S Series Multifunction DAQ 12 or 16-Bit, 800 kS/s to 10 MS/s, 4 Analog Inputs

S Series

- 2 or 4 analog inputs; dedicated A/D converter per channel
- Analog and digital triggering
- AC or DC coupling
- 8 input ranges from ±200 mV to ±42 V
- 2 analog outputs at 4 MS/s single channel or 2.5 MS/s dual
- 8 digital I/O lines (5 V TTL/CMOS)
- Two 24-bit counter/timers

NI 6115, NI 6120

- Per-channel on/off antialias filters
- 32 or 64 Msample onboard memory
- Hardware timed and digital I/O
- Phase locking for multiboard synchronization (PXI only)

Families

- NI 6120 ***New!***
- NI 6115
- NI 6111
- NI 6110

Operating Systems

- Windows 2000/NT/XP
- Real-Time Performance with LabVIEW (page 134)
- Others such as Linux and Mac OS X (page 187)

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio
- VI Logger

Other Compatible Software

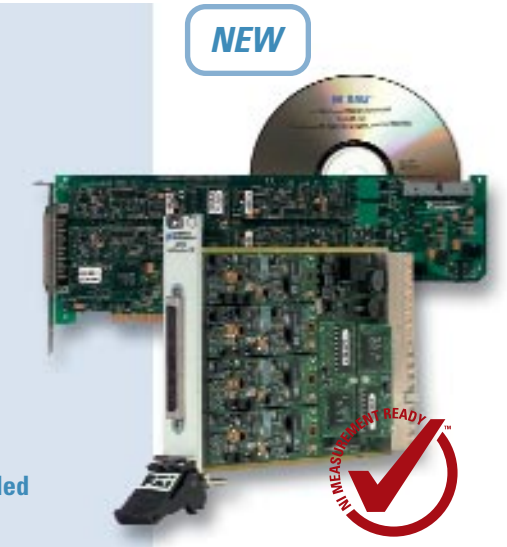
- Visual Basic, C/C++ and C#

Driver Software (included)

- NI-DAQ 7

Calibration Certificate Included

See page 21.



Family	Bus	Analog Inputs	Input Resolution	Sampling Rate	Input Range	Analog Outputs	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	4 MS/s[1]	±10 V	8[2]	2, 24-bit	Analog, digital
NI 6115	PCI, PXI	4	12 bits	10 MS/s	±0.2 to ±42 V	2	4 MS/s[1]	±10 V	8[2]	2, 24-bit	Analog, digital
NI 6111	PCI	2	12 bits	5 MS/s	±0.2 to ±42 V	2	4 MS/s[1]	±10 V	8	2, 24-bit	Analog, digital
NI 6110	PCI	4	12 bits	5 MS/s	±0.2 to ±42 V	2	4 MS/s[1]	±10 V	8	2, 24-bit	Analog, digital

[1] 4 MS/s single channel; 2.5 MS/s on two channels [2] Hardware timed and FIFOs

Table 1. NI S Series Model Guide (See page 228 for detailed specifications.)

Overview and Applications

National Instruments S Series 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. S Series devices are used in a variety of applications including:

- Continuous high-speed 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 required
- 42 V automotive applications
- Radar, sonar
- Transient/ballistics measurements
- Highly accurate time/frequency domain measurements – as little as 6 µV of noise, as much as 90 dB spurious-free dynamic range

Features

The NI high-performance S Series DAQ devices have the same basic features of a typical E Series device – 8 digital I/O lines, 2 counter/timers, 2 analog outputs, RTSI or PXI trigger bus for multidevice synchronization, and PFI lines for software-controlled routing of timing and triggering signals. S Series boards are also programmed with the same functions as E Series DAQ devices. S Series devices, however, exceed the analog input performance of traditional multiplexed devices with features including:

Dedicated A/D Converters per Channel – for faster sampling rates per channel, simultaneous sampling, and better dynamic accuracy for transient or frequency measurements

200 mV to 42 V Input Ranges – configure each analog input channel to read from a very wide variety of voltage ranges. The input impedance is lower for 20 and 42 V ranges, preserving the bandwidth for signals with high frequencies and large amplitudes.

AC or DC Coupling – analog inputs can be configured for AC or DC coupling on a per-channel basis. AC coupling removes the DC offset for applications only analyzing signals in the frequency domain.

Antialias Filters (NI 6115 and NI 6120) – the antialias filters are turned on from software on a per-channel basis. NI 6115 devices have 50 or 500 kHz filters for each channel, and NI 6120 devices have 100 kHz filters for each channel.

Large Onboard Memory (NI 6115 and NI 6120) – NI 6120 devices feature a 64 Msample onboard memory and NI 6115 devices feature a 64 or 32 Msample onboard memory. With the extra memory, which requires no extra programming, you can capture high-bandwidth signals over long periods of time, even if multiple devices are sharing the same PCI or PXI bus.

S Series Multifunction DAQ 12 or 16-Bit, 800 kS/s to 10 MS/s, 4 Analog Inputs

		High-Performance S Series		
Models		NI 6120	NI 6115	NI 6110, NI 6111
Measurement Sensitivity* (mV)		0.0023	0.051	0.046
Nominal Range (V)				
Positive FS	**Negative FS**	**Absolute Accuracy (mV)**		
42	-42	101.5	211	293.56
20	-20	33	69.4	123.42
10	-10	5.28	10.22	17.51
5	-5	2.66	4.61	6.36
2	-2	1.07	2.26	2.63
1	-1	0.55	1.23	1.38
0.5	-0.5	0.3	0.71	0.76
0.2	-0.2	0.14	0.39	0.36

Note: Accuracies are valid for measurements following an internal Calibration. 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 Absolute Accuracy at Full Scale calculations were performed for a maximum range input voltage (for example, 10 V for the ±10 V range) after one year, assuming 100 pt averaging of data.*Smallest detectable voltage change in the input signal at the smallest input range.

Table 2. S Series Analog Input Absolute Accuracy Specifications

		High-Performance S Series		
Models		NI 6120	NI 6115	NI 6110, NI 6111
Nominal Range (V)				
Positive FS	**Negative FS**	**Absolute Accuracy (mV)**		
10	-10	0.305	4.88	8.133

Table 3. S Series Analog Output Absolute Accuracy Specifications

Hardware-Timed Digital I/O – the digital I/O lines can synchronize with the analog input, analog output, counter/timer I/O, or an external clock for mixed signal measurement applications. Using the onboard FIFO, you can achieve reliable data transfers to 10 MBytes/s.

Phase Locking (PXI only) – multiple devices can be synchronized to a common PXI backplane clock to preserve the phase between measurements across multiple device analog input channels.

Worldwide Support and Services

NI provides you with a wealth of resources to help you get your application up and running more quickly, including:

Technical Support – purchase of NI hardware or software gives you access to application engineers all over the world as well as Web resources with more than 3,000 measurement examples and more than 9,000 KnowledgeBase entries. – ***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 certificates, 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, please visit ni.com/services

Ordering Information

NI PCI-6120 (64 Msample buffer) 778397-01
NI PXI-6120 (64 Msample buffer) 778396-01
NI PCI-6115 with
  32 Msample buffer 778534-01
  64 Msample buffer 778554-01
NI PXI-6115 with
  32 Msample buffer 778194-01
  64 Msample buffer 778204-01
NI PCI-6110 777475-01
NI PCI-6111 777530-01

Includes NI-DAQ driver software and calibration certificate

Recommended Configurations

DAQ Device	Accessory	Cable
PCI-6120	BNC-2110 (777643-01)	SH68-68-EP (184749-01)
PXI-6120	TB-2705 (778241-01)	–
PCI-6115	BNC-2110 (777643-01)	SH68-68-EP (184749-01)
PXI-6115	TB-2705 (778241-01)	–
PCI-6110	BNC-2110 (777643-01)	SH68-68-EP (184749-01)
PCI-6111	BNC-2110 (777643-01)	SH68-68-EP (184749-01)

BUY ONLINE!
Visit ni.com/dataacquisition

S Series Multifunction DAQ Specifications

Specifications – NI 61xx

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

Analog Input

Accuracy specifications – See tables, page 228

Input Characteristics

Number of channels
- NI 6110, NI 6115, NI 6120 ..... 4 pseudodifferential
- NI 6111 ..... 2 pseudodifferential

ADC resolution
- NI 6110, NI 6111, NI 6115 ..... 12 bits, 1 in 4,096
- NI 6120 ..... 16 bits, 1 in 65,536

ADC pipeline
- NI-6110, NI 6111 3
- NI 6115 4
- NI 6120 0

Maximum sampling rate
- NI 6110, NI 6111 ..... 5 MS/s
- NI 6115 ..... 10 MS/s
- NI 6120 ..... 800 kS/s

Minimum sampling rate
- NI 6110, NI 6111 ..... 1 kS/s
- NI 6115 ..... 20 kS/s
- NI 6120 ..... No minimum.

Input signal ranges
- (selectable by channel)..... ±42, ±20, ±10, ±5, ±2, ±1, ±0.5, ±0.2 V

Input coupling..... AC or DC

Max working voltage for all analog input channels

NI 6110, NI 6111

Input Channels	Range	Maximum Working Voltage (Signal + Common Mode)
ACH <0..3>+	±20 V, ±42 V, others	±42 V ±11 V
ACH <0..3>-	All	±11 V

NI 6115, NI 6120

Input Channels	Range	Maximum Working Voltage (Signal + Common Mode)
ACH <0..3>+	±20 V, ±42 V, others	±42 V ±11 V
ACH <0..3>-	All	±2.5 V

Overvoltage protection
- (ACH+, ACH-) ..... ±42 V

Input FIFO buffer
- NI 6110, NI 6111 ..... 8,192 samples
- NI 6115, NI 6120 ..... 16 Msamples or 32 Msamples

Data transfers ..... DMA (scatter-gather), interrupts, programmed I/O

Transfer Characteristics

INL
- NI 6110, NI 6111 ..... ±0.5 LSB typical, ±1 LSB maximum
- NI 6115 ..... ±0.35 LSB typical, ±1 LSB maximum
- NI 6120 ..... ±2.5 LSB maximum

DNL
- NI 6110, NI 6111 ..... ±0.3 LSB typical, ±0.75 LSB maximum
- NI 6115 ..... ±0.25 LSB typical, ±1 LSB maximum
- NI 6120 ..... ±0.75 LSB typical, No missing codes

Dynamic Characteristics

Interchannel skew ..... 1 ns typical (f_{in} = 100 kHz, input range = ±10 V)

NI 6110, NI 6111

Input Range (V)	Bandwidth (MHz)[1]	SFDR (dB)[2]	CMRR (dB)[3]	System Noise (LSB_{rms})[4]
±42	5.5	78	34	0.5
±20	4.4	78	40	0.5
±10	7.2	81	46	0.5
±5	4.8	81	52	0.5
±2	4.8	85	60	0.5
±1	4.4	85	66	0.5
±0.5	4.4	85	70	0.6
±0.2	4.1	81	72	1.0

[1]-3 dB frequency for input amplitude at 96% of the input range (-0.3 dB) [2]Measured at 100 kHz [3]DC to 60 Hz
[4]Not including quantization

NI 6115

Input Range (V)	Bandwidth (MHz)[1]	SFDR (dB)[2] Typ	CMRR (dB)[3]	System Noise (LSB_{rms})[4]
±42	5.5	78	34	0.35
±20	4.4	78	40	0.45
±10	7.2	81	46	0.35
±5	4.8	81	52	0.35
±2	4.8	85	60	0.45
±1	4.4	85	66	0.60
±0.5	4.4	85	70	0.80
±0.2	4.1	81	72	1.30

[1]-3 dB frequency for input amplitude at 96% of the input range (-0.3 dB) [2]Measured at 100 kHz [3]DC to 60 Hz
[4]Not including quantization

NI 6120

Input Range (V)	Bandwidth (MHz)[1]	SFDR (dB)[2] Typ	CMRR (dB)[3]	System Noise (LSB_{rms})[4]
±42	1.0	90	60	1.2
±20	1.0	90	68	1.2
±10	1.0	90	76	1.2
±5	1.0	90	82	1.5
±2	1.0	90	90	1.7
±1	1.0	90	95	2.0
±0.5	1.0	85	100	2.2
±0.2	1.0	80	105	2.8

[1]-3 dB frequency for input amplitude at 96% of the input range (-0.3 dB) [2]Measured at 100 kHz [3]DC to 60 Hz
[4]Including quantization

ENOB
- NI 6110, NI 6111 ..... 11.0 bits, DC to 100 kHz

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

Analog filter type
- NI 6115 ..... 3-pole Bessel
- NI 6120 ..... 5-pole Bessel

Analog filter frequency
- NI 6115 ..... 50 and 500 kHz
- NI 6120 ..... 100 kHz

Amplifier Characteristics

Input impedance (ACH+ to ACH–)
- NI 6110, NI 6111
  - Normal powered on..... 1 MΩ in parallel with 100 pF
  - Powered off ..... 1 MΩ minimum
  - Overload..... 1 MΩ
- NI 6115, NI 6120
  - Input Range ±20 V, ±42 V ..... 10 kΩ in parallel with 40 pF
  - Input Range (others) ..... 1 MΩ in parallel with 100 pF

Input impedance (ACH– to ACHGND)
- NI 6110, NI 6111, NI 6115 ..... 100 GΩ in parallel with 10 nF
- NI 6120 ..... 100 GΩ in parallel with 100 pF

Input impedance (ACH+ to ACHGND)
- NI 6115, NI 6120 ..... 100 GΩ in parallel with 100 pF

Input bias current ..... ±300 pA

Input offset current ..... ±200 pA

Input current during overvoltage conditions
- NI 6115, NI 6120 ..... ±20 mA maximum

Analog Output

Output Characteristics

Number of channels..... 2 voltage

Resolution
- NI 6110, NI 6111, NI 6120 ..... 16 bits, 1 in 65536
- NI 6115 ..... 12 bits, 1 in 4,096

Max update rate
- 1 channel ..... 4 MS/s
- 2 channel ..... 2.5 MS/s

Output FIFO buffer size
- NI 6110, NI 6111 ..... 2,048 samples
- NI 6115, NI 6120 ..... 16 or 32 Msamples

Data transfers ..... DMA (scatter-gather), interrupts, programmed I/O

Transfer Characteristics

INL
- NI 6110, NI 6111 ..... ±4 LSB typical, ±8 LSB maximum
- NI 6115 ..... ±0.5 LSB typical, ±2 LSB maximum
- NI 6120 ..... ±0.35 LSB typical, ±1 LSB maximum

S Series Multifunction DAQ Specifications

Specifications – NI 61xx (continued)

DNL
- NI 6110, NI 6111 ..... ±2 LSB typical, ±8 LSB maximum
- NI 6115 ..... ±0.25 LSB typical, ±1 LSB maximum
- NI 6120 ..... ±0.2 LSB typical, ±1 LSB maximum

Voltage Output

- Ranges ..... ±10 V
- Output coupling ..... DC
- Output impedance ..... 50 Ω ±5%
- Current drive ..... ±5 mA minimum
- Output stability ..... Any passive load
- Protection ..... Short-circuit to ground

Power-on output voltage (before software loads calibration values)
- NI 6110, NI 6111, NI 6115 ..... 0 V, ±400 mV
- NI 6120 ..... 0 V, ±80 mV

Dynamic Characteristics

Settling time
- NI 6110, NI 6111, NI 6115 ..... 300 ns to ±0.01%
- NI 6120 ..... 4 µs to ±1 LSB

Slew rate
- NI 6110, NI 6111, NI 6115 ..... 300 V/µs
- NI 6120 ..... 15 V/µs

Noise
- NI 6110, NI 6111 ..... 1 mV_{rms}, DC to 5 MHz
- NI 6115 ..... 600 μV_{rms}, DC to 5 MHz
- NI 6120 ..... 100 μV_{rms}, DC to 1 MHz

Glitch energy at midscale transition
- NI 6110, NI 6111, NI 6115 ..... ±30 mV for 1 µs
- NI 6120 ..... ±10 mV for 1 µs

Digital I/O

- Number of channels ..... 8 input/output
- Compatibility ..... TTL/CMOS
- Power-on state ..... Input (high-impedence)

Data transfers
- NI 6110, NI 6111 ..... Programmed I/O
- NI 6115, NI 6120 ..... DMA (scatter-gather), interrupts, programmed I/O

Transfer rate

Digital Logic Levels

Level	Minimum	Maximum
Input low voltage	0.0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Input low current (V_{in} = 0 V)	–	-320 µA
Input high current (V_{in} = 5 V)	–	10 µA
Output low voltage (I_{OL} = 24 mA)	–	0.4 V
Output high voltage (I_{OH} = -13 mA)	4.35 V	–

- NI 6115, NI 6120 ..... 10 Mbytes/s

Input buffer size
- NI 6115, NI 6120 ..... 2,048 bytes

Output buffer size
- NI 6115, NI 6120 ..... 2,048 bytes

Timing I/O

Number of channels
- Up/down counter/timers 2
- Frequency scaler 1

Resolution
- Up/down counter/timers ..... 24 bits
- Frequency scaler ..... 4 bits

- Compatibility ..... TTL/CMOS

Base clocks available
- Up/down counter/timers ..... 20 MHz, 100 kHz
- Frequency scaler ..... 10 MHz, 100 kHz

- Base clock accuracy ..... ±0.01%

Maximum source frequency
- Up/down counter/timers ..... 20 MHz

- Minimum source pulse duration ..... 10 ns, edge-detect mode
- Minimum gate pulse duration ..... 10 ns, edge-detect mode
- Data transfers ..... DMA (scatter-gather), interrupts, programmed I/O

Calibration

- Recommended warm-up time ..... 15 minutes
- Calibration interval ..... 1 year

Onboard calibration reference
- DC level ..... 5.000V (± 2.5 mV); actual value stored in EEPROM
- Temperature coefficient ..... ±2.0 ppm/°C maximum
- Long-term stability ..... ±6 ppm $/\sqrt{1000\ h}$

Triggers

Analog Trigger

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

- Source ..... All analog input channels, PFI0/TRIG1

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

- Slope ..... Positive or negative; software-selectable

Resolution
- NI 6110, NI 6111, NI 6115 ..... 8 bits, 1 in 256
- NI 6120 ..... 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

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

- External Sources ..... PFI<0..9>, RTSI<0..6>
- Compatibility ..... 5 V/TTL
- Response ..... Rising or falling edge
- Pulse width ..... 10 ns minimum

External input for digital or analog trigger (PFI 0/AI START TRIG)

- 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

PXI Trigger Bus (PXI only)

- Trigger lines 7

RTSI Bus (PCI only)

- Trigger lines 7

Bus Interface

- PXI or PCI ..... Master, slave

Power Requirements

Family	+5 VDC (±5%)	+ 3.3 V
NI 6110	2.5 A	0
NI 6111	2.0 A	0
NI 6115	2.2 A	0.8 A
NI 6120	3.0 A	0.8 A

- Power available at I/O connector ..... +4.65 to +5.25 VDC at 1 A

Physical

Dimensions (not including connectors)
- PCI ..... 31.2 by 10.6 cm (12.3 by 4.2 in.)
- PXI ..... 16 by 10 cm (6.3 by 3.9 in.)

- I/O connector ..... 68-pin male SCSI-II type

Environment

Operating temperature
- NI 6110, NI 6111 ..... 0 to 45 °C
- NI 6115, NI 6120 ..... 0 to 50 °C

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

Certifications and Compliances

CE Mark Compliance CE

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:

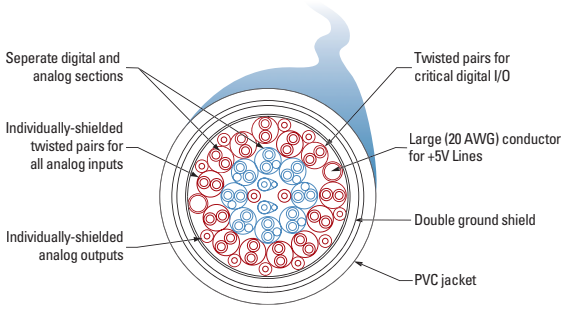


Figure 1. SH68-68-EP Cable

A variety of cabling and accessory options are available for your needs. Use the following tables to choose the most appropriate cables and accessories. To determine which Multifunction DAQ device best fits your needs, please see page 189.

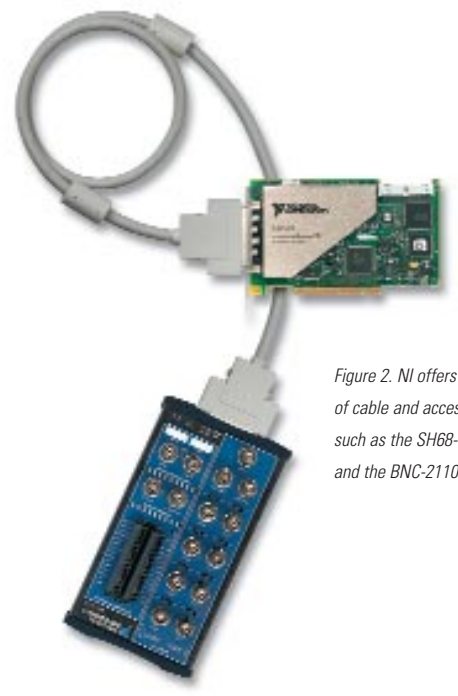


Figure 2. NI offers a wide variety of cable and accessory options, such as the SH68-68-EP cable and the BNC-2110 terminal block.

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, page 251
	Shielded	SCXI high-performance signal conditioning	SCXI-1349	–	SCXI Chassis and Modules, page 270
	Shielded	Screw terminals [1]	SH68-68-EP or SH68-68R1-EP	–	SCB-68
	Shielded	BNC terminal block	SH68-68-EP	–	BNC-2110, BNC-2120, BNC-2090
	Shielded	50-pin connector	SH6850	–	CB50, custom or 3rd party
	Shielded	Configurable connectivity box	SH68-68-EP	–	CA-1000, page 351
	Unshielded	Screw terminals [1]	R6868	–	TBX-68, CB-68LP, CB-68LPR, DAQ signal accessory
	Unshielded	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
	Shielded	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
	Unshielded	50-pin connector	RC68-68	68M-50F MIO	CB50, custom or 3rd party

[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 and Basic Multifunction DAQ (except NI 6025E, which is on the next page)

Multifunction DAQ Cable and Accessory Selection Guides

AI 0-	34	68	AI 0+
AI 1+	33	67	AI 0 GND
AI 1 GND	32	66	AI 1-
AI 2-	31	65	AI 2+
AI 3+	30	64	AI 2 GND
AI 3 GND	29	63	AI 3-
NC	28	62	NC
NC	27	61	NC
NC	26	60	NC
NC	25	59	NC
NC	24	58	NC
NC	23	57	NC
AO 0	22	56	NC
AO 0	21	55	AO GND
EXT REF	20	54	AO GND
P0.4	19	53	D GND
D GND	18	52	P0.0
P0.1	17	51	P0.5
P0.6	16	50	D GND
D GND	15	49	P0.2
+5 V	14	48	P0.7
D GND	13	47	P0.3
D GND	12	46	AI HOLD
PFI 0/AI START	11	45	EXT STROBE
PFI 1/REF TRIG	10	44	D GND
D GND	9	43	PFI 2/AI CONV
+5 V	8	42	PFI 3/CTR 1 SRC
D GND	7	41	PFI 4/CTR1 GATE
PFI 5/AO SAMP	6	40	CTR 1 OUT
PFI 6/AO START	5	39	D GND
D GND	4	38	PFI 7/AI SAMP
PFI 9/CTR 0 GATE	3	37	PFI 8/CTR 0 SRC
CTR 0 OUT	2	36	D GND
F OUT	1	35	D GND

Figure 2. S Series Devices Connector

[1]No connects for boards that do not support AO or use an external reference with the SH1006868 cable.

AI 8	34	68	AI 0
AI 1	33	67	AI GND
AI GND	32	66	AI 9
AI 10	31	65	AI 2
AI 3	30	64	AI GND
AI GND	29	63	AI 11
AI 4	28	62	AI SENSE
AI GND	27	61	AI 12
ACH13	26	60	AI 5
ACH6	25	59	AI GND
AIGND	24	58	AI 14
ACH15	23	57	AI 7
AO 0[1]	22	56	AI GND
AO 1[1]	21	55	AO GND
EXT REF[1]	20	54	AO GND
P0.4	19	53	D GND
D GND	18	52	P0.0
P0.1	17	51	P0.5
P0.6	16	50	D GND
D GND	15	49	P0.2
+5 V	14	48	P0.7
D GND	13	47	P0.3
D GND	12	46	AI HOLD
PFI 0/AI START	11	45	EXT STROBE
PFI 1/REF TRIG	10	44	D GND
D GND	9	43	PFI 2/AI CONV
+5 V	8	42	PFI 3/AI CTR 1 SRC
D GND	7	41	PFI 4/AI CTR 1 GATE
PFI 5/AO SAMP	6	40	CTR 1 OUT
PFI 6/AO START	5	39	D GND
DGND	4	38	PFI 7/AI SAMP
PFI 9/CTR 0 GATE	3	37	PFI 8/CTR 0 SRC
CTR 0 OUT	2	36	D GND
F OUT	1	35	D GND

Figure 3. I/O Connector for 16-Channel E Series and Basic Multifunction DAQ Devices, except NI 6025E

AI GND	1	51	AI 16
AI GND	2	52	AI 24
AI 0	3	53	AI 17
AI 8	4	54	AI 25
AI 1	5	55	AI 18
AI 9	6	56	AI 26
AI 2	7	57	AI 19
AI 10	8	58	AI 27
AI 3	9	59	AI 20
AI 11	10	60	AI 28
AI 4	11	61	AI 21
AI 12	12	62	AI 29
AI 5	13	63	AI 22
AI 13	14	64	AI 30
AI 6	15	65	AI 23
AI 14	16	66	AI 31
AI 7	17	67	AI 32
AI 15	18	68	AI 40
AI SENSE	19	69	AI 33
AO 0	20	70	AI 41
AO 1	21	71	AI 34
EXT REF	22	72	AI 42
AO GND	23	73	AI 35
D GND	24	74	AI 43
P0.0	25	75	AI SENSE 2
P0.4	26	76	AI GND
P0.1	27	77	AI 36
P0.5	28	78	AI 44
P0.2	29	79	AI 37
P0.6	30	80	AI 45
P0.3	31	81	AI 38
P0.7	32	82	AI 46
D GND	33	83	AI 39
+5 V	34	84	AI 47
+5 V	35	85	AI 48
AI HOLD	36	86	AI 56
EXT STROBE	37	87	AI 49
PFI 0/AI START	38	88	AI 57
PFI 1/REF TRIG	39	89	AI 50
PFI 2/AI CONV	40	90	AI 58
PFI 3/CTR 1 SRC	41	91	AI 51
PFI 4/CTR 1 GATE	42	92	AI 59
CTR 1 OUT	43	93	AI 52
PFI 5/AO SAMP	44	94	AI 60
PFI 6/AO START	45	95	AI 53
PFI 7/AI SAMP	46	96	AI 61
PFI 8/CTR 0 SRC	47	97	AI 54
PFI 9/CTR 0 GATE	48	98	AI 62
CTR 0 OUT	49	99	AI 55
F OUT	50	100	AI 63

Figure 4. I/O Connector for 64-Channel E Series Devices

AI GND	1	51	P2.7
AI GND	2	52	GND
AI 0	3	53	P2.6
AI 8	4	54	GND
AI 1	5	55	P2.5
AI 9	6	56	GND
AI 2	7	57	P2.4
AI 10	8	58	GND
AI 3	9	59	P2.3
AI 11	10	60	GND
AI 4	11	61	P2.2
AI 12	12	62	GND
AI 5	13	63	P2.1
AI 13	14	64	GND
AI 6	15	65	P2.0
AI 14	16	66	GND
AI 7	17	67	P1.7
AI 15	18	68	GND
AI SENSE	19	69	P1.6
AO 0	20	70	GND
AO 1	21	71	P1.5
NC	22	72	GND
AO GND	23	73	P1.4
D GND	24	74	GND
P0.0	25	75	P1.3
P0.4	26	76	GND
P0.1	27	77	P1.2
P0.5	28	78	GND
P0.2	29	79	P1.1
P0.6	30	80	GND
P0.3	31	81	P1.0
P0.7	32	82	GND
D GND	33	83	P0.7
+5 V	34	84	GND
+5 V	35	85	P0.6
AI HOLD	36	86	GND
EXT STROBE	37	87	P0.5
PFI 0/AI START	38	88	GND
PFI 1/REF TRIG	39	89	P0.4
PFI 2/AI CONV	40	90	GND
PFI 3/CTR 1 SRC	41	91	P0.3
PFI 4/CTR 1 GATE	42	92	GND
CTR 1 OUT	43	93	P0.2
PFI 5/AO SAMP	44	94	GND
PFI 6/AO START	45	95	P0.1
PFI 7/AI SAMP	46	96	GND
PFI 8/CTR 0 SRC	47	97	P0.0
PFI 9/CTR 0 GATE	48	98	GND
CTR 0 OUT	49	99	+5 V
F OUT	50	100	GND

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
	Shielded	Screw terminals	SH1006868	MIO:	–	SCB-68
	Shielded		SH1006868	Extended:	–	SCB-68
	Shielded	Screw terminals[1]	SH1006868	MIO:	–	TBX-68, CB-68LP, CB-68LPR, DAQ signal accessory
	Shielded	Screw terminals[1]	SH1006868	Extended:	–	TBX-68, CB-68LP, CB-68LPR
	Shielded	BNC terminal block	SH1006868	MIO:	–	BNC-2110, BNC-2120, BNC-2090
	Shielded		SH1006868	Extended:	–	BNC-2115
	Shielded	50-pin connectors	SH1006868	MIO:	68M-50F MIO	Custom or 3rd party
	Shielded		SH1006868	Extended:	68M-50F Extended	Custom or 3rd party
	Unshielded	50-pin connector	R1005050	MIO:	–	Custom or 3rd party
	Unshielded		R1005050	Extended:	–	Custom or 3rd party

[1]Shielded cable with unshielded accessories

Table 2. Cable Connection Specifications for 64-Channel E Series Devices and the NI 6025E