
NI-9469 Getting Started

2022-07-06



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Overview

This document explains how to connect to the NI-9469.



Note Before you begin, read the **NI-9469 Safety, Environmental, and Regulatory Information** document on ni.com/manuals and complete the software and hardware installation procedures in your chassis documentation.



Note The guidelines in this document are specific to the NI-9469. The other components in the system might not meet the same safety ratings. Refer to the documentation for each component in the system to determine the safety and EMC ratings for the entire system.

Safety Guidelines



Caution Observe all instructions and cautions in the user documentation. Using the product in a manner not specified can damage the product and compromise the built-in safety protection.



Attention Suivez toutes les instructions et respectez toutes les mises en garde de la documentation d'utilisation. L'utilisation du produit de toute autre façon que celle spécifiée risque de l'endommager et de compromettre la protection de sécurité intégrée.

Safety Guidelines for Hazardous Locations

The NI-9469 is suitable for use in hazardous locations; , and hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI-9469 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.



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, or Zone 2.



Caution The system must be installed in an enclosure certified for the intended hazardous (classified) location, having a tool secured cover/door, where a minimum protection of at least IP54 is provided.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI-9469 has been evaluated as equipment under DEMKO ATEX and is IECEx certified. Each NI-9469 is marked and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of $-40\text{ °C} \leq T_a \leq 70\text{ °C}$. If you are using the NI-9469 in Gas Group IIC hazardous locations, you must use the device in an NI chassis that has been evaluated as Ex nC IIC T4, Ex IIC T4, Ex nA IIC T4, or Ex nL IIC T4 equipment.



Caution Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value of 85 V at the supply terminals to the equipment.



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 cables and accessories.

Special Conditions for Marine Applications

Some products are approved for marine (shipboard) applications. To verify marine approval certification for a product, visit ni.com/product-certifications, search by model number, and click the appropriate link.



Notice 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.

NI 9469 Overview

The NI-9469 is a synchronization module for C Series platforms. It has a configurable multi-port interface that enables distribution of triggers and clocks from a host chassis, and an onboard DDS and PLL for clock generation and synchronization capabilities.

Connecting the NI 9469

The NI-9469 has three RJ45 connectors on the front panel labeled Port 0, 1, and 2. These connectors use standard straight through CAT 5e Ethernet cabling to provide connection to other NI-9469 modules only. Each port is software configurable to drive or receive four differential signals through the cable, which are referred to as Line 0 to 3. Each port can carry either four triggers, or three triggers and one clock, in which Line 3 is dedicated to carry the clock.

Routing the NI 9469

The NI-9469 features a configurable crosspoint switch. You can control the routing of signals and the onboard clock generator between each front port and the trigger lines in the backplane. However, the crosspoint switch is not a full routing matrix. You can connect only the same Line or Trig number. For example, Line 0 to Trig 0, but not Line 0 to Trig 2. However, you can route clock signals on only Line 3 or Trig 3. The following figure details the crosspoint switch's routing capabilities.



Note You can set only eight of the 12 total port lines as outputs due to power constraints.

Figure 1. Routing Capabilities of the Crosspoint Switch



Note The preceding figure details hardware routing capability only. Software imposed limitations may prevent certain routing or input/output functions from being realized. For more information, refer to the documentation for your specific software platform.

NI 9469 Application

In a basic application, a single NI-9469 module is inserted into each host C Series chassis. One module is set as master, the remainder as slaves, and all modules are connected with a tree topology. Figure 2 shows a tree topology example. More advanced and customizable options create a flexible topological network of NI-9469 modules. Refer to the **Topologies** section for examples of various topological networks.

Based on user needs, you may desire certain topologies over others due to application or timing requirements. Because signals are physically propagated over cabling, the module cannot compensate for inherent cable delays and skew. For example, if all slave modules must receive triggers at the same time with minimal skew and delay, a star topology with short length-matched cables is preferred. Refer to Figure 3 for a star topology configuration example.

If maximum separation distance is required, connect the modules using a daisy chain topology with maximum cable length per hop, as shown in Figure 4. Refer to the **Cable** section for information about maximum cable length.

Topologies

Figure 2. Tree Topology



Figure 3. Star Topology



Figure 4. Daisychain Topology

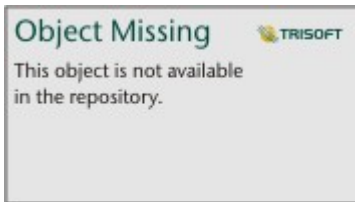
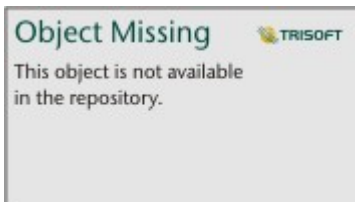


Figure 5. Hybrid Topology



Activity LEDs

The NI-9469 has four front panel LEDs labeled Trig 0, Trig 1, Trig 2, and Trig 3/Clk. The LEDs blink when activity is detected on the corresponding line to or from the carrier.

Sleep Mode

This module supports a low-power sleep mode. Support for sleep mode at the system level depends on the chassis the module is plugged into. Refer to the chassis manual for information about support for sleep mode. If the chassis supports sleep mode, refer to the software help for information about enabling sleep mode. Visit ni.com/info and enter cseriesdoc for information about C Series documentation.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system consumes minimal power and may dissipate less heat than it does in normal mode. Refer to the **Specifications** section for more information about power consumption and thermal dissipation.

Notice that when the NI 9469 is in sleep mode, the clock generation settings (if used) must be reconfigured when the module exits sleep mode and power is restored.

NI-9469 Specifications

The following specifications are typical for the range -40 °C to 70 °C unless otherwise noted.

I/O Characteristics

Front panel connectors	Shielded RJ45 receptacle
Front panel indicators	4 green LEDs
Number of ports	3 (Port 0, 1, and 2)
Number of input/output signals	4 (Line 0, 1, 2, and 3) per port, 12 total
Signal type	Differential
Maximum simultaneous outputs	8
Number of I/O triggers to backplane	4 (Trig 0, 1, 2, and 3)
Clock generation (DDS)	
Frequency	12.8 MHz or 13.1072 MHz
Accuracy	±3.5 ppm typical

Cable

Type ^[1]	CAT 5e (Shielded Twisted Pair) (straight-through)
Maximum propagation delay ^[2]	4.98 ns/m
Maximum length	100 m

¹ Refer to the **I/O Characteristics** section for more information.

² As specified for CAT 5e in TIA/EIA-568 Standard.

Power Requirements

Power consumption from chassis	
Active mode	1 W maximum
Sleep mode	25 μ W
Thermal dissipation (at 70 °C)	
Active mode	1 W maximum
Sleep mode	25 μ W

Physical Characteristics

Dimensions	Visit ni.com/dimensions and search by module number.
Weight	148 g (5.2 oz)

Safety Voltages

Isolation	
Channel-to-channel	None
Channel-to-earth ground	None

Safety Compliance 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 C22.2 No. 61010-1
- EN 60079-0, EN 60079-7
- IEC 60079-0, IEC 60079-7
- UL 60079-0, UL 60079-7
- CSA C22.2 No. 60079-0, CSA C22.2 No. 60079-7



Note For safety certifications, refer to the product label or the [Product Certifications and Declarations](#) section.

Hazardous Locations

U.S. (UL)	;
Canada (C-UL)	;
Europe (DEMKO)	

Electromagnetic Compatibility

CE Compliance **CE**

- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI

products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration	
Random	5 g RMS, 10 Hz to 500 Hz
Sinusoidal	5 g, 10 Hz to 500 Hz
Operating shock	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations

Environmental

Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Ingress protection	IP40
Operating humidity (IEC 60068-2-30)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-30)	5% RH to 95% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m

Indoor use only.


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 **Engineering a Healthy Planet** 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.

EU and UK Customers

-  Waste Electrical and Electronic Equipment (WEEE)—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.

电子信息产品污染控制管理办法 (中国 RoHS)

-  中国 RoHS— NI 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 NI 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

NI Services

Visit ni.com/support to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit ni.com/services to learn about NI service offerings such as calibration options, repair, and replacement.

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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