
NI-9381

Specifications

2022-10-07

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NI 9381 Datasheet



- DSUB connectivity
- 4 LVTTTL lines with a 1 MHz update rate

The NI-9381 multifunction I/O module for CompactRIO systems. The NI-9381 combines common I/O circuitry into a single module to help system designers fit more functionality into a single system.

 <p>Kit Contents</p>	<ul style="list-style-type: none"> • NI 9381 • NI 9381 Getting Started Guide
 <p>Accessories</p>	<p>Front-Mount</p> <ul style="list-style-type: none"> • NI 9923 Screw-Terminal Block <p>Cable</p> <ul style="list-style-type: none"> • DSUB Cable, 1 m (778621-01) • Din-Rail Spring-Terminal Block (778676-01)

NI 9381 MODULE COMPARISON					
Product Name	Measurement Type	Channels	Range	Resolution	Connectivity
NI 9201	AI	8	±10 V	12 Bit	Screw-terminal, Spring-terminal, DSUB
NI 9263	AO	4	±10 V	16 Bit	Screw-terminal, Spring-terminal
NI 9381	AI, AO, DIO	8 AI, 8 AO, 4 DIO	0 V to 5 V, 3 V TTL	12 Bit	DSUB
NI 9401	DIO	8	5 V TTL	—	DSUB

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.

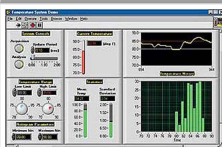
CompactRIO



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.

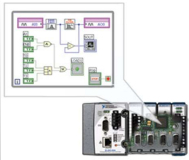
Software

LabVIEW Professional Development System for Windows



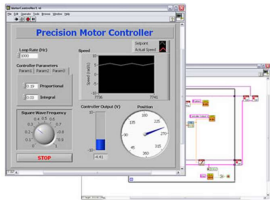
- Use advanced software tools for large project development
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables, and MSI installers

NI LabVIEW FPGA Module



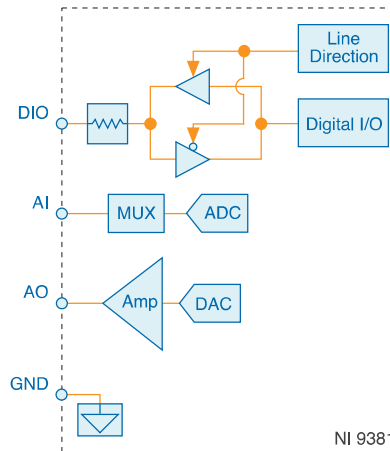
- Design FPGA applications for NI RIO hardware
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing 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-9381 Circuitry



- The module provides an analog-to-digital converter (ADC), eight digital-to-analog converters (DAC), and four digital lines.
- Line direction logic enables/disables the line input and output transceiver.

NI-9381 Specifications

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

Caution Do not operate the NI-9381 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.

Analog Input

Number of channels	8 single-ended channels
ADC resolution	12 bits
Type of ADC	Successive approximation register (SAR)
Input range	0 V to 5 V \pm 1%
DNL	\pm 1.25 LSB
Conversion time	50 μ s (20 kS/s)
Input coupling	DC
Input impedance	1 M Ω in parallel with 50 pF
Bandwidth	1 kHz
Stability	

Gain drift	80 ppm/°C		
Offset drift	85 μ V/°C		
Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range (Offset Error)
Calibrated	Maximum (-40 °C to 70 °C)	$\pm 0.70\%$	± 13 mV
	Typical (23 °C, ± 5 °C)	$\pm 0.15\%$	± 6.5 mV
Uncalibrated ^[2]	Maximum (-40 °C to 70 °C)	$\pm 1.00\%$	± 16 mV
	Typical (23 °C, ± 5 °C)	$\pm 0.50\%$	± 7.5 mV

Table 2. Accuracy^[1]

Analog Output

Number of channels	8 channels
DAC resolution	12 bits
Type of DAC	String
Startup voltage	0 V
Output range	0 V to 5 V $\pm 1\%$
Current drive	± 1 mA
Output impedance	5 Ω
Update time	50 μ s (20 kS/s)
Short-circuit protection	Indefinitely

Slew rate	30 V/ms		
Settling time	900 μ s		
DNL	± 1 LSB		
Capacitive drive	1,500 pF		
Stability			
Gain drift	85 ppm/ $^{\circ}$ C		
Offset drift	180 μ V/ $^{\circ}$ C		
Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range (Offset Error)
Calibrated	Maximum (-40 $^{\circ}$ C to 70 $^{\circ}$ C)	$\pm 1.02\%$	± 23.5 mV
	Typical (23 $^{\circ}$ C, ± 5 $^{\circ}$ C)	$\pm 0.19\%$	± 5 mV
Uncalibrated ^[4]	Maximum (-40 $^{\circ}$ C to 70 $^{\circ}$ C)	$\pm 1.9\%$	± 50 mV
	Typical (23 $^{\circ}$ C, ± 5 $^{\circ}$ C)	$\pm 0.6\%$	± 10 mV

Table 2. Accuracy^[3]

Digital Input/Output

Number of channels	4 channels	
Default power-on line direction	Input	
Input/output type	LVTTTL, single-ended	
Digital logic levels		
Maximum input voltage	5.2 V	

Input high, V_{IH}	2 V
Input low, V_{IL}	0.8 V
Output high, V_{OH}	
Sourcing 100 μ A	2.7 V
Output low, V_{OL}	
Sinking 100 μ A	0.2 V
Maximum I/O switching frequency	1 MHz
Capacitive drive	100 pF

¹ Accuracy is impacted for AC signals by an amount equal to $4.0f \mu\text{V}$, where f is the signal frequency in hertz

² Uncalibrated accuracy refers to the accuracy achieved when acquiring in raw or unscaled modes where the calibration constants stored in the module are not applied to the data.

³ Accuracy is impacted for AC signals by an amount equal to $4.0f \mu\text{V}$, where f is the signal frequency in hertz

⁴ Uncalibrated accuracy refers to the accuracy achieved when acquiring in raw or unscaled modes where the calibration constants stored in the module are not applied to the data.