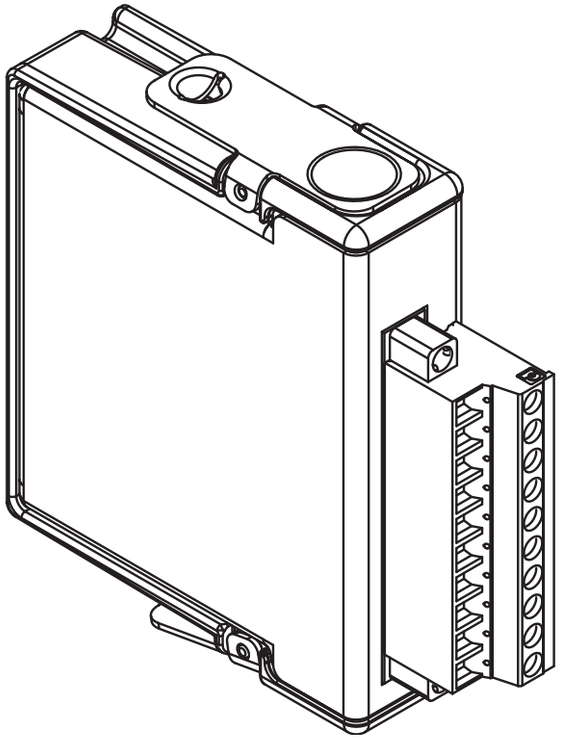
OPERATING INSTRUCTIONS

CompactRIO™ cRIO-9263

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



NATIONAL INSTRUMENTS™

These operating instructions describe how to use the National Instruments cRIO-9263 module. For information about installing, configuring, and programming the CompactRIO system, refer to the *CompactRIO Bookshelf* at **Start»Program Files»National Instruments»CompactRIO»Search the CompactRIO Bookshelf**.

Safety Guidelines

Operate the cRIO-9263 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 cRIO-9263 is suitable for use in Class I, Division 2, Groups A, B, C, and D hazardous locations; Class 1, Zone 2, AEx nC IIC T4 and Ex nC IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the cRIO-9263 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 CompactRIO system in an enclosure rated to at least IP 54 as defined by IEC 60529 and EN 60529.

Special Conditions for Safe Use in Europe

This equipment has been evaluated as EEx nC IIC T4 equipment under DEMKO Certificate No. 03 ATEX 0324020X. Each module is marked ⟨Ex⟩ II 3G and is suitable for use in Zone 2 hazardous locations.

Safety Guidelines for Hazardous Voltages

If *hazardous voltages* are connected to the module, take the following precautions. A hazardous voltage is a voltage greater than 42.4 V_{peak} 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.

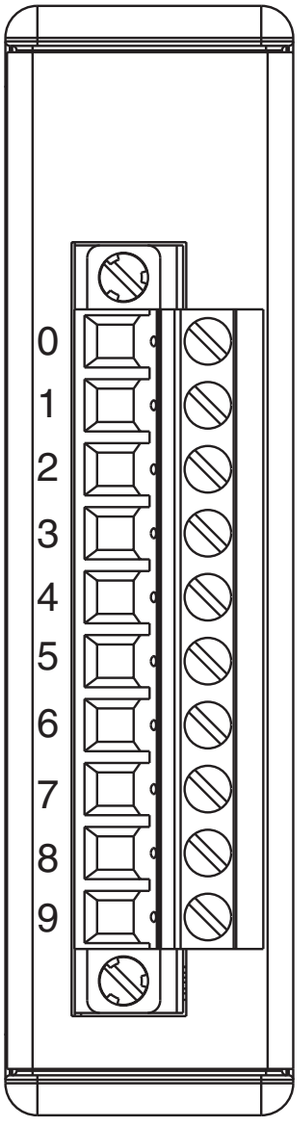
Caution Make sure that devices and circuits connected to the module are properly insulated from human contact.

Caution When module terminals are live with hazardous voltages, make sure that the terminals are *not* accessible. You can use the cRIO-9932 connector kit or put the CompactRIO chassis in a suitably rated enclosure.

Wiring the cRIO-9263

The cRIO-9263 has a 10-terminal, detachable screw-terminal connector that provides connections for four analog output channels. Each channel has a terminal to which you can connect the positive lead of a voltage signal, AO. The cRIO-9263 also has common terminals, COM, that are internally connected to the isolated ground reference of the module. Refer to Table 1 for the terminal assignments for each channel.

Table 1. Terminal Assignments

Module	Terminal	Signal
	0	AO0
	1	Common (COM)
	2	AO1
	3	Common (COM)
	4	AO2
	5	Common (COM)
	6	AO3
	7	Common (COM)
	8	No Connection
	9	Common (COM)

Connecting a Load to the cRIO-9263

You can connect loads to the cRIO-9263. Connect the positive lead of the load to the AO terminal. Connect the ground of the load to a COM terminal.

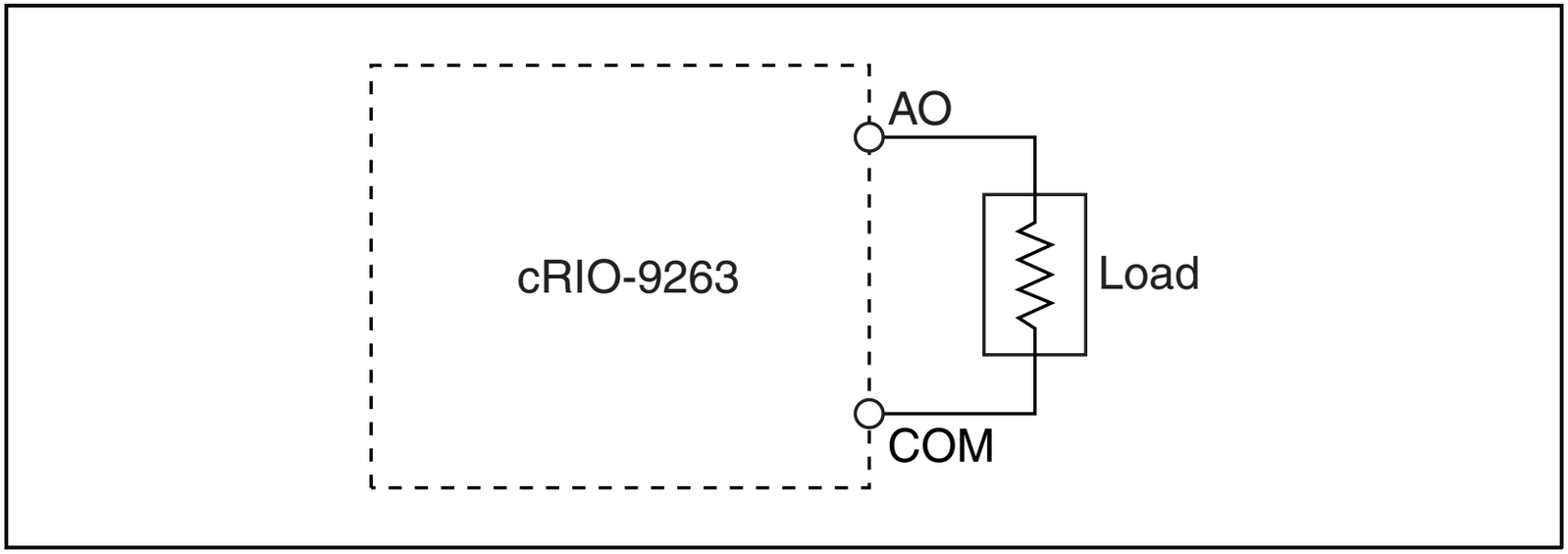


Figure 1. Connecting a Load to the cRIO-9263

cRIO-9263 Circuitry

The cRIO-9263 channels share a common ground that is isolated from the other modules in the CompactRIO system. Each channel has a digital-to-analog converter (DAC) that produces a voltage signal. You must write binary values to the analog output channels. Refer to the *CompactRIO Bookshelf* for more information about converting and calibrating cRIO-9263 output values in software.

Each channel also has overvoltage and short-circuit protection. For more information about the overvoltage and short-circuit protection, refer to the *Specifications* section.

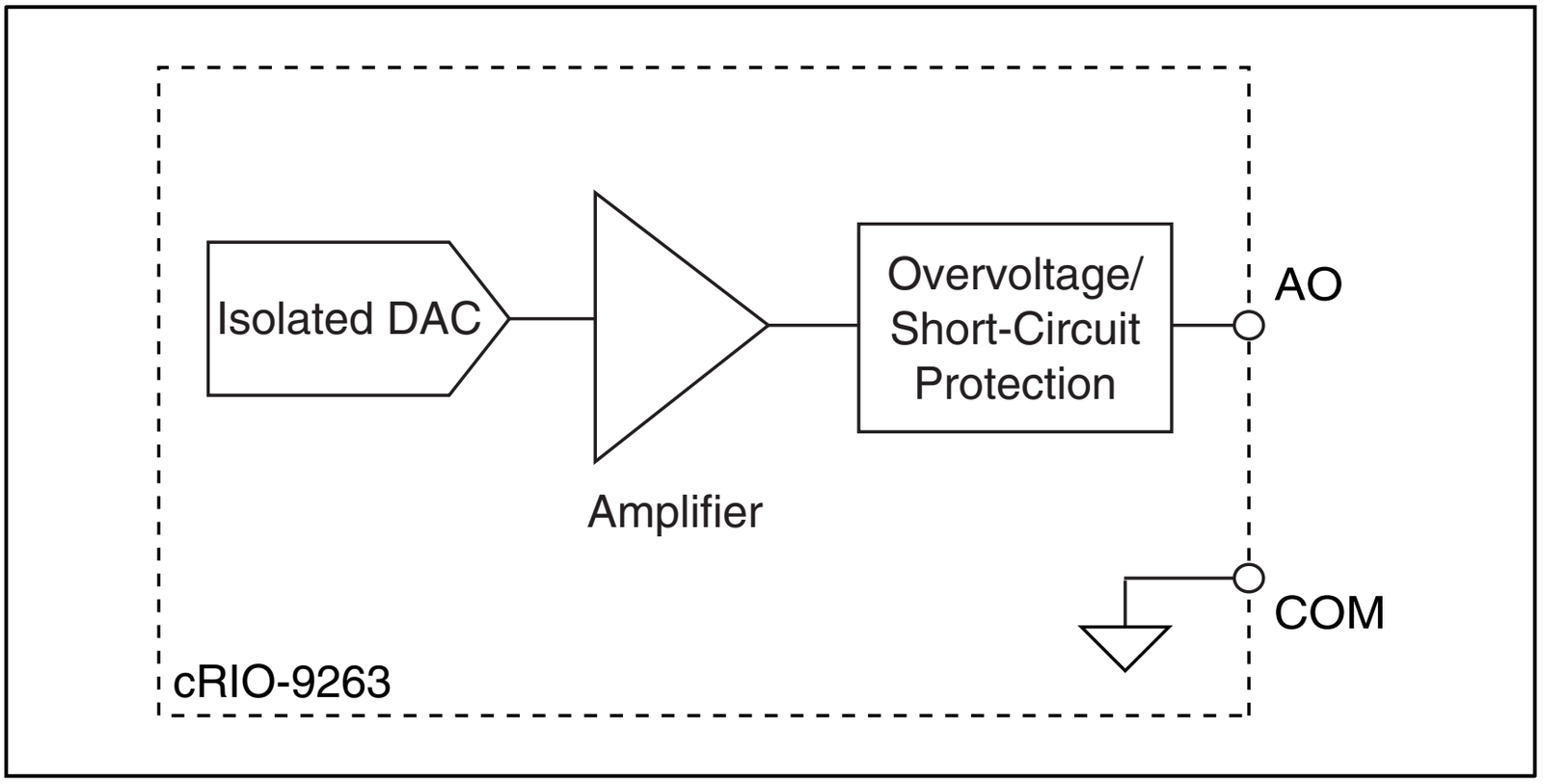


Figure 2. Output Circuitry for One Channel

When the module powers on, the output channel drives the power-on voltage. Refer to the *Specifications* section for more information about power-on voltage. Refer to the *CompactRIO Bookshelf* for more information about configuring initial output values in software.

Sleep Mode

You can enable sleep mode for the CompactRIO system in software. Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system minimizes power consumption. The system thermal dissipation may decrease. Refer to the *Specifications* section for more information about power consumption and thermal dissipation. Refer to the *CompactRIO Bookshelf* for more information about enabling sleep mode in software.

Specifications

The following specifications are typical for the range –40 to 70 °C unless otherwise noted.

Output Characteristics

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

DAC resolution ..... 16 bits

Type of DAC ..... String

Operating voltage

Nominal ..... ±10.7 V

Minimum ..... ±10.3 V

Maximum ..... ±11 V

Current drive ..... ±1 mA per channel min

Output impedance ..... 0.1 Ω

Accuracy

Error	Percentage of Reading	Percent of Range*
Calibrated, max (–40 to 70 °C)	0.35%	0.75%
Calibrated, typ (25 °C, ±5 °C)	0.01%	0.1%
Uncalibrated, max (–40 to 70 °C)	2.2%	1.7%
Uncalibrated, typ (25 °C, ±5 °C)	0.3%	0.25%
* Range equals ±10.7 V		

Stability

Offset drift ..... 80 µV/°C

Gain drift ..... 6 ppm/°C

Protection

- Overvoltage ..... ±30 V
- Short-circuit ..... Indefinitely

Power-on voltage ..... 0 V

Update time

- Reconfigurable Embedded Chassis
  - One channel ..... 3 µs
  - Two channels ..... 5 µs
  - Three channels ..... 7.5 µs
  - Four channels ..... 9.5 µs
- R Series Expansion Chassis
  - One channel ..... 3.5 µs
  - Two channels ..... 6.5 µs
  - Three channels ..... 9 µs
  - Four channels ..... 12 µs

Noise ..... 260 μV_{rms}

Slew rate ..... 4 V/µs

Crosstalk ..... 76 dB

Settling time (100 pF load, to 1 LSB)

- FS step ..... 20 µs
- 3 V step..... 10 µs
- 0.1 V step..... 8 µs

Glitch energy (0x6FFF to 0x7000) ... 110 mV for 2 µs

Capacitive drive ..... 1,500 pF min

Monotonicity..... 16 bits

DNL ..... –1 to 2 LSBs max

INL (endpoint) ..... 130 LSBs max

MTBF ..... 1,732,619 hours at 25 °C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method

Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications. Go to `ni.com/hardref.nsf` and search by model number or product line for more information about MTBF and other product certifications.

Power Requirements

Power consumption from chassis

Active mode ..... 625 mW max

Sleep mode ..... 25 µW max

Thermal dissipation (at 70 °C)

Active mode ..... 625 mW max

Sleep mode ..... 25 µW max

Physical Characteristics

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

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.)

Weight ..... Approx. 150 g (5.3 oz)

Safety

Safety Voltages

Channel-to-COM ..... ±11 V max, Installation Category I

Installation 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.

Isolation

Channel-to-channel	No isolation between channels
Channel-to-earth ground	
Withstand	2,300 V_{rms}, 1 minute max
Continuous	250 V_{rms}, Installation Category II

Installation 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).

Safety Standards

The cRIO-9263 is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- EN 61010-1, IEC 61010-1
- UL 3111-1, UL 61010B-1
- CAN/CSA C22.2 No. 1010.1

Note For UL and other safety certifications, refer to the product label, or visit `ni.com/hardref.nsf`, search by model number or product line, and click the appropriate link in the Certification column.

Hazardous Locations

U.S. (UL) ..... Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nC IIC T4

Canada (C-UL) ..... Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nC IIC T4

Europe (DEMKO)..... EEx nC IIC T4

Environmental

CompactRIO modules are intended for indoor use only. For outdoor use, mount the CompactRIO system in a suitably rated enclosure. Refer to the installation instructions for the chassis you are using for more information about meeting these specifications.

Operating temperature ..... –40 to 70 °C

Storage temperature ..... –40 to 85 °C

Ingress protection..... IP 40

Operating humidity ..... 10 to 90% RH, noncondensing

Storage humidity ..... 5 to 95% RH, noncondensing

Maximum altitude ..... 2,000 m

Pollution Degree (IEC 60664) 2

Shock and Vibration

To meet these specifications, you must panel mount the CompactRIO system and affix ferrules to the end of the terminal wires.

Operating vibration,
random (IEC 60068-2-64) ..... 5 g_{rms}, 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

Operating vibration,
sinusoidal (IEC 60068-2-6) ..... 5 g, 10 to 500 Hz

Electromagnetic Compatibility

Emissions	EN 55011 Class A at 10 m FCC Part 15A above 1 GHz
Immunity	Industrial levels per EN 61326-1:1997 + A2:2001, Table A.1
EMC/EMI	CE, C-Tick, and FCC Part 15 (Class A) Compliant

Note For EMC compliance, operate this device with shielded cabling.

FCC Compliance

Go to `ni.com/info` and enter `rdcriofcc` for information on using this product in compliance with FCC regulations.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety)..... 73/23/EEC

Electromagnetic Compatibility
Directive (EMC) 89/336/EEC

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/hardref.nsf`, search by model number or product line, and click the appropriate link in the Certification column.

Calibration

You can obtain the calibration certificate for the cRIO-9263 at `ni.com/calibration`.

Calibration interval ..... 1 year

National Instruments Contact Information

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 0 662 45 79 90 0,
Belgium 32 0 2 757 00 20, Brazil 55 11 3262 3599,
Canada (Calgary) 403 274 9391, Canada (Ottawa) 613 233 5949,
Canada (Québec) 450 510 3055, Canada (Toronto) 905 785 0085,
Canada (Vancouver) 514 685 7530, China 86 21 6555 7838,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24,
Germany 49 0 89 741 31 30, Greece 30 2 10 42 96 427,
India 91 80 51190000, Israel 972 0 3 6393737,
Italy 39 02 413091, Japan 81 3 5472 2970,
Korea 82 02 3451 3400, Malaysia 603 9131 0918,
Mexico 001 800 010 0793, Netherlands 31 0 348 433 466,
New Zealand 0800 553 322, Norway 47 0 66 90 76 60,

Poland 48 22 3390150, Portugal 351 210 311 210,
Russia 7 095 783 68 51, Singapore 65 6226 5886,
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Switzerland 41 56 200 51 51, Taiwan 886 2 2528 7227,
Thailand 662 992 7519, United Kingdom 44 0 1635 523545

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