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# PXIe-4154 Specifications

2022-11-04

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# PXIe-4154 Specifications

These specifications apply to the PXIe-4154.

## 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[1] of 23 °C ± 5 °C
- Calibration interval of 1 year
- 30 minutes warm-up time
- Self-calibration performed within the last 24 hours
- niDCPower Samples to Average property or NIDCPOWER_ATTR_SAMPLES_TO_AVERAGE attribute set to 20,000

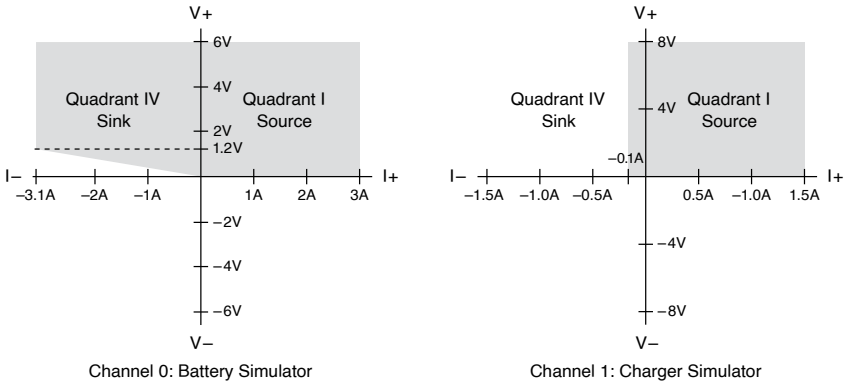
# Device Capabilities

The following table and figure illustrate the voltage and the current source and sink ranges of the PXIe-4154.

| Channel | DC voltage ranges | DC Current Source Ranges[] | DC Current Sink Limits, Typical[] |
|---|---|---|---|
| Channel 0 (Battery Simulator) | 0 V to +6 V | 30 mA | 31 mA |
| | | 3 Arefvars 4154 | 3.1 A |
| Channel 1 (Charger Simulator) | 0 V to +8 V | 1.5 A[] | 0.1 A |

Table 1. Current Source and Sink Ranges

Figure 1. Quadrant Diagram, Characteristic[5]




# Channel 0 (Battery Simulator) Specifications

## Programming and Measurement Accuracy/Resolution

| Range | Minimum Programmable Value, Nominal | Resolution, Nominal | Accuracy (23 °C ± 5 °C) ± (% of voltage + offset) |
|---|---|---|---|
| +6 V | 0 V | 2.3 mV | 0.04% + 5 mV |

Table 2. Voltage Programming Accuracy/Resolution

| Range | Minimum Programmable Value, Nominal | Resolution, Nominal | Accuracy (23 °C ± 5 °C) ± (% of current + offset) |
|---|---|---|---|
| 30 mA | 100 µA | 10 µA | 0.12% + 35 µA |

| Range | Minimum Programmable Value, Nominal | Resolution, Nominal | Accuracy (23 °C ± 5 °C) ± (% of current + offset) |
|---|---|---|---|
| 3 A [6] | 10 mA | 1 mA | 0.12% + 3.5 mA[7] |

Table 7. Current Programming Accuracy/Resolution

| Maximum Programmable Value, Nominal | Minimum Programmable Value, Nominal | Resolution, Nominal | Accuracy (23 °C ± 5 °C) ± (% of reading + offset) |
|---|---|---|---|
| 1 Ω | -0.04 Ω | 1 mΩ | 0.3% + 3 mΩ |

Table 4. Output Resistance Programming Accuracy/Resolution

| Range | Resolution, Nominal | Accuracy (23 °C ± 5 °C) ± (% of voltage + offset) |
|---|---|---|
| +6 V | 100 µV | 0.025% + 2 mV |

Table 5. Voltage Measurement Accuracy/Resolution

| Range | Resolution, Nominal | Accuracy (23 °C ± 5 °C) ± (% of current + offset) |
|---|---|---|
| 30 mA | 1 µA | 0.04% + 7 µA |
| 3 A | 100 µA | 0.04% + 0.7 mA[7] |

Table 6. Current Measurement Accuracy/Resolution

## Related reference

- Current Programming/Measurement Accuracy Derating

# Channel 0 General Specifications

| | |
|---|---|
| Temperature coefficient | 10% of accuracy specification per °C |
| Settling time | 500 µs (settled to 1%, 1 V step, 50% of current range at final value), typical |
| Rise or fall time (10%–90%) | <200 µs (current limit ≥1% of range), typical |
| Maximum sampling rate | 200 kS/s, characteristic |

| | |
|---|---|
| **Transient response time after change in load current from 0.1 A to 1.5 A[8]** | |
| Device configured for normal transient response | Recovers to <± 20 mV within 40 µs, typical |
| Device configured for fast transient response | Recovers to <± 20 mV within 20 µs |
| **Transient voltage dip after a change in load current from 0.1 A to 1.5 A[8]** | |
| Device configured for normal transient response | <250 mV, typical |
| Device configured for fast transient response | <70 mV |
| RMS normal mode noise | <1 mV RMS (<6m $V_{p-p}$) into resistive load (20 Hz to 20 MHz bandwidth), typical |
| **Load regulation, output resistance set to 0 Ω** | |
| Voltage | 3 mV max per amp of output load using remote sense and sensing at the connector |
| Current | 0.01% of range per volt of output change |
| Remote sense | Add 2 µV to voltage accuracy specification per mV of lead drop |
| Maximum remote sense lead drop | Up to 1 V drop per lead |
| Overvoltage protection | Output disconnected if the voltage at the Output + terminal exceeds the programmed voltage by 2.5 V, typical |

# Channel 1 (Charger Simulator) Specifications

## Programming and Measurement Accuracy/Resolution

| Output Function | Range | Minimum Programmable Value, Nominal | Resolution, Nominal | Accuracy ± (% of output + offset), 23 °C ± 10 °C |
|---|---|---|---|---|
| Voltage | +8 V | 0 V | 3 mV | 0.04% + 6 mV |
| Current | 1.5 A [9] | 10 mA | 1 mA | 0.16% + 3.5 mA[10] |

Table 7. Programming Accuracy/Resolution

| Measurement Type | Range | Resolution, Nominal | Accuracy ± (% of output + offset), 23 °C ± 10 °C |
|---|---|---|---|
| Voltage | +8 V | 150 µV | 0.05% + 2.5 mV |
| Current | 1.5 A | 50 µA | 0.12% + 0.35 mA[10] |

Table 8. Measurement Accuracy/Resolution

### Related reference

- Current Programming/Measurement Accuracy Derating

## Channel 1 General Specifications

| | |
|---|---|
| Temperature coefficient | 10% of accuracy specification per °C |
| Settling time | 500 µs (settled to 1%, 1 V step, 50% of current range at final value), typical |
| Rise or fall time (10%–90%) | <200 µs (current limit ≥ 1% of range), typical |
| Maximum sampling rate | 200 kS/s, characteristic |
| Transient response time after change in load current from 0.75 A to 1.5 A | Recovers to <±20 mV within 45 µs, typical |

| | |
|---|---|
| RMS normal mode noise | <2 mV RMS (<10 $mV_{p-p}$) into resistive load (20 Hz to 20 MHz bandwidth), typical |

**Load regulation**

Voltage 1 mV max per amp of output load using remote sense and sensing at the connector

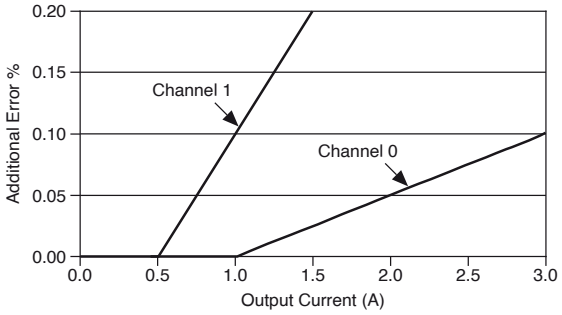
Current 0.01% of range per volt of output change

| | |
|---|---|
| Remote sense | Add 2 µV to voltage accuracy specification per mV of lead drop |
| Maximum remote sense lead drop | Up to 1 V drop per lead for voltage output from 0 V to 6 V. For voltage output >6 V, linearly derate from 1 V to 0.4 V |
| Overvoltage protection | Output disconnected if the voltage at the Output + terminal exceeds the programmed voltage by 2.5 V, typical |

# Channel 0 and Channel 1 Specifications

## Current Programming/Measurement Accuracy Derating

Figure 2. Accuracy Derating Versus Output Current




## Triggers

**Input triggers**

| | |
|---|---|
| Types | Start |
| | Source |
| | Sequence Advance |
| | Measure |

**Sources (PXI trigger lines 0 to 7)[11]**

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

**Destinations[12] (PXI trigger lines 0 to 7)[11]**

| | |
|---|---|
| Polarity | Active high (not configurable) |
| Minimum pulse width | 250 ns |

**Output triggers (events)**

| | |
|---|---|
| Types | Source Complete |
| | Sequence Iteration Complete |
| | Sequence Engine Done |
| | Measure Complete |

**Destinations (PXI trigger lines 0 to 7)[11]**

| | |
|---|---|
| Polarity | Active high (not configurable) |
| Pulse width | 230 ns |

## Isolation

| | |
|---|---|
| **Isolation voltage, characteristic** | |
| Channel-to-ground or channel-to-channel | 60 VDC, CAT I, verified by dielectric withstand test, 5 s, continuous |

## Maximum Measurement Speed

| | |
|---|---|
| Maximum source update rate[13] | 1,850 Updates/s, characteristic |
| Trigger in to source delay | 15 µs, characteristic |

## Power Characteristics

| | |
|---|---|
| PXI Express power requirement | 5 W at 3.3 V, 46 W at 12 V, typical |

# Physical

| | |
|---|---|
| Dimensions | 3U, two-slot, PXI Express/CompactPCI Express module<br>4.0 cm × 13.0 cm × 21.6 cm(1.6 in. × 5.1 in. × 8.5 in.) |
| **Weight** | |
| 20 W | 565 g (19.9 oz) |
| 40 W | 428 g (15.1 oz) |
| Front panel connectors | Phoenix Contact COMBICON, 5.08 mm (5 position), nominal |

# Cleaning Statement

> **Notice** Clean the hardware with a soft, nonmetallic brush. Make sure that the hardware is completely dry and free from contaminants before returning it to service.

# Calibration Interval

| | |
|---|---|
| Recommended calibration interval | 1 year |

# Environment

| | |
|---|---|
| Maximum altitude | 2,000 m (800 mbar) (at 25 °C ambient temperature) |
| Pollution Degree | 2 |

Indoor use only.

## Operating Environment

| | |
|---|---|
| Ambient temperature range | 0 °C to 40 °C |
| Relative humidity range | 10% to 90%, noncondensing |

## Storage Environment

| | |
|---|---|
| Ambient temperature range | -40 °C to 70 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 limits.) |

| | |
|---|---|
| Relative humidity range | 5% to 95%, noncondensing |

## Shock and Vibration

| | |
|---|---|
| Storage Shock | 50 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.) |
| Operating shock | 30 g peak, half-sine, 11 ms pulse |
| **Random vibration** | |
| Operating | 5 Hz to 500 Hz, 0.3 $g_{rms}$ |
| Nonoperating | 5 Hz to 500 Hz, 2.4 $g_{rms}$ |

## Compliance and Certifications

> **Caution** You can impair the protection provided by the PXIe-4154 if you use it in a manner not described in this document.

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

### 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.

## CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2011/65/EU; Restriction of Hazardous Substances (RoHS)
- 2014/53/EU; Radio Equipment Directive (RED)
- 2014/34/EU; Potentially Explosive Atmospheres (ATEX)

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

[2] Current source limits are programmable in Quadrant I (source).

[3] Current sink limits are fixed (not programmable) in Quadrant IV (sink).

[4] Total combined output current from all channels cannot exceed 3.1 A.

[5] For channel 0 in Quadrant IV (sink) when the terminal voltage drops below 1.2 V (sensing at the connector), the maximum sink current derates linearly from -3.1 A.

[6] Total output current for both channels combined cannot exceed 3.1 A

[7] For current output ≥1 A, accuracy is derated.

[8] Tested with 1 meter 18 AWG cables.

[9] Total output current for both channels combined cannot exceed 3.1 A

[10] For current output ≥500 mA, accuracy is derated.

[11] Pulse widths and logic levels are compliant with **PXI Express Hardware Specification Revision 1.0 ECN 1**.

[12] 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.

[13] Maximum source update rate is performed with the source delay set to 500 µs. This is sufficient for the output to settle within 1% of the requested level with a simple resistive load. As you adjust the source delay for your application's requirements, maximum rates may vary.


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