
NI-9234

Specifications


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Contents

NI 9234 Datasheet..... 3

NI 9234 Datasheet

 <p>The image shows the NI 9234 signal acquisition module, a blue and silver device with four BNC connectors on the front panel. The top of the module is labeled 'NI 9234' and '4-Channel Dynamic Signal Acquisition Module with AC/DC Coupling'. The front panel also features four BNC connectors labeled 'CH1', 'CH2', 'CH3', and 'CH4'.</p>	<ul style="list-style-type: none"> ■ 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
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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.

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

C SERIES DYNAMIC SIGNAL ACQUISITION 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 μ 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 μ Vrms	Screw Terminal, BNC	60 VDC Ch-Earth
NI 9232	±30 V	3	102.4 kS/s/ch	IEPE with AC Coupling, AC Coupling, DC Coupling	251 μ Vrms	Screw Terminal, BNC	60 VDC Ch-Earth
NI 9234	±5 V	4	51.2 kS/s/ch	IEPE with AC Coupling, AC Coupling, DC Coupling	50 μ Vrms	BNC	None
NI 9250	±5 V	2	102.4 kS/s/ch	IEPE with AC Coupling, AC Coupling, DC Coupling	9.7 μ Vrms	BNC	None
NI 9251	3 Vrms (\pm 4.243 V)	2	102.4 kS/s/ch	AC Coupling, DC Coupling	8.5 μ 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

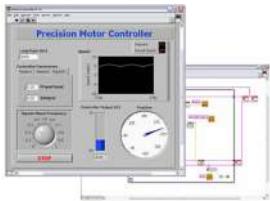


- Design FPGA applications for NI RIO hardware

NI LabVIEW FPGA Module

- 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

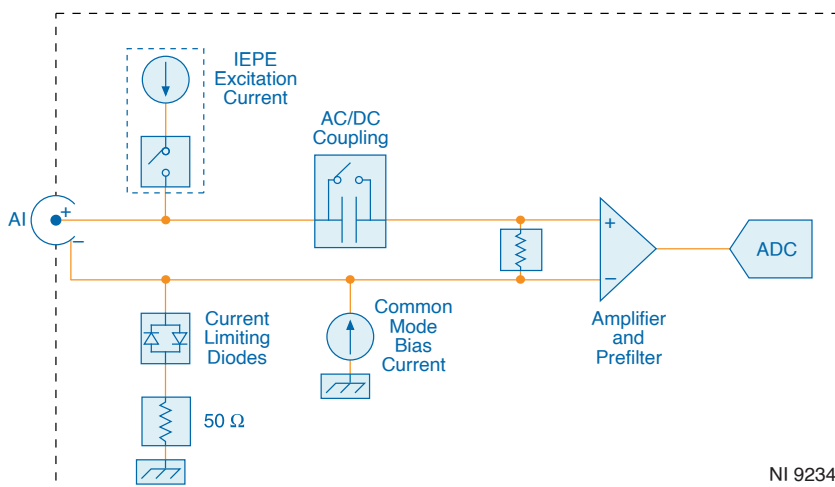
NI LabVIEW Real-Time Module

- Purchase individually or as part of a LabVIEW suite

NI-9234 Block Diagram

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 Ω 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 and enter the Info Code rdteds.

Filtering

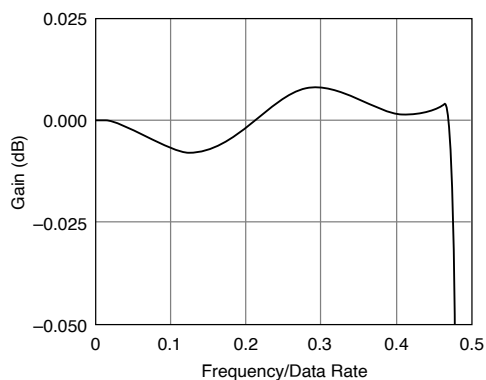
The NI-9234 uses a combination of analog and digital filtering to provide an accurate representation of in-band signals and reject out-of-band signals. The filters discriminate between signals based on the frequency range, or bandwidth, of the signal. The three important bandwidths to consider are the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