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Requirements and Compatibility | Ordering Information | Detailed Specifications | Pinouts/Front Panel Connections
*For user manuals and dimensional drawings, visit the product page resources tab on ni.com.*

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***Last Revised: 2010-03-02 11:34:58.0***

# NI 9472

## 8 Ch, 24 V Logic, 100 µs Sourcing C Series Digital Output Module



- 8-channel, 100 µs digital output
- 6 to 30 V range, sourcing digital output
- D-Sub or screw-terminal connector options
- Hot-swappable operation
- -40 to 70 °C operating range

### Overview

The NI 9472 is an eight-channel, 100 µs sourcing digital output module for any NI CompactDAQ or CompactRIO chassis. Each channel is compatible with 6 to 30 V signals and features 2,300 Vrms of transient overvoltage protection between the output channels and the backplane. Each channel also has an LED that indicates the state of that channel. With the NI 9472, you can connect directly to a variety of industrial devices such as motors, actuators, and relays. There are two connector options for the NI 9472 - a 10-position screw-terminal connector and a 25-position D-Sub connector. This industry-standard 25-position D-Sub connector provides for low-cost cabling to a wide variety of accessories from NI or other vendors. Many vendors with custom D-Sub cable fabrication services can deliver cables with a pinout that matches your exact application needs.

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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 | 6 to 30 V | 8 | 1 A/ch | 1 µs | Screw terminal | Sourcing digital output |
| NI 9475 | Up to 60 V | 8 | 1 A/ch | 1 µs | 27-pin D-Sub | Sourcing digital output |


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| Product Name | Signal Levels | Number of Channels | Current Rating | Speed | Connectivity | Special Features |
|---|---|---|---|---|---|---|
| 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 |

## 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.

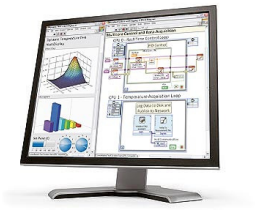
## Ordering Information

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

| Products | Part Number | Recommended Accessories | Part Number |
|---|---|---|---|
| **NI 9472** | | | |
| **NI 9472**<br>Each NI 9472 requires: 1 Connectivity Accessory | 779004-01 | **Connectivity Accessory:** Screw Terminals - NI 9932 Backshell with 10-pos connector block (qty 1) | 779017-01 |
| **NI 9472** | | | |
| **NI 9472 with DSub**<br>Each NI 9472 with DSub requires: 1 Connectivity Accessory | 779137-01 | **Connectivity Accessory:** Screw Terminals - NI 9934 25pin D-Sub connector kit | 779104-01 |

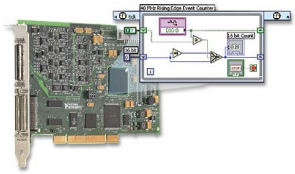
## Software Recommendations

**NI LabVIEW Professional Development System for Windows**



- Easy-to-use graphical development environment
- Tight integration with a wide range of measurement hardware
- Rapid user interface development for displaying live data
- Extensive signal processing, analysis, and math functionality
- Source code control integration and code complexity metrics
- Support for Windows XP/Vista/7 (32-bit) and Windows Vista/7 (64-bit)

**NI LabVIEW FPGA Module**

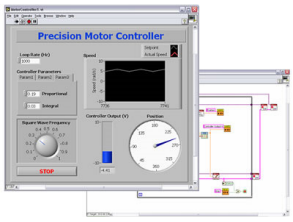


- Define your own control algorithms with loop rates up to 40 MHz
- Execute multiple tasks simultaneously and deterministically
- Create your own I/O hardware without VHDL coding or board design
- Implement custom timing and triggering logic with 25 ns resolution
- Graphically configure FPGAs on NI reconfigurable I/O (RIO) hardware targets

**LabVIEW Real-Time Module**

Design real-time applications with graphical


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programming

Download to a dedicated target for reliable, deterministic performance

Deploy as a distributed, stand-alone, or embedded system

Use built-in PID control functions or create your own control algorithms

Purchase individually or as part of the NI Developer Suite

## 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

View Detailed Specifications Table of Contents

The following specifications are typical for the range –40 to 70 °C unless otherwise noted. All voltages are relative to COM unless otherwise noted. The specifications are the same for the NI 9472 and the NI 9474 unless otherwise noted.

### Output Characteristics

| | |
|---|---|
| Number of channels | 8 digital output channels |
| Output type | Sourcing |
| Power-on output state | Channels off |
| External power supply voltage range ($V_{sup}$) | |
| NI 9472 | 6–30 VDC |
| NI 9474 | 5–30 VDC |
| Output impedance ($R_0$) | |
| Typical | 0.07 Ω |
| Maximum | 0.13 Ω |
| Continuous output current ($I_0$), per channel | |
| NI 9472 | 0.75 A max |
| NI 9474 | 1 A max |
| Output voltage ($V_0$) | $V_{sup} – (I_0 \cdot R_0)$ |
| I/O protection | |
| Voltage | 30 VDC max |
| Reversed voltage | None |

| **Short-circuit behavior** | | |
|---|---|---|
| **Current** | **Channel Behavior** | **Module Protection** |
| 0 to 1 A | Channel does not trip | Module is not damaged |
| 1 to 6 A | Channel does not trip | Module may be damaged |
| 6 to 13 A | Channel may trip | Module may be damaged |
| >13 A | Channel trips | Module is not damaged |

| | |
|---|---|
| Short-circuit trip time | 10 µs at 13 A |
| Output delay time (full load) | |
| NI 9472 | 100 µs max |
| NI 9474 | 1 µs max |
| MTBF | |
| NI 9472 | 1,113,301 hours at 25 °C; Bellcore Issue 2, Method 1, Case 3, Limited Part Stress Method |
| NI 9474 | 479,889 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.

### NI 9472 Power Requirements

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| | |
|---|---|
| Power consumption from chassis | |
| Active mode | 230 mW max |
| Sleep mode | 0.4 mW max |


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| | |
|---|---|
| Thermal dissipation (at 70 °C) | |
| Active mode | 1.5 W max |
| Sleep mode | 55 mW max |

### NI 9474 Power Requirements

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| | |
|---|---|
| Power consumption from chassis | |
| Active mode | 660 mW max |
| Sleep mode | 0.6 mW max |
| Thermal dissipation (at 70 °C) | |
| Active mode | 1.5 W max |
| Sleep mode | 0.6 mW max |

### Physical Characteristics

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| | |
|---|---|
| If you need to clean the module, wipe it with a dry towel. | |
| Screw-terminal wiring | 12 to 24 AWG copper conductor wire with 10 mm (0.39 in.) of insulation stripped from the end |
| Torque for screw terminals | 0.5 to 0.6 N · m (4.4 to 5.3 lb · in.) |
| Ferrules | 0.25 $mm^2$ to 2.5 $mm^2$ |
| Weight | |
| NI 9472/9474 with screw terminal | 150 g (5.3 oz) |
| NI 9472 with DSUB | 145 g (5.1 oz) |

### Safety

Back to Detailed Specs

**NI 9472/9474 with Screw Terminal Safety Voltages**

| | |
|---|---|
| Connect only voltages that are within the following limits. | |
| Channel-to-COM | 30 VDC max |
| Isolation | |
| Channel-to-channel | None |
| Channel-to-earth ground | |
| Continuous | 250 $V_{rms}$, Measurement Category II |
| Withstand | 2,300 $V_{rms}$, verified by a 5 s dielectric withstand test |

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet (e.g., 115 V for U.S. or 230 V for Europe). Examples of Measurement Category II are measurements performed on household appliances, portable tools, and similar products.

**Caution** Do *not* connect the NI 9472/9474 with screw terminal to signals or use for measurements within Measurement Categories III or IV.

**NI 9472 with DSUB Safety Voltages**

| | |
|---|---|
| Connect only voltages that are within the following limits. | |
| Channel-to-COM | 30 VDC max |
| Isolation | |
| Channel-to-channel | None |
| Channel-to-earth ground | |
| Continuous | 60 VDC, 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 [1] 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 9472 with DSUB to signals or use for measurements within Measurement Categories II, III, or IV.

**Safety Standards**


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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

Back to Detailed Specs

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

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To meet these specifications, you must panel mount the system. If you are using the NI 9472/9474 with screw terminal, you also must either affix ferrules to the ends of the terminal wires or use the NI 9932 backshell kit to protect the connections.

| | |
|---|---|
| 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

Back to Detailed Specs

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 double-shielded cables.

### CE Compliance

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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

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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

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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.

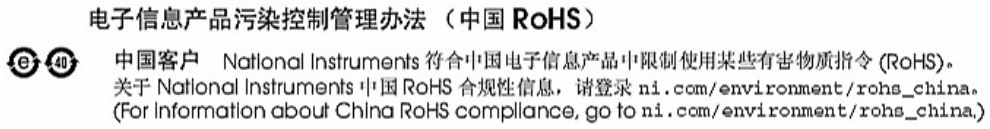
For additional environmental information, refer to the *NI and the Environment* Web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

### Waste Electrical and Electronic Equipment (WEEE)

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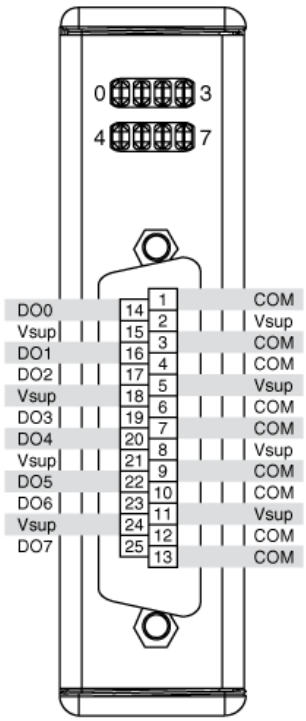

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**EU Customers** At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.



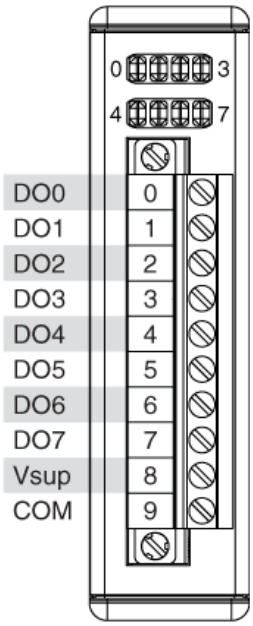

[1] MAINS is defined as the (hazardous live) electrical supply system to which equipment is designed to be connected for the purpose of powering the equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

**Pinouts/Front Panel Connections**




NI 9472/9474 with Screw Terminal


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NI 9472 with DSUB

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