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## NI CompactDAQ

### Ethernet Data Acquisition System



- Measure up to 256 channels of sensor, analog I/O, and digital I/O signals
- Choose from more than 50 hot-swappable I/O modules with integrated signal conditioning
- Run up to seven hardware-timed measurement I/O tasks simultaneously
- Stream continuous waveform I/O with patented NI Signal Streaming technology
- Standard IEEE 802.3ab Gigabit Ethernet communication interface
- Access four 32-bit advanced general-purpose counters built into the chassis
- Simplify setup with zero configuration networking and Web-based configuration
- BNC digital I/O connections for up to 1 MHz clock import/export and triggers

### Overview

#### Simple, Complete Ethernet Data Acquisition

The NI cDAQ-9188 is an 8-slot NI CompactDAQ Gigabit Ethernet chassis designed for remote or distributed sensor and electrical measurements. A single NI CompactDAQ chassis can measure up to 256 channels of sensor signals, analog I/O, digital I/O, and counter/timers with an Ethernet interface back to a host PC or laptop. By combining more than 50 sensor-specific NI C Series I/O modules with patented NI Signal Streaming technology, the NI CompactDAQ platform delivers high-speed data and ease of use in a flexible, mixed-measurement system. Modules are available for a variety of sensor measurements including thermocouples, RTDs, strain gages, load and pressure transducers, torque cells, accelerometers, flow meters, and microphones. In addition, with NI-DAQmx driver software, you can log data for simple experiments on the benchtop or deploy a distributed test system across the factory floor using NI LabVIEW, ANSI C/C++, Visual Basic .NET, and other programming environments.

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### Application and Technology

#### Mix Analog, Digital, and Sensor Measurements in the Same System

Many devices can measure temperature, voltage, or bridge-based sensors, but NI CompactDAQ can integrate all of these measurements and more into a single device that outputs all of the data via the same bus interface. With an NI CompactDAQ system, you can mix multiplexed voltage input signals, simultaneously sampled accelerometers, low-speed thermocouples, and TTL digital I/O all in the same chassis using the same driver, NI-DAQmx. NI CompactDAQ makes programming easier because you use the same driver for all measurements. This solution saves space and simplifies service and support.



Figure 1. The NI cDAQ-9188 Ethernet chassis can hold up to eight analog I/O, digital I/O, or sensor measurement modules.

## More Than 50 C Series Modules

You can choose from more than 50 NI C Series modules for different measurements including thermocouple, voltage, resistance temperature detector (RTD), current, resistance, strain, digital (TTL and other), accelerometers, and microphones. Each C Series module combines sensor connectivity, signal conditioning, and A/D converters into a small 2.8 by 3.5 in. package. Channel counts on the individual modules range from three to 32 channels to accommodate a wide variety of system requirements. With eight slots to fill per chassis, you can tailor each NI CompactDAQ system to your unique application needs.



Figure 2. You can choose from more than 50 NI C Series measurement modules.

## Long-Distance Ethernet Data Acquisition

The convenience and reliability of Ethernet technology are as familiar to most as those of USB. For data acquisition, however, Ethernet offers two advantages when compared to other common PC peripheral buses: long cabling lengths and distributed infrastructure. Ethernet is ideal for taking measurements at distances beyond the 5 m limit of a USB cable. A single CAT 5E cable can reach 100 m before needing a switch or router to carry the signal farther. Furthermore, many IT departments have standardized on Gigabit Ethernet (IEEE 802.3ab) as the backbone for their corporate networks. With NI CompactDAQ, you can take advantage of that existing infrastructure and additional network bandwidth for your remote or distributed measurement applications. One host computer can manage multiple test stations within the same facility or across multiple sites.



Figure 3. The cDAQ-9188 chassis uses a standard 10/100 Ethernet or Gigabit Ethernet connection to communicate with a host PC or laptop.

## Rugged Design

NI CompactDAQ and all C Series modules are constructed from A380 cast aluminum for a rugged system that can withstand operating temperatures from -20 to 55 °C, and up to 30 g of shock. NI CompactDAQ was built to be used in the lab but not to necessarily stay there. With a rugged, flexible system such as NI CompactDAQ, you can reconfigure and move a single test system from place to place without having to purchase different equipment for every lab or test stand. C Series modules are equally rugged and designed with spring-loaded latches to lock into place when installed in the chassis. The shock and vibration specifications are all tested on an NI CompactDAQ system with modules installed, so modules do not fall out or come undocked under the specified conditions. The rugged features of NI CompactDAQ help you quickly begin testing because less time is needed to prepare the instrumentation for the rigors of field testing.

## Four 32-Bit General-Purpose Counters

The cDAQ-9188 chassis has four 32-bit counters built in. These counters are accessed through an installed hardware-timed digital I/O module (sold separately) such as the NI 9401 or NI 9402. Once you have installed the digital module, you can create a counter task in software for operations such as quadrature encoder, period and frequency measurement, or finite pulse train and PWM generation. For some operations, you can access the counters in the cDAQ-9188 chassis through the built-in BNC connectors on the chassis.

## Multiple Timing Engines to Acquire from Different Modules at Different Rates

With the cDAQ-9188 chassis, you can install a thermocouple module next to an accelerometer measurement module and acquire from both simultaneously at different rates. The cDAQ-9188 chassis have multiple analog input timing engines, which means you can group all of your analog input modules in up to three sets of modules. These sets, known as tasks, can all run at different rates because each one has its own timing engine in the chassis back plane. This alleviates the need to decimate or parse lower-speed data from the higher-speed data as you need to do for devices with only one timing engine or ADC.

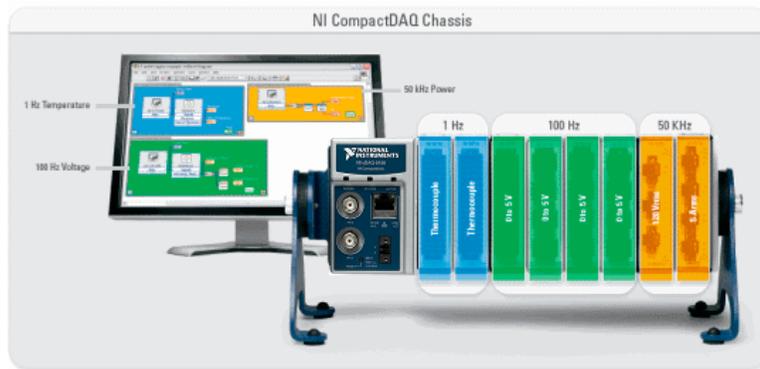


Figure 4. Run multiple tasks at different sampling rates in independent parallel loops.

## NI Signal Streaming Technology

To take advantage of the 1,000 Mbit/s of bandwidth on a Gigabit Ethernet network, NI CompactDAQ chassis implement a TCP/IP version of the same patented NI Signal Streaming technology on high-performance NI USB data acquisition (DAQ) products. With this technology, high-speed C Series modules, such as the NI 9223, can continuously acquire up to 1 MS/s of simultaneous 16-bit data on each of four channels. Furthermore, multiple NI CompactDAQ chassis can share the same Gigabit Ethernet network for distributed, high-channel-count systems. Using a sophisticated software architecture, NI-DAQmx driver software maintains a double-buffered transfer mechanism between the chassis and host computer capable of sustaining several bidirectional continuous waveforms. At the same time, the driver monitors the state of the network to adjust for unexpected delays or temporary interruptions. All of this is abstracted from the user, so you can focus on the measurement application and not the network.

## Zero Configuration Networking

To make networking technology more accessible to the non-IT professional, NI CompactDAQ uses the Zero Configuration Networking (Zeroconf) collection of standards. With Zeroconf technology, you can plug an NI CompactDAQ system directly into your computer or local subnet, and it appears automatically in NI Measurement & Automation Explorer (MAX) without any network setup or configuration. In addition, a new Web configuration interface built into the cDAQ-9188 provides the ability to manage your system through a Web browser without installing any software on your host machine.

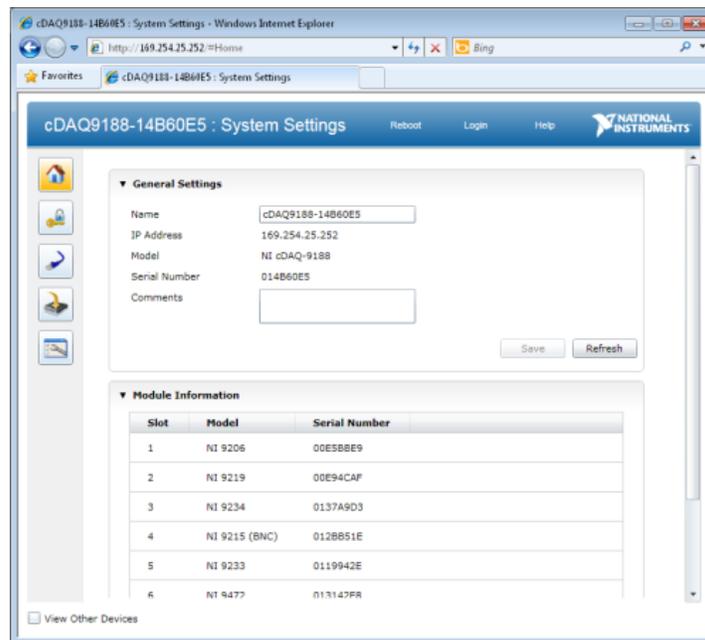


Figure 5. With the embedded Web server on the cDAQ-9188 chassis, you can remotely configure your NI CompactDAQ system from a Web browser.

## NI-DAQmx Software Flexibility

Recognizing the diversity of measurement applications, NI approaches programmatic data acquisition independent of specific PC bus technologies. You can use the same NI-DAQmx driver software to communicate with NI data acquisition hardware across PCI, PCI Express, PXI, PXI Express, USB, Ethernet, and Wi-Fi. You can use an application developed for an NI CompactDAQ USB system with an NI CompactDAQ Ethernet system without making any changes to your software. Furthermore, the NI-DAQmx API is consistent across multiple programming platforms, so you can develop an application for NI CompactDAQ in NI LabVIEW, ANSI C/C++, C#, or Microsoft Visual Basic .NET.



**Figure 6.** NI-DAQmx driver software abstracts data acquisition bus technology and provides a consistent API across multiple programming languages.

National Instruments recommends using the latest version of NI-DAQmx driver software for application development in NI LabVIEW, LabVIEW SignalExpress, LabWindows™/CVI, and Measurement Studio software. To obtain the latest version of NI-DAQmx, visit [ni.com/support/daq/versions](http://ni.com/support/daq/versions). NI measurement services software speeds up your development with features including the following:

- A configuration-based interface to create fast and accurate measurements with no programming using the DAQ Assistant
- Automatic code generation to create your application in LabVIEW; LabWindows/CVI; LabVIEW SignalExpress; and C#, Visual Studio .NET, ANSI C/C++, or Visual Basic using Measurement Studio
- Multithreaded streaming technology for 1,000 times performance improvements
- More than 3,000 free software downloads that are available at [ni.com/zone](http://ni.com/zone) to jump-start your project
- A single programming interface for hundreds of PCI, PXI, USB, Ethernet, and Wi-Fi data acquisition hardware devices

NI CompactDAQ Ethernet chassis are compatible with the following versions (or later) of NI application software: LabVIEW 8.6, LabWindows/CVI 8.x, and Measurement Studio 8.x. They are also compatible with ANSI C/C++, C#, and Visual Basic .NET.

## Shipping Kit Contents

Every cDAQ-9188 shipping kit includes the following:

- cDAQ-9188 eight-slot NI CompactDAQ Gigabit Ethernet chassis
- 12 VDC power supply (**region-specific power cord not included**)
- NI-DAQmx 9.2 (or later) software DVD for Windows 7/Vista/XP
- LabVIEW SignalExpress LE data-logging software
- NI cDAQ-9188 Quick Start flyer
- NI screwdriver (flat and Phillips head)

## Accessories



Desktop Mounting Kit (779473-01)



DIN-Rail Mounting Kit (779018-01)



Panel Mounting Kit (779558-01)



Rugged Carrying Case (780315-01)



Industrial Wireless Client/Access Point/Bridge (780036-01, 780037-01)



Industrial Power Supplies (781093-01, 781094-01, 781095-01)

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## Ordering Information

For a complete list of accessories, visit the product page on [ni.com](http://ni.com).

Products	Part Number	Recommended Accessories	Part Number
<b>Industrial Wireless Client/Access Point/Bridge</b>			
NI WAP-3701 802.11g (N. America)	780036-01	No accessories required.	
NI WAP-3711 802.11g (International)	780037-01	No accessories required.	
<b>Accessories</b>			
Panel Mounting Kit	779558-01	No accessories required.	
Rugged Carrying Case	780315-01	No accessories required.	
Filler Module for Empty Slots	196917-01	No accessories required.	

<b>Replacement/Spare Power Supply</b>	780703-01	No accessories required.
<b>Desktop Mounting Kit</b>	779473-01	No accessories required.
<b>DIN-Rail Mounting Kit</b>	779018-01	No accessories required.
<b>NI CompactDAQ Ethernet Chassis</b>		
<b>cDAQ-9188 8 slot chassis</b>	781424-01	No accessories required.
<b>Power Cords (Not Included in Shipping Kit)</b>		
<b>UK, 240 VAC</b>	763064-01	No accessories required.
<b>North America, 240 VAC</b>	763068-01	No accessories required.
<b>U.S., 120 VAC</b>	763000-01	No accessories required.
<b>Japan, 100 VAC</b>	763634-01	No accessories required.
<b>Switzerland, 220 VAC</b>	763065-01	No accessories required.
<b>Europe, 240 VAC</b>	763067-01	No accessories required.
<b>Australia, 240 VAC</b>	763066-01	No accessories required.

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## Support and Services

### System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at [ni.com/advisor](http://ni.com/advisor) to find a system assurance program to meet your needs.

### Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit [ni.com/calibration](http://ni.com/calibration).

### Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit [ni.com/support](http://ni.com/support) to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit [forums.ni.com](http://forums.ni.com) for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit [community.ni.com](http://community.ni.com) to find, contribute, or collaborate on customer-contributed technical content with users like you.

### Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit [ni.com/repair](http://ni.com/repair).

### Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit [ni.com/training](http://ni.com/training) for more information.

### Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit [ni.com/warranty](http://ni.com/warranty).

### OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit [ni.com/oem](http://ni.com/oem).

### Alliance

## Detailed Specifications

These specifications are for the NI cDAQ-9181/9188/9191 chassis only.

These specifications are typical at 25 °C unless otherwise noted. For the C Series I/O module specifications, refer to the documentation for the C Series I/O module you are using.

### Analog Input

Input FIFO size	127 samples per slot
Sample rate <sup>1</sup>	
Maximum	Determined by the C Series I/O 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 I/O modules

### Analog Output

Numbers of channels supported	
In hardware-timed task using onboard regeneration	16
In hardware-timed task not using onboard regeneration	Determined by the C Series I/O modules
In non-hardware-timed task	Determined by the C Series I/O modules
Maximum update rate	
Regeneration	1.6 MS/s (multi-channel, aggregate)
Non-regeneration	Determined by the C Series I/O 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	127 samples per slot
Waveform generation (DO) FIFO	
Slots 1–4	2,047 samples
Slots 5–8	1,023 samples

 **Note (NI cDAQ-9188)** When modules are installed in slots 1 through 4, FIFO is 2,047 samples per slot for all slots. When any module is installed 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 - 10 MHz
Digital output sample clock frequency	
Streaming from application memory	System-dependent

Regeneration from FIFO	0 - 10 MHz
Finite	0 - 10 MHz
<b>General-Purpose Counter/Timers</b>	
Number of counter/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 - 20 MHz
Base clock accuracy	50 ppm
Output frequency	0 - 20 MHz
Inputs	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down
Routing options for inputs	Any PFI, analog trigger, many internal signals
FIFO	Dedicated 127-sample FIFO

### Frequency Generator

Number of channels	1
Base clocks	10 MHz, 20 MHz, 100 kHz
Divisors	1 - 16 (integers)
Base clock accuracy	50 ppm
Output is available on any PFI terminal.	

### Module PFI Characteristics

Functionality	Static digital input, static digital output, timing input, and timing output
Timing output sources	Many analog input, analog output, counter, digital input, and digital output timing signals
Timing input frequency	0 - 20 MHz
Timing output frequency	0 - 20 MHz

### Chassis PFI Characteristics (NI cDAQ-9188)

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

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

### Maximum operating conditions

Level	Minimum	Maximum
$I_{OL}$ output low current	--	8 mA
$I_{OH}$ output high current	--	-8 mA

### DC input characteristics

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

Cable length 3 m (10 ft.)

DC output characteristics

Level	Conditions	Minimum	Maximum
High	--	--	5.25 V
High	Sourcing 100 $\mu$ A	4.65 V	--
High	Sourcing 2 mA	3.60 V	--
High	Sourcing 3.5 mA	3.44 V	--
Low	Sinking 100 $\mu$ A	--	0.10 V
Low	Sinking 2 mA	--	0.64 V
Low	Sinking 3.5 mA	--	0.8 V

**Digital Triggers**

Source

NI cDAQ-9181/9191	Any PFI terminal
NI cDAQ-9188	Any chassis PFI BNC or 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 functions

Gate, Source, HW\_Arm, Aux, A, B, Z, Up\_Down

**Module I/O States**

At power-on

Module-dependent. Refer to C Series I/O module(s) documentation.

**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

NI cDAQ-9181/9191	7
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Data stream types available	Analog input, analog output, digital input, digital output, counter/timer input, counter/timer output
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Default MTU size

1500

NI cDAQ-9188 jumbo frame support

Up to 9000

**Ethernet**

Network interface

NI cDAQ-9181/9191	100 Base-TX, full-duplex; 100 Base-TX, half-duplex; 10 Base-T, full-duplex; 10 Base-T, half-duplex
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NI cDAQ-9188	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
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Communication rates

NI cDAQ-9181/9191	10/100 Mbps, auto-negotiated
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NI cDAQ-9188	10/100/1000 Mbps, auto-negotiated
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Maximum cabling distance	100 m/segment
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### Wireless (NI cDAQ-9191)

Radio mode	IEEE 802.11b, 802.11g
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Wireless mode	Infrastructure and Ad-Hoc
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Infrastructure	
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Security types	WEP-40, WEP-104, WPA, WPA2
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EAP types	EAP-TLS, EAP-TTLS <sup>1</sup> , EAP-FAST, LEAP, PEAP <sup>2</sup>
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Ad-Hoc	
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Security types	WEP-40, WEP-104
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Channel <sup>3</sup>	1–14
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Center frequency	
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11b	2412 to 2484 MHz
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11g	2412 to 2472 MHz
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Modulation type	
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11b	DSSS (CCK, DQPSK, DBPSK)
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11g	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)
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Center interval	
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11b	5 MHz
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11g	5 MHz
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TX power	
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Specification	11b		11g				
Channel	1 - 14	1	2	3, 4	5 - 7	8 - 10	11 - 13
Maximum Radio Output	16 dBm	12 dBm	16 dBm	15.5 dBm	15 dBm	14.5 dBm	14 dBm

Receiver sensitivity	
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Specification	Rate	Sensitivity
11b, FER<8%	11 Mbps	-82 dB/minimum
11b, FER<8%	5.5 Mbps	-84 dB/minimum
11b, FER<8%	2 Mbps	-86 dB/minimum
11b, FER<8%	1 Mbps	-88 dB/minimum
11g, PER<10%	54 Mbps	-68 dB/minimum
11g, PER<10%	48 Mbps	-68 dB/minimum
11g, PER<10%	36 Mbps	-75 dB/minimum
11g, PER<10%	24 Mbps	-79 dB/minimum
11g, PER<10%	18 Mbps	-82 dB/minimum
11g, PER<10%	12 Mbps	-84 dB/minimum
11g, PER<10%	9 Mbps	-87 dB/minimum
11g, PER<10%	6 Mbps	-88 dB/minimum

### Antenna (NI cDAQ-9191)

Connector	Bulkhead RP-SMA connector
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Electrical performance	
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VSWR	Maximum 2.0 (2.4 to 2.5 GHz)
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Impedance	50 Ω nominal
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Directivity	Omni
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Maximum gain	2.0 dBi (2.4 to 2.5 GHz)
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### Power Requirements



**Caution** You must use a UL Listed ITE power supply marked LPS with the NI cDAQ-918x/919x chassis.



**Note** Some C Series I/O modules have additional power requirements. For more information about C Series I/O module(s) power requirements, refer to documentation included with the C Series I/O module(s).



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

Input voltage range	9 - 30 V
Recommended power supply	15 W secondary
Maximum required input power	
NI cDAQ-9181	5 W
NI cDAQ-9188	15 W
NI cDAQ-9191	6 W
Power input connector	2 positions 3.5 mm pitch pluggable screw terminal with screw locks similar to Sauro CTM020F8
NI cDAQ-9181/9191	Phoenix Contact 1727566
NI cDAQ-9188	Sauro CTMH020F8-0N001
Power input mating connector	Sauro CTF020V8, Phoenix Contact 1714977, or equivalent

### Physical Characteristics

NI cDAQ-9181	
Weight (unloaded)	Approx. 470 g (16.6 oz)
Dimensions (unloaded)	194.0 mm x 88.7 mm x 33.6 mm (7.64 in. x 3.49 in. x 1.32 in.)
NI cDAQ-9188	
Weight (unloaded)	Approx. 900 g (31.7 oz)
Dimensions (unloaded)	254.0 mm x 88.1 mm x 58.9 mm (10.0 in. x 3.5 in. x 2.3 in.)
NI cDAQ-9191	
Weight (unloaded)	
Without antenna	Approx. 481 g (16.9 oz)
With antenna	Approx. 491 g (17.3 oz)
Dimensions (unloaded)	202.7 mm x 88.7 mm x 33.6 mm (7.98 in. x 3.49 in. x 1.32 in.)
Antenna connector; attached, fully extended	+109.9 mm (+4.33 in.)

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

### Safety Voltages

Connect only voltages that are within these limits.

V terminal to C terminal	30 V maximum, Measurement Category I
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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.

### RF Safety (NI cDAQ-9191)

This equipment complies with FCC radiation exposure limits set for uncontrolled equipment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This product generates and radiates radio frequency energy. To comply with the radio frequency radiation exposure guidelines in an uncontrolled environment, this equipment should be installed and operated with at least 20 cm and more between the radiator and the person's body (excluding extremities: hands, wrists, feet, and legs).

This equipment complies with the European Council Recommendation (1995/519/EC) on the limitation of exposure of the general public to electromagnetic fields. Compliance was determined in accordance with the requirements in EN 50371.

## Environmental

### Temperature

#### Operating temperature

NI cDAQ-9181/9191	0 to 55 °C (IEC-60068-2-1 and IEC-60068-2-2)
NI cDAQ-9188	-20 to 55 °C (IEC-60068-2-1 and IEC-60068-2-2)



**Caution** To maintain product performance and accuracy specifications when the ambient temperature is between 45 and 55 °C, you must mount the chassis 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 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

NI cDAQ-9181/9191	-10 to 70 °C (IEC-60068-2-1 and IEC-60068-2-2)
NI cDAQ-9188	-40 to 85 °C (IEC-60068-2-1 and IEC-60068-2-2)

### Ingress protection

IP 30

### Humidity

#### Operating

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

#### Storage

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

### Maximum altitude

5,000 m

### Pollution Degree (IEC 60664)

2

Indoor use only.

## Shock and Vibration

To meet these specifications, you must panel mount the NI cDAQ-918x/919x 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.)

### Random vibration

#### Operating

5 to 500 Hz, 0.3 g<sub>rms</sub>

#### Non-operating

5 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.)

## Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1



**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; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

The NI cDAQ-9191 also meets the requirements of the following EMC standards for intentional radiators:

- EN 300 328
- EN 301 489-1 and EN 301 489-17
- FCC 47 CFR Part 15C
- IC RSS-210



**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

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)
- 1999/5/EC; Radio and Telecommunications Terminal Equipment (R&TTE) Directive

## Online Product Certification

To obtain product certifications and the DoC for this product, visit [ni.com/certification](http://ni.com/certification), search by module number or product line, and click the appropriate link in the Certification column.

## 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 not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at [ni.com/environment](http://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 products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit [ni.com/environment/weee.htm](http://ni.com/environment/weee.htm).

## 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](http://ni.com/environment/rohs_china)。  
(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](http://ni.com/environment/rohs_china).)

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

<sup>2</sup> Does not include group delay. Refer to C Series I/O module documentation for more information.

<sup>3</sup> When operated in temperatures below 0 °C, you must use the PS-15 power supply, or another power supply rated for below 0 °C.

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