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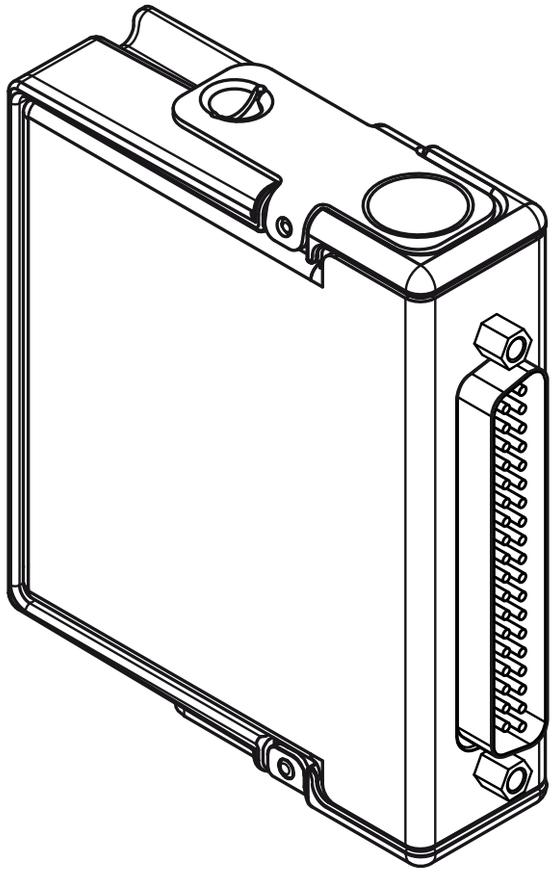
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GETTING STARTED GUIDE

NI 9381

8 AI/8 AO/4 DIO, 0 V to 5 V, 12 Bit, 20 kS/s Aggregate



NATIONAL INSTRUMENTS™

This document explains how to connect to the NI 9381.



Note Before you begin, complete the software and hardware installation procedures in your chassis documentation.



Note The guidelines in this document are specific to the NI 9381. 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 9381 only as described in this document.



Caution Do not operate the NI 9381 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 Voltages

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

Safety Guidelines for Hazardous Locations

The NI 9381 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 9381 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.

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.

Caution For Division 2 and Zone 2 applications, connected low impedance sources must include a protection device installed between the source and the AI and DIO terminals. The protection device must prevent the AI to ground voltage and DIO to ground voltage from exceeding 42 V if there is a transient overvoltage condition.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9381 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 12 ATEX 1202658X and is IECEx UL 14.0089X certified. Each NI 9381 is marked Ex 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 9381 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 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 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 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 9381 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.

NI 9381 Pinout

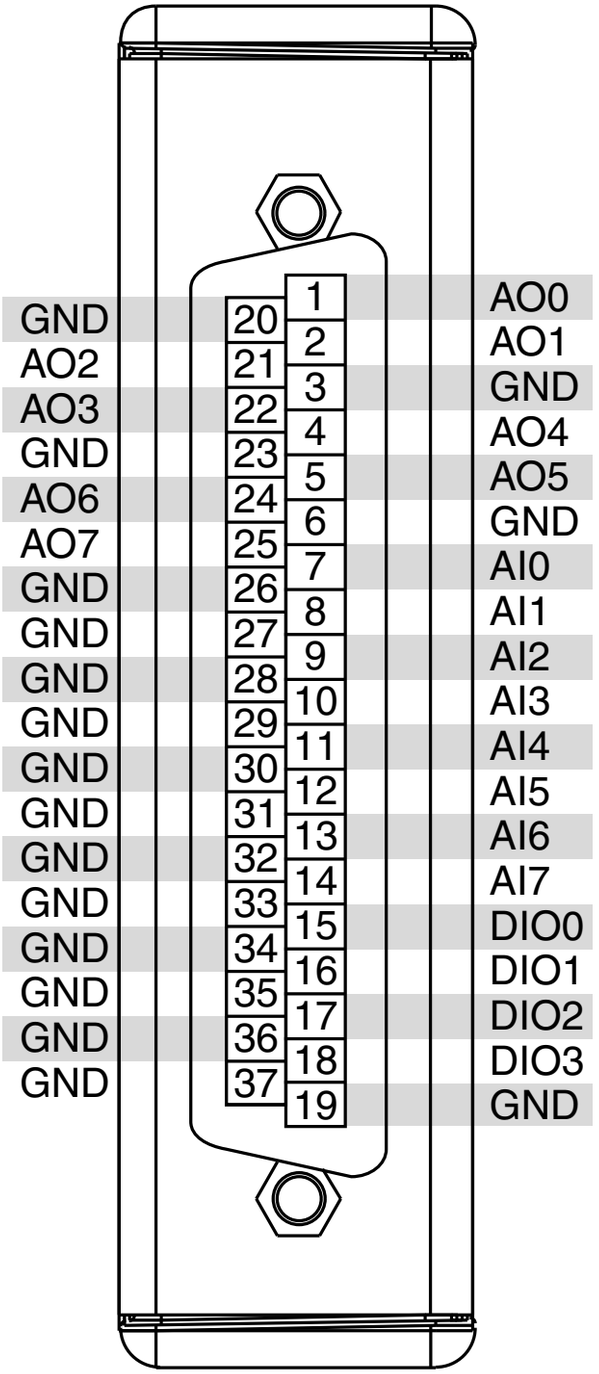
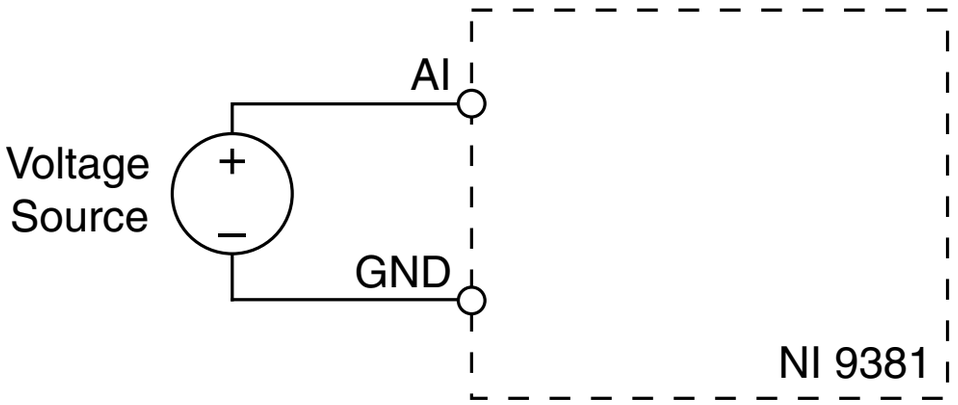


Table 1. Signal Descriptions

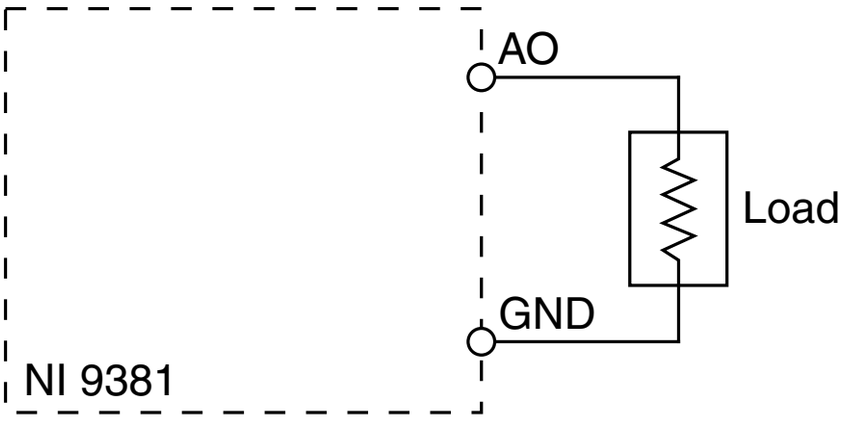
Signal	Description
AI	Analog input signal connection
AO	Analog output signal connection
DIO	Digital input/output signal connection
GND	Ground connection

Single-Ended Connections

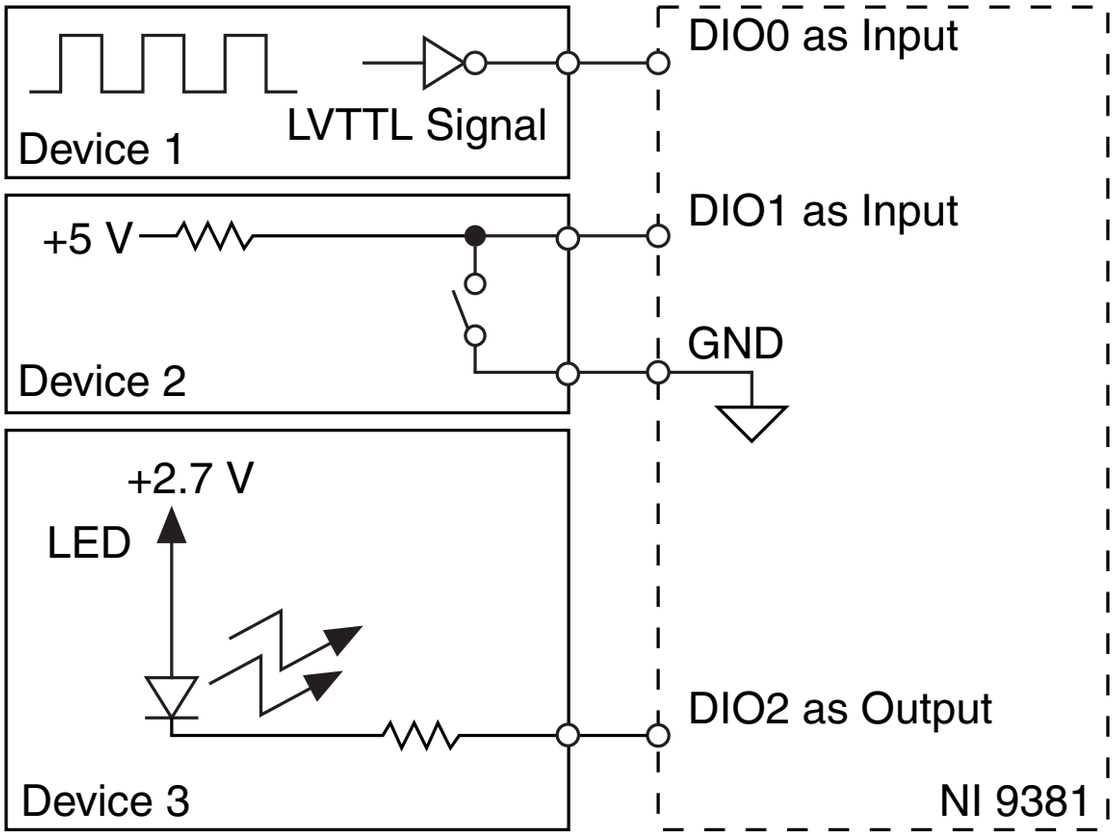


To ensure fast settling times, connect signal sources that have an impedance smaller than 1 kΩ. Large source impedances increase the settling time of the ADC, which decreases the accuracy at fast scanning rates.

Analog Output Connections



Digital Input/Output Connections



DIO channel direction is software selectable. Changing the direction on any channel does not affect the direction on the other channels.

Timing Guidelines

When using the AI, AO, and DIO channels on the NI 9381 concurrently, follow these guidelines to ensure high accuracy.

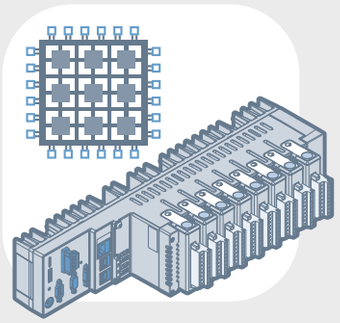
- Use a single I/O Node to access AI and AO operations to ensure proper sequencing.
- Configure the line direction of the DIO channels before performing operations on other channels or stop all operations to change the line direction of a DIO channel.



Tip Refer to the *NI CompactRIO Device Drivers Help* on *ni.com/manuals* for more information about NI 9381 timing.

Where to Go Next

Hardware



NI 9381 Datasheet

Software



CompactRIO Device Drivers Help

LabVIEW FPGA Help

RELATED INFORMATION

C Series Documentation & Resources
ni.com/info ⇨ cseriesdoc

Services
ni.com/services

Located at ni.com/manuals

Installs with the software

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Visit *ni.com/services* for NI Factory Installation Services, repairs, extended warranty, and other services.

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

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting *ni.com/certification*. If your product supports calibration, you can obtain the calibration certificate for your product at *ni.com/calibration*.

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