NI 628*x* Specifications

Specifications listed below are typical at 25 °C unless otherwise noted. Refer to the *M Series User Manual* for more information about NI 628*x* devices.

このドキュメントの日本語版については、ni.com/manuals を参照してください。
(For a Japanese language version, go to ni.com/manuals.)

Analog Input

Number of channels
- NI 6280/6281 ..... 8 differential or 16 single ended
- NI 6284/6289 ..... 16 differential or 32 single ended

ADC resolution ..... 18 bits

DNL ..... No missing codes guaranteed

INL ..... Refer to the *AI Absolute Accuracy Tables*

Sampling rate
- Maximum ..... 625 kS/s single channel, 500 kS/s multi-channel (aggregate)
- Minimum ..... No minimum
- Timing accuracy ..... 50 ppm of sample rate
- Timing resolution ..... 50 ns

Input coupling ..... DC

Input range ..... ±10 V, ±5 V, ±2 V, ±1 V, ±0.5 V, ±0.2 V, ±0.1 V

Maximum working voltage for analog inputs (signal + common mode) ..... ±11 V of AI GND

CMRR (DC to 60 Hz) ..... 110 dB

Input impedance
- Device on
  - AI+ to AI GND ..... >10 GΩ in parallel with 100 pF
  - AI– to AI GND ..... >10 GΩ in parallel with 100 pF
- Device off
  - AI+ to AI GND ..... 820 Ω
  - AI– to AI GND ..... 820 Ω

Input bias current ..... ±100 pA

Crosstalk (at 100 kHz)
- Adjacent channels ..... –75 dB
- Non-adjacent channels ..... –95 dB

Small signal bandwidth (–3 dB) ..... 750 kHz filter off, 40 kHz filter on

Input FIFO size ..... 2,047 samples

Scan list memory ..... 4,095 entries

Data transfers
- PCI/PXI devices ..... DMA (scatter-gather), interrupts, programmed I/O
- USB devices ..... USB Signal Stream, programmed I/O

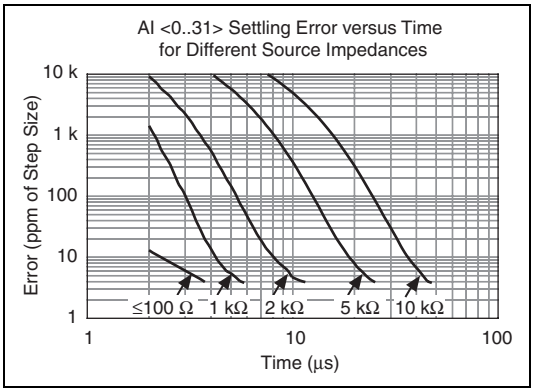
Overvoltage protection (AI <0..31>, AI SENSE, AI SENSE 2)
- Device on ..... ±25 V for up to eight AI pins
- Device off ..... ±15 V for up to eight AI pins

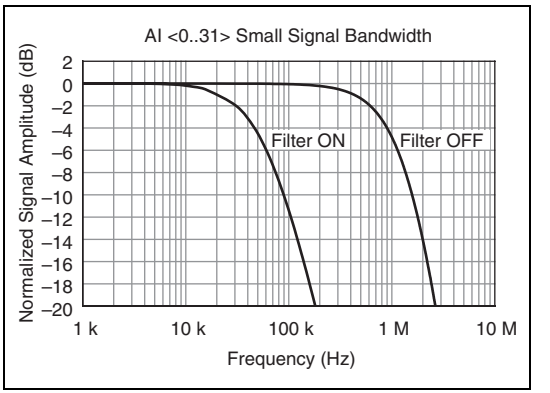
Input current during overvoltage condition ..... ±20 mA max/AI pin

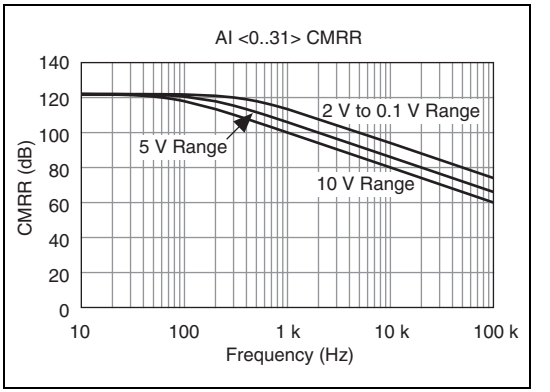
Settling Time for Multichannel Measurements

Range	Filter Off		Filter On
	±15 ppm of Step (±4 LSB for Full Scale Step)	±4 ppm of Step (±1 LSB for Full Scale Step)	±4 ppm of Step (±1 LSB for Full Scale Step)
±10 V, ±5 V	2 µs	8 µs	50 µs
±2 V, ±1 V, ±0.5 V	2.5 µs	8 µs	50 µs
±0.2 V, ±0.1 V	3 µs	8 µs	50 µs

Typical Performance Graphs







Analog Triggers

Number of triggers 1

Source
- NI 6280/6281 ..... AI <0..15>, APFI 0
- NI 6284/6289 ..... AI <0..31>, APFI <0..1>

Functions ..... Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Convert Clock, Sample Clock Timebase

Source level
- AI <0..31> ..... ±Full scale
- APFI <0..1> ..... ±10 V

Resolution ..... 10 bits, 1 in 1024

Modes ..... Analog edge triggering, analog edge triggering with hysteresis, and analog window triggering

Bandwidth (–3 dB)
- AI <0..31> ..... 700 kHz filter off, 40 kHz filter on
- APFI <0..1> ..... 5 MHz

Accuracy ..... ±1%

APFI <0..1> characteristics
- Input impedance ..... 10 kΩ
- Coupling ..... DC
- Protection
  - Power on ..... ±30 V
  - Power off ..... ±15 V

Analog Output

Number of channels
- NI 6280/6284 0
- NI 6281 2
- NI 6289 4

DAC resolution ..... 16 bits

DNL ..... ±1 LSB

Monotonicity ..... 16 bit guaranteed

Accuracy ..... Refer to the *AO Absolute Accuracy Table*

Maximum update rate
- 1 channel ..... 2.86 MS/s
- 2 channels ..... 2.00 MS/s
- 3 channels ..... 1.54 MS/s
- 4 channels ..... 1.25 MS/s

Timing accuracy ..... 50 ppm of sample rate

Timing resolution ..... 50 ns

Output range ..... Offset ± reference, includes ±10 V, ±5 V, ±2 V, and ±1 V calibrated ranges
- Offset ..... 0 V, 5 V, APFI <0..1>, AO <0..3>[1]
- Reference ..... 10 V, 5 V, 2 V, 1 V, APFI <0..1>, AO <0..3>[1]
- Maximum output level ..... ±11 V

Output coupling ..... DC

Output impedance ..... 0.2 Ω

Output current drive ..... ±5 mA

Overdrive protection ..... ±25 V

Overdrive current ..... 20 mA

Power-on state ..... ±5 mV

Power-on glitch ..... 2.3 V peak for 1.2 s

Output FIFO size ..... 8,191 samples shared among channels used

[1] An AO channel cannot be a reference or offset to itself.

Data transfers

PCI/PXI devices.....DMA (scatter-gather), interrupts, programmed I/O

USB devices.....USB Signal Stream, programmed I/O

AO waveform modes:

- Non-periodic waveform
- Periodic waveform regeneration mode from onboard FIFO
- Periodic waveform regeneration from host buffer including dynamic update

Settling time, full scale step
15 ppm (1 LSB).....3 µs

Slew rate.....20 V/µs

Glitch energy at midscale transition, ±10 V range

Magnitude.....15 mV

Duration.....0.5 µs

External Reference

APFI <0..1> characteristics

Input impedance.....10 kΩ

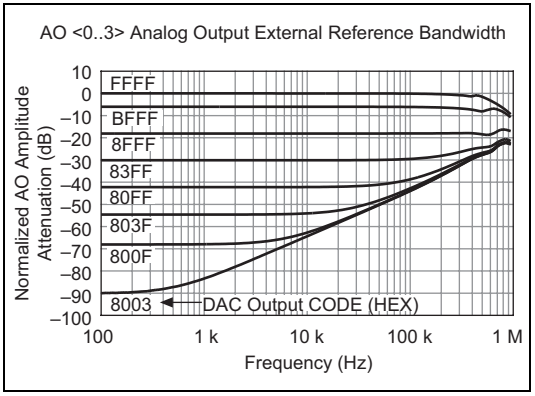
Coupling.....DC

Protection

Power on.....±30 V

Power off.....±15 V

Range.....±11 V



Calibration (AI and AO)

Recommended warm-up time

PCI/PXI devices ..... 15 minutes

USB devices ..... 30 minutes

Calibration interval ..... 2 years

AI Absolute Accuracy Table (Filter On)

Nominal Range		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 (μVrms)	Absolute Accuracy at Full Scale[1] (μV)	Sensitivity[2] (μV)
Positive Full Scale	Negative Full Scale									
10	–10	40	17	1	8	11	10	60	980	24
5	–5	45	17	1	8	11	10	30	510	12
2	–2	45	17	1	8	13	10	12	210	4.8
1	–1	55	17	1	15	15	10	7	120	2.8
0.5	–0.5	55	17	1	30	20	10	4	70	1.6
0.2	–0.2	75	17	1	45	35	10	3	39	1.2
0.1	–0.1	120	17	1	60	60	10	2	28	0.8

Accuracies listed are valid for up to two years from the device external calibration.

AbsoluteAccuracy = Reading · (GainError) + Range · (OffsetError) + NoiseUncertainty
GainError = ResidualAIGainError + GainTempco · (TempChangeFromLastInternalCal) + ReferenceTempco · (TempChangeFromLastExternalCal)
OffsetError = ResidualAIOffsetError + OffsetTempco · (TempChangeFromLastInternalCal) + INL_Error

$$\text{NoiseUncertainty} = \frac{\text{RandomNoise} \cdot 3}{\sqrt{100}}$$ 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 = 40 ppm + 17 ppm · 1 + 1 ppm · 10 GainError = 67 ppm
OffsetError = 8 ppm + 11 ppm · 1 + 10 ppm OffsetError = 29 ppm

$$\text{NoiseUncertainty} = \frac{60\ \mu\text{V} \cdot 3}{\sqrt{100}}$$ NoiseUncertainty = 18 μV

AbsoluteAccuracy = 10 V · (GainError) + 10 V · (OffsetError) + NoiseUncertainty Absolute Accuracy = 980 μV

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

AI Absolute Accuracy Table (Filter Off)

Nominal Range		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 (μVrms)	Absolute Accuracy at Full Scale[1] (μV)	Sensitivity[2] (μV)
Positive Full Scale	Negative Full Scale									
10	–10	45	17	1	10	11	10	70	1050	28.0
5	–5	50	17	1	10	11	10	35	550	14.0
2	–2	50	17	1	10	13	10	15	230	6.0
1	–1	60	17	1	17	15	10	12	130	4.8
0.5	–0.5	60	17	1	32	20	10	10	80	4.0
0.2	–0.2	80	17	1	47	35	10	9	43	3.6
0.1	–0.1	120	17	1	62	60	10	9	31	3.6

Accuracies listed are valid for up to two years from the device external calibration.

AbsoluteAccuracy = Reading · (GainError) + Range · (OffsetError) + NoiseUncertainty
GainError = ResidualAIGainError + GainTempco · (TempChangeFromLastInternalCal) + ReferenceTempco · (TempChangeFromLastExternalCal)
OffsetError = ResidualAIOffsetError + OffsetTempco · (TempChangeFromLastInternalCal) + INL_Error

$$\text{NoiseUncertainty} = \frac{\text{RandomNoise} \cdot 3}{\sqrt{100}}$$ 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 = 45 ppm + 17 ppm · 1 + 1 ppm · 10 GainError = 72 ppm
OffsetError = 10 ppm + 11 ppm · 1 + 10 ppm OffsetError = 31 ppm

$$\text{NoiseUncertainty} = \frac{70\ \mu\text{V} \cdot 3}{\sqrt{100}}$$ NoiseUncertainty = 21 μV

AbsoluteAccuracy = 10 V · (GainError) + 10 V · (OffsetError) + NoiseUncertainty Absolute Accuracy = 1050 μV

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

AO Absolute Accuracy Table

Nominal Range		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)	Absolute Accuracy at Full Scale[1] (μV)
Positive Full Scale	Negative Full Scale							
10	–10	55	15	1	30	12	32	1540
5	–5	60	15	1	30	17	32	820
2	–2	65	25	1	40	30	32	404
1	–1	85	25	1	57	50	32	259

[1] Absolute Accuracy at full scale numbers is valid immediately following internal calibration and assume the device is operating within 10 °C of the last external calibration. Accuracies listed are valid for up to two years from the device external calibration.

AbsoluteAccuracy = OutputValue · (GainError) + Range · (OffsetError)
GainError = ResidualGainError + GainTempco · (TempChangeFromLastInternalCal) + ReferenceTempco · (TempChangeFromLastExternalCal)
OffsetError = ResidualOffsetError + AOOffsetTempco · (TempChangeFromLastInternalCal) + INL_Error

Digital I/O/PFI

Static Characteristics

Number of channels
- NI 6280/6281 ..... 24 total
  8 (P0.<0..7>)
  16 (PFI <0..7>/P1, PFI <8..15>/P2)
- NI 6284/6289 ..... 48 total
  32 (P0.<0..31>)
  16 (PFI <0..7>/P1, PFI <8..15>/P2)

I/O type ..... 5 V TTL/CMOS compatible

Ground reference ..... D GND

Direction control ..... Each terminal individually programmable as input or output

Pull-down resistor ..... 50 kΩ typical, 20 kΩ minimum

Input voltage protection[1] ..... ±20 V on up to two pins

Waveform Characteristics (Port 0 Only)

Terminals used
- NI 6280/6281 ..... Port 0 (P0.<0..7>)
- NI 6284/6289 ..... Port 0 (P0.<0..31>)

Port/sample size
- NI 6280/6281 ..... Up to 8 bits
- NI 6284/6289 ..... Up to 32 bits

Waveform generation (DO) FIFO ... 2,047 samples

Waveform acquisition (DI) FIFO .... 2,047 samples

DI Sample Clock frequency
- PCI/PXI devices ..... 0 to 10 MHz[2]
- USB devices ..... 0 to 1 MHz system dependent[2]

DO Sample Clock frequency
- PCI/PXI devices
  - Regenerate from FIFO ..... 0 to 10 MHz
  - Streaming from memory ..... 0 to 10 MHz system dependent[2]
- USB devices
  - Regenerate from FIFO ..... 0 to 10 MHz
  - Streaming from memory ..... 0 to 1 MHz system dependent[2]

Data transfers
- PCI/PXI devices ..... DMA (scatter-gather), interrupts, programmed I/O
- USB devices ..... USB Signal Stream, programmed I/O

DO or DI Sample Clock source[3] ..... Any PFI, RTSI, AI Sample or Convert Clock, AO Sample Clock, Ctr *n* Internal Output, and many other signals

PFI/Port 1/Port 2 Functionality

Functionality ..... Static digital input, static digital output, timing input, timing output

Timing output sources ..... Many AI, AO, counter, DI, DO timing signals

Debounce filter settings ..... 125 ns, 6.425 µs, 2.56 ms, disable; high and low transitions; selectable per input

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[1] Stresses beyond those listed under *Input voltage protection* may cause permanent damage to the device.

[2] Performance can be dependent on bus latency and volume of bus activity.

[3] The digital subsystem does not have its own dedicated internal timing engine. Therefore, a sample clock must be provided from another subsystem on the device or an external source.

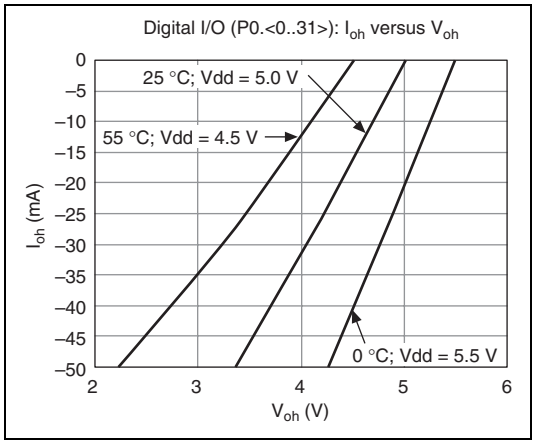
Recommended Operation Conditions

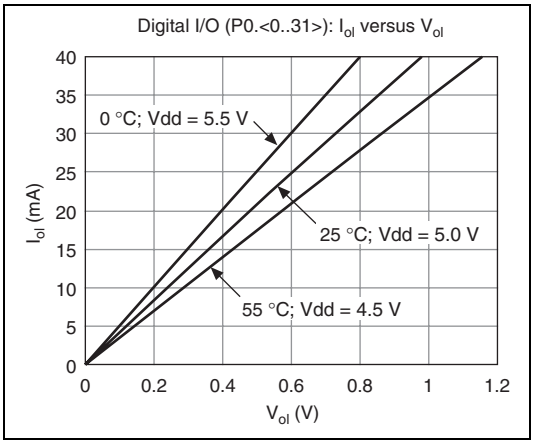
Level	Min	Max
Input high voltage (V_{IH})	2.2 V	5.25 V
Input low voltage (V_{IL})	0 V	0.8 V
Output high current (I_{OH})		
P0.<0..31>	—	–24 mA
PFI <0..15>/P1/P2	—	–16 mA
Output low current (I_{OL})		
P0.<0..31>	—	24 mA
PFI <0..15>/P1/P2	—	16 mA

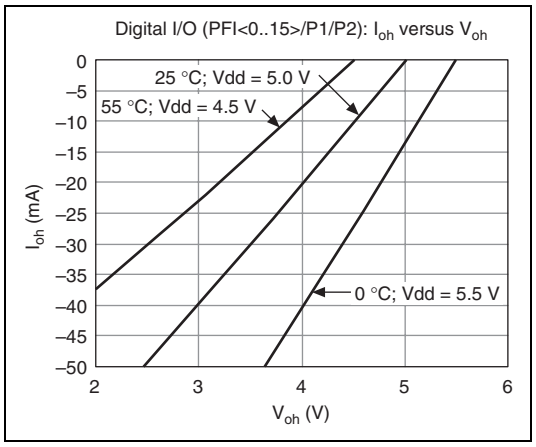
Electrical Characteristics

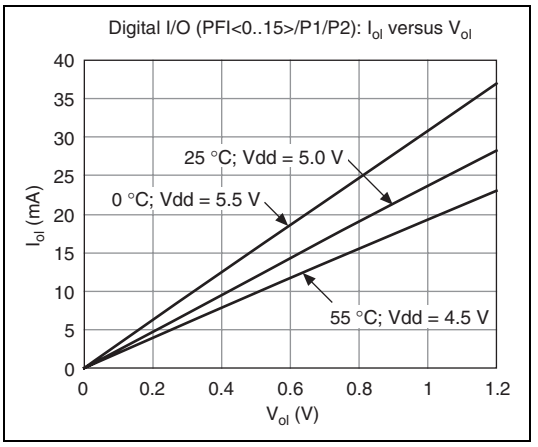
Level	Min	Max
Positive-going threshold (VT+)	—	2.2 V
Negative-going threshold (VT–)	0.8 V	—
Delta VT hysteresis (VT+ – VT–)	0.2 V	—
I_{IL} input low current (V_{in} = 0 V)	—	–10 µA
I_{IH} input high current (V_{in} = 5 V)	—	250 µA

Digital I/O Characteristics









General-Purpose Counter/Timers

Number of counter/timers 2

Resolution ..... 32 bits

Counter measurements ..... Edge counting, pulse, semi-period, period, two-edge separation

Position measurements ..... X1, X2, X4 quadrature encoding with Channel Z reloading; two-pulse encoding

Output applications ..... Pulse, pulse train with dynamic updates, frequency division, equivalent time sampling

Internal base clocks ..... 80 MHz, 20 MHz, 100 kHz

External base clock frequency ..... 0 to 20 MHz

Base clock accuracy ..... 50 ppm

Inputs ..... Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down

Routing options for inputs ..... Any PFI, RTSI, PXI_TRIG, PXI_STAR, analog trigger, many internal signals

FIFO ..... 2 samples

Data transfers

- PCI/PXI devices ..... Dedicated scatter-gather DMA controller for each counter/timer, interrupts, programmed I/O
- USB devices ..... USB Signal Stream, programmed I/O

Frequency Generator

Number of channels 1

Base clocks ..... 10 MHz, 100 kHz

Divisors ..... 1 to 16

Base clock accuracy ..... 50 ppm

Output is available on any PFI or RTSI terminal.

Phase-Locked Loop (PLL)

Number of PLLs 1

Reference signal ..... PXI_STAR, PXI_CLK10, RTSI <0..7>

Output of PLL ..... 80 MHz Timebase; other signals derived from 80 MHz Timebase including 20 MHz and 100 kHz Timebases

External Digital Triggers

Source ..... Any PFI, RTSI, PXI_TRIG, PXI_STAR

Polarity ..... Software-selectable for most signals

Analog input function ..... Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Convert Clock, Sample Clock Timebase

Analog output function ..... Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase

Counter/timer function ..... Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down

Digital waveform generation (DO) function ..... Sample Clock

Digital waveform acquisition (DI) function ..... Sample Clock

Device-To-Device Trigger Bus

PCI devices ..... RTSI <0..7>[1]

PXI devices ..... PXI_TRIG <0..7>, PXI_STAR

USB devices ..... None

Output selections ..... 10 MHz Clock; frequency generator output; many internal signals

[1] In other sections of this document, *RTSI* refers to RTSI <0..7> for PCI devices or PXI_TRIG <0..7> for PXI devices.

Debounce filter settings.....125 ns, 6.425 µs, 2.56 ms, disable; high and low transitions; selectable per input

Bus Interface

PCI/PXI devices .....3.3 V or 5 V signal environment

USB devices .....USB 2.0 Hi-Speed or Full-Speed[1,2]

DMA channels (PCI/PXI devices).....6, analog input, analog output, digital input, digital output, counter/timer 0, counter/timer 1

USB Signal Stream (USB devices).....4, can be used for analog input, analog output, digital input, digital output, counter/timer 0, counter/timer 1

All PXI-628*x* devices support one of the following features:

- May be installed in PXI Express hybrid slots
- Or, may be used to control SCXI in PXI/SCXI combo chassis

Table 1. PXI/SCXI Combo and PXI Express Chassis Compatibility

M Series Device	M Series Part Number	SCXI Control in PXI/SCXI Combo Chassis	PXI Express Hybrid Slot Compatible
PXI-6280	191501C-04	No	Yes
PXI-6281	191501C-03	No	Yes
PXI-6284	191501C-02	No	Yes
PXI-6289	191501C-01	No	Yes
	191501C-11	Yes	No
Earlier versions of PXI-628*x*	191501A-0*x* 191501B-0*x*	Yes	No

Power Requirements

PCI/PXI devices

Current draw from bus during no-load condition[3]

+5 V ..... 0.03 A

+3.3 V ..... 0.78 A

+12 V ..... 0.40 A

–12 V..... 0.06 A

Current draw from bus during AI and AO overvoltage condition[3]

+5 V ..... 0.03 A

+3.3 V ..... 1.26 A

+12 V ..... 0.43 A

–12 V..... 0.06 A

Caution USB-628*x* devices *must* be powered with NI offered AC adapter or a National Electric Code (NEC) Class 2 DC source that meets the power requirements for the device and has appropriate safety certification marks for country of use.

[1] If you are using a USB M Series device in full-speed mode, device performance will be lower and you will not be able to achieve maximum sampling/update rates.

[2] Operating on a full-speed bus may result in lower performance.

[3] Does not include P0/PFI/P1/P2 and +5 V terminals.

USB devices

Power supply requirements ..... 11 to 30 VDC, 20 W, locking or non-locking power jack with 0.080 in. diameter center pin, 5/16–32 thread for locking collars

Power supply fuse ..... 2 A, 250 V

Power Limits

Caution Exceeding the power limits may cause unpredictable behavior by the device and/or PC/chassis.

PCI devices

+5 V terminal (connector 0) ..... 1 A max[1]

+5 V terminal (connector 1) ..... 1 A max[1]

PXI devices

+5 V terminal (connector 0) ..... 1 A max[1]

+5 V terminal (connector 1) ..... 1 A max[1]

P0/PFI/P1/P2 and +5 V terminals combined ..... 2 A max

USB devices

+5 V terminal..... 1 A max[2]

P0/PFI/P1/P2 and +5 V terminals combined ..... 2 A max

Physical Requirements

Printed circuit board dimensions

NI PCI-6280/6281/6284/6289.... 10.6 cm × 15.5 cm (4.2 in. × 6.1 in.)

NI PXI-6280/6281/6284/6289.... Standard 3U PXI

Enclosure dimensions (includes connectors)

NI USB-6281/6289 Mass Termination..... 18.8 × 17.09 × 4.45 cm (7.4 × 6.73 × 1.75 in.)

NI USB-6281/6289 Screw Terminal ..... 26.67 × 17.09 × 4.45 cm (10.5 × 6.73 × 1.75 in.)

NI USB-6258/6289 OEM..... Refer to the *NI USB-622x/625x/628x OEM User Guide*

Weight

NI PCI-6280.....151 g (5.3 oz)

NI PCI-6281.....158 g (5.6 oz)

NI PCI-6284.....159 g (5.6 oz)

NI PCI-6289.....167 g (5.9 oz)

NI PXI-6280 .....218 g (7.7 oz)

NI PXI-6281 .....225 g (7.9 oz)

NI PXI-6284 .....229 g (8.1 oz)

NI PXI-6289 .....237 g (8.4 oz)

NI USB-6281 Mass Termination .....1.04 kg (2 lb 4.5 oz)

NI USB-6289 Mass Termination .....1.06 kg (2 lb 5.5 oz)

NI USB-6281 OEM .....261 g (9.2 oz)

NI USB-6289 OEM .....274 g (9.6 oz)

NI USB-6281 Screw Terminal ...1.46 kg (3 lb 3.4 oz)

NI USB-6289 Screw Terminal ...1.52 kg (3 lb 5.5 oz)

I/O connector

NI PCI/PXI-6280/6281 .....1 68-pin VHDCI

NI PCI/PXI-6284/6289 .....2 68-pin VHDCI

NI USB-6281 Mass Termination .....1 68-pin SCSI

NI USB-6289 Mass Termination .....2 68-pin SCSI

NI USB-6281 OEM .....1 34-pin IDC, 1 50-pin IDC

NI USB-6289 OEM .....2 34-pin IDC, 2 50-pin IDC

NI USB-6281 Screw Terminal ...64 screw terminals

NI USB-6289 Screw Terminal ...128 screw terminals

USB-6281/6289 Screw Terminal wiring .....16–28 AWG

Maximum Working Voltage[3]

NI 6280/6281/6284/6289

Channel to earth .....11 V, Measurement Category I

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

[1] Older revisions have a self-resetting fuse that opens when current exceeds this specification. Newer revisions have a traditional fuse that opens when current exceeds this specification. This fuse is not customer-replaceable; if the fuse permanently opens, return the device to NI for repair.

[2] Has a user-replaceable socketed fuse that opens when current exceeds this specification. Refer to the *M Series User Manual* for information about fuse replacement.

[3] *Maximum working voltage* refers to the signal voltage plus the common-mode voltage.

Environmental

Operating temperature

PCI/PXI devices.....0 to 55 °C

USB devices.....0 to 45 °C

Storage temperature.....–20 to 70 °C

Humidity.....10 to 90% RH, noncondensing

Maximum altitude .....2,000 m

Pollution Degree (indoor use only) 2

Shock and Vibration (PXI Devices 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.)

Safety

This product is 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, CSA 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

This product is 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 with shielded cables.

CE Compliance

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

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; 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.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as any other environmental information not included in this document.

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`.

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`.)

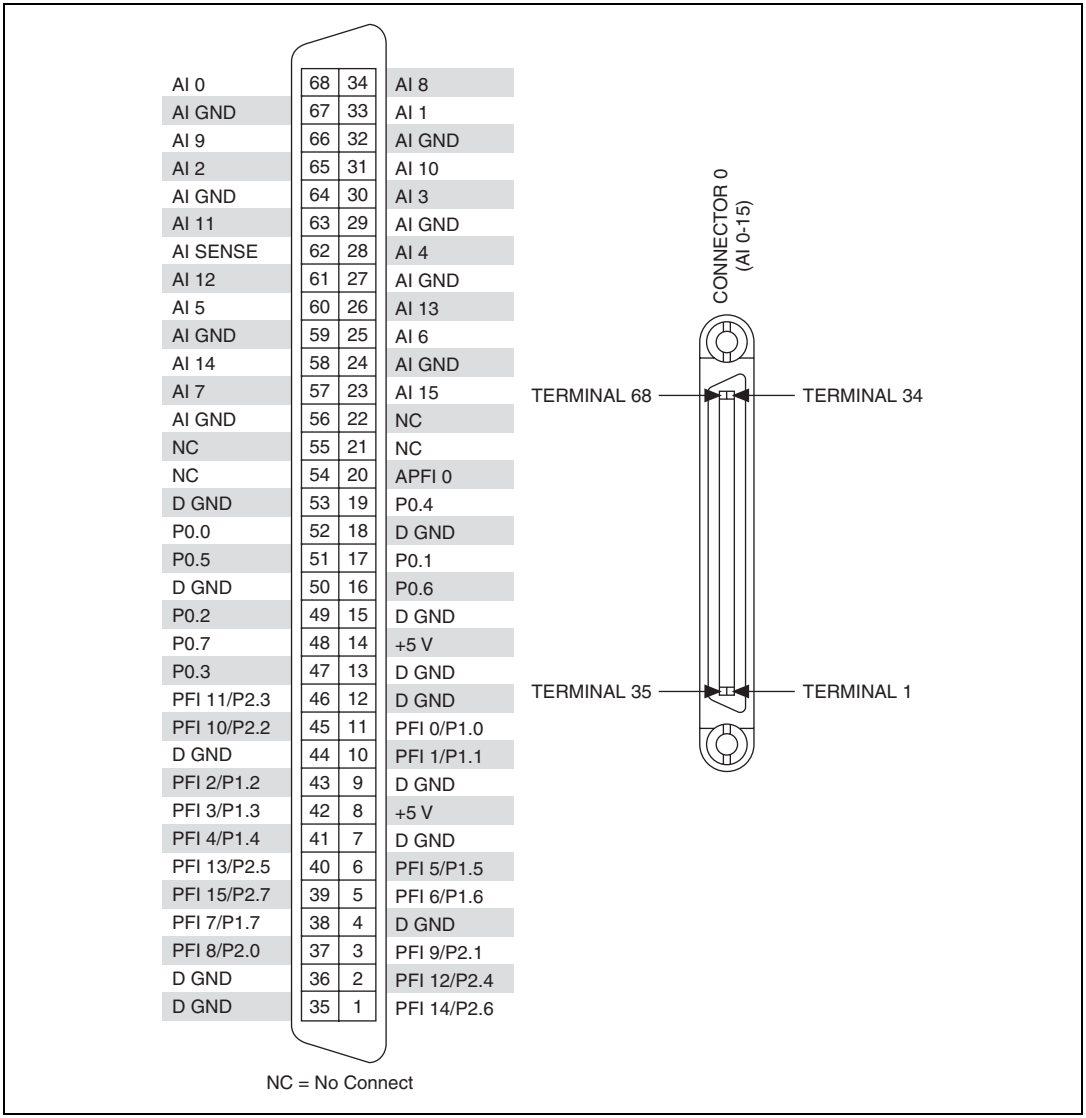


Figure 1. NI PCI/PXI-6280 Pinout

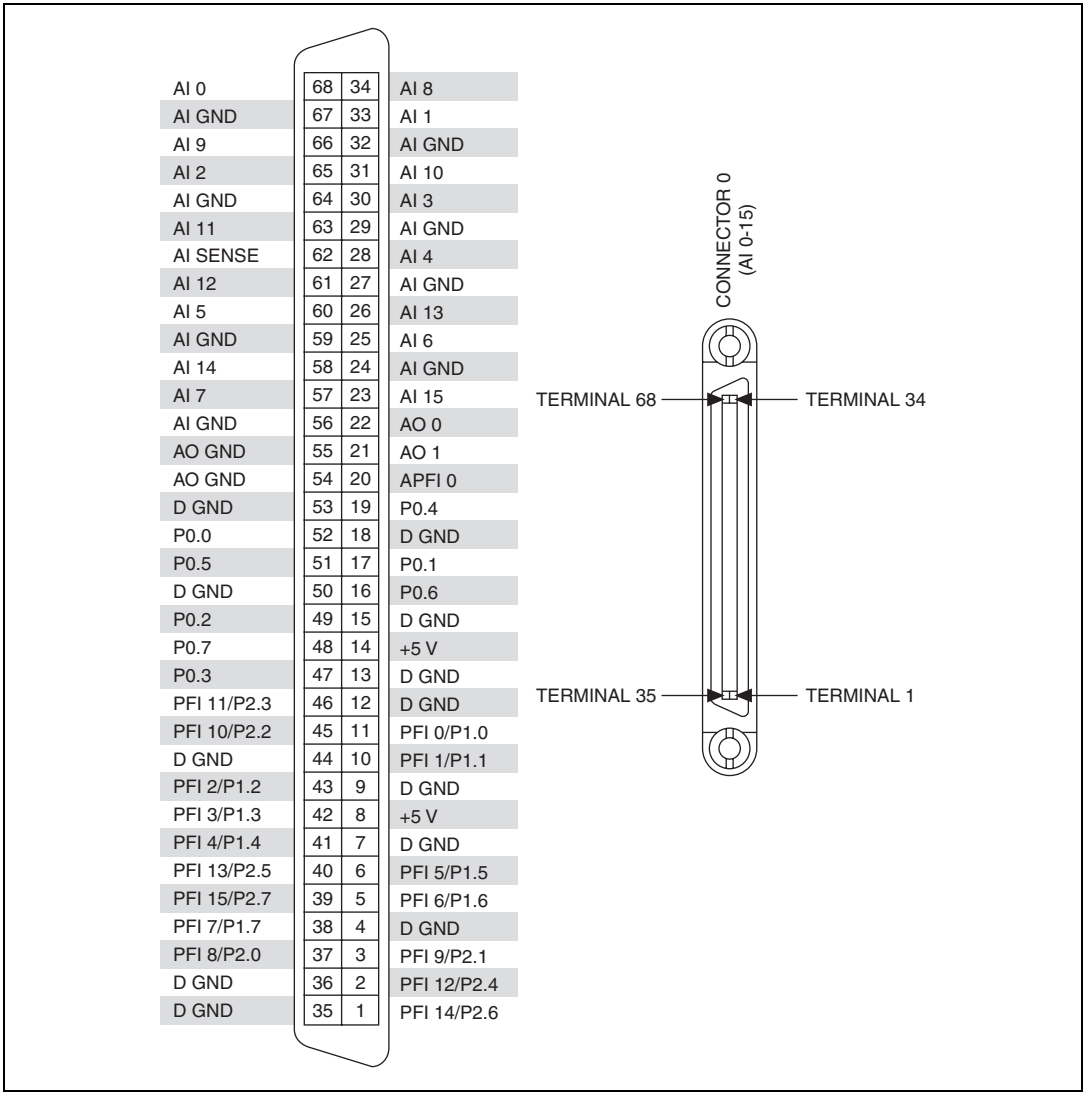


Figure 2. NI PCI/PXI-6281 Pinout

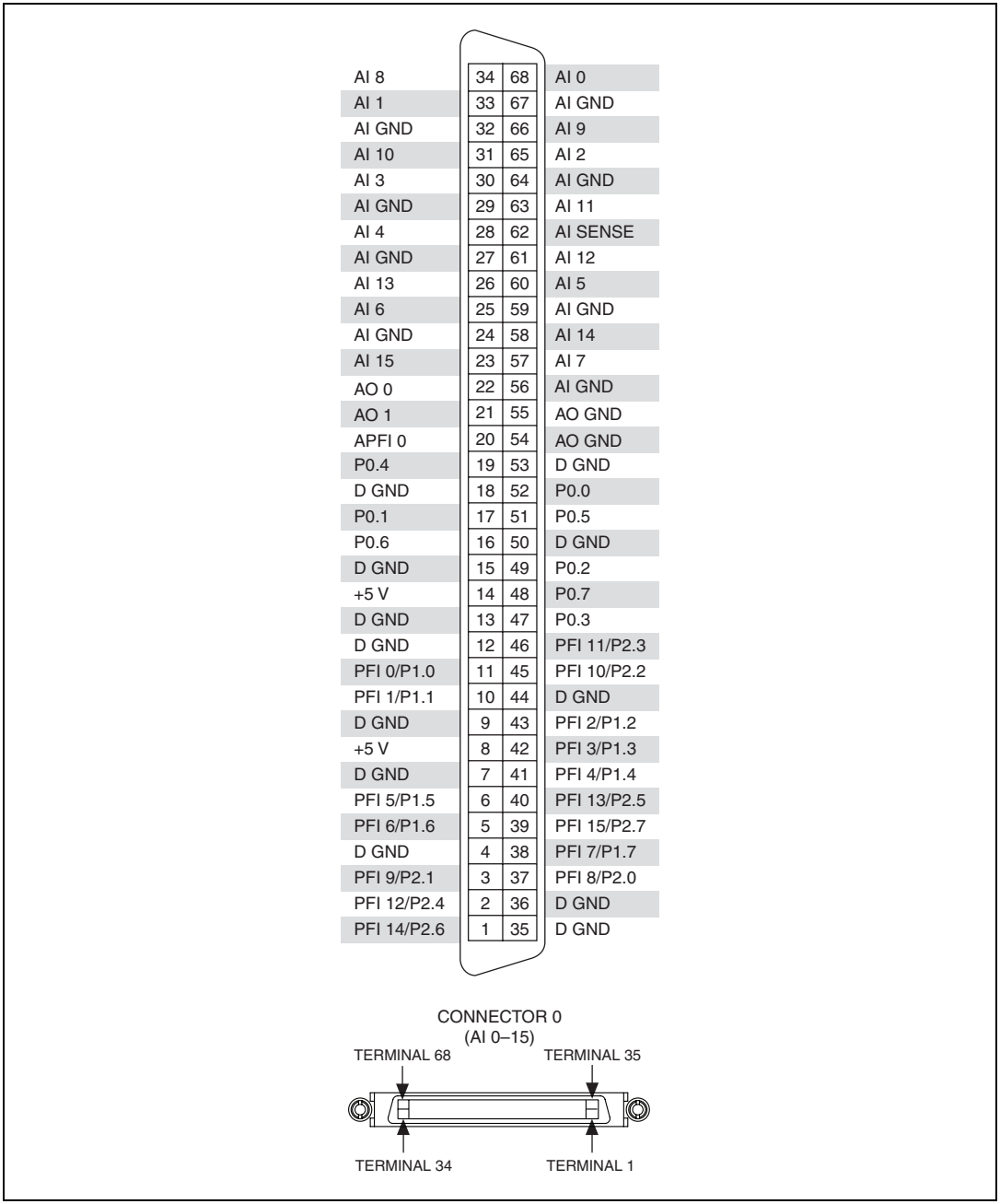


Figure 3. NI USB-6281 Mass Termination Pinout

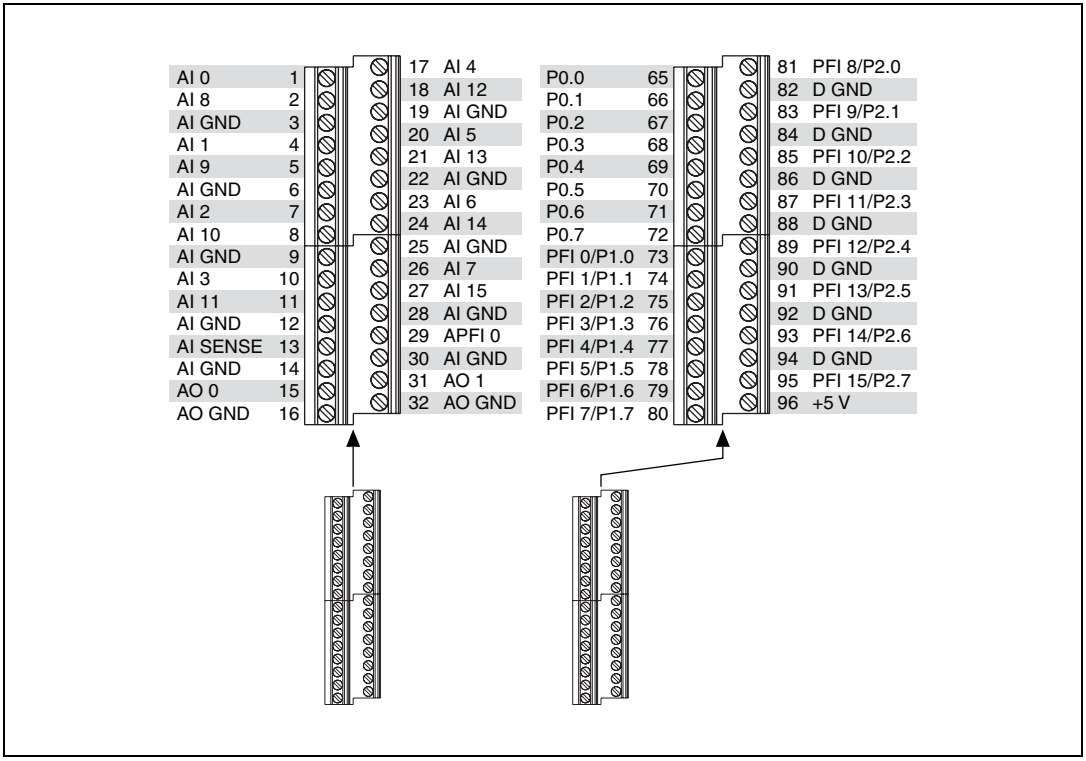


Figure 4. NI USB-6281 Screw Terminal Pinout

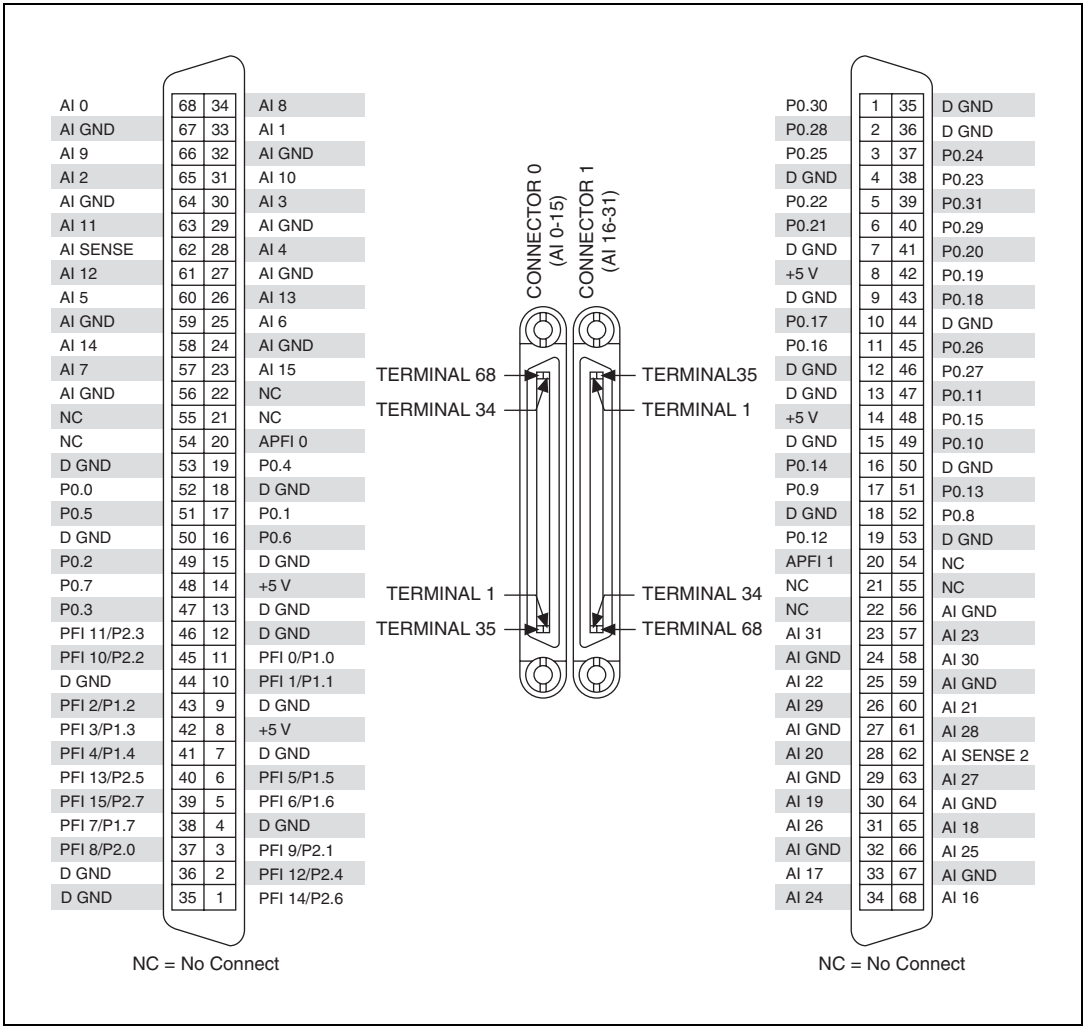


Figure 5. NI PCI/PXI-6284 Pinout

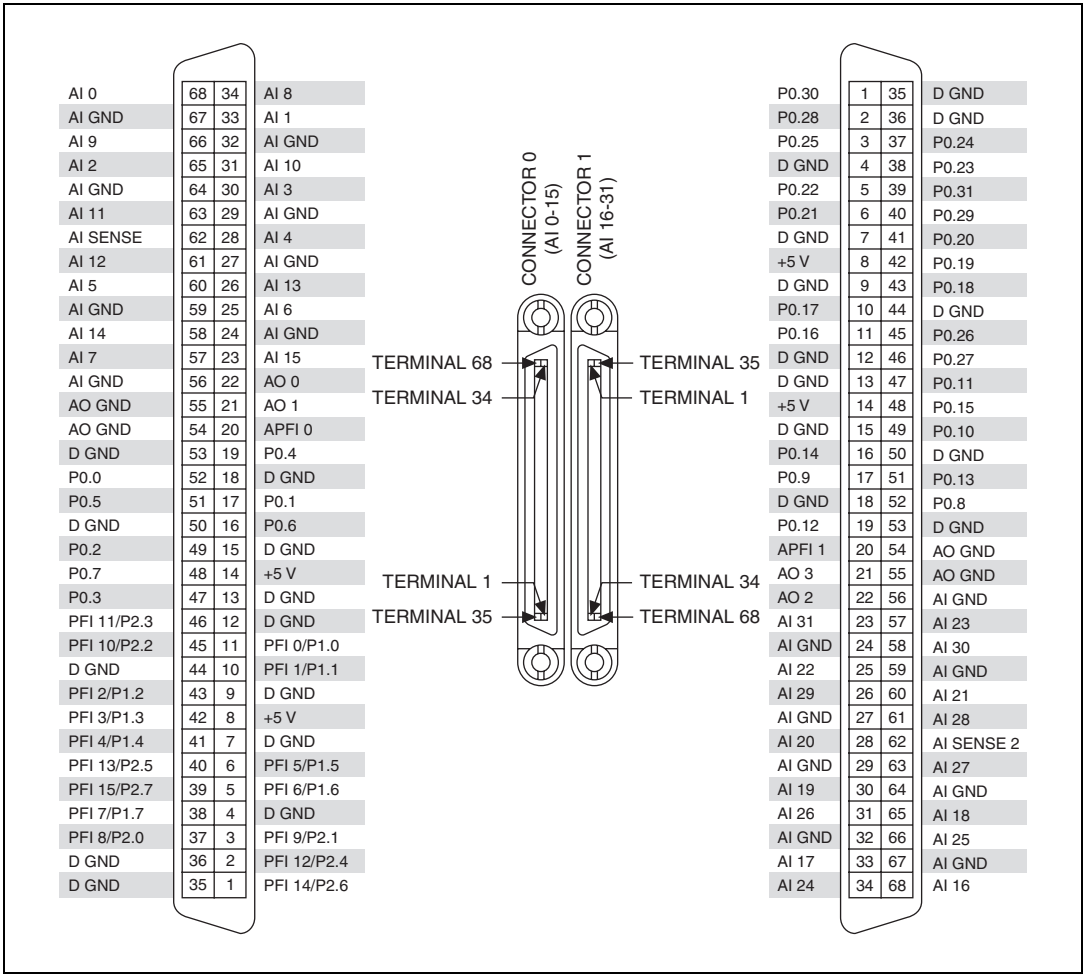


Figure 6. NI PCI/PXI-6289 Pinout

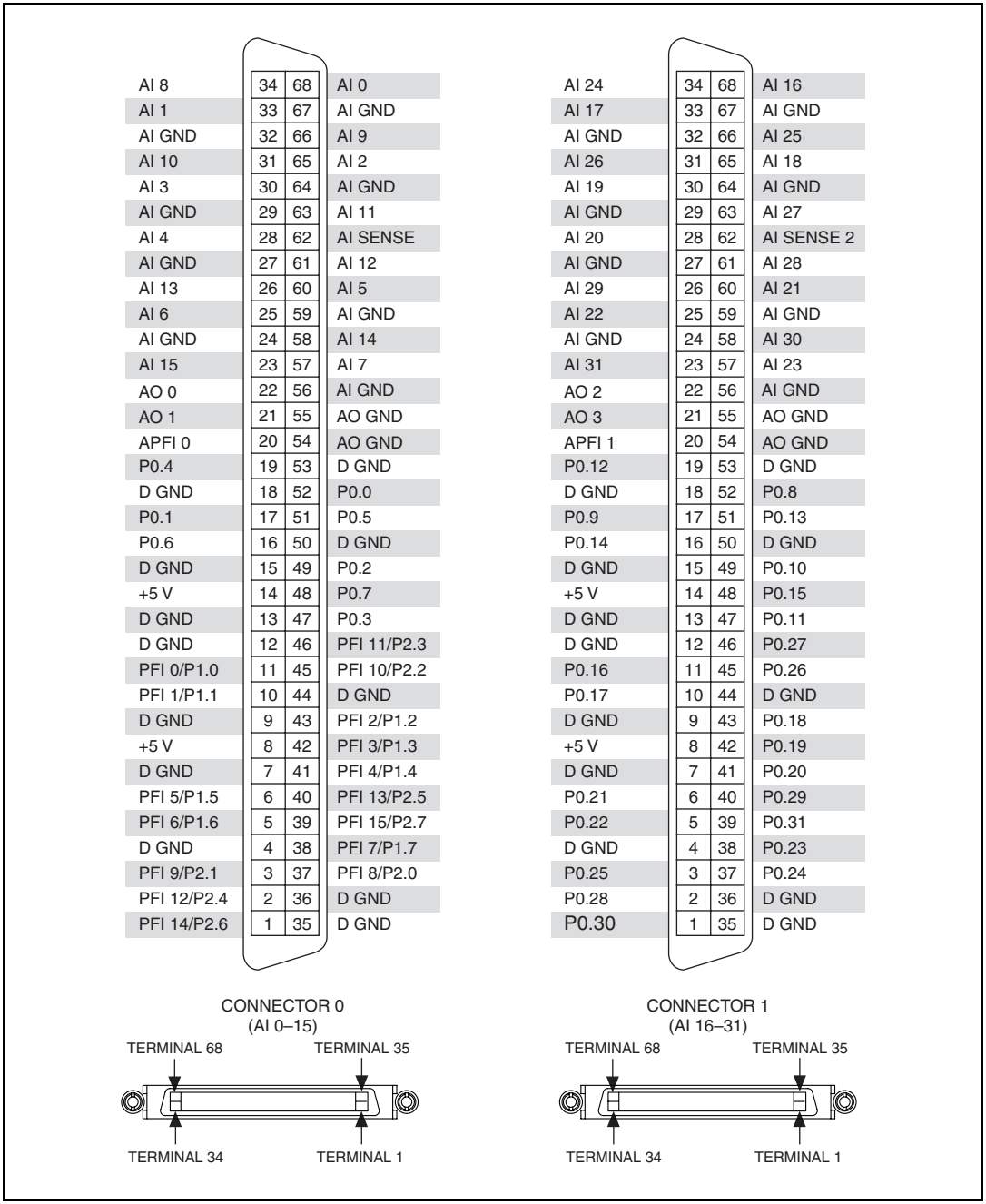


Figure 7. NI USB-6289 Mass Termination Pinout

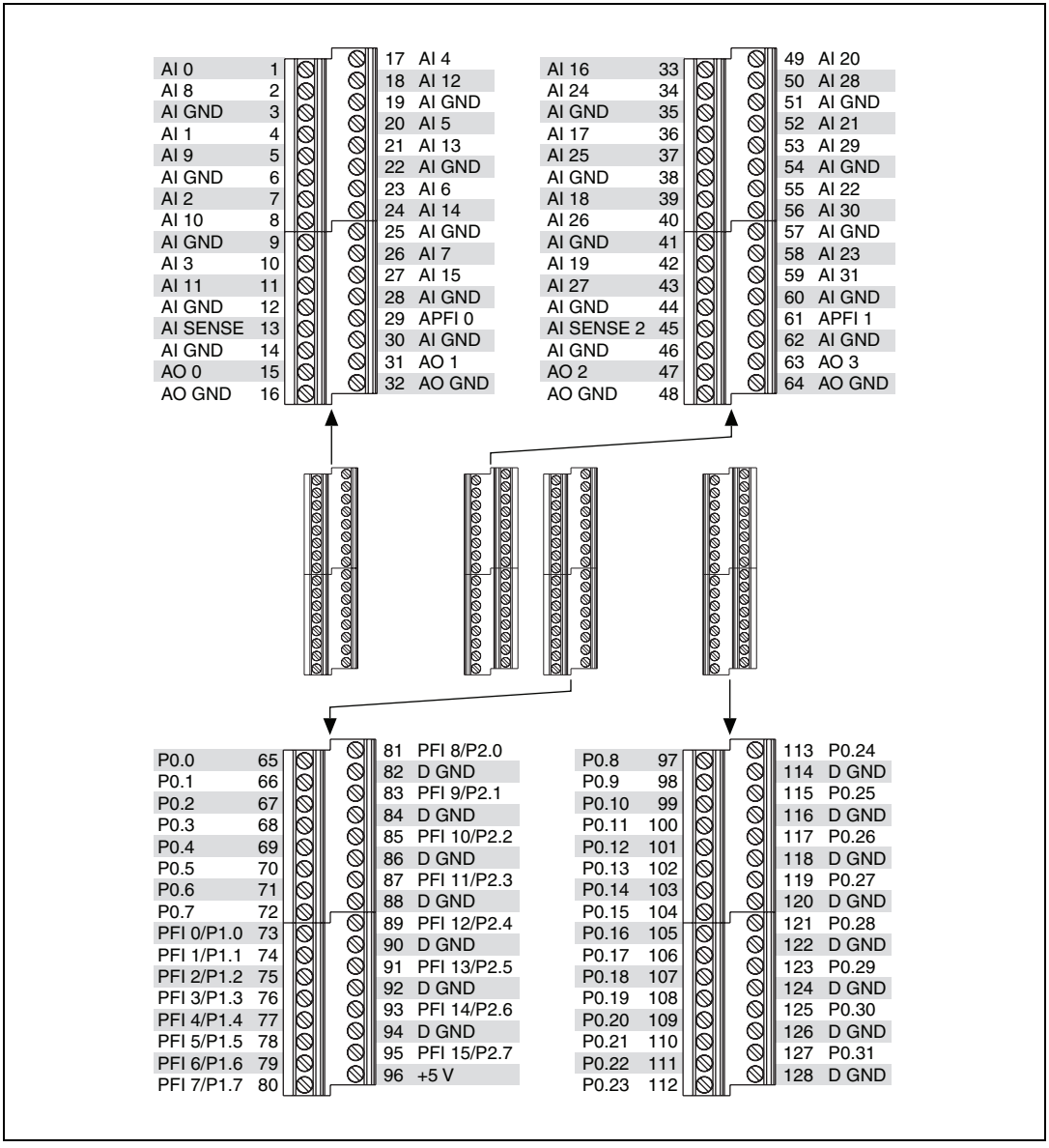


Figure 8. NI USB-6289 Screw Terminal Pinout