
NI-9222

Specifications

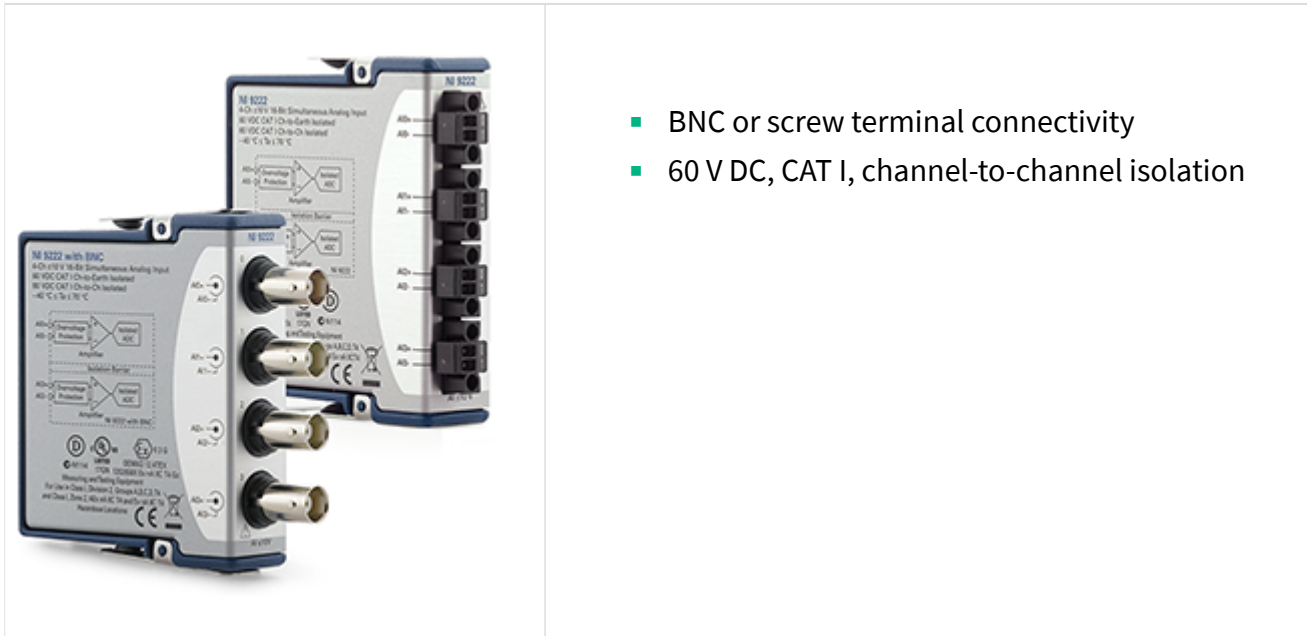
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Contents



NI-9222.....	3
NI-9222 Specifications.....	7

NI-9222



The NI-9222 C Series module is a high-speed, simultaneous module for use in any NI CompactDAQ or CompactRIO chassis. With a sample rate of up to 500 kS/s and simultaneous analog-to-digital converters (ADCs), this module is well-suited for applications such as ballistics, impact, and blast wave testing.

C SERIES ANALOG INPUT MODULE COMPARISON						
Product Name	Signal Levels	Channels	Sample Rate	Simultaneous	Resolution	Connectivity
NI 9201	±10 V	8 Single-Ended	500 kS/s	No	12-Bit	Screw-Terminal, Spring-Terminal, DSUB
NI 9205	±200 mV, ±1 V, ±5 V, ±10 V	32 Single-Ended, 16 differential	250 kS/s	No	16-Bit	Spring-Terminal, DSUB
NI 9206	±200 mV, ±1 V, ±5 V, ±10 V	32 Single-Ended, 16 Differential	250 kS/s	No	16-Bit	Spring-Terminal
NI 9207	±10 V, ±20 mA	8 Differential, 8 Current	500 S/s	No	24-Bit	Spring-Terminal, DSUB
NI 9209	±10 V	32 Single-Ended, 16 Differential	500 S/s	No	24-Bit	Spring-Terminal, DSUB
NI 9215	±10 V	4 Differential	100 kS/s/ch	Yes	16-Bit	Screw-Terminal, Spring-Terminal, BNC
NI 9220	±10 V	16 Differential	100 kS/s/ch	Yes	16-Bit	Spring-Terminal, DSUB
NI 9221	±60 V	8 Single-Ended	800 kS/s	No	12-Bit	Screw-Terminal, Spring-Terminal, DSUB
NI 9222	±10 V	4 Differential	500 kS/s/ch	Yes	16-Bit	Screw-Terminal, BNC
NI 9223	±10 V	4 Differential	1 MS/s/ch	Yes	16-Bit	Screw-Terminal, BNC

	<p>Kit Contents</p>	<ul style="list-style-type: none"> • NI 9222 • NI 9222 Getting Started Guide
	<p>Accessories</p>	<ul style="list-style-type: none"> • NI 9971 Backshell Connector Kit (Screw Terminal)

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.



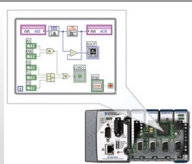
Software

LabVIEW Professional Development System for Windows



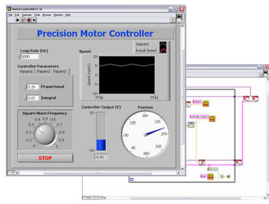
- Use advanced software tools for large project development
- Generate code automatically using DAQ Assistant and Instrument I/O Assistant
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables,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

NI LabVIEW FPGA Module



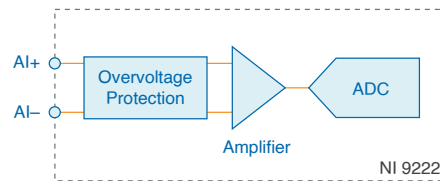
- Design FPGA applications for NI RIO hardware
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing 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-9222 Input Circuitry



- Input signals on each channel are buffered, conditioned, and then sampled by an ADC.
- Each AI channel provides an independent signal path and ADC, enabling you to sample all channels simultaneously.

NI-9222 Specifications

The following specifications are typical for the range -40 °C to 70 °C unless otherwise noted. All voltages are relative to the AI- signal on each channel unless otherwise noted.



Caution Do not operate the NI-9222 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	4 analog input channels		
ADC resolution	16 bits		
Type of ADC	Successive approximation register (SAR)		
Input voltage ranges^[1], Measurement Voltage (AI+ to AI-)			
Minimum ^[2]	±10.5 V		
Typical	±10.6 V		
Maximum	±10.7 V		
Overvoltage protection	±30 V		
Maximum Sampling Rate			
CompactDAQ (NI-DAQmx)	500 kS/s		
CompactRIO			
FPGA User-Controlled I/O Sampling ^[3]	500 kS/s		
FPGA I/O Nodes	300 kS/s		
Measurement Conditions			
	Percent of Reading (Gain Error)	Percent of Range^[4] (Offset Error)	
Calibrated	Maximum (-40 °C to 70 °C)	±0.20%	±0.10%
	Typical (23 °C ±5 °C)	±0.02%	±0.01%
Uncalibrated ^[5]	Maximum (-40 °C to 70 °C)	±0.40%	±0.40%
	Typical (23 °C ±5 °C)	±0.20%	±0.10%

Table 1. Accuracy

Stability

Gain drift	6 ppm/°C
Offset drift	29 μ V/°C
CMRR ($f_{in} = 60$ Hz)	100 dB
-3 dB bandwidth ^[6]	500 kHz
Input impedance	>1 G Ω
Noise	0.75 LSB _{rms}
Total Harmonic Distortion (THD) (20 Vpp at 1 kHz)	-85 dB
Crosstalk (20 Vpp at 1 kHz)	-100 dB

Power Requirements

Power consumption from chassis	
Active mode	1 W maximum
Sleep mode	5 mW maximum
Thermal dissipation (at 70 °C)	
Active mode	1.3 W maximum
Sleep mode	430 mW maximum

Physical Characteristics

Screw-terminal wiring

Gauge	0.05 mm ² to 1.5 mm ² (30 AWG to 14 AWG) copper conductor wire
Wire strip length	6 mm (0.24 in.) of insulation stripped from the end
Temperature rating	90 °C, minimum
Torque for screw terminals	0.22 N · m to 0.25 N · m (1.95 lb · in. to 2.21 lb · in.)

Wires per screw terminal	One wire per screw terminal; two wires per screw terminal using a 2-wire ferrule
Ferrules	0.25 mm ² to 1.5 mm ²
Connector securement	
Securement type	Screw flanges provided
Torque for screw flanges	0.2 N · m (1.80 lb · in.)

Safety Voltages

Connect only voltages that are within the following limits:

Isolation	
Channel-to-channel	
Continuous	60 V DC, Measurement Category I
Withstand	1000 V RMS, verified by a 5 s dielectric withstand test
Channel-to-earth ground	
Continuous	60 V DC, Measurement Category I
Withstand	1000 V RMS, verified by a 5 s dielectric withstand test

Hazardous Locations

U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA IIC T4 Gc
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Ex nA IIC T4 Gc
Europe (ATEX) and International (IECEX)	Ex nA IIC T4 Gc DEMKO 07 ATEX 0626664X IECEX UL 14.0089X

Safety Compliance 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 C22.2 No. 61010-1
- EN 60079-0, EN 60079-7
- IEC 60079-0, IEC 60079-7
- UL 60079-0, UL 60079-7
- CSA C22.2 No. 60079-0, CSA C22.2 No. 60079-7



Note For safety certifications, refer to the product label or the [Product Certifications and Declarations](#) section.

Electromagnetic Compatibility

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity

CE Compliance

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

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

Shock and Vibration

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

Operating vibration

Random	5 g RMS, 10 Hz to 500 Hz
Sinusoidal	5 g, 10 Hz to 500 Hz
Operating shock	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 60068-2-30)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-30)	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-9222 at ni.com/calibration.

Calibration interval	1 year
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¹ Refer to the [Safety Voltages](#) section for more information about safe operating voltages.

² The minimum measurement voltage range is the largest voltage the NI-9222 is guaranteed to accurately measure.

³ FPGA User-Controlled I/O Sampling provides low level access to sample acquisition and transfer, and higher sample rates. Visit ni.com/info and enter the Info Code [samplerate](#) for information about FPGA User-Controlled I/O Sampling.

⁴ Range equals ± 10.6 V.

⁵ Uncalibrated accuracy refers to the accuracy achieved when acquiring in raw or unscaled modes where the calibration constants stored in the module are not applied to the data.

⁶ -3 dB bandwidth for input amplitude at 10% of the input range.