

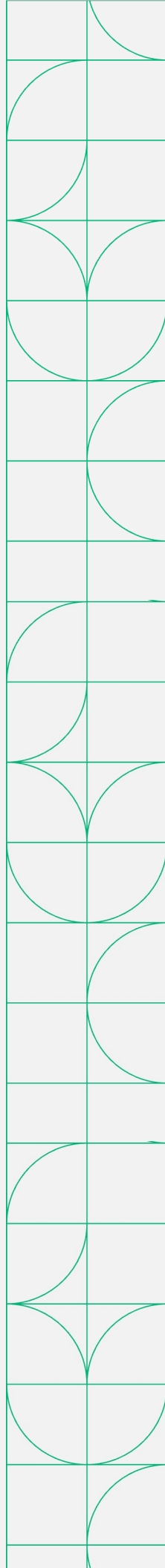


# cDAQ-SV4202

CompactDAQ Sound and Vibration Bundle

Datasheet and Specifications

cDAQ 9174 and NI-9234



# CompactDAQ Sound and Vibration Bundle

## In-Box Components

### cDAQ-SV4202 System P/N: 868017-01



cDAQ-9174  
(4-slot CompactDAQ Chassis  
w/ Desktop Mounting)



NI-9234 (x2)  
(Sound and Vibration  
Input Module)

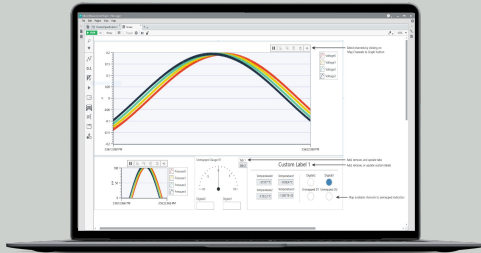
#### Included Accessories:

- Desktop Mounting Kit
- USB A to B Cable
- AC/DC Power Supply\*

\*IEC Power Cord sold separately based on geographic region

## Recommended Software

### FlexLogger



P/N: 785748-3501

No code software that accelerates measurement configuration and logging with NI DAQ Hardware.

- Acquire data and log test results to .tdms or .csv files
- Inline calculations for simple math, filtering, Boolean logic, and more
- Integrated TDMS Viewer for interactive data review

## Table of Contents

This document combines the PDFs of this system together. The page numbers in the table of contents correspond to the page number of PDF the component's documentation begins.

cDAQ 9174 Specifications.....	3
NI-9234 Specifications.....	14

---

# cDAQ-9174

## Specifications

---



## SPECIFICATIONS

# NI cDAQ™ -9174

## NI CompactDAQ Four-Slot USB Chassis

These specifications are for the National Instruments CompactDAQ 9174 chassis only. These specifications are typical at 25 °C unless otherwise noted. For the C Series I/O module specifications, refer to the documentation for the C Series I/O module you are using.

### Analog Input

---

Input FIFO size.....	127 samples per slot
Maximum sample rate <sup>1</sup> .....	Determined by the C Series I/O module or modules
Timing accuracy <sup>2</sup> .....	50 ppm of sample rate
Timing resolution <sup>3</sup> .....	12.5 ns
Number of channels supported.....	Determined by the C Series I/O module or modules

### Analog Output

---

Number of channels supported	
Hardware-timed task	
Onboard regeneration.....	16
Non-regeneration.....	Determined by the C Series I/O module or modules

---

<sup>1</sup> Performance dependent on type of installed C Series I/O module and number of channels in the task.

<sup>2</sup> Does not include group delay. For more information, refer to the documentation for each C Series I/O module.

<sup>3</sup> Does not include group delay. For more information, refer to the documentation for each C Series I/O module.

Non-hardware-timed task.....	Determined by the C Series I/O module or modules
Maximum update rate	
Onboard regeneration.....	1.6 MS/s (multi-channel, aggregate)
Non-regeneration.....	Determined by the C Series I/O module or modules
Timing accuracy.....	50 ppm of sample rate
Timing resolution.....	12.5 ns
Output FIFO size	
Onboard regeneration.....	8,191 samples shared among channels used
Non-regeneration.....	127 samples per slot
AO waveform modes.....	Non-periodic waveform, periodic waveform regeneration mode from onboard memory, periodic waveform regeneration from host buffer including dynamic update

## Digital Waveform Characteristics

---

Waveform acquisition (DI) FIFO.....	127 samples per slot
Waveform generation (DO) FIFO.....	2,047 samples
Digital input sample clock frequency	
Streaming to application.....	System-dependent memory
Finite.....	0 to 10 MHz
Digital output sample clock frequency	
Streaming from application.....	System-dependent memory
Regeneration from FIFO.....	0 to 10 MHz
Finite.....	0 to 10 MHz
Timing accuracy.....	50 ppm

# General-Purpose Counters/Timers

---

Number of counters/timers.....	4
Resolution.....	32 bits
Counter measurements.....	Edge counting, pulse, semi-period, period, two-edge separation, pulse width
Position measurements.....	X1, X2, X4 quadrature encoding with Channel Z reloading; two-pulse encoding
Output applications.....	Pulse, pulse train with dynamic updates, frequency division, equivalent time sampling
Internal base clocks.....	80 MHz, 20 MHz, 100 kHz
External base clock frequency.....	0 to 20 MHz
Base clock accuracy.....	50 ppm
Output frequency.....	0 to 20 MHz
Inputs.....	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down
Routing options for inputs.....	Any module PFI, analog trigger, many internal signals
FIFO.....	Dedicated 127-sample FIFO

# Frequency Generator

---

Number of channels.....	1
Base clocks.....	20 MHz, 10 MHz, 100 kHz
Divisors.....	1 to 16 (integers)
Base clock accuracy.....	50 ppm
Output.....	Any module PFI terminal

# Module PFI Characteristics

---

Functionality.....	Static digital input, static digital output, timing input, and timing output
Timing output sources <sup>4</sup> .....	Many analog input, analog output, counter, digital input, and digital output timing signals
Timing input frequency.....	0 to 20 MHz
Timing output frequency.....	0 to 20 MHz

# Digital Triggers

---

Source.....	Any module PFI terminal
Polarity.....	Software-selectable for most signals
Analog input function.....	Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Analog output function.....	Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Counter/timer function.....	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down

# Module I/O States

---

At power-on.....	Module-dependent. Refer to the documentation for each C Series I/O module.
------------------	--



**Note** The chassis may revert the input/output of the modules to their power-on state when the USB cable is removed.

---

<sup>4</sup> Actual signals available dependent on type of installed C Series I/O module.

# Power Requirements

---



**Caution** You must use a National Electric Code (NEC) Class 2 power source with the NI cDAQ-9174 chassis.



**Note** Some C Series I/O modules have additional power requirements. For more information about C Series I/O module power requirements, refer to the documentation for each C Series I/O module.



**Note** Sleep mode for C Series I/O modules is not supported in the NI cDAQ-9174.

Input voltage range.....	9 to 30 V
Maximum required input power <sup>5</sup> .....	15 W
Power input connector.....	2 positions 3.5 mm pitch pluggable screw terminal with screw locks similar to Sauro CTMH020F8-0N001
Power input mating connector.....	Sauro CTF020V8, Phoenix Contact 1714977, or equivalent
Power consumption from USB,.....	500 $\mu$ A maximum 4.10 to 5.25 V

# Bus Interface

---

USB specification.....	USB 2.0 Hi-Speed
High-performance data streams.....	7
Data stream types available.....	Analog input, analog output, digital input, digital output, counter/timer input, counter/timer output, NI-XNET <sup>6</sup>



**Note** If you are connecting the NI cDAQ-9174 chassis to a USB hub, the hub must be externally powered.

---

<sup>5</sup> Includes maximum 1 W module load per slot across rated temperature and product variations.

<sup>6</sup> When a session is active, CAN or LIN (NI-XNET) C Series modules use a total of two data streams regardless of the number of NI-XNET modules in the chassis.



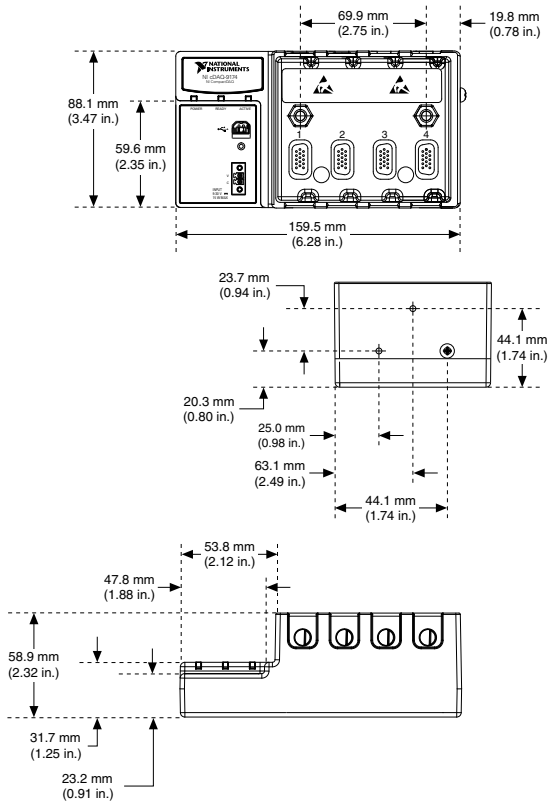
# Physical Characteristics

Weight (unloaded).....Approx. 574 g (20.2 oz)

Dimensions (unloaded).....159.5 mm × 88.1 mm × 58.9 mm  
(6.28 in. × 3.47 in. × 2.3 in.) Refer to the following figure.

If you need to clean the chassis, wipe it with a dry towel.

**Figure 1. NI cDAQ-9174 Dimensions**



# Environmental

---

Operating temperature <sup>7</sup> .....	-20 °C to 55 °C (IEC-60068-2-1 and IEC-60068-2-2)
Storage temperature.....	-40 °C to 85 °C (IEC-600068-2-1 and IEC-60068-2-2)
Ingress protection.....	IP 30
Operating humidity.....	10 to 90% RH, noncondensing (IEC-60068-2-56)
Storage humidity.....	5 to 95% RH, noncondensing (IEC-60068-2-56)
Pollution Degree (IEC 60664).....	2
Maximum altitude.....	5,000 m
Indoor use only.	

# Shock and Vibration

---

To meet these specifications, you must panel mount the NI cDAQ-9174 system, use an NI locking USB cable, and affix ferrules to the ends of the terminal lines.

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-28800F.)
Random vibration	
Operating.....	5 to 500 Hz, 0.3 g <sub>rms</sub>
Non-operating.....	5 to 500 Hz, 2.4 g <sub>rms</sub> (Tested in accordance with IEC 60068-2-64. Non-operating test profile exceeds the requirements of MIL PRF-28800F, Class 3.)

---

<sup>7</sup> When operating the NI cDAQ-9174 in temperatures below 0 °C, you must use the PS-15 power supply or another power supply rated for below 0 °C.

# 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 generate radio frequency energy for the treatment of material or inspection/analysis purposes.



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

# CE Compliance

---

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

---

To obtain product certifications and the DoC for this product, visit [ni.com/certification](https://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 not only to the environment but also to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at [ni.com/environment](http://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](http://ni.com/environment/weee).

## 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](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

Refer to the *NI Trademarks and Logo Guidelines* at [ni.com/trademarks](http://ni.com/trademarks) for information on National Instruments trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patent Notice* at [ni.com/patents](http://ni.com/patents). You can find information about end-user license agreements (EULAs) and third-party legal notices in the readme file for your NI product. Refer to the *Export Compliance Information* at [ni.com/legal/export-compliance](http://ni.com/legal/export-compliance) for the National Instruments global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data.

© 2013 National Instruments. All rights reserved.

374045A-01 May13

---

# NI-9234

# DataSheet

---



## DATASHEET



# NI 9234

4 AI,  $\pm 5$  V, 24 Bit, 51.2 kS/s/ch Simultaneous, AC/DC Coupling, IEPE AC Coupling



- Software-selectable AC/DC coupling (AC coupled at 0.5 Hz)
- Software-selectable IEPE signal conditioning with AC coupling (2 mA)
- $-40$  °C to  $70$  °C operating, 5 g vibration, 50 g shock
- 24-bit resolution
- Anti-aliasing filters
- 102 dB dynamic range
- Smart TEDS sensor compatibility

The NI 9234 is a four-channel dynamic signal acquisition module for making high-accuracy measurements from IEPE sensors. The NI 9234 delivers 102 dB of dynamic range and incorporates Integrated Electronics Piezoelectric (IEPE) signal conditioning at 2 mA constant current for accelerometers and microphones. The four input channels simultaneously acquire at rates up to 51.2 kS/s. In addition, the module includes built-in anti-aliasing filters that automatically adjust to your sampling rate. Compatible with a single-module USB carrier and NI CompactDAQ and CompactRIO hardware, the NI 9234 is ideal for a wide variety of mobile or portable applications such as industrial machine condition monitoring and in-vehicle noise, vibration, and harshness testing.

	Kit Contents	<ul style="list-style-type: none"><li>• NI 9234</li><li>• NI 9234 Getting Started Guide</li></ul>
	Recommended Accessories	<ul style="list-style-type: none"><li>• BNC Cable (x4) (779697-02)</li></ul>

C SERIES ANALOG MODULE COMPARISON							
Product Name	Signal Ranges	Channels	Sample Rate	Input Configurations	Noise at Maximum Sample Rate	Connectivity	Isolation Continuous
NI 9218	±5 V	2	51.2 kS/s/ch	IEPE with AC Coupling	50 $\mu$ Vrms	9-Position DSUB, LEMO	60 VDC Ch-Ch
NI 9230	±30 V	3	12.8 kS/s/ch	IEPE with AC Coupling, AC Coupling, DC Coupling	106 $\mu$ Vrms	Screw Terminal	60 VDC Ch-Earth
NI 9232	±30 V	3	102.4 kS/s/ch	IEPE with AC Coupling, AC Coupling, DC Coupling	251 $\mu$ Vrms	Screw Terminal	60 VDC Ch-Earth
NI 9234	±5 V	4	51.2 kS/s/ch	IEPE with AC Coupling, AC Coupling, DC Coupling	50 $\mu$ Vrms	BNC	None
NI 9251	±4.24 Vpk	2	102.4 kS/s/ch	AC Coupling, DC Coupling	8.8 $\mu$ Vrms	mini XLR	None

## 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.



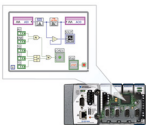
# Software

## LabVIEW Professional Development System for Windows



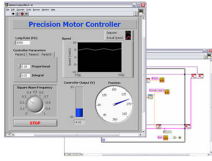
- Use advanced software tools for large project development
- Generate code automatically using DAQ Assistant and Instrument I/O Assistant
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables,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

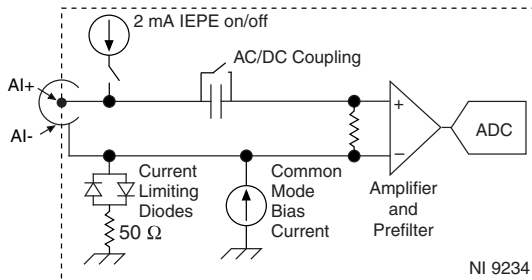


- Design deterministic real-time applications with LabVIEW graphical programming
- Download or dedicated NI or third-party hardware for reliable execution and a wide selection of I/O
- Take advantage of built-in PID control, signal processing, and analysis functions
- Automatically take advantage of 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

## Circuitry

The input signal on each channel is buffered, conditioned, and then sampled by a 24-bit Delta-Sigma ADC.

**Figure 1.** NI 9234 Input Circuitry for One Channel



The NI 9234 analog input channels are referenced to chassis ground through a 50  $\Omega$  resistor. To minimize ground noise, make sure the chassis ground is connected to earth ground. Each channel is protected from overvoltages.

## AC/DC Coupling

You can configure each channel in software for AC or DC coupling. For channels set to AC coupling, you can turn the IEPE excitation current on or off. Refer to your software help for more information about configuring AC/DC coupling and enabling excitation current.

## NI 9234 TEDS

The NI 9234 also has TEDS circuitry. For more information about TEDS, visit [ni.com/info](http://ni.com/info) and enter the Info Code `rdteds`.

# Filtering

---

The NI 9234 uses a combination of analog and digital filtering to provide an accurate representation of in-band signals and reject out-of-band signals. The filters discriminate between signals based on the frequency range, or bandwidth, of the signal. The three important bandwidths to consider are the passband, the stopband, and the anti-imaging bandwidth.

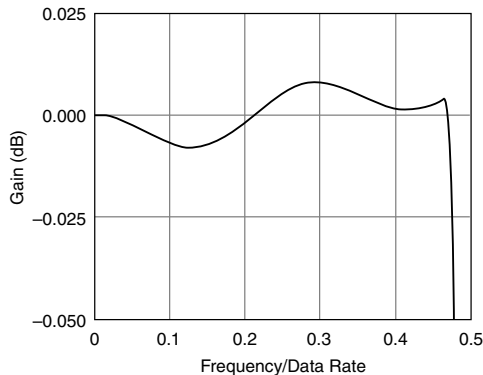
The NI 9234 represents signals within the passband, as quantified primarily by passband ripple and phase nonlinearity. All signals that appear in the alias-free bandwidth are either unaliased signals or signals that have been filtered by at least the amount of the stopband rejection.

## Passband

The signals within the passband have frequency-dependent gain or attenuation. The small amount of variation in gain with respect to frequency is called the passband flatness. The digital filters of the NI 9234 adjust the frequency range of the passband to match the data rate. Therefore, the amount of gain or attenuation at a given frequency depends on the data rate.

**Figure 2.** Typical Passband Response for the NI 9234

---



## Stopband

The filter significantly attenuates all signals above the stopband frequency. The primary goal of the filter is to prevent aliasing. Therefore, the stopband frequency scales precisely with the data rate. The stopband rejection is the minimum amount of attenuation applied by the filter to all signals with frequencies within the stopband.

## Alias-Free Bandwidth

Any signals that appear in the alias-free bandwidth are not aliased artifacts of signals at a higher frequency. The alias-free bandwidth is defined by the ability of the filter to reject frequencies above the stopband frequency. The alias-free bandwidth is equal to the data rate minus the stopband frequency.

# Data Rates

The frequency of a master timebase ( $f_M$ ) controls the data rate ( $f_s$ ) of the NI 9234. The NI 9234 includes an internal master timebase with a frequency of 13.1072 MHz, but the module also can accept an external master timebase or export its own master timebase. To synchronize the data rate of an NI 9234 with other modules that use master timebases to control sampling, all of the modules must share a single master timebase source.

The following equation provides the available data rates of the NI 9234:

$$f_s = \frac{f_M \div 256}{n}$$

where  $n$  is any integer from 1 to 31.

However, the data rate must remain within the appropriate data rate range. When using the internal master timebase of 13.1072 MHz, the result is data rates of 51.2 kS/s, 25.6 kS/s, 17.067 kS/s, and so on down to 1.652 kS/s, depending on the value of  $n$ . When using an external timebase with a frequency other than 13.1072 MHz, the NI 9234 has a different set of data rates.



**Note** The NI 9151 R Series Expansion chassis does not support sharing timebases between modules.

## NI 9234 Specifications

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



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



**Caution** Do not operate the NI 9234 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	24 bits
Type of ADC	Delta-Sigma (with analog prefiltering)
Sampling mode	Simultaneous
Type of TEDS supported	IEEE 1451.4 TEDS Class I

---

**Internal master timebase ( $f_M$ )**

---

Frequency	13.1072 MHz
-----------	-------------

---

Accuracy	$\pm 50$ ppm maximum
----------	----------------------

---

**Data rate range ( $f_s$ )**

---

Using internal master timebase

---

Minimum	1.652 kS/s
---------	------------

---

Maximum	51.2 kS/s
---------	-----------

---

Using external master timebase

---

Minimum	0.391 kS/s
---------	------------

---

Maximum	52.734 kS/s
---------	-------------

---

Data rates <sup>1</sup> ( $f_s$ )	$(f_M \div 256) / n, n = 1, 2, \dots, 31$
-----------------------------------	---

---

Input coupling	AC/DC (software-selectable)
----------------	-----------------------------

---

**AC cutoff frequency**

---

-3 dB	0.5 Hz
-------	--------

---

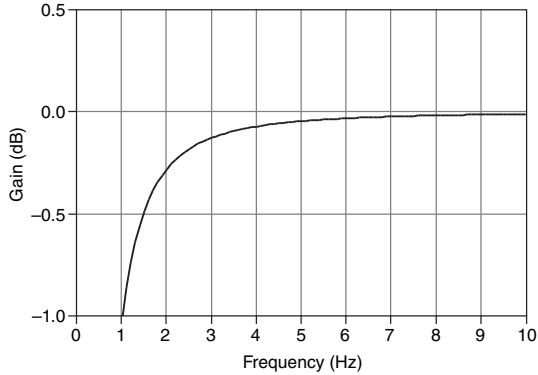
-0.1 dB	4.6 Hz maximum
---------	----------------

---

---

<sup>1</sup> The data rate must remain within the appropriate data range. Refer to the [Data Rates](#) for more information.

**Figure 3. AC Cutoff Frequency Response**



Input range	±5 V
AC voltage full-scale range	
Minimum	±5 Vpk
Typical	±5.1 Vpk
Maximum	±5.2 Vpk
Common-mode voltage range (AI- to earth ground)	±2 V maximum
IEPE excitation current (software-selectable on/off)	
Minimum	2.0 mA
Typical	2.1 mA
Power-on glitch	90 μA for 10 μs
IEPE compliance voltage	19 V maximum

If you are using an IEPE sensor, use the following equation to make sure your configuration meets the IEPE compliance voltage range.

$$(V_{\text{common-mode}} + V_{\text{bias}} \pm V_{\text{full-scale}}) \text{ must be } 0 \text{ to } 19$$

Where

$V_{\text{common-mode}}$  is the common-mode voltage applied to the NI 9234

$V_{\text{bias}}$  is the bias voltage of the IEPE sensor

$V_{\text{full-scale}}$  is the full-scale voltage of the IEPE sensor

Overvoltage protection (with respect to chassis ground)	
For a signal source connected to AI+ and AI-	$\pm 30$ V
For a low-impedance source connected to AI+ and AI-	-6 V to 30 V
Input delay	$(40 + 5/512)/f_s + 2.6 \mu\text{s}$

**Table 1.** Accuracy

Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range <sup>2</sup> (Offset Error)
Calibrated	Maximum (-40 °C to 70 °C)	0.34%, $\pm 0.03$ dB	$\pm 0.14\%$ , 7.1 mV
	Typical (25 °C $\pm 5$ °C)	0.05%, $\pm 0.005$ dB	$\pm 0.006\%$ , 0.3 mV
Uncalibrated <sup>3</sup>	Maximum (-40 °C to 70 °C)	1.9%, $\pm 0.16$ dB	$\pm 0.27\%$ , 13.9 mV
	Typical (25 °C $\pm 5$ °C)	0.48%, $\pm 0.04$ dB	$\pm 0.04\%$ , 2.3 mV

Gain drift

Typical	0.14 mdB/°C (16 ppm/°C)
Maximum	0.45 mdB/°C (52 ppm/°C)

Offset drift

Typical	19.2 $\mu\text{V}/^\circ\text{C}$
Maximum	118 $\mu\text{V}/^\circ\text{C}$

Channel-to-channel matching

Phase ( $f_{in}$ in kHz)	$(f_{in} * 0.045^\circ + 0.04 \text{ maximum})$
Gain	
Typical	0.01 dB
Maximum	0.04 dB

Passband

Frequency	$0.45 * f_s$
Flatness ( $f_s = 51.2$ kS/s)	40 mdB (pk-to-pk maximum)

<sup>2</sup> Range = 5.1 Vpk

<sup>3</sup> 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.

Phase nonlinearity ( $f_s = 51.2$ kS/s)	$\pm 0.45^\circ$ maximum
Stopband	
Frequency	$0.55 * f_s$
Rejection	100 dB
Alias-free bandwidth	$0.45 * f_s$
Oversample rate	$64 * f_s$
Crosstalk (1 kHz)	-110 dB
CMRR ( $f_{in} \leq 1$ kHz)	
Minimum	40 dB
Typical	47 dB
SFDR ( $f_{in} = 1$ kHz, -60 dBFS)	120 dB

**Table 2.** Idle Channel Noise and Noise Density

Idle Channel	51.2 kS/s	25.6 kS/s	2.048 kS/s
Noise	97 dBFS	99 dBFS	103 dBFS
	50 $\mu$ Vrms	40 $\mu$ Vrms	25 $\mu$ Vrms
Noise density	310 nV/ $\sqrt$ Hz	350 nV/ $\sqrt$ Hz	780 nV/ $\sqrt$ Hz

Input impedance

Differential	305 k $\Omega$
AI- (shield) to chassis ground	50 $\Omega$

**Table 3.** Total Harmonic Distortion (THD)

Input Amplitude	1 kHz	8 kHz
-1 dBFS	-95 dB	-87 dB
-20 dBFS	-95 dB	-80 dB

Intermodulation distortion (-1 dBFS)

DIN 250 Hz/8 kHz 4:1 amplitude ratio	-80 dB
CCIF 11 kHz/12 kHz 1:1 amplitude ratio	-93 dB

MTBF	390,362 hours at 25 $^\circ$ C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method
------	--



# Power Requirements

## Power consumption from chassis

Active mode	900 mW maximum
Sleep mode	25 $\mu$ W maximum

## Thermal dissipation (at 70 °C)

Active mode	930 mW maximum
Sleep mode	25 $\mu$ W maximum

# Physical Characteristics

If you need to clean the module, wipe it with a dry towel.

Weight	173 g (6.1 oz)
--------	----------------

# Safety Voltages

Connect only voltages that are within the following limits:

Channel-to-earth ground	$\pm$ 30 V maximum, Measurement Category I
Isolation	
Channel-to-channel	None
Channel-to-earth ground	None

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, circuits powered by regulated low-voltage sources, and electronics.



**Caution** Do not connect the NI 9234 to signals or use for measurements within Measurement Categories II, III, or IV.

# Hazardous Locations

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

# 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 5, UL 60079-15; Ed 3
- 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 sensitive 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 cabling.

## CE Compliance

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)
- 94/9/EC; 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](https://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 <sub>rms</sub> , 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 *Minimize Our Environmental Impact* web page at [ni.com/environment](https://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 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](https://ni.com/environment/weee).

# 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](http://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

## Calibration

You can obtain the calibration certificate and information about calibration services for the NI 9234 at [ni.com/calibration](http://ni.com/calibration).

---

Calibration interval	1 year
----------------------	--------

---

Refer to the *NI Trademarks and Logo Guidelines* at [ni.com/trademarks](http://ni.com/trademarks) for information on NI trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering NI products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patent Notice* at [ni.com/patents](http://ni.com/patents). You can find information about end-user license agreements (EULAs) and third-party legal notices in the readme file for your NI product. Refer to the *Export Compliance Information* at [ni.com/legal/export-compliance](http://ni.com/legal/export-compliance) for the NI global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data. NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS. U.S. Government Customers: The data contained in this manual was developed at private expense and is subject to the applicable limited rights and restricted data rights as set forth in FAR 52.227-14, DFAR 252.227-7014, and DFAR 252.227-7015.

© 2015 National Instruments. All rights reserved.

374238A-02 Oct15