PXIe-6571

Specifications

Provided by:

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Authorized Distributor

Integration Partner

Contents

PXIe-6571 Specifications

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These specifications apply to the PXIe-6571 (8-channel) and PXIe-6571 (32-channel).

> **Note** Unless otherwise noted, "PXIe-6571" encompasses both the 8-channel and 32-channel variants.

When using the PXIe-6571 in the Semiconductor Test System, refer to the ***Semiconductor Test System Specifications***.

Revision History

Version	Date changed	Description
377477E-01	July 2025	Active Load specification update. Pinout added.
377477D-01	May 2025	Pinout added.
377477C-01	June 2024	Bug fixes.
377477B-01	April 2024	Added Safety Voltage and Environmental specifications.
377477A-01	May 2018	Initial release.

Looking For Something Else?

For information not found in the specifications for your product, such as operating instructions, browse ***Related Information***.

Related information:

- User Manual
- Software and Driver Downloads
- Dimensional Drawings

- Product Certifications
- Letter of Volatility
- Discussion Forums
- NI Learning Center

Definitions

Warranted Specifications describe the performance of a model under stated operating conditions and are covered by the model warranty. Specifications account for measurement uncertainties, temperature drift, and aging. Specifications are ensured by design or verified during production and calibration.

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

Values are ***Nominal*** unless otherwise noted.

Conditions

Specifications are valid under the following conditions unless otherwise noted.

- Operating temperature of 0 °C to 40 °C
- Chassis with slot cooling capacity as follows:
  - PXIe-6571 (8-channel): ≥58 W
  - PXIe-6571 (32-channel): 82 W
- Operating temperature within ±5 °C of the last self-calibration temperature[1]
- Recommended calibration interval of 1 year. The PXIe-6571 will not meet specifications unless operated within the recommended calibration interval.
- DUT Ground Sense (DGS) same potential as the Ground (GND) pins
- 30-minute warmup time before operation

1. For guidance on thermal management best practices, visit ni.com/info and enter the Info Code ThermalManagement.

Note When the pin electronics on the PXIe-6571 are in the disconnect state, some I/O protection and sensing circuitry remain connected. Do not subject the PXIe-6571 to voltages beyond the supported measurement range.

PXIe-6571 Pinout

The PXIe-6571 exposes signal terminals via a VHDCI connector.

Figure 1. PXIe-6571 (8-Channel) Connector Pinout

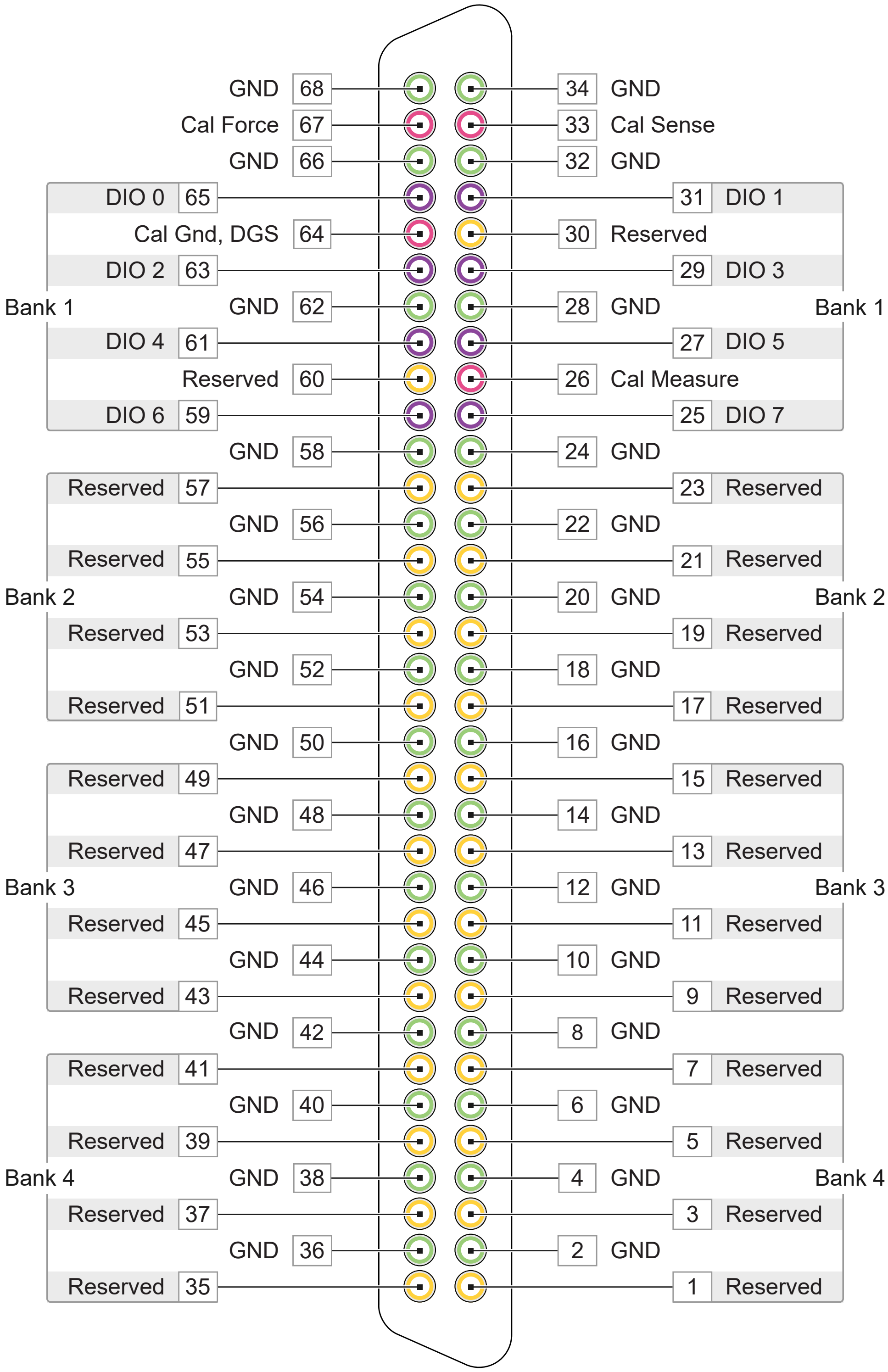


Figure 2. PXIe-6571 (32-Channel) Connector Pinout

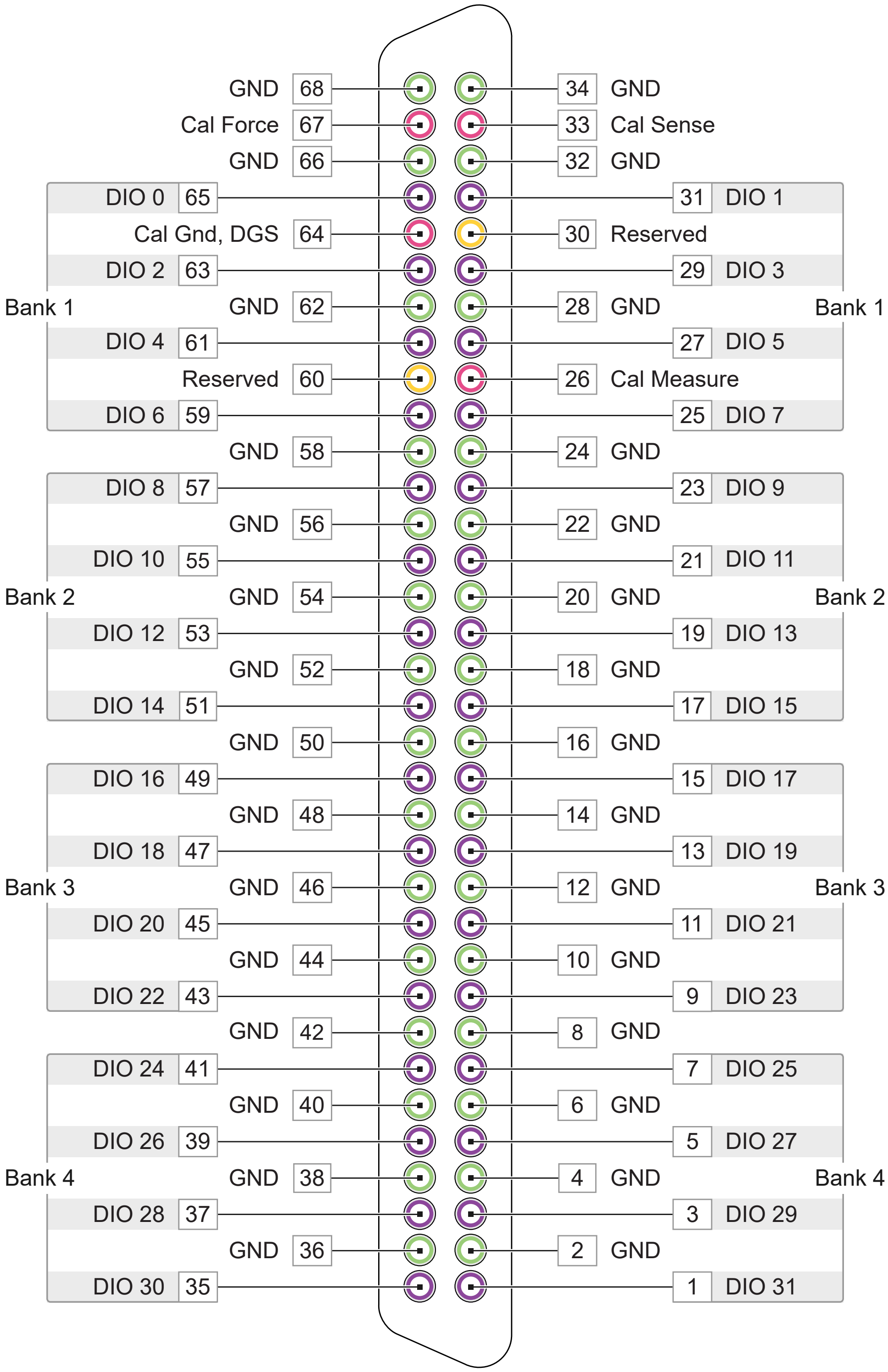


Table 1. PXIe-6571 Digital Data and Control Connector Pins/Signal Descriptions

Signal Type	Signal Name	Signal Description
Data	DIO <0..31>	Bidirectional PPMU-capable digital I/O data channels 0 through 31.
Ground	GND	Instrument ground. Acts as the default ground reference when DUT Ground Sense (DGS) is not connected.
Ground	DGS	Optional DGS for improved accuracy at higher currents in some configurations.
Analog	CAL MEASURE	Resource for external calibration.
Analog	CAL SENSE	Resource for external calibration.
Analog	CAL GND	Resource for external calibration.
Analog	CAL FORCE	Resource for external calibration.
N/A	RESERVED	These terminals are reserved for future use. Do not connect to these pins.

Note The digital I/O data channels of 32-channel digital pattern instruments are split into banks for PPMU operation efficiency: DIO <0..7>, DIO <8..15>, DIO <16..23>, DIO <24..31>. PPMU measurements run in parallel when you take measurements on channels across different banks. Taking PPMU measurements simultaneously with channels on the same bank impacts test time performance based on certain measurement settings. Test time performance for frequency counter measurements is not impacted by taking multiple frequency counter measurements on channels in the same bank.

Physical Characteristics

Table 2. Physical Characteristics

PXIe slots	1
Dimensions	131 mm × 21 mm × 214 mm (5.16 in. × 0.83 in. × 8.43 in.)

	For more information, visit ***ni.com/dimensions*** and search by module number.
Weight	640 g (22.5 oz.)

Related information:

- Dimensional Drawings

General

Table 3. Channel Count

PXIe-6571 (8-channel)	8
PXIe-6571 (32-channel)	32
System channel count, PXIe-6571 (32-channel)[2]	512

Table 4. Multi-site Resources per Instrument

PXIe-6571 (8-channel)	8
PXIe-6571 (32-channel)	8

Table 5. Memory Resources

Large Vector Memory (LVM)	128M vectors

Table 6. History RAM (HRAM)

HRAM	(8,192/N sites)-1 cycles

Table 7. Offset and Memory Range

Maximum allowable offset (DGS minus GND)	±300 mV
Supported measurement range[3]	-2 V to 7 V[4]

2. The ***system channel count*** is the maximum number of channels available when using multiple PXIe-6571 (32-channel) instruments in a single chassis as a digital subsystem within an application system. Some functionality described in this document requires that a PXIe-6674T synchronization module be used in conjunction with each digital subsystem.

Vector Timing

Table 8. Vector Timing Characteristics

Maximum vector rate	100 MHz
Vector period range	10 ns to 40 µs (100 MHz to 25 kHz)
Vector period resolution	38 fs

Table 9. Timing Control

Vector period	Vector-by-vector on the fly
Edge timing	Per channel, vector-by-vector on the fly
Drive formats	Per channel, vector-by-vector on the fly

Clocking

Table 10. Clocking Parameters

Master clock source	PXIe_CLK100[5]
Sequencer clock domains	One (independent sequencer clock domains on a single instrument not supported)

Signal Interface

Note The maximum vector rate for patterns may be limited by the pulse width requirements, which may not allow all formats and edge multipliers to be used up to the fastest vector rate.

Table 11. Drive Formats

100 MHz maximum vector rate	Non-Return (NR), Return to Low (RL), Return to High (RH)

3. If the total voltage sourced or driven on any pin relative to GND exceeds the supported measurement range, instrument performance may be degraded.
4. ***Voltage*** > 6 V requires the Extended Voltage Range mode of operation. For additional information, refer to ***PPMU Force Voltage***.
5. Sourced from chassis 100 MHz backplane reference clock, external 10 MHz reference, or PXIe-6674T.

50 MHz maximum vector rate	Surround by Complement (SBC)[6]

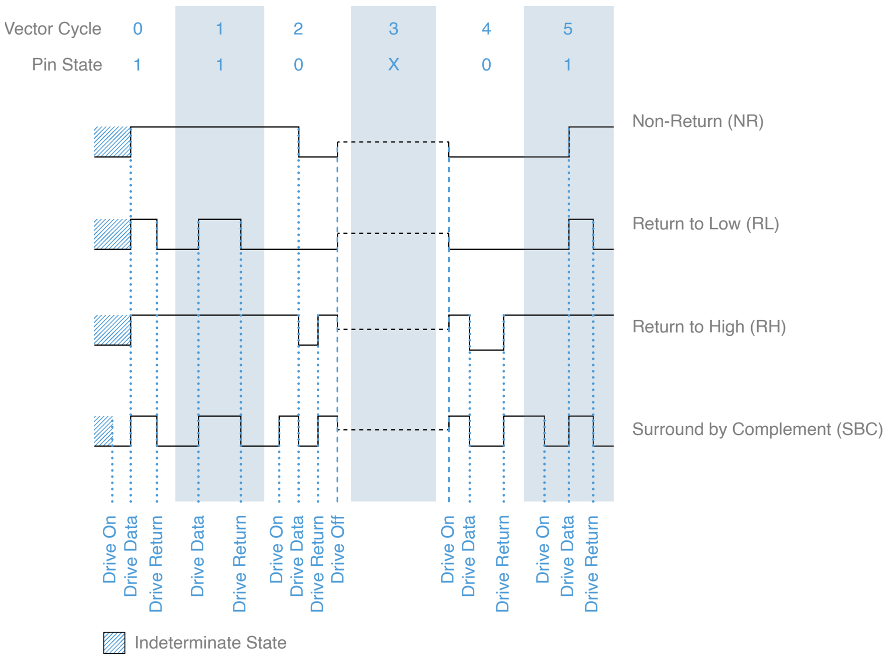
Table 12. Compare Formats

Compare formats	Edge strobe

Table 13. Edge Multipliers

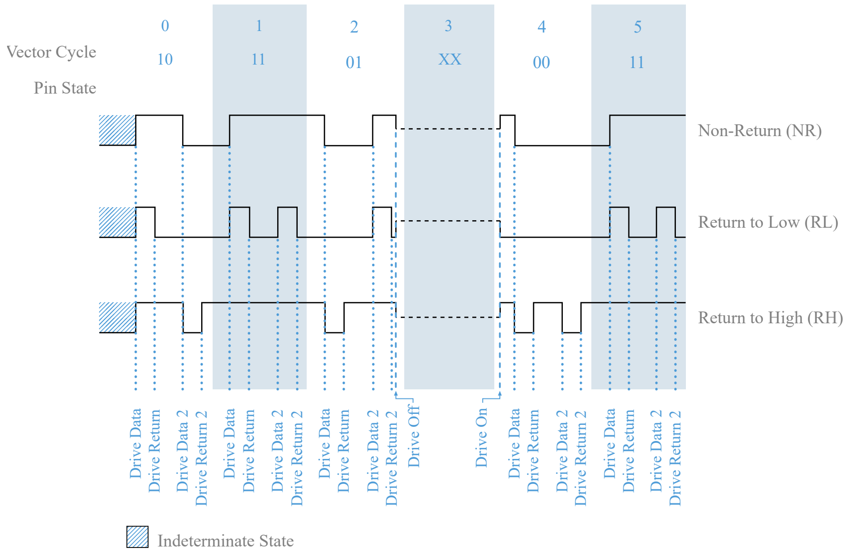
Edge Multipliers	1x, 2x

Figure 3. Drive Formats



6. The SBC format is not supported within the 2x edge multiplier mode.

Figure 4. 2x Mode Drive Formats



Pin Data States

- **0**—Drive zero
- **1**—Drive one
- **L**—Compare low
- **H**—Compare high
- **X**—Do not drive; mask compare
- **M**—Compare midband, not high or low
- **V**—Compare high or low, not midband; store results from capture functionality if configured
- **D**—Drive data from source functionality if configured
- **E**—Expect data from source functionality if configured
- **-**—Repeat previous cycle; do not use a dash (–) for the pin state on the first vector of a pattern file unless the file is used only as a target of a jump or call operation

Note Termination mode settings affect the termination applied to all non-driving pin states. Non-drive states include L, H, M, V, X, E, and potentially -. Refer to the ***Programmable input termination mode*** specification for more information.

Edge Types

Table 14. Edge General Specifications

Drive edges	6: drive on, drive data, drive return, drive data 2, drive return 2, drive off
Compare edge	2: strobe, strobe 2
Number of time sets[7]	31

Edge Generation Timing

Table 15. Edge Placement Range

Minimum	Start of vector period (0 ns)
Maximum	5 vector periods or 40 µs, whichever is smaller

Table 16. Minimum Required Edge Separation

Between any driven data change	3.75 ns
Between any Drive On and Drive Off edges	5 ns
Between Compare Strobes	5 ns

Table 17. Edge Generation Precision

Edge placement resolution	39.0625 ps
TDR deskew adjustment resolution	39.0625 ps

Table 18. Edge Placement Accuracy, Drive

Edge Multiplier = 1x, PXIe-6571 (32-channel)	±500 ps, warranted
Edge Multiplier = 1x, PXIe-6571 (8-channel)	±500 ps, typical
Edge Multiplier = 2x	***Bit Rate*** ≤ 266 Mbps: ±600 ps, typical

Table 19. Edge Placement Accuracy, Compare

Edge Multiplier = 1x, PXIe-6571 (32-channel)	±500 ps, warranted

7. 31 time sets can be configured. One additional time set, represented by a -, repeats the previous time set.

Edge Multiplier = 1x, PXIe-6571 (8-channel)	±500 ps, typical
Edge Multiplier = 2x	***Bit Rate*** ≤ 100 Mbps: ±500 ps, typical ***Bit Rate*** ≤ 133 Mbps: ±700 ps, typical

Table 20. Overall Timing Accuracy

Edge Multiplier = 1x, PXIe-6571 (32-channel)	±1.5 ns, warranted
Edge Multiplier = 1x, PXIe-6571 (8-channel)	±1.5 ns, typical
Edge Multiplier = 2x	***Bit Rate*** ≤ 200 Mbps: ±1.5 ns, typical ***Bit Rate*** ≤ 266 Mbps: ±1.8 ns, typical

Note For specifications in a Semiconductor Test System, refer to the ***Semiconductor Test System Specifications***.

Driver

Table 21. Driver Signal Configuration

Signal type	Single-ended, referenced to the DGS pin when connected. Otherwise referenced to GND.
Programmable levels	V_{IH}, V_{IL}, V_{TERM}

Table 22. Driver Voltage Levels

Range (V_{IH}, V_{IL}, V_{TERM})	-2 V to 6 V
Minimum swing (V_{IH} minus V_{IL})	400 mV, into a 1 MΩ load
Resolution (V_{IH}, V_{IL}, V_{TERM})	122 µV
Accuracy (V_{IH}, V_{IL}, V_{TERM})	±15 mV, 1 MΩ load, warranted

Table 23. Driver Characteristics

Maximum DC drive current	±32 mA
Output impedance	50 Ω
Rise/fall time, 20% to 80%	1.2 ns, up to 5 V

Comparator

Table 24. Comparator Signal Configuration

Signal type	Single-ended, referenced to the DGS pin when connected. Otherwise referenced to GND.
Programmable levels	V_{OH}, V_{OL}

Table 25. Comparator Voltage Levels

Range (V_{OH}, V_{OL})	-2 V to 6 V
Resolution (V_{OH}, V_{OL})	122 µV
Accuracy (V_{OH}, V_{OL})	±25 mV, from -1.5 V to 5.8 V, warranted

Table 26. Comparator Characteristics

Programmable input termination modes	High Z, 50 Ω to V_{TERM}, Active Load
Leakage current	<15 nA, in the High Z termination mode

Active Load

Table 27. Programmable Levels

Programmable levels	I_{OH}, I_{OL}

Table 28. Commutating Voltage (V_{COM})

Range	-2 V to 6 V
Resolution	122 µV

Table 29. Current Levels

Range	150 µA to 16 mA
Resolution	488 nA
Accuracy	• ±14 µA for current level ≤512 µA, typical • ±93 µA for current level >512 µA, typical

PPMU Force Voltage

Table 30. PPMU Force Voltage Signal Type

Signal type	Single-ended, referenced to the DGS pin when connected. Otherwise referenced to GND.

Table 31. PPMU Force Voltage Levels

Range	-2 V to 6 V
Resolution	122 µV
Accuracy	±15 mV, 1 MΩ load, from -2 V to 6 V, warranted ±50 mV, 1 MΩ load, from 6 V to 7 V, typical

Note The ***Extended Voltage Range*** is an unwarranted mode of operation that allows the PMU to force voltages between 6 V and 7 V for applications that can tolerate more error than the normal force voltage accuracy.

PPMU Measure Voltage

Table 32. PPMU Measure Voltage Signal Type

Signal type	Single-ended, referenced to the DGS pin when connected. Otherwise referenced to GND.

Table 33. PPMU Measure Voltage Levels

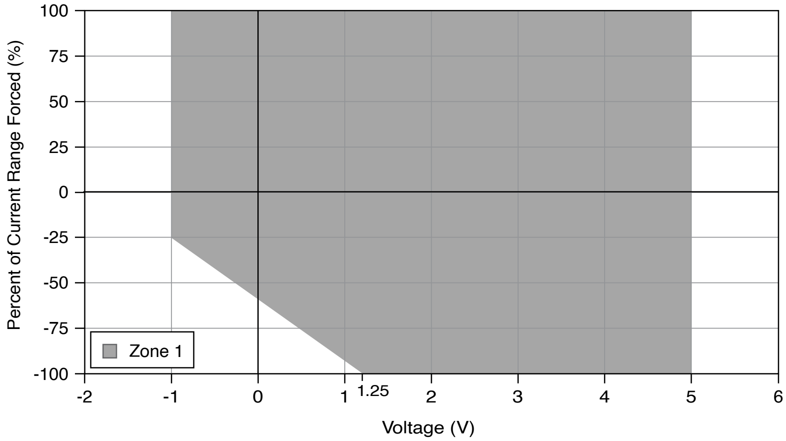
Range	-2 V to 6 V
Resolution	228 µV
Accuracy	±5 mV, warranted

PPMU Force Current

Table 34. PPMU Force Current Accuracy

Range	Resolution	Accuracy
±2 µA	60 pA	±1% of range for Zone 1 of Figure 5. Warranted Current Accuracy Zone for PPMU Force Current, warranted
±32 µA	980 pA	±1% of range for Zone 1 of Figure 5. Warranted Current Accuracy Zone for PPMU Force Current, warranted
±128 µA	3.9 nA	±1% of range for Zone 1 of Figure 5. Warranted Current Accuracy Zone for PPMU Force Current, warranted
±2 mA	60 nA	±1% of range for Zone 1 of Figure 5. Warranted Current Accuracy Zone for PPMU Force Current, warranted
±32 mA	980 nA	±1% of range for Zone 1 of Figure 5. Warranted Current Accuracy Zone for PPMU Force Current, warranted

Figure 5. Warranted Current Accuracy Zone for PPMU Force Current



Note The boundaries of Zone 1 are inclusive of that zone. The area outside of Zone 1 does not have a warranted specification for PPMU force current accuracy.

How to Calculate PPMU Force Current Accuracy

1. Specify the desired forced current.
2. Based on the desired forced current, select an appropriate current range from Table 34. PPMU Force Current Accuracy.
3. Divide the desired forced current from step 1 by the current range from step 2 and multiply by 100 to calculate the Percent of Current Range Forced.
4. Based on the impedance of the load, calculate the voltage required to force the desired current from step 1. Use the following equation: ***Voltage Required*** = ***Desired Current*** × ***Load Impedance***.
5. Using Figure 5. Warranted Current Accuracy Zone for PPMU Force Current, locate the zone in which the Percent of Current Range Forced calculated in step 3 intersects with the voltage calculated in step 4. If the intersection is outside of Zone 1, then there are no warranted specifications. To get warranted specifications, the current range and/or forced current must be adjusted until the intersection is in Zone 1.
6. Based on the zone found in step 5, use Table 34. PPMU Force Current Accuracy to calculate the accuracy of the forced current.

Table 35. PPMU Voltage Clamps

Range	-2 V to 6 V

Resolution	122 µV
Accuracy	±100 mV, typical

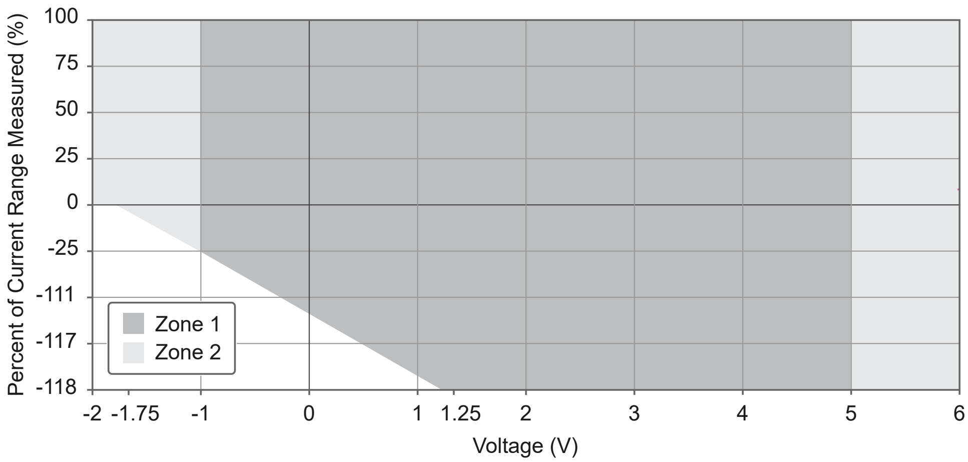
PPMU Measure Current

Table 36. PPMU Measure Current Accuracy

Range	Resolution	Accuracy
±2 µA	460 pA	• ±1% of range for Zone 1 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted • ±1.5% of range for Zone 2 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted
±32 µA	7.3 nA	• ±1% of range for Zone 1 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted • ±1.5% of range for Zone 2 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted
±128 µA	30 nA	• ±1% of range for Zone 1 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted • ±1.5% of range for Zone 2 of Figure 6. Warranted

Range	Resolution	Accuracy
		Current Accuracy Zones for PPMU Measure Current, warranted
±2 mA	460 nA	• ±1% of range for Zone 1 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted • ±1.5% of range for Zone 2 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted
±32 mA	7.3 µA	• ±1% of range for Zone 1 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted • ±1.5% of range for Zone 2 of Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, warranted

Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current



Note The boundaries of Zone 1 are inclusive of that zone. All other boundaries are inclusive of Zone 2. The area outside of Zone 1 and Zone 2 does not have a warranted specification for PPMU measure current accuracy.

How to Calculate PPMU Measure Current Accuracy

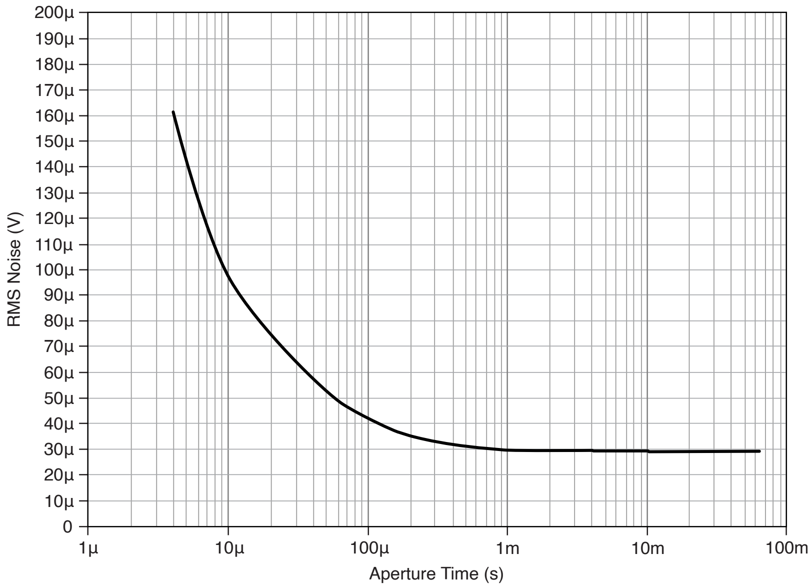
1. Specify the desired measured current.
2. Based on the desired measured current, select an appropriate current range from Table 36. PPMU Measure Current Accuracy.
3. Divide the desired measured current from step 1 by the current range from step 2 and multiply by 100 to calculate the Percent of Current Range Measured.
4. If forcing voltage and then measuring current, Voltage in Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current is equal to the forced voltage. If forcing current and then measuring current, Voltage in Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current is equal to the voltage required to force the desired current based on the impedance of the load. Use the following equation: ***Voltage Required*** = ***Desired Current*** × ***Load Impedance***.
5. Using Figure 6. Warranted Current Accuracy Zones for PPMU Measure Current, locate the zone in which the Percent of Current Range Measured calculated in step 3 intersects with the Voltage calculated in step 4. If the intersection is outside of Zone 1 or Zone 2, then there are no warranted specifications. To get warranted specifications, the current range and forced current or forced voltage must be adjusted until the intersection is in Zone 1 or Zone 2.
6. Based on the zone found in step 5, use Table 36. PPMU Measure Current Accuracy to calculate the accuracy of the measured current.

PPMU Programmable Aperture Time

Table 37. Aperture Time

Minimum	4 µs
Maximum	65 ms
Resolution	4 µs

Figure 7. Voltage Measurement Noise for Given Aperture Times, Typical



Opcodes

Refer to the following table for supported opcodes. Using matched and failed opcode parameters with multiple PXIe-6571 instruments requires the PXIe-6674T synchronization module. Other uses of flow-control opcodes with multiple PXIe-6571 instruments only require NI-TClk synchronization.

Category	Supported Opcodes
Flow Control	• `repeat` • `jump` • `jump_if` • `set_loop` • `end_loop`

Category	Supported Opcodes
	• exit_loop • exit_loop_if • call • return • keep_alive • match • halt
Sequencer Flags and Registers	• set_seqflag • clear_seqflag • write_reg
Signal	• set_signal • pulse_signal • clear_signal
Digital Source and Capture	• capture_start • capture • capture_stop • source_start • source • source_d_replace

Pipeline Latencies

Table 38. Pipeline Latencies

Minimum delay between source_start opcode and the first source opcode or subsequent source_start opcode	3 µs
Matched and failed condition pipeline latency	80 cycles

Source and Capture

Table 39. Digital Source

Operation modes	Serial and parallel; broadcast and site-unique
Source memory size	32 MB (256 Mbit) total
Maximum waveforms	512

Table 40. Digital Capture

Operation modes	Serial and parallel; site-unique
Capture memory size	1 million samples
Maximum waveforms	512

Note To learn how to calculate achievable data rates for Digital Source or Digital Capture, visit ni.com/info and enter the Info Code `DigitalSourceCapture` to access the Calculating Digital Source Rate tutorial or the Calculating Digital Capture Rate tutorial.

Independent Clock Generators

Table 41. Number of Clock Generators

PXIe-6571 (8-channel)	8 (one per pin)
PXIe-6571 (32-channel)	32 (one per pin)

Table 42. Clock Period

Clock period range	6.25 ns to 40 us (160 MHz to 25 kHz)[8]
Clock period resolution	38 fs

Frequency Measurements

Table 43. Frequency Counter Measure Frequency

Range	5 kHz to 200 MHz, 2.5 ns minimum pulse width

8. Clocks with ***Period*** < 7.5 ns will have a non-50% duty cycle.

Accuracy	See Calculating Frequency Counter Error

Calculating Frequency Counter Error

Use the following equation to calculate the frequency counter error (ppm).

$$\left(\frac{TB_{err}}{\left(1 - TB_{err}\right)} + \frac{20\text{ ns}}{\left(Measurement\ Time - Unknown\ Clock\ Period\right)}\right) \times 1,000,000$$

where

- ***Measurement Time*** is the time, in seconds, over which the frequency counter measurement is configured to run
- ***Unknown Clock Period*** is the time, in seconds, of the period of the signal being measured
- ***TB_{err}*** is the error of the Clk100 timebase

Refer to the following table for a few examples of common Clk100 timebase accuracies.

Table 44. TB_{err}

PXI Express Hardware Specification Revision 1.0	PXIe-1095 Chassis	PXIe-6674T Override
100 µ (100 ppm)	25 µ (25 ppm)	80 n (80 ppb)

Example 1: Calculating Error with a PXIe-1095 Chassis

Calculate the error of performing a frequency measurement of a 10 MHz clock (100 ns period) with a 1 ms measurement time using the PXIe-Clk100 provided by the PXIe-1095 chassis as the timebase.

Solution

$$\left(\frac{25\mu}{\left(1 - 25\mu\right)} + \frac{20\text{ns}}{\left(1\text{ms} - 100\text{ns}\right)}\right) \times 1,000,000 = 45\text{ ppm}$$

Example 2: Calculating Error when Overriding with the PXIe-6674T

Calculate the error if you override the PXIe-Clk100 timebase with the PXIe-6674T and increase the measurement time to 10 ms.

Solution

$$\left(\frac{80n}{(1-80n)}+\frac{20\text{ns}}{(10\text{ms}-100\text{ns})}\right)\times 1,\ 000,\ 000 = 2\text{ ppm}$$

Safety Voltages

Connect only voltages that are within these limits.

Table 45. Safety Voltages

Supported measurement range[9]	-2 V to 7 V[10]
Measurement Category	CAT I

Measurement Category

Caution Do not connect the product to signals or use for measurements within Measurement Categories II, III, or IV.

Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as ***MAINS*** voltage. MAINS is a hazardous live electrical supply system that powers equipment. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.

9. If the total voltage sourced or driven on any pin relative to GND exceeds the supported measurement range, instrument performance may be degraded.
10. ***Voltage*** > 6 V requires the Extended Voltage Range mode of operation.

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 CAT II, CAT III, or CAT IV.

Power Requirements

The PXIe-6571 draws current from a combination of the 3.3 V and 12 V power rails. The maximum current drawn from each of these rails can vary depending on the PXIe-6571 mode of operation.

Table 46. Input Power

PXIe-6571 (8-channel)	49 W
PXIe-6571 (32-channel)	76 W

Table 47. Current Draw, PXIe-6571 (8-channel)

3.3 V	1.3 A
12 V	3.7 A

Table 48. Current Draw, PXIe-6571 (32-channel)

3.3 V	1.7 A
12 V	5.9 A

Environmental Guidelines

Notice This model is intended for use in indoor applications only.

Environmental Characteristics

Table 49. Temperature

Operating[11]	0 °C to 40 °C

11. The PXIe-6571 (8-channel) requires a chassis with ≥58 W slot cooling capacity; the PXIe-6571 (32-channel) requires a chassis with 82 W slot cooling capacity. Refer to the specifications for your PXI

Storage	-40 °C to 71 °C

Table 50. Humidity

Operating	10% to 90%, noncondensing
Storage	5% to 95%, noncondensing

Table 51. Pollution Degree

Pollution degree	2

Table 52. Maximum Altitude

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

Table 53. 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

Table 54. Calibration Interval

Calibration Interval	1 year

chassis to determine the ambient temperature ranges your chassis can achieve.