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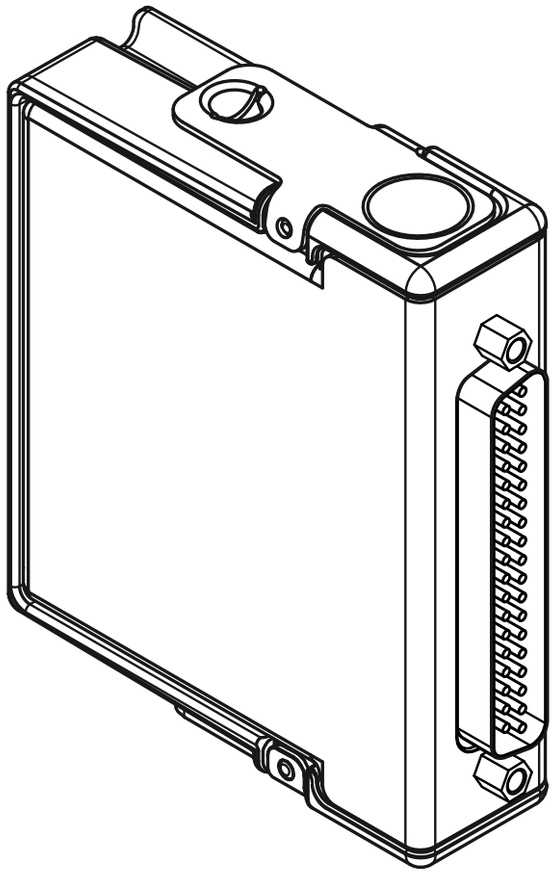
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Find the *National Instruments NI 9361* at our website: ***Click HERE***

GETTING STARTED GUIDE

NI 9361

8 Counter DI, 0 V to 5 V Differential/0 V to 24 V Single-Ended, 32 Bit, 102.4 kHz



NATIONAL INSTRUMENTS™

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This document explains how to connect to the NI 9361.



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 9361. 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 9361 only as described in this document.



Caution Do not operate the NI 9361 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:

Isolation		
	Channel-to-channel	None
	Channel-to-earth ground (up to 3000 m)	
	Continuous	60 VDC, Measurement Category I
	Withstand	1,000 Vrms, verified by a 5 s dielectric withstand test
	Vsup inputs-to-earth ground (up to 3000 m)	
	Continuous	60 VDC, Measurement Category I
	Withstand	1,000 Vrms, verified by a 5 s dielectric withstand test

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Channel-to-earth ground (up to 5000 m)	
Continuous	60 VDC, Measurement Category I
Withstand	860 Vrms, verified by a 5 s dielectric withstand test
Vsup inputs-to-earth ground (up to 5000 m)	
Continuous	60 VDC, Measurement Category I
Withstand	860 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 9361 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 9361 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 9361 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.

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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.

Special Conditions for Hazardous Locations Use in Europe and Internationally

The NI 9361 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 9361 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 9361 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.

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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

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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.



Caution To ensure the specified EMC performance, the length of all I/O cables must be no longer than 30 m (100 ft).

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.

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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 9361 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	5,000 m

Indoor use only.

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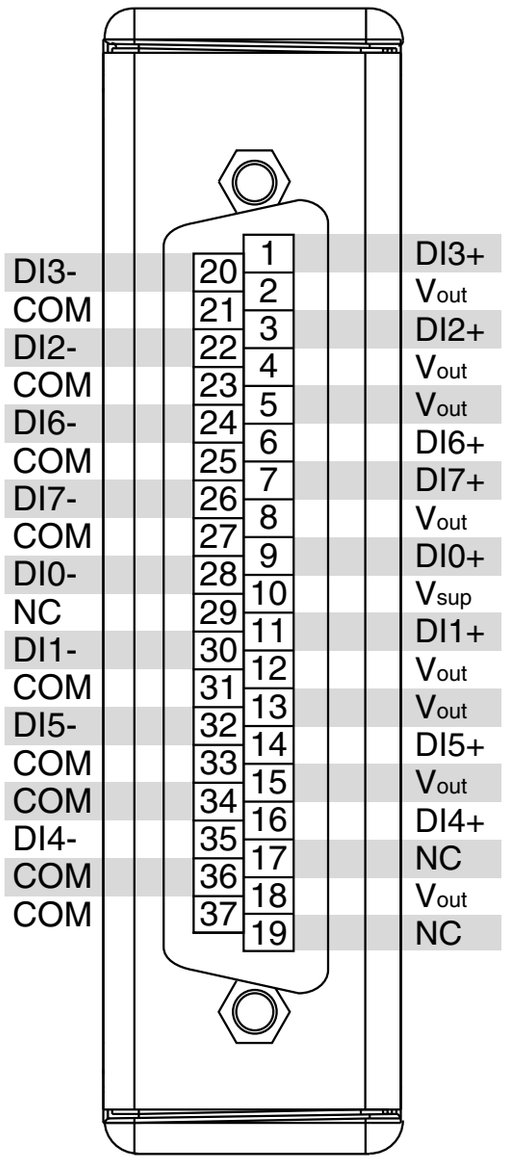
Note Refer to the device datasheet on *ni.com/manuals* for complete specifications.

Connecting the NI 9361

The NI 9361 provides connections for eight digital input channels for the embedded counters.

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Figure 1. NI 9361 Pinout



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NI 9361 Signals

Table 1. Signal Descriptions

Signal	Description
COM	Common reference connection to isolated ground
DI+	Digital input signal connection for singled-ended measurements and positive digital input signal connection for differential measurements
DI-	Negative digital input signal connection for differential measurements
NC	No connection
Vout	Voltage supply output connection
Vsup	Voltage supply input connection

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Connecting an External Power Supply

You can optionally connect an external power supply to the NI 9361 to provide current for the devices that you connect to the module. Install a 2 A maximum, fast-acting fuse between the external power supply and the Vsup terminal.



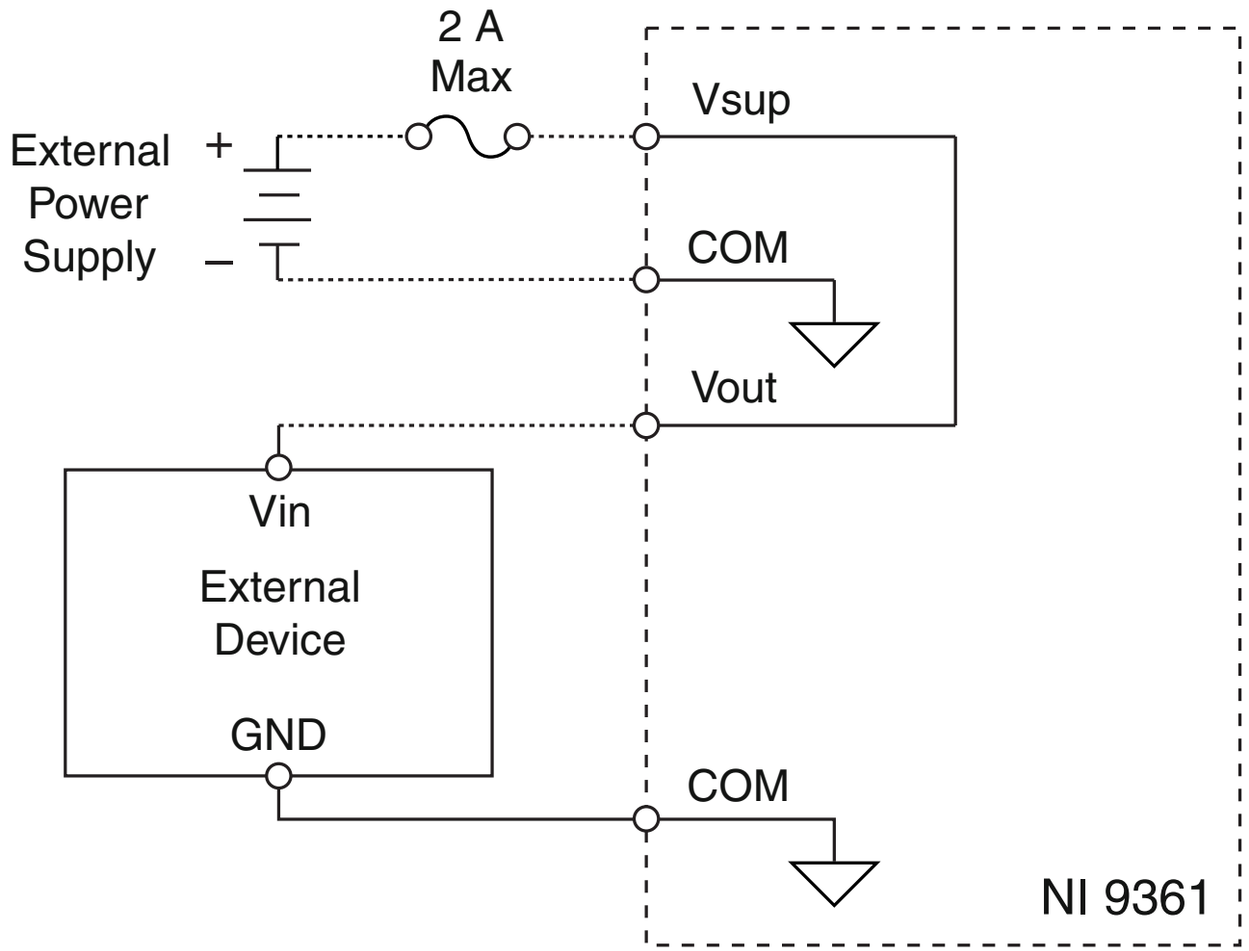
Note Refer to the *NI 9361 Datasheet* on *ni.com/manuals* for more information about the Vsup pins.



Caution Do not remove or install modules if the connected external power supply is powered on.

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Figure 2. Connecting an External Power Supply

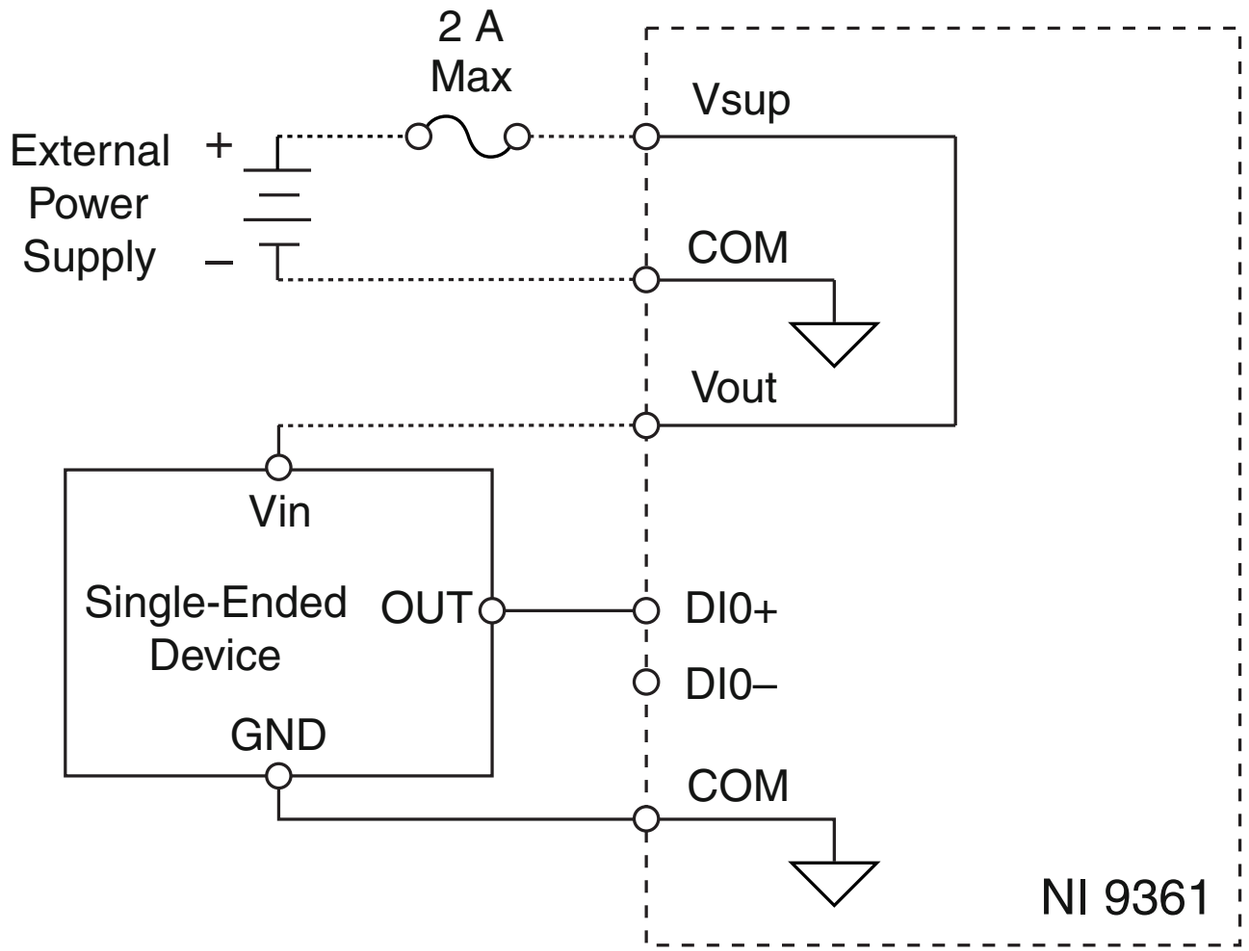


Connecting Single-Ended Devices

You can connect single-ended devices, such as TTL or CMOS to the NI 9361. For single-ended connections, connect the device out to the DI+ terminal on the NI 9361. Do not connect the DI- terminal on the NI 9361 for single-ended connections.

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Figure 3. Connecting a Single-Ended Device

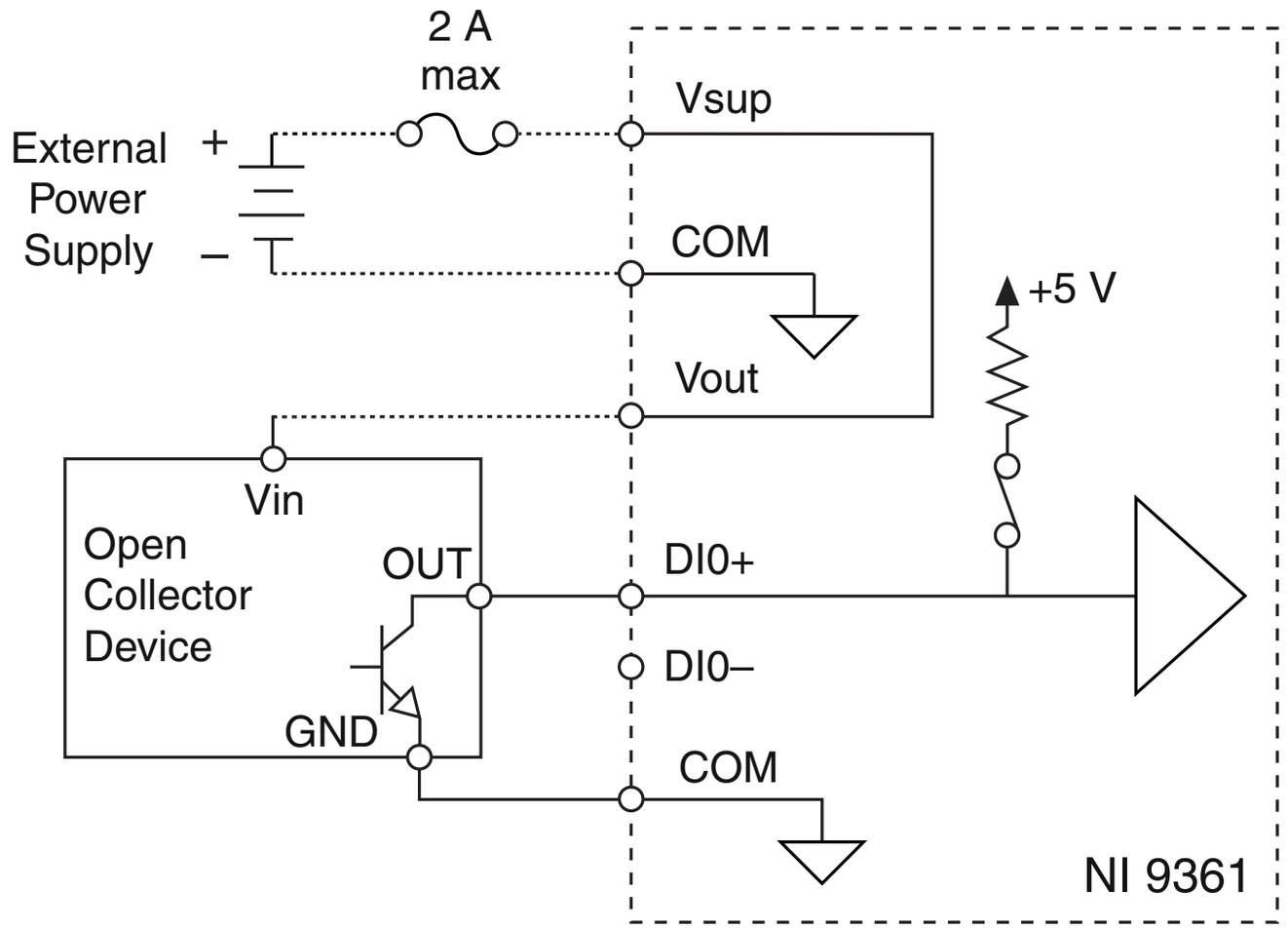


Connecting Single-Ended Devices with Open Collector Outputs

You can connect a device with open collector or open drain outputs to the NI 9361.

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Figure 4. Connecting a Single-Ended Device with Open Collector Outputs



An open collector device does not actively drive the signal high and relies on an external pull-up. The NI 9361 provides a 5 V pull-up on each DI+ pin that can be enabled individually to pull the signal high.

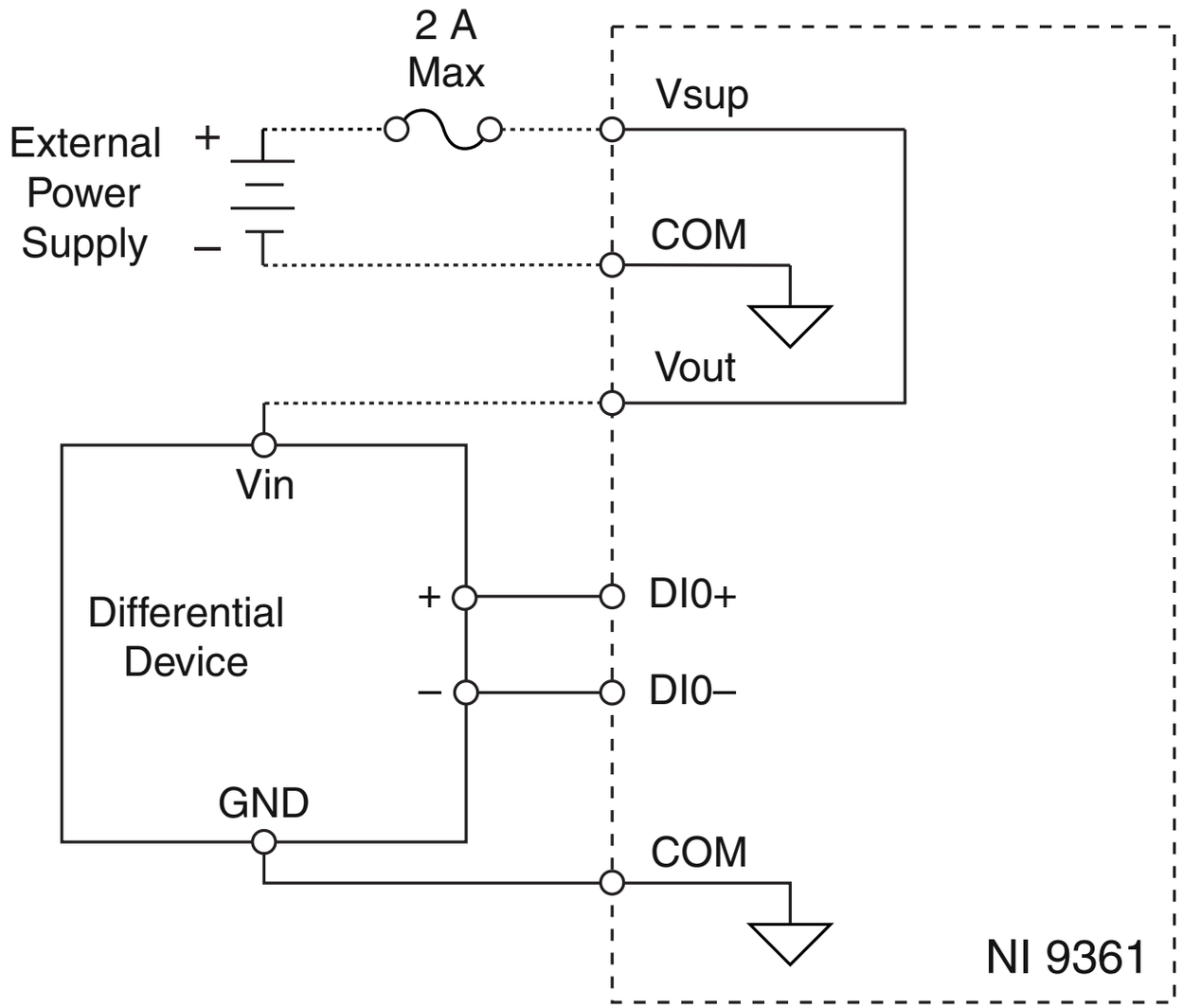
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Connecting Differential Devices

You can connect differential devices to the NI 9361. For differential connections, connect the positive device out to the DI+ terminal on the NI 9361 and the negative device out to the DI- terminal on the NI 9361.

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Figure 5. Connecting a Differential Device



The NI 9361 measures the difference between the DI+ and DI- terminals to determine if that difference is greater or less than the digital logic levels. If the difference between the terminals is within the input high range, the channel registers as high. If the

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difference between the terminals is within the input low range, the channel registers as low.



Note Refer to the *NI 9361 Datasheet* on *ni.com/manuals* for more information about digital logic levels.

Incremental Encoders

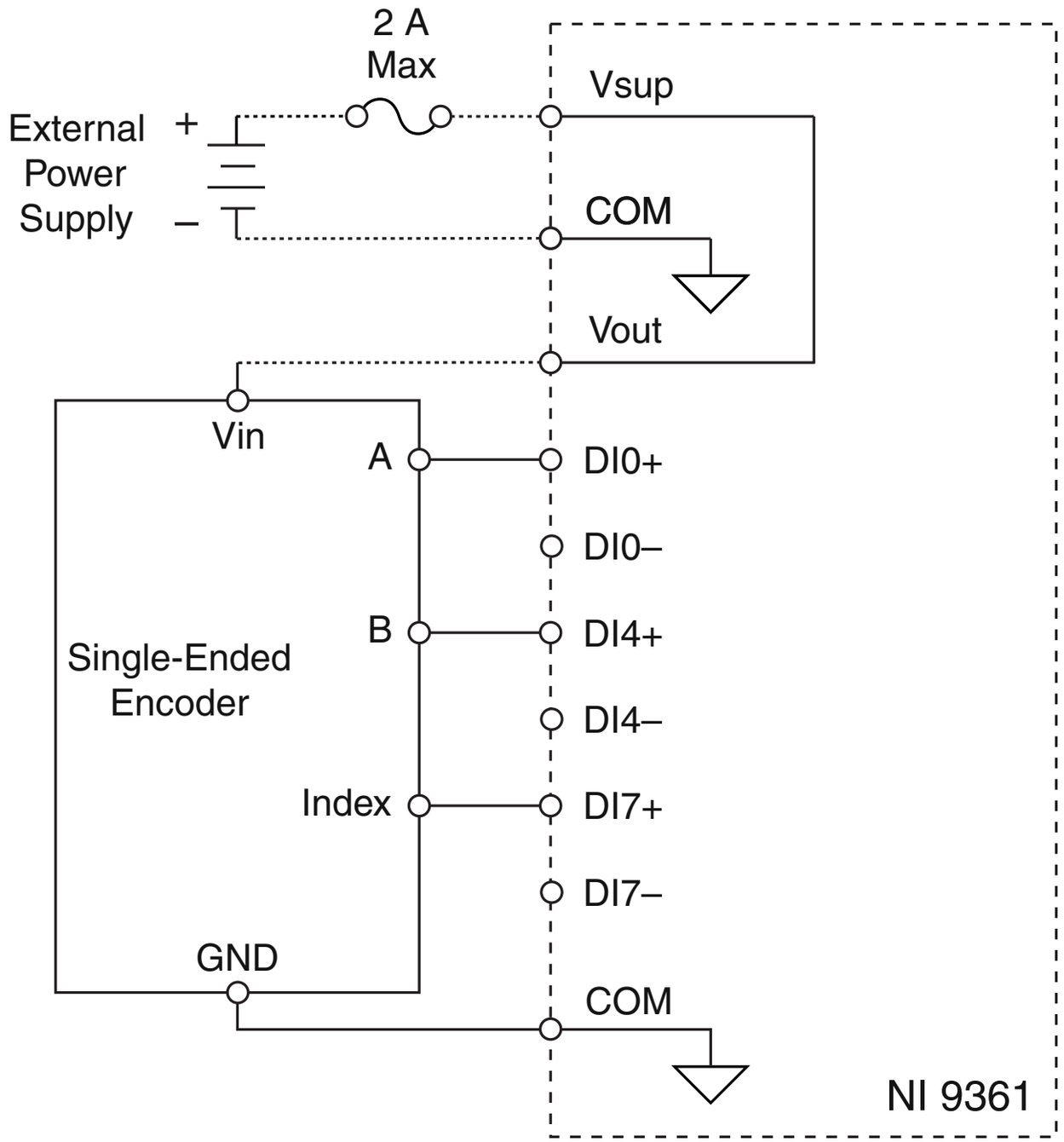
Incremental encoders typically have channel A and channel B. By monitoring both the number of pulses and the relative phase of channels A and B, you can track both the position and direction of rotation. Some encoders have a third channel, channel Z, which is also referred to as the index channel. A high level on channel Z causes the counter to be reloaded with a specific value in a specific phase of a cycle.

Connecting Single-Ended Incremental Encoders

You can connect single-ended incremental encoders to the NI 9361.

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Figure 6. Connecting a Single-Ended Incremental Encoder



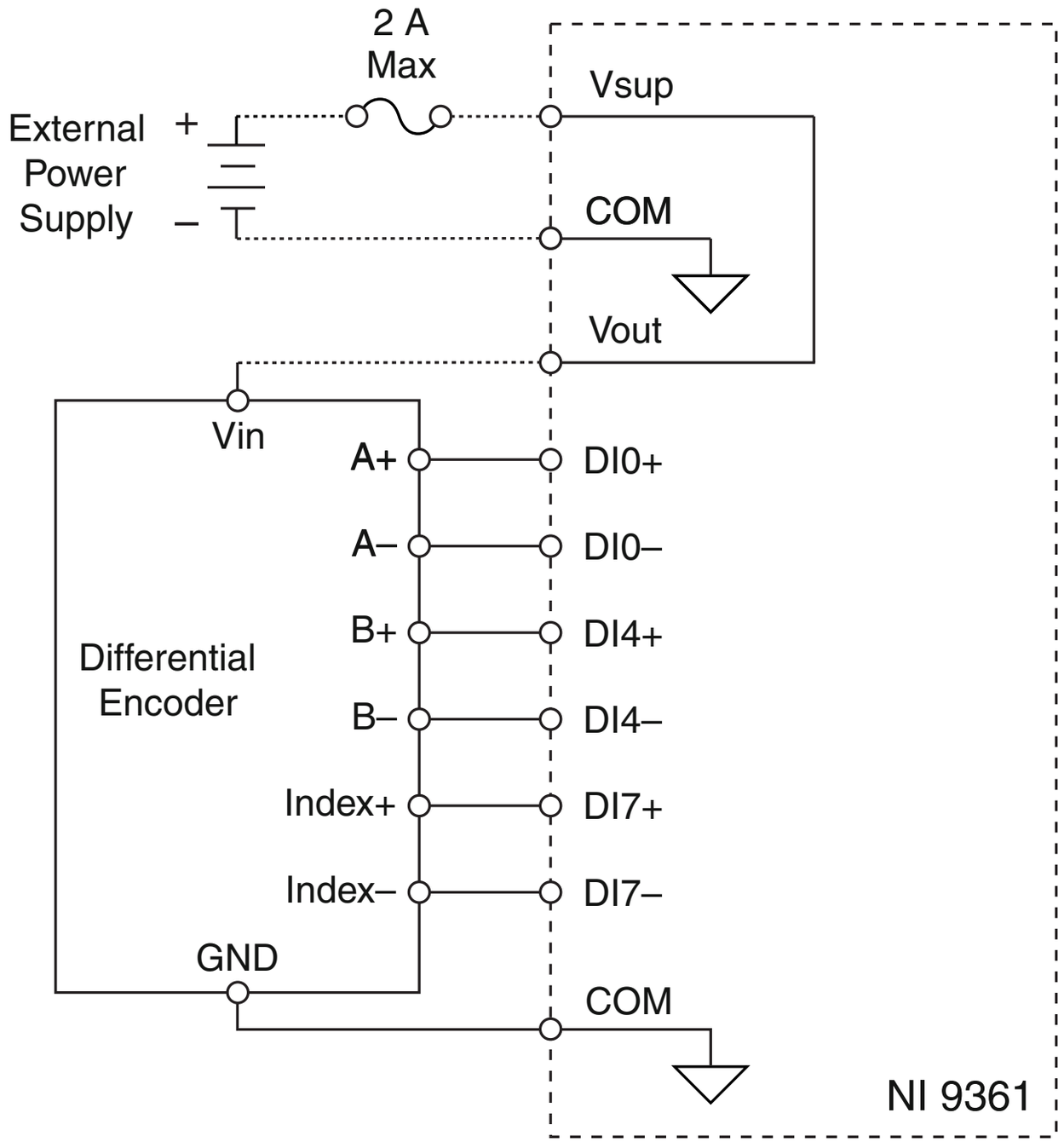
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Connecting Differential Incremental Encoders

You can connect differential incremental encoders to the NI 9361.

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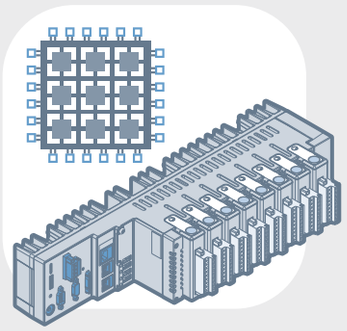
Figure 7. Connecting a Differential Incremental Encoder



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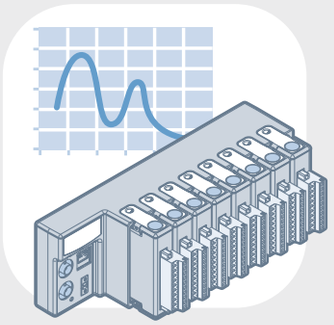
Where to Go Next

CompactRIO



- *NI 9361 Datasheet*
- *NI-RIO Help*
- *LabVIEW FPGA Help*

NI CompactDAQ



- *NI 9361 Datasheet*
- *NI-DAQmx Help*
- *LabVIEW Help*

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The NI website is your complete resource for technical support. At *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.

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