Low-Cost Industrial Digital I/O – 60 V, Channel-to-Channel Isolated

NI 6528

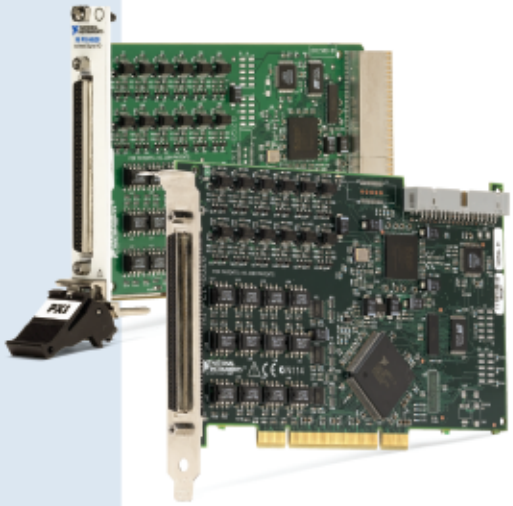
- 24 channel-to-channel optically isolated inputs (±60 VDC)
- 24 channel-to-channel isolated, solid-state relay outputs (±60 VDC)
- High-reliability industrial feature set-isolation, programmable power-up states, digital I/O watchdogs, change detection, and programmable input filters
- High-voltage input to PXI trigger bus or RTSI bus
- Superior features for automotive, aerospace, industrial monitoring, and control applications
- NI-DAQmx software for highest productivity and performance

Operating Systems
- Windows 2000/NT/XP
- LabVIEW Real-Time

Recommended Software
- LabVIEW
- LabWindows/CVI
- Measurement Studio

Other Compatible Software
- C, C++
- Microsoft Visual Studio .NET 2003

Measurement Services Software (included)
- NI-DAQmx version 7.1 or higher



Family	Bus	Input Lines	Output Lines	Isolation	Max Range	Low Threshold	High Threshold	Output Current	Industrial Feature Set
NI 6528	PCI, PXI	24	24	Channel-to-channel	±60 VDC	1 VDC	3.2 VDC	150 mA	✓

Table 1. NI 6528 Specifications Overview

Overview and Applications

National Instruments 6528 devices are industrial 48-channel isolated digital I/O interfaces for PCI and PXI. You can use the 24 channel-to-channel optically isolated inputs of NI 6528 devices to read the status of sensors, actuators, and logic devices. NI 6528 devices have 24 solid-state relay outputs to switch external devices, including those requiring input currents up to 150 mA. Device configuration is completely jumper-free. NI 6528 devices are ideal for automotive test, industrial monitoring, and control applications. With high current drive and isolation, you can connect the digital I/O module directly to a wide array of industrial electronic devices, sensors, and actuators.

NI 6528 devices offer advanced features for industrial control and manufacturing test applications such as factory automation, embedded machine control, and production line verification. NI 6528 devices are designed from top to bottom to incorporate the latest hardware technologies and provide innovative features for applications requiring ease of use, high reliability, and performance. NI 6528 devices take advantage of NI-DAQmx measurement services software (version 7.1 or higher) to speed up application development with many helpful features such as DAQ Assistant, automatic code generation, and high-performance multithreaded streaming technology.

Hardware

High-Reliability Industrial Feature Set

NI 6528 devices offer a set of high-reliability features designed to automate even the most demanding applications.

- Isolation provides an extended voltage range for direct connection to industrial sensors and actuators
- Programmable power-up states provide safe operation when connected to pumps/valves/motors/relays
- Digital I/O watchdogs detect computer or application crashes 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
- Isolated I/O for triggering means you can route signals directly from high-voltage devices (±60 VDC) to the PXI trigger bus or RTSI bus for synchronization

Connect Sensors Directly with Isolation

Isolation is a form of built-in signal conditioning that provides several advantages. Isolation provides an extended voltage range for direct connection to industrial sensors and actuators. Isolation also improves signal quality and protects computer circuitry. NI 6528 devices provide channel-to-channel isolation where every channel is physically and electrically separated from the others, 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.

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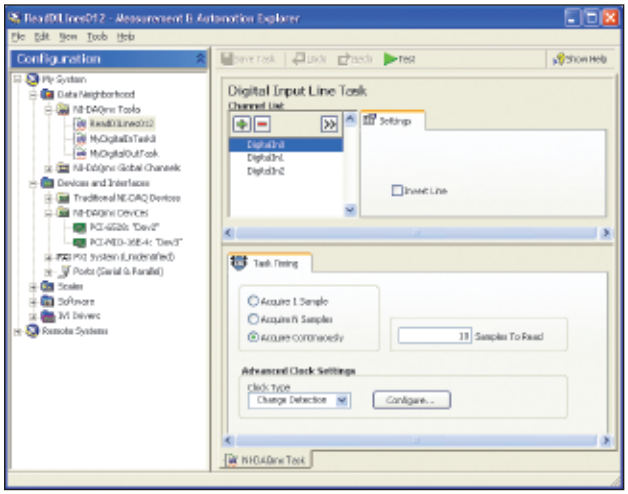

Figure 1. Write Your Application with No Programming Using DAQ Assistant

Glitch-Free Startup with Programmable Power-Up States

Using programmable power-up states, you can configure the initial NI 6528 device output states in software to ensure glitch-free operation when connected to industrial actuators such as pumps, valves, motors, and relays. The NI 6528 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 individual digital line as high-output or low-output. The NI 6528 stores the settings in onboard nonvolatile memory and implements the power-up states instantaneously after power is applied to the device.

Detect and Recover with Digital I/O Watchdogs

Digital I/O watchdogs are an innovative technology that provides 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 state when a fault condition is detected and recover safely after the watchdog timer expires. Watchdogs are important whenever the module is connected to actuators such as pumps, valves, motors, and relays. An NI 6528 monitors the software application; if the application fails to respond within the time limit, the NI 6528 device automatically sets the output lines to a user-defined safe state. The NI 6528 remains in the watchdog state until the watchdog timer is disarmed by the application and new I/O values are written, the NI 6528 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. Using change detection, you can monitor for digital events with minimal processor usage. No polling is necessary because the digital I/O module generates an interrupt to automatically wake up your application.

Using NI-DAQmx software technology, an NI 6528 device 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, 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 independent 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 also provide debouncing for digital switches and relays. These features are important for applications in noisy industrial environments to prevent false readings caused by noise. The programmable input filter for each digital line can be configured by setting the filter time in seconds. The NI 6528 blocks any digital noise, glitch, or spike that is shorter than half of the specified filter time, preventing invalid readings and false triggers for change-detection events.

Isolated PXI Triggering

With an NI 6528 device, you can route isolated high-voltage (±60 VDC) signals to the PXI trigger bus or RTSI bus, so you can synchronize between multiple high-voltage devices without additional circuitry. This feature is particularly useful in automotive, aerospace, and industrial monitoring and control applications where you need triggering by high-voltage input signals.

Digital I/O Connector

The 100-pin high-density SCSI connector on an NI 6528 interfaces 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 (a CB-100 kit). For shielded connectivity, use the SH100-100-F shielded digital I/O cable with the SCB-100 connector block.

Software

NI-DAQmx Software Technology

NI 6528 devices require NI-DAQmx measurement services software 7.1 or higher. NI-DAQmx software, included FREE with an NI 6528 device, is available for download from ***ni.com/downloads***. With NI-DAQmx 7.1 or higher, you can use your NI digital I/O device in LabVIEW, ANSI C, Microsoft Visual C++, and the Microsoft .NET languages C# and Visual Basic .NET.

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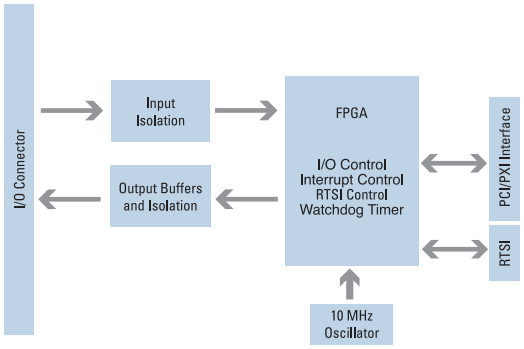

Figure 2. NI 6528 Hardware Block Diagram

Using NI-DAQmx technology, you can access the full functionality and state-of-the-art hardware technology of your NI 6528 digital I/O devices. NI-DAQmx technology speeds up your development with many features such as automatic code generation to make configuration and programming easy. NI 6528 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 DAQ Assistant to guide you to fast, accurate measurements with no programming
- Use automatic code generation to create your application in LabVIEW, 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

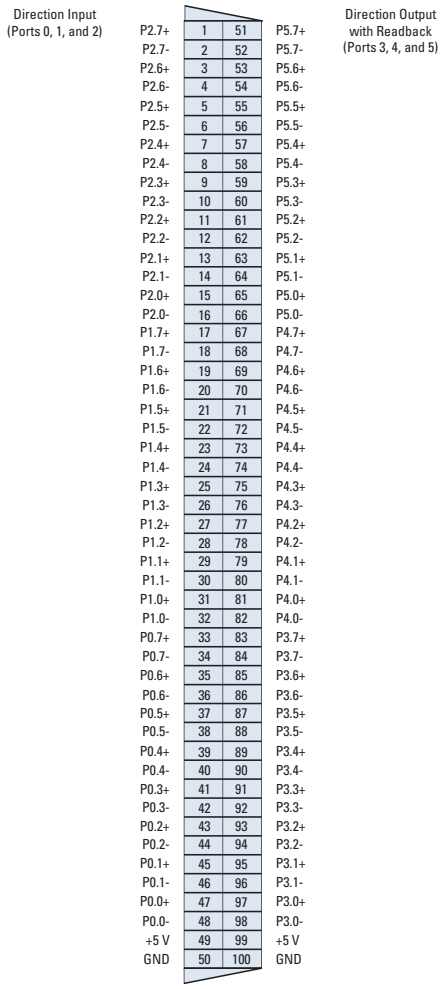

Figure 3. NI 6528 100-Pin SCSI I/O Connector

Ordering Information

NI PCI-6528 778833-01
NI PXI-6528 778543-01
Includes NI-DAQmx software

For information on extended warranty and value-added services, visit ***ni.com/services***.

Recommended Configurations

Family	Accessory	Cable
NI 6528	SCB-100 (776990-01) CB-100 kit (777812-01)	SH100-100-F (185095-02) R1005050 included in kit

BUY NOW!

For complete product specifications, pricing, and accessory information, call (800) 813-3693 (U.S. only) or go to ***ni.com/dataacquisition****.*

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Specifications

These specifications are typical at 25 °C, unless otherwise noted.

Digital I/O

Number of channels ..... 24 optically-isolated digital input channels and 24 solid-state relay output channels

I/O connector ..... 100-pin keyed female SCSI connector

Isolated Inputs

Number of input channels ..... 24, each with its own ground reference isolated from other channels

Input voltage range ..... -60 to 60 VDC

Digital logic levels

Level	Min (VDC)	Max (VDC)
Input logic low-voltage	-60	1
Input logic high-voltage	3.2	60

Input current

5 V inputs ..... 1.5 mA/channel max

60 V inputs ..... 2 mA/channel max

Isolation ..... 60 VDC channel-to-channel and from computer ground and Vcc

Solid-state relay outputs

Number of channels ..... 24, each with two terminals that are isolated from other channels

Relay type ..... Normally open form A solid-state relays

Max switching voltage

AC ..... 30 V_{rms} (42 V_p)

DC ..... 60 VDC

Max switching capacity ..... 150 mA[1]

Common-mode isolation ..... 60 VDC
30 V_{rms} (42 V_p)
(channel-to-channel and channel-to-computer)

On-resistance ..... 18 Ω max

Output capacitance ..... 50 pF at 50 V

Off-leakage current (max) ..... 1 mA

Relay set time (max) ..... 5.0 ms

Relay reset time (max) ..... 5.0 ms

Default power-on state ..... Relays open

[1]With all relays carrying 150 mA and all inputs driven to 60 V, the total power dissipation can approach 20 W. The maximum switching capacity in PCI and CompactPCI systems must be derated according to the ambient temperature and cooling capacity of your system to prevent the device from overheating (the PXI chassis has built-in fans to handle 25 W per slot).

Power Requirements

+5 VDC (± 5%) ..... 300 mA, typical (excluding the power consumed through the I/O connector)

+3.3 VDC (± 5%) ..... 600 mA, typical

Power available at I/O connector ..... +4.5 to +5.25 VDC, fused at 1 A

Physical

Dimensions

PCI-6528 (not including connectors) ..... 17.5 by 10.7 cm (6.9 by 4.2 in.)

PXI-6528 (not including connectors) ..... 16 by 10 cm (6.3 by 3.9 in.)

Environment

NI 6528 devices are intended for indoor use only.

Operating environment

Ambient temperature range ..... 0 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 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-6528 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}

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

NI 6528 devices meet the requirements of the following standards for safety and electrical equipment for measurement, control and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 3111-1, UL 61010B-1
- CAN/CSA C22.2 No. 1010.1

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

Electromagnetic Compatibility

Emissions ..... EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Immunity ..... EN 61326:1997 + A2: 2001, Table 1

EMC/EMI ..... CE, C-Tick, and FCC Part 15 (Class A) Compliant

For EMC compliance, you must operate this device with shielded cabling.

CE Compliance CE

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

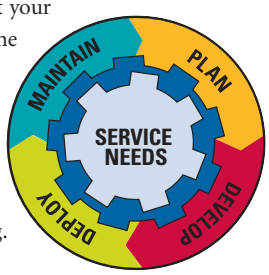
Low-Voltage Directive (safety) 73/23/EEC

Electromagnetic Compatibility
Directive (EMC) 89/336/EEC

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/hardref.nsf***, search by model number or product line, and click the appropriate link in the Certification column.

NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit *ni.com/services*.



Training and Certification

NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit *ni.com/training*.

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Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide NI Alliance Partner Program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit *ni.com/alliance*.

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OEM Support

We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit *ni.com/oem*.

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We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit *ni.com/ssp*.

Hardware Services

NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with *ni.com/pxiadvisor*.

Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit *ni.com/calibration*.

Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit *ni.com/services*.

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