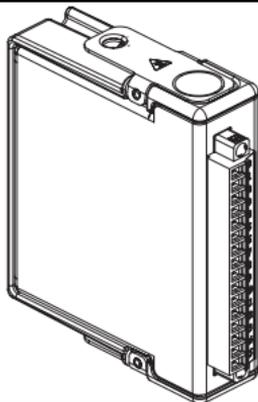


OPERATING INSTRUCTIONS

NI 9485

8-Channel Solid-State Relay (SSR) Digital Output Module

このドキュメントの日本語版については、ni.com/jp/manualsを参照してください。(For a Japanese language version, go to ni.com/jp/manuals.)



These operating instructions describe how to use the National Instruments 9485. For information about installing, configuring, and programming the system, refer to the system documentation. Visit ni.com/info and enter the info code `rdsoftwareversion` to determine which software you need for the modules you are using.



Note The safety guidelines and specifications in this document are specific to the NI 9485. The other components in the system might not meet the same safety ratings and specifications. Refer to the documentation for each component in the system to determine the safety ratings and specifications for the entire system.

Safety Guidelines

Operate the NI 9485 only as described in these operating instructions.



Hot Surface This icon denotes that the component may be hot. Touching this component may result in bodily injury.

Safety Guidelines for Hazardous Voltages

If *hazardous voltages* are connected to the module, take the following precautions. A hazardous voltage is a voltage greater than $42.4 V_{pk}$ or 60 VDC to earth ground.



Caution Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.



Caution Do *not* mix hazardous voltage circuits and human-accessible circuits on the same module.



Caution When module terminals are hazardous voltage LIVE ($>42.4V_{pk}/60$ VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9939 connector backshell kit to ensure that the terminals are *not* accessible.

Figure 1 shows the NI 9939 connector backshell.

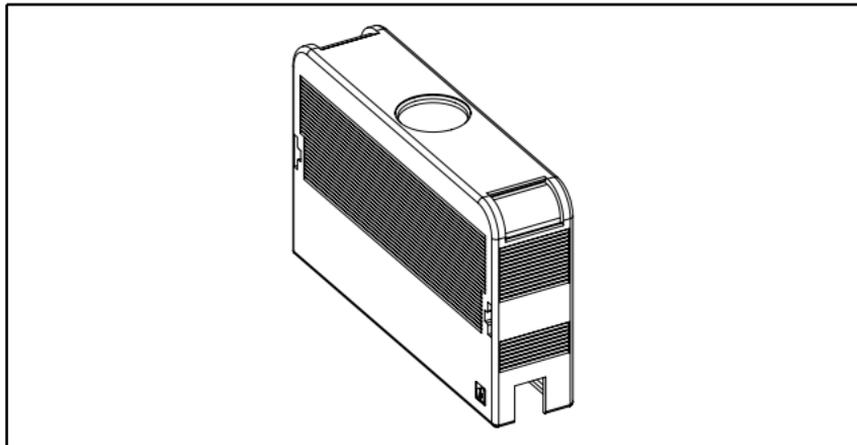


Figure 1. NI 9939 Connector Backshell

Safety Guidelines for Hazardous Locations

The NI 9485 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nA II T4 and Ex nA II T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI 9485 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.



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 Zone 2 applications, install the system in an enclosure rated to at least IP 54 as defined by IEC 60529 and EN 60529.



Caution For Zone 2 applications, install a protection device across the positive and negative terminals of the external power supply (or supplies). The device must prevent the external power supply from exceeding 80 V if there is a transient overvoltage condition.

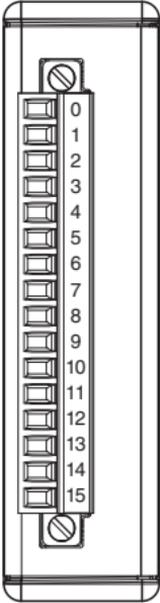
Special Conditions for Hazardous Locations Use in Europe

This equipment has been evaluated as EEx nA II T4 equipment under DEMKO Certificate No. 03 ATEX 0324020X. The equipment is marked EEx II 3G and is suitable for use in Zone 2 hazardous locations.

Wiring the NI 9485

The NI 9485 has a 16-terminal, detachable screw-terminal connector that provides connections for eight solid-state relay channels. Each channel has two interchangeable terminals, CHa and CHb. Refer to Table 1 for the terminal assignments for each channel.

Table 1. Terminal Assignments

Module	Terminal	Signal
	0	CH0a
	1	CH0b
	2	CH1a
	3	CH1b
	4	CH2a
	5	CH2b
	6	CH3a
	7	CH3b
	8	CH4a
	9	CH4b
	10	CH5a
	11	CH5b
	12	CH6a
	13	CH6b
	14	CH7a
15	CH7b	

Wiring for High-Vibration Applications

If an application is subject to high vibration, National Instruments recommends that you either use ferrules to terminate wires to the detachable screw-terminal connector or use the NI 9939 backshell kit to protect the connections. Refer to Figure 2 for an illustration.

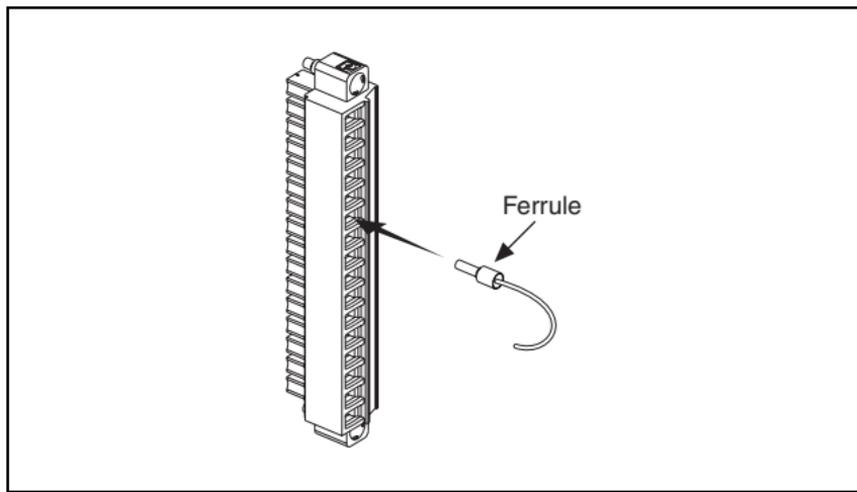


Figure 2. 16-Pin Detachable Screw Terminal with Ferrule

Connecting Loads to the NI 9485

You can connect loads to the NI 9485. Connect the load to one of the leads of the power source. Connect either the CHa or the CHb terminal to the load and the other terminal to the other lead of the AC or DC power source. Figure 3 shows a possible configuration where the load is connected to the CHb terminal and the DC or AC power source.

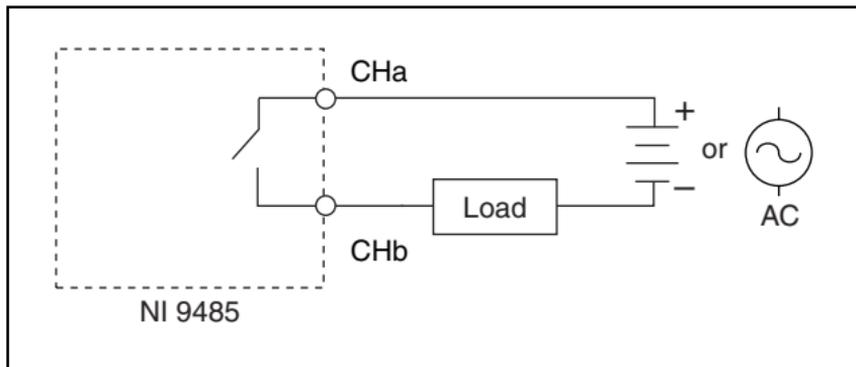


Figure 3. Connecting a Load to the NI 9485

When you write an ON command to a channel, the SSR is closed and the terminal that is connected to the load allows current to flow or allows voltage to be applied to the load. When you write an OFF command to a channel, the switch opens, disconnecting the circuit so no current flows and no voltage is applied to the load.

Protecting Inductive Loads

When inductive loads are connected to the NI 9485 relay outputs, a large counter-electromotive force may occur at switching time because of the energy stored in the inductive load. These flyback voltages can damage the relay outputs and/or the external power supply.

Limit flyback voltages at your inductive load by installing one of the following:

- For DC loads—Install a flyback diode within 18 in. of the load.
- For AC loads—Install a metal oxide varistor (MOV) rated for $30 V_{\text{rms}}$ or slightly higher.

Figures 4 and 5 show examples of using an external flyback diode to protect DC inductive loads and an MOV to protect AC inductive loads, respectively.

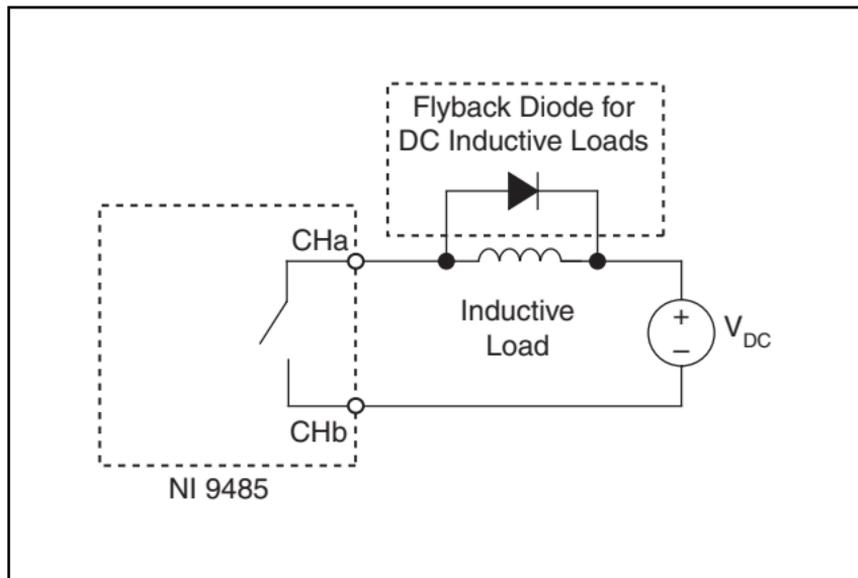


Figure 4. Contact Protection for DC Inductive Loads

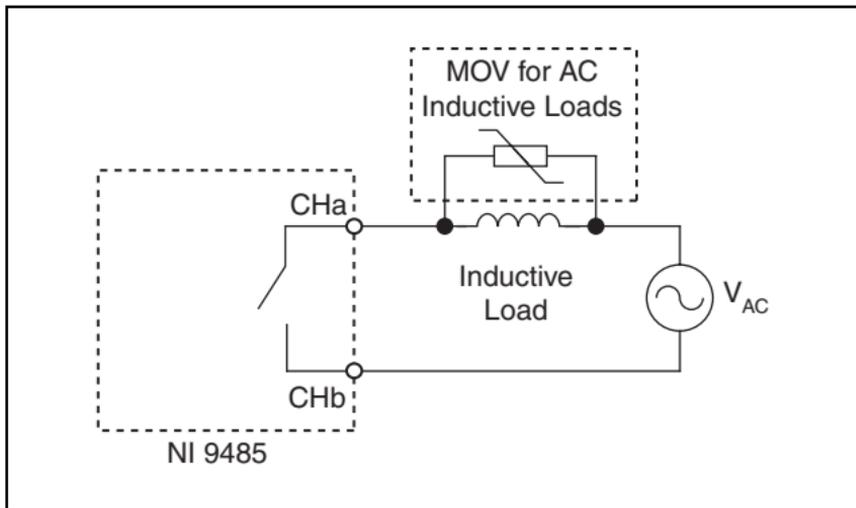


Figure 5. Contact Protection for AC Inductive Loads

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 documentation for information about support for sleep mode. You can enable sleep mode in software. Refer to the driver software documentation for more information.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the SSRs open to prevent current from flowing through the load. Consequently, 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.

Specifications

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

Output Characteristics

Number of channels	8 digital output channels
Relay type	Normally open solid-state relay (SSR)
Switching voltage	60 VDC max, $30 V_{\text{rms}}$ max

Switching current, per channel¹

All channels..... 0.75 A max

Up to four channels 1.2 A max

Switching rate (90% duty cycle)¹ 1 operation per second

Relay open time 0.5 ms typ

Relay close time..... 9.0 ms typ

On resistance..... 200 m Ω max

Off state leakage 30 μ A typ

MTBF 2,172,740 hours at 25 °C;
Bellcore Issue 6, Method 1,
Case 3, Limited Part Stress
Method



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

¹ For additional specifications related to faster switching rates and/or higher currents at lower temperatures, go to ni.com/info and enter the info code rd9485specs.

Power Requirements

Power consumption from chassis

Active mode 500 mW max

Sleep mode 5 mW max

Thermal dissipation (at 70 °C)

Active mode 1.5 W max

Sleep mode 5 mW max

Physical Characteristics

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

Ferrules 0.25 mm² to 0.5 mm²

Torque for screw terminals 0.5 to 0.6 N · m
(4.4 to 5.3 lb · in.)

Weight Approx. 145 g (5.1 oz)

Safety

Safety Voltages

Connect only voltages that are within these limits.

Channel a-to-Channel b 60 VDC max, 30 V_{rms} max

Isolation

Channel-to-channel

Continuous 60 VDC

Withstand 1,390 V_{rms}, verified by a 5 s dielectric withstand test

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 (for example, 115 V for U.S. or 230 V for Europe). Do *not* connect to signals or use for measurements within Measurement Categories III or IV.

Safety Standards

The NI 9485 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.

Hazardous Locations

U.S. (UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nA II T4
Canada (C-UL)	Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, Ex nA II T4
Europe (DEMKO).....	EEx nA II 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 installation instructions 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 and either use ferrules to terminate wires to the detachable screw-terminal connector or use the NI 9939 backshell kit to protect the connections.

Operating vibration

Random (IEC 60068-2-34)..... 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 according to product documentation.

CE Compliance

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

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)



Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain 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.

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.

National Instruments Contact Information

The National Instruments Web site 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.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0,
Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,
Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 385 (0) 9 725 72511, France 33 (0) 1 48 14 24 24,
Germany 49 89 7413130, India 91 80 41190000,
Israel 972 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970,

Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793,
Netherlands 31 (0) 348 433 466, New Zealand 0800 553 322,
Norway 47 (0) 66 90 76 60, Poland 48 22 3390150,
Portugal 351 210 311 210, Russia 7 495 783 6851,
Singapore 1800 226 5886, Slovenia 386 3 425 42 00,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151,
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