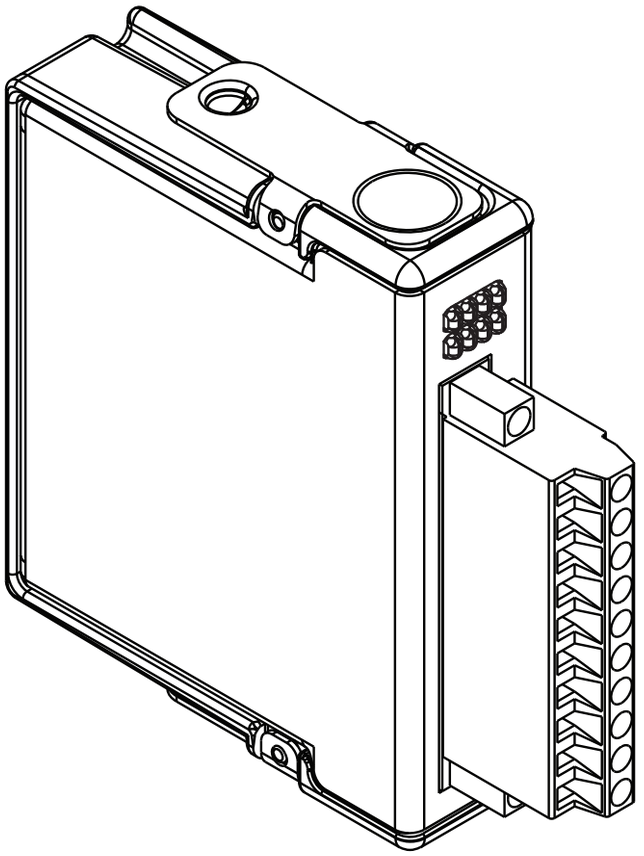
GETTING STARTED GUIDE

NI-9437

8-Channel, 250 V Sinking Digital Input Module

Français Deutsch 日本語 한국어 简体中文

ni.com/manuals



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.

Hazardous Voltage This icon denotes a warning advising you to take precautions to avoid electrical shock.

Tension dangereuse Cette icône vous avertit que vous devez prendre les précautions nécessaires pour éviter toute décharge électrique.

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

Attention Le NI-9437 ne doit en aucun cas être utilisé d'une autre façon que celle spécifiée dans ce manuel. Une mauvaise utilisation du produit peut s'avérer dangereuse. Si le produit est endommagé de quelque manière que ce soit, la sécurité intégrée dans le produit risque d'en être compromise. Si le produit est endommagé, le renvoyer à National Instruments pour réparation.

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.

Attention S'assurer que le câblage à tension dangereuse est ? tu? par du personnel qualifié respectant les normes électriques locales.

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

Attention *Ne pas* combiner des circuits avec des tensions dangereuses et des circuits accessibles aux personnes sur le même produit.

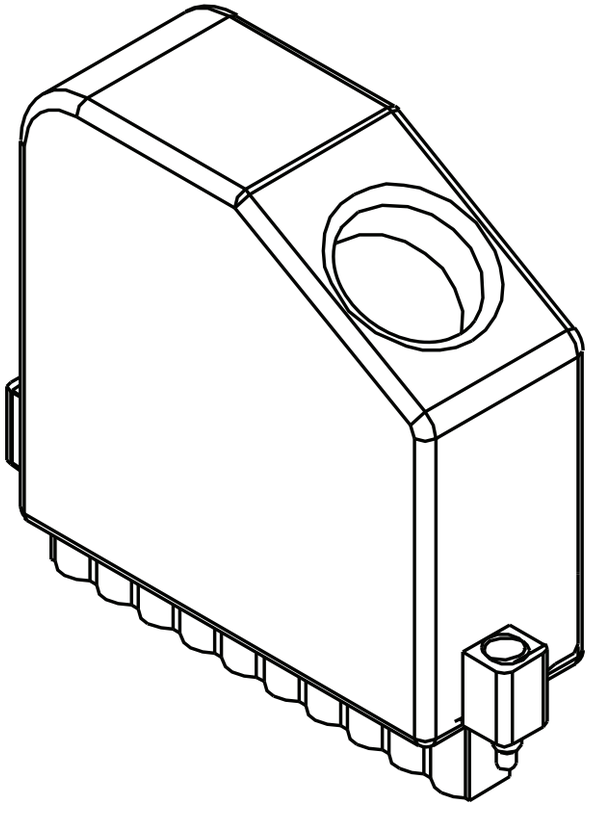
Caution Make sure that devices and circuits connected to the module are properly insulated from human contact.

Attention S'assurer que les appareils et circuits connectés au module sont correctement isolés de tout contact avec les personnes.

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.

Attention Lorsqu'une haute tension dangereuse est appliquée aux bornes du module (> 42,4 V_{pic}/60 VCC), s'assurer que les appareils et les circuits connectés au module sont correctement isolés de tout contact avec les personnes. Vous devez utiliser le kit de capots de protection pour connecteurs NI 9932 pour vous assurer que les bornes ne sont pas accessibles

Figure 1. NI 9932 Connector Backshell



Safety Voltages

Connect only voltages that are within the following limits.

Channel-to-COM, V_{SUP}-to-COM .....300 VDC max,
Measurement Category I

Note The digital inputs are rated for measurements of circuits isolated from the MAINs (such as from secondary isolated circuits derived from the MAINS, or isolated DC sources), and not rated for circuits directly connected to the electrical distribution system in normal operation. Do not connect the NI-9437 digital inputs to CAT II, III or IV circuits between V_{SUP}, DI Channels, and COM.

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[1]

Withstand ..... 3,000 V, verified by a 5 s dielectric withstand test

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[1] Reinforced Isolation is provided from Channel-to-Earth to protect the users and hardware in the event circuits connected to the DC Channel have an external fault to a CAT II phase or earth ground in abnormal operation. Refer to the *Ground-Fault Protection* section for more information.

Measurement Category I

The following Measurement Category I guidance applies to the Channel-to-COM and V_{SUP}-to-COM inputs.

Caution Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV, or for measurements on MAINs circuits or on circuits derived from Overvoltage Category II, III, or IV which may have transient overvoltages above what the product can withstand. The product must not be connected to circuits that have a maximum voltage above the continuous working voltage, relative to earth or to other channels, or this could damage and defeat the insulation. The product can only withstand transients up to the transient overvoltage rating without breakdown or damage to the insulation. An analysis of the working voltages, loop impedances, temporary overvoltages, and transient overvoltages in the system must be conducted prior to making measurements.

Attention Ne pas connecter le produit à des signaux dans les catégories de mesure II, III ou IV et ne pas l'utiliser pour des mesures dans ces catégories, ou des mesures sur

secteur ou sur des circuits dérivés de surtensions de catégorie II, III ou IV pouvant présenter des surtensions transitoires supérieures à ce que le produit peut supporter. Le produit ne doit pas être raccordé à des circuits ayant une tension maximale supérieure à la tension de fonctionnement continu, par rapport à la terre ou à d'autres voies, sous peine d'endommager et de compromettre l'isolation. Le produit peut tomber en panne et son isolation risque d'être endommagée si les tensions transitoires dépassent la surtension transitoire nominale. Une analyse des tensions de fonctionnement, des impédances de boucle, des surtensions temporaires et des surtensions transitoires dans le système doit être effectuée avant de procéder à des mesures.

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.

Note Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the MAINS building installations of Measurement Categories CAT II, CAT III, or CAT IV.

Measurement Category II

The following Measurement Category II guidance applies to the isolation of Channel-to-earth ground, V_{SUP}-to-earth ground, and COM-to-earth ground.

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.

Attention *Ne pas* connecter le NI-9437 à des signaux ou l'utiliser pour effectuer des mesures dans les catégories de mesure III ou IV.

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

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.

Attention Pour garantir les performances de CEM spécifiées, utiliser ce produit uniquement avec des câbles et accessoires blindés. Ne pas utiliser de câbles ou d'accessoires non blindés sauf s'ils sont installés dans une enceinte blindée dotée de ports d'entrée/sortie blindés correctement conçus et qu'ils sont connectés au matériel par un câble blindé. Si des câbles ou accessoires non blindés ne sont pas correctement installés et blindés, les spécifications de CEM ne sont plus garanties pour le produit.

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.

Attention Pour garantir les performances de CEM spécifiées, les blindages de câbles doivent être connectés

à la cosse de mise à la masse du boîtier à l'aide d'un fil ayant une longueur pratique minimale.

Special Guidelines 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. 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 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

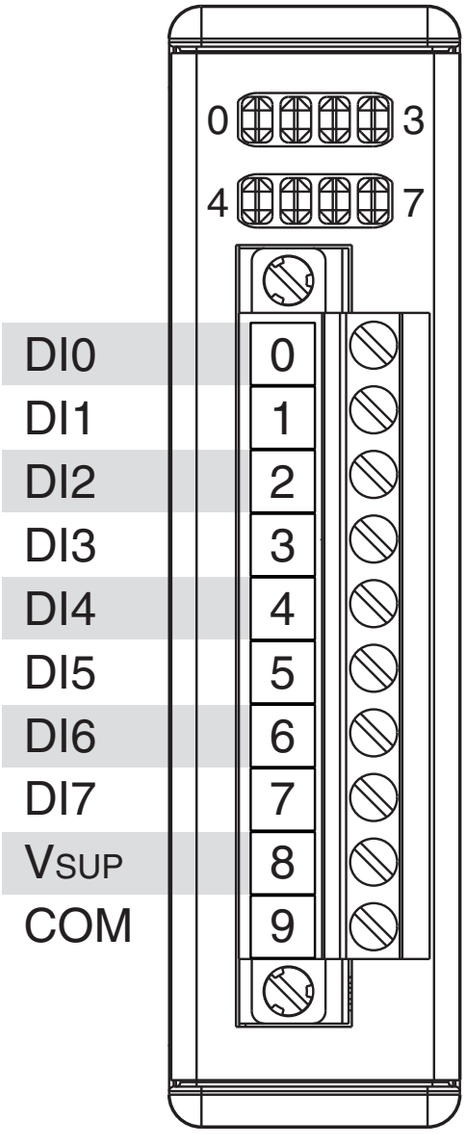
Indoor use only.

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

Connecting the NI-9437

The NI-9437 provides connections for 8 digital input channels.

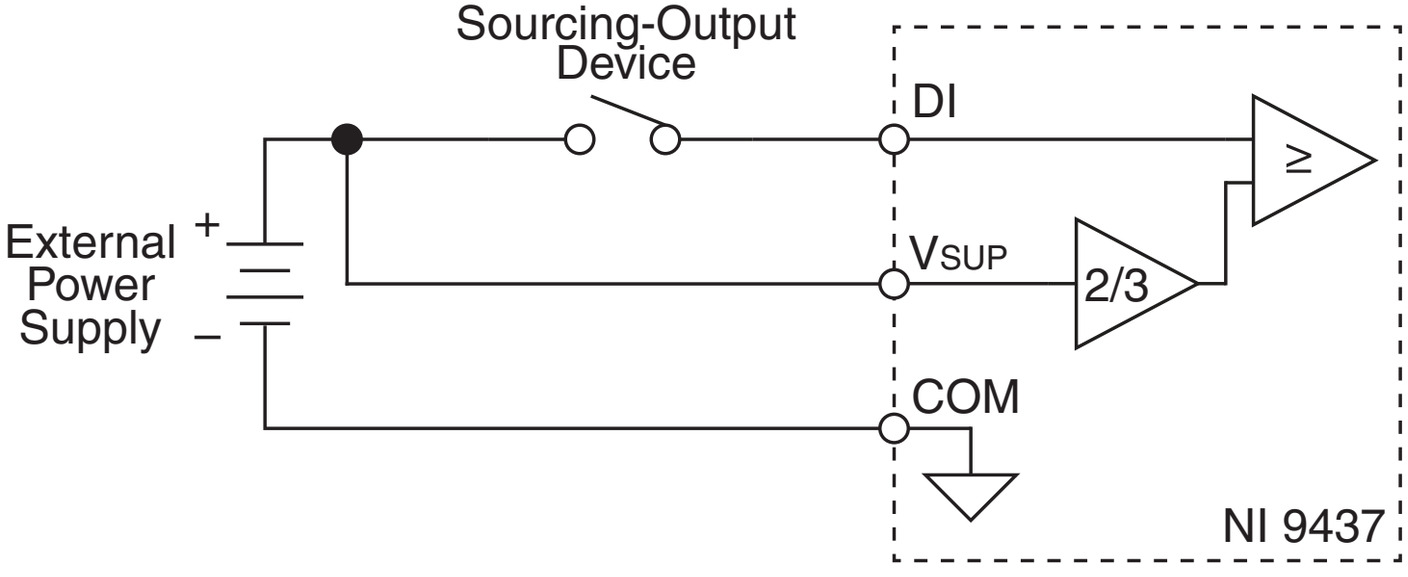
Figure 2. NI-9437 Pinout



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.

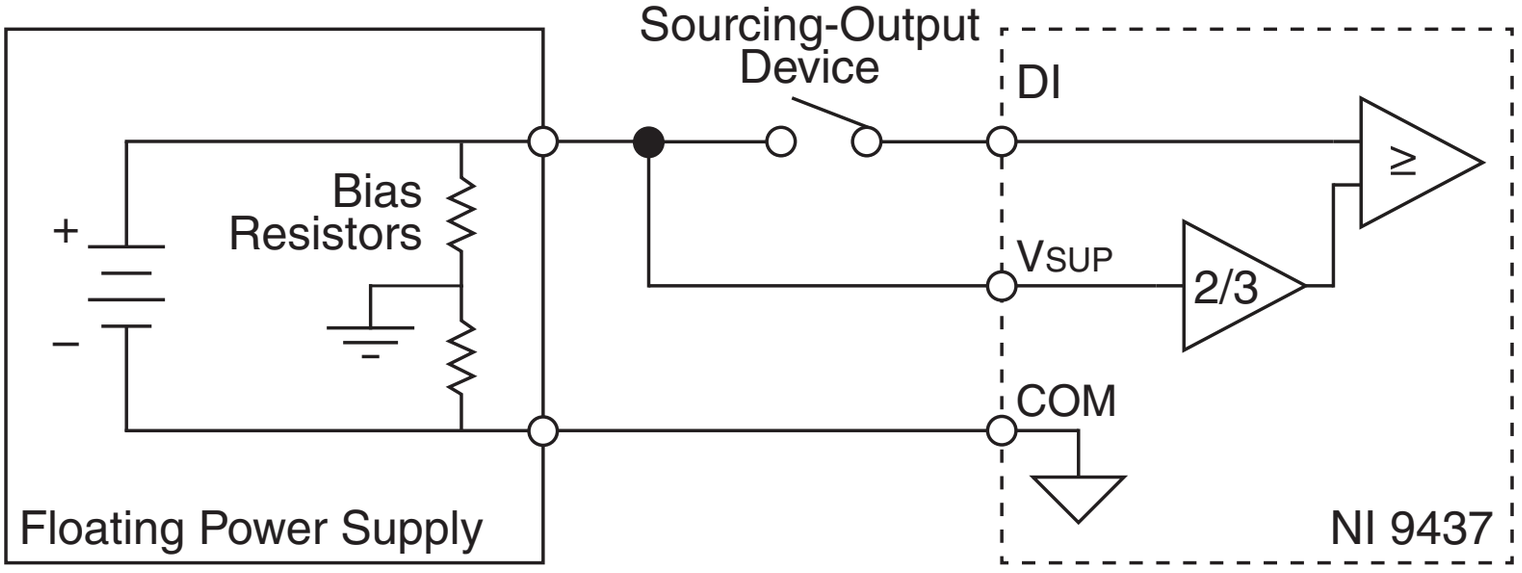
Figure 3. Connecting a Sourcing-Output Device



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

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.

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/docs 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/docs 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.

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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