NI-9209 Specifications

2022-10-25

Contents

NI 9209 Datasheet

- 250 V RMS, CAT II, channel-to-earth isolation (spring terminal); 60 V DC, CAT I, channel-to-earth isolation (DSUB)
- DSUB or spring terminal connectivity
- 50Hz/60 Hz noise rejection

The NI-9209 voltage input C Series module features 16 differential channels or 32 single-ended channels of ±10 V input with built-in 50/60 Hz rejection for noise rejection. Designed with industrial systems in mind, the NI-9209 has high-channel density to reduce the number of modules needed.

Kit Contents	• NI 9209 • NI 9209 Getting Started Guide
Accessories	• NI 9923 Screw-Terminal Connector Block • NI SH37F-37M Shielded Cable

NI C Series Overview

NI provides more than 100 C Series modules for measurement, control, and communication applications. C Series modules can connect to any sensor or bus

and allow for high-accuracy measurements that meet the demands of advanced data acquisition and control applications.

- Measurement-specific signal conditioning that connects to an array of sensors and signals
- Isolation options such as bank-to-bank, channel-to-channel, and channel-to-earth ground
- -40 °C to 70 °C temperature range to meet a variety of application and environmental needs
- Hot-swappable

The majority of C Series modules are supported in both CompactRIO and CompactDAQ platforms and you can move modules from one platform to the other with no modification.

CompactRIO

CompactRIO combines an open-embedded architecture with small size, extreme ruggedness, and C Series modules in a platform powered by the NI LabVIEW reconfigurable I/O (RIO) architecture. Each system contains an FPGA for custom timing, triggering, and processing with a wide array of available modular I/O to meet any embedded application requirement.

CompactDAQ

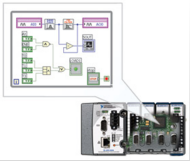
CompactDAQ is a portable, rugged data acquisition platform that integrates connectivity, data acquisition, and signal conditioning into modular I/O for directly interfacing to any sensor or signal. Using CompactDAQ with LabVIEW, you can easily customize how you acquire, analyze, visualize, and manage your measurement data.

Software

LabVIEW Professional Development System for Windows

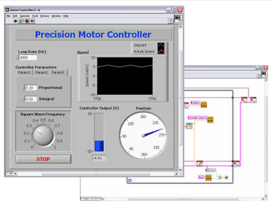
- Use advanced software tools for large project development
- Generate code automatically using DAQ Assistant and Instrument I/O Assistant
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables, and MSI installers

NI LabVIEW FPGA Module



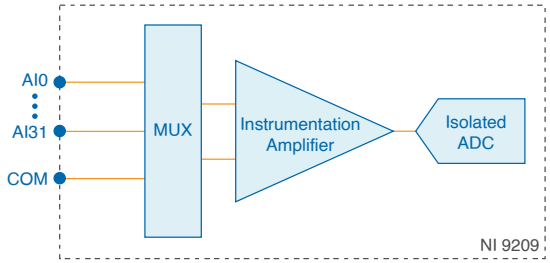
- Design FPGA applications for NI RIO hardware
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx IP generator functions
- Purchase as part of the LabVIEW Embedded Control and Monitoring Suite

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
- Take advantage of real-time OS, development and debugging support, and board support
- Purchase individually or as part of a LabVIEW suite

NI-9209 Input Circuitry



Input signals are scanned, buffered, conditioned, and then sampled by a single ADC.

NI-9209 Specifications

The following specifications are typical for the range -40 °C to 70 °C unless otherwise noted. All voltages are relative to COM unless otherwise noted.

> **Caution** Do not operate the NI-9209 in a manner not specified in this document. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to NI for repair.

Input Characteristics

Number of channels	16 differential/32 single-ended channels
ADC resolution	24 bits
Type of ADC	Delta-Sigma
Sampling mode	Scanned

Calibrated Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range[1] (Offset Error)
Maximum (-40 °C to 70 °C)	±0.46%	±0.011%
Typical (25 °C ±5 °C)	±0.06%	±0.003%

Table 1. Accuracy

Input range	
Minimum	±10.2 V
Typical	±10.4 V

Maximum working voltage for analog inputs (signal voltage + common mode voltage)	Each channel must remain within ±10.2 V of common
Conversion time (per channel)	
High-Resolution Mode	52 ms
High-Speed Mode	2 ms
Overvoltage protection, channel-to-COM	±30 V maximum on one channel at a time
Input impedance	>1 GΩ
Input noise	
High-Resolution Mode	20 µVrms
High-Speed Mode	86 µVrms
Alias rejection	
High-Resolution Mode	14 dB
High-Speed Mode	42 dB
Stability	
Gain drift	25 ppm/°C
Offset drift	2.4 µV/°C
CMRR (f_{in} = 0 Hz to 60 Hz)	68 dB
CMRR, channel-to-earth ground (50/60 Hz)[2]	

High-Resolution Mode	160 dB
High-Speed Mode	100 dB

NMRR (High-Resolution Mode only)

50 Hz	66 dB
60 Hz	68 dB

Power Requirements

Power consumption from chassis

Active mode	333 mW maximum
Sleep mode	25 µW maximum

Thermal dissipation

Active mode	354 mW maximum
Sleep mode	25 µW maximum

Physical Characteristics

Spring terminal wiring

Gauge	copper conductor wire
Wire strip length	of insulation stripped from the end
Temperature rating	

Wires per spring terminal	

Connector securement

Securement type	Screw flanges provided
Torque for screw flanges	

NI-9209 with Spring Terminal Safety Voltages

Connect only voltages that are within the following limits:

Isolation

Channel-to-channel	None

Channel-to-earth ground

Continuous	250 V RMS, Measurement Category II
Withstand up to 5,000 m	3,000 V RMS, verified by a 5 s dielectric withstand test

NI-9209 with DSUB Safety Voltages

Connect only voltages that are within the following limits:

Isolation

Channel-to-channel	None

Channel-to-earth ground

Continuous	60 V DC, Measurement Category I

Withstand	1,000 V RMS up to 3,000 m, verified by a 5 s dielectric withstand test; 860 V RMS up to 5,000 m

Hazardous Locations

U.S. (UL)	; ,
Canada (C-UL)	; ,
Europe (ATEX) and International (IECEx)	

Safety and Hazardous Locations Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1
- EN 60079-0:2012, EN 60079-15:2010
- IEC 60079-0: Ed 6, IEC 60079-15; Ed 4
- UL 60079-0; Ed 6, UL 60079-15; Ed 4
- CSA 60079-0:2011, CSA 60079-15:2012

> **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; Industrial immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: 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 generate 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.

Caution For EMC compliance, operate the NI-9209 with DSUB with shielded cables.

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

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.

Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration	
Random (IEC 60068-2-64)	5 g_{rms}, 10 Hz to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 Hz to 500 Hz
Operating shock (IEC 60068-2-27)	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

Environmental

Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Ingress protection	IP40

Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-78)	5% RH to 95% RH, noncondensing
Pollution Degree	2
Maximum altitude	5,000 m

Indoor use only.

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 **Engineering a Healthy Planet** 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.

EU and UK Customers

- **Waste Electrical and Electronic Equipment (WEEE)**—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

电子信息产品污染控制管理办法（中国 RoHS）

- **中国 RoHS**— NI 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 NI 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.)

Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9209 at ni.com/calibration.

Calibration interval	2 years

[1] Range equals 10.4 V

[2] NI-9209 with spring terminal only.