SPECIFICATIONS

# PXIe-4464

## 204.8 kS/s, 119 dB, 6 Gains, AC/DC-Coupled, 4-Input PXI Sound and Vibration Module

This document lists specifications for the PXIe-4464 Dynamic Signal Acquisition (DSA) analog input module. All specifications are subject to change without notice. Visit `ni.com/manuals` for the most current specifications and product documentation.

**Caution** BNC version only—Electromagnetic interference can adversely affect the measurement accuracy of this product. The construction of a BNC coaxial cable is inherently unbalanced in that the outer conductor (LO) is used as a shield for the inner conductor (HI). However, for functional reasons, there is no input configuration of the PXIe-4464 that directly connects the LO terminal to the chassis ground. Without a direct connection to chassis ground, the outer conductor does not act as a shield for unwanted noise and may act as an antenna for coupling noise into the module inputs. For single-ended measurements, the noise immunity for the system can be improved by directly connecting the outer conductor to the chassis or earth ground at the load end of the cable. For differential measurements, where such a connection is inherently not possible, the BNC cable can alternatively be wrapped in a separate grounded shield. In addition, you might need to use snap-on ferrite beads or other remedial measures to improve electromagnetic compatibility.

# Terminology

*Maximum* and *minimum* specifications characterize the warranted performance of the instrument within the recommended calibration interval and under the stated operating conditions. These specifications are subject to production verification or guaranteed by design.

*Typical* specifications are specifications met by the majority of the instruments within the recommended calibration interval and under the stated operating conditions, based on measurements taken during production verification and/or engineering development. The performance of the instrument is not warranted.

*Supplemental* specifications describe the basic function and attributes of the instrument established by design and are not subject to production verification. They provide information that is relevant for the adequate use of the instrument that is not included in the previous definitions.

All performance specifications are *typical* unless otherwise noted. These specifications are valid within the full operating temperature range. Accuracy specifications are valid within ±5 °C of the self-calibration or over the full operating range as specifically noted.

NATIONAL INSTRUMENTS™

# Input Characteristics

Number of simultaneously sampled input channels: 4

Input configuration: Differential or pseudodifferential (50 Ω between negative input and chassis ground), each channel independently software-selectable

Input coupling: AC or DC, each channel independently software-selectable

A/D converter (ADC) resolution: 24 bits

ADC type: Delta-sigma

Sample rates ($f_s$)

- Range: 100 S/s to 204.8 kS/s
- Resolution[1]: ≤181.9 µS/s

ADC modulator sample rate: 6.640625 MS/s

FIFO buffer size: 1,023 samples

Data transfers: Direct memory access (DMA), programmed I/O

## Signal Range

| Gain (dB) | Full-Scale Range*, Min | |
|---|---|---|
| | $V_{pk}$ | $V_{rms}$† |
| 30 | ± 0.316 | 0.224 |
| 20 | ±1.00 | 0.707 |
| 10 | ±3.16 | 2.24 |
| 0 | ±10.0 | 7.07 |
| -10 | ±31.6 | 22.4 |
| -20 | ±42.4 | 30.0 |

* Each input channel gain is independently software-selectable.
† Sine input.

[1] Depends on the sample rate. Refer to the *NI-DAQmx Help* for more information.

## Common-Mode Range

| Gain (dB) | Input | Configuration | |
|---|---|---|---|
| | | Differential ($V_{pk}$)* | Pseudodifferential ($V_{pk}$)* |
| 0, 10, 20, 30 | Positive input (+) | ±12 | ±12 |
| | Negative input (-) | ±12 | ±10 |
| -10, -20 | Positive input (+) | ±42.4 | ±42.4 |
| | Negative input (-) | ±42.4 | ±10 |

* Voltages with respect to chassis ground.

## Overvoltage Protection

| Input | Configuration | |
|---|---|---|
| | Differential ($V_{pk}$)* | Pseudodifferential ($V_{pk}$)* |
| Positive input (+) | ±42.4 | ±42.4 |
| Negative input (-) | ±42.4 | ±10 |

* Voltages with respect to chassis ground.

# Transfer Characteristics

## Offset (Residual DC)

| Gain (dB) | DC-Coupled Offset (±mV)*, †, Max, $T_{cal}$‡ ±5 °C | DC-Coupled Offset (±mV)*, Max, Over Full Operating Temperature Range | AC-Coupled Offset (±mV), Max, Over Full Operating Temperature Range |
|---|---|---|---|
| 30 | 0.1 | 0.5 | 3.4 |
| 20 | 0.15 | 0.7 | 3.4 |
| 10 | 0.3 | 1.6 | 3.7 |
| 0 | 0.9 | 5.0 | 6.0 |
| -10 | 3.0 | 16 | 16 |
| -20 | 9.0 | 50 | 50 |

* Source impedance ≤50 Ω.
† Listed accuracy is valid for 30 days following a self-calibration.
‡ $T_{cal}$ = ambient temperature at which the last self-calibration was performed.

## Gain Amplitude Accuracy

1 kHz input tone

$T_{cal}$ ±5 °C ................................................±0.03 dB max

(Listed accuracy is valid for 30 days following a self-calibration.)

($T_{cal}$ = ambient temperature at which the last self-calibration was performed.)

Over full operating temperature range......±0.15 dB max

# Amplifier Characteristics

## Input Impedance

| Input Impedance | Configuration | |
|---|---|---|
| | Differential | Pseudodifferential |
| Between positive input and chassis ground | 1 MΩ ‖ 265 pF | 1 MΩ ‖ 265 pF |
| Between negative input and chassis ground | 1 MΩ ‖ 265 pF | 50 Ω |

## Common-Mode Rejection Ratio (CMRR)

| Gain (dB) | DC-Coupled CMRR (dBc)*, † | AC-Coupled CMRR (dBc)†, ‡ |
|---|---|---|
| 30 | 105 | 90 |
| 20 | 100 | |
| 10 | 90 | |
| 0 | 80 | 80 |
| -10, -20 | 60 | 75 |

* $f_{in} \leq 1$ kHz.
† Differential configuration.
‡ $f_{in}$ = 50 Hz or 60 Hz.

# Dynamic Characteristics

## Bandwidth and Alias Rejection

Alias-free bandwidth (BW) (passband) ............DC to 0.454 $f_s$

Alias rejection ..................................................120 dBc min,
0.546 $f_s < f_{in} <$ 6.5272 MHz

## Filter Delay

Digital filter delay.......................................... Adjustable[1]

Analog filter delay

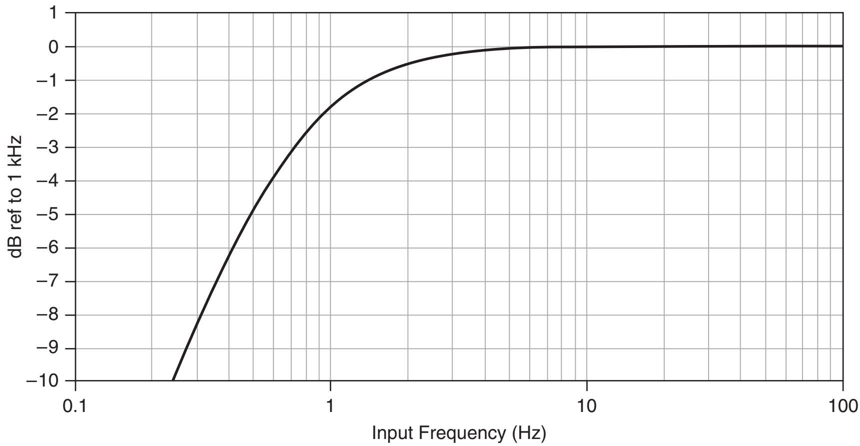
- 0 dB gain................................................ 300 ns
- 10 dB gain.............................................. 310 ns
- 20 dB gain.............................................. 375 ns
- 30 dB gain.............................................. 530 ns

## AC Coupling

-3 dB cutoff frequency.................................... 0.72 Hz

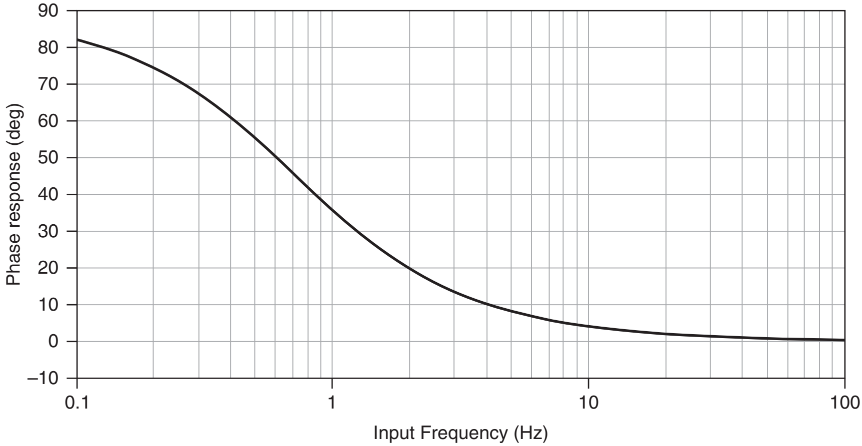
-0.1 dB cutoff frequency ................................ 4.7 Hz

**Figure 1.** Magnitude Response of AC Coupling Circuit (Typical)




[1] Digital filter delay is compensated to 0 ns by default and adjustable in software.

**Figure 2.** Phase Response of AC Coupling Circuit (Typical)




# Flatness

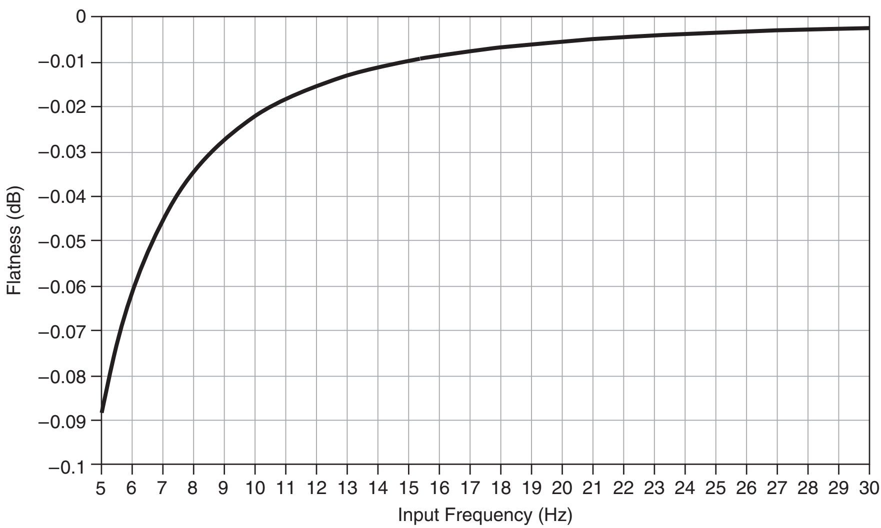
| Gain (dB) | $f_s$ = 51.2 kS/s | | |
|---|---|---|---|
| | DC-Coupled Flatness (dB)*, Max (Typical) | AC-Coupled Flatness (dB)*, Max (Typical) | |
| | $f_{in}$ = 20 Hz to 20 kHz | $f_{in} \leq 30$ Hz | $f_{in} > 30$ Hz to 20 kHz |
| 0, 10, 20, 30 | ±0.006 (±0.003) | Refer to Figure 3 | ±0.006 (±0.003) |
| -10, -20 | ±0.2 (±0.1) | Refer to Figure 3 | ±0.2 (±0.1) |

* Relative to 1 kHz.

| Gain (dB) | $f_s$ = 204.8 kS/s | | | | | | |
|---|---|---|---|---|---|---|---|
| | DC-Coupled Flatness (dB)*, Max (Typical) | | | AC-Coupled Flatness (dB)*, Max (Typical) | | | |
| | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 45 kHz | $f_{in}$ > 45 kHz to 92.2 kHz | $f_{in} \leq$ 30 Hz | $f_{in}$ > 30 Hz to 20 kHz | $f_{in}$ > 20 kHz to 45 kHz | $f_{in}$ > 45 kHz to 92.2 kHz |
| 0, 10, 20, 30 | ±0.006 (±0.003) | ±0.03 (±0.02) | ±0.1 (±0.08) | Refer to Figure 3 | ±0.006 (±0.003) | ±0.03 (±0.02) | ±0.1 (±0.08) |
| -10, -20 | ±0.2 (±0.1) | ±0.6 (±0.33) | ±1 (±0.55) | Refer to Figure 3 | ±0.2 (±0.1) | ±0.6 (±0.33) | ±1 (±0.55) |

* Relative to 1 kHz.

**Figure 3.** AC-Coupled Flatness (Typical)



## Interchannel Gain Mismatch

| Gain (dB) | AC/DC-Coupled Mismatch (dB)*, †, Max (Typical) | | | AC-Coupled Mismatch (dB)*, Max (Typical) | |
|---|---|---|---|---|---|
| | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 45 kHz | $f_{in}$ > 45 kHz to 92.2 kHz | $f_{in}$ = 5 Hz | $f_{in}$ = 10 Hz |
| 30 | 0.015 (0.004) | 0.016 (0.006) | 0.033 (0.015) | 0.018 (0.007) | 0.015 (0.004) |
| 20 | 0.014 (0.004) | 0.014 (0.004) | 0.016 (0.005) | | |
| 10 | 0.014 (0.004) | 0.014 (0.004) | 0.015 (0.005) | | |
| 0 | 0.014 (0.004) | 0.014 (0.004) | 0.015 (0.005) | | |
| -10, -20 | 0.1 (0.05) | 0.25 (0.125) | 0.4 (0.2) | | |

* Identical channel configurations.
† Operating temperature within 5 °C of the last self-calibration temperature.

## Interchannel Phase Mismatch

| Gain (dB) | AC/DC-Coupled Mismatch*, Max (Typical) | | | AC-Coupled Mismatch*, Max (Typical) | |
|---|---|---|---|---|---|
| | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 45 kHz | $f_{in}$ > 45 kHz to 92.2 kHz | $f_{in}$ = 5 Hz | $f_{in}$ = 10 Hz |
| 30 | 0.32° (0.16°) | 0.73° (0.37°) | 1.48° (0.74°) | 0.48° (0.24°) | 0.24° (0.12°) |
| 20 | 0.14° (0.07°) | 0.31° (0.15°) | 0.63° (0.31°) | | |
| 10 | 0.08° (0.04°) | 0.17° (0.09°) | 0.35° (0.18°) | | |
| 0 | 0.05° (0.02°) | 0.11° (0.05°) | 0.23° (0.11°) | | |
| -10, -20 | 1.2° (0.6°) | 1.4° (0.7°) | 2° (1°) | | |

* Identical channel configurations.

**Note** Listed gain and phase mismatch specifications are valid for measurements made on channels on the same module. For measurements made on channels on different modules, the listed gain and phase mismatch specifications still apply, but are subject to the following conditions:

- For gain matching, all modules must be properly warmed up and then self-calibrated.
  Refer to the *Environmental* section for the specified warm-up time.
- For phase matching, all modules must be synchronized to a common timebase. To the listed specifications, add the following error: 360° × $f_{in}$ × *clock skew*.
  Refer to the *General Specifications* section for the maximum intermodule clock skew.

## Phase Linearity

| Gain (dB) | Phase Linearity | |
|---|---|---|
| | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 92.2 kHz |
| 0, 10, 20, 30 | ±0.01° | ±0.03° |
| -10, -20 | ±0.1° | ±1° |

## Idle Channel Noise

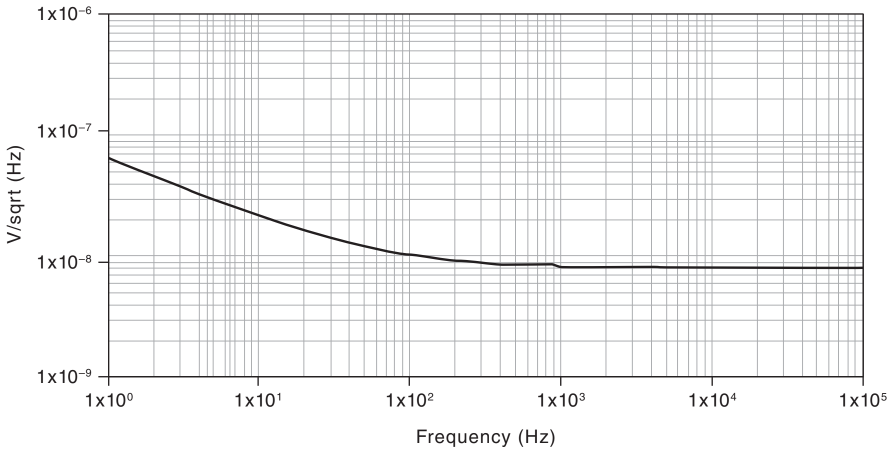
| Gain (dB) | Idle Channel Noise (μ$V_{rms}$)*, Max (Typical) | | | |
|---|---|---|---|---|
| | $f_s$ = 51.2 kS/s | | $f_s$ = 204.8 kS/s | |
| | Audio BW† | Full BW‡ | Audio BW† | Full BW** |
| 30 | 1.3 (1.1) | 1.4 (1.2) | 1.3 (1.1) | 2.8 (2.5) |
| 20 | 1.8 (1.4) | 2.0 (1.6) | 1.8 (1.4) | 4.3 (3.2) |
| 10 | 4.3 (2.9) | 4.7 (3.1) | 4.3 (2.9) | 10.8 (6.8) |
| 0 | 12.9 (8.3) | 14.0 (9.0) | 12.9 (8.3) | 32.9 (19.9) |
| -10 | 108 (84) | 117 (91) | 108 (84) | 243 (184) |
| -20 | 182 (115) | 197 (124) | 182 (115) | 445 (262) |

* Source impedance ≤50 Ω.
† 20 Hz to 20 kHz.
‡ 0.1 Hz to 23.2 kHz.
** 0.1 Hz to 92.8 kHz.

## Spectral Noise Density

Spectral noise density ....................................... $8\ nV/\sqrt{Hz}$ at 30 dB gain, 1 kHz

**Figure 4.** Spectral Noise Density (30 dB Gain)




## Dynamic Range

| Gain (dB) | Dynamic Range (dBFS)*, †, Min (Typical) | | | |
|---|---|---|---|---|
| | $f_s$ = 51.2 kS/s | | $f_s$ = 204.8 kS/s | |
| | Audio BW‡ | Full BW** | Audio BW‡ | Full BW†† |
| 30 | 105 (106) | 104 (105) | 105 (106) | 98 (99) |
| 20 | 112 (114) | 111 (113) | 112 (114) | 104 (107) |
| 10 | 114 (118) | 114 (117) | 114 (118) | 106 (110) |
| 0 | 115 (119) | 114 (118) | 115 (119) | 107 (111) |
| -10 | 106 (109) | 106 (108) | 106 (109) | 99 (102) |
| -20 | 104 (108) | 104 (108) | 104 (108) | 97 (101) |

* 1 kHz input tone, -60 dBFS input amplitude.
† Source impedance ≤50 Ω.
‡ 20 Hz to 20 kHz.
** 0.1 Hz to 23.2 kHz.
†† 0.1 Hz to 92.8 kHz.

## Representative Measurement FFTs (1 kHz)

Test conditions for all FFTs: Unaveraged computation of 65,536 samples, differential input configuration.

**Figure 5.** FFT of -1 dBFS, 1 kHz Tone Acquired at 51.2 kS/s, 0 dB Gain

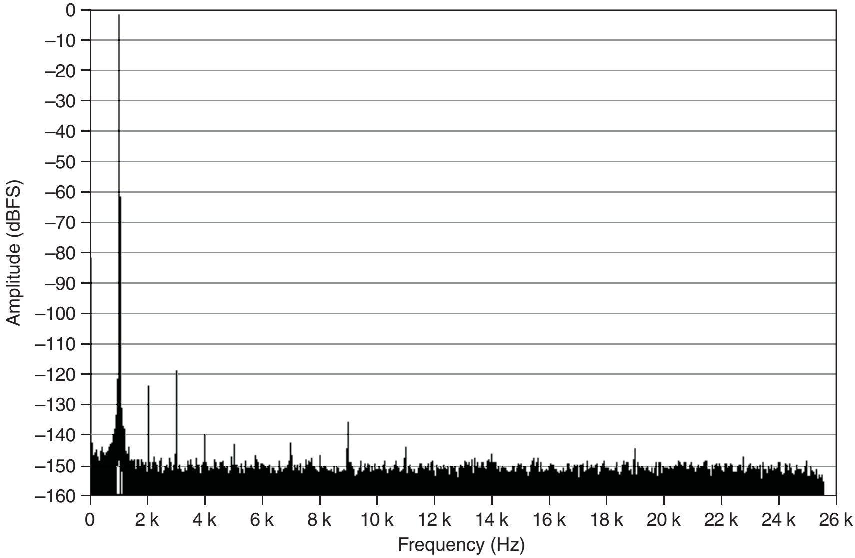



**Figure 6.** FFT of -1 dBFS, 1 kHz Tone Acquired at 51.2 kS/s, 10 dB Gain

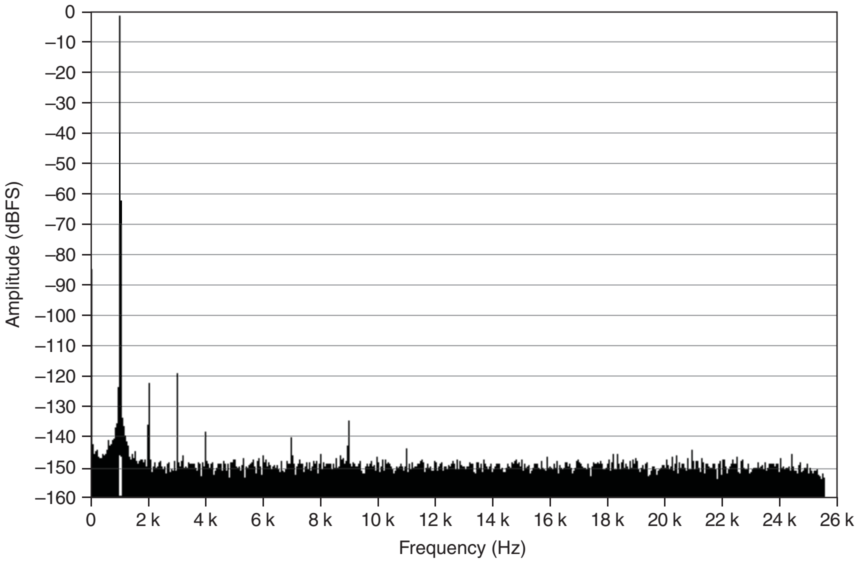


**Figure 7.** FFT of -1 dBFS, 1 kHz Tone Acquired at 51.2 kS/s, 20 dB Gain

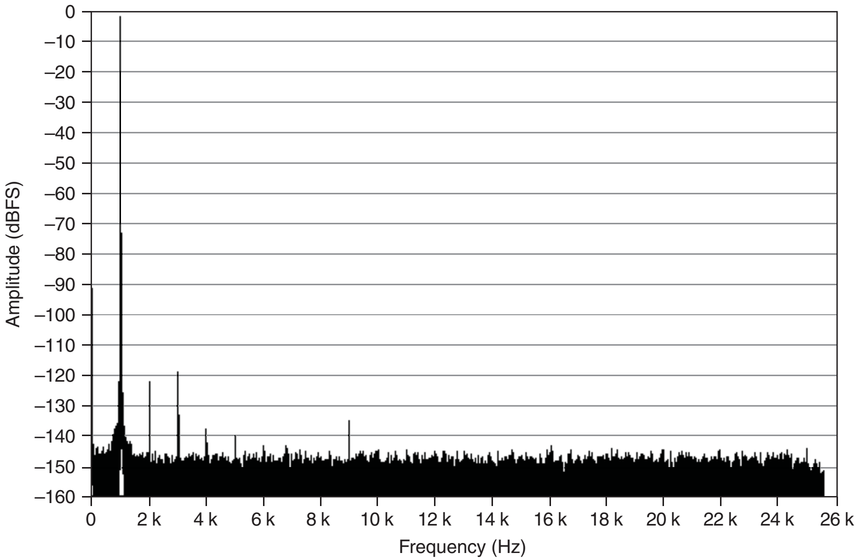
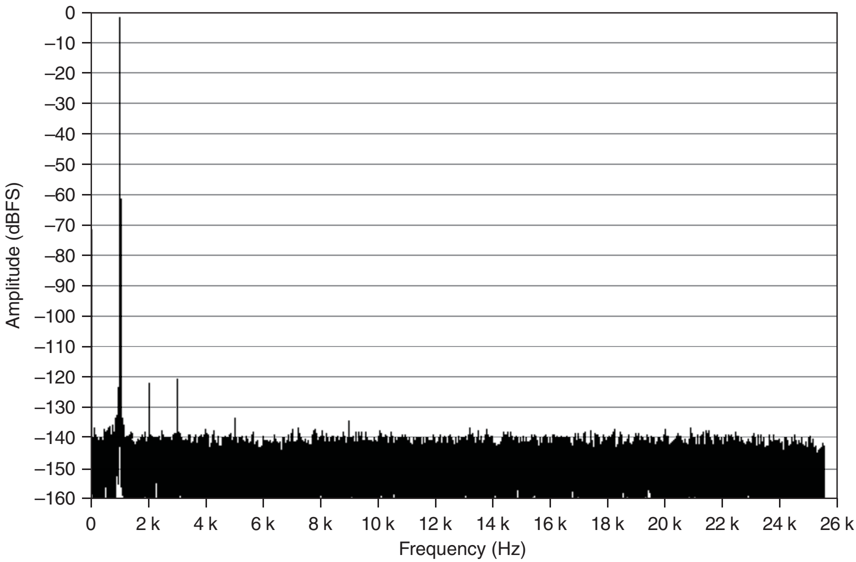



**Figure 8.** FFT of -1 dBFS, 1 kHz Tone Acquired at 51.2 kS/s, 30 dB Gain



## Representative Measurement FFTs (10 kHz)

Test conditions for all FFTs: Unaveraged computation of 262,144 samples, differential input configuration.

**Figure 9.** FFT of -1 dBFS, 10 kHz Tone Acquired at 204.8 kS/s, 0 dB Gain

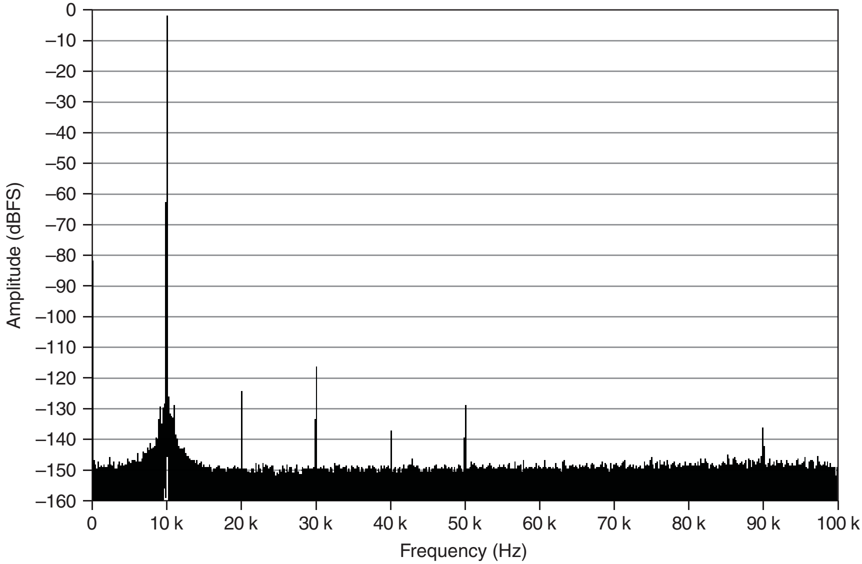



**Figure 10.** FFT of -1 dBFS, 10 kHz Tone Acquired at 204.8 kS/s, 10 dB Gain

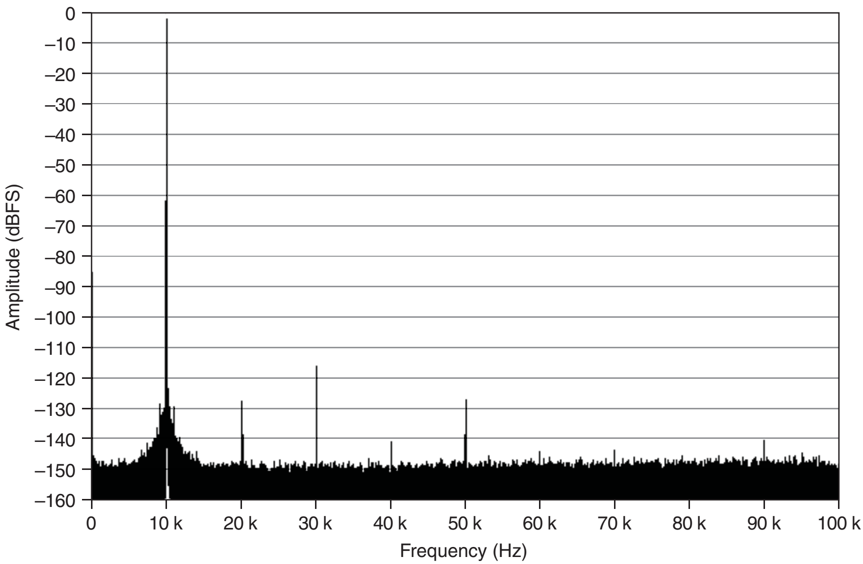


**Figure 11.** FFT of -1 dBFS, 10 kHz Tone Acquired at 204.8 kS/s, 20 dB Gain

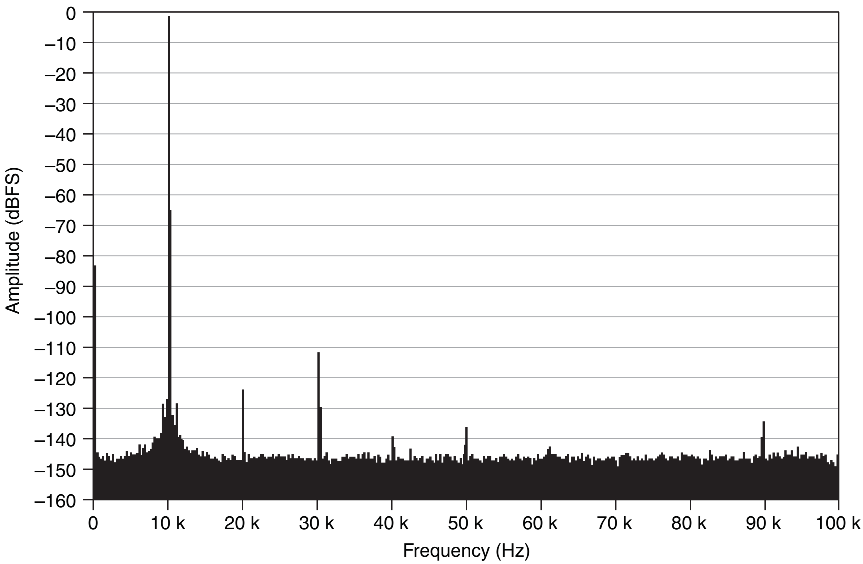
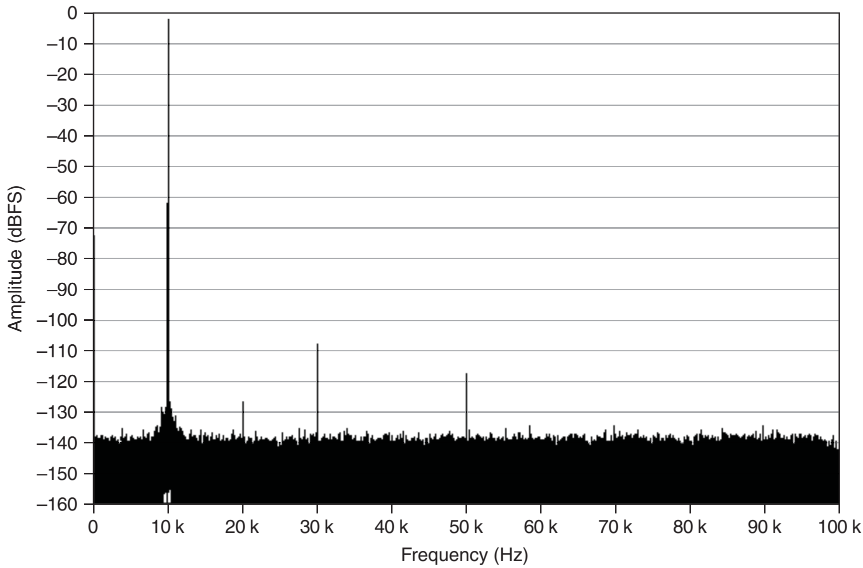



**Figure 12.** FFT of -1 dBFS, 10 kHz Tone Acquired at 204.8 kS/s, 30 dB Gain



## Spurious Free Dynamic Range (SFDR)

| Gain (dB) | SFDR (dBc)*, † | |
|---|---|---|
| | $f_s$ = 51.2 kS/s | $f_s$ = 204.8 kS/s |
| 30 | 106 | 106 |
| 20 | 108 | 108 |
| 10 | 108 | 108 |
| 0 | 108 | 108 |
| -10 | 110 | 110 |
| -20 | 110 | 110 |

* 1 kHz input tone, input amplitude is the lesser of -1 dBFS or 8.91 $V_{pk}$.
† Differential configuration.

## Total Harmonic Distortion (THD), Balanced Source

| Gain (dB) | THD (dBc)*, † | | | | |
|---|---|---|---|---|---|
| | $f_s$ = 51.2 kS/s | | $f_s$ = 204.8 kS/s | | |
| | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 92.2 kHz |
| 30 | -104 | -100 | -104 | -100 | -97 |
| 20 | -109 | -102 | -109 | -102 | -102 |
| 10 | -107 | -102 | -107 | -102 | -102 |
| 0 | -107 | -102 | -107 | -102 | -102 |
| -10 | -108 | -102 | -108 | -102 | -102 |
| -20 | -108 | -102 | -108 | -102 | -102 |

* Input amplitude is the lesser of -1 dBFS or 8.91 $V_{pk}$.
† Differential configuration.

## Total Harmonic Distortion (THD), Unbalanced Source

| Gain (dB) | THD (dBc)*, † | | | | |
|---|---|---|---|---|---|
| | $f_s$ = 51.2 kS/s | | $f_s$ = 204.8 kS/s | | |
| | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 92.2 kHz |
| 30 | -104 | -100 | -104 | -100 | -93 |
| 20 | -106 | -102 | -106 | -102 | -94 |
| 10 | -105 | -102 | -105 | -102 | -94 |
| 0 | -102 | -99 | -102 | -96 | -87 |
| -10 | -105 | -97 | -105 | -93 | -91 |
| -20 | -105 | -97 | -105 | -93 | -91 |

* Input amplitude is the lesser of -1 dBFS or 8.91 $V_{pk}$.
† Pseudodifferential configuration.

**Figure 13.** THD (0 dB Gain, Balanced Source, Differential Configuration, 204.8 kS/s)

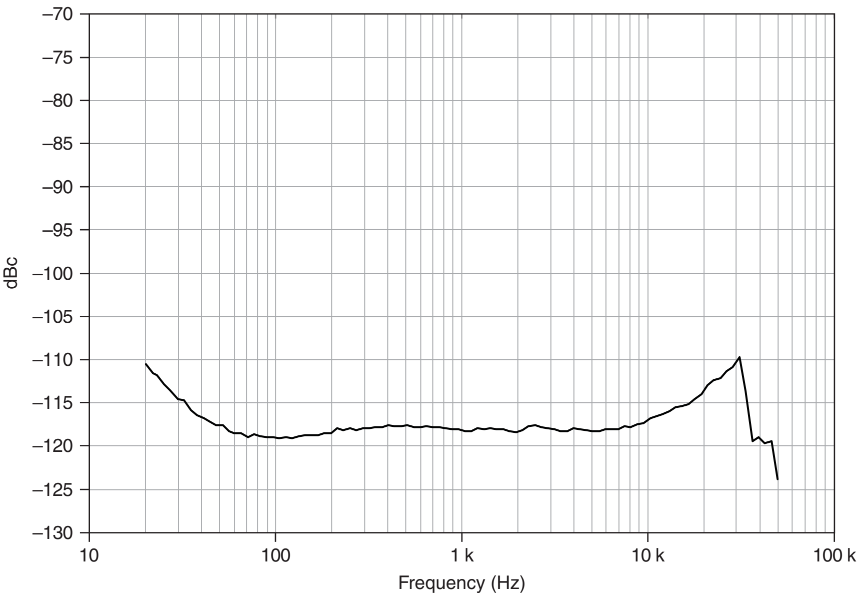


**Figure 14.** THD (10 dB Gain, Balanced Source, Differential Configuration, 204.8 kS/s)

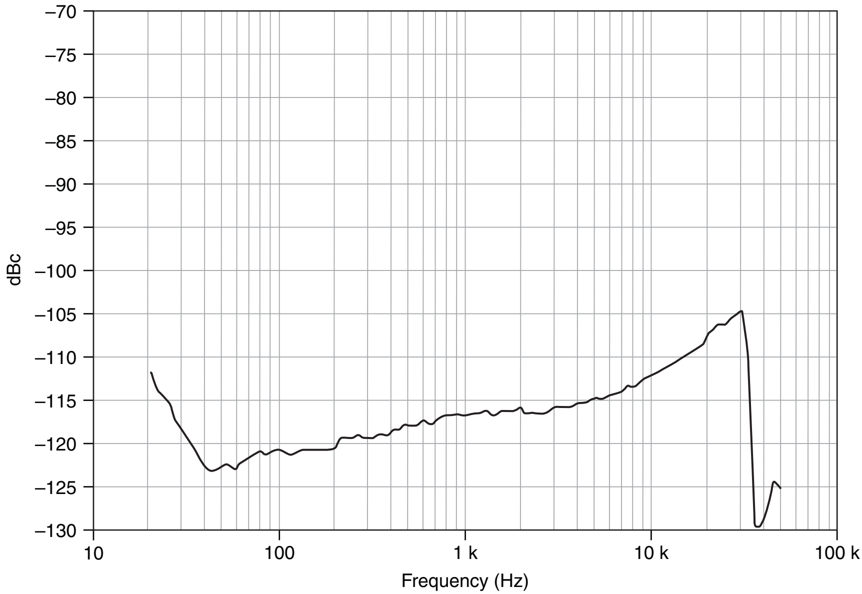



**Figure 15.** THD (20 dB Gain, Balanced Source, Differential Configuration, 204.8 kS/s)

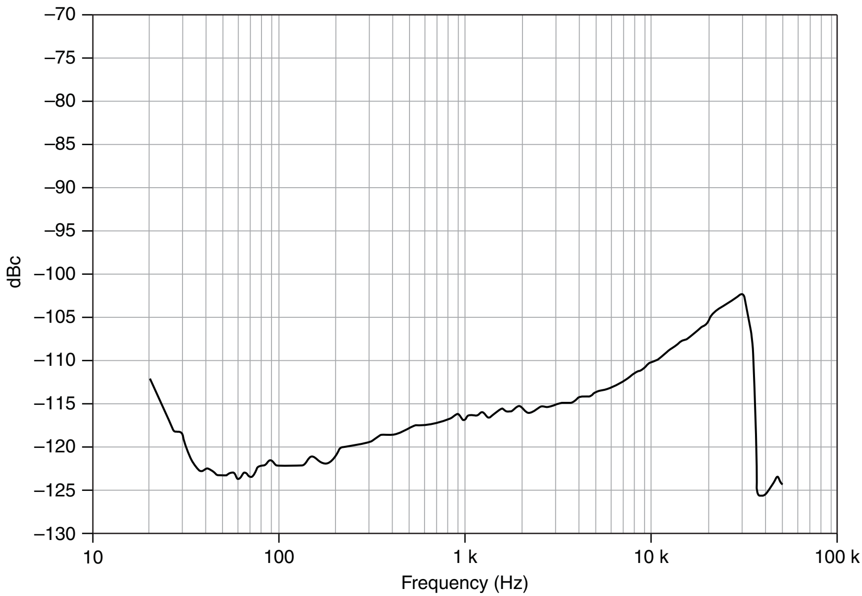
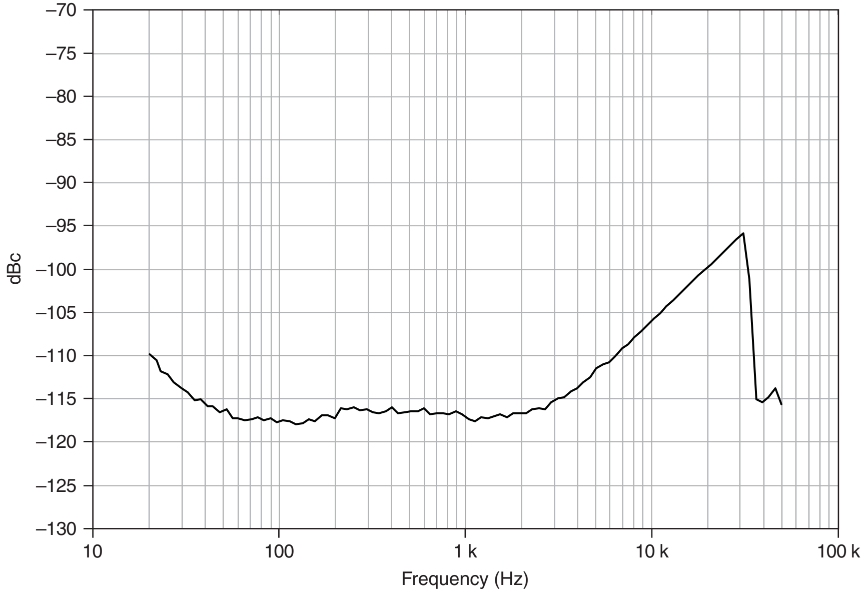


**Figure 16.** THD (30 dB Gain, Balanced Source, Differential Configuration, 204.8 kS/s)




## Total Harmonic Distortion Plus Noise (THD+N), Balanced Source

| Gain (dB) | THD+N (dBc)* | | | | |
|---|---|---|---|---|---|
| | $f_s$ = 51.2 kS/s† | | $f_s$ = 204.8 kS/s‡ | | |
| | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 92.2 kHz |
| 30 | -100 | -97 | -96 | -94 | -93 |
| 20 | -107 | -102 | -100 | -100 | -98 |
| 10 | -107 | -102 | -102 | -100 | -98 |
| 0 | -107 | -102 | -103 | -100 | -98 |
| -10 | -97 | -97 | -93 | -93 | -93 |
| -20 | -94 | -94 | -89 | -89 | -89 |

* Input amplitude is the lesser of -1 dBFS or 8.91 $V_{pk}$, differential configuration.
† Measurement BW = 0.1 Hz to 23.2 kHz.
‡ Measurement BW = 0.1 Hz to 92.8 kHz.

## Total Harmonic Distortion Plus Noise (THD+N), Unbalanced Source

| Gain (dB) | THD+N (dBc)* | | | | |
|---|---|---|---|---|---|
| | $f_s$ = 51.2 kS/s† | | $f_s$ = 204.8 kS/s‡ | | |
| | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ = 1 kHz | $f_{in}$ = 20 Hz to 20 kHz | $f_{in}$ > 20 kHz to 92.2 kHz |
| 30 | -100 | -97 | -83 | -83 | -83 |
| 20 | -106 | -102 | -91 | -90 | -89 |
| 10 | -105 | -102 | -98 | -97 | -91 |
| 0 | -102 | -99 | -101 | -95 | -86 |
| -10 | -97 | -97 | -93 | -91 | -90 |
| -20 | -94 | -94 | -89 | -88 | -87 |

* Input amplitude is the lesser of -1 dBFS or 8.91 $V_{pk}$, pseudodifferential configuration.
† Measurement BW = 0.1 Hz to 23.2 kHz.
‡ Measurement BW = 0.1 Hz to 92.8 kHz.

## Intermodulation Distortion (IMD)

| Gain (dB) | IMD (dBc)* |
|---|---|
| 30 | -109 |
| 20 | -109 |
| 10 | -107 |
| 0 | -104 |
| -10 | -111 |
| -20 | -111 |

* CCIF 14 kHz + 15 kHz, each tone amplitude is the lesser of -6 dBFS or 5 $V_{pk}$.

## Crosstalk, Input Channel Separation

| Gain (dB) | Crosstalk for Adjacent (Nonadjacent) Channels (dBc)*, † | |
|---|---|---|
| | $f_{in}$ = 1 kHz | $f_{in}$ = 92.2 kHz |
| 30 | -145 (-145) | -110 (-130) |
| 20 | -145 (-145) | -110 (-130) |
| 10 | -145 (-145) | -110 (-130) |
| 0 | -145 (-145) | -110 (-130) |
| -10 | -95 (-125) | -60 (-100) |
| -20 | -95 (-125) | -60 (-100) |

* Input amplitude is the lesser of -1 dBFS or 8.91 $V_{pk}$.
† Source impedance ≤50 Ω.

# Onboard Calibration References

## Voltage

DC level ........................................................ 5.000 V

Temperature coefficient .................................. 9 ppm/°C max

Time stability .................................................. 50 ppm/ $\sqrt{1{,}000 \text{ hr}}$

## Frequency

Oscillator........................................................ 20 MHz TCXO

Temperature stability ....................................... 2.8 ppm max over full temperature range

Time stability .................................................. 1 ppm/year

# IEPE Excitation

Current settings

- OFF ........ 0 mA
- 4 mA ........ 4 mA min, 4.15 mA typ, 4.3 mA max
- 10 mA ........ 9.6 mA min, 10 mA typ, 10.4 mA max
- 20 mA ........ 19.3 mA min, 20 mA typ, 20.7 mA max

Each channel independently software-selectable.

Voltage compliance........ 25 V

**Note** Use the following equation to make sure that your configuration meets the IEPE voltage compliance range:

$$V_{common\text{-}mode} + V_{bias} \pm V_{full\text{-}scale} + (I_{IEPE} \times 50\ \Omega) \text{ must be 0 V to 25 V}$$

where

$V_{common\text{-}mode}$ is the common-mode voltage seen by the input channel,

$V_{bias}$ is the DC bias voltage of the sensor,

$V_{full\text{-}scale}$ is the AC full-scale voltage of the sensor, and

$I_{IEPE}$ is the selected excitation setting.

Sensor open detection[1] (software-readable)

- 4 mA ........ 26 V
- 10 mA ........ 25.5 V
- 20 mA ........ 25 V

Sensor short detection[2] (software-readable)

- 4 mA ........ 1.3 V
- 10 mA ........ 1 V
- 20 mA ........ 0.5 V

Channel input impedance
with IEPE enabled ........ 1 MΩ || 315 pF, pseudodifferential

---

[1] Voltage between positive input (+) and negative input (-).

[2] Voltage between positive input (+) and negative input (-).

# Transducer Electronic Data Sheet (TEDS) Support

Supports Transducer Electronic Data Sheet (TEDS) according to the IEEE 1451 Standard ........ Class I, all module inputs

**Note** For more information about TEDs, go to `ni.com/info` and enter the Info Code `rdteds`.

Maximum load capacitance ........ 10,000 pF

# Frequency Timebase Characteristics

Accuracy

- Using internal VCXO timebase
  - $T_{cal}$ ±5 °C ........ ±27 ppm max
    - ($T_{cal}$ = ambient temperature at which the last self-calibration was performed.)
    - (Listed accuracy is valid for 30 days following a self-calibration.)
  - Over full operating temperature range ........ ±100 ppm max
- Using external timebase ........ Equal to accuracy of external timebase

# Triggers

Analog trigger

- Purpose ........ Reference trigger only
- Source ........ Any channel
- Level ........ Full scale, programmable
- Mode ........ Rising-edge or falling-edge with hysteresis, entering or leaving window
- Resolution ........ 24 bits

Digital Trigger

- Purpose ........ Start or reference trigger
- Source ........ PFI0, PXI_Trig<0..7>, PXI_Star, PXIe_DStar<A..B>
- Polarity ........ Rising or falling edge, software-selectable
- Minimum pulse width ........ 100 ns for PXI_Trig<0..7>, 20 ns for others

## Output Timing Signals

Sources ........ Start Trigger Out, Reference Trigger Out, Sync Pulse Out

Destinations ........ PFI0, PXI_Trig<0..7>, PXIe_DStarC

Polarity ........ Software-selectable except for Sync Pulse Out (always active low)

## PFI0 (Front Panel Digital Trigger)

Input

- Logic compatibility ........ 3.3 V or 5 V
- Input range ........ 0 V to 5.5 V
- $V_{IL}$ ........ 0.95 V max
- $V_{IH}$ ........ 2.4 V min
- Input impedance ........ 10 kΩ
- Overvoltage protection ........ ±10 $V_{pk}$

Output

- Output range ........ 0 V to 3.45 V
- $V_{OL}$ ........ 0.33 V max @ 5 mA
- $V_{OH}$ ........ 2.8 V min @ 5 mA
- Output impedance ........ 42 Ω
- Output current ........ ±5 mA max

## General Specifications

This section lists general specification information for the PXIe-4464.

### Bus Interface

Form factor ........ x1 PXI Express peripheral module, Specification rev 1.0 compliant

Slot compatibility ........ x1 and x4 PXI Express or PXI Express hybrid slots

DMA channels ........ 2, analog input

## Timing and Synchronization

Number of timing engines ................................ 2[1]

Reference clock source ..................................... Onboard clock, backplane PXIe_CLK100

Intermodule ADC clock skew[2]

$T_{tb}$ ±5 °C .................................................. 12 ns max

(Listed accuracy is valid for 30 days following a timebase change.)

($T_{tb}$ = ambient temperature at which the timebase source was last changed.)

Over full operating temperature range...... 20 ns max

## Power Requirements

| Voltage (V) | Current (A), Max (Typical) |
|---|---|
| +3.3 | 3.0 (2.0) |
| +12 | 2.0 (1.6) |

# Physical

Dimensions (not including connectors) ............ 16 cm × 10 cm
(6.3 in. × 3.9 in.)
3U CompactPCI slot

Analog input connectors ................................... BNC female or Mini-XLR male

Digital trigger connector (PFI0) ....................... SMB male

Weight .............................................................. 260 g (9.2 oz)

Measurement Category .................................... I[3]

**Caution** Do *not* use the PXIe-4464 for connections to signals or for measurements within Categories II, III, or IV.

**Caution** The protection provided by the PXIe-4464 can be impaired if it is used in a manner not described in this document.

**Caution** 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.

---

1 Channels can be arbitrarily grouped into timing engines. Timing engines can be independently synchronized, started, and stopped. Both timing engines must use the same reference clock source.

2 Valid between PXIe-4464 modules installed in the same chassis. Between PXIe-4464 modules in different chassis, add the potential skew in the PXI_CLK10 clock distribution. Refer to the appropriate chassis documentation for its clock skew specifications.

3 Measurement Categories CAT I and CAT O are equivalent. These test and measurement circuits are not intended for direct connections to the MAINS building installations of Measurement Categories CAT II, CAT III, CAT IV.

# Environmental

## Operating Environment

Ambient temperature range .............................. 0 °C to 55 °C
(Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)

Relative humidity range.................................. 10% to 90%, noncondensing
(Tested in accordance with IEC 60068-2-56.)

Altitude .......................................................... 2,000 m (800 mbar)

Pollution Degree ............................................. 2

Indoor use only.

## Storage Environment

Ambient temperature range .............................. -20 °C to 70 °C
(Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)

Relative humidity range.................................. 5% to 95%, noncondensing
(Tested in accordance with IEC 60068-2-56.)

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

# Calibration

Self-calibration ............................................... On software command, the module computes gain and offset corrections relative to the high-precision internal voltage reference and a timebase correction relative to the high-precision internal frequency reference.

Self-calibration interval ..................................Recommended whenever the ambient temperature differs from $T_{cal}$ by more than ±5 °C. $T_{cal}$ = ambient temperature at which the last calibration was performed. Listed accuracies are valid for 30 days following a self-calibration.

External calibration interval.............................2 years

Warm-up time .................................................15 minutes

# 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

## Mini-XLR Version

The PXIe-4464 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 and certifications, and additional information, refer to the *Online Product Certification* section.

## BNC Version

The PXIe-4464 meets the requirements of the following EMC standards for sensitive electrical equipment for measurement, control, and laboratory use:

- EN 61326-2-1 (IEC 61326-2-1): 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, and additional information, refer to the *Online Product Certification* section.

# CE Compliance CE

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

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 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 and Electronic Equipment, visit `ni.com/environment/weee`.

## 电子信息产品污染控制管理办法（中国 RoHS）

**中国客户** National Instruments 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 National Instruments 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`.)

# Worldwide Support and Services

The National Instruments website is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit `ni.com/services` for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit `ni.com/register` to register your National Instruments product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world. For telephone support in the United States, create your service request at `ni.com/support` or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of `ni.com/niglobal` to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.



376165B-01 Dec16