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cDAQ-9137

NI cDAQ™-9137

NI CompactDAQ Eight-Slot Controller with Quad-Core Processor

These specifications are for the NI cDAQ-9137 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 Atom E3845
Number of cores	4
CPU frequency	1.91 GHz
On-die L2 cache	2 MB (shared)

Operating System

Supported operating systems	Windows Embedded Standard 7 (WES7), NI Linux Real-Time

Network/Ethernet Port

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

NATIONAL INSTRUMENTS™

RS-232 Serial Port

Maximum baud rate	115,200 bps
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

USB Ports

Number of ports	
Device ports	1 standard B connector
Host ports	2 standard A connectors

Note The USB device port is intended for use in device configuration, application deployment, debug, and maintenance.

USB interface	USB 2.0, Hi-Speed
Maximum data rate	480 Mb/s
Maximum current (USB host ports)	1 A (aggregate)

Mini DisplayPort

Maximum resolution	2560 × 1600 at 60 Hz

SD Card Slot

SD card support	SD and SDHC standards

Memory

Nonvolatile[1]	
SD removable (user supplied)	Up to 32 GB
SSD	32 GB
System memory	2 GB DDR3L

> **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 SD removable storage[2,3]	10 MB/s
Module slots to system memory	20 MB/s, application and system dependent

Internal Real-Time Clock

Accuracy	200 ppm; 40 ppm at 25 °C

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

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[1] 1 MB is equal to 1 million bytes. 1 GB is equal to 1 billion bytes; formatted capacity might be less.
[2] Go to `ni.com/info` and enter Info Code `exyerk` for information about best practices for data logging performance with the NI cDAQ-9137.
[3] Consult the SD removable storage manufacturer specifications.

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

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[4] Performance dependent on type of installed C Series module and number of channels in the task.
[5] Does not include group delay. For more information, refer to the documentation for each C Series module.

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 to 10 MHz
Digital output sample clock frequency	
Streaming from application memory	System-dependent
Regeneration from FIFO	0 to 10 MHz
Finite	0 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 to 20 MHz
Base clock accuracy	50 ppm
Output frequency	0 to 20 MHz
Inputs	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down
Routing options for inputs	Any module PFI, controller 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 controller PFI or 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

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[6] Actual available signals are dependent on type of installed C Series module.

Timing input frequency	0 to 20 MHz
Timing output frequency	0 to 20 MHz

Controller PFI Characteristics

Maximum input or output frequency	1 MHz
Cable length	3 m (10 ft)
Cable impedance	50 Ω
PFI 0 connector	SMB
Power-on state	High impedance

Table 1. Input/Output Voltage Protection

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

Maximum operating conditions[7]

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

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[7] Stresses beyond those listed under *Maximum operating conditions* may cause permanent damage to the controller.

Table 3. DC Output Characteristics

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

Digital Triggers

Source	Any controller PFI 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 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[8]

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[8] 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 controller.

Module I/O States

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

Power Requirements

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-9137.

Voltage input range	9 to 30 V (measured at the NI cDAQ-9137 power connector)
Maximum power consumption[9]	46 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 and USB devices consuming the maximum allowed power.

Typical standby power consumption	3.4 W at 24 VDC input
Recommended power supply	100 W, 24 VDC
Typical leakage current from secondary power input (V2) while system is powered from primary power input (V1)	
At 9 V	0.40 mA
At 30 V	1.93 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

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[9] Includes maximum 1 W module load per slot across rated temperature and product variations.

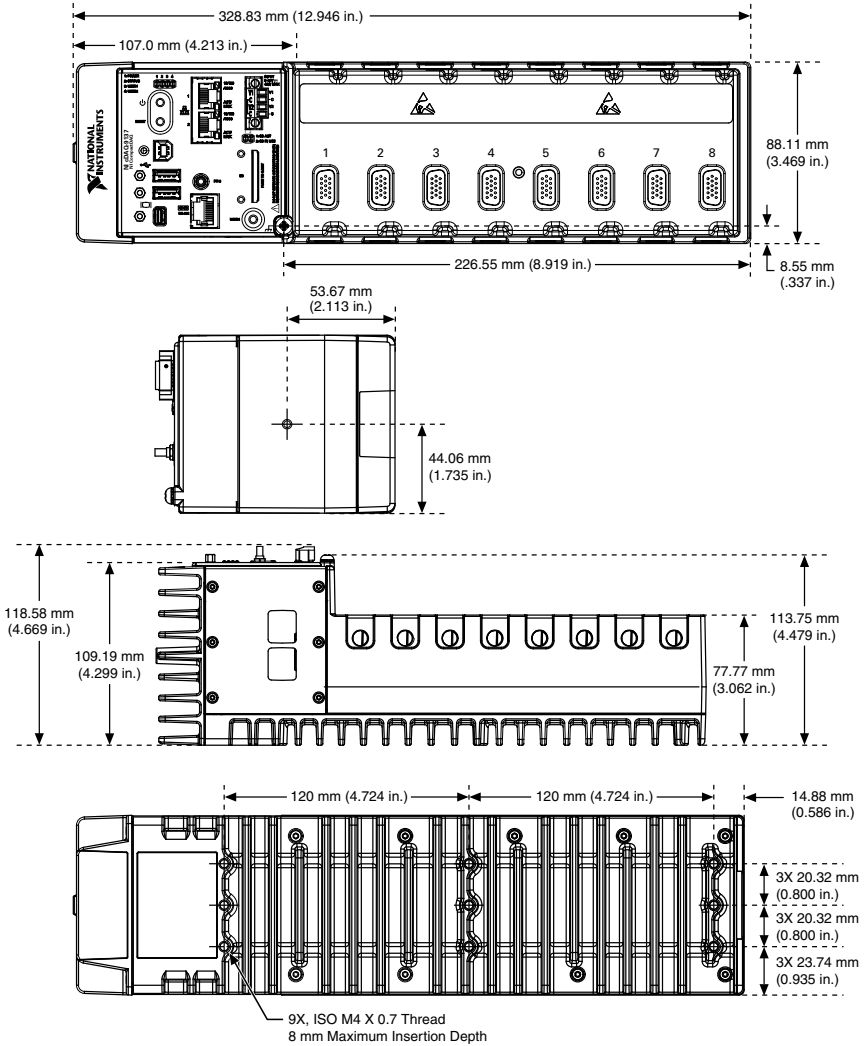| Power input connector	4 position 3.5 mm pitch pluggable screw terminal with screw locks, Sauro CTF04BV8-AN000A

Physical Characteristics

Weight (unloaded)	2.5 kg (5 lb 8.2 oz)
Dimensions (unloaded)	328.8 mm × 88.1 mm × 118.6 mm (12.95 in. × 3.47 in. × 4.67 in.) Refer to the following figure.
Screw-terminal wiring	
Gauge	0.5 mm^2 to 2.1 mm^2 (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 controller, wipe it with a dry towel.

⚠️ **Caution** The protection provided by the NI cDAQ-9137 controller can be impaired if it is used in a manner not described in this document.

Figure 1. NI cDAQ-9137 Dimensions

Safety Voltages

Connect only voltages that are below these limits.

V1 terminal to C terminal	30 VDC maximum, Measurement Category I
V2 terminal to C terminal	30 VDC maximum, Measurement Category I
Chassis ground to C terminal	30 VDC 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 cDAQ-9137 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 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)

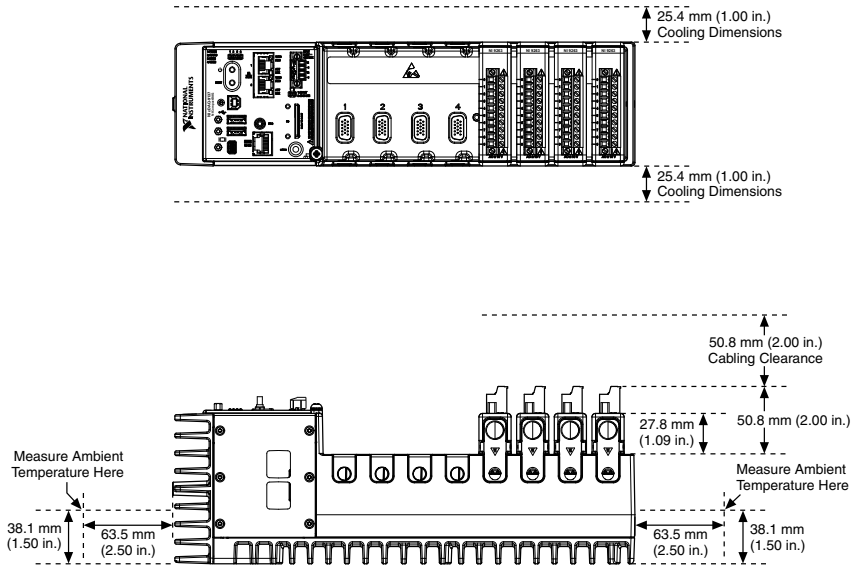|	
Operating	-20 to 55 °C
Storage	-40 to 85 °C

⚠ **Caution** Failure to follow the mounting instructions in the *NI cDAQ-9132/9133/9134/9135/9136/9137 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.

⚠ **Caution** To maintain product performance and accuracy specifications when the ambient temperature is -20 to 55 °C, you must mount the controller 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 38.1 mm (1.50 in.) from the rear cover of the system. For further information about mounting configurations, go to ni.com/info and enter the Info Code cdaqmounting.

Figure 2. NI cDAQ-9137 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 30
Pollution Degree (IEC 60664)	2
Maximum altitude	5,000 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
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nA IIC T4
Europe (DEMKO)	Ex nA IIC T4 Gc

Shock and Vibration

To meet these specifications, you must mount the NI cDAQ-9137 system directly on a flat, rigid surface as described in the *NI cDAQ-9132/9133/9134/9135/9136/9137 User Manual*, affix ferrules to the ends of the terminal wires, install an SD card cover (SD Door Kit, NI part number 783660-01), and use retention accessories for the USB host ports (NI Industrial USB Extender Cable, NI part number 152166-*xx*), USB device port (NI Locking USB Cable, NI part number 157788-01), and mini DisplayPort connector (NI Retention Accessory for Mini DisplayPort, NI part number 156866-01). All cabling should be strain relieved near input connectors. Take care to not directionally bias cable connectors within input connectors when applying strain relief.

Operating vibration	
Random (IEC 60068-2-64)	5 g_{rms}, 10 to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 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

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 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

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
- 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 $C \epsilon$

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.

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*.

Battery Replacement and Disposal

Battery Directive This device contains a long-life coin cell battery. If you need to replace it, use the Return Material Authorization (RMA) process or contact an authorized National Instruments 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*.

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