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Find the *National Instruments PXIe-4357* at our website: *Click HERE*

Technical Sales

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Detailed Specifications

For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

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NI PXIe-4357

Data Acquisition With Integrated Signal Conditioning for RTD Measurements





- 20 RTD input channels
- 100 S/s/ch sampling rate in high-speed mode; 0.275 S/s/ch in high-resolution mode
- 0.09 °C typical measurement accuracy
- 24-bit delta-sigma ADCs
- Antialiasing and lowpass filters
- Multidevice triggering and synchronization via PXI Express
- Designed for PT100 RTDs
- NI-DAQmx driver software support
- Support for 2-, 3-, and 4-wire configurations

Overview

The NI PXIe-4357 provides integrated data acquisition and signal conditioning for resistance temperature detector (RTD) measurements. This 20-channel module features five 24-bit delta-sigma analog-to-digital converters with antialiasing and lowpass filters to achieve typical measurement accuracies of 0.09 °C. The module features both a high-speed mode (100 S/s per channel) and a high-resolution mode (1 S/s per channel). The NI TB-4357 front mount terminal block provides screw terminal connectivity for 2-, 3-, or 4-wire RTDs. The NI-DAQmx device driver software included with the module gives you the flexibility of per channel software-programmable configurations and automatically scales measured data into engineering units. The signal conditioning circuitry on the NI PXIe-4357 is optimized for PT100 RTDs but can also measure resistors between 0 Ω and 400 Ω.

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Application and Technology

Integrated Signal Conditioning

By combining signal conditioning and analog-to-digital converters (ADCs) on the same device, the NI PXIe-4357 RTD 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.

PXI Express Dedicated Data Throughput

NI 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. SC Express modules take advantage of PXI Express to deliver tight synchronization between modules in one chassis or multiple chassis.

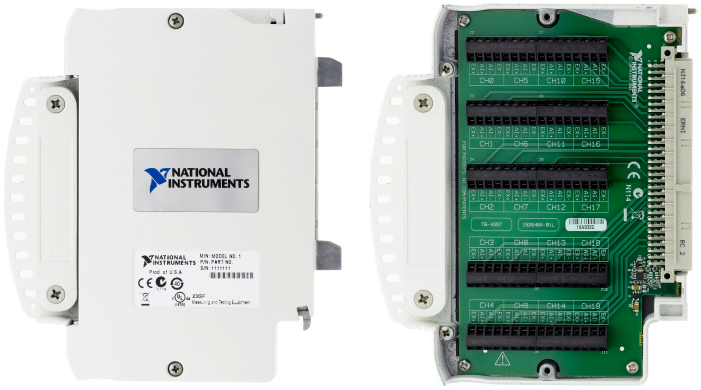
Wide Variety of I/O on the PXI Platform

When combined with the more than 1,500 I/O types in the PXI platform, this module offers the flexibility 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

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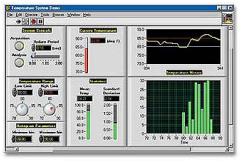
The NI PXIe-4357 is designed to be used with the TB-4357 front mount terminal block. The TB-4357 provides screw terminal connectivity for 2-, 3-, and 4-wire RTDs. SC Express terminal blocks are hot-swappable and automatically recognized in software. This makes troubleshooting easier because you can connect 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 to minimize the risk of bent pins.



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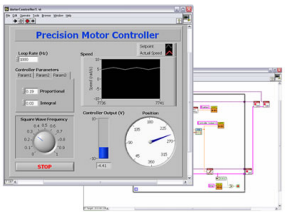
Software Recommendations

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

NI LabVIEW Real-Time Module



- Design deterministic real-time applications with LabVIEW graphical programming
- Download to dedicated NI or third-party hardware for reliable execution and a wide selection of I/O
- Take advantage of built-in PID control, signal processing, and analysis functions
- Automatically take advantage of multicore CPUs or set processor affinity manually
- Includes real-time OS, development and debugging support, and board support
- Purchase individually or as part of a LabVIEW suite

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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.
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- **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.

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Detailed Specifications

This document lists specifications for the NI PXIe-4357 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.

Caution Refer to the Read Me First: Safety and Electromagnetic Compatibility document for important safety and electromagnetic compatibility information. To obtain a copy of this document online, visit ni.com/manuals, and search for the document title.

Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

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

Input Characteristics	
Number of channels	20 RTD channels
ADC resolution	24 bits
Type of ADC	Delta-Sigma
Sampling mode	Scanned
Maximum sample rate	100 S/s (Refer to Timing for more details.)
Measurement Range	
Temperature	–200 °C to 850 °C, PT100 RTD
Resistance	0 Ω to 400 Ω
Excitation current	0.9 mA per channel

50/60 Hz noise rejection

Timing Mode	50 Hz ±1 Hz	60 Hz ±1 Hz
1 (High Resolution)	–124 dB	–131 dB
2	–105 dB	–121 dB
3	–131 dB	–125 dB
4	–103 dB	–83 dB
5	–47 dB	–106 dB
6	–6 dB	–8 dB
7	–1.4 dB	–2 dB
8	—	—
9 (High Speed)	—	—

DC linearity	±15 ppm max

Common Mode Voltage Range	
Channel-to-earth ground	±60 VDC

Common Mode Rejection Ratio (CMRR)	
COM-to-earth ground at DC, 50/60 Hz	1 mΩ/Vcm, –120 dB

Filter Response

ADC Timing Modes*	Input Bandwidth (–3 dB)
1 (High Resolution)	1.1 Hz
2	1.8 Hz
3	2.4 Hz
4	11.9 Hz
5	14.2 Hz
6	35.6 Hz
7	71.1 Hz
8	227.5 Hz
9 (High Speed)	566.4 Hz

* Refer to the Timing section for more information about ADC timing modes.

Overvoltage Protection	
Between any AI± or EX± (except between two EX– pins)	60 V
Between any two EX– pins	None
Between RSVD lines and any other pin	None

Measurement Accuracy

Operating Temperature	Offset Error (Ω)*, †, ‡		Gain Error (% of Reading)	
	Typical	Maximum	Typical	Maximum
23 °C ±5 °C	0.008 Ω	0.034 Ω	0.02	0.04
0 °C – 55 °C	0.010 Ω	0.060 Ω	0.03	0.06

* Offset error is exclusive of noise.

† For 2-wire mode, add an additional 1.33 Ω.

‡ For 3-wire mode, add an additional 0.04 Ω.

Input Noise

Timing Modes*	Input Noise (mΩrms)	
	3-Wire	2- and 4-Wire
1 (High Resolution)	0.10	0.05
2	0.12	0.06
3	0.14	0.07
4	0.30	0.16
5	0.33	0.18
6	0.52	0.28
7	0.73	0.40
8	1.30	0.71
9 (High Speed)	2.2	1.12

* Refer to the Timing section for more information about ADC timing modes.

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Input Stability		
Input Stability	**Typical**	**Max**
Offset stability	100 µΩ/°C	960 µΩ/°C
Gain stability	4 ppm/°C	9 ppm/°C

Temperature Measurement Accuracy

The following RTD measurement table shows the accuracy for PT100 RTDs under the following conditions:

• Scaling from resistance to °C is performed using the Callendar-Van Dusen equation with the following constants:
– R0 = 100
– A = 3.908×10^{-3}
– B = -5.775×10^{-7}
– C = -4.183×10^{-12}
• The module is connected to a TB-4357.
• Accuracies do not include the accuracy of the RTD itself
• The accuracy tables are valid for 1 year from the last calibration and include all measurement errors of the module and the terminal block, excluding noise.
• The 3-wire and 2-wire accuracy specifications are inclusive of 10 meter 24 gage lead wires.
• The 3-wire accuracy specification assumes lead wire resistances are matched to within 5%.

RTD Measurement Accuracy (°C)

Mode	Operating Temperature	-200 °C	-100 °C	0 °C	100 °C	300 °C	500 °C	700 °C	850 °C
4-Wire Mode*	Typical 23 °C ±5 °C	0.03	0.05	0.07	0.09	0.13	0.18	0.24	0.28
	Max 23 °C ±5 °C	0.09	0.14	0.18	0.22	0.32	0.41	0.52	0.61
	Max 0 °C - 55 °C	0.16	0.24	0.31	0.38	0.53	0.70	0.88	1.02
3-Wire Mode†	Typical 23 °C ±5 °C	0.12	0.15	0.17	0.20	0.25	0.30	0.37	0.42
	Max 23 °C ±5 °C	0.19	0.24	0.29	0.33	0.43	0.54	0.65	0.75
	Max 0 °C - 55 °C	0.26	0.34	0.41	0.49	0.65	0.82	1.01	1.16
2-Wire Mode	Typical 23 °C ±5 °C	3.10	3.33	3.47	3.59	3.87	4.17	4.52	4.82
	Max 23 °C ±5 °C	3.17	3.42	3.58	3.73	4.05	4.40	4.81	5.15
	Max 0 °C - 55 °C	3.24	3.52	3.71	3.89	4.26	4.69	5.16	5.56

* The accuracies listed are valid for timing modes up to and including timing mode 5.

For timing modes higher than 5, include an additional 0.019 °C.

† The accuracies listed are valid for timing modes up to and including timing mode 7.

For timing modes higher than 7, include an additional 0.036 °C.

Timing

Note The maximum allowable sample rate is 100 S/s.

ADC Timing Modes [2]	ADC Conversion Time / Max Sample Rate (20 Channels)	
1 (High Resolution)†	909 ms	0.275 S/s
2	556 ms	0.45 S/s
3	435 ms	0.575 S/s
4	84 ms	2.975 S/s
5	70 ms	3.55 S/s
6	29 ms	8.75 S/s
7	15 ms	17 S/s
8	5 ms	49 S/s
9 (High Speed)	2.5 ms	100 S/s

* Refer to the NI PXIe-4357 User Manual for more information about ADC timing modes.
† ADC Timing Mode 1 is the default setting for the On Demand timing mode when sample rate is not explicitly selected.

Digital Triggers

Source	PXI_TRIG <0..7>, PXI_STAR, PXIe_DSTAR <A..B>
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>, 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>			—

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

Output Timing Signals	
Source	Start Trigger, Reference Trigger, Pause Trigger, 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 v1.0 compliant
Slot compatibility	x1 and x4 PXI Express or PXI Express hybrid slots
DMA channels	1, analog input
Calibration	
You can obtain the calibration certificate and information about calibration services for the NI PXIe-4357 at ni.com/calibration.	
Recommended warm-up time	15 minutes
Calibration interval	1 year
Power Requirements	
+3.3 V	568 mA
+12 V	162 mA
Physical Requirements	
Dimensions	Standard 3U PXIe, 16 cm × 10 cm (6.3 in. × 3.9 in.)
Weight	145 g (5.1 oz)
I/O connector	96-pin male DIN 41612/IEC 60603-2 connector
Environmental Specifications	
Maximum altitude	2,000 m (800 mbar)
Pollution Degree	2
Indoor use only	
Operating Environment	
Ambient temperature range	0 °C 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 °C 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 Hz to 500 Hz, 0.3 grms
Non-operating	5 Hz to 500 Hz, 2.4 grms (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Safety Voltages

Channel-to-channel	None
Channel-to-earth ground	
Continuous	60 VDC, Measurement Category I
Withstand	1,000 Vrms, verified by a 5 s dielectric withstand test

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment.

Caution Do not connect the NI PXIe-4357 to signals or use for measurements within Measurement Categories II, III, or IV.

Caution The protection provided by the NI PXIe-4357 can be impaired if it is used in a manner not described in this document.

Safety

This product meets 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 61326-1 (IEC 61326-1): 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 In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generates radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations and certifications, and additional information, refer to the Online Product Certification section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives 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 model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and 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 and Electronic Equipment, visit ni.com/environment/ weee.

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The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.



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