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NI 9476

32 Ch, 24 V, 500 µs Sourcing C Series Digital Output Module



- 32-channel, 500 µs digital output
- 6 to 36 V output range, sourcing
- 250 mA/ch maximum current drive on all channels
- Industry-standard 37-pin D-Sub connector
- Hot-swappable operation
- -40 to 70 °C operating range

Overview

The NI 9476 is a 32-channel, 500 µs sourcing C Series digital output module. It works in any NI CompactDAQ or CompactRIO chassis. Each channel is compatible with 6 to 36 V signals and features 1,000 Vrms withstand isolation from channel to earth ground. You can programmatically monitor the built-in overcurrent and short-circuit protection status of each channel. The NI 9476 can drive up to 250 mA/ch continuous current on all channels simultaneously. It contains an industry-standard 37-pin D-Sub connector for low-cost cabling to a wide variety of 37-pin accessories available from NI or other vendors. The NI 9476 works with industrial logic levels and signals for direct connection to a wide array of industrial relays, solenoids, and motors.

The NI 9476 is a static digital module, which means you can use it to perform software-timed or static operations only when it is installed in an NI CompactDAQ chassis.

This module requires a 37-pin D-Sub connector such as the NI 9933 accessory kit for direct connectivity. The NI 9933 includes a screw-terminal connector with strain relief as well as a D-Sub solder cup backshell for creating custom cable assemblies.

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Requirements and Compatibility

OS Information

- Real-Time OS
- Windows

Driver Information

- NI-DAQmx
- NI-RIO

Software Compatibility

- LabVIEW
- LabVIEW SignalExpress
- LabWindows/CVI
- Visual Studio
- Visual Studio .NET

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Comparison Tables

Product Name	Signal Levels	Number of Channels	Current Rating	Speed	Connectivity	Special Features
NI 9472	6 to 30 V	8	750 mA/ch	100 µs	Screw-terminal, D-Sub	Sourcing digital output
NI 9474	5 to 30 V	8	1 A/ch	1 µs	Screw-terminal	Sourcing digital output

Product Name	Signal Levels	Number of Channels	Current Rating	Speed	Connectivity	Special Features
NI 9475	Up to 60 V	8	1 A/ch	1 µs	27-pin D-Sub	Sourcing digital output
NI 9476	6 to 36 V	32	250 mA/ch	500 µs	37-pin D-Sub	Sourcing digital output
NI 9477	5 to 60 V	32	1 A/ch	8 µs	37-pin D-Sub	Sinking digital output
NI 9478	5 to 50 V	16	1.2 A/ch	7 µs	37-pin D-Sub	Solenoid and valve drive module

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Application and Technology

High-performance digital output and switching modules for NI CompactDAQ systems, CompactRIO embedded systems, and R Series expansion chassis provide extended voltage ranges and high-current-switching capacity for direct control of a wide array of industrial and automotive actuators. Each module features an integrated connector junction box with screw-terminal or cable options for flexible, low-cost signal wiring. All modules feature CompactRIO extreme industrial certifications and ratings including -40 to 70 °C operating temperatures and 50 g shock.

When used in CompactRIO, C Series digital output modules connect directly to reconfigurable I/O (RIO) field-programmable gate array (FPGA) hardware to create high-performance embedded systems. The reconfigurable FPGA hardware within CompactRIO provides a variety of options for timing, triggering, synchronization, digital waveform generation, or digital communication. For instance, with CompactRIO, you can implement a circuit to generate pulse-width modulation (PWM) outputs for controlling motors, heaters, or fans as well as to perform pulse code modulation encoding (PCME) for wireless telemetry applications.

C Series Compatibility

The C Series hardware family features more than 50 measurement modules and several chassis and carriers for deployment. With this variety of modules, you can mix and match measurements such as temperature, acceleration, flow, pressure, strain, acoustic, voltage, current, digital, and more to create a custom system. Install the modules in one of several carriers to create a single module USB, Ethernet, or Wi-Fi system, or combine them in chassis such as NI CompactDAQ and CompactRIO to create a mixed-measurement system with synchronized measurements. You can install up to eight modules in a simple, complete NI CompactDAQ USB data acquisition system to synchronize all of the analog output, analog input, and digital I/O from the modules. For a system without a PC, CompactRIO holds up to eight modules and features a built-in processor, RAM, and storage for an embedded data logger or control unit. For higher-speed control, CompactRIO chassis incorporate an FPGA that you can program with NI LabVIEW software to achieve silicon-speed processing on I/O data from C Series modules.

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Ordering Information

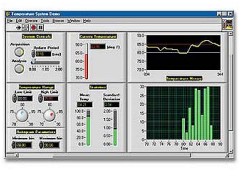
For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories	Part Number
NI 9476			
NI 9476 Each NI 9476 requires: 1 Connectivity Accessory	779140-01	**Connectivity Accessory:** Screw Terminals - NI 9933 37pin D-Sub connector kit	779103-01
NI 9476 CC Each NI 9476 CC requires: 1 Connectivity Accessory	780175-01	**Connectivity Accessory:** Screw Terminals - NI 9933 37pin D-Sub connector kit	779103-01

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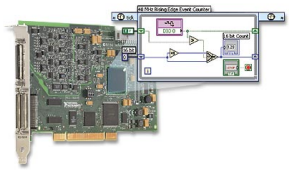
Software Recommendations

LabVIEW Professional Development System for Windows



- Advanced software tools for large project development
- Automatic code generation using DAQ Assistant and Instrument I/O Assistant
- Tight integration with a wide range of hardware
- Advanced measurement analysis and digital signal processing
- Open connectivity with DLLs, ActiveX, and .NET objects
- Capability to build DLLs, executables, and MSI installers

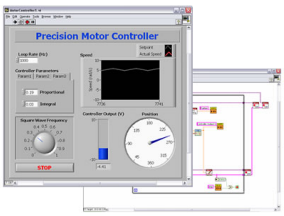
NI LabVIEW FPGA Module



- Create your own I/O hardware without VHDL coding or board design
- Graphically configure FPGAs on NI reconfigurable I/O (RIO) hardware targets
- Define your own control algorithms with loop rates up to 200 MHz
- Execute multiple tasks simultaneously and deterministically
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx CORE Generator functions

NI LabVIEW Real-Time Module

- Design deterministic real-time applications with LabVIEW graphical programming
- Download to dedicated NI or third-party hardware for reliable execution and a wide selection of I/O
- Take advantage of built-in PID control, signal processing, and analysis functions



Automatically take advantage of multicore CPUs or set processor affinity manually

- Includes real-time operating system (RTOS), development and debugging support, and board support
- Purchase individually or as part of an NI Developer Suite bundle

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Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. NI offers a number of calibration services to help maintain the ongoing accuracy of your measurement hardware. These services allow you to be completely confident in your measurements, and help you maintain compliance to standards like ISO 9001, ANSI/NCSL Z540-1 and ISO/IEC 17025. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

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Detailed 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)	$V_{sup} - (I_0 R_0)$
Power-on output state	Channels off
External power supply voltage range (V_{sup})	6–36 VDC
Continuous output current (I_0) per channel	
With 6–30 VDC supply voltage	250 mA max
With 30–36 VDC supply voltage	200 mA max
Output impedance (R_0)	0.3 Ω max
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
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	147 g (5.2 oz)

Safety	
Maximum Voltage [1]	
Connect only voltages that are within the following limits.	
V_{sup}-to-COM	36 VDC, Measurement Category I

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS [2] voltage. 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.

Isolation Voltages	
Channel-to-channel	No isolation between channels

Channel-to-earth ground	
Continuous	60 VDC, Measurement Category I
Withstand	1,000 V_{rms}, verified by a 5 s dielectric withstand test

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 the *Online Product Certification* section.

Hazardous Locations	
U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nC IIC T4
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nC IIC T4
Europe (DEMKO)	EEx nC IIC T4

Environmental

National Instruments C Series modules are intended for indoor use only but may be used outdoors if installed in a suitable enclosure. 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 70 °C
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
Maximum altitude	2,000 m
Pollution Degree (IEC 60664)	2

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

Electromagnetic Compatibility

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

- EN 61326 EMC requirements; Industrial Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device with shielded cables.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

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.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* 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 their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.

电子信息产品污染控制管理办法 （中国 RoHS）

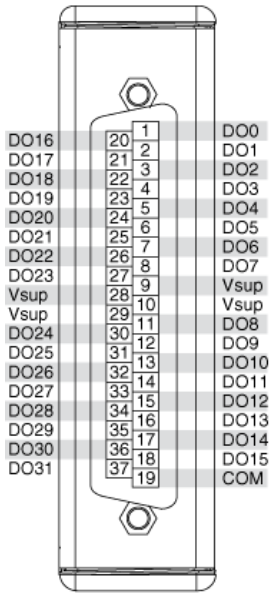
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(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

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

[2] MAINS is defined as the (hazardous live) electrical supply system to which equipment is designed to be connected for the purpose of powering the equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

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Pinouts/Front Panel Connections



NI 9476 Pin Assignments

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