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Technical Sales
United States
(866) 531-6285
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NI 9423

8 Ch, Up to 30 V, 1 µs Sinking C Series Digital Input Module



- 8-channel, 1 µs high-speed digital input
- Up to 30 V, sinking digital input
- -40 to 70 °C operating range
- Extreme industrial certifications/ratings
- Hot-swappable operation

Overview

The NI 9423 is an eight-channel, 1 µs high-speed sinking C Series digital input module for any NI CompactDAQ or CompactRIO chassis. Each channel can input up to 30 V discrete voltage levels, is compatible with 12 and 24 V signals, and features transient overvoltage protection of 2,300 Vrms between the input channels and earth ground. Each channel also has an LED that indicates the state of that channel. The NI 9423 works with industrial logic levels and signals for direct connection to a wide array of industrial switches, transducers, and devices. The NI 9423 module is a correlated digital module, so it can perform correlated operations, triggering, and synchronization when installed in an NI CompactDAQ chassis.

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Requirements and Compatibility

OS Information

- Real-Time OS
- Windows

Driver Information

- NI-DAQmx
- NI-RIO

Software Compatibility

- LabVIEW
- LabVIEW SignalExpress
- LabWindows/CVI
- Visual Studio
- Visual Studio .NET

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Comparison Tables

Product Name	Signal Levels	Number of Channels	Connectivity	Speed	Special Features
9411	±5 to 24 V	6	15-pin D-Sub	500 ns	Differential/single-ended digital input, differential quadrature encoder
9421	12 to 24 V	8	Screw-terminal, D-Sub	100 µs	Sinking digital input
9422	24 to 60 V	8	Screw-terminal	250 µs	Sinking/sourcing digital input
9423	11 to 30 V	8	Screw-terminal	1 µs	Sinking digital input
9425	12, 24 V	32	37-pin D-Sub	7 µs	Sinking digital input
9426	24 V	32	37-pin D-Sub	7 µs	Sourcing digital input

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Application and Technology

High-performance digital output and switching modules for NI CompactDAQ systems, CompactRIO embedded systems, and R Series expansion chassis provide extended voltage ranges and high-current-switching capacity for direct control of a wide array of industrial and automotive actuators. Each module features an integrated connector junction box with screw-terminal or cable options for flexible, low-cost signal wiring. All modules feature CompactRIO extreme industrial certifications and ratings including -40 to 70 °C operating temperatures and 50 g shock.

When used in CompactRIO, C Series digital output modules connect directly to reconfigurable I/O (RIO) field-programmable gate array (FPGA) hardware to create high-performance embedded systems. The reconfigurable FPGA hardware within CompactRIO provides a variety of options for timing, triggering, synchronization, digital waveform generation, or digital communication. For instance, with CompactRIO you can implement a circuit to generate pulse-width modulation (PWM) outputs for controlling motors, heaters, or fans as well as to perform pulse code modulation encoding (PCME) for wireless telemetry applications.

C Series Compatibility

The C Series hardware family features more than 50 measurement modules and several chassis and carriers for deployment. With this variety of modules, you can mix and match measurements such as temperature, acceleration, flow, pressure, strain, acoustic, voltage, current, digital, and more to create a custom system. Install the modules in one of several carriers to create a single module USB, Ethernet, or Wi-Fi system, or combine them in chassis such as NI CompactDAQ and CompactRIO to create a mixed-measurement system with synchronized measurements. You can install up to eight modules in a simple, complete NI CompactDAQ USB data acquisition system to synchronize all of the analog output, analog input, and digital I/O from the modules. For a system without a PC, CompactRIO holds up to eight modules and features a built-in processor, RAM, and storage for an embedded data logger or control unit. For higher-speed control, CompactRIO chassis incorporate an FPGA that you can program with NI LabVIEW software to achieve silicon-speed processing on I/O data from C Series modules.

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Ordering Information

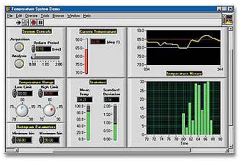
For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories	Part Number
null			
null	null	No accessories required.	

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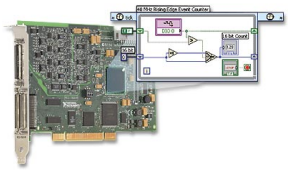
Software Recommendations

LabVIEW Professional Development System for Windows



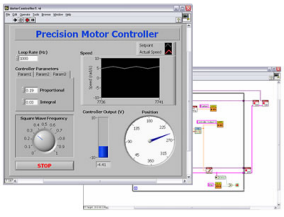
- Advanced software tools for large project development
- Automatic code generation using DAQ Assistant and Instrument I/O Assistant
- Tight integration with a wide range of hardware
- Advanced measurement analysis and digital signal processing
- Open connectivity with DLLs, ActiveX, and .NET objects
- Capability to build DLLs, executables, and MSI installers

NI LabVIEW FPGA Module



- Create your own I/O hardware without VHDL coding or board design
- Graphically configure FPGAs on NI reconfigurable I/O (RIO) hardware targets
- Define your own control algorithms with loop rates up to 200 MHz
- Execute multiple tasks simultaneously and deterministically
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx CORE Generator functions

NI LabVIEW Real-Time Module



- Design deterministic real-time applications with LabVIEW graphical programming
- Download to dedicated NI or third-party hardware for reliable execution and a wide selection of I/O
- Take advantage of built-in PID control, signal processing, and analysis functions
- Automatically take advantage of multicore CPUs or set processor affinity manually
- Includes real-time operating system (RTOS), development and debugging support, and board support
- Purchase individually or as part of an NI Developer Suite bundle

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Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. NI offers a number of calibration services to help maintain the ongoing accuracy of your measurement hardware. These services allow you to be completely confident in your measurements, and help you maintain compliance to standards like ISO 9001, ANSI/NCSL Z540-1 and ISO/IEC 17025. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

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Detailed Specifications

The following specifications are typical for the range –40 to 70 °C unless otherwise noted. The specifications are the same for the NI 9421 and the NI 9423 unless otherwise noted. All voltages are relative to COM unless otherwise noted.

Input Characteristics	
Number of channels	8 digital input channels
Input type	Sinking
Digital logic levels	
OFF state	
Input voltage	≤5 V
Input current (NI 9421)	≤300 µA

Input current (NI 9423)	≤150 µA
ON state	
Input voltage	11–30 V
Input current	≥3 mA
I/O protection	
Input voltage	
NI 9421	40 V max
NI 9423	35 V max
Reverse biased voltage	–30 V max
Input current	
NI 9421	7 mA max, internally limited
NI 9423	8.5 mA max, internally limited
Input delay time	
NI 9421	100 µs max
NI 9423	1 µs max
MTBF	
NI 9421	2,086,204 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method
NI 9423	979,623 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. Go to *ni.com/certification* and search by module number or product line for more information about MTBF and other product certifications.

NI 9421 Power Requirements

Power consumption from chassis	
Active mode	240 mW max
Sleep mode	7 mW max
Thermal dissipation (at 70 °C)	
Active mode	1.3 W max
Sleep mode	1.1 W max

NI 9423 Power Requirements

Power consumption from chassis	
Active mode	290 mW max
Sleep mode	7 mW max
Thermal dissipation (at 70 °C)	
Active mode	1.5 W max
Sleep mode	1.3 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.

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 2.5 mm^2
Weight	
NI 9421/9423 with screw terminal	150 g (5.3 oz)
NI 9421 with DSUB	145 g (5.1 oz)

Safety

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NI 9421/9423 with Screw Terminal Safety Voltages	
Connect only voltages that are within the following limits.	
Channel-to-COM	30 V max
Isolation	
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 (MAINS [1]). This category refers to local-level electrical distribution, such as that provided by a standard wall outlet (for example, 115 AC voltage for U.S. or 230 AC voltage for Europe). Examples of Measurement Category II are measurements performed on household appliances, portable tools, and similar hardware.

Caution Do not connect the NI 9421/9423 with screw terminal to signals or use for measurements within Measurement Categories III or IV.

NI 9421 with DSUB Safety Voltages	
Connect only voltages that are within the following limits.	
Channel-to-COM	30 V max
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 [2] voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special hardware, limited-energy parts of hardware, circuits powered by regulated low-voltage sources, and electronics.

Caution Do not connect the NI 9421 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 nC IIC T4
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nC IIC T4
Europe (DEMKO)	EEx nC IIC T4

Safety Standards

This product is designed to meet 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 is designed to meet the requirements of the following standards of EMC 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 double-shielded cables.

CE Compliance

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

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note For the standards applied to assess the EMC of this product, refer to 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.

Shock and Vibration

To meet these specifications, you must panel mount your system. If you are using the NI 9421/9423 with screw terminal, you also must either affix ferrules to the ends of the terminal wires or use the NI 9932 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
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 (IEC 60664)	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 not only to the environment but also 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 their 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.htm.

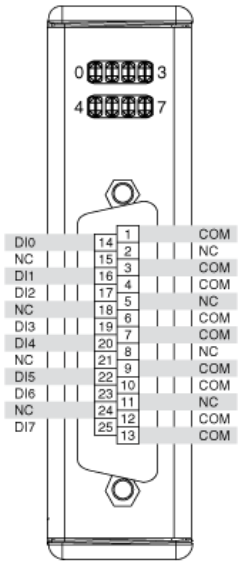
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(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

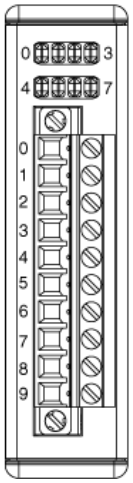
[1] MAINS is defined as a hazardous live electrical supply system that powers hardware. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.
[2] MAINS is defined as a hazardous live electrical supply system that powers hardware. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

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Pinouts/Front Panel Connections



Pin assignments (25-pin)



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