NI-9411 Specifications

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Contents

NI-9411

- DSUB connectivity
- CompactDAQ counter compatibility
- 60 V DC, CAT I, channel-to-earth isolation

The NI-9411 works with industrial logic levels and signals for direct connection to a wide array of industrial switches, transducers, and devices. The NI-9411 is a correlated digital module, so it can perform correlated measurements, triggering, and synchronization when installed in a CompactDAQ chassis.

Kit Contents	• NI 9411 •NI 9411 Getting Started Guide
Required Accessories	• NI 9935 DSUB Connector for 15-Pin C Series Modules • NI 9948 Strain Relief and Operator Protection for 2-Position Modules

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

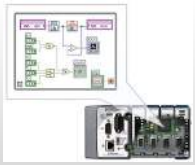
CompactDAQ is a portable, rugged data acquisition platform that integrates connectivity, data acquisition, and signal conditioning into modular I/O for directly interfacing to any sensor or signal. Using CompactDAQ with LabVIEW, you can easily customize how you acquire, analyze, visualize, and manage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

Software

LabVIEW Professional Development System for Windows

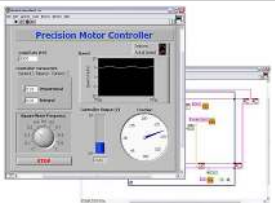
- Use advanced software tools for large project development
- Generate code automatically using DAQ Assistant and Instrument I/O Assistant
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables,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



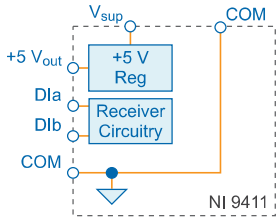
- Design deterministic real-time applications with LabVIEW graphical programming
- Download to dedicated NI or third-party hardware for reliable execution and a wide selection of I/O
- Take advantage of built-in PID control, signal processing, and analysis functions
- Automatically take advantage of multicore CPUs or set processor affinity manually
- Take advantage of real-time OS, development and debugging support, and board support

NI LabVIEW Real-Time Module	
	▪ Purchase individually or as part of a LabVIEW suite

Input Circuitry

The NI-9411 channels share a common ground isolated from other modules in the system.

Figure 1. NI-9411 Input Circuitry



NI-9411 Specifications

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

> **Caution** Do not operate the NI-9411 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	6 digital input channels
Input type	Differential or single-ended

Digital logic levels

Differential (DIa and DIb)

Input high range	300 mV to 24 V

Input low range	-300 mV to -24 V
Common-mode voltage	-7 V to 12 V

Single-ended

Input high range	2 V to 24 V
Input low range	0 V to 0.8 V

Input current

At 5 V	±1 mA per channel
At 24 V	±4 mA per channel

Input impedance	8.4 kΩ

I/O protection

Input voltage (channel-to-COM)	30 V maximum
Input current	±4 mA, internally limited

Input delay time	500 ns maximum
MTBF	800,319 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method

Power Requirements

Power consumption from chassis

Active mode	340 mW maximum
Sleep mode	1.1 mW maximum

Thermal dissipation (at 70 °C)

Active mode	1.4 W maximum
Sleep mode	1.1 W maximum

External Power Supply

Input voltage range (Vsup)	5 V DC to 30 V DC maximum
5 V regulated output	
Voltage tolerance	5 V ±3%, Vsup ≥ 6 V
Current	200 mA
Short-circuit protection	400 mA

> **Notice** The NI-9411 does not provide overvoltage protection for the external power supply.

Physical Characteristics

Screw-terminal wiring

Gauge	0.05 mm^2 to 1.5 mm^2 (30 AWG to 14 AWG) copper conductor wire
Wire strip length	6 mm (0.24 in.) of insulation stripped from the end
Temperature rating	90 °C, minimum
Torque for screw terminals	0.22 N · m to 0.25 N · m (1.95 lb · in. to 2.21 lb · in.)
Wires per screw terminal	One wire per screw terminal; two wires per screw terminal using a 2-wire ferrule
Ferrules	0.25 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.)

Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-COM or Vsup-to-COM	30 V maximum, Measurement Category I

Isolation

Channel-to-channel	None

Channel-to-earth ground

Continuous	30 V RMS, 42.4 Vpk, 60 V DC
Withstand	400 V RMS, verified by a 5 s dielectric withstand test

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 DEMKO 03 ATEX 0324020X IECEx UL 14.0089X

Safety Compliance 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, EN 60079-7
- IEC 60079-0, IEC 60079-7
- UL 60079-0, UL 60079-7
- CSA C22.2 No. 60079-0, CSA C22.2 No. 60079-7

> **Note** For safety certifications, refer to the product label or the Product Certifications and Declarations section.

Electromagnetic Compatibility

- EN 61326 (IEC 61326): Class A emissions; Industrial immunity

> **Note** For EMC compliance, operate this device with shielded cables.

CE Compliance CE

- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration	
Random	5 g RMS, 10 Hz to 500 Hz
Sinusoidal	5 g, 10 Hz to 500 Hz
Operating shock	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 60068-2-30)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-30)	5% RH to 95% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 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 **Engineering a Healthy Planet** 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.

EU and UK Customers

- **Waste Electrical and Electronic Equipment (WEEE)**—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 RoHS**— NI 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 NI 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.)