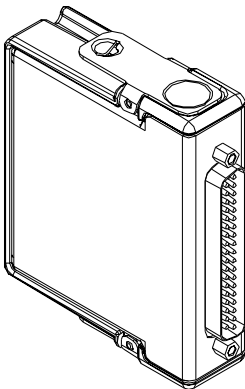


## GETTING STARTED GUIDE

# NI 9477

32 DO, 0 V to 60 V, Sinking, 8  $\mu$ s



This document explains how to connect to the NI 9477.



**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 9477. 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 9477 only as described in this document.



**Caution** Do not operate the NI 9477 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

Connect only voltages that are within the following limits:

---

Channel-to-COM <sup>1</sup>	60 VDC maximum, Measurement Category I
-----------------------------	---

---

### Isolation

---

Channel-to-channel	None
--------------------	------

---

Channel-to-earth ground	
-------------------------	--

---

Continuous	60 VDC, Measurement Category I
------------	-----------------------------------

---

Withstand	1,000 Vrms, verified by a 5 s dielectric withstand test
-----------	--

---

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

---

<sup>1</sup> The maximum voltage that can be applied or output between a channel and COM without creating a safety hazard.

circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.



**Caution** Do not connect the NI 9477 to signals or use for measurements within Measurement Categories II, III, or IV.



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

## Safety Guidelines for Hazardous Locations

The NI 9477 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 9477 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, install a protection device across the external power supply and the COM pin. The device must prevent the external power supply voltage from exceeding 80 V if there is a transient overvoltage condition.

## Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9477 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 03 ATEX 0324020X and is

IECEX UL 14.0089X certified. Each NI 9477 is marked  $\text{Ex}$  II 3G and is suitable for use in Zone 2 hazardous locations, in ambient temperatures of  $-40\text{ }^{\circ}\text{C} \leq T_a \leq 70\text{ }^{\circ}\text{C}$ . If you are using the NI 9477 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.

## 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](https://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 9477 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.

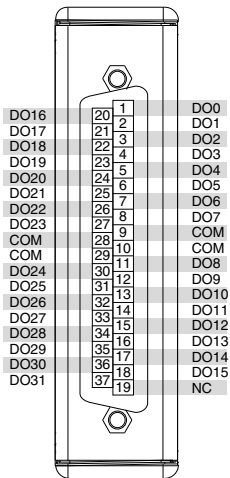


**Note** Refer to the device datasheet on [ni.com/manuals](https://ni.com/manuals) for complete specifications.



# NI 9477 Pinout

---



**Table 1. NI 9477 Signal Descriptions**

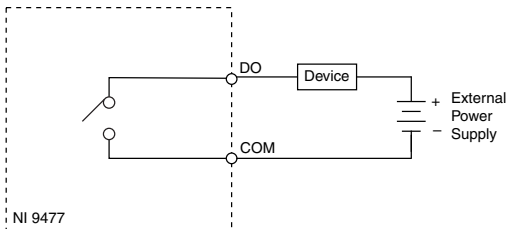
<b>Signal</b>	<b>Description</b>
COM	Common reference connection
DO	Digital output signal connection
NC	No connection

## Connecting Digital Devices

---

You can connect a variety of industrial devices, such as solenoids, motors, actuators, relays, and lamps to the NI 9477. You must connect an external power supply to the NI 9477. The power supply provides the current for the output channels.

**Figure 1.** Connecting an Industrial Device to the NI 9477



**Caution** Do not install or remove C Series modules from your system if the external power supply connected to the Vsup and COM pins is powered on.

Ensure that the devices you connect to the NI 9477 are compatible with the output specifications of the NI 9477. Refer to the device datasheet at [ni.com/manuals](https://ni.com/manuals) for output specifications.

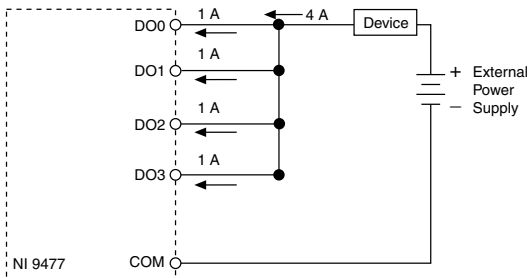
## Increasing Current Drive

---

Each channel of the NI 9477 has a continuous output current of 1 A. If you want to increase the output current to a device, you can connect any number of channels together in parallel.

For example, if you want to drive 4 A of current, connect DO0 through DO3 in parallel, as shown in the following figure. You must turn all parallel channels on and off simultaneously so that the current on any single channel cannot exceed the 1 A rating.

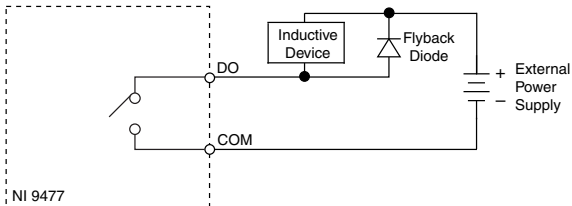
**Figure 2.** Increasing the Current to a Device Connected to the NI 9477



# Protecting the Digital Outputs from Flyback Voltages

If the channel is switching an inductive or energy-storing device such as a solenoid, motor, or relay, and the device does not have flyback protection, install an external flyback diode.

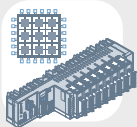
**Figure 3.** Connecting a Flyback Diode



# Where to Go Next

---

## CompactRIO



NI 9477 Datasheet



NI-RIO Help



LabVIEW FPGA Help

## NI CompactDAQ



NI 9477 Datasheet



NI-DAQmx Help



LabVIEW Help

## RELATED INFORMATION



C Series Documentation  
& Resources  
[ni.com/info](http://ni.com/info) ↪ [cseriesdoc](http://cseriesdoc)



Services  
[ni.com/services](http://ni.com/services)



Located at [ni.com/manuals](http://ni.com/manuals)



Installs with the software

## Worldwide Support and Services

---

The NI website is your complete resource for technical support. At [ni.com/support](https://ni.com/support), you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit [ni.com/services](https://ni.com/services) for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit [ni.com/register](https://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](https://ni.com/certification). If your product supports calibration, you can obtain the calibration certificate for your product at [ni.com/calibration](https://ni.com/calibration).



NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at [ni.com/support](https://ni.com/support) or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the *Worldwide Offices* section of [ni.com/niglobal](https://ni.com/niglobal) to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Refer to the *NI Trademarks and Logo Guidelines* at [ni.com/trademarks](http://ni.com/trademarks) for information on NI trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering NI products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patent Notice* at [ni.com/patents](http://ni.com/patents). You can find information about end-user license agreements (EULAs) and third-party legal notices in the readme file for your NI product. Refer to the *Export Compliance Information* at [ni.com/legal/export-compliance](http://ni.com/legal/export-compliance) for the NI global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data. NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS. U.S. Government Customers: The data contained in this manual was developed at private expense and is subject to the applicable limited rights and restricted data rights as set forth in FAR 52.227-14, DFAR 252.227-7014, and DFAR 252.227-7015.

© 2005—2016 National Instruments. All rights reserved.