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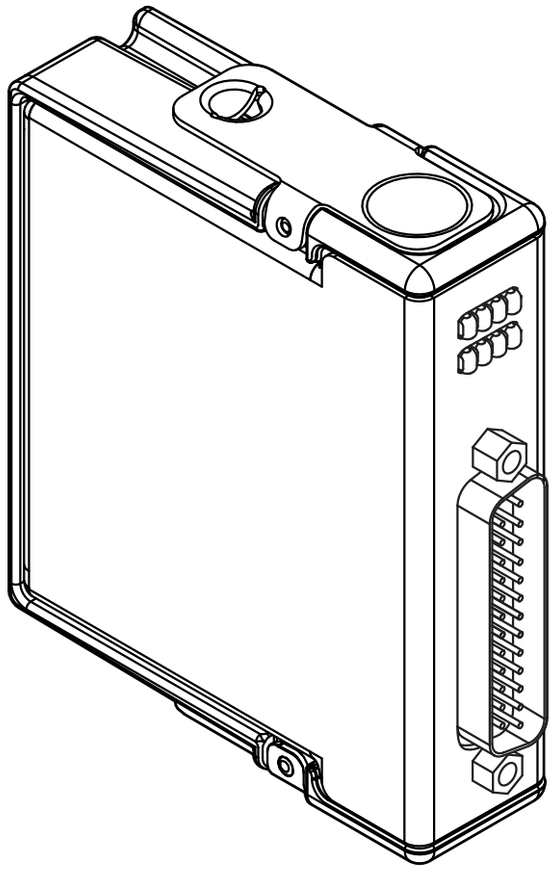
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Find the *National Instruments NI 9475* at our website: ***Click HERE***

GETTING STARTED GUIDE

NI 9475

8-Channel, 60 V, High-Speed, Sourcing Digital Output Module



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This document explains how to connect to the NI 9475.



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 9475. 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 9475 only as described in this document.



Caution Do not operate the NI 9475 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.

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Safety Voltages

Connect only voltages that are within the following limits:

Vsup-to-COM	60 VDC max, 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 circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

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Caution Do not connect the NI 9475 to signals or use for measurements within Measurement Categories II, III, or IV.

Safety Guidelines for Hazardous Voltages

If hazardous voltages are connected to the device, take the following precautions. A hazardous voltage is a voltage greater than 42.4 Vpk voltage 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 Ensure that devices and circuits connected to the module are properly insulated from human contact.



Caution When module terminals are hazardous voltage LIVE (>42.4 Vpk/60 VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact.

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Safety Guidelines for Hazardous Locations

The NI 9475 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 9475 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.

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Caution For Division 2 and Zone 2 applications, install a protection device between the input signal and the input pin. The device must prevent the input Vsup-to-COM voltage from exceeding 84 V if there is a transient overvoltage condition.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9475 has been evaluated as Ex nA IIC T4 Gc equipment under DEMKO Certificate No. 07 ATEX 0626664X and is IECEx UL 14.0089X certified. Each NI 9475 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 9475 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.

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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

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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* 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.

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Preparing the Environment

Ensure that the environment in which you are using the NI 9475 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.



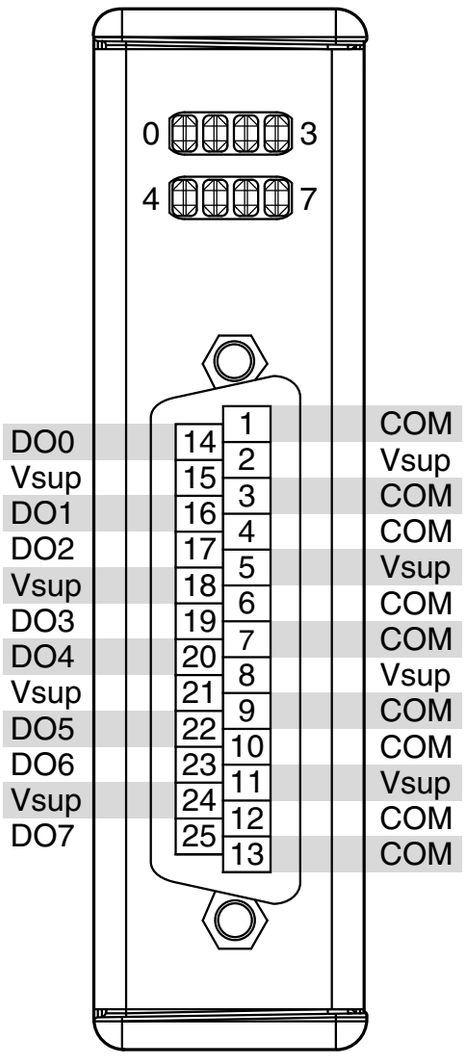
Note Refer to the device datasheet on *ni.com/manuals* for complete specifications.

Connecting the NI 9475

The NI 9475 provides connections for eight digital output channels.

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Figure 1. NI 9475 Pinout



Signals

Each channel of the NI 9475 has a DO pin to which you can connect a device. Each channel also has a COM pin and a Vsup

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pin. NI recommends you provide independent COM and Vsup wiring for each channel to minimize current flow in the COM and Vsup wiring. The COM pins are all connected together internally.

Each channel has an LED that indicates the state of the channel. When a channel LED is lit, the channel is on. When the LED is dark, the channel is off.

Connecting an External Power Supply

You must connect an external power supply to the NI 9475. This power supply provides the current for the devices you connect to the module. Connect the positive lead of the power supply to Vsup and the negative lead of the power supply to COM.



Caution Do not remove or insert modules if the external power supply connected to the Vsup and COM pins is powered on.

The NI 9475 has current sourcing outputs, which means the DO pin is driven to Vsup when the channel is turned on.

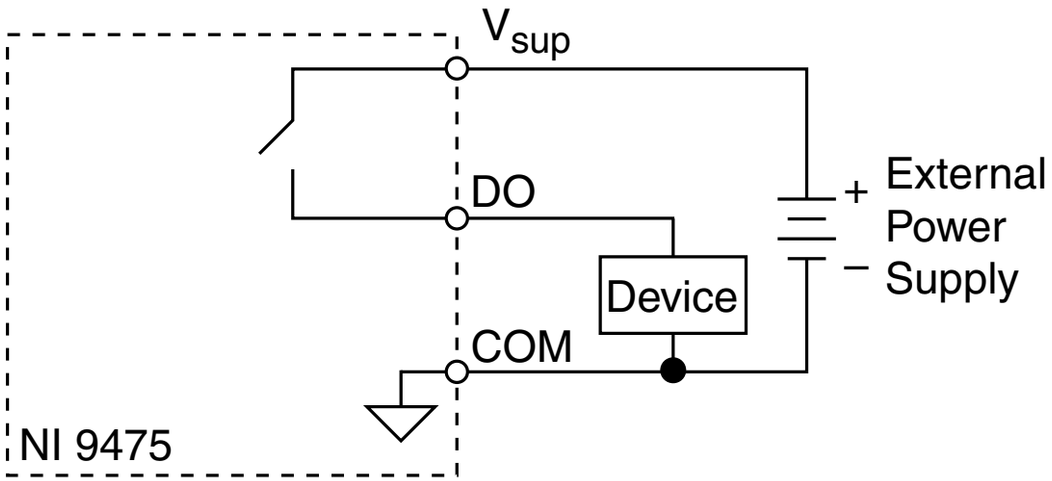
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Connecting a Device

You can directly connect the NI 9475 to a variety of industrial devices such as solenoids, motors, actuators, relays, and lamps. Make sure the devices you connect to the NI 9475 are compatible with the output specifications of the module.

Connect the device to DO and connect the common of the device to COM.

Figure 2. Connecting a Device to the NI 9475



Note When the device is off, DO is not connected to COM. For large source impedances, you must use a pull-down resistor between DO and COM. Visit

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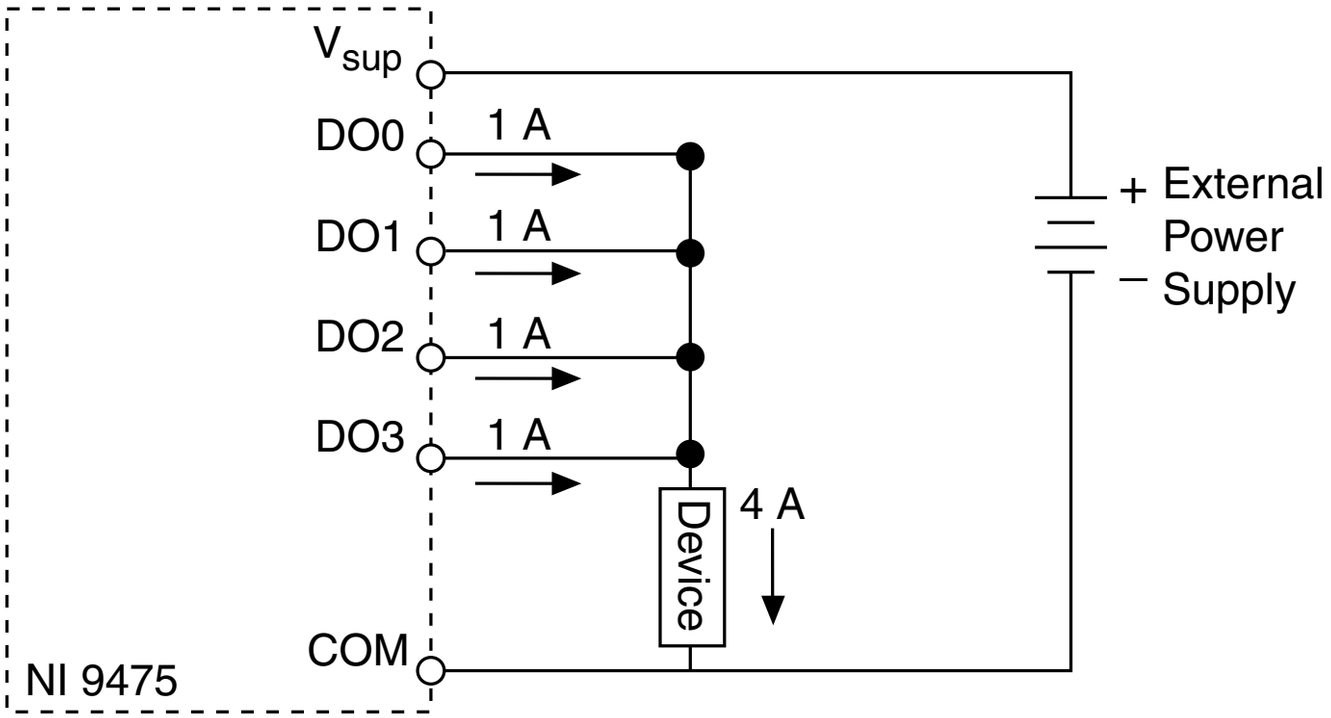
ni.com/info and enter the Info Code `CSeriesDOPulseGen` for more information.

Increasing Current Drive

Each channel 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 DO<0..3> 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.

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Figure 3. Increasing the Current to a Device Connected to the NI 9475



I/O Protection

The NI 9475 provides overcurrent protection.

Each channel has circuitry that protects it from current surges resulting from short circuits, as described in the following table.

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Table 1. Overcurrent Channel Protection Behavior

Amount of Current through the DO Terminal or Pin	Channel Behavior
Greater than 13 A	The channel trips and goes into an overcurrent state, in which the channel turns off and the module is not damaged.
Between 6 A and 13 A	The state of the channel is indeterminate and depends on factors such as the current level, temperature, and power supply.
Higher inrush currents that exist for less than the trip time	The circuit protection does not trip.



Note Refer to the *NI 9475 Datasheet* at *ni.com/manuals* for maximum continous output current, short-circuit behavior, and short-circuit trip time specifications and information about conditions that may damage the module.

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Note Refer to the IEC 61131-2 standard for more information about short-circuit-proof devices.

Note Because the NI 9475 includes internal flyback diodes, you do not need to add external diodes when connecting to switching devices that store energy.

Detecting an Overcurrent Condition

If a device connected to the module is not working while the channel is on, the module channel may be in an overcurrent state. Neither the software nor the module LEDs indicate if an overcurrent condition occurs. A channel LED may be on even if the channel is off because of an overcurrent condition.

To determine if the channel is in an overcurrent state, measure the voltage between DO and Vsup. If the voltage is equal to the voltage of the external power supply connected to the module, the channel is in an overcurrent state.

Power Supplies and Overcurrent Conditions

If a short-circuit occurs, the current through DO can exceed the current rating for the power supply and the maximum continuous output current for the NI 9475.

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If the power supply you are using with the NI 9475 cannot supply more than 13 A, the module may be damaged if a short-circuit condition occurs.

Resetting Channels after an Overcurrent Condition

After you have determined and fixed the cause of an overcurrent condition, reset the channel by turning it off.

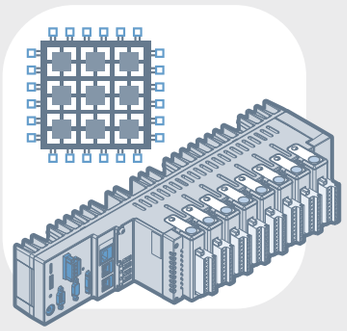
Alternatively, you can disconnect the external power supply from the module. However, doing so disconnects power from all the module channels.

Normal operation can resume after you correct the overcurrent condition and reset the channel.

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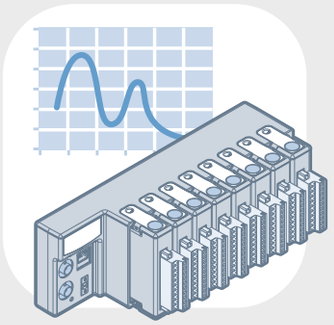
Where to Go Next

CompactRIO



- *NI 9475 Datasheet*
- *NI-RIO Help*
- *LabVIEW FPGA Help*

NI CompactDAQ



- *NI 9475 Datasheet*
- *NI-DAQmx Help*
- *LabVIEW Help*

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