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TB-2627

NI PXI/PXIe-2527 Specifications

32 × 1 Relay Multiplexer

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-2527 (NI 2527) 32 × 1 multiplexer relay module. All specifications are subject to change without notice. Visit ni.com/manuals for the most current specifications.

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

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 Device relays might change state momentarily during electrostatic discharge.



Caution Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document at 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.

Input Characteristics

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

Maximum switching voltage

Channel-to-channel 300 V
Channel-to-ground 300 V, CAT I



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.



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.



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.



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 Figure 1

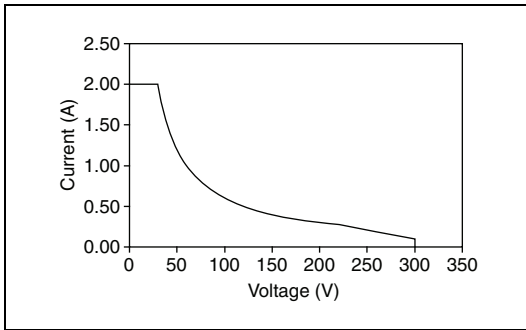


Figure 1. Maximum Switching Power for DC Loads (per channel)

Maximum total current
(switching or carry) 2 A

Minimum switch load..... 20 mV/1 mA



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



Note 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`.

DC path resistance

Initial <1 Ω

End-of-life $\geq 2 \Omega$

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.

Differential thermal EMF

Typical¹ 2.5 μV

Maximum <12 μV

Channel-to-channel DC leakage..... 500 G Ω @ 300 V

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 Characteristics

Relay operate time

Typical 1 ms

Maximum 3.4 ms



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

Expected relay life

Mechanical 1×10^8 cycles

Electrical

300 VDC,

60 mADC resistive 5×10^5 cycles

30 VDC, 2 ADC resistive 1×10^5 cycles

<30 mV, <10 mA 2.5×10^6 cycles



Note The relays used in the NI 2527 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 2527 recognizes trigger pulse widths less than 150 ns when you disable digital filtering. Refer to the *NI Switches Help* for information about disabling digital filtering.

¹ 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.

Output trigger

Destinations PXI trigger lines 0–7

Pulse width Programmable
(1 μs to 62 μs)

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

$$E_S = E_{EMF} + E_{CJC} \quad (2)$$

where E_S = system error of the NI 2527/TB-2627
 E_{EMF} = error due to thermal EMF of the NI 2527
 E_{CJC} = error due to CJC temperature sensor of the NI TB-2627³

Thermocouple Measurement

You can use the NI 2527 and the NI TB-2627 to measure thermocouples. NI software can convert a thermocouple voltage to the thermocouple temperature. For example code, visit ni.com/zone, click the Example Code link in the navigation bar, 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 NI 2527 and the CJC temperature of the NI TB-2627) and the thermocouple error (determined by the type of thermocouple used).

Determining the System Error

To determine the system error for the NI 2527/TB-2627, first calculate the error due to thermal EMF of the NI 2527 using the following equation.

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

where E_{EMF} = error due to thermal EMF of the NI 2527
 T = temperature being measured, in degrees Celsius
 $T_{+1} = T + 1$ °C
 V = voltage that corresponds to T
 V_{+1} = voltage that corresponds to T_{+1}
 V_{EMF} = thermal EMF of the NI 2527²

Example

Measuring a K-type thermocouple at 200 °C with a CJC temperature of 25 °C, the system error of the NI 2527/TB-2627 is calculated below.⁴

Assuming typical thermal EMF (2.5 μV), first calculate the error due to thermal EMF using Equation 1.

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

To determine the system error, add the error due to thermal EMF to the error due to the CJC temperature sensor using Equation 2.

$$E_S = 0.063 \text{ °C} + 0.5 \text{ °C}$$
$$= 0.563 \text{ °C}$$

Determining the Thermocouple Error

Independent of the NI 2527/TB-2627 system, thermocouple error is the greater of the following values: ±a temperature range or ±a 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.⁵ 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.

¹ In thermocouple reference tables, T and 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 V_{+1} that correspond to T and T_{+1} , respectively.

² Refer to the *Input Characteristics* section of this document to determine the thermal EMF value of the NI 2527. For optimal thermocouple measurement performance ($V_{EMF} = 2.5 \mu\text{V}$), power down the latching relays of the NI 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.

³ From 15 °C to 35 °C, the NI TB-2627 has an accuracy of ±0.5 °C. From 0 °C to 15 °C and 35 °C to 55 °C, the NI TB-2627 has an accuracy of ±1.0 °C. For more information about temperature sensor accuracy, refer to the *NI TB-2627 Installation Instructions*.

⁴ In this example, the values of V and V_{+1} are found in the thermocouple reference tables of Omega Engineering's *The Temperature Handbook*. Vol. 29. Stamford, CT: Omega Engineering Inc, 1995.

⁵ Omega Engineering. *The Temperature Handbook*. Vol. 29. Stamford, CT: Omega Engineering Inc, 1995.

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.

$$E_T = E_S + E_{Th} \quad (3)$$

where E_T = total error in thermocouple measurement
 E_S = system error
 E_{Th} = thermocouple error

To determine the total error in thermocouple measurement in the example, add the thermocouple error to the system error using Equation 3, as illustrated below.

$$\begin{aligned} E_T &= 0.56 \text{ }^\circ\text{C} + 2.2 \text{ }^\circ\text{C} \\ &= 2.76 \text{ }^\circ\text{C} \end{aligned}$$

Assuming typical thermal EMF, the total error in thermocouple measurement at 200 °C for the NI 2527/TB-2627 with a K-type thermocouple is $\pm 2.76 \text{ }^\circ\text{C}$.

Physical Characteristics

Relay type	Electromechanical, 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 12V, 2.5 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	209 g (7.4 oz)

Environment

Operating temperature 0 °C to 55 °C



Caution If you are using the NI 2527 with the NI PXI-101x or the NI PXI-1000B chassis, the operating temperature for the NI 2527 is 0 °C to 45 °C. Do *not* operate the NI 2527 above the maximum operating temperature of the chassis.

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 to 500 Hz, 0.3 g_{rms}
 Nonoperating 5 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.)

Diagrams

Figure 2 shows the NI 2527 power-on state.

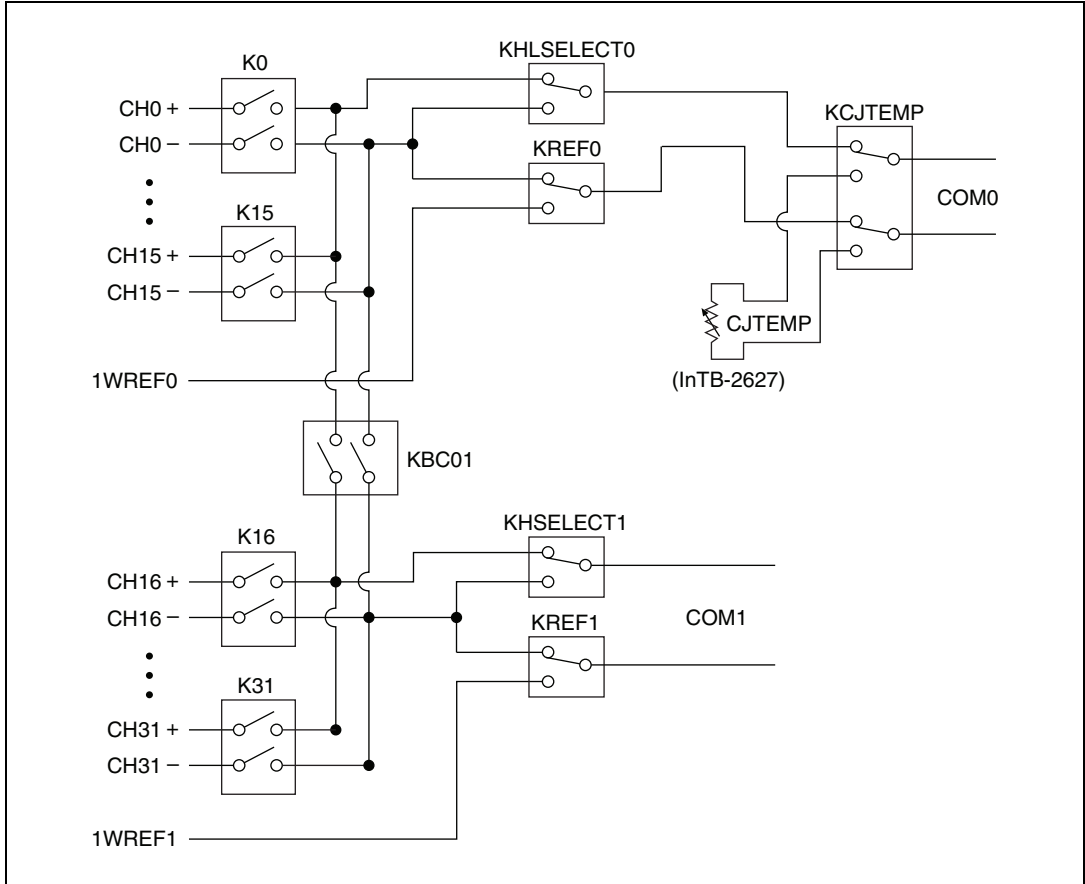


Figure 2. NI 2527 Power-On State

Figure 3 shows the NI PXI-2527 connector pinout.

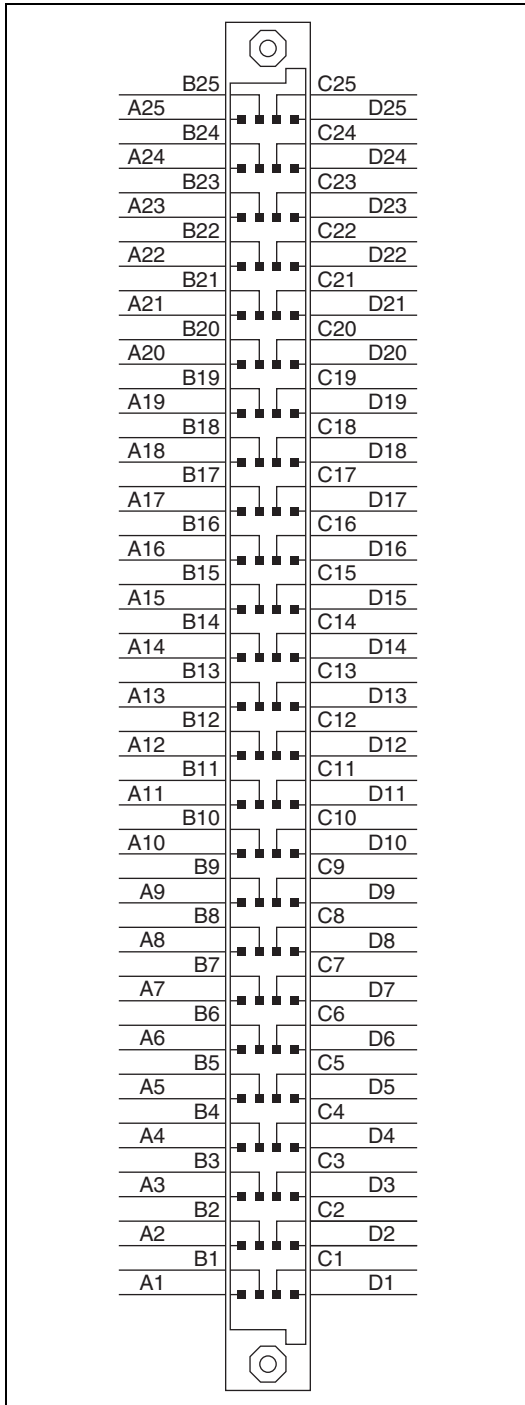


Figure 3. NI PXI-2527 Connector Pinout



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.

Accessories

Visit ni.com for more information about NI accessories.

Table 1. Accessories for the NI 2527

Accessory	Manufacturer	Part Number
NI TB-2627 terminal block	NI	779358-01
IM42PGR relay replacement kit	NI	782051-01
100-pin HDI right angle mating connector*	NI	779311-01
Mating front panel connector, vertical*	AMP	5533285-1
Mating front panel connector, right-angle*	AMP	5532903-2

* PCB mount, additional cover or enclosure required. See the previous safety caution.



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.

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 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 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, 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. 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.

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