USB-2600 Series

16-Bit, 1 MS/s High-Speed Data Acquisition Boards

Logicbus
¡ Tu Sitio de Automatización !

Features

- 16-bit resolution
- 1 MS/s sample rate
- Up to 64 single-ended analog inputs
- Up to four 16-bit, 1 MS/s analog outputs
- 24 digital I/O lines
- Four 32-bit event counters
- Four timer outputs
- USB powered (no external power required)
- Includes USB cable and standoffs
- Small, compact design (6" x 5.93") for OEM and embedded applications
- Custom versions available for OEMs (contact factory)

Software

- Universal Library includes support for Visual Studio® and Visual Studio® .NET, including examples for Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET
- InstaCal software utility for installing, calibrating, and testing
- ULx for NI LabVIEW™
- TracerDAQ® software for acquiring and displaying data and generating analog signals
- Comprehensive drivers for DASYLab®
- Supported Operating Systems: Windows® 8/7/Vista®/XP, 32-bit or 64-bit

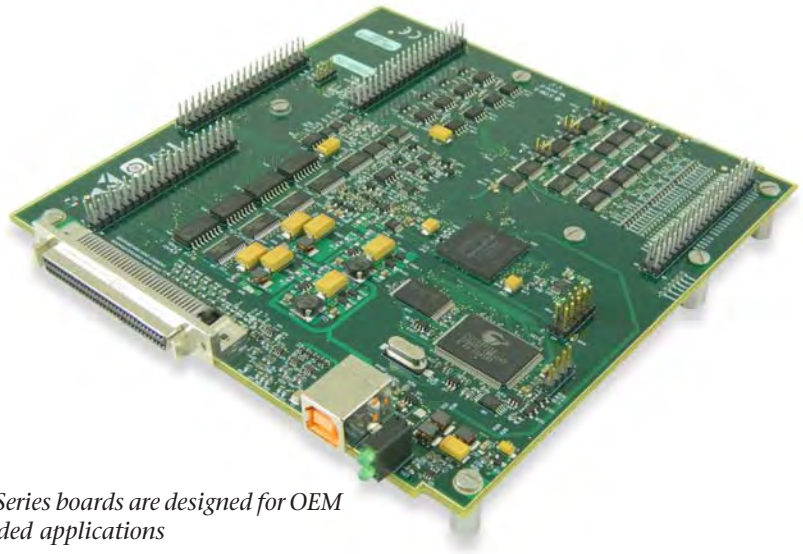
Overview

The USB-2600 Series offers high-speed, multifunction data acquisition in a low-cost, board-only design. Each board offers voltage input, digital trigger input, counter input, timer output, digital I/O, and clock input.

Analog output is also available on the USB-2627 and USB-2637.

Analog Input

Each USB-2600 Series board has a 16-bit, 1 MS/s ADC coupled with 16 SE analog inputs (USB-2623 and USB-2627), 64 SE analog inputs (USB-2633 and USB-2637). The input range is fixed at ±10 V.



USB-2600 Series boards are designed for OEM and embedded applications

USB-2600 Series Selection Chart

Model	Analog Inputs	Sample Rate	Analog Outputs	Digital I/O	Counters	Timer Outputs
USB-2623	16 SE (16-bit)	1 MS/s max	0	24	4	4
USB-2627	16 SE (16-bit)	1 MS/s max	4	24	4	4
USB-2633	64 SE (16-bit)	1 MS/s max	0	24	4	4
USB-2637	64 SE (16-bit)	1 MS/s max	4	24	4	4

Trigger Input

USB-2600 Series boards have an external digital trigger input. The trigger mode is software-selectable for edge sensitive or level sensitive mode.

- Edge sensitive mode is software-selectable for rising or falling edge.
- Level sensitive mode is software-selectable for high or low level.

Analog Output

(USB-2627 and USB-2637 Only)

Four 16-bit, 1 MS/s analog output channels are built into the USB-2633 and USB-2637 with a fixed output range of ±10 V. The maximum rate at which analog outputs update depends on several factors, including the speed of the USB port.

Typically, with the A/D operating at the full 1 MS/s rate, each analog output updates continuously from computer memory at 1 MS/s regardless of the number of channels in a scan.

Digital I/O

Twenty-four TTL-level digital I/O lines are included in USB-2600 Series boards. Each channel is software-selectable for input or output. Each board typically provides a maximum transfer rate (system paced, asynchronous) of 4,000 8-bit port or single-bit reads/writes per second.

Pull-Up/Pull-Down Configuration: Each USB-2600 Series board has a user-configurable jumper to configure the digital I/O for pull-up or pull-down (default).

Counter Input

Four 32-bit counters are included in USB-2600 Series devices. Each counter accepts frequency inputs up to 20 MHz.

¡Tu sitio de automatización!

USB-2600 Series

General Information

Timer Output

USB-2600 Series boards have four pulse-width modulation (PWM) timer outputs. Each timer can generate a pulse output from 0.015 Hz to 32 MHz. Timer output frequency and other parameters are software-selectable.

External Clock I/O

USB-2600 Series boards provide one external clock input for pacing analog inputs. The USB-2627 and USB-2637 also have one external clock input for pacing analog outputs.

Signal Connections

A 68-pin SCSI connector provides access to 16 SE analog inputs, up to four analog outputs, 24 digital I/O, four counters, and two timers.

Each board also includes four sets of header connectors that provides the following connections:

- all signals on the 68-pin connector
- an additional 48 SE analog inputs on the USB-2633 and USB-2637
- two additional timer outputs

Use these headers to connect to the C40FF-x ribbon cable or to custom, user-provided cables.

TB-103 Screw Terminal Board

The optional TB-103 screw terminal board connects directly to the 40-pin headers on a USB-2600 Series board, and secures to the board with the included stand-offs. The TB-103 provides access for up to 64 SE analog inputs (when using a USB-2633 or USB-2637), up to 4 analog outputs (when using a USB-2627 or USB-2637), 24 digital I/O and all counters/timers.

USB-2637 connected to TB-103 screw-terminal board.

TB-100 Screw Terminal Board

The optional TB-100 screw terminal board connects directly to the 68-pin SCSI connector using a CA-68-xx ribbon cable. The TB-100 provides access to 16 SE analog inputs, up to four analog outputs, 24 digital I/O, and all counters/timers

When using the TB-100 with the USB-2633 or USB-2637, access to the remaining 48 SE analog inputs is available through the 40-pin header connectors.

DAQ Software

USB-2600 Series devices ship with the DAQ software CD, which includes InstaCal, a software utility for installing, configuring, and testing hardware.

Universal Library

The Universal Library (UL) is a set of programming libraries for developing applications with Visual Studio programming languages (and others) for use with hardware. UL includes a complete function library that simplifies the configuration and operation of your measurement device. UL supports Visual Studio and Visual Studio .NET, and includes 64-bit driver support for Windows 8/7/Vista/XP.

ULx for NI LabVIEW

ULx for NI LabVIEW is a comprehensive library of graphical functions and example programs comprising all the power of the Universal Library and InstaCal. ULx for NI LabVIEW is compatible with NI LabVIEW 8.5 and later, and allows quick development of NI LabVIEW instrumentation, acquisition, and control applications

USB-2600 Series

General Information

TracerDAQ

TracerDAQ is an out-of-the-box application that can generate, acquire, analyze, display, and export data within seconds of installing data acquisition hardware.
TracerDAQ includes a strip chart, an oscilloscope, a function generator, and a rate generator, all of which are accessed through a common, easy-to-use interface.

TracerDAQ provides four virtual instrument applications used to graphically display and store input data.

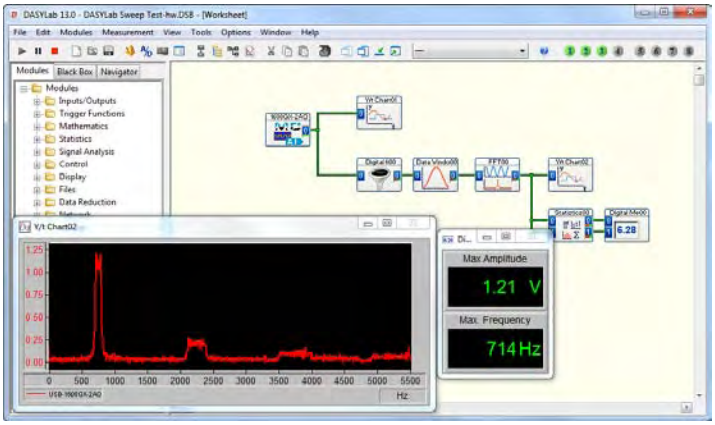
Software Available Separately

TracerDAQ Pro

TracerDAQ Pro is available as a purchased upgrade to TracerDAQ. TracerDAQ Pro supports more active channels, more samples per channel, and a selection of options and enhancements designed to address many test and measurement applications.

DASYLab

Customers needing more performance than TracerDAQ Pro provides can purchase DASYLab, an icon-based data acquisition, graphics, control, and analysis software package. DASYLab offers real-time analysis and control, and provides the ability to create custom graphical user interfaces without programming. Compared to other graphical programming environments, DASYLab has a very short user-learning curve. Many applications can be configured in a few minutes, rather than days or weeks.



DASYLab users can interactively develop PC-based data acquisition applications by simply attaching functional icons.

PLCs Adquisición Instrumentos Registradores Potencia HMIs Switches Movimiento Sensores Convertidores Teclados SCADA Telemetría
¡Tu sitio de automatización!

USB-2600 Series
Specifications

Specifications
All specifications are subject to change without notice.
Typical for 25 °C unless otherwise specified.

Analog Input
A/D Converter (ADC) Type: Successive approximation
ADC Resolution: 16-bit
Number of Channels
USB-2623/USB-2627: 16 SE
USB-2633/USB-2637: 64 SE
Input Voltage Range: ±10 V
Absolute Maximum Input Voltage
CHx Relative to AGND
±25 V max (power on)
±10.5 V max (power off)
Input Impedance
1 GΩ (power on)
390 Ω (power off)
Input Bias Current: ±100 pA
Input Bandwidth
Small Signal (–3 dB): 3.1 MHz
Input Capacitance: 40 pf
Maximum Working Voltage: ±10.1 V max relative to AGND
Crosstalk
Adjacent Channels, DC to 10 kHz: –80 dB
Input Coupling: DC
Sample Rate: 0.0149 S/s to 1,000 kS/s; software-selectable
Trigger Source: TTLTRG
A/D Pacing
Internal input scan clock
External input scan clock (XAPCR)
Burst Mode: Burst rate = 1 µs, software-selectable,
Throughput
Software Paced: 33 S/s to 4,000 S/s typ; system dependent
Hardware Paced: 1 MS/s max
Channel Queue
USB-2623/USB-2627: Up to 16 element list of random channels
USB-2633/USB-2637: Up to 64 element list of random channels
Warm-Up Time: 15 minutes min

Accuracy

Analog Input DC Voltage Measurement Accuracy
Range: ±10 V
Gain Error (% of Reading): 0.031
Offset Error: 915 µV
INL Error (% of Range): 0.0076
Absolute Accuracy at Full Scale: 4775 µV
Gain Temperature Coefficient (% Reading/°C): 0.0013
Offset Temperature Coefficient (µV/°C): 35

Noise Performance
For the peak-to-peak noise distribution test, the input channel is connected to AGND at the input terminal block, and 32,000 samples are acquired at the maximum throughput.
Range: ±10 V
Counts: 8
LSBrms: 1.21

Settling Time for Multichannel Measurements
Settling time is defined as the accuracy that can be expected after one conversion when switching from a channel with a DC input at one extreme of full scale to another channel with a DC input at the other extreme of full scale.

Range: ±10 V
1 µS Settling Accuracy (% FSR): 0.0152
5 µS Settling Accuracy (% FSR): 0.0061
10 µS Settling Accuracy (% FSR): 0.0015

Analog Output (USB-2627/USB-2637 Only)
Number of Channels: 4
Leave unused analog output channels disconnected.
Resolution: 16 bits
Output Ranges (Calibrated): ±10 V
Output Transient
Host Computer is Reset, Powered On, Suspended, or a Reset Command is Issued to the Device
Duration: 100 ms
Amplitude: 2 V p-p
Analog outputs default to 0 V whenever the host computer is reset, powered on, suspended, or a reset command is issued to the device.
Powered Off
Duration: 100 ms
Amplitude: 5 V peak
Differential Nonlinearity: ±0.25 LSB typ, ±1 LSB max
Output Current
XDACx Pins: ±3.5 mA max
Output Short-Circuit Protection
XDACx Connected to AGND: Unlimited duration
Output Coupling: DC
Power On and Reset State
DACs Cleared to Zero-Scale: 0 V, ±150 mV
Pacer Source
Two Programmable Sources
Internal output scan clock
External output scan clock (XDPCR), independent of external input scan clock (XAPCR)
Trigger Sources: TTLTRIG (refer to *External Trigger* specifications)
Output Update Rate: 1 MS/s max
The DAC update rate is not affected by the number of channels in the scan
Settling Time
To Rated Accuracy, 10 V Step: 2 µs
Slew Rate: 20 V/µs
Throughput
Software Paced: 33 S/s to 4,000 S/s typ, system-dependent
Hardware Paced: 1 MS/s max, system-dependent

Calibrated Absolute Accuracy Specifications (USB-2627/USB-2637 Only)
Range: ±10 V
% of Reading: ±0.0183
Offset: ±1.831
Offset Tempco: 12.7 µV/°C)
Gain Tempco: 13 ppm of range/°C)

Relative Accuracy Specifications (±LSB) (USB-2627/USB-2637 Only)
Range: ±10 V
Relative Accuracy (INL): 4.0 typ

Analog Input/Output Calibration
Recommended Warm-Up Time: 15 minutes min
Calibration Method: Self-calibration (firmware)
Calibration Interval: 1 year (factory calibration)
AI Calibration Reference: 5 V, ±2.5 mV max. Actual measured values stored in EEPROM.
Tempco: 5 ppm/°C max
Long Term Stability: 15 ppm/1,000 hours
AO Calibration Procedure (USB-2627/USB-2637 Only): The analog output pins are internally routed to the analog input circuit. For best calibration results, disconnect any XDACx connections at the I/O connectors before performing AOUT calibration.

Digital Input/Output
Digital Type: TTL
Number of I/O: 24
Configuration: Three banks of 8. Each bit may be configured as input (power on default) or output.
Pull-Up Configuration: Each port has 47 kΩ resistors that are configurable as pull-up or pull-down (default) using onboard jumpers (W5, W6, W7).
Digital I/O Transfer Rate (System Paced, Asynchronous): 33 to 4,000 port reads/writes or single bit reads/writes per second typ; system dependent.
Input High Voltage: 2.0 V min, 5.0 V absolute max
Input Low Voltage: 0.8 V max, 0 V recommended min
Output High Voltage: 4.4 V min (IOH = –50 µA), 3.76 V min (IOH = –24 mA)
Output Low Voltage: 0.1 V max (IOL = 50 µA)
0.44 V max (IOL = 24 mA)
Output Current: 60 mA max, not to exceed 24 mA for one bit, resulting in 2.5 mA max when all 24 bits are enabled.

External Trigger
Trigger Source: TTLTRG
Trigger Mode: Software programmable for edge or level sensitive, rising or falling edge, high or low level. Power on default is edge sensitive, rising edge.
Trigger Latency: 1 µs + 1 clock cycle max
Trigger Pulse Width: 100 ns min
Input Type: 33 Ω series resistor and 49.9 kΩ pull-down to GND
Input High Voltage: 2.2 V min, 5.5 V absolute max
Input Low Voltage: 1.5 V max, –0.5 V absolute min, 0 V recommended min

External Clock
Terminal Names: XAPCR, XDPCR
Terminal Types: Input, active on rising edge
Terminal Descriptions: Receives pacer clock from external source
Input Clock Rate: 1 MHz max
Clock Pulse Width: 100 ns min
Input Type: 33 Ω series resistor, 47 kΩ pull-down to GND
Input High Voltage: 2.2 V min, 5.5 V absolute max
Input Low Voltage: 1.5 V max, –0.5 V absolute min
0 V recommended min

USB-2600 Series

Specifications

Counter

Terminal Names: CTR0, CTR1, CTR2, CTR3
Number of Channels: 4 channels
Resolution: 32-bit
Counter Type: Event counter
Input Type: 33 Ω series resistor, 47 kΩ pull-down to GND
Input Source
68-Pin SCSI: CTR0 (pin 5), CTR1 (pin 39), CTR2 (pin 4), CTR3 (pin 38)
40-Pin (J4): CTR0 (pin 35), CTR1 (pin 34), CTR2 (pin 37), CTR3 (pin 36)
Counter Read/Writes Rates (software Paced): 33 to 8,000 reads/writes per second typ; system dependent
Input High Voltage: 2.2 V min
Input Low Voltage: 1.5 V max
Maximum Input Voltage Range: –5 V to +10 V max
Input Frequency: 20 MHz, max
High Pulse Width: 100 ns, min
Low Pulse Width: 100 ns, min

Timer Output

Terminal Name: TMR0, TMR1, TMR2, TMR3
Number of Channels: 4 channels
Timer Type: PWM output with count, period, delay, and pulse width registers
Output Value: Default state is idle low with pulses high, software-selectable, output invert
Input Source: 68-pin SCSI: TMR0 (pin 3), TMR1 (pin 37)
40-Pin (J4): TMR0 (pin 33), TMR1 (pin 32)
40-Pin (J5): TMR2 (pin 31), TMR3 (pin 35)
Internal Clock Frequency: 64 MHz
Register Widths: 32-bit
High Pulse Width : 10.42 ns, min
Low Pulse Width: 10.42 ns, min
Output High Voltage: 4.4 V min (IOH = –50 µA)
3.76 V min (IOH = –1.0 mA)
Output Low Voltage: 0.1 V max (IOL = 50 µA)
0.44 V max (IOL = 1.0 mA)
Output Waveform: Square wave
Output Rate: 64 MHz base rate divided by 2^{32}; software-selectable.

Memory

Data FIFO: 4 kS analog input/2 kS analog output
Non-Volatile Memory: 32 KB (30 KB firmware storage, 2 KB calibration/user data)

Power

Supply Current: Quiescent current: 360 mA
This is the total quiescent current requirement for the device that includes up to 10 mA for the Status LED. This value does not include potential loading of the DIO bits, +VO pin, or the XDACx outputs.

USB 2.0 ports are required by USB 2.0 standards to supply 2500 mW (nominal at 5 V, 500 mA).

Self-powered hubs and externally-powered root port hubs provide up to 500 mA of current for a USB device. Battery-powered root port hubs, such as in a laptop PC, provide 100 mA or 500 mA, depending on the manufacturer. If your laptop is constrained to the 100 mA maximum, you need to purchase a self-powered hub.
+VO Output Voltage Range: 4.25 V to 5.25 V
+VO Output Current: 10 mA max

USB

USB Device Type: USB 2.0 (high-speed)
Device Compatibility: USB 1.1, USB 2.0
USB Cable Type: A-B cable, UL type AWM 2725 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D–)
USB Cable Length: 3 m (9.84 ft) max

Environmental

Operating Temperature Range: 0 °C to 55 °C max
Storage Temperature Range: –40 °C to 85 °C max
Humidity: 0% to 90% non-condensing max

Mechanical

PCB Dimensions (L × W): 152.4 × 150.62 mm (6.00 × 5.93 in.)

Signal Connections

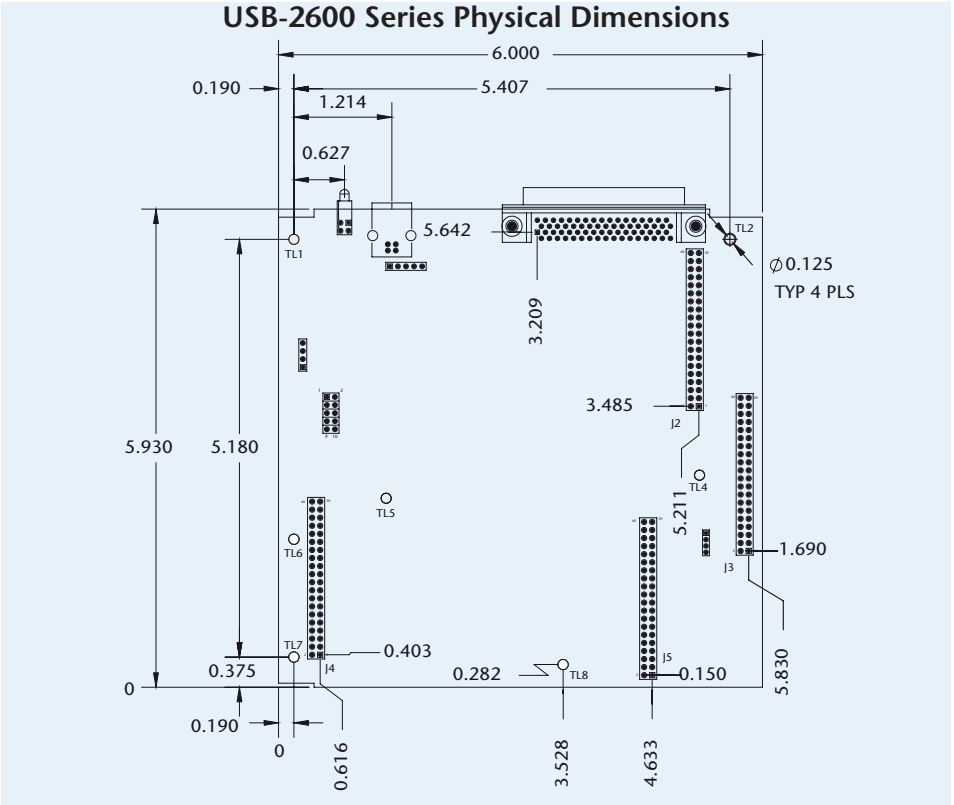
Connector Type
P1: 68-pin standard SCSI TYPE III female connector
USB-2623/USB-2627
J2, J4, J5: Three 40-pin header connectors AMP# 2-103328-0
USB-2633/USB-2637
J2, J3, J4, J5: Four 40-pin header connectors AMP# 2-103328-0

Compatible Cables
P1: CA-68-3R ribbon cable; 3 feet
J2, J3, J4, J5: C40FF-x ribbon cable; x is length in feet
TB-100: Connects to a CA-68-3R or CA-68-3S cable
TB-103: Mounts directly onto the header connectors
CIO-MINI40: Connects to a C40FF-x cable

Standoff Locations

Each board is designed with standoff holes labeled TL1 to TL8. Refer to *USB-2600 Series Physical Dimensions* below for the location of these standoff holes
TL1: Standoff hole TL1 Is connected directly to the J1 USB connector shield.
TL2: Standoff hole TL2 is connected directly to the P1 SCSI connector shield (pin 69, pin 70). The SCSI connector shield and TL2 can also be connected to the board chassis ground guard trace using the R21 (OPEN by default) resistor location.
TL4-8: Standoff holes TL4-TL8 are electrically-isolated from the PCB.

USB-2600 Series Physical Dimensions



PLCs Adquisición Instrumentos Registradores Potencia HMIs Switches Movimiento Sensores Convertidores Teclados SCADA Telemetría
¡Tu sitio de automatización!

USB-2600 Series

Ordering Information

Ordering Information

Part No.	Description
USB-2623	USB-based DAQ device with 16 SE analog inputs, 1 MS/s throughput; 24 digital I/O lines; four 32-bit counter input channels; and four timer outputs.
USB-2627	USB-based DAQ device with 16 SE analog inputs, 1 MS/s throughput, 4 analog outputs, 24 digital I/O lines, four 32-bit counter input channels, and four timer outputs.
USB-2633	USB-based DAQ device with 64 SE analog inputs, 1 MS/s throughput; 24 digital I/O lines; four 32-bit counter input channels; and four timer outputs.
USB-2637	USB-based DAQ device with 64 SE analog inputs, 1 MS/s throughput, 4 analog outputs, 24 digital I/O lines, four 32-bit counter input channels, and four timer outputs.

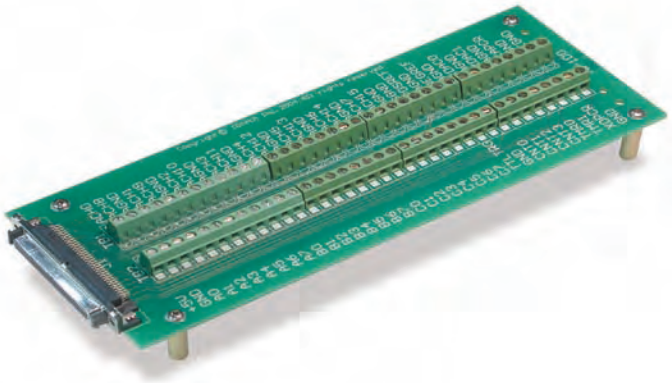
Accessories & Cables

Part No.	Description
TB-100	Termination board with screw-terminals for access to USB-2600 Series I/O; connects via a CA-68-3R, CA-68-3S, or CA-68-6S cable
TB-103	Termination board with screw terminals for access to USB-2600 Series I/O; mates directly with board and includes mounting stand-offs
CA-68-3R	68-conductor ribbon expansion cable from USB-2600 Series boards to TB-100, 3 ft.
CA-248	Ribbon cable, 40-pin header to 37-pin DSUB, 9 in.

Software

Part No.	Description
DASYLab	Icon-based data acquisition, graphics, control, and analysis software
TracerDAQ Pro	Out-of-the-box virtual instrument suite with strip chart, oscilloscope, function generator, and rate generator – professional version

TB-103 termination board with screw terminals provides access to all USB-2600 Series I/O. The TB-103 mounts directly onto the board with included hardware.



The TB-100 termination board with screw terminals provides access to USB-2600 Series I/O.

PLCs Adquisición Instrumentos Registradores Potencia HMIs Switches Movimiento Sensores Convertidores Teclados SCADA Telemetría
¡Tu sitio de automatización!