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NI 651x, Low-Cost Industrial Digital I/O – 30 V, Bank Isolated





- 32- or 64-bank optically isolated inputs and outputs (±30 VDC)
- High-reliability industrial feature set – isolation, programmable power-up states, digital I/O watchdogs, change detection, programmable input filters
- Low-cost solution with superior features for data acquisition, manufacturing test, and industrial control applications
- Direct connection to industrial sensors and actuators
- NI-DAQmx driver software for highest productivity and performance

Overview

NI 651x devices are industrial 32- or 64-channel isolated digital I/O interfaces for PCI and PXI/CompactPCI systems. You can wire each input bank in a source or sink configuration and input and output at digital levels up to ±30 VDC with high current switching capability. NI 651x devices are ideal for general-purpose data acquisition applications as well as industrial control and automated manufacturing test. With high current drive and isolation, you can connect the digital I/O directly to a wide array of 24 V electronic devices, sensors, and actuators. NI 651x devices offer superior features and high value for industrial control and manufacturing test applications such as factory automation, embedded machine control, and production line verification. These devices have been designed to incorporate the latest hardware technologies and provide innovative features for applications requiring ease of use, high reliability, and performance. NI 651x devices take advantage of NI-DAQmx software, which includes technology to speed up application development with many helpful features including the DAQ Assistant, automatic code generation, and high-performance multithreaded streaming technology.

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Requirements and Compatibility

OS Information

Real-Time OS
Windows Vista x64/x86
Windows XP

Driver Information

NI-DAQmx

Software Compatibility

ANSI C/C++
LabVIEW
LabWindows/CVI
Measurement Studio
Visual Basic
Visual C#
Visual Studio .NET

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Comparison Tables

Product	Bus	Input Lines	Output Lines	Isolation	Max Range (VDC)	Low Thresh (VDC)	High Thresh (VDC)	Output Current (mA)
NI 6510	PCI	32 source/sink	-	Bank	±30	±4	±11	-
NI 6511	PCI,PXI	64 source/sink	-	Bank	±30	±4	±11	-
NI 6512	PCI, PXI	-	64 source	Bank	±30	-	-	350 (75)
NI 6513	PCI, PXI	-	64 sink	Bank	±30	-	-	500 (120)
NI 6514	PCI, PXI	32 source/sink	32 source	Bank	±30	±4	±11	350 (75)
NI 6515	PCI, PXI	32 source/sink	32 sink	Bank	±30	±4	±11	500 (120)

Product	Bus	Input Lines	Output Lines	Isolation	Max Range (VDC)	Low Thresh (VDC)	High Thresh (VDC)	Output Current (mA)
NI 6516	PCI	-	32 source	Bank	±30	-	-	350 (75)
NI 6517	PCI	-	32 sink	Bank	±30	-	-	500 (120)
NI 6518	PCI	16 source/sink	16 source	Bank	±30	±4	±11	350 (75)
NI 6519	PCI	16 source/sink	16 sink	Bank	±30	±4	±11	500 (120)

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Application and Technology

Note: When using all lines at a 100 percent duty cycle, the maximum drive current for NI 6512 and NI 6514 devices is 75 mA, and 120 mA for NI 6513 and NI 6515 devices. When using only one output line in each bank at a 100 percent duty cycle, the maximum drive current for NI 6512 and NI 6514 devices is 350 mA, and 500 mA for NI 6513 and NI 6515 devices.

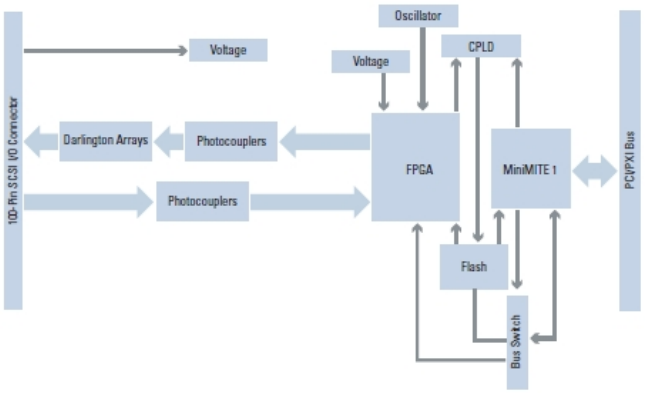
High-Reliability Industrial Feature Set

NI 651x devices offer a set of high-reliability features designed to automate even the most demanding applications.

Isolation provides an extended voltage range and direct connection to industrial sensors and actuators
Programmable power-up states offer safe operation when connected to pumps/valves/motors/relays
Digital I/O watchdogs detect computer or application errors and ensure safe recovery
Change detection triggers your application and returns I/O data after a digital event with minimal processor usage
Programmable input filters eliminate glitches/spikes and remove noise

Connect Sensors Directly with Isolation

Isolation is a form of built-in signal conditioning that offers several advantages, such as an extended voltage range and direct connection to industrial sensors and actuators. Isolation also improves signal quality and protects computer circuitry. It physically and electrically separates two parts of a circuit, which breaks ground loops, improves common-mode voltage and noise rejection, and permits the two parts of the circuit to be at different voltage levels. Many industrial applications require isolation to protect the electronics from transient voltage spikes and provide greater common-mode noise rejection in electrically noisy environments containing machinery and inductive loads. In bank-to-bank isolated devices, such as an NI 651x, each bank (or group) of several channels shares the same ground but is isolated from other banks.



Glitch-Free Startup with Programmable Power-Up States

With programmable power-up states, you can configure the initial output states of the digital I/O device in software to ensure glitch-free operations when connected to industrial actuators such as pumps, valves, motors, and relays. The digital I/O device holds these I/O states after receiving power, so your computer can boot and your software application can begin running. Programmable power-up states are glitch-free, meaning the outputs never go through an incorrect state during power up. You can configure each digital line as high-output or low-output. The digital I/O device stores the settings in onboard nonvolatile memory and implements the power-up states automatically after power is applied to the device.

Detect and Recover with Digital I/O Watchdogs

NI digital I/O watchdogs provide protection against a wide variety of fault conditions:

Computer crash – total OS crash
Application crash – software application ceases to respond
Driver crash – device driver ceases to respond
PCI bus failure – communications cease to respond

With watchdogs, the digital outputs go to a safe recovery state when a fault condition is detected and the watchdog timer expires. Watchdogs are important whenever the device is connected to actuators such as pumps, valves, motors, and relays. The digital I/O device monitors the software application, and if the application fails to respond within the time limit, the device automatically sets the output lines to a user-defined safe state. The device remains in the watchdog state until the watchdog timer is disarmed by the application and new I/O values are written, the NI 651x is reset, or the computer is restarted.

Trigger Your Application with Change Detection

With change detection, you can automatically trigger your software application to perform a digital read operation upon a digital change of state. A digital change of state is defined as the rising edge (0 to 1 transition) or falling edge (1 to 0 transition) on one or more digital lines. With change detection, you can monitor digital events with minimal processor usage. No polling is necessary because the digital I/O device generates an interrupt to automatically wake up your application. Using NI-DAQmx software technology, an NI 651x notifies the software application when the event is detected, causing the application to automatically perform a read operation. To minimize the effects of noisy input lines, you can use programmable input filters in combination with change detection to eliminate spurious change detection events caused by noise or glitches. NI-DAQmx also includes multithreaded streaming technology so digital change detection events can occur independently of other data acquisition activities such as analog input or output events.

Eliminate Noise with Programmable Input Filters

Programmable input filters remove noise, glitches, and spikes on inputs and provide debouncing for digital switches and relays. This feature is important for applications in noisy industrial environments to prevent false readings caused by noise. You can configure the programmable input filter for each digital line by setting the filter time in seconds. Any digital noise, glitch, or spike that is shorter than half of the specified filter time is blocked by the digital I/O device, preventing invalid readings and false triggers for change detection events.

NI-DAQmx Software Technology

NI 651x devices use NI-DAQmx measurement services software, which is included free with the purchase of an NI 651x device and is available for download from ni.com/downloads. With NI-DAQmx, you can program your NI digital I/O device in NI LabVIEW, ANSI C, Microsoft Visual C++, and the Microsoft .NET languages C# and Visual Basic .NET. You can access the full functionality and state-of-the art hardware technology of your NI 651x devices. NI-DAQmx technology speeds up your development with many features such as automatic code generation to make configuration and programming easy. NI 651x devices take full advantage of key NI-DAQmx software technologies such as multithreaded streaming technology for dramatic improvements in I/O performance and ease of use.

Use the DAQ Assistant to guide you to fast, accurate measurements with no programming
Use automatic code generation to create your application in LabVIEW, ANSI C, Visual Basic .NET, or C#
Take advantage of multithreaded streaming technology for 1,000X performance improvements
Use automatic timing, triggering, and synchronization technology to make advanced applications easy
Visit ni.com for more than 3,000 free software downloads to jump-start your project
Use the NI-DAQmx functions for jumper-free software configuration of all digital I/O features without hardware switches/jumpers
Develop your application with easy and open programming in LabVIEW, ANSI C, Microsoft Visual C++, C#, and Visual Basic .NET

Digital I/O Connector

The 100-pin high-density SCSI connector on each NI 6511/12/13/14/15 device connects to 100-pin ribbon cables or shielded cables. For low-cost unshielded connectivity, use the R1005050 ribbon cable with two CB-50LP or CB-50 connector blocks (CB-100 kit). For shielded connectivity, use the SH100-100-F shielded digital I/O cable with the SCB-100 connector block. The 37-pin D-Sub connector on NI 6510/16/17/18/19 devices connects to 37-pin accessories including the SH37F-37M shielded digital I/O cable with the CB-37FH DIN-rail-mountable connector block.

Test test 123

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Ordering Information

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

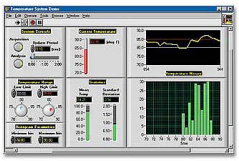
Products	Part Number	Recommended Accessories	Part Number
NI PCI-6510			
NI PCI-6510 Requires: 1 Cables , 1 Connector Blocks ;	779081-01	**Cables:** Shielded - SH37F-37M Cable (1m) ***Also Available: [Unshielded]*	778621-01
		Connector Blocks: Spring-Screw_Terminals - CB-37FH ***Also Available: [Custom]*	778673-01
NI PCI-6511			
NI PCI-6511 Requires: 1 Cables , 1 Connector Blocks ;	778966-01	**Cables:** Shielded - SH100-100-F Cable (2m)	185095-02
		Connector Blocks: Spring-Screw_Terminals - SCB-100	776990-01
NI PXI-6511			
NI PXI-6511 Requires: 1 Cable , 1 Connector Block ;	778967-01	**Cable:** Shielded - SH100-100-F Cable (2m) ***Also Available: [Unshielded]*	185095-02
		Connector Block: Spring-Screw_Terminals - SCB-100	776990-01
NI PCI-6512			
NI PCI-6512 Requires: 1 Cables , 1 Connector Blocks ;	778968-01	**Cables:** Shielded - SH100-100-F Cable (2m)	185095-02
		Connector Blocks: Spring-Screw_Terminals - SCB-100	776990-01
NI PXI-6512			
NI PXI-6512 Requires: 1 Cable , 1 Connector Block ;	778969-01	**Cable:** Shielded - SH100-100-F Cable (2m) ***Also Available: [Unshielded]*	185095-02
		Connector Block: Spring-Screw_Terminals - SCB-100	776990-01
NI PCI-6513			
NI PCI-6513 Requires: 1 Cables , 1 Connector Blocks ;	778970-01	**Cables:** Shielded - SH100-100-F Cable (2m) ***Also Available: [Unshielded]*	185095-02
		Connector Blocks: Spring-Screw_Terminals - SCB-100	776990-01
NI PXI-6513			
NI PXI-6513 Requires: 1 Cable , 1 Connector Block ;	778971-01	**Cable:** Shielded - SH100-100-F Cable (2m) ***Also Available: [Unshielded]*	185095-02
		Connector Block: Spring-Screw_Terminals - SCB-100	776990-01
NI PCI-6514			

NI PCI-6514 Requires: 1 Cables , 1 Connector Blocks ;	778836-01	**Cables:** Shielded - SH100-100-F Cable (2m)	185095-02
		Connector Blocks: Spring-Screw_Terminals - SCB-100	776990-01
NI PXI-6514			
NI PXI-6514 Requires: 1 Cable , 1 Connector Block ;	778965-01	**Cable:** Shielded - SH100-100-F Cable (2m) ***Also Available: [Unshielded]*	185095-02
		Connector Block: Spring-Screw_Terminals - SCB-100	776990-01
NI PCI-6515			
NI PCI-6515 Requires: 1 Cables , 1 Connector Blocks ;	778835-01	**Cables:** Shielded - SH100-100-F Cable (2m)	185095-02
		Connector Blocks: Spring-Screw_Terminals - SCB-100	776990-01
NI PXI-6515			
NI PXI-6515 Requires: 1 Cable , 1 Connector Block ;	778964-01	**Cable:** Shielded - SH100-100-F Cable (2m) ***Also Available: [Unshielded]*	185095-02
		Connector Block: Spring-Screw_Terminals - SCB-100	776990-01
NI PCI-6516			
NI PCI-6516 Requires: 1 Cables , 1 Connector Blocks ;	779082-01	**Cables:** Shielded - SH37F-37M Cable (1m) ***Also Available: [Unshielded]*	778621-01
		Connector Blocks: Spring-Screw_Terminals - CB-37FH ***Also Available: [Custom]*	778673-01
NI PCI-6517			
NI PCI-6517 Requires: 1 Cables , 1 Connector Blocks ;	779083-01	**Cables:** Shielded - SH37F-37M Cable (1m) ***Also Available: [Unshielded]*	778621-01
		Connector Blocks: Spring-Screw_Terminals - CB-37FH ***Also Available: [Custom]*	778673-01
NI PCI-6519			
NI PCI-6519 Requires: 1 Cables , 1 Connector Blocks ;	779085-01	**Cables:** Shielded - SH37F-37M Cable (1m) ***Also Available: [Unshielded]*	778621-01
		Connector Blocks: Spring-Screw_Terminals - CB-37FH ***Also Available: [Custom]*	778673-01

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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

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.

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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.

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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

This document lists specifications for the NI 651*x* devices. These specifications are typical at 25 °C unless otherwise noted.

Power Requirements	
Power consumption on +5 VDC (±5%)	250 mA, typical
Power consumption on +3.3 VDC (±5%)	300 mA, typical
(NI 6512/6513/6514/6515 only)	
+5 V Power available at I/O connector (pins 50 and 100)	
Voltage	+4.3 VDC to +6.3 VDC
Current	20 mA/port, typical

Note The power at the I/O connector is derived from the output Vcc (user-provided). The output Vcc must be greater than 10 VDC to ensure that the output voltage is in the range of +4.3 VDC to +6.3 VDC.

Digital I/O

Channel distribution and I/O connector. All channels are optically isolated.

Device	Inputs	Outputs	Connector Type
NI 6510 [1]	32 source/sink	0	37-pin male D-SUB
NI 6511 [2]	64 source/sink	0	100-pin keyed female SCSI
NI 6512 [2]	0	64 source	100-pin keyed female SCSI
NI 6513 [2]	0	64 sink	100-pin keyed female SCSI
NI 6514 [2]	32 source/sink	32 source	100-pin keyed female SCSI
NI 6515 [2]	32 source/sink	32 sink	100-pin keyed female SCSI

Device	Inputs	Outputs	Connector Type
NI 6516 [1]	0	32 source	37-pin male D-SUB
NI 6517 [1]	0	32 sink	37-pin male D-SUB
NI 6518 [1]	16 source/sink	16 source	37-pin male D-SUB
NI 6519 [1]	16 source/sink	16 sink	37-pin male D-SUB

Common-mode isolation	30 VDC (bank-to-bank and bank-to-bus)
Data transfers	Interrupts, programmed I/O

Isolated Inputs

Maximum input voltage	30 VDC

Level	Min	Max
Input logic low voltage (V_{IL})	0 VDC	±4 VDC
Input logic high voltage (V_{IH})	±11 VDC	±30 VDC

Input current	
11 V inputs	4.5 mA/line, maximum
30 V inputs	12.5 mA/line, maximum
Propagation delay	75 µs, typical

Isolated Outputs

Power-on state	0 (open), default; user-programmable to 0 or 1
Maximum switching voltage	30 VDC

The following table lists the derated current values for the PXI-6512, PXI-6513, PXI-6514, and PXI-6515 devices. Working at higher current values might damage the device.

Ambient Temperature	PXI-6512/6514, Eight Lines per Port	PXI-6512/6514, One Line per Port	PXI-6513/6515, Eight Lines per Port	PXI-6513/6515, One Line per Port
Up to 25 °C	75 mA	350 mA	125 mA	500 mA
Up to 35 °C	75 mA	350 mA	125 mA	500 mA
Up to 45 °C	75 mA	350 mA	120 mA	500 mA
Up to 55 °C	75 mA	350 mA	100 mA	500 mA

Note: The values listed in the *Eight Lines per Port* columns are the current values of each line when *all* eight lines in a port are used. The values listed in the *One Line per Port* columns are the current values of the *only* line used in a port. For more information about the current output of these devices, refer to the KnowledgeBase document, *Per Channel Current Output of an NI 651x Digital Data Acquisition Device*, by going to ni.com/info and entering the Info Code 651xoutput.

These devices have a self-resetting fuse on each output port for overcurrent protection. The actual current value might be lower depending on the device working temperature, which is affected by the ambient temperature, air flow, I/O voltage, I/O usage, and duty cycle. For more information about the self-resetting fuse on the device, refer to the KnowledgeBase document, *Why does my 651x Shut Down When Outputting Over Maximum Current?*, by going to ni.com/info and entering the Info Code 651xfuse.

The following table lists the derated current values for the PCI-6512, PCI-6513, PCI-6514, PCI-6515, PCI-6516, PCI-6517, PCI-6518, and PCI-6519 devices. Working at higher current values might damage the device.

Ambient Temperature	PCI-6512/6514/ 6516/6518, Eight Lines per Port	PCI-6512/6514/ 6516/6518, One Line per Port	PCI-6513/6515/ 6517/6519, Eight Lines per Port	PCI-6513/6515/ 6517/6519, One Line per Port
Up to 25 °C	75 mA	350 mA	125 mA	475 mA
Up to 35 °C	65 mA	350 mA	125 mA	425 mA
Up to 45 °C	55 mA	350 mA	115 mA	375 mA
Up to 55 °C	50 mA	300 mA	100 mA	325 mA

Note: The values listed in the *Eight Lines per Port* columns are the current values of each line when *all* eight lines in a port are used. The values listed in the *One Line per Port* columns are the current values of the *only* line used in a port. For more information about the current output of these devices, refer to the KnowledgeBase document, *Per Channel Current Output of an NI 651x Digital Data Acquisition Device*, by going to ni.com/info and entering the Info Code 651xoutput.

Ambient Temperature	PCI-6512/6514/ 6516/6518, Eight Lines per Port	PCI-6512/6514/ 6516/6518, One Line per Port	PCI-6513/6515/ 6517/6519, Eight Lines per Port	PCI-6513/6515/ 6517/6519, One Line per Port
These devices have a self-resetting fuse on each output port for overcurrent protection. The actual current value might be lower depending on the device working temperature, which is affected by the ambient temperature, air flow, I/O voltage, I/O usage, and duty cycle. For more information about the self-resetting fuse on the device, refer to the KnowledgeBase document, *Why does my 651x Shut Down When Outputting Over Maximum Current?*, by going to ni.com/info and entering the Info Code 651xfuse.				

Propagation delay	80 µs, typical with 100 Ω load
Programmable power-up states response time	400 ms

Physical Characteristics

PCI dimensions	
NI 6510/6511	15.1 cm × 12.1 cm (5.94 in. × 4.75 in.)
NI 6512/6513/6514/6515/6516/6517/6518/6519	14.1 cm × 11.4 cm (5.54 in. × 4.47 in.)
PXI dimensions	
NI 6511/6512/6513	21 cm × 13 cm (8.38 in. × 5.12 in.)
NI 6514/6515	16 cm × 10 cm (6.3 in. × 3.9 in.)
PCI weight	
NI 6510/6511	87.9 g (3.1 oz)
NI 6512/6513/6514/6515/6516/6517/6518/6519	70.9 g (2.5 oz)
PXI weight	
NI 6511/6512/6513	136 g (4.8 oz)
NI 6514/6515	172.9 g (6.1 oz)

Environmental

NI 651*x* devices are intended for indoor use only.

Operating Environment

Ambient temperature range	0 °C to 55 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Relative humidity range	10% to 90%, noncondensing (tested in accordance with IEC-60068-2-56)
Altitude	2,000 m (at 25 °C ambient temperature)

Storage Environment

Ambient temperature range	–20 °C to 70 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Relative humidity range	5% to 95%, noncondensing (tested in accordance with IEC-60068-2-56)

Shock and Vibration (PXI-6511/6512/6513/6514/6515 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 Hz to 500 Hz, 0.3 g_{rms}
Nonoperating	5 Hz to 500 Hz, 2.4 g_{rms}

Random vibration is tested in accordance with IEC-60068-2-64. The 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 (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 device with shielded cables.

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

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 module number or product line, and click the appropriate link in the Certification column.

Environmental Management

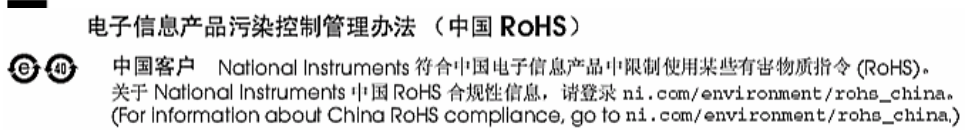
National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

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 other environmental information not included in this document.

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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.

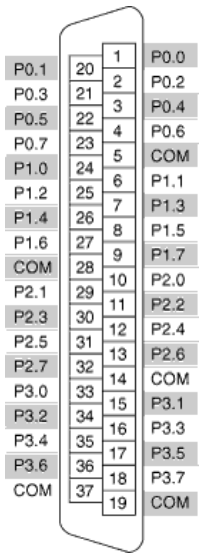


[1] All channels belong to one isolated bank and use the same ground and/or power.

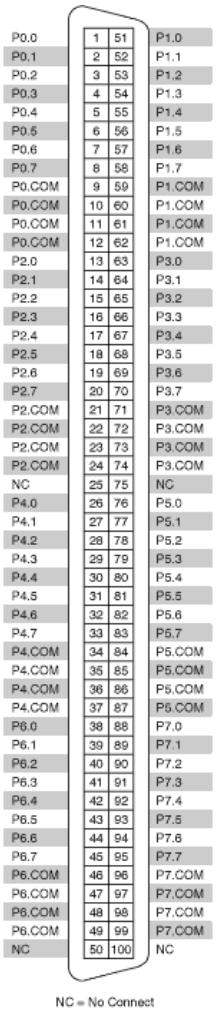
[2] Eight lines per bank. All lines in the same bank use the same ground and/or power.

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Pinouts/Front Panel Connections



NI 6510 Pin Assignments



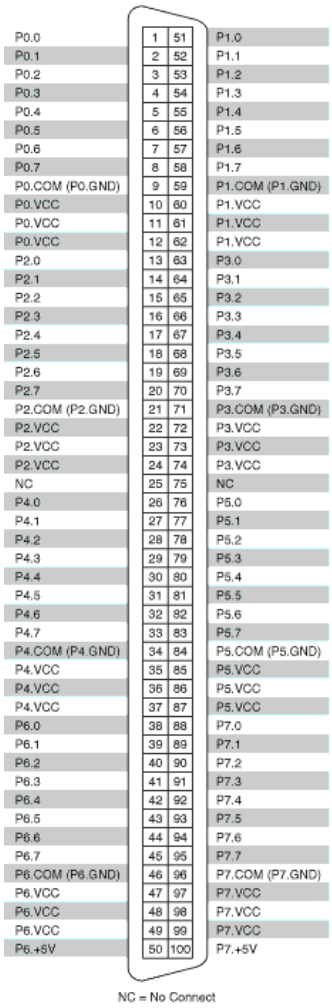
NI 6511 Pin Assignments for the SH100-100-F Cable

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Positions 1 through 50				Positions 51 through 100			
P0.0	1	2	P0.1	P1.0	1	2	P1.1
P0.2	3	4	P0.3	P1.2	3	4	P1.3
P0.4	5	6	P0.5	P1.4	5	6	P1.5
P0.6	7	8	P0.7	P1.6	7	8	P1.7
P0.COM	9	10	P0.COM	P1.COM	9	10	P1.COM
P0.COM	11	12	P0.COM	P1.COM	11	12	P1.COM
P2.0	13	14	P2.1	P3.0	13	14	P3.1
P2.2	15	16	P2.3	P3.2	15	16	P3.3
P2.4	17	18	P2.5	P3.4	17	18	P3.5
P2.6	19	20	P2.7	P3.6	19	20	P3.7
P2.COM	21	22	P2.COM	P3.COM	21	22	P3.COM
P2.COM	23	24	P2.COM	P3.COM	23	24	P3.COM
NC	25	26	P4.0	NC	25	26	P5.0
P4.1	27	28	P4.2	P5.1	27	28	P5.2
P4.3	29	30	P4.4	P5.3	29	30	P5.4
P4.5	31	32	P4.6	P5.5	31	32	P5.6
P4.7	33	34	P4.COM	P5.7	33	34	P5.COM
P4.COM	35	36	P4.COM	P5.COM	35	36	P5.COM
P4.COM	37	38	P6.0	P5.COM	37	38	P7.0
P6.1	39	40	P6.2	P7.1	39	40	P7.2
P6.3	41	42	P6.4	P7.3	41	42	P7.4
P6.5	43	44	P6.6	P7.5	43	44	P7.6
P6.7	45	46	P6.COM (P6.GND)	P7.7	45	46	P7.COM
P6.COM	47	48	P6.COM	P7.COM	47	48	P7.COM
P6.COM	49	50	NC	P7.COM	49	50	NC

NC = No Connect

NI 6511 Pin Assignments for the R1005050 Cable

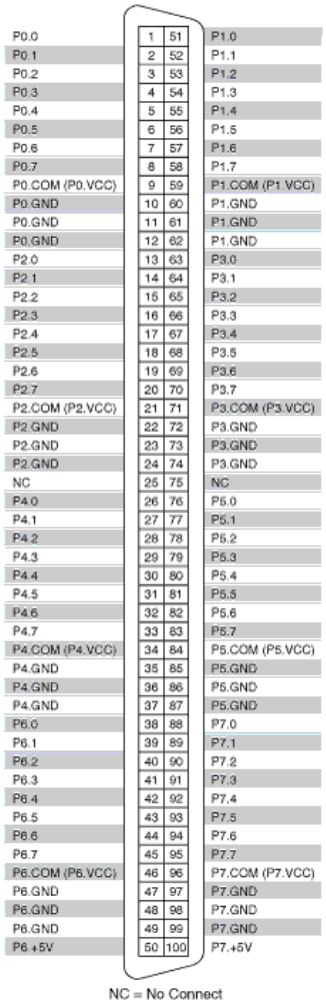


NI 6512 Pin Assignments for the SH100-100-F Cable

Positions 1 through 50				Positions 51 through 100			
P0.0	1	2	P0.1	P1.0	1	2	P1.1
P0.2	3	4	P0.3	P1.2	3	4	P1.3
P0.4	5	6	P0.5	P1.4	5	6	P1.5
P0.6	7	8	P0.7	P1.6	7	8	P1.7
P0.COM (P0.GND)	9	10	P0.VCC	P1.COM (P1.GND)	9	10	P1.VCC
P0.VCC	11	12	P0.VCC	P1.VCC	11	12	P1.VCC
P2.0	13	14	P2.1	P3.0	13	14	P3.1
P2.2	15	16	P2.3	P3.2	15	16	P3.3
P2.4	17	18	P2.5	P3.4	17	18	P3.5
P2.6	19	20	P2.7	P3.6	19	20	P3.7
P2.COM (P2.GND)	21	22	P2.VCC	P3.COM (P3.GND)	21	22	P3.VCC
P2.VCC	23	24	P2.VCC	P3.VCC	23	24	P3.VCC
NC	25	26	P4.0	NC	25	26	P5.0
P4.1	27	28	P4.2	P5.1	27	28	P5.2
P4.3	29	30	P4.4	P5.3	29	30	P5.4
P4.5	31	32	P4.6	P5.5	31	32	P5.6
P4.7	33	34	P4.COM (P4.GND)	P5.7	33	34	P5.COM (P5.GND)
P4.VCC	35	36	P4.VCC	P5.VCC	35	36	P5.VCC
P4.VCC	37	38	P6.0	P5.VCC	37	38	P7.0
P6.1	39	40	P6.2	P7.1	39	40	P7.2
P6.3	41	42	P6.4	P7.3	41	42	P7.4
P6.5	43	44	P6.6	P7.5	43	44	P7.6
P6.7	45	46	P6.COM (P6.GND)	P7.7	45	46	P7.COM (P7.GND)
P6.VCC	47	48	P6.VCC	P7.VCC	47	48	P7.VCC
P6.VCC	49	50	P6.+5V	P7.VCC	49	50	P7.+5V

NC = No Connect

NI 6512 Pin Assignments for the R1005050 Cable

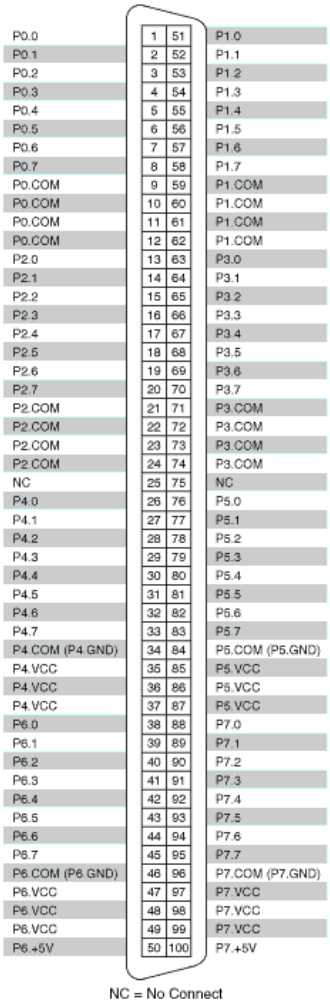


NI 6513 Pin Assignments for the SH100-100-F Cable

Positions 1 through 50				Positions 51 through 100			
P0.0	1	2	P0.1	P1.0	1	2	P1.1
P0.2	3	4	P0.3	P1.2	3	4	P1.3
P0.4	5	6	P0.5	P1.4	5	6	P1.5
P0.6	7	8	P0.7	P1.6	7	8	P1.7
P0.COM (P0.VCC)	9	10	P0.GND	P1.COM (P1.VCC)	9	10	P1.GND
P0.GND	11	12	P0.GND	P1.GND	11	12	P1.GND
P2.0	13	14	P2.1	P3.0	13	14	P3.1
P2.2	15	16	P2.3	P3.2	15	16	P3.3
P2.4	17	18	P2.5	P3.4	17	18	P3.5
P2.6	19	20	P2.7	P3.6	19	20	P3.7
P2.COM (P2.VCC)	21	22	P2.GND	P3.COM (P3.VCC)	21	22	P3.GND
P2.GND	23	24	P2.GND	P3.GND	23	24	P3.GND
NC	25	26	P4.0	NC	25	26	P5.0
P4.1	27	28	P4.2	P5.1	27	28	P5.2
P4.3	29	30	P4.4	P5.3	29	30	P5.4
P4.5	31	32	P4.6	P5.5	31	32	P5.6
P4.7	33	34	P4.COM (P4.VCC)	P5.7	33	34	P5.COM (P5.VCC)
P4.GND	35	36	P4.GND	P5.GND	35	36	P5.GND
P4.GND	37	38	P6.0	P5.GND	37	38	P7.0
P6.1	39	40	P6.2	P7.1	39	40	P7.2
P6.3	41	42	P6.4	P7.3	41	42	P7.4
P6.5	43	44	P6.6	P7.5	43	44	P7.6
P6.7	45	46	P6.COM (P6.VCC)	P7.7	45	46	P7.COM (P7.VCC)
P6.GND	47	48	P6.GND	P7.GND	47	48	P7.GND
P6.GND	49	50	P6.+5V	P7.GND	49	50	P7.+5V

NC = No Connect

NI 6513 Pin Assignments for the R1005050 Cable

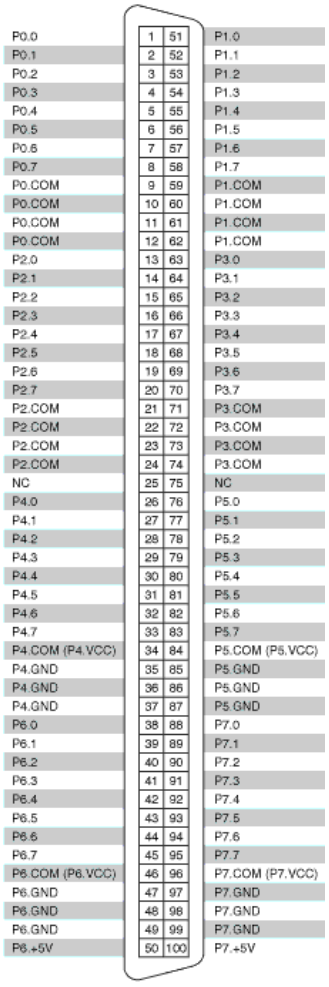


NI 6514 Pin Assignments for the SH100-100-F Cable

Positions 1 through 50				Positions 51 through 100			
P0.0	1	2	P0.1	P1.0	1	2	P1.1
P0.2	3	4	P0.3	P1.2	3	4	P1.3
P0.4	5	6	P0.5	P1.4	5	6	P1.5
P0.6	7	8	P0.7	P1.6	7	8	P1.7
P0.COM	9	10	P0.COM	P1.COM	9	10	P1.COM
P0.COM	11	12	P0.COM	P1.COM	11	12	P1.COM
P2.0	13	14	P2.1	P3.0	13	14	P3.1
P2.2	15	16	P2.3	P3.2	15	16	P3.3
P2.4	17	18	P2.5	P3.4	17	18	P3.5
P2.6	19	20	P2.7	P3.6	19	20	P3.7
P2.COM	21	22	P2.COM	P3.COM	21	22	P3.COM
P2.COM	23	24	P2.COM	P3.COM	23	24	P3.COM
NC	25	26	P4.0	NC	25	26	P5.0
P4.1	27	28	P4.2	P5.1	27	28	P5.2
P4.3	29	30	P4.4	P5.3	29	30	P5.4
P4.5	31	32	P4.6	P5.5	31	32	P5.6
P4.7	33	34	P4.COM (P4.GND)	P5.7	33	34	P5.COM (P5.GND)
P4.VCC	35	36	P4.VCC	P5.VCC	35	36	P5.VCC
P4.VCC	37	38	P6.0	P5.VCC	37	38	P7.0
P6.1	39	40	P6.2	P7.1	39	40	P7.2
P6.3	41	42	P6.4	P7.3	41	42	P7.4
P6.5	43	44	P6.6	P7.5	43	44	P7.6
P6.7	45	46	P6.COM (P6.GND)	P7.7	45	46	P7.COM (P7.GND)
P6.VCC	47	48	P6.VCC	P7.VCC	47	48	P7.VCC
P6.VCC	49	50	P6.+5V	P7.VCC	49	50	P7.+5V

NC = No Connect

NI 6514 Pin Assignments for the R1005050 Cable

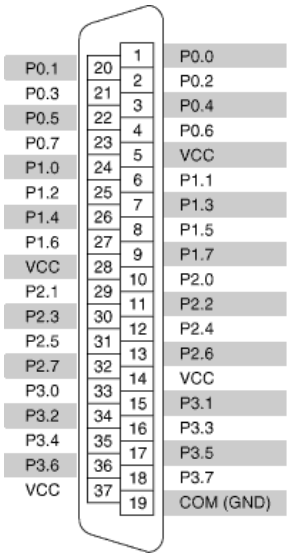


NI 6515 Pin Assignments for the SH100-100-F Cable

Positions 1 through 50				Positions 51 through 100			
P0.0	1	2	P0.1	P1.0	1	2	P1.1
P0.2	3	4	P0.3	P1.2	3	4	P1.3
P0.4	5	6	P0.5	P1.4	5	6	P1.5
P0.6	7	8	P0.7	P1.6	7	8	P1.7
P0.COM	9	10	P0.COM	P1.COM	9	10	P1.COM
P0.COM	11	12	P0.COM	P1.COM	11	12	P1.COM
P2.0	13	14	P2.1	P3.0	13	14	P3.1
P2.2	15	16	P2.3	P3.2	15	16	P3.3
P2.4	17	18	P2.5	P3.4	17	18	P3.5
P2.6	19	20	P2.7	P3.6	19	20	P3.7
P2.COM	21	22	P2.COM	P3.COM	21	22	P3.COM
P2.COM	23	24	P2.COM	P3.COM	23	24	P3.COM
NC	25	26	P4.0	NC	25	26	P5.0
P4.1	27	28	P4.2	P5.1	27	28	P5.2
P4.3	29	30	P4.4	P5.3	29	30	P5.4
P4.5	31	32	P4.6	P5.5	31	32	P5.6
P4.7	33	34	P4.COM (P4.VCC)	P5.7	33	34	P5.COM (P5.VCC)
P4.GND	35	36	P4.GND	P5.GND	35	36	P5.GND
P4.GND	37	38	P6.0	P5.GND	37	38	P7.0
P6.1	39	40	P6.2	P7.1	39	40	P7.2
P6.3	41	42	P6.4	P7.3	41	42	P7.4
P6.5	43	44	P6.6	P7.5	43	44	P7.6
P6.7	45	46	P6.COM (P6.VCC)	P7.7	45	46	P7.COM (P7.VCC)
P6.GND	47	48	P6.GND	P7.GND	47	48	P7.GND
P6.GND	49	50	P6.+5V	P7.GND	49	50	P7.+5V

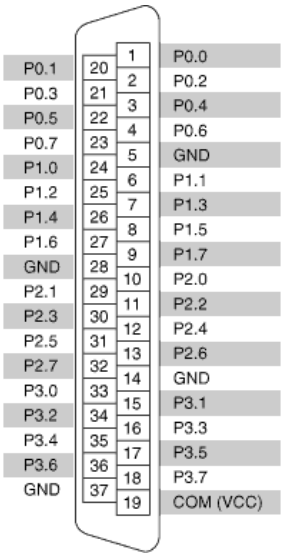
NC = No Connect

NI 6515 Pin Assignments for the R1005050 Cable



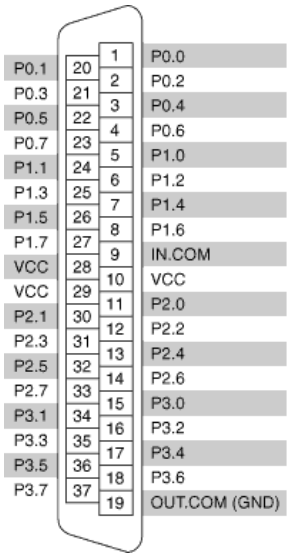
NI 6516 Pin Assignments

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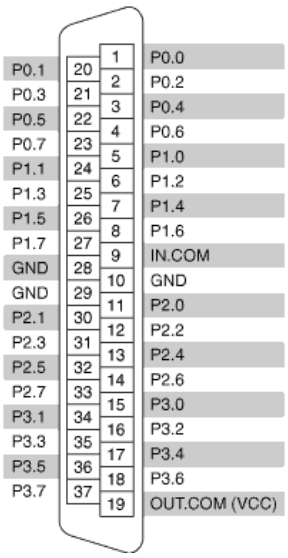
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NI 6519 Pin Assignments

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