S Series Multifunction DAQ
16-Bit, 250 kS/s/Channel, 8 Analog Inputs

NI 6143

- 8 differential 16-bit analog inputs
- 250 kS/s per channel analog input
- Simultaneous sampling
- 8 digital I/O lines (5 V TTL/CMOS); two 24-bit counter/timers
- Digital triggering
- ±5 V analog input signal range
- NI-DAQ measurement services simplifies configuration and measurements

Operating Systems
- Windows 2000/NT/XP
- Linux and Mac OS X with the NI Measurement Hardware DDK

Recommended Software
- LabVIEW™
- LabWindows™/CVI™
- Measurement Studio™
- VI Logger

Other Compatible Software
- Visual Basic
- C/C++

Measurement Services Software (Included)
- NI-DAQmx™

Calibration Certificate Included

NEW

Family	Bus	Analog Inputs	Input Resolution	Sampling Rate	Input Range	Digital I/O	Counter/ Timers	Trigger
NI 6143	PCI, PXI	8	16 bits	250 kS/s per channel	±5V	8	2, 24-bit	Digital

Table 1. NI 6143 Channel, Speed, and Resolution Specifications

Overview and Applications

National Instruments 6143 devices combine the latest in PC technologies to deliver simultaneous sampling for high-channel-count applications at a low cost. These devices are used in a variety of applications, including:

- High-energy physics
- Ultrasonic and sonar testing
- Ballistics and highly transient signals

Features

These devices fall into NI S Series product family. The S stands for simultaneous sampling, the most evident benefit of the dedicated analog-to-digital converter (ADC) per channel architecture. However, the architecture has a few less obvious but very important advantages.

Dedicated ADCs per Channel – This architecture offers a much higher sampling rate per channel. Traditional data acquisition devices share the sampling rate among the number of active channels. The overall throughput of the data stays the same. With S Series devices, the aggregate throughput increases with the number of active channels.

Better Dynamic Specifications – Because each channel has a dedicated ADC, there is less concern with settling time and the noise and error caused by switching input channels. You can tune the analog input path for both accurate DC and dynamic measurements. Traditional data acquisition devices are ideal for DC measurements, but are not always the best solution for dynamic measurements.

Low-Cost – The price of ADCs has gone down over time, making a dedicated ADC per channel architecture cost effective.

Ordering Information

NI PXI-6143 779063-01
NI PCI-6143 778913-01
Includes NI-DAQ software

BUY ONLINE!
Visit ni.com/info and enter ni6143.

DAQ Device	Accessory	Cable
NI 6143 – shielded option	SCB-68 (776844-01)	SHC68-68-EP (186838-01)
NI 6143 – unshielded option	CB-68LPR (777145-02)	RC68-68 (187252-01)

Table 2. Recommended Configurations

Measurement Services Software

NI-DAQ measurement services is the robust driver software that makes it easy to access the functionality of your data acquisition hardware, whether you are a beginner or advanced user. Helpful features include:

Automatic Code Generation – The DAQ Assistant is an interactive guide that navigates you through configuring, testing, and programming measurement tasks and generates the necessary code automatically for LabVIEW, LabWindows/CVI, or Measurement Studio.

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Cleaner Code Development – Basic and advanced software functions have been combined into one easy-to-use yet powerful set to help you build cleaner code and move from basic to advanced applications without replacing functions.

High-Performance Driver Engine – NI-DAQ delivers maximum I/O system throughput with a multithreaded driver.

Test Panels – With NI-DAQ, you can test all of your device functionality before you begin development.

Scaled Channels – Easily scale your voltage data into the proper engineering units using the NI-DAQ Measurement Ready virtual channels by choosing from a list of common sensors and signals or creating your own custom scale.

LabVIEW Integration – All NI-DAQ functions create the waveform data type, which carries acquired data and timing information directly into more than 400 LabVIEW built-in analysis routines for display of results in engineering units on a graph.

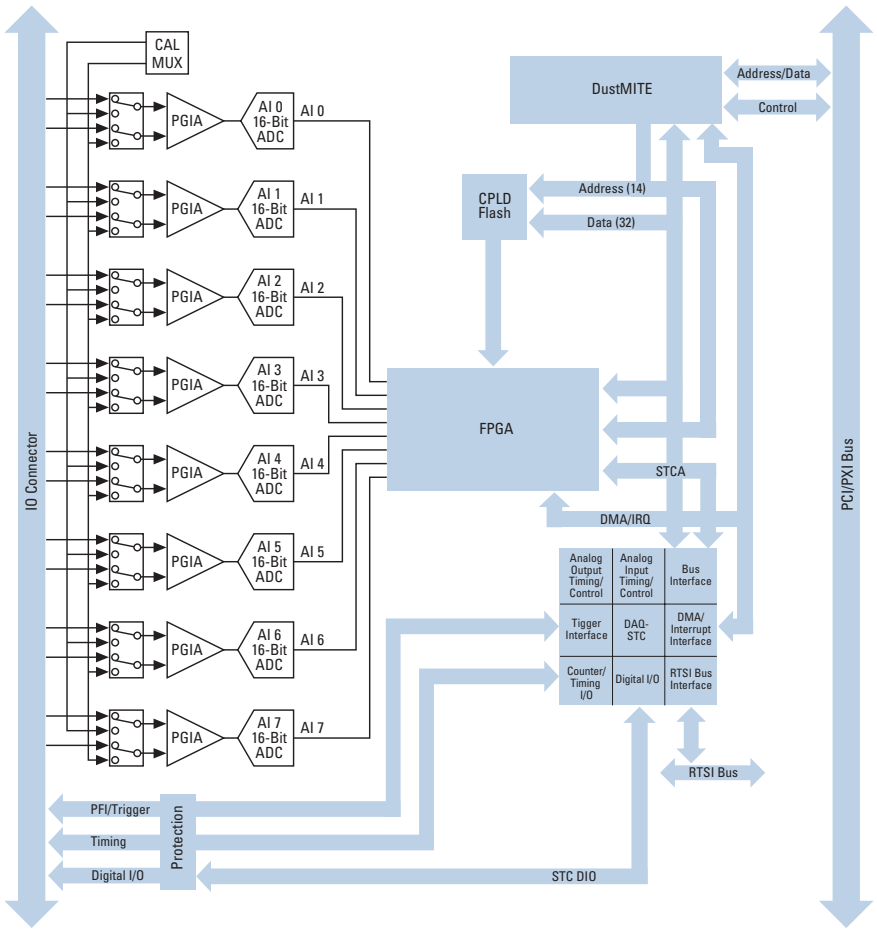
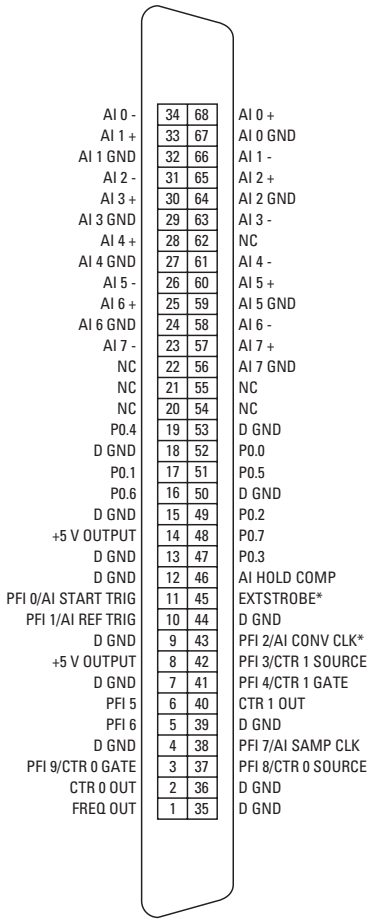


Figure 1. Block Diagram



NC = No Connect

Figure 2. NI 6143 I/O Connector

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SHC68-68-EP Noise-Rejecting, Shielded Cable (See Figure 3)

This cable connects the NI 6143 devices directly to 68-pin accessories. Latching screws secure the shielded connector to the NI 6143. 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.

SHC68-68-EP

0.5 m 186838-0R5

1 m 186838-01

Figure 3. SHC68-68-EP Noise-Rejecting, Shielded Cable

RC68-68 Low-Cost Ribbon Cable (See Figure 4)

The RC68-68 cable connects the NI 6143 devices directly to 68-pin accessories.

0.25 m 187252-0R25

1 m 187252-01

Figure 4. RC68-68 Low-Cost Ribbon Cable

SCB-68 Noise-Rejecting, Shielded I/O Connector Block (See Figure 5)

The SCB-68 is a shielded I/O connector block for rugged, very-low-noise signal termination for connecting 68-pin S Series DAQ devices, such as NI 6143. Silk-screened component locations provide an easy addition of simple signal-conditioning circuitry for your analog input channels. It also includes a general-purpose breadboard area as well as an IC temperature sensor for cold-junction compensation in temperature measurements.

SCB-68 776844-01

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

Figure 5. SCB-68 Noise-Rejecting, Shielded I/O Connector Block

CB-68LP and CB-68LPR Low-Cost I/O Connector Blocks (See Figure 6)

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 DAQ devices, such as NI 6143. 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.

CB-68LP.....777145-01

Dimensions – 14.35 by 10.74 cm (5.65 by 4.23 in.)

CB-68LPR 777145-02

Dimensions – 7.62 by 16.19 cm (3.00 by 6.36 in.)

Figure 6. CB-68LP and CB-68LPR Low-Cost I/O Connector Blocks

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Specifications

The following specifications are typical at 25 °C unless otherwise noted.

Analog Input

Input Characteristics
Number of channels ..... 8 differential
ADC resolution ..... 16 bits, 1 in 65,536
Sampling rate
  Maximum ..... 250 kS/s
  Minimum ..... 0 S/s
  Accuracy ..... ±50 ppm for internal timebase
Input coupling ..... DC
Input range ..... ±5 V
Input impedance
  AI + to AI GND ..... 100 MΩ in parallel with 10 pF
  AI – to AI GND ..... 100 MΩ in parallel with 10 pF
Input bias current ..... ±20 pA typ, ±150 pA max
Input offset current ..... ±3 pA typ, ±20 pA max
Max working voltage for all analog input channels
  Positive input (AI +) ..... ±7 V
  Negative input (AI –) ..... ±7 V
Overvoltage protection
(AI +, AI –) ..... ±15 V
Input current during
overvoltage conditions ..... ±5.7 mA max
Input FIFO size ..... 2,046 samples
Data transfers ..... DMA, interrupts, programmed I/O
DMA mode ..... Scatter-gather

DC Transfer Characteristics

DNL ..... ±0.8 LSB typ, no missing codes
INL ..... ±1.5 LSB typ, ±3.0 LSB max
System noise ..... 0.8 LSB_{rms}

Dynamic Characteristics

Phase mismatch ..... ±0.5 deg at 100 kHz
Crosstalk ..... -90 dB at 50 kHz
Bandwidth ..... 490 kHz
SINAD ..... 89 dB at 10 kHz
CMRR ..... 75 dB at 60 Hz
SFDR ..... 98 dB at 10 kHz
THD ..... -96 dBc at 10 kHz

Stability

Recommended warm-up time ..... 15 min
Onboard Calibration Reference
  Level ..... 2.50 V (±2.5 mV)
  (actual value stored in EEPROM)
  Temperature coefficient ..... ±7.0 ppm/°C max
  Long-term stability ..... ±20 ppm/$\sqrt{1{,}000}$ h

Digital I/O

Number of channels ..... 8 input/output
Compatibility ..... TTL/CMOS
Digital Logic Levels

Level	Min	Max
Input low voltage	0.0 V	0.8 V
Input high voltage	2.2 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)	–	0.83 V
Output low voltage (I_{OL} = 11 mA)	–	0.4 V
Output low voltage (I_{OL} = -13 mA)	4.1 V	–
Output high voltage (I_{OH} = -8 mA)	4.35 V	–

Power-on state ..... Input (high-impedance)
Data transfers ..... DMA, interrupts, programmed I/O

Timing I/O

Counter/Timers
  Number of channels ..... 2 up/down counter/timers
  Resolution ..... 24 bits
  Compatibility ..... TTL/CMOS
Digital Logic Levels

Level	Min	Max
Input low voltage	0.0 V	0.8 V
Input high voltage	2.2 V	5.0 V
Output low voltage (I_{OL} = 5 mA)	–	0.4 V
Output high voltage (I_{OH} = -3.5 mA)	4.35 V	–

Base clock frequency ..... 20 MHz
Base clock accuracy ..... ±0.01%
Max source frequency ..... 20 MHz
Min source pulse duration ..... 10 ns, edge-detect mode
Min gate pulse duration ..... 0 ns, edge-detect mode
Data transfers ..... DMA, interrupts, programmed I/O

Frequency Scaler

Number of channels 1
Resolution 4-bit
Compatibility ..... TTL/CMOS
Digital logic levels ..... Timing I/O level table
Base clock frequency ..... 10 MHz, 100 kHz
Base clock accuracy ..... ±0.01%

Digital Trigger

Purpose ..... Start, reference, and pause trigger; sample clock
External sources ..... PFI <0..9>, RTSI <0..6>
Compatibility ..... TTL
Response ..... Rising or falling edge
Pulse width ..... 10 ns min

RTSI Bus (PCI only)

Trigger lines <0..6> 7
RTSI clock 1

PXI Trigger Bus (PXI only)

Trigger lines <0..5> 6
Star trigger 1
Clock 1

Power Requirements

+5 VDC (±5%) ..... 40 mA
+3.3 VDC (±5%) ..... 140 mA
+12 VDC (±5%) ..... 150 mA
–12 VDC (±5%) ..... 80 mA
Power available at I/O connector ..... +4.65 to +5.25 VDC at 1 A

Physical

Dimensions (not including connectors) ..... 15.5 cm by 10.6 cm
(6.10 in. by 4.17 in.)
I/O connector ..... 68-pin VHDCI

Environmental

NI 6143 devices are intended for indoor use only.
Operating Environment
  Ambient temperature ..... 0 to 50 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
  Relative humidity ..... 10 to 90%, noncondensing (tested in accordance with IEC-60068-2-56)
  Altitude ..... 2,000 m (at 25 °C ambient temperature)
Storage Environment
  Ambient temperature ..... -20 to 70 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
  Relative humidity ..... 5 to 95%, noncondensing (tested in accordance with IEC-60068-2-56)

Shock and Vibration

Operational shock ..... 30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800-F.)
Random vibration
  Operating ..... 5 to 500 Hz, 0.3 g_{rms}
  Nonoperating ..... 5 to 500 Hz, 2.4 g_{rms} (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800-F, Class 3.)

* Note Clean the device with a soft, non-metallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:
- IEC 61010-1, EN 61010-1
- UL 3111-1, UL 61010B-1
- CAN/CSA C22.2 No. 1010.1

* Note For UL and other safety certifications, refer to the product label, or visit ***ni.com/hardref.nsf***, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

Emissions ..... EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz
Immunity ..... EN 61326:1997
A2:2001, Table 1
EMC/EMI ..... CE, C-Tick, and FCC Part 15 (Class A) Compliant

* Note For EMC compliance, you must operate this device with shielded cabling.

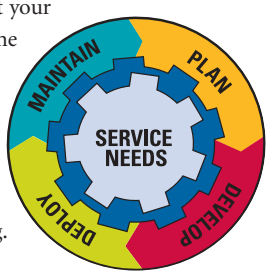
CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:
Low-Voltage Directive (safety) 73/23/EEC
Electromagnetic Compatibility
Directive (EMC) 89/336/EEC

* Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit ***ni.com/hardref.nsf***, search by model number or product line, and click the appropriate link in the Certification column.

NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit ni.com/services.



Training and Certification

NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit ni.com/training.

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NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI™ combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with ni.com/pxiadvisor.

Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit ni.com/calibration.

Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit ni.com/services.

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