NI Product Guide

NATIONAL
INSTRUMENTS
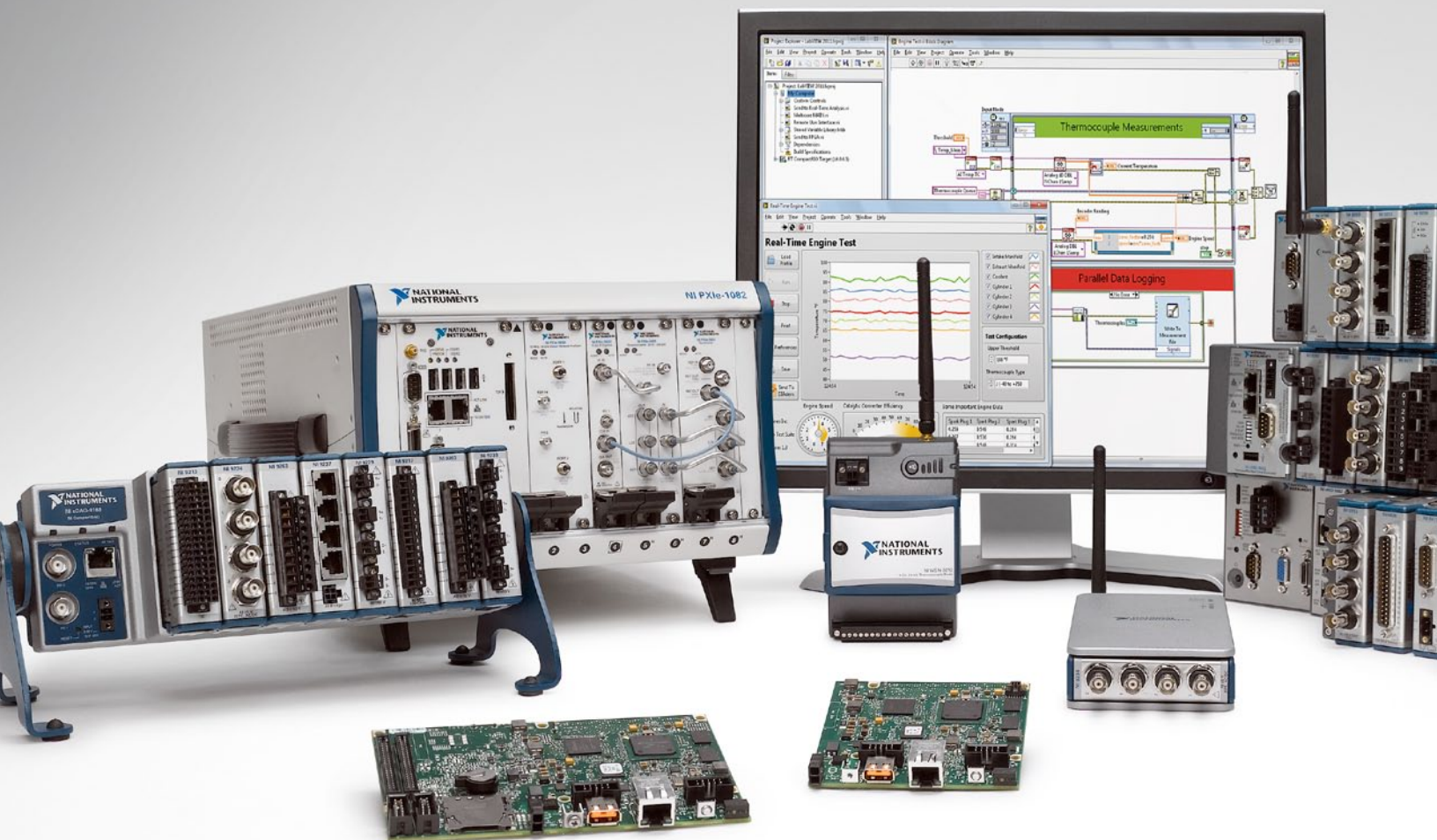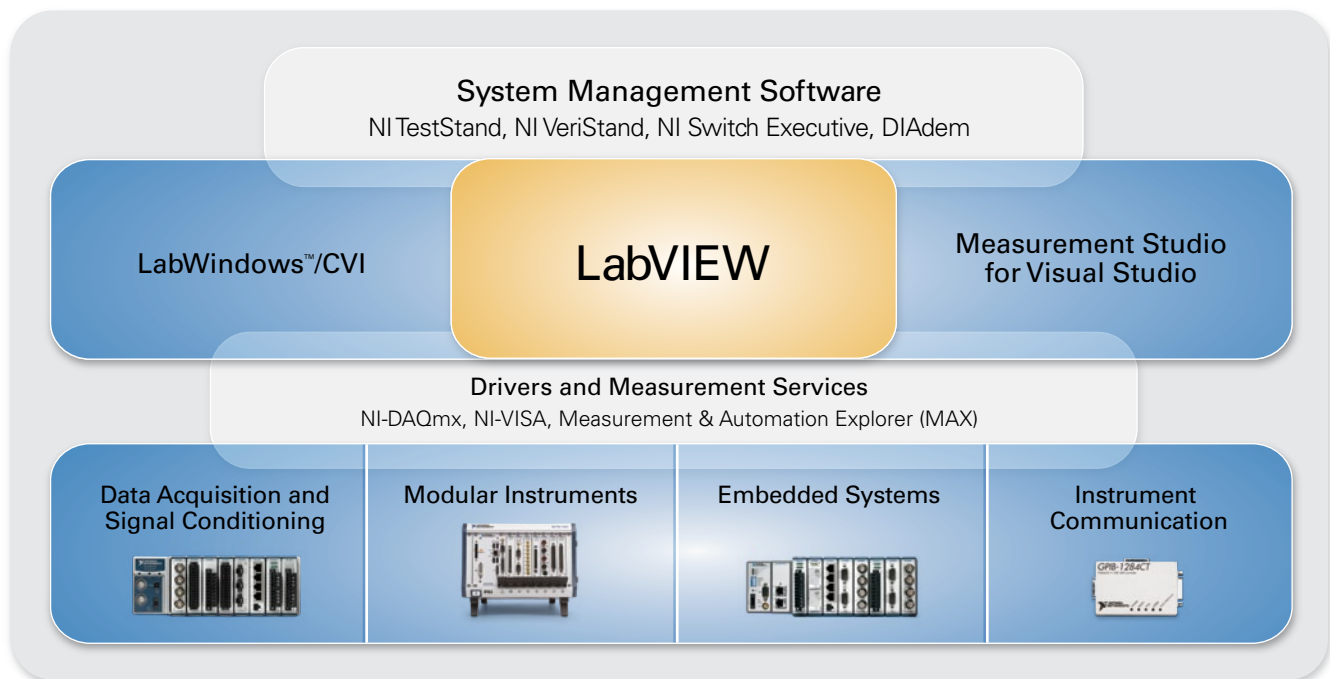
The National Instruments approach to graphical system design can change how you see the world.

National Instruments is a technology pioneer and industry leader, delivering today's most advanced technologies for test, control, and design. Engineers and scientists in hundreds of industries use flexible, high-performance NI products to create reliable, user-defined systems. With graphical programming software and modular, open hardware, NI has redefined how engineers work throughout the entire product design cycle, resulting in reduced time to market and lower development costs.

Measurement and Automation Software Overview

For three decades, National Instruments has pioneered measurement and automation software for virtual instrumentation. The NI vision of virtual instrumentation is advancing into graphical system design, giving you a single development platform to rapidly design, prototype, and deploy your systems. Today, NI delivers application development environments (ADEs), analysis and test management software, and device and instrument drivers to meet your test, control, and design needs.

System Management Software
NI TestStand, NI VeriStand, NI Switch Executive, DIAdem

LabWindows™/CVI	LabVIEW	Measurement Studio for Visual Studio

Drivers and Measurement Services
NI-DAQmx, NI-VISA, Measurement & Automation Explorer (MAX)

Data Acquisition and Signal Conditioning	Modular Instruments	Embedded Systems	Instrument Communication

NI offers system management software such as NI TestStand for test management and DIAdem for offline data analysis and presentation. For graphical, interactive, and text-based programming solutions, use ADEs such as NI LabVIEW, LabWindows™/CVI, and Measurement Studio for Microsoft Visual Studio. NI provides hardware drivers, flexible high-level APIs, and a configuration manager.

NI Software Services and Training

National Instruments services programs complete and complement the NI software product offering so you can increase your development productivity and achieve long-term success.

- Reduce development time and maintenance costs for your applications

- Keep your software products up to date with the latest features and capabilities

- Maximize your ability to develop efficient, powerful applications using your available resources

Learn more at **ni.com/services**

Services

Software Maintenance and Support
Provides automatic upgrades, maintenance releases, on-demand training, and technical support via phone and email.

Training and Certification
Offers the fastest, most effective way to increase application development productivity with NI software and hardware.

Volume License Program
Simplifies your software license management and provides NI software at a discounted rate.
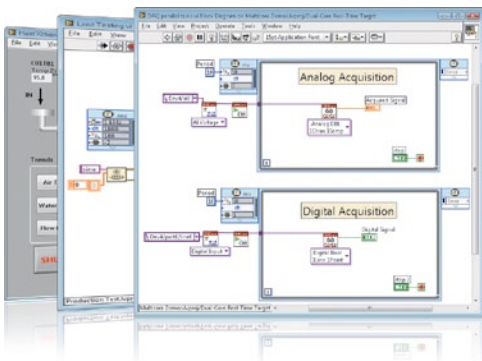
NI Developer Suite

NI Developer Suite offers substantial savings and provides regular biannual software updates with the latest versions of your application software. The modular NI Developer Suite is configurable for your application needs.

- Offers up to 72 percent savings on software

- Provides regular updates to keep your software current

- Reduces development downtime with technical support

Learn more at **ni.com/suite**

Related Products

NI Developer Suite With Automated Test Option
Adds NI TestStand for test execution management, sequencing, data collection, and report generation and adds NI Switch Executive for intelligent switch routing and management.

NI Developer Suite With Real-Time Deployment Option
Adds the LabVIEW Real-Time Module and Real-Time Execution Trace Toolkit to deploy LabVIEW code to dedicated real-time hardware.

NI Developer Suite With Image Acquisition and Machine Vision Option
Adds support for thousands of cameras, including IEEE 1394 cameras, and libraries for image processing and machine vision.

What is NI LabVIEW?

Since 1986 engineers and scientists worldwide have depended on LabVIEW system design software to build cost-effective design, control, and test systems. The unique LabVIEW graphical development environment features connectivity with tens of thousands of devices for easily gathering data, wide-ranging compatibility with multiple programming approaches, and hundreds of built-in engineering-specific functions. Because LabVIEW connects to virtually any measurement device and design tool, you can incorporate new LabVIEW applications seamlessly into systems without risking your application investment.

> **"** *In the first design stage of our control application programmed with LabVIEW, we have obtained a 20X processing speed–up on an octal-core processor machine over a single-core processor while reaching our 1 ms control loop rate requirement.* **"**

—Dr. Louis Giannone, Lead Researcher, **Max Planck Institute**
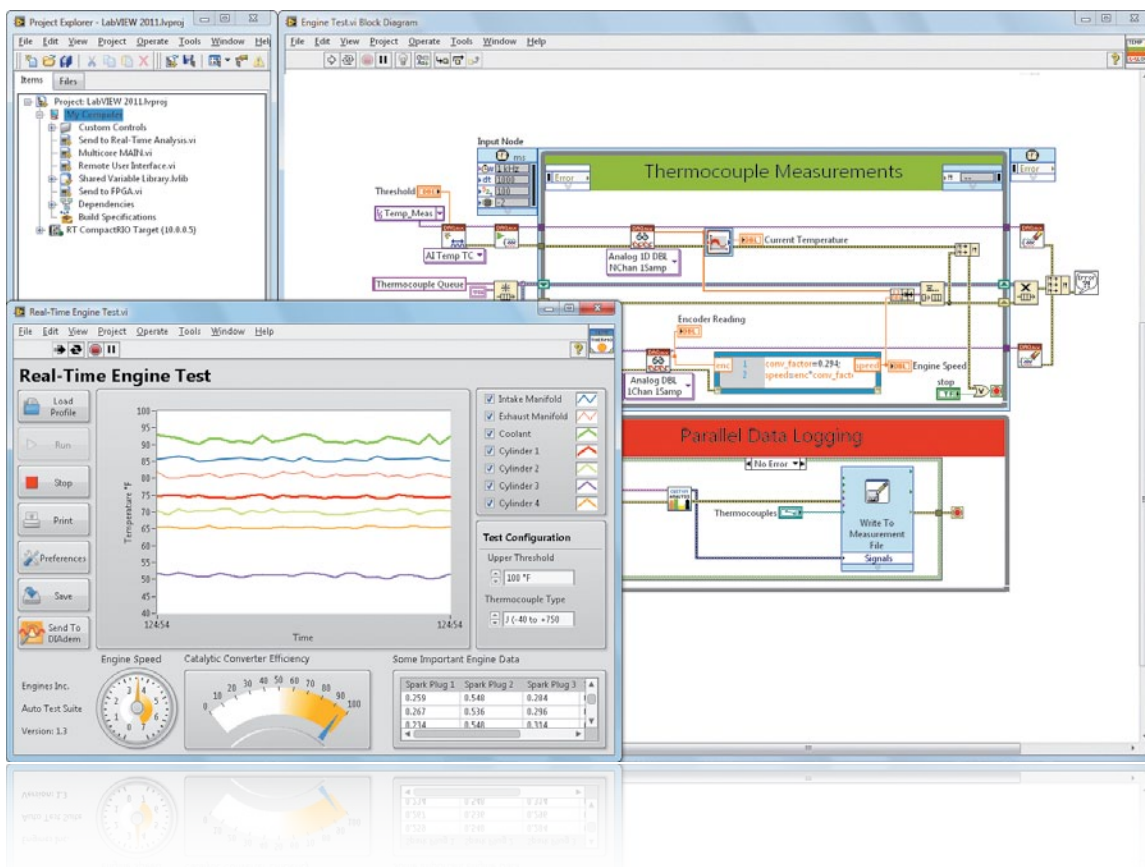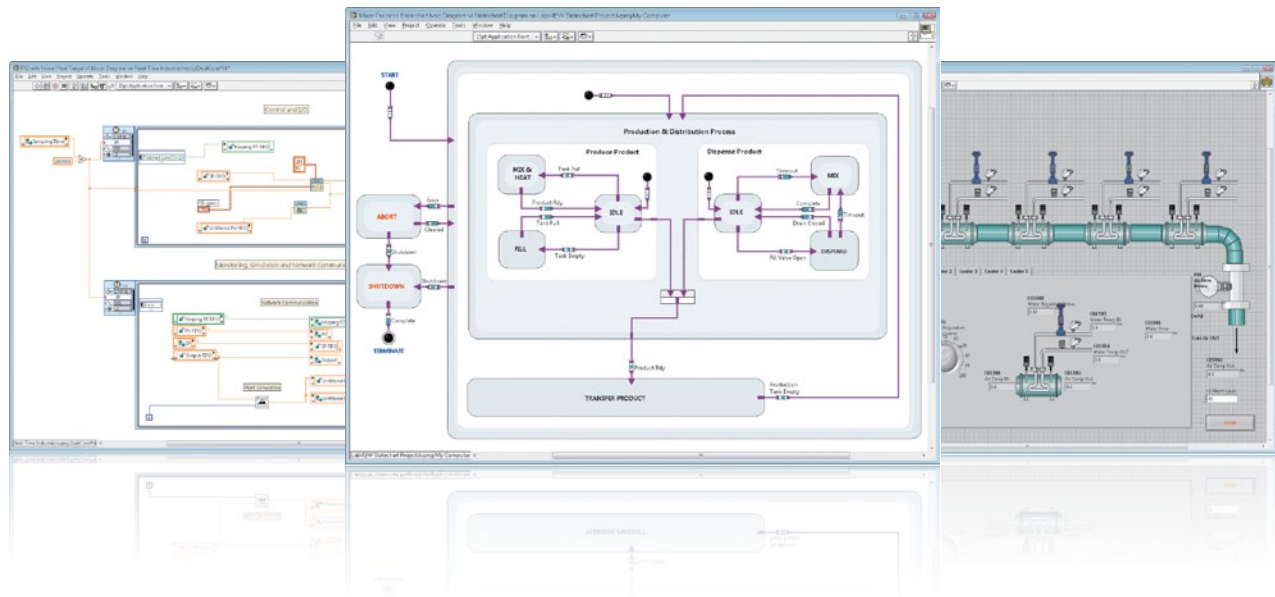
LabVIEW Modules

Along with the LabVIEW development environment, National Instruments offers a variety of add-on modules that provide additional libraries, programming methods, and deployment to computing targets ranging from industrial real-time devices to field-programmable gate arrays (FPGAs) and microprocessors.

LabVIEW Real-Time Module

- Develop real-time systems with LabVIEW graphical programming

- Download to a dedicated real-time target for reliable, deterministic performance

- Deploy as a distributed, stand-alone, autonomous, or embedded system

LabVIEW FPGA Module

- Program FPGAs without knowledge of VHDL using LabVIEW graphical programming

- Create custom logic to implement advanced timing and triggering, onboard decision making, and digital I/O

- Execute tasks deterministically and simultaneously in hardware

LabVIEW Control Design and Simulation Module

- Design, prototype, and deploy control systems within a single software environment

- Choose the syntax for your desktop or embedded system—.m file, signal flow, or a combination

- Integrate with real-world signals to achieve both model-based and measurement-based design

LabVIEW MathScript RT Module

- Deploy your custom .m files to NI real-time hardware for deterministic execution

- Develop your .m files using an interactive command-line interface or programmatic deployment node

- Reuse many of your existing scripts created with The MathWorks, Inc. MATLAB® software and others

Learn more at **ni.com/family**

More LabVIEW Add-Ons

Other LabVIEW add-ons are available for programming 32-bit microprocessors, industrial touch panel computers, and more. These include

- LabVIEW Datalogging and Supervisory Control Module
- LabVIEW Embedded Module for ARM Microcontrollers

- LabVIEW Wireless Sensor Network Module
- LabVIEW Statechart Module
- LabVIEW Touch Panel Module

- LabVIEW C Generator
- NI Vision Development Module

Learn more at **ni.com/labview/family**
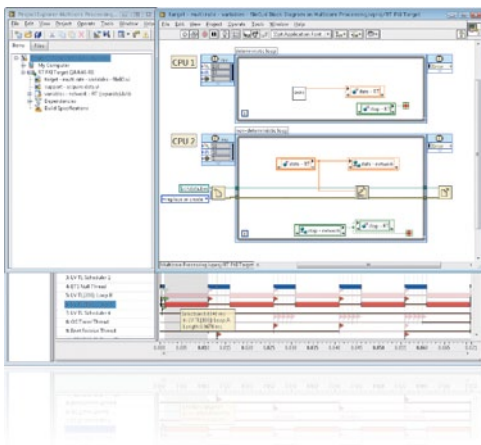
LabVIEW Toolkits

LabVIEW toolkits provide additional functionality for report generation, advanced analysis, database communication, vibration analysis, and more.

- Report Generation Toolkit for Microsoft Office, Database Connectivity Toolkit

- Sound and Vibration Measurement Suite, PID and Fuzzy Logic Toolkit

- Advanced Signal Processing Toolkit, Modulation Toolkit

- Unit Test Framework Toolkit, Desktop Execution Trace Toolkit, VI Analyzer Toolkit

Learn more at **ni.com/labview/family**

More LabVIEW Toolkits

- Real-Time Execution Trace Toolkit
- Multicore Analysis and Sparse Matrix Toolkit
- Digital Filter Design Toolkit

- LabVIEW FPGA Compile Farm Toolkit
- NI Motion Assistant
- System Identification Toolkit

- GPS Simulation Toolkit
- DataFinder Toolkit
- Adaptive Filter Toolkit

Learn more at **ni.com/labview/products**

Instrument Driver Network

Instrument drivers offer a high-level programming interface that eliminates the need to learn an instrument's low-level messaging. This saves you programming time and improves your productivity. Whether you use NI LabVIEW, NI LabWindows™/CVI, or Microsoft Visual Studio, the NI Instrument Driver Network has you covered with over 9,500 instrument drivers from more than 360 vendors.

- Take advantage of the industry's largest source for instrument drivers

- Get started immediately with open-and-run examples

- Choose from LabVIEW Plug and Play, LabWindows/CVI, and Interchangeable Virtual Instrument (IVI) drivers

Learn more at **ni.com/idnet**

10 of the Most Downloaded Drivers

- Tektronix TDS 200, 1000, and 2000 series oscilloscopes
- Tektronix TDS 3000 series oscilloscopes
- Agilent 34401A digital multimeter

- Agilent 33000 series function generators
- Stanford Research SR830 lock-in amplifier
- LeCroy Wave series oscilloscopes

- Ocean Optics 2000 series spectrometers
- Keithley 2400 series sourcemeters
- Fluke 884X series digital multimeters
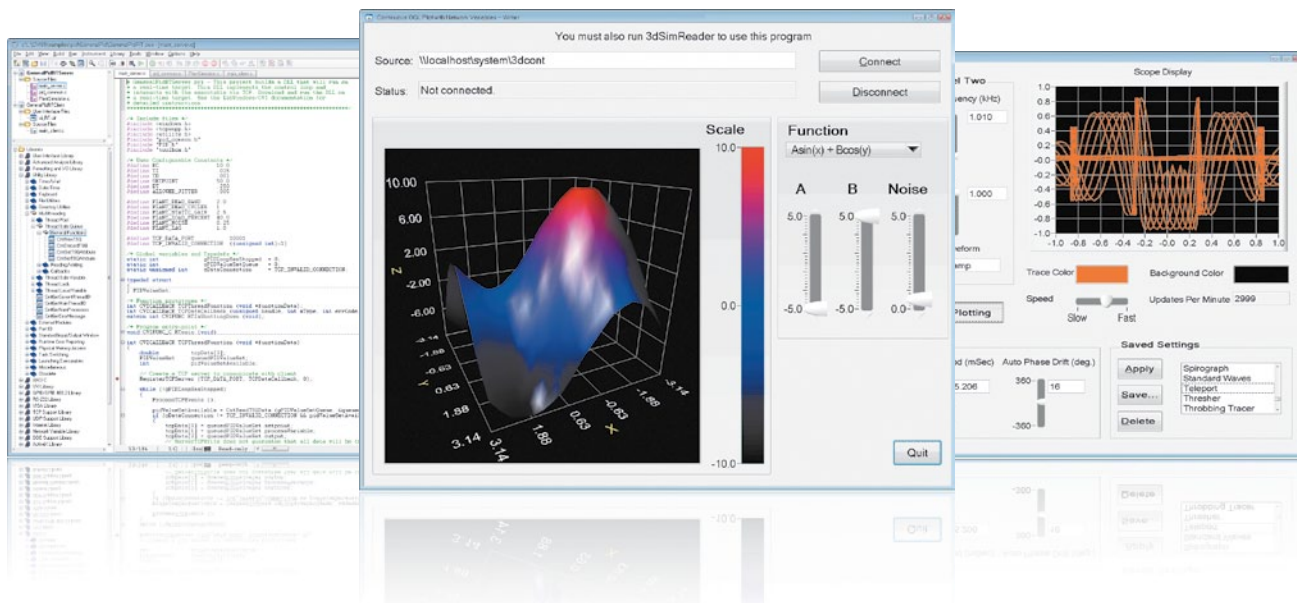
NI LabWindows™/CVI

LabWindows/CVI is a proven ANSI C integrated development environment that provides engineers and scientists with a comprehensive set of programming tools for creating test and control applications. Specifically designed for building instrumentation systems based on PXI, plug-in data acquisition devices, GPIB, and more, LabWindows/CVI combines an interactive, easy-to-use development approach with the programming power and flexibility of compiled ANSI C code. In addition, LabWindows/CVI delivers many usability features that improve productivity without sacrificing speed or source code manageability.

- Built-in libraries for acquisition, analysis, and visualization

- Simplified drag-and-drop user interface editor

- Automated code generation tools and hardware assistants

- Interactive execution of individual functions without changing the source code

- Analysis and math functions including signal processing

- IVI Instrument Driver wizards for fast creation of IVI-C drivers

- High-level multithreading library and optimized data structures for building multithreaded applications

- Simplified API to transfer live measurement data between applications over the network

- Ability to integrate DLLs, ActiveX, and .NET components

- Ability to build professional, distributable installers and application patches

- Support for advanced PC technologies such as 64-bit operating systems and Windows 7

- Memory management and resource tracking tools for advanced debugging

- Function execution profiling tools to help analyze and optimize source code for improved run-time performance

- Simplified NI FPGA communication through integrated FPGA Interface C API

- Ability to guarantee execution behavior of compiled code by binding to a specific version of the run-time engine

Learn more at **ni.com/lwcvi**

LabWindows/CVI Add-Ons

- LabWindows/CVI Real-Time Module
- LabWindows/CVI Run-Time Module for Linux

- Vision Development Module
- Execution Profiler Toolkit

- SQL Toolkit
- Signal Processing Toolkit
- PID Control Toolkit

Learn more at **ni.com/lwcvi**
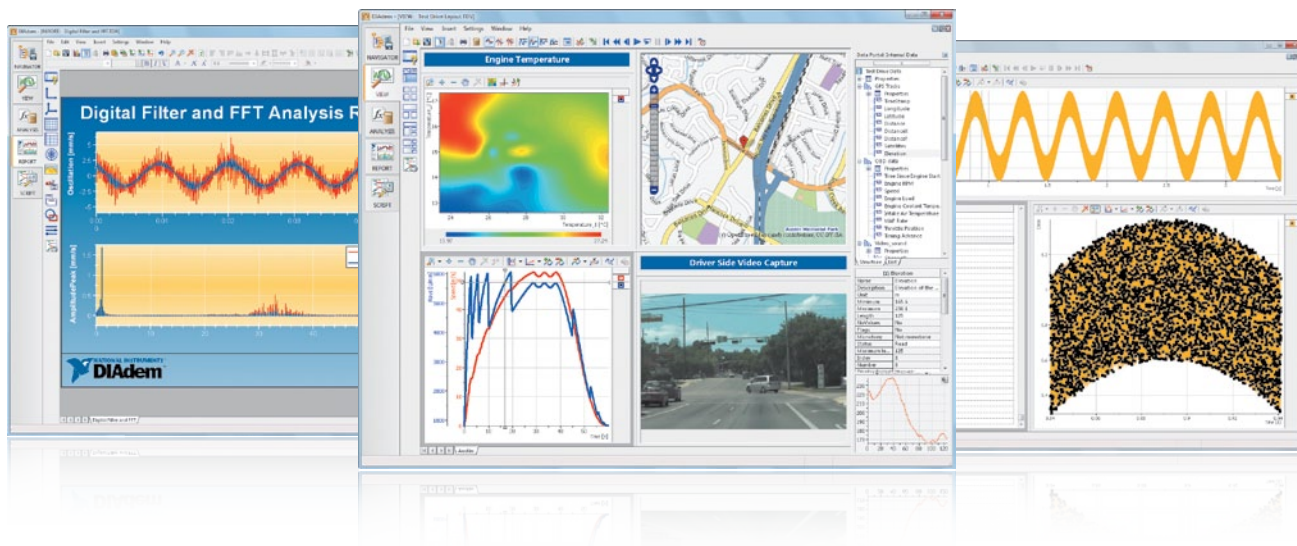
NI DIAdem

DIAdem is an off-the-shelf tool for offline data postprocessing. It can interface with any file format—from ASCII to binary to custom—through the use of modular technology called DataPlugins, making it flexible enough to handle today's applications and tomorrow's challenges. Using the built-in My DataFinder, DIAdem provides a cohesive data management and mining solution that you can use to avoid the six-figure investment of a custom database. After finding and loading data—from a few data points to billions of values—you can inspect data, perform analysis, and report results interactively. DIAdem also includes a robust engine fully capable of postprocessing automation to save time and increase efficiency.

- Analyze large data sets containing more than 100 billion values

- Quickly search and mine data

- Find trends and correlations

- Inspect data, compare test runs, and identify anomalies

- Synchronize data playback with videos, 3D models, and more

- Create professional, reusable reports

- Automate repetitive processes to save time

- Manage units and calculations sets automatically

Learn more at **ni.com/diadem**

Related Products
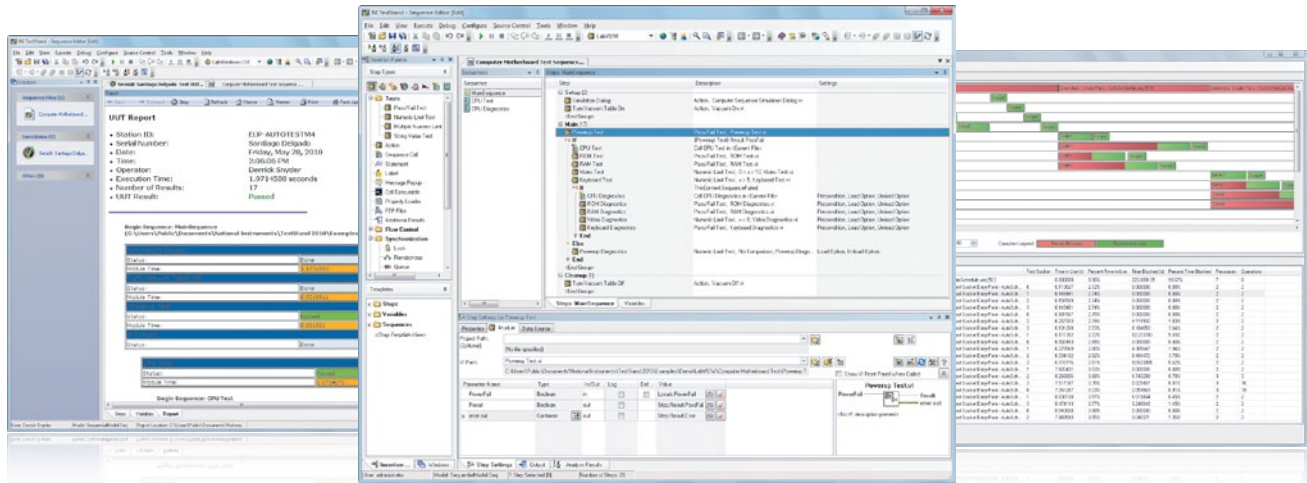
NI DataFinder Server Edition
Manage test data across multiple groups and departments regardless of format.

NI LabVIEW DataFinder Toolkit
Create custom, deployable data management applications with LabVIEW.

DIAdem Crash Analysis Toolkit
Automate crash data analysis and reporting in compliance with international standards.

NI TestStand

NI TestStand is a ready-to-run test management environment for organizing, controlling, and executing your automated prototype, validation, and manufacturing test systems. Quickly build your test sequences with NI TestStand by incorporating tests written in your preferred programming language. Built on a high-speed, multithreaded execution engine, NI TestStand delivers the performance to meet your most rigorous test throughput requirements. NI TestStand is also completely customizable, so you can modify and enhance it to match your specific needs, including customizing the operator interface, generating custom reports, and modifying sequence execution requirements. Using NI TestStand, you can focus your engineering efforts on testing a particular product while NI TestStand manages the sequencing, execution, and reporting tasks for you.

- Sequence development environment
- Parallel multithreaded testing
- Customizable reporting
- Source code control integration

- Debugging
- User management
- Customizable operator interfaces
- Database logging

Learn more at **ni.com/teststand**

Related Products

NI TestStand ATML Toolkit
Translate Automatic Test Markup Language (ATML) Test Description files into NI TestStand sequence files and code modules to help reduce long-term obsolescence and promote rehosting.

NI Requirements Gateway
Integrate with requirements written in Microsoft Excel, Microsoft Word, or Adobe Acrobat as well as Telelogic DOORS and IBM Rational RequisitePro.

NI Switch Executive
Increase your development productivity by interactively configuring and naming switch modules, external connections, and signal routes.
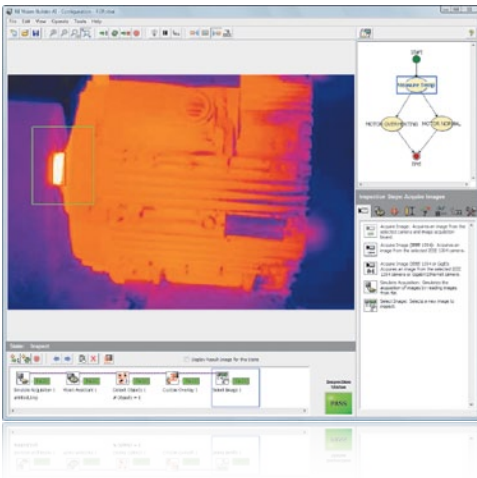
NI Vision Builder for Automated Inspection (AI)

Configure, benchmark, and deploy complete systems that address vision applications such as classification, code reading, presence detection, metrology, and precision alignment. Vision Builder AI simplifies the development and maintenance process by replacing the complexities of programming with an interactive menu-driven development environment.

- Configure more than 100 powerful machine vision functions including geometric matching, optical character recognition (OCR), and particle analysis

- Acquire and process images with NI Smart Cameras, NI vision systems, NI frame grabbers, and standard camera buses such as USB and GigE Vision

- Set up pass/fail decisions based on multiple inspection results by specifying inspection flow with the state diagram tool

- Communicate triggering and inspection results directly over digital I/O, serial, and Ethernet protocols

- Use the default deployment interface or customize your own

- Verify application robustness by modeling variations in lighting, camera position, and more

- Integrate directly with LabVIEW and NI TestStand for large applications

Learn more at **ni.com/vision**
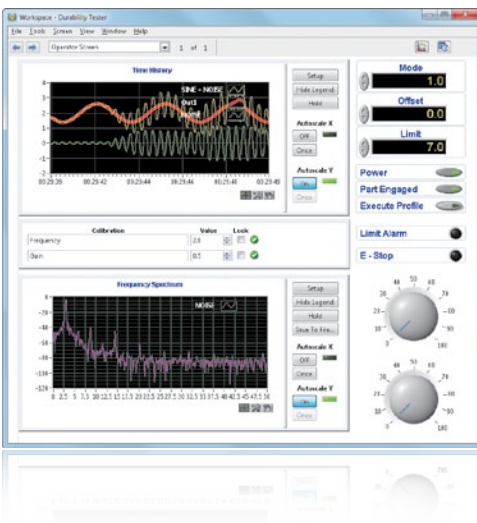
NI VeriStand

NI VeriStand is an open, configuration-based software tool for creating real-time testing applications more efficiently. It provides the common functionality required to implement real-time testing applications, which reduces development cost and risk. Although no programming knowledge is required to use NI VeriStand, you can customize and extend it using a variety of software environments such as LabVIEW; The MathWorks, Inc. Simulink® software; ANSI C/C++; and others for modeling and programming.

- Real-time stimulus generation
- Triggerable, multirate data logging
- Real-time hardware I/O interfaces
- Event detection and response

- Closed-loop control
- Multichassis synchronization
- Simulation model execution
- Run-time editable user interface

Learn more at **ni.com/veristand**

Related Products

### NI Developer Suite Real-Time Testing and HIL Simulation
Get NI VeriStand with additional tools for customizing the environment.

NI TestStand and NI Requirements Gateway
Add automation and requirements traceability to your NI VeriStand applications.

INERTIA Add-On for NI VeriStand
Adds out-of-the-box functionality for real-time test cell applications such as dynamometers and servo-hydraulic testers.
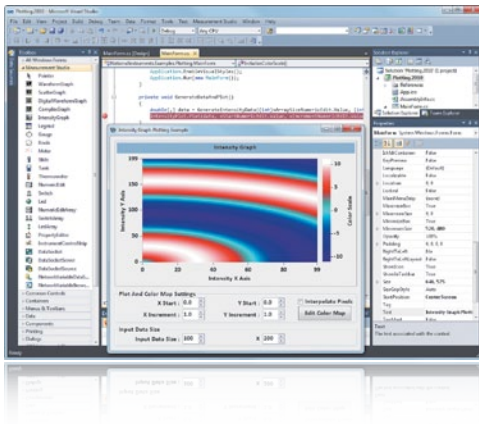
NI Measurement Studio

Measurement Studio is a suite of tools and class libraries for Microsoft Visual Studio that is designed to reduce the development time of test and measurement applications in Visual Studio 2010/2008/2005. The software provides highly extensible measurement and automation classes, hardware connectivity tools, and Windows Presentation Foundation, Windows Forms, and Web Forms controls for Visual Basic .NET and Visual C#.

- Integrated toolbox within Microsoft Visual Studio for direct access to Help, examples, and APIs; managed .NET APIs for data acquisition and instrument control

- Power to create an immersive graphical user interface experience using the latest Microsoft technology—Windows Presentation Foundation (WPF)

- Analysis libraries for signal generation, signal processing, curve fitting, linear algebra, statistics, filtering, and more

- Scientific and test-related user interface controls with data binding

- .NET instrument driver generation for IVI, VXI plug&play, and legacy drivers

- Automated code generation tools, hardware assistants, and simplified network communication

Learn more at **ni.com/mstudio**
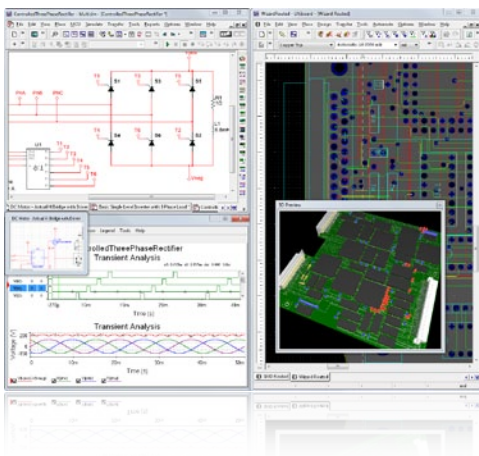
NI Multisim

Multisim is an advanced analog circuit design and simulation environment optimized for usability. With it, you can rapidly define a circuit schematic and analyze performance with an intuitive interface to simulation. By interactively probing a design with a sophisticated set of analyses, you can identify errors, fine-tune behavior, and reduce overall prototype iterations earlier in the design flow. The result is saved time and improved productivity.

- Intuitive circuit capture and interactive simulation in a single design environment

- System-level design of analog and digital applications with LabVIEW co-simulation

- Ability to define custom simulation analyses through unparalleled integration with LabVIEW

Learn more at **ni.com/multisim**

Related Products

NI Ultiboard
Rapidly prototype PCBs with the Ultiboard layout environment. Through seamless integration with Multisim, export schematics to Ultiboard for complete design synchronization.

NI Circuits Teaching Solution
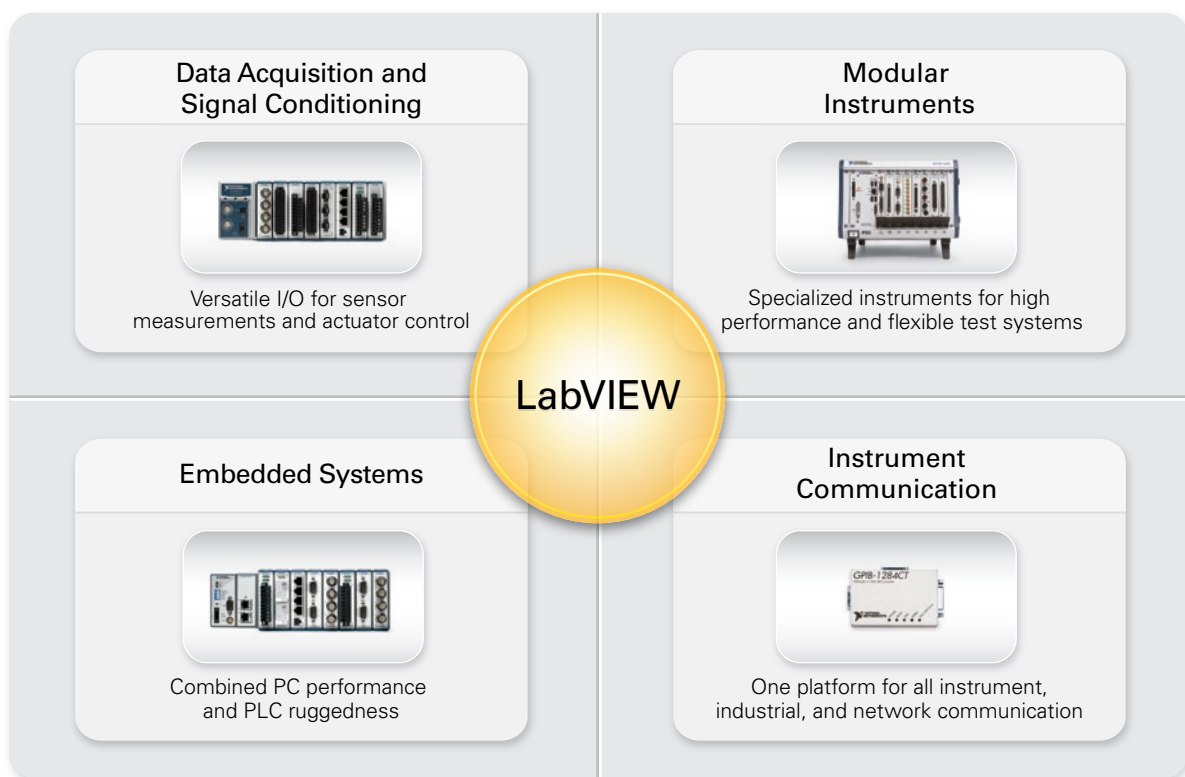Facilitate student comprehension of circuit theory by providing the best-in-class, integrated teaching platform of Multisim, LabVIEW, and the NI Educational Laboratory Virtual Instrumentation Suite (NI ELVIS).

NI LabVIEW
Expand the simulation capabilities of Multisim with LabVIEW by defining custom analyses, integrating real measurements for increased accuracy, and co-simulating system-level designs.

Measurement and Automation Hardware Overview

National Instruments offers engineers and scientists a tightly integrated suite of hardware and software tools to measure and automate the world around them. By using cutting-edge commercial technology, such as the latest ADCs, FPGAs, and PC buses, NI hardware delivers modular and easy-to-use solutions for a wide range of applications from automated test and data logging to industrial control and embedded design.

Data Acquisition and Signal Conditioning

Versatile I/O for sensor measurements and actuator control

Modular Instruments

Specialized instruments for high performance and flexible test systems

LabVIEW

Embedded Systems

Combined PC performance and PLC ruggedness

Instrument Communication

One platform for all instrument, industrial, and network communication

National Instruments data acquisition (DAQ) devices measure electrical or physical signals from a variety of sensors. NI modular instruments synchronize measurement, signal generation, RF, and switching components for automated test systems. NI embedded systems offer rugged packaged and board-level form factors along with a modular, reconfigurable architecture for advanced control and monitoring applications. For instrument control and communication, NI provides numerous GPIB, USB, Ethernet, and serial interfaces.
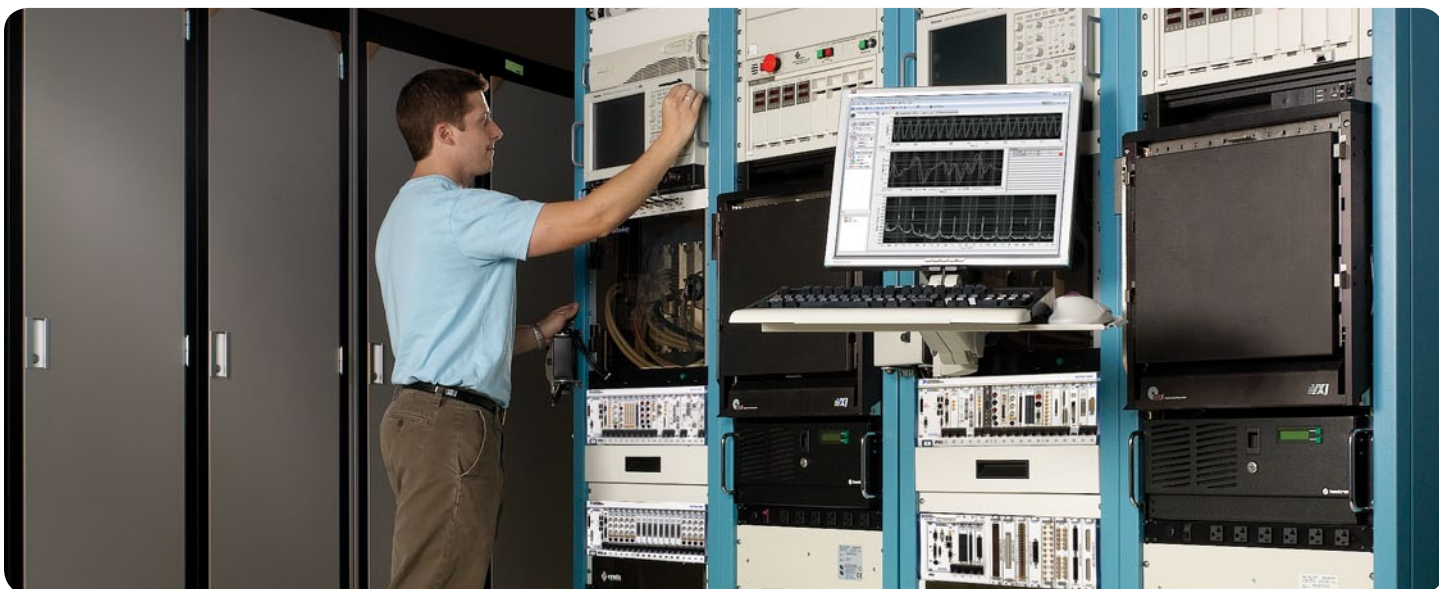
NI Hardware Services and Support

Whether you own a single NI data acquisition device, a state-of-the-art PXI system, or hundreds of NI CompactRIO systems deployed in critical applications around the world, NI hardware services protect your investment and save you money.

Product Services

Extended Warranty—NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project.

Repair—Highly trained technicians perform NI repair services as quickly as possible. In addition, NI offers advanced replacement and next-on-bench services.

Calibration—NI calibration helps make sure that every measurement is as good as the first measurement by verifying the accuracy of your measurements and adjusting them back to specification when necessary. In addition, NI calibration helps you maintain traceability to national and international standards.

Learn more at **ni.com/services**

System Services

Standard—During standard system configuration, NI technicians assemble, configure, test, and document your NI PXI, CompactRIO, or Compact FieldPoint system to give you the ultimate out-of-box experience.

Custom—Custom system configuration helps you successfully deploy a large number of systems at a lower price. Featured services include system assembly and configuration, custom test, custom application installation, and custom documentation.

Additional Services

OEM Support

NI offers design-in consulting and product integration assistance if you want to use NI products for OEM applications. Visit **ni.com/oem** for more information.

Technical Support

NI delivers industry-leading technical support through online knowledge bases, applications engineers, and discussion forums. Visit **ni.com/support** for more information.

Upgrades

NI service programs include automatic upgrades to your application development environment and higher levels of technical support. Visit **ni.com/ssp** for more information.

NI PXI

PXI is the open, PC-based platform for test, measurement, and control that provides the industry's highest bandwidth and lowest latency with modular I/O for high-resolution DC to 26.5 GHz RF. With more than 10 years of industry adoption and over 1,500 products from more than 70 members of the PXI Systems Alliance (pxisa.org), PXI is the automated test platform of choice for thousands of companies worldwide.

Chassis
High-throughput backplane with triggering and tight synchronization

Controllers
Embedded controllers with Windows or real-time OS and remote controllers

Modules
More than 1,500 products from more than 70 vendors

Platform Advantages

Modular—Build custom test systems using a hardware architecture that can scale with your changing needs.

High Performance—Take advantage of the latest commercial technologies offering the test and measurement industry's highest throughput and lowest latency.

Rugged—Develop and deploy industrial applications using hardware with small, rugged packaging and high-temperature tolerances.

PXI Express Chassis

PXI Express chassis from NI increase bandwidth by up to 100 times over PXI, incorporate the industry's best timing and synchronization, and preserve compatibility with software and the more than 1,500 standard PXI modules.

- Compatibility with PXI, PXI Express, CompactPCI, and CompactPCI Express modules

- Up to 791 W total power available

- Use with PXI Express embedded, real-time, and remote controllers from NI

Features

High Performance
NI PXI Express chassis use best-in-class PCI Express switches to deliver the highest-performance PCI Express communication between modules and to the system controller.

Enhanced Cooling
Many NI PXI Express chassis provide heat dissipation of 38.25 W in every peripheral slot even when installed in up to 50 °C environments.

System Longevity
NI PXI Express chassis offer the flexibility to use PXI Express modules as well as compatibility with most PXI modules.

PXI Chassis

NI PXI chassis are designed to meet a wide range of test and measurement application needs. From 4 to 18 slots to an operating temperature of 0 to 55 °C to options for both 3U and 6U modules, NI has the chassis for your application.

- Compatibility with PXI and CompactPCI modules

- Up to 600 W total power available

- Use with PXI embedded, real-time, and remote controllers from NI

Features

Extensive Offering
Since the introduction of the first NI PXI chassis more than a decade ago, NI has continued to increase the variety of chassis it offers.

Established Design
With tens of thousands of units deployed, NI PXI systems have proved to be highly reliable.

Backplanes
Can't find the mechanical form factor that you are looking for? NI offers PXI and PXI Express backplanes that you can incorporate into your own chassis design.

PXI High-Value Chassis

With NI high-value chassis, you can control up to five PXI/CompactPCI or PXI Express/CompactPCI Express modules across a remote link that offers up to 250 MB/s of sustained throughput. These high-value chassis are ideal for remote, real-time, and data acquisition applications.

- Quiet acoustic noise emissions as low as 38 dBA

- AC and AC/DC power options

- Options for integrated MXI-Express controller, remote controllers, or embedded controller

Features

Low Cost
These chassis offer the lowest entry cost of the PXI platform, with kits starting at $999 USD.

Ease of Use
With a built-in remote controller, simply install a host controller in your PC and you are up and running.

Scalable
When you need to add more peripheral slots, purchase another chassis and daisy chain your low-cost integrated chassis to it.

Learn more at **ni.com/pxi**

Embedded Controllers

PXI embedded controllers from National Instruments use the latest advancements in computing technology to provide high performance and the best value in a compact form factor, making them ideal for test and measurement systems.

- Up to 8 GB/s system bandwidth

- Integrated hard drive, memory, Ethernet, video, USB, GPIB, and other peripherals

- Preinstalled Microsoft Windows OS

Features

High Performance
NI embedded controllers use the latest multicore processors from Intel to provide high computing performance.

High I/O Bandwidth and Lowest Latency
PXI embedded controllers harness the advantages of PCI/PCI Express to offer the industry's highest I/O throughput and lowest latency.

NI System Assurance Program
You receive a preconfigured controller with all software and drivers applicable for your system.

Real-Time Controllers

National Instruments RT series PXI embedded controllers deliver a flexible, rugged platform for your deterministic, real-time measurement and control applications.

- Up to 191 kHz PID control loop rate

- Deployment platform for LabVIEW Real-Time and LabWindows™/CVI Real-Time applications

- Submicrosecond loop rates with only 3 to 4 μs of system jitter

- Integrated hard drive, USB, GPIB, serial, and other peripheral I/O

Features

Deterministic Performance
Run your application on dedicated PXI real-time hardware for real-time responses, fast loop rates, and extremely low system jitter.

Multicore Processor Benefits
Exclusively control processor affinity for executing certain sections of your code.

Extended Temperature and 24/7 Operation Options
Deploy your PXI-based systems in more demanding conditions.

Remote Controllers

With PXI remote controllers from National Instruments, you can control PXI systems directly from your PC or laptop computer with a transparent, high-speed serial link that requires no programming. Using PXI remote controllers, you can take advantage of the latest high-performance, low-cost PCs for control of your PXI system.

- Direct PC/laptop control of PXI/CompactPCI and PXI Express/CompactPCI Express systems

- Fiber-optic cabling options for distributed applications up to 200 m

- Up to 5.6 GB/s of sustained throughput with low-latency cabled PCI Express link

Features

High Performance
PXI remote controllers use high-performance computers to stream live measurement or control data quickly.

Low Cost
These controllers offer the lowest entry cost into the PXI platform, with kits starting at $999 USD.

Control of Multiple PXI Chassis
You can build multichassis PXI systems by daisy chaining individual PXI chassis up to 200 m apart.

Learn more at **ni.com/pxi**

Timing and Synchronization Modules

PXI Express and PXI timing and synchronization modules use the trigger bus, star trigger, and system reference clocks to implement advanced multimodule and multisystem synchronization. Through shared clocks, triggers, and time references, you can vastly improve the accuracy of measurements and implement advanced clocking and triggering schemes.

- Control trigger lines and the 10 MHz reference clock

- Synchronize multiple PXI Express and/or PXI chassis

- Synchronize hybrid systems with GPIB, VXI, and other instruments

- Discipline 10 MHz reference clock to GPS, IEEE 1588, and IRIG-B

Learn more at **ni.com/pxi**

Features

Synchronization
With PXI Express and PXI timing and synchronization modules, you can tightly synchronize multiple PXI systems with chassis-to-chassis skew below 100 ps.

Clock and Delay Generation
Generate clocks from DC to 1 GHz with 1 µHz resolution. With the GFT9404, you can generate delays with 1 ps resolution.

References
High-stability OCXO and TCXO reference clocks are available with a maximum stability of 50 ppb. With the NI PXI-6682 and PXI-6682H, you can reference GPS, IEEE 1588, and IRIG-B time sources.

Data Record and Playback

Because it is based on the high-bandwidth PCI and PCI Express buses, the PXI platform enables instruments and data acquisition modules to continuously stream data to and from high-speed RAID hard drive arrays.

- Up to 750 MB/s sustained reading and writing to disk per storage device

- Up to 2.8 GB/s of aggregate sustained read and write to disk data rate in a single PXI Express chassis with multiple storage devices

- Up to 12 hard drives with 24 TB total storage capacity per storage device

- Ability to aggregate multiple storage devices to increase system's total storage capacity

Learn more at **ni.com/pxi**

Features

High-Bandwidth Interface
PXI systems interface to the RAID hard drive arrays using cabled PCI Express.

Standard File I/O
NI data streaming systems support standard file I/O application programming interfaces.

RAID
The external RAID hard drive enclosures support multiple RAID levels, including 0, 1, and 5.
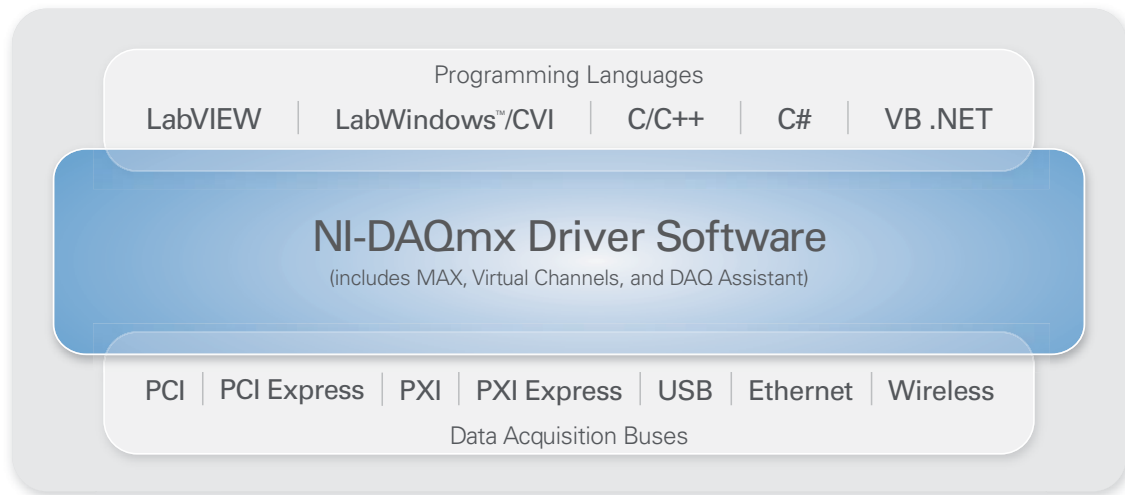
NI Data Acquisition and Signal Conditioning

The purpose of data acquisition is to measure a physical or electrical phenomenon such as voltage, current, temperature, pressure, or sound. PC-based data acquisition uses a combination of measurement hardware and software to provide a flexible, user-defined system for automating measurements and making data available for analysis. While each data acquisition system is uniquely defined by its application requirements, every system is designed to acquire, analyze, and present information.

Designed for Performance

Engineers and scientists across industries and application areas have chosen NI data acquisition (DAQ) devices for their high-performance I/O, industry-leading technologies, and software-driven productivity gains. NI offers PC-based measurement and control solutions that deliver increased productivity through user-defined logging, analysis, and visualization. NI-DAQmx multithreaded driver software provides ease of use, flexibility, and performance in multiple programming environments, including NI LabVIEW, NI LabWindows™/CVI, C/C++, Visual C#, and Visual Basic .NET.

Programming Languages

| LabVIEW | LabWindows™/CVI | C/C++ | C# | VB .NET |

NI-DAQmx Driver Software

(includes MAX, Virtual Channels, and DAQ Assistant)

| PCI | PCI Express | PXI | PXI Express | USB | Ethernet | Wireless |

Data Acquisition Buses

NI Data Acquisition Software

NI-DAQmx, a high-performance, multithreaded driver, provides a consistent set of functions across multiple programming languages and for all supported PC buses. So no matter which language you use, NI-DAQmx software can simplify any application. Every NI data acquisition device works with NI-DAQmx and is shipped with NI Measurement & Automation Explorer (MAX), NI-DAQmx virtual channels, and the DAQ Assistant.

Measurement & Automation Explorer (MAX)

- Configure and test hardware with interactive test panels
- Perform self-test sequences
- Create simulated devices
- Save, import, and export configuration files
- Reference wiring diagrams and documentation

NI-DAQmx Virtual Channels

- Configure input ranges and signal conditioning parameters
- Convert sensor voltage measurements into real-world engineering units
- Apply user-defined scaling operations
- Create NI-DAQmx tasks by adding timing, triggering, and synchronization information

DAQ Assistant

- Create a measurement task interactively through a wizard-like configuration utility
- Configure sampling parameters, data scaling, and data-logging formats (including ASCII and TDMS)
- Automatically generate LabVIEW, C, C++, or Visual Basic .NET code

Learn more at **ni.com/dataacquisition**
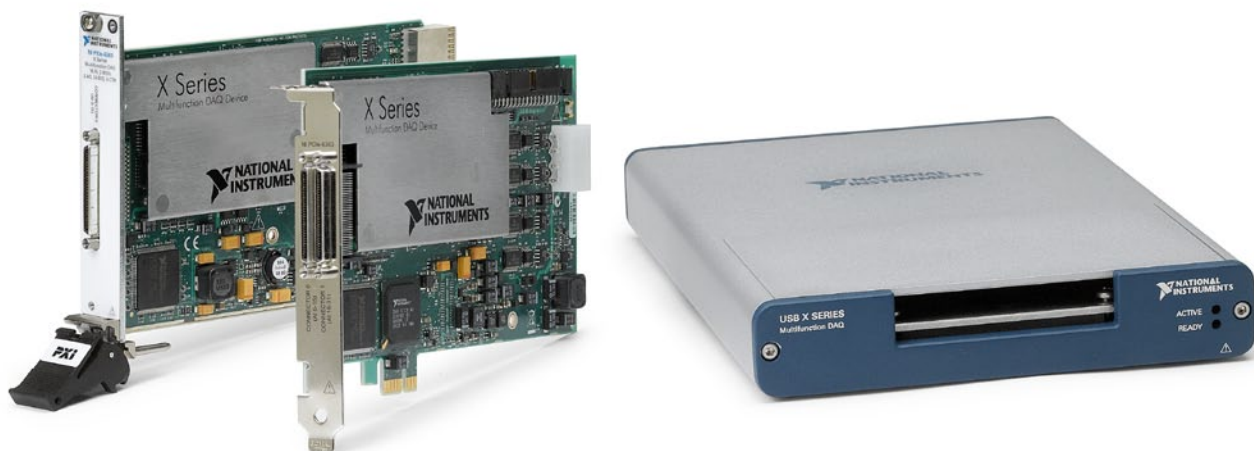
NI X Series Multifunction Data Acquisition for PCI Express, PXI Express, and USB

Multifunction DAQ devices integrate analog input and output, digital input and output, and counter/timer circuitry. NI X Series devices for USB, PCI Express, and PXI Express are the most advanced multifunction DAQ devices ever designed by National Instruments. The X Series DAQ family incorporates significant enhancements to onboard timing, triggering, data streaming, and driver software, which make it possible to perform parallel execution of measurement tasks at both the hardware and software levels. X Series devices are well-suited for applications ranging from basic data logging to control and test automation.

NI-STC3 Timing and Synchronization Technology

- Four 32-bit counters for PWM, encoder, frequency, and more
- 100 MHz timebase for precise sample clock generation
- Independent analog and digital timing engines
- Retriggerable analog I/O, digital I/O, and counter I/O

Native x1 PCI Express Interface
(PCI Express and PXI Express Devices)

- Dedicated bandwidth of up to 250 MB/s in each direction
- 8 DMA channels for analog I/O, digital I/O, and all four counters

NI Signal Streaming (USB Devices)

- Patented technology that ensures high-speed bidirectional data transfer over USB
- Message-based instructions and device-side intelligence
- Concurrent analog, digital, and counter operations

Learn more at **ni.com/xseries**

Simultaneous Sampling X Series on PXI Express

- Take advantage of up to 16 ADCs per device for higher sampling rates per channel and reduced phase offset
- Synchronize up to 272 analog input channels in a PXI Express chassis
- Easily acquire from multiple devices with NI-DAQmx multidevice tasks
- Log data to TDMS files at up to 1.2 GB/s with new Configure Logging VI

NI M Series
Multifunction DAQ
for USB, PCI, and PXI

NI M Series DAQ offers a broad set of
I/O options and signal connectivity for
data acquisition applications. You can
choose USB M Series DAQ with
both bus- and wall-powered options.
For high-channel-count systems, some
M Series devices include up to
80 channels on a single device, and you
can meet higher-resolution requirements
with 18-bit M Series DAQ. NI also
provides industrial M Series hardware
with built-in isolation circuitry and
analog current measurement options.

Learn more at **ni.com/daq/mseries**

NI S Series
Simultaneous Sampling
Multifunction DAQ for
PCI, PXI, and PXI Express

With a dedicated analog-to-digital
converter (ADC) per channel, high-
performing S Series DAQ devices are
ideal for applications such as transient
analysis; ultrasonic, radar, and sonar
measurements; 42 V automotive
applications; and industrial measurement
and control.

- Achieve up to 10 MS/s/ch
  sampling rates

- Eliminate crosstalk and preserve
  phase relationship between
  input channels

Learn more at
ni.com/dataacquisition

Low-Cost
NI USB-6000 Series

Low-cost NI USB DAQ devices provide
basic functionality for applications
such as simple data logging, portable
measurements, and academic lab
experiments. They are affordable for
student use yet powerful enough
for more sophisticated measurement
applications. All low-cost USB DAQ
devices include free NI LabVIEW
SignalExpress LE data-logging software.

Learn more at **ni.com/daq/usb**

NI USB-TC01 With NI InstantDAQ Technology

Just plug it in and instantly start taking temperature measurements with the NI USB-TC01.
Built-in software for viewing and logging data is automatically loaded once the device is
connected. Connect to any USB port to use your PC as a display and monitor data in real time.

Learn more at **ni.com/usb-thermocouple**

NI CompactDAQ Data Acquisition

NI CompactDAQ modular data acquisition systems for USB and Ethernet provide sensor and electrical measurements on the benchtop, in the field, and on the production line. By combining more than 50 sensor-specific I/O modules with NI Signal Streaming technology, the NI CompactDAQ platform delivers performance and ease of use in a flexible, mixed-measurement system. NI CompactDAQ features

- 1-, 4-, and 8-slot chassis

- USB, Ethernet, and IEEE 802.11 wireless options

- More than 50 measurement modules

- Operational temperature range of -20 to 55 °C

- Analog input modules that you can run at different rates with multiple timing engines

- Four 32-bit counters for PWM, encoder, frequency, and more

- NI Signal Streaming technology

- Support for LabVIEW, LabWindows™/CVI, ANSI C/C++, C#, Visual Basic .NET, and Visual Basic 6.0

- Free NI LabVIEW SignalExpress LE data-logging software

Learn more at **ni.com/compactdaq**

1-Slot NI CompactDAQ Chassis

With USB, Ethernet, and wireless options, 1-slot NI CompactDAQ chassis are optimal for both low-channel-count, portable systems and remote monitoring applications. NI-DAQmx driver software provides a single programming interface for all NI USB, Ethernet, and wireless DAQ devices, so programming is identical for any bus.

Measurement Modules for NI CompactDAQ

You can choose from more than 50 NI C Series modules for different measurements including thermocouple, voltage, resistance temperature detector (RTD), current, resistance, strain, digital (TTL and other), accelerometers, and microphones. Channel counts on the individual modules range from three to 32 channels to accommodate a wide range of system requirements.

Measurement Types

- Voltage

- Temperature

- Resistance

- Load/pressure/torque/strain

- Accelerometer

- Microphone

- Digital I/O

- Current

- Counter measurements

- Up to 500 kHz waveforms

Learn more at **ni.com/compactdaq**

Features

- Channel-to-channel or bank isolation

- BNC or screw-terminal connectivity

- Available mass termination

- IEPE conditioning

- Antialiasing filters

- NIST-traceable calibration certificates included

Physical Test and Measurement With PXI Express

PXI Express data acquisition with integrated signal conditioning improves real-world measurements. Combining integrated signal conditioning with NI-DAQmx results in the fastest ever time to measurement for real-world signals such as strain, pressure, load, temperature, sound, and acceleration. PXI Express also has a fiber optical interrogator for environments where electrical sensors are not practical. The variety of PXI Express physical measurements is crucial for building data acquisition systems for structural test and measurement. PXI Express integrated signal conditioning with NI-DAQmx allows the same application developed for eight channels to be easily scaled to acquire signals from thousands of channels.

Learn more at **ni.com/structural-test**

Products

NI SC Express Modules
NI SC Express modules provide solutions for strain, temperature, pressure, and many other measurement types.

NI Dynamic Signal Acquisition Modules
NI dynamic signal acquisition modules are accurate and flexible enough to measure any vibration or acoustic signal.

NI Optical Sensor Interrogator
The NI optical sensor interrogator is designed to work with fiber Bragg grating (FBG) optical sensors.

NI SC Express

The SC Express family features PXI Express data acquisition modules with integrated signal conditioning for measuring strain gages, pressure transducers, load cells, thermocouples, high voltages, and more. These modules have been designed for maximum accuracy, high throughput, and tight synchronization for advanced measurement systems.

- Resolution up to 24 bits, sample rates up to 250 kS/s/ch

- Isolation and antialias filtering on certain measurement types

- Up to 250 MB/s of dedicated bandwidth per device

- Software-selectable configurations, including excitation, bridge completion, and shunt calibration

Learn more at **ni.com/sc-express**

Dynamic Signal Acquisition

National Instruments sound and vibration measurement hardware provides flexible, high-performance data acquisition for vibration and acoustic signals. NI dynamic signal acquisition (DSA) devices for USB, PCI, PXI, and NI CompactRIO are ideal for precision measurements with microphones, accelerometers, or any measurement requiring high dynamic range. You can use NI DSA devices to identify noise and vibration or perform audio tests across a wide range of industries.

- Sample up to 272 channels in one chassis

- Use 117 dB dynamic range for low noise measurements

- Measure anywhere from 42 V to 1.1 μV

- Remove unwanted noise with automated antialiasing filters

Learn more at **ni.com/soundandvibration**

NI Optical Sensor Interrogator

The National Instruments optical sensor interrogator is a dual-slot 3U PXI Express data acquisition module for fiber Bragg grating (FBG) optical sensors. Optical sensors eliminate many of the challenges associated with electrical sensors because they are nonconductive, electrically passive, immune to EMI-induced noise, and able to transmit data over long distances with little or no loss in signal integrity. In addition, you can daisy chain multiple FBG sensors along a single optical fiber to greatly reduce the size, weight, and complexity of your measurement systems.

- 4 simultaneous optical channels, 10 Hz full-spectrum scan frequency

- 1510 to 1590 nm wavelength range, ability to daisy chain over 20 sensors per channel

- No external calibration required (onboard NIST-traceable reference)

- NI-OSI driver software and NI-OSI Explorer for automatic sensor detection and easy sensor configuration

Learn more at **ni.com/opticalsensing**

Digital I/O

Industrial digital I/O devices are suitable for a wide range of automation applications including controlling switches, relays, actuators, fans, lights, and motors. These devices offer the following specialized industrial features for high reliability:

- Programmable power-up states ensure actuators and relays begin in a known state

- Watchdog timers detect and respond to fault conditions

- Change detection triggers applications with minimal processor usage

- Programmable input filters remove glitches and spikes

- Isolation provides safety and prevents ground loops

Learn more at **ni.com/digitalio**

Features

Low-Cost Digital I/O
Up to 96 5 V TTL/CMOS lines for PCI, PCI Express, PXI, and USB

30 V Bank-Isolated Digital I/O
Up to 64 sourcing or sinking digital I/O lines with 24 V logic levels

Up to 150 V Digital Relays
Mechanical or solid-state relay devices with up to 150 VDC channel-to-channel isolation

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Counter/Timers

Counter/timer devices, which feature up to eight 32-bit counters, provide a variety of time-related measurements and fulfill critical timing functions as components of complex measurement systems. Use counter/timers for

- Frequency measurements

- Edge/event counting

- Pulse-width measurements

- Event timestamps

- Quadrature encoders

- Frequency generation

- Frequency division

- Pulse-train generation

- Pulse-width modulation

Learn more at **ni.com/digitalio**

Features

High Voltage
Up to 48 VDC channel-to-channel isolation for industrial applications

High Precision
High-stability (75 ppb) timebase and GPS-based synchronization for high-precision measurements

Analog Output

Analog voltage and current output devices cover a full spectrum of test and control applications from basic software-timed output to complex high-speed waveform generation. Analog output devices feature

- Up to 1 MS/s per-channel arbitrary waveform generation

- 12-, 13-, or 16-bit resolution

- ±10 V voltage or 0 to 20 mA current outputs

- High-channel density

- Multidevice synchronization

- Digital triggering and external clocking

- Simultaneous updates

- Eight digital I/O lines

- Two 24-bit counter/timers
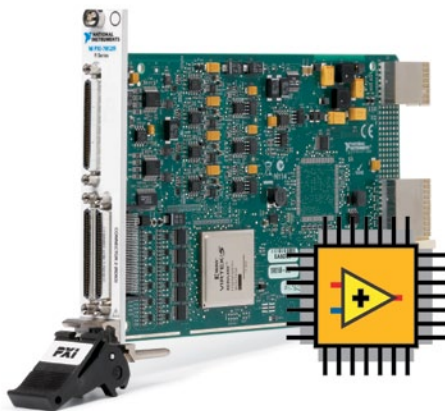
Learn more at **ni.com/daq**

Features

Software-Timed Outputs
Simultaneous software-timed single-point updates across many channels for control applications

Waveform Generation
Onboard FIFOs and high-speed update rates for simple sine, square, and triangle waves or more complex user-defined waveforms

NI R Series Multifunction RIO

R Series multifunction reconfigurable I/O (RIO) devices feature user-defined, onboard processing for flexible system timing and triggering. An FPGA-based system timing controller makes all analog and digital I/O configurable for application-specific operation with embedded custom logic. R Series devices offer up to eight analog inputs, up to eight analog outputs, and up to 160 digital I/O lines.

- LabVIEW FPGA-configured hardware for custom onboard decision making

- Digital lines individually configurable as inputs, outputs, counter/timers, PWM, flexible encoder inputs, or specialized communication protocols

Learn more at **ni.com/rseries**

Applications

High-Speed Control Loops
With LabVIEW code that executes in silicon, you can implement multiple analog PID control systems at loop rates exceeding 100 kHz and digital decision making at 40 MHz.

Custom Digital Protocols
Implement both standard and custom digital communication protocols with commercial off-the-shelf (COTS) hardware.

Sensor Simulation
Simulate complex analog and digital sensors for test system validation and hardware-in-the-loop (HIL) test.

NI Modular Instruments

NI modular instruments combine world-class measurement hardware with optimized measurement and analysis software. With modular instruments, you specify the essential functionality you require and choose from a wide variety of measurement, signal generation, RF, power, and switch modules. Then configure those instruments in software for your specific measurement tasks. Because these instruments are modular and software-defined, you can quickly interchange and easily repurpose them to meet your evolving test needs. With reconfigurable I/O (RIO) instruments, software configuration extends to powerful, open FPGAs for even greater instrument customization. NI modular instruments provide high-speed test on a variety of platforms including PXI, PXI Express, PCI, PCI Express, and USB.

RF Instruments
Acquisition and generation up to 26.5 GHz

Mixed-Signal Instruments
Digitizers, arbitrary waveform generators, dynamic signal acquisition, and high-speed digital I/O

Precision DC Instruments
Digital multimeters, power supplies, and source measure units

Switching
Complete switch offering including general purpose, fault insertion, multiplexer, matrix, RF, and microwave

Platform Advantages

Performance—Specialized instruments for high-resolution, high-speed, and high-channel-count applications.

Flexibility—Software-defined measurement capability for automated test and customization, including RIO technology for FPGA-enabled test.

Integration—Ability to tightly synchronize modular instruments and integrate the measurements with test software to achieve solutions from design to manufacturing test.

NI Digitizers/Oscilloscopes

Digitizers offer several advantages over traditional stand-alone oscilloscopes by delivering an open architecture and flexible software. With a National Instruments digitizer, you can not only perform standard oscilloscope measurements but also easily build other instruments such as spectrum analyzers, transient recorders, and ultrasonic receivers. Digitizers optimized for automated test take advantage of the high-throughput PXI and PXI Express buses to lower test times, offer picosecond-level synchronization between modules, and integrate with the entire suite of NI hardware—including arbitrary waveform generators, high-speed digital I/O, and other digitizers—so you can build and customize complete mixed-signal or high-channel-count test systems.

- Acquire wideband frequency-domain signals or make precise time-domain measurements using NI high-speed digitizers, ranging from 300 MHz bandwidth to 5 MHz

- Make high-dynamic-range, low-distortion measurements using high-resolution digitizers ranging from 14 to 24 bits of resolution

- Capture long records with deep onboard memory up to 512 MB per channel

- Expand your measurement system using high-channel-density cards and multiple instrument synchronization with NI T-Clock technology

- Perform fully customized, inline measurements using FPGA-programmable NI FlexRIO digitizer adapter modules

- Select the form factor best for your application: USB, PCI, PXI, and PXI Express

Learn more at **ni.com/digitizers**

High-Speed Data Streaming

Using PXI Express digitizers from National Instruments, you can stream data to the PC memory or RAID-0 array of disks. This streaming capability makes NI PXI Express digitizers ideal for applications such as signals intelligence, radar, and IF/RF data streaming.

Learn more at **ni.com/streaming**

NI FlexRIO

NI FlexRIO enhances the capability of the PXI platform by providing easier access to new semiconductor technology, custom hardware designs, and high-performance FPGA-based algorithms. NI FlexRIO FPGA modules harness the processing power and performance of Xilinx Virtex-5 FPGAs through the flexibility of LabVIEW FPGA, providing the ideal platform for high-throughput inline processing, DSP, and control applications. Choose from a growing selection of NI FlexRIO adapter modules featuring I/O including the latest high-speed ADCs and DACs, high-throughput digital transceivers, specialty interfaces, and more.

Learn more at **ni.com/flexrio**

Features

NI Reconfigurable I/O (RIO)
Define your own custom measurement hardware by combining reconfigurable FPGA chips and LabVIEW graphical development tools.

Peer-to-Peer Streaming
Stream data directly between PXI Express NI FlexRIO modules and other high-speed instruments for high-throughput inline processing.

LabVIEW FPGA Module
Download advanced filtering, data manipulation, and custom math algorithms and examples to get started quickly.

NI Audio and Video Analyzers

National Instruments audio and video analyzers combine high-performance, PXI-based modular instruments with application-specific software to simplify multimedia test development. The NI Video Measurement Suite and NI AudioMASTER platforms include built-in measurements that are easily automated for high-throughput applications.

- Analyze HDMI, CAV, Composite, S-video, and VGA

- Remove operator inspection with perceived quality measurements

- Apply parallel test techniques to optimize production test

Learn more at **ni.com/vms**

Features

Set-Top Box Test
Combine analog and digital video testing in a single, high-performance solution optimized for automated measurements.

HDTV Test
Generate custom video patterns and analyze high-speed LVDS channels. Calculate pixel errors on 1080p240, 4k x 2k resolutions, and 3D content.

Digital Camera and Smartphone Test
Test LCD quality as well as micro-HDMI content on the latest mobile devices.

NI Signal Generators

National Instruments PXI and PCI signal generators include versatile arbitrary waveform generators, function generators, and clock generators. By combining these instruments with the NI Analog Waveform Editor, you can produce completely user-defined signals in minutes. Whether generating simple sine and clock signals or complex modulated communications waveforms, the broad offering of NI signal generators can improve your prototyping and test systems by delivering world-class performance and higher system throughput.

Features

- Up to 16-bit resolution at a 400 MS/s sampling rate for high dynamic range and bandwidth

- Deep waveform and instruction memory for long play times

- Download rates over 600 MB/s using PXI Express

- Continuous streaming from FPGA coprocessors at rates exceeding 400 MS/s (800 MB/s) with PXI Express and NI peer-to-peer technology

- Powerful waveform linking, looping, scripting, and triggering

- Onboard signal processing for interpolation and upconversion to intermediate frequencies
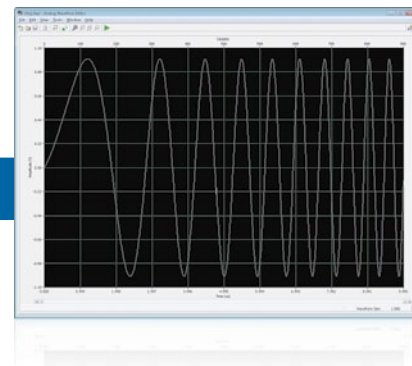
Function Generators

- DC to 100 MHz

- 1.07 µHz frequency resolution

Arbitrary Waveform Generators

- Up to 2 GB shared waveform data and sequence instruction memory

- Multimodule/multichannel synchronization with <20 ps skew

- PCI, PXI, and PXI Express models

Learn more at **ni.com/signalgenerators**

NI Analog Waveform Editor

Create and edit analog waveforms with this tool. To view or edit waveforms, you can open and resample data files saved in binary or ASCII file formats. After importing your waveforms, you can view and edit them. You can also create new waveforms by selecting from a library of more than 20 waveform primitives or by entering a mathematical expression.

High-Speed Digital I/O

National Instruments high-speed digital I/O products provide a high-performance, flexible experience for digital communication and testing with up to 1 Gbit/s data rates. You can synchronize multiple modules to create a high-channel-count digital system with subnanosecond synchronization. The NI-HSDIO driver is easy-to-use software for your digital testing needs, and the LabVIEW FPGA Module and NI FlexRIO platform offer the flexibility for protocol-aware testing. With high-speed digital I/O products, you can perform

- Bit error rate testing (BERT)

- Protocol emulation and testing

- Timing tests (setup and hold time)

- DC per-pin parametric measurements

- Logic analysis/pattern generation

- Voltage threshold testing

- Scripting for looping and linking of multiple waveforms with zero idle time

Product Family	Maximum Clock Rate	Voltage Levels	DIO Channels	Direction Control	Form Factor
5 V TTL/CMOS, low-cost	20 Mbit/s	5 V	32	By 8-bit ports	PCI/PXI
Selectable voltage, low-cost, high-streaming	25/50 Mbit/s	2.5, 3.3, 5 V	32	Per-channel	PCI Express/PXI Express
Selectable voltage, bidirectional	Up to 100 Mbit/s	1.8, 2.5, 3.3, 5 V	32	Per-channel	PCI/PXI
Programmable voltage, bidirectional	Up to 100 Mbit/s	-2 to 5.5 V (10 mV steps)	20	Per-channel, per-cycle (tri-state)	PXI
Programmable voltage, high-speed, bidirectional	Up to 400 Mbit/s	1.2 to 3.3 V (100 mV steps)	32	Per-channel, per-cycle (tri-state)	PXI Express
Differential voltage, high-speed	Up to 400 Mbit/s	LVDS, LVTTL	16	Per-channel (SDR), dedicated I/O (DDR)	PCI/PXI
Programmable voltage, high-speed, PPMU	200 Mbit/s	-2 to 7 V (122 µV steps)	24	Per-channel, per-cycle (tri-state)	PXI Express
FPGA-programmable	1 Gbit/s	LVDS, single-ended, RS422/RS485	54	Per-channel, deterministic	PXI, PXI Express, NI FlexRIO

Learn more at **ni.com/hsdio**

NI Digital Waveform Editor

Use this interactive software tool to create digital signals/buses as well as import existing test vectors from VCD or ASCII files for interfacing and communications applications.

- Design digital vectors with six drive and compare states (0, 1, Z, H, L, and X)
- Use built-in patterns for count up/down, PRBS data, and more
- Highlight bit errors in designs and "play" signals with LabVIEW SignalExpress
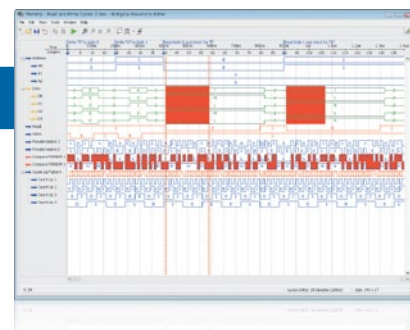
NI Dynamic Signal Acquisition Hardware and Software

National Instruments sound and vibration measurement hardware provides the flexibility and performance required by applications such as acoustic test and noise mapping, vibration analysis, dynamic structural test, machinery monitoring and diagnostics, and audio performance validation. NI dynamic signal acquisition (DSA) devices for USB, PCI, PXI, PXI Express, and NI CompactRIO are ideal for precision measurements with microphones, accelerometers, and other transducers that have very large dynamic ranges.

Features

- 24-bit ADCs and DACs with up to 118 dB dynamic range and multiple gains

- Up to 204.8 kS/s sampling rate (AI) and 204.8 kS/s update rate (AO)

- 2-, 4-, 8-, and 16-channel options with AC/DC coupling, IEPE conditioning, antialiasing filters, and TEDS

- NIST-traceable calibration certificates included

Learn more at **ni.com/soundandvibration**

High-Density PXI Modules

- 16 simultaneous analog inputs offer the highest-channel density

- 24-bit ADCs with sampling rates up to 204.8 kS/s

- Four gain settings from ±316 mV to 10 V

- Ability to synchronize up to 272 channels in a single PXI chassis or more than 13,000 channels in a distributed system with <0.1 deg mismatch

NI Sound and Vibration Measurement Suite

NI sound and vibration analysis software includes both a configuration-based, ready-to-run acquisition and processing package and comprehensive LabVIEW analysis VIs for acoustic, vibration, structural test, and machine monitoring applications.

- Interactive viewing, processing, and logging of live data
- Flexible audio, octave, and frequency response analysis
- More than 30 LabVIEW Express VIs and more than 50 example code bases
- Vibration trending and order analysis to define machine vibration

NI AudioMASTER

NI AudioMASTER is an audio generation and analysis test solution for analog and digital audio validation and production test. With it, you can use the same tool from validation and verification through production test. This tool provides a full-featured audio analyzer inside the NI TestStand environment. You can perform swept sine test and define single tone production test values all in NI TestStand.

- View data in NI TestStand to determine appropriate limits
- Perform any audio test

RF Instruments

Testing today's complex RF and microwave devices requires a fast, flexible, and accurate RF instrumentation platform. NI modular RF instruments incorporate technologies such as multicore processors and the PCI Express data bus to deliver unprecedented flexibility, accuracy, and measurement speed to automated test applications. In addition, with the inherent flexibility of a software-defined platform, you can test multiple wireless standards from GSM and LTE to WLAN and GPS with the same RF instrumentation.

RF Signal Analyzers

- Vector signal analyzers up to 26.5 GHz with up to 350 MHz of instantaneous bandwidth

- Phase noise as low as -129 dBc/Hz at 800 MHz (10 kHz offset)

- Noise floor as low as -165 dBm/Hz at 1 GHz

- Tuning times less than 400 µs

RF Signal Generators

- Vector or continuous wave signal generation up to 6.6 GHz with 100 MHz of instantaneous bandwidth

- Typical phase noise of -110 dBc/Hz at 1 GHz (10 kHz offset)

- Tuning times less than 300 µs in cellular and PCS bands

RF Network Analyzers

- The industry's first PXI vector network analyzer delivers unsurpassed flexibility in a small form factor for automated test applications

- Network analysis from 10 MHz to 6 GHz

- Wider than 100 dB dynamic range

- Up to 3,201 points at less than 400 µs/point

- Advanced time-domain analysis and time-domain gating features

- Custom and advanced network analysis with full-featured LabVIEW and LabWindows™/CVI API

Learn more at **ni.com/rf**

RF Accessory Modules

RF accessory modules include 6 GHz and 18 GHz USB true RMS power meters with typical linearity of ±0.13 dB, a programmable 8 GHz attenuator with up to 60 dB attenuation, and a programmable 8 GHz amplifier with up to 30 dB of gain and 1 dB compression point at +20 dBm.
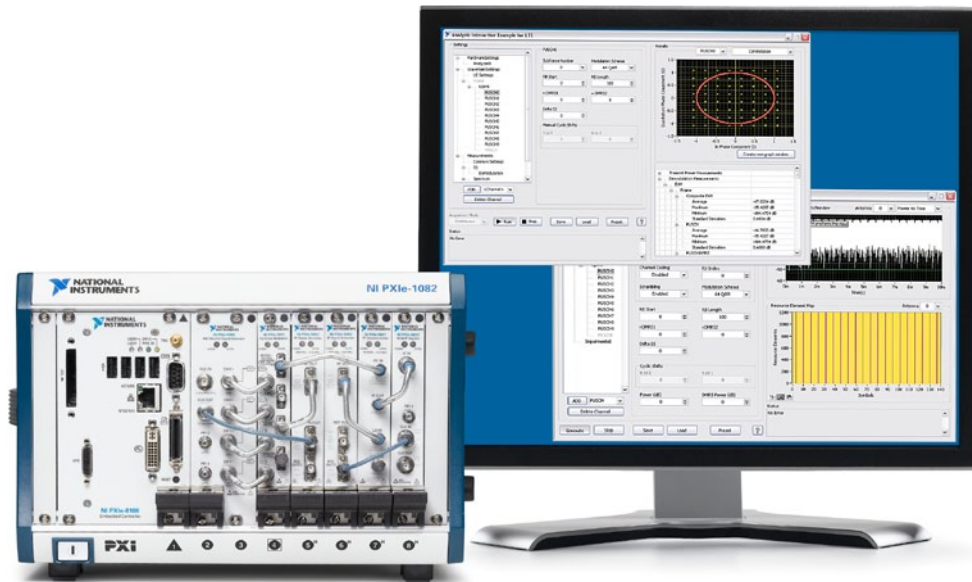
RF and Wireless Test Software

With software-defined measurement systems from NI, you can keep pace with rapidly evolving wireless standards. National Instruments RF tools deliver a highly flexible software selection to help you stay ahead of the latest developments.

NI GSM/EDGE Measurement Suite

- LabVIEW and C-style API with LabVIEW example code

- EDGE RMS EVM <0.5 percent (NI PXIe-5663E)

NI WCDMA/HSPA+ Measurement Suite

- LabVIEW and C-style API with interactive soft front panels

- WCDMA ACLR <-63 dBc (NI PXIe-5663E)

- WCDMA EVM <0.5 dBc (NI PXIe-5663E)

NI LTE Measurement Suite

- LabVIEW and C-style API with interactive soft front panels

- FDD and TDD support for UE testing

- Typical RMS EVM <-48 dB

NI WLAN Measurement Suite for IEEE 802.11a/b/g/n and ac

- LabVIEW and C-style API with interactive soft front panels

- Up to 4x4 MIMO generation and analysis

NI Measurement Suites for Fixed and Mobile WiMAX

- LabVIEW and C-style APIs with interactive soft front panels

- Example programs and demo panels for the generation and analysis of IEEE 802.16-2004 and IEEE 802.16e-2005 signals

NI GPS Simulation Toolkit for LabVIEW

- Use with PXI RF vector signal generators

- Simulate up to 12 satellites for up to 24 hours

- Input custom receiver motion trajectories

NI Bluetooth Measurement Suite

- Interactive soft front panels for generation and acquisition

- LabVIEW and C-style API

Learn more at **ni.com/rf**

NI RIO IF Transceivers

National Instruments PXI and PCI reconfigurable I/O (RIO) intermediate frequency (IF) transceivers add the flexibility and performance of LabVIEW FPGA to RF test and measurement applications. They feature high-performance, dual-channel inputs and outputs coupled to Xilinx FPGAs and interface with NI and third-party upconverters and downconverters.

Learn more at **ni.com/transceiver**

NI Digital Multimeters

National Instruments digital multimeters (DMMs) achieve remarkable throughput rates while maintaining precise and stable measurements. NI DMMs accurately measure voltage, resistance, current, capacitance, inductance, and temperature. Build high-channel-count systems by integrating these DMMs with NI switch modules.

- Up to 7½ digits of resolution (26 bits) and up to 1.8 MS/s sample rate

- Voltage from 10 nV to 1000 V, current from 1 pA to 3 A, resistance from 10 µΩ to 5 GΩ

- Low-cost and high-performance devices for PXI, PCI, PCI Express, and USB

Learn more at **ni.com/digitalmultimeters**

Features

Intuitive Software
The NI-DMM instrument driver makes configuration quick and easy and helps you tightly synchronize DMMs and NI switches.

Superior Accuracy
The NI 7½-digit DMM offers the best DC accuracy of any instrument in its class with 12.5 ppm accuracy over a two-year calibration cycle.

Guarding and Current Amplification
Combine NI DMMs with the 6-wire guard and current amplifier module to guard signals for in-circuit test or to measure current with subpicoamp resolution.

NI Programmable Power Supplies and SMUs

National Instruments precision DC sources combine high-resolution, high-speed outputs with accurate voltage and current measurements. These instruments provide constant current or voltage, sweep IV curves, and measure leakages in automated test systems or lab environments.

- High-precision, 4-quadrant outputs with down to 10 pA measurement sensitivity or up to 40 W sourcing and 2 A current

- Voltage or current source with precision voltage and current measurement capability and channel density of up to 4 channels per PXI slot

Learn more at **ni.com/powersupplies**

Features

Fast Sampling
These products offer source-measure rates up to 15 kS/s and asynchronous sampling rates up to 600 kS/s with hardware triggering for automated measurements.

Optimized Outputs
NI SourceAdapt technology features a user-configurable SMU control loop for achieving ideal responses even with reactive loads for faster, more stable measurements while protecting the device under test.

Intuitive Software
With an easy-to-use soft front panel and intuitive driver software for programmatic control, NI precision sources help get applications up and running quickly.

NI Switches

National Instruments delivers a flexible, modular switching solution based on PXI or SCXI to help you maximize equipment reuse, test throughput, and system scalability. Automate your signal routing in applications ranging from automobile ECU test, to in-circuit test, to RF stimulus/response test. The NI switches offering includes the IVI-compliant NI-SWITCH driver software as well as a variety of accessories for channel expansion.

General Purpose and Fault Insertion

- Turn on/off high-power devices such as motors, fans, and lights with SPDT and SPST relays

- Simulate faults for HIL testing

- Switch up to 40 A

RF and Microwave

- Minimal insertion loss (less than 2 dB typical), reflection, and crosstalk

- Multiplexer, matrix, and general-purpose relay configurations

- Bandwidth up to 26.5 GHz

Matrix

- Armature, reed, and solid-state options

- Up to 544 matrix crosspoints in a single PXI slot

NI SwitchBlock: Expandable Large Matrix

- Integrated relay test in the NI Switch Health Center

- Internal analog bus for matrix expansion

Multiplexer

- Switch up to 198 channels or up to 600 V in a single PXI slot

- Deterministically scan with PXI triggers

Learn more at **ni.com/switches**

NI Switch Executive

NI Switch Executive is an intelligent switch management and routing application that simplifies switch system configuration, increases test performance, and facilitates code reuse to help you reduce test system cost.

- Development system—Configure switch modules and control switches from any application software.
- Deployment system—Import switch configuration from a file or network and validate deployment setup.

Learn more at **ni.com/switchexecutive**

Embedded Control and Monitoring Systems

NI embedded control and monitoring systems are a core component of the National Instruments graphical system design platform. These systems combine the ruggedness of a PLC with the performance of a PC and the flexibility of custom hardware. All NI embedded controllers are programmed with LabVIEW software, which combines intuitive graphical programming with advanced algorithms for a wide range of applications. With these flexible yet powerful systems, engineers and system designers can design, prototype, and deploy custom embedded systems and machines much faster and at a lower cost.

Industrial Controller
Fanless, deterministic real-time processing and a rich user interface

CompactRIO
Embedded controller with reliable, high-speed FPGA-based I/O

NI Single-Board RIO
Lower-cost embedded deployment solution based on CompactRIO architecture

NI Smart Camera
Image sensor and a real-time embedded processor in a small, rugged package

Platform Advantages

Productivity—A complete system design software toolchain to program all aspects of the embedded system, including processors, FPGAs, and I/O interfaces.

Precision and accuracy—High resolution analog measurements and ultrahigh precision control.

Flexibility—Connect to any sensor, actuator, or network and take advantage of built-in control and signal processing algorithms.

Quality and ruggedness—Leverage highly reliable hardware that is stringently built and tested.

NI CompactRIO and NI Single-Board RIO

The CompactRIO system consists of an embedded controller for communication and processing, a reconfigurable chassis housing the user-programmable FPGA, hot-swappable I/O modules, and graphical LabVIEW system design software. NI Single-Board RIO provides the same RIO architecture in a board-level form factor for high-volume and OEM embedded control and monitoring applications.
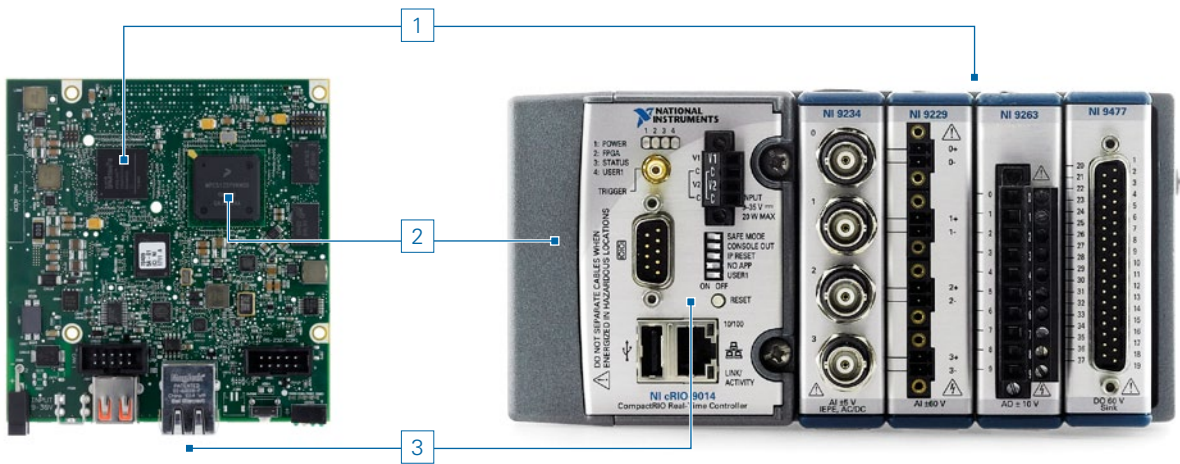
1 Reconfigurable FPGA

- High-speed control

- Customizable timing, triggering, and processing

- Reuse of existing hardware description language (HDL) code

2 Real-Time Processor

- Deterministic processing and control

- User interface, data logging, and communication

- Built-in web and FTP servers

3 Built-In Peripherals

- USB and SD for extended data storage

- Serial, CAN, Ethernet, VGA, and MXI-Express ports for communication and expansion

Learn more at **ni.com/compactrio**

	Value	Ultra Rugged	Performance
Processor Performance	Up to 400 MHz	Up to 800 MHz	Up to 1.33 GHz dual-core
FPGA Performance	Up to 43,661 logic cells, up to 58 multipliers	Up to 110,592 logic cells, up to 64 multipliers	Up to 147,443 logic cells, up to 180 multipliers
Operating System	Real-time OS	Real-time OS	Windows/real-time OS
I/O	Up to 8 I/O module slots, 100 Mbit/s Ethernet USB, RS232	Up to 8 I/O module slots, up to 1000 Mbit/s Ethernet USB, RS232	8 I/O module slots, 1000 Mbit/s Ethernet, USB, RS232/RS485, VGA
Power	Up to 9 to 30 VDC supply range, 6 to 25 W consumption	6 to 35 VDC supply range, 6 to 35 W consumption	9 to 30 VDC supply range, 20 to 75 W consumption
Ruggedness	-20 °C to 55 °C*, up to 50 g shock	-40 °C to 70 °C, 50 g shock	0 °C to 55 °C, 50 g shock
Size	Starts at 17.8 x 9.3 x 8.7 cm³*	Starts at 18 x 9.3 x 8.7 cm³	Starts at 40.4 x 13.4 x 8.7 cm³
Certification Ratings	Product Safety: 2006/95/EC, EN61010-1, IEC 61010-1, CSA 61010-1 Hazardous Locations: Class I, Division 2, Groups A, B, C, D, T4; Class I, Zone 2, AEx nC IIC T4, Ex nL IIC T4 Shock and Vibration: IEC 60068-2-64, IEC 60068-2-27, IEC 60068-2-6 Mean Time Before Failure (MTBF): Bellcore Issue 6, Method 1, Case 3, MIL-HDBK-217F Marine: Lloyd's Register (LR Type Approval System Test Spec No. 1) Quality/Environmental Management System (QMS/EMS): ISO 9001/14001 Typical Certifications: Actual specifications vary from product to product. Visit **ni.com/certification** for complete details.		

*Some NI Single-Board RIO versions operate from -40 °C to 85 °C and start at 10.3 x 9.7 x 2.4 cm³.

MXI-Express RIO

MXI-Express RIO delivers the highest-performance expansion reconfigurable I/O solution for applications that require custom signal processing, control algorithms, and mixed-signal conditioned I/O. Featuring high-throughput and best-in-class FPGAs, MXI-Express RIO chassis are ideal for hardware-in-the-loop, real-time test, and complex research applications.

- 250 MB/s throughput for high-speed data streaming

- 14 C Series I/O slots per chassis, ideal for high-channel-count applications

- Up to 6 chassis per daisy chain

- Up to 8 daisy chains per controller

- Controller support for real-time or Windows PXI, PC, rack-mount, and industrial controllers as well as multicore CompactRIO systems

Ethernet RIO

Ethernet RIO delivers the most flexible RIO expansion solution, making it easy to add a user- programmable FPGA and mixed-signal conditioned I/O to any Ethernet network. Ethernet RIO chassis are ideal for distributed, remote measurement systems and can integrate easily with any real-time NI CompactRIO system, real-time PXI system, or Windows PC using standard 10/100 Ethernet.

- 8 C Series I/O slots per chassis

- 2M gate FPGA for custom timing, inline processing, and control

- Network fail-safe for increased reliability

- Support for LabVIEW FPGA and RIO Scan Mode

EtherCAT RIO

EtherCAT RIO provides deterministic, distributed I/O to maintain the tight timing and synchronization needed for time-critical systems. Using real-time Ethernet, this 8-slot rugged RIO expansion chassis communicates deterministically with any CompactRIO, real-time industrial controller, or real-time PXI system that has two Ethernet ports. You can daisy chain multiple slave chassis from the controller to expand time-critical applications to high channel counts while maintaining hard determinism. Plus, you can embed FPGA code on your expansion chassis to offload processing from the controller and reduce response time.

- 8 C Series I/O slots per chassis

- 2M gate FPGA for custom timing, inline processing, and control

- Tightly integrated implicit synchronization via EtherCAT

- Ability to connect to any NI EtherCAT master controller

Learn more at
ni.com/distributedio/expand

NI C Series Modular I/O

C Series hardware from National Instruments features more than 50 hot-swappable modules and over 50 third-party modules. C Series I/O modules provide measurement-quality I/O and communication for desktop, portable, remote, industrial, and embedded applications. For a complete list of C Series modules, visit **ni.com/compactrio**.

Signal	Channels	Special Features
Analog Input		
Small signal (±80 mV)	4, 32	16- to 24-bit, 100 to 250 kS/s, differential
Voltage (±10 V)	4, 8, 32	12- to 24-bit, 100 kS/s to 1 MS/s, up to 250 V_{rms} ch-ch to 600 VDC CAT I bank isolation
High voltage (±60 V to 300 V_{rms})	3, 4, 8	12- to 24-bit, 100 to 800 kS/s, 250 V_{rms} to 2300 V_{rms} ch-ch isolation
Thermocouple	4, 16	24-bit, 15 to 100 S/s (J, K, R, S, T, N, E, and B thermocouple types), differential
Thermocouple (high accuracy)	16	Isothermal design for accuracy down to 0.36 °C
RTD	4	24-bit, 100 to 400 S/s, 3- and 4-wire measurements
IEPE and proximity probes	3, 4	24-bit, 51.2 kS/s/ch to 102.4 kS/s/ch, 5 to 30 V input range
Bridge-based sensors (strain gages/load cells)	4, 8	24-bit, 10 to 100 kS/s (±125 mV to ±60 V; ±25 mA; TC; 3- and 4-wire RTD; ¼-, ½-, and full-bridge)
Analog Output		
Voltage (±10 V)	4, 16	16-bit, 25 to 100 kS/s/ch
Current 0 to 20 mA	4	16-bit, 100 kS/s/ch, open-loop detection
Digital Input		
Bidirectional 5 V TTL	8	50 ns, 5 V TTL, ultrahigh-speed, bidirectional, 30 V protection
24 V sinking	8, 32	100 to 7 µs, up to 60 V protection
250 AC/DC universal	4	3 ms, ±5 to 250 VDC, 10 to 250 VAC, universal, sink/source
Differential or TTL	6	500 ns, ±5 to 24 V, single-ended TTL or differential, regulated 5 V supply output
Digital Output		
Bidirectional 5 V TTL	8	100 ns, 5 V TTL, ultrahigh-speed, bidirectional, 30 V protection
24 V sourcing	8, 32	1 to 500 µs, 750 mA/ch max to 1 A/ch max, short-circuit-proof
24 V sinking	32	8 µs, 5 to 60 V, sinking, isolation, up to 20 A per module
Relay Output		
Form A (SPST)	4	1 s, 30 VDC (2 A), 60 VDC (1 A), 250 VAC (2 A) electromechanical Form A (SPST)
Solid-state relay	8	60 VDC, SSR Form A, up to 750 mA/ch, 5 ms set and reset time, ch-ch isolation
Counter, Pulse Generation		
Counter/timer (24 V)	8, 32	1 µs, 7 µs, 30 to 60 V, single-ended and differential
Counter/timer (TTL)	6, 8	100 to 500 ns, ±5 to 24 V, single-ended and differential
Quadrature encoder (differential)	2	500 ns, ±5 to 24 V, six digital inputs for two encoders (phase A, phase B, and index inputs)
PWM/pulse generation (24 V, TTL)	8, 32	1 to 500 µs, 5 to 60 V output, short-circuit-proof
Serial Interface		
RS232, RS485	4	—
Removable Storage		
Secure digital module	2	2-slot, up to 4 GB added storage, read/write at 2 MB/s
Motion		
H-bridge	1	5 A continuous current at 40 °C (1 A at 70 °C), built-in encoder interface and current sensor)
Drive interface	1	Stepper and servo drive signals, incremental encoder feedback, motion I/O
Controller Area Network (CAN)		
High-speed CAN, low-speed CAN	2	125 kbit/s to 1 Mbit/s transfer rate, ISO 11519 compliance

Customize CompactRIO and NI Single-Board RIO

The CompactRIO Module Development Kit and RIO Mezzanine Card (RMC) connector offer the option to customize CompactRIO and NI Single-Board RIO hardware to meet your specifications. Use these resources to help you develop custom C Series modules for CompactRIO and mate custom RMCs to NI Single-Board RIO. Visit **ni.com/compact/mdk** and **ni.com/rmc** for more information.
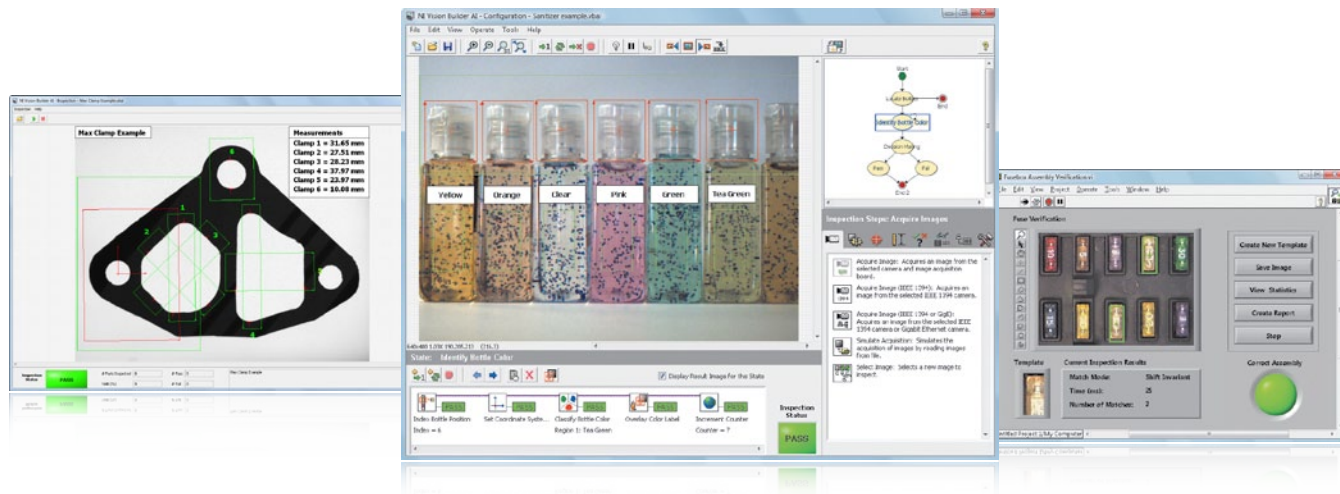
NI Vision Software

NI offers two software packages tailored to the needs of programmers and manufacturing line operators. These include world-class image processing algorithms to enhance images, check for presence, locate features, identify or classify objects, and measure parts. With additional capabilities, you can acquire images, make pass/fail decisions based on multiple inspection results, view results through customizable deployment interfaces, and integrate with other automation devices using a range of I/O and industrial communications protocols.

Both software packages can be used across the entire NI vision hardware portfolio. This open platform means that after learning just one set of vision software tools, you can easily reduce development time and maintenance costs as well as port existing code when changing hardware.

Vision Builder for Automated Inspection

- Simplify the development process with this sophisticated yet easy-to-use menu-driven environment

- Configure, benchmark, and deploy complete applications

- Specify inspection flow with the state diagram tool

- Model variations in lighting, camera position, and more

- Integrate directly with LabVIEW and NI TestStand for large applications

Learn more at **ni.com/vision/vbai**

Vision Development Module

- Build highly customized applications with this comprehensive library of image processing and machine vision functions

- Take advantage of add-ons and toolkits that complement the LabVIEW environment

- Program in LabVIEW, C, C++, Visual Basic, or .NET languages

- Prototype and engineer algorithms and generate ready-to-run code with the NI Vision Assistant

Learn more at **ni.com/vision/vdm**

NI Vision Acquisition Software

NI Vision Acquisition Software provides an API to acquire, save, and display images from a wide array of cameras, including area scan, line scan, color, monochrome, and infrared. The driver package, included with all NI vision hardware and software products, works with Camera Link, GigE Vision, IEEE 1394 (FireWire®), USB (DirectShow), analog, parallel digital, and IP cameras.

NI Smart Cameras

Save on cost and space by combining an image sensor and a real-time embedded processor into one rugged, industrial package.

- Cost-effective hardware for packaging inspection, assembly verification, 1D and 2D code reading, and robot guidance

- Variety of resolution and performance options

- Rugged, compact form factor with low power consumption and IP67 options

- Integrated lighting control, digital I/O, serial and Ethernet protocols, and video out

- Vision Builder for Automated Inspection included

Learn more at
ni.com/vision/smartcamera

NI Vision Systems

Harness multicore performance with fanless designs, connectivity to multiple cameras, and reconfigurable digital I/O.

- Acquire images from GigE Vision, IEEE 1394, and Camera Link

- Choose between the NI Embedded Vision System or NI Compact Vision System form factors

- View images and inspection results in real time through video output

- Interface using RS232 serial, Modbus serial, Modbus/TCP, EtherNet/IP, TCP/IP, EtherCAT, and reconfigurable digital I/O

- Obtain additional I/O through C Series expansion options

Learn more at **ni.com/vision/evs**

NI Frame Grabbers

Build high-performance, PC-based systems using the latest processor technologies.

- Benefit from unequalled synchronization with data acquisition and motion products

- Acquire from Camera Link, GigE Vision, IEEE 1394, and parallel digital devices

- Choose from PXI, PXI Express, PCI, and PCI Express form factors

- Achieve integrated I/O for triggering and synchronization

- Use in real-time and Windows systems

Learn more at
ni.com/vision/framegrabber

Onboard FPGA Image Processing

With the LabVIEW FPGA Module and vision RIO hardware, you can perform high-speed inline image processing on field-programmable gate arrays (FPGAs) for applications that involve high-speed control or image preprocessing. The NI 1483 adapter module for NI FlexRIO provides Camera Link connectivity to NI FlexRIO FPGA modules. PCI Express versions are available for PC-based deployment systems.
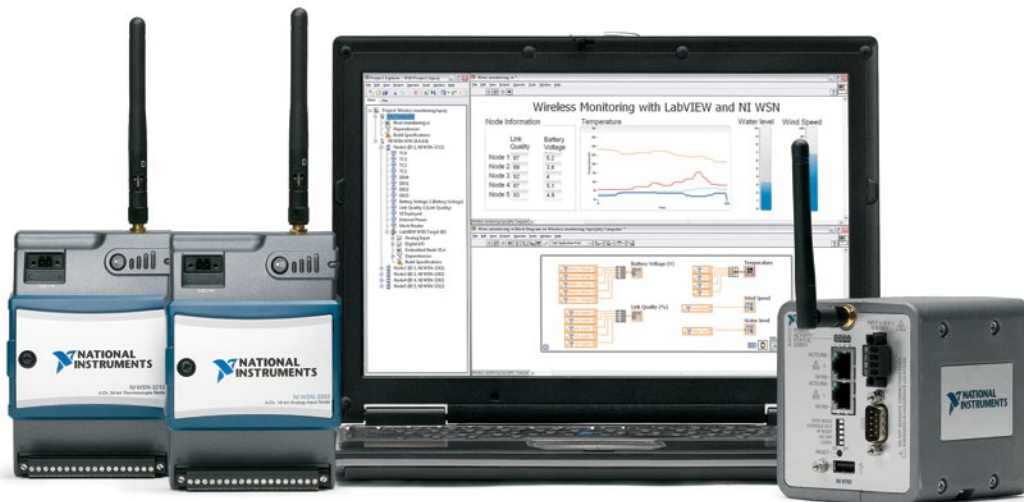
NI Wireless Sensor Networks

Eliminate the need for costly and prohibitive wiring by taking advantage of the National Instruments wireless sensor network (WSN) platform for distributed measurement applications such as environmental monitoring, structural health monitoring, and machine condition monitoring. The NI WSN platform simplifies remote monitoring applications and delivers low-power, reliable measurement nodes that feature industrial certifications and local control capabilities. The quick-setup wireless sensor network can be used to implement a stand-alone remote monitoring system or easily integrate with existing PC and real-time-based measurement and control systems.

- Variety of measurement I/O nodes

- Programmable WSN gateway that enables local data logging and remote data access with web services

- Ability to connect up to 36 measurement nodes per gateway

- Up to 14 wireless channels for creating WSN systems that can scale to hundreds of measurement channels

- Single hop wireless communication range up to 300 m

- Up to three-year node battery lifetime

- Powered mesh routing delivers increased network range and reliability

- Optional ingress protection (IP) enclosures to meet outdoor monitoring application challenges

- Ability to wirelessly download LabVIEW code to run on WSN nodes using the LabVIEW WSN Module

Learn more at **ni.com/wsn**

LabVIEW WSN Module

With the LabVIEW WSN Module, you can add intelligence to NI WSN nodes using the same graphical programming approach that has become the industry standard for developing applications that acquire and process data. The LabVIEW WSN Module helps you create and wirelessly deploy embedded applications to WSN measurement nodes to customize and enhance node operation. Use LabVIEW WSN to store measurement data locally, improve acquisition performance, optimize battery life, and perform local analysis, data reduction, and control.
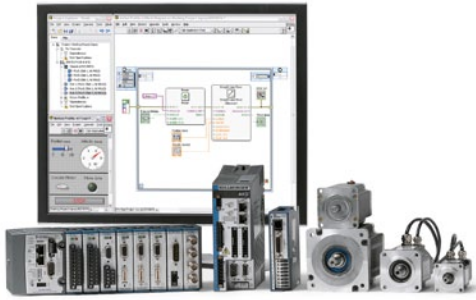
NI Motion Control

Engineers use NI motion control as part of a complete machine design platform to develop demanding applications faster and at a lower cost. NI motion control is an ideal solution for tightly integrating motion with machine vision and sensor I/O in measurement, control, and test solutions.

- Use one platform for motion control, machine vision, and an extensive suite of measurement I/O

- Tailor motion control functionality to meet the specific requirements of your application

Learn more at **ni.com/motion**

Motion Control Hardware

Drive Interface Modules
Control NI and third-party drives. Use plug-and-play programming.

- NI 9512: Stepper
- NI 9514: Servo
- NI 9516: Dual Feedback Servo

Drive Modules
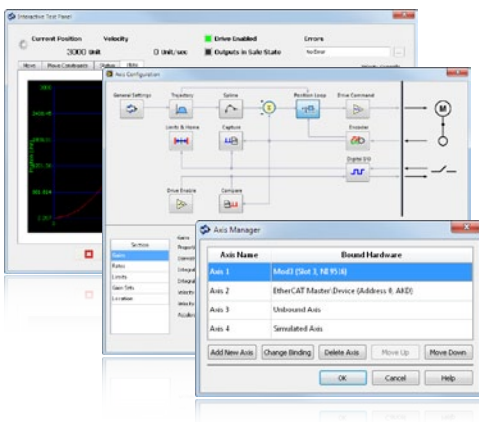Customize drive functionality. Eliminate external drives.

- NI 9501: Stepper
- NI 9502: Brushless Servo (PMSM)
- NI 9505: Brushed DC

Drives and Motors
Use a full line of stepper and servo drives.

- AKD Brushless Servo Drives
- AKM Brushless Servo Motors
- P7000 Stepper Drives
- Stepper Motors

NI Motion System Configurations

The National Instruments LabVIEW NI SoftMotion Module makes it possible for you to program motion for development machines, NI real-time processors, and NI FPGA targets. Within the same interface, you can control steppers, servos, NI drives, and third-party drives. Implement advanced motion systems right out of the box or customize just the pieces you need for specialized applications.

- Simplified application development

- NI RIO platform integration

- Custom control

Learn more at **ni.com/motion**

Graphical Motion Programming

LabVIEW NI SoftMotion delivers the power and flexibility of LabVIEW to motion applications.

Project-Based Configuration

LabVIEW NI SoftMotion resources provide a common framework to configure and control stepper, servo, EtherCAT, embedded C Series, or simulated devices.

Controller Area Network (CAN), FlexRay, and Local Interconnect Network (LIN)

NI CAN, FlexRay, and LIN interfaces provide connectivity to automotive and embedded networks for sending, receiving, monitoring, logging, and simulating frame and signal data. Tight integration with the NI hardware and software platform enables a wide variety of automotive applications in many different environments.

- High-performance NI-XNET CAN, FlexRay, and LIN interfaces for PCI, PXI, NI CompactDAQ, and NI CompactRIO

- Low-cost and portable USB CAN and LIN interfaces

- Embedded CAN interfaces with LabVIEW FPGA access for the CompactRIO platform

Learn more at **ni.com/can, ni.com/lin**, or **ni.com/flexray**

Diagnostic and Calibration Toolkits for NI CAN Interfaces

Ideal for the automotive industry, the diagnostic and calibration toolkits add functionality to NI CAN interfaces. The NI Automotive Diagnostic Command Set for KWP2000 (ISO 14230), Diagnostics on CAN (ISO 15765, OBD-II), and Diagnostics over IP (ISO 13400) protocols help you access diagnostic trouble codes, flash electronic control unit (ECU) firmware, initiate diagnostics tests, and more. The NI ECU Measurement and Calibration Toolkit for XCP and CCP calibration protocols offers access to internal ECU characteristics for calibration applications. Both toolkits work with LabVIEW, LabWindows™/CVI, and Visual C/C++.

Serial Interfaces for RS232, RS485, and RS422

NI serial interfaces are ideal for connecting a wide variety of devices to PC and PXI systems ranging from consumer electronics and PC peripherals to specialized military, industrial, and laboratory devices. You can add up to 16 standard COM ports per interface to a Windows or LabVIEW Real-Time system.

- Interfaces for PCI, PCI Express, PXI, USB, ExpressCard, and CompactRIO

- Standard and flexible baud rates up to 3 Mbit/s

- High-speed DMA transfer technology to reduce CPU usage and improve system performance

- Optional 2000 V port-to-port isolation for industrial and harsh electrical environments

Learn more at **ni.com/serial**
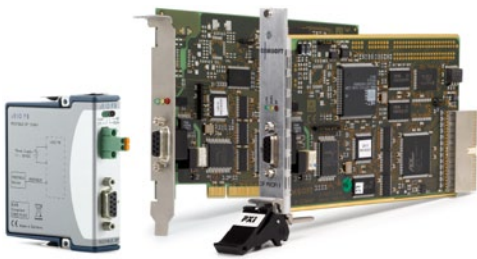
Industrial Communications Protocols

National Instruments offers hardware and driver software products for communication with industrial devices. Whether you are communicating with devices such as process instruments, programmable logic controllers (PLCs), smart sensors, and single-loop controllers or performing instrument control from your PC, National Instruments solutions can meet your communication needs.

- Robust, reliable solutions for communicating with industrial devices

- Hardware and software solutions compatible with CompactRIO, PXI, and PC platforms

- LabVIEW libraries for fast application development

Learn more at **ni.com/comm**

Electrical Utility Protocols for Outstation Application Communication

DNP3 and IEC 60870-5 are sets of open communication protocols commonly used in electrical and water utilities. SCADA systems use DNP3 and IEC 60870-5 to communicate between a master station, remote terminal units (RTUs), and intelligent electronic devices (IEDs). NI real-time targets may be programmed as DNP3 or IEC 60870-5 outstation devices with advanced functionality, such as power quality monitoring, phasor measurements, and other smart grid-related analysis.

OPC and Modbus Support With the LabVIEW DSC Module

The LabVIEW Datalogging and Supervisory Control (DSC) Module includes support for commonly used open protocols including OPC and Modbus. To connect LabVIEW to systems based on proprietary protocols, NI OPC Servers offer over 100 drivers to convert these protocols to the open OPC communication. Coupling the LabVIEW DSC Module with NI OPC Servers enables an application to communicate with virtually all PLCs and programmable automation controllers. This flexibility allows for easy integration of LabVIEW into existing SCADA/HMI systems.

Learn more at **ni.com/dsc**

Develop Flexible HMI/SCADA Systems With LabVIEW

With LabVIEW graphical system design software, you can program your human machine interface (HMI) and NI programmable automation controllers (PACs) in the same environment, which minimizes development cost and training time. You can use the LabVIEW Touch Panel Module to target Windows Embedded Standard 7 (WES7) HMIs for local operator interfaces or the LabVIEW Datalogging and Supervisory Control (DSC) Module to develop a local HMI/SCADA application.

LabVIEW Touch Panel Module

- Support for Windows XP Embedded and WES7 based HMI targets

- Ethernet download of application to remote touch panel hardware

- Communication to NI PACs through shared variable, TCP/IP, and other protocols

- Suite of built-in management examples to build intuitive operator interfaces

- Built-in tools for data analysis and communication

Learn more at **ni.com/hmi**

LabVIEW DSC Module

Includes the same functionality as the LabVIEW Touch Panel Module plus the following:

- Networked, SQL-compliant database for distributed data logging

- Configuration-based alarms and events

- OPC, Modbus, and EPICS connectivity to PLCs and sensors

- Real-time and historical trending

- User-level application security

- Unlimited tags and open connectivity through custom I/O servers

- More than 4,000 user interface graphics

Learn more at **ni.com/dsc**

Related Products

**6, 12, and 15 in. Touch Panel Computers**
Include a 1.33 GHz Intel Atom processor, 1 GB DDR2 SDRAM, 4 GB CompactFlash storage with Windows XP Embedded, and a TFT LCD touch screen display with an LED backlight.

15 in. Flat Panel Touch Monitor
Offers an XGA touch display for control of Multicore CompactRIO, PXI, and PCs, with extended temperature range and NEMA4/IP65-compliant front panel.

15 in. Panel PC
Features an XGA/TFT color LCD touch screen, 1 GHz Celeron M fanless cooling, 512 MB RAM, and 40 GB hard drive running Windows XP.
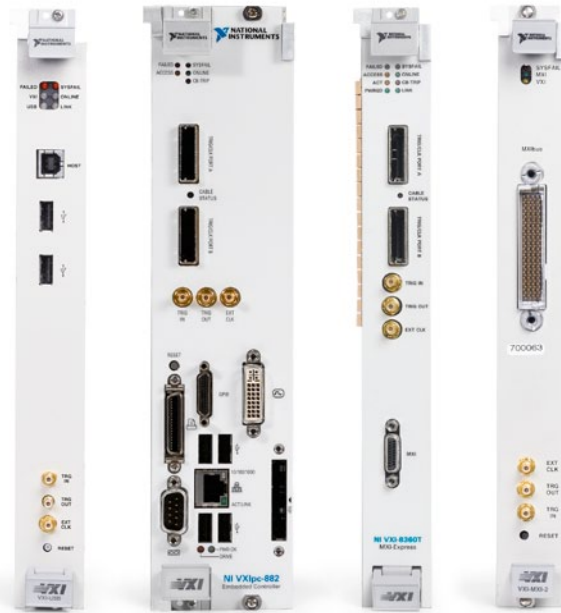
VXI

As a VXI hardware and software leader, National Instruments offers VXI controllers that take advantage of off-the-shelf PC technologies to deliver state-of-the-art VXI control solutions. Comprehensive NI software—from NI-VXI and NI-VISA I/O software to LabVIEW, LabWindows™/CVI, and Measurement Studio for Microsoft Visual Studio application development tools—is vital to successful VXI development. This combination of hardware and software sets NI VXI controllers apart from the competition.

- Embedded 2-slot, C-size controllers or remote controllers for a PXI system, desktop PC, laptop, or workstation via PCI, PCI Express, or Hi-Speed USB

- VXIplug&play compliance and compatibility with software available for general-market computers

- High-performance, custom ASICs—the MITE and MANTIS—or VXI backplane resource access

- Ability to perform block-mode transfers, giving the processor time to perform application-specific tasks

- Full VXI Slot 0 capabilities, including slot identification and bus management responsibilities

- External VXI CLK10 synchronization for multiple mainframe configuration

- Advanced trigger/timing capabilities and full software and hardware control of the VXI trigger lines

- Ability to function as an interrupter and an interrupt handler for any or all of the VXIbus interrupt lines

Learn more at **ni.com/vxi**

Features

Intuitive Software
The NI-VXI/NI-VISA bus interface software features high-performance routines for industry-standard programming languages.

High Throughput
With the NI VXI-MXI-Express remote controller, you can achieve up to 29 MB/s sustained throughput across PCI Express and VXI.

Hybrid Systems
With NI VXI controller interfaces to PXI, PCI, PCI Express, and USB and intuitive software packages, NI makes it easy to build optimized, integrated test systems across multiple platforms.

GPIB Instrument Control

For more than 30 years, National Instruments has provided a variety of instrument control solutions so you can get the most from your GPIB hardware and software investment while benefiting from advancements in computer technology.

- Industry-leading platform and OS compatibility

- NI-488.2—the de facto industry-standard API for GPIB

- Up to 8.0 MB/s with HS488

Learn more at **ni.com/gpib**

Features

Performance
NI GPIB performance includes sustained data transfer rates up to 1.8 MB/s (IEEE 488.1) and 8.0 MB/s (HS488).

OS Support
NI provides support for Windows including Windows 7 (32- and 64-bit), Mac, Solaris, real-time, and Linux OSs as well as a driver development kit for compatibility with any other OS.

Premier NI-488.2 API
This de facto industry-standard API has increased in performance and efficiency while providing a consistently superior user experience for more than 20 years.
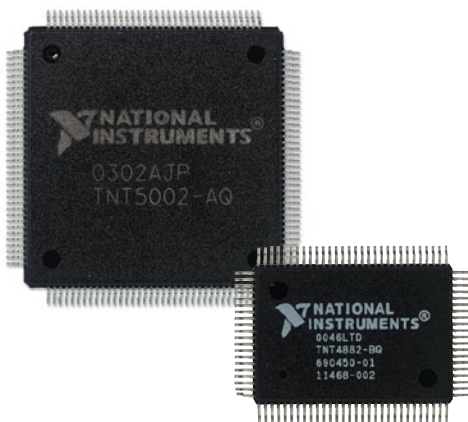
NI GPIB Application-Specific Integrated Circuits (ASICs)

National Instruments offers single-chip TNT GPIB Talker/Listener chips and drop-in replacement controller chips to help you upgrade your designs to IEEE 488.2 standards. NI GPIB ASICs are also RoHS-compliant (sometimes referred to as "lead free"). With GPIB ASICs, you can increase performance through faster clock inputs and enhanced functionality.

- TNT5002 high-performance, GPIB Talker/Listener ASIC for PCI

- NAT7210 drop-in replacement chip for NEC µPD7210 controller

- NAT9914 drop-in replacement chip for TI TMS9914A controller

Learn more at **ni.com/gpib**
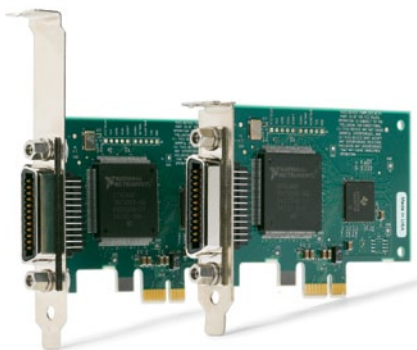
Features

Performance
Take advantage of 1.8 MB/s maximum transfer rates using IEEE 488.1 handshaking and up to 8 MB/s using HS488.

OEM Supplier
National Instruments is the leading OEM supplier of GPIB ASICs. Contact National Instruments for your custom GPIB needs.

Legacy Support
Obtain drop-in replacements for legacy GPIB controllers/ASICs.

GPIB Controller for PCI Express and PCI

PCI Express and PCI controllers combine reliable, high-performance hardware with a complete suite of development tools to get your applications up and running fast.

- Support for Windows including Windows 7 (32- and 64-bit), Mac, Solaris, real-time, and Linux OSs
- Driver development kit for compatibility with any OS

GPIB Analyzer

National Instruments offers a complete GPIB Analyzer and controller on a single device for both PCI and PCI Express. GPIB Analyzer software features tools for interpreting captured GPIB information.

- Capture, analyze, and monitor the real-time state of each of the 16 GPIB data and control lines
- Take advantage of easy-to-use analyzer software with online help

GPIB Controller for Hi-Speed USB

The compact NI GPIB-USB-HS transforms any computer with a USB port into a full-function GPIB controller.

- Connect directly from a USB port to a GPIB instrument
- Reuse code for other NI GPIB controllers without modification
- Take advantage of support for Windows, Mac, and Linux OSs

GPIB Controllers for Ethernet and Serial

Connect to GPIB instruments and other common industry interfaces.

- Remote connection to any GPIB instrument connected to a 10BASE-/100BASE-TX/Gigabit Ethernet network
- Password-protected web interface (GPIB-ENET/1000)

Cables and Accessories

Choose from the following NI accessories:

- Adapters, cables, fixtures, and rack-mount kits
- Electrical isolation up to 2,500 VDC
- Direct cable length up to 2,000 m

GPIB Software

NI-488.2 software allows

- Creation of high-performance, portable, and distributed GPIB applications using LabVIEW, LabWindows™/CVI, ANSI C/C++, C#, Visual Basic .NET, or Visual Basic 6.0
- Better system configurability and ease of use

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- Save development time and reduce maintenance costs

Benefits of NI Certification

- Gain recognition from the industry, employers, clients, and peers

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US Corporate Headquarters
11500 N Mopac Expwy   Austin, TX 78759-3504
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