PXI-2527 Specifications

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Contents

PXI-2527 Specifications

Caution The protection provided by the PXI-2527 can be impaired if it is used in a manner not described in this document.

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

Caution Device relays might change state momentarily during electrostatic discharge.

Caution Refer to the **Read Me First: Safety and Electromagnetic Compatibility** document for important safety and compliance information.

Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

Characteristics describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are **Typical** unless otherwise noted.

Conditions

Specifications are valid at 23 °C unless otherwise noted.

All voltages are specified in DC, AC_{pk}, or a combination unless otherwise specified.

Topology

Topologies	1-wire 64 × 1 multiplexer 1-wire dual 32 × 1 multiplexer 2-wire 32 × 1 multiplexer 2-wire dual 16 × 1 multiplexer 4-wire 16 × 1 multiplexer Independent

Input

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

Caution This module is rated for Measurement Category I and is intended to carry signal voltages no greater than 300 V. This module can withstand up to 1,500 V impulse voltage. Do not use this module for connections to signals or for measurements within Measurement Categories II, III, or IV.

Attention Ce module est conçu pour la catégorie de mesure I et pour supporter des tensions de signal ne dépassant pas 300 V. Ce module peut supporter une tension d'impulsion allant jusqu'à 1500 V. N'utilisez pas ce module pour le connecter à des signaux ou effectuer des mesures de catégorie de mesure CAT II, III ou IV.

Caution Do not connect to MAINs supply circuits (e.g., wall outlets) of 115 or 230 VAC. Refer to the **Read Me First: Safety and Electromagnetic Compatibility** document for more information about Measurement Categories.

Attention Ne connectez pas ce module au réseau d'alimentation électrique du secteur (prises murales, par exemple) de 115 VCA ou 230 VCA. Reportez-vous au document Read Me First: Safety and Electromagnetic Compatibility pour en savoir plus sur les catégories de mesure.

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.

Attention Lorsque des tensions dangereuses (> 42,4 V_{pic}/60 VCC) sont présentes sur une borne de relais, la basse tension de sécurité (≤42,4 V_{pic}/60 VCC) ne peut être connectée à aucune autre borne de relais.

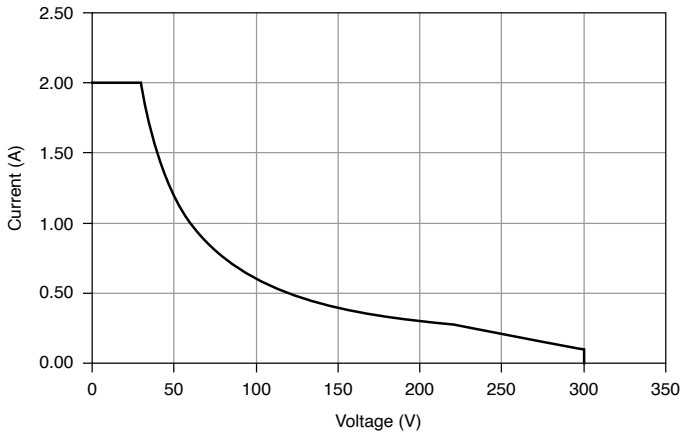
Maximum switching voltage[1]	
Channel-to-channel	300 V
Channel-to-ground	300 V, CAT I

Caution The maximum switching power is limited by the maximum switching current, the maximum voltage, and must not exceed 60 W, 62.5 VA.

Maximum switching power (per channel)	
AC systems	60 W, 62.5 VA (up to 60 Hz)

DC systems	Refer to the following figure.

Figure 1. Maximum Switching Power for DC Loads (per channel)



Maximum total current (switching or carry)	2 A
Minimum switch load[2]	20 mV /1 mA
DC path resistance[3]	
Initial	<1 Ω, warranted
End-of-life	≥2 Ω
Differential thermal EMF	2.5 µV, typical[4] <12 µV, maximum
Channel-to-channel DC leakage at 300 V	500 GΩ
Bandwidth (-3 dB, 50 Ω termination)	
1-wire	>30 MHz

2-wire	>25 MHz

Channel-to-channel isolation (50 Ω termination) (1-wire and 2-wire)	
10 kHz	>80 dB
100 kHz	>60 dB
1 MHz	>40 dB

Open channel isolation (50 Ω termination) (1-wire and 2-wire)	
10 kHz	>80 dB
100 kHz	>60 dB
1 MHz	>40 dB

Dynamic

Relay operate time	1 ms, typical 3.4 ms, maximum

Expected relay life[5]	
Mechanical	1×10^8 cycles

Trigger

Input trigger[6]	
Sources	PXI trigger lines <0...7>

Minimum pulse width	150 ns

Output trigger	
Destinations	PXI trigger lines <0...7>
Pulse width	Software-selectable: 1 µs to 62 µs

Thermocouple Measurement

You can use the PXI-2527 and the TB-2627 to measure thermocouples. NI software can convert a thermocouple voltage to the thermocouple temperature. For example code, visit ni.com/examples, and enter PXI-2527 in the Search field.

When measuring thermocouples, be sure to account for error in your measurements. The total error in thermocouple measurement is the sum of the system error (determined by the thermal EMF of the PXI-2527 and the CJC temperature of the TB-2627) and the thermocouple error (determined by the type of thermocouple used).

Determining the System Error

To determine the system error for the PXI-2527 and TB-2627, first calculate the error due to thermal EMF of the PXI-2527 using the following equation:

$$E_{EMF} = \left(\frac{T_{+1} - T}{V_{+1} - V}\right)(V_{EMF})$$ $$E_{EMF} = \left(\frac{T_{+1} - T}{V_{+1} - V}\right)(V_{EMF})$$

where[7]

- $\mathbf{E}_{EMF}$ = error due to thermal EMF of the PXI-2527
- **T** = temperature being measured, in degrees Celsius
- $\mathbf{T}_{+1}$ = **T** + 1 °C
- **V** = voltage that corresponds to **T**
- $\mathbf{V}_{+1}$ = voltage that corresponds to $\mathbf{T}_{+1}$

- $\mathbf{V}_{EMF}$ = thermal EMF of the PXI-2527[8]

After you have determined the error due to thermal EMF, calculate the system error using the following equation.

$\mathbf{E}_S = \mathbf{E}_{EMF} + \mathbf{E}_{CJC}$

where

- $\mathbf{E}_S$ = system error of the PXI-2527/TB-2627
- $\mathbf{E}_{EMF}$ = error due to thermal EMF of the PXI-2527
- $\mathbf{E}_{CJC}$ = error due to CJC temperature sensor of the TB-2627[9]

Example

Measuring a K-type thermocouple at 200 °C with a CJC temperature of 25 °C, the system error of the PXI-2527/TB-2627 is calculated below.[10]

Assuming typical thermal EMF (2.5 µV), first calculate the error due to thermal EMF using the following equation:

$$E_{EMF} = \left(\frac{201\ °C - 200\ °C}{8.178\ mV - 8.138\ mV}\right)(0.0025\ mV) = 0.063\ °C$$

$$E_{EMF} = \left(\frac{201\ °C - 200\ °C}{8.178\ mV - 8.138\ mV}\right)(0.0025\ mV) = 0.063\ °C$$

To determine the system error, add the error due to thermal EMF to the error due to the CJC temperature sensor using the following equation.

$\mathbf{E}_S$ = 0.063 °C + 0.5 °C = 0.563 °C

Determining the Thermocouple Error

Independent of the PXI-2527/TB-2627 system, thermocouple error is the greater of the following values: ±**temperature range** or ±**percent of the measurement**.

In the example, a standard grade K-type thermocouple is used to measure 200 °C. The error for a standard grade K-type thermocouple is ±2.2 °C or ±0.75% of the

measurement temperature.[11] Because ±0.75% of 200 °C (±1.5 °C) is less than ±2.2 °C, the error of a standard grade K-type thermocouple is ±2.2 °C.

Determining the Total Error

The total error in thermocouple measurement is the sum of the system error and the thermocouple error. Use the following equation to determine the total error in thermocouple measurement:

$\mathbf{E}_T = \mathbf{E}_S + \mathbf{E}_{Th}$

where

- $\mathbf{E}_T$ = total error in thermocouple measurement
- $\mathbf{E}_S$ = system error
- $\mathbf{E}_{Th}$ = thermocouple error

To determine the total error in thermocouple measurement in the example, add the thermocouple error to the system error using the following equation:

$\mathbf{E}_T = 0.56\ °C + 2.2\ °C = 2.76\ °C$

Assuming typical thermal EMF, the total error in thermocouple measurement at 200 °C for the PXI-2527/TB-2627 with a K-type thermocouple is ±2.76 °C.

Physical

Relay type	Electromechanical, non-latching
Relay contact material	Palladium-ruthenium, gold covered
I/O connector	100 position HDI right angle, male
Power requirement	

PXI	6 W at 5 V 2.5 W at 3.3 V
PXI Express	7.5 W at 12 V 2.5 W at 3.3 V
Dimensions (L × W × H)	3U, one slot, PXI/cPCI module 21.6 cm × 2.0 cm × 13.0 cm (8.5 in. × 0.8 in. × 5.1 in.)
Weight	209 g (7.4 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.)

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.)

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, 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. 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.

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。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

[1] Switching inductive loads (for example, motors and solenoids) can produce high voltage transients in excess of the module's rated voltage. Without additional protection, these transients can interfere with module operation and impact relay life. For more information about transient suppression, visit ni.com/info and enter the Info Code induct.

[2] The minimum switch load is not recommended for 2-wire resistance measurements.

[3] DC path resistance typically remains low for the life of the relay. At the end of relay life, the path resistance rapidly rises above 1 Ω. Load ratings apply to relays used within the specification before the end of relay life.

[4] To ensure the typical thermal EMF, power down all relays and avoid pulsing high currents near the channels you are measuring. For more information about powering down latching relays, refer to the Power Down Latching Relays After Debounce property in NI-SWITCH or the Power Down Latching Relays After Settling property in NI-DAQmx.

[5] The relays used in the PXI-2527 are field replaceable. Refer to the **NI Switches Help** for information about replacing a failed relay.

[6] The PXI-2527 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.

[7] In thermocouple reference tables, **T** and $\mathbf{T}_{+1}$ are known values used to calculate the slope of the thermocouple Temperature vs. Voltage graph. Refer to a thermocouple reference table to determine the values of **V** and $\mathbf{V}_{+1}$ that correspond to **T** and $\mathbf{T}_{+1}$, respectively.

[8] Refer to the **Input** section of this document to determine the thermal EMF value of the PXI-2527. For optimal thermocouple measurement performance (V_{EMF} = 2.5 µV), power down the latching relays of the PXI-2527. For more information about powering down latching relays, refer to the Power Down Latching Relays After Debounce property in NI-SWITCH or the Power Down Latching Relays After Settling property in NI-DAQmx.

[9] From 15 °C to 35 °C, the TB-2627 has an accuracy of ±0.5 °C. From 0 °C to 15 °C and 35 °C to 55 °C, the TB-2627 has an accuracy of ±1.0 °C. For more information about temperature sensor accuracy, refer to the **TB-2627 Installation Instructions**.

[10] In this example, the values of **V** and $\mathbf{V}_{+1}$ are found in the thermocouple reference tables of Omega Engineering's **The Temperature Handbook**. Vol. 29. Stamford, CT: Omega Engineering Inc, 1995.

[11] Omega Engineering. **The Temperature Handbook**. Vol. 29. Stamford, CT: Omega Engineering Inc, 1995.