Low-Cost E Series Multifunction DAQ
12-Bit, 200 kS/s, 16 Analog Inputs

NI 6023E, NI 6024E, NI 6025E

- 16 analog inputs at 200 kS/s, 12-bit resolution
- Up to 2 analog outputs, 12-bit resolution
- 8 digital I/O lines (5 V/TTL/CMOS); two 24-bit counter/timers
- Digital triggering
- 4 analog input signal ranges
- NI-DAQ driver simplifies configuration and measurements

Models
- NI PCI-6023E
- NI PCI-6024E
- NI DAQCard-6024E for PCMCIA
- NI PCI-6025E
- NI PXI-6025E

*See ordering information

Operating Systems
- Windows 2000/NT/XP/Me/9x
- Mac OS 9*
- Real-time performance with LabVIEW (page 134)
- Others such as Linux (page 187)

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
See page 21



Overview and Applications

National Instruments 6023E, NI 6024E and NI 6025E devices use E Series technology to deliver high performance, reliable data acquisition capabilities. These devices are used in a broad variety of applications including:

- Continuous high-speed data logging at up to 200 kS/s
- Externally timed and/or triggered data acquisition
- High-voltage and sensor measurements when used with NI signal conditioning (see page 244)
- High-channel-count system scalability with RTSI or PXI trigger bus

Features

NI 6023E, NI 6024E, and NI 6025E devices feature a highly precise voltage reference used during self-calibration. A simple software call initiates self-calibration, which minimizes errors caused by temperature drift and time. These devices feature the NI-PGIA, which is an instrumentation-class amplifier that guarantees settling times at all gains. Typical commercial off-the-shelf amplifier components might not meet the settling time requirements for high-gain measurement applications. Without the NI-PGIA, 12-bit devices with a 100X gain can have an effective resolution of only 10 bits. For a full description of NI accuracy advantages, see page 188. These devices offer several methods for connecting your signals including a differential mode for eight AI channels and maximum noise elimination, as well as referenced and nonreferenced single-ended mode for 16 AI channels.

NI 6023E, NI 6024E, and NI 6025E devices feature digital triggering, and two 24-bit 20 MHz counter/timers. NI 6023E and NI 6024E devices feature eight digital I/O lines compatible with both 5 V TTL and CMOS while NI 6025E devices feature 32 digital I/O lines. NI 6024E and NI 6025E devices feature two 12-bit analog outputs.

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

pci6023e
pci6024e
daqcard6024e
pci6025e
pxi6025e

BUY ONLINE!

For a detailed list of differences between Performance E Series and Low-Cost E Series, see Table 1 on page 191.

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 LabVIEW,

Family	Bus	Analog Inputs	Resolution	Sampling Rate S/s	Input Range	Analog Outputs	Resolution	Output Rate	Output Range	Digital I/O	Counter/ Timers	Triggers
NI 6023E	PCI	16 SE/8 DI	12 bits	200 kS/s	±0.05 to ±10 V	–	–	–	–	8	2, 24-bit	Digital
NI 6024E	PCI, PCMCIA	16 SE/8 DI	12 bits	200 kS/s	±0.05 to ±10 V	2	12 bits	10 kS/s[1]	±10 V	8	2, 24-bit	Digital
NI 6025E	PCI, PXI	16 SE/8 DI	12 bits	200 kS/s	±0.05 to ±10 V	2	12 bits	10 kS/s[1]	±10 V	32	2, 24-bit	Digital

[1]10 kS/s maximum when using the single DMA channel for analog output. 1 kS/s maximum when using the single DMA channel for either analog input or counter/timer operations. 1 kS/s maximum for DAQCard-6024E in all cases.

Table 1. NI 6023E, NI 6024E, and NI 6025E Channel, Speed, and Resolution Specifications (see page 233 for detailed specifications)

Low-Cost E Series Multifunction DAQ
12-Bit, 200 kS/s, 16 Analog Inputs

Nominal Range (V)		Absolute Accuracy							Relative Accuracy	
		% of Reading		Offset	Noise + Quantization (mV)		Temp	Absolute Accuracy	Resolution (mV)	
Positive FS	Negative FS	24 Hrs	1 Year	(mV)	Single Pt.	Averaged	Drift (%/°C)	at Full Scale (mV)	Single Pt.	Averaged
10.0	-10.0	0.0872	0.0914	6.380	3.910	0.975	0.0010	16.504	5.890	1.280
5.0	-5.0	0.0272	0.0314	3.200	1.950	0.488	0.0005	5.263	2.950	0.642
0.5	-0.5	0.0872	0.0914	0.340	0.195	0.049	0.0010	0.846	0.295	0.064
0.05	-0.05	0.0872	0.0914	0.054	0.063	0.006	0.0010	0.106	0.073	0.008

Note: Accuracies are valid for measurements following an internal E Series 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 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. See the overview on page 194 for example calculations.

Table 2. NI 6023E, PCI-6024E, and NI 6025E Analog Input Accuracy Specifications

Nominal Range (V)		Absolute Accuracy							Relative Accuracy	
		% of Reading		Offset	Noise + Quantization (mV)		Temp	Absolute Accuracy	Resolution (mV)	
Positive FS	Negative FS	24 Hrs	1 Year	(mV)	Single Pt.	Averaged	Drift (%/°C)	at Full Scale (mV)	Single Pt.	Averaged
10.0	-10.0	0.0872	0.0914	8.830	3.910	1.042	0.0010	19.012	5.890	1.370
5.0	-5.0	0.0272	0.0314	4.420	1.950	0.521	0.0005	6.517	2.950	0.686
0.5	-0.5	0.0872	0.0914	0.462	0.452	0.052	0.0010	0.972	0.516	0.069
0.05	-0.05	0.0872	0.0914	0.066	0.063	0.007	0.0010	0.119	0.073	0.009

Note: Accuracies are valid for measurements following an internal E Series 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 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. See the overview on page 194 for example calculations.

Table 3. DAQCard-6024E Analog Input Accuracy Specifications

Nominal Range (V)		Absolute Accuracy					Absolute
		% of Reading				Temp	Accuracy at
Positive FS	Negative FS	24 Hrs	90 Days	1 Year	Offset (mV)	Drift (%/°C)	Full Scale (mV)
10	-10	0.0177	0.0197	0.0219	5.93	0.0005	8.127

Note: Temp Drift applies only if ambient is greater than ±10 °C of previous external calibration. See page 194 for example calculations.

Table 4. PCI-6024E, and NI 6025E Analog Output Accuracy Specifications

Nominal Range (V)		Absolute Accuracy					Absolute
		% of Reading				Temp	Accuracy at
Positive FS	Negative FS	24 Hrs	90 Days	1 Year	Offset (mV)	Drift (%/°C)	Full Scale (mV)
10	-10	0.0177	0.0197	0.0219	8.37	0.0005	10.568

Note: Temp Drift applies only if ambient is greater than ±10 °C of previous external calibration. See page 194 for example calculations.

Table 5. DAQCard-6024E Analog Output Accuracy Specifications

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 Measurement & Automation Explorer utility simplifies the configuration of your 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.

Related Products

For related products, please refer to:

- SCXI Signal Conditioning – page 246
- SCC Signal Conditioning – page 320
- Analog Output Multifunction DAQ – page 365
- High-Speed Digital I/O – page 378

See page 221 for connector diagrams.
See page 233 for detailed specifications.

Ordering Information

NI PCI-6023E 777742-01
NI PCI-6024E 777743-01
NI DAQCard-6024E[1] 778269-01
NI PCI-6025E[1] 777744-01
NI PXI-6025E[1] 777798-01

Includes NI-DAQ driver software.
[1] Windows only.

For information on extended warranty and value-added services, see page 20.

Recommended Configurations

Family	DAQ Device	Accessory	Cable
NI 6023E	PCI-6023E	CB-68LP (777145-01)	R6868 (182482-01)
NI 6024E	PCI-6024E	CB-68LP (777145-01)	R6868 (182482-01)
	DAQCard-6024E	CB-68LP (777145-01)	RC68-68 (187252-01)
NI 6025E	PCI-6025E	Two CB-50LPs (777101-01)	R1005050 (182762-01)
	PXI-6025E	Two CB-50LPs (777101-01)	R1005050 (182762-01)

For E Series accessory and cable information, see page 221.

Multifunction DAQ Overview

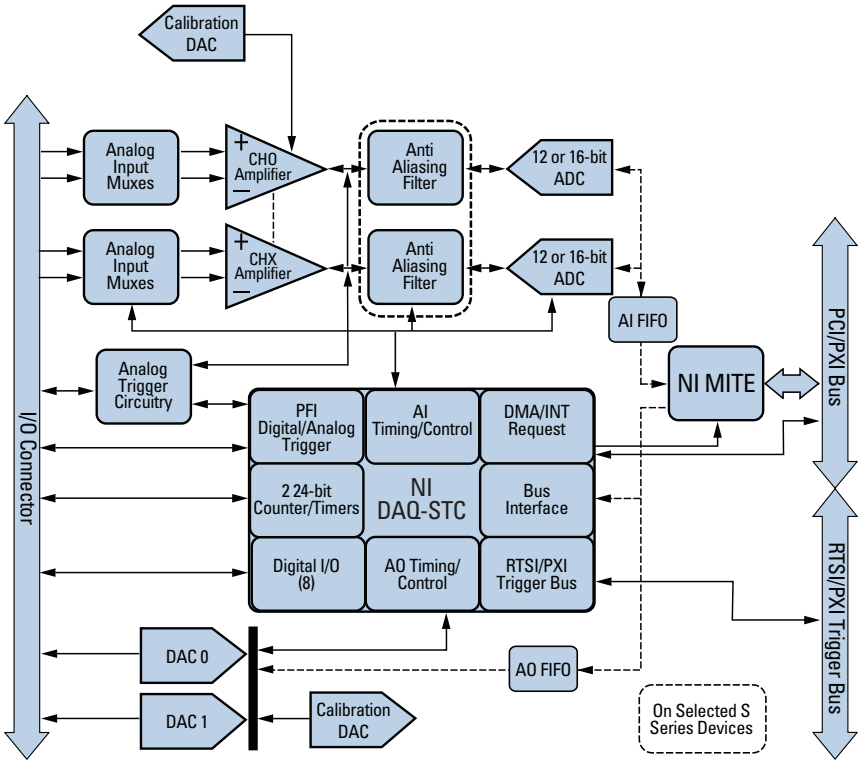


Diagram 1. S Series Diagram

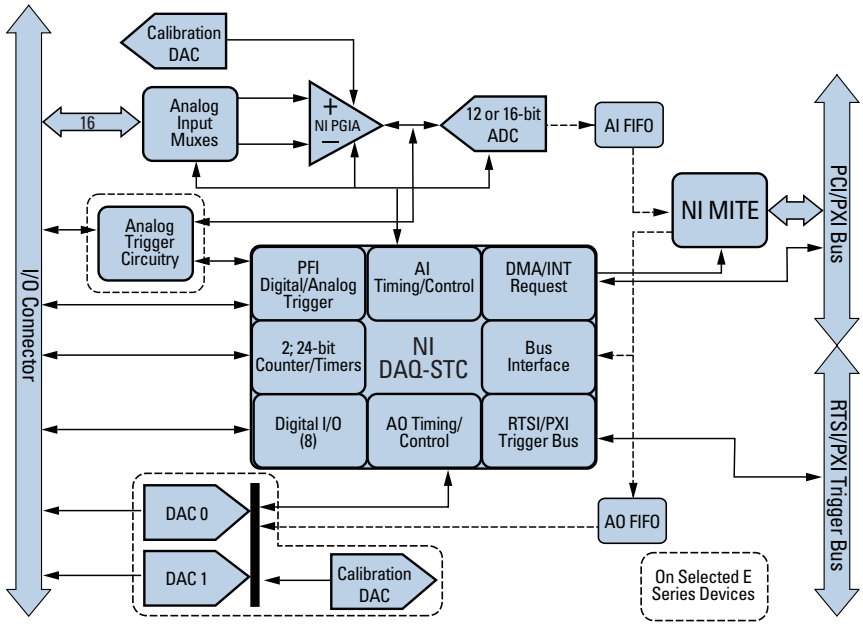


Diagram 2. E Series Diagram