

Wide Selection of Modular Instruments

Modular Instruments

Optimized for Automated Test



Overview

From entry-level to high-end products and from data acquisition to digital input/output, ADLINK provides a wide variety of modular instruments with the best price/performance ratio to enable cost-effective development of your measurement and automation systems. Four categories of instruments are available to fit your needs: high-speed digitizers, switches, digital multimeters, and arbitrary waveform generators.

High-Speed Digitizers

Digitizers offer a quick and precise way for input signal acquisition and are widely used in IC testing, video testing, automatic test equipment, radar and sonar testing, etc. ADLINK's PXI-9816, PXI-9826 and PXI-9846 are 4-CH 16-bit, 10/20/40MS/s simultaneous sampling digitizers. The PXI-9820/PCI-9820 is a 65 MS/s, high-resolution PXI/PCI-based digitizer with deep SODIMM SDRAM memory. The PCI-9812, PCI-9810 and PCI-9812A are 4-CH, 10 or 12-bit, 20 MS/s simultaneous-sampling analog input PCI cards.

Switches

Switches are widely used in automatic test equipment (ATE), process control systems, data acquisition systems, etc. ADLINK offers several types of switches to meet your application requirements. ADLINK switches include 16-CH general-purpose relays, 24-CH scanners or multiplexers, and a 32 cross-point two-wire matrix.

Digital Multimeters

ADLINK provides two series of digital multimeters: 7-1/2 digit and 6-1/2 digit digital multimeters. Both are available in PXI and PCI formats. The SMX2064/2060 and SM2064/2060 are 7-1/2 digit high-speed PXI/PCI digital multimeters, which maintain high accuracy at high measurement rates. The SMX2040 and SM2040 series are 6-1/2 digit PXI/PCI digital multimeters, which provide a combination of resolution, accuracy, and speed that surpasses rivals.

Arbitrary Waveform Generators

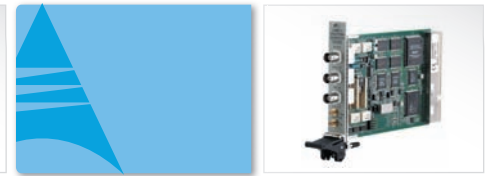
Arbitrary waveform generators generate user-defined signals in automation and measurement applications. The TE-5201, a singlechannel PXI-based AWG, provides a high-speed waveform to stimulate signal distortion, power line cycle dropouts, video signals, and power supply transients.

PXI/PCI High Speed Digitizers



Model Name	PXI-9846/9826/9816	PXI-9820/PCI-9820	PCI-9812(A)/PCI-9810
Bus Type	PXI	PXI / PCI	PCI
Analog Inputs	4-CH	2-CH	4-CH
Sampling Rate	40 MS/s (PXI-9846) 20 MS/s (PXI-9826) 10 MS/s (PXI-9816)	65 MS/s (External) 60 MS/s (Internal)	20 MS/s
Input Resolution (Bits)	16-Bit	14-Bit	12-Bit (PCI-9812/A) 10-Bit (PCI-9810)
Input Ranges	±1 V, ±0.2 V	±5 V, ±1 V	±5 V, ±1 V
Input Impedance	50 Ω, 1 MΩ	50 Ω, 1.5 MΩ	50 Ω, 1.25 KΩ, 1.5 MΩ
AI Bandwidth	20 MHz (PXI-9846) 9.6 MHz (PXI-9826) 5.1 MHz (PXI-9816)	30 MHz	19 MHz
Crosstalk, dB	<-75 dB, DC to 1MHz	<-80 dB, DC to 1MHz	<-75 dB, DC to 1MHz
I/O Connector	BNC, SMB	BNC, SMB	BNC
Onboard Memory	512 MB	512 MB, 128 MB	128 Ksamples (PCI-9812A) 32 Ksamples (PCI-9812/9810)
Digital Input	-	2-CH (PXI-9820)	3-CH
Analog Trigger	✓	✓	✓
Ext. Digital Trigger	✓	✓	✓
Ext. Clock	✓	✓	✓
System Synchronization Interface	✓	✓	-
Auto Calibration	✓	✓	-
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High Speed Arbitrary Waveform Generator



Model Name	TE-5201
Analog Output	1-CH
DAC Resolution	14-Bit
Update Rate	50 S/s to 100 MS/s
Output Range	80 mVpp to 8 Vpp into 50 Ω load
Output Impedance	50 Ω
Offset Range	0 to ±3.6 V, amplitude dependent
Standard Waveform	Sine, Triangle, Square, Pulse, Ramp, Sinc, Gaussian/Pulse, Exponential Decay/Rise Pulse, Noise, DC
Arbitrary Waveform Memory	1 M points
Sample Clock Modulation	FM, FSK, Ramped FSK, Sweep
SYNC/Marker	✓
10 MHz Reference IN	✓
Sine output	✓
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PXI Switch Modules



Model Name	PXI-7901	PXI-7921	PXI-7931
Description	General-purpose	Two-wire Multiplexer	4-groups 2x4 Two-wire Matrix
No. of Channel	16	24 (two-wire) 48 (one-wire)	32 (two-wire)
Relay Type	SPDT (1 Form C)	DPDT (2 Form C)	DPDT (2 Form C)
Max. Switching Current	3 A @ 20 V _{DC}	2 A @ 30 V _{DC}	2 A @ 30 V _{DC}
Max. Switching Voltage	220 V _{DC} , 250 V _{AC}	220 V _{DC} , 125 V _{AC}	220 V _{DC} , 125 V _{AC}
Max. Switching Power	50 VA, 60 W	50 VA, 60 W	50 VA, 60 W
Max. Carrying Current	3 A	2 A	3 A
Failure Rate	10 μA @ 10 mV _{DC}	10 μA @ 10 mV _{DC}	10 μA @ 10 mV _{DC}
Contact Resistance	150 mΩ max.	100 mΩ max.	150 mΩ max.
Scan List	1024 steps	1024 steps	1024 steps
Operation Speed	125 operations/s	125 operations/s	200 operations/s
PXI Trigger Bus	✓	✓	✓
Star Trigger	✓	✓	✓
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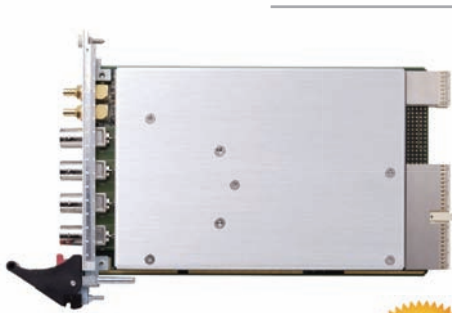
PXI/PCI Digital Multimeter



Model Name	SM2040, SM2042, SM2044, SMX2040, SMX2042, SMX2044	SM2060, SM2064 SMX2060, SMX2064
Max. Digits	6.5	7.5
Max. Measurement Rate	1000/sec	1400/sec, 20000/sec
DCV Ranges	330 mV to 330 V	240 mV to 330 V
ACV Ranges	330 mV to 250 V	240 mV to 330 V
2/4-Wire Ohms Measurement	✓	✓
DC/AC Current Measurement	✓	✓
Capacitance Measurement	SM2042, SM2044, SMX2042, SMX2044	SM2064, SMX2064
Inductance Measurement	SM2044, SMX2044	SM2064, SMX2064
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PXI-9816/9826/9846

4-CH 16-Bit 10/20/40 MS/s Digitizers with 512 MB SDRAM



Features

- 3U Eurocard form factor
 - Supports 5 V and 3.3 V PCI signals
 - Supports the 32-bit /66 MHz PCI interface
 - 4 channels of simultaneous single-ended analog input
 - 16-bit high resolution A/D converter
 - Up to 10 MS/s, 20 MS/s and 40 MS/s per channel
 - 512 MB on-board memory for data storage
 - Software selectable 50 Ω or 1 M Ω input impedance
 - Programmable input voltage range: ± 0.2 V, ± 1 V
 - 5.1 MHz, 9.6 MHz and 20 MHz analog input bandwidth for PXI-9816, PXI-9826 and PXI-9846, respectively
 - Multiple module synchronization via the PXI trigger bus
 - Supports scatter-gather DMA transfer
 - Fully automated calibration
- Operating Systems
 - Windows Vista/XP/2000
 - Linux
 - Recommended Software
 - AD-Logger
 - VB.NET/VC.NET/VB/VC/BCB/Delphi
 - DAQBench
 - Driver Support
 - DAQPilot for Windows
 - DAQPilot for LabVIEW™
 - DAQ-MTLB for MATLAB
 - WD-DASK for Linux
 - WD-DASK/X for Windows

Introduction

The ADLINK PXI-9816/9826/9846 are 10 MS/s, 20 MS/s, 40 MS/s sampling 16-bit 4-CH digitizers designed for digitizing high frequency and wide dynamic range signals with an input frequency up to 20 MHz. The analog input range can be programmed via software to ± 1 V or ± 0.2 V. With a deep onboard acquisition memory up to 512 MB, the PXI-9816/PXI-9826/PXI-9846 are not limited by the data transfer rate of the PCI bus to enable the recording of waveforms for extended periods of time.

The PXI-9816/PXI-9826/PXI-9846 are equipped with four high linearity 16-bit A/D converters ideal for demanding applications with a high dynamic range such as radar, ultrasound, and software-defined radio.

Analog Input

The PXI-9816/PXI-9826/PXI-9846 each feature four analog input channels. The bandwidth of each channel can be up to 5 MHz, 10 MHz, and 20 MHz for PXI-9816, PXI-9826, and PXI-9846, respectively. The input ranges are software programmable as either ± 1 V or ± 0.2 V. Software selectable 50 Ω input impedance makes it easy to interface to high speed high frequency signals.

Acquisition System and On-board Memory

The PXI-9816/PXI-9826/PXI-9846 include four 16-bit A/D converters to digitize the input signals. These four channels sample signals simultaneously at a maximum sampling rate of 10 MS/s, 20 MS/s, and 40 MS/s, respectively. The PXI-9816/PXI-9826/PXI-9846 supports a total of 512 MB on-board memory. The digitized data is stored in the on-board memory before being transferred to the host memory. The data transfer is performed using scatter-gather DMA, which provides a high data throughput rate and uses system memory more effectively. If the data throughput from digitizer is less than the available PCI bus bandwidth, the PXI-9816/PXI-9826/PXI-9846 also features an on-board 2 K-sample FIFO to achieve real-time transfer, directly to the host memory by bypassing the on-board memory.

Multiple-Module Synchronization

The versatile trigger options provided by the PXI backplane allow the PXI-9816/PXI-9826/PXI-9846 to achieve multi-module synchronization in a simplified way. Utilizing the PXI Trigger bus, the PXI-9816/PXI-9826/PXI-9846 can output trigger signals and the timebase to the PXI trigger bus when configured as a master, or receive trigger signals and the timebase from the PXI trigger bus when configured as a slave. Moreover, when the PXI-9816/PXI-9826/PXI-9846 is plugged into a peripheral slot of a PXI system, they can also receive triggers or the timebase from the PXI star trigger controller slot. The precision 10 MHz clock that comes from the PXI backplane can also be used as one of the timebase sources. Combining these PXI trigger features with the interface of the PXI-9816/PXI-9826/PXI-9846 makes it very easy to synchronize multiple modules.

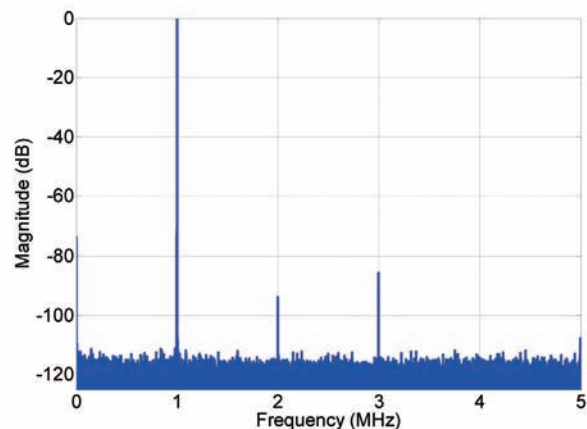
Specifications

Analog Input

- Number of channels: 4 single-ended channels
- Input impedance: 50 Ω or 1 M Ω , software selectable
- Input coupling: DC
- Input range: ± 0.2 V, ± 1 V
- ADC resolution: 16 bits, 1 in 65536
- Spectral Characteristics

Typical values are measured using 1 MHz sine wave input at 10MS/s with amplitude of -1dB of full scale on the ± 1 V range of PXI-9816. Acquired data length in 64K point, calculated with Hanning window FFT.

- SINAD: 77.6 dBc
- SNR: 78.5 dBc
- SFDR: 84.8 dBc
- THD: -84.2 dBc
- ENOB: 12.6-Bit



* Note that these dynamic parameters may vary from one unit to another, with input frequency and with the full scale input range selected.

- System Noise, unit in LSB_{RMS}:

Input Range	PXI-9816	PXI-9826	PXI-9846
±0.2V	9.0	12.0	17.0
±1V	3.0	4.0	7.0

- Offset Error: ±0.2mV, for all models in both input ranges
- Gain Error
 - ±0.2V input range: ±0.1%
 - ±1V input range: ±0.05%
- 3 dB Bandwidth, typical

Input Range	PXI-9816	PXI-9826	PXI-9846
±0.2V, ±1V	5.1 MHz	9.6 MHz	20 MHz

Timebase

- Sample clock sources
 - Internal: on-board oscillator
 - External: CLK IN (front panel SMB connector), PXI Trigger Bus[0..7], PXI 10 MHz, PXI Star
- Timebase frequency range
 - PXI-9816: 1 MHz - 10 MHz
 - PXI-9826: 1 MHz - 20 MHz
 - PXI-9846: 1 MHz - 40 MHz
- Sampling rate range (Internal Timebase divided by 24-bit divide counter)
 - PXI-9816: 10 MS/s - 0.596 S/s
 - PXI-9826: 20 MS/s - 1.192 S/s
 - PXI-9846: 40 MS/s - 2.384 S/s

Dedicate external clock input from panel

- Connector type: SMB
- Clock type: sine wave or square wave
- Input impedance: 50
- Input coupling: AC
- Input range: 1 V_{p-p} to 2 V_{p-p}
- Overvoltage protection: 2.5 V_{p-p}

Triggering

- Trigger sources: software, TRG IO (front panel SMB connector), analog trigger from CH0 - CH3, PXI Star, PXI Trigger Bus[0..7]
- Trigger modes: pre-trigger, post-trigger, middle-trigger, delay-trigger

TRG IO (front panel SMB connector, as input port)

- Connector type: SMB
- Compatibility: 3.3 V LVTTTL (5 V tolerant)
- Input high threshold (VIH): 2.0 V, minimum
- Input low threshold (VIL): 0.8 V, maximum
- Maximum input overload: -0.5 V to +5.5 V
- Trigger polarity: rising edge or falling edge, software programmable

TRG IO (front panel SMB connector, as output port)

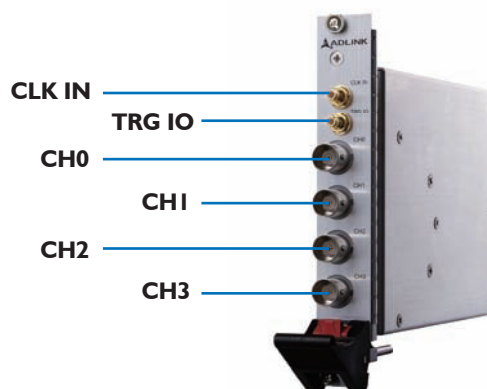
- Connector type: SMB
- Compatibility: 3.3 V LVTTTL
- Output high threshold: 2.4 V, minimum
- Output low threshold: 0.2 V, maximum

Analog Trigger

- Sources: AI CH0 - CH3
- Trigger slope: rising/falling
- Trigger level range: full scale input range
- Trigger level resolution: 256 steps in full scale range

Data Storage and Transfer

- On-board memory: 512 MB, share for four AI channels
- Data transfer: scatter-gather DMA



On-board Reference

- On-board reference voltage: +5 V
- Temperature drift: ±2 ppm/°C
- Stability: 6 ppm/1000 Hrs
- Recommended warm-up time: 15 minutes

General Specifications

- I/O Connector
 - BNC X4 for analog inputs
 - SMB X2 for external digital trigger and external timebase input
- Dimensions (not including connectors)
 - Single 3U PXI module, 100 mm by 160 mm
- PCI Bus Interface
 - PCI signaling: support 3.3 V and 5 V signaling
 - PCI interface: 32-bit, 66 MHz
- Operating Environment
 - Ambient temperature: 0°C to 55°C
 - Relative humidity: 10% to 90%, non-condensing
- Storage Environment
 - Ambient temperature: -20°C to 80°C
 - Relative humidity: 10% to 90%, non-condensing
- Power Requirement, typical:

Power Rails	PXI-9816	PXI-9826	PXI-9846
3.3 V	0.8 A	0.8 A	0.8 A
5 V	0.7 A	0.8 A	1.3 A
12 V	0.3 A	0.3 A	0.3 A

Certification

- EMC/EMI: CE, FCC Class A

Accessories

- SMB-SMB-1M**
1 meter SMB to SMB cable
- SMB-BNC-1M**
1 meter SMB to BNC cable

Ordering Information

- PXI-9816D/512**
4-CH 10 MS/s 16-Bit Digitizer with 512 MB Memory
- PXI-9826D/512**
4-CH 20 MS/s 16-Bit Digitizer with 512 MB Memory
- PXI-9846D/512**
4-CH 40 MS/s 16-Bit Digitizer with 512 MB Memory

PCI/PXI-9820

2-CH 65 MS/s 14-Bit Digitizers with SDRAM



PCI-9820



PXI-9820

Introduction

ADLINK's PCI/PXI-9820 is a 65 MS/s, high-resolution PXI digitizer with deep SODIMM SDRAM memory. The device features flexible input configurations, including programmable input ranges and user-configurable input impedance. With the deep onboard acquisition memory, the PCI-9820/PXI-9820 is not limited by the 132 MB/s bandwidth of PCI bus and can record the waveform for a long period of time. The PCI-9820/PXI-9820 is ideal for high-speed waveform capturing, such as radar and ultrasound applications, as well as software radio applications, or those signal digitizing applications which need deep memory for data storage.

Analog Input

The PCI/PXI-9820 device features two analog input channels. The small signal bandwidth of each channel exceeds 30 MHz. The input ranges are programmable as either ± 5 V or ± 1 V. The 14-bit A/D resolution makes the PCI/PXI-9820 ideal both for time-domain and frequency-domain applications.

Acquisition System

ADLINK PCI/PXI-9820 device uses a pair of 65 MS/s, 14-bit pipeline ADCs to digitize the input signals, and the device provides an internal 60 MHz timebase for data acquisition. The maximum real-time sampling rate is 60 MS/s with internal timebase, and is up to 65 MS/s with external timebase. By using a "ping pong" mode, the sampling rate is up to 120 MS/s with internal timebase or 130 MS/s with external timebase.

Acquisition Memory

The PCI/PXI-9820 device supports different size of SODIMM SDRAM ranging from 128 MB to 512 MB.

The digitized data are stored in the onboard SDRAM before being transferred to the host memory. The PCI/PXI-9820 device uses the scatter-gather bus-mastering DMA to move data to the host memory. If the data throughput from the PCI/PXI-9820 is less than the available PCI bus bandwidth, the PCI/PXI-9820 also features onboard 3 k-sample FIFO to achieve real-time transfer bypassing the SDRAM, directly to the host memory.

Triggering

The PCI/PXI-9820 device features flexible triggering functionalities, such as analog and digital triggering. The analog trigger features programmable trigger thresholds on rising or falling edges on both input channels. The 5 V/TTL digital trigger comes from PXI trigger bus or the external SMB connector for synchronizing multiple devices.

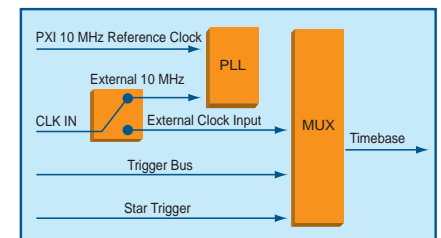
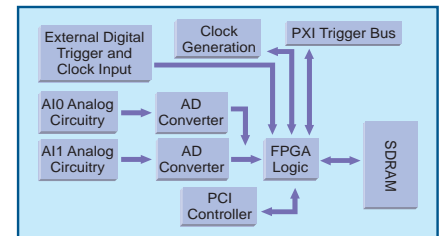
Post-trigger, pre-trigger, delay-trigger and middletrigger modes are available to acquire data around the trigger event. The PCI/PXI-9820 also features repeated trigger acquisition, so you can acquire data in multiple segments coming with successive trigger events at extremely short rearming interval.

Multiple-Module Synchronization

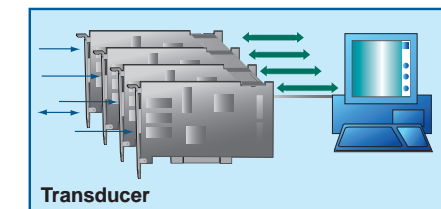
For PCI/PXI-9820, a proprietary bus named SSI (System Synchronization Interface) is designed to synchronize multiple PCI/PXI-9820 devices. SSI provides the timing and trigger synchronization between multiple cards by using a special ribbon cable to all the cards in a daisy-chain configuration. The PCI/PXI-9820 implements star trigger and trigger bus to route timing and trigger signals between one or more PCI/PXI-9820 and other PXI modules. These interfaces allow users to synchronize multiple PXI modules into a system easily. Timebase is also selectable. Users can choose to use the internal clock or the output of the onboard PLL with the reference clock from external clock input, or the PXI 10 MHz reference clock.

Calibration

The auto-calibration function of the PCI/PXI-9820 is performed with trim DACs to calibrate the offset and gain errors of the analog input channels. Once the calibration process is done, the calibration constant will be stored in EEPROM such that these values can be loaded and used as needed by the board. Because all the calibration is conducted automatically by software commands, users don't have to adjust trimpots to calibrate the modules manually.



Timebase Architecture, for PXI-9820 Only



Transducer

Features

- Supports a 32-bit 3.3 V or 5 V PCI bus
- PXI specifications Rev. 2.1 compliant 3U Eurocard form factor, CompactPCI compliant (PICMG 2.0 R3.0) (PXI-9820)
- 14-bit A/D resolution
- Up to 60 MS/s sampling rate per channel with internal timebase
- Up to 65 MS/s sampling rate per channel with external timebase
- Up to 130 MS/s sampling rate in "ping pong" mode
- 2-CH single-ended bipolar inputs
- >30 MHz -3 dB bandwidth
- Up to 512 MB onboard SODIMM SDRAM
- Programmable ranges of ± 1 V and ± 5 V
- User-configurable input impedance of 50 Ω or high input impedance
- Scatter-gather DMA
- Analog and digital triggering
- 2-CH synchronous digital inputs (PXI-9820)
- Fully auto calibration
- Multiple modules synchronization capability

Operating Systems

- Windows Vista/XP/2000/2003
- Linux
- Windows CE (call for availability)

Recommended Software

- AD-Logger
- VB.NET/VC.NET/VB/VB++/BCB/Delphi
- DAQBench

Driver Support

- DAQPilot for Windows
- DAQPilot for LabVIEW™
- DAQ-MTLB for MATLAB®
- WD-DASK for Linux
- WD-DASK/X for Windows

Specifications

Analog Input

- Number of channels: 2 simultaneous-sampled single-ended
- Resolution: 14 bits
- Maximum sampling rate
 - 65 MS/s for 2 inputs
 - 130 MS/s for Ping-Pong mode using external timebase
- Onboard sample memory
 - 128 MB or 512 MB
- Bandwidth (-3 dB): 30 MHz minimum
- Input signal ranges: (software programmable) ± 5 V, ± 1 V
- Input Coupling: DC
- Overvoltage protection

Range	Overvoltage protection
± 5 V	± 14 V
± 1 V	± 5 V

- Input Impedance (soldering selectable): 50 Ω , 1.5 M Ω
- Crosstalk: < -80 dB, DC to 1 MHz
- Total harmonic distortion (THD): -75 dB
- Signal-to-Noise ratio (SNR)

Range	SNR
± 5 V	66 dB
± 1 V	62 dB

- Spurious-free dynamic range (SFDR): 75 dB
- Data transfer: bus-mastering DMA with scatter-gather

Auto Calibration

- Onboard reference: +5 V
- Onboard reference temperature drift: 2 ppm/ $^{\circ}$ C
- Stability: 6 ppm/1000 Hrs

External Timebase Input

- PCI-9820: direct external timebase input
PXI-9820: 10 MHz input for PLL or direct external timebase input
- Connector: SMB
- Impedance: 50 Ω
- Coupling: AC
- Input amplitude: 1 V_{pp} to 2 V_{pp}
- Overvoltage protection: 2.5 V_{pp}
- Frequency range: 500 kHz - 65 MHz

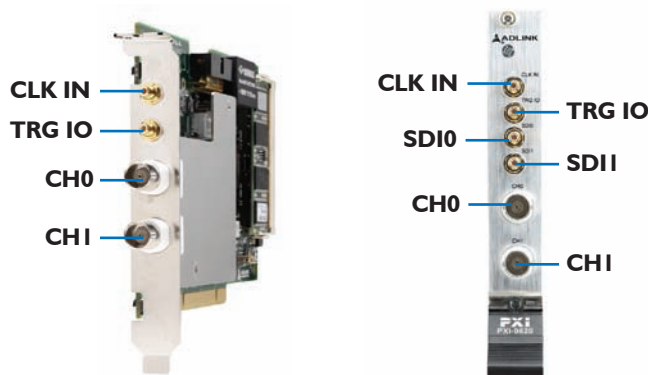
Triggering

Analog Triggering

- Modes: pre-trigger, post-trigger, middle-trigger, delay-trigger
- Sources: CH0 and CH1
- Slope: rising/falling
- Coupling: DC
- Trigger sensitivity: 256 steps in full-scale voltage range

Digital triggering

- Modes: pre-trigger, post-trigger, middle-trigger, delay-trigger
- Source: external digital trigger from SMB
- Slope: rising/falling
- Compatibility: 5 V/TTL
- Minimum pulse width: 10 ns
- Repeated trigger rearming interval: 2 cycles of timebase
- Pre-trigger depth: 128 MB or 512 MB, depending on memory option
- Post-trigger depth: 128 MB or 512 MB, depending on memory option



Synchronous Digital Input (For PXI-9820 Only)

- Number of channels: 2
- Compatibility: 5 V/TTL
- Data transfer: bus-mastering DMA with scatter/gather

General Specifications

- I/O connector
 - BNC x 2 for analog inputs
 - SMB x 4 for external digital trigger, external time base, and synchronous digital inputs
- Operating temperature: 0 $^{\circ}$ C to 50 $^{\circ}$ C
- Storage temperature: -20 $^{\circ}$ C to 80 $^{\circ}$ C
- Relative humidity: 5% to 95%, non-condensing
- Power requirements

Power Rail	Current	
	PXI-9820	PCI-9820
5 V	900 mA typical	895 mA
12 V	305 mA typical	295 mA
3.3 V	360 mA typical (with 128 MB SDRAM)	310 mA (with 128 MB SDRAM)
	500 mA typical (with 512 MB SDRAM)	430 mA (with 512 MB SDRAM)

- Dimensions (not including connectors)
PCI-9820: 175 mm x 107 mm
PXI-9820: 160 mm x 100 mm

Certificate

- EMC/EMI: CE, FCC Class A

Accessories

Cable	Description	PXI-9820	PCI-9820
SMB-SMB-1M	1-meter SMB to SMB cable	√	√
SMB-BNC-1M	1-meter SMB to BNC cable	√	√
ACL-SSI-2	SSI Bus cable for 2 devices	-	√
ACL-SSI-3	SSI Bus cable for 3 devices	-	√
ACL-SSI-4	SSI Bus cable for 4 devices	-	√



SMB-SMB-1M



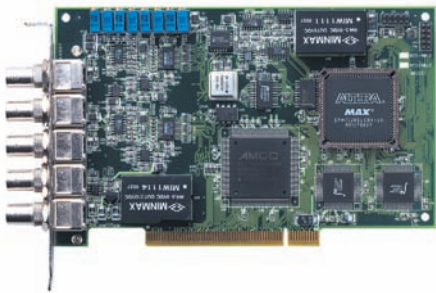
SMB-BNC-1M

Ordering Information

- PXI-9820D/128**
2-CH 65 MS/s 14-Bit Digitizer with 128 MB Memory
- PXI-9820D/512**
2-CH 65 MS/s 14-Bit Digitizer with 512 MB Memory
- PCI-9820D/128-0**
2-CH 65 MS/s 14-Bit Digitizer with 128 MB Memory
- PCI-9820D/512-0**
2-CH 65 MS/s 14-Bit Digitizer with 512 MB Memory

PCI-9812/9812A/9810

4-CH 10/12-Bit 20 MS/s Simultaneous-Sampling Analog Input Cards



Introduction

ADLINK's PCI-9812, PCI-9810 and PCI-9812A are 4-CH, 10 or 12-bit, 20 MS/s simultaneous-sampling analog input cards. The high-speed analog input channels are single-ended, with hardware programmable input ranges of ± 1 V, ± 5 V and input impedances of 50 Ω , 1.25 k Ω and 15 M Ω . The onboard 32 k-sample A/D FIFO can buffer so data throughput is less than 100 Mbytes/s, the FIFO performs as the temporary A/D sample buffer, and as a rule of thumb, no data loss will occur. When four channels operate at 20 MS/s simultaneously, each sample generates two bytes, resulting in 160 Mbytes/s (4 channels * 20 M * 2 bytes) throughput, which exceeds the peak 132 Mbyte/s bandwidth of PCI bus. To avoid data loss, the 32 k-sample FIFO is the limitation of sample count. For applications requiring a larger number of samples at full sampling rate, the PCI-9812A features 128 k sample A/D FIFO for storage.

In addition to the onboard 40 MHz time base, users are able to supply the external time base in either sine wave or digital forms. The PCI-9810 and PCI-9812 also feature external digital trigger and programmable analog trigger, thus the conversion start point of multiple cards can be synchronized to external events. The trigger modes include software-trigger, pre-trigger, post-trigger, middle-trigger and delay trigger, further expands the capabilities of these high-speed devices.

ADLINK's PCI-9812, PCI-9810 and 9812A deliver cost-effective and reliable data acquisition capabilities and are ideal for vibration testing, image digitizing, ultrasonic measurement, biomedical research, ATE and other high-end industrial, scientific, and military applications.

Features

- Supports a 32-bit 3.3 V or 5 V PCI bus
- 12-bit A/D resolution (PCI-9812 and PCI-9812A)
- 10-bit A/D resolution (PCI-9810)
- Up to 20 MS/s simultaneous-sampling rate
- > 17 MHz -3 dB bandwidth
- 4-CH single-ended inputs
- Bipolar analog input ranges
- User-selectable input impedance of 50 Ω or high-input impedance
- Onboard 32 k-sample A/D FIFO (PCI-9810 and PCI-9812)
- Onboard 128 k-sample A/D FIFO (PCI-9812A)
- Analog and digital triggering
- External clock input for customized conversion rate
- Bus-mastering DMA for analog inputs
- 3-CH TTL digital inputs
- Compact, half-size PCB

Operating Systems

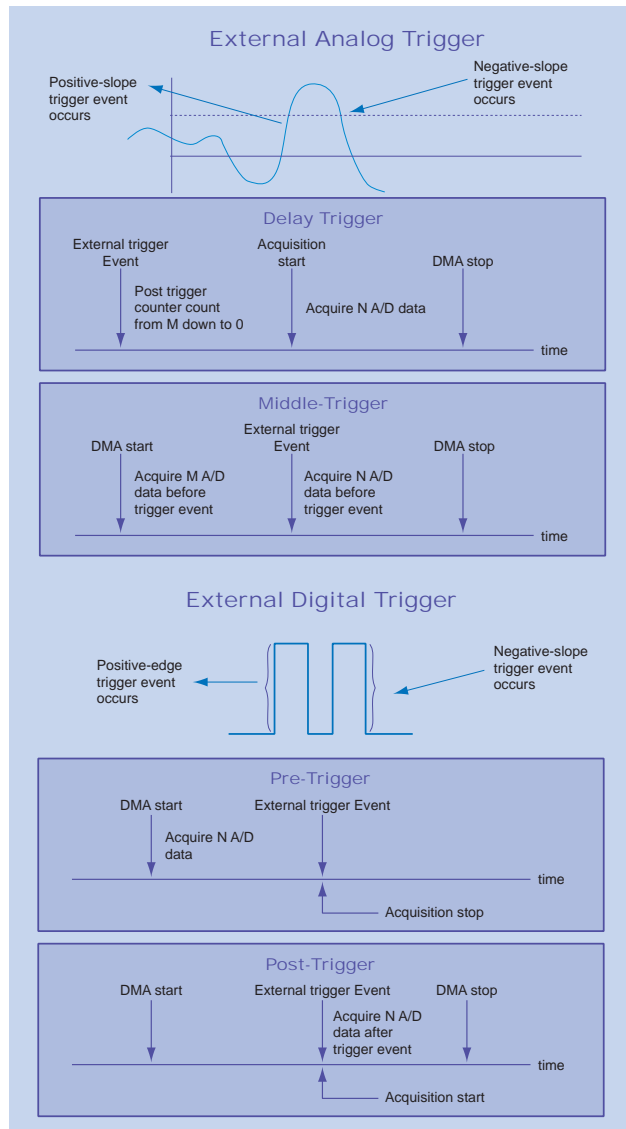
- Windows Vista/XP/2000/2003
- Linux
- Windows CE (call for availability)

Recommended Software

- AD-Logger
- VB.NET/VC.NET/VB/VC++/BCB/Delphi
- DAQBench

Driver Support

- DAQPilot for Windows
- DAQPilot for LabVIEW™
- DAQ-MTLB for MATLAB®
- PCIS-DASK for Windows
- PCIS-DASK/X for Linux



Specifications

Analog Input

- Number of channels: 4 single-ended Resolution
 - 12-bit (PCI-9812 and PCI-9812A)
 - 10-bit (PCI-9810)
- Maximum sampling rate: 20 MS/s
- Input signal ranges, impedance and overvoltage protection

Input Range	Model	Input Impedance	Overvoltage protection
±1 V		50 Ω	±2 V
		15 MΩ	
±5 V		50 Ω	±10 V
		1.25 kΩ	

- Accuracy: ±1.5 % typical
- DNL: ±0.4 LSB typical, ±1.0 LSB maximum
- INL: ±1.9 LSB typical
- Input coupling: DC
- Trigger sources: software, analog and digital trigger (5 V/TTL compatible)
- Trigger modes: software-trigger, pre-trigger, post-trigger, middle-trigger & delay trigger
- FIFO buffer size
 - 32 k samples (PCI-9810 & PCI-9812)
 - 128 k samples (PCI-9812A)
- Data transfers: bus-mastering DMA

Triggering

- Analog Trigger
 - Modes: pre-trigger, post-trigger, middle-trigger, delay-trigger
 - Source: CH0, CH1, CH2 and CH3
 - Slope: rising/falling
 - Coupling: DC
 - Trigger sensitivity: 256 steps in full-scale voltage range
- Digital Triggering
 - Modes: pre-trigger, post-trigger, middle-trigger, delay-trigger
 - Source: external digital trigger
 - Slope: rising edge
 - Compatibility: 5 V/TTL
 - Minimum pulse width: 25 ns

External Sine Wave Clock

- Input coupling: AC
- Input impedance: 50 Ω
- Input frequency: 300 kHz to 40 MHz
- Input range: 1.0 to 2.0 V_{pp}
- Overvoltage protection: 2.5 V_{pp}

External Digital Clock

- Input coupling: DC
- Input impedance: 50 Ω
- Compatibility: 5 V/TTL
- Input frequency: 20 kHz to 40 MHz
- Overvoltage protection: diode clamping, -0.3 V to +5.3 V

Digital Input

- Number of channels: 3
- Compatibility: 5 V/TTL with 10 KΩ pull down resistors
- Overvoltage protection: Diode clamping, -0.3 V to +5.3 V
- Data transfers: bus-mastering DMA with A/D samples

General Specifications

- I/O connector
 - BNC x 5
 - 10-pin ribbon male
- Operating temperature: 0°C to 40°C
- Storage temperature: -20°C to 70°C
- Relative humidity: 5% to 95 %, non-condensing
- Power requirements

Device	+5 V
PCI-9812	1.4 A typical
PCI-9812A	
PCI-9810	1 A typical

- Dimensions (not including connectors)
173 mm x 108 mm

Pin Assignment

(BNC): Analog Inputs & External Sine Wave Clock

CH0	1	Shield: GND
CH1	2	Shield: GND
CH2	3	Shield: GND
CH3	4	Shield: GND
Ext. Sine Wave CLK	5	Shield: GND

Pin Assignment

(Ribbon male): External Digital Clock, Digital Trigger & Digital Inputs

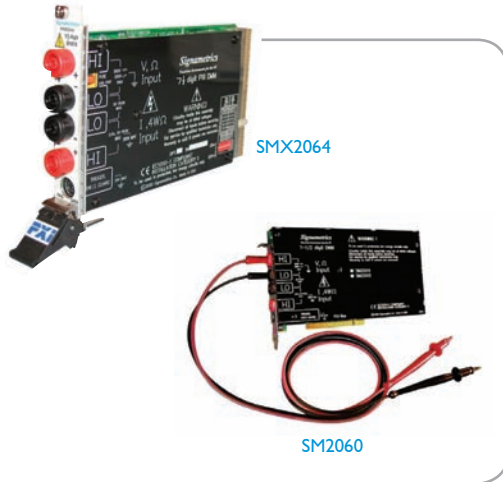
Ext. Digital CLK	1	2	GND
Ext. Digital TRIG	3	4	GND
D10	5	6	GND
D11	7	8	GND
D12	9	10	GND

Ordering Information

- PCI-9810**
4-CH 10-Bit 20 MS/s Simultaneous-Sampling Analog Input Card with 32 k-Sample A/D FIFO
- PCI-9812**
4-CH 12-Bit 20 MS/s Simultaneous-Sampling Analog Input Card with 32 k-Sample A/D FIFO
- PCI-9812A**
4-CH 12-Bit 20 MS/s Simultaneous-Sampling Analog Input Card with 128 k-Sample A/D FIFO

SMX2064/2060, SM2064/2060 Series

7-1/2 Digit Digital Multimeters



Introduction

The SMX2064/2060 and SM2064/2060 series are 7-1/2 digit high-speed digital multimeters in PXI and PCI form factors, which maintain high accuracy at high measurement rates. The measurement speed is up to 20,000 readings/second for the SMX2064 and SM2064. The SMX206x and SM206x series provides a comprehensive set of DMM capabilities, including 2-wire, 4-wire, and 6-wire guarded resistance measurements; inductance and capacitance; leakage and temperature; frequency and timing; sourcing of voltage and current; and much more. The SMX2064/2060 and SM2064/2060 series digital multimeters are easy to setup and use, have sophisticated analog and digital circuitry to provide repeatable measurements, and are protected to handle any unexpected situation your measurement environment may encounter. With high performance and variable applications, the SMX2064/2060 and SM2064/2060 series are suitable for automated production testing, laboratory automation, and portable/field testing.

Specifications

Specifications subject to change without notice.

For the most current and complete specifications, please refer to the user manual.

Features

- Flexible, full-featured auto-ranging DMM
- 7-1/2 digit resolution
- 20,000 readings/second (SMX2064, SM2064)
- 1,400 readings/second (SMX2060, SM2060)
- DC & AC voltage & current, 2-wire, 4-wire, 6-wire (SMX2064, SM2064) ohms
- Frequency and time measurements
- Capacitance & inductance measurements (SMX2064, SM2064)
- Voltage & current sourcing (SMX2064, SM2064)
- Precise trigger capabilities
- 330 V isolation barrier
- Self-calibrating
- Plug-and-Play software with graphical user interface
- Fully programmable with Visual Basic, C++, LabVIEW™, etc.

Operating Systems

- Windows 98/NT/2000/XP/2003

Recommended Software

- VB/VC++/BCB/Delphi
- DAQBench

DC Functions

DC Voltage

Accuracy ± (% of reading + Volts) [1]

240 mV	Full scale 7-1/2 Digits	Resolution	Input Resistance	24 hours 23°C±1°C	90 Days 23°C±5°C	One Year 23°C±5°C
240 mV	240.00000 mV	10 nV	> 10 GΩ	0.003 + 1 μV	0.004 + 1.5 μV	0.005 + 2 μV
2.4 V	2.4000000 V	100 nV	> 10 GΩ	0.002 + 3 μV	0.0025 + 5 μV	0.003 + 5 μV
24 V	24.000000 V	1 μV	10 MΩ	0.004 + 120 μV	0.005 + 130 μV	0.006 + 150 μV
240 V	240.00000 V	10 μV	10 MΩ	0.003 + 250 μV	0.004 + 300 μV	0.005 + 0.5 mV
330 V	330.00000 V	10 μV	10 MΩ	0.005 + 550 μV	0.01 + 700 μV	0.015 + 0.8 mV

[1] With Aperture set to ≥ 0.5 sec, and within one hour from Self Calibration (S-Cal)

DC current

Accuracy ± (% of reading + Amps) [1]

240 mV	Full scale 7-1/2 Digits	Resolution	Max Burden Voltage	24 hours 23°C±1°C	90 Days 23°C±5°C	One Year 23°C±5°C
240 nA[2]	240.0000 nA	0.1 pA	100 μV	0.07 + 40 pA	0.1 + 45 pA	0.17 + 60 pA
2.4 μA[2]	2.400000 nA	1 pA	100 μV	0.05 + 70 pA	0.08 + 90 pA	0.21 + 150 pA
24 μA[2]	24.00000 μA	10 pA	100 μV	0.05 + 400 pA	0.08 + 600 pA	0.13 + 0.8 nA
240 μA[2]	240.000 μA	10 nA	2.5 mV	0.052 + 200 nA	0.07 + 300 nA	0.1 + 400 nA
2.4 mA	2.400000 mA	10 nA	25 mV	0.05 + 300 nA	0.06 + 400 nA	0.07 + 550 nA
24 mA	24.00000 mA	1 μA	250 mV	0.05 + 350 nA	0.065 + 450 nA	0.08 + 550 nA
240 mA	240.000 mA	100 nA	55 mV	0.05 + 50 μA	0.055 + 60 μA	0.065 + 80 μA
2.4 A	2.400000 A	10 μA	520 mV	0.3 + 60 μA	0.4 + 70 μA	0.45 + 90 μA

[1] With Aperture set to ≥ 0.96 sec, and within one hour from zero (Relative control).

[2] Available only with the SMX2064 and SM2064.

2-Wire Resistance

Accuracy ± (% of reading + Ω) [1]

Range [3]	Full scale 7-1/2 Digits	Resolution	Source Current	24 hours 23°C±1°C	90 Days 23°C±5°C	One Year 23°C±5°C
24 Ω[2]	24.000000 Ω	1 μΩ	10 mA	0.0038 + 1.4 mΩ	0.005 + 1.6 mΩ	0.008 + 2 mΩ
240 Ω	240.00000 Ω	10 μΩ	1 mA	0.0037 + 4.5 mΩ	0.0046 + 5 mΩ	0.007 + 6 mΩ
2.4 kΩ	2.4000000 kΩ	100 μΩ	1 mA	0.0023 + 28 mΩ	0.004 + 32 mΩ	0.006 + 33 mΩ
24 kΩ	24.000000 kΩ	1 mΩ	100 μA	0.0025 + 300 mΩ	0.004 + 330 mΩ	0.006 + 350 mΩ
240 kΩ	240.00000 kΩ	10 mΩ	10 μA	0.0055 + 3.2 Ω	0.006 + 4 Ω	0.007 + 5 Ω
2.4 MΩ	2.4000000 MΩ	100 mΩ	1 μA	0.018 + 40 Ω	0.03 + 50 Ω	0.04 + 70 Ω
24 MΩ	24.00000 MΩ	100 Ω	100 nA	0.12 + 400 Ω	0.13 + 500 Ω	0.2 + 600 Ω
240 MΩ[2]	240.000 MΩ	1 kΩ	10 nA	0.8 + 20 kΩ	1.0 + 30 kΩ	1.3 + 50 kΩ

[1] With Aperture set to ≥ 0.5 Sec, and within one hour from Self Calibration (S-Cal).

[2] Ranges are only with the SMX2064, SM2064.

[3] Test voltages are 2.4 V max with the exception of the 24 Ω and 240 Ω ranges at 240 mV.

4-Wire Resistance

Accuracy ± (% of reading + Ω) [1]

Range [3]	Full scale 7-1/2 Digits	Resolution	Source Current	24 hours 23°C±1°C	90 Days 23°C±5°C	One Year 23°C±5°C
24 Ω[2]	24.000000 Ω	1 μΩ	10 mA	0.0038 + 0.7 mΩ	0.005 + 0.8 mΩ	0.008 + 1 mΩ
240 Ω	240.00000 Ω	10 μΩ	1 mA	0.0037 + 3 mΩ	0.0046 + 4 mΩ	0.007 + 5 mΩ
2.4 kΩ	2.4000000 kΩ	100 μΩ	1 mA	0.0023 + 28 mΩ	0.004 + 32 mΩ	0.006 + 33 mΩ
24 kΩ	24.000000 kΩ	1 mΩ	100 μA	0.0025 + 300 mΩ	0.004 + 330 mΩ	0.006 + 350 mΩ
240 kΩ	240.00000 kΩ	10 mΩ	10 μA	0.0055 + 3.2 Ω	0.007 + 4 Ω	0.007 + 5 Ω
2.4 MΩ	2.4000000 MΩ	100 mΩ	1 μA	0.018 + 40 Ω	0.03 + 50 Ω	0.04 + 70 Ω
24 MΩ	24.00000 MΩ	100 Ω	100 nA	0.12 + 400 Ω	0.13 + 500 Ω	0.2 + 600 Ω

[1] With Aperture set to ≥ 0.5 Sec, and within one hour from Self Calibration (S-Cal).

[2] Ranges are only with the SMX2064, SM2064.

[3] Test voltages are 2.4 V max with the exception of the 24 Ω and 240 Ω ranges at 240 mV.

Diode Characterization

Maximum Diode Voltage Compliance	Available DC Current Uncertainty	Typical Current Value	Typical Voltage Value Uncertainty
4 V	100 nA, 1 μ A, 10 μ A, 100 μ A and 0.02% 1 mA (SMX2064 and SM2064 10 mA & 12.5 mA)	1%	0.02%

AC Functions

AC Voltage (true RMS) One Year Accuracy \pm (% of reading + Volts), 23°C \pm 5°C

Range [3]	Full scale 7-1/2 Digits	Resolution	10 Hz - 20 Hz	20 Hz - 47 Hz	47 Hz - 10 kHz	10 kHz - 50 kHz	50 kHz - 100 kHz
240 mV	240.00000 mV	100 nV	3.2 + 430 μ V	0.4 + 200 μ V	0.15 + 120 μ V	0.27 + 230 μ V	2.0 + 400 μ V
2.4 V	2.4000000 V	1 μ V	3.2 + 2.5 mV	0.4 + 1.7 mV	0.065 + 1.2 mV	0.35 + 1.5 mV	2.1 + 2 mV
24 V	24.000000 V	10 μ V	3.3 + 20 mV	0.4 + 16 mV	0.073 + 13 mV	0.22 + 25 mV	1.5 + 40 mV
240 V	240.00000 V	100 μ V	3.3 + 200 mV	0.4 + 150 mV	0.06 + 130 mV	0.30 + 200 mV	1.6 + 300 mV
330 V	330.00000 V	100 μ V	3.3 + 200 mV	0.45 + 250 mV	0.09 + 230 mV	0.32 + 300 mV	1.6 + 400 mV

AC Current (true RMS) One Year Accuracy \pm (% of reading + Amps), 23°C \pm 10°C

Range	Full scale 6-1/2 Digits	Resolution	Max Burden	10 Hz - 20 Hz[1]	20 Hz - 47 Hz[1]	47 Hz - 1 kHz[1]	1 kHz - 10 kHz[1]
2.4 mA	2.400000 mA	1 nA	25 mV	2.9 + 4 μ A	1.0 + 4 μ A	0.12 + 4 μ A	0.22 + 4 μ A
24 mA	24.00000 mA	10 nA	250 mV	2.8 + 30 μ A	1.0 + 30 μ A	0.16 + 30 μ A	0.4 + 40 μ A
240 mA	240.0000 mA	100 nA	55 mV	2.8 + 400 μ A	1.0 + 400 μ A	0.2 + 220 μ A	0.4 + 400 μ A
2.4 A	2.400000 A	1 μ A	520 mV	2.7 + 5 mA	0.9 + 6 mA	0.35 + 4 mA	0.5 + 5 mA

[1] All AC Current ranges have typical measurement capability to 20 kHz.

Time Functions

Frequency and Period

ACV Mode

Input RMS Voltage range	Input Impedance	Frequency Range	Period Range	Resolution	Uncertainty
24 mV - 250 V	1 M Ω with < 300 pF	2 Hz - 300 kHz	0.5 s - 3.33 μ s	5 1/2 digits	\pm 0.002% of reading

ACI Mode

Input Signal range	Input Impedance	Frequency Range	Period Range	Resolution	Uncertainty
0.33 mA - 2.5 A	10 Ω (3 mA & 30 mA) 0.1 Ω (330 mA & 2.5 A)	2 Hz - 500 kHz	0.5 s - 2.0 μ s	5 1/2 digits	\pm 0.01% of reading

Pulse Width

Polarity	Frequency Range	Resolution	Width Range	Typical Uncertainty
Positive or negative pulse widths	2 Hz to 100 kHz	1 μ s	2 μ s to 1 s	0.01% of reading \pm 4 μ s

Threshold DAC

Selected VAC Range	Threshold range (DC level)	Threshold DAC resolution	Highest allowed input Vp-p	Typical one year setting uncertainty
240 mV	-1.0 V to +1.0 V	0.5 mV	1.900 V	0.2% + 4 mV
2.4 V	-10.0 V to +10.0 V	5.0 mV	19.00 V	0.2% + 40 mV
24 V	-100.0 V to +100.0 V	50 mV	190.0 V	0.2% + 0.4 V
240 V	-400 V to 400 V	500 mV	850.0 V	0.2% + 4 V

Totalizer

Active edge polarity	Maximum Count	Allowed rate	Condition
Positive or negative transition	10 [~] 9	1 to 30,000 events per second	Uses Threshold DAC

Capacitance and Inductance Specifications (SMX2064 and SM2064 only)

Capacitance Accuracy \pm (% of reading + farads) [1]

Range	Full scale Reading	Resolution	One Year 23°C \pm 5°C	Measurement Time	Measurement Rate (rps)
1,200 pF	1,199.9 pF	0.1 pF	1.5 \pm 0.25 pF	52.3 ms	19.1
12 nF	11,999 nF	1 pF	1.2 \pm 5 pF	118 ms	8.5
120 nF	119,99 nF	10 pF	1.0	127 ms	7.9
1.2 μ F	1,1999 μ F	100 pF	1.0	175 ms	5.7
12 μ F	11,999 μ F	1 nF	1.0	480 ms	2.1
120 μ F	119,99 μ F	10 nF	1.0	50.3 ms	19.9
1.2 mF	1,1999 mF	100 nF	1.2	151.5 ms	6.6
12 mF	50,000 mF	1 μ F	2	170 ms	5.9

[1] Within one hour of zero, using relative control. Accuracy is specified for values higher than 5% of the selected range with the exception of the 1,200 pF range.

Inductance

Accuracy \pm (% of reading + henrys)

Range	Test Frequency	Full Scale 4 1/2 Digits	Resolution	One Year Accuracy 23°C \pm 5°C [1]
24 μ H	75k Hz	33,000 μ H	1 nH	3.0% + 500 nH
240 μ H	50 kHz	330,00 μ H	10 nH	2.0% + 3 μ H
2.4 mH	4 kHz	3,300 mH	100 nH	1.5% + 25 μ H
24 mH	1.5 kHz	33,000 mH	1 μ H	1.5% + 200 μ H
240 mH	1 kHz	330,00 mH	10 μ H	2.5 + 3 mH
2.4 H	100 Hz	3,300 H	100 μ H	3.0 + 35 mH

[1] Accuracy is specified for values greater than 5% of the selected range.

Other measurement functions of SMX2064 and SM2064 6-wire guarded resistance, extended resistance, AC peak-to-peak voltage, AC crest factor, AC median value, leakage current, RTD temperature, thermocouple temperature

Source Function (SMX2064 and SM2064 only)

- DC Voltage Source
 - Output range: -10,000 V to +10,000 V
 - DAC resolution: 18 bits (closed loop), 12 bits (open loop)
- AC Voltage Source
 - Output range: 900 mV to 8 V
 - DAC resolution: 12 bits
 - Frequency range/resolution: 1 Hz to 200 kHz/2 mHz
- DC Current Source
 - Output range: 1.25 μ A to 12.5 mA

Trigger Functions

- External Hardware Trigger (at DIN-7 connector)
 - Trigger input voltage level range: +3 V to +15 V
 - Minimum trigger input current: 1 mA
- Analog Threshold Trigger
 - Trigger point: selectable positive or negative transition of set threshold
 - Captures up to 120 post-trigger readings for apertures > 625 μ s
 - Captures up to 80 post-trigger readings for apertures > 625 μ s
- Delayed Hardware Trigger
 - Up to 65 m Sec with 1 μ s resolution
 - Up to 1 s with 2 μ s resolution

General Specifications

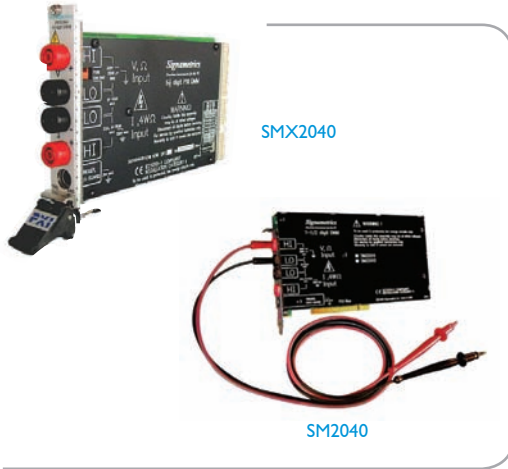
- Overload Protection (voltage inputs): 330 VDC, 250 VAC
- Isolation: 330 VDC, 250 VAC from earth ground
- Maximum Input (Volt x Hertz):
 - 8x10⁶ volts x Hz normal mode input
 - 1x10⁶ volts x Hz common mode input
- Calibration: Calibrations are performed by Signametrics in a computer at 23°C internal temperature rise. All calibration constants are stored in a text file.
- Operating Temperature: -10°C to 65°C
- Storage Temperature: -40°C to 85°C
- Power requirements: +5 V, 300 mA maximum
- Dimensions (not including connectors):
 - SMX2064/2060: 160 mm x 100 mm
 - SM2064/2060: 208 mm x 112 mm
- Safety: Designed to IEC 1010-1, Installation Category II

Ordering Information

- **SMX2064**
7-1/2 digits PXI Digital Multimeter with LCR Meter
- **SMX2060**
7-1/2 digits PXI Digital Multimeter
- **SM2064**
7-1/2 digits PCI Digital Multimeter with LCR Meter
- **SM2060**
7-1/2 digits PCI Digital Multimeter

SMX2040, SM2040 Series

6-1/2 Digit Digital Multimeters



Introduction

The SMX2040 and SM2040 series are 6-1/2 digit digital multimeters which provide a combination of resolution, accuracy, and speed that surpasses rivals. A 6-1/2 digit display, 0.0045% basic DCV accuracy and 1,000 readings per second assure accurate, fast, and repeatable measurements. The SMX2040 and SM2040 series is designed as a universal, multi-function DMM. Measurements commonly associated with "high-end" system DMMs are standard features with the SMX2040 and SM2040 family, such as 2-wire, 4-wire and 6-wire guarded resistance measurements, inductance and capacitance, leakage and temperature, RMS and peak-to-peak, frequency and timing, sourcing of voltage and current, and much more. The SMX2044 and SM2044 are best suited for applications demanding precision sources with simultaneous measurements such as in parametric testing, while the SMX2040 and SM2040 fit the bill where basic DMM functions are required, such as telecommunication, aerospace, automotive and education fields.

Specifications

Specifications subject to change without notice.
For the most current and complete specifications, please refer to the user manual.

Features

- Flexible, full-featured auto-ranging DMM
- 6-1/2 digit resolution
- Up to 1,000 readings/second
- DC & AC Volts & Current, 2-Wire, 4-Wire Ohms
- True AC RMS measurements, 10 Hz to 100 kHz
- Measures 1 μ V to 330 V
- Frequency Counter 1 Hz to 300 kHz
- Capacitance, Inductance, Leakage, 6-Wire Guarded Resistance, Temperature measurements (SMX2042/2044, SM2042/2044)
- 330 V Isolation Barrier
- Self-Calibrating
- Plug-and-Play, Windows® 98/NT/2000/XP/2003
- Language support - Visual Basic, MSVisual C++, Delphi
- Package support - LabVIEW™, LabWindows/CVI,
- TestPoint, ATEasy, Matlab, VBA & more.

Operating Systems

- Windows 98/NT/2000/XP/2003

Recommended Software

- VB/VC++/BCB/Delphi
- DAQbench

DC Functions

DC Voltage

Accuracy \pm (% of reading + Volts) [1]

Range	Full scale 6-1/2 Digits	Resolution	Input Resistance	24 hours 23°C \pm 1°C	90 Days 23°C \pm 5°C	One Year 23°C \pm 5°C
330 mV	330.0000 mV	100 nV	> 10 G Ω	0.003 + 4.5 μ V	0.004 + 5.5 μ V	0.007 + 8 μ V
3.3 V	3.300000 V	1 μ V	> 10 G Ω	0.002 + 10 μ V	0.0025 + 12 μ V	0.0045 + 17 μ V
33 V	33.00000 V	10 μ V	10 M Ω	0.003 + 250 μ V	0.004 + 280 μ V	0.007 + 330 μ V
330 V	330.0000 V	100 μ V	10 M Ω	0.004 + 1 mV	0.005 + 1.2 mV	0.008 + 1.5 mV

[1] With reading rate set to 10 readings per second (rps) or slower, and within one hour of DCV zero, using relative control.

DC Current

Accuracy \pm (% of reading + Amps) [1]

Range	Full scale 5-1/2 Digits	Resolution	Max Burden Voltage	24 hours 23°C \pm 1°C	90 Days 23°C \pm 5°C	One Year 23°C \pm 5°C
3.3 mA	3.30000 mA	10 nA	350 mV	0.052 + 200 nA	0.07 + 350 nA	0.1 + 400 nA
33 mA	33.0000 mA	100 nA	350 mV	0.04 + 1 μ A	0.06 + 2 μ A	0.1 + 3 μ A
330 mA	330.000 mA	1 μ A	350 mV	0.05 + 30 μ A	0.055 + 40 μ A	0.075 + 60 μ A
2.5 A	2.50000 A	10 μ A	350 mV	0.55 + 50 μ A	0.6 + 200 μ A	0.65 + 350 μ A

[1] With reading rate set to 10 rps or slower, and within one hour of DCI zero, using relative control.

2-Wire and 4-Wire Resistance

Accuracy \pm (% of reading + Ω) [1]

Range [3]	Full scale 6-1/2 Digits	Resolution	Source Current	24 hours 23°C \pm 1°C	90 Days 23°C \pm 5°C	One Year 23°C \pm 5°C
33 Ω [2]	33.00000 Ω	10 $\mu\Omega$	10 mA	0.0038 + 1 m Ω	0.005 + 1.5 m Ω	0.008 + 2 m Ω
330 Ω	330.0000 Ω	100 $\mu\Omega$	1 mA	0.0037 + 4.5 m Ω	0.0046 + 5 m Ω	0.007 + 6 m Ω
3.3 k Ω	3.300000 k Ω	1 m Ω	1 mA	0.0023 + 28 m Ω	0.004 + 32 m Ω	0.005 + 33 m Ω
33 k Ω	33.00000 k Ω	10 m Ω	100 μ A	0.0025 + 300 m Ω	0.0033 + 330 m Ω	0.006 + 350 m Ω
330 k Ω	330.0000 k Ω	100 m Ω	10 μ A	0.0055 + 3.2 Ω	0.007 + 4 Ω	0.009 + 5 Ω
3.3 M Ω	3.300000 M Ω	1 Ω	1 μ A	0.018 + 40 Ω	0.03 + 50 Ω	0.04 + 70 Ω
33 M Ω	33.0000 M Ω	100 Ω	100 nA	0.12 + 400 Ω	0.13 + 500 Ω	0.2 + 600 Ω
330 M Ω [2]	330.00 M Ω	1 k Ω	10 nA	1 + 50 k Ω	1.4 + 60 k Ω	2.0 + 80 k Ω

[1] With reading rate set to 2 rps or slower, and within one hour of Ohms zero, using relative control.

[2] 33 Ω and 330 M Ω ranges are only available with the SMX2042, SMX2044, SM2042 and SM2044.

[3] 4-wire ohms is available up to the 330 k Ω range.

Diode Characterization

Maximum Diode Voltage Compliance	Available DC current Uncertainty	Typical Current Value	Typical Voltage Value Uncertainty
4 V	100 nA, 1 μ A, 10 μ A, 100 μ A and 1 mA (SMX2044 and SM2044: 10 mA constant current plus variable current from 10 nA to 12.5 mA)	1%	0.02%

AC Functions

AC Voltage (true RMS)

One Year Accuracy \pm (% of reading + Volts), 23°C \pm 5°C

Range [3]	Full scale 6-1/2 Digits	Resolution	10Hz - 20Hz	20Hz - 47Hz	47Hz - 10kHz	10kHz - 50kHz	50kHz-100kHz
330 mV	330.0000 mV	100 nV	3.2 + 430 μ V	0.95 + 200 μ V	0.15 + 120 μ V	0.63 + 230 μ V	5.6 + 400 μ V
3.3 V	3.300000 V	1 μ V	3.2 + 2.5 mV	1.0 + 1.7 mV	0.065 + 1.2 mV	0.70 + 1.5 mV	5.3 + 2 mV
33 V	33.00000 V	10 μ V	3.3 + 20 mV	1.0 + 16 mV	0.073 + 13 mV	0.35 + 25 mV	2.4 + 40 mV
250 V	250.0000 V	100 μ V	3.3 + 200 mV	1.0 + 150 mV	0.06 + 130 mV	0.45 + 200 mV	3.2 + 300 mV

AC Current (true RMS)

One Year Accuracy \pm (% of reading + Volts), 23°C \pm 5°C

Range [3]	Full scale 6-1/2 Digits	Resolution	Max Burden Voltage (RMS)	10Hz - 20Hz[1]	20Hz - 47Hz[1]	47Hz - 1kHz[1]	1kHz - 10kHz[1]
3.3 mA	3.300000 mA	1 nA	350 mV	2.9 + 4 μ A	1.0 + 4 μ A	0.12 + 4 μ A	0.22 + 4 μ A
33 mA	33.00000 mA	10 nA	350 mV	2.8 + 30 μ A	1.0 + 30 μ A	0.16 + 30 μ A	0.4 + 40 μ A
330 mA	330.0000 mA	100 nA	350 mV	2.8 + 400 μ A	1.0 + 400 μ A	0.22 + 220 μ A	0.6 + 400 μ A
2.5 A	2.500000 A	1 μ A	350 mV	2.7 + 5 mA	0.9 + 6 mA	0.65 + 4 mA	0.7 + 5 mA

[1] All AC Current ranges have typical measurement capability to 20 kHz.

Time Functions (SMX2042, SMX2044, SM2042 and SM2044)

Frequency and Period

ACV Mode

Input RMS Voltage range	Input Impedance	Frequency Range	Period Range	Resolution	Uncertainty
33 mV - 250 V	1 MΩ with < 300 pF	1 Hz - 300 kHz	1 s - 3.33 μs	5 1/2 digits	± 0.002% of reading

ACI Mode

Input RMS Voltage range	Input Impedance	Frequency Range	Period Range	Resolution	Uncertainty
0.33 mA - 2.5 A	10 Ω (3 mA & 30 mA) 0.1 Ω (330 mA & 2.5 A)	1 Hz - 500 kHz	1 s - 2.0 μs	5 1/2 digits	± 0.01% of reading

Pulse Width

Polarity	Frequency Range	Resolution	Width Range	Typical Uncertainty
Positive or negative pulse widths	1 Hz to 100 kHz	2 μs	2 μs to 1 s	0.01% of reading ± 4 μs

Threshold DAC

Selected VAC Range	Threshold range (DC level)	Threshold DAC resolution	Highest allowed input Vp-p	Typical one year setting uncertainty
330 mV	-1.0 V to +1.0 V	0.5 mV	1.900 V	0.2% + 4 mV
3.3 V	-10.0 V to +10.0 V	5.0 mV	19.00 V	0.2% + 40 mV
33 V	-100.0 V to +100.0 V	50 mV	190.0 V	0.2% + 0.4 V
250 V	-500 V to 500 V	500 mV	850.0 V	0.2% + 4 V

Totalizer

Active edge polarity	Maximum Count	Allowed rate	Condition
Positive or negative transition	10 [^] 9	1 to 30,000 events per second	Uses Threshold DAC

Capacitance and Inductance Specifications (SMX2042, SMX2044, SM2042 and SM2044)

Capacitance

Accuracy ± (% of reading + farads) [1]

Range	Full scale Reading	Resolution	One Year 23°C±5°C
10 pF	11.999 nF	1 pF	2.1 ± 5 pF
100 nF	119.99 nF	10 nF	1.0
1 nF	1,199.9 pF	100 nF	1.0
10 μF	11.999 nF	1 μF	1.0
100 μF	119.99 nF	10 μF	1.0
1 mF	1,199.9 μF	100 mF	1.2
10 mF	11.999 μF	1 mF	2

[1] Within one hour of zero, using relative control. Accuracy is specified for values higher than 5% of the selected range with the exception of the 10 nF range, which measures down to 0 pF.

Inductance (SM2044 and SMX2044 only)

Accuracy ± (% of reading + farads) [1]

Range	Test Frequency	Full Scale 4 1/2 Digits	Resolution	One Year Accuracy 23°C±5°C [1]
33 μH	75 kHz	33.000 μH	1 nH	3.0% + 500 nH
330 μH	50 kHz	330.00 μH	10 nH	2.0% + 3 μH
3.3 mH	4 kHz	3.3000 mH	100 nH	1.5% + 25 μH
33 mH	1.5 kHz	33.000 mH	1 μH	1.5% + 200 μH
330 mH	1 kHz	330.00 mH	10 μH	2.5 + 3 mH
3.3 H	100 Hz	3.3000 H	100 μH	3.0 + 35 mH

[1] Within one hour of zero, and Open Terminal Calibration. Accuracy is specified for values greater than 5% of the selected range.

Other measurement functions of the SMX2044 and SM2044: 6-wire guarded resistance, AC peak-to-peak voltage, AC crest factor, AC median value, leakage current, RTD temperature, in circuit AC-based capacitance

Source Functions (SMX2044 and SM2044 only)

- DC Voltage Source
 - Output range: -10.000 V to +10.000 V
 - DAC resolution: 18 bits (closed loop), 12 bits (open loop)
- AC Voltage Source
 - Output range: 50 mV to 7.1 V_{RMS}
 - DAC resolution: 16 bits (closed loop), 12 bits (open loop)
 - Frequency range/resolution: 2 Hz to 75 kHz/ 2 Hz
- DC Current Source
 - Output range: 1.25 μA to 12.5 mA

Trigger Functions

- External Hardware Trigger (at DIN-7 connector)
 - Trigger input voltage level range: High: +3 V to +15 V, Low: -15 V to +0.8 V
 - Trigger high current drive: Min. 1 mA, Max 10 mA (TTL or CMOS logic level)
- PXI Bus Hardware Trigger Inputs (at PXI J2)
 - Trigger Input: TTL or CMOS positive pulse
 - Trigger Pulse Width: Minimum 250 μs
- PXI Bus Hardware Trigger Outputs (to PXI J2)
 - Trigger Output: TTL or CMOS negative pulse. Positive edge = ready
 - Trigger Pulse Width: Approximately 140 μs
- Analog Threshold Trigger
 - Captures up to 64 post-trigger readings
 - Reading rate: 10 rps or higher

General Specifications

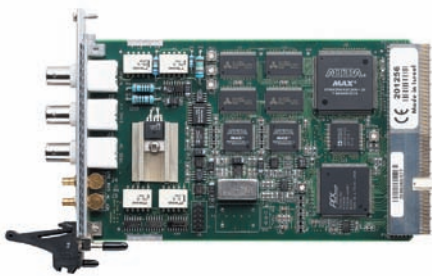
- Reading Rate (user selectable):
 - 0.5 to 1,000 readings per second (rps)
 - Up to 10 rps, 6 1/2 digits
 - Up to 30 rps, 5 1/2 digits
- Overload Protection (voltage inputs): 330 V_{DC}, 250 V_{AC}
- Isolation: 330 V_{DC}, 250 V_{AC} from Earth Ground
- Maximum Input (Volt x Hertz):
 - 8x10⁶ Volt x Hz normal mode input
 - 1x10⁶ Volt x Hz common mode input
- Calibration: Calibrations are performed by Signametrics in a computer at a 3 °C internal temperature rise. All calibration constants are stored in a text file.
- Operating Temperature: -10 °C to 70 °C
- Storage Temperature: -65 °C to 85 °C
- Power requirements: +5 volts, 300 mA maximum
- Dimensions (not including connectors):
 - SMX2040 series: 160 mm x 100 mm
 - SM2040 series: 208 mm x 112 mm
- Safety: Designed to IEC 1010-1, Installation Category II

Ordering Information

- **SMX2044**
6-1/2 digits PXI LCR Sourcing Digital Multimeter
- **SMX2042**
6-1/2 digits PXI Multi-Function Digital Multimeter
- **SMX2040**
6-1/2 digits PXI Digital Multimeter
- **SM2044**
6-1/2 digits PCI LCR Sourcing Digital Multimeter
- **SM2042**
6-1/2 digits PCI Multi-Function Digital Multimeter
- **SM2040**
6-1/2 digits PCI Digital Multimeter

TE-520 I

100 MS/s Arbitrary Waveform Generator



Features

- 100 MS/s clock
- 10 digits resolution
- Multiple instrument synchronization
- 14-bit vertical resolution
- 2 MS memory depth
- Ultra fast waveform downloads using DMA
- Low phase noise carrier
- Internal trigger generation
- Frequency agility: FSK, ramped FSK, sweep, FM
- Sequence generator controls 128 k segments

Operating Systems

- Windows Vista/XP/2000/2003

Recommended Software

- ARBDetector

Introduction

The TE-520 I is a 100 MS/s, full performance, arbitrary waveform generator on a 3U PXI form factor. The single channel AWG generates waveforms up to 2 MS in length. The clock in/clock out connector provides a synchronized platform for up to six plug-in arbitrary generators, as well as for other plug-in instruments. Built in sequencing technology links up to 4096 memory segments and repeats each segment up to 32 k times.

Specifications

- Number of Output Channel: 1

Multiple Instrument Synchronization

- Description: Multiple instruments can be connected together and synchronized to provide multi-channel synchronization
- Sample Clock
 - Source: From Master card to slave boards through the local bus
 - Range & Resolution: Same as Sample Clock range and resolution
 - Initial Skew: < 15 ns to the first master; 15 ns cumulative to additional slaves
- Sample Clock: Internal
 - Range: 50 S/s to 100 MS/s
 - Resolution: 10 digits limited by 1 μ Hz
 - Accuracy: Same as reference
 - Stability: Same as reference
 - Standard
 - System clock > 0.01% (100 ppm)
 - Option
 - System clock > 0.0001% (1 ppm TCXO) initial tolerance over a 19 °C to 29 °C temperature
 - Range: 1 ppm/ °C below 19 °C and above 29 °C ; 1 ppm/year aging rate
 - External
 - 10 MHz TTL, 50 % \pm 2 % duty cycle

Sample Clock Modulation

- FM
 - Description: Sample clock can be frequency modulated by internal waveforms that are resident in internal memory (fixed waveforms)
 - Modulation Source: Internal sine square, triangle and ramp
 - Modulation Freq. Range: 2 mHz to 100 kHz
 - Resolution: 10 digits
 - Accuracy: 0.1 %
 - Peak Freq. Deviation: DC 50 MHz
 - Advance: Automatic, triggered, gated or software command
 - Marker
 - Output and level same as SYNC output.
 - Position: Fixed at carrier frequency

FM-Downloaded Arbitrary Waveforms

- Description: Sample clock can be frequency modulated arbitrary waveforms that are downloaded by the user (user waveforms)
- Modulation Source: User waveform, any shape, 10 to 20000 waveform points
- Mod. Sample Clock Range: 1 mS/s
 - Resolution: 7 digits
 - Accuracy: 0.1%
- Peak Sample Clock Dev: DC to 100 MHz
- Advance: Automatic, triggered, gated or software command
- Marker:
 - Output and Level: Same as SYNC output
 - Position: Programmable for selected sample clock frequency
- Waveform Download: 5 M points per second.

FSK

- Description: Current segment is sampled continuously. External low TTL level programs carrier sample clock, external high TTL level programs shifted sample clock frequency. Sample clock changes coherently between frequencies. FSK operates in arbitrary waveforms only.
- Carrier Sample Clock Range: 50 S/s to 100 MS/s
- FSK Stimuli
 - External: Front panel Trigger input BNC
 - Low level = carrier sample clock
 - High level = hop frequency
- Frequency: Ranges from 10 MHz to DC
- Internal: Same as internal trigger range
- FSK Delay: Minimum 1 waveform cycle + 50 ns



Ramped FSK

- Description: Same as FSK except carrier sample clock ramps to shifted frequency at a rate defined by the ramp time parameter. External low TTL level programs carrier sample clock, external high TTL level programs shifted frequency
- Ramp Time Range 10 μ s to 1 s, 3 digits, ± 0.1 %

Sweep

- Description: Sample clock sweeps continuously from start to stop, at a rate defined by the sweep time. More complex sweep modes and types can be generated using the FM mode in conjunction with the FM composer program
- Type: Linear or logarithmic
- Direction: Up or down, depending on the start and stop setting
- Range: 50 mS/s to 100 MS/s
- Time: 1 ms to 1000 s, 7 digits, ± 0.1 %
- Advance: Automatic, triggered, gated or software command
- Marker
 - Output and Level: Same as SYNC output.
 - Position: Programmable for selected frequency

Operating Modes

- Normal: Continuous waveform is generated
- Triggered: Each input cycle generates a single output cycle
- Gated: External signal enables generator. First output cycle synchronous with the active slope of the triggering signal. Last cycle of output waveform always completed
- External Burst: Preset number of up to 128 k cycles stimulated by an internal, or external. This mode is not available in Sequencer mode

Trigger Sources

- External
 - Input: Front panel BNC
 - Level: TTL
 - Slope Positive or negative, programmable
 - Frequency: 5 MHz to DC
- Internal
 - Range: 100 mHz to 2 MHz
 - Resolution: 7 digits
 - Accuracy: 0.1 %
- Backplane: TTL Trig0 through TTL Trig7, STAR
- Software: SCPI command

System Delay

- Trigger to waveform out: 1 Sample Clock + 120 ns

Standard Waveforms Library

- Waveforms: Sine, Triangle, Square, Pulse, Ramp, Sinc, Gaussian Pulse, Exponential decay/Rise Pulse, Noise, DC
- Frequency Range: Waveform dependent

Arbitrary Waveform

- Waveform Memory: 1 M points, 2 M points optional
- Memory Segmentation
 - Number of Segments: 1 to 64 K (128 K with 2 Mb option)
 - Min Segment Size: 16 points
 - Memory Interleave: 4 (All trace lengths must be multiples of 4)
 - Vertical Resolution: 14 bits (16,384 points)
- Sine Wave Performance
 - Sine wave performance is measured using the maximum sample clock rate, at 5 Vpp, the maximum amplitude resolution of the DAC (14-bit) and without filters. Spectrum analyzer settings: Start frequency = 0 MHz; stop frequency = 50 MHz (Nyquist frequency)
- Sine wave Total Harmonic Distortion: 0.3 % to 1 MHz
- Harmonics and non-related spurious
 - Below 10 MHz
 - < -55 dBc for carrier frequencies < 1 MHz
 - < -40 dBc for carrier frequencies < 5 MHz
 - < -25 dBc for carrier frequencies < 25 MHz

Sequenced Arbitrary Waveform

- Operation: Permits division of the memory bank into smaller segments. Segments may be linked, and repeated in user-configurable fashion to generate extremely long waveforms
- Advance Modes
 - Automatic Sequence Advance: No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table. Stepped Sequence Advance: Current segment is sampled continuously, external trigger advances to next programmed segment. Control input is TRIG IN connector

- Single Sequence Advance: Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment. Control input is the TRIG IN connector
- Mixed Sequence Advance: Each step of a sequence can be programmed to advance either a) automatically (Automatic Sequence Advance), or b) with a trigger (Stepped Sequence Advance)
 - Advance Source: External, internal, or soft trigger
 - Sequencer steps from: 1 to 4096
 - Segment loops from: 1 to 128 k

Outputs

- Waveform Output
 - Connector: Front panel BNC
 - Stand-by: Output Off or Normal
 - Impedance: 50 Ω , ± 1 %
 - Protection: Protected against temporary short to case ground
 - Amplitude:
 - Range: 80 mVpp to 8 Vpp, at 50 Ω load; 160 mVpp to 16 Vpp, for open circuits
 - Resolution: 3.5 digits
 - Accuracy (1 kHz):
 - $\pm(1\%+25\text{ mV})$, 1.000 V to 10 Vpp
 - $\pm(1\%+5\text{ mV})$, 80 mV to 999.9 mVpp
 - Offset: Offset is attenuated with amplitude
 - Range: 0 to ± 3.6 V, amplitude dependent
 - Resolution: 22 mV
- Accuracy
 - ± 4 V window $\pm(1\%$ of reading + 1 % if amplitude + 2 mV)
 - ± 400 mV window $\pm(1\%$ of reading + 1 % if amplitude + 200 μ V)
 - Filters: 25 MHz and 50 MHz, 7-pole elliptic

Square Wave, Pulse

- Rise/Fall time: < 10 ns, 10 % to 90 % of amplitude
- Aberration: < 5 %
- SYNC/Marker Output Description: Provides dual functionality. All functions and modes, this output generates sync pulse, which is synchronous with the output waveform. In FM and sweep modes only, this output generates a marker having properties similar to the sync pulse output
- Connector: Front panel BNC
- Impedance: 50 Ω , ± 1 %
- Level: > 2 V into 50 Ω , 4 V nominal into 10 k Ω
- Protection: Protected against temporary short to case ground
- Position: Point 0 to n, Programmable with 4-point resolution

Sine Output

- Description: An output that is directly derived from the sample clock generator and has an output frequency equal to the programmed sample clock frequency. This output generates sine waveforms that corresponds to sample clock setting, including modulated waveform, such as FM, sweep and FSK
- Connector: Front panel SMB
- Impedance: 50 Ω , ± 1 %
- Level: 1 V into 50 Ω
- Protection: Protected against temporary short to case ground
- Source: Sample clock frequency
- Frequency Range and Resolution: Same as Sample clock
- Flatness: -3 dB at 100 MHz
- Total Harmonic Distortion: < 40 dBc to 1 MHz
- Harmonics & non-related spurious:
 - < 50 dBc to 10 MHz
 - < 38 dBc to 100 MHz

Trigger Input

- Connector: Front panel BNC
- Impedance: 10 k Ω , $\pm 5\%$
- Threshold Level: TTL
- Minimum Pulse Width: 20 ns
- Slope: Positive or negative going edge

10 MHz Reference Input

- Connector: Front panel SMB
- Impedance: 10 k Ω , ± 5 %
- Threshold Level: TTL
- Duty Cycle: 50 %, ± 5 %

Ordering Information

- **TE-5201**
100 MS/s Arbitrary Waveform Generator

Switch Introduction

Introduction

To meet the needs of a wide range of uses in the measurement and automation field, switches come in a variety of types and sizes for versatile applications. It is important to understand the different types of switches available before selecting the most appropriate switch configuration.

Characteristics

Switches are generally separated into 3 forms, single-pole single-throw (SPST), single-pole double-throw (SPDT), and double-pole double-throw (DPDT). The pole is the source wire, while the throw refers to the switch position. A direct application of SPST switches is to close or open a circuitry (Figure 1). A SPDT switch has one source wire and two switch positions. The contact of the SPDT switch stays on the normally closed (NC) position. When the SPDT switch is excited, then the contact changes the position to the normally open (NO) position (Figure 2). The DPDT switch consists of 2 SPDT switches operating at the same time. The other classification of switches is done by forms, Form A, Form B, Form C and Form D. Form A refers to a normally open SPST switch, while Form B refers to a normally closed SPST switch. In Figure 1, the normally open SPST switch is called a 1 Form A switch.

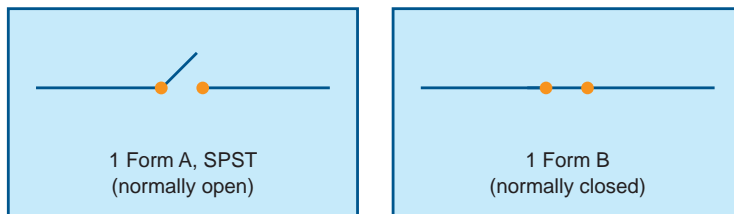


Figure 1 (Form A, Form B)

Form C is a single-pole double-throw (SPDT) switch with "break-before-make" functionality, while Form D is also a SPDT switch, but with "make-before-break" functionality. In Figure 2, the switch on the left is a "1 Form C", which chooses two signals to connect with the source wire; the switch on the right is a "2 Form C" switch, which is DPDT as previously described.

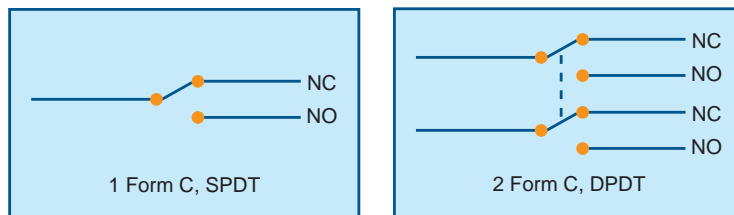


Figure 2 (Form C, 2 Form C)

Functions

General-Purpose (GP) Switches

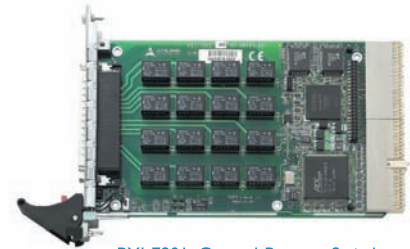
General purpose switches contain several independent relays which are isolated from each other. GP switches are commonly used to connect one input to one output and are usually built with Form A or Form C relays. The normal usage of GP switches is to turn on or turn off devices, such as motors, fans, heaters, and lights.

Multiplexers (MUX)

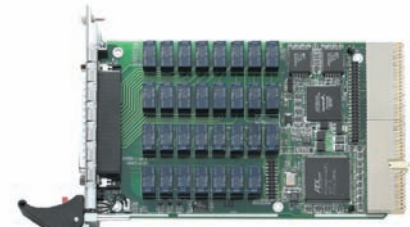
In test applications, the quantity of instruments is usually lower due to high cost. Thus, to connect multiple units under test (UUT) with the testing instrument, a multiplexer is always the choice to make the maximum utilization of the instruments. A 1-wire multiplexer routes single-ended signals to one point, and a 2-wire multiplexer selects differential signals. A 4-wire multiplexer is usually used to measure low resistance or RTDs. The instruments which are often used with multiplexer include DMM, digitizer and signal source, such as AWG, to provide both measurement and excitation.

Matrix

Matrix switches provide the most versatile switching capacity among these function topologies. In the matrix, any input can connect to any output individually or in combination. Unlike the multiplexer, the matrix can connect the source or measurement instrument to multiple UUTs at the same time. Matrix' advantage is the save of wiring. When users want to change the configurations of measurement or excitation, users just change the internal connection path, and do not have to manually reconfigure the wiring.



PXI-7901, General-Purpose Switch



PXI-7921, 24-CH 2-Wire Multiplexer



PXI-7931, 4x8 2-Wire Matrix

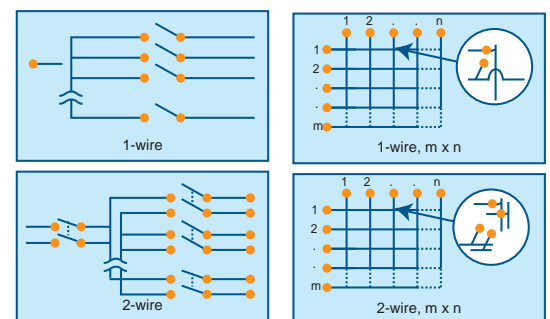
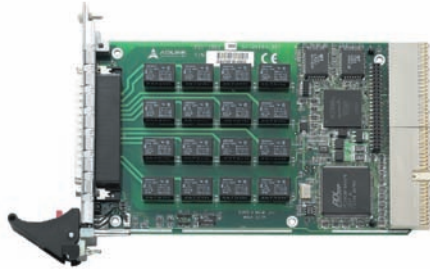


Figure 3 (Multiplexer)

Figure 4 (Matrix)

PXI-7901

16-CH General-Purpose SPDT Relay Module



Features

- PXI specifications Rev. 2.2 compliant
- 3U Eurocard form factor, CompactPCI compliant (PICMG 2.0 R3.0)
- PICMG 2.1 R2.0 CompactPCI Hot Swap specifications compliant
- 16-CH SPDT (1 Form C) non-latching relays
- Switching capacity
 - 3 A switching, 3 A carrying
 - 220 V_{DC}, 250 V_{AC}
- 125 operations per second for full settling
- Onboard 1 k-sample scan list for deterministic scanning
- Handshaking signals for external instruments synchronization
- Design for safety-critical applications
- Hardware emergency shutdown with programmable relay safety status
- Watchdog timer from 1 ms to 420 s with programmable relay safety status
- 8 auxiliary 3.3 V/TTL digital inputs/outputs with 5 V tolerance
- Multiple modules synchronization through PXI trigger bus and star trigger
- Fully software programmable
- Operating Systems
 - Windows Vista/XP/2000/2003
- Recommended Software
 - VB/VC++/BCB/Delphi
 - DAQBench
- Driver Support
 - ADL-SWITCH for Windows

Introduction

ADLINK's PXI-7901 is a general-purpose (GP) switch module implementing 16-CH independent single-pole double-throw (SPDT) relays (1 Form C). The PXI-7901 can connect one input to one output and be used as signal switching and routing for measurement systems or ATE. Thanks to its high switching capacity, PXI-7901 can also be used to turn on or turn off devices such as motors, fans, heaters, and lights.

The contact position of the relays can be changed either by direct software commands or by following the instructions previously stored in the onboard scan list. The scan list advances upon the trigger from external measurement devices, such as a DMM. The scan list could also advance when the scan-delay timer expires. In the PXI-7901, PXI trigger functions are supported and software programmable. Multiple modules can therefore be synchronized without additional field wiring.

Specifications

Relay Characteristics

- Number of channels: 16
- Relay type: SPDT (1 Form C), non-latching
- Switching capacity
 - Max. switching current: 3 A
 - Max. switching voltage: 220 V_{DC}, 250 V_{AC}
 - Max. switching power: 50 VA, 60 W
 - Max. carrying current: 3 A
- Failure rate*: 10 μ A @ 10 m V_{DC}
- Contact resistance: 150 m Ω max.
 - Relay set/reset time
 - Operate time: 5 ms max.
 - Release time: 5 ms max.
 - Bounce time: 3 ms max.
- Expected life
 - Mechanical life: 108 operations min.
 - Electrical life: 105 operations min. (0.4 A @ 125 V_{AC}, resistive load)
- Data transfer: Programmed I/O

Auxiliary Digital I/O

- Numbers of channel: 8 inputs/outputs
- Compatibility: 3.3 V/TTL (5 V tolerant)

Handshaking Signals

- Programmable polarity
- Logic level: 3.3 V/TTL (5 V tolerant)
- TRG_IN source: AUX1, PXI trigger bus, PXI star trigger input
- S_ADV destination: AUX0, PXI trigger bus, PXI star trigger outputs (in the star trigger slot)

Safety Functions

- Emergency shutdown
 - Logic level: 3.3 V/TTL (5 V tolerant)
 - Active: logic low
- Watchdog timer
 - Base clock available: 10 MHz, fixed
 - Counter width: 32-bit

General Specifications

- I/O Connector: 62-pin D-sub male
- Operating temperature: 0 °C to 55 °C
- Storage temperature: -20 °C to 70 °C
- Relative humidity: 5% to 85% non-condensing
- Power requirements: (when all relays are ON)

Device	+5 V	+3.3 V
PXI-7901	700 mA	400 mA

- Dimensions (not including connectors)
 - 160 mm x 100 mm

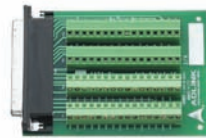
Certificate

- EMC/EMI: CE, FCC Class A

Terminal Boards

■ TB-6201-01

General-Purpose Switch Terminal Board with one 62-Pin D-Sub Female Connector (Cables are not included. For information on mating cables, refer to Section 4.)



Terminal board TB-6201-01

Pin Assignment

CNI

		22. COM0		
43. NO0	23. COM1		1. NC0	
44. NO1	24. COM2		2. NC1	
45. NO2	25. COM3		3. NC2	
46. NO3	26. COM4		4. NC3	
47. NO4	27. COM5		5. NC4	
48. NO5	28. COM6		6. NC5	
49. NO6	29. COM7		7. NC6	
50. NO7	30. COM8		8. NC7	
51. NO8	31. COM9		9. NC8	
52. NO	32. COM10		10. NC9	
53. NO10	33. COM11		11. NC10	
54. NO11	34. COM12		12. NC11	
55. NO12	35. COM13		13. NC12	
56. NO13	36. COM14		14. NC13	
57. NO14	37. COM15		15. NC14	
58. NO15	38. N/C		16. NC15	
59. N/C	39. N/C		17. N/C	
60. AUX3	40. AUX4	18. AUX2/SHDNn		
61. AUX6	41. +5Vout	19. AUX5		
62. AUX7	42. AUX1/TRG_IN	20. GND		
		21. AUX0/S_ADV		

Ordering Information

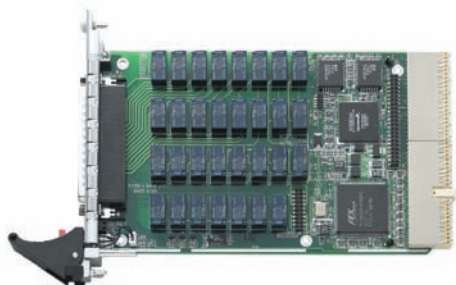
■ PXI-7901

16-CH General-Purpose SPDT Relay Module

* Failure rate indicates the lower limit of switching capacity of a relay contact at a reliability level of 60 %

PXI-7921

24-CH 2-Wire Multiplexer Module



Features

- PXI specifications Rev. 2.2 compliant
- 3U Eurocard form factor, CompactPCI compliant (PICMG 2.0 R3.0)
- PICMG 2.1 R2.0 CompactPCI Hot Swap specifications compliant
- 24-CH DPDT (2 Form C) non-latching relays
- Switching capacity
 - 2 A switching, 2 A carrying
 - 220 V_{DC}, 125 V_{AC}
- Onboard 1 k-sample scan list for deterministic scanning
- Handshaking signals for external instruments synchronization
- Design for safety-critical applications
- Hardware emergency shutdown with programmable relay safety status
- Watchdog timer from 1 ms to 420 s with programmable relay safety status
- Multiple modules synchronization through PXI trigger bus and star trigger
- Fully software programmable
- Operating Systems
 - Windows Vista/XP/2000/2003
- Recommended Software
 - VB/VC++/BCB/Delphi
 - DAQBench
- Driver Support
 - ADL-SWITCH for Windows

Introduction

ADLINK's PXI-7921 is a relay multiplexer which consists of 24 2-wire relays (DPDT, 2 Form C). As a multiplexer, the PXI-7921 provides 48x1 1-wire, 24x1 2-wire and 12x1 4-wire configurations. Users could choose one of the configurations by software. The PXI-7921 typically connects one instrument, such as a DMM, a digitizer or a signal source, with many points which need measurement or excitation.

The contact position of the relays can be changed either by direct software commands or by following the instructions previously stored in the onboard scan list. The scan list advances upon the trigger from external measurement devices, such as a DMM. The scan list could also advance when the scan-delay timer expires. In the PXI-7921, PXI trigger functions are supported and software programmable. Multiple modules can therefore be synchronized without additional field wiring.

Specifications

Source Wire	Multiplexer
1-wire	One 48x1
2-wire	One 24x1, Two 12x1, Four 6x1
4-wire	One 12x1

Relay Characteristics

- Number of channels: 24 (2-wire)
- Relay type: DPDT (2 Form C), non-latching
- Switching capacity
 - Max. switching current: 2 A
 - Max. switching voltage: 220 V_{DC}, 125 V_{AC}
 - Max. switching power: 60 W
 - Max. carrying current: 2 A
- Failure rate*: 10 μ A @ 10 mV_{DC}
- Contact resistance: 100 m Ω max.
- Relay set/reset time
 - Operate time: 4 ms max.
 - Release time: 4 ms max.
- Expected life
 - Mechanical life: 108 operations min.
 - Electrical life : 5x10⁵ operations min. (1 A @ 30 V_{DC}, resistive load)
- Data transfer: programmed I/O

Handshaking Signals

- Programmable polarity
- Logic level: 3.3 V/TTL (5 V tolerant)
- TRG_IN source: PXI trigger bus, PXI star trigger input
- S_ADV destination: PXI trigger bus, PXI star trigger outputs (in the star trigger slot)

Safety Functions

- Emergency shutdown
 - Logic level: 3.3 V/TTL (5 V tolerant)
 - Active with logic low
- Watchdog timer
 - Base clock available: 10 MHz, fixed
 - Counter width: 32-bit

General Specifications

- I/O Connector: 62-pin D-sub male
- Operating temperature: 0°C to 55°C
- Storage temperature: -20°C to 70°C
- Relative humidity: 5% to 85% non-condensing
- Power requirements: (when all relays are ON)

Device	+5 V	+3.3 V
PXI-7921	1 A	400 mA

Certificate

- EMC/EMI: CE, FCC Class A

Terminal Boards

■ TB-6221-01

Multiplexer Switch Terminal Board with One 62-Pin D-Sub Female Connector (Cables are not included. For information on mating cables, refer to Section 4.)

Pin Assignment

CNI		22. +5Vout
43. COM2+	23. CH8+	1. CH0+
44. COM2-	24. CH8-	2. CH0-
45. COM3+	25. CH9+	3. CH1+
46. COM3-	26. CH9-	4. CH1-
47. CH18+	27. CH10+	5. CH2+
48. CH18-	28. CH10-	6. CH2-
49. CH19+	29. CH11+	7. CH3+
50. CH19-	30. CH11-	8. CH3-
51. CH20+	31. CH12+	9. CH4+
52. CH20-	32. CH12-	10. CH4-
53. CH21+	33. CH13+	11. CH5+
54. CH21-	34. CH13-	12. CH5-
55. CH22+	35. CH14+	13. COM0+
56. CH22-	36. CH14-	14. COM0-
57. CH23+	37. CH15+	15. COM1+
58. CH23-	38. CH15-	16. COM1-
59. IWireloRef	39. CH16+	17. CH6+
60. TRG_IN	40. CH16-	18. CH6-
61. S_ADV	41. CH17+	19. CH7+
62. SHDNn	42. CH17-	20. CH7-
		21. GND

Ordering Information

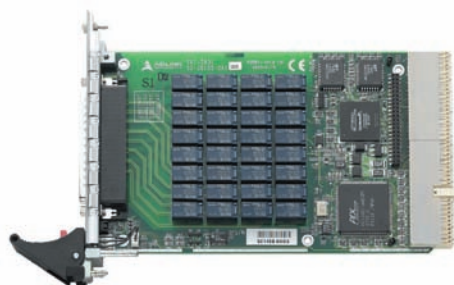
■ PXI-7921

24-CH 2-Wire Multiplexer Module

* Failure rate indicates the lower limit of switching capacity of a relay contact at a reliability level of 60 %

PXI-7931

4x8 2-Wire Matrix Module



Introduction

ADLINK's PXI-7931 is a matrix module with 32 cross-point 2-wire relays (DPDT, 2 Form C). The default configuration of the PXI-7931 is a 4-group 2x4 2-wire matrix. With the terminal board, TB-6231-01, users could flexibly choose one of the configurations: one 4x8, two 4x4, one 2x16, two 2x8 and four 2x4. Any contact of the PXI-7931 can connect to other contacts, individually or in combination. The PXI-7931 matrix module simplifies the wiring and makes it easy to change the internal connection path.

The contact position of the relays can be changed either by direct software commands or by following the instructions previously stored in the onboard scan list. The scan list advances upon the trigger from external measurement devices, such as a DMM. The scan list could also advance when the scan-delay timer expires. In the PXI-7931 the PXI trigger functions are supported and software programmable. Multiple modules can therefore be synchronized without additional field wiring.

Specifications

Source Wire	Multiplexer
2-wire	One 4x8, Two 4x4, One 2x16, Two 2x8, Four 2x4

Relay Characteristics

- Number of cross points: 32 (2-wire)
- Relay type: DPDT (2 Form C), non-latching
- Switching capacity
 - Max. switching current: 2 A
 - Max. switching voltage: 220 Vdc, 125 Vac
 - Max. switching power: 60 W
 - Max. carrying current: 2 A
- Failure rate*: 10 μ A @ 10 mVdc
- Contact resistance: 100 m Ω max.
- Relay set/reset time
 - Operate time: 4 ms max.
 - Release time: 4 ms max.
- Expected life
 - Mechanical life: 108 operations min.
 - Electrical life: 5x10⁵ operations min. (1 A @ 30 Vdc, resistive load)
- Data transfer: programmed I/O

Auxiliary Digital I/O

- Numbers of channel: 8 inputs/outputs
- Compatibility: 3.3 V/TTL (5 V tolerant)

Handshaking Signals

- Programmable polarity
- Logic level: 3.3 V/TTL (5 V tolerant)
- TRG_IN source: AUX1, PXI trigger bus, PXI star trigger input
- S_ADV destination: AUX0, PXI trigger bus,
- PXI star trigger outputs (star trigger slot)

Safety Functions

- Emergency shutdown
 - Logic level: 3.3 V/TTL (5 V tolerant)
 - Active: logic low
- Watchdog timer
 - Base clock available: 10 MHz, fixed
 - Counter width: 32-bit

General Specifications

- I/O Connector: 62-pin D-sub male
- Operating temperature: 0°C to 55°C
- Storage temperature: -20°C to 70°C
- Relative humidity: 5% to 85% non-condensing
- Power requirements: (when all relays are ON)

Device	+5 V	+3.3 V
PXI-7931	1 A	400 mA

- Dimensions
160 mm x 100 mm (not including connectors)

Certificate

- EMC/EMI: CE, FCC Class A

Terminal Boards

■ TB-6231-01

Multiplexer Switch Terminal Board with One 62-Pin D-Sub Female Connector (Cables are not included. For information on mating cables, refer to Section 4.)

Pin Assignment

2x4x4 configuration

	22. C8+	
43. C0+	23. C8-	1. R0+
44. C0-	24. C9+	2. R0-
45. C1+	25. C9-	3. R1+
46. C1-	26. C10+	4. R1-
47. C2+	27. C10-	5. R2+
48. C2-	28. C11+	6. R2-
49. C3+	29. C11-	7. R3+
50. C3-	30. C12+	8. R3-
51. C4+	31. C12-	9. R4+
52. C4-	32. C13+	10. R4-
53. C5+	33. C13-	11. R5+
54. C5-	34. C14+	12. R5-
55. C6+	35. C14-	13. R6+
56. C6-	36. C15+	14. R6-
57. C7+	37. C15-	15. R7+
58. C7-	38. N/C	16. R7-
59. N/C	39. N/C	17. N/C
60. AUX3	40. AUX4	18. AUX2/SHDNn
61. AUX6	41. +5Vout	19. AUX5
62. AUX7	42. AUX1/TRG_IN	20. GND
		21. AUX0/S_ADV

Ordering Information

- **PXI-7931**
4x8 2-Wire Matrix Module

* Failure rate indicates the lower limit of switching capacity of a relay contact at a reliability level of 60 %

Features

- PXI specifications Rev. 2.2 compliant
- 3U Eurocard form factor, CompactPCI compliant (PICMG 2.0 R3.0)
- PICMG 2.1 R2.0 CompactPCI Hot Swap specifications compliant
- Configuration determined by terminal board
- Up to 32 cross-point DPDT (2 Form C) non-latching relays
- Contact rating
 - 2 A switching, 2 A carrying
 - 220 Vdc, 125 Vac
- Onboard 1 k-sample scan list for deterministic scanning
- Handshaking signals for external instruments synchronization
- Design for safety-critical applications
- Hardware emergency shutdown with programmable relay safety status
- Watchdog timer from 1 ms to 420 s with programmable relay safety status
- 8 auxiliary 3.3 V/TTL digital inputs/outputs with 5 V tolerance
- Multiple modules synchronization through
- PXI trigger bus and star trigger
- Versatile matrix configuration with terminal board
- Fully software programmable

■ Operating Systems

- Windows Vista/XP/2000/2003

■ Recommended Software

- VB/VC++/BCB/Delphi
- DAQBench

■ Driver Support

- ADL-SWITCH for Windows