SPECIFICATIONS

NI 4461/4462

204.8 kS/s, 2-Input/2-Output or 4-Input Sound and Vibration Device/Module

This document lists specifications for the NI PCI/PXI-4461 and NI PCI/PXI-4462 (NI 4461/4462) Dynamic Signal Acquisition (DSA) devices. These specifications are typical at 25 °C unless otherwise stated. The operating range for the PXI-4461/4462 is 0 to 55 °C, and the operating range for the PCI-4461/4462 is 0 to 50 °C. All accuracies listed are valid for up to one year from the time of the device external calibration. All specifications are subject to change without notice. Visit `ni.com/manuals` for the most current specifications and product documentation.

Caution The inputs of this sensitive test and measurement product are not protected for electromagnetic interference for functional reasons. As a result, this product may experience reduced measurement accuracy or other temporary performance degradation when cables are attached in an environment with electromagnetic interference present. Refer to the Declaration of Conformity (DoC) for this product for details of the standards applied to assess electromagnetic compatibility performance. To obtain the DoC, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

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

Analog Input

This section lists the NI 4461/4462 analog input (AI) specifications.

Input Characteristics

Number of simultaneously sampled input channels	
NI 4461	2
NI 4462	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),	
samples-per-second (S/s)	1 kS/s to 204.8 kS/s in 181.9 µS/s increments, maximum
ADC modulator oversample rate	
1.0 kS/s ≤ f_s ≤ 51.2 kS/s	128 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	64 f_s
102.4 kS/s < f_s ≤ 204.8 kS/s	32 f_s

Input Signal Range

Gain (dB)	Full-Scale Range (V_{pk})*
30	± 0.316
20	±1.00
10	±3.16
0	±10.0
-10	±31.6
-20	±42.4

* Each input channel gain is independently software selectable.

Sample Clock Timebase Rate

Ratio between sample rate (f_s) and sample clock timebase rate

Sample Rate (f_s)	Sample Clock Timebase Rate	
	Low-Frequency Alias Rejection Enabled (Default)	Low-Frequency Alias Rejection Disabled
1.0 kS/s ≤ f_s ≤ 1.6 kS/s	16,384 f_s	512 f_s
1.6 kS/s < f_s ≤ 3.2 kS/s	8,192 f_s	
3.2 kS/s < f_s ≤ 6.4 kS/s	4,096 f_s	
6.4 kS/s < f_s ≤ 12.8 kS/s	2,048 f_s	
12.8 kS/s < f_s ≤ 25.6 kS/s	1,024 f_s	
25.6 kS/s < f_s ≤ 51.2 kS/s	512 f_s	
51.2 kS/s < f_s ≤ 102.4 kS/s	256 f_s	256 f_s
102.4 kS/s < f_s ≤ 204.8 kS/s	128 f_s	128 f_s

FIFO buffer size	2,047 samples
Data transfers	Direct memory access (DMA)

Input Common-Mode Range

Gain (dB)	Input	Configuration	
		Differential (V_{pk})*	Pseudodifferential (V_{pk})*
≥0	Positive input (+)	±12	±12
	Negative input (-)	±12	±10
<0	Positive input (+)	±42.4	±42.4
	Negative input (-)	±42.4	±10

* Voltages with respect to chassis ground

Input Overvoltage Protection

Differential configuration	±42.4 V_{pk}[1]
Pseudodifferential configuration	
Positive terminal	±42.4 V_{pk}
Negative terminal (shield)	±10.0 V_{pk}

Transfer Characteristics

AI Offset (Residual DC)

Gain (dB)	DC-Coupled Offset*, †, Max, T_{cal}‡ ±5 °C (±mV)	DC-Coupled Offset*, Max, Over Operating Temperature Range (±mV)
30	0.1	1
20	0.2	2
10	0.5	3
0	0.7	7
-10	5	30
-20	7	70

* Source impedance ≤ 50 Ω.
† Listed offset is valid 24 hours following a self calibration.
‡ T_{cal} = ambient temperature at which last self calibration was performed.

AI Gain Amplitude Accuracy

1 kHz input tone	
T_{cal} ±5 °C	±0.03 dB max
(T_{cal} = ambient temperature at which last self calibration was performed.)	
(Listed accuracy is valid 24 hours following a self calibration.)	
Over operating temperature range	±0.2 dB max

[1] With respect to chassis ground.

Amplifier Characteristics

Input Impedance

Input Impedance	Differential Configuration	Pseudodifferential Configuration
Between positive input and chassis ground	1 MΩ ‖ 217 pF	1 MΩ ‖ 217 pF
Between negative input and chassis ground	1 MΩ ‖ 229 pF	50 Ω

Common-Mode Rejection Ratio (CMRR)

Gain (dB)	DC-Coupled CMRR (dBc)[*, †]	AC-Coupled CMRR (dBc)[†, ‡]
30	105	70
20	101	
10	90	
0	80	
-20, -10	60	65

[*] ≤ 1 kHz
[†] Differential configuration
[‡] 50 or 60 Hz

Dynamic Characteristics

Specification	Low-Frequency Alias Rejection Enabled (Default)	Low-Frequency Alias Rejection Disabled
Alias-free bandwidth (BW) (passband)	DC to 0.4 f_s	DC to 0.4535 f_s
Alias rejection, minimum	104 dBc	120 dBc

Specification	Low-Frequency Alias Rejection Enabled (Default)	Low-Frequency Alias Rejection Disabled
Alias rejection by frequency	Input frequency > 0.6 f_s	0.5465 f_s < input frequency < 127.4535 f_s, where 1.0 kS/s ≤ f_s ≤ 51.2 kS/s 0.5465 f_s < input frequency < 63.4535 f_s, where 51.2 kS/s < f_s ≤ 102.4 kS/s 0.5465 f_s < input frequency < 31.4535 f_s, where 102.4 kS/s < f_s ≤ 204.8 kS/s
-3 dB BW	0.484 f_s	0.491 f_s

Figure 1. NI 4461/4462 Digital Filter Input Frequency Response with Low-Frequency Alias Rejection Enabled

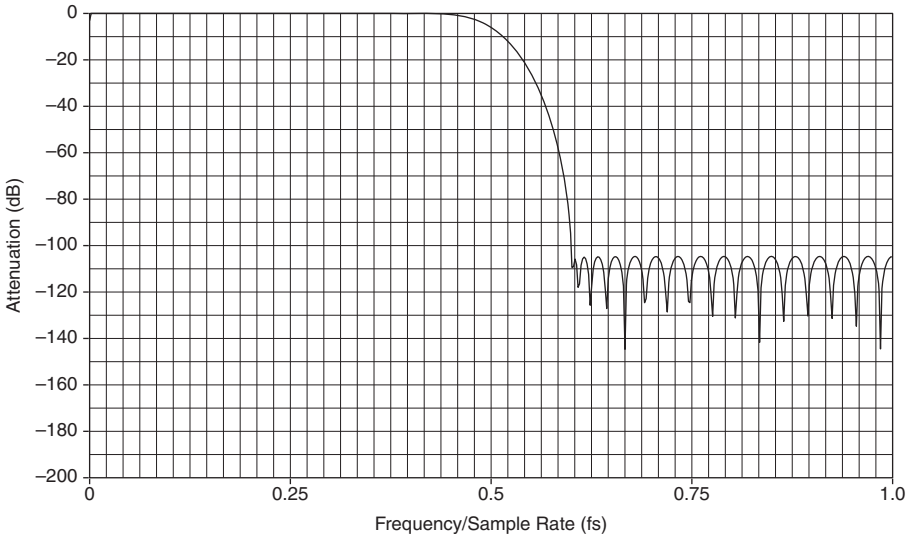
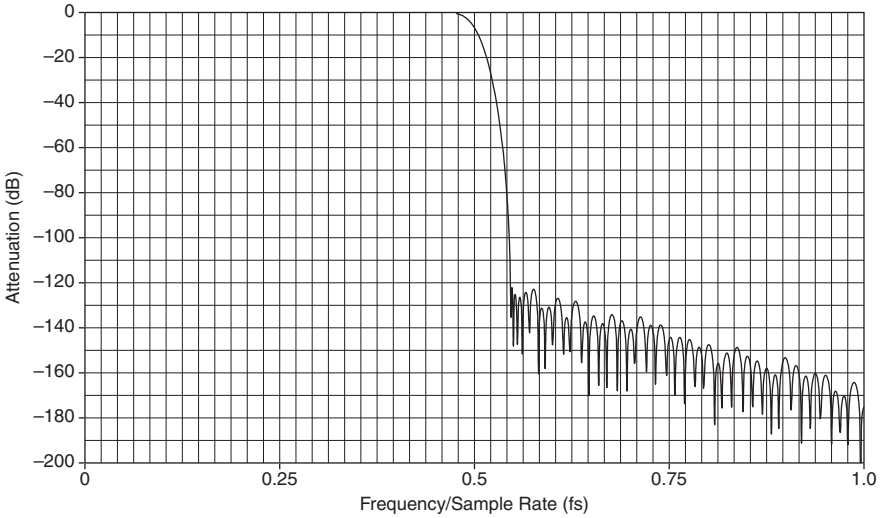


Figure 2. NI 4461/4462 Digital Filter Input Frequency Response with Low-Frequency Alias Rejection Disabled



AC coupling	
-3 dB cutoff frequency	3.4 Hz
-0.1 dB cutoff frequency	22.6 Hz

Figure 3. Magnitude Response of AC Coupling Circuit (1 Hz to 1 kHz)

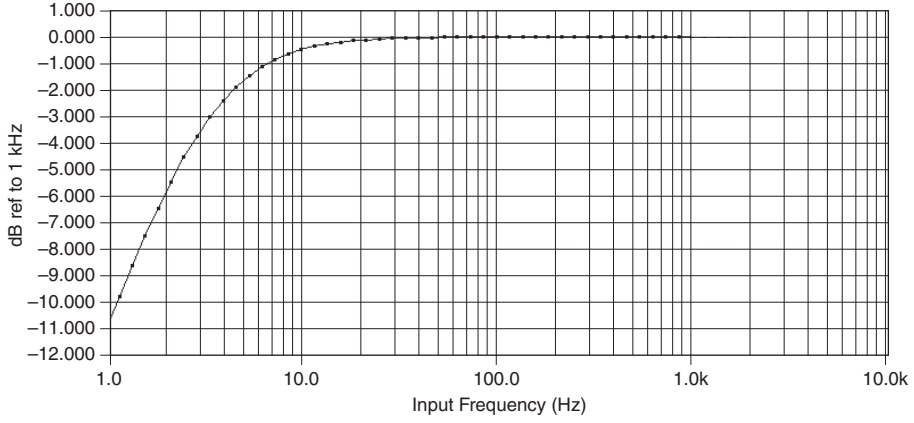
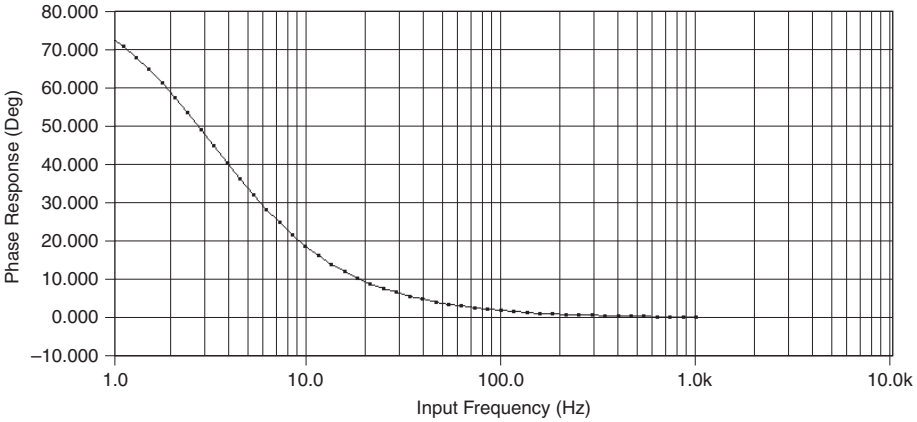


Figure 4. Phase Response of AC Coupling Circuit (1 Hz to 1 kHz)



ADC Filter Delay

Low-Frequency Alias Rejection Enabled (Default)		Low-Frequency Alias Rejection Disabled
Sample Rate (kS/s)	**Filter Delay (Samples)**	**Filter Delay (Samples)**
$1.0 \leq f_s \leq 1.6$	32.96875	63
$1.6 < f_s \leq 3.2$	33.9375	
$3.2 < f_s \leq 6.4$	35.875	
$6.4 < f_s \leq 12.8$	39.75	
$12.8 < f_s \leq 25.6$	47.5	
$25.6 < f_s \leq 204.8$	63	

AI Flatness

Gain (dB)	DC-Coupled Flatness* (dB), Max (Typical)		
	20 Hz to 20 kHz	**20 Hz to 45 kHz**	**20 Hz to 92.2 kHz**
0, 10, 20, 30	±0.006 (±0.003)	±0.03 (±0.02)	±0.1 (±0.08)
-20, -10	±0.2 (±0.1)	±0.6 (±0.33)	±1 (±0.55)

* For all attenuation settings, measurements relative to 1 kHz, at an update rate of 204.8 kS/s.

AI Interchannel Gain Mismatch

Gain (dB)	DC-Coupled Mismatch (dB)*		AC-Coupled Mismatch (dB)*
	20 Hz to 20 kHz	20 Hz to 92.2 kHz	20 Hz
30	0.004	0.008	0.004
0, 10, 20	0.003	0.003	
-20, -10	0.04	0.25	0.006
* Identical channel configurations			

AI Interchannel Phase Mismatch

Gain (dB)	DC-Coupled Mismatch (deg)*		AC-Coupled Mismatch (deg)*
	20 Hz to 20 kHz	20 Hz to 92.2 kHz	20 Hz
30	0.10	0.60	0.08
20	0.04	0.15	
0, 10	0.015	0.08	
-20, -10	0.7	1	
* Identical channel configurations			

Note All gain and phase mismatch specifications are for the same device and are not applicable between different NI 4461/4462 devices.

AI Phase Linearity

Gain (dB)	Linearity (deg)	
	20 Hz to 20 kHz	20 Hz to 92.2 kHz
0, 10, 20, 30	±0.01	±0.03
-20, -10	±0.10	±1

AI Idle Channel Noise

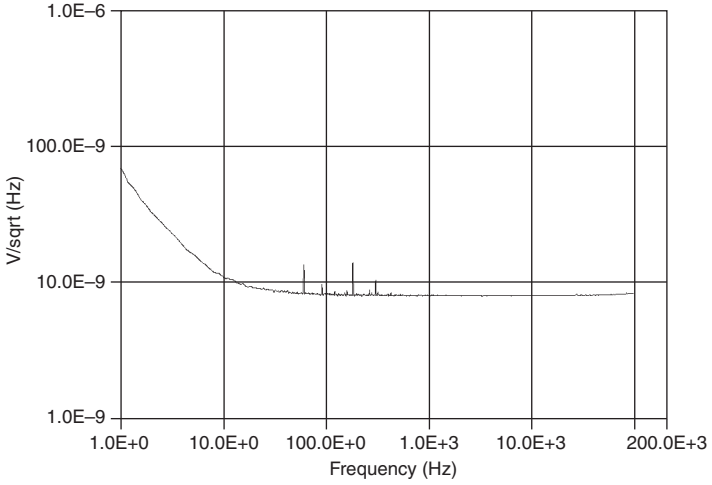
Sample Rate (kS/s)	Idle Channel Noise*, †	
	dBV_{rms}	μV_{rms}
1.0 kS/s ≤ f_s ≤ 51.2 kS/s	-118 dBV_{rms}	1.3 μV_{rms}
51.2 kS/s < f_s ≤ 102.4 kS/s	-115 dBV_{rms}	1.8 μV_{rms}
102.4 kS/s < f_s ≤ 204.8 kS/s	-111 dBV_{rms}	2.8 μV_{rms}

* Source impedance ≤ 50 Ω
† 30 dB gain

AI Spectral Noise Density

AI spectral noise density (with Enhanced Alias Rejection (EAR) turned on)..... 8 nV/$\sqrt{Hz}$ at 30 dB gain, 1 kHz

Figure 5. AI Spectral Noise Density (30 dB Gain)



AI Dynamic Range

Gain Setting (dB)	Dynamic Range (dBFS)*, Min (Typical)		
	1 kS/s ≤ f_s ≤ 51.2 kS/s	51.2 kS/s < f_s ≤ 102.4 kS/s	102.4 kS/s < f_s ≤ 204.8 kS/s
30	103 (105)	100 (102)	96 (98)
20	111 (113)	108 (110)	104 (106)
10	114 (117)	111 (114)	106 (110)
0	116 (118)	113 (114)	107 (110)
-10	107 (108)	104 (105)	101 (102)
-20	105 (107)	102 (104)	98 (101)

* 1 kHz input tone, -60 dBFS input amplitude

AI Spurious Free Dynamic Range (SFDR)

Gain Setting (dB)	SFDR (dBc)*, †, ‡
30	106
0, 10, 20	108
-20, -10	110

* f_s = 204.8 kS/s
† 1 kHz input tone, input amplitude is the lesser of -1 dBFS or 8.91 V_{pk}.
‡ Measurement includes all harmonics.

Figure 6. SFDR 51.2 kS/s (-1 dBFS, 0 dB Gain, 1 kHz Sine Wave Input)

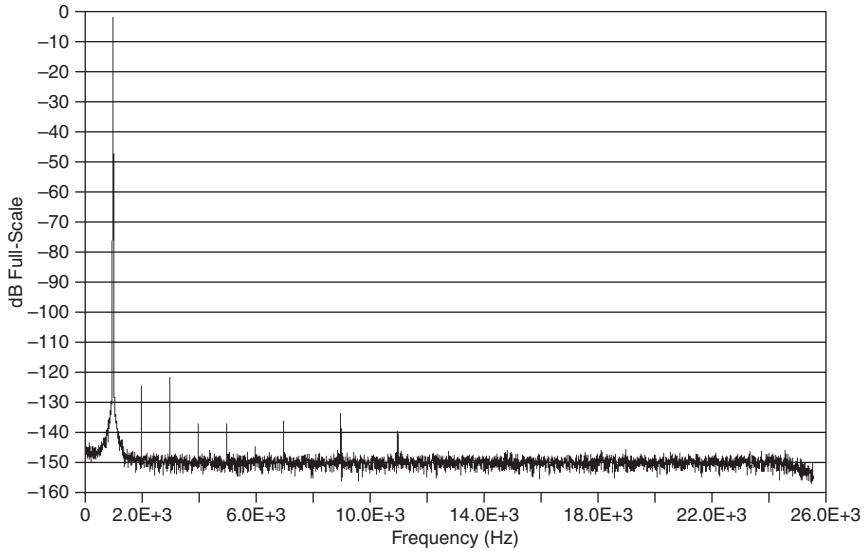


Figure 7. SFDR 102.4 kS/s (-1 dBFS, 0 dB Gain, 1 kHz Sine Wave Input)

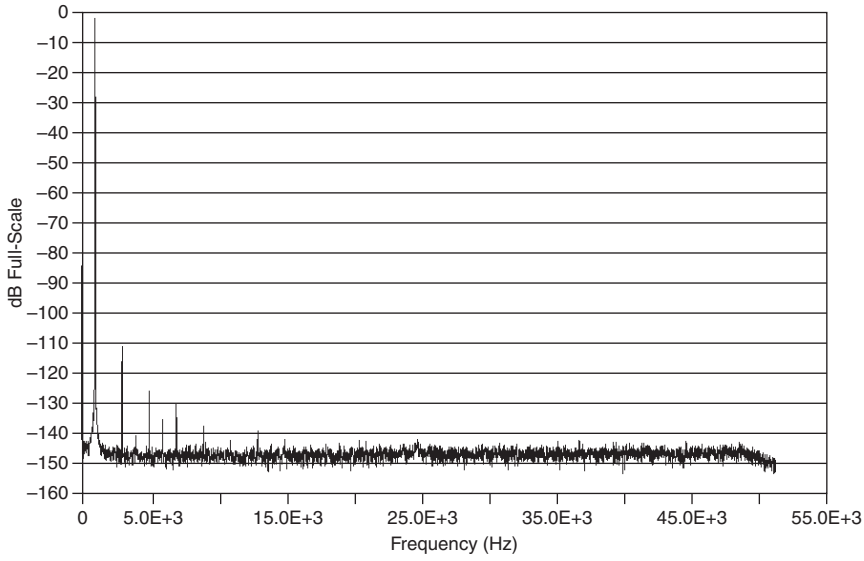
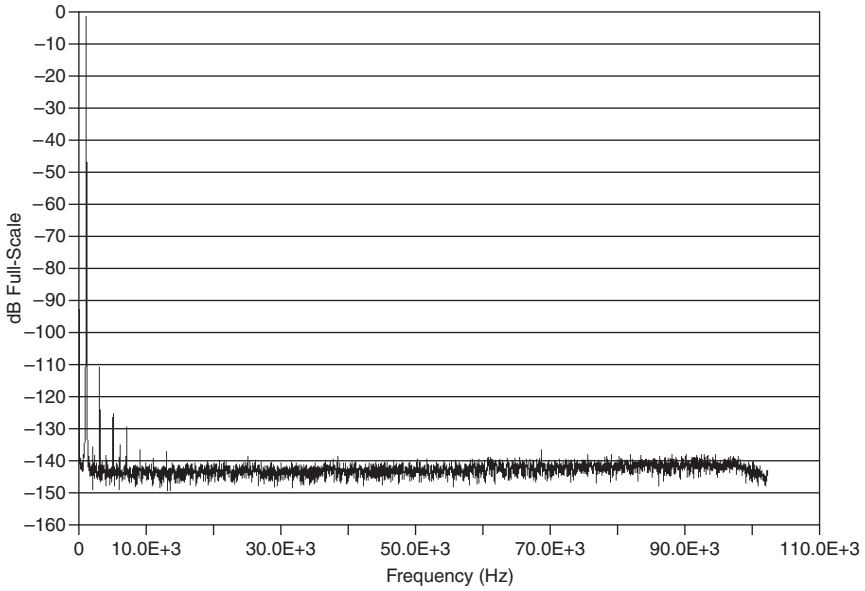


Figure 8. SFDR 204.8 kS/s (-1 dBFS, 0 dB Gain, 1 kHz Sine Wave Input)



AI Total Harmonic Distortion (THD), Balanced Source

Gain (dB)	THD (dBc)*, †	
	20 Hz to 20 kHz	20 Hz to 92.2 kHz
30	-100	-97
20	-109	-106
0, 10	-107	-104
-10	-108	-107
-20	-107	-106

* f_s = 204.8 kS/s, 92.8 kHz BW, differential configuration
† Input amplitude is the lesser of -1 dBFS or 8.91 V_{pk}.

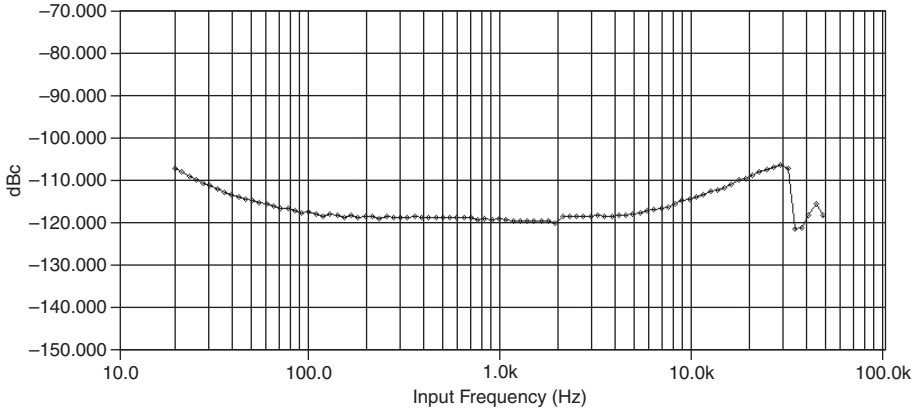
AI THD, Unbalanced Source

Gain (dB)	THD (dBc)*, †	
	20 Hz to 20 kHz	20 Hz to 92.2 kHz
30	-100	-93
20	-106	-94

Gain (dB)	THD (dBc)*, †	
	20 Hz to 20 kHz	20 Hz to 92.2 kHz
10	-105	-92
0	-97	-87
-10	-90	-88
-20	-91	-89

* f_s = 204.8 kS/s, 92.8 kHz BW
† Input amplitude is the lesser of -1 dBFS or 8.91 V_{pk}.

Figure 9. AI THD (Balanced Source with Differential Configuration, 204.8 kS/s, 0 dB Gain)



AI THD Plus Noise (THD+N), Balanced Source

Gain (dB)	THD+N (dBc)*	
	51.2 kS/s 20 Hz to 20 kHz†	204.8 kS/s 20 Hz to 92.2 kHz‡
30	-103	-94
20	-107	-95
10	-108	-96
0	-107	-96

Gain (dB)	THD+N (dBc)*	
	51.2 kS/s 20 Hz to 20 kHz†	204.8 kS/s 20 Hz to 92.2 kHz‡
-10	-96	-91
-20	-94	-88

* Input amplitude is the lesser of -1 dBFS or 8.91 V_{pk}, differential configuration.
† 23.2 kHz measurement BW
‡ 92.8 kHz measurement BW

AI THD+N, Unbalanced Source

Gain (dB)	THD+N (dBc)*	
	51.2 kS/s 20 Hz to 20 kHz†	204.8 kS/s 20 Hz to 92.2 kHz‡
30	-103	-91
20	-107	-93
10	-108	-91
0	-104	-87
-10	-94	-86
-20	-93	-86

* Input amplitude is the lesser of -1 dBFS or 8.91 V_{pk}.
† 23.2 kHz measurement BW
‡ 92.8 kHz measurement BW

AI Intermodulation Distortion (IMD)

Gain (dB)	IMD (dBc)*
20, 30	-109
10	-107
0	-104
-20, -10	-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)*, †	
	1 kHz Signal	92.2 kHz
30	-130 (-140)	-110 (-124)
0, 10, 20	-138 (-145)	-110 (-124)
-20, -10	-96 (-124)	-60 (-108)

* Source impedance $\leq 50\ \Omega$

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

Onboard Calibration Reference

DC level	5.000 V ±2.5 mV
Temperature coefficient	±5 ppm/°C max
Long-term stability	±15 ppm/ $\sqrt{1{,}000\ \text{hr}}$

Integrated Electronic Piezoelectric (IEPE)

Current	0 mA, 4 mA ±15%, or 10 mA ±15%, each channel independently software selectable
Compliance	24 V min

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

$$V_{common\text{-}mode} + V_{bias} + V_{full\text{-}scale} \text{ must be 0 to 24 V,}$$

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, and

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

Channel input impedance

with IEPE enabled	$(1\ \text{M}\Omega \parallel 240\ \text{pF})$, pseudodifferential
Current noise	$< 300\ \text{pA}/\sqrt{\text{Hz}}$

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`.

Analog Output (NI 4461 Only)

This section lists the NI 4461 analog output (AO) specifications.

Output Characteristics

Number of output channels	2, simultaneously sampled
Output configuration	Differential or pseudodifferential (50 Ω to chassis ground on shield), each channel independently software selectable
DAC resolution	24 bits
DAC type	Delta-sigma
Update rates (f_s)	1 kS/s to 204.8 kS/s in 181.9 μS/s increments, maximum
DAC modulator oversample rate	
1.0 kS/s ≤ f_s ≤ 1.6 kS/s	8,192 f_s
1.6 kS/s < f_s ≤ 3.2 kS/s	4,096 f_s
3.2 kS/s < f_s ≤ 6.4 kS/s	2,048 f_s
6.4 kS/s < f_s ≤ 12.8 kS/s	1,024 f_s
12.8 kS/s < f_s ≤ 25.6 kS/s	512 f_s
25.6 kS/s < f_s ≤ 51.2 kS/s	256 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	128 f_s
102.4 kS/s < f_s ≤ 204.8 kS/s	64 f_s
FIFO buffer size	1,023 samples
Data transfers	DMA

Output Signal Range

Attenuation (dB)	Full-Scale Range (V_{pk})*
40	±0.1
20	±1.0
0	±10.0

* Each output channel range is independently software selectable.

Transfer Characteristics

AO Offset (Residual DC)

Attenuation (dB)	Maximum Offset*, T_{cal} ± 5 °C†(±mV)	Maximum Offset, Over Operating Temperature Range (±mV)
20, 40	1	2
0	1	10

* Listed offset is valid 24 hours following a self calibration.
† T_{cal} = ambient temperature at which last self calibration was performed.

AO Gain Amplitude Accuracy

Specifications valid at any attenuation setting with a 1 kHz output signal.

T_{cal} ±5 °C ±0.04 dB max

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

(Listed accuracy is valid 24 hours following a self calibration.)

Over operating temperature range.....±0.1 dB max

Output Characteristics

Output coupling	DC
Short circuit protection	Indefinite protection between positive and negative
Minimum working load	600 Ω

Output Impedance

Output Impedance	Differential Configuration	Pseudodifferential Configuration
Between positive output and chassis ground	2.4 kΩ	70 Ω
Between negative output and chassis ground	2.4 kΩ	50 Ω
Between positive and negative outputs	22 Ω	22 Ω

Dynamic Characteristics

Image rejection	75 dB min < 768 kHz, 66 dB min > 768 kHz
-3 dB BW	0.487 f_s

Table 1. DAC filter delay (samples)

Sample Rate (kS/s)	Interpolation Factor	Filter Delay (Samples)
$1.0 \leq f_s \leq 1.6$	128	36.6
$1.6 < f_s \leq 3.2$	64	36.8
$3.2 < f_s \leq 6.4$	32	37.4
$6.4 < f_s \leq 12.8$	16	38.5
$12.8 < f_s \leq 25.6$	8	40.8
$25.6 < f_s \leq 51.2$	4	43.2
$51.2 < f_s \leq 102.4$	2	48.0
$102.4 < f_s \leq 204.8$	1	32.0

AO Flatness

For all attenuation settings, measurements relative to 1 kHz, at an update rate of 204.8 kS/s

20 Hz to 20 kHz	±0.008 dB max
20 Hz to 92.1 kHz	±0.1 dB max

AO Idle Channel Noise

Attenuation (dB)	Maximum Idle Channel Noise					
	102.5 kS/s (30 kHz BW)		204.8 kS/s (80 kHz BW)		204.8 kS/s (500 kHz BW)	
	dB V_{rms}	μV_{rms}	dB V_{rms}	μV_{rms}	dB V_{rms}	μV_{rms}
40	-106	5	-101	9	-87	45
20	-106	5	-101	9	-86	50
0	-96	16	-93	23	-73	224

* Noise equivalent bandwidth

AO Dynamic Range

Attenuation (dB)	Minimum Dynamic Range (dBFS)*		
	102.5 kS/s (30 kHz BW)†	204.8 kS/s (80 kHz BW)†	204.8 kS/s (500 kHz BW)†
40	83	78	64
20	103	98	83
0	113	110	90

* 1 kHz output frequency, -60 dBFS output amplitude
† Noise equivalent bandwidth

AO Spurious Free Dynamic Range (SFDR)

Attenuation (dB)	SFDR (dBc)*, †, ‡
40	87
20	94
0	98

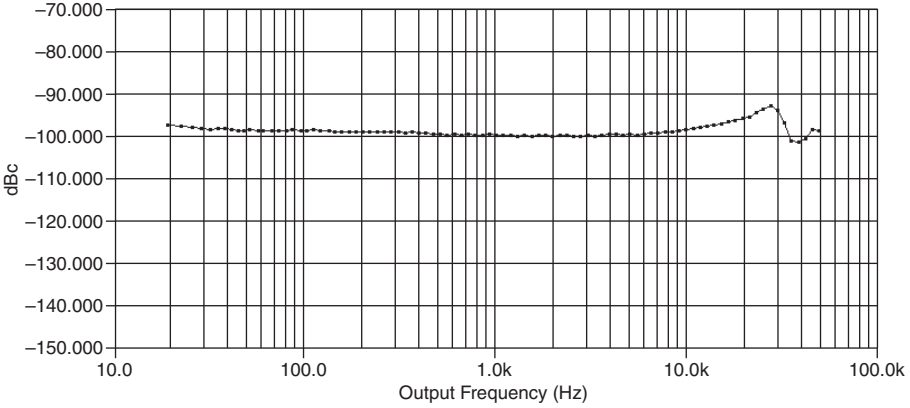
* f_s = 204.8 kS/s
† 1 kHz output frequency, -1 dBFS output amplitude
‡ Measurement includes all harmonics.

AO THD

Attenuation (dB)	THD (dBc)*		
	102.5 kS/s 20 Hz to 20 kHz†	204.8 kS/s 20 Hz to 20 kHz‡	204.8 kS/s 20 Hz to 92.1 kHz‡
40	-99	-92	-92
20	-98	-95	-93
0	-97	-94	-83

* -1 dBFS output amplitude
† 30 kHz measurement BW
‡ 92.8 kHz measurement BW

Figure 10. AO THD (204.8 kS/s, 0 dB Gain, 65,536 Samples, 92.8 kHz Measurement BW)



AO THD+N

Attenuation (dB)	THD+N (dBc)*		
	102.5 kS/s 20 Hz to 20 kHz†	204.8 kS/s 20 Hz to 80 kHz‡	204.8 kS/s 20 Hz to 92.1 kHz**
40	-83	-76	-63
20	-98	-92	-79
0	-97	-86	-68

* -1 dBFS output amplitude
† 30 kHz measurement BW
‡ 80 kHz measurement BW
** 500 kHz measurement BW

AO Intermodulation Distortion (IMD)

Attenuation (dB)	IMD (dBc)*
40	-99
20	-104
0	-104

* CCIF 14 kHz + 15 kHz, each tone amplitude is -6 dBFS.

Crosstalk, Output to Input Channel Separation

Gain (dB)	Crosstalk (dBc)*, †	
	1 kHz Signal	92.1 kHz
30	-151	-118
20	-150	-118
10	-144	-115
0	-137	-111
-20, -10	-87	-51

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

Crosstalk, Output Channel Separation

All attenuation settings (0, 20, and 40 dB)	
1 kHz signal	No measurable crosstalk
92.1 kHz signal	-110 dBc

AO Interchannel Gain Mismatch

All attenuation settings	
20 Hz to 92.1 kHz	0.03 dB

AO Interchannel Phase Mismatch

All attenuation settings	
20 Hz to 20 kHz	0.1°
20 Hz to 92.1 kHz	0.2°

Note All gain and phase mismatch specifications are for the same device and are not applicable between different NI 4461/4462 devices.

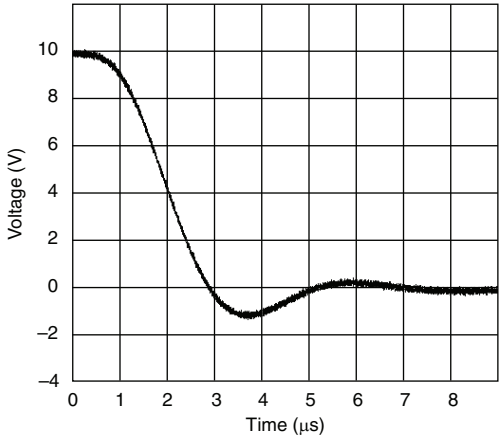
AO Phase Linearity

Attenuation (dB)	Linearity (deg)	
	20 Hz to 20 kHz	20 Hz to 92.1 kHz
0	±0.1	±1.7
20	± 0.1	±1.6
40	±0.1	±1.8

Power Off and Power Loss Behavior

When the NI 4461 is powered off or loses power, the output channels assume a high-impedance state. The outputs of the NI 4461 drop to 0.0 V in approximately 8 µs. The following illustrates the typical behavior of an NI 4461 generating 10 V when powered off or when the device loses power.

Figure 11. Power Off and Power Loss Behavior



Frequency Timebase Characteristics

Internal timebase	
Accuracy	±20 ppm, over operating temperature range
Aging	8 ppm in first year; 5 ppm max/year after first year
External timebase	Equal to accuracy of external timebase

Triggers

Analog trigger	
Purpose	Start trigger
Source	
NI 4461	AI0 or AI1
NI 4462	AI0, AI1, AI2, or AI3
Level	Full scale, programmable
Slope	Positive (rising) or negative (falling), software selectable
Resolution	24 bits
Hysteresis	Programmable
Digital Trigger	
Purpose	Start or reference trigger
Source	PFI0, PXI_Trig<0..6>
Compatibility	Transistor-transistor logic (5V TTL)
Polarity	Rising or falling edge
Minimum pulse width	10 ns

General Specifications

This section lists general specification information for the NI 4461/4462.

Bus Interface

PCI or PXI	3.3 V or 5 V signal environment
DMA channels	
NI 4461	2, analog input and analog output
NI 4462	1, analog input

Synchronization

PXI	
CLK_10	Multiple, full chassis
PXI_STAR	Up to 14 devices per chassis
PCI	
RTSI	Up to 3 devices across ribbon cable

Power Requirements

Voltage	NI PXI-4461	NI PCI-4461	NI PXI-4462	NI PCI-4462
+5 V	990 mA	2,200 mA	990 mA	1,900 mA
+3.3 V	1,430 mA	1,750 mA	1,750 mA	2,300 mA
+12 V	170 mA	40 mA	130 mA	100 mA
-12 V	110 mA	40 mA	70 mA	40 mA

Physical

Dimensions (not including connectors)	
PCI	17.5 cm × 9.9 cm (6.9 in. × 3.9 in.) PCI slot
PXI	16 cm × 10 cm (6.3 in. × 3.9 in.) 3U CompactPCI slot
Analog I/O connectors	BNC female
Digital trigger connector	SMB male

Weight	
PCI	226.8 g (8.0 oz)
PXI	241 g (8.5 oz)
Measurement Category[1]	I

Caution Do *not* use the NI 4461/4462 for connections to signals or for measurements within Categories II, III, or IV.

Environmental

Operating Environment

Ambient temperature range	
PXI-4461/4462	0 to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
PCI-4461/4462	0 to 50 °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 (at 25 °C ambient temperature)
Pollution Degree	2
Indoor use only.	

Storage Environment

Ambient temperature range	-20 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.)

[1] *Measurement Category* is also referred to as *Installation Category.*

Shock and Vibration (PXI Only)

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 to 500 Hz, 0.3 g_{rms}
Nonoperating	5 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 device computes gain and offset corrections relative to high-precision internal reference.
Interval	Recommended whenever 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	1 year
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

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): 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 For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

Note For EMC compliance, operate this product according to the documentation.

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.)

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