NATIONAL INSTRUMENTS NI-9221 8 Channel C Series Voltage Input Module User Guide

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NATIONAL INSTRUMENTS NI-9221 8 Channel C Series Voltage Input Module

Product Information: NI-9927

The NI-9927 is a data acquisition module that is used to measure voltage signals. It comes in three variations: NI 9221 with screw terminal, NI 9221 with spring terminal, and NI 9221 with DSUB.

Getting Started Guide for NI 9221
The Getting Started Guide explains how to connect to the NI 9221. Before starting, ensure that you have completed the software and hardware installation procedures in your chassis documentation. The guidelines provided in the document are specific to the NI 9221. Refer to the documentation for each component in the system to determine the safety and EMC ratings for the entire system.

Safety Guidelines
Operate the NI 9221 only as described in the Getting Started Guide. Do not operate the NI 9221 in a manner not specified in the guide as product misuse can result in a hazard. If the product is damaged, return it to NI for repair.

Hazardous Voltage
The hazardous voltage icon denotes a warning advising you to take precautions to avoid electrical shock.

NI 9221 with Screw Terminal and NI 9221 with Spring Terminal Safety Voltages
Connect only voltages that are within the following limits:

- Channel-to-COM: Continuous 250 Vrms, Measurement Category II
- Channel-to-channel: Withstand 2,300 Vrms, verified by a 5 s dielectric withstand test
- Channel-to-earth ground: Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system.

Do not connect the NI 9221 with screw terminal or NI 9221 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

NI 9221 with DSUB Safety Voltages

Connect only voltages that are within the following limits:

- Channel-to-COM: Continuous 60 VDC, Measurement Category I
- Channel-to-channel: Withstand 1,000 Vrms, verified by a 5 s dielectric withstand test
- Channel-to-earth: Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS voltage.

Do not connect the NI 9221 with DSUB to signals or use for measurements within Measurement Categories III or IV. These test and measurement circuits are not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Safety Guidelines for Hazardous Voltages
You can connect hazardous voltages only to the NI 9221 with screw terminal and the NI 9221 with spring terminal. Do not connect hazardous voltages to the NI 9221 with DSUB.

Product Usage Instructions

Follow the instructions provided in the Getting Started Guide to connect to the NI 9221. Ensure that you connect only voltages that are within the specified limits. Do not connect hazardous voltages to the NI 9221 with DSUB. If the product is damaged, return it to NI for repair.

This document explains how to connect to the NI 9221. In this document, the NI 9221 with screw terminal, NI 9221 with spring terminal, and NI 9221 with DSUB are referred to inclusively as the NI 9221.

- **Note** Before you begin, complete the software and hardware installation procedures in your chassis

documentation.

- **Note** The guidelines in this document are specific to the NI 9221. The other components in the system might not meet the same safety ratings. Refer to the documentation for each component in the system to determine the safety and EMC ratings for the entire system.

Safety Guidelines

Operate the NI 9221 only as described in this document.

Caution Do not operate the NI 9221 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.

Hazardous Voltage This icon denotes a warning advising you to take precautions to avoid electrical shock.

NI 9221 with Screw Terminal and NI 9221 with Spring Terminal Safety Voltages
Connect only voltages that are within the following limits.

- Channel-to-COM ±60 VDC maximum
- Channel-to-channel None
- Channel-to-earth ground
- Continuous 250 Vrms, Measurement
- Category II
- Withstand 2,300 Vrms, verified by a 5 s dielectric withstand test

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

Caution Do not connect the NI 9221 with screw terminal or NI 9221 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

NI 9221 with DSUB Safety Voltages
Connect only voltages that are within the following limits.

- Channel-to-COM ±60 VDC maximum
- Channel-to-channel None
- Channel-to-earth
- 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, circuits powered by regulated low-voltage sources, and electronics.

- **Caution** Do not connect the NI 9221 with DSUB to signals or use for measurements within Measurement Categories III or IV.
- **Note** Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Safety Guidelines for Hazardous Voltages
You can connect hazardous voltages only to the NI 9221 with screw terminal and the NI 9221 with spring terminal. Do not connect hazardous voltages to the NI 9221 with DSUB.
If hazardous voltages are connected to the device, take the following precautions. A hazardous voltage is a voltage greater than 42.4 Vpk voltage or 60 VDC to earth ground.

- Ca**ution** Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.
- **Caution** Do not mix hazardous voltage circuits and human-accessible circuits on the same module.
- **Caution** Ensure that devices and circuits connected to the module are properly insulated from human contact.
- **Caution** When module terminals are hazardous voltage LIVE (>42.4 Vpk/60 VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9927 connector backshell kit with the NI 9221 with screw terminal and the NI 9981 connector backshell kit with the NI 9221 with spring terminal to ensure that the terminals are not accessible.

Safety Guidelines for Hazardous Locations
The NI 9221 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nA IIC T4 and Ex nA IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI 9221 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.

- **Caution** Do not disconnect I/O-side wires or connectors unless power has been switched off or the area is known to be nonhazardous.
- **Caution** Do not remove modules unless power has been switched off or the area is known to be nonhazardous.
- **Caution** Substitution of components may impair suitability for Class I, Division 2.
- **Caution** For Division 2 and Zone 2 applications, install the system in an enclosure rated to at least IP54 as defined by IEC/EN 60079-15.
- **Caution** For Zone 2 applications, install a protection device between the input signal and the NI 9221 input terminal. The device must prevent the channel-to-COM voltage from exceeding 85 V if there is a transient overvoltage condition.

Special Conditions for Hazardous Locations Use in Europe and Internationally
The NI 9221 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 03 ATEX 0324020X and is IECEx UL 14.0089X certified. Each NI 9221 is marked II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of -40 °C ≤ Ta ≤ 70 °C. If you are using the NI 9221 in Gas Group IIC hazardous locations, you must use the device in an NI chassis that has been evaluated as Ex nC IIC T4, Ex IIC T4, Ex nA IIC T4, or Ex nL IIC T4 equipment.

- **Caution** You must make sure that transient disturbances do not exceed 140% of the rated voltage.
- **Caution** The system shall only be used in an area of not more than Pollution Degree 2, as defined in IEC

60664-1.

- **Caution** The system shall be mounted in an ATEX/IECEx-certified enclosure with a minimum ingress protection rating of at least IP54 as defined in IEC/EN 60079-15.
- **Caution** The enclosure must have a door or cover accessible only by the use of a tool.

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.
This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation. Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.

Special Conditions for Marine Applications
Some products are Lloyd's Register (LR) Type Approved for marine (shipboard) applications. To verify Lloyd's Register certification for a product, visit **ni.com/certification** and search for the LR certificate, or look for the Lloyd's Register mark on the product.
Caution In order to meet the EMC requirements for marine applications, install the product in a shielded enclosure with shielded and/or filtered power and input/output ports. In addition, take precautions when designing, selecting, and installing measurement probes and cables to ensure that the desired EMC performance is attained.

Preparing the Environment

Ensure that the environment in which you are using the NI 9221 meets the following specifications.

- Operating temperature (IEC 60068-2-1, IEC 60068-2-2) -40 °C to 70 °C
- Operating humidity (IEC 60068-2-78) 10% RH to 90% RH, noncondensing
- Pollution Degree 2
- Maximum altitude 2,000 m

Indoor use only.

Note Refer to the device datasheet on **ni.com/manuals** for complete specifications.

NI 9221 Pinout

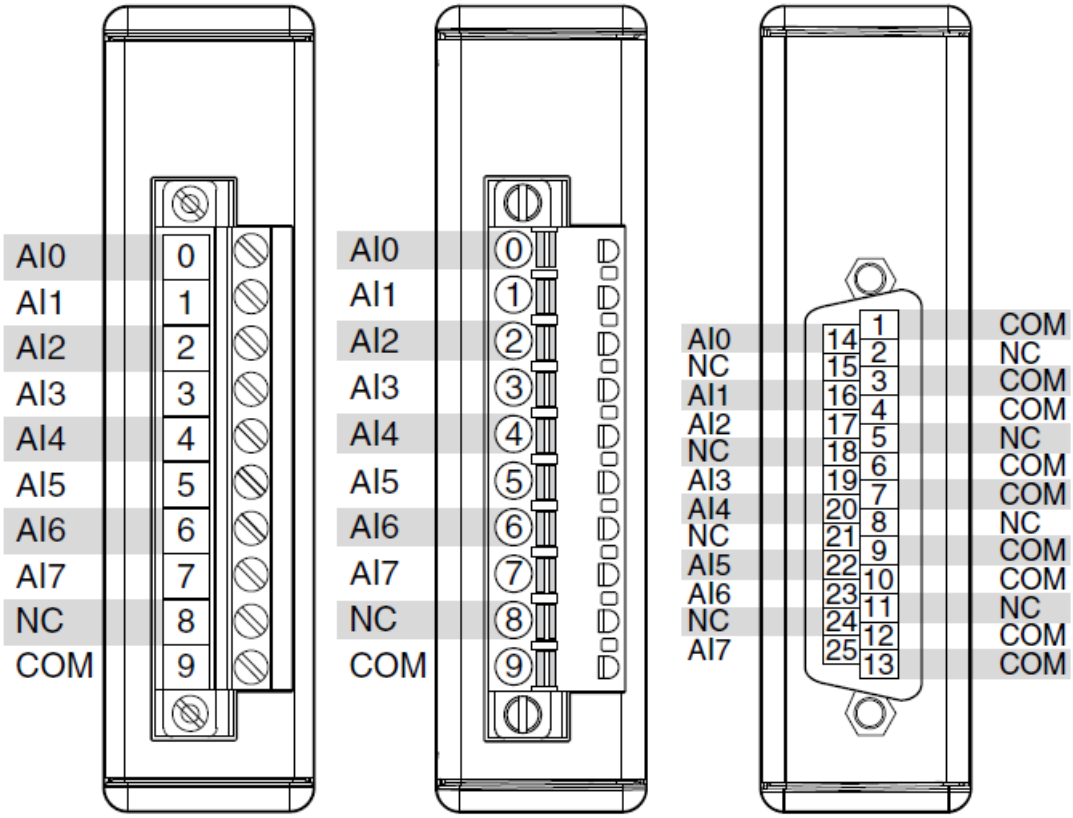
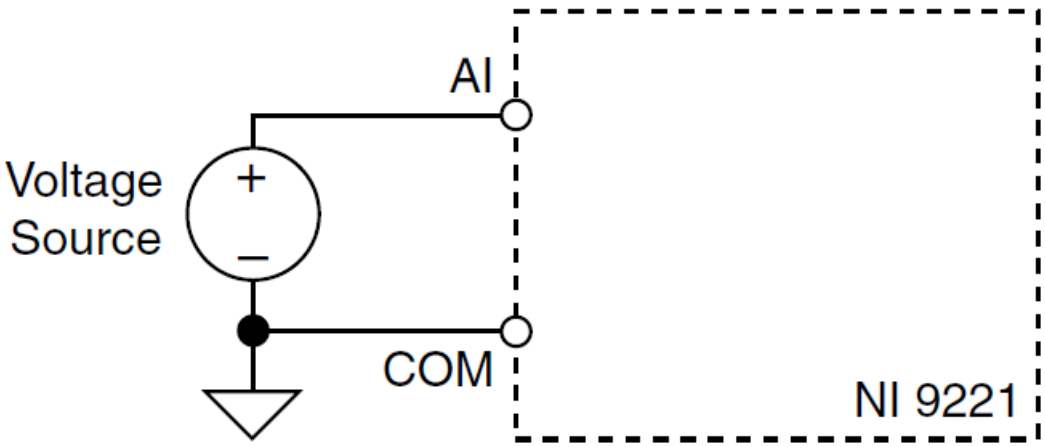


Table 1. Signal Descriptions

Signal	Description
AI	Analog input signal connection
COM	Common reference connection
NC	No connection

Single-Ended Connections



NI 9221 Connection Guidelines

- Make sure that devices you connect to the NI 9221 are compatible with the module specifications.

- You must use 2-wire ferrules to create a secure connection when connecting more than one wire to a single terminal on the NI 9221 with screw terminal or NI 9221 with spring terminal.

High-Vibration Application Connections
If your application is subject to high vibration, NI recommends that you follow these guidelines to protect connections to the NI 9221 with screw terminal or the NI 9221 with spring terminal:

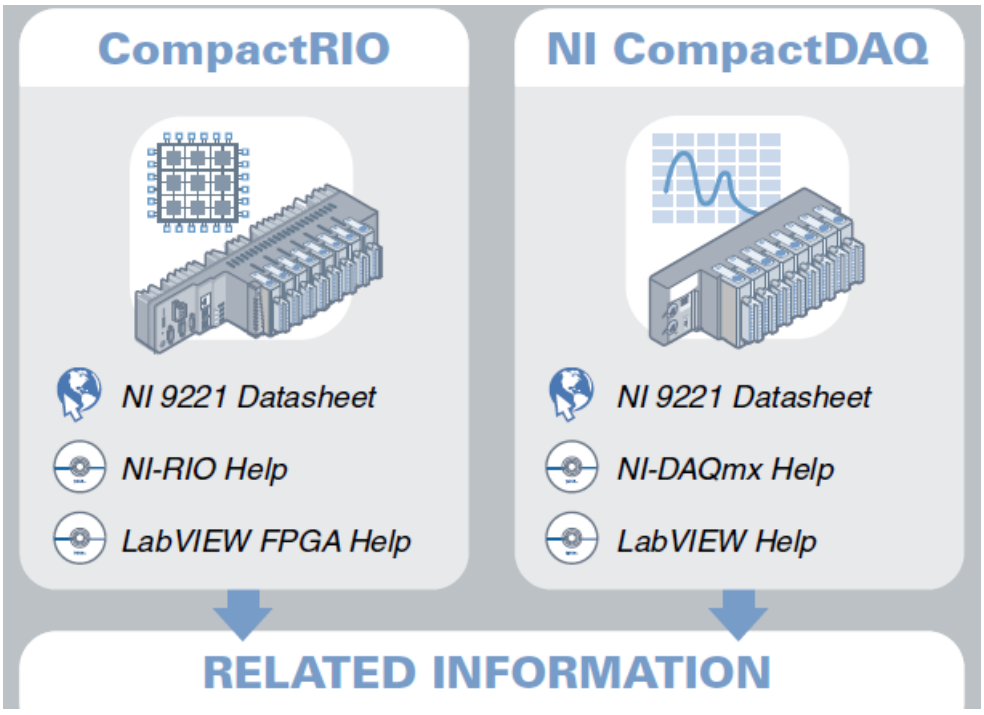
- Use ferrules to terminate wires to the detachable connector.
- Use the NI 9927 backshell kit with the NI 9221 with screw terminal or the NI 9981 backshell kit with the NI 9221 with spring terminal.

Overvoltage Protection

The NI 9221 provides overvoltage protection for each channel.

Note Refer to the device datasheet on ni.com/manuals for more information about overvoltage protection.

Where to Go Next



C Series Documentation & Resources
ni.com/info cseriesdoc

Services
ni.com/services

Located at ni.com/manuals
Installs with the software

Worldwide Support and Services

The NI website 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.
Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services.
Visit ni.com/register to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.
A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration. NI corporate headquarters is located at
11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

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Documents / Resources

	NATIONAL INSTRUMENTS NI-9221 8 Channel C Series Voltage Input Module [pdf] User Guide NI-9221 8 Channel C Series Voltage Input Module, NI-9221, 8 Channel C Series Voltage Input Module, C Series Voltage Input Module, Voltage Input Module, Input Module, Module

References

- Engineer Ambitiously - NI
- Calibration Services - NI
- Product Certifications - NI
- Using Info Codes - NI
- Trade Compliance - NI
- Product Documentation - NI
- Contact Us - NI
- National Instruments Patents - NI
- Log In - National Instruments
- NI Services - NI
- Support - NI
- NI Trademarks and Logo Guidelines - NI

- Calibration Services - NI
- Product Certifications - NI
- Product Documentation - NI
- Contact Us - NI
- Log In - National Instruments
- NI Services - NI
- Support - NI
- NI-9927 National Instruments Backshell Connector Kit | Apex Waves