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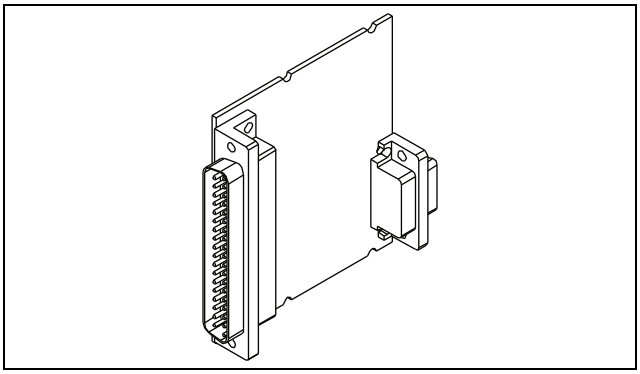
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Find the *National Instruments sbRIO-9207* at our website: *Click HERE*

OPERATING INSTRUCTIONS AND SPECIFICATIONS

NI 9207E

16-Channel, ±20 mA/±10 V, 24-Bit Analog Input Module



NATIONAL INSTRUMENTS

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This document describes how to use the National Instruments 9207E and includes dimensions, pin assignments, and specifications for the NI 9207E. Visit `ni.com/info` and enter `rdsoftwareversion` to determine which software you need for the modules you are using. For information about installing, configuring, and programming the system, refer to the system documentation. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.

Caution National Instruments makes no electromagnetic compatibility (EMC) or CE marking compliance claims for the NI 9207E. The end-product supplier is responsible for conformity to any and all compliance requirements.

Caution The NI 9207E must be installed inside a suitable enclosure prior to use. Hazardous voltages may be present.

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NI 9207E Dimensions

The following figure shows the dimensions of the NI 9207E.

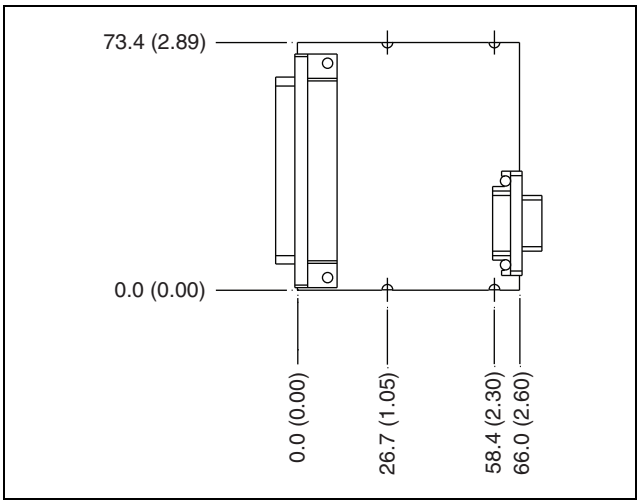


Figure 1. NI 9207E Dimensions in Millimeters (Inches)

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Connecting the NI 9207E

The NI 9207E has a 37-pin DSUB connector that provides connections for 16 analog input channels: 8 voltage and 8 current.

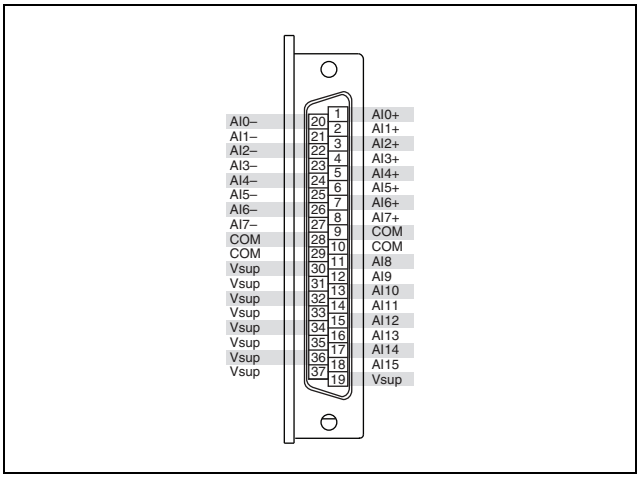


Figure 2. NI 9207E Pin Assignments

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Each voltage channel has an AI+ pin and an AI– pin to which you can connect a voltage signal. Each current channel has an AI pin to which you can connect a current signal. The NI 9207E also has nine V_{sup} pins, one for connecting an external power supply, and one for each current channel. There are also four common pins, COM, that are internally connected to the isolated ground reference of the module.

The input signals are scanned, amplified, conditioned, and then sampled by a single 24-bit ADC. The module provides overvoltage protection for each channel. Only one channel can be in an overvoltage condition at a time. Refer to the *Specifications* section for information about overvoltage protection. Refer to Figure 3 for an illustration of the input circuitry on the NI 9207E.

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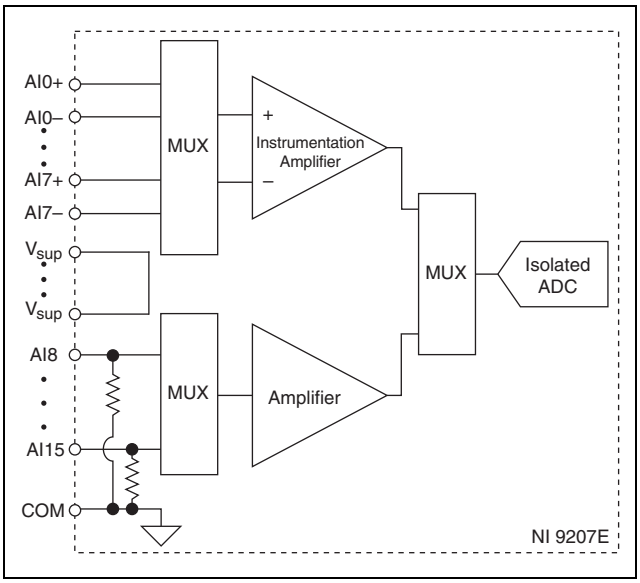


Figure 3. Input Circuitry on the NI 9207E

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Connecting Voltage Channels

You can connect differential or single-ended voltage signals to the NI 9207E voltage channels.

Connecting Differential Voltage Signals to the NI 9207E

You can connect grounded or floating differential signals to the NI 9207E voltage channels. Connect the positive voltage signal to AI+ and the negative voltage signal to AI–. To connect grounded differential signals to the NI 9207E, you must also connect the signal reference to COM, as shown in Figure 4.

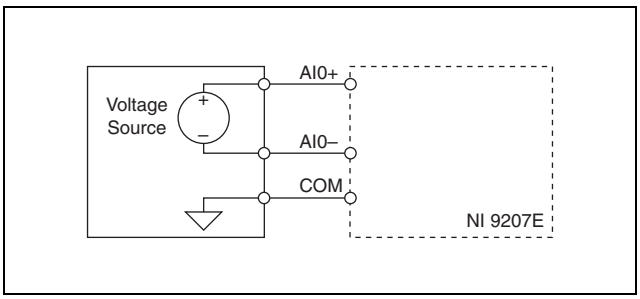


Figure 4. Connecting a Grounded Differential Voltage Signal to the NI 9207E

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To connect floating differential signals to the NI 9207E, you must connect the negative lead of the signal to COM through a 1 MΩ resistor to keep the voltage source within the common-mode voltage range, as shown in Figure 5. If the voltage source is outside of the common-mode range, then the NI 9207E does not read data accurately. For more information about the common-mode voltage range, refer to the *Specifications* section.

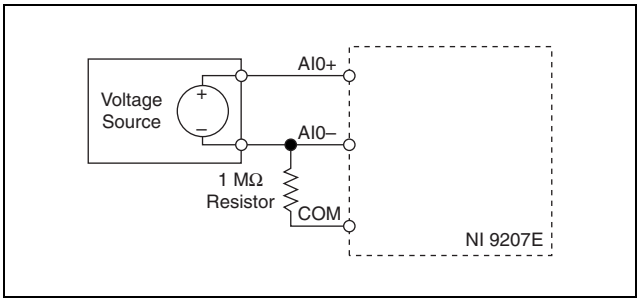


Figure 5. Connecting a Floating Differential Voltage Signal to the NI 9207E

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Connecting Single-Ended Voltage Signals to the NI 9207E

To connect single-ended voltage signals to the NI 9207E, you must also connect the voltage ground signal to COM to keep the common-mode voltage in the specified range, as shown in Figure 6. For more information about the common-mode voltage range, refer to the *Specifications* section.

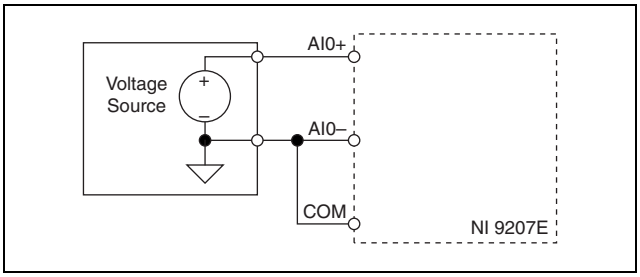


Figure 6. Connecting a Single-Ended Voltage Signal to the NI 9207E

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Connecting Current Channels

You can connect an external power supply to the NI 9207E. This power supply provides the current for the devices you connect to the module. Connect the positive lead of the power supply to a V_{sup} pin and the negative lead of the power supply to COM. Install a 2 A maximum, fast-acting fuse between the external power supply and the V_{sup} pin. Refer to the *Specifications* sections for more information about the V_{sup} pins.

Note The V_{sup} pins are internally connected to each other. You can connect only one external voltage supply to the device.

Caution Do *not* remove or insert modules if the external power supply connected to the V_{sup} and COM pins is powered on.

You can connect single-ended current signals to the NI 9207E, including loop-powered and three-wire current transducers. Connect the output of the current signal to the AI pin of the channel and the voltage supply of the current signal to V_{sup}. For a three-wire transducer, also connect the common of the device to COM. Refer to Figures 7 and 8 for illustrations of how to connect loop-powered and three-wire current transducers to the NI 9207E.

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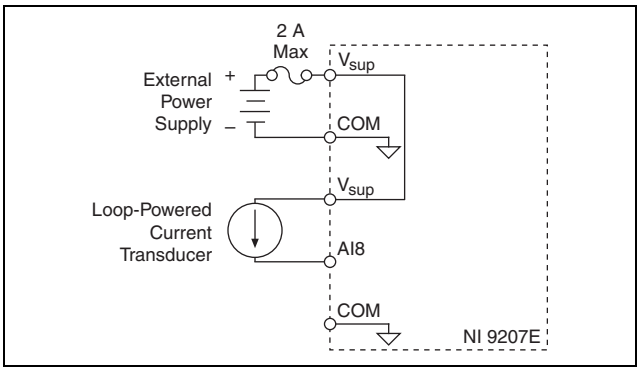


Figure 7. Connecting a Loop-Powered Current Transducer to the NI 9207E

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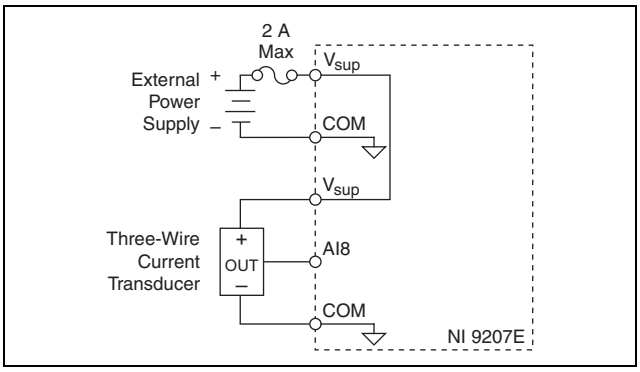


Figure 8. Connecting a Three-Wire Current Transducer to the NI 9207E

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Sleep Mode

This module supports a low-power sleep mode. Support for sleep mode at the system level depends on the chassis that the module is plugged into. Refer to the chassis manual for information about support for sleep mode. If the chassis supports sleep mode, refer to the software help for information about enabling sleep mode. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system consumes minimal power and may dissipate less heat than it does in normal mode. Refer to the *Specifications* section for more information about power consumption and thermal dissipation.

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Specifications

The following specifications are typical for the range –40 to 85 °C internal to any enclosures unless otherwise noted. All voltages are relative to COM unless otherwise noted.

Input Characteristics

Number of channels ..... 16 analog input channels: 8 voltage and 8 current

ADC resolution ..... 24 bits

Type of ADC ..... Delta-Sigma

Sampling mode ..... Scanned

Input range

- Voltage channels
  - Minimum ..... ±10.2 V
  - Typical ..... ±10.4 V
- Current channels
  - Minimum ..... ±21.5 mA
  - Typical ..... ±22.0 mA

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Maximum working voltage for analog inputs (signal voltage + common-mode voltage), voltage channels only ..... Each channel must remain within ±10.2 V of common

Conversion time (per channel)

- High-resolution mode..... 52 ms
- High-speed mode..... 2 ms

Overvoltage protection, channel-to-COM..... ±30 V max on one channel at a time

V_{sup} pins, current channels only

- Current..... 2 A max
- Voltage..... 30 V max

Input impedance

- Voltage channels..... >1 GΩ
- Current channels..... 85 Ω

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Accuracy, voltage channels

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated max (–40 to 85 °C)	±0.52%	±0.04%
* Range equals 10.4 V		

Accuracy, current channels

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated max (–40 to 85 °C)	±0.87%	±0.05%
* Range equals 22.0 mA		

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Input noise

- Voltage channels
  - High-resolution mode ..... 16 μV_{rms}
  - High-speed mode ..... 80 μV_{rms}
- Current channels
  - High-resolution mode ..... 50 nA_{rms}
  - High-speed mode ..... 200 nA_{rms}

Stability

- Voltage channels
  - Gain drift ..... ±21 ppm/°C
  - Offset drift ..... ±14 µV/°C
- Current channels
  - Gain drift ..... ±43 ppm/°C
  - Offset drift ..... ±30 nA/°C

CMRR (f_{in} = 0 to 60 Hz), voltage channels only ..... 86 dB

NMRR (High-resolution mode only)

- 50 Hz ..... 66 dB
- 60 Hz ..... 68 dB

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MTBF ..... Contact NI for Bellcore MTBF or MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis

- Active mode ..... 295 mW max
- Sleep mode ..... 25 µW max

Thermal dissipation (at –40 °C)

- Active mode ..... 0.75 W max
- Sleep mode ..... 0.59 W max

Physical Characteristics

Use a dry, low-velocity stream of air to clean the module. If needed, use a soft-bristle brush for cleaning around components.

Note For two-dimensional drawings and three-dimensional models of the C Series module and connectors, visit `ni.com/dimensions` and search by module number.

Weight ..... 45 g (1.6 oz)

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Safety

Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-COM ..... ±30 V max on one channel at a time

Isolation

- Channel-to-channel ..... None
- Channel-to-earth ground
  - Continuous ..... 60 VDC, Measurement Category I, (Double insulation)
  - Withstand ..... 1,000 V_{rms}, 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

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equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

Caution Do *not* connect the NI 9207E to signals or use for measurements within Measurement Categories II, III, or IV.

Safety Standards

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use when installed in a suitable enclosure:

- 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.

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`, search by module number or product line, and click the appropriate link in the Certification column.

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Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. 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 to 85 °C

Storage temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... –40 to 85 °C

Operating humidity
(IEC 60068-2-56)..... 10 to 90% RH, noncondensing

Storage humidity
(IEC 60068-2-56)..... 5 to 95% RH, noncondensing

Maximum altitude..... 2,000 m

Pollution Degree 2

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Environmental Management

National Instruments 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 *NI and the Environment* 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.

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 and Electronic Equipment, visit `ni.com/environment/weee`.

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Calibration

You can obtain the calibration certificate and information about calibration services for the NI 9207E at `ni.com/calibration`.

Calibration interval ..... 2 years

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Where to Go for Support

The National Instruments Web site 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.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

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