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# PXle-4150

# Specifications

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# PXIe-4150 Specifications

## PXIe-4150 Specifications

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## 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 **Warranted** unless otherwise noted.

## Conditions

Specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature<sup>1</sup> of 23 °C ± 5 °C.

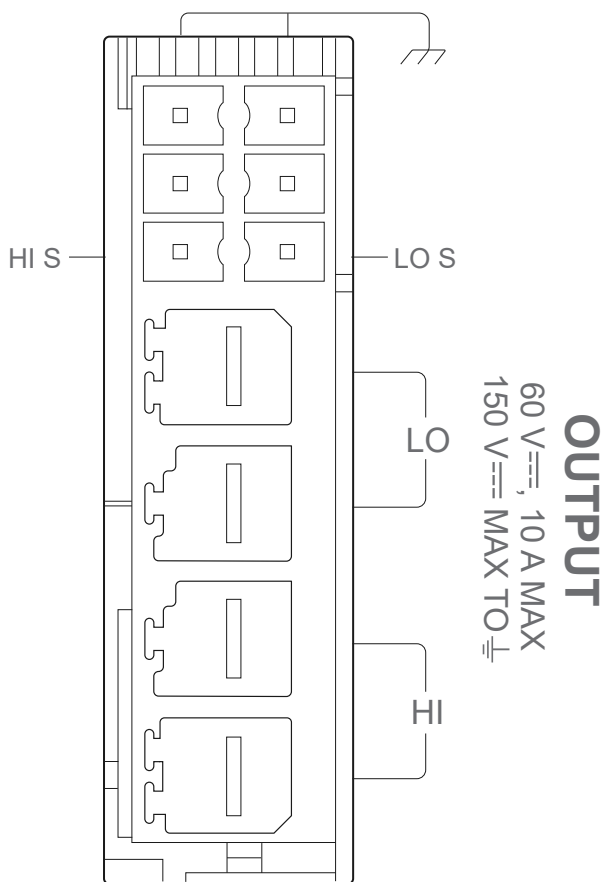
1. The ambient temperature of a PXI system is defined as the temperature at the chassis fan inlet (air intake).

- Chassis with  $\geq 38$  W slot cooling capacity.<sup>2</sup>
  - For chassis with slot cooling capacity = 38 W, fan speed set to HIGH
- Calibration interval of 2 years.
- Warm-up time of 30 minutes.
- Self-calibration performed within the last 24 hours.
- NI-DCPower Aperture Time is set to 1 power-line cycle (PLC).

## PXIe-4150 Pinout

The following figures display the terminals on the PXIe-4150 connector.


### Output Connector



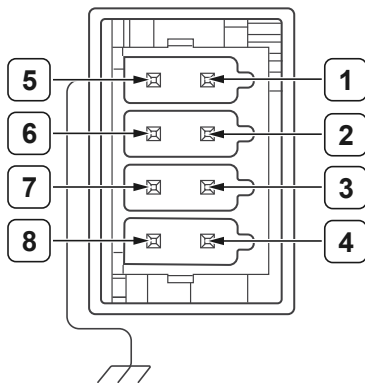
**Table 1.** Output Connector Pin Descriptions

Pin	Description
HI terminal	HI force terminal connected to channel power


2. For increased capability, NI recommends installing the PXIe-4150 in a chassis with slot cooling capacity  $\geq 58$  W.

Pin	Description
	stage (generates and/or dissipates power). Positive polarity is defined as voltage measured on HI > LO.
LO terminal	LO force terminal connected to channel power stage (generates and/or dissipates power). Positive polarity is defined as voltage measured on HI > LO.
HI S terminal	Voltage remote sense input terminals. Used to compensate for I x R voltage drops in cable leads, connectors, and switches.
LO S terminal	
GND (  ) terminals	Tied to chassis ground through module front panel. Use for connections to cable shields. Do not use for grounding the LO force terminal due to pin current rating.

## AUX I/O Connector



**Table 2.** AUX I/O Connector Pin Descriptions

Pin		Descriptions
1	PFI 0	Programmable Function Interface for digital timing and triggering.
2	PFI 1	
3	FAULT	Device fault status output.
4	RESERVED	Reserved.
		 <b>Note</b> Before operating the programmable power supply, short

Pin		Descriptions
		<p>this pin with a GND pin. For more information, refer to <b><i>Installing the Input and AUX I/O Connector on the PXIe-4150.</i></b></p>
5	GND	Ground reference for AUX I/O.
6	PFI 2	Programmable function interface for digital timing and triggering.
7	GND	Ground reference for AUX I/O.
8	GND	

## AUX Power In Connector

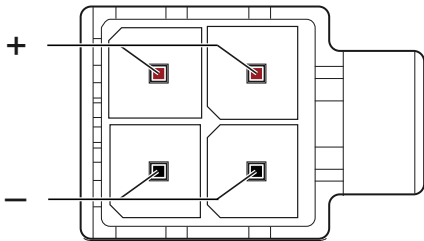


Table 3. AUX Power In Pin Descriptions

Signal	Descriptions
+	Positive Auxiliary Power Input
-	Negative Auxiliary Power Input

## Physical Characteristics

Table 4. Physical Characteristics

Dimensions	<p>3U, one-slot, PXI Express/cPCI Express module, 2.0 cm × 13.0 cm × 21.6 cm (0.8 in. × 5.1 in. × 8.5 in.)</p> <p>For more information, visit <a href="http://ni.com/dimensions">ni.com/dimensions</a> and search by module number.</p>
Weight	650 g (22.9 oz)

**Table 5.** Front Panel Connectors

Output	OMNIMATE Hybrid, 7.62 mm (4 position), 2.54 mm (6 position)
AUX I/O	MICRO COMBICON - DFMC 0, 5, 2.54 mm (8 position)
AUX Power In	MEGA-FIT RECEPTACLE, 5.7 mm, (4 position)

## Instrument Capabilities

**Table 6.** DC Ranges

Voltage	6 V, 60 V
Current	100 mA, 1 A, 10 A



**Note** Maximum current allowed in the 10 A range is dependent on ambient temperature and chassis cooling capacity. Refer to the following figures for additional detail.

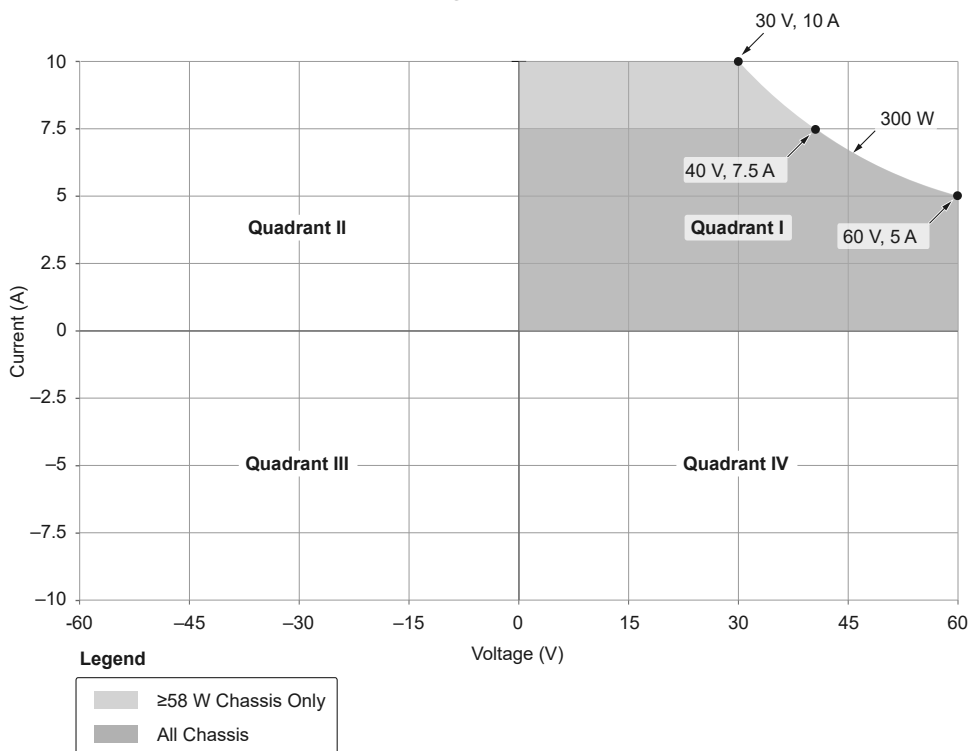
**Figure 1.** PXIe-4150 Quadrant Diagram, 0 °C to 40 °C

Figure 2. PXle-4150 Quadrant Diagram, >40 °C

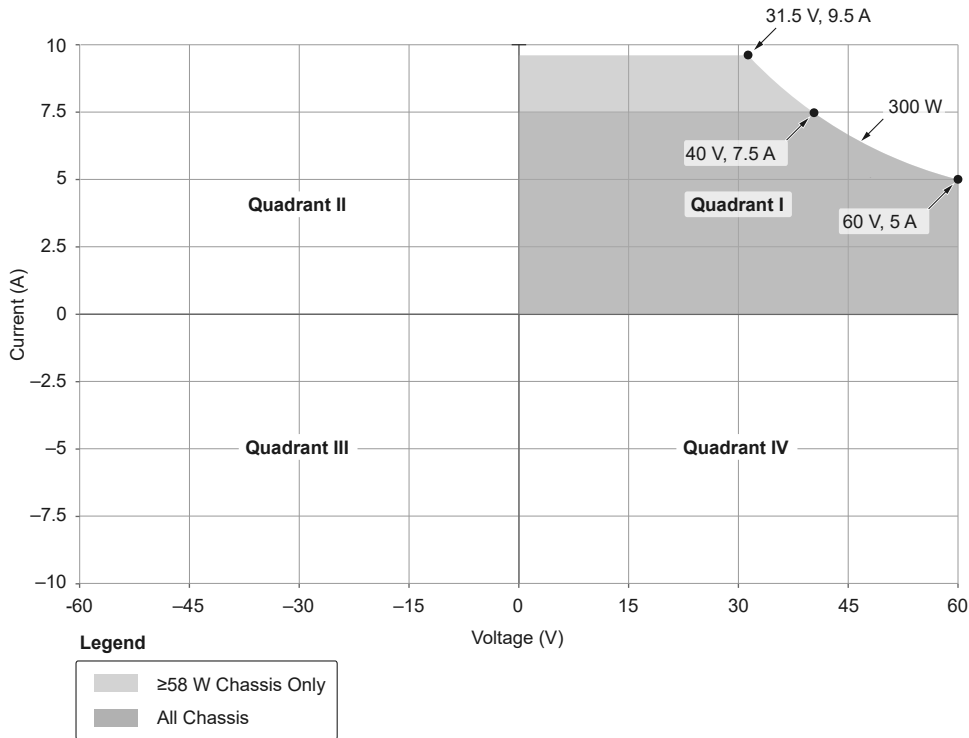


Table 7. DC Power

Available DC output power <sup>3</sup>	300 W
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**Note** An auxiliary power source with sufficient capacity is required for operation. Refer to **Power Requirements** for additional details.

3. Power limit defined by voltage measured between HI and LO terminals.



## Voltage

**Table 8.** Voltage Programming and Measurement Accuracy/Resolution

Range	Resolution (Noise Limited)	Noise (0.1 Hz to 10 Hz, peak-to-peak, typical)	Accuracy $\pm$ (% of Voltage + Offset) <sup>4</sup> $T_{\text{ambient}} 23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}, T_{\text{cal}}^5 \pm 5\text{ }^{\circ}\text{C}$	Tempco <sup>6</sup> $\pm$ (% of Voltage + Offset)/ $^{\circ}\text{C}$ $T_{\text{ambient}} 0\text{ }^{\circ}\text{C} \text{ to } 40\text{ }^{\circ}\text{C}, T_{\text{cal}} \pm 5\text{ }^{\circ}\text{C}$
6 V	1 $\mu\text{V}$	10 $\mu\text{V}$	0.022% + 500 $\mu\text{V}$	0.001% + 3 $\mu\text{V}$
60 V	10 $\mu\text{V}$	100 $\mu\text{V}$	0.024% + 5 mV	0.001% + 30 $\mu\text{V}$

## Current

**Table 9.** Current Programming and Measurement Accuracy/Resolution

Range	Resolution (Noise Limited)	Noise (0.1 Hz to 10 Hz, peak-to-peak, typical)	Accuracy $\pm$ (% of Current + Offset) $T_{\text{ambient}} 23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}, T_{\text{cal}}^7 \pm 5\text{ }^{\circ}\text{C}$	Tempco <sup>8</sup> $\pm$ (% of Current + Offset)/ $^{\circ}\text{C}$ $T_{\text{ambient}} 0\text{ }^{\circ}\text{C} \text{ to } 40\text{ }^{\circ}\text{C}, T_{\text{cal}} \pm 5\text{ }^{\circ}\text{C}$
100 mA	10 nA	200 nA	0.03% + 30 $\mu\text{A}$	0.002% + 100 nA
1 A	100 nA	2 $\mu\text{A}$	0.03% + 300 $\mu\text{A}$	0.002% + 1 $\mu\text{A}$
10 A	10 $\mu\text{A}$	50 $\mu\text{A}$	0.075% + 2 mA	0.003% + 10 $\mu\text{A}$

4. Refer to the Remote Sense section for additional accuracy derating and conditions.
5.  $T_{\text{cal}}$  is the internal device temperature recorded by the PXIe-4150 at the completion of the last self-calibration.
6. Temperature coefficient applies beyond  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  ambient within  $\pm 5\text{ }^{\circ}\text{C}$  of  $T_{\text{cal}}$ .
7.  $T_{\text{cal}}$  is the internal device temperature recorded by the PXIe-4150 at the completion of the last self-calibration.
8. Temperature coefficient applies beyond  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  ambient within  $\pm 5\text{ }^{\circ}\text{C}$  of  $T_{\text{cal}}$ .

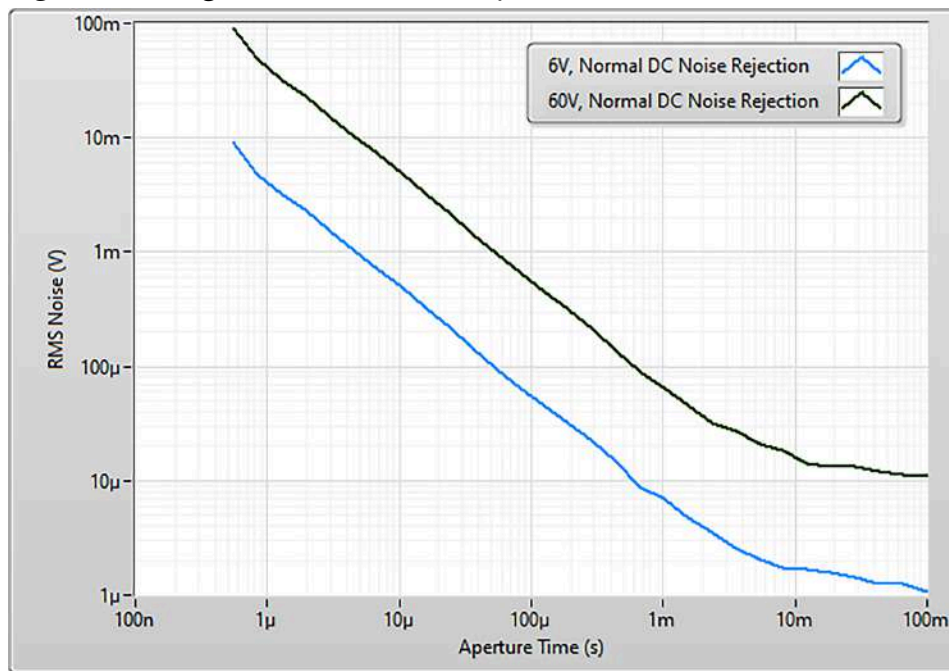
# Noise

**Table 10.** Noise

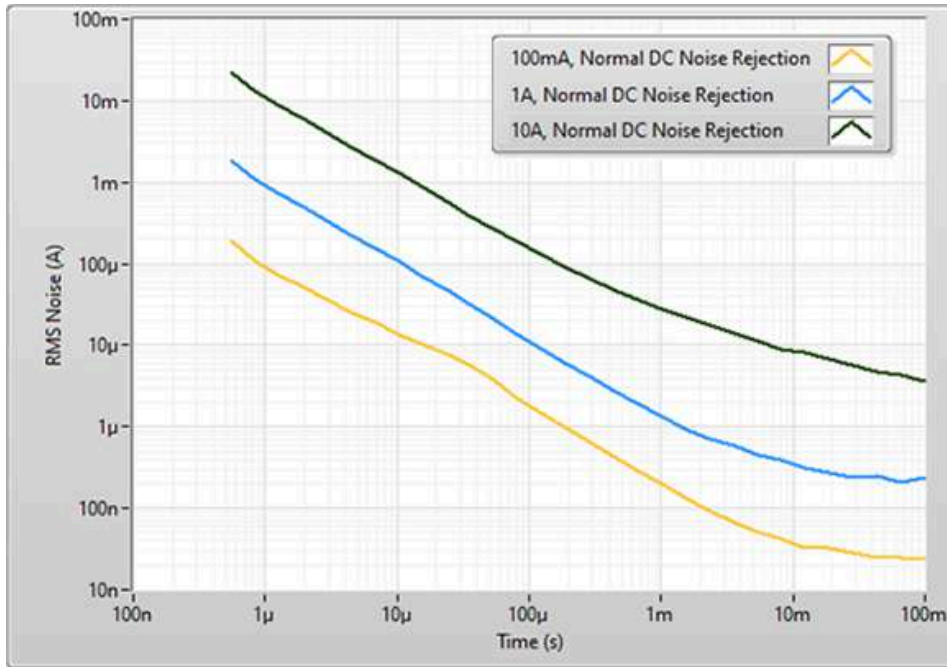
Wideband source noise <sup>9</sup>	<20 mV peak-to-peak, typical
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The following figures illustrate measurement noise as a function of measurement aperture time for the PXIe-4150.

**Figure 1.** Voltage RMS Noise Versus Aperture Time, Nominal



9. 10 Hz to 20 MHz bandwidth, measured with 1  $\mu$ F load capacitance at the end of 1 m shielded cable. PXIe-4150 configured for normal transient response.

**Figure 1.** Current RMS Noise Versus Aperture Time, Nominal

**Note** When the aperture time is set to two power-line cycles (PLCs), measurement noise differs slightly depending on whether the Power Line Frequency property is set to 50 Hz or 60 Hz.



**Note** Use the DC Noise Rejection property to configure normal or second-order DC noise rejection.

## Settling Time and Transient Response



**Note** Settling time is measured as the time to settle to within 0.1% of step amplitude, PXle-4150 configured for fast transient response.

**Table 11.** Settling Time

Voltage mode, $\leq 54$ V step, unloaded	<4.7 ms, typical
Current mode, full-scale step, 10 A range	<3.1 ms, typical
Current mode, full-scale step, 1 A range	<3.3 ms, typical
Current mode, full-scale step, 100 mA range	<2.9 ms, typical



**Note** Settling time specifications for voltage mode derived with current limit set to  $\geq 20\%$  of the selected current limit range.



**Note** Settling time specifications for current mode (all ranges) derived with voltage limit set to  $\geq 2$  V, resistive load set to 1 V/selected current range.

**Table 12.** Transient Response

Current Range	Value
10 A	<100 $\mu$ s, typical to recover within $\pm 300$ mV
1 A	<150 $\mu$ s, typical to recover within $\pm 10$ mV



**Note** Transient response is the time to recover within the stated recovery band after a load current change from 50% to 100% of range, PXIe-4150 configured for fast transient response.

## Remote Sense

**Table 13.** Remote Sense

Voltage accuracy	Add 10 $\mu$ V per volt of lead drop per ohm of corresponding sense lead resistance to voltage accuracy specifications.
Maximum sense lead resistance	100 $\Omega$
Maximum lead drop per lead	1 V, maximum 60 V between HI and LO terminals

## Load Regulation

**Table 14.** Load Regulation

Voltage, local sense <sup>10</sup>	15 $\mu$ V/mA (15 m $\Omega$ ), nominal; 30 $\mu$ V/mA (30 m $\Omega$ ), maximum
Voltage, remote sense	Error included in accuracy specifications.
Current	Error included in accuracy specifications.

10. Measured between HI and LO terminals at the module output connector.

## Auxiliary Power Input Line Regulation



**Note** Auxiliary power input line regulation is the impact to voltage and current accuracy specifications as a result of change in voltage at the auxiliary power input.

**Table 15.** Auxiliary Power Input Line Regulation

Voltage	Error included in accuracy specifications.
Current	Error included in accuracy specifications.

## Isolation

**Table 16.** Isolation

Isolation voltage, any channel I/O pin <sup>11</sup> to earth ground	150 V DC, CAT I
Transient overvoltage	800 V peak



**Caution** Isolation voltage ratings apply to the voltage measured between any channel pin (HI, LO, HI Sense, LO Sense) and the chassis ground. When operating channels in series or floating on top of external voltage references, ensure that no terminal exceeds this rating.



**Caution** Les tensions nominales d'isolation s'appliquent à la tension mesurée entre n'importe quelle broche de voie et la masse du châssis. Lors de l'utilisation de voies en série ou flottantes en plus des références de tension externes, assurez-vous qu'aucun terminal ne dépasse cette valeur nominale.



**Note** Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are for other circuits not intended for direct connection to the MAINS building installations of Measurement Categories

11. Channel I/O pins include the HI, LO, HI Sense and LO Sense terminals. The Shield GND terminals of the output connector are connected to chassis ground and not considered channel I/O pins.

CAT II, CAT III, or CAT IV.

## Protection

**Table 17.** General Module Protection

Absolute maximum voltage, between any channel I/O pin <sup>12</sup> and LO	60 V
Any AUX I/O pin to ground	5 V
AUX Power In + to AUX Power In -	±60 V
AUX Power In - to ground	±1 V

**Table 18.** Output channel protection

Overcurrent or overvoltage	Automatic shutdown, output disconnect relay opens
Reverse voltage protection	Automatic shutdown, output disconnect relay opens
Down programmer overload	Automatic shutdown, output disconnect relay opens
Overtemperature	Automatic shutdown, output disconnect relay opens

**Table 19.** AUX Power protection

Overvoltage or undervoltage	Automatic shutdown, output disconnect relay opens
Overcurrent	Automatic shutdown, output disconnect relay opens, non-accessible fuse as backup protection

## Measurement and Update Timing

**Table 20.** General Module Measurement and Update Timing

Available sample rates <sup>13</sup>	(1.8 MS/s)/N, nominal where
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12. Channel I/O pins include the HI, LO, HI Sense and LO Sense terminals. The Shield GND terminals of the output connector are connected to chassis ground and not considered channel I/O pins.

13. When sourcing while measuring, both the Source Delay and Aperture Time affect the sampling rate.

	<ul style="list-style-type: none"> <li>• S is samples</li> <li>• <math>N = 1, 2, 3, \dots 2^{24}</math></li> </ul>
Sample rate accuracy	Equal to PXIe_CLK100 accuracy, nominal
Maximum measure rate to host	1.8 MS/s per channel, continuous, nominal
Maximum source update rate <sup>14</sup>	100,000 updates/s, nominal

**Table 21.** Input Trigger To

Source event delay	10 $\mu$ s, nominal
Source event jitter	2 $\mu$ s peak-to-peak, nominal
Measure event jitter	2 $\mu$ s peak-to-peak, nominal

## Triggers

### Input Triggers

**Table 22.** General Input Triggers

Types	Start, Source, Sequence Advance, Measure
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**Table 23.** Input Trigger Sources (PXI trigger lines <0...7>)

Polarity	Active high (not configurable)
Minimum pulse width	100 ns



**Note** Pulse widths and logic levels are compliant with *PXI Express Hardware Specification Revision 1.0 ECN 1*

When taking a measure record, only the Aperture Time affects the sampling rate.

14. As the Source Delay is adjusted, or if advanced sequencing is used, maximum update rates vary.

**Table 24.** Input Trigger Destinations

Polarity	Active high (not configurable)
Pulse width	>200 ns



**Note** Input triggers can come from any source (PXI trigger or software trigger) and be exported to any PXI trigger line. This allows for easier multi-board synchronization regardless of the trigger source.



**Note** As the Source Delay is adjusted, or if advanced sequencing is used, maximum update rates vary.

## Output Triggers (Events)

**Table 25.** General Output Triggers

Types	Source Complete, Sequence Iteration Complete, Sequence Engine Done, Measure Complete
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**Table 26.** Output Trigger Destinations

Polarity	Active high (not configurable)
Pulse width	>230 ns



**Note** As the Source Delay is adjusted, or if advanced sequencing is used, maximum update rates vary.

## AUX I/O (Fault)

**Table 27.** General AUX I/O Triggers

Direction	Output
Logic type	3.3 V CMOS (open drain, internal pull-up)
Polarity	Active low (not configurable)
Output voltage range	0 V to 3.3 V, typical
Output impedance	50 $\Omega$ , nominal



(active low)	
Internal pull-up resistance	10 k $\Omega$ , nominal

## Power Requirements

Table 28.

PXIe Chassis, +3.3 V	1 A, maximum
PXIe Chassis, +12 V	1 A, maximum
Auxiliary power source input	45.6 VDC to 50.4 VDC, 9 A, maximum



**Note** Current drawn from the auxiliary power source depends on power delivered from the instrument to the load. Refer to the PXIe-4150 user manual for additional details on power budgeting when multiple modules are powered from a single auxiliary power source.

## Environmental Guidelines



**Notice** Failure to follow the mounting instructions in the product documentation can cause temperature derating.



**Notice** This product is intended for use in indoor applications only.

## Environmental Characteristics

Temperature	
Operating	0 °C to 55 °C <sup>15,16</sup>
Storage	-40 °C to 71 °C

15. Not all chassis can achieve this ambient temperature range. Refer to PXI chassis specifications to

Humidity	
Operating	10% to 90%, noncondensing
Storage	5% to 95%, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)
Shock and Vibration	
Operating vibration	5 Hz to 500 Hz, 0.3 g RMS
Non-operating vibration	5 Hz to 500 Hz, 2.4 g RMS
Operating shock	30 g, half-sine, 11 ms pulse

## Calibration Interval

You can obtain the calibration certificate and information about calibration services for the at [ni.com/calibration](https://ni.com/calibration).

**Table 29.** Calibration Interval

Calibration Interval	2 years
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determine the ambient temperature ranges your chassis can achieve.

- Max ambient temperature deratings apply when operating the 10 A range above certain current levels. Refer to Instrument Capabilities section of the specifications for additional detail.