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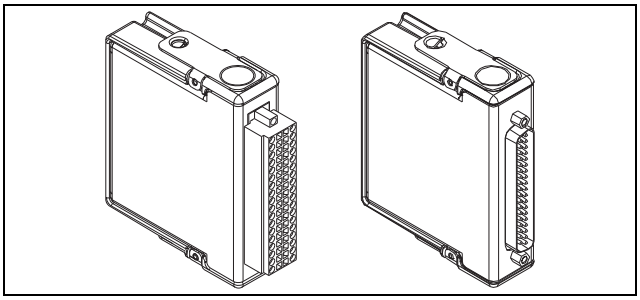
OPERATING INSTRUCTIONS AND SPECIFICATIONS

NI 9264

16-Channel, ±10 V, 16-Bit Analog Voltage Output Module

Français Deutsch 日本語 한국어 简体中文

ni.com/manuals



NATIONAL INSTRUMENTS

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This document describes how to use the National Instruments 9264 and includes specifications and terminal assignments for the NI 9264. In this document, the NI 9264 with spring terminal and the NI 9264 with DSUB are referred to inclusively as the NI 9264. 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 9264. 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.

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Safety Guidelines

Operate the NI 9264 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 Voltages

You can connect hazardous voltages only to the NI 9264 with spring terminal. Do *not* connect hazardous voltages to the NI 9264 with DSUB.

If hazardous voltages are connected to the module, take the following precautions. A hazardous voltage is a voltage greater than 42.4 V_{pk} or 60 VDC to earth ground.



Caution 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.

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Caution Make sure that devices and circuits connected to the module are properly insulated from human contact.

Caution When module terminals are hazardous voltage LIVE (>42.4 V_{pk}/60 VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9940 connector backshell kit to ensure that the terminals are *not* accessible.

Figure 1 shows the NI 9940 connector backshell.

Note You can use the NI 9940 connector backshell only with the NI 9264 with spring terminal.

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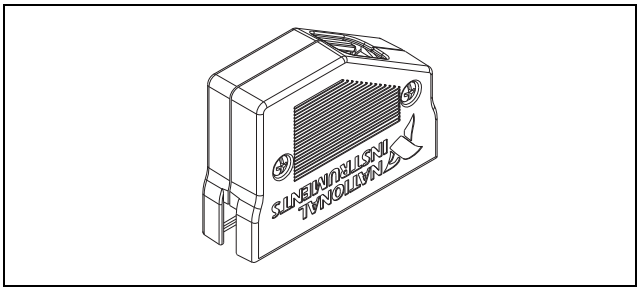


Figure 1. NI 9940 Connector Backshell

Safety Guidelines for Hazardous Locations

The NI 9264 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 9264 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.

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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.

Caution For Zone 2 applications, connected signals must be within the following limit:

Capacitance ..... 0.2 µF max

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 ⟨Ex⟩ II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of –40 °C ≤ Ta ≤ 70 °C. If you

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are using the NI 9264 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.

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Connecting the NI 9264

The NI 9264 provides connections for 16 analog output channels.

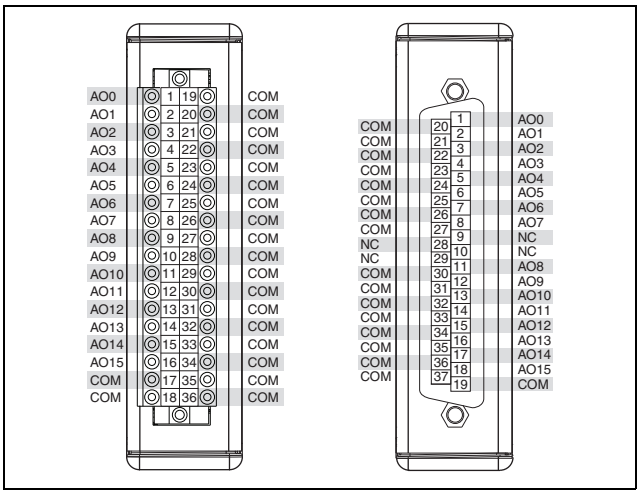


Figure 2. NI 9264 Terminal and Pin Assignments

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The NI 9264 with spring terminal has a 36-terminal detachable spring-terminal connector. The NI 9264 with DSUB has a 37-pin DSUB connector.

Each channel of the NI 9264 has an AO terminal or pin to which you can connect the positive lead of a load. Each channel also has a common terminal or pin, COM, and the NI 9264 with spring terminal has additional COMs at the bottom of the connector. All of the COM terminals or pins are internally connected to the isolated ground reference of the module. When connecting a load to the NI 9264, connect the positive lead of the load to AO, and the ground of the load to the corresponding COM. Refer to Figure 3 for an illustration of connecting a load to the NI 9264.

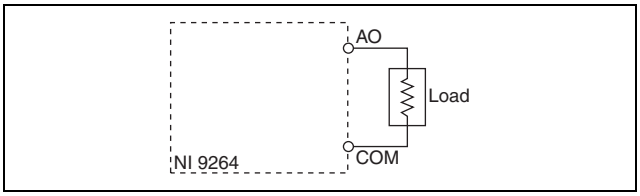


Figure 3. Connecting a Load to the NI 9264

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Each channel has a digital-to-analog converter (DAC) that produces a voltage signal. Each channel also has overvoltage and short-circuit protection. Refer to the *Specifications* section for more information about overvoltage and short-circuit protection. Refer to Figure 4 for an illustration of the output circuitry for one channel of the NI 9264.

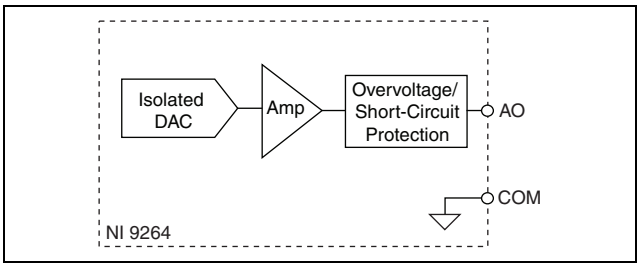


Figure 4. Output Circuitry for One Channel of the NI 9264

When the module powers on, the channels output the startup voltage. Refer to the *Specifications* section for more information about startup voltage. Refer to the software help for information about configuring startup output states in software.

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Connecting Wires to the NI 9264 Spring-Terminal Connector

Use a flathead screwdriver with a blade smaller than 2.3 × 1.0 mm (0.09 × 0.04 in.) to connect wires to the detachable spring-terminal connector. Insert the screwdriver into a spring clamp activation slot and press a wire into the corresponding connector terminal, then remove the screwdriver to clamp the wire into the terminal. Refer to the *Specifications* section for more information about spring-terminal wiring. Refer to Figure 5 for an illustration of connecting wires to the NI 9264 with spring terminal.

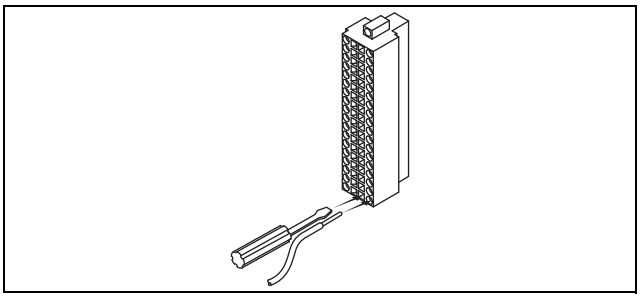


Figure 5. Connecting Wires to the NI 9264 with Spring-Terminal Connector

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Wiring for High-Vibration Applications

If an application using the NI 9264 with spring terminal is subject to high vibration, National Instruments recommends that you use the NI 9940 backshell to protect the connections. Refer to Figure 1 for an illustration of the NI 9940 connector backshell.

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 70 °C unless otherwise noted. All voltages are relative to COM unless otherwise noted.

Output Characteristics

Number of channels ..... 16 analog output channels

DAC resolution ..... 16 bits

Type of DAC ..... String

Power-on output state ..... Channels off

Startup voltage[1] ..... 0 V

Power-down voltage[2] ..... 0 V

[1] When the module powers on, a glitch occurs for 20 µs peaking at 500 mV.

[2] The power-down voltage peaks at 1.7 V, then exponentially discharges to 0 V in 200 ms. You can add a load to reduce peak voltage.

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Output range

- Nominal ..... ±10 V
- Minimum ..... ±10.35 V
- Typical ..... ±10.5 V
- Maximum ..... ±10.65 V

Current drive ..... ±16 mA all channels max; ±4 mA per channel typ

Output impedance ..... 2.0 Ω

Accuracy

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated, max (–40 to 70 °C)	0.15%	0.15%
Calibrated, typ (25 °C)	0.05%	0.05%
Uncalibrated, max (–40 to 70 °C)	0.6%	1.0%
Uncalibrated, typ (25 °C)	0.2%	0.25%

* Range equals 10.5 V

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Stability

Gain drift ..... 6 ppm/°C

Offset drift ..... 80 µV/°C

Protection

Overvoltage ..... ±27 V at 25 °C

Short-circuit..... Indefinitely

Update time

Number of Channels	Update Time for NI cRIO-9151 R Series Expansion Chassis	Update Time for All Other Chassis
1	3.7 µs min	3.1 µs min
2	6.6 µs min	5.3 µs min
3	9.4 µs min	7.5 µs min
16	47 µs min	37 µs min

Noise[1]..... 500 μV_{rms}

Slew rate ..... 4 V/µs

[1] The noise specification includes the glitch energy.

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Crosstalk at 1 kHz sine wave ..... 85 dB

Settling time (100 pF load, to 1 LSB)

- 20 V step..... 20 µs
- 1 V step..... 15 µs
- 0.1 V step..... 13 µs

Capacitive drive ..... 1,500 pF max

Monotonicity..... 16 bits

DNL ..... ±1 LSB max

INL (endpoint)..... ±12 LSBs max

MTBF ..... 595,509 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method



Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

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Power Requirements

Power consumption from chassis

Active mode ..... 1 W max

Sleep mode ..... 25 µW max

Thermal dissipation (at 70 °C)

Active mode ..... 1 W max

Sleep mode ..... 25 µW 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.

Spring-terminal wiring..... 18 to 28 AWG copper conductor wire with 7 mm (0.28 in.) of insulation stripped from the end

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Weight

NI 9264 with spring terminal ..... 156 g (5.5 oz)

NI 9264 with DSUB ..... 146 g (5.2 oz)

Safety

Connect only voltages that are within the following limits.

NI 9264 with Spring Terminal Isolation Voltages

Channel-to-channel ..... None

Channel-to-earth ground

Continuous ..... 250 V_{rms}, Measurement Category II

Withstand ..... 2,300 V_{rms}, 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.

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Caution Do *not* connect the NI 9264 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

NI 9264 with DSUB Isolation Voltages

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.

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Caution Do *not* connect the NI 9264 with DSUB 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

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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.

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CE Compliance CE

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. If you are using the NI 9264 with spring terminal, you also must use the NI 9940 backshell kit to protect the connections.

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

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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

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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`.

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Calibration

You can obtain the calibration certificate and information about calibration services for the NI 9264 at `ni.com/calibration`.

Calibration interval ..... 1 year

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.

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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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Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
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Israel 972 3 6393737, Italy 39 02 41309277, Japan 0120-527196,
Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
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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,
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