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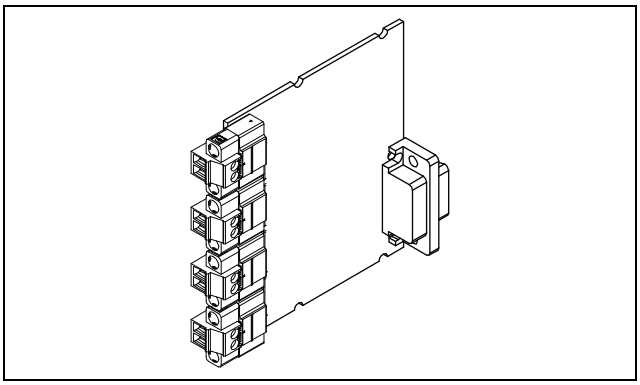
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Find the *National Instruments sbRIO-9269* at our website: *Click HERE*

OPERATING INSTRUCTIONS AND SPECIFICATIONS

NI 9269E

4-Channel, ±10 V, 16-Bit, Simultaneous, Channel-to-Channel Isolated Analog Voltage Output Module



NATIONAL INSTRUMENTS

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This document describes how to use the National Instruments 9269E and includes dimensions, terminal assignments, and specifications for the NI 9269E. 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 9269E. The end-product supplier is responsible for conformity to any and all compliance requirements.

Caution The NI 9269E must be installed inside a suitable enclosure prior to use. Hazardous voltages may be present.

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NI 9269E Dimensions

The following figure shows the dimensions of the NI 9269E.

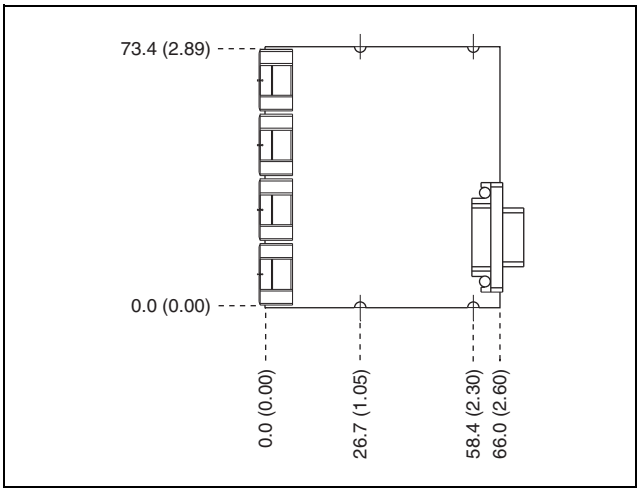


Figure 1. NI 9269E Dimensions in Millimeters (Inches)

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Connecting the NI 9269E

The NI 9269E has four 2-terminal detachable screw-terminal connectors that provide connections for 4 analog output channels.

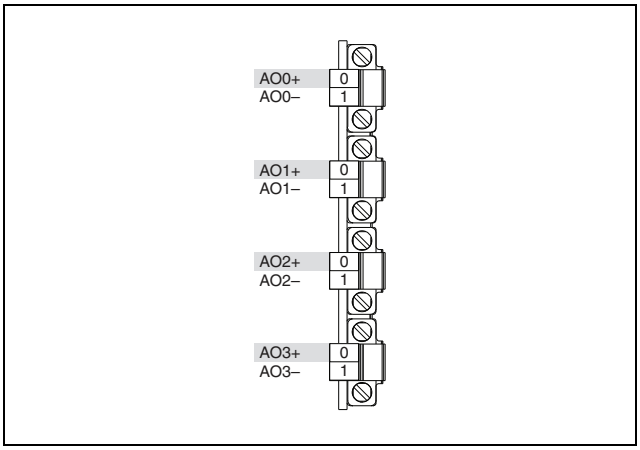


Figure 2. NI 9269E Terminal Assignments

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You can connect a load to each channel of the NI 9269E. Connect the positive lead of the load to the AO+ terminal. Connect the ground of the load to the corresponding AO– terminal. Refer to Figure 3 for an illustration of how to connect a load to the NI 9269E.

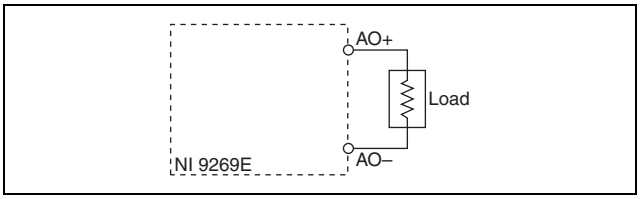


Figure 3. Connecting a Load to the NI 9269E

Note You must use 2-wire ferrules to create a secure connection when connecting more than one wire to a single terminal on the NI 9269E.

The analog output channels are floating with respect to earth ground and each other. Each channel has a digital-to-analog converter (DAC) that produces a voltage signal. Each channel provides an independent signal path, enabling you to update all

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four channels simultaneously. Each channel also has overvoltage and short-circuit protection. Refer to the *Specifications* section for more information about the overvoltage and short-circuit protection. Refer to Figure 4 for an illustration of the output circuitry for one channel of the NI 9269E.

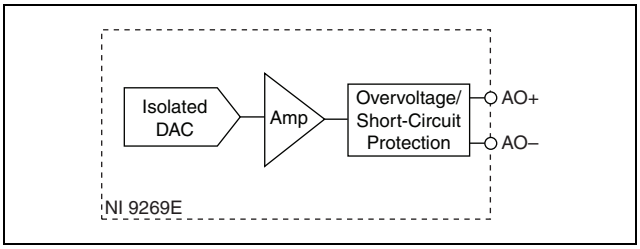


Figure 4. Output Circuitry for One Channel of the NI 9269E

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. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.

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Increasing Output Voltage Range

Each channel of the NI 9269E has a nominal output voltage range of ±10 V and can drive up to ±10 mA of current. The total output current of all channels is limited to ±20 mA. For example, if the output current of AO0 is ±10 mA, the output current of AO<1, 2, 3> is limited to ±10 mA total or ±3.33 mA each.

If you want to increase the nominal output voltage range, you can cascade up to four output channels for a maximum of ±40 V nominal. For example, if you want two channels with a nominal output voltage range of ±20 V each, connect AO<0, 1> and AO<2, 3> as shown in Figure 5. The output current of the cascaded channels flows across two channels, limiting the total output current to ±10 mA.

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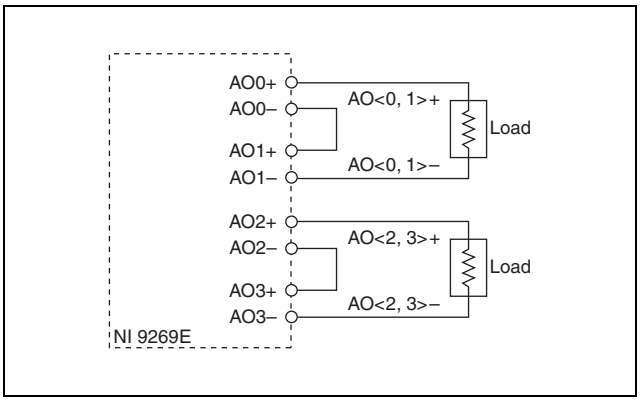


Figure 5. Increasing the Output Voltage Range of the NI 9269E

Cascading more than four output channels of multiple NI 9269E modules violates the electrical safety and overvoltage protection ratings.

Because the NI 9269E outputs can source and sink current, it is not possible to increase the current drive by connecting output channels in parallel.

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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 the AO– signal on each channel unless otherwise noted.

Output Characteristics

Number of channels ..... 4 analog output channels

DAC resolution ..... 16 bits

Type of DAC R-2R

Power-on output state ..... High impedance

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

Power-down output state[2] ..... High impedance

[1] When the output stage powers on, a glitch occurs for 5 µs peaking at –900 mV.

[2] When the module powers down, a glitch occurs for 20 µs peaking at –600 mV.

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Output voltage range[1]

Nominal	±10 V
Minimum	±10.38 V
Typical	±10.47 V
Maximum	±10.56 V
Current drive	±20 mA all channels max; ±10 mA per channel typ
Output impedance	100 mΩ

[1] Refer to the *Increasing Output Voltage Range* section for the cascaded nominal output voltage range and current drive.

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Accuracy

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated, max (–40 to 85 °C)	0.17%	0.15%
Calibrated, typ (25 °C, ±5 °C)	0.05%	0.01%
Uncalibrated, max (–40 to 85 °C)	0.44%	0.37%
Uncalibrated, typ (25 °C, ±5 °C)	0.14%	0.05%
* Range equals 10.47 V		

Stability

Gain drift ..... 14 ppm/°C

Offset drift ..... 80 µV/°C

Protection

Overvoltage ..... ±30 V

Short-circuit ..... Indefinitely

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Update time

Number of Channels	Update Time for NI cRIO-9151 R Series Expansion Chassis	Update Time for All Other Chassis
1	3.5 µs min	3 µs min
2	6.5 µs min	5 µs min
3	9.3 µs min	7.5 µs min
4	12.3 µs min	9.7 µs min

Noise ..... 300 μV_{rms}

Slew rate ..... 7 V/µs

Crosstalk

Channel-to-channel ..... 100 dB

Common-mode voltage ..... 120 dB

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Settling time

100 pF load, to 1 LSB

Full-scale step ..... 20 µs

1 V step ..... 10 µs

0.1 V step ..... 10 µs

1 kΩ ‖ 100 pF load, to 4 LSB

Full-scale step ..... 20 µs

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

Monotonicity..... 16 bits

DNL ..... ±1 LSB max

INL (best fit) ..... ±2 LSBs max

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

Power Requirements

Power consumption from chassis

Active mode ..... 1 W max

Sleep mode ..... 120 µW max

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Thermal dissipation (at 85 °C)

Active mode ..... 1.4 W max

Sleep mode ..... 77 mW 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.

Screw-terminal wiring ..... 12 to 24 AWG copper conductor wire with 10 mm (0.39 in.) of insulation stripped from the end

Torque for screw terminals ..... 0.5 to 0.6 N · m (4.4 to 5.3 lb · in.)

Ferrules ..... 0.25 mm^2 to 0.5 mm^2

Weight ..... 47 g (1.7 oz)

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Safety

Isolation Voltages

Connect only voltages that are within the following limits.

Channel-to-channel

Continuous	250 V_{rms}, Measurement Category II, (Basic insulation)
Withstand	1,390 V_{rms}, verified by a 5 s dielectric withstand test

Channel-to-earth ground

Continuous	250 V_{rms}, Measurement Category II, (Double insulation)
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 9269E to signals or use for measurements within Measurement Categories 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 Electrical 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 9269E 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.

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