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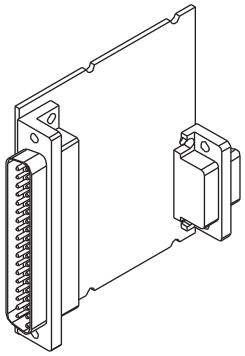
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Find the *National Instruments sbRIO-9476* at our website: *Click HERE*

OPERATING INSTRUCTIONS AND SPECIFICATIONS

NI 9476E

32-Channel, 24 V Sourcing Digital Output Module



NATIONAL INSTRUMENTS

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This document describes how to use the National Instruments 9476E and includes dimensions, connector assignments, and specifications for the NI 9476E. Visit `ni.com/info` and enter `rdsoftwareversion` to determine which software you need for the modules you are using. For information about installing, configuring, and programming the system, refer to the system documentation. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.

Caution National Instruments makes no electromagnetic compatibility (EMC) or CE marking compliance claims for the NI 9476E. The end-product supplier is responsible for conformity to any and all compliance requirements.

Caution The NI 9476E must be installed inside a suitable enclosure prior to use. Hazardous voltages may be present.

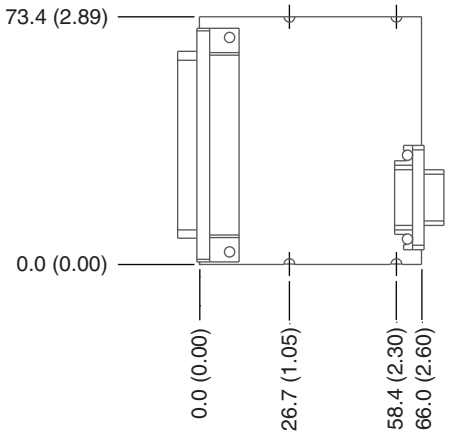
Caution Do not operate the NI 9476E in a manner not specified in these operating instructions. Product misuse can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to National Instruments for repair.

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NI 9476E Dimensions

The following figure shows the dimensions of the NI 9476E.

Figure 1. NI 9476E Dimensions in Millimeters (Inches)

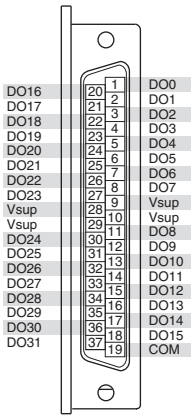


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Connecting the NI 9476E

The NI 9476E has a 37-pin DSUB connector that provides connections for 32 digital output channels.

Figure 2. NI 9476E Pin Assignments



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Each channel has a DO pin to which you can connect a digital input device. The 32 digital output channels are internally referenced to COM.

You must connect an external power supply to the NI 9476. The power supply provides the current for the output channels. Connect the positive lead of the power supply to the supply pin, V_{sup}, and the negative lead of the power supply to the common pin, COM. Refer to the *Specifications* section for information about the power supply voltage range.

Note The V_{sup} pins are internally connected. You can connect only one external voltage supply to the device.

Caution Do *not* remove or insert modules if the external power supply connected to the V_{sup} and COM pins is powered on.

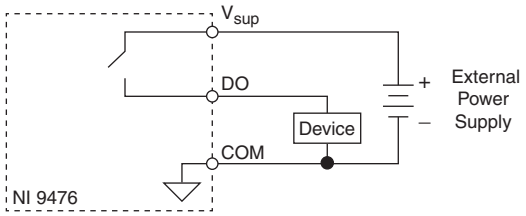
The NI 9476 has current sourcing outputs, meaning the DO pin is driven to V_{sup} when the channel is turned on.

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You can directly connect the NI 9476 to a variety of industrial devices such as solenoids, motors, actuators, relays, and lamps. Make sure the devices you connect to the NI 9476 are compatible with the output specifications of the module. Refer to the *Specifications* section for more information about the output specifications.

Connect the device to DO and COM, and connect the external power supply to V_{sup} and COM, as shown in Figure 3.

Figure 3. Connecting a Device to the NI 9476



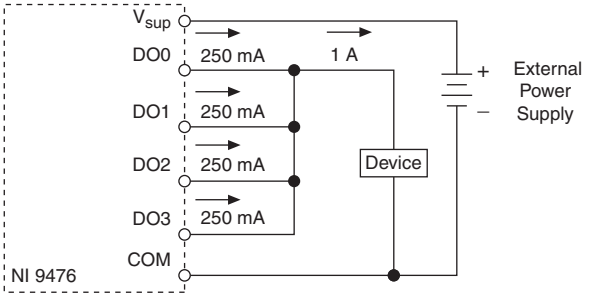
Caution To ensure a grounded connection, use shielded I/O cables and tie the shield to the chassis ground.

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Increasing Current Drive

Each channel has a continuous output current of 250 mA. 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 1 A of current, connect DO <0..3> in parallel as shown in Figure 4. You must turn all parallel channels on and off simultaneously so that the current on any single channel cannot exceed the 250 mA rating.

Figure 4. Increasing the Current to a Device Connected to the NI 9476

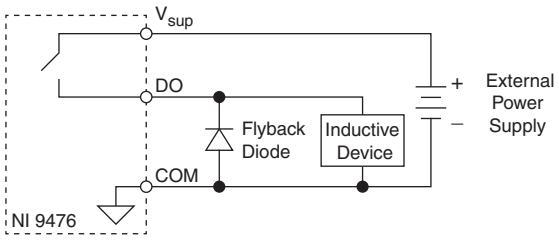


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Protecting the Module from Flyback Voltages

If the module 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 as shown in Figure 5.

Figure 5. Connecting a Flyback Diode to the NI 9476



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I/O Protection

The NI 9476 is protected against overcurrent, inrush, and short-circuit conditions in accordance with IEC 1131-2.

Understanding Protected Devices

Each channel on the NI 9476 has circuitry that protects it from voltage and current surges resulting from short circuits.

Caution The NI 9476 can be damaged under overvoltage and reverse bias voltage conditions. Check the voltage specifications for all devices that you connect to the NI 9476.

Excessive current through a DO pin causes the channel to go into an overcurrent state. In an overcurrent state, the channel cycles off and on until the short circuit is removed or the current returns to an acceptably low level. Refer the *Specifications* section for typical trip currents.

Each channel has a status line that indicates in software whether the channel is in an overcurrent state. Refer to the software help for information about reading output status.

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Sleep Mode

This module supports a low-power sleep mode. Support for sleep mode at the system level depends on the chassis that the module is plugged into. Refer to the chassis manual for information about support for sleep mode. If the chassis supports sleep mode, refer to the software help for information about enabling sleep mode. Visit `ni.com/info` and enter `cseriesdoc` for information about C Series documentation.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system consumes minimal power and may dissipate less heat than it does in normal mode. Refer to the *Specifications* section for more information about power consumption and thermal dissipation.

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Specifications

The following specifications are typical for the range -40 to 70 °C unless otherwise noted. All voltages are relative to COM unless otherwise noted.

Output Characteristics

Number of channels ..... 32 digital output channels

Output type ..... Sourcing

Output voltage (V_0) ..... V_{sup} - (I_0R_0)

Power-on output state ..... Channels off

External power supply voltage range (V_{sup}) ..... 6 to 36 VDC

Continuous output current (I_0) per channel

- With 6 to 30 VDC supply voltage ..... 250 mA max
- With 30 to 36 VDC supply voltage ..... 200 mA max

Output impedance (R_0) ..... 0.3 Ω max

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Continuous overvoltage protection (V_{sup}) ..... up to 40 V max

Reversed-voltage protection ..... None

Current limiting ..... None

Short-circuit protection ..... Indefinitely protected when a channel is shorted to COM or to a voltage up to V_{sup}

Trip current for one channel

- With all other channels at rated current ..... 3 A typ
- With all other channels off ..... 5 A typ

V_{sup} current consumption ..... 28 mA max

Maximum update rate ..... 40 µs max

Propagation delay ..... 500 µs max

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MTBF ..... 1,091,425 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method

Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis

- Active mode ..... 250 mW max
- Sleep mode ..... 25 µW max

Thermal dissipation (at 70 °C)

- Active mode ..... 1.5 W max
- Sleep mode ..... 30 mW max

Physical Characteristics

If you need to clean the module, wipe it with a dry towel.

Weight ..... 46 g (1.6 oz)

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Safety

Maximum Voltage[1]

Connect only voltages that are within the following limits.

V_{sup}-to-COM..... 36 VDC,
Measurement Category 1

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.

Caution Do *not* connect the NI 9476 to signals or use for measurements within Measurement Categories II, III, or IV.

[1] The maximum voltage that can be applied or output between V_{sup} and COM without creating a safety hazard.

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Caution Measurement Categories CAT I and CAT O (Other) 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.

Isolation Voltages

Channel-to-channel ..... None

Channel-to-earth ground

- Continuous ..... 60 VDC, Measurement Category I up to 5,000 m altitude
- Withstand
  - up to 2,000 m altitude ..... 1,000 V_{rms}, verified by a 5 s dielectric withstand test
  - up to 5,000 m altitude ..... 500 V_{rms}, verified by a 5 s dielectric withstand test

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Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search by module number or product line, and click the appropriate link in the Certification column.

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit `ni.com/certification`, search by module number or product line, and click the appropriate link in the Certification column.

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Shock and Vibration

To meet these specifications, you must panel mount the system.

Operating vibration

Random (IEC 60068-2-64)..... 5 g_{rms}, 10 to 500 Hz

Sinusoidal (IEC 60068-2-6) ..... 5 g, 10 to 500 Hz

Operating shock
(IEC 60068-2-27)..... 30 g, 11 ms half sine,
50 g, 3 ms half sine,
18 shocks at 6 orientations

Environmental

Refer to the manual for the chassis you are using for more information about meeting these specifications.

Operating temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... -40 to 85 °C

Note Measure the local ambient temperature by placing thermocouples on both sides of the PCB, 0.2 in. (5 mm) from the board surface. Avoid placing thermocouples next

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to hot components such as the FPGA, processor, or near board edges, which can cause inaccurate temperature measurements.

Storage temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... -40 to 85 °C

Ingress protection..... IP 40

Operating humidity
(IEC 60068-2-56)..... 10 to 90% RH, noncondensing

Storage humidity
(IEC 60068-2-56)..... 5 to 95% RH, noncondensing

Pollution Degree 2

Maximum altitude..... 5,000 m

Indoor use only.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

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For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)



EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

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