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Find the *National Instruments PXIe-2512* at our website: ***Click HERE***

DEVICE SPECIFICATIONS

# NI PXI/PXIe-2512

## 10 A Fault Insertion Unit

This document lists specifications for the NI PXI/PXIe-2512 (NI 2512) fault insertion unit (FIU) switch module. All specifications are subject to change without notice. Visit *ni.com/manuals* for the most current specifications.

Topology.....Independent

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

**Caution** The protection provided by the NI 2512 can be impaired if it is used in a manner not described in this document.

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# About These Specifications

Specifications characterize the warranted performance of the instrument under the following operating conditions:

- The PXI/PXIe chassis fan speed is set to High.
- The fan filters are clean.
- The empty slots contain filler panels.

For more information, refer to the *Maintain Forced-Air Cooling Note to Users* document available at *ni.com/manuals*.

*Typical* specifications are specifications met by the majority of the instruments under the stated operating conditions. Typical specifications are not warranted.

Data provided in this document are specifications unless otherwise noted.

# Input Characteristics

All input characteristics are DC, $AC_{rms}$, or a combination unless otherwise specified.

Maximum switching voltage.....50 VDC, 30 V $AC_{rms}$, CAT I[1]

**Caution** Steady state voltages applied to the NI 2512 between any two I/O connector pins in excess of the maximum switching voltage specification may damage this module.

**Caution** This module is rated for Measurement Category I and intended to carry signal voltages no greater than 30 $V_{rms}$/42 $V_{pk}$/50 VDC. 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.

**Note** Signal connections through the NI 2512 are intended to go through the DUTn pin connections. Signal paths that do not use the DUTn pin connections may exceed the module's thermal capabilities. Refer to the connector pinout in the Diagrams section of this document for DUTn pin connections.

Maximum continuous current.....10 A (per channel or common, switching or carry)

Maximum pulsed current.....50 A (for 600 µs max)

[1] Measurement Categories CAT I and CAT O (Other) 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.



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**Caution** The maximum switching power is limited by the maximum switching current and the maximum voltage, and must not exceed 500 W.

Maximum switching power (per channel) ..... 500 W

Use the following equation to determine the Maximum Possible Pulse Width (seconds) for a given Maximum Inrush Current "peak" amplitude (Amps) and Steady State Current (Amps).

$$\text{MaxPulseWidth} = \frac{1.512 - 0.01 \cdot (I_{\text{SteadyState}})^2}{(I_{\text{PeakInrush}})^2}$$

DC path resistance

- Typical ..... 16 mΩ
- Maximum ..... 35 mΩ

Typical bandwidth (50 Ω system) ..... >800 kHz

# Overcurrent Detection

Overcurrent detection limit ..... 10.5 A typical

Overcurrent detection delay ..... 20 ms

**Note** After a switch operation, an overcurrent error condition occurs when both the overcurrent limit of the module is exceeded, and the overcurrent delay time has expired.

# Overtemperature Detection

To help protect against fault conditions, the NI 2512 incorporates circuitry to detect overtemperature conditions.

**Note** Exceeding the module's thermal limit induces an overtemperature condition.

**Note** Overtemperature conditions are created when excessive power is dissipated in the channel paths such as when switching large impulses created by switching into capacitive or inductive loads or when switching a signal at a higher rate than the module dissipates the generated heat. Refer to the figures below for information about the maximum cycle rate.

The Switching Current Waveform graph indicates where on the inrush waveform you can find the parameters necessary for determining maximum cycle rate.



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**Figure 1.** Switching Current Waveform

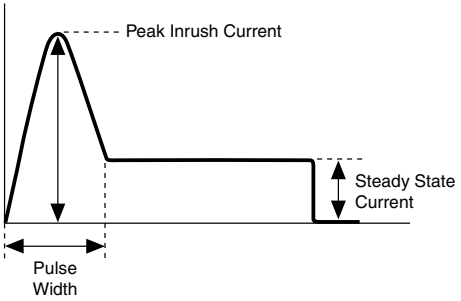
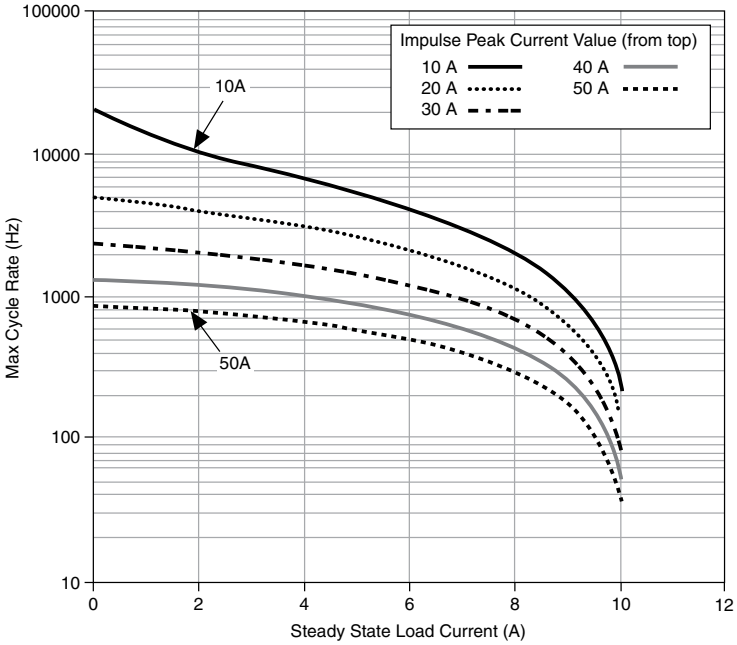


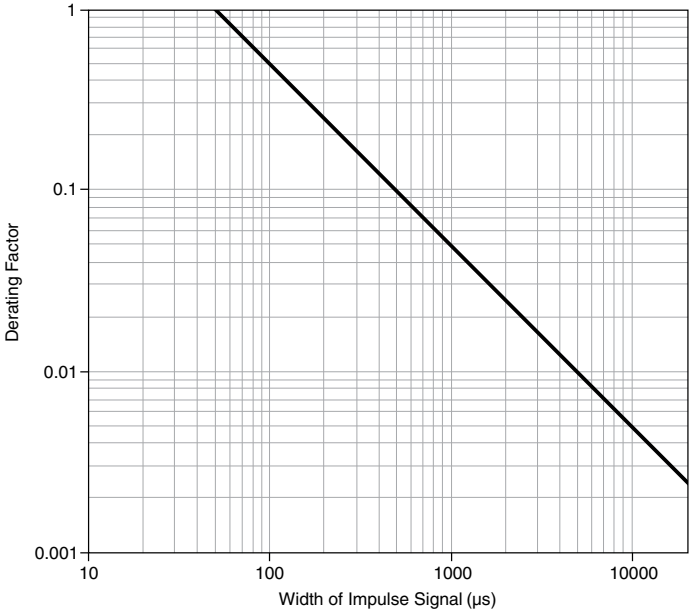

**Figure 2.** Maximum Cycle Rate






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**Figure 3.** Maximum Cycle Rate Derating Factor by Pulse Width




# Determining the Maximum Cycle Rate

Complete the following steps and use the figures above to determine the maximum cycle rate at which a channel can be switched when the peak impulse current value and duration are known.

1. Using the Maximum Cycle Rate graph, choose the graph line that meets or exceeds the peak inrush current value of the signal being switched. Find the point on the trace that equates to the steady state current being switched by the load.
2. Find the corresponding intersection on the y-axis which indicates the maximum cycle rate allowed for a signal with a 50 µs maximum inrush pulse duration.
3. Find the point on the Maximum Cycle Rate Derating Factor by Pulse Width graph that corresponds to the measured pulse width of the inrush current pulse. Find the corresponding derating factor.

Then calculate the maximum cycle rate using the following equation:

$$\text{MaxCycleRate} = CR50_{\mu s} \cdot DF(Hz)$$

where $CR_{50\ \mu s}$ = max cycle rate for a 50 µs wide inrush current pulse in Hz

$DF$ = derating factor

**Note** If the peak impulse current does not exceed 10 A, do not derate the maximum cycle rate below 220 Hz.



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For switching a steady state current of 4 A into a load with peak inrush current of 45 A that lasts for 400 µs, choose the 50 A graph line in the Maximum Cycle Rate graph. Find the y-axis value that corresponds to the 4 A load current (650 Hz). Then find the derating factor in the Maximum Cycle Rate Derating Factor by Pulse Width graph that corresponds to 400 µs (0.1).

The maximum cycle rate at which this signal can be switched by the module is calculated as follows:

$$\text{MaxCycleRate} = 650Hz \cdot 0.1 \cong 65\,Hz$$

# Dynamic Characteristics

Relay Operate Time

Typical.....8 µs

Maximum.....35 µs

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

Typical relay life.....Unlimited, when operated within specified limits

# Trigger Characteristics

Input trigger

Sources.....PXI trigger lines <0..7>

Minimum pulse width.....150 ns

**Note** The NI 2512 can recognize trigger pulse widths less than 150 ns if you disable digital filtering. Refer to the *NI Switches Help* for information about disabling digital filtering.

Output trigger

Destinations.....PXI trigger lines <0..7>

Pulse width.....Programmable (1 µs to 62 µs)



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# Physical Characteristics

Relay type.....FET

Front panel connector.....2 DSUB, 8 positions, male

Power requirement

- PXI
  - 3.3 V.....1.0 W
  - 5 V.....13.0 W
- PXI Express
  - +12 V.....14.7 W
  - 3.3 V.....1.4 W

Dimensions (L × W × H).....3U, two slots, PXI/cPCI module, PXI Express compatible 21.6 cm × 4.1 cm × 13.0 cm (8.5 in. × 1.6 in. × 5.1 in.)

Weight.....403 g (14.2 oz)

# Environment

Operating temperature.....0 °C to 50 °C

Storage temperature.....-40 °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.)



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Random Vibration

Operating.....5 Hz to 500 Hz, 0.3 $g_{rms}$

Nonoperating.....5 Hz to 500 Hz, 2.4 $g_{rms}$ (Tested in accordance with IEC 60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

# Accessories

Visit ni.com for more information about the following accessories.

**Table 1.** NI Accessories for the NI 2512

| Accessory | Part number |
|---|---|
| DB8F-40A Cable (To 8-pin DSUB), 1 m | 781092-01 |
| DB8F-40A Cable (To Bare Wire), 1 m | 781092-02 |

You must install mating connectors according to local safety codes and standards and according to the specifications provided by the manufacturer. You are responsible for verifying the 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.

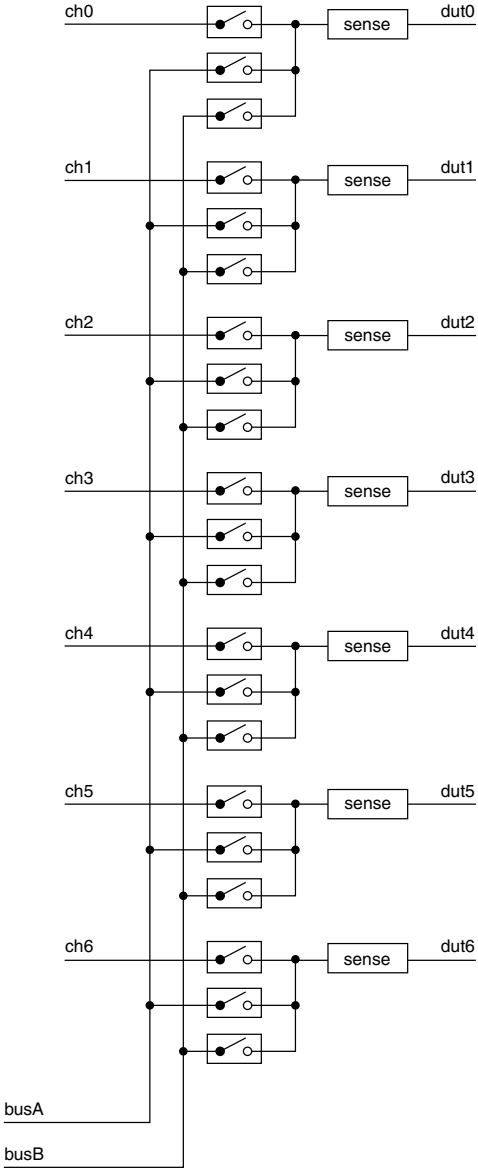
# Diagrams

The following figure shows the NI 2512 power-on state.



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**Figure 4.** NI 2512 Power-On State

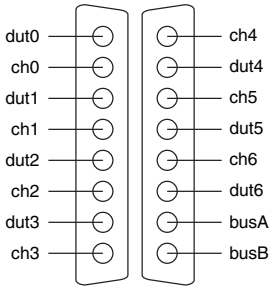



The following figure shows the NI 2512 connector pinout.



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**Figure 5.** NI 2512 Connector Pinout




# Compliance and Certifications

## Safety

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

**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** 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 *Online Product Certification* section.



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## CE Compliance CE

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

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.

## 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*.

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