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

NI 6034E, NI 6036E

- 16 analog inputs at 200 kS/s, 16-bit resolution
- Up to 2 analog outputs, 16-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 6034E
- NI PCI-6034E

NI 6036E
- NI PCI-6036E
- NI DAQCard-6036E ***NEW!***

Operating Systems
- Windows 2000/NT/XP/Me/9x
- Mac OS 9*

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 ordering information

NEW

Overview and Applications

NI 6034E and NI 6036E devices use E Series technology to deliver high performance, reliable data acquisition capabilities. These devices enable 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
- High channel-count synchronization with RTSI

Features

NI 6034E and NI 6036E devices feature the NI-PGIA, an instrumentation-class amplifier that guarantees settling times at all gains. Typical commercial off-the-shelf amplifier components don't meet the settling time requirements for high-gain measurement applications. Without the NI-PGIA, 16-bit devices with a 100X gain can have an effective resolution of 12 bits. The NI 6034E and NI 6036E devices also offer resolution improvement technologies such as dithering to reduce quantization error. This technology permits NI 16-bit multifunction DAQ devices to perform with an effective input resolution of at least 18-bits. These devices offer several methods in which to connect your signals including differential for eight analog input channels and maximum noise elimination, as well as referenced and nonreferenced single-ended for 16 analog input channels.

NI 6034E and NI 6036E devices feature digital triggering, two 24-bit 20 MHz counter/timers, and eight digital I/O lines compatible with both 5 V TTL and CMOS. NI 6036E devices also feature two 16-bit analog outputs.

INFO CODES

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

pci6034e
pci6036e
daqcard6036e

BUY ONLINE!

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 6034E	PCI	16 SE/8 DI	16 bits	200 kS/s	±0.05 to ±10 V	–	–	–	–	8	2, 24-bit	Digital
NI 6036E	PCI,PCMCIA	16 SE/8 DI	16 bits	200 kS/s	±0.05 to ±10 V	2	16 bits	10 kS/s[1]	±10 V	8	2, 24-bit	Digital

[1]10 kS/s maximum when using the single DMA channel for analog output. 1kS/s system dependent when using the single DMA channel for either analog input or counter/timer operations.

Table 1. NI 6036E and NI 6034E Channel, Speed, and Resolution Specifications

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

Nominal Range (V)		Absolute Accuracy							Relative Accuracy	
		% of Reading		Offset	Noise + Quantization (µV)		Temp	Absolute Accuracy	Resolution (µV)	
Positive FS	Negative FS	24 Hrs	1 Year	(µV)	Single Pt.	Averaged	Drift (%/°C)	at Full Scale (mV)	Single Pt.	Averaged
10.0	-10.0	0.0646	0.0688	1591.4	885.0	77.90	0.0010	8.553	1025.20	102.50
5.0	-5.0	0.0146	0.0188	806.2	442.5	38.90	0.0005	1.787	512.60	51.26
0.5	-0.5	0.0646	0.0688	99.5	53.4	4.76	0.0010	0.448	62.73	6.27
0.05	-0.05	0.0646	0.0688	28.9	26.4	2.57	0.0010	0.066	33.80	3.38

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.

Table 2. NI PCI-6034E and NI PCI-6036E 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	-10	0.0872	0.0914	2.93	0.89	0.078	0.0010	12.154	1.03	0.10
5	-5	0.0272	0.0314	1.48	0.44	0.039	0.0005	3.087	0.51	0.051
0.5	-0.5	0.0872	0.0914	0.167	0.053	0.005	0.0010	0.629	0.063	0.006
0.05	-0.05	0.0872	0.0914	0.036	0.026	0.003	0.0010	0.084	0.034	0.003

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.

Table 3. NI DAQCard-6036E Analog Input Accuracy Specifications.

Family	Nominal Range (V) FS	Absolute Accuracy					Absolute Accuracy at Full Scale (mV)
		% of Reading			Offset (mV)	Temp Drift (%/°C)	
		24 Hrs	90 Days	1 Year			
NI PCI-6036E	±10	0.009	0.011	0.013	1.1	0.0005	2.417
NI DAQCard-6036E	±10	0.009	0.011	0.013	1.22	0.0005	2.547

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

Table 4. NI PCI-6036E and NI DAQCard-6036E Analog Output Accuracy Specifications

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

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, 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.

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 1000 example programs and more than 7000 Knowledge Bases, 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***

Related Products

For related products, please refer to:

- SCXI Signal Conditioning
- SCC Signal Conditioning
- Analog Output Multifunction DAQ
- High-speed Digital I/O

Tech Tip

Learn how to reduce your development time and system costs. Visit ***ni.com/info*** and enter **mready** to download an interactive white paper on the benefits of Measurement Ready DAQ – measurement quality, software integration, and solutions support.

For more information, visit ***ni.com/info*** and enter: mready.

Ordering Information

NI PCI-6034E[1] 778075-01
NI PCI-6036E 778465-01
NI DAQCard-6036E 778561-01

Includes NI-DAQ driver software.
[1]Compatible with Mac OS 9

Recommended Configurations

Family	DAQ Devices	Accessory	Cable
NI 6034E	NI PCI-6034E	CB-68LP (777145-01)	R6868 (182482-01)
NI 6036E	NI PCI-6036E	CB-68LP (777145-01)	R6868 (182482-01)
NI 6036E	NI DAQCard-6036E	CB-68LP (777145-01)	RC6868 (187252-01)

16-Bit E Series Multifunction DAQ Specifications

Specifications – 16-Bit E Series NI 6052E and NI 603xE

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

Analog Input

Accuracy specifications ..... See tables in E Series product pages.

Input Characteristics

Number of channels

6052E 6030E 6032E 6034E 6036E	16 single-ended or 8 differential (software selectable per channel)
6031E 6033E	64 single-ended or 32 differential (software-selectable per channel)

Resolution ..... 16 bits, 1 in 65,536

Maximum sampling rate

6052E	333 kS/s
6034E 6036E	200 kS/s
6030E 6031E 6032E 6033E	100 kS/s

Streaming-to-disk rate (system dependent)[1]

6052E	333 kS/s
6034E 6036E	200 kS/s
6030E 6031E 6032E 6033E	100 kS/s

[1]Streaming-to-disk rates do not apply to RT Series devices.

Input signal ranges

Device	Range Software Selectable	Bipolar Input Range	Unipolar Input Range
6052E	20 V	±10 V	–
	10 V	±5 V	0 to 10 V
	5 V	±2.5 V	0 to 5 V
	2 V	±1 V	0 to 2 V
	1 V	±500 mV	0 to 1 V
	500 mV	±250 mV	0 to 500 mV
	200 mV	±100 mV	0 to 200 mV
	100 mV	±50 mV	0 to 100 mV
6030E	20 V	±10 V	–
6031E	10 V	±5 V	0 to 10 V
6032E	5 V	–	0 to 5 V
6033E	4 V	±2 V	–
	2 V	±1 V	0 to 2 V
	1 V	±500 mV	0 to 1 V
	500 mV	–	0 to 500 mV
	400 mV	±200 mV	–
	200 mV	±100 mV	0 to 200 mV
	100 mV	–	0 to 100 mV
6034E	20 V	±10 V	–
6036E	10 V	±5 V	–
	1 V	±500 mV	–
	100 mV	±50 mV	–

Input coupling ..... DC

Maximum working voltage
(signal + common mode) ..... Each input should remain within ±11 V of ground

Overvoltage protection
Powered on ..... ±25 V
Powered off ..... ±15 V

Inputs protected

6052E 6030E 6032E 6034E 6036E	ACH<0..15>, AISENSE
6031E 6033E	ACH<0..63>, AISENSE, AISENSE2

FIFO buffer size ..... 512 samples, (1024 samples for DAQCard)

Data transfers
PCI, PXI ..... DMA, interrupts, programmed I/O
DAQCard ..... Interrupts, programmed I/O

DMA modes
PCI, PXI ..... Scatter-gather (single transfer, demand transfer)

Configuration memory size ..... 512 words

Transfer Characteristics

Relative accuracy (dithered)

Device	Typical	Maximum
6052E 6034E PCI-6036E	±1.5 LSB	±3 LSB
6030E 6031E 6032E 6033E	±0.75 LSB	±1 LSB
DAQCard-6036E	±3.0 LSB	±6 LSB

DNL

Device	Typical	Maximum
6052E 603xE (except DAQCard-6036E)	±0.5 LSB	±1 LSB
DAQCard-6036E	+4. -0.5 LSB	+4, -2 LSB

No missing codes ..... 16 bits, guaranteed

Amplifier Characteristics

Input impedance

Device	Normal Powered On	Powered Off	Overload
6052E 603xE	100 GΩ in parallel with 100 pF	820 Ω	820 Ω

Input bias and offset current

Device	Bias Current	Offset Current
6052E 6034E PCI-6036E	±200 pA	±100 pA
6030E 6031E 6032E 6033E	±1 nA	±2 nA
DAQCard-6036E	±200 pA	±100 pA

16-Bit E Series Multifunction DAQ Specifications

Specifications – 16-Bit NI 6052E and NI 603xE (continued)

CMRR, DC to 60 Hz

Device	Range	CMRR	
		Bipolar (dB)	Unipolar (dB)
6052E	20 V	92	–
	10 V	97	97
	5 V	101	101
	2 V	104	104
	100 mV to 1 V	105	105
6030E	20 V	92	–
6031E	10 V	97	92
6032E	5 V	–	97
6033E	4 V	101	–
	2 V	104	101
	1 V	105	104
	100 mV to 500 mV	105	105
6034E	20 V	85	–
6036E	10 V	85	–
	1 V	96	–
	100 mV	96	–

Dynamic Characteristics

Bandwidth

Device	Range	Small Signal (-3 dB)
6052E	All ranges	480 kHz
6030E 6031E 6032E 6033E	All ranges	255 kHz
6034E 6036E	All ranges	413 kHz

System noise (LSB_, including quantization)

Device	Range	Bipolar	Unipolar
6052E	2 to 20 V	0.95	0.95
	1 V	1.1	1.1
	500 mV	1.3	1.3
	200 mV	2.7	2.7
	100 mV	5.0	5.0
6030E	2 to 20 V	0.6	0.8
6031E	1 V	0.7	0.8
6032E	400 to 500 mV	1.1	1.1
6033E	200 mV	2.0	2.0
	100 mV	–	3.8
6034E	10 to 20 V	0.8	–
6036E	1 V	1.0	–
	100 mV	6.2	–

Settling time to full-scale step

Device	Range	Accuracy				
		±0.00076% (±0.5 LSB)	±0.0015% (±1 LSB)	±0.0031% (±2 LSB)	±0.0061% (±4 LSB)	±0.024% (±6 LSB)
6052E	2 to 20 V	–	10 µs max	5 µs max	4 µs max	3 µs max
	1 V	–	15 µs max	5 µs max	4 µs max	3 µs max
	200 to 500 mV	–	15 µs max	10 µs max	4 µs max	3 µs max
	100 mV	–	15 µs typical	10 µs typical	4 µs max	3 µs max
6030E 6032E	All	40 µs max	20 µs max	–	10 µs max	–
6031E 6033E	All	50 µs max	25 µs max	–	10 µs max	–
6034E	1 to 10 V	–	–	5 µs max	–	–
6036E	200 mV	–	–	–	5 µs typical	–

Crosstalk

Device	Adjacent Channels	All Other Channels
6052E 603xE	-75 dB	-90 dB

Analog Output

Output Characteristics

Number of channels

6052E 6030E 6031E 6036E 6032E	2 voltage outputs
6033E 6034E	None

Resolution

6052E 6036E 6030E 6031E	16 bits, 1 in 65,536

Maximum update rate

6052E	333 kS/s
6036E	10 kS/s, system dependent
6030E 6031E	100 kS/s

Type of DAC ..... Double buffered, multiplying

FIFO buffer size

6052E 6030E 6031E	2,048 samples
6036E	None

Data transfers

PCI, PXI ..... DMA, interrupts, programmed I/O

DAQCard ..... Interrupts, programmed I/O

DMA modes

PCI, PXI ..... Scatter-gather (single transfer, demand transfer)

Transfer Characteristics

Relative accuracy

6052E	±0.35 LSB typical, ±1 LSB max
6030E 6031E	±0.5 LSB typical, ±1 LSB max
6036E	±2 LSB max

DNL ..... ±1.0 LSB max

Monotonicity

6052E 6036E 6030E 6031E	16 bits, guaranteed

Voltage Output

Ranges

6052E	±10 V, 0 to 10 V, ±EXTREF, 0 to EXTREF; software selectable
6030E 6031E	±10 V, 0 to 10 V; software selectable
6036E	±10 V

Output coupling ..... DC

Output impedance ..... 0.1 Ω max

Current drive ..... ±5 mA max

Protection ..... Short-circuit to ground

Power-on state

6052E 6030E 6031E	0 V (±20 mV)
PCI-6036E	0 V (±44 mV)
DAQCard-6036E	0 V (±60 mV)

16-Bit E Series Multifunction DAQ Specifications

Specifications – 16-Bit NI 6052E and NI 603xE (continued)

External reference input (6052E only)
- Range ..... ±11 V
- Overvoltage protection ..... ±25 V powered on, ±15 V powered off
- Input impedance ..... 10 kΩ
- Bandwidth (-3 dB) ..... 3 kHz
- Slew rate ..... 0.3 V/µs

Dynamic Characteristics

Settling time and slew rate

Device	Settling Time for Full-Scale Step	Slew Rate
6052E	3.5 µs to ±1 LSB accuracy	15 V/µs
6030E 6031E	10 µs to ±1 LSB accuracy	5 V/µs
PCI-6036E	10 µs to ±4.0 LSB accuracy	15 V/µs
DAQCard-6036E	10 µs to ±0.5 LSB	5 V/µs

Noise

6052E 6030E 6031E	60 μV_{rms}, DC to 1 MHz
PCI-6036E	110 μV_{rms}, DC to 400 kHz
DAQCard-6036E	160 μV_{rms}, DC to 400 kHz

Glitch energy (at mid-scale transition)

Device	Magnitude	Duration
6052E	±10 mV	1 µs
6030E 6031E	N/A	N/A
PCI-6036E	±10 mV	1 µs

Digital I/O

Number of channels ..... 8 input/output
Compatibility ..... 5 V/TTL/CMOS
Power-on state ..... Input (high impedance)
Data transfers ..... Programmed I/O
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 = 24 mA)	–	0.4 V
Output high voltage (Iout = 13 mA)	4.35 V	–

Timing I/O

General-Purpose Up/Down Counter/Timers

Number of channels 2
Resolution ..... 24 bits (1 in 16, 777, 216)
Compatibility ..... 5 V/TTL/CMOS

Digital logic levels

Level	Minimum	Max
Input low voltage	0.0 V	0.8 V
Input high voltage	2.0 V	5.0 V
Output low voltage (Iout = 5 mA)	–	0.4 V
Output high voltage (Iout = 3.5 mA)	4.35 V	–

Base clocks available ..... 20 MHz and 100 kHz
Base clock accuracy ..... ±0.01%
Maximum source frequency ..... 20 MHz
External source selections ..... PFI <0..9>, RTSI <0..6>, analog trigger; software selectable
External gate selections ..... PFI <0..9>, RTSI <0..6>, analog trigger; software selectable
Minimum source pulse duration ..... 10 ns
Minimum gate pulse duration ..... 10 ns, edge-detect mode
Data transfers
- PCI, PXI ..... DMA, interrupts, programmed I/O
- DAQCard ..... Interrupts, programmed I/O

DMA modes
- PCI, PXI ..... Scatter-gather (single transfer, demand transfer)

Frequency Scaler

Number of channels 1
Resolution ..... 4 bits
Compatibility ..... 5 V/TTL
Digital logic levels

Level	Minimum	Max
Input low voltage	0.0 V	0.8 V
Input high voltage	2.0 V	5.0 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 ..... Programmed I/O

Triggers

Analog Triggers

Number of triggers

6052E 6030E 6031E 6032E 6033E	1
6034E 6036E	None

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

Source

6052E 6030E 6032E	ACH<0..15>, PF10/TRIG1
6031E 6033E	ACH<0..63>, PF10/TRIG1

Level
- Internal source, ACH<0..15/63> ..... ±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)

Device	Internal source ACH<0..15/63>	External Source PFI0/TRIG1
6052E	700 kHz	700 kHz
6030E, 6031E, 6032E, 6033E	255 kHz	4 MHz

Accuracy ..... ±1% of full-scale range max

Digital Triggers (all devices)

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 ..... PFI <0..9>, RTSI <0..6>
Slope ..... Positive or negative; software selectable
Compatibility ..... 5 V/TTL
Response ..... Rising or falling edge
Pulse width ..... 10 ns minimum

Specifications – 16-Bit NI 6052E and NI 603xE (continued)

External Input for Digital or Analog Trigger (PFI0/TRIG1)
Impedance ..... 10 kΩ
Coupling ..... DC
Protection
Digital trigger ..... -0.5 to (Vcc + 0.5) V
Analog trigger
On/Off/Disabled ..... ±35 V

Calibration

Recommended warm-up time ..... 15 minutes; 30 minutes for DAQCard
Calibration Interval ..... 1 year
Onboard calibration reference
DC Level

6052E 6030E 6031E 6032E 6033E	5.000 V (±1.0 mV)	Over full operating temperature, actual value stored in EEPROM
6034E 6036E	5.000 V (±3.5 mV)	

Temperature coefficient

6052E 6030E 6031E 6032E 6033E	±0.6 ppm/°C max
6012E 6034E 6036E	±5.0 ppm/°C max

Long-term stability

6052E 6030E 6031E 6032E 6033E	±6.0 ppm/$\sqrt{1000\ h}$
6034E 6036E	±15.0 ppm/$\sqrt{1000\ h}$

RTSI (PCI only)

Trigger lines 7

PXI Trigger Bus (PXI only)

Trigger lines 6
Star Trigger 1

Bus Interface

PCI, PXI ..... Master, slave
DAQCard ..... Slave

Power Requirements[1]

Device	+5 VDC (±5%)	Power Available at I/O Connector
6052E	1.3 A	+4.65 to +5.25 VDC, 1 A
603xE (PCI, PXI); except 6034E	1.5 A	+4.65 to +5.25 VDC, 1 A
6034E PCI-6036E	0.9 A	+4.65 to +5.25 VDC, 1 A
DAQCard-6036E	300 mA	+4.65 to +5.25 VDC, 0.75 A

Physical[1]

Dimensions (not including connectors)[1]
PCI ..... 17.5 by 10.6 cm (6.9 by 4.2 in.)
PXI ..... 16.0 by 10.0 cm (6.3 by 3.9 in.)
DAQCard ..... Type II PC Card

I/O connectors

6052E 6030E 6032E 6034E PCI-6036E	68-pin male SCSI-II type
6031E 6033E	100-pin female 0.050 D-type
DAQCard-6036E	68-position VHDCI female

Environment

Operating temperature ..... 0 to 55 °C; DAQCards should not exceed 55 °C while in PCMCIA slot
Storage temperature ..... -20 to 70 °C
Relative humidity ..... 10 to 90%, noncondensing

Certifications and Compliances

CE Mark Compliance CE

[1]See RT Series devices for RT Series power requirements and physical parameters.