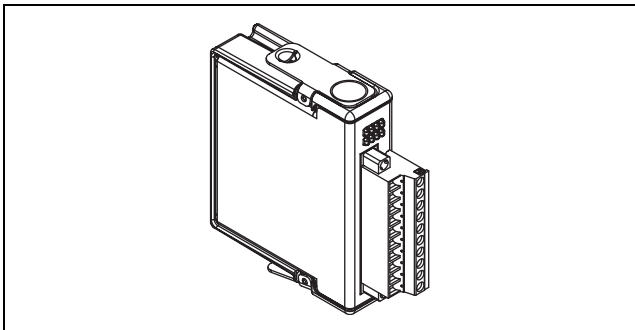


OPERATING INSTRUCTIONS

CompactRIO™ cRIO-9421/9423

8-Channel Digital Input Modules



These operating instructions describe how to use the National Instruments cRIO-9421 and cRIO-9423. 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-9421/9423 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-9421/9423 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 T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the cRIO-9421/9423 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. 02 ATEX 0324020X. Each module is marked  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 $42.4 V_{\text{peak}}$ 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.

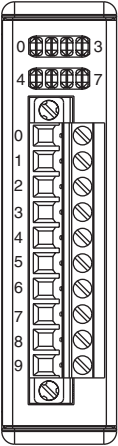


Caution When module terminals are live with hazardous voltages, make sure that the terminals are *not* accessible. You can use the cRIO-9932 connector kit or put the CompactRIO chassis in a suitably rated enclosure to prevent access to the terminals.

Wiring the cRIO-9421/9423

The cRIO-9421/9423 has a 10-terminal, detachable screw-terminal connector that provides connections for eight digital input channels. Each channel has a terminal, DI, to which you can connect voltage or current signals. Each digital input channel has an LED that indicates the state of that channel. Refer to Table 1 for the terminal assignments for each channel.

Table 1. Terminal Assignments

Module	Terminal	Signal
	0	DI0
	1	DI1
	2	DI2
	3	DI3
	4	DI4
	5	DI5
	6	DI6
	7	DI7
	8	No connection
	9	Common (COM)

Connecting Devices to the cRIO-9421/9423

The cRIO-9421/9423 has *sinking inputs*, meaning that when current goes through or voltage is applied to the DI terminal, the terminal provides a path for the current or voltage. The cRIO-9421/9423 internally limits current signals connected to the DI terminals. For more information about input current protection, refer to the *Specifications* section.

You can connect 2-, 3-, and 4-wire *sourcing-output* devices to the cRIO-9421/9423. A sourcing-output device drives current or applies voltage to the DI terminal. An example of a sourcing-output device is a PNP open collector.

Connect the sourcing-output device to the DI terminal on the cRIO-9421/9423. Connect the common of the external device to the COM terminal. Figure 1 shows a possible configuration.

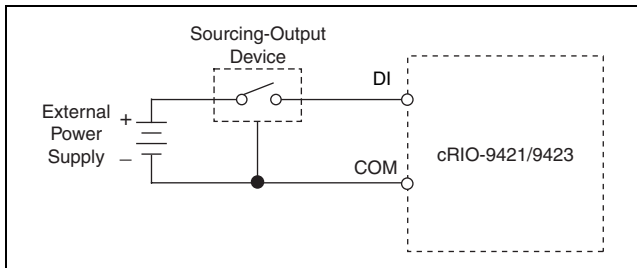


Figure 1. Connecting a Device to the cRIO-9421/9423 (3-Wire Device Shown)

The cRIO-9421/9423 channel registers as ON when the sourcing-output device applies a voltage or drives a current to the DI terminal that is in the input ON range. The channel registers as OFF when the device applies a voltage or drives a current to the DI terminal that is in the input OFF range. If no device is connected to the DI terminal, the channel registers as OFF. The channel LED turns on and off to indicate the state of the channel. Refer to the [Specifications](#) section for more information about ON and OFF ranges.

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. The specifications are the same for the cRIO-9421 and cRIO-9423 unless otherwise noted.

Input Characteristics

Number of channels	8
Input type	Sinking

Digital logic levels

OFF state

Input voltage ≤ 5 V

cRIO-9421 input current ≤ 300 μ A

cRIO-9423 input current ≤ 150 μ A

ON state

Input voltage 11 to 30 V

Input current ≥ 3 mA

I/O protection

Input voltage

cRIO-9421 40 V max

cRIO-9423 35 V max

Input current

cRIO-9421 7 mA max, internally limited

cRIO-9423 8.5 mA max,
internally limited

Reverse biased -30 V max

Input delay time

cRIO-9421 100 μ s max

cRIO-9423 1 μ s max

MTBF

cRIO-9421	900,752 hours at 25 °C; Bellcore Issue 6, Method 1, Case 3, Limited Part Stress Method
cRIO-9423	979,623 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.

cRIO-9421 Power Requirements

Power consumption from chassis

Active mode 240 mW max

Sleep mode 7 mW max

Thermal dissipation (at 70 °C)..... 1.3 W max

cRIO-9423 Power Requirements

Power consumption from chassis

Active mode 290 mW max

Sleep mode 7 mW max

Thermal dissipation (at 70 °C)..... 1.5 W 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

Connect only voltages that are within these limits.

Channel-to-COM 30 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

Continuous 250 V_{rms}

Withstand 2,300 V_{rms}, 1 minute max

Safety Standards

The cRIO-9421/9423 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,
ATEX 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
Humidity	10 to 90% 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 ends 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.

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.

National Instruments Contact Information

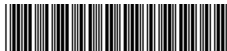
Go to ni.com/support for the most current manuals, examples, and troubleshooting information. For telephone support in the United States, create a service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

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Canada (Toronto) 905 785 0085,
Canada (Vancouver) 514 685 7530, China 86 21 6555 7838,
Czech Republic 420 2 2423 5774, 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,
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