Requirements and Compatibility | Ordering Information | Detailed Specifications | Pinouts/Front Panel Connections
For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

Last Revised: 2014-11-06 07:14:22.0

NI X Series Multifunction Data Acquisition

Overview

NI X Series devices for USB, PCI Express, and PXI Express are the most advanced data acquisition devices ever designed by National Instruments. They feature significant improvements in onboard timing and triggering and optimizations for use with multicore PCs. X Series devices integrate high-performance analog, digital, and counter/timer functionality onto a single device, making them well-suited for a broad range of applications, from basic data logging to control and test automation.

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Requirements and Compatibility

OS Information

- PharLap
- Real-Time OS
- Windows 7
- Windows 7 64-bit
- Windows Vista x64/x86
- Windows XP

Driver Information

- NI-DAQmx

Software Compatibility

- ANSI C/C++
- LabVIEW
- LabVIEW Real-Time Module
- LabWindows/CVI
- Measurement Studio
- SignalExpress
- Visual Basic
- Visual Studio .NET

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Comparison Tables

Bus	Model Number	Analog Inputs (AI)	Max AI Sampling Rate (1-channel)	Max Total AI Throughput	Analog Outputs (AO)	Max AO Update Rate	Digital I/O Lines	Max Digital I/O Rate	Triggering
PCI Express	6320	16	250 kS/s	250 kS/s	0	-	24	1 MHz	Digital
PCI Express	6321	16	250 kS/s	250 kS/s	2	900 kS/s	24	1 MHz	Digital
PCI Express	6323	32	250 kS/s	250 kS/s	4	900 kS/s	48	1 MHz	Digital
USB, PCI Express, PXI Express	6341	16	500 kS/s	500 kS/s	2	900 kS/s	24	1 MHz	Digital
USB, PCI Express	6343	32	500 kS/s	500 kS/s	4	900 kS/s	48	1 MHz	Digital
USB, PCI Express	6351	16	1.25 MS/s	1.25 MS/s	2	2.86 MS/s	24	10 MHz	Analog, Digital
USB, PCI Express	6353	32	1.25 MS/s	1.25 MS/s	4	2.86 MS/s	48	10 MHz	Analog, Digital

Bus	Model Number	Analog Inputs (AI)	Max AI Sampling Rate (1-channel)	Max Total AI Throughput	Analog Outputs (AO)	Max AO Update Rate	Digital I/O Lines	Max Digital I/O Rate	Triggering
USB, PCI Express, PXI Express	6361	16	2 MS/s	2 MS/s	2	2.86 MS/s	24	10 MHz	Analog, Digital
USB, PCI Express, PXI Express	6363	32	2 MS/s	2 MS/s	4	2.86 MS/s	48	10 MHz	Analog, Digital
USB, PXI Express	6356	8 simultaneous	1.25 MS/s/channel	10 MS/s	2	3.33 MS/s	24	10 MHz	Analog, Digital
PXI Express	6358	16 simultaneous	1.25 MS/s/channel	20 MS/s	4	3.33 MS/s	48	10 MHz	Analog, Digital
USB, PXI Express	6366	8 simultaneous	2 MS/s/channel	16 MS/s	2	3.33 MS/s	24	10 MHz	Analog, Digital
PXI Express	6368	16 simultaneous	2 MS/s/channel	32 MS/s	4	3.33 MS/s	48	10 MHz	Analog, Digital

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Application and Technology

NI-STC3 Timing and Synchronization Technology

NI X Series multifunction DAQ devices include the NI-STC3, an ASIC designed by NI for advanced timing, triggering, and synchronization. This technology includes the following:

- Four counter/timers with more functionality than ever before, such as the ability to create a finite pulse train with a single counter
- A 100 MHz timebase for faster triggering response and more precise generation of analog and digital sample clocks
- Independent analog and digital timing engines
- Retriggerable measurement tasks for analog I/O, digital I/O, and counter/timers

Native PCI Express Interface

In contrast to a PCI-to-PCI Express bridge chip, which limits the bandwidth of the device to that of the PCI bus and introduces latency, PCI Express and PXI Express X Series devices use a native x1 PCI Express interface that provides up to 250 MB/s in each direction. National Instruments has also optimized this interface for low latency in single-point control applications. You can use X Series PCI Express boards in any PCI Express slot from x1 up to x16.

NI Signal Streaming

USB X Series devices include patented NI Signal Streaming, a technology that uses message-based instructions and device-side intelligence to ensure high-speed, bidirectional data transfer over USB. With USB X Series, you can concurrently transfer analog, digital, and counter data in both directions. The total device throughput over USB is PC-dependent; on some systems, up to 32 MB/s sustained transfers are possible.

Improved Mechanical Enclosure

USB X Series devices introduce a redesigned, extruded aluminum enclosure with an easy-access magnetic lid. This lid keeps signal wiring secured and shielded and can be opened easily when needed. The underside of the lid has a device-specific pinout label so that you can quickly determine the corresponding screw terminals for a given channel. The enclosure also includes a lockable USB port to prevent accidental removal during operation and a security slot that can be used with ordinary laptop locks to secure the device to a desk or workstation.

Board-Only Form Factor for OEM Applications

USB X Series devices are also available in a board-only form factor that is intended for high-volume OEM applications. These devices include standard 34-pin and 50-pin IDC connectors for easy mating to a daughter board, which can contain custom signal conditioning and connectivity.

Software Enhancements

PCI Express and PXI Express X Series devices are compatible with NI-DAQmx Version 9.0 or later driver software. USB X Series devices require NI-DAQmx Version 9.2 or later. More than a basic driver, NI-DAQmx includes the NI Measurement & Automation Explorer (MAX) configuration utility, the DAQ Assistant for rapid development of basic applications, and hundreds of example programs for NI LabVIEW and text-based languages. NI-DAQmx also includes LabVIEW SignalExpress LE basic data-logging software.

NI-DAQmx 9.0 introduces the ability to synchronize multiple PCI Express or PXI Express X Series devices with a single NI-DAQmx task, which previously took several tasks and manual routing of clocks and triggers. This version also introduces the fastest, easiest way to acquire measurement data to disk in the Technical Data Management Streaming (TDMS) format with the new Configure Logging VI. NI-DAQmx 9.2 introduces the ability to log acquired data to TDMS files within the DAQ Assistant Express VI.

With NI-DAQmx and intuitive LabVIEW graphical programming, you can easily develop applications that take advantage of today's multicore systems so you can perform acquisition, signal processing, and data logging on different CPU cores.

Simultaneous Sampling X Series

Some X Series devices for USB and PXI Express offer simultaneous sampling, with the same channel counts and connectivity as multiplexed devices.

Unlike multiplexed devices that reduce sampling rates as you add more channels, you can use simultaneous sampling devices to maintain sampling rates as you expand the number of channels. Simultaneous sampling X Series devices are available with up to 16 differential channels per device, and with PXI Express, you can sample more than 200 channels simultaneously.

Simultaneous X Series devices for USB include 32 or 64 MS onboard memory to ensure the transfer of finite acquisitions, even in the presence of heavy USB traffic.

Applications

Acquisition and Visualization

X Series devices include analog, digital, and counter circuitry for the most common types of static and waveform measurements. With LabVIEW, you can easily acquire the data and view it on a variety of graphs and displays. You can use configuration-based wizards called Express VIs to take measurements and perform signal processing with minimal programming.

Data Logging

Whether you are validating a new hardware design, monitoring conditions on a factory floor, or recording temperature changes during a scientific experiment, you need to take measurements, visualize your data, and often log it to disk. With X Series multifunction DAQ, you can develop a user-defined measurement system by using intuitive graphical programming software and incorporating the exact visualization, analysis, and data-logging capabilities your application requires.

Control Systems

If you need to control the temperature of a room, the speed of a motor, or the pressure of hydraulic fluids, you can use X Series DAQ hardware to connect sensors and actuators to your computer and build the control system that meets your exact application needs. The low-latency PCI Express bus improves single-point I/O performance, and with LabVIEW software and NI-DAQmx driver software, you can easily take sensor measurements, compare values to a setpoint, and update output signals. X Series devices also have four counter/timers for performing quadrature encoder measurements, pulse-width modulation, pulse train generation, frequency measurements, and much more, making them ideal for basic motor control.

Due to the inherent higher latency of USB as compared to PCI Express, National Instruments recommends that you use PCI Express or PXI Express X Series devices for applications that require single-point control or deterministic operation.

Test Automation

X Series DAQ hardware provides analog inputs, analog outputs, hardware-timed digital I/O, and four counter/timers on a single device, making it a cost-effective option for basic device under test characterization and test automation. With NI-DAQmx software, you can easily synchronize acquisition or generation on multiple subsystems, such as an analog input and analog output channel. In addition, you can easily synchronize two or more X Series devices for further expansion by using a RTSI cable for PCI Express devices or over the PXI Express backplane for PXI Express modules. It is possible to synchronize two or more USB X Series devices by exporting sample or reference clocks from the master device to the slave device, and using external wiring.

Compatible Accessories

PCI Express and PXI Express X Series devices use either a single or dual-stack 68-pin VHDCI female connector, depending on the number of analog and digital channels on the device. National Instruments offers several options for cables, from 0.5 m to 10 m and from low-cost to high-performance with shielding. Connector blocks are available with screw terminal, BNC, or custom connector types.

For measurements requiring signal conditioning, you can use X Series with SCXI signal conditioning modules.

You can purchase DIN rail or panel mount kits for USB X Series devices, as well as replacement power supplies and latching USB cables. See the model page for ordering information.

Upgrading

Because X Series devices use the same NI-DAQmx driver software as NI M Series devices, upgrading is easy. In addition, PCI Express and PXI Express X Series devices use the same VHDCI connector as PCI and PXI M Series. You can reuse your code and preserve your investment in accessories. The pinouts for X Series devices are backward-compatible with M Series devices.

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Ordering Information

For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories	Part Number
NI PXIe-6356			
NI PXIe-6356 Requires: 1 Cable , 1 Connector Block ;	781053-01	**Cable:** Shielded - SHC68-68-EPM Cable (2m) ***Also Available: [Unshielded]*	192061-02
		Connector Block: Spring-Screw_Terminals - SCB-68A ***Also Available: [BNC_Terminals, Custom]*	782536-01
NI PXIe-6358			
NI PXIe-6358 Requires: 1 Cable , 1 Connector Block ;	781054-01	**Connector 0:**	
		Cable: Shielded - SHC68-68-EPM Cable (2m) ***Also Available: [Unshielded]*	192061-02
		Connector Block: Spring-Screw_Terminals - SCB-68A ***Also Available: [BNC_Terminals]*	782536-01
		Connector 1:	
		Cable: Shielded - SHC68-68-EPM Cable (2m) ***Also Available: [Unshielded]*	192061-02
		Connector Block: Spring-Screw_Terminals - SCB-68A ***Also Available: [BNC_Terminals]*	782536-01

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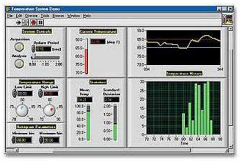
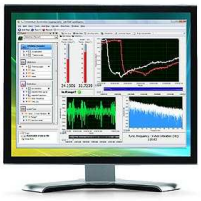
Software Recommendations

LabVIEW Professional Development System for Windows



- Advanced software tools for large project development
- Automatic code generation using DAQ Assistant and Instrument I/O Assistant
- Tight integration with a wide range of hardware
- Advanced measurement analysis and digital signal processing
- Open connectivity with DLLs, ActiveX, and .NET objects
- Capability to build DLLs, executables, and MSI installers

SignalExpress for Windows

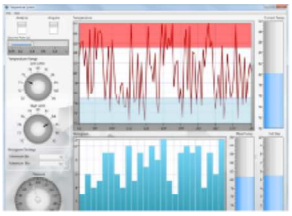


- Quickly configure projects without programming
- Control over 400 PC-based and stand-alone instruments
- Log data from more than 250 data acquisition devices
- Perform basic signal processing, analysis, and file I/O
- Scale your application with automatic LabVIEW code generation
- Create custom reports or easily export data to LabVIEW, DIAdem or Microsoft Excel

NI LabWindows™/CVI for Windows

- Real-time advanced 2D graphs and charts
- Complete hardware compatibility with IVI, VISA, DAQ, GPIB, and serial
- Analysis tools for array manipulation, signal processing statistics, and curve fitting
- Simplified cross-platform communication with network variables
- Measurement Studio .NET tools (included in LabWindows/CVI Full only)
- The mark LabWindows is used under a license from Microsoft Corporation.

NI Measurement Studio Professional Edition



- Customizable graphs and charts for WPF, Windows Forms, and ASP.NET Web Forms UI design
- Analysis libraries for array operations, signal generation, windowing, filters, signal processing
- Hardware integration support with native .NET data acquisition and instrument control libraries
- Automatic code generation for all NI-DAQmx data acquisition hardware
- Intelligent and efficient data-logging libraries for streaming measurement data to disk
- Support for Microsoft Visual Studio .NET 2012/2010/2008

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Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support -** Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums -** Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community -** Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide -** the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility -** an excellent option to train multiple employees at the same time.
- **Online instructor-led training -** lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits -** lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits **-** to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

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Detailed Specifications

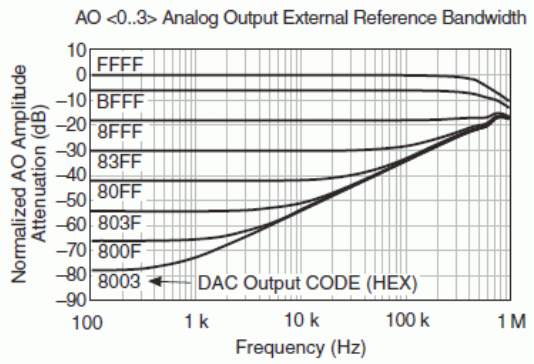
Specifications listed below are typical at 25 °C unless otherwise noted. Refer to the *X Series User Manual* for more information about NI PXIe-6356/6358 and NI USB-6356 (32 MS and 64 MS) devices.

Analog Input	
Number of channels	
NI 6356	8 differential
NI 6358	16 differential
ADC resolution	16 bits
DNL	No missing codes guaranteed

INL	Refer to the *AI Absolute Accuracy Table*
Sampling rate	
Maximum	1.25 MS/s per channel
Minimum	No minimum
Timing accuracy	50 ppm of sample rate
Timing resolution	10 ns
Input coupling	DC
Input range	±10 V, ±5 V, ±2 V, ±1 V
Maximum working voltage for all analog inputs	
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.	
CMRR (at 60 Hz)	75 dB
Bandwidth	1 MHz
THD	–80 dBFS
Input impedance	
Device on	
AI– to AI GND	>100 GΩ in parallel with 10 pF
AI+ to AI GND	>100 GΩ in parallel with 10 pF
Device off	
AI+ to AI GND	2 kΩ
AI– to AI GND	2 kΩ
Input bias current	±10 pA
Crosstalk (at 100 kHz)	
Adjacent channels	–80 dB
Non-adjacent channels	–100 dB
Input FIFO size	
NI PXIe-6356/6358	8,182 samples shared among channels used
NI USB-6356 (32 MS)	32 MS shared among channels used
NI USB-6356 (64 MS)	64 MS shared among channels used
Data transfers	
NI PXIe-6356/6358	DMA (scatter-gather), programmed I/O
NI USB-6356	USB Signal Stream, programmed I/O
Overvoltage protection (AI+, AI–)	
Device on	±36 V
Device off	±15 V
Input current during overvoltage conditions	±20 mA max/AI pin
Analog Triggers	
Number of triggers	1
Source	
NI 6356	AI <0..7>, APFI 0

NI 6358	AI <0..15>, APFI <0, 1>
Functions	Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Source level	
AI <0..15>	±full scale
APFI <0, 1>	±10 V
Resolution	16 bits
Modes	Analog edge triggering, analog edge triggering with hysteresis, and analog window triggering
Bandwidth (–3 dB)	
AI <0..15>	3.4 MHz
APFI <0, 1>	3.9 MHz
Accuracy	±1% of range
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 6356	2
NI 6358	4
DAC resolution	16 bits
DNL	±1 LSB max
Monotonicity	16 bit guaranteed
Accuracy	Refer to the *AO Absolute Accuracy Table*
Update rate	
Maximum	
One channel	3.3 MS/s
Two channels	3.3 MS/s
Three channels	3.3 MS/s
Four channels	3.3 MS/s
Minimum	No minimum
Timing accuracy	50 ppm of sample rate
Timing resolution	10 ns
Output range	±10 V, ±5 V, ±external reference on APFI <0, 1>
Output coupling	DC
Output impedance	0.4 Ω
Output current drive	±5 mA
Overdrive protection	±25 V
Overdrive current	10 mA

Power-on state	±5 mV
Power-on/off glitch	
NI PXIe-6356/6358	1.5 V peak for 200 ms
NI USB-6356	1.5 V peak for 200 ms [1]
Output FIFO size	8,191 samples shared among channels used
Data transfers	
NI PXIe-6356/6358	DMA (scatter-gather), programmed I/O
NI USB-6356	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)	2 µs
Slew rate	20 V/µs
Glitch energy at midscale transition	
±10 V range	6 nV s
External Reference	
APFI <0, 1> characteristics	
Input impedance	10 kΩ
Coupling	DC
Protection	
Power on	±30 V
Power off	±15 V
Range	±11 V
Slew rate	20 V/µs



Calibration (AI and AO)

Recommended warm-up time	15 minutes
Calibration interval	2 years

AI Absolute Accuracy Table

Nominal Range		Residual Gain Error (ppm of Reading)	Gain Tempco (ppm/°C)	Reference Tempco (ppm/°C)	Residual Offset Error (ppm of Range)	Offset Tempco (ppm of Range/°C)	INL Error (ppm of Range)	Random Noise, σ (µV $_{rms}$)	Absolute Accuracy at Full Scale* (µV)
Positive Full Scale	Negative Full Scale								
10	–10	95	8	5	15	35	46	252	2498
5	–5	102	8	5	15	36	46	134	1289

Nominal Range		Residual Gain Error (ppm of Reading)	Gain Tempco (ppm/°C)	Reference Tempco (ppm/°C)	Residual Offset Error (ppm of Range)	Offset Tempco (ppm of Range/°C)	INL Error (ppm of Range)	Random Noise, σ (μV_{rms})	Absolute Accuracy at Full Scale* (µV)
Positive Full Scale	Negative Full Scale								
2	–2	102	8	5	15	42	46	71	528
1	–1	120	8	5	15	50	46	61	291

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

NoiseUncertainty $\frac{RandomNoise \cdot 3}{\sqrt{10{,}000}}$ For a coverage factor of 3 σ and averaging 10,000 points.

*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 = 10,000
CoverageFactor = 3 σ

For example, on the 10 V range, the absolute accuracy at full scale is as follows:
GainError = 95 ppm + 8 ppm · 1 + 5 ppm · 10
GainError = 153 ppm

OffsetError = 15 ppm + 35 ppm · 1 + 46 ppm
OffsetError = 96 ppm

NoiseUncertainty= $\frac{252\ \mu V \cdot 3}{\sqrt{10{,}000}}$ NoiseUncertainty = 7.6 µV

AbsoluteAccuracy = 10 V · (GainError) + 10 V · (OffsetError) + NoiseUncertainty AbsoluteAccuracy = 2,498 µV

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

AO Absolute Accuracy Table

Nominal Range		Residual Gain Error (ppm of Reading)	Gain Tempco (ppm/°C)	Reference Tempco (ppm/°C)	Residual Offset Error (ppm of Range)	Offset Tempco (ppm of Range/°C)	INL Error (ppm of Range)	Absolute Accuracy at Full Scale* (µV)
Positive Full Scale	Negative Full Scale							
10	–10	110	17	5	65	1	64	3,066
5	–5	117	8	5	65	1	64	1,526

*Absolute Accuracy at full scale numbers is valid immediately following internal calibration and assumes 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 6356	24 total, 8 (P0.<0..7>), 16 (PFI <0..7>/P1, PFI <8..15>/P2)
NI 6358	48 total, 32 (P0.<0..31>), 16 (PFI <0..7>/P1, PFI <8..15>/P2)
Ground reference	D GND
Direction control	Each terminal individually programmable as input or output
Pull-down resistor	50 kΩ typ, 20 kΩ min
Input voltage protection [2]	±20 V on up to two pins

Waveform Characteristics (Port 0 Only)

Terminals used	
NI 6356	Port 0 (P0.<0..7>)
NI 6358	Port 0 (P0.<0..31>)
Port/sample size	
NI 6356	Up to 8 bits

NI 6358	Up to 32 bits
Waveform generation (DO) FIFO	2,047 samples
Waveform acquisition (DI) FIFO	255 samples
DI Sample Clock frequency	
NI PXIe-6356/6358	0 to 10 MHz, system and bus activity dependent
NI USB-6356	0 to 1 MHz system and bus activity dependent
DO Sample Clock frequency	
NI PXIe-6356/6358	
Regenerate from FIFO	0 to 10 MHz
Streaming from memory	0 to 10 MHz, system and bus activity dependent
NI USB-6356	
Regenerate from FIFO	0 to 10 MHz
Streaming from memory	0 to 1 MHz system and bus activity dependent
Data transfers	
NI PXIe-6356/6358	DMA (scatter-gather), programmed I/O
NI USB-6356	USB Signal Stream, programmed I/O
Digital line filter settings	160 ns, 10.24 µs, 5.12 ms, disable
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	90 ns, 5.12 µs, 2.56 ms, custom interval, disable; programmable high and low transitions; selectable per input

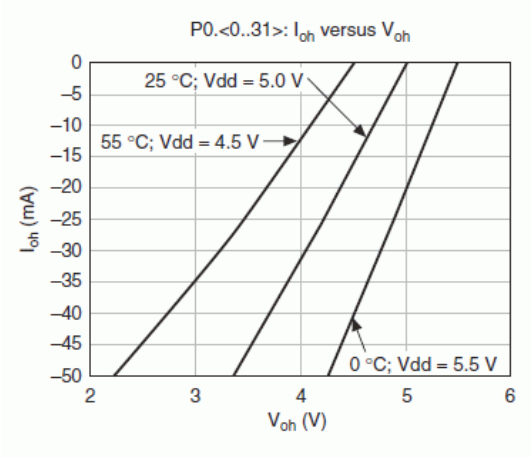
Recommended Operation Conditions

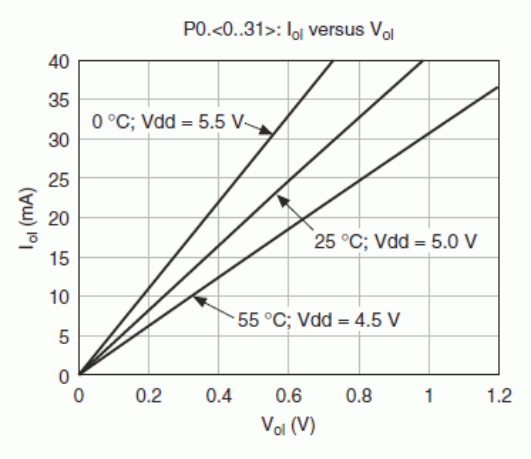
Level	Min	Max
Input high voltage (V_{IH})	2.2 V	5.25 V
Input low voltage (V_{IL})	0 V	0.8 V
Output high current (I_{OH})		
P0.<0..7>	—	–24 mA
PFI <0..15>/P1/P2	—	–16 mA
Output low current (I_{OL})		
P0.<0..7>	—	24 mA
PFI <0..15>/P1/P2	—	16 mA

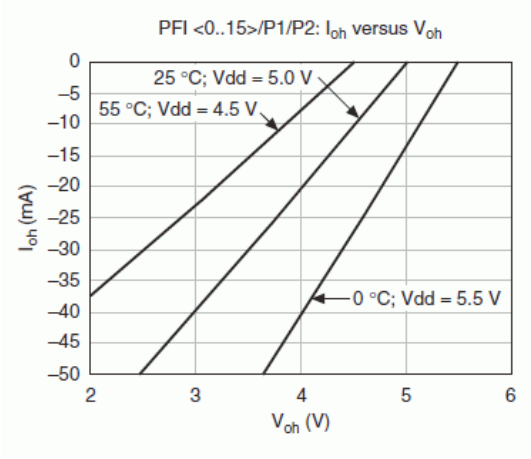
Electrical Characteristics

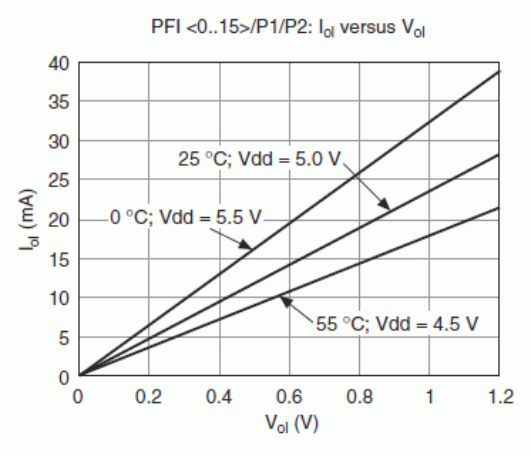
Level	Min	Max
Positive-going threshold (VT+)	—	2.2 V
Negative-going threshold (VT–)	0.8 V	—
Delta VT hysteresis (VT+ – VT–)	0.2 V	—
I_{IL} input low current (V_{in} = 0 V)	—	–10 µA
I_{IH} input high current (V_{in} = 5 V)	—	250 µA

Digital I/O Characteristics









General-Purpose Counter/Timers	
Number of counter/timers	4
Resolution	32 bits
Counter measurements	Edge counting, pulse, pulse width, 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	100 MHz, 20 MHz, 100 kHz
External base clock frequency	
NI PXIe-6356/6358	0 MHz to 25 MHz; 0 MHz to 100 MHz on PXIe-DSTAR<A, B>
NI USB-6356	0 MHz to 25 MHz
Base clock accuracy	50 ppm
Inputs	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down, Sample Clock
Routing options for inputs	
NI PXIe-6356/6358	Any PFI, PXIe-DSTAR<A, B>, PXI_TRIG, PXI_STAR, analog trigger, many internal signals
NI USB-6356	Any PFI, analog trigger, many internal signals
FIFO	127 samples per counter
Data transfers	
NI PXIe-6356/6358	Dedicated scatter-gather DMA controller for each counter/timer, programmed I/O
NI USB-6356	USB Signal Stream, programmed I/O

Frequency Generator

Number of channels	1
Base clocks	20 MHz, 10 MHz, 100 kHz
Divisors	1 to 16
Base clock accuracy	50 ppm

Output can be available on any PFI terminal.

Phase-Locked Loop (PLL)

Number of PLLs	1

Reference clock locking frequencies

Reference Signal	Locking Input Frequency (MHz)	
	PXIe	USB
PXIe_DSTAR<A, B>	10, 20, 100	—
PXI_STAR	10, 20	—
PXIe_CLK100	100	—
PXI_TRIG <0..7>	10, 20	—
PFI <0..15>	10, 20	10

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

External Digital Triggers

Source	
NI PXIe-6356/6358	Any PFI, PXIe-DSTAR<A, B>, PXI_TRIG, PXI_STAR
NI USB-6356	Any PFI
Polarity	Software-selectable for most signals
Analog input function	Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Analog output function	Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Counter/timer functions	Gate, Source, HW_Arm, Aux, A, B, Z, Up_Down, Sample Clock
Digital waveform generation (DO) function	Start Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Digital waveform acquisition (DI) function	Start Trigger, Reference Trigger, Pause Trigger, Sample Clock, Sample Clock Timebase
Device-To-Device Trigger Bus	
Input source	
NI PXIe-6356/6358	PXI_TRIG <0..7>, PXI_STAR, PXIe-DSTAR<A, B>
NI USB-6356	None
Output destination	
NI PXIe-6356/6358	PXI_TRIG <0..7>, PXIe-DSTARC
NI USB-6356	None
Output selections	10 MHz Clock; frequency generator output; many internal signals
Debounce filter settings	90 ns, 5.12 µs, 2.56 ms, custom interval, disable; programmable high and low transitions; selectable per input

Bus Interface

NI PXIe-6356/6358	
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	8, analog input, analog output, digital input, digital output, counter/timer 0, counter/timer 1, counter/timer 2, counter/timer 3

All NI PXIe-6356/6358 devices may be installed in PXI Express slots or PXI Express hybrid slots.

NI USB-6356	
USB compatibility	USB 2.0 Hi-Speed or full-speed [3]
USB Signal Stream	8, can be used for analog input, analog output, digital input, digital output, counter/timer 0, counter/timer 1, counter/timer 2, counter/timer 3

Power Requirements

NI PXIe-6356	
+3.3 V	4.7 W
+12 V	15.4 W
NI PXIe-6358	
+3.3 V	7.8 W
+12 V	22.2 W

Caution NI USB-6356 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.

NI USB-6356	
Power supply requirements	11 to 30 VDC, 30 W, 2 positions 3.5mm pitch pluggable screw terminal with screw locks similar to Phoenix Contact MC 1,5/2-STF-3,5 BK
Power input mating connector	Phoenix Contact MC 1,5/2-GF-3,5 BK or equivalent

Current Limits

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

NI PXIe-6356	
+5 V terminal (connector 0)	1 A max [4]
NI PXIe-6358	
+5 V terminal (connector 0)	1 A max [4]
+5 V terminal (connector 1)	1 A max [4]
P0/PFI/P1/P2 and +5 V terminals combined	1.8 A max
NI USB-6356	
+5 V terminal	1 A max [4]

Physical Requirements

Printed circuit board dimensions	
NI PXIe-6356/6358	Standard 3U PXI
Enclosure dimensions (includes connectors)	
NI USB-6356	26.4 × 17.3 × 3.6 cm (10.4 × 6.8 × 1.4 in.)
Enclosure dimensions (without connectors)	
NI USB-6356 OEM	175.3 x 162.6 mm (6.9 x 6.4 in.)
Weight	
NI PXIe-6356	168 g (5.9 oz)
NI PXIe-6358	241 g (8.5 oz)
NI USB-6356	1.42 kg (3 lb 2 oz)
NI USB-6356 OEM	172 g (6.0 oz)

I/O connector

NI PXIe-6356	1 68-pin VHDCI
NI PXIe-6358	2 68-pin VHDCI
NI USB-6356	64 screw terminals

NI PXIe-6356/6358 mating connectors:

- 68-Pos Right Angle Single Stack PCB-Mount VHDCI (Receptacle), MOLEX 71430-0011
- 68-Pos Right Angle Dual Stack PCB-Mount VHDCI (Receptacle), MOLEX 74337-0016
- 68-Pos Offset IDC Cable Connector (Plug) (SHC68-*), MOLEX 71425-3001

NI USB-6356 screw terminal wiring	16–24 AWG

Maximum Working Voltage [5]

Channel-to-earth	11 V, Measurement Category I

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

Environmental

Operating temperature	
NI PXIe-6356/6358	0 to 55 °C
NI USB-6356	0 to 45 °C
Storage temperature	–40 to 70 °C
Humidity	10 to 90% RH, noncondensing
Maximum altitude	2,000 m
Pollution Degree (indoor use only)	2
Shock and Vibration (NI PXIe-6356/6358 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 Standards

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 the *Online Product Certification* section.

Electromagnetic Compatibility

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

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note For EMC declarations and certifications, refer to the *Online Product Certification* section.

Caution When operating this product, use shielded cables and accessories.

CE Compliance CE

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)

Online Product Certification

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 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 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 Electrical and Electronic Equipment, 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.)

[1] Typical behavior. Time period may be longer due to host system USB performance. Time period will be longer during firmware updates.

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

[3] Operating on a full-speed bus will result in lower performance and you might not be able to achieve maximum sampling/update rates.

[4] Has a self-resetting fuse that opens when current exceeds this specification.

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

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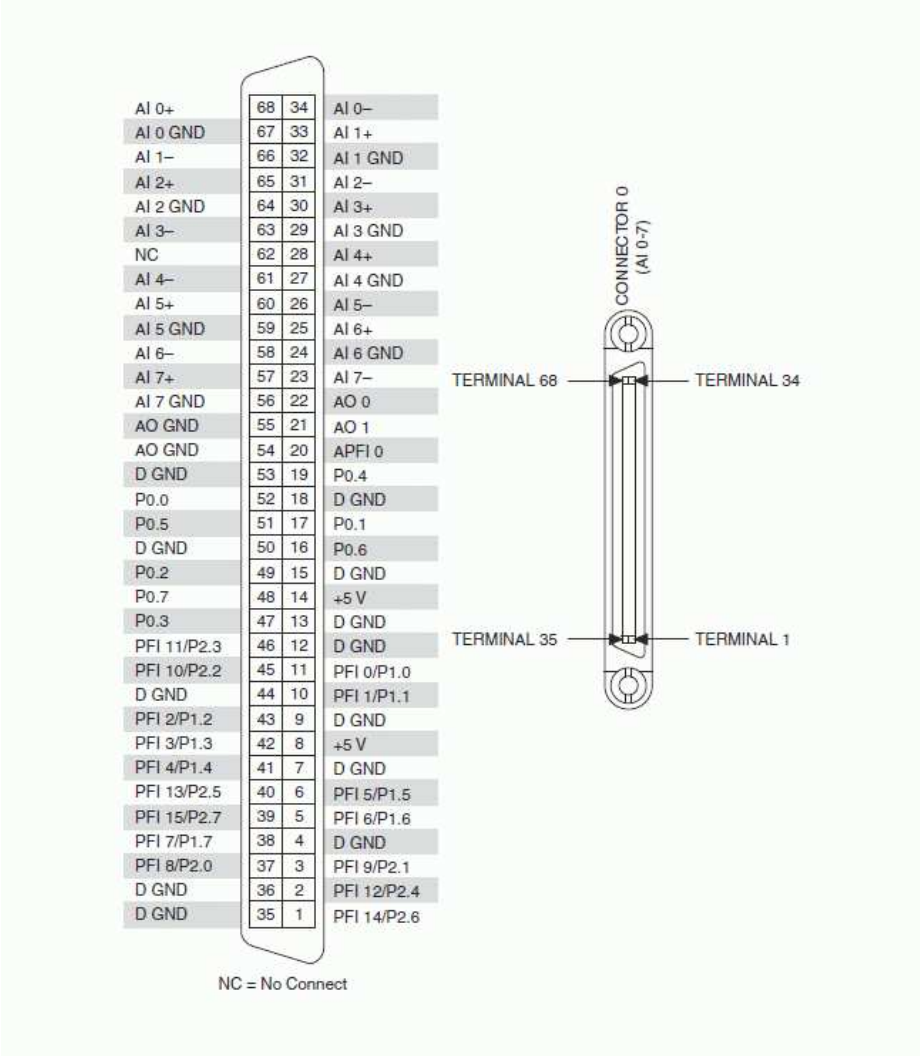
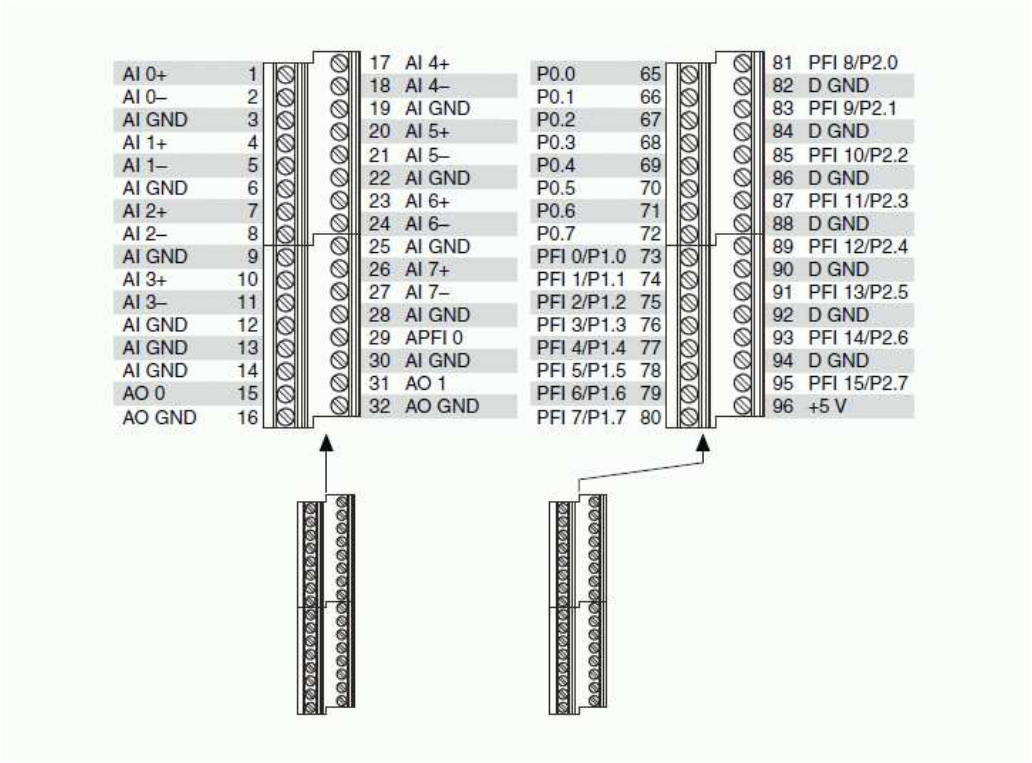
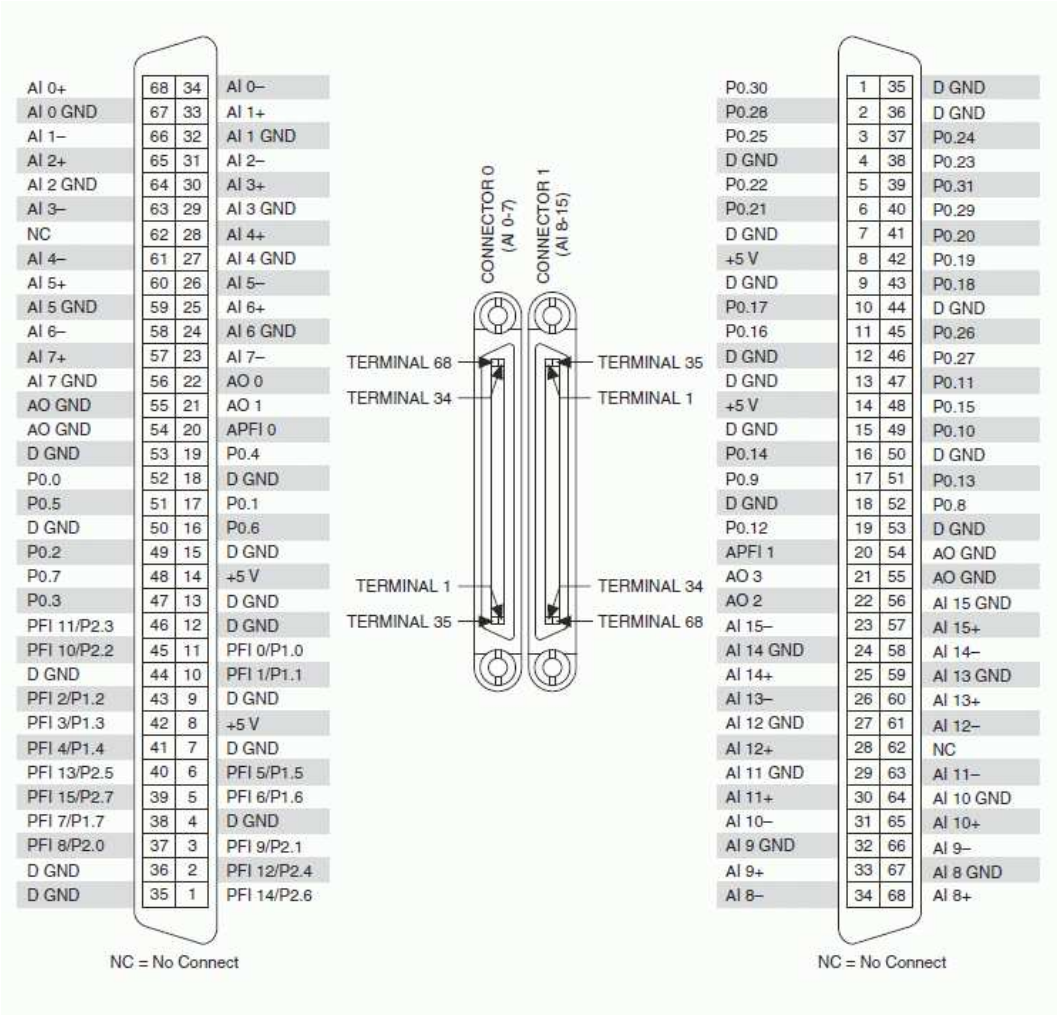


NI PXIe-6356 Pinout



NI USB-6356 Pinout



NI PXIe-6358 Pinout

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