

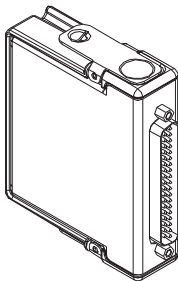
OPERATING INSTRUCTIONS AND SPECIFICATIONS

NI 9207

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

Français Deutsch 日本語 한국어 简体中文

ni.com/manuals



This document describes how to use the National Instruments 9207 and includes specifications and pin assignments for the NI 9207. 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.



Note The safety guidelines and specifications in this document are specific to the NI 9207. The other components in the system might not meet the same safety ratings and specifications. Refer to the documentation for each component in the system to determine the safety ratings and specifications for the entire system. Visit ni.com/info and enter `cseriesdoc` for information about C Series documentation.

Safety Guidelines

Operate the NI 9207 only as described in these operating instructions.



Hot Surface This icon denotes that the component may be hot. Touching this component may result in bodily injury.

Safety Guidelines for Hazardous Locations

The NI 9207 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 9207 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 Zone 2 applications, install the system in an enclosure rated to at least IP 54 as defined by IEC 60529 and EN 60529.

Special Conditions for Hazardous Locations Use in Europe

This equipment has been evaluated as Ex nA IIC T4 equipment under DEMKO Certificate No. 07 ATEX 0626664X. Each module is marked $\langle \text{Ex} \rangle$ II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of $-40\text{ }^{\circ}\text{C} \leq T_a \leq 70\text{ }^{\circ}\text{C}$. If you are using the NI 9207 in Gas Group IIC hazardous locations, you must use the device in an NI chassis that has been evaluated as Ex nC IIC T4, EEx nC IIC T4, Ex nA IIC T4, or Ex nL IIC T4 equipment.

Special Conditions for Marine Applications

Some modules are Lloyd's Register (LR) Type Approved for marine applications. To verify Lloyd's Register certification, visit ni.com/certification and search for the LR certificate, or look for the Lloyd's Register mark on the module.



Caution To meet radio frequency emission requirements for marine applications, use shielded cables and install the system in a metal enclosure. Suppression ferrites must be installed on power supply inputs near power entries to modules and controllers. Power supply and module cables must be separated on opposite sides of the enclosure and must enter and exit through opposing enclosure walls.

Connecting the NI 9207

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

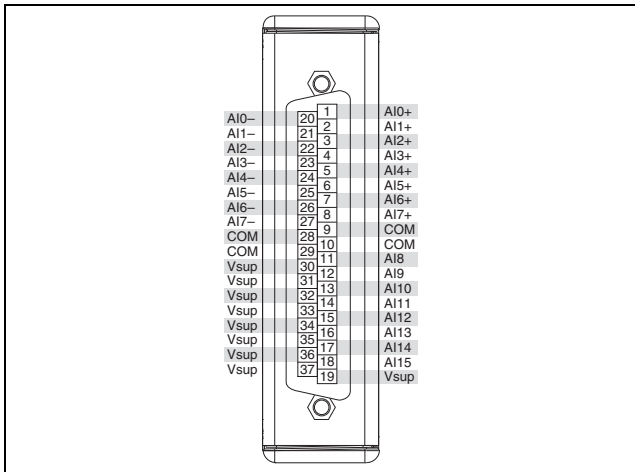


Figure 1. NI 9207 Pin Assignments

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 9207 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 2 for an illustration of the input circuitry on the NI 9207.

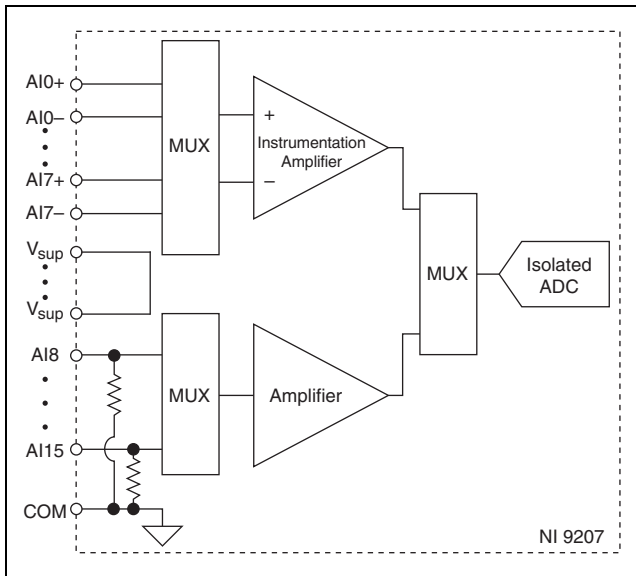


Figure 2. Input Circuitry on the NI 9207

Connecting Voltage Channels

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

Connecting Differential Voltage Signals to the NI 9207

You can connect grounded or floating differential signals to the NI 9207 voltage channels. Connect the positive voltage signal to AI+ and the negative voltage signal to AI-. To connect grounded differential signals to the NI 9207, you must also connect the signal reference to COM, as shown in Figure 3.

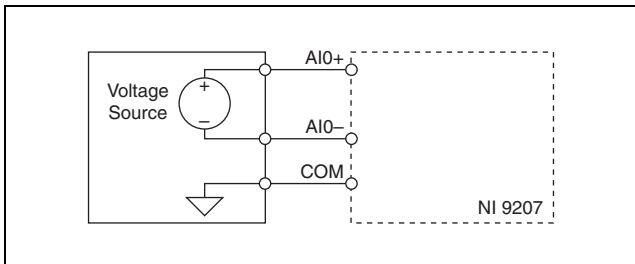


Figure 3. Connecting a Grounded Differential Voltage Signal to the NI 9207

To connect floating differential signals to the NI 9207, you must connect the negative lead of the signal to COM through a $1\text{ M}\Omega$ resistor to keep the voltage source within the common-mode voltage range, as shown in Figure 4. If the voltage source is outside of the common-mode range, then the NI 9207 does not read data accurately. For more information about the common-mode voltage range, refer to the *Specifications* section.

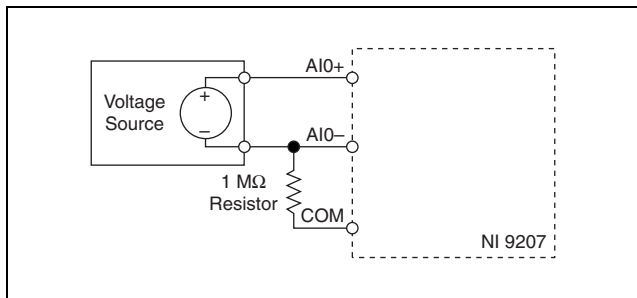


Figure 4. Connecting a Floating Differential Voltage Signal to the NI 9207

Connecting Single-Ended Voltage Signals to the NI 9207

To connect single-ended voltage signals to the NI 9207, you must also connect the voltage ground signal to COM to keep the common-mode voltage in the specified range, as shown in Figure 5. For more information about the common-mode voltage range, refer to the [Specifications](#) section.

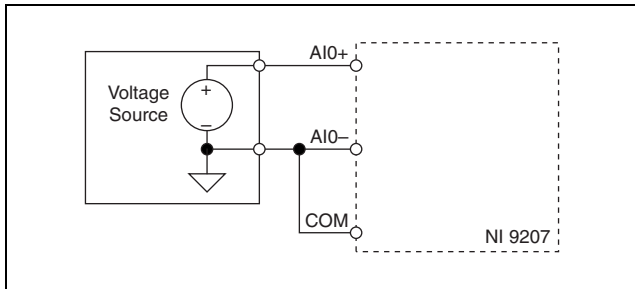


Figure 5. Connecting a Single-Ended Voltage Signal to the NI 9207

Connecting Current Channels

You can connect an external power supply to the NI 9207. 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 9207, 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 6 and 7 for illustrations of how to connect loop-powered and three-wire current transducers to the NI 9207.

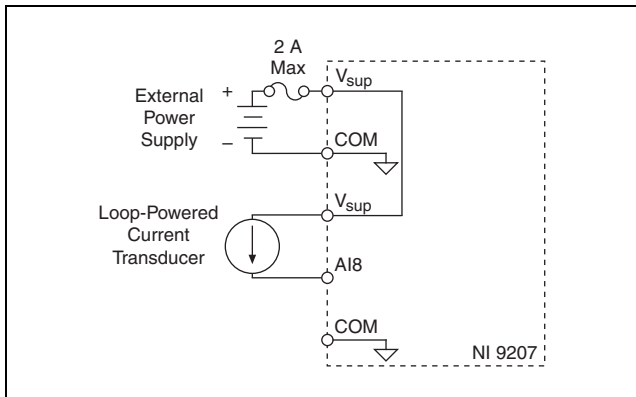


Figure 6. Connecting a Loop-Powered Current Transducer to the NI 9207

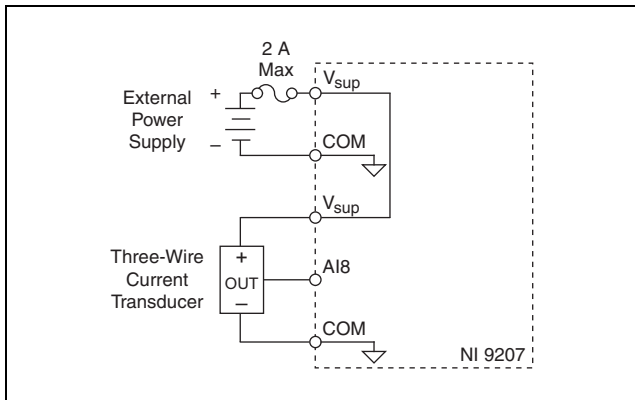


Figure 7. Connecting a Three-Wire Current Transducer to the NI 9207

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.

Specifications

The following specifications are typical for the range -40 to 70 °C 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
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 G Ω

Current channels 85 Ω

Accuracy, voltage channels

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated max (-40 to 70 °C)	$\pm 0.52\%$	$\pm 0.04\%$
* Range equals 10.4 V		

Accuracy, current channels

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated max (-40 to 70 °C)	±0.87%	±0.05%
* Range equals 22.0 mA		

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 $\mu\text{V}/^\circ\text{C}$

Current channels

Gain drift..... ± 43 ppm/ $^{\circ}\text{C}$

Offset drift..... ± 30 nA/ $^{\circ}\text{C}$

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

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 $^{\circ}\text{C}$)

Active mode 0.75 W max

Sleep mode 0.59 W max

Physical Characteristics

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



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..... 144 g (5.1 oz)

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

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



Caution Do *not* connect the NI 9207 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 (DEMKO).....	Ex nA IIC T4

Safety Standards

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 (IEC 61326): Class A emissions; Industrial 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 cables.

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

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.

Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration

Random (IEC 60068-2-64)..... 5 g_{rms}, 10 to 500 Hz

Sinusoidal (IEC 60068-2-6) 5 g, 10 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

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 70 °C

Storage temperature

(IEC 60068-2-1, IEC 60068-2-2) -40 to 85 °C

Ingress protection..... IP 40

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

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 life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit 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。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

Calibration

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

Calibration interval 2 years

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:

Australia 1800 300 800, Austria 43 662 457990-0,
Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,

Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 358 (0) 9 725 72511, France 01 57 66 24 24,
Germany 49 89 7413130, India 91 80 41190000,
Israel 972 3 6393737, Italy 39 02 41309277, Japan 0120-527196,
Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793,
Netherlands 31 (0) 348 433 466, New Zealand 0800 553 322,
Norway 47 (0) 66 90 76 60, Poland 48 22 328 90 10,
Portugal 351 210 311 210, Russia 7 495 783 6851,
Singapore 1800 226 5886, Slovenia 386 3 425 42 00,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151,
Taiwan 886 02 2377 2222, Thailand 662 278 6777,
Turkey 90 212 279 3031, United Kingdom 44 (0) 1635 523545

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