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**PXI-2532**

# NI PXI/PXIe-2532 Specifications

## 512-Crosspoint, 1-Wire Matrix

このドキュメントには、日本語ページも含まれています。

This document lists specifications for the NI PXI/PXIe-2532 (NI 2532) 512-crosspoint matrix. All specifications are subject to change without notice. Visit [ni.com/manuals](http://ni.com/manuals) for the most current specifications.

Topologies ..... 1-wire 4 × 128 matrix,  
1-wire 8 × 64 matrix,  
1-wire 16 × 32 matrix,  
1-wire dual 4 × 64 matrix,  
1-wire dual 8 × 32 matrix,  
1-wire dual 16 × 16 matrix,  
1-wire sixteen 2 × 16 matrix,  
2-wire 4 × 64 matrix,  
2-wire 8 × 32 matrix,  
2-wire 16 × 16 matrix

Refer to the *NI Switches Help* for detailed topology information.



**Caution** To ensure the specified EMC performance, operate this product only with shielded cables and accessories.



**Caution** Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document at [ni.com/manuals](http://ni.com/manuals) for important safety and compliance information.

## About These Specifications

*Specifications* characterize the warranted performance of the instrument under the stated operating conditions.

*Typical Specifications* are specifications met by the majority of the instrument under the stated operating conditions and are tested at 23 °C. Typical specifications are not warranted.

All voltages are specified in DC, AC<sub>pk</sub>, or a combination unless otherwise specified.

## Input Characteristics

Maximum switching voltage

Channel-to-channel ..... 100 V  
Channel-to-ground ..... 100 V, CAT I



**Caution** This module is rated for Measurement Category I and intended to carry signal voltages no greater than 100 V. This module can withstand up to 500 V impulse voltage. Do not use this module for connection to signals or for measurements within Categories II, III, or IV. Do not connect to MAINS supply circuits (for example, wall outlets) of 115 or 230 VAC. Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document for more information on measurement categories.



**Caution** When hazardous voltages ( $>42.4 V_{pk}/60 VDC$ ) are present on any relay terminal, safety low-voltage ( $<42.4 V_{pk}/60 VDC$ ) cannot be connected to any other relay terminal.

Maximum current ..... 0.5 A  
(switching or carry, per channel)



**Caution** The maximum switching power is limited by the maximum switching current and the maximum voltage, and must not exceed 10 W.

Maximum switching power ..... 10 W  
(per channel)

DC path resistance

Initial .....  $<1 \Omega$   
End-of-life .....  $\geq 2 \Omega$   
Open channel .....  $>1 \times 10^9 \Omega$



**Note** DC path resistance typically remains low for the life of the relay. At the end of relay life, the path resistance rapidly rises above 2 Ω. Load ratings apply to relays used within the specification before the end of relay life.

#### Thermal EMF

1-wire .....	<50 μV
2-wire .....	<20 μV

#### Bandwidth, typical (–3 dB, 50 Ω termination)

1-wire row/column .....	≥30 MHz
2-wire row/column .....	≥25 MHz

#### Crosstalk, typical (50 Ω termination)

Channel-to-channel	
10 kHz .....	<–89 dB
100 kHz .....	<–73 dB
1 MHz .....	<–54 dB
10 MHz .....	<–36 dB

#### Isolation, typical (50 Ω termination)

Open channel	
10 kHz .....	>91 dB
100 kHz .....	>71 dB
1 MHz .....	>51 dB
10 MHz .....	>32 dB

## Dynamic Characteristics

#### Simultaneous drive limit

PXI .....	40 relays
PXI Express .....	64 relays

Relay operate time ..... 0.25 ms



**Note** Certain applications may require additional time for proper settling. Refer to the *NI Switches Help* for information about including additional settling time.

Release time ..... 0.25 ms

#### Typical relay life (no load)

Mechanical .....	$1 \times 10^9$ cycles
Electrical (resistive, <10 pF load)	
10 V, 100 mA .....	$1 \times 10^7$ cycles
20 V, 500 mA .....	$5 \times 10^6$ cycles
100 V, 10 mA .....	$5 \times 10^5$ cycles

To estimate reed relay lifetime, refer to the *Reed Relay Life* section of this document.



**Note** Optional series protection resistance, available for the terminal blocks, increases the expected relay life at higher voltages. This series protection resistance shields the reed relays from the effects of cable and load capacitance. For more information, refer to the *Reed Relay Protection* tutorial at [ni.com/zone](http://ni.com/zone).



**Note** Reed relays are highly susceptible to damage caused by switching capacitive and inductive loads. Capacitive loads can cause high inrush currents while inductive loads can cause high flyback voltages. The addition of appropriate resistive protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load, visit [ni.com/info](http://ni.com/info) and enter the info code `relaylifetime`. For information about inductive loads, enter the Info Code `relayflyback`.



**Note** The relays used in the NI 2532 are field replaceable. Refer to the *NI Switches Help* for information about replacing a failed relay.

## Trigger Characteristics

#### Input trigger

Sources .....	PXI trigger lines 0–7
Minimum pulse width .....	150 ns



**Note** The NI 2532 can recognize trigger pulse widths <150 ns if you disable digital filtering. For information about disabling digital filtering, refer to the *NI Switches Help* at [ni.com/manuals](http://ni.com/manuals).

#### Output trigger

Destinations .....	PXI trigger lines 0–7
Pulse width .....	Programmable (1 μs to 62 μs)

## Physical Characteristics

Relay type ..... Reed



**Note** NI advises against installing reed relay modules directly adjacent to an embedded controller with a magnetic hard drive because of the sensitivity of reed relays and the possibility of interference.

Relay contact material ..... Rhodium

I/O connectors ..... 2, 160 pos,  
Samtec BTE-EM series



**Note** Terminal block connectivity is with standard 0.050 inch pitch headers. Refer to the [Accessories](#) section for more information.



**Note** Achieve the best performance by minimizing the number of I/O connector mating cycles.

**Power requirement**

PXI.....	10 W at 5 V 2 W at 3.3 V
PXI Express .....	15 W at 12V 2 W at 3.3 V

**Dimensions (L × W × H)** ..... 3U, one slot,  
PXI/cPCI module,  
PXIe compatible  
21.6 × 2.0 × 13.0 cm  
(8.5 × 0.8 × 5.1 in.)

**Weight**..... 454 g (1 lb)

## Environment

The NI 2532 is intended for indoor use only.

Operating temperature.....	0 °C to 55 °C
Storage temperature.....	-20 °C to 70 °C
Relative humidity .....	5% to 85%, noncondensing
Pollution Degree.....	2
Maximum altitude .....	2,000 m

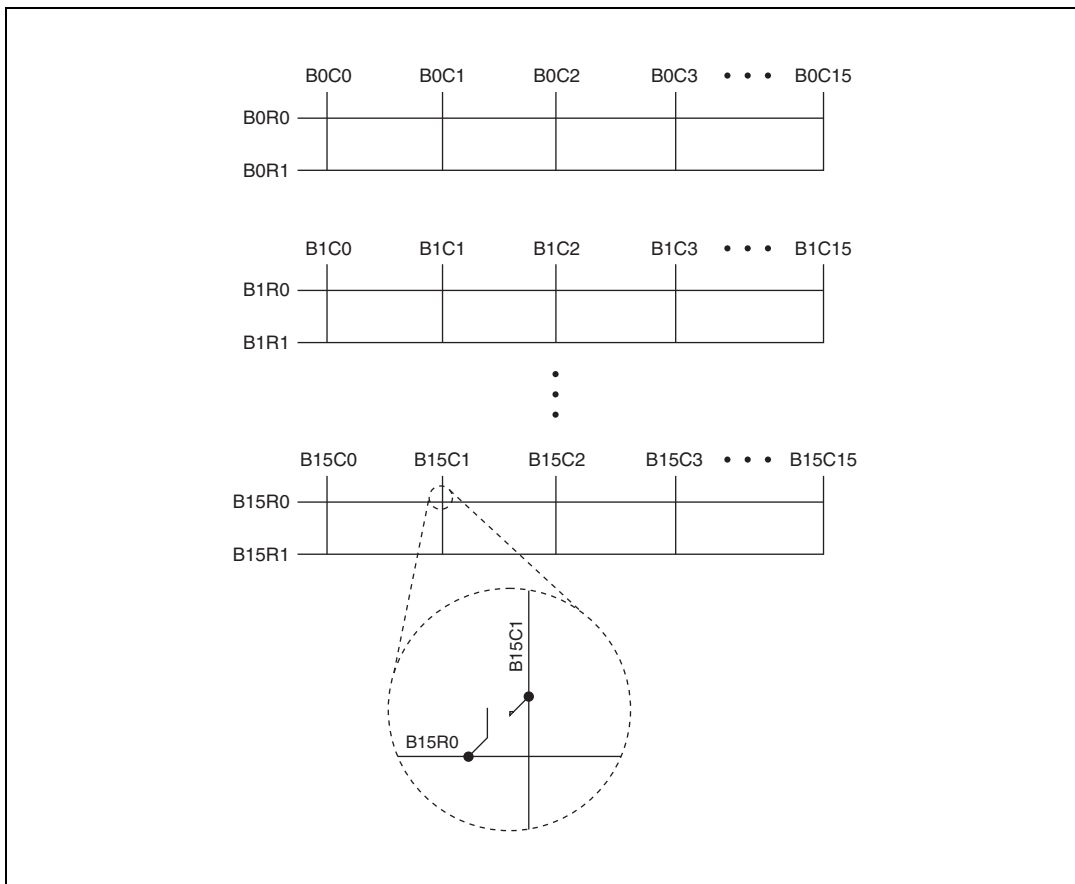
## Shock and Vibration

**Operational shock**.....30 g peak, half-sine,  
11 ms pulse  
(Tested in accordance  
with IEC 60068-2-27.  
Test profile developed  
in accordance with  
MIL-PRF-28800F.)

**Random vibration**

Operating .....	5 to 500 Hz, 0.3 g <sub>rms</sub>
Nonoperating .....	5 to 500 Hz, 2.4 g <sub>rms</sub> (Tested in accordance with IEC 60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Refer to Figure 1 for the power-on state diagram of the NI PXI/PXIe 2532.



**Figure 1.** NI PXI/PXIe 2532 Configuration (Relay Shown in Power-On State)

The following figure shows the NI PXI/PXIe-2532 connector pinout for the left and right connectors.

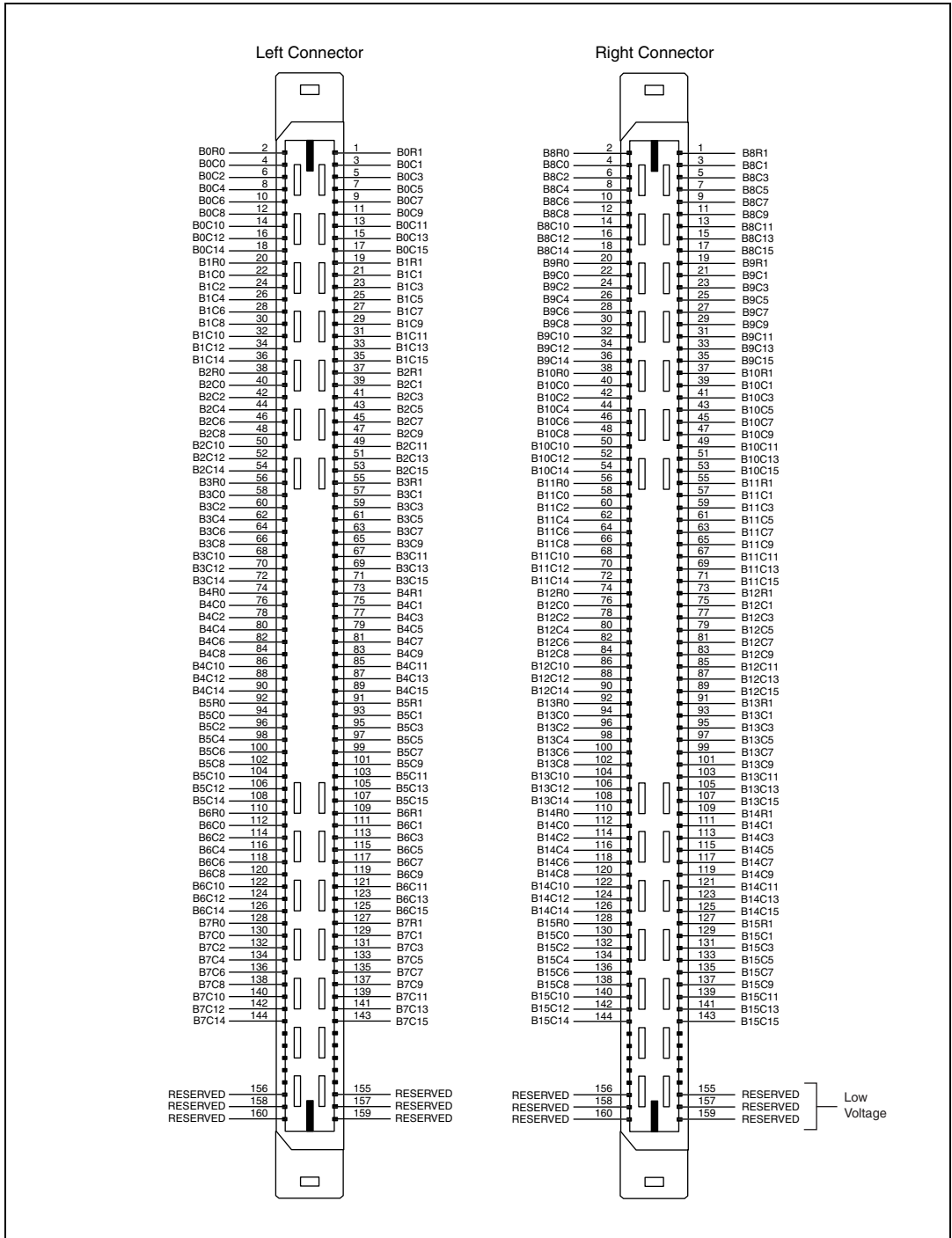


Figure 2. NI PXI/PXIe-2532 Connector Pinout



**Note** For topology-specific connection information, refer to your device in the *NI Switches Help* and the installation instructions for any associated cables or terminal blocks.



**Note** Refer to the terminal block installation instructions for signal connectivity and matrix expansion options. Contact NI for custom terminal block designs.

## Accessories

Visit [ni.com](http://ni.com) for more information about the following accessories.



**Note** The specifications listed in this document, including the safety and compliance certifications, also apply to the terminal blocks for the NI 2532 unless otherwise noted in the terminal block installation instructions.

**Table 1.** NI Accessories for the NI 2532

Accessory	Part Number
NI TB-2640 terminal block (1-wire 4 × 128 matrix)	779056-01
NI TB-2640 terminal block, with protection resistance	779056-02
NI TB-2641 terminal block (1-wire 8 × 64 matrix)	779056-03
NI TB-2641 terminal block, with protection resistance	779056-04
NI TB-2642 terminal block (1-wire 16 × 32 matrix)	779056-05
NI TB-2642 terminal block, with protection resistance	779056-06
NI TB-2643 terminal block (2-wire 4 × 64 matrix or 1-wire dual 4 × 64 matrix)	779056-07
NI TB-2643 terminal block, with protection resistance	779056-08
NI TB-2644 terminal block (2-wire 8 × 32 matrix or 1-wire dual 8 × 32 matrix)	779056-09
NI TB-2644 terminal block, with protection resistance	779056-10
NI TB-2645 terminal block (2-wire 16 × 16 matrix or 1-wire dual 16 × 16 matrix)	779056-11
NI TB-2645 terminal block, with protection resistance	779056-12

**Table 2.** Third-Party Accessory for the NI 2532

Accessory	Manufacturer	Manufacturer Part Number
Module mating connector*	Samtec	BSE-080-01-L-D-A
* PCB mount, additional cover or enclosure required. See previous safety caution.		



**Note** Third-party vendors offer mass-interconnect solutions for this module. Refer to Virginia Panel at [www.vpc.com](http://www.vpc.com) or MAC Panel at [www.macpanel.com](http://www.macpanel.com) for connectivity offerings.



**Caution** You *must* install mating connectors according to local safety codes and standards and according to the specifications provided by the connector manufacturer. You are responsible for verifying safety compliance of third-party connectors and their usage according to the relevant standard(s), including UL and CSA in North America and IEC and VDE in Europe.

## Reed Relay Life

Figure 3 shows the reed relay lifetime nomograph. The purpose of this graph is to estimate reed relay lifetime.



**Note** This nomograph is not meant to be an exact or guaranteed specification and should only be used as a guideline to estimate lifetime. Actual reed relay lifetimes may vary depending on application.

Complete the following steps to use this nomograph:

1. Determine the peak voltage experienced across the relay while switching and mark this value on the *Volts* line.
2. Determine the sum of the DUT, cable, and instrumentation capacitances and mark this value on the *Load Capacitance* line.
3. Draw a straight line between both values.

The intersection points of this line and the *No Protection* and *100 Ω Protection* axes are the corresponding estimated relay lifetimes in cycles. For more information on adding protection resistance, visit [ni.com/info](http://ni.com/info) and enter the Info Code `relaylifetime`.

Refer to the following example and Figure 3 for an example application.

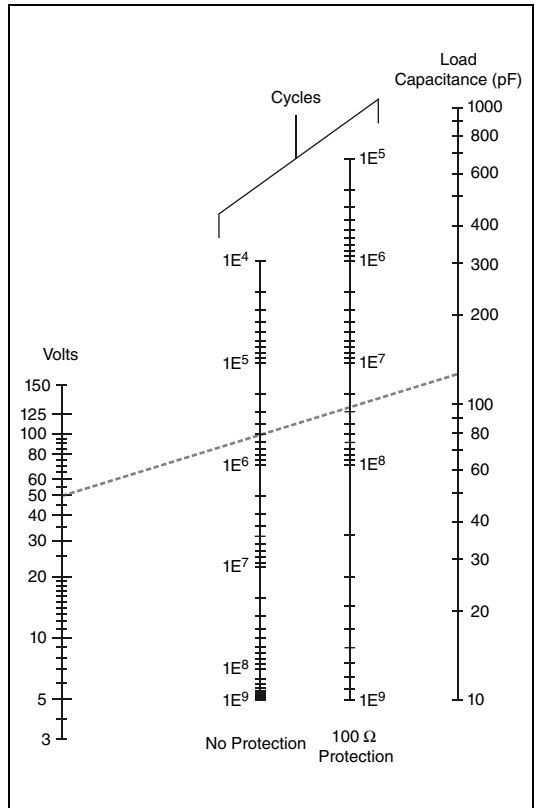
### Example

The reed relay module is connected to a DMM via 1 meter of cable. The DMM and cable capacitances are 100 pF and 30 pF respectively. The maximum voltage switched across the relay is 50 volts. Determine the estimated number of relay cycles with and without protection resistance.

### Solution

The total load capacitance is the sum of the cable and DMM capacitance, which is 130 pF. Draw a line between the 50V point on the *Volts* axis and 130 pF on the *Load Capacitance* axis.

The line drawn intersects the *Cycles* axes at approximately 500,000 on the *No Protection* axis and about 25,000,000 on the *100 Ω Protection* axis (refer to Figure 3). This series resistance should be placed as close as possible to the relay for maximum effect.



**Figure 3.** Reed Relay Lifetime Nomograph



# Compliance and Certifications

## Safety

This product meets 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.

## Electromagnetic Compatibility

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

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic 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 EMC declarations and certifications, refer to the *Online Product Certification* section.

## CE Compliance

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

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

## Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## 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 *NI and the Environment* Web page at [ni.com/environment](http://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 Electrical and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

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