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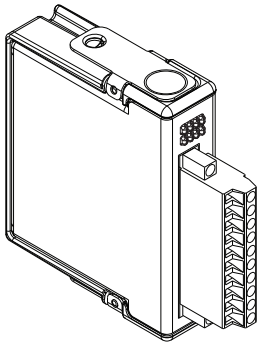
GETTING STARTED GUIDE

# NI 9437

8-Channel, 250 V Sinking Digital Input Module

Français Deutsch 日本語 한국어 简体中文

ni.com/manuals



NATIONAL INSTRUMENTS

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This document explains how to connect the National Instruments 9437.

**Before You Begin** Complete the hardware and software installation procedures in your chassis documentation.

**Note** The guidelines in this document are specific to the NI 9437. 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

Operate the NI 9437 only as described in these operating instructions.

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

**Caution** Do not operate the NI 9437 in a manner not specified in this manual. Product misuse can result in a hazard. You can compromise the safety protection built



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into the product if the product is damaged in any way. If the product is damaged, return it to National Instruments for repair.

## Safety Guidelines for Hazardous Voltages

If hazardous voltages are connected to the module, take the following precautions. A hazardous voltage is a voltage greater than 42.4 $V_{pk}$ or 60 VDC to earth ground.

**Caution** Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.

**Caution** Do *not* mix hazardous voltage circuits and human-accessible circuits on the same module.

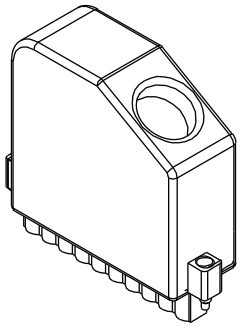
**Caution** Make sure that devices and circuits connected to the module are properly insulated from human contact.



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**Caution** When module terminals are hazardous voltage LIVE (>42.4 $V_{pk}$/60 VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9932 connector backshell kit to ensure that the terminals are *not* accessible.

**Figure 1.** NI 9932 Connector Backshell





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## Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-COM, $V_{SUP}$-to-COM ..... 300 VDC max

Isolation

- Channel-to-channel ..... None
- Channel-to-$V_{SUP}$ ..... None
- Channel-to-earth ground, $V_{SUP}$-to-earth ground, COM-to-earth ground
  - Continuous ..... 300 $V_{rms}$, Measurement Category II
  - Withstand ..... 3,000 V, verified by a 5 s dielectric withstand test

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

**Caution** Do *not* connect the NI 9437 to signals or use for measurements within Measurement Categories III or IV.



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## Electromagnetic Compatibility Guidelines

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

This product is intended for use in industrial locations. There is no guarantee that harmful interference will not occur in a particular installation, when the product is connected to a test object, or if the product is used in residential areas. To minimize the potential for the product to cause interference to radio and television reception or to experience 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. Do not use unshielded cables or accessories unless they are installed in a shielded enclosure with



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properly designed and shielded input/output ports and connected to the product using a shielded cable. If unshielded cables or accessories are not properly installed and shielded, the EMC specifications for the product are no longer guaranteed.

**Caution** To ensure the specified EMC performance, cable shields must be connected to the ground lug of the carrier using a wire of minimum practical length.

## Special Guidelines 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 label.

**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.



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## Preparing the Environment

Ensure that you are using the NI 9437 in an environment that meets the following specifications:

Operating temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... -40 °C to 70 °C

Operating humidity
(IEC 60068-2-56)..... 10% to 90% RH, noncondensing

Pollution Degree ..... 2

Maximum altitude..... 5,000 m

Indoor use only.

**Note** Refer to the *NI 9437 Datasheet* on ni.com/manuals for complete specifications.

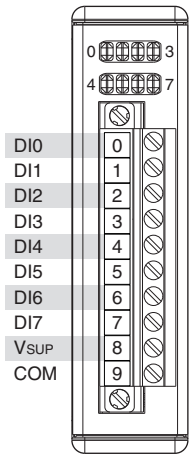


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## Connecting the NI 9437

The NI 9437 provides connections for 8 digital input channels.

**Figure 2.** NI 9437 Pinout



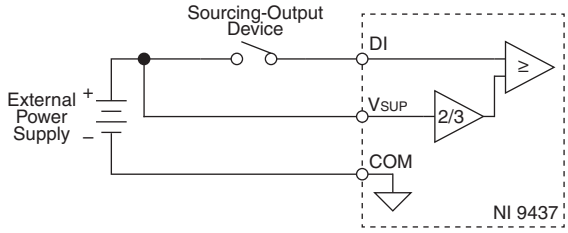



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## Connecting Sourcing-Output Devices

You can connect sourcing-output devices to the NI 9437. You must connect a supply voltage to the $V_{SUP}$ pin on the NI 9437. Input channels on the NI 9437 read ON or OFF depending on the threshold set by the $V_{SUP}$ pin. The $V_{SUP}$ threshold is approximately 2/3 of the supply voltage on the $V_{SUP}$ pin.

**Figure 3.** Connecting a Sourcing-Output Device



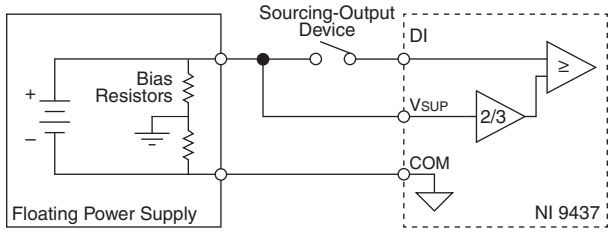



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## Connecting a Split-Rail Power Supply

You can connect a split-rail power supply to the NI 9437. A split-rail power supply consists of a floating power supply that is weakly centered around earth ground using bias resistors.

**Figure 4.** Connecting a Split-Rail Power Supply




## Ground-Fault Protection

When using a floating or split-rail power supply, the NI 9437 can tolerate a single ground fault from $V_{SUP}$-to-earth ground, COM-to-earth ground, or DI-to-earth ground. The NI 9437 can tolerate a single ground fault from $V_{SUP}$-to-earth ground or COM-to-earth ground because of the isolation of the module. The NI 9437 can tolerate a single ground fault from DI-to-earth ground



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because the threshold reference is 2/3 the supply voltage on the $V_{SUP}$ pin. With any one pin—$V_{SUP}$, COM, or a single DI—shorted to earth ground, the NI 9437 operates normally and returns valid data.

You can also use a power supply with the NI 9437 that requires a connection to earth ground for normal operation. When using this type of power supply, there is always a connection between COM and earth ground and you will not have protection against ground faults from $V_{SUP}$-to-earth ground or from DI-to-earth ground.

## LED Indicators

The NI 9437 has eight LEDs to display the ON/OFF state of the eight channels. When an LED is lit, the corresponding channel is ON and data is being read from the NI 9437. When an LED is dark, the corresponding channel is OFF.

**Note** If $V_{SUP}$ is not connected, the LED does not indicate the state of the channel.



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## Connection Considerations

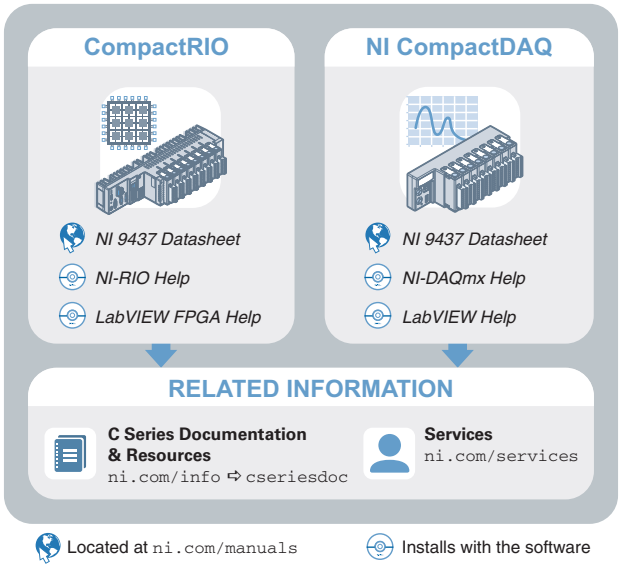
Keep in mind the following requirements when connecting to the NI 9437.

- The supply voltage to $V_{SUP}$ must be within the range of 24 VDC to 250 VDC.
- Output devices that you connect to the NI 9437 must be able to source enough current to overcome the NI 9437 input load (burden). The NI 9437 burden is dynamic and varies depending on the input voltage. Refer to the *NI 9437 Datasheet* on ni.com/manuals for more information about dynamic burden current on the NI 9437.
- Output devices that you connect to the NI 9437 do not need to sink current. The NI 9437 input load current pulls the input voltage to a low value when the output device is open, high impedance, or not connected.
- The NI 9437 is immune to capacitively coupled transients when using the correct debounce time based on the supply voltage and the amount of capacitance in your system. Refer to the *NI 9437 Datasheet* on ni.com/manuals for more information about debounce times.
- Connecting more than one wire to a single terminal on the NI 9437 requires 2-wire ferrules to create a secure connection.



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

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