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PCI-2500 Series

PCI 16-Bit, 1 MHz Multifunction Boards

MEASUREMENT COMPUTING

Features

- Four low-cost, 16-bit, 1 MHz multifunction PCI boards
- 8 differential or 16 single-ended analog inputs (software selectable per channel)
- Four 16-bit, 1 MHz analog outputs with continuous waveform capability
- 24 high speed digital I/O lines
- Four 32-bit counter input channels with quadrature encoder capability
- Ultra low-latency control output capability (as low as 2 µs latency)
- Multiple DMA channels

Software

- TracerDAQ® software included for acquiring and displaying data and generating signals
- Universal Library includes support for Visual Studio® and Visual Studio® .NET, including examples for Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET
- Comprehensive drivers for DASYLab® and NI LabVIEW™
- Supported by MATLAB® Data Acquisition Toolbox™
- InstaCal software utility for installation, calibration, and testing
- Supported Operating Systems: Windows 7/Vista/XP SP2, 32-bit or 64-bit

The PCI-2500 Series feature a 16-bit/1 MHz A/D converter, 16 analog input channels, user expandable to 64, up to four 16-bit/1 MHz analog outputs, 24 high-speed digital I/O, 2 timer outputs, and four 32-bit counters. All analog I/O, digital I/O, and counter/timer I/O can operate synchronously and simultaneously, guaranteeing deterministic I/O timing amongst all signal types. Also unique to the PCI-2500 Series is a high-speed, low-latency, highly deterministic control output mode that operates independent of the PC. In this mode both digital and analog outputs can respond to analog, digital, and counter inputs as fast as 2 µs; at least 1,000 times faster than most other boards that rely on the PC for decision making.



The PCI-2500 Series provides 1 MHz sampling, synchronous multifunction I/O, analog input expansion capability, and extensive software support

PCI-2500 Series Selection					
Product or System	Analog Inputs	Input Ranges	Digital I/O	Analog Outputs	Counters/Timers
PCI-2511	16 SE	1	24	0	4/2
PCI-2513	16 SE/8 DE	7	24	0	4/2
PCI-2515	16 SE/8 DE	7	24	2	4/2
PCI-2517	16 SE/8 DE	7	24	4	4/2

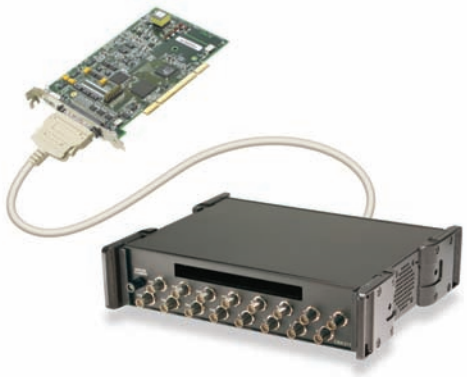
Signal Connections

One 68-pin connector provides access to the 16 SE/8 DE analog input channels, 24 digital I/O lines, 6 counter/timer channels, and up to 4 analog outputs on each PCI-2500 Series board.

In addition to standard screw-terminal options for the PCI-2500 Series, the DBK215 BNC connection module provides screw-terminal access to all I/O, plus 16 BNC connectors that can be user configured.



PCI-2500 attached to a TB-100 terminal board



PCI-2500 attached to a DBK215 BNC and screw-terminal module

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PCI-2500 Series
General Information

Analog Input
The PCI-2500 Series has a 16-bit/1 MHz A/D coupled with 16 single-ended, or 8 differential analog inputs. Seven software programmable ranges provide inputs from ±10 V to ±100 mV full scale*. Each channel can be software-configured for a different range, as well as for single-ended or differential bipolar input**.

Synchronous I/O
The PCI-2500 Series can make analog measurements and read digital and counter inputs, while synchronously generating up to four analog outputs as well as digital pattern outputs. Additionally, digital and counter inputs do not affect the overall A/D rate because they use no time slot in the scanning sequencer. For example, one analog input channel can be scanned at the full 1 MHz A/D rate along with digital and counter input channels. The 1 MHz A/D rate is unaffected by the additional digital and counter channels. Many other data acquisition boards provide no capability to scan digital/counter channels along with analog channels, in which case digital and counter channels must be read asynchronously, which leads to a non-deterministic collection of data.

Input Scanning
The PCI-2500 Series has several scanning modes to address a wide variety of applications. A 512 location scan buffer can be loaded by the user with any combination of analog input channels. All analog input channels in the scan buffer are measured sequentially at 1 µs per channel. The user can also specify that the sequence repeat immediately, or repeat after a programmable delay from 0 to 19 hours, with 20.83 ns resolution. For example, in the fastest mode, with a 0 delay, a single analog channel can be scanned continuously at 1 Ms/s; two analog channels can be scanned at 500 kS/s each; 16 analog input channels can be scanned at 62.5 kS/s.

PCI-2500 Series digital inputs and counter inputs can be read in several modes. First, via software the digital inputs or counter inputs can be read asynchronously at anytime before, during, or after an analog input scan sequence. This mode is not deterministic as to exactly when the digital or counter input was read relative to an analog input channel.

In either of the two synchronous modes, the digital inputs and/or counter inputs are read with deterministic time correlation to the analog inputs. In the once-per-scan mode, all of the enabled digital inputs and counter inputs are read during the first analog measurement of an analog input scan sequence. The advantage of this mode as compared to most other boards is the digital and counter inputs do not consume an analog input time slot, and therefore do not reduce the available bandwidth for making analog input measurements. For example, presume all 24 bits of digital input are enabled, and all four 32-bit counters are enabled, and eight channels of analog inputs are in the scan sequence at the full 1 µs/channel rate. At the beginning of each analog input scan sequence, which would be 8 µs in total duration, all digital inputs and counter inputs will be measured and sent to the PC during the first µs of the analog scan sequence.

Another synchronous mode is where digital inputs are scanned every time an analog input channel is scanned. For example, if eight analog inputs are scanned at 1 µs per channel continuously, and 24 bits of digital inputs are enabled, then the 24 bits of digital inputs will be scanned at 24 bits per 1 µs. If counters are enabled in this mode, they will be scanned at once per scan, in the same manner as in the prior example.

Output Timing
The digital and analog outputs on the PCI-2500 Series can be updated asynchronously or synchronously in several modes. In the asynchronous mode, digital, and analog outputs can be updated at anytime before, during or subsequent to an analog input sequence. The maximum update rate in this mode is non-deterministic and entirely dependent on the PC processor speed, the operating system, and programming environment.

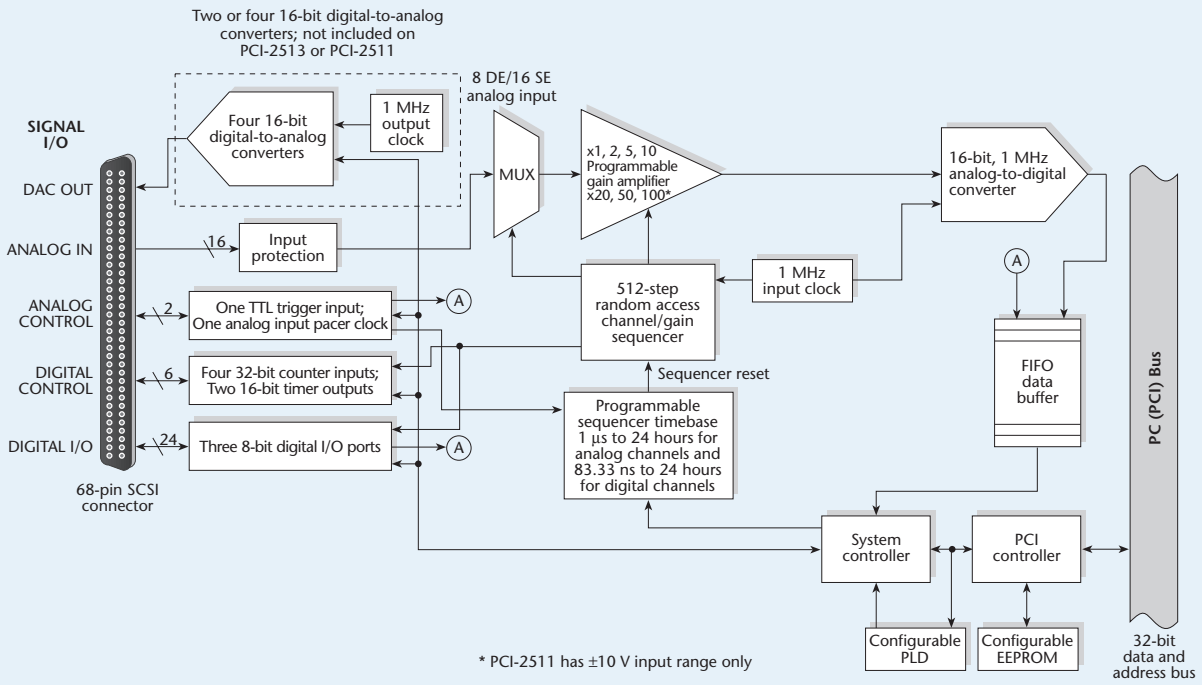
In the synchronous output modes, the outputs can be updated directly from memory in the PC, or as the direct result of an input from either an analog channel, digital channel, or counter channel. When updated from memory in the PC (via DMA), the user can specify the rate by which the output is updated in 20.83 ns intervals, and all outputs can be updated synchronously at a maximum rate of 1 µs. For example, all four 16-bit analog outputs can be generating different waveforms from PC memory with a 1 µs per channel update rate, while up to 16 bits of digital pattern can be generated from PC memory concurrently at the 1 µs per 16-bit update rate. Outputs can also be specified to update concurrently with inputs, so there is an exact timing correlation between inputs and outputs.

The other synchronous method of output control is where an output, either digital or analog, is associated with any input — analog, digital or counter. The state or level of the output is determined by the level or state of an associated input. For example, a digital output can be programmed for a logic 1 when an analog input exceeds a certain value, or when a freqency input exceeds a certain rate. In addition, hysteresis can be programmed for each limit to insure the output is stable near the transition point. Up to eight digital outputs and four analog outputs can be programmed to respond to any analog, digital or counter input. When analog or digital outputs are used in this mode, the user can specify two output values, determined by whether the input is above or below the limit.

* Single-ended ±10 V range on PCI-2511
** API programming can mix single-ended and differential channels

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PCI-2500 Series Block Diagram



The slowest rate by which an analog output can respond to an input is 4 µs plus the time period of a scan sequence. For example, if 4 channels of analog input are scanned continuously at 4 µs per scan, then the maximum latency between an analog input satisfying a limit, and the output responding, is 4 + 4 or 8 µs max. The worst-case response time can also be improved in several ways. For example, if a digital output is correlated to a digital input, then the worst-case latency can be reduced to 2 µs total if all digital inputs are scanned at the 1 µs rate without a delay period at the end of each scan.

In addition, an output status channel can be specified in the input scan sequence buffer so that users can correlate output state changes to their respective input channels within their data buffers and files. Adding the status channel takes no additional scan time and has no effect on the overall acquisition rate. The status channel can also be read asynchronously at any time during an acquisition for monitoring of the control outputs.

The advantage of this mode as compared to other boards is the response time can be in the range of 2 to 20 µs, versus 1000 or more microseconds when using other supplier's boards.

Analog Output
(PCI-2515 and PCI-2517 Only)

Two or four 16-bit, 1 MHz analog output channels are built into the PCI-2500 Series with an output range from -10 V to +10 V. Through the use of Bus Mastering DMA, each D/A output can continuously output a waveform at up to 1 MHz, which can be read from PC RAM or a file on the hard disk. In addition, a program can asynchronously output a value to any of the D/A channels for non-waveform applications, presuming that the D/A is not already being used in the waveform output mode. Lastly, each of the analog outputs can be used in a control mode, where their output level is dependent on whether an associated analog, digital or counter input is above or below a user-specified limit condition.

When used to generate waveforms, the D/As can be clocked in several different modes. Each D/A can be separately selected to be clocked from one of the sources described as follows.

Asynchronous Internal Clock. The on-board programmable clock can generate updates ranging from once every 19 hours to 1 MHz, independent of any acquisition rate.

Synchronous Internal Clock. The rate of analog output update can be synchronized to the acquisition rate derived from 1 MHz to once every 19 hours.

Asynchronous External Clock. A user-supplied external input clock can be used to pace the D/A, entirely independent of analog inputs.

Synchronous External Clock. A user-supplied external input clock can pace both the D/A and the analog input.

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Digital I/O

Twenty four TTL-level digital I/O lines are included in the PCI-2500 Series. Digital I/O can be programmed in 8-bit groups as either inputs or outputs, and can be scanned in several modes (see Input Scanning). Ports programmed as inputs can be part of the scan group and scanned along with analog input channels, or can be asynchronously accessed via the PC at any time, including when a scanned acquisition is occurring.

Two synchronous modes are supported when scanned along with analog inputs. One mode is where the digital inputs are scanned at the start of each scan sequence, which means the rate at which they are scanned is dependent on the number of analog input channels, and the delay period. For example, if 8 analog inputs are enabled with 0 delay period, then the digital inputs in this mode would be scanned at once per 8 µs, which is 125 kHz. In the other synchronous mode, the enabled digital inputs are scanned synchronously with every analog input channel. So in the example above, the digital inputs would be scanned at once per µs, or 1 MHz.

When no analog inputs are being scanned, the digital inputs can be scanned at up to 12 Ms/s.

Digital Outputs and Pattern Generation

Digital outputs can be updated asynchronously at anytime before, during or after an acquisition. Two of the 8-bit ports can also be used to generate a 16-bit digital pattern at up to 12 MHz. The PCI-2500 Series supports digital pattern generation via Bus Mastering DMA. In the same manner as analog output, the digital pattern can be read from PC RAM or a file on the hard disk. Digital pattern generation is clocked in the same four modes as described with analog output.

The ultra low-latency digital output mode allows a digital output to be updated based on the level of an analog, digital, or counter input. In this mode, the user associates a digital output bit with a specific input, and specifies the level of the input where the digital output changes state. The response time in this mode is dependent on the number of input channels being scanned, and can typically be in the range of 2 to 20 µs.

Counter Inputs

Four 32-bit counters are built into the PCI-2500 Series. Each of the four counters will accept frequency inputs up to 20 MHz, and each counter channel can be configured in a variety of modes including counter, period, pulse width, time between edges, or multi-axis quadrature encoder. The counters can concurrently monitor time periods, frequencies, pulses, and other event-driven incremental occurrences from encoders, pulse generators, limit switches, proximity switches, and magnetic pick-ups. As with all other inputs to the PCI-2500 Series, the counter inputs can be read asynchronously under program control, or synchronously as part of an analog and digital scan group based either on an internal programmable timer, or an external clock source. Counter inputs configured as Z-channel encoders or mapped channels must be read synchronously.

The PCI-2500 Series supports quadrature encoders with up to 2 billion pulses per revolution, 20 MHz input frequencies, and x1, x2, x4 count modes. With only A phase and B phase signals, 2 channels are supported. With A phase, B phase, and Z index signals, 1 channel is supported. Each input can be debounced from 500 ns to 25.5 ms (total of 16 selections) to eliminate extraneous noise or switch induced transients. Encoder input signals must be within -15 V to +15 V, and the switching threshold is TTL (1.3 V). Power is available for encoders, +5 V at up to 500 mA.

Timer Outputs

Two 16-bit timer outputs are built into the PCI-2500 Series, each capable of generating different square waves with a programmable frequency range from 16 Hz to 1 MHz.

Multiple Boards per PC

All of the features described for the PCI-2500 Series can be replicated with up to four PCI-2500 Series boards installed in the same PC. The serial number on each PCI-2500 Series board is used to differentiate one from another, and a user-selected name can be assigned to each board for easy program documentation. When multiple boards are installed, all boards can be operated synchronously by designating one board as the master. All of the other boards are then slaves, and are synchronized to the master via the pacer clock which is externally routed to the designated slave boards.

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Specifications

General

Power Consumption (per board): 3 W
Operating Temperature: 0 °C to +60 °C
PCI Bus: PCI r2.2 compliant, universal 3.3 V/5 V signaling support, compatible with PCI-X
Storage Temperature: -40 °C to +80 °C
Relative Humidity: 0 to 95% non-condensing
Vibration: MIL STD 810E cat 1 and 10
Signal I/O Connector: 68-pin standard "SCSI Type III" female connector
Dimensions: 165 mm W x 15 mm x 108 mm H (6.5" x 0.6" x 4.2")
Weight: 160 g (0.35 lbs)

Analog Inputs

Channels: 16 single-ended or 8 differential, programmable on a per channel basis as single-ended or differential†
Over-Voltage Protection: ±30 V without damage
Ranges: Software or sequencer selectable on a per channel basis, ±10 V, ±5 V, ±2 V, ±1 V, ±0.5 V, ±0.2 V, ±0.1 V†
Input Impedance: 10 MOhm single-ended; 20 MOhm differential
Total Harmonic Distortion: -80 dB typ for ±10 V range, 1 kHz fundamental
Signal to Noise and Distortion: 72 dB typ for ±10 V range, 1 kHz fundamental
Bias Current: 40 pA typ (0 °C to 35 °C)
Crosstalk: -67 dB typ DC to 10 kHz
Common Mode Rejection: -70 dB typ DC to 1 kHz

A/D Specifications

Maximum Usable Input Voltage + Common Mode Voltage	
Ranges	Maximum (CMV + Vin)
5, 10 V	10.5 V
0.1, 0.2, 0.5, 1, 2 V	6.0 V

Type: Successive approximation
Resolution: 16 bit
Maximum Sample Rate: 1 MHz
Nonlinearity (Integral): ±2 LSB max
Nonlinearity (Differential): ±1 LSB max

Input Sequencer

Analog, digital, and frequency inputs can be scanned synchronously, based on either an internal programmable timer, or an external clock source. Analog and digital outputs can be synchronized to either of these clocks.

Scan Clock Sources: 2

Note: The maximum scan clock rate is the inverse of the minimum scan period. The minimum scan period is equal to 1 µs times the number of analog channels. If a scan contains only digital channels then the minimum scan period is 83 ns times the number of digital channels.

1. **Internal, programmable**
   Analog channels from 1 µs to 1 sec in 20.83 ns steps
   Digital channels and counters from 83.33 ns to 1 sec in 20.83 ns steps
2. **External, TTL level input**
   Analog Channels down to 1 µs min
   Digital Channels and counters down to 83 ns min

Voltage Range*	Accuracy ±(% of reading + % Range) 23 °C ±10 °C, 1 year	Temperature Coefficient ±(ppm of reading + ppm Range)/°C 0 °C to 13 °C and 33 °C to 60 °C	Noise** (cts RMS)
-10 V to 10 V	0.031% + 0.008%	14 + 8	1.5
-5 V to 5 V	0.031% + 0.009%	14 + 9	2.0
-2 V to 2 V	0.031% + 0.010%	14 + 10	1.6
-1 V to 1 V	0.031% + 0.02%	14 + 12	2.5
-500 mV to 500 mV	0.031% + 0.04%	14 + 18	4.0
-200 mV to 200 mV	0.036% + 0.075%	14 + 12	5.0
-100 mV to 100 mV	0.042% + 0.15%	14 + 18	9.0

* Specifications assume differential input single channel scan, 1 MHz scan rate, unfiltered, CMV=0.0 V, 30 minute warm-up, exclusive of noise
** Noise reflects 10,000 samples at 1 MHz, typical, differential short, CA-16-3S
Note: PCI-2511 is single-ended only, 0.040% + 0.010% accuracy, 14 + 8 temperature coefficient, 2.0 noise

Programmable Parameters per Scan: Channel (random order), gain
Depth: 512 locations
On-Board Channel-to-Channel Scan Rate:
Analog: 1 MHz max
Digital: 12 MHz if no analog channels are enabled, 1 MHz with analog channels enabled

External Acquisition Scan Clock Input

Maximum Rate: 990 kHz
Clock Signal Range: Logical zero 0 V to 0.8 V; logical one 2.4 V to 5.0 V
Minimum Pulse Width: 50 ns high, 50 ns low

Triggering

Trigger Sources: 6, individually selectable for starting and stopping an acquisition. Stop acquisition can occur on a different channel than start acquisition; stop acquisition can be triggered via modes 2, 4, 5, or 6 described below.

1. **Single-Channel Analog Hardware Trigger**
   Any analog input channel can be software programmed as the analog trigger channel, including any of the analog expansion channels
   Input Signal Range: -10 to +10 V max
   Trigger Level: Programmable (12-bit resolution)
   Hysteresis: Programmable (12-bit resolution)
   Latency: 350 ns typ, 1.3 µs max
   Accuracy: ±0.5% of reading, ±2 mV offset
   Noise: 2 mV RMS
2. **Single-Channel Analog Software Trigger**
   Any analog input channel, including any of the analog expansion channels, can be selected as the software trigger channel. If the trigger channel involves a calculation, such as temperature, then the driver automatically compensates for the delay required to obtain the reading, resulting in a maximum latency of one scan period.
   Input Signal Range: Anywhere within range of the selected trigger channel
   Trigger Level: Programmable (16-bit resolution), including "window triggering"
   Latency: One scan period max
3. **Single-Channel Digital Trigger**
   A separate digital input is provided for digital triggering.
   Input Signal Range: -15 V to +15 V
   Trigger Level: TTL
   Minimum Pulse Width: 50 ns high, 50 ns low
   Latency: 100 ns typ, 1.1 µs max
4. **Digital Pattern Triggering**
   8- or 16-bit pattern triggering on any of the digital input ports. Programmable for trigger on equal, above, below, or within/outside of a window. Individual bits can be masked for "don't care" condition.
   Latency: One scan period max
5. **Counter/Totalizer Triggering**
   Counter/totalizer inputs can trigger an acquisition. User can select to trigger on a frequency or on total counts that are equal, above, below, or within/outside of a window.
   Latency: One scan period, max
6. **Software Triggering**
   Trigger can be initiated under program control.

Analog Outputs (PCI-2515 and PCI-2517 only)

Analog output channels are updated synchronously relative to scanned inputs, and clocked from either an internal on-board clock, or an external clock source. Analog outputs can also be updated asynchronously, independent of any other scanning in the system. Bus mastering DMA provides CPU and system-independent data transfers, ensuring accurate outputs that are irrespective of other system activities. Streaming from disk or memory is supported, allowing continuous waveform outputs (limited only by available PC system resources).

Channels: 2 (PCI-2515); 4 (PCI-2517)
Resolution: 16 bits
Data Buffer: PC-based memory
Output Voltage Range: ±10 V
Output Current: ±10 mA
Offset Error: ±0.0045 V max
Digital Feedthrough: <10 mV when updated
DAC Analog Glitch: <12 mV typical at major carry
Gain Error: ±0.01%
Update Rate: 1 MHz max, 19 hours min (no minimum with external clock), resolution 20.83 ns
Settling Time: 2 µs to rated accuracy
Clock Sources: 4, programmable

1. On-board D/A clock, independent of scanning input clock
2. Onboard scanning input clock
3. External D/A input clock, independent of external scanning input clock
4. External scanning input clock

† Except PCI-2511, which is limited to 16 single-ended analog inputs with a fixed range of ±10 V.

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PCI-2500 Series

Specifications & Ordering Information

Digital I/O

Channels: 24
Ports: 3 x 8-bit, each port is programmable as input or output
Input Scanning Modes: 2 programmable
1. Asynchronous, under program control at any time relative to input scanning
2. Synchronous with input scanning

Input Characteristics: 10 kOhm pull up to +5 V, 20pF to common
Input Protection: ±15 kV ESD clamp diodes
Input Levels:
Low: 0 to 0.8 V
High: +2.0 V to +5.0 V
Output Levels:
Low: <0.8 V
High: >2.0 V
Output Characteristics: Output 12 mA per pin, 200 mA total continuous
Sampling/Update Rate: 12 MHz max

Pattern Generation Output

Two of the 8-bit ports can be configured for 16-bit pattern generation. The pattern can also be updated synchronously with an acquisition at up to 12 MHz.

Counter

Each of the four high speed, 32-bit counter channels can be configured for counter, period, pulse width, time between edges, or multi-axis quadrature encoder modes. Counter inputs can be scanned synchronously along with analog and digital scanned inputs, based on an internal programmable timer, or an external clock source.
Channels: 4 x 32-bit
Input Frequency: 20 MHz max
Input Signal Range: -5 V to +10 V
Input Characteristics: 10 kOhm pull-up, ±15 kV ESD protection
Trigger Level: TTL
Minimum Pulse Width: 25 ns high, 25 ns low
Debounce Times: 16 selections from 500 ns to 25.5 ms; positive or negative edge sensitive; glitch detect mode or debounce mode
Time Base Accuracy: 30 ppm (0 ˚C to 50 ˚C)
Five Programmable Modes: Counter, Period, Pulsewidth, Timing, Encoder
Counter Mode Options: Totalize, Clear on Read, Rollover, Stop at all Fs, 16- or 32-bit, any other channel can gate or decrement the counter
Period Mode Options: Measure x1, 10, 100, or 1000 periods, 16- or 32-bit, 4 different time bases to choose from: 20.83 ns, 208.3 ns, 2.083 µs, 20.83 µs, any other channel can gate the period measurement
Pulsewidth Mode Options: 16- or 32-bit values, 4 different time bases to choose from: 20.83 ns, 208.3 ns, 2.083 µs, 20.83 µs, any other channel can gate the pulsewidth measurement
Timing Mode Options: 16- or 32-bit values, 4 different time bases to choose from: 20.83 ns, 208.3 ns, 2.083 µs, 20.83 µs
Encoder Mode Options: x1, 2, 4 options, 16- or 32-bit values, Z-channel clearing of counter, any other channel can gate the counter
Power Available for Encoders: 5 V @ 500 mA max
Multi-axis Quadrature Encoder Inputs:
- 1 channel with A (phase), B (phase), and Z (index)
- 2 channel with A (phase) and B (phase)
- x1, x2, and x4 count modes
- Single-ended TTL

Frequency/Pulse Generators

Channels: 2 x 16-bit
Output Waveform: Square wave
Output Rate: 1 MHz base rate divided by 1 to 65,535 (programmable)
High-Level Output Voltage: 2.0 V min @ -1.0 mA; 2.9 V min @ -400 µA
Low-Level Output Voltage: 0.4 V max @ 400 µA

Ordering Information

All boards include TracerDAQ® software included for acquiring and displaying data and generating signals; Universal Library includes support for Visual Studio® and Visual Studio® .NET, including examples for Visual C++®, Visual C#®, Visual Basic®, and Visual Basic® .NET; Comprehensive drivers for DASYLab® and NI LabVIEW™; Supported by MATLAB® Data Acquisition Toolbox™; InstaCal software utility for installation, calibration, and testing.

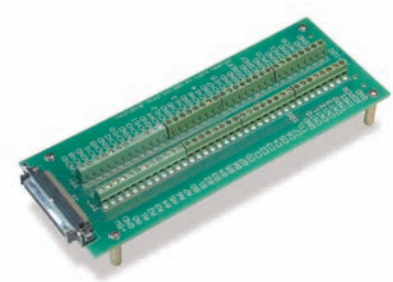
Description	Part No.
16-channel (single-ended), 1 MS/s, 16-bit analog input board with four counters and 24 digital I/O lines	PCI-2511
16-channel, 1 MS/s, 16-bit analog input board	PCI-2513
16-channel, 1 MS/s, 16-bit analog I/O board, two 16-bit analog outputs	PCI-2515
16-channel, 1 MS/s, 16-bit analog I/O board, four 16-bit analog outputs	PCI-2517

Accessories & Cables

Description	Part No.
Terminationboard with screw-terminals for access to PCI-2500 Series I/O	TB-100
Rack-mount kit, 19 in., for TB-100	RM-TB-100
BNC termination module with 16 BNC connectors and internal screw terminal connections	DBK215
Cable, 68-conductor shielded, 3 ft.	CA-68-3S
Cable, 68-conductor ribbon, 3 ft.	CA-68-3R
Cable, 68-conductor shielded, 6 ft.	CA-68-6S

Software

Icon-based data acquisition, graphics, control, and analysis software	DASYLab



The TB-100 termination board with screw terminals, provides access to all PCI-2500 Series I/O. The TB-100 can be panel mounted or 19" rack mounted using the optional RM-TB-100 rack mount.



The DBK215 provides 16 BNC connectors plus internal screw-terminal connections

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