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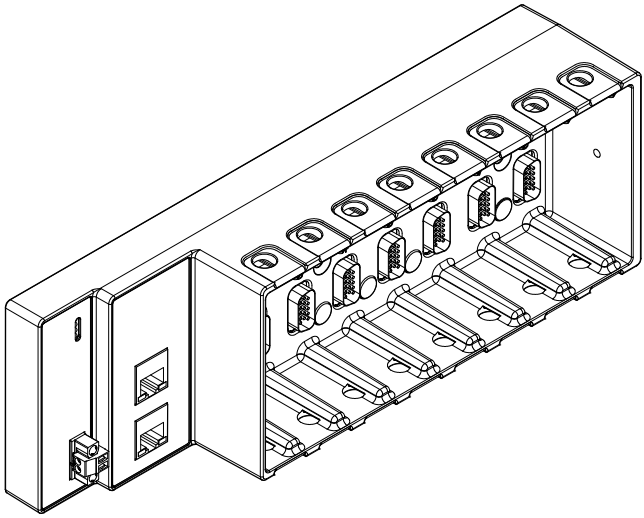
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GETTING STARTED GUIDE

NI 9145

Deterministic Ethernet Expansion Chassis for C Series Modules

This document describes how to begin using the NI 9145.



Safety Guidelines

Caution Do not operate the NI 9145 in a manner not specified in this document. 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 NI for repair.

Safety Guidelines for Hazardous Locations

The NI 9145 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 9145 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.

NATIONAL INSTRUMENTS

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.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9145 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 12 ATEX 1202658X and is IECEx UL 14.0089X certified. Each device is marked Ⓔx II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of -40 °C ≤ Ta ≤ 70 °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/EN 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.

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, operate this product only with shielded Ethernet cables and accessories.

Caution To ensure the specified EMC performance, do not connect the power input to a DC mains supply or 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.

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* 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.

Preparing the Environment

Ensure that the environment in which you are using the NI 9145 meets the following specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Pollution Degree	2
Maximum altitude	5,000 m

Indoor use only.

Note Refer to the device specifications on *ni.com/manuals* for complete specifications.

Unpacking the Kit

Caution To prevent electrostatic discharge (ESD) from damaging the device, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.

1. Touch the antistatic package to a metal part of the computer chassis.

2. Remove the device from the package and inspect the device for loose components or any other sign of damage.

Caution Never touch the exposed pins of connectors.

Note Do not install a device if it appears damaged in any way.

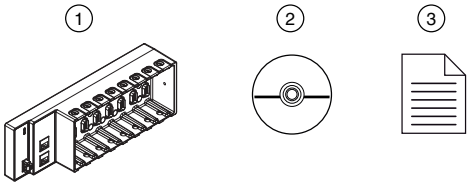
3. Unpack any other items and documentation from the kit.

Store the device in the antistatic package when the device is not in use.

Verifying the Kit Contents

Verify that the following items are included in the NI 9145 kit.

Figure 1. NI 9145 Kit Contents



1. Chassis with power connector
2. NI Driver Media
3. Getting Started Guide

Installing Software on the Host Computer

When using an NI master controller with the NI 9145, you must install the following application software and device drivers on the host computer in this order:

1. LabVIEW 2016 or later
2. LabVIEW 2016 Real-Time Module or later
3. NI CompactRIO Device Drivers August 2016 or later
4. NI-Industrial Communications for EtherCAT 16.1 or later
5. LabVIEW 2016 FPGA Module or later[1]

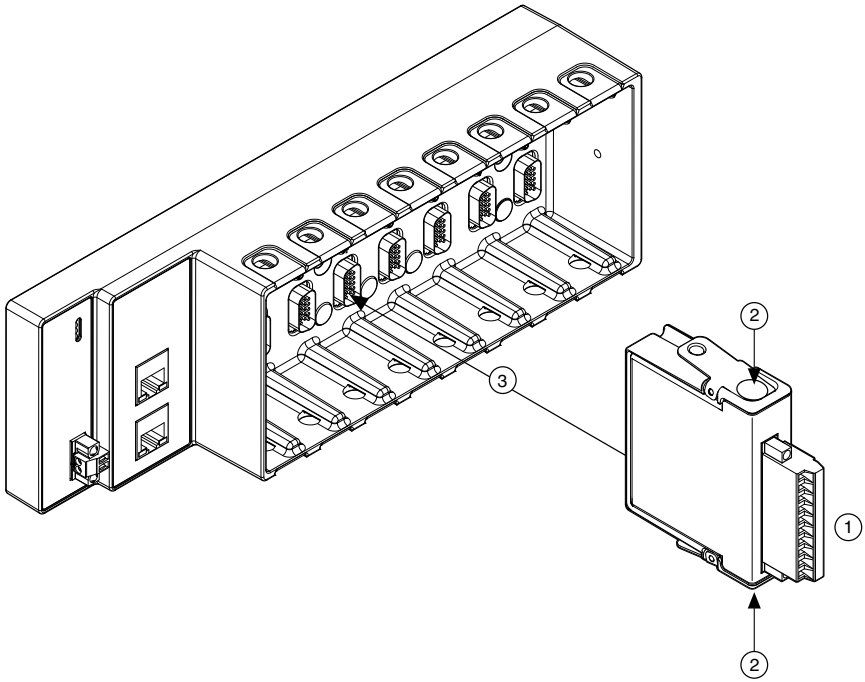
Note For more information about downloading and getting started with EtherCAT hardware drivers, go to *ni.com/info* and enter Info Code `ecatdriver`. NI recommends that you install the latest version of NI-Industrial Communications for EtherCAT.

[1] Optional installation for FPGA functionalities.

Tip Refer to the user manual on *ni.com/manuals* for more information about integrating the NI 9145 with a third-party master controller.

Installing C Series Modules

Complete the following steps to install a C Series module.



1. Verify that power is not connected to the I/O connector(s) on the C Series module. If the system is in a nonhazardous location, the NI 9145 can be powered on when you install modules.
2. Press the latches on the C Series module.
3. Align the C Series module with a slot and seat it in the slot until the latches lock in place.

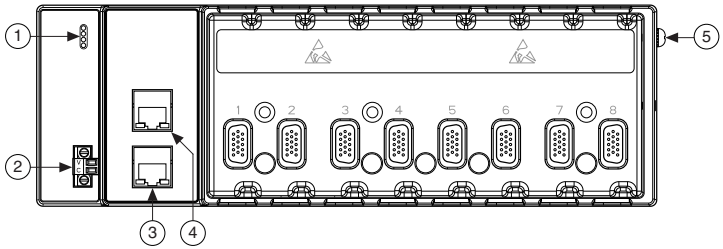
Removing C Series Modules

Verify that power is not connected to the I/O connector(s) on the C Series module before you remove a module from the NI 9145. If the system is in a nonhazardous location, the NI 9145 can be powered on when you remove modules.

Connecting the NI 9145

The NI 9145 has the following connectors and LEDs.

Figure 2. NI 9145



1. LEDs
2. Power Connector
3. OUT Port
4. IN Port
5. Grounding Terminal

Connecting the NI 9145 to Ground

You must connect the NI 9145 grounding terminal to the grounding electrode system of the facility.

What to Use

- Ring lug
- Wire, 2.0 mm^2 (14 AWG) or larger
- Screwdriver, Phillips #2

What to Do

Complete the following steps to ground the NI 9145.

1. Attach the ring lug to the wire.
2. Remove the grounding screw from the grounding terminal on the NI 9145.
3. Attach the ring lug to the grounding terminal.
4. Tighten the grounding screw to 0.5 N · m (4.4 lb · in.) of torque.
5. Attach the other end of the wire to the grounding electrode system of your facility using a method that is appropriate for your application.

Caution If you use shielded cabling to connect to a C Series module with a plastic connector, you must attach the cable shield to the chassis grounding terminal using 2.0 mm^2 (14 AWG) or larger wire. Attach a ring lug to the wire and attach the wire to the chassis grounding terminal. Solder the other end of the wire to the cable shield. Use shorter wire for better EMC performance.

For more information about ground connections, visit *ni.com/info* and enter the Info Code `emcground`.

Connecting the NI 9145 to Power

The NI 9145 requires a 9 V to 30 V external power supply. The NI 9145 filters and regulates the supplied power and provides power for the C Series modules. The NI 9145 has one layer of reverse-voltage protection.

The following table lists the POWER LED indicators.

Table 1. POWER LED Indicators

LED Color	LED Pattern	Indication
Green	Solid	The NI 9145 is powered on and the connected power supply is adequate.
—	Off	The NI 9145 is powered off.

What to Use

- Screwdriver, 2.54 mm (0.10 in.) flathead
- Power supply, 9 V to 30 V, 20 W minimum
- Wire, 2.0 mm^2 (14 AWG) or larger

NI recommends the power supply listed in the following table for the NI 9145.

Table 2. NI Power Supplies

Power Supply	Part Number
NI PS-15 Industrial Power Supply (24 VDC, 5 A, 100 VAC to 120 VAC/200 VAC to 240 VAC input)	781093-01

What to Do

Complete the following steps to connect a power supply to the NI 9145.

1. Ensure that your power supply is powered off.
2. Remove the power connector from the NI 9145.

   Caution Do not tighten or loosen the terminal screws on the power connector while the NI 9145 is powered on.

3. Connect the power supply to the power connector, as shown in the following figure.

Figure 3. NI 9145 Power Connections



Note The C terminals are internally connected to each other.

4. Tighten the terminal screws on the power connector to 0.20 N · m to 0.25 N · m (1.8 lb · in. to 2.2 lb · in.) of torque.
5. Install the power connector on the front panel of the NI 9145.
6. Tighten the power connector screw flanges to 0.3 N · m to 0.4 N · m (2.7 lb · in. to 3.5 lb · in.) of torque.
7. Power on the power supply.

Connecting the NI 9145 to an NI Master Controller

Before you connect the NI 9145 to an NI master controller, you must setup and connect the NI master controller to a network. Refer to your master controller documentation on *ni.com/manual* for setup information.

NI recommends that you install a private network segment for your deterministic Ethernet expansion devices. Slave devices cause network flooding on a standard network. Non-EtherCAT frames jeopardize the system performance and determinism on an EtherCAT network. Refer to the EtherCAT Technology Group Web site at *www.ethercat.org* for more information.

What to Use

- NI 9145
- NI Master Controller[2]
- Category 5 Ethernet Cable

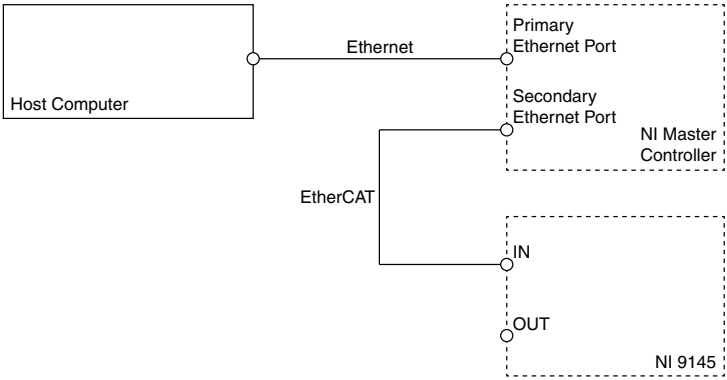
Note To prevent data loss and to maintain the integrity of your EtherCAT installation, do not use a CAT-5 Ethernet cable longer than 100 m. NI recommends using a CAT-5 or better shielded twisted-pair Ethernet cable

What to Do

Connect the NI 9145 to the NI master controller as shown in the following figure.

[2] For supported NI master controllers, visit *ni.com/info* and enter the Info Code `ecatmaster`.

Figure 4. Connecting to an NI Master Controller



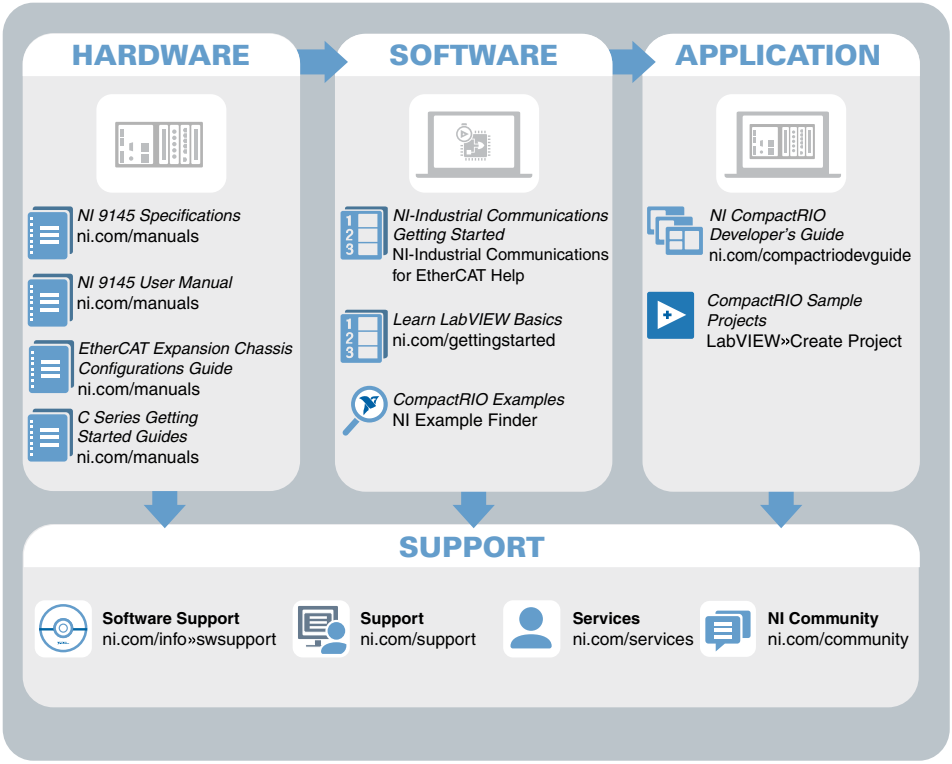
Tip Use the OUT port on the NI 9145 to connect additional slave chassis.

Note NI recommends downloading the latest version of the firmware to the NI 9145 before deploying your system. Each firmware release expands module support and ensures compatibility with the most recent version of the NI EtherCAT driver. For more information about updating the firmware on the NI 9145, refer to the NI 9145 User Manual on *ni.com/manual*.

Third-Party Master Controller

Refer to the *EtherCAT® Expansion Chassis Vendor Configurations Guide* on *ni.com/manuals* for more information about integrating the NI 9145 with a third party master controller.

Where to Go Next



Worldwide Support and Services

The NI website is your complete resource for technical support. At *ni.com/support*, you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit *ni.com/services* for information about the services NI offers.

Visit *ni.com/register* to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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