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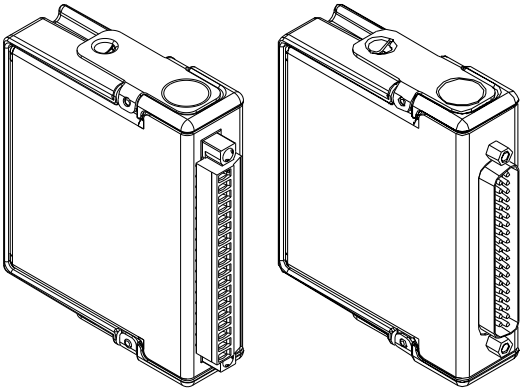
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Find the *National Instruments NI 9266* at our website: ***Click HERE***

DATASHEET

NI 9266 Datasheet

8 AO, 0 mA to 20 mA, 16 Bit Simultaneous



- DSUB or screw terminal connectivity
- 250 V RMS, CAT II, channel-to-earth isolation (screw terminal); 60 V DC, CAT I, channel-to-earth isolation (DSUB)
- 8 channels, 24 kS/s per channel simultaneous analog output
- 0 mA to 20 mA output range, 16-bit resolution
- Open-loop detection with interrupt, 0.0 mA power-on
- -40 °C to 70 °C operating range, 5 g vibration, 50 g shock

Note In this document, the NI 9266 with screw terminal and the NI 9266 with DSUB are referred to inclusively as the NI 9266.

The NI 9266 is ideal for interfacing and controlling industrial current-driven actuators. The module has built-in open-loop detection, which generates an interrupt in software when an open loop is detected as well as zeroing outputs to ensure safety and avoid driving actuators at system power on. The NI 9266 includes channel-to-earth ground isolation for safety and noise immunity.

Kit Contents	• NI 9266 • NI 9266 Getting Started Guide
Accessories	• NI 9928 Backshell Kit (784819-01) (Screw Terminal) OR • NI 9923 Front Mount Screw Terminal Block (DSUB) • DIN-Rail Mount Terminal Block (DSUB)

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C SERIES ANALOG OUTPUT FOR CONTROL APPLICATIONS MODULE COMPARISON								
Product Name	Module Type	Signal Ranges	Channels	Update Rate	Settling Time		Isolation	Connectivity
					Small Step	Full Scale		
NI 9263	Voltage Output	±10 V	4	100 kS/s/ch	10 µs	20 µs	250 Vrms CH-Earth	Screw-Terminal, Spring-Terminal
NI 9264	Voltage Output	±10 V	16	25 kS/s/ch	13 µs	20 µs	250 Vrms CH-Earth (Spring) 60 VDC CH-Earth (DSUB)	Spring-Terminal, 37-Pin DSUB
NI 9265	Current Output	0 mA to 20 mA	4	100 kS/s/ch	5 µs	10 µs	250 Vrms CH-Earth	Screw-Terminal, Spring-Terminal
NI 9266	Current Output	0 mA to 20 mA	8	24 kS/s/ch	40 µs	1000 µs	250 Vrms CH-Earth	Screw-Terminal
NI 9269	Voltage Output	±10 V	4	100 kS/s/ch	10 µs	20 µs	250 Vrms CH-CH 250 Vrms CH-Earth	Screw-Terminal

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.

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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.



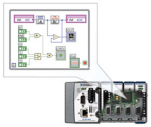
Software

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

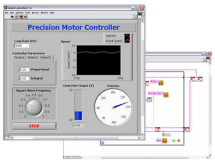
NI LabVIEW FPGA Module



- 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

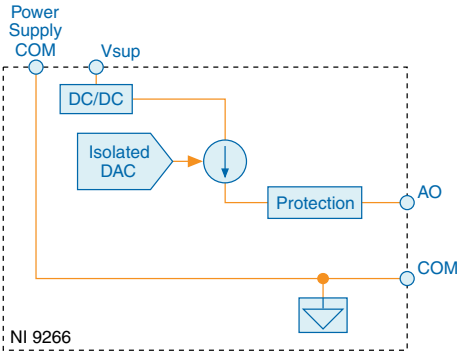
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NI LabVIEW Real-Time Module



- 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

Circuitry



- Each AO channel has a digital-to-analog converter (DAC) that produces a current signal.
- Each channel also has overvoltage and short-circuit protection.

Dynamic Power Supply Control

The NI 9266 uses a technique called dynamic power supply control featuring a DC-DC converter circuit, which allows reductions in power consumption from standard designs. The NI 9266 circuitry senses the output voltage and regulates the internal DC-DC converter in order to limit the power dissipation while maintaining the necessary compliance voltage for the given load and output current. The NI 9266 has a dedicated DC-DC converter for each channel, allowing it to dynamically adjust to a specific use case.

The DC-DC converters have a slower slew rate than linear stages, so the module will respond slower to a step response than a classic linear output module, resulting in slower settling times.

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Current Loop Status

The NI 9266 provides channel-based indicators for open current loop condition or if the loop is out of regulation. This could be the result of a wire disconnect or a violation of the maximum load or maximum compliance voltage. When an output channel is set to a nonzero current value, an Open Current Loop status bit corresponding to that channel can be read in software. The external power supply connected to the NI 9266 terminals is monitored for non-compliance to the voltage range shown in the Specifications section. The external power supply is part of the current loop, so a fault at the power supply terminals will also trigger the Open Current Loop status bits on all channels. The Power Supply Fault status bit can also be read in the software. Refer to the documentation for the software you are using with the NI 9266 for information about reading status indicators.

NI 9266 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 9266 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.

Output Characteristics

Number of channels	8 analog output channels
DAC resolution	16 bits
Type of DAC	String
Power-on output state	0
Startup current	0.0 mA
Power-down current	0.0 mA
Full-scale output current	
Minimum	20.3 mA
Typical	20.77 mA
Maximum	21.2 mA
Output range	0 mA to 20 mA
Compliance voltage[1]	12 V DC maximum
Maximum load	600 Ω

[1] The maximum voltage a current source can provide to the load.

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Table 1. Accuracy

Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range[2] (Offset Error)
Calibrated	Maximum (-40 °C to 70 °C)	0.27%	0.36%
	Typical (25 °C, ±5 °C)	0.035%	0.02%
Uncalibrated[3]	Maximum (-40 °C to 70 °C)	0.76%	1.4%
	Typical (25 °C, ±5 °C)	0.2%	0.64%

Stability	
Gain drift	35 ppm/°C
Offset drift	47 ppm/°C
External power supply voltage range (V_{sup}-to-COM)	9 V DC to 30 V DC
Protection (AO-to-COM, V_{sup}-to-COM)	
Overvoltage	±36 V
Short-circuit	Indefinitely

Table 2. Update Time

Number of Channels	Update Time for R Series Expansion Chassis	Update Time for Any Other Chassis
One	7.5 µs	6 µs
Four	26.5 µs	21.5 µs
Eight	51.5 µs	41.5 µs

Noise	600 nA RMS
Crosstalk	-90 dB
Settling time (to 1 LSB)	
Full-scale step	1 ms
1 mA step	40 µs
Glitch energy	Unmeasurable

[2] Range equals 0 mA to 20.77 mA.
[3] 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.

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Monotonicity	16 bits
DNL	1 LSB maximum
INL	±16 LSB
External power supply fault response time	100 ms
Open Current Loop response time	2.5 ms

Power Requirements

Power consumption from chassis	
Active mode	230 mW maximum
Sleep mode	25 µW maximum
Thermal dissipation (at 70 °C)	
Active mode	1.5 W maximum
Sleep mode	10 mW maximum
Power consumption from external power supply	
Active mode	3.1 W maximum[4]
Sleep mode	20 mW

NI 9266 with Screw Terminal Safety Voltages

Connect only voltages that are within the following limits:

AO-to-COM and V_{sup}-to-COM	±36 V DC maximum
Isolation	
Channel-to-channel	None
Channel-to-earth ground, V_{sup}-to-earth ground, or COM-to-earth ground	
Continuous	250 V RMS, Measurement Category II
Withstand up to 3,000 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 9266 with screw terminal to signals or use for measurements within Measurement Categories III or IV.

[4] When the NI 9266 outputs 20 mA into a 600 Ohms user load on all eight channels, 1.92 W are dissipated at the user load.

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NI 9266 with DSUB Safety Voltages

Connect only voltages that are within the following limits.

AO-to-COM and V_{sup}-to-COM	±36 V DC maximum
Isolation	
Channel-to-channel	None
Channel-to-earth ground	
Continuous	60 V DC, Measurement Category I
Withstand up to 3,000 m	1,000 V RMS, verified by a 5 s dielectric withstand test
Withstand up to 5,000 m	860 V RMS

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 9266 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.

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.

Screw-terminal wiring	
Gauge	0.05 mm^2 to 0.82 mm^2 (30 AWG to 18 AWG) copper conductor wire
Wire strip length	5 mm to 6 mm (0.20 in. to 0.24 in.) of insulation stripped from the end
Temperature rating	90 °C, minimum
Torque for screw terminals	0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.)

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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 1.0 mm^2
Connector securement	
Securement type	Screw flanges provided
Torque for screw flanges	0.3 N · m to 0.4 N · m (2.7 lb · in. to 3.5 lb · in.)
Weight	
NI 9266 with screw terminal	147 g (5.2 oz)
NI 9266 with DSUB	151 g (5.3 oz)

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
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions

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- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia and New Zealand (per CISPR 11) Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

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

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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	
NI 9266 with screw terminal	3,000 m
NI 9266 with DSUB	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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Calibration

You can obtain the calibration certificate and information about calibration services for the NI 9266 at *ni.com/calibration*.

Calibration interval	1 year

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