

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

NI PCI-6520

- 8 channel-to-channel optically isolated inputs, ± 30 VDC
- 8 nonlatching mechanical relay outputs
- ± 60 V switching voltage with maximum switching current of 2 A and maximum switching power of 60 W
- High-reliability industrial feature set, includes: isolation, programmable power-up states, digital filtering, watchdog timers, and change detection
- NI measurement services software for highest productivity and performance

Operating Systems

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

Recommended Software

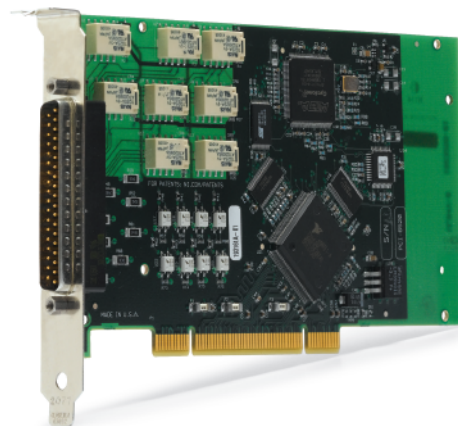
- LabVIEW
- LabWindows/CVI
- Measurement Studio

Other Compatible Software

- C, C++
- Microsoft Visual Studio .NET 2003

Measurement Services Software (included)

- NI-DAQmx driver, version 7.5 or higher



		INPUT				OUTPUT				Industrial Feature Set
Product	Bus	Inputs	Isolation	Low Threshold	High Threshold	Mechanical Relay Outputs	Max Voltage	Max Current	Max Power	
NI 6520	PCI	8	Channel-to-channel	± 4 VDC	± 11 VDC	8	± 60 VDC, $42.5 V_{DC}$, $\pm 30 V_{rms}$	2 A	60 W	✓

Table 1. NI 6520 Specifications Overview

Overview and Applications

The National Instruments PCI-6520 is an industrial digital I/O board with eight channel-to-channel isolated digital inputs and eight nonlatching mechanical relay outputs. You can use the eight differential, isolated, ± 30 VDC digital inputs to read the status of sensors, actuators, and logic devices. You can use the bipolar digital input channels to read from both sinking and sourcing devices. The NI PCI-6520 registers a logic low if the voltage is between ± 4 V, and registers a logic high if the voltage is less than -11 V or greater than $+11$ V.

The PCI-6520 device offers three single-pole double-throw (SPDT) Form C relays and five single-pole single-throw (SPST) Form A relays. You can use the PCI-6520 relay outputs to switch devices requiring up to 60 VDC or 30 Vrms with maximum current of 2 A and maximum switching power of 60 W.

Note: The switching current is limited by the maximum switching power and maximum voltage (current = power/voltage).

The PCI-6520 configuration is completely programmable and does not require setting up jumpers or DIP switches. This board is ideal for use with a programmable automation controller (PAC) for automotive test, industrial monitoring, and control applications. With high-current drive, high-voltage outputs, and isolation, you can connect the digital I/O module directly to a wide array of industrial electronic devices, sensors, and actuators.

The PCI-6520 takes advantage of NI measurement services software to speed up application development, with the NI-DAQmx driver software (version 7.5 or higher) and many helpful features such as DAQ Assistant, automatic code generation, and high-performance multithreaded streaming technology.

Hardware

High-Reliability Industrial Feature Set

The PCI-6520 offers a set of high-reliability features designed for demanding automation 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
- Watchdogs timer detects computer or application crashes and ensures safe recovery to know digital I/O states
- Change detection triggers your application and returns I/O data after a digital event to minimize processor usage
- Programmable input filters eliminate glitches/spikes and remove noise

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Direct Sensor Connection with Isolation

Isolation, a form of built-in signal conditioning, provides several advantages, such as an extended voltage range for direct connection to industrial sensors and actuators. Isolation also improves signal quality and protects computer circuitry. The PCI-6520 provides channel-to-channel isolation where every channel is physically and electrically separated from the others. This isolation 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.

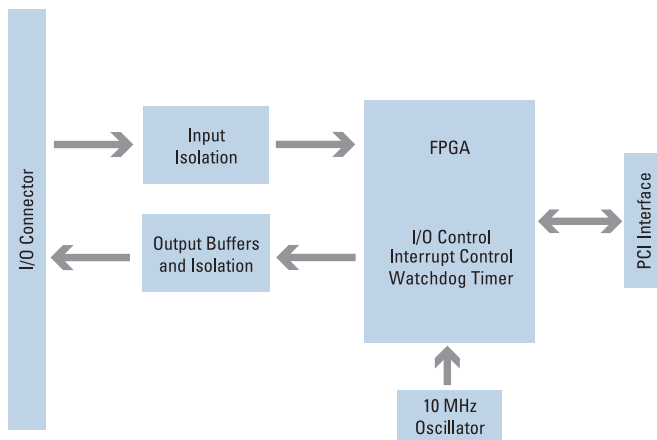


Figure 1. PCI-6520 Hardware Block Diagram

Glitch-Free Startup with Programmable Power-Up States

Using programmable power-up states, you can configure the initial PCI-6520 output states in software to ensure glitch-free operation when connected to industrial actuators such as pumps, valves, motors, and relays. The PCI-6520 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 output line as logic high or logic low. The PCI-6520 stores the settings in onboard nonvolatile memory and implements the power-up states automatically after power is applied to the board.

Watchdog Timers for Fault Detection and Recovery

Watchdog timers are an innovative technology that 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 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. The PCI-6520 monitors the software application; if the application fails to reset the watchdog timer within the time limit, the device automatically sets the output lines to a user-defined safe state. The PCI-6520 remains in the watchdog state until the watchdog timer is disarmed by the application and new I/O values are written, the PCI-6520 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, PCI-6520 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. 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 will be blocked by the digital I/O device, preventing invalid readings and false triggers for change detection events.

Relay Forms

Relays are classified by number of poles and number of throws. The pole of a relay is the terminal common to every path. Each position where the pole can connect is called a throw. A relay can be made of *n* poles and *m* throws. A single-pole single-throw (SPST) relay has one pole and one throw. A single-pole double-throw (SPDT) relay has one pole and two throws.



Figure 2. Types of Relays

Form	Symbol	Description
Form A		SPST relays with a normally open default state
Form C		SPDT relays that break the connection with one throw before making contact with the other (break-before-make)

Table 1. Form A and Form C Relays

Nonlatching Relays

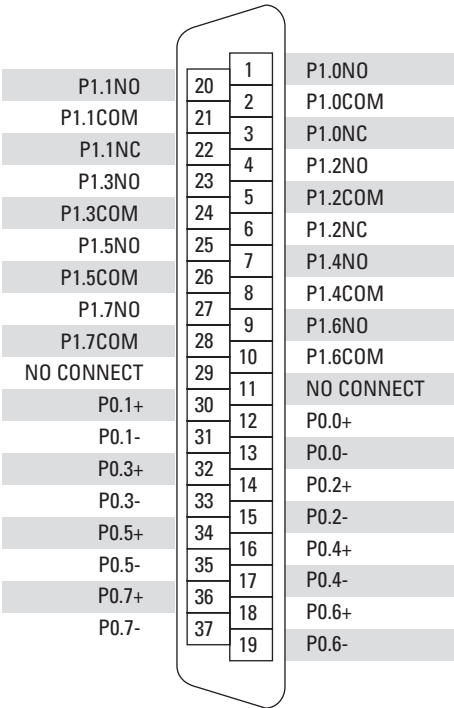
A nonlatching relay has a power-off initial position of normally closed (NC). This position is maintained by the force of a spring or permanent magnet while no current flows. The normally open (NO) contact is maintained by the force of a magnetic field while current flows through the coil. When the current stops, the relay reverts back to its initial NC position. Nonlatching relays return to the default NC position in case of a fault or power failure. This is particularly useful when controlling a motor or valve where the motor or valve needs to be turned off in case of power failure or fault.

Software

NI-DAQmx Software Technology

The PCI-6520 requires and is shipped with NI-DAQmx driver software, version 7.5 or higher. NI-DAQmx software is also available for download from ni.com/downloads. With NI-DAQmx, you can use your NI digital I/O device in NI LabVIEW, ANSI C, Microsoft Visual C++, and the Microsoft .NET languages C# and Visual Basic .NET.

Using NI-DAQmx technology, you can access the full functionality and state-of-the-art hardware technology of your PCI-6520 digital I/O board. NI-DAQmx technology speeds up your development with many features such as automatic code generation to make configuration and programming easy. The PCI-6520 takes full advantage of key NI-DAQmx software technologies such as multithreaded streaming technology for dramatic improvements in I/O performance and ease of use.



Digital Input: P0.0 – P0.7
Form C relays: P1.0 – P1.2
Form A relays: P1.3 – P1.7

Figure 3. NI 6520, 37-Pin D-Sub I/O Connector

- 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.

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Low-Cost 37-Pin Accessories

Several low cost accessory options are available for connectivity to the 37-pin D-Sub connector of the PCI-6520.

CB-37FH – 37-pin female D-Sub horizontal terminal block that mounts in line with the DIN rail.
CB-37FH778673-01

CB-37FV – 37-pin female D-Sub vertical terminal block that mounts perpendicular to the DIN rail.
CB-37FV778672-01

CB-37F-LP – 37-pin female D-Sub screw-terminal accessory for direct connect to board or optionally via cable.
CB-37F-LP779353-01

SH37F-37M – 37-pin D-Sub female-to-male shielded I/O cable.
1 m778621-01
2 m778621-02

R37F-37M-1 – 37-pin D-Sub female-to-male ribbon I/O cable.
1 m779195-01

SH37F-P-4 – 37-pin D-Sub shielded female-to-pigtail cable.
4 m778620-04

TB-37F-37CP – 37-pin female D-Sub crimp and poke termination accessory for custom cabling. High-voltage rated for Cat II, 150 VDC/VAC.
TB-37F-37CP779185-01

TB-37F-37SC – 37-pin female D-Sub solder cup termination accessory for custom cabling.
TB-37F-37SC779184-01

Ordering Information

NI PCI-6520.....779443-01

Family	Accessory	Cable
PCI-6520	CB-37FH (778673-01)	SH37F-37M (778621-01, 778621-02) R37F-37M-1 (779195-01)
	CB-37FV (778672-01)	SH37F-37M (778621-01, 778621-02) R37F-37M-1 (779195-01)
	CB-37F-LP (779353-01)	–
	SH37F-P-4 (778620-04)	–
	TB-37F-37CP (779185-01)	–
	TB-37F-37SC (779184-01)	–

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

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NI Factory Installation Services

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