

## SPECIFICATIONS

# NI cDAQ™-9188

8-Slot, Ethernet CompactDAQ Chassis

## Definitions

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*Warranted* specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

*Characteristics* describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- *Typical* specifications describe the expected performance met by a majority of the models.
- *Nominal* specifications describe parameters and attributes that may be useful in operation.

Specifications are *Typical* unless otherwise noted.

## Conditions

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Specifications are valid at 25 °C unless otherwise noted.

## Analog Input

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Input FIFO size	127 samples per slot
Maximum sample rate <sup>1</sup>	Determined by the C Series module or modules
Timing accuracy <sup>2</sup>	50 ppm of sample rate
Timing resolution <sup>2</sup>	12.5 ns
Number of channels supported	Determined by the C Series module or modules

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<sup>1</sup> Performance dependent on type of installed C Series module and number of channels in the task.

<sup>2</sup> Does not include group delay. For more information, refer to the documentation for each C Series module.

# Analog Output

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## Number of channels supported

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### Hardware-timed task

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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

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Onboard regeneration

1.6 MS/s (multi-channel, aggregate)

Non-regeneration

Determined by the C Series module or modules

## Timing accuracy

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50 ppm of sample rate

## Timing resolution

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12.5 ns

## Output FIFO size

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Onboard regeneration

8,191 samples shared among channels used

Non-regeneration

127 samples per slot

## AO waveform modes

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Non-periodic waveform,  
periodic waveform regeneration mode from  
onboard memory,  
periodic waveform regeneration from host  
buffer including dynamic update

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# Digital Waveform Characteristics

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## Waveform acquisition (DI) FIFO

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Parallel modules

511 samples per slot

Serial modules

63 samples per slot

## Waveform generation (DO) FIFO

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Parallel modules

Slots 1 to 4

2,047 samples per slot

Slots 5 to 8

1,023 samples per slot

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**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, chassis PFI, analog trigger, many internal signals
FIFO	Dedicated 127-sample FIFO

# Frequency Generator

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

## Module PFI Characteristics

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Functionality	Static digital input, static digital output, timing input, and timing output
Timing output sources <sup>3</sup>	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

## Chassis PFI Characteristics

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Maximum input or output frequency	1 MHz
Cable length	3 m (10 ft)
Cable impedance	50 $\Omega$
PFI 0, PFI 1 connectors	BNC
Power-on state	High impedance

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<sup>3</sup> Actual available signals are dependent on type of installed C Series module.

**Table 1. Input/Output Voltage Protection**

Voltage	Minimum	Maximum
Input	-20 V	25 V
Output	-15 V	20 V

Maximum operating conditions<sup>4</sup>

$I_{OL}$ output low current	8 mA maximum
$I_{OH}$ output high current	-8 mA maximum

**Table 2. DC Input Characteristics**

Voltage	Minimum	Maximum
Positive going threshold	1.43 V	2.28 V
Negative going threshold	0.86 V	1.53 V
Hysteresis	0.48 V	0.87 V

**Table 3. DC Output Characteristics**

Voltage	Conditions	Minimum	Maximum
High	—	—	5.25 V
	Sourcing 100 $\mu$ A	4.65 V	—
	Sourcing 2 mA	3.60 V	—
	Sourcing 3.5 mA	3.44 V	—
Low	Sinking 100 $\mu$ A	—	0.10 V
	Sinking 2 mA	—	0.64 V
	Sinking 3.5 mA	—	0.80 V

## Digital Triggers

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

<sup>4</sup> Stresses beyond those listed under *Maximum operating conditions* may cause permanent damage to the chassis.

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 I/O States

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

Network protocols	TCP/IP, UDP
Network ports used	HTTP:80 (configuration only), TCP:3580; UDP:5353 (configuration only), TCP:5353 (configuration only); TCP:31415; UDP:7865 (configuration only), UDP:8473 (configuration only)
Network IP configuration	DHCP + Link-Local, DHCP, Static, Link-Local
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 <sup>5</sup>
Default MTU size	1500 bytes
Jumbo frame support	Up to 9000 bytes

<sup>5</sup> When a session is active, CAN or LIN (NI-XNET) C Series modules use a total of two data streams regardless of the number of NI-XNET modules in the chassis.

# Ethernet

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Network interface	1000 Base-TX, full-duplex; 1000 Base-TX, half-duplex; 100 Base-TX, full-duplex; 100 Base-TX, half-duplex; 10 Base-T, full-duplex; 10 Base-T, half-duplex
Communication rates	10/100/1000 Mbps, auto-negotiated
Maximum cabling distance	100 m/segment

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## Power Requirements

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**Caution** The protection provided by the NI cDAQ-9188 chassis can be impaired if it is used in a manner not described in the *NI cDAQ-9181/9184/9188/9191 User Manual*.



**Note** Some C Series modules have additional power requirements. For more information about C Series module power requirements, refer to the documentation for each C Series module.



**Note** Sleep mode for C Series modules is not supported in the NI cDAQ-9188.

Voltage input range	9 V to 30 V
Maximum power consumption <sup>6</sup>	15 W

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**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 consuming the maximum allowed power.

Power input connector	2 positions 3.5 mm pitch mini-combicon screw terminal with screw flanges, Sauro CTMH020F8-0N002
Power input mating connector	Sauro CTF020V8, Phoenix Contact 1714977, or equivalent

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<sup>6</sup> Includes maximum 1 W module load per slot across rated temperature and product variations.

# Physical Characteristics

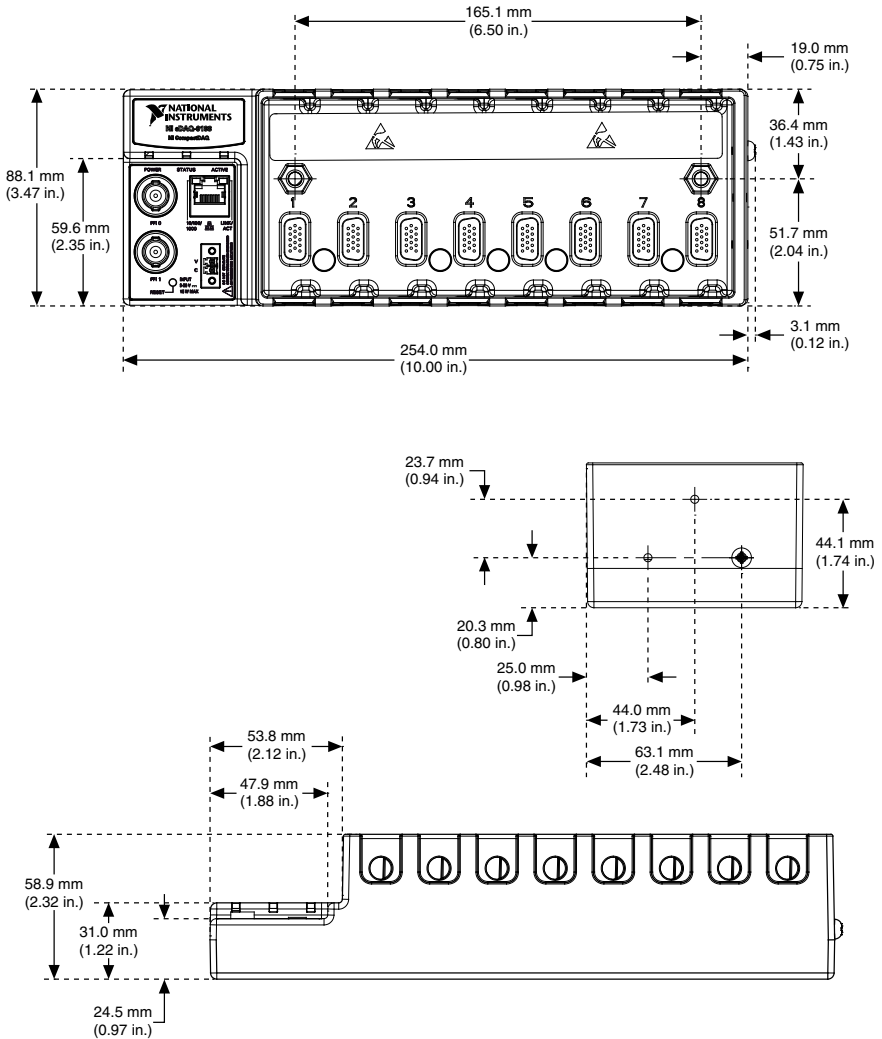
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Weight (unloaded)	Approximately 900 g (31.7 oz)
Dimensions (unloaded)	254.0 mm × 88.1 mm × 58.9 mm (10.00 in. × 3.47 in. × 2.32 in.) Refer to the following figure.
Screw-terminal wiring	
Gauge	0.5 mm <sup>2</sup> to 2.1 mm <sup>2</sup> (20 AWG to 14 AWG) copper conductor wire
Wire strip length	6 mm (0.24 in.) of insulation stripped from the end
Temperature rating	85 °C
Torque for screw terminals	0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.)
Wires per screw terminal	One wire per screw terminal
Connector securement	
Securement type	Screw flanges provided
Torque for screw flanges	0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.)

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



**Figure 1. NI cDAQ-9188 Dimensions**



## Safety Voltages

Connect only voltages that are within these limits.

V terminal to C terminal

30 V maximum, Measurement Category I

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 system to signals or use for measurements within Measurement Categories II, III, or IV.



**Note** Measurement Categories CAT I and CAT O (Other) are equivalent. These test and measurement circuits are not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

## Environmental

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Operating temperature (IEC 60068-2-1 and IEC 60068-2-2)      -20 °C to 55 °C<sup>7</sup>

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**Caution** To maintain product performance and accuracy specifications when the ambient temperature is between 45 and 55 °C, you must mount the chassis horizontally to a metal panel or surface using the screw holes or the panel mount kit. Measure the ambient temperature at each side of the CompactDAQ system 63.5 mm (2.5 in.) from the side and 25.4 mm (1.0 in.) from the rear cover of the system. For further information about mounting configurations, go to [ni.com/info](http://ni.com/info) and enter the Info Code `cdaqmounting`.

Storage temperature (IEC 60068-2-1 and IEC 60068-2-2)      -40 °C to 85 °C

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Ingress protection      IP 30

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Operating humidity (IEC 60068-2-56)      10% to 90% RH, noncondensing

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Storage humidity (IEC 60068-2-56)      5% to 95% RH, noncondensing

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Pollution Degree (IEC 60664)      2

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Maximum altitude      5,000 m

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Indoor use only.

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<sup>7</sup> When operating the NI cDAQ-9188 in temperatures below 0 °C, you must use the PS-15 power supply or another power supply rated for below 0 °C.

# Hazardous Locations

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

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# Shock and Vibration

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To meet these specifications, you must direct mount the NI cDAQ-9188 system and affix ferrules to the ends of the terminal lines.

Operational shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)
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## Random vibration

Operating	5 Hz to 500 Hz, 0.3 g <sub>rms</sub>
Non-operating	5 Hz to 500 Hz, 2.4 g <sub>rms</sub> (Tested in accordance with IEC 60068-2-64. Non-operating test profile exceeds the requirements of MIL PRF-28800F, Class 3.)

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# Safety and Hazardous Locations Standards

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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 60079-0:2011, CSA 60079-15:2012



**Note** For UL and other safety certifications, refer to the product label or the [Online Product Certification](#) section.

# Electromagnetic Compatibility

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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; Basic 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
- 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

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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

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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](https://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

# Environmental Management

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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](https://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](https://ni.com/environment/weee).

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