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# PXI-2541

# Specifications

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2022-07-06



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# PXI-2541 Specifications

This document lists specifications for the PXI-2541. All specifications are subject to change without notice.

## PXI-2541 Specifications

**Specifications** characterize the warranted performance of the instrument under the stated operating conditions. Data in this document are **Specifications** unless otherwise noted.

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

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



**Caution** The protection provided by the PXI-2541 can be impaired if it is used in a manner not described in this document.

## Topology

|          |               |
|----------|---------------|
| Topology | 8 × 12 matrix |
|----------|---------------|

## Input Characteristics

|  |                                 |
|--|---------------------------------|
| Maximum switching voltage                        | 60 V DC (42.4 V <sub>pk</sub> ) |
| Maximum switching or carry current (per channel) | 0.5 A                           |



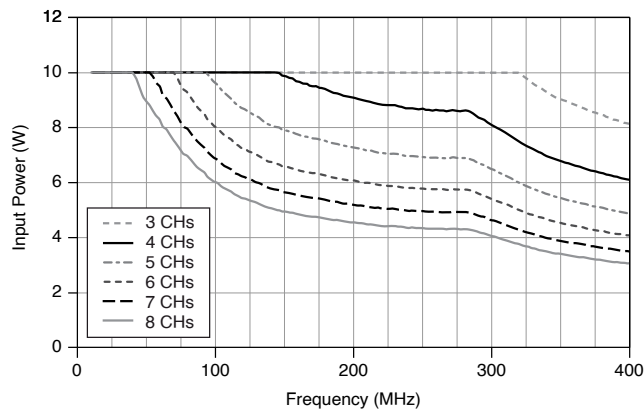
**Caution** The switching power is limited by the maximum switching current and the maximum voltage, and must not exceed 10 W.

|   |      |
|---|------|
| Maximum DC switching or carry power (per channel)         | 10 W |
| Maximum RF power (per channel, 50 $\Omega$ system)        | 10 W |
| Simultaneous channels at maximum RF power (up to 300 MHz) | 3    |



**Note** Maximum RF power derates as frequency and number of simultaneous channels increase and must not exceed the values shown in the following figures.

Figure 1. Maximum RF Input Power



**Note** NI recommends against switching active RF signals. As a relay actuates, the channel is momentarily unterminated. Some RF sources can be damaged by reflections if their outputs are not properly terminated. Consult your RF source documentation for more information.

#### DC path resistance

Initial <math><2.1 \Omega</math>, typical

|             |                             |
|-------------|-----------------------------|
| End-of-life | $\geq 3.1 \Omega$ , typical |
|-------------|-----------------------------|

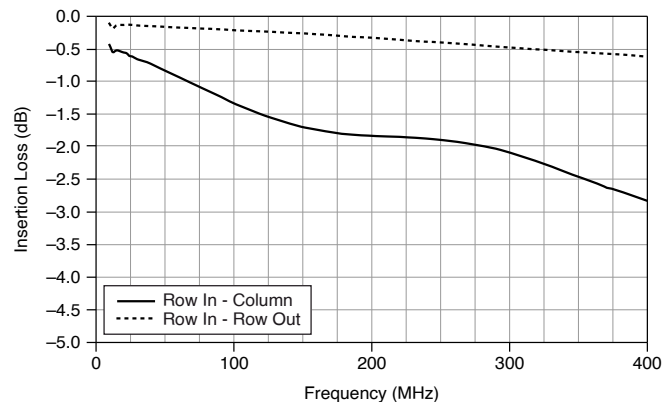
Path resistance is a combination of relay contact resistance and trace resistance. Contact resistance typically remains low for the life of a relay. At the end of relay life, the contact resistance rises rapidly above  $3.1 \Omega$ .

## RF Performance Characteristics

|   |                          |
|---|--------------------------|
| Characteristic impedance ( $Z_0$ )                | 50 $\Omega$ , nominal    |
| <b>Insertion loss (<math>\leq 300</math> MHz)</b> |                          |
| Row In - Column                                   | <3 dB (<2.1 dB, typical) |
| Row In - Row Out                                  | <1 dB (<0.5 dB, typical) |

Refer to the following figure for the insertion loss of the PXI-2541.

Figure 2. PXI-2541 Insertion Loss, Typical



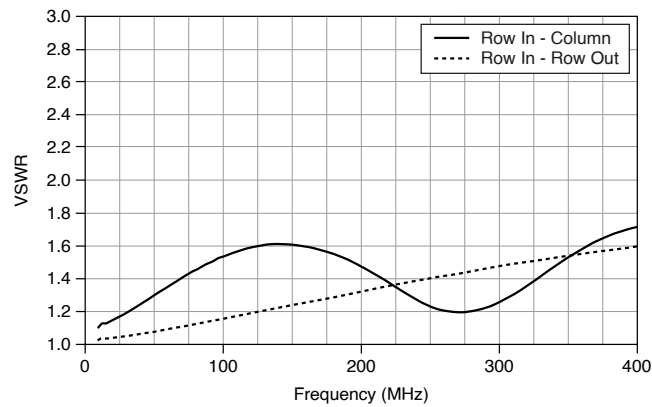
|   |                      |
|---|----------------------|
| <b>VSWR (<math>\leq 300</math> MHz)</b> |                      |
| Row In - Column                         | <2.2 (<1.6, typical) |

Row In - Row Out

&lt;1.8 (&lt;1.5, typical)

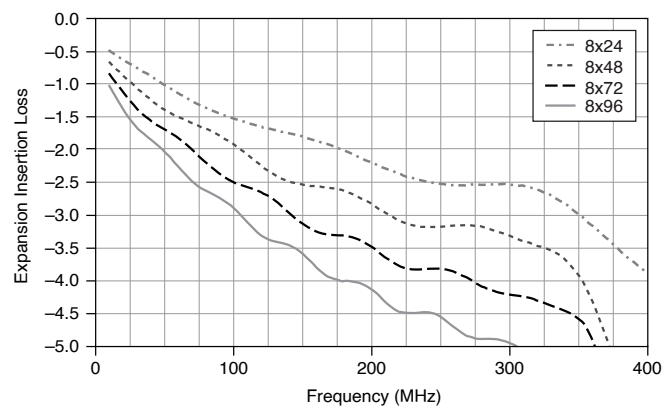
Refer to the following figure for the VSWR of the PXI-2541.

Figure 3. PXI-2541 VSWR, Typical



The PXI-2541 supports column expansion. Row Out connectors of one module can be connected to the Row In connectors of another module to create larger matrices. The following figure shows the effect of matrix expansion on R0C0 insertion loss when cable part number 188374-0R15 is used to cascade 2, 4, 6, and 8 modules. VSWR for these cases remains below 1.8 past 300 MHz. Refer to the **NI Switches Help** at [ni.com/manuals](http://ni.com/manuals) for more information about matrix expansion.

Figure 4. PXI-2541 Expansion Insertion Loss

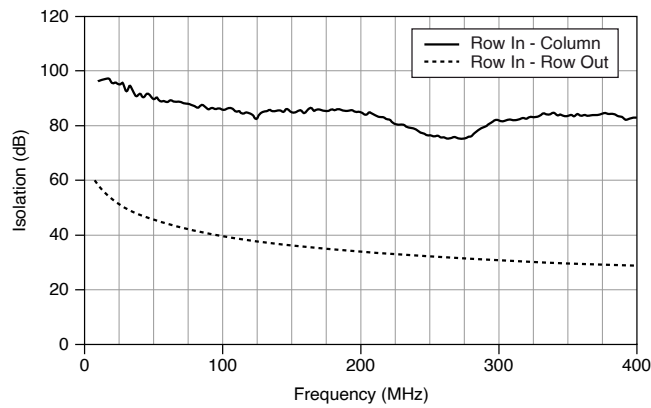


**Open CH isolation ( $\leq 300$  MHz)**

|                  |                 |
|------------------|-----------------|
| Row In - Column  | >75 dB, typical |
| Row In - Row Out | >30 dB, typical |

Refer to the following figure for the channel-to-channel isolation of the PXI-2541.

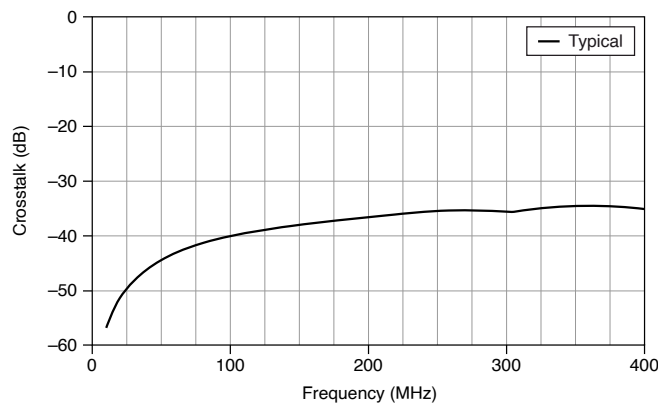
Figure 5. PXI-2541 Open Channel Isolation, Typical



|                              |                  |
|------------------------------|------------------|
| <b>Crosstalk</b><br>≤300 MHz | <-35 dB, typical |
|------------------------------|------------------|

Refer to the following figure for the crosstalk of the PXI-2541.

Figure 6. PXI-2541 Crosstalk, Typical



**Propagation delay**

|                   |                  |
|-------------------|------------------|
| Row In - Column   | <6 ns, typical   |
| Row In - Row Out  | <1 ns, typical   |
| <b>CH-CH skew</b> |                  |
| Row In - Column   | <2.0 ns, typical |
| Row In - Row Out  | <0.1 ns, typical |

## Dynamic Characteristics

|                                |           |
|--------------------------------|-----------|
| Simultaneous relay drive limit | 40 relays |
| Maximum operate time           | 0.25 ms   |
| Maximum release time           | 0.25 ms   |



**Note** Certain applications may require additional time for proper settling. Refer to the **NI Switches Help** at [ni.com/manuals](http://ni.com/manuals) for information about including additional settling time.

### Relay life

Mechanical  $1 \times 10^7$  cycles, typical

#### Electrical (resistive, <10 pF load, DC or 50 Ω RF systems)

10 V, 100 mA  $1 \times 10^7$  cycles, typical

20 V, 500 mA  $5 \times 10^6$  cycles, typical





**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 protection can greatly improve contact lifetime. For more information about adding protection circuitry to a capacitive load, visit [ni.com/info](https://ni.com/info) and enter the Info Code relaylifetime. For information about inductive loads, enter the Info Code relayflyback.

#### Related reference

- [CE Compliance](#)

## Trigger Characteristics

### Input trigger

|                     |                           |
|---------------------|---------------------------|
| Sources             | PXI trigger lines <0...7> |
| Minimum pulse width | 150 ns                    |



**Note** The PXI-2541 can recognize trigger pulse widths less than 150 ns by disabling digital filtering. For information about disabling digital filtering, refer to the **NI Switches Help** at [ni.com/manuals](https://ni.com/manuals).

### Output trigger

|              |  |
|--------------|--|
| Destinations | PXI trigger lines <0...7>              |
| Pulse width  | Programmable (1 $\mu$ s to 62 $\mu$ s) |

## Physical Characteristics

|            |                    |
|------------|--------------------|
| Relay type | Reed, non-latching |
|------------|--------------------|

|                          |  |
|--------------------------|--|
| Relay contact material   | Rhodium  |
| I/O connectors           | 28 MCX jacks   |
| <b>Power requirement</b> |  |
| PXI                      | 10 W at 5 V  |
|                          | 2 W at 3.3 V   |
| PXI Express              | 10 W at 12 V   |
|                          | 2.5 W at 3.3 V   |
| Dimensions (L × W × H)   | 3U, one slot, PXI/cPCI module, PXIe compatible<br>21.6 cm × 2.0 cm × 13.0 cm (8.5 in. × 0.8 in. × 5.1 in.) |
| Weight                   | 410 g (14.46 oz)   |

## Environment

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

Indoor use only.

## 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.) |
| <b>Random Vibration</b><br>Operating 5 Hz to 500 Hz, 0.3 g <sub>rms</sub><br><br>Nonoperating 5 Hz 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.) |   |

## Compliance and Certifications

### Safety Compliance 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 C22.2 No. 61010-1



**Note** For safety certifications, refer to the product label or the [Product Certifications and Declarations](#) 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
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity

- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Note** In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.



**Note** Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.



**Note** For EMC declarations, certifications, and additional information, refer to the [Product Certifications and Declarations](#) section.

## Product Certifications and Declarations


Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit [ni.com/product-certifications](https://ni.com/product-certifications), search by model number, and click the appropriate link.

## 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 **Engineering a Healthy Planet** web page at [ni.com/environment](https://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.

## EU and UK Customers

-  Waste Electrical and Electronic Equipment (WEEE)—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](https://ni.com/environment/weee).

## 电子信息产品污染控制管理办法 ( 中国 RoHS )

-  中国 RoHS— NI 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 NI 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](https://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](https://ni.com/environment/rohs_china).)