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Find the *National Instruments PXIe-6545* at our website: *Click HERE*

SPECIFICATIONS

# PXIe-6545

## 200 MHz Digital Waveform Generator/Analyzer

This document provides the specifications for the PXIe-6545.



**Hot Surface** If the PXIe-6545 has been in use, it may exceed safe handling temperatures and cause burns. Allow the PXIe-6545 to cool before removing it from the chassis.



**Note** All values were obtained using a 1 m cable (SHC68-C68-D4 recommended). Performance specifications are not guaranteed when using longer cables.

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# Definitions and Conditions

Specifications are valid for the range 0 °C to 55 °C unless otherwise noted.

*Maximum* and *minimum* specifications are warranted not to exceed these values within certain operating conditions and include the effects of temperature and uncertainty unless otherwise noted.

*Typical* specifications are unwarranted values that are representative of a majority (3σ) of units within certain operating conditions and include the effects of temperature and uncertainty unless otherwise noted.

*Characteristic* specifications are unwarranted values that are representative of an average unit operating at room temperature.

*Nominal* specifications are unwarranted values that are relevant to the use of the product and convey the expected performance of the product.

All specifications are Typical unless otherwise noted.

# Channels

| | |
|---|---|
| Data | |
| Number of channels | 32, single data rate (SDR)[1] |
| Direction control | Per channel<br>Per operation |
| Time to tristate ($t_{PZ}$), 2 kΩ and 15 pF load | 6.2 ns, nominal |
| Programmable Function Interface (PFI) | |
| Number of channels | 4 |
| Direction control | Per channel |

[1] Using SDR, data is clocked using the rising or falling edge of the Sample clock.



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| | |
|---|---|
| Clock terminals | |
| Input | 2 |
| Output | 2 |

**Related Information**

*Triggers* on page 20
*Events* on page 22
*CLK IN* on page 15
*CLK OUT* on page 17

# Generation Channels

| | |
|---|---|
| Channels | Data<br>DDC CLK OUT<br>PFI <0..3> |
| Generation signal type | Single-ended |
| DC generation voltage accuracy[2] | ±35 mV, typical<br>±200 mV, maximum |

[2] Into 1 MΩ; does not include system crosstalk.



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**Table 1.** Generation Voltage Levels

| Logic Family[3] | Voltage Low Level ($V_{OL}$) | | Voltage High Level ($V_{OH}$) | | Accuracy for Nominal Values into 1 MΩ Load |
|---|---|---|---|---|---|
| | Nominal | Max | Min | Nominal | |
| 1.2 V ($V_{OH}$ = 1.2 V) | 0.0 V | 0.2 V | 1 V | 1.2 V | ±35 mV, typical |
| 1.5 V ($V_{OH}$ = 1.5 V) | | | 1.3 V | 1.5 V | |
| 1.8 V ($V_{OH}$ = 1.8 V) | | | 1.6 V | 1.8 V | |
| 2.5 V ($V_{OH}$ = 2.5 V) | | | 2.3 V | 2.5 V | |
| 3.3 V ($V_{OH}$ = 3.3 V) | | | 3.1 V | 3.3 V | |

**Note** Generation and acquisition sessions share a common voltage resource. Simultaneous operations must be set to the same logic family.

| | |
|---|---|
| Output impedance | 50 Ω, nominal |
| Maximum allowed DC drive strength per channel, by logic family | |
| 1.2 V | ±12 mA, nominal |
| 1.5 V | ±15 mA, nominal |
| 1.8 V | ±18 mA, nominal |
| 2.5 V | ±25 mA, nominal |
| 3.3 V | ±33 mA, nominal |
| Data channel driver enable/disable control | Software-selectable: per channel |
| Channel power-on state | Drivers disabled, 50 kΩ nominal input impedance |

[3] For all data, PFI, and clock channels. Does not include system crosstalk.



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| | |
|---|---|
| Output protection | |
| Range | 0 V to 5 V |
| Duration | Indefinite |

**Related Information**

*CLK OUT* on page 17
*DDC CLK OUT* on page 18

# Acquisition Channels

| | |
|---|---|
| Channels | Data<br>STROBE<br>PFI <0..3> |
| Acquisition signal type | Single-ended |
| Accuracy[4] | ±150 mV, typical<br>±30%, maximum |

**Table 2.** Acquisition Voltage Threshold Accuracy

| Logic Family[5] | Voltage Thresholds Low ($V_{IL}$) | | Voltage Thresholds High ($V_{IH}$) | |
|---|---|---|---|---|
| | Minimum | Typical | Typical | Maximum |
| 1.2 V ($V_{IH}$, $V_{IL}$ = 0.60 V) | 420 mV | 450 mV | 750 mV | 780 mV |
| 1.5 V ($V_{IH}$, $V_{IL}$ = 0.75 V) | 525 mV | 600 mV | 900 mV | 975 mV |
| 1.8 V ($V_{IH}$, $V_{IL}$ = 0.90 V) | 630 mV | 750 mV | 1.05 V | 1.17 V |
| 2.5 V ($V_{IH}$, $V_{IL}$ = 1.25 V) | 875 mV | 1.10 V | 1.40 V | 1.625 V |
| 3.3 V ($V_{IH}$, $V_{IL}$ = 1.65 V) | 1.155 V | 1.50 V | 1.80 V | 2.145 V |

**Note** Generation and acquisition sessions share a common voltage resource. Simultaneous operations must be set to the same logic family.

| | |
|---|---|
| Input impedance | High-impedance (50 kΩ), nominal |
| Input protection[6] | -1 V to 5 V |

[4] Does not include system crosstalk.
[5] For all data, PFI, and clock channels. Does not include system crosstalk.
[6] Internal diode clamps may begin conduction outside the -0.5 V to 3.5 V range.



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# Timing

## Sample Clock

| | |
|---|---|
| Sources | 1. On Board clock (internal 800 MHz VCO with 32-bit DDS)<br>2. CLK IN (SMA jack connector)<br>3. STROBE (Digital Data & Control [DDC] connector; acquisition only) |
| Frequency range | |
| On Board clock | 100 Hz to 200 MHz |
| CLK IN | 20 kHz to 200 MHz |
| STROBE | 100 Hz to 200 MHz |
| On Board clock characteristics | |
| Resolution[7] | 0.2 Hz, maximum |
| Accuracy[8] | ±150 ppm + 5 ppm per year |
| On Board clock characteristics valid only when PLL reference source is set to None | |
| Frequency accuracy | ±150 ppm (including temperature effects), typical |
| Aging | ±5 ppm first year, nominal |
| Sample clock relative delay adjustment[9] | |
| Range | |
| Acquisition sessions | 0.0 to 1.0 Sample clock periods |
| Generation sessions | 0.0 ns to 5.0 ns |
| Resolution | 0.5 ps |
| Exported Sample clock destinations | DDC CLK OUT (DDC connector)<br>CLK OUT (SMA jack connector) |
| Exported Sample clock delay | |
| Range | 0.0 to 1.0 Sample clock periods |
| Resolution ($\delta_C$)[10] | 117 ps to 143 ps, nominal |

[7] Varies with Sample clock frequency. You can query NI-HSDIO for the programmed frequency value.
[8] Accuracy may be increased by using a higher-performance external Reference clock.
[9] You can apply a delay or phase adjustment to the On Board clock to align multiple devices.
[10] Resolution is nonlinearly dependent on clock frequency. You can query clock frequency using NI-HSDIO.



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| | |
|---|---|
| Frequency | |
| On Board clock | All supported frequencies |
| External clock | Frequencies ≥20 MHz |
| Exported Sample clock jitter, using On Board clock | |
| Period | 24 $ps_{rms}$, characteristic |
| Cycle-to-cycle | 43 $ps_{rms}$, characteristic |

**Figure 1.** Characteristic Period Jitter (RMS) vs. Frequency

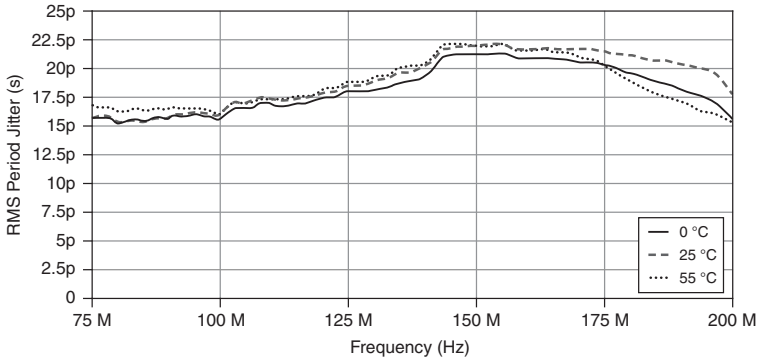



**Table 3.** Exported Sample Clock Duty Cycle

| Logic Family | DDC Clock Out[11] | |
|---|---|---|
| | Minimum | Maximum |
| 1.2 V | 37% | 50% |
| 1.5 V | 41% | 53% |
| 1.8 V | 42% | 55% |
| 2.5 V | 45% | 57% |
| 3.3 V | 48% | 58% |

**Related Information**

*CLK IN* on page 15
*STROBE* on page 17

[11] Does not include the effects of system crosstalk.



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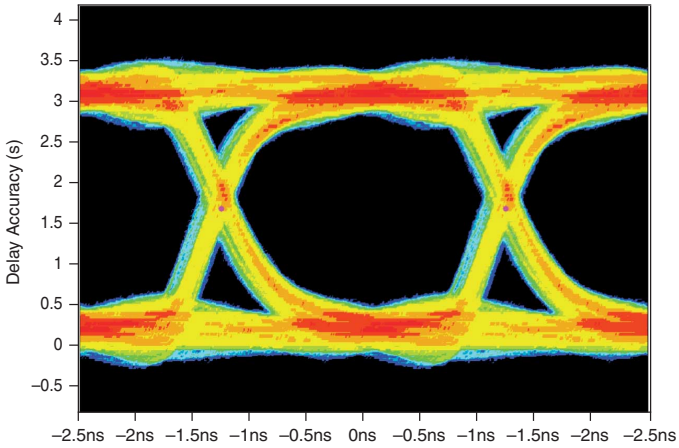
## Generation Timing

| | |
|---|---|
| Channels | Data<br>DDC CLK OUT<br>PFI <0..3> |
| Data channel-to-channel skew[12] | ±300 ps, maximum |
| Maximum data rate per channel | |
| SDR | 100 Mbps |

**Note** Includes maximum data channel-to-channel skew and typical crosstalk.

The following figure shows an eye diagram of a 400 Mbps pseudorandom bit sequence (PRBS) waveform in DDR mode at 3.3 V. This waveform was captured on DIO 0 at room temperature into high impedance.

**Figure 2.** Characteristic Eye Diagram (High Impedance)



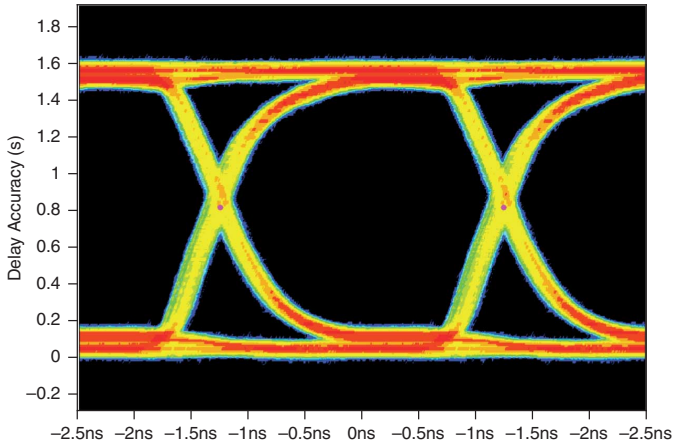

The following figure shows an eye diagram of a 400 Mbps PRBS waveform in DDR mode at 3.3 V. This waveform was captured on DIO 0 at room temperature into 50 Ω termination.

[12] Maximum skew across all data channels, PFI channels, and voltage levels when using the same data position or data delay bank.



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**Figure 3.** Characteristic Eye Diagram (50 Ω Termination, characteristic)



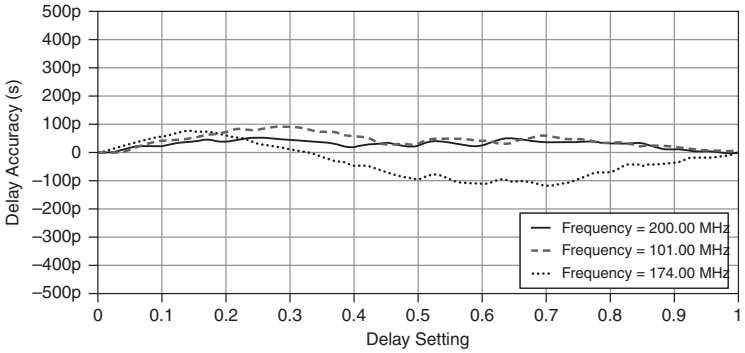

| | |
|---|---|
| Data position modes | Sample clock rising edge<br>Sample clock falling edge<br>Delay from Sample clock rising edge |
| Data delay banks | 1 bank for all channels and PFI lines |
| Generation data delay | |
| Range ($\delta_G$) | 0.0 to 1.0 Sample clock periods |
| Resolution ($\delta_G$)[13] | 117 ps to 143 ps, nominal |
| Frequency | |
| On Board clock | All supported frequencies |
| External clock | Frequencies ≥20 MHz |

[13] Resolution is nonlinearly dependent on clock frequency. You can query resolution using NI-HSDIO.



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**Figure 4.** Characteristic Data Delay Accuracy




| | |
|---|---|
| Exported Sample clock offset ($t_{CO}$) | 0.0 ns or 1.65 ns (default),[14] nominal |
| Time delay from On Board Sample clock to DDC connector ($t_{SCDDC}$) | 8.1 ns, characteristic; exported Sample clock offset = 0 ns |

# Generation Provided Setup and Hold Times

Compare the setup and hold times from the datasheet of your device under test (DUT) to the values in the table. The provided setup and hold times must be greater than the setup and hold times required for the DUT. If you require more setup time, configure your exported Sample clock mode to Inverted and/or delay your clock or data relative to the Sample clock. This table includes worst-case effects of channel-to-channel skew and intersymbol interference.

| Exported Sample Clock Offset ($t_{PCO}$) | Minimum Provided Setup Time ($t_{PSU}$) | Minimum Provided Hold Time ($t_{PH}$) |
|---|---|---|
| 1.65 ns | $t_p$ - 2.15 ns | 1.15 ns |
| 0.0 ns | $t_p$ - 500 ps | -500 ps |

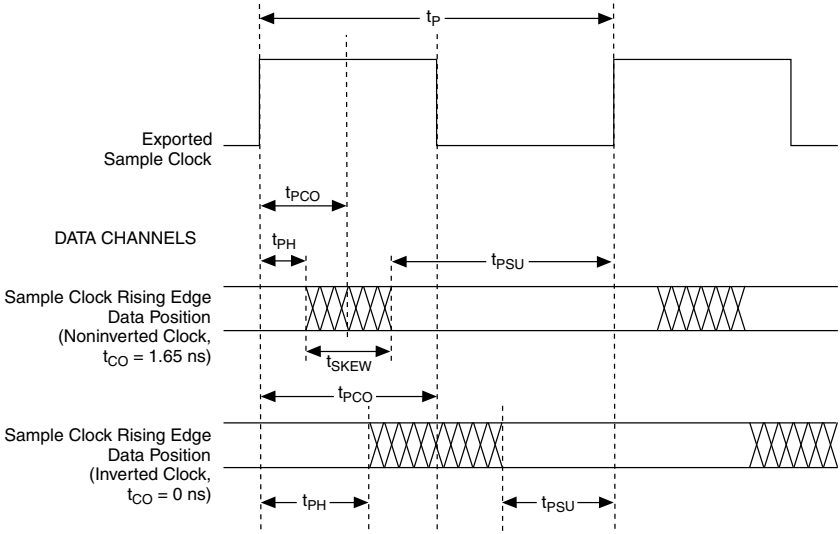
**Note** This table assumes the data position is set to Sample clock rising edge and the noninverted Sample Clock is exported to the DDC connector.

[14] Software-selectable for DDC CLK OUT.



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**Figure 5.** Generation Provided Setup and Hold Times Timing Diagram




$t_P = \frac{1}{f}$ = Sample Clock Period

$t_{PH}$ = Minimum Provided Hold Time

$t_{PSU}$ = Minimum Provided Set-Up Time

$t_{PCO}$ =Time from Rising Clock Edge to Data Transition (Provided Clock to Out Time)

$t_{CO}$ = Exported Sample Clock Offset

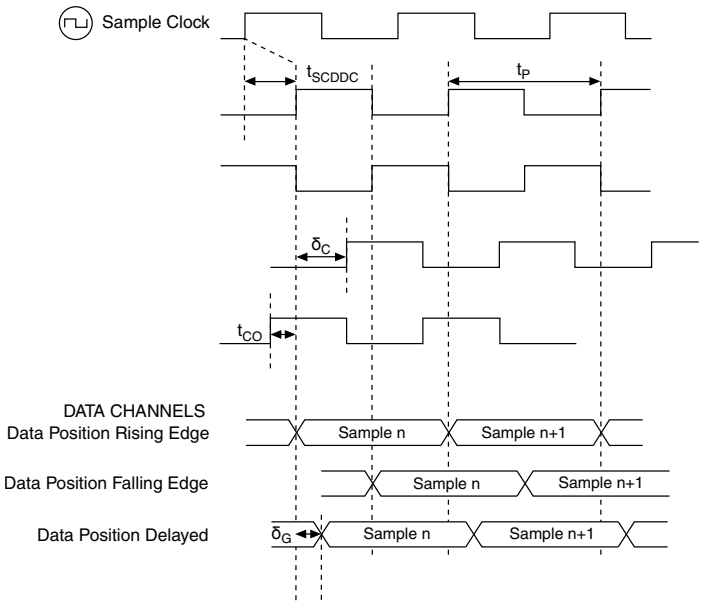
$t_{SKEW}$ = Maximum Channel-to-Channel Skew and Clock Uncertainty

**Note** Provided setup and hold times account for maximum channel-to-channel skew and jitter.



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**Figure 6.** Generation Timing Diagram




$t_{SCDDC}$ : Time Delay from Sample Clock (Internal) to DDC Connector

$0 \le \delta_C \le 1$ : Exported Sample Clock Delay (Fraction of $t_P$)

$0 \le \delta_G \le 1$ : Pattern Generation Data Delay (Fraction of $t_P$)

$t_P = \frac{1}{f}$ = Period of Sample Clock

$t_{CO}$ = Exported Sample Clock Offset; 1.65 ns, Software-Selectable

# Acquisition Timing

| | |
|---|---|
| Channels | Data<br>STROBE<br>PFI <0..3> |
| Channel-to-channel skew[15] | ±350 ps, maximum |
| Maximum data rate per channel[16] | |
| SDR | 100 Mbps |
| Data position modes | Sample clock rising edge<br>Sample clock falling edge<br>Delay from Sample clock rising edge |

[15] Across all data channels, PFI channels, and voltage levels.
[16] Includes maximum data channel-to-channel skew and typical crosstalk.



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**Table 4.** Setup and Hold Times to STROBE, Characteristic[17]

| Voltage Threshold | Setup Time ($t_{sus}$) | | Hold Time ($t_{hs}$) | |
|---|---|---|---|---|
| | $f$ <20 MHz | $f$ ≥20 MHz | $f$ <20 MHz | $f$ ≥20 MHz |
| 1.25 V to 1.65 V | 2.8 ns | 1.15 ns | 2.4 ns | 900 ps |
| 0.90 V to 1.20 V | | 1.20 ns | | 1.00 ns |
| 0.75 V to 0.85 V | | 1.40 ns | | 1.10 ns |
| 0.60 V to 0.70 V | | 1.75 ns | | 1.25 ns |

| | |
|---|---|
| Setup and hold times to Sample clock[18] | |
| Setup time ($t_{susc}$) | 900 ps, nominal |
| Hold time ($t_{HSC}$) | 425 ps, nominal |
| Data delay banks | 1 bank for all channels and PFI lines |
| Time delay from DDC connector to internal Sample clock | 6.8 ns, nominal |
| Acquisition data delay | |
| Frequency | |
| On Board clock | All supported frequencies |
| External clock and STROBE | Frequencies ≥20 MHz |
| Range | 0.0 to 1.0 Sample clock periods |
| Resolution[19] | 117 ps to 143 ps, nominal |

[17] Includes maximum data channel-to-channel skew and uncertainty, but does not include system crosstalk. Performance may vary with system crosstalk performance.

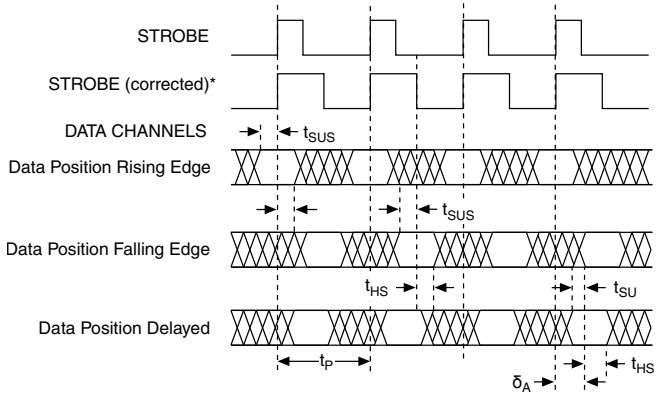
[18] Does not include channel-to-channel skew, $t_{DDCSC}$, or $t_{SCDDC}$

[19] Resolution is nonlinearly dependent on clock frequency. You can query resolution using NI-HSDIO.



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**Figure 7.** Acquisition Timing Diagram Using STROBE as the Sample Clock




$t_{SUS}$ = Set-Up Time to STROBE

$t_{HS}$ = Hold Time from STROBE

$0 \le \delta_A \le 1$ : Acquisition Data Delay (fraction of $t_P$)

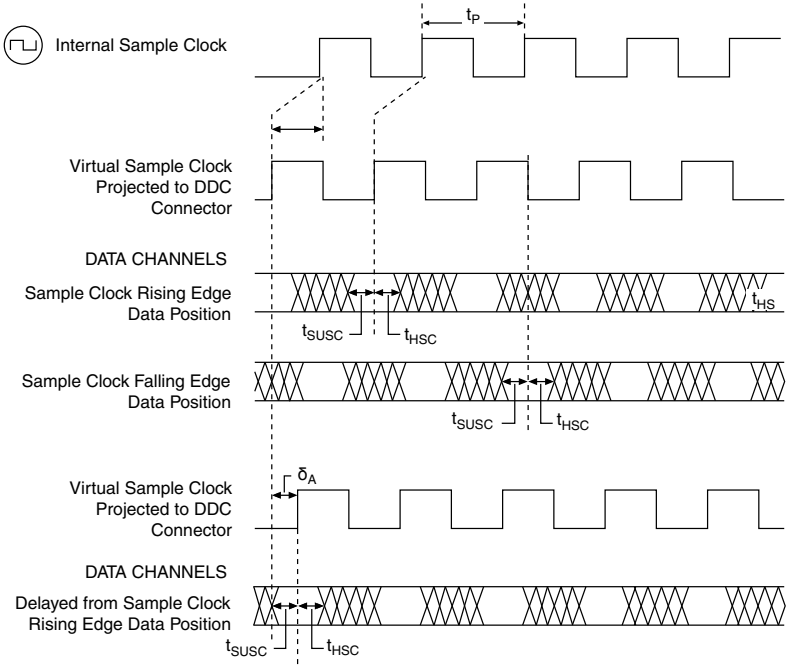
$t_P = \frac{1}{f}$ = Sample Clock Period

*Note: When using an external Sample clock greater than 20 MHz, the duty cycle is corrected to 50%.



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**Figure 8.** Acquisition Timing Diagram with Sample Clock Sources Other than STROBE




$t_{DDCSC}$ : Time Delay from DDC Connector to Internal Sample Clock

$0 \le \delta_A \le 1$ : Acquisition Data Delay (fraction of $t_P$)

$t_P = \frac{1}{f}$ = Period of Sample Clock

$t_{SUSC}$ = Set-Up Time to Sample Clock

$t_{HSC}$ = Hold Time to Sample Clock

**Related Information**

*STROBE* on page 17

# CLK IN

| | |
|---|---|
| Connector | SMA jack |
| Direction | Input |
| Destinations | 1. Reference clock (PLL)<br>2. Sample clock |
| Input coupling | AC |
| Input protection | ±10 VDC, nominal |



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| | |
|---|---|
| Input impedance | Software-selectable: 50 Ω (default) or 1 kΩ, nominal |
| Minimum detectable pulse width | 2 ns, nominal |
| Clock requirements | Free-running (continuous) clock |

### Waveform Voltage Ranges

| | |
|---|---|
| Square wave voltage range | 0.65 $V_{pk-pk}$ to 5.0 $V_{pk-pk}$ |

**Table 5.** Sine Wave Voltage Ranges

| Voltage Range ($V_{pk-pk}$) | Frequency Range |
|---|---|
| 0.65 to 5.0 | 20 MHz to 200 MHz |
| 1.0 to 5.0 | 13 MHz to 200 MHz |
| 1.3 to 5.0 | 10 MHz to 200 MHz |
| 2.6 to 5.0 | 5 MHz to 200 MHz |

### CLK IN Implementations

| | |
|---|---|
| As Sample clock[20] | |
| Frequency range | 20 kHz to 200 MHz |
| Duty cycle range | |
| $f$ <20 MHz | 25% to 75% |
| $f$ ≥20 MHz | 40% to 60% |
| As Reference clock | |
| Frequency range | 5 MHz to 100 MHz (integer multiples of 1 MHz) |
| Frequency accuracy[21] | ±0.1% |
| Duty cycle range | 25% to 75% |

**Related Information**

*Channels* on page 2
*Sample Clock* on page 6

[20] Nominal 3 dB cutoff point at 100 MHz when using 1 kΩ input impedance.
[21] Required accuracy of the external Reference clock source.



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# STROBE

| | |
|---|---|
| Connector | DDC |
| Direction | Input |
| Destination | Sample clock (acquisition only) |
| Frequency range | 100 Hz to 200 MHz |
| Duty cycle range (at the programmed threshold) | |
| *f* <20 MHz | 25% to 75% |
| *f* ≥20 MHz | 40% to 60% (corrected to 50%) |
| Minimum detectable pulse width[22] | 2 ns, nominal |
| Clock requirements | Free-running (continuous) clock |
| Input impedance | 50 kΩ, nominal |

**Related Information**

*Sample Clock* on page 6
*Acquisition Timing* on page 12

# CLK OUT

| | |
|---|---|
| Connector | SMA jack |
| Direction | Output |
| Sources | 1. Sample clock (excluding STROBE)<br>2. Reference clock (PLL) |
| Output impedance | 50 Ω, nominal |
| Logic type | Matched with generation and acquisition sessions |

**Related Information**

*Channels* on page 2
*Generation Channels* on page 3

[22] Required at acquisition voltage thresholds.



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## DDC CLK OUT

| | |
|---|---|
| Connector | DDC |
| Direction | Output |
| Source | Sample clock (generation only) |

**Note** STROBE and acquisition Sample clock cannot be routed to DDC CLK OUT.

**Related Information**

*Generation Channels* on page 3

## Reference Clock (PLL)

| | |
|---|---|
| Sources[23] | 1. PXI_CLK100 (PXI Express backplane)<br>2. CLK IN (SMA jack connector)<br>3. None (internal oscillator locked to an internal reference) |
| Destination | CLK OUT (SMA jack connector) |
| Lock time | 150 ms, maximum (not including software latency) |
| Frequency range | 5 MHz to 100 MHz (integer multiples of 1 MHz), 0.1% required accuracy |
| Duty cycle range | 25% to 75% |

# Waveform

## Memory and Scripting

| | |
|---|---|
| Memory architecture | This device uses the Synchronization and Memory Core (SMC) technology in which waveforms and instructions share onboard memory. Parameters such as number of script instructions, maximum number of waveforms in memory, and number of samples (S) available for waveform storage are flexible and user defined. |

[23] Provides the frequency for the PLL.



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| | |
|---|---|
| Onboard memory size[24] | |
| 1 Mbit per channel | |
| Acquisition | 1 Mbit per channel (4 MBytes total) |
| Generation | 1 Mbit per channel (4 MBytes total) |
| 8 Mbit per channel | |
| Acquisition | 8 Mbit per channel (32 MBytes total) |
| Generation | 8 Mbit per channel (32 MBytes total) |
| 64 Mbit per channel | |
| Acquisition | 64 Mbit per channel (256 MBytes total) |
| Generation | 64 Mbit per channel (256 MBytes total) |
| Generation | |
| Single-waveform mode | Generates a single waveform once, *n* times, or continuously |
| Scripted mode[25] | Generates a simple or complex sequence of waveforms. |
| Finite repeat count | 1 to 16,777,216 |
| Waveform quantum[26] | |
| Data width = 4 | 1 sample |
| Data width = 2 | 2 samples |
| Waveform block size (in physical memory) | |
| Data width = 4 | 32 samples |
| Data width = 2 | 64 samples |

**Table 6.** Generation Minimum Waveform Size[27]

| Configuration | Sample Rate | |
|---|---|---|
| | 200 MHz | 100 MHz |
| Single waveform | 1 S | 1 S |
| Continuous waveform | 128 S | 64 S |

[24] Maximum limit for generation sessions assumes no scripting instructions.
[25] Use scripts to describe the waveforms to be generated, the order in which the waveforms are generated, how many times the waveforms are generated, and how the device responds to Script Triggers.
[26] DDR mode sets data width to 2.
[27] Sample rate dependent. Increasing sample rate increases minimum waveform size requirement.



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**Table 6.** Generation Minimum Waveform Size[27] (Continued)

| Configuration | Sample Rate | |
|---|---|---|
| | 200 MHz | 100 MHz |
| Stepped sequence | 128 S | 64 S |
| Burst sequence | 1056 S | 512 S |

Acquisition

| | |
|---|---|
| Minimum waveform size[28] | 1 S |
| Record quantum | 1 S |
| Total number of records[29] | 2,147,483,647 |
| Total pre-Reference trigger samples | 0 up to full record |
| Total post-Reference trigger samples | 0 up to full record |

# Triggers

| Types | Sessions | Edge Detection | Level Detection |
|---|---|---|---|
| 1. Start | Acquisition and generation | Rising or falling | — |
| 2. Pause | Acquisition and generation | — | High or low |
| 3. Script <0..3> | Acquisition | Rising or falling | High or low |
| 4. Reference | Acquisition | Rising or falling | — |

[27] Sample rate dependent. Increasing sample rate increases minimum waveform size requirement.
[28] Regardless of waveform size, NI-HSDIO allocates at least 640 bytes for a record.
[29] The session should fetch quickly enough that unfetched data is not overwritten.



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| Types | Sessions | Edge Detection | Level Detection |
|---|---|---|---|
| 5. Advance | Acquisition | Rising or falling | — |
| 6. Stop | Generation | Rising or falling | — |

| | |
|---|---|
| Sources | 1. PFI 0 (SMA jack connector)<br>2. PFI <1..3> (DDC connector)<br>3. PXI_TRIG <0..7> (PXI Express backplane)<br>4. Pattern match (acquisition sessions only)<br>5. Software (user function call)<br>6. Disabled (do not wait for a trigger) |
| Destinations, excluding Pause trigger[30] | 1. PFI 0 (SMA jack connector)<br>2. PFI <1..3> (DDC connector)<br>3. PXI_TRIG <0..6> (PXI Express backplane) |
| Minimum required trigger pulse width | 15 ns |
| Trigger rearm time | |
| Start to Reference trigger | 150 S, maximum |
| Start to Advance trigger | 220 S, maximum |
| Advance to Advance trigger | 220 S, maximum |
| Reference to Reference trigger | 220 S, maximum |
| Delay from Pause trigger to Pause state and Stop trigger to Done state[31] | |
| Generation sessions | 50 Sample clock periods + 300 ns, maximum |
| Acquisition sessions | Synchronous with the data |
| Delay from Start trigger and Script trigger to digital data output | 3 Sample clock periods + 600 ns, maximum |

**Related Information**

*Channels* on page 2

[30] Each trigger can be routed to any destination except the Pause trigger. The Pause trigger cannot be exported.

[31] Use the Data Active event during generation to determine on a sample-by-sample basis when the device enters the Pause or Done states.



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## Events

| Types | Sessions |
|---|---|
| 1. Marker <0..2> | Generation |
| 2. Data Active | Generation |
| 3. Ready for Start | Acquisition and generation |
| 4. Ready for Advance | Acquisition |
| 5. End of Record | Acquisition |

| | |
|---|---|
| Destinations (excluding Data Active event)[32] | 1. PFI 0 (SMA jack connectors)<br>2. PFI <1..3> (DDC connector)<br>3. PXI_TRIG <0..6> (PXI Express backplane) |
| Marker time resolution (placement) | |
| SDR | Can be placed at any sample |
| DDR | Must be placed at an integer multiple of two samples |

**Related Information**

*Channels* on page 2

# Software

## Driver Software

Driver support for this device was first available in NI-HSDIO 1.6.

NI-HSDIO is an IVI-compliant driver that allows you to configure, control, and calibrate the PXIe-6545. NI-HSDIO provides application programming interfaces for many development environments.

## Application Software

NI-HSDIO provides programming interfaces, documentation, and examples for the following application development environments:

- LabVIEW
- LabWindows™/CVI™
- Measurement Studio

[32] The Data Active event can only be routed to the PFI channels.



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- Microsoft Visual C/C++
- .NET (C# and VB.NET)

## NI Measurement Automation Explorer

NI Measurement Automation Explorer (MAX) provides interactive configuration and test tools for the PXIe-6545. MAX is included on the NI-HSDIO media.

# Power

**Note** Characteristic results are commensurate with an average user application using all data channels into high impedance load. Maximum results include worst-case data pattern.

| VDC | Current, Characteristic | Current, Maximum |
|---|---|---|
| +3.3 V | 1.75 A | 1.77 A |
| +12 V | 2.2 A | 2.3 A |

| | |
|---|---|
| Total power | 32.2 W, characteristic<br>33.5 W, maximum |
| Warm-up time | 15 minutes |

# Physical

| | |
|---|---|
| Dimensions | Single 3U, CompactPCI Express slot, PXI Express compatible<br>21.6 cm × 2.0 cm × 13.0 cm |
| Weight | 519 g (18.3 oz) |



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## I/O Panel Connectors

| Label | Connector Type | Description |
|---|---|---|
| CLK IN | SMA jack | External Sample clock, external Reference clock |
| PFI 0 | | Events, triggers |
| CLK OUT | | External Sample clock, exported Reference clock |
| DIGITAL DATA & CONTROL | 68-pin VHDCI | Digital data channels, exported Sample clock, STROBE, events, triggers |

# Environment

**Note** To ensure that the PXIe-6545 cools effectively, follow the guidelines in the *Maintain Forced Air Cooling Note to Users* included with the PXIe-6545 or available at *ni.com/manuals*. The PXIe-6545 is intended for indoor use only.

| | |
|---|---|
| Operating temperature | 0 °C to 55 °C in all NI PXI Express chassis and hybrid NI PXI Express chassis |
| Operating relative humidity | 10 to 90% relative humidity, noncondensing (meets IEC 60068-2-56) |
| Storage temperature | -20 °C to 70 °C |
| Storage relative humidity | 5 to 95% relative humidity, noncondensing (meets IEC 60068-2-56) |
| Operating shock | 30 g, half-sine, 11 ms pulse (meets IEC 60068-2-27; test profile developed in accordance with MIL-PRF-28800F) |
| Operating vibration | 5 Hz to 500 Hz, 0.31 $g_{rms}$ (meets IEC 60068-2-64) |
| Storage shock | 50 g, half-sine, 11 ms pulse (meets IEC 60068-2-27; test profile developed in accordance with MIL-PRF-28800F) |
| Storage vibration | 5 Hz to 500 Hz, 2.46 $g_{rms}$ (meets IEC 60068-2-64; test profile exceeds requirements of MIL-PRF-28800F, Class B) |



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| | |
|---|---|
| Altitude | 0 to 2,000 m above sea level (at 25 °C ambient temperature) |
| Pollution degree | 2 |

# Compliance and Certifications

## Safety

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 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
- 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 *Online Product Certification* section.

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



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obtain a copy of this document online, visit *ni.com/manuals* and search for the document title.

**Caution** To ensure the specified EMC performance, operate this product only with shielded cables and accessories. Do not use unshielded cables or accessories unless they are installed in a shielded enclosure with properly designed and shielded input/output ports and connected to the product using a shielded cable. If unshielded cables or accessories are not properly installed and shielded, the EMC specifications for the product are no longer guaranteed.

**Note** SHC68-C68-D4 shielded cable and the provided snap-on ferrite beads, National Instruments part number 711627-01, must be used when operating the PXIe-6545.

**Caution** To ensure the specified EMC performance, the length of all I/O cables must be no longer than 3 m (10 ft).

**Caution** To ensure the specified EMC performance, you must install PXI EMC Filler Panels, National Instruments part number 778700-01, in all open chassis slots.

## 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)

## Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the 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 *Minimize Our Environmental Impact* 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 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*.



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