

8-Channel Simultaneous Analog Input USB Data Acquisition Modules

OM-USB-1608FS Series



- ✓ 16-Bit Resolution
- ✓ 8 Single-Ended Analog Input Channels
- ✓ Simultaneous Sampling (1 A/D Converter Per Input)
- ✓ Up to 400 kS/s Overall Throughput (100 kS/s Maximum for Any Channel)
- ✓ 8 Digital I/O
- ✓ 1 Event Counter
- ✓ External Clock I/O
- ✓ External Digital Trigger Input
- ✓ No External Power Required

OM-USB-1608FS-PLUS shown smaller than actual size.



The OM-USB-1608FS Series consists of the following low-cost, analog and digital I/O modules:

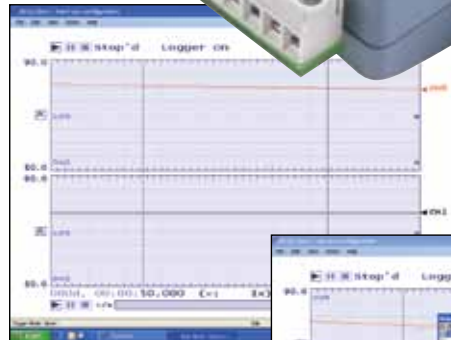
- OM-USB 1608FS
- OM-USB-1608FS-PLUS

These modules provide eight single-ended (SE), simultaneous-sampling 16-bit analog inputs, eight DIO, one event counter, one external digital trigger input, and one bidirectional external clock.

Everything you need to begin acquiring, viewing, and storing data is included with each OM-USB-1608FS Series module, including comprehensive software support.

SOFTWARE

OM-USB-1608FS Series modules ship with an impressive array of software, including the new 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 v8.5 through 2013) and InstaCal™ installation, calibration and test utility-powerful solutions for programmers and nonprogrammers alike. These modules operate under Microsoft Windows® XP (32-bit only) and VISTA/7/8 (32-bit and 64-bit) operating systems.



TracerDAQ Strip Chart.



TracerDAQ-PRO Strip Chart with Measurements.

The OM-USB-1608FS Series data acquisition modules are 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 acquired 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. A comparison of some of the features included in TracerDAQ vs TracerDAQ PRO is shown on the next page.



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

ANALOG INPUT

Both modules provide eight single-ended (SE) 16-bit analog input channels with a dedicated A/D converter per channel for simultaneous sampling. The devices offer software-selectable analog input ranges for $\pm 10V$, $\pm 5V$, $\pm 2V$, and $\pm 1V$.

SAMPLING RATE

OM-USB-1608FS Series modules offer the following sampling rates when scanning continuously to computer memory (hardware-paced mode):

- **OM-USB-1608FS-PLUS** - Total rate of 400 kS/s divided by the number of channels sampled; maximum rate of 100 kS/s per channel.
- **OM-USB-1608FS** - Total rate of 100 kS/s divided by the number of channels sampled; maximum rate of 50 kS/s per channel.

SIMULTANEOUS SAMPLING

In hardware paced mode, both modules can acquire data from up to eight channels simultaneously. The analog data is continuously acquired, converted to digital values, temporarily stored in the onboard FIFO buffer, and periodically uploaded to the computer.

CHANNEL-GAIN QUEUE

The channel-gain queue lets you configure a list of channels and gains for each scan. Each channel can have a different gain setting. The gain settings are stored in a channel-gain queue list that is written to local memory on the device. The channel-gain queue list for both modules can contain up to eight unique channels. On the OM-USB-1608FS, the channels must be consecutive and listed in increasing order. On the OM-USB-1608FS-PLUS, the channels can be non-consecutive, but still must be listed in increasing order.



DIGITAL I/O

Both modules provide eight digital I/O connections. Each digital channel is individually-configurable for input or output. When configured for input, you can use the digital I/O terminals to detect the state of any TTL level input. On the OM-USB-1608FS-PLUS, the digital I/O channels are high-drive (24 mA) connections.

PULL-UP/PULL-DOWN CONFIGURATION

Recent revisions of OM-USB-1608FS Series modules have a user-configurable internal jumper to configure the digital bits for pull-up (default) or pull-down.

OM-USB-1608FS Series Selection Chart

Specification	OM-USB-1608FS	OM-USB-1608FS-PLUS
Analog Inputs	8 single-ended (SE)	8 single-ended (SE)
A/D Sampling Rate (Continuous Scan to Computer Memory)	(100 kS/s)/(# of channels) 50 kS/s maximum for any channel	(400 kS/s)/(# of channels) 100 kS/s maximum for any channel
Channel-Gain Queue	Up to 8 unique, consecutive elements	Up to 8 unique, ordered elements, consecutive not required
Digital Output Current	±2.5 mA per pin	±24 mA per pin
Calibration	Factory and user calibration	Factory calibration only
External Clock Input	50 kHz maximum	100 kHz maximum
Trigger Sensitivity	Edge sensitive	Edge or level sensitive
Counter Input	One 32-bit event counter	1 MHz input frequency maximum

COUNTER INPUT

The OM-USB-1608FS-PLUS has a 32-bit event counter that can accept a signal up to 1 MHz. The internal counter increments when the TTL levels transition from low to high.

EXTERNAL CLOCK I/O

Each OM-USB-1608FS Series module has a bidirectional external clock terminal. When configured for input, A/D conversions can be paced by an external source.

The OM-USB-1608FS supports TTL-level input signals up to 50 kHz.

The OM-USB-1608FS-PLUS supports TTL-level input signals up to 100 kHz.

When configured for output, both devices can pace A/D conversions on a second device and acquire data from all input channels simultaneously.

TRIGGER INPUT

OM-USB-1608FS Series modules provide an external digital trigger input.

The OM-USB-1608FS trigger mode is edge sensitive and software-selectable for rising or falling edge.

The OM-USB-1608FS-PLUS trigger mode is edge or level sensitive. Edge sensitive is software-selectable for rising or falling edge. Level sensitive is software-selectable for high or low level.

CALIBRATION

Each OM-USB-1608FS Series module ships fully calibrated and can be re-calibrated at the factory. The OM-USB-1608FS also supports user calibration.

SPECIFICATIONS

ANALOG INPUT

A/D Converter Type: 16-bit successive approximation type

Channels: 8 single-ended

Input Configuration: Individual A/D per channel

Sampling Method: Simultaneous

Absolute Maximum Input Voltage: CHx IN Relative to GND: ±15V max

Input Impedance: 100 MΩ min

Input Ranges: ±10V, ±5V, ±2 V, ±1V; software-selectable per channel

Sampling Rate (Hardware Paced)

OM-USB-1608FS: 0.6 S/s to 50 kS/s, software-selectable

OM-USB-1608FS-PLUS: 0.01 S/s to 100 kS/s, software-selectable

Throughput

Software Paced: 500 S/s all channels

Hardware Paced (System-Dependent):

OM-USB-1608FS: (100 kS/s)/(# of channels) max, 50 kS/s max for any channel

OM-USB-1608FS-PLUS: (400 kS/s)/(# of channels) max, 100 kS/s max for any channel

Burst Scan ≤ 32,768 Total Samples (Uses Onboard FIFO):

OM-USB-1608FS: (200 kS/s)/(# of channels) max, 50 kS/s max for any channel

OM-USB-1608FS-PLUS: (800 kS/s)/(# of channels) max, 100 kS/s max for any channel



Gain Queue:

OM-USB-1608FS: Up to eight elements; one gain element per unique, consecutive channel; software-selectable

OM-USB-1608FS-PLUS: Up to eight elements; one gain element per unique, ordered channel; software-selectable

Resolution: 16 bits

ACCURACY

Analog Input DC Voltage Measurement Accuracy

Calibrated Absolute Accuracy	
Range	Accuracy
±10V	5.66 mV
±5V	2.98 mV
±2V	1.31 mV
±1V	0.68 mV

Accuracy Components All values are (±)			
Range	Gain Error (% of Reading)	Gain Error at Full Scale	Offset
±10V	0.04	4.00 mV	1.66 mV
±5V	0.04	2.00 mV	0.98 mV
±2V	0.04	0.80 mV	0.51 mV
±1V	0.04	0.40 mV	0.28 mV

Noise Performance*		
Range	Typical Counts	Least Significant Bit Root Mean Square (LSB ^{RMS})
±10V	10	1.52
±5V	10	1.52
±2V	11	1.67
±1V	14	2.12

*Summarizes the noise performance for OM-USB-1608FS Series devices. Noise distribution is determined by gathering 50 kS with inputs tied to ground at the user connector. Samples are gathered at the maximum specified sampling rates of 50 kS/s (OM-USB-1608FS) and 100 kS/s (OM-USB-1608FS-PLUS).

No Missing Codes:

OM-USB-1608FS: 15 bits

OM-USB-1608FS-PLUS: 16 bits

Crosstalk (Signal DC to 25 kHz): -80 dB

CAL Output (OM-USB-1608FS Only): 0.625V, 1.25V, 2.5V, 5V

CAL Output Accuracy (OM-USB-1608FS Only): 0.5% typ, 1.0% max (actual values used for calibration are measured and stored in EEPROM)

CAL Current (OM-USB-1608FS Only): ±5 mA max

Trigger Source (Software-Selectable)

External Digital: TRIG_IN

DIGITAL INPUT/OUTPUT

Digital Type:

OM-USB-1608FS: CMOS

OM-USB-1608FS-PLUS: 5V TTL

Number of I/O: 8 (DIO0 through DIO7)

Configuration: Independently configured for input or output

Pull-Up/Pull-Down Configuration: All pins pulled up to 5V via 47 kΩ resistors (default). May be changed to pull-down using an internal jumper (OM-USB-1608FS hardware revisions E and later may be changed to pull-down using an internal user-configurable jumper. Previous revisions can be configured for pull-down at the factory).

Input High Voltage Threshold: 2.0V min

Input High Voltage Limit: 5.5V absolute max

Input Low Voltage Threshold: 0.8V max

Input Low Voltage Limit: -0.5V absolute min; 0V recommended min

Output High Voltage:

OM-USB-1608FS (IOH = -2.5 mA): 3.8V min

OM-USB-1608FS-PLUS: 4.4V min (IOH = -50 μA); 3.76V min (IOH = -24 mA)

Output Low Voltage:

OM-USB-1608FS (IOL = 2.5 mA): 0.44V max

OM-USB-1608FS-PLUS: 0.1V max (IOL = 50 μA); 0.44V max (IOL = 24 mA)

Power On and Reset State: Input

EXTERNAL TRIGGER

Trigger Source (External Digital): TRIG_IN

Trigger Mode (Software-Selectable):

OM-USB-1608FS: Edge sensitive: user configurable for CMOS compatible rising or falling edge

OM-USB-1608FS-PLUS: Edge sensitive or level sensitive: user configurable for CMOS compatible rising or falling edge, high or low level

Trigger Latency:

OM-USB-1608FS: 10 μs max

OM-USB-1608FS-PLUS: 2 μs + 1 pacer clock cycle max

Trigger Pulse Width: 1 μs min

Input Type: Schmitt trigger, 47 kΩ pull-down to ground

Schmitt Trigger Hysteresis: 1.01V typ, 0.6V min, 1.5V max

Input High Voltage Threshold: 2.43V typ, 1.9V min, 3.1V max

Input High Voltage Limit: 5.5V absolute max

Input Low Voltage Threshold: 1.42V typ, 1.0V min, 2.0V max

Input Low Voltage Limit: -0.5V absolute min, 0V recommended min

EXTERNAL CLOCK I/O

Pin Name: SYNC

Pin Type: Bidirectional

Direction (Software-Selectable):

Input: Receives A/D pacer clock from external source;

Output: Outputs internal A/D pacer clock



Input Clock Rate:

OM-USB-1608FS: 50 kHz max

OM-USB-1608FS-PLUS: 100 kHz max

Clock Pulse Width:

Input: 1 μ s min

Output:

OM-USB-1608FS: 5 μ s min

OM-USB-1608FS-PLUS: 4 μ s min

Input Clock Mode: Edge sensitive, rising edge

Input Type: Schmitt trigger, 47 k Ω pull-down to ground

Schmitt Trigger Hysteresis: 1.01V typ, 0.6V min, 1.5V max

Input High Voltage Threshold: 2.43V typ, 1.9V min, 3.1V max

Input High Voltage Limit: 5.5V absolute max

Input Low Voltage Threshold: 1.42V typ, 1.0V min, 2.0V max

Input Low Voltage Limit: -0.5V absolute min, 0V recommended min

Output High Voltage: 4.4V min (IOH = -50 μ A), 3.80V min (IOH = -8 mA)

Output Low Voltage: 0.1V max (IOL = 50 μ A), 0.44V max (IOL = 8 mA)

COUNTER

Pin Name: CTR

Counter Type: Event counter

Number Of Channels: 1

Input Type: Schmitt trigger, 47 k Ω pull-down to ground

Input Source: CTR screw terminal

Resolution: 32 bits

Schmitt Trigger Hysteresis: 1.01V typ, 0.6V min, 1.5V max

Input High Voltage Threshold: 2.43V typ, 1.9V min, 3.1V max

Input High Voltage Limit: 5.5V absolute max

Input Low Voltage Threshold: 1.42V typ, 1.0V min, 2.0V max

Input Low Voltage Limit: -0.5V absolute min, 0V recommended min

Input Frequency: 1 MHz max

High Pulse Width: 500 ns min

Low Pulse Width: 500 ns min

POWER

Supply Current

USB Enumeration: < 100 mA

Including DIO and SYNC Output Loading: < 500 mA

+5V USB Power Available (Connected to Externally-Powered Root Port Hub or a Self-Powered Hub): 4.5V min, 5.25V max

Output Current (Total Amount of Current that can be Sourced from the USB 5V and Digital Outputs): 300 mA max

MEMORY

Data FIFO: 32,768 samples, 65,536 bytes

EEPROM:

OM-USB-1608FS: 1024 bytes

OM-USB-1608FS-PLUS: 2048 bytes

GENERAL

Operating Temperature Range: 0 to 70°C (32 to 158°F), 0 to 90% RH non-condensing

Storage Temperature Range: -40 to 70°C (-40 to 158°F), 0 to 90% RH non-condensing

Communications: USB 2.0 hi-speed mode (480 Mbps) is recommended; otherwise USB 1.1 full-speed mode (12 Mbps)

Microcontroller Type: High performance 32-bit RISC

Signal I/O Connector Type: Screw terminal

USB Cable Length: 3 m (9.84') max

Dimensions: 79 L x 82 W x 27 mm H (3.10 x 3.20 x 1.05")

Weight: 91 g (3.2 oz)



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

To Order	
Model No.	Description
OM-USB-1608FS	8-channel 100 Ks/S simultaneous analog input USB data acquisition module
OM-USB-1608FS-PLUS	8-channel 400 Ks/S simultaneous analog input USB data acquisition module
SWD-TRACERDAQ-PRO	TracerDAQ-PRO software
SWD-DASYLAB	DASyLab software

Comes complete with 1.8 m (6') USB cable, TracerDAQ software and user manual on CD.

Ordering Example: OM-USB-1608FS 8-channel 100 kS/s simultaneous analog input USB data acquisition module and OCW-1, OMEGACARESM extends standard 1-year warranty to a total of 2 years.