DAQ-2416-PL-UK	Spare UK plug for AC adaptor
OMB-CA-179-1	Spare USB cable, 1 m (3.2')
OMB-CA-179-3	USB cable, 3 m (9.8')
OMB-CA-179-5	USB cable, 5 m (16.4')
OMB-ACC-202	DIN rail adaptor kit for OMB-DAQ-2416 Series
OMB-ACC-216	Spare detachable screw terminal kit (set of 6 screw terminal blocks) for OMB-DAQ-2416 and OMB-DAQ-2416-4AO
SWD-TRACERDAQ-PRO	TracerDAQ Pro software

Comes complete with AC adaptor, 2 m (6') USB cable, US power plug, quick start guide, software, and operator's manual on CD.

***Ordering Example: OMB-DAQ-2416-4AO,** multi-function I/O USB data acquisition module with 4 analog outputs, **OCW-1** OMEGACARE℠ 1-year extended warranty for **OMB-DAQ-2416-4AO,** (adds 1 year to standard 1-year warranty), **OMB-AI-EXP32,** expansion module and **OCW-1** OMEGACARE℠ 1 year extended warranty for **OMB-AI-EXP32,** (adds 1 year to standard 1 year warranty).*

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