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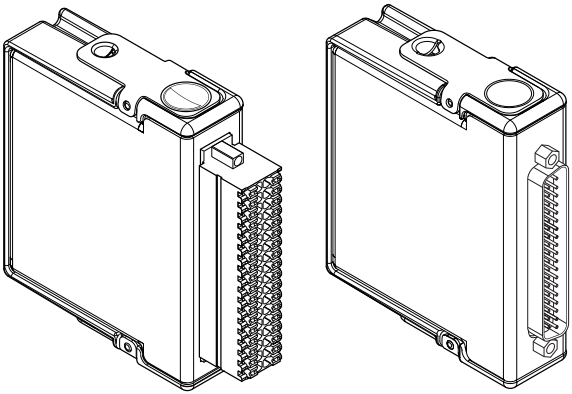
DATASHEET

# NI 9425 Datasheet

## 24 V, 32-Channel (Sinking Input), 7 µs C Series Digital Module



- Compatible with 24 V logic levels
- DSUB or spring terminal connectivity
- 250 V RMS, CAT II, channel-to-earth isolation (spring terminal); 60 V DC, CAT I, channel-to-earth isolation (DSUB)

**Note** In this document, the NI 9425 with spring terminal and the NI 9425 with DSUB are referred to inclusively as the NI 9425.

The NI 9425 works with industrial logic levels and signals to connect directly to a wide array of industrial switches, transducers, and devices. Each digital input line is compatible with 24 V logic levels. The NI 9425 offers isolation between the input and output banks from channel to earth ground. You cannot use the NI 9425 in a CompactDAQ chassis to perform counter operations.

| | |
|---|---|
| Kit Contents | • NI 9425<br>• NI 9425 Getting Started Guide |
| Required Accessories | • NI 9940 Backshell Kit (Spring)<br>• NI 9923 Front-mount DSUB to Screw-Terminal (DSUB)<br>OR<br>• DIN-Rail 37-Pin, Spring-Terminal Connector Block with Shielded Female to Male Cable, 1m (DSUB) |

NATIONAL INSTRUMENTS

| C SERIES DIGITAL INPUT MODULE COMPARISON | | | | | | | |
|---|---|---|---|---|---|---|---|
| Product Name | Module Type | Signal Levels | Direction | Channels | Update Rate | Connectivity | Isolation |
| NI 9411 | Digital Input | ±5, 24 V | Sinking/Sourcing Diff/ SE Input | 6 | 500 ns | 15-Pin DSUB | 60 V DC Ch-Earth |
| NI 9421 | Digital Input | 12, 24 V | Sinking Input | 8 | 100 µs | Screw Terminal, Spring Terminal, 25-Pin DSUB | 250 V RMS Ch-Earth (Screw/Spring) 60 V DC Ch-Earth (DSUB) |
| NI 9422 | Digital Input | 24, 48, 60 V | Sinking/ Sourcing Input | 8 | 250 µs | Screw Terminal | 250 V RMS Ch-Ch and Ch-Earth |
| NI 9423 | Digital Input | 12, 24 V | Sinking Input | 8 | 1 µs | Screw Terminal, Spring Terminal | 60 V DC Ch-Earth |
| NI 9425 | Digital Input | 12, 24 V | Sinking Input | 32 | 7 µs | Spring Terminal, 37-Pin DSUB | 250 V RMS Ch-Earth (Spring) 60 V DC Ch-Earth (DSUB) |
| NI 9426 | Digital Input | 24 V | Sourcing Input | 32 | 7 µs | 37-Pin DSUB | 60 V DC Ch-Earth |
| NI 9435 | Digital Input | 250 V DC/ V AC | Sinking/ Sourcing Input | 4 | 3 ms | Screw Terminal | 250 V RMS Ch-Earth |
| NI 9436 | Digital Input | 250 V DC/ V AC | Sinking/ Sourcing Input | 8 | 20 ms | Screw Terminal | 250 V RMS Ch-Ch and Ch-Earth |
| NI 9437 | Digital Input | 24 V to 250 V | Sinking Input | 8 | 1 µs | Screw Terminal, Spring Terminal | 300 V RMS Ch-Earth |

# NI C Series Overview

NI provides more than 100 C Series modules for measurement, control, and communication applications. C Series modules can connect to any sensor or bus and allow for high-accuracy measurements that meet the demands of advanced data acquisition and control applications.

- Measurement-specific signal conditioning that connects to an array of sensors and signals
- Isolation options such as bank-to-bank, channel-to-channel, and channel-to-earth ground
- -40 °C to 70 °C temperature range to meet a variety of application and environmental needs
- Hot-swappable

The majority of C Series modules are supported in both CompactRIO and CompactDAQ platforms and you can move modules from one platform to the other with no modification.

# CompactRIO

CompactRIO combines an open-embedded architecture with small size, extreme ruggedness, and C Series modules in a platform powered by the NI LabVIEW reconfigurable I/O (RIO) architecture. Each system contains an FPGA for custom timing, triggering, and processing with a wide array of available modular I/O to meet any embedded application requirement.

# CompactDAQ

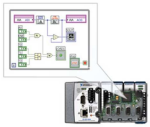
CompactDAQ is a portable, rugged data acquisition platform that integrates connectivity, data acquisition, and signal conditioning into modular I/O for directly interfacing to any sensor or signal. Using CompactDAQ with LabVIEW, you can easily customize how you acquire, analyze, visualize, and manage your measurement data.

# Software

### LabVIEW Professional Development System for Windows

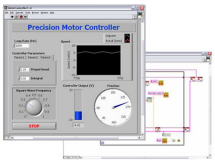
- Use advanced software tools for large project development
- Generate code automatically using DAQ Assistant and Instrument I/O Assistant
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables, and MSI installers

### NI LabVIEW FPGA Module



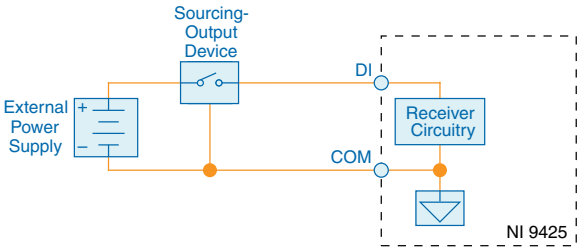
- Design FPGA applications for NI RIO hardware
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx IP generator functions
- Purchase as part of the LabVIEW Embedded Control and Monitoring Suite

**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
- Take advantage of real-time OS, development and debugging support, and board support
- Purchase individually or as part of a LabVIEW suite

# NI 9425 Circuitry




- The NI 9425 has sinking inputs. Sinking inputs provide a path to COM when the sourcing device connected to the NI 9425 drives current or applies voltage to DI.

**Tip** For more information about sinking inputs, visit *ni.com/info* and enter the Info Code `sinksource`.

# NI 9425 Specifications

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

**Caution** Do not operate the NI 9425 in a manner not specified in this document. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to NI for repair.

# Input Characteristics

| | |
|---|---|
| Number of channels | 32 digital input channels |
| Input type | Sinking |
| Digital logic levels | |
| OFF state | |
| Input voltage | ≤5 V |
| Input current | ≤150 µA |
| ON state | |
| Input voltage | ≥10 V |
| Input current | ≥330 µA |
| Hysteresis | |
| Input voltage | 2 V minimum |
| Input current | 60 µA minimum |
| Input impedance | 30 kΩ ± 5% |
| I/O protection | |
| Input voltage | |
| 8 channels | 60 V DC maximum |
| 32 channels | 30 V DC maximum |
| Reverse-biased voltage | |
| 8 channels | -60 V DC maximum |
| 32 channels | -30 V DC maximum |
| Hold time[1] | 0 µs minimum |
| Setup time[2] | 1 µs minimum |
| Update/transfer time[3] | |
| cRIO-9151 R Series Expansion chassis | 8 µs maximum |
| All other chassis | 7 µs maximum |
| MTBF | 1,256,699 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method |

[1] *Hold time* is the amount of time input signals must be stable after initiating a read from the module.
[2] *Setup time* is the amount of time input signals must be stable before reading from the module.
[3] The update/transfer time is valid when the module is used in a CompactRIO system. When used in other systems, driver software and system latencies impact this time.

## Power Requirements

| | |
|---|---|
| Power consumption from chassis | |
| Active mode | 410 mW maximum |
| Sleep mode | 0.5 mW maximum |
| Thermal dissipation (at 70 °C) | |
| Active mode | 1.45 W maximum |
| Sleep mode | 1 W maximum |

## Physical Characteristics

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

**Tip** 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 | |
| Gauge | 0.14 $mm^2$ to 1.5 $mm^2$ (26 AWG to 16 AWG) copper conductor wire |
| Wire strip length | 10 mm (0.394 in.) of insulation stripped from the end |
| Temperature rating | 90 °C, minimum |
| Wires per spring terminal | One wire per spring terminal; two wires per spring terminal using a 2-wire ferrule |
| Ferrules | 0.14 $mm^2$ to 1.5 $mm^2$ |
| Connector securement | |
| Securement type | Screw flanges provided |
| Torque for screw flanges | 0.2 N · m (1.80 lb · in.) |
| Weight | |
| NI 9425 with spring terminal | 163 g (5.7 oz) |
| NI 9425 with DSUB | 147 g (5.2 oz) |

## NI 9425 with Spring Terminal Safety Voltages

Connect only voltages that are within the following limits.

| | |
|---|---|
| Channel-to-channel | |
| Up to 8 channels simultaneously | ±60 V maximum |
| All channels simultaneously | ±30 V maximum |

| | |
|---|---|
| Isolation | |
| Channel-to-channel | None |
| Channel-to-earth ground | |
| Continuous | 250 V RMS, Measurement Category II |
| Withstand up to 5,000 m | 3,000 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.

**Caution** Do not connect the NI 9425 with spring terminal to signals or use for measurements within Measurement Categories III or IV.

## NI 9425 with DSUB Safety Voltages

Connect only voltages that are within the following limits.

| | |
|---|---|
| Channel-to-channel | |
| Up to 8 channels simultaneously | ±60 V maximum |
| All channels simultaneously | ±30 V maximum |
| Isolation | |
| Channel-to-channel | None |
| Channel-to-earth ground | |
| Continuous | 60 V DC, Measurement Category I |
| Withstand up to 2,000 m | 1,000 V RMS, verified by a 5 s dielectric withstand test |
| Withstand up to 5,000 m | 500 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.

**Caution** Do not connect the NI 9425 with DSUB to signals or use for measurements within Measurement Categories II, III, or IV.

**Note** Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the

MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

## Hazardous Locations

| | |
|---|---|
| U.S. (UL) | Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA IIC T4 Gc |
| Canada (C-UL) | Class I, Division 2, Groups A, B, C, D, T4; Ex nA IIC T4 Gc |
| Europe (ATEX) and International (IECEx) | Ex nA IIC T4 Gc |

## Safety and Hazardous Locations Standards

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1
- EN 60079-0:2012, EN 60079-15:2010
- IEC 60079-0: Ed 6, IEC 60079-15; Ed 4
- UL 60079-0; Ed 6, UL 60079-15; Ed 4
- CSA C22.2 No. 60079-0, CSA C22.2 No. 60079-15

**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 61326-1 (IEC 61326-1): 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 EMC declarations and certifications, and additional information, refer to the *Online Product Certification* section.

## CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

## 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 model 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.

| | |
|---|---|
| Operating vibration | |
| Random (IEC 60068-2-64) | 5 $g_{rms}$, 10 Hz to 500 Hz |
| Sinusoidal (IEC 60068-2-6) | 5 g, 10 Hz 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

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 °C to 70 °C |
| Storage temperature (IEC 60068-2-1, IEC 60068-2-2) | -40 °C to 85 °C |
| Ingress protection | IP40 |
| Operating humidity (IEC 60068-2-78) | 10% RH to 90% RH, noncondensing |
| Storage humidity (IEC 60068-2-78) | 5% RH to 95% RH, noncondensing |
| Pollution Degree | 2 |
| Maximum altitude | 5,000 m |

Indoor use only.

## Environmental Management

NI 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 *Minimize Our Environmental Impact* 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 NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit *ni.com/environment/weee*.

# 电子信息产品污染控制管理办法（中国 RoHS）

**中国客户** National Instruments 符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)



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