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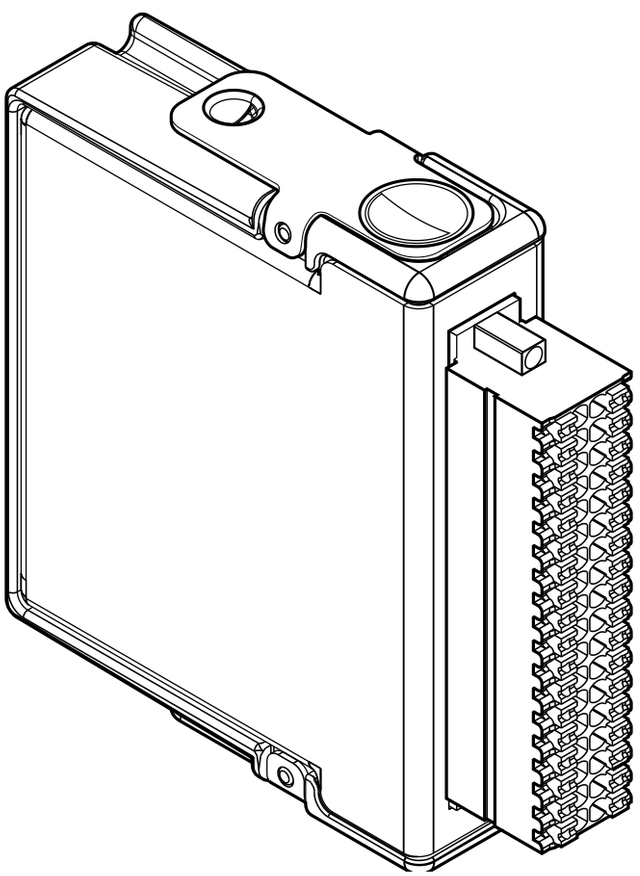
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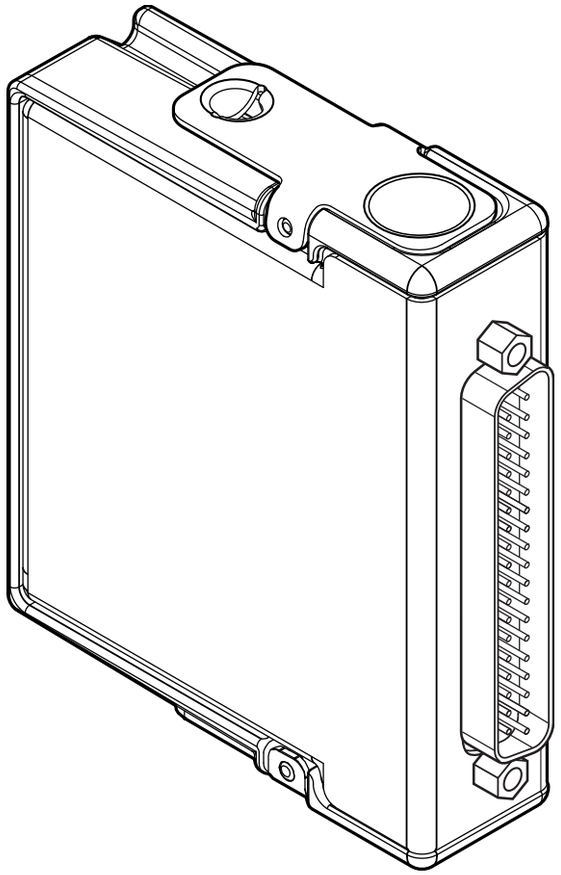
Find the *National Instruments NI 9216* at our website: ***Click HERE***

GETTING STARTED GUIDE

NI 9216

8 RTD, 0 Ω to 400 Ω, 24 Bit, 400 S/s Aggregate, PT100





NATIONAL INSTRUMENTS™

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This document explains how to connect to the NI 9216. In this document, the NI 9216 with spring terminal and the NI 9216 with DSUB are referred to inclusively as the NI 9216.



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 9216. 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.



Caution Electrostatic Discharge (ESD) can damage the NI 9216 with spring terminal. To prevent damage, use industry-standard ESD prevention measures during installation, maintenance, and operation.

Safety Guidelines

Operate the NI 9216 only as described in this document.

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Caution Do not operate the NI 9216 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.

Safety Guidelines for Hazardous Voltages

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.

You can connect hazardous voltages only to the NI 9216 with spring terminal. Do not connect hazardous voltages to the NI 9216 with DSUB.



Caution Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.

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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.

Safety Voltages

Connect only voltages that are within the following limits:

NI 9216 with Spring Terminal Isolation Voltages

Channel-to-channel	None
Channel-to-earth ground	
Continuous	250 Vrms, Measurement Category II
Withstand up to 5,000 m	3,000 Vrms, verified by a 5 s dielectric withstand test

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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 9216 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

NI 9216 with DSUB Isolation Voltages

Channel-to-channel	None
Channel-to-earth ground	
Continuous	60 VDC, Measurement Category I
Withstand	
Up to 3,000 m	1,000 Vrms, verified by a 5 s dielectric withstand test
Up to 5,000 m	860 Vrms, verified by a 5 s dielectric withstand test

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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 9216 with DSUB to signals or use for measurements within Measurement Categories II, 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 Locations

The NI 9216 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

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NI 9216 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.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9216 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 12 ATEX 1202658X and is IECEx UL 14.0089X certified. Each NI 9216 is marked Ex 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 9216 in Gas Group IIC

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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/EN 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

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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.



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



Caution To ensure the specified EMC performance of the NI 9216 with DSUB, the length of all I/O cables must be no longer than 30 m (100 ft).

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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.

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Preparing the Environment

Ensure that the environment in which you are using the NI 9216 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	5,000 m

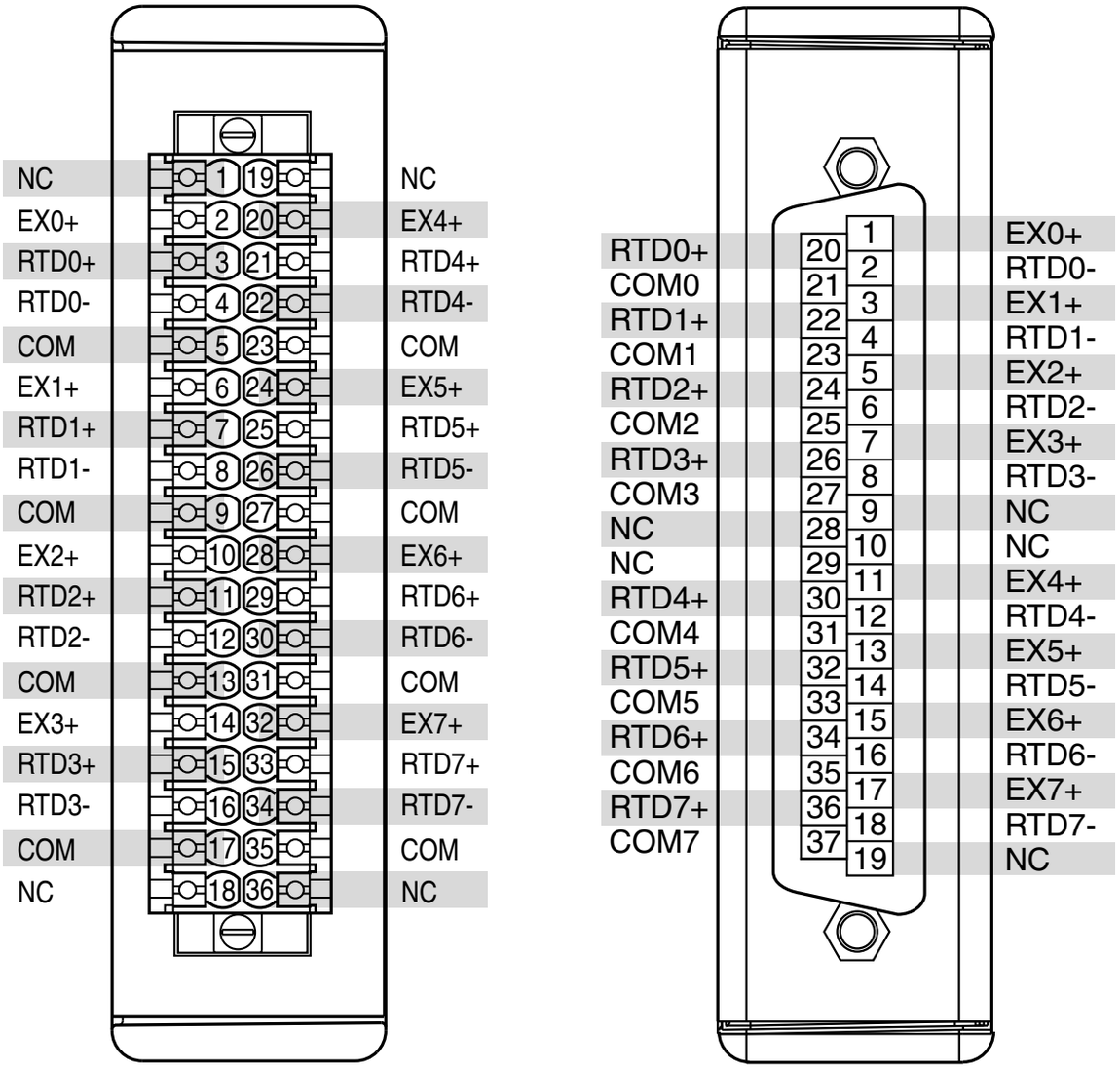
Indoor use only.



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

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NI 9216 Pinout



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Table 1. Signal Descriptions

Signal	Description
COM	Common reference connection to isolated ground
EX+	Positive sensor excitation connection
NC	No connection
RTD+	Positive resistance temperature detector connection
RTD-	Negative resistance temperature detector connection

Connecting 3-Wire and 4-Wire RTDs

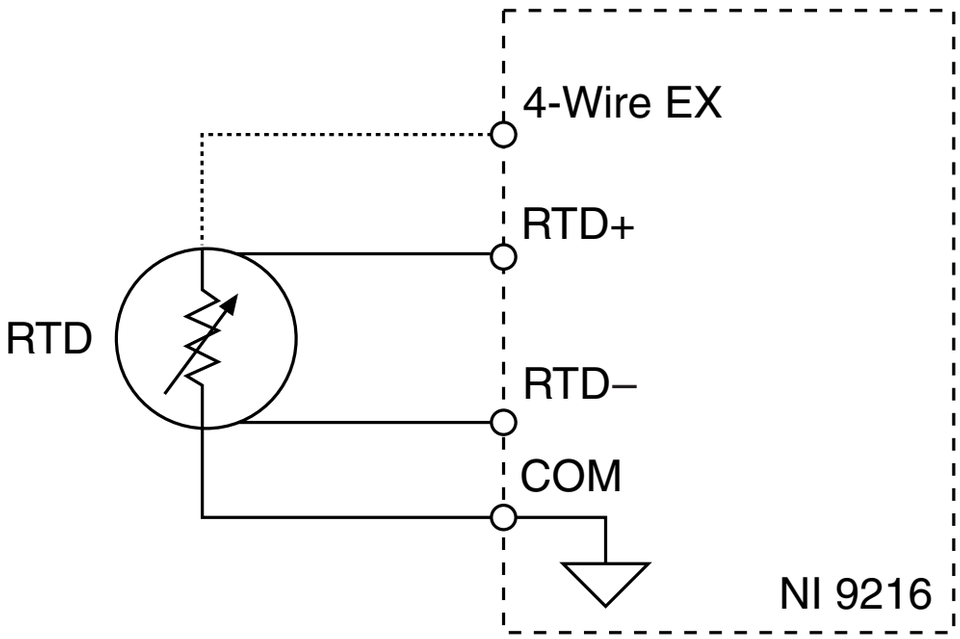
You can connect any combination of 3-wire or 4-wire RTDs to the NI 9216. Each NI 9216 channel contains circuitry that automatically detects the type of RTD connected to the channel. The NI 9216 scans all eight input channels and automatically configures each channel for the appropriate mode. In 4-wire mode, the EX terminal is a 1 mA current source. In 3-wire mode, the RTD+ terminal is a 1 mA current source. The NI 9216

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compensates for the error that lead resistance causes in 3-wire mode.

If you are using a 4-wire RTD, connect EX to the positive lead of the RTD. If you are using a 3-wire RTD, do not connect the RTD to the EX terminal.

Figure 1. Connecting an RTD to the NI 9216



For the best measurement results when using the NI 9216 with a 3-wire RTD, use equal-length wires between the RTD+ terminal and the RTD and between the COM terminal and the RTD. Also, keep the lead resistance within 5% of the nominal RTD value. The NI 9216 accuracy specifications account for this lead error.

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Note The accessory used with the NI 9216 may introduce additional lead resistance mismatch error in 3-wire mode. Refer to the device datasheet on *ni.com/manuals* for information about errors due to lead resistance mismatch.

NI 9216 Connection Guidelines

- Make sure that devices you connect to the NI 9216 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 9216 with spring terminal.
- For the NI 9216 with spring terminal, push the wire into the terminal when using a solid wire or a stranded wire with a ferrule.
- For the NI 9216 with spring terminal, open the terminal by pressing the push button when using stranded wire without a ferrule.

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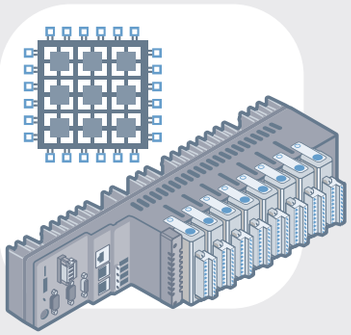
High-Vibration Application Connections

If your application is subject to high vibration, NI recommends that you use the NI 9940 backshell kit to protect connections to the NI 9216 with spring terminal.

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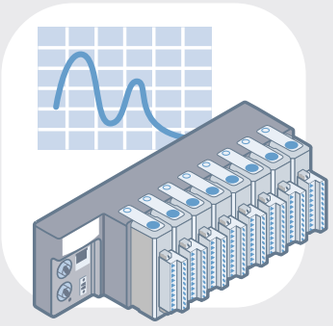
Where to Go Next

CompactRIO



- *NI 9216 Datasheet*
- *NI-RIO Help*
- *LabVIEW FPGA Help*

CompactDAQ



- *NI 9216 Datasheet*
- *NI-DAQmx Help*
- *LabVIEW Help*

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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*.

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