cDAQ-9138 Specifications

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NI cDAQ-9138 Specifications

These specifications are for the NI cDAQ-9138 controller only. These specifications are typical at 23 °C ±5 °C unless otherwise noted. For the C Series module specifications, refer to the documentation for the C Series module you are using.

Processor

CPU	Intel Celeron U3405
Number of cores	2
CPU frequency	1.06 GHz
On-die L2 cache	256 KB x2 (256 KB/core)
On-die L3 cache	2 MB shared between cores
Hyper-threading	Not supported

Operating System

Supported operating systems	Windows Embedded Standard 7 (WES7), LabVIEW Real-Time 2012 or later

Network/Ethernet Port

Number of ports	2
Network interface	10Base-T, 100Base-TX, and 1000Base-T Ethernet
Compatibility	IEEE 802.3
Communication rates	10 Mb/s, 100 Mb/s, 1,000 Mb/s auto-negotiated
Maximum cabling distance	100 m/segment

RS-232 Serial Port

Maximum baud rate	115,200 b/s
Data bits	5, 6, 7, 8
Stop bits	1, 2
Parity	Odd, even, mark, space
Flow control	RTS/CTS, XON/XOFF, DTR/DSR
RI wake maximum low level	0.8 V

RI wake minimum high level	2.4 V
RI overvoltage tolerance	±24 V

RS-485/422 (DTE) Serial Port

Maximum baud rate	320,400 bit/s
Data bits	5, 6, 7, 8
Stop bits	1, 1.5, 2
Parity	Odd, Even, Mark, Space
Flow control	XON/XOFF
Wire mode	4-wire, 2-wire, 2-wire auto

MXI-Express Port

Communication rate	2.5 Gbit/s, PCIe x1
Maximum cabling distance	7 m

USB Ports

Number of ports	4
USB interface	USB 2.0, Hi-Speed
Maximum data rate	480 Mbit/s
Maximum current	500 mA

Video (VGA) Port

Maximum resolution	1600 × 1200 at 60 Hz

Memory

Nonvolatile	32 GB [1], [2]
DDR3 system memory	2 GB

Note For information about the life span of the nonvolatile memory and about best practices for using nonvolatile memory, go to `ni.com/info` and enter Info Code `ssdbp`.

Data throughput
System memory to internal storage[1],[3]

Read	85 MB/s
Write	60 MB/s
Module slots to system memory[1]	24 MB/s, application and system dependent

Internal Real-Time Clock

Accuracy	140 ppm, maximum, at operating temperature range

CMOS Battery

Typical battery life with power applied to power connector	10 years
Typical battery life when stored at temperatures up to 25 °C	7.8 years
Typical battery life when stored at temperatures up to 85 °C	5.4 years

Analog Input

Input FIFO size	127 samples per slot
Maximum sample rate[4]	Determined by the C Series module or modules

Timing accuracy[5]	50 ppm of sample rate
Timing resolution[5]	12.5 ns
Number of channels supported	Determined by the C Series module or modules

Analog Output

Number of channels supported		
Hardware-timed task		
Onboard regeneration	16	
Non-regeneration	Determined by the C Series module or modules	
Non-hardware-timed task	Determined by the C Series module or modules	
Maximum update rate		
Onboard regeneration	1.6 MS/s (multi-channel, aggregate)	
Non-regeneration	Determined by the C Series module or modules	
Timing accuracy	50 ppm of sample rate	
Timing resolution	12.5 ns	
Output FIFO size		

Onboard regeneration	8,191 samples shared among channels used
Non-regeneration	127 samples per slot
AO waveform modes	Non-periodic waveform, periodic waveform regeneration mode from onboard memory, periodic waveform regeneration from host buffer including dynamic update

Digital Waveform Characteristics

Waveform acquisition (DI) FIFO	
Parallel modules	511 samples per slot
Serial modules	63 samples per slot
Waveform generation (DO) FIFO	
Parallel modules	
Slots 1 to 4	2,047 samples per slot
Slots 5 to 8	1,023 samples per slot
Serial modules	63 samples per slot

Note When parallel modules in a digital task are in slots 1 through 4, FIFO is 2,047 samples per slot for all slots. When any parallel module in a digital task

> is in slots 5 through 8, FIFO is 1,023 samples per slot for all eight slots.

Digital input sample clock frequency	
Streaming to application memory	System-dependent
Finite	0 MHz to 10 MHz
Digital output sample clock frequency	
Streaming from application memory	System-dependent
Regeneration from FIFO	0 MHz to 10 MHz
Finite	0 MHz to 10 MHz
Timing accuracy	50 ppm

General-Purpose Counters/Timers

Number of counters/ timers	4
Resolution	32 bits
Counter measurements	Edge counting, pulse, semi-period, period, two-edge separation, pulse width

Position measurements	X1, X2, X4 quadrature encoding with Channel Z reloading; two-pulse encoding
Output applications	Pulse, pulse train with dynamic updates, frequency division, equivalent time sampling
Internal base clocks	80 MHz, 20 MHz, 100 kHz
External base clock frequency	0 MHz to 20 MHz
Base clock accuracy	50 ppm
Output frequency	0 MHz to 20 MHz
Inputs	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down
Routing options for inputs	Any module PFI,analog trigger, many internal signals
FIFO	Dedicated 127-sample FIFO

Frequency Generator

Number of channels	1

Base clocks	20 MHz, 10 MHz, 100 kHz
Divisors	1 to 16 (integers)
Base clock accuracy	50 ppm
Output	Any module PFI terminal

Module PFI Characteristics

Functionality	Static digital input, static digital output, timing input, and timing output
Timing output sources[6]	Many analog input, analog output, counter, digital input, and digital output timing signals
Timing input frequency	0 MHz to 20 MHz
Timing output frequency	0 MHz to 20 MHz

Digital Triggers

Source	Any module PFI terminal
Polarity	Software-selectable for most signals

Analog input function	Start Trigger, Reference Trigger,Pause Trigger,Sample Clock,Sample Clock Timebase
Analog output function	Start Trigger, Pause Trigger,Sample Clock,Sample Clock Timebase
Counter/timer function	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down

Module Data Interface

High-performance data streams	7
Data stream types available	Analog input, analog output, digital input, digital output, counter/timer input, counter/timer output, NI-XNET[7]

Module I/O States

At power-on	Module-dependent. Refer to the documentation for each C Series module.

Power Requirements

You must use a UL Listed ITE power supply marked ***LPS*** with the NI cDAQ-9138.

Note Some C Series modules have additional power requirements. For more information about C Series module power requirements, refer to the C Series module(s) documentation.

Note Sleep mode for C Series modules is not supported in the NI cDAQ-9138.

Voltage input range	9 V to 30 V (measured at the NI cDAQ-9138 power connector)
Maximum power consumption[8]	75 W

Note The maximum power consumption specification is based on a fully populated system running a high-stress application at elevated ambient temperature, and with all C Series modules, CXM devices, and USB devices consuming the maximum allowed power.

Typical standby power consumption	2 W
Recommended power supply	100 W, 24 V DC
Typical leakage current from secondary power input (V2) while system is powered from primary power input (V1)	
At 9 V	0.5 mA
At 30 V	2.7 mA

Caution Do ***not*** connect V2 to a DC mains supply or to any supply requiring a connecting cable longer than 3 m (10 ft). A DC mains supply is a local DC electricity supply network in the infrastructure of a site or building.

EMC ratings for inputs as described in IEC 61000

V1	Short lines, long lines, and DC distributed networks
V2	Short lines only

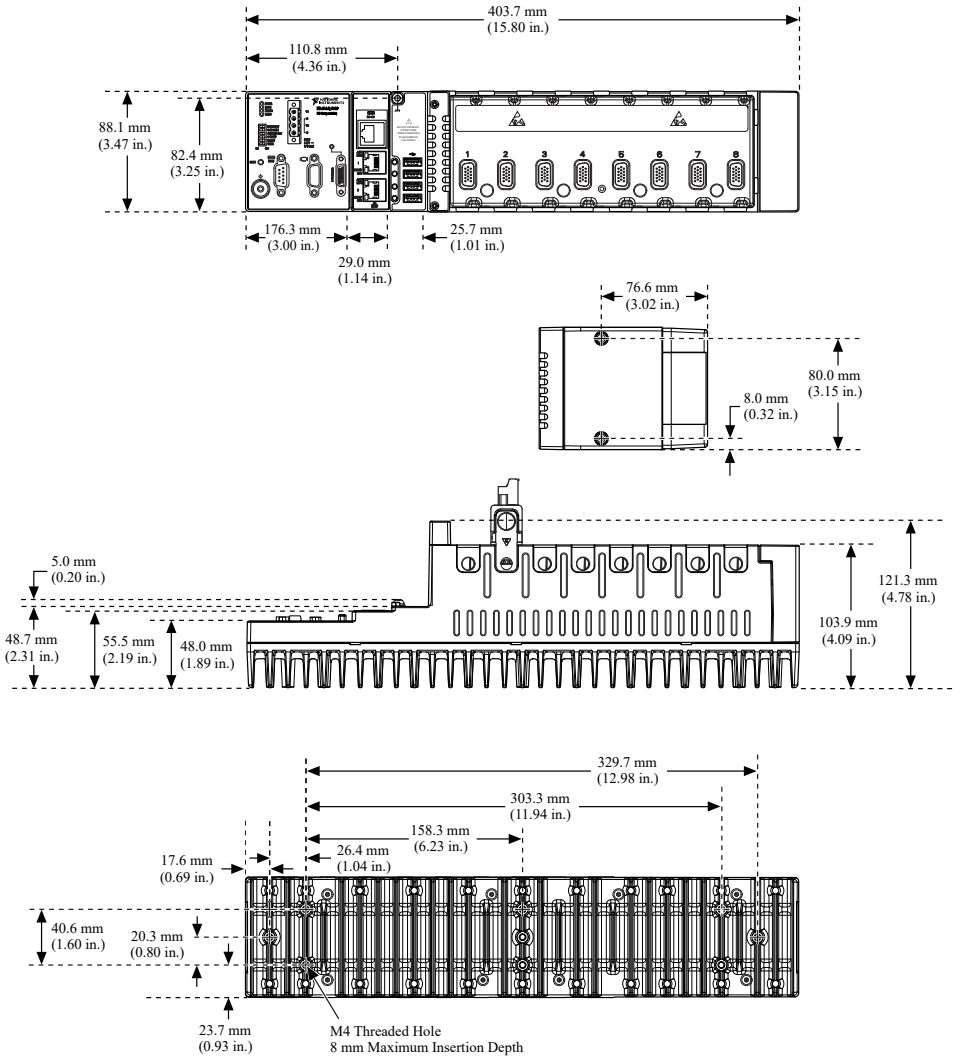
Power input connector	4 positions 5.08 mm pitch pluggable screw terminal with screw locks similar to Phoenix Contact 1955769
Power input mating connector	Phoenix Contact 1704001 or equivalent

Physical Characteristics

Weight (unloaded)	2.8 kg (6.16 lb)
Dimensions (unloaded)	403.7 mm × 88.1 mm × 121.3 mm (15.80 in. × 3.47 in. × 4.78 in.) Refer to the following figure.
Gauge	3.0 mm^2 (12 AWG) copper conductor wire
Wire strip length	7 mm (0.276 in.) of insulation stripped from the end
Temperature rating	85 °C
Torque for screw terminals	0.5 N · m to 0.6 N · m (4.4 lb · in. to 5.3 lb · in.)

Wires per screw terminal	One wire per screw terminal
Connector securement	
Securement type	Screw flanges provided
Torque for screw flanges	0.5 N · m (4.4 lb · in.)

Figure 1. NI cDAQ-9138 Dimensions



Safety Voltages

Connect only voltages that are below these limits.

V1 terminal to C terminal	30 V maximum, Measurement Category I
V2 terminal to C terminal	30 V maximum, Measurement Category I
Chassis ground to C terminal	30 V maximum, Measurement Category I
Isolation voltage, RS-485/422 (DTE) serial port to earth ground	
Continuous	60 V DC, Measurement Category I
Withstand	1,000 V RMS, verified by a 5 s dielectric withstand test

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.

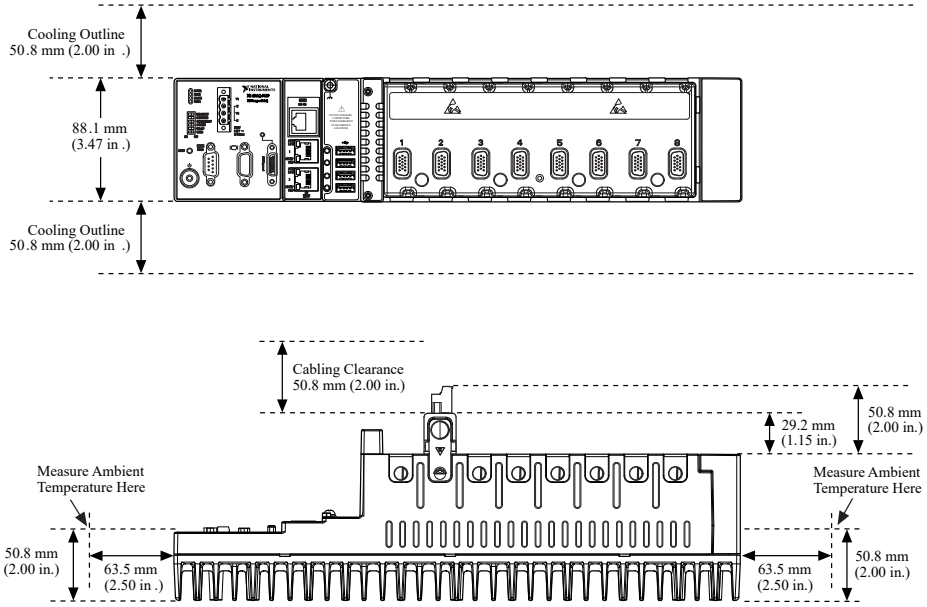
Environmental

Temperature (IEC 60068-2-1 and IEC 60068-2-2)	
Operating	0 °C to 45 °C
Operating with NI panel mount kit (part number 781919-01)	0 °C to 55 °C
Storage	-40 °C to 85 °C

Caution Failure to follow the mounting instructions in the ***NI cDAQ-9138/9139 User Manual*** can cause temperature derating. For more information about mounting configurations and temperature derating, go to `ni.com/info` and enter Info Code `cdaqmounting`.

Note The NI cDAQ-9138 was designed and tested in multiple mounting configurations. The varied mounting orientations or configurations can reduce the maximum allowable ambient temperature and can affect the accuracy of C Series modules in the chassis. Visit `ni.com/info` and enter the Info Code `cdaqmounting` for more information about mounting and accuracy.

Figure 2. NI cDAQ-9138 Temperature, Cooling, and Cabling Dimensions



Humidity (IEC 60068-2-56)	
Operating	10% to 90% RH, noncondensing
Storage	5% to 95% RH, noncondensing
Ingress protection	IP 20

Pollution Degree (IEC 60664)	2
Maximum altitude	2,000 m

Indoor use only.

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 12 ATEX 1202658X IECEx UL 14.0089X

Shock and Vibration

To meet these specifications, you must panel mount the NI cDAQ-9138 system, affix ferrules to the ends of the terminal wires, and install a tie wrap on the USB cable for strain relief. You can use the tie wrap to attach the USB cable to the Ethernet cable.

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

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

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.

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.

Battery Replacement and Disposal

- **Battery Directive**—This product contains a long-life coin cell battery. If you need to replace it, use the Return Material Authorization (RMA) process or contact an authorized NI service representative. For more information about compliance with the EU Battery Directive 2006/66/EC about Batteries and Accumulators and Waste Batteries and Accumulators, visit ni.com/environment/batterydirective.

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`.)