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***cDAQ-9133***

# NI cDAQ™-9133

## NI CompactDAQ Eight-Slot Controller

This document includes compliance precautions and connection information for the NI cDAQ-9133.



**Note** The guidelines in this document are specific to the NI cDAQ-9133. The other components in the system might not meet the same ratings. Refer to the documentation for each component in the system to determine the safety and EMC guidelines for the entire system.

## Safety Guidelines

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**Caution** Do not operate the NI cDAQ-9133 in a manner not specified in this user manual. 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 National Instruments for repair.



**Note** Because some C Series modules may have more stringent certification standards than the NI cDAQ-9133, the combined system may be limited by individual component restrictions. Refer to the *NI cDAQ-9133 Specifications* for more details.



**Hot Surface** This icon denotes that the component may be hot. Touching this component may result in bodily injury.

## 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-9133 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.

## Safety Guidelines for Hazardous Locations

The NI cDAQ-9133 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nA IIC T4 and Ex nA IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI cDAQ-9133 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.



**Caution** Do not disconnect the power supply wires and connectors from the controller unless power has been switched off.



**Caution** Do not disconnect I/O-side wires or connectors unless power has been switched off or the area is known to be nonhazardous.



**Caution** Do not remove modules unless power has been switched off or the area is known to be nonhazardous.



**Caution** Substitution of components may impair suitability for Class I, Division 2.



**Caution** For Division 2 and Zone 2 applications, install the system in an enclosure rated to at least IP54 as defined by IEC/EN 60079-15.



**Caution** Do not insert or remove SD cards unless power has been switched off or the area is known to be nonhazardous.



**Caution** The USB host ports, USB device port, mini DisplayPort, and SD card slot require the retention accessories listed in the following table for hazardous locations. All cables must be used in a conduit or cable gland to wire to a nonhazardous location. Do not disconnect a cable unless the cDAQ-9133 is powered off or the area is known to be nonhazardous.

**Table 1.** Hazardous Location Retention Accessories

| Port            | Required Accessory               | Part Number |
|-----------------|----------------------------------|-------------|
| USB Host Port   | NI Industrial USB Extender Cable | 152166-xx   |
| USB Device Port | NI Locking USB Cable             | 157788-01   |

**Table 1.** Hazardous Location Retention Accessories (Continued)

| Port             | Required Accessory                       | Part Number |
|------------------|------------------------------------------|-------------|
| Mini DisplayPort | Mini DisplayPort Cable Retention Bracket | 156866-01   |
| SD Card Slot     | SD Door Kit                              | 783660-01   |

## Special Conditions for Hazardous Locations Use in Europe and Internationally

The cDAQ-9133 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 12 ATEX 1202658X and is IECEx UL 14.0089X certified. Each device is marked Ⓔ II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of  $-20\text{ }^{\circ}\text{C} \leq T_a \leq -55\text{ }^{\circ}\text{C}$ .



**Caution** You must make sure that transient disturbances do not exceed 140% of the rated voltage.



**Caution** The system shall only be used in an area of not more than Pollution Degree 2, as defined in IEC 60664-1.



**Caution** The system shall be mounted in an ATEX/IECEx-certified enclosure with a minimum ingress protection rating of at least IP54 as defined in IEC/EN 60079-15.



**Caution** The enclosure must have a door or cover accessible only by the use of a tool.

## Power Requirements



**Caution** The protection provided by the NI cDAQ-9133 can be impaired if it is used in a manner not described in the user documentation.



**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-9133.

|                                        |                                                          |
|----------------------------------------|----------------------------------------------------------|
| Voltage input range                    | 9 to 30 V (measured at the NI cDAQ-9133 power connector) |
| Maximum power consumption <sup>1</sup> | 46 W                                                     |
| Recommended power supply               | 100 W, 24 VDC                                            |

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



**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.

## Power Connector Characteristics

### 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.)                             |

## Wiring Power to the NI cDAQ-9133

The NI cDAQ-9133 requires an external power source as described in the [Power Requirements](#) section. The NI cDAQ-9133 filters and regulates the supplied power and provides power to all of the I/O modules. The NI cDAQ-9133 has a primary power input, V1, and a secondary power input, V2. The POWER LED on the front panel identifies the power input in use. When the LED is lit green, V1 is in use; when the LED is lit yellow, V2 is in use.



**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.

Complete the following steps to connect a power source to the NI cDAQ-9133.

1. Make sure the power source is turned off.
2. Install the ferrite (National Instruments part number 711849-01, included in the shipping kit) across the negative and positive leads of the power source, approximately 50 mm to 75 mm (2 in. to 3 in.) from the ends of the leads near the NI cDAQ-9133.
3. Loosen the connector screw flanges and remove the power screw terminal connector plug from the NI cDAQ-9133.



**Note** Do not tighten or loosen the terminal screws on the power connector while the power is on.

4. Connect the positive lead of the primary power source to the V1 terminal of the power connector plug and tighten the terminal screw.

5. Connect the negative lead of the primary power source to one of the C terminals of the power screw terminal connector plug and tighten the terminal screw.
6. Optionally, you can connect the positive lead of a secondary power source to the V2 terminal and the negative lead to the other C terminal.
7. Install the power connector plug on the front panel of the NI cDAQ-9133 and tighten the connector screw flanges.
8. Turn on the external power source(s).

The cDAQ controller uses V1 if the voltage across V1 and C is 9 V or greater. If the V1-to-C voltage drops below 9 V, the NI cDAQ-9133 switches to V2. If the V2-to-C voltage is less than 9 V, operation may be interrupted.



**Note** If the NI cDAQ-9133 is using V1 and a secondary power source is connected to V2, there is a small leakage current on V2. The leakage current depends on the V2-to-C voltage. Refer to the *NI cDAQ-9133 Specifications* for nominal values of this leakage current

If the power source is connected to the power connector using long wiring with high DC resistance, the voltage at the power connector may be significantly lower than the specified voltage of the power source.

The C terminals are internally connected to each other but are not connected to chassis ground. You can connect the C terminals to chassis ground externally. Refer to the [Power Requirements](#) section for information about the power supply input range. Refer to the [Safety Guidelines](#) section for information about the maximum voltage from terminal to chassis ground.



**Caution** Removing power without shutting down the NI cDAQ-9133 for Windows can corrupt the embedded Windows system drive.

# Preparing the Environment

Ensure that the environment you are using the NI cDAQ-9133 in meets the following specifications.

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](http://ni.com/info) and enter Info Code `cdaqmounting`.

|                              |         |
|------------------------------|---------|
| Pollution Degree (IEC 60664) | 2       |
| Maximum altitude             | 5,000 m |

Indoor use only.



**Note** Refer to the *NI cDAQ-9133 Specifications* for complete specifications.

# Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.



**Caution** To ensure the specified EMC performance, product installation requires either special considerations or user-installed add-on devices. Refer to the *NI cDAQ-9132/9133/9134/9135/9136/9137 User Manual* for further information.



**Caution** To ensure the specified EMC performance, operate this product only with shielded cables and accessories. Note that the input DC power cables may be unshielded.



**Caution** To ensure the specified EMC performance, 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.



**Caution** To ensure the specified EMC performance, the length of any cable connected to the video and USB host ports must be no longer than 3 m (10 ft). The length of any cable connected to the RS-232 port must be no longer than 30 m (100 ft).



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

## Special Conditions for Marine Applications

Some products are Lloyd's Register (LR) Type Approved for marine (shipboard) applications. To verify Lloyd's Register certification for a product, visit [ni.com/certification](https://ni.com/certification) and search for the LR certificate, or look for the Lloyd's Register mark on the product.



**Caution** In order to meet the EMC requirements for marine applications, install the product in a shielded enclosure with shielded and/or filtered power and input/output ports. In addition, take precautions when designing, selecting, and installing measurement probes and cables to ensure that the desired EMC performance is attained.

## Connecting to the cDAQ Controller

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### Connecting to the Network through the Ethernet Port



**Caution** To prevent data loss and to maintain the integrity of your Ethernet installation, do not use a cable longer than 100 m.

### Connecting to the Mini DisplayPort Connector



**Caution** Do not hot-swap mini DisplayPort devices while the NI cDAQ-9133 is in a hazardous location or connected to high voltages.

### Connecting to the USB Host Ports

Install a noise-suppression ferrite (National Instruments part number 711849-01, included in the shipping kit) around all external USB cables attached to the USB host ports to ensure that your device meets all EMC standards applicable to your country. The ferrite should be installed so that it is approximately 50 to 75 mm (2 to 3 in.) from the end of the cable that plugs into the USB host port. The ferrite should accommodate both USB cables depending on cable diameter.



**Caution** Do not hot-swap USB devices while the NI cDAQ-9133 is in a hazardous location or connected to high voltages. If the NI cDAQ-9133 is not in a hazardous location, you can connect and disconnect USB devices without affecting operation.

### Connecting to the USB Device Port



**Caution** National Instruments requires a locking USB cable, such as part number 157788-01, in order to meet the shock and vibration specifications of this product.



**Caution** Do not hot-swap USB devices while the NI cDAQ-9133 is in a hazardous location or connected to high voltages. If the NI cDAQ-9133 is not in a hazardous location, you can connect and disconnect USB devices without affecting operation.



# Using the SD Card Removable Storage



**Caution** You must use the SD card slot cover to protect the SD card in hazardous locations.



**Caution** Do not insert or remove SD cards unless power has been switched off or the area is known to be nonhazardous.

## Where to Go Next

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The following documents contain information that you may find helpful as you use this document:

- *NI cDAQ-9132/9133/9134/9135/9136/9137 User Manual*
- *NI cDAQ-9133 Specifications*

## Worldwide Support and Services

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