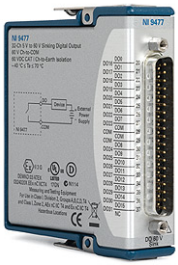
DATASHEET

NI 9477 Datasheet

60 V, 32-Channel (Sinking Output), 8 µs C Series Digital Module



- DSUB connectivity
- Source up to 1 A per channel (20 A per module)
- 60 V DC, CAT I, channel-to-earth isolation

The NI 9477 is a digital output module for CompactDAQ and CompactRIO systems. Each channel is compatible with 0 V to 60 V signals and features 1,000 V RMS withstand isolation from channel to earth ground. The module can sink up to 625 mA per channel continuous current on all channels and is capable of sinking up to 20 A of current per module (1 A per channel maximum). You can wire NI 9477 channels in parallel to sink up to 20 A of current to a single actuator, motor, or solenoid. The NI 9477 works with industrial logic levels and signals to directly connect to a wide array of industrial relays, solenoids, and motors. The NI 9477 is a serial digital module, so it cannot be used to perform counter operations when installed in an CompactDAQ chassis.

Kit Contents	• NI 9477 • NI 9477 Getting Started Guide
Required Accessories	• NI 9923 Screw-Terminal Block

C SERIES DIGITAL OUTPUT MODULE COMPARISON							
Product Name	Module Type	Maximum Output	Channels	Update Rate	Continuous Current	Connectivity	Isolation
NI 9375	Sourcing Output	30 V DC	16	7 µs	100 mA/ch	Spring Terminal, 37-Pin DSUB	250 V RMS Ch-Earth (Spring) 60 V DC Ch-Earth (DSUB)
NI 9472	Sourcing Output	30 V	8	100 µs	750 mA/ch	Screw Terminal, Spring Terminal, 25-Pin DSUB,	250 V RMS Ch-Earth (Screw/Spring) 60 V DC Ch-Earth (DSUB)
NI 9474	Sourcing Output	30 V	8	1 µs	1 A/ch	Screw Terminal, Spring Terminal	250 V RMS Ch-Earth
NI 9475	Sourcing Output	60 V	8	1 µs	1 A/ch	25-Pin DSUB	60 V DC Ch-Earth
NI 9476	Sourcing Output	36 V	32	500 µs	250 mA/ch	Spring Terminal, 37-Pin DSUB	250 V RMS Ch-Earth (Spring) 60 V DC Ch-Earth (DSUB)
NI 9477	Sinking Output	60 V	32	8 µs	1 A/ch (20 A/module)	37-Pin DSUB	60 V DC Ch-Earth
NI 9478	Sinking Output	60 V	16	7 µs	1.2 A/ch	37-Pin DSUB	60 V DC Ch-Earth

NI C Series Overview

NI provides more than 100 C Series modules for measurement, control, and communication applications. C Series modules can connect to any sensor or bus and allow for high-accuracy measurements that meet the demands of advanced data acquisition and control applications.

- Measurement-specific signal conditioning that connects to an array of sensors and signals
- Isolation options such as bank-to-bank, channel-to-channel, and channel-to-earth ground
- -40 °C to 70 °C temperature range to meet a variety of application and environmental needs
- Hot-swappable

The majority of C Series modules are supported in both CompactRIO and CompactDAQ platforms and you can move modules from one platform to the other with no modification.

CompactRIO

CompactRIO combines an open-embedded architecture with small size, extreme ruggedness, and C Series modules in a platform powered by the NI LabVIEW reconfigurable I/O (RIO) architecture. Each system contains an FPGA for custom timing, triggering, and processing with a wide array of available modular I/O to meet any embedded application requirement.

CompactDAQ

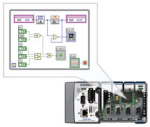
CompactDAQ is a portable, rugged data acquisition platform that integrates connectivity, data acquisition, and signal conditioning into modular I/O for directly interfacing to any sensor or signal. Using CompactDAQ with LabVIEW, you can easily customize how you acquire, analyze, visualize, and manage your measurement data.

Software

LabVIEW Professional Development System for Windows

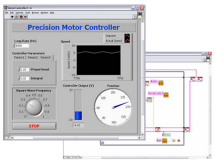
- Use advanced software tools for large project development
- Generate code automatically using DAQ Assistant and Instrument I/O Assistant
- Use advanced measurement analysis and digital signal processing
- Take advantage of open connectivity with DLLs, ActiveX, and .NET objects
- Build DLLs, executables, and MSI installers

NI LabVIEW FPGA Module



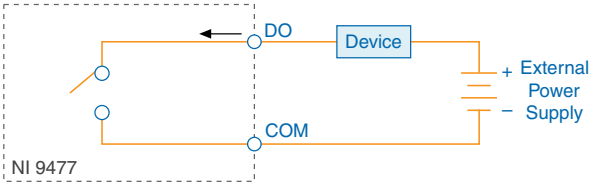
- Design FPGA applications for NI RIO hardware
- Program with the same graphical environment used for desktop and real-time applications
- Execute control algorithms with loop rates up to 300 MHz
- Implement custom timing and triggering logic, digital protocols, and DSP algorithms
- Incorporate existing HDL code and third-party IP including Xilinx IP generator functions
- Purchase as part of the LabVIEW Embedded Control and Monitoring Suite

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
- Take advantage of real-time OS, development and debugging support, and board support
- Purchase individually or as part of a LabVIEW suite

NI 9477 Circuitry



The NI 9477 has sinking outputs. Sinking outputs drive current from DO to COM when the channel is on.

Tip For more information about sinking outputs, visit *ni.com/info* and enter the Info Code `sinksource`.

NI 9477 Specifications

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

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.

Output Characteristics

Number of channels	32 digital output channels
Output type	Sinking

Power-on output state	Channels off[1]
Output voltage (V_0)	$I_0 \cdot R_0$
External power supply voltage range	0 V DC to 60 V DC
Continuous output current (I_0)	
Per channel	1 A maximum, on up to 20 channels
Module (sum of all channels)	20 A maximum
Output impedance (R_0)	0.065 Ω maximum
Reversed-voltage protection	None
Short-circuit protection	None
Maximum update rate	8 µs maximum
Propagation delay	1 µs maximum
MTBF	717,920 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method

Power Requirements

Power consumption from chassis	
Active mode	650 mW maximum
Sleep mode	25 µW maximum
Thermal dissipation (at 70 °C)	
Active mode	1.5 W maximum
Sleep mode	25 µW maximum

Physical Characteristics

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

Tip For two-dimensional drawings and three-dimensional models of the C Series module and connectors, visit *ni.com/dimensions* and search by module number.

Weight	145 g (5.1 oz)

Safety Voltages

Connect only voltages that are within the following limits:

Channel-to-COM[2]	60 V DC maximum, Measurement Category I

[1] The module may experience a 3 ms to 4 ms glitch on the output during a chassis power cycle or software reset. Go to *ni.com/info* and enter info code `9477reset` for more details.

[2] The maximum voltage that can be applied or output between a channel and COM without creating a safety hazard.

Isolation	
Channel-to-channel	None
Channel-to-earth ground	
Continuous	60 V DC, Measurement Category I
Withstand	1,000 V RMS, 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.

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.

Hazardous Locations

U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA IIC T4
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nA IIC T4
Europe (ATEX) and International (IECEx)	Ex nA IIC T4 Gc

Safety and Hazardous Locations Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1
- EN 60079-0:2012, EN 60079-15:2010
- IEC 60079-0: Ed 6, IEC 60079-15; Ed 4
- UL 60079-0; Ed 5, UL 60079-15; Ed 3
- CSA 60079-0:2011, CSA 60079-15:2012

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for sensitive electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Industrial immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

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

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

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 94/9/EC; Potentially Explosive Atmospheres (ATEX)

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 model number or product line, and click the appropriate link in the Certification column.

Shock and Vibration

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

Operating vibration	
Random (IEC 60068-2-64)	5 g_{rms}, 10 Hz to 500 Hz
Sinusoidal (IEC 60068-2-6)	5 g, 10 Hz 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 °C to 70 °C
Storage temperature (IEC 60068-2-1, IEC 60068-2-2)	-40 °C to 85 °C
Ingress protection	IP40
Operating humidity (IEC 60068-2-78)	10% RH to 90% RH, noncondensing
Storage humidity (IEC 60068-2-78)	5% RH to 95% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 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.

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 NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit *ni.com/environment/weee*.

电子信息产品污染控制管理办法（中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

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