NI-9401 Getting Started

Contents

Before You Begin

Read the **NI-9401 Safety, Environmental, and Regulatory Information** and complete the software and hardware installation procedures in your chassis documentation.

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 Voltages

Connect only voltages that are within the following limits:

Maximum voltage[1]

Channel-to-COM	±30 V maximum on one channel at a time, Measurement Category I

Isolation voltages

Channel-to-channel	None

Channel-to-earth ground

Continuous	60 V DC, Measurement Category I
Withstand	1,000 V RMS, verified by a 5 s dielectric withstand test

[1] The maximum voltage that can be applied or output between any channel and COM without damaging the module or other devices.

Safety Guidelines for Hazardous Locations

The NI-9401 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 Gc and Ex nA IIC T4 Gc hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI-9401 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.

⚠ **Caution** For Division 2 and Zone 2 applications, connected signals must be within the following limits.

Capacitance	0.2 µF maximum

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9401 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO 03ATEX 0324020X and is IECEx UL 14.0089X certified. Each NI 9401 is marked

⌀ II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of -40 °C ≤ Ta ≤ 70 °C . If you are using the NI 9401 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.

Cable Requirements for EMC Compliance

Select and install cables for the NI-9401 in accordance with the following requirements:

- Install a clamp-on ferrite bead (782803-01) on the cable that you are connecting to NI-9401.
- The clamp-on ferrite bead must be connected to the cable as close to the module as possible. Placing the ferrite elsewhere on the cable noticeably impairs its effectiveness.

Figure 1. Installing a Ferrite Bead
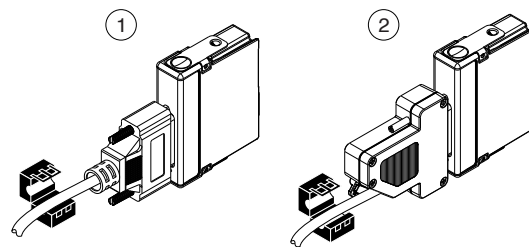
1. Installing a ferrite bead on a 25-pin DSUB cable.
2. Installing a ferrite bead on the cable of the terminal block.

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.

Preparing the Environment

Ensure that the environment in which you are using the NI 9401 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	2,000 m

Indoor use only.

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

Connecting the NI-9401

The NI-9401 provides connections for 8 digital input/output channels.

Figure 2. NI-9401 Pinout
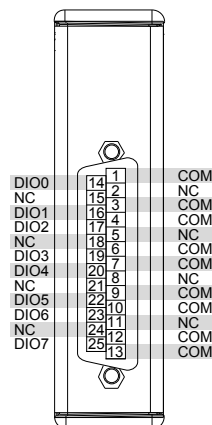
NI-9401 Signals

Signal	Description
COM	Common reference connection to isolated ground
DIO	Digital input/output signal connection

Signal	Description
NC	No connection

Table 1. Signal Descriptions

Ports

The DIO channels are grouped in two ports, one containing channels 0, 1, 2, and 3, and one containing channels 4, 5, 6, and 7. You can independently configure each digital port in software for input or output. Note that all four channels in the port must share the same line direction.

Connecting a Serial Peripheral Interface Device

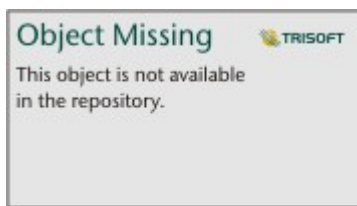You can connect a Serial Peripheral Interface (SPI) device to the NI-9401.

Figure 3. Connecting an SPI Device to the NI-9401
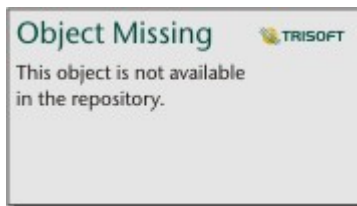
Connecting Digital Devices

You can connect several types of digital devices to the NI-9401.

Figure 4. Connecting Digital Devices to the NI-9401

Overcurrent/Short-Circuit Protection

The overcurrent protection allows only a specified amount of current through the output channels to protect the NI-9401 from short circuits. If the NI-9401 goes into an overcurrent state, the module sets all the DIO channels to high impedance for approximately 280 ms.

When the channels are in an overcurrent state, the NI-9401 can accept new line direction configuration and output state data but cannot pass valid input data to the software.

Where to Go Next

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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