

NI 6132/6133 Specifications

This document lists the I/O terminal summary and specifications for the NI 6132/6133.

For the most current edition of this document, refer to ni.com/manuals. Refer to the *DAQ Getting Started Guide* for more information about accessing documents on the NI-DAQ CD.



Note With NI-DAQmx, National Instruments has revised its terminal names so they are easier to understand and more consistent among NI hardware and software products. The revised terminal names used in this document are usually similar to the names they replace. For a complete list of Traditional NI-DAQ terminal names and their NI-DAQmx equivalents, refer to the *Terminal Name Equivalents* table in the *S Series Help*.

Table 1. I/O Terminal Summary

| Terminal Name | Terminal Type and Direction | Impedance Input/ Output | Protection (Volts) On/Off | Source (mA at V) | Sink (mA at V) | Rise Time (ns) | Bias |
|-------------------------|-----------------------------|---------------------------------------|---------------------------|------------------------------|----------------|----------------|----------------------------|
| AI <0..7> | AI | 100 M Ω in parallel with 10 pF | 35/25 | — | — | — | ± 16 nA ± 35 nA |
| AI GND | — | — | — | — | — | — | — |
| D GND | — | — | — | — | — | — | — |
| +5 V | — | 0.1 Ω 0.45 Ω | Short-circuit to ground | 1 A | — | — | — |
| P0.<0..7> | DIO | — | $V_{CC} + 0.5$ | 13 at ($V_{CC} - 0.4$) | 24 at 0.4 | 1.1 | 50 k Ω pu |
| EXTSTROBE* | DO | — | — | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 0/ AI START TRIG | DIO | — | $V_{CC} + 0.5$ | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 1/ AI REF TRIG | DIO | — | $V_{CC} + 0.5$ | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 2 | DIO | — | $V_{CC} + 0.5$ | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 3/ CTR 1 SOURCE | DIO | — | $V_{CC} + 0.5$ | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 4/ CTR 1 GATE | DIO | — | $V_{CC} + 0.5$ | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |
| CTR 1 OUT | DO | — | — | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 5 | DIO | — | $V_{CC} + 0.5$ | 3.5 at ($V_{CC} - 0.4$) | 5 at 0.4 | 1.5 | 50 k Ω pu |

Table 1. I/O Terminal Summary (Continued)

| Terminal Name | Terminal Type and Direction | Impedance Input/Output | Protection (Volts) On/Off | Source (mA at V) | Sink (mA at V) | Rise Time (ns) | Bias |
|------------------------|-----------------------------|------------------------|---------------------------|-------------------------|----------------|----------------|------------------|
| PFI 6 | DIO | — | $V_{CC} + 0.5$ | 3.5 at $(V_{CC} - 0.4)$ | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 7/ AI SAMP CLK | DIO | — | $V_{CC} + 0.5$ | 3.5 at $(V_{CC} - 0.4)$ | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 8/ CTR 0 SOURCE | DIO | — | $V_{CC} + 0.5$ | 3.5 at $(V_{CC} - 0.4)$ | 5 at 0.4 | 1.5 | 50 k Ω pu |
| PFI 9/ CTR 0 GATE | DIO | — | $V_{CC} + 0.5$ | 3.5 at $(V_{CC} - 0.4)$ | 5 at 0.4 | 1.5 | 50 k Ω pu |
| CTR 0 OUT | DO | — | — | 3.5 at $(V_{CC} - 0.4)$ | 5 at 0.4 | 1.5 | 50 k Ω pu |
| FREQ OUT | DO | — | — | 3.5 at $(V_{CC} - 0.4)$ | 5 at 0.4 | 1.5 | 50 k Ω pu |

AI = Analog Input DIO = Digital Input/Output DO = Digital Output pu = pull-up
Note: The tolerance on the 50 k Ω pull-up resistors is large. Actual value might range between 17 k Ω and 100 k Ω .

Specifications

The following specifications are typical at 25 °C unless otherwise noted.

Analog Input

Input Characteristics

Number of channels

NI 61324

NI 61338

Type of ADC

Resolution14 bits, 1 in 16,384

Pipeline0

Sampling rate

Maximum2.5 MS/s per channel

MinimumNo minimum

Input impedance

AI – to AI GND100 M Ω in parallel with
10 pF

AI + to AI GND100 M Ω in parallel with
10 pF

Input bias current ± 2 pA typ, ± 25 pA max

Input offset current ± 1 pA typ, ± 10 pA max

Input couplingDC

Max working voltage for all analog input channels

Positive input (AI +) ± 11 V for all ranges,
Measurement Category I

Negative input (AI –) ± 11 V for all ranges,
Measurement Category I



Caution Do not use for measurements within Categories II, III, and IV.

Overvoltage protection

(AI +, AI –) ± 36 V

Input current during

overvoltage conditions ± 20 mA max

Input FIFO size

NI 6132 16 MS

NI 6133 16 or 32 MS

Data transfers DMA, interrupts,
programmed I/O

DMA mode Scatter-gather

DC Transfer Characteristics

INL ± 0.6 LSB typ,
 ± 1 LSB max

DNL ± 0.25 typ, ± 0.75 max,
no missing codes

Absolute Accuracy

| Nominal Range at Full Scale (V) | Residual Gain Error (ppm of Reading) | Gain Tempco (ppm/°C) | Reference Tempco | Residual Offset Error (ppm of Range) | Offset Tempco (ppm of Range/°C) | INL Error (ppm of Range) | Random Noise, σ (μ Vrms) | Absolute Accuracy at Full Scale ¹ (μ V) | Sensitivity ² (μ V) |
|---------------------------------|--------------------------------------|----------------------|------------------|--------------------------------------|---------------------------------|--------------------------|--------------------------------------|---|-------------------------------------|
| ±10 | 151 | 2.5 | 5 | 47 | 39 | 122 | 1080 | 4660 | 432.0 |
| ±5 | 176 | 2.5 | 5 | 40 | 43 | 122 | 546 | 2440 | 218.4 |
| ±2.5 | 207 | 2.5 | 5 | 47 | 61 | 122 | 305 | 1370 | 122.0 |
| ±1.25 | 234 | 2.5 | 5 | 45 | 78 | 122 | 172 | 740 | 68.8 |

AbsoluteAccuracy = Reading · (GainError) + Range · (OffsetError) + NoiseUncertainty
GainError = ResidualAGainError + GainTempco · (TempChangeFromLastInternalCal) + ReferenceTempco · (TempChangeFromLastExternalCal)

OffsetError = ResidualAOffsetError + OffsetTempco · (TempChangeFromLastInternalCal) + INL_Error

NoiseUncertainty = $\frac{\text{RandomNoise} \cdot 3}{\sqrt{100}}$ For a coverage factor of 3 σ and averaging 100 points.

¹ Absolute accuracy at full scale on the analog input channels is determined using the following assumptions:

TempChangeFromLastExternalCal = 10 °C

TempChangeFromLastInternalCal = 1 °C

number_of_readings = 100

CoverageFactor = 3 σ

For example, on the 10 V range, the absolute accuracy at full scale is as follows:

GainError = 151 ppm + 2.5 ppm · 1 + 5 ppm · 10

OffsetError = 47 ppm + 39 ppm · 1 + 122 ppm

NoiseUncertainty = $\frac{1,080 \mu\text{V} \cdot 3}{\sqrt{100}}$ NoiseUncertainty = 320 μ V

AbsoluteAccuracy = 10 V · (GainError) + 10 V · (OffsetError) + NoiseUncertainty AbsoluteAccuracy = 4,660 μ V

² Sensitivity is the smallest voltage change that can be detected. It is a function of noise.

Dynamic Characteristics

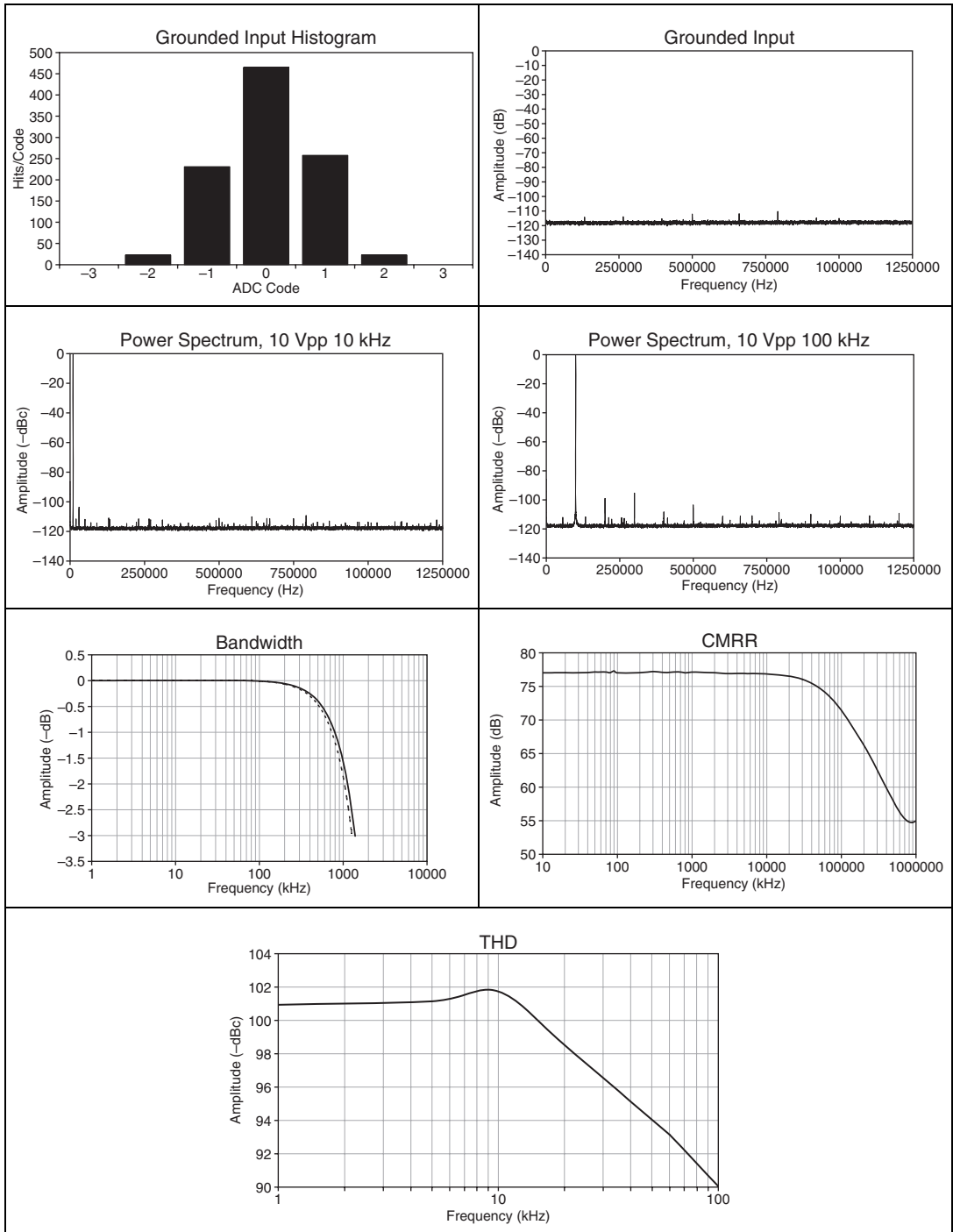
Phase mismatch $\pm 2^\circ$ at 1 MHz

Table 2. NI 6132/6133 Analog Input Dynamic Characteristics

| Input Range | Bandwidth ¹ (MHz) | SFDR Typ ² (dB) | CMRR ³ (dB) | System Noise ⁴ (LSB _{rms}) | Crosstalk ⁵ (dB) | THD (dB at 10 kHz) |
|--------------|---------------------------------|-------------------------------|---------------------------|---|--------------------------------|--------------------------|
| ± 10 V | 1.3 | 95 | 70 | 0.78 | -74 | -101.1 |
| ± 5 V | 1.3 | 95 | 70 | 0.79 | -74 | -102.5 |
| ± 2.5 V | 1.25 | 96 | 70 | 0.86 | -74 | -102.2 |
| ± 1.25 V | 1.25 | 94 | 70 | 0.95 | -74 | -102.1 |

¹ -3 dB frequency for input amplitude at 10% of the input range (-20 dB)
² Measured at 100 kHz with twelfth-order bandpass filter after signal source
³ DC to 60 Hz
⁴ LSB_{rms}, including quantization
⁵ DC to 100 kHz

Typical Performance Graphs



Stability

Recommended warm-up time15 min

Calibration

Level.....5.000 V (± 2.5 mV)
(actual value stored in
EEPROM)

Temperature coefficient ± 5.0 ppm/ $^{\circ}$ C max

Long-term stability ± 15 ppm/ $\sqrt{1,000}$ h

Digital I/O

Number of channels.....8 input/output

Compatibility.....TTL/CMOS

Table 3. Digital Logic Levels

| Level | Min | Max |
|---|--------|--------------|
| Input low voltage | 0.0 V | 0.8 V |
| Input high voltage | 2.0 V | 5.0 V |
| Input low current ($V_{in} = 0$ V) | — | -320 μ A |
| Input high current ($V_{in} = 5$ V) | — | 10 μ A |
| Output low voltage ($I_{OL} = 24$ mA) | — | 0.4 V |
| Output high voltage ($I_{OH} = 13$ mA) | 4.35 V | — |

Power-on stateInput (high-impedance)

Data transfers.....DMA, interrupts,
programmed I/O

Input buffer.....2,044 bytes

Output buffer2,044 bytes

Transfer rate (1 word = 8 bits).....10 Mwords/s

Timing I/O

Number of channels.....2 up/down
counter/timers,
1 frequency scaler

Resolution

Counter/timers24 bits

Frequency scaler4 bits

Compatibility.....TTL/CMOS

Base clocks available

Counter/timers20 MHz, 100 kHz

Frequency scaler10 MHz, 100 kHz

Base clock accuracy $\pm 0.01\%$

Max source frequency20 MHz

Min source pulse duration..... 10 ns, edge-detect mode

Min gate pulse duration 10 ns, edge-detect mode

Data transfers DMA, interrupts,
programmed I/O

DMA modes..... Scatter-gather

Triggers

Analog Trigger

Source All analog input channels

Level \pm full-scale

Slope Positive or negative
(software-selectable)

Resolution 8 bits, 1 in 256

Hysteresis..... Programmable

Bandwidth (-3 dB)..... 5 MHz internal/external

Digital Trigger

Compatibility TTL

Response Rising or falling edge

Pulse width..... 10 ns min

RTSI Trigger Lines (PCI Only)

Trigger lines <0..6> 7

RTSI clock 1

PXI Trigger Bus (PXI Only)

Trigger lines <0..6> 7

Star trigger 1

Bus Interface

Type Master, slave

Power Requirement

+5 VDC ($\pm 5\%$)

NI 6132..... 2.2 A

NI 6133..... 3.0 A

+3.3 V

NI 6132..... 1.0 A

NI 6133..... 1.2 A

-12 VDC

NI 6132..... 45 mA

NI 6133..... 70 mA

Power available at I/O connector.... +4.65 to +5.25 VDC
at 1 A

Physical

Dimensions (not including connectors)

| | |
|------------------------|---|
| NI PCI-6132/6133 | 31.2 cm × 10.6 cm (12.3 in. × 4.2 in.) |
| NI PXI-6132/6133 | 16.0 cm × 10.0 cm (6.3 in. × 3.9 in.) |

I/O connector 68-pin male SCSI-II type

Environmental

Operating temperature 0 to 50 °C

Storage temperature -20 to 70 °C

Humidity 10 to 90% RH,
noncondensing

Maximum altitude 2,000 m

Pollution Degree 2

Indoor use only.

Safety

The NI 6132/6133 devices are designed to meet 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, CAN/CSA-C22.2 No. 61010-1



Note For UL and other safety certifications, refer to the product label, or visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

The NI 6132/6133 devices are designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



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

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)



Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain 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.

Waste Electrical and Electronic Equipment (WEEE)



EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.

| | | | |
|-----------------------|----|----|-----------------------|
| AI 0 - | 34 | 68 | AI 0 + |
| AI 1 + | 33 | 67 | AI 0 GND |
| AI 1 GND | 32 | 66 | AI 1 - |
| AI 2 - | 31 | 65 | AI 2 + |
| AI 3 + | 30 | 64 | AI 2 GND |
| AI 3 GND | 29 | 63 | AI 3 - |
| AI 4 + ¹ | 28 | 62 | NC |
| AI 4 GND ¹ | 27 | 61 | AI 4 - ¹ |
| AI 5 - ¹ | 26 | 60 | AI 5 + ¹ |
| AI 6 + ¹ | 25 | 59 | AI 5 GND ¹ |
| AI 6 GND ¹ | 24 | 58 | AI 6 - ¹ |
| AI 7 - ¹ | 23 | 57 | AI 7 + ¹ |
| NC | 22 | 56 | AI 7 GND ¹ |
| NC | 21 | 55 | NC |
| NC | 20 | 54 | NC |
| P0.4 | 19 | 53 | D GND |
| D GND | 18 | 52 | P0.0 |
| P0.1 | 17 | 51 | P0.5 |
| P0.6 | 16 | 50 | D GND |
| D GND | 15 | 49 | P0.2 |
| +5 V | 14 | 48 | P0.7 |
| D GND | 13 | 47 | P0.3 |
| D GND | 12 | 46 | AI HOLD COMP |
| PFI 0/AI START TRIG | 11 | 45 | EXT STROBE* |
| PFI 1/AI REF TRIG | 10 | 44 | D GND |
| D GND | 9 | 43 | PFI 2/AI CONV CLK |
| +5 V | 8 | 42 | PFI 3/CTR 1 SOURCE |
| D GND | 7 | 41 | PFI 4/CTR 1 GATE |
| PFI 5 | 6 | 40 | CTR 1 OUT |
| PFI 6 | 5 | 39 | D GND |
| D GND | 4 | 38 | PFI 7/AI SAMP CLK |
| PFI 9/CTR 0 GATE | 3 | 37 | PFI 8/CTR 0 SOURCE |
| CTR 0 OUT | 2 | 36 | D GND |
| FREQ OUT | 1 | 35 | D GND |

NC = No Connect

¹ NC on NI 6132

Figure 1. NI 6132/6133 Pinout

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