S Series Multifunction DAQ
16-Bit, 800 kS/s, 4 Analog Inputs

NI 6120

- Four 16-bit analog inputs at 800 kS/s/channel
- 2 analog outputs at 4 MS/s, 16-bit resolution (2.5 MS/s dual-channel)
- 8 high-speed digital I/O lines (5 V TTL/CMOS); two 24-bit counter/timers
- Analog and digital triggering
- Pseudodifferential simultaneous sampling inputs with 100 kHz filters
- 64 Msample onboard memory
- ±200 mV to ±42 V signal ranges
- NI-DAQ driver simplifies configuration and measurements

Models

- NI PCI-6120 ***NEW!***
- NI PXI-6120 ***NEW!***

Operating Systems

- Windows 2000/NT/XP/Me/9x
- Real-time performance with LabVIEW
- Others such as Linux

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio for Visual Basic
- VI Logger

Other Compatible Software

- Visual Basic
- C/C++

Driver Software (included)

- NI-DAQ

Calibration Certificate Included

NEW

Family	Bus	Analog Inputs	Input Resolution	Sampling Rate	Input Range	Analog Outputs	Output Resolution	Max Output Rate	Output Range	Digital I/O	Counter/ Timers	Triggers
NI 6120	PCI, PXI	4	16 bits	800 kS/s	±0.2 to ±42 V	2	16 bits	4 MS/s[1]	±10 V	8	2, 24-bit	Analog and Digital

[1] 4 MS/s single channel; 2.5 MS/s on two channels

Table 1. NI 6120 Channel, Speed, and Resolution Specifications

INFO CODES

For more information or to order products online, visit *ni.com/info* and enter:

pci6120
pxi6120

BUY ONLINE!

Overview and Applications

National Instruments 6120 devices combine the latest in PC technologies to deliver simultaneous-sampling, high-bandwidth capabilities for low and high-channel-count data acquisition and control systems. NI 6120 devices are used in a broad variety of applications including:

- Continuous data logging at speeds in excess of 8 MS/s
- Stimulus/response applications where synchronization between high-speed analog input (AI), analog output (AO), and digital I/O are required
- 42 V automotive applications
- Radar, sonar
- High-energy physics
- Highly accurate time/frequency domain measurements – as little as 17 µV of noise, as much as 96 dB spurious-free dynamic range

Features

NI 6120 devices feature deep onboard memory, so you can capture higher-bandwidth signals over long periods of time, especially when multiple devices are used. The onboard memory acts as a large FIFO and requires no extra programming. Half of the memory is reserved for AI operations and half for AO. Each analog input has 100 kHz on/off antialiasing filters that minimize phase distortion while ensuring validity of both time and frequency-domain analog input data. With pseudodifferential inputs on each input channel, an NI 6120 minimizes ground loops and achieves up to 105 dB common-mode rejection ratio (CMRR). These devices also feature software-selectable AC/DC input coupling to maximize measurement resolution.

NI 6120 devices feature analog and digital triggering, as well as two 16-bit analog outputs, two 24-bit 20 MHz counter/timers, and eight high-speed digital I/O lines capable of 10 Mwords/s pattern generation and acquisition. You can acquire digital data synchronized to AI samples or AO updates. You can also share an external clock to perform correlated analog and digital operations. Correlation of multiple I/O types is important as your test requirements change and evolve.

In addition, the PXI-6120 automatically phase-locks its onboard reference to the PXI backplane clock for better synchronization capabilities.

Driver Software

NI-DAQ is the robust driver software included with all National Instruments data acquisition and signal conditioning products. This easy-to-use software tightly integrates the full functionality of your DAQ hardware to NI LabVIEW, LabWindows/CVI, and Measurement Studio for Visual Basic. High-performance features include multidevice synchronization, networked measurements, and DMA data management. Bundled with NI-DAQ, the NI Measurement & Automation Explorer utility simplifies the configuration of your

NATIONAL INSTRUMENTS™

S Series Multifunction DAQ
16-Bit, 800 kS/s, 4 Analog Inputs

Nominal Range (V)	Absolute Accuracy							Relative Accuracy	
	% of Reading			Noise + Quantization (µV)		Temp Drift	Absolute Accuracy	Resolution (µV)	
Full Scale	24 Hrs	1 Year	Offset (µV)	Single Pt.	Averaged	(%/°C)	at Full Scale (±mV)	Single Pt.	Averaged
±42	0.190	0.191	6274.4	5621.9	503.5	0.0106	101.5	6629.9	663.0
±20	0.152	0.156	2511.3	2248.7	201.4	0.0106	33.0	2652.0	265.2
±10	0.039	0.041	1257.0	1124.4	100.7	0.0006	5.28	1326.0	132.6
±5	0.040	0.041	630	562.2	50.4	0.0006	2.66	663.0	66.3
±2	0.040	0.042	253	224.9	20.1	0.0006	1.07	265.2	26.5
±1	0.041	0.043	128	150.0	13.7	0.0006	0.55	180.8	18.1
±0.5	0.045	0.046	66.0	144.3	13.7	0.0006	0.30	180.8	18.1
±0.2	0.050	0.052	29.1	112.8	11.0	0.0006	0.14	144.7	14.5

Note: Accuracies are valid for measurements following an internal calibration. Averaged numbers assume dithering and averaging of 100 single-channel readings. Measurement accuracies are listed for operational temperatures within ±1 °C of internal calibration temperature and ±10 °C of external or factory-calibration temperature. One-year calibration interval recommended. The sample absolute accuracy calculations were performed for a maximum range input voltage value (i.e. 10 V for the ±10 V range) after 1 year, assuming 100 pt averaging of data.

Table 2. NI 6120 Analog Input DC Accuracy Specifications

Nominal Range at Full Scale (V)	Absolute Accuracy						Relative Accuracy
	% of Reading			Offset (mV)	Temp Drift (%/°C)	Absolute Accuracy at Full Scale (mV)	Theoretical Resolution (µV)
	24 Hrs	90 Days	1 Year				
±10	0.0460	0.0468	0.0477	1.9	0.0006	6.7	305.2

Note: Temp Drift applies only if ambient is greater than ±10 °C of previous external calibration.

Table 3. NI 6120 Analog Output DC Accuracy Specifications

measurement hardware with device test panels, interactive measurements, and scaled I/O channels. NI-DAQ also provides numerous example programs for LabVIEW and other application development environments to get you started with your application quickly.

Services and Support/Training

As a complement to your data acquisition and signal conditioning product, consider:

- Technical Support – Included in hardware/software purchase through Applications Engineers worldwide, Web resources with more than 1,000 example programs and more than 7,000 KnowledgeBases, and Premier Support – ***ni.com/support***
- NI Factory Installation Services (FIS) – Software and hardware installed in PXI and PXI/SCXI systems, tested and ready to use – ***ni.com/advisor***
- Calibration – Includes NIST-traceable basic calibration certificate, services for ANSI/NCSL-Z540 and periodic calibration – ***ni.com/calibration***
- Extended Warranty – Meet project life-cycle requirements and maintain optimal performance in a cost-effective way – ***ni.com/services***
- Data Acquisition Training – Instructor-led courses – ***ni.com/training***
- Professional Services – Feasibility, consulting, and integration through our Alliance Program members – ***ni.com/alliance***

For more information on NI services and support, visit ***ni.com/services***

Ordering Information

NI PCI-6120 with 64 MS buffer.....778397-01
NI PXI-6120 with 64 MS buffer.....778396-01
Includes NI-DAQ driver software.

Recommended Configurations

DAQ Device	Accessory	Cable
PXI-6120	TB-2705 (778241-01)	–
PCI-6120	BNC-2110 (777643-01)	SH68-68-EP (184749-01)

S Series Multifunction DAQ
16-Bit, 800 kS/s, 4 Analog Inputs

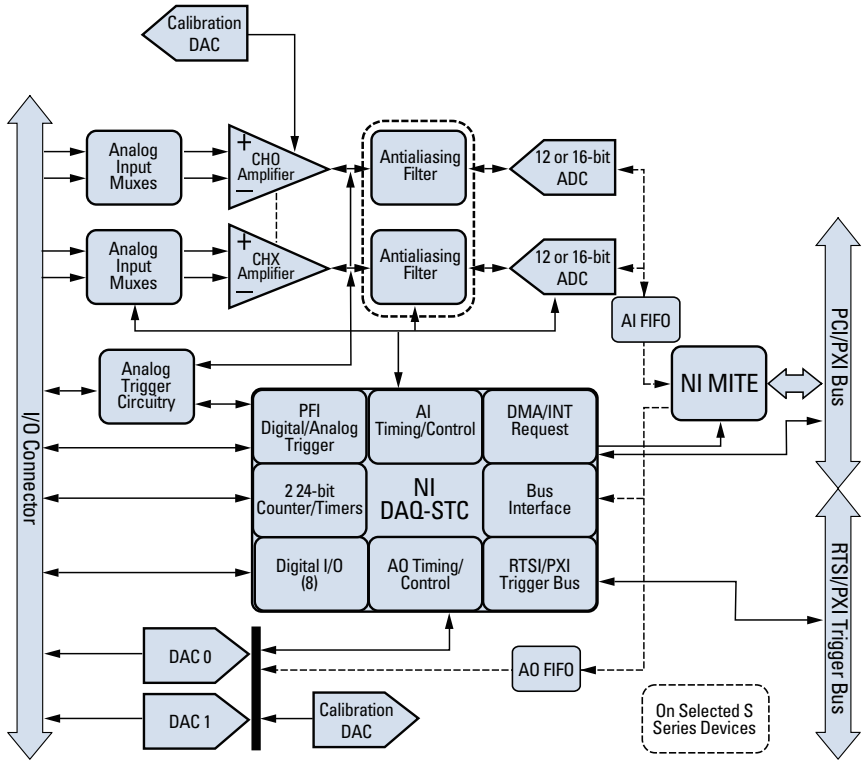


Diagram 1. S Series Diagram

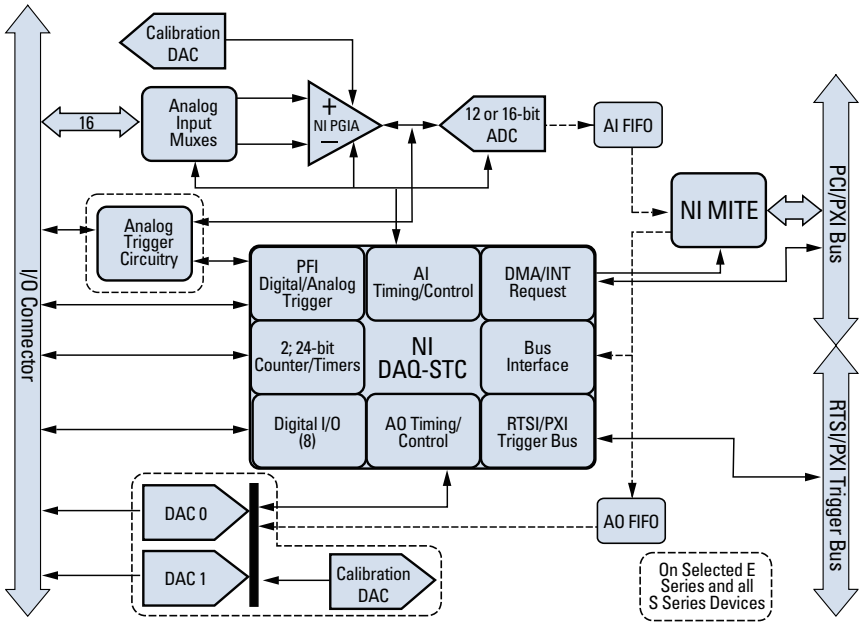


Diagram 2. E Series Diagram

Driver Software for Data Acquisition and Signal Conditioning

NI-DAQ

- Driver software for NI data acquisition and signal conditioning hardware
- Short time to first measurement with quick configuration and application-specific example programs
- Named and scaled channels remove configuration complexity
- Multiple-device synchronization and integration with RTSI or PXI trigger bus
- Networking features for remote and distributed measurements
- Robust double-buffered DMA data management routines

Operating Systems

- Windows 2000/NT/XP/Me/9x
- Mac OS 9
- Others such as Linux
- Real-Time performance with LabVIEW

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio for Visual Basic
- VI Logger

Other Compatible Software

- Visual Basic
- C/C++

Overview

The quality of your configuration and driver software is just as important as the quality of your measurement hardware. NI-DAQ is a robust, time-proven driver for National Instruments data acquisition and signal conditioning hardware. This software helps you quickly install your device and begin taking measurement data. NI-DAQ includes hundreds of application examples to jump-start your application development. NI-DAQ delivers the same ease of use and performance across many development environments, operating systems, and computer buses.

Integrated Software Framework

Software ties the various pieces of measurement hardware together into a complete measurement system. National Instruments provides an integrated software framework (see Figure 1) to increase development productivity and decrease cost. NI-DAQ is part of the measurement and control services software, which tightly integrates NI measurement hardware with your application development environment. Because NI-DAQ is built in this framework, you can easily integrate and synchronize multiple measurement types, including motion and vision, with your data acquisition system. With this flexible, hardware-independent software, you can achieve interactive configuration, powerful programming, and excellent measurement performance.

Configuration with NI Measurement & Automation Explorer

NI Measurement & Automation Explorer simplifies the configuration of your measurement hardware, so you can:

- Quickly detect and configure all hardware
- Use test panels to verify the operation of your hardware (See Figure 2)
- Make simple, interactive measurements
- Name and scale your I/O channels to physical or engineering units (See Figure 3)

Powerful Programming

NI-DAQ software isolates you from hardware-specific register commands and gives you a simple, yet powerful application programming interface (API) between the complete hardware capabilities and a wide variety of development environments and languages. Because of the consistent API, you can use different DAQ hardware with the same application without modifying your software.

High-Performance Measurements

NI-DAQ is optimized for measurement performance and ease of use. NI-DAQ software delivers:

- Efficiency and speed through event-driven programming
- Synchronization of measurements across multiple devices
- Seamless integration of measurement accessories
- Flawless buffer and DMA management

Driver Software for Data Acquisition and Signal Conditioning

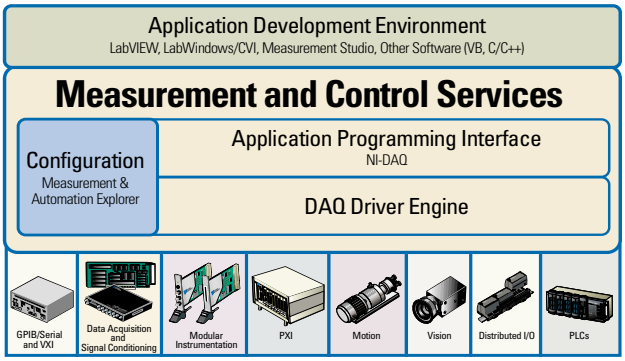


Figure 1. Integrated Software Framework

NI LabVIEW and NI-DAQ

Using NI-DAQ, you can easily acquire, analyze, and present your measurements in LabVIEW. Figure 4 shows the block diagram of a typical data acquisition in LabVIEW. With the first set of NI-DAQ VIs, you configure your acquisition and read data from your sensor. Because this VI uses a named channel, most of the signal conditioning and DAQ hardware configuration is handled automatically. Next, you route the waveform from the read VI to the peak detect measurement VI. The waveform data type carries the scaled sensor and time data to the measurement function. Finally, the measurement data can be displayed in an indicator and/or a waveform graph that automatically has the correct time and engineering units.

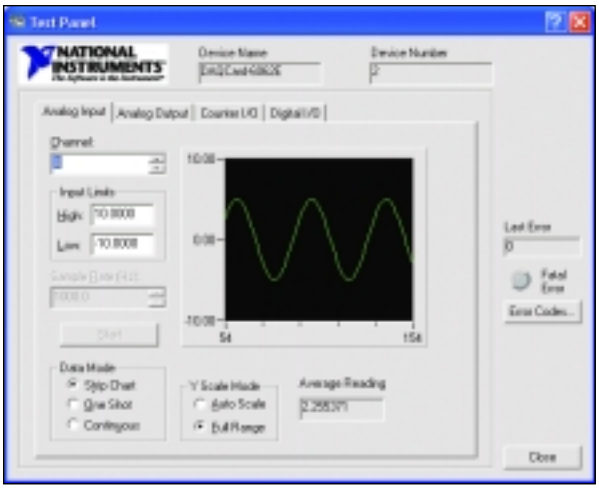


Figure 2. Quickly test your devices with the NI-DAQ test panels.

Measurement Examples

The NI Developer Zone (*ni.com/zone*) has more than 2,000 NI LabVIEW, C, and Visual Basic source code examples written by NI development and application engineers, system integrators, and customers. These free measurement examples cover basic functional examples such as analog and digital I/O, counter/timer operations, and signal processing and analysis. Plus, you can search on applications ranging from temperature and strain to sound and vibration to machine vision and motion control. With the increasing National Instruments community of virtual instrumentation developers, the number of examples continues to grow quickly.

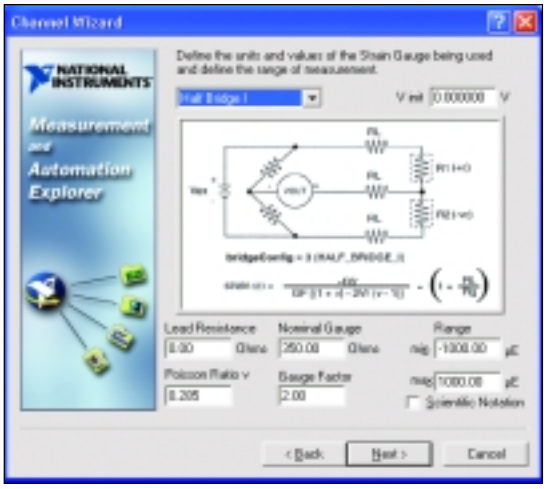


Figure 3. Measurement & Automation Explorer makes naming, scaling, and accessing I/O channels easy.

Other Operating Systems

NI-DAQ is built on proven, industry-standard Windows and Mac OS technologies. If your application requires the use of another operating system, you have several options. For information on an open-source, third-party Linux driver, please visit ***ni.com/linux*** For other OSs, such as WinCE and QNX, please see the NI Measurement Hardware Driver Development Kit (DDK). Please visit ***ni.com/info*** and enter *mhddk*.

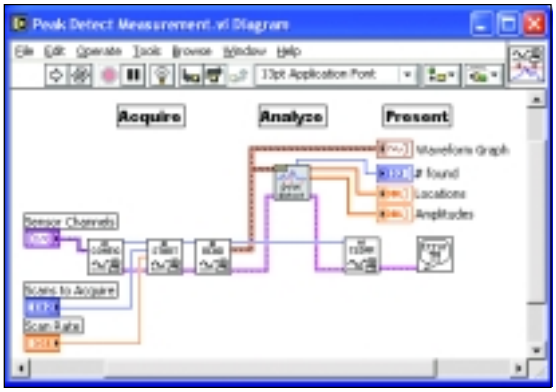


Figure 4. Acquire, analyze, and present with NI-DAQ and LabVIEW.

Multifunction DAQ Cable and Accessory Selection Guides

NI Cable Design Advantages

The SH68-68-EP cable is the most commonly used E Series and S Series cable. The cable is designed to work specifically with the NI Multifunction DAQ devices to preserve signal integrity through these technologies:

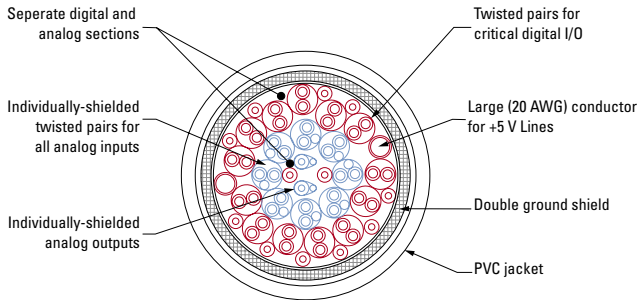
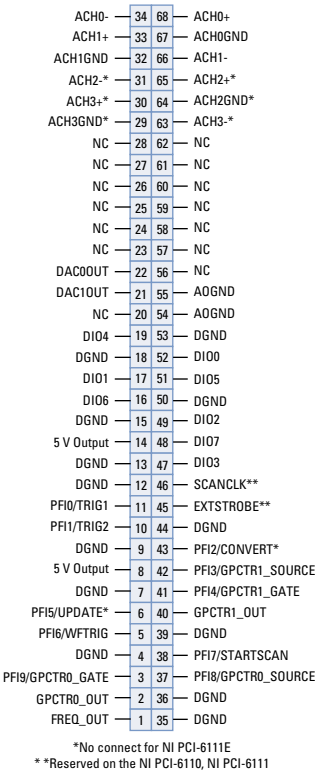


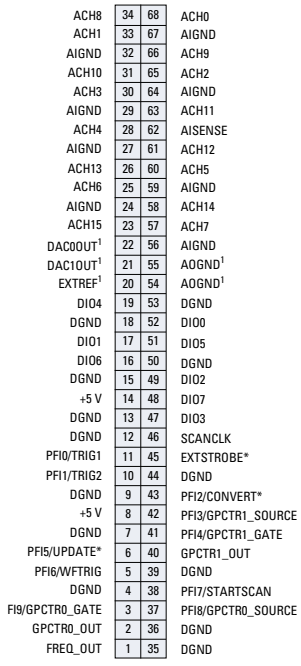
Figure 1. SH68-68-EP Cable

A variety of cabling and accessory options are available for your needs. Use the following tables to choose the most appropriate cables and accessories.



*No connect for NI PCI-6111E
* *Reserved on the NI PCI-6110, NI PCI-6111

Figure 2. S Series Devices Connector



[1]Not used on NI PCI-6032E, NI PCI-6023, NI PCI-6034E, NI PCI-6013

Figure 3. I/O Connector for 16-channel E Series Devices, except NI 6025E

Platform	Shielding	Connect to ...	Cable	Adapter	Accessory
PCI/PXI/USB/FireWire	Shielded	SCC portable signal conditioning per channel	SH68-68-EP	–	SC-2345 and modules
		SCXI high-performance signal conditioning	SCXI-1349	–	SCXI Chassis and Modules
		Screw terminals [1]	SH68-68-EP or SH68-68R1-EP	–	SCB-68
		BNC terminal block	SH68-68-EP	–	BNC-2110, BNC-2120, BNC-2090
		50-pin connector	SH6850	–	CB50, custom or 3rd party
		Configurable connectivity box	SH68-68-EP	–	CA-1000
	Unshielded	Screw terminals [1]	R6868	–	TBX-68, CB-68LP, CB-68LPR, DAQ Signal Accessory
		50-pin connector	R6850	–	CB50, custom or 3rd party
PXI only	Shielded	Front-mounted screw terminals	N/A	–	TB-2705
PCMCIA	Shielded	Screw terminals [1]	SHC68-68-EP or SHC68U-68-EP [2]	–	SCB-68, CA-1000
		50-pin connector	SHC68-68-EP or SHC68U-68-EP [2]	68M-50F MIO	CB50, custom or 3rd party
	Unshielded	Screw terminals [1]	RC68-68	–	TBX-68, CB-68LP, CB-68LPR, DAQ Signal Accessory
		50-pin connector	RC68-68	68M-50F MIO	CB50, custom or 3rd party

ISA - Visit ***ni.com/info*** and enter in "legacy" for more information on ISA products

[1] Unshielded Cables can connect to Shielded Accessories and vice-versa.

[2] In adjacent PCMCIA slots, both cables types are required because the same cable would cause mechanical hindrance.

Table 1. Cable Connection Specifications for 16-Channel E Series Devices (except NI 6025E)

Multifunction DAQ Cable and Accessory Selection Guides

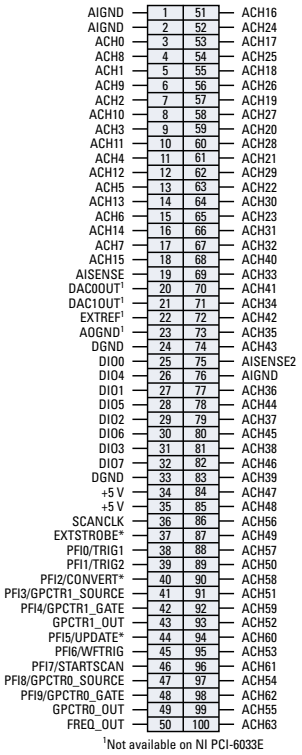


Figure 4. I/O Connector for 64-channel NI devices

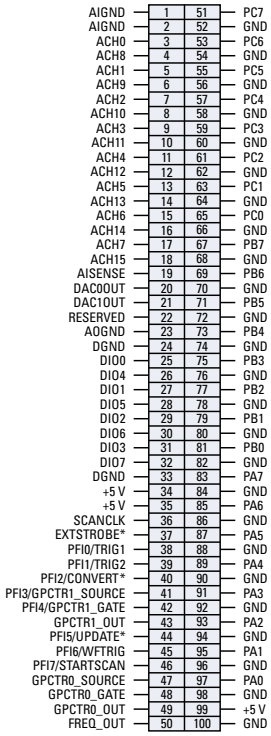


Figure 5. I/O Connector for the NI 6025E device

E Series Devices (NI 6031E, NI 6033E, NI 6071E, NI 6025E)

Platform	Shielding	Connect to ...	Cable	Cable Leg	Adapter	Accessory
PCI, PXI	Shielded	Screw Terminals	SH100100	–	–	SCB-100
		Screw Terminals	SH1006868	MIO:	–	SCB-68
				Extended:	–	SCB-68
		Screw Terminals[1]	SH1006868	MIO:	–	TBX-68, CB-68LP, CB-68LPR, DAQ Signal Accessory
				Extended:	–	TBX-68, CB-68LP, CB-68LPR
		BNC Terminal Block	SH1006868	MIO:	–	BNC-2110, BNC-2120, BNC-2090
				Extended:	–	BNC-2115
		50-pin Connectors	SH1006868	MIO:	68M-50F MIO	custom or 3rd party
				Extended:	68M-50F Extended	custom or 3rd party
	Unshielded	50-pin Connector	R1005050	MIO:	–	custom or 3rd party
				Extended:	–	custom or 3rd party

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[1]Shielded cable with unshielded accessories

Table 1. Cable Connection Specifications for 64-Channel E Series Devices and the NI 6025E

Multifunction DAQ Cable and Accessory Selection Guides

SCXI High-Performance Modular Signal Conditioning (see Figure 1)

SCXI is a high-performance modular signal conditioning platform that you use as a front end to your E Series DAQ device. With the SCXI multiplexing architecture, you can expand your analog inputs to 3,072 channels. Additionally, SCXI offers a variety of modules for connecting to thermocouples, RTDs, strain gauge transducers, LVDT position sensors, ICP-compatible accelerometers/microphones, thermistors, millivolt inputs, voltage inputs up to 1000 V, current inputs (0-20mA), frequency inputs or dynamic signals.

Figure 1. SCXI High-Performance Signal Conditioning

SCC Portable Modular Signal Conditioning for Low-Channel-Count Applications (see Figure 2)

The SCC Series portable modular signal conditioning system consists of SCC modules that plug into a low-profile SC-2345 shielded carrier. SCC modules give you single or dual-channel signal conditioning for up to 16 analog input channels and eight digital I/O lines of your E Series or basic multifunction DAQ device. The SCC Series offers signal conditioning for a variety of inputs, including thermocouples, RTDs, strain gauges, ICP-compatible accelerometers, accelerators, analog inputs requiring isolation, high voltage (up to 100 V), current (0-20mA), and optically isolated digital I/O. Lowpass filtering and breadboard modules are also available.

Figure 2. SCC Portable, Modular Signal Conditioning

Connector Blocks

NI BNC-2100 Series Connector Blocks (see Figure 3)

The BNC-2100 Series are shielded connector blocks with signal-labeled BNC connectors for easy connectivity of your analog input, analog output, digital I/O and counter/timer signals to your multifunction DAQ device, including analog input devices. The BNC-2110 and BNC-2120 work with all E Series devices. The BNC-2120 also provides a function generator, quadrature encoder, temperature reference, thermocouple connector, and LED so that you can test the functionality of your hardware. The BNC-2115 has 24 BNC inputs for connecting to the extended I/O channels of our 100-pin E Series DAQ devices.

NI BNC-2110 777643-01
Dimensions – 20.3 by 11.2 by 5.5 cm (8.0 by 4.4 by 2.2 in.)
NI BNC-2115 777807-01
Dimensions – 20.3 by 11.2 by 5.5 cm (8.0 by 4.4 by 2.2 in.)
NI BNC-2120 777960-01
Dimensions – 26.7 by 11.2 by 6.0 cm (10.5 by 4.4 by 2.4 in.)

Figure 3. BNC-2100 Series Connector Blocks – BNC-2120, BNC-2110, BNC-2115

NI SC-2075 Breadboard Connector Block (see Figure 4)

The SC-2075 provides breadboard area for prototyping and BNC and spring terminal connectivity for 68-pin E Series DAQ devices. The built-in ±15 V or adjustable 0 to 5 V power supply and LEDs for digital lines make the SC-2075 a cost-effective device, ideal for academic laboratories.

NI SC-2075.....778147-90
Dimensions – 26.72 by 20.70 by 4.37 cm (10.52 by 8.15 by 1.72 in.)

Figure 4. SC-2075 Breadboard Connector Block

Multifunction DAQ Cable and Accessory Selection Guides

Figure 5. BNC-2090 Shielded BNC Adapter Chassis

NI BNC-2090 Shielded BNC Adapter Chassis (see Figure 5)

The BNC-2090 is a shielded, rack-mountable adapter with signal-labeled BNC connectors, spring terminal blocks, and component locations for passive signal conditioning. Consists of 22 BNC connectors and 28 spring terminals to simplify connection to your analog, digital, trigger and counter/timer signals. The BNC-2090 has silk-screened component locations that you use to develop simple signal conditioning circuits. For added flexibility, you can connect any E Series DAQ device to the BNC-2090 from the front or rear through dual 68-pin connectors.

NI BNC-2090 777270-01

Dimensions – 48.3 by 4.4 by 18.8 cm (19.0 by 1.7 by 7.4 in.)

Figure 6. CA-1000 Configurable Signal Conditioning Enclosure

NI CA-1000 Configurable Signal Conditioning Enclosure (see Figure 6)

The CA-1000 is a configurable enclosure that gives you maximum user-defined connectivity and flexibility through customized panelettes. Each enclosure can accommodate up to nine panelettes.

Dimensions – 30.7 by 25.4 by 4.3 cm (21.1 by 10 by 1.7 in.)

Figure 7. TB-2705 Terminal Block

NI TB-2705 Terminal Block for 68-pin PXI E Series and S Series Devices (see Figure 7)

The TB-2705 is a screw terminal block for PXI that works with your PXI E Series and S Series DAQ modules. It latches to the front of your PXI module with locking screws and provides strain relief and easy access to your analog, digital, trigger and counter/timer signals through screw terminals.

NI TB-2705 778241-01

Dimensions – 8.43 by 10.41 by 2.03 cm (3.32 by 4.1 by 0.8 in.)

Figure 8. SCB-68 and SCB-100 Shielded I/O Connector Blocks

NI SCB-68 and SCB-100 Shielded I/O Connector Blocks (see Figure 8)

The SCB-68 and SCB-100 are shielded I/O connector blocks for rugged, very low-noise signal termination for connecting to 68-pin or 100-pin E Series DAQ devices, respectively. Silk-screened component locations for easy addition of simple signal-conditioning circuitry for your analog input channels. They also include general-purpose breadboard areas (two on the SCB-68; three on the SCB-100) as well as an IC temperature sensor for cold-junction compensation in temperature measurements.

NI SCB-68.....776844-01

Dimensions – 19.5 by 15.2 by 4.5 cm (7.7 by 6.0 by 1.8 in.)

NI SCB-100.....776990-01

Dimensions – 19.5 by 15.2 by 4.5 cm (7.7 by 6.0 by 1.8 in.)

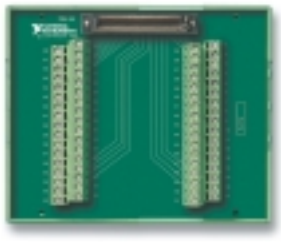


Figure 9. TBX-68 I/O Connector Block

NI TBX-68 I/O Connector Block with DIN-Rail Mounting (see Figure 9)

The TBX-68 is a termination accessory with 68 screw terminals for easy connection of field I/O signals to 68-pin DAQ devices. It includes one 68-pin male connector for direct connection to 68-pin cables. The TBX-68 is mounted in a protective plastic base with hardware for mounting on a standard DIN rail.

NI TBX-68 777141-01

Dimensions – 12.50 by 10.74 cm (4.92 by 4.23 in.)

Multifunction DAQ Cable and Accessory Selection Guides

NI CB-68LP and CB-68LPR I/O Connector Blocks (see Figure 10)

The CB-68LP and CB-68LPR are low-cost termination accessories with 68 screw terminals for easy connection of field I/O signals to 68-pin E Series DAQ devices. They include one 68-pin male connector for direct connection to 68-pin cables. The connector blocks include standoffs for use on a desktop or for mounting in a custom panel. The CB-68LP has a vertical-mounted 68-pin connector. The CB-68LPR has a right-angle mounted connector, and it is used with the CA-1000.

NI CB-68LP.....777145-01
Dimensions – 14.35 by 10.74 cm (5.65 by 4.23 in.)
NI CB-68LPR 777145-02
Dimensions – 7.62 by 16.19 cm (3.00 by 6.36 in.)

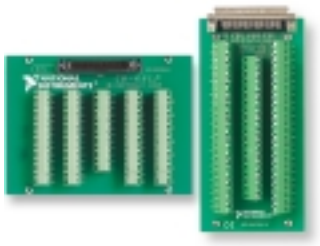


Figure 10. CB-68LP and CB-68LPR I/O Connector Blocks

DAQ Signal Accessory (see Figure 11)

The DAQ Signal Accessory demonstrates and tests the use of analog, digital, and counter/timer functions of DAQ devices. You can connect the DAQ Signal Accessory directly to your DAQ device. It features a built-in function generator, quadrature encoder, solid-state relay, IC temperature sensor, noise generator, microphone jack, thermocouple jack, four LEDs, and a digital trigger button. The DAQ Signal Accessory works with all E Series DAQ devices.

DAQ Signal Accessory.....777382-01
Dimensions – 12.7 by 12.7 cm (5.0 by 5.0 in.)

Figure 11. DAQ Signal Accessory

RTSI Bus Cables (see Figure 12)

Use RTSI bus cables to connect timing and synchronization signals among Measurement, Vision, Motion, and CAN boards for PCI, and FireWire DAQPad devices. For systems using long and short boards, order the extended RTSI cable.

2 boards 776249-02
3 boards 776249-03
4 boards 776249-04
5 boards 776249-05
Extended, 5 boards 777562-05
3 FireWire DAQPads 186464-01

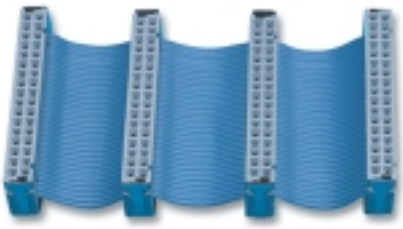


Figure 12. RTSI Bus Cable

Shielded I/O Cables

NI SH68-68-EP Shielded Cable (see Figure 13)

The SH68-68-EP is a shielded 68-conductor cable terminated with two 68-pin female 0.050 series D-type connectors. It features individually-shielded analog twisted pairs for reduced crosstalk with high-speed devices. This cable connects to all 68-pin E Series devices (except DAQCards). If you need a right-angle connector, the SH68-68R1-EP shielded cable is electrically equivalent.

1 m.....184749-01
2 m.....184749-02
Please call for other length options.

Figure 13. SH68-68-EP Shielded Cable

NI SH68-68R1-EP Shielded Cable (see Figure 14)

The SH68-68R1-EP is a shielded 68-conductor cable. One end terminates with a 68-pin female 0.050 series D-type connector and the other end terminates with a right-angle 68-pin female 0.050 series D-type connector.

1 m.....187051-01

Figure 14. SH68-68R1-EP Shielded Cable

Multifunction DAQ Cable and Accessory Selection Guides

Figure 15. SH100100 Shielded Cable

NI SH100100 Shielded Cable (see Figure 15)

The SH100100 is a shielded 100-conductor cable terminated with 100-pin male 0.050 series D-type connectors. This cable connects the 100-pin E Series devices to 100-pin accessories.

1 m.....182853-01
2 m.....182853-02

Figure 16. 68M-50F Cable Adapters

NI 68M-50F S Series Cable Adapters (see Figure 16)

The 68M-50F cable adapter connects a 68-pin NI cable to a standard 0.1 by 0.1 in. 50-pin connector on third-party or custom accessories. The 68M-50F MIO should be used with the SH68-68-EP, SHC68-68-EP, SHC68U-68-EP, or the MIO leg of the SH1006868. The 68M-50F Extended I/O cable adapter should be used for the extended I/O leg of the SH1006868.

NI 68M-50F MIO 184670-01
NI 68M-50F Extended I/O 184670-02

Figure 17. SH1006868 Shielded Cable

NI SH1006868 Shielded Cable (see Figure 17)

The SH1006868 is a shielded cable that connects to 100-pin E Series devices and terminates with two female 68-pin 0.050 series D-type connectors.

1 m 182849-01
2 m 182849-02

Figure 18. SHC68-68-EP and SHC68U-68-EP Shielded Cables

NI SHC68-68-EP and SHC68U-68-EP Shielded Cables for DAQCards (see Figure 18)

These cables connect DAQCards to standard 68-pin accessories. Latching screws secure the shielded connector to the PCMCIA DAQCard. The SHC68-68-EP is a shielded 68-conductor cable terminated with a VHDCI 68-pin male connector at one end and a 68-pin female 0.050 series D-type connector at the other. The SHC68U-68-EP is identical to the SHC68-68-EP except it uses an inverted VHDCI 68-pin male connector. Use the SHC68-68-EP cable with a DAQCard inserted in the lower PCMCIA slot in your laptop or when using only one DAQCard. Use the SH68U-68-EP for a DAQCard located in the upper PCMCIA slot in your laptop. When using two E Series DAQCard PCMCIA devices in adjacent slots, use one SHC68-68-EP and one SHC68U-68-EP.

NI SHC68-68-EP
0.5 m 186838-0R5
1 m 186838-01
NI SHC68U-68-EP
0.5 m 187406-0R5
1 m 187406-01

Figure 19. SH6850 Shielded Cable

NI SH6850 Shielded Cable (see Figure 19)

The SH6850 connects a standard 68-pin E Series or S Series product to a 3rd party or custom standard 50-pin accessory. The cable provides a screw-latching 68-pin female connector on one side and a standard 50-pin female connector on the other side.

1 m 776784-01
2 m 776784-02

Multifunction DAQ Cable and Accessory Selection Guides

Ribbon I/O Cables

NI R6868 Ribbon Cable for E Series Devices (see Figure 20)

The R6868 is a 68-conductor flat ribbon cable terminated with two 68-pin connectors. Use this cable to connect a 68-pin E Series device to 68-pin accessories.

1 m 182482-01

Figure 20. R6868 Ribbon Cable

NI RC68-68 Ribbon Cable for DAQCards (see Figure 21)

The RC68-68 ribbon cable connects DAQCards directly to 68-pin accessories. Two RC68-68 cables can be used together in adjacent PCMCIA slots.

0.25 m 187252-0R25

1 m 187252-01

Figure 21. RC68-68 Ribbon Cable

NI R1005050 Ribbon Cable (see Figure 22)

This cable connects 100-pin E Series devices, including the NI 6071E, NI 6033E, NI 6031E, and NI 6025E to standard 50-pin 3rd party or custom connectors.

1 m 182762-01

2 m 182762-02

Figure 22. R1005050 Ribbon Cable

NI R6850 Ribbon Cable Kit (see Figure 23)

This cable kit combines a 68F-50M cable adapter and a standard 50-pin cable with female connectors on both ends. The cable kit is designed to adapt an E Series, S Series, or PCI-6013/6014 product to a third-party or custom 50-pin accessory.

1 m 776842-01

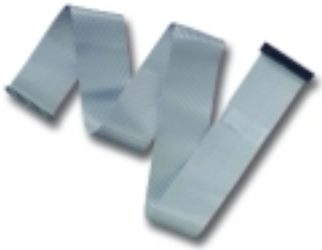


Figure 23. R6850 Ribbon Cable Kit

Custom Connectivity Components

68-Pin Custom Cable Connector/Backshell Kit (see Figure 24)

The 68-pin female mating connector and backshell kit is used to make custom cables. Solder-cup contacts are available for soldering cable wires to the connector.

68-pin connector/backshell kit 776832-01

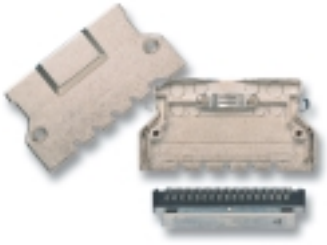


Figure 24. 68-Pin Custom Cable Connector/Backshell Kit

Multifunction DAQ Cable and Accessory Selection Guides

Figure 25. PCB Mounting Connectors for Custom Accessories

Figure 26. PCMCIA Strain-Relief Accessory

NI PCB Mounting Connectors for Custom Accessories (see Figure 25)

PCB mounting connectors are used to build custom accessories that connect to 68-conductor or 100-conductor shielded and ribbon cables. Two connectors are available, one for right-angle and one for vertical mounting onto a PCB.

68-pin, male, right-angle mounting 777600-01
68-pin, male, vertical mounting 777601-01
100-pin, female, right-angle mounting.....777778-01
100-pin, female, vertical mounting 777779-01

NI PCMCIA Strain-Relief Accessory (see Figure 26)

The PCMCIA Strain-Relief accessory attaches to the bottom of your notebook computer and provides adjustable strain relief for one or two PCMCIA cables attached to the installed PCMCIA card(s).

PCMCIA Strain-Relief Accessory 777550-01

S Series Multifunction DAQ Specifications
16-Bit, 800 kS/s, 4 Analog Inputs

Specifications

These specifications are typical for 25 °C unless otherwise noted.

Analog Input

Accuracy specifications ..... see Table 2

Input Characteristics

Number of channels ..... 4 pseudodifferential
Type of ADC ..... Pipelined
Resolution ..... 16 bits, 1 in 65,536
Maximum sampling rate ..... 800 kS/s
Streaming-to-disk rate ..... 3.2 MS/s, system dependent
Bandwidth ..... 1 MHz or 100 kHz with filters enabled
Input coupling ..... DC or AC
Maximum working voltage for all analog input channels

Input Channels	Range	Maximum Working Voltage (Signal + Common Mode)
ACH<0..3>+	200 mV to 10 V	Should remain within ±11 V of ground
	20 to 42 V	Should remain within ±42 V of ground
ACH<0..3>-	All	Should remain within ±2.5 V of ground

Overvoltage protection ..... ±42 V
Inputs protected ..... ACH<0..3>+, ACH<0..3>-
Input FIFO size ..... 32 MS
Data transfers ..... DMA, interrupts, programmed I/O
DMA modes ..... Scatter-gather

Transfer Characteristics

INL ..... ±0.5 LSB typical, ±2 LSB maximum
DNL ..... ±0.5 LSB typical, ±2 LSB maximum
Spurious free dynamic range (SFDR), DC to 100 kHz

Input Range	SFDR Typ (dB)[1]	SFDR Max (dB)[2]
±42 V	95	90
±20 V	96	90
±10 V	95	90
±5 V	95	98
±2 V	96	90
±1 V	94	90
±500 mV	90	85
±200 mV	85	80

[1] Measured at 100 kHz
[2] 100% production tested at 100 kHz

Amplifier Characteristics

Input impedance
ACH+ to ACH–
Range <= ±10 V ..... 1 MΩ in parallel with 100 pF
Range > ±10 V ..... 10 kΩ in parallel with 40 pF
ACH– to ACHGND ..... 10 nF
Input bias current ..... ±200 pA
Input offset current ..... ±100 pA
Input current during overvoltage conditions ..... ±20 mA maximum
CMRR ..... DC to 60 Hz

Input Range	CMRR (dB)[1]
±42 V	60
±20 V	68
±10 V	76
±5 V	82
±2 V	90
±1 V	95
±500 mV	100
±200 mV	105

[1] DC to 60 Hz

Dynamic Characteristics

Interchannel skew ..... 1 ns typical; f_{in} = 100 kHz, 10 V range
System Noise

Input Range	System Noise (LSB_{rms})[1]
±42 V	1.2
±20 V	1.2
±10 V	1.2
±5 V	1.5
±2 V	1.7
±1 V	2.0
±500 mV	2.2
±200 mV	2.8

[1] LSB_{rms} not including quantization

Crosstalk ..... -80 dB, DC to 100 kHz

Analog Output

Output Characteristics

Number of channels ..... 2 voltage outputs
Resolution ..... 16 bits, 1 in 65,536
Max update rate
1 channel ..... 4 MS/s
2 channel ..... 2.5 MS/s
Output buffer size ..... 32 MS
Data transfers ..... DMA, interrupts, programmed I/O
DMA modes ..... Scatter-gather

Transfer Characteristics

INL ..... ±0.35 LSB typical, ±1 LSB maximum
DNL ..... ±0.2 LSB typical, ±1 LSB maximum

Voltage Output

Ranges ..... ±10 V
Output coupling ..... DC
Output impedance ..... 50 Ω ±5%
Current drive ..... ±5 mA
Output stability ..... Any passive load
Protection ..... Short-circuit to ground
Power-on output voltage ..... ±80 mV (before software loads calibration values)

Dynamic Characteristics

Settling time and slew rate

Settling Time for Full-Scale Step	Slew Rate
3.5 µs to 1 LSB	15 V/µs

Noise ..... 100 μV_{rms}, DC to 1 MHz
Glitch energy ..... ±30 mV for 1 µs

Digital I/O

Number of channels ..... 8 input/output
Compatibility ..... TTL/CMOS
Power-on state ..... Input (High-Z)
Data transfers ..... DMA, interrupts, programmed I/O
Transfer rate ..... 10 Mwords/s
Input buffer size ..... 2,000 words
Output buffer size ..... 2,000 words

S Series Multifunction DAQ Specifications
16-Bit, 800 kS/s, 4 Analog Inputs

Specifications (continued)

Digital logic levels

Level	Minimum	Maximum
Input low voltage	0 V	0.8 V
Input high voltage	2 V	5 V
Input low current (Vin= 0 V)	–	-320 µA
Input high current (Vin= 5 V)	–	10 µA
Output low voltage (IOL = 24 mA)	–	0.4 V
Output high voltage (IOH = 13 mA)	4.35 V	–

Timing I/O

General-Purpose Up/Down Counter/Timers

Number of channels 2
Resolution ..... 24 bits
Compatibility ..... TTL/CMOS

Digital logic levels

Level	Minimum	Maximum
Input low voltage	0 V	0.8 V
Input high voltage	2 V	5 V
Input low current (Vin= 0 V)	–	-320 µA
Input high current (Vin= 5 V)	–	10 µA
Output low voltage (IOL = 24 mA)	–	0.4 V
Output high voltage (IOH = 13 mA)	4.35 V	–

Base clocks available ..... 20 MHz, 100 kHz
Base clock accuracy ..... ±0.01%
Maximum source frequency ..... 20 MHz
Minimum source pulse duration ..... 10 ns, edge-detect mode
Minimum gate pulse duration ..... 10 ns, edge-detect mode
Data transfers ..... DMA, interrupts, programmed I/O
DMA modes ..... Scatter-gather

Frequency Scaler

Number of channels 1
Frequency scaler ..... 4 bits
Compatibility ..... TTL/CMOS

Digital logic levels

Level	Minimum	Maximum
Input low voltage	0 V	0.8 V
Input high voltage	2 V	5 V
Output low voltage (Iout = 5 mA)	–	0.4 V
Output high voltage (Iout = 3.5 mA)	4.35 V	–

Base clocks available ..... 10 MHz, 100 kHz
Base clock accuracy ..... ±0.01%
Data transfers ..... DMA, interrupts, programmed I/O

Triggers

Analog Triggers

Number of triggers 1
Purpose
- Analog input ..... Start and stop trigger, gate, clock
- Analog output ..... Start trigger, gate, clock
- General-purpose counter/timers ..... Source, gate

Source ..... ACH<0..3>, PFI0/TRIG1
Level
- Internal source, ACH<0..3> ..... ±Full-scale
- External source, PFI0/TRIG1 ..... ±10 V

Slope ..... Positive or negative; software-selectable
Resolution ..... 12 bits, 1 in 4,096
Hysteresis ..... Programmable
Bandwidth (-3 dB)
- Internal source, ACH<0..3> ..... 5 MHz
- External source, PFI0/TRIG1 ..... 5 MHz

Digital Triggers

Number of triggers 2
Purpose
- Analog input ..... Start and stop trigger, gate, clock
- Analog output ..... Start trigger, gate, clock
- General-purpose counter/timers ..... Source, gate

Source ..... PFI0..PFI9, RTSI0..RTSI6
Slope ..... Positive or negative; software-selectable
Compatibility ..... 5 V/TTL
Response ..... Rising or falling edge
Pulse width ..... 10 ns minimum

External input for digital or analog trigger (PFI0/TRIG1)

Impedance ..... 10 kΩ
Coupling ..... DC or AC
Protection
- Digital trigger ..... -0.5 to V_{cc} + 0.5 V
- Analog trigger
  - On/off/disabled ..... ±35 V

Calibration

Recommended warm-up time ..... 15 minutes
Calibration Interval ..... 1 year
Onboard calibration reference
- DC Level ..... 5.000 V (±3.5 mV); actual value stored in EEPROM
- Temperature coefficient ..... ±0.6 ppm/°C maximum
- Long-term stability ..... ±6 ppm/$\sqrt{1{,}000h}$

PXI Trigger Bus

Trigger lines 7

RTSI Bus (PCI only)

Trigger lines 7

Bus Interface

PXI/PCI ..... Master, slave

Power Requirements

+5 VDC (±5%) ..... 2.2 A
+3.3 V ..... 0.8 A
Power available at I/O connector ..... +4.65 to +5.25 VDC at 1 A

Physical

Dimensions (not including connectors) ..... 31.2 by 10.6 cm (12.3 by 4.2 in.)
I/O connector ..... 68-pin male SCSI-II type

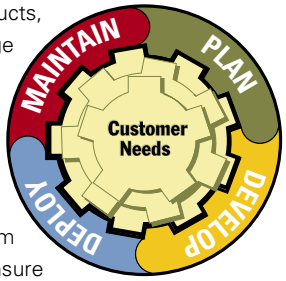
Environment

Operating temperature ..... 0 to 50 °C
Storage temperature ..... -20 to 70 °C
Relative humidity ..... 10 to 90%, noncondensing

Certifications and Compliances

CE Mark Compliance CE

NI Services and Support



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