S Series Multifunction DAQ – 16-Bit, 250 kS/s, Channel-to-Channel Isolation

NI PCI-6154

- 4 channel-to-channel isolated, simultaneously sampled differential analog inputs, 16-bit resolution, 250 kS/s
- 4 channel-to-channel isolated analog outputs, 16-bit resolution, 250 kS/s
- 6 digital inputs and 4 digital outputs, bank-isolated channels, 5 V TTL/CMOS
- 2 counter/timers, 32-bit resolution, 80 MHz
- Programmable input range (±10, ±5, ±2, ±1 V) per channel
- Digital triggering
- NI-MCal calibration technology for improved measurement accuracy
- DMA channels for fast data throughput
- 1-year warranty

Industrial Features

- 60 VDC continuous channel-to-channel isolation, 1,400 V_{rms}/1,950 VDC channel-to-bus isolation, withstand for 5 s
- Overvoltage protection
- 37-pin D-Sub I/O connector

Operating Systems

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

Recommended Software

- LabVIEW
- LabWindows™/CVI
- Measurement Studio

Other Compatible Software

- LabVIEW SignalExpress
- Visual Studio.NET
- C/C++/C#

Measurement Services Software (included)

- NI-DAQmx driver software
- Measurement & Automation
 Explorer configuration utility
- LabVIEW SignalExpress LE
 data-logging software



		Analog Input			Analog Output							
Family	Bus	Channels	Resolution (bits)	Max Sampling Rate (kS/s)	Channels	Resolution (bits)	Max Sampling Rate (kS/s)	Voltage Range (V)	Digital Inputs	Digital Outputs	Digital Voltage	Isolation
NI 6154	PCI	4	16	250	4	16	250	±10	6	4	5 V TTL/CMOS	Channel-to-channel

Table 1. PCI-6154 Specifications Overview

Overview and Applications

The National Instruments PCI-6154 is an isolated S Series multifunction data acquisition (DAQ) board. It combines the safety of isolation with high-performance timing, calibration technologies, and per-channel dedicated analog-to-digital converters (ADCs) to offer extreme reliability, accurate measurements, and precise control. The NI PCI-6154 features four differential simultaneously sampled 16-bit analog inputs with channel-to-channel isolation and 250 kS/s sampling. It also has four channel-to-channel isolated 16-bit analog outputs with a 250 kS/s output rate, six bank-isolated digital inputs, four bank-isolated digital outputs, two counter/timers, and digital triggering.

You can configure the PCI-6154, which integrates seamlessly with LabVIEW, using NI measurement services software. NI offers drivers for various OSs, including LabVIEW Real-Time and Windows. The PCI-6154 comes with a one-year manufacturing warranty and a one-year calibration interval. You can use the PCI-6154 for measurement, control, and design applications including reading from encoders, flow meters, and proximity sensors and controlling valves, pumps, and relays.

Isolated S Series for Test

The PCI-6154 offers many benefits for test applications. Isolation reduces common problems caused by common-mode voltages and ground loops. Per-channel dedicated ADCs ensure simultaneous sampling from all channels. You can use the PCI-6154 with the National Instruments touch screen panel PC (NI PPC-2015) or any industrial PC for inline manufacturing and production line test applications, including sensor measurements for analysis and data logging. The isolated analog and digital I/O lines of the PCI-6154 offer direct connectivity to sensors and actuators. You also can use the two 32-bit, 80 MHz counter/timers to read from encoders, count digital events, and generate pulse trains. The PCI-6154 is well-suited for other test applications with proximity to wall power or other high-voltage sources.



Isolated S Series for Control

The PCI-6154 and LabVIEW Real-Time offer a low-cost, reliable solution for industrial control applications such as process control, discrete manufacturing, and packaging. Process control applications requiring closed-loop PID control can use the PCI-6154 channel-to-channel isolated analog output lines for precise control of valves; the channel-to-channel isolated analog input lines to read from pressure sensors with high accuracy; and the 32-bit, 80 MHz counter/timers to make precise measurements from flow sensors. Discrete manufacturing and packaging applications can benefit from the PCI-6154 digital output lines, which can drive 24 mA for relay and actuator control, and digital input lines to read from switches and proximity sensors.

The PCI-6154 also offers capabilities for encoder measurements, pulse-width modulation (PWM), and the implementation of user-defined communication protocols.

Isolated S Series for Design

For design applications, you can use the flexible analog and digital I/O lines of the PCI-6154 to measure and verify prototypes. By providing protection for your measurement system from transient voltages resulting from design flaws, channel-to-channel isolation can be particularly useful for prototype testing.

Using the PCI-6154 along with NI LabVIEW SignalExpress interactive configuration-based software, you can quickly create design verification tests. The fast acquisition and generation rates of the PCI-6154 with the built-in analysis functions of LabVIEW SignalExpress provide an easy way to perform design analysis. You can convert your tested and verified LabVIEW SignalExpress projects to LabVIEW applications and bridge the gap between the development of test, control, and design applications.

Isolation

The PCI-6154 uses digital isolation technology based on chip-scale transformers for increased signal bandwidth, and features 60 V continuous channel-to-channel isolation for analog I/O channels and bank isolation for digital I/O channels with 1,400 V_{rms}/1,950 VDC of channel-to-PCI bus isolation withstand for up to 5 s.

Isolation provides three main benefits:

- 1. Safety from hazardous high voltages and transients
- 2. Rejection of common-mode voltages
- 3. Removal of ground loops

Safety from High-Voltage Transients

Isolation electrically separates the high-voltage front end and the low-voltage back end of the PCI-6154 board. Signals are passed between the

two sections of the board using digital isolators. By separating the two sections, any voltages, within the isolation specifications of the board, are prevented from entering the bus section (see Figure 1). Isolation provides protection for the user, data acquisition system, and measurement data.



Figure 1. PCI-6154 isolation provides safety from hazardous voltages.

Common-Mode Voltage Rejection

A voltage common to both sides of a differential circuit pair is called common-mode voltage. The differential voltage across the circuit pair is the desired signal, whereas the common voltage signal is the unwanted signal that may have been coupled into the transmission line. The PCI-6154 can measure signals from lines with signal plus common mode of up to 60 VDC; with channel-to-channel isolation, each independent channel can reject a different common-mode voltage. (*Note: The maximum analog input signal voltage for the PCI-6154 is \pm 10 V.*)

Ground-Loop Removal

Ground loops are the most common source of noise in single-ended data acquisition applications. They occur when two connected terminals in a circuit are at different ground potentials, causing current to flow between the two points. This additional voltage can cause significant error in the measurement. When a ground loop exists, the measured voltage is the sum of the signal voltage and the potential difference that exists between the signal source ground and the measurement system ground. This potential is generally not a DC level; therefore, the result is a noisy measurement system, often showing power-line frequency (60 Hz) components in the readings. By offering isolation, the PCI-6154 is able to prevent ground loops.

NI-DAQmx Software Technology

National Instruments measurement services software, built around NI-DAQmx driver software, includes intuitive application programming

interfaces, configuration tools, I/O assistants, and other tools designed to reduce system setup, configuration, and development time. National Instruments recommends using the latest version of NI-DAQmx driver software for application development in National Instruments LabVIEW, LabWindows/CVI, and Measurement Studio. To obtain the latest version of NI-DAQmx, visit **ni.com/support/daq/versions**. NI-DAQmx technology speeds up your development with many features such as automatic code generation to make configuration and programming easy. The PCI-6154 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.

- 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 1,000 times 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 NI-DAQmx functions for 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. The PCI-6154 is compatible with the following versions (or later) of

NI application software – LabVIEW, LabWindows/CVI, or Measurement Studio versions 7.x; LabVIEW SignalExpress 1.x; or LabVIEW with the LabVIEW Real-Time Module 7.1. The PCI-6154 is not compatible with the Traditional NI-DAQ (Legacy) driver.

Intelligent Data Acquisition

When you need to obtain performance beyond the capabilities of an isolated multifunction DAQ device, National Instruments provides R Series intelligent data acquisition devices and isolated C Series modules in a National Instruments CompactRIO R Series expansion chassis. The NI multifunction R Series devices, which contain up to a 3M gate FPGA, are reconfigurable using the LabVIEW FPGA Module. Multifunction R Series devices have up to eight independent 16-bit analog inputs with up to 200 kHz simultaneous sampling, up to eight independent 16-bit analog outputs with up to 1 MHz simultaneous update rates, and up to 96 digital I/O lines configurable at rates up to 40 MHz. You can customize these devices to develop capabilities such as complete control over the synchronization and timing of all signals and operations.

Low-Cost 37-Pin Accessories

Several low-cost accessory options are available for connecting to the 37-pin D-Sub connector of the PCI-6154.

~	CB-37F-HVD – 150 V CAT II rated 37-pin female D-Sub						
1	horizontal terminal block. Mounts in line with the DIN	rail.					
	CB-37F-HVD	.779491-01					
10	CB-37FH – 37-pin female D-Sub horizontal terminal						
5	block that mounts in line with the DIN rail.						
9	СВ-37F-Н	.778673-01					
	CB-37FV – 37-pin female D-Sub vertical terminal						
XIE	block that mounts perpendicular to the DIN rail.						
and the second	CB-37F-V	.778672-01					
	CB-37F-LP – 37-pin female D-Sub screw-terminal accessory						
THE	for direct connect to board or optionally via cable.						
	CB-37F-LP	.779353-01					
\frown	DB37M-DB37F-EP - 37-pin shielded cable.						
\mathbf{O}	1 m	.193737-01					
Real	R37F-37M-1 – 37-pin D-Sub female-to-male ribbon l	'O cable.					
	1 m	.779195-01					
n J	SH37F-P-4 – 37-pin D-Sub shielded female-to-pigtail	cable.					
	4 m	.778620-04					
4							
4_	TB-37F-37CP – 37-pin female D-Sub crimp and poke	termination					
	accessory for custom cabling. Rated 150 VDC/VAC, CA	T II.					
****0	TB-37F-37CP	.779185-01					
1	TB-37F-37SC - 37-pin female D-Sub solder-cup term	ination					
1000	accessory for custom cabling.						
	TB-37F-37SC	.779184-01					

Table 2. 37-Pin Accessories

,	1		
41.01	20	1	AI 0-
AI 0+	20	2	NC
AI 1-	21	3	AI 1+
NC	22	4	AI 2-
AI 2+	23	5	NC
AI 3-	24	5	ALC:
NC	25 26	0	AI 3+
AO 0+		1	AO 0-
40.1-	27	8	NC
NC	28	9	AO 1+
100	29 30 31	10	AO 2-
AU 2+		11	NC
AU 3-		12	AO 3+
NC		13	PEL0/P0.0
PFI 1/P0.1	32	14	D GND
PFI 2/P0.2	33	15	PEL3/P0.3
PFI 4/P0.4	PFI 4/P0.4 34 PFI 5/P0.5 35 PFI 7/P1.1 36	16	
PFI 5/P0.5		17	
PFI 7/P1.1		17	PF16/P1.0
PEL8/P1.2	37	18	D GND
	<u> </u>	19	PFI 9/P1.3
(J
		\sim	/

NC = No Connect

Figure 2. The PCI-6154 37-Pin D-Sub I/O Connector

BUY ONLINE at ni.com or CALL 800 813 3693 (U.S.)

Ordering Information

NI PCI-6154......779340-01

Accessories

Data Acquisition: 7 Steps to Success tutorial kit779489-01

Board	Accessory	Cable
PCI-6154 (779340-01)	CB-37F-HVD (779491-01)	DB37M-DB37F-EP (193737-01)
		R37F-37M-1 (779195-01)
	CB-37FH (778673-01)	DB37M-DB37F-EP (193737-01)
		R37F-37M-1 (779195-01)
	CB-37FV (778672-01)	DB37M-DB37F-EP (193737-01)
		R37F-37M-1 (779195-01)
	CB-37F-LP (779353-01)	-
	TB-37F-37CP (779185-01)	_
	TB-37F-37SC (779184-01)	-

Includes NI-DAQmx 8 or later.

For information on extended warranty and value-added services,

visit ni.com/services.

BUY NOW!

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

Safety and Compliance

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

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

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note: For EMC compliance, operate this device according to product documentation.

CE Compliance

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

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)

Note: Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit **ni.com/certification**, search by model number or product line, and click the appropriate link in the Certification column.

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EU Customers: At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit **ni.com/environment/weee.htm**.

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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**.

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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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