Technical Sales

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Ordering Information | Detailed Specifications
For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

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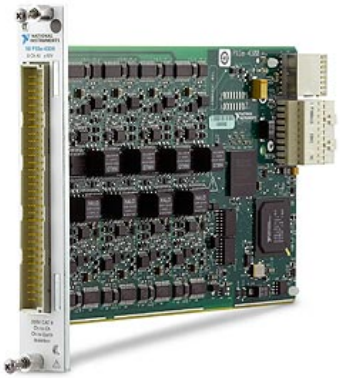
NI PXIe-4300

Data Acquisition with Integrated Signal Conditioning for High-Voltage Measurements



- 8 simultaneously sampled analog input channels
- 300 Vrms CAT II channel-to-channel isolation
- 300 V signal inputs with TB-4300B
- 3,300 Vrms channel-to-earth transient withstand
- ADC per channel; 250 kS/s/ch sampling rate
- Programmable gain and lowpass filtering options per channel
- Multidevice triggering and synchronization via PXI Express
- Supported by NI-DAQmx driver software

Overview

The NI PXIe-4300 isolated analog input module provides data acquisition with integrated signal conditioning for high-voltage measurements. It features eight channels with 300 Vrms channel-to-channel isolation and simultaneous sampling up to 250 kS/s per channel. For accurate measurements, the NI PXIe-4300 offers programmable lowpass filters (10 kHz, 100 kHz, bypass) per channel. You can choose the NI TB-4300 terminal block for 1, 2, 5, and 10 V signal inputs or the TB-4300B for 30, 60, 150, and 300 V signal inputs. The TB-4300 and TB-4300B are front-mounting terminal blocks with screw terminal connectivity.

Back to Top

Application and Technology

Integrated Signal Conditioning

By combining signal conditioning and analog-to-digital converters (ADCs) on the same device, the NI PXIe-4300 isolated analog input module delivers a smaller footprint and higher measurement performance. Integrated signal conditioning also provides simplified cable management and calibration due to fewer components, which drastically reduces the installation and maintenance cost of a high-channel-count measurement system.

Safety and Accuracy with Channel-to-Channel Isolation

Isolation is needed for safe operation around high voltages. The NI PXIe-4300 has 300 V_{rms} of continuous channel-to-channel isolation for measurements with differing potentials as well as 3,300 V_{rms} transient withstand for protection from sudden voltage spikes. In addition to offering increased safety, channel-to-channel isolated systems are more accurate and easier to set up due to the elimination of ground loops.

PXI Express Dedicated Data Throughput

The SC Express modules are built on the x1 PXI Express bus with dedicated bandwidth per device up to 250 MB/s. Because of the added bandwidth provided by PXI Express, SC Express modules offer simultaneous sampling options using the same channel counts and connectivity as multiplexed devices. Unlike multiplexed devices that reduce sampling rates, you can use simultaneous sampling devices to maintain sampling rates as you expand the number of channels.

PXI Platform Advanced Timing and Synchronization

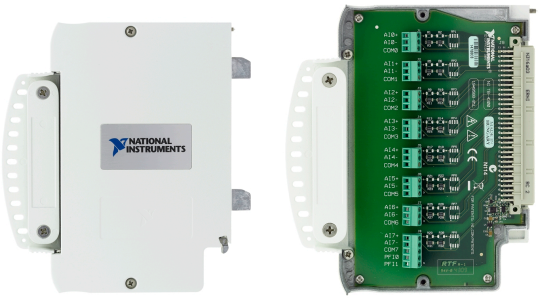
PXI Express provides advanced timing and synchronization features, including a 100 MHz differential system clock, differential signaling, and differential star triggers. By using differential clocking and synchronization, PXI Express systems benefit from increased noise immunity for instrumentation clocks and the ability to transmit at higher-frequency rates. The SC Express family leverages PXI Express to deliver tight synchronization between modules in one chassis or multiple chassis.

Wide Variety of I/O on the PXI Platform

When combined with more than 1500 I/O types in the PXI platform, this module offers the flexibility needed to develop a measurement system that meets your application needs. PXI modules are compatible with the CompactPCI and CompactPCI Express industrial computer standards and offer additional features such as environmental specifications, standardized software, and built-in timing and synchronization.

Connectivity

The NI PXIe-4300 is designed to be used with the NI TB-4300 and TB-4300B front-mounting terminal blocks. You can choose the TB-4300 for 1, 2, 5, and 10 V signal inputs or the TB-4300B for 30, 60, 150, and 300 V signal inputs. The terminal blocks are hot-swappable and automatically recognized in software. This makes troubleshooting easier because you can connect and remove terminal blocks without powering down the PXI measurement system. Each terminal block also includes alignment fins that guide the connector onto the PXI Express module without bent pins.



Back to Top

Ordering Information

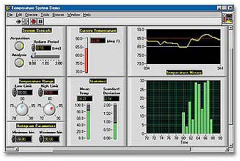
For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories	Part Number
NI PXIe-4300			
NI PXIe-4300 Requires: 1 Connector Block	781337-01	**Connector 0:**	
		Connector Block: Screw Terminal - NI TB-4300 Front Mounting Terminal Block (10V)	781338-01
		Connector 0:	
		Connector Block: Spring Terminal - NI TB-4300B Front Mounting Terminal Block (300V)	781338-02

Back to Top

Software Recommendations

LabVIEW Professional Development System for Windows



- Advanced software tools for large project development
- Automatic code generation using DAQ Assistant and Instrument I/O Assistant
- Tight integration with a wide range of hardware
- Advanced measurement analysis and digital signal processing
- Open connectivity with DLLs, ActiveX, and .NET objects
- Capability to build DLLs, executables, and MSI installers

Back to Top

Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

Back to Top

Detailed Specifications

This document lists specifications for the NI PXIe-4300 module. These specifications are typical for the range of 0 °C to 55 °C unless otherwise stated. The system must be allowed to warm up for 15 minutes to achieve the rated accuracy. All specifications are subject to change without notice. Visit ni.com/manuals for the most current specifications and product documentation.

Note Keep the filler panels on all unused slots in your chassis to maintain forced air cooling.

Caution Maximum voltage for all analog inputs is ±11 V for all ranges.

Analog Input	
Number of channels	8 differential
ADC resolution	16 bits
DNL	No missing codes guaranteed
INL	Refer to the AI Absolute Accuracy Table
Sampling rate	
Maximum	250 kS/s per channel
Minimum	No minimum
Timing accuracy	50 ppm of sample rate
Timing resolution	10 ns
Input coupling	DC
Voltage measurement range (software-selectable per channel)	±10 V, ±5 V, ±2 V, ±1 V
CMRR from COM (to 60 Hz)	
10 V	95 dB
5 V	100 dB
2 V, 1 V	105 dB

Bandwidth	520 kHz
Filtering	
Lowpass (software-selectable per channel)	10 kHz, 100 kHz, disable
Cut-off frequency tolerance	±5%
Filter type	2nd order Butterworth
Input impedance	
Device on	
With TB-4300	
AI – to AI COM	>1 GΩ in parallel with 10 pF
AI + to AI COM	>1 GΩ in parallel with 10 pF
With TB-4300B	
AI – to AI COM	>1.2 MΩ in parallel with 10 pF
AI + to AI COM	>1.2 MΩ in parallel with 10 pF
Device off	
AI+ to AI COM	10 kΩ
AI– to AI COM	10 kΩ
Input bias current	±6 nA
Input FIFO size	2,046 samples shared among channels used
Data transfers	DMA (scatter-gather), programmed I/O
Fault protection (powered on)	
Between AI+ and AI–	±60 V
Between any AI and COM	±60 V
Between PFI or RSVD lines and COM	±24 V
Input current during fault conditions	±5 mA max/AI pin

AI Absolute Accuracy Table [1]

Nominal Range		Residual Gain Error (ppm of Reading)	Gain Tempco (ppm/°C)	Reference Tempco (ppm/°C)	Residual Offset Error (ppm of Range)	Offset Tempco (ppm of Range/°C)	INL Error (ppm of Range)	Random Noise, σ (μV_{rms})	Absolute Accuracy at Full Scale* (μV)
Positive Full Scale	Negative Full Scale								
10	–10	65	11.5	5	33	10	76	208	2,460
5	–5	69	11.5	5	68	10	76	107	1,430
2	–2	75	11.5	5	168	11	76	58	785
1	–1	88	11.5	5	337	11	76	50	575

Absolute Accuracy Formulas

AbsoluteAccuracy = Reading · (GainError) + Range · (OffsetError) + NoiseUncertainty
GainError = ResidualAIGainError + GainTempco · (TempChangeFromLastInternalCal) + ReferenceTempco · (TempChangeFromLastExternalCal)
OffsetError = ResidualAIOffsetError + OffsetTempco · (TempChangeFromLastInternalCal) + INL_Error

NoiceUncertainty = $\frac{\text{RandomNoise} \cdot 3}{\sqrt{10000}}$ For a coverage factor of 3 sigma and averaging 10000 points

* Absolute accuracy at full scale on the analog input channels is determined using the following assumptions:
TempChangeFromLastExternalCal = 10 °C
TempChangeFromLastInternalCal = 1 °C
number_of_readings = 10000
CoverageFactor = 3 σ

For example, on the 10 V range, the absolute accuracy at full scale is as follows:
GainError = 65 ppm + 11.5 ppm · 1°C + 5 ppm · 10 °C GainError = 126.5 ppm
OffsetError = 33 ppm + 10 ppm · 1°C + 76 ppm OffsetError = 119 ppm

NoiseUncertainty = $\frac{208\ \mu V \cdot 3}{\sqrt{10000}}$ NoiseUncertainty = 6.2 μV

AbsoluteAccuracy = 10 V · (GainError) + 10 V · (OffsetError) + NoiseUncertainty	AbsoluteAccuracy = 2,460 µV

Digital PFI I/O

Electrical Characteristics

Level	Min	Max
Input high voltage (V_{IH})	1.87 V	5.5 V
Input low voltage (V_{IL})	0 V	0.84 V
Hysteresis	0.56 V	0.87 V

Triggers

Analog Trigger	
Source	AI<0..7>
Purpose	Reference Trigger
Level	Full Scale (depending on AiRange), Programmable
Resolution	16-bit
Mode	Rising-edge, Rising-edge with Hysteresis, Falling-edge, Falling-edge with Hysteresis, Entering Window, Leaving Window
Digital Trigger	
Source	PXI_TRIG<0..7>, PXI_STAR, PXIe_DSTAR<A..B> PFI<0..1>
Purpose	Start Trigger, Reference Trigger, Pause Trigger
Polarity	Software-selectable
Debounce Filter Settings	Disable, 90 ns, 5.12 µs, 2.56 ms, Custom interval

Clocking

Source	Onboard Clock, PXI_TRIG<0..7>, PXI_STAR, PXIe_DSTAR<A..B>, PFI<0..1>, PXIe_Clk100 (RefClk Only)
Destination	Sample Clock, Sample Clock Timebase, Reference Clock
Polarity	Software-selectable (except Reference Clock)
Debounce filter settings (Sample Clock Only)	Disable, 90 ns, 5.12 µs, 2.56 ms, Custom interval

Reference clock locking frequencies			
Reference Signal	Locking Input Frequency (MHz)		
	10	20	100
PXIe_DSTAR<A.. B>			
PXI_STAR			—
PXIe_Clk100	—	—	
PXI_TRIG<0..7>			—
PFI<0..1>			—

Note National Instruments does not recommend locking to non-selected frequencies.

Output Timing Signals

Source	Start Trigger, Reference Trigger, Pause Trigger, PFI<0..1>, Sample Clock, Various Derived Timebases and Clocks
Destination	PXI_TRIG<0..7> PXIe_DSTAR C
Polarity	Software-selectable

Bus Interface

Form factor	x1 PXI Express peripheral module, specification rev 1.0 compliant
Slot compatibility	x1 and x4 PXI Express or PXI Express hybrid slots
DMA channels	1 analog input

NI PXIe-4300 modules may be installed in PXI Express slots or PXI Express hybrid slots.

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

Power Requirements	
+3.3 V	2.0 W
+12 V	8.8 W

Physical Requirements	
Dimensions	Standard 3U PXIe, 16 × 10 cm (6.3 × 3.9 in.)
Weight	148 g (5.2 oz)
I/O connector	96-pin male DIN 41612/IEC 60603-2 connector.

Environmental Specifications	
Maximum altitude	2,000 m (800 mbar), at 25 °C ambient temperature
Pollution Degree	2

Indoor use only

Operating Environment	
Ambient temperature range	0 to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Storage Environment	
Ambient temperature range	–40 to 71°C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)
Relative humidity range	5% to 95% noncondensing (Tested in accordance with IEC-60068-2-56.)

Shock and Vibration	
Operating shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)
Random vibration	
Operating	5 to 500 Hz, 0.3 g_{rms}
Non-operating	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-28800F, Class 3.)

Safety Voltage	
Connect only voltages that are within the following limits:	
Between any AI+ and AI–	±11 V
Between any AI terminal and COM	±11 V
Isolation	
Channel to channel	
Continuous	300 V_{rms}, Measurement Category II (Basic)
Withstand	1,400 V_{rms}, verified by a 5 s dielectric withstand test
Channel to earth ground	
Continuous	300 V_{rms}, Measurement Category II
Withstand	3,300 V_{rms}, verified by a 5 s dielectric withstand test

Caution Do *not* use for measurements within Measurement Categories III or IV.

Safety Standards

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 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

Note For EMC compliance, operate this device with shielded cables and accessories.

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

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

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit ni.com/environment/weee.htm.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。
关于 National Instruments 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。
(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

[1] Accuracies listed are warranted for the conditions described in the table above and for up to one year from the module external calibration.

TB-4300/4300B Technical Specifications

Note NI PXIe-4300 module specifications are located in the *NI PXIe-4300 Technical Specifications* topic.

All specifications are typical at 23 °C unless otherwise specified.

Calibration Interval	
TB-4300	No calibration
TB-4300B	1 year interval (verification only)
Electrical	
Attenuation ratio (TB-4300B)	30 to 1
Attenuator tolerance (TB-4300B)	0.05%
Attenuator temperature coefficient (TB-4300B)	5 ppm/°C
Input impedance	
Device on	
TB-4300	Feedthrough [1]
	1.2 MΩ

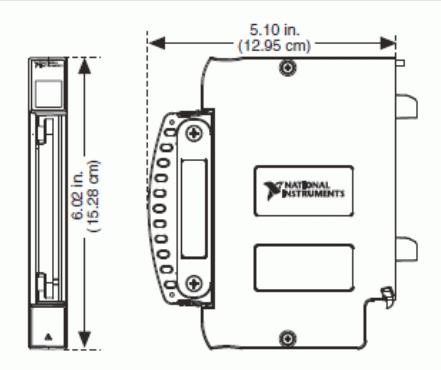
TB-4300B	
Analog input range	
Refer to the Maximum Voltage section.	

Mechanical

Screw terminal wire gauge	14 AWG, max

Physical

TB-4300/4300B Dimensions



Weight	618 g (21.8 oz)

Environmental Specifications

Maximum altitude	2,000 m (800 mbar), at 25 °C ambient temperature
Pollution Degree	2
Indoor use only	

Operating Environment

Ambient temperature range	0 to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Storage Environment

Ambient temperature range	– 40 to 71°C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)
Relative humidity range	5% to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Shock and Vibration

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

Safety Voltages

Maximum Voltage

Depending upon the input range, connect only voltages that are within the following limits.

AI+ to AI–	
TB-4300	1, 2, 5, 10 V max
TB-4300B	30, 60, 150, 300 V max

Isolation Voltages

Channel-to-channel	300 V_{rms}, Measurement Category II (Basic)
Channel-to-earth ground	300 V_{rms}, Measurement Category II (Basic)

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

Caution Do *not* connect the TB-4300/4300B to signals or use for measurements within Measurement Categories III or IV.

Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

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(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

[1] The TB-4300 is a feedthrough terminal block with no active circuitry. The input impedance registered is the input impedance of the module to which it is attached.

Back to Top