Instrumentation newsletter

Technical News from National Instruments

First Quarter 2001

The Future of Computer-Based Mixed I/O Test Systems

As popular computer technology enters the test and measurement arena, we can expect instrumentation systems to combine popular buses, such as GPIB and serial, with emerging communication buses, such as Ethernet, USB, and IEEE 1394.

With a structured architecture, you can combine current and future I/O buses into one system, preserving your software and hardware investment in the process. The key to providing this common architecture lies in software. With industry standards, such as the virtual instrument software architecture (VISA) and interchangeable virtual instruments (IVI™), you can combine different I/O buses into one system and provide the abstraction layer to make the transition to new buses transparent to the user. With this architecture, you can preserve your investments and take advantage of new technologies without worrying about their low-level details.

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Integrate High-Density Switching Applications into Computer-Based Test Systems

With the new SCXI™-1129 high-density, multiconfiguration matrix, National Instruments delivers the functionality and density required to integrate the most demanding, high-volume test applications. Because of its modular, computer-based design, you gain great flexibility and ease of use in yet another key component for ATE systems.

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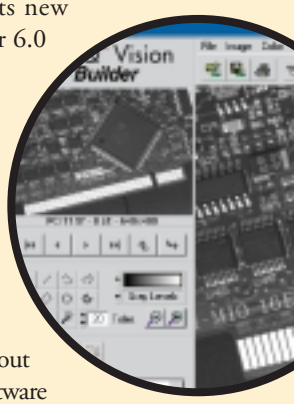
Automatically Create LabVIEW™ VIs with IMAQ™ Vision Builder



National Instruments new IMAQ Vision Builder 6.0 accelerates your application development because it automatically creates LabVIEW diagrams (VIs). With this configurable environment, you can test vision algorithms easily and quickly without programming. The software also helps the inexperienced vision developer find a starting point for building vision applications.

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- Learning how to speed your measurements with performance algorithms
- Personalizing **ni.com**™ with MyNI
- Understanding multiplexed and simultaneous-sampling architectures for DAQ

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Decrease Cost and Improve Quality with Networked Measurement and Automation

At National Instruments, we understand your need to increase profitability and improve quality, and we believe that networking can give you the options you need to meet your changing needs. Imagine the power of distributing your measurement and automation system's computer components to the most effective location for your application and then easily transferring real-time data into your database or publishing it to the Web.

With networked measurement and automation systems, you can improve speed and efficiency.

Distributed Monitoring and Control

The distribution of your measurement and automation system no longer depends on the location most accessible to controllers and wires. With networking technologies, you can distribute system components to the locations that most effectively serve your application. With Ethernet connectivity, your measurement and automation data is no longer confined to the factory floor. Because you use computer software and hardware to make measurements, you can connect your data to corporate databases. By viewing and interpreting real-time data directly from the plant floor, you can make more effective management decisions and achieve higher productivity.

Improved Speed and Efficiency

With National Instruments LabVIEW, you can acquire measurements from measurement nodes and publish results to clients around the world. With real-time capabilities, you can execute deterministic control routines on your remote measurement devices. LabVIEW data logging and supervisory control capabilities manage more complex, high-channel count measurement solutions across a network. With the industrial capabilities of LabVIEW, you can communicate with distributed I/O, high-speed DAQ devices, single-loop controllers, and programmable logic controllers (PLCs). Because NI takes advantage of open industry standards, all these devices can become nodes in a networked measurement and control solution that can publish data throughout your enterprise. We also have similar networking capabilities integrated in the Measurement Studio™ environment.

Networking across the Enterprise

Because we understand measurement and automation processes, we offer products and services that simplify the design and implementation of networked systems. With NI hardware and software, you can build a flexible application that adapts to your changing needs and takes advantage of networking technologies and the Internet. With our networked measurement and automation solutions, you decrease cost and time-to-market, improve quality, and gain flexibility.

John Graff, VP Marketing

ni.com

Effectively Deploy Telematics Test Systems

With more prevalent use of telematics systems – automobile systems that combine global positioning systems (GPS) and wireless communications for automatic roadside assistance, remote diagnostics, and more – manufacturers must perform increasingly complex tests. The components of a telematics system are common in the consumer marketplace today and already have proven test methodologies. The key to effective telematics test systems is to efficiently combine these methodologies to create a flexible system that adapts to diverse telematics needs.

Creating telematics test systems is a challenge for manufacturers, especially as they strive to deploy these systems more rapidly. However, developing complex telematics test systems quickly and effectively is possible when you consider high-performance hardware, such as PXI™, and flexible software, such as National Instruments LabVIEW.

Develop a Strategy to Avoid Test Redundancy

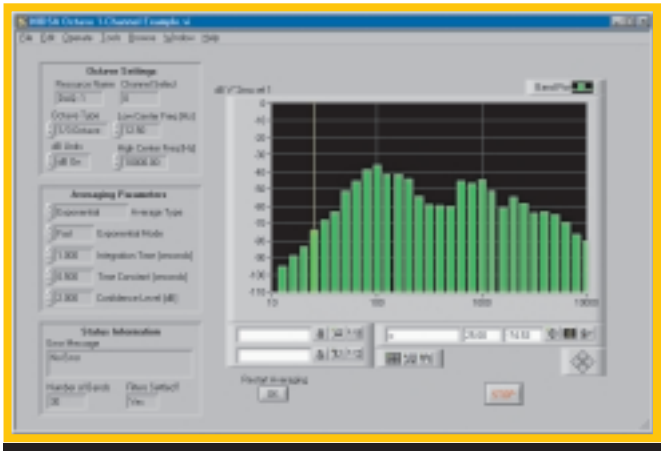
One development strategy involves separately defining test requirements and tools for each telematics component. Test redundancy can occur when you test each component individually from beginning to end. However, after completing this definition process for each component, you can compare all necessary tools to identify similar requirements and maximize reuse.

We can examine the steps to develop a test system for a telematics system containing an automotive radio, integrated wireless communication, and GPS components. Let us also assume test time and system cost are driving concerns for this system.

Choose Your Platform

First, we must identify tool requirements and, more importantly, our platform core – PC, PXI, or VXI-based. When selecting from these platforms, we must consider the functions, the necessary equipment and measurements, and the application area of the test. In our manufacturing test example, an industry-standard PXI platform is a good choice because it is low in cost, high speed, compact, and very flexible. When the tools are not available in PXI, GPIB is a common option for stand-alone equipment, while VXI-based instrumentation often provides a high-density switching platform. Both easily integrate into our PXI system.

With our test platform determined, we then focus on tools needed to test the telematics components. For the stereo (AM/FM radio, tape deck, CD player), each component requires the generation and analysis of audio data. Therefore, a PXI-based arbitrary waveform generator, such as National Instruments NI 5411, can generate the audio waveforms for our tests. We can use a GPIB-based AM/FM modulator to convert these signals for insertion at the antenna. Then, to acquire the generated signals in the speakers and to analyze the quality of the produced audio, a PXI-based data acquisition or dynamic signal acquisition module meets our needs.



Software acts as the "glue" that integrates individual tests into a test system.

You may notice you can use the same PXI-based data acquisition module to test radio components as used to test audio output from a wireless component, such as a "hands-free" speaker option. It could also acquire simple voltage readings from components, such as the GPS.

Explore Your Software Options

We can use the same strategy to define software. Our software selection should effectively test each component in the telematics unit and act as the "glue" that integrates the individual tests into a system.

For our previous example, the software must first manage the GPIB and PXI tools for each individual component test. National Instruments LabVIEW is a good option in this case because it is modular, easily modifiable, and integrates into a variety of I/O, including motion and vision. In a simple frequency response test for the radio, LabVIEW controls the different audio level signals produced by the waveform generator and also acquires and analyzes the resultant signals from the PXI dynamic signal acquisition device. In addition, with LabVIEW, we can control the GPIB tools to modulate the signal into the AM/FM bands quickly.

Manage Your Tests

Our individual LabVIEW tests must integrate into a cohesive whole – a test executive performs this task in a standard automated test environment. National Instruments TestStand™ offers this functionality as well as the ability to run multiple tests in parallel, further reducing test times. A test executive, such as TestStand, does more than execute a sequence of individual tests; it also serves as the central point of communication between the test system and the company itself. It logs the test data, generates reports, and tracks important manufacturing statistics.

The test executive completes our telematics test platform. As shown in our example test strategy, with hardware such as PXI and software such as LabVIEW and TestStand, you can have a low-cost, flexible telematics test system.

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For more information on telematics system testing, visit ni.com/info and enter **newsletter.**

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The Future of Computer-Based Mixed I/O Test Systems

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Exploring Your Connectivity Options Using Common Buses of Today

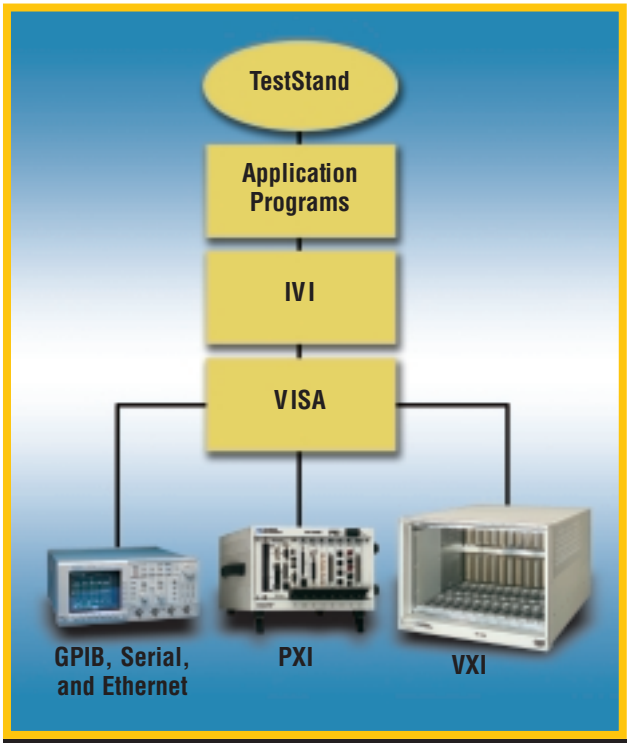
The general-purpose interface bus (GPIB) and the RS-232 serial bus have been the most common I/O interfaces for many years. Instrument manufacturers have included GPIB, used specifically for instrument control applications, in thousands of instruments for more than two decades. RS-232, a specification for serial communication, most commonly controls modems and printers, but is also very popular for instrument control applications. However, unlike GPIB, which can control up to 14 instruments per controller, you can connect and control only one device at a time with a RS-232 interface.

Consider the Benefits of New and Emerging Buses

Recently, instrument vendors began including Ethernet, universal serial bus (USB), or IEEE 1394 as alternative communication interfaces on stand-alone instruments.

Instrument control applications across Ethernet take advantage of unique characteristics of the bus, such as remote control of instruments and sharing among different users at different locations. Furthermore, there is a protocol (VXI-11) already designed for the control of instruments across Ethernet.

With USB, you connect peripheral devices, such as a keyboard and mouse, to PCs. USB is a Plug and Play bus, in which the host automatically detects and configures new devices. Because today USB ports are a standard on PCs, you do not need to purchase a dedicated controller. Finally, because no protocol exists for instrument control with USB, you must use a proprietary implementation from the instrument manufacturer.



VISA is a software layer for configuring, programming, and troubleshooting instrumentation systems comprised of VXI, VME, PXI, GPIB, Ethernet, and/or serial interfaces.

IEEE 1394, also known as FireWire, is a high-performance serial bus developed by Apple Computer, Inc. in the early 1990s. Although Microsoft Windows 2000/98 works with FireWire, Intel PC peripheral chip sets do not currently include it, so in most cases you need an IEEE 1394 controller for your PC. The IEEE 1394 Trade Association has defined a protocol to control instruments across the bus.

Using Bridge Products Preserves Investment

Because of the slow adoption of new buses by instrument manufacturers, relative to PC manufacturers, bridge products are emerging as a viable alternative. Bridge products are hardware products that include two different buses arranged for conversion, facilitating the integration of new buses into traditional systems. Bridge products help preserve your investment in hardware, software, and time, and act as a transparent solution for your application. For example, if you decide to replace the GPIB plug-in controller with an Ethernet-to-GPIB bridge product, you can ideally take the code written for the GPIB plug-in controller and reuse it without any modifications.

VISA provides a common foundation for the development, delivery, and interoperability of high-level multivendor system software components.

Creating a Flexible Software Architecture

Learn the Basics of VISA

As a step toward industry-wide software compatibility, the VXI*plug&play* Systems Alliance developed one specification for I/O software – VISA. When the alliance was founded in 1993, many nonstandard commercial implementations of I/O software for VXI, GPIB, and serial interfaces existed. For these buses, VISA provides a common foundation for the development, delivery, and interoperability of high-level multivendor system software components, such as instrument drivers, soft front panels, and application software. Although the alliance defined VISA, individual vendors created different implementations of VISA.

Because VISA defines one application programming interface (API) for instrument communication, you can preserve your software investment when you migrate to new interface buses or mixed I/O systems. The NI-VISA™ implementation today works with interfaces other than VXI, GPIB, and serial, including PXI and Ethernet.

Ease VISA Implementation with Passport Model

One problem with the previous model was that each vendor designed its VISA implementation to work with that vendor's controllers, and you could not use it with those from other vendors. In addition, to work with new interfaces, you had to install a complete VISA library, and sometimes it came from a different vendor and did not guarantee the preservation of existing interfaces.

To solve such problems, National Instruments has redesigned our VISA implementation using a "Passport" plug-in model, which defines a distinct communication port, or passport, for each different bus. The NI Passport model separates the specific communication mechanisms for connectivity buses from the core VISA library, which contains the popular high-level VISA API. With this model, each different bus requires a passport to connect to the core VISA engine, so you can add compatibility with new buses easily without disturbing the existing interfaces.

With this model you can truly have multivendor and multi-interface systems. Unlike other solutions that rely on technologies such as component object model (COM), multiplatform ANSI-C technology is still the basis of the passport model. In addition to the interfaces with which VISA works today, National Instruments is committed to adding compatibility within VISA for any bus interface that becomes popular in test and measurement applications.

Find Versatility with IVI

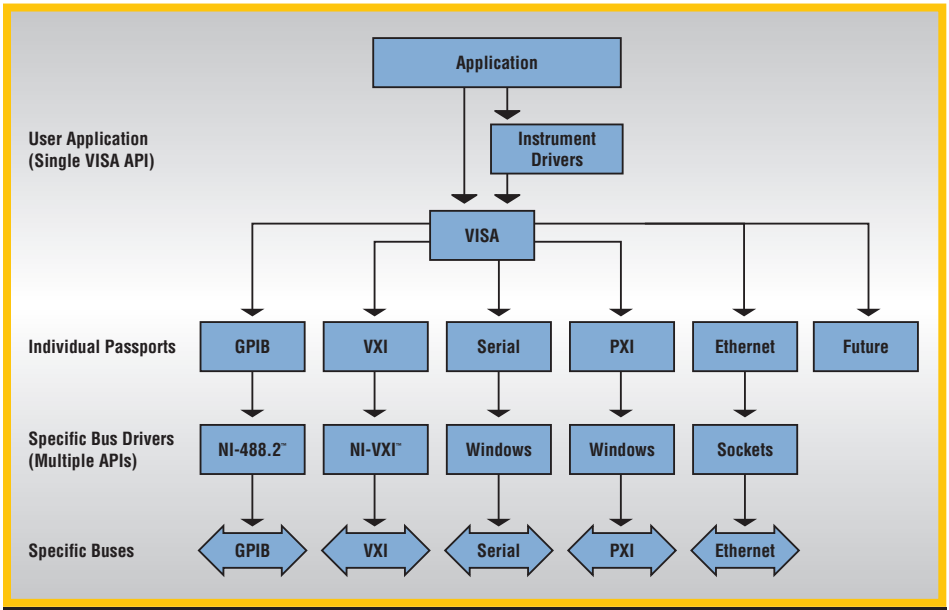
The IVI Foundation is defining a standard for instrument drivers – software modules that abstract low-level communication details – that builds on VISA to provide a robust, high-performance, and easy-to-use instrument communication protocol. These instrument drivers, created according to the foundation standards, contain high-level functions, such as Configure Measurement or Read Waveform, which internally contain the low-level VISA read and write functions. Combined with VISA, IVI provides a great mechanism to deliver multivendor, multiplatform, mixed I/O test systems (see page 14 for more information).

Software Architecture Provides Connectivity Benefits

Because multivendor, multi-interface systems are becoming increasingly prevalent, you need to have in place a software architecture that can handle those systems with minimal effort and with maximum software reuse. The software architecture based on VISA can provide such compatibility, as well as the following other benefits:

- *Gain compatibility with multiple connectivity buses.* Develop a system that mixes traditional interface buses with newer buses. In addition, a plug-in model provides an easy migration path to future buses, which might include Bluetooth.
- *Preserve your hardware investment.* Use bridge products to incorporate existing hardware into systems. And use a multi-interface architecture, so you can slowly migrate to newer bus technology without replacing all instruments or waiting for them to become available with the new bus.
- *Preserve your software investment, the most costly part of a system.* When migrating to a new control bus, use bridge products to control traditional equipment without code modification. For instruments that only work with newer buses, a system written with VISA continues to work.
- *Eliminate the learning curve.* Although programming instruments across new buses can require you to learn a completely new API, the same familiar API continues to work with the VISA Passport model.
- *Gain compatibility with the most popular and emerging instrumentation platforms.* The VISA API currently works with Windows, Linux, Macintosh, Solaris, and more.

The future of test systems is one comprised of instrumentation hardware with mixed I/O connectivity.



Preserve your software and hardware investment by using a stable software architecture, such as NI-VISA, which works with multivendor, multi-interface, and multiplatform systems.

The future of test systems is one comprised of instrumentation hardware with mixed I/O connectivity. The best way you can maintain the investment in software and hardware throughout the life of the system is to use a stable software architecture capable of working with multivendor, multi-interface, and multiplatform systems.

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ni.com/visa

Integrate High-Density Switching Applications into Computer-Based Test Systems

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Discover Six Configurations in One Switch Module

The SCXI-1129 is far more than just a high-density matrix module with 256 crosspoints (2-wire) in a single SCXI slot because its advanced signal connectivity approach amplifies the impact of this density. Simply by changing the terminal block, you change the nature of the high-density module. So, with one SCXI-1129, you can choose from six different configurations – 4x64, 8x32, 16x16, dual 8x16, dual 4x32, or quad 4x16 matrix – as illustrated in the table below.

Terminal Block	Matrix Configuration
SCXI-1333	Quad 4x16 (2-wire)
SCXI-1334	4x64 (2-wire)
SCXI-1335	8x32 (2-wire)
SCXI-1336	16x16 (2-wire)
SCXI-1337	Dual 8x16 (2-wire)
SCXI-1339	Dual 4x32 (2-wire)

Simply changing the terminal block offers different configurations.

One of the benefits of such a flexible solution is the preservation of the hardware investment. As the needs of a test system evolve continuously, its architecture might need some modifications. By using the terminal block approach, even if your system needs considerable change, you only have to replace the most inexpensive component – the terminal blocks. Also, handling spare parts for emergency situations becomes much easier because one module fulfills all needs.

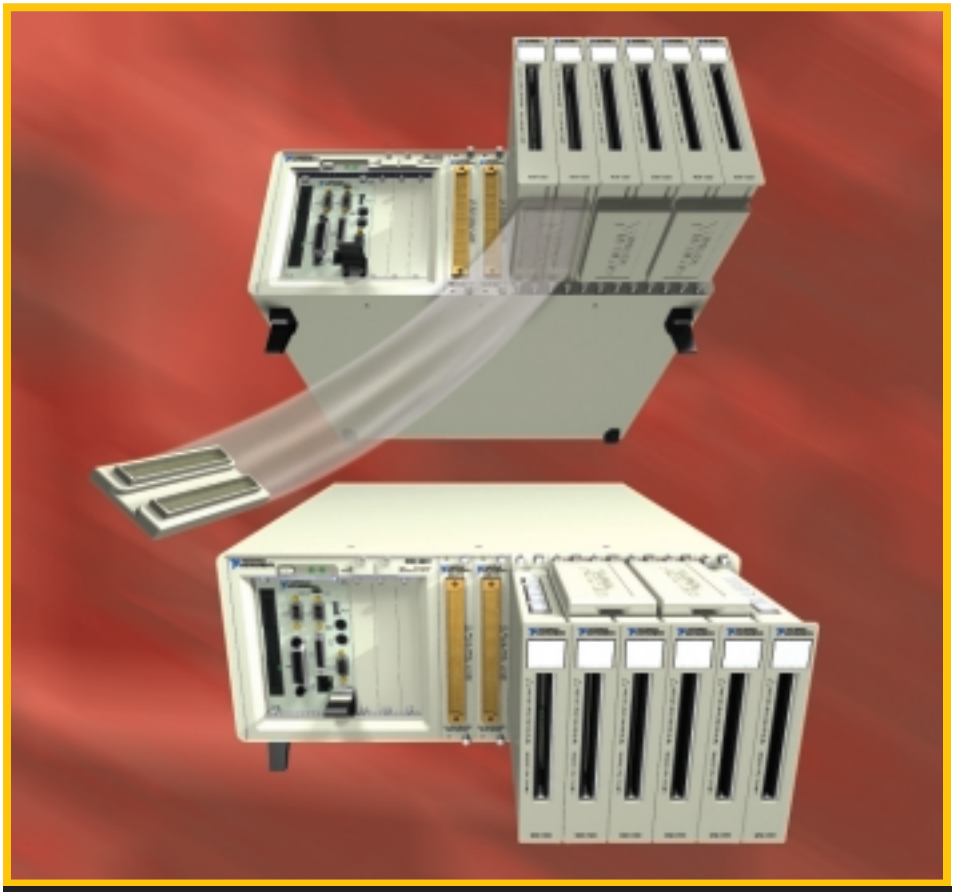
Expand Your Matrix Easily

In another important innovation, the SCXI-1129 virtually eliminates external wiring for matrix expansion. Manually wiring connections between modules to create bigger matrices is a time-consuming and labor-intensive process. For instance, creating a 48x64 matrix using twelve 4x64 matrix modules traditionally implies the creation of more than 1,000 manual connections between modules. Even if you required only one minute to wire every connection, you would face hours of continuous, costly, professional wiring. Now, the exclusive matrix expansion plug makes such long operations a thing of the past. With one simple, natural action, you can expand your matrix in a matter of seconds and have the freedom to reconfigure your switching system, to adapt to your changing needs.

You use the plug to expand the number of rows in the SCXI-1129 system, connecting terminal blocks from the top or bottom, using as many units as needed. The illustration below shows two terminal blocks connected with the expansion plug.

Because of the high-voltage analog backplane in the SCXI chassis, you can share the row signals of different modules and expand the column number in your matrix, again eliminating the need for tedious and time-consuming external wiring. Using the matrix expansion plug, in a matter of seconds, a 12-slot SCXI chassis using

"National Instruments SCXI-1129 high-density switch provides us with unmatched flexibility in our test systems," said Rodney Lesine, Research Engineer, DuPont. "With its multiconfiguration capabilities, we can easily reconfigure or expand the matrix to address our exact application needs."

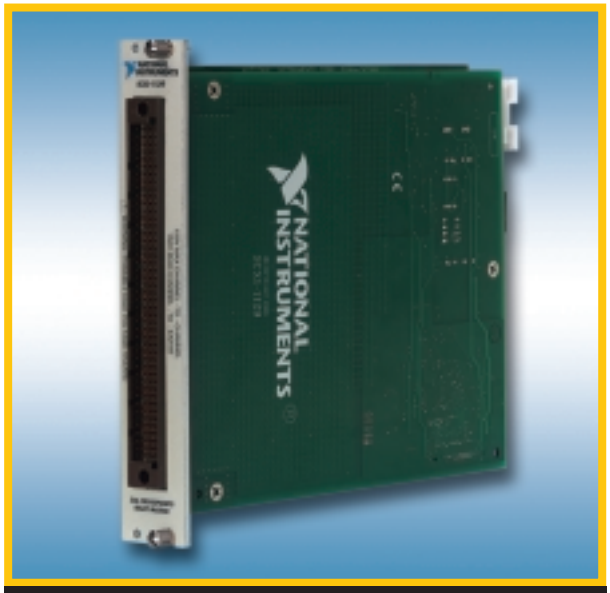


In a matter of seconds, a 12-slot chassis using SCXI-1129 and SCXI-1334 terminal blocks becomes a 48x64 matrix (2-wire).

SCXI-1129 and SCXI-1334 terminal blocks becomes a 48x64 matrix (2-wire). Or, with the same modules and terminal blocks, you can transform the system into a 4x768 matrix (2-wire) in less than five minutes, simply by using the high-voltage analog backplane to connect the rows in the different modules.

If you use a PXI-1011 combination chassis that features four PXI and eight SCXI slots, you can quickly create a 4x512 matrix (2-wire). Using the integrated high-voltage backplane, your signals are available in the front of the PXI combination chassis, again eliminating manual wiring.

The SCXI-1129 high-density matrix can work with voltages up to 150 VDC and 150 V_{rms}. The maximum currents the module can switch are 1 ADC and 250 mA AC.



The SCXI-1129 provides 256 crosspoints (2-wire) in a single-slot SCXI module.

Use the Flexible Switching Module Easily and Safely

In the design of the switching module, we paid particular attention to ensure a bandwidth superior to the critical frequency of 5 MHz because the vast majority of the high-density switching applications involves frequencies within this range. The SCXI-1129 is an ideal module to serve this large part of your application spectrum.

We designed the SCXI-1129 high-density matrix with testing applications in mind, so it provides a wide variety of scanning features – from a generous memory that stores up to 32,000 configuration steps, to the ability to use hardware handshaking with external instruments, such as digital multimeters (DMMs), scopes, and loggers. The handshaking function uses the two standard signals, Scanner Advanced and External Trigger, to provide quality, reliable communication with external devices in a nonproprietary manner.

From customer feedback, National Instruments realized the need to ensure ease of operation during inventory procedures that companies conduct periodically on the deployed test systems. For this reason, we designed the SCXI-1129 to provide, via simple software query, the serial number of the switching module. In this way, you do not need to dismantle and recompose the test system to read this piece of data on the physical card – you can acquire the number entirely via software.

Safety is a primary concern when designing any switching module to work with high voltages. Not only did we engineer the module to comply with the safety requirements of Voltage Installation Category I, but we also incorporated a safety interlock that disconnects the high-voltage bus from the matrix if the front terminal block detaches. This arrangement may prevent potentially hazardous voltages from appearing on exposed front panel connector pins when you have removed the terminal block.

Now you can integrate very high-density switching applications directly into a PXI/CompactPCI-based test system.

Interoperable Software Preserves Your Development Investment

The Measurement & Automation Explorer, an easy-to-use configuration tool included with the NI hardware and software, can automatically recognize not only the switching module, but also the terminal block placed on its front. The computer immediately identifies an intelligent chip in the module and the configuration in which it operates, such as 4x64 or 8x32.

The IVI instrument driver NI-Switch™, included with the product at no additional cost, controls all the operations. The interoperability of IVI drivers makes possible the preservation of your investment in development time. You can also reuse the programs with any other switch board from any vendor who provides IVI-compliant hardware. For more information on the IVI Foundation and its benefits, visit **ivifoundation.org**

Gain Density and Flexibility

The SCXI-1129 multiconfiguration matrix is truly a breakthrough innovation in the computer-based test world – delivering exceptional density and flexibility because of revolutionary accessories designed for easy reconfiguration and expansion. Now you can integrate very high-density switching applications directly into a PXI/CompactPCI™-based test system.

Maurizio Basso, Computer-Based Instruments Product Manager
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For more information on SCXI-1129, visit ni.com/info and enter **newsletter.**

ni.com/instruments

Automatically Create LabVIEW VIs with IMAQ Vision Builder

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The National Instruments solution for vision is unique because you can use a combination of nonprogramming or configurable tools and programming tools to solve applications. You can use IMAQ Vision Builder as a stand-alone machine vision environment when you need image acquisition triggering and image processing. And, for experienced vision developers who need flexibility, performance, and the ability to integrate measurements, instrument control, and data acquisition, you can quickly transition from a configurable environment to a programming environment, such as LabVIEW. With the ability to scale between development environments, you can solve simple applications quickly by automatically creating LabVIEW VIs, while also having the flexibility to solve advanced applications that may require diverse I/O and high performance.

Automatically Create VIs

With the step-by-step Vision Solution Wizard, IMAQ Vision Builder 6.0 automatically creates LabVIEW VIs that shorten your machine vision and scientific imaging application development time. The VIs are the complete LabVIEW VI diagrams, which include IMAQ Vision analysis, display, and region of interest (ROI) functions. You can easily integrate, edit, or modify the VIs into your automation or production test application, which may include motion control, instrument control, and data acquisition. If you use LabWindows™/CVI, a component of Measurement Studio, or Visual Basic, IMAQ Vision Builder can also create a builder file or code recipe. This builder file gives you a detailed description of the functions and constants of the diagram in a form that you can easily translate into C or Visual Basic.

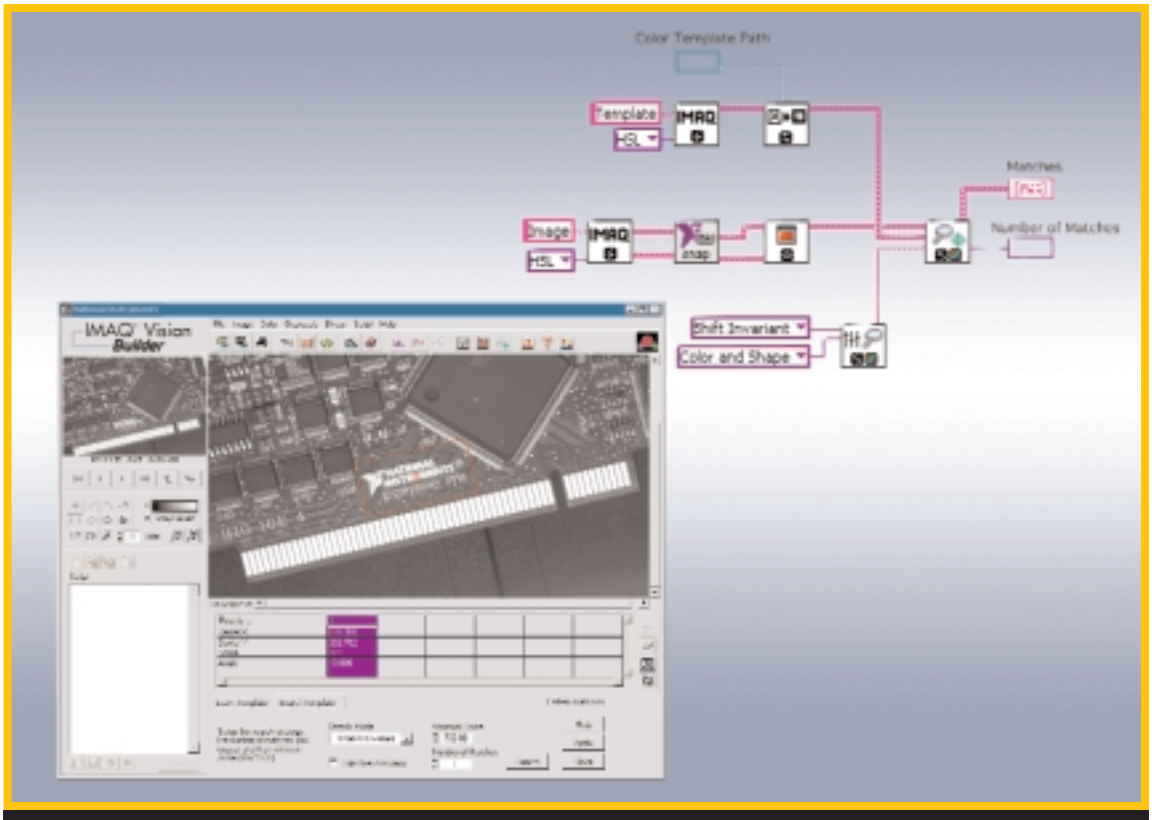
Use IMAQ Vision Builder for Low-Cost Online Inspection

When your applications only require a digital I/O line and vision algorithms for inspection, you can now use IMAQ Vision Builder and IMAQ hardware as a low-cost, configurable, PC-based vision system for production quality.

In addition, you can use IMAQ Vision Builder as stand-alone software for inline production monitoring and offline inspection applications. For an inline production application, you can use National Instruments IMAQ hardware in conjunction with IMAQ Vision Builder to wait and acquire an image initiated by a digital trigger. The digital trigger can originate from devices such as photo cells or proximity sensors. You can save the image for offline processing; or, when you acquire an image, you can immediately run an IMAQ Vision Builder script for inspection.

An IMAQ Vision Builder script consists of a sequence of machine vision and image processing functions that you configure interactively without programming. Data and results, such as pass/fail, particle counts, locations, areas, and so on, automatically transfer to a Microsoft Excel spreadsheet. Then you can review the spreadsheet to monitor production quality and trends. For offline applications that include counting,

You can solve simple applications quickly by automatically creating LabVIEW VIs, while also having the flexibility to solve advanced applications.



IMAQ Vision Builder 6.0 creates LabVIEW VIs.

inspection, and dimensional measurements, you can easily configure IMAQ Vision Builder to automatically process images from files. Once again, you can record and save your results in Microsoft Excel for review.

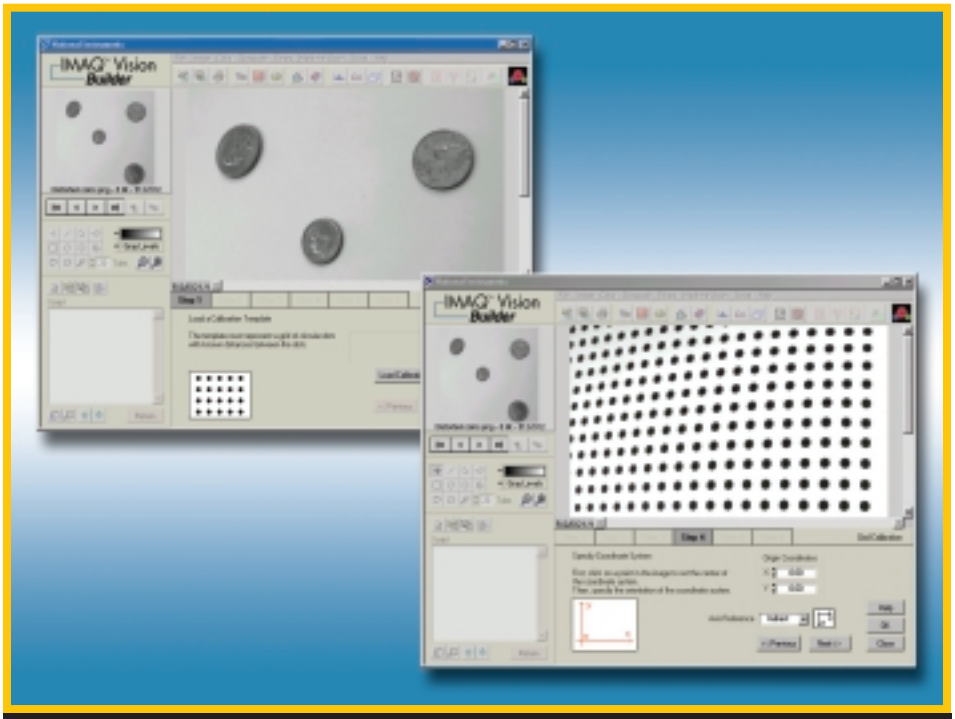
The system price for IMAQ Vision Builder, a PC, a lens, a camera, and IMAQ hardware can start as low as $3,000 (U.S.). And, you can use built-in features, such as the benchmarking tool, to test whether or not your strategy meets your inspection time requirements. Other unique features included in the latest version of IMAQ Vision Builder and IMAQ Vision library are new functions for color pattern matching, lens and camera angle calibration, and easy-to-use, high-level machine vision tools.

Quickly Locate Objects

You can use color pattern matching to locate quickly known reference patterns, or fiducials, in a color image. With color pattern matching, you create a model or template of an object. The search tool first scans the image to match the color distribution, then scores the match for shape. The score relates how closely the model matches the pattern found. You use color pattern matching to locate reference patterns fully described by the color and spatial information in the pattern. Color can often simplify a monochrome problem by improving contrast or separation of the object from the background.

Color pattern matching can also prove faster than monochrome pattern matching in many applications when the object for which you are searching has a distinct color. Use color pattern matching in automotive parts inspection and in color display inspection of cell phones, PDAs, and medical devices.

The Vision Solution Wizard simplifies the creation process for your vision applications, and you gain the flexibility to create LabVIEW VIs with ease.



Unique vision software accounts for camera angle.

Correct Distortions in Your Optics

The calibration functions compensate for lens distortions when the camera is directly above the object, or when the camera is at an angle from the object under inspection. You can use the new functions to correct for distortions in your optics and improve the accuracy, consistency, and reliability of your inspection system. The new calibration functions map pixel coordinates to real-world units.

Improve Productivity with High-Level Machine Vision Tools

New high-level functions dramatically improve development productivity in LabVIEW. These new functions include edge tools for quickly finding multiple edges in rectangles, along circles, and within concentric circles. Other functions include clamp tools for quickly measuring distances between edges and nondestructive overlays for displaying and manipulating graphics on acquired images without changing the underlying image data.

Finding Easy Solutions to Speed Creation

When you use IMAQ Vision Builder 6.0, the Vision Solution Wizard simplifies the creation process for your vision applications, and you gain the flexibility to create LabVIEW VIs with ease.

Jason Mulliner, Vision Product Manager
E-mail jason.mulliner@ni.com

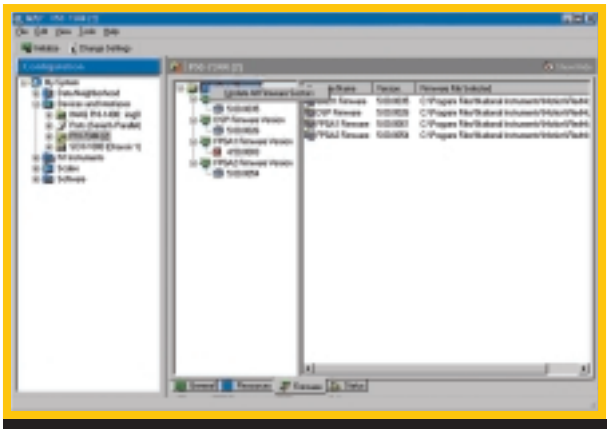
To upgrade to IMAQ Vision Builder 6.0, visit ni.com/vision/upgrade

To download the IMAQ Vision Builder data sheet, visit ni.com/info and enter **newsletter**.

ni.com/vision

Upgrade Firmware Easily with NI-Motion™ and PCI/PXI

The National Instruments 7344 Series stepper/servo controllers have upgradeable firmware, a component of NI-Motion software, to help you stay up-to-date with improvements in motion control. Firmware is software running on an embedded system, such as a motion control board. Because some motion control applications must be real time to ensure safety, precision, and performance, you must complete much of the processing and monitoring on the board itself. You use firmware to accomplish functions such as creating motion profiles and monitoring switches.



Easily upgrade NI-Motion firmware online.

Easily Add New Functions

The advantage of the firmware on the 7344 Series boards is that you can upgrade it; whereas, on some other motion controllers, the firmware is permanently applied to the board and cannot be rewritten. When NI adds new features, such as contouring or other enhancements, you can easily access the upgrade online and download it to your board. Essentially, you add new functions to your board without replacing any hardware.

Download Firmware at ni.com

When a new version of NI-Motion software is available, you can upgrade the firmware for the 7344 Series motion controller in several easy steps.

1. Download the latest NI-Motion software from the Drivers and Downloads section at **ni.com/motion**
2. After installing the software, open Measurement & Automation Explorer, find your 7344 board in the Devices and Interfaces section. Click on the icon.
3. Click on the firmware tab.
4. Locate the board in the new window, right-click the icon, and select Update All Firmware Sectors. The software automatically determines which version of the firmware is currently on your board and performs an upgrade.

Recently, National Instruments made several improvements to the stepper generation function on the 7344 Series board. The newest stepper generation algorithms make stepper control smoother than ever at both high and low speeds.

To download the improved stepper firmware, visit the Drivers and Downloads section of ni.com/motion

ni.com/motion

Gain Speed, Resolution, and Calibration for Imaging Applications

The PCI 1409, the latest NI image acquisition board for PCI, offers higher resolution, speed, and calibration. With the PCI 1409, you can acquire high-resolution, measurement-quality images from standard and nonstandard cameras and sensors.

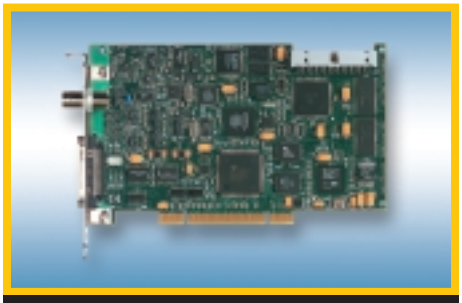
Measurement Quality with a Variety of Cameras

The PCI 1409 has high-resolution, 10-bit digitization for cameras and sensors that offer 60 dB dynamic range. In addition, you can easily configure the PCI 1409 to work with standard monochrome cameras (RS-170 or CCIR), slow or variable pixel clock cameras, double-speed progressive-scan cameras, and analog line-scan cameras.

Calibration ensures repeatable, consistent image acquisition for your machine vision and scientific imaging applications. We calibrate the PCI 1409 and deliver it with a calibration certificate.

Camera Flexibility with NI-IMAQ™

NI-IMAQ driver software, packaged with the PCI 1409, can scale between many types of cameras and acquisition methods. With NI-IMAQ, you can begin by using a low-cost RS-170 camera and image acquisition board, and then upgrade to a faster, higher-resolution camera and board with minimal software changes. Because NI-IMAQ driver software uses one set of function calls for a wide variety of cameras, there is no need to rewrite your software.



The PCI 1409 offers quick and easy configuration to produce quality imaging measurements.

The PCI 1409 for PCI works with software that includes LabVIEW, Measurement Studio, and both IMAQ Vision and IMAQ Vision Builder software.

For more information on PCI 1409, visit ni.com/info and enter **newsletter.**

ni.com/vision

Configure Your Measurement System Using DAQ Designer™

With DAQ Designer 2001, an interactive configuration advisor on CD, you can choose appropriate devices for your measurement system based on your specific needs. You may choose from hundreds of products for connecting any signal to your PC or network, including:

- Voltages up to 1,000 V
- Current from 0 to 20 mA
- Frequency
- Thermocouples
- Resistance temperature detectors (RTDs) and thermistors
- Strain/pressure/load
- Accelerometers
- LVDT/RVDT (displacement)
- Quadrature encoders
- Analog and digital cameras
- Controller area network (CAN)

First, DAQ Designer prompts you with questions, and you describe your measurement system specifics, including type of computer bus and operating system, number and type of signals, sampling speed or acquisition rate, required filtering and isolation, and type of programming environment and language. Then, based on your answers, the configuration advisor recommends optimal hardware and software products, so you can build a system meeting your specifications.

Choose devices specific to the needs of your measurement system.

Throughout the configuration process, you can view product images and descriptions, data sheets, tutorials, and application notes to learn more about how specific hardware and software optimize your measurement system. If you have a Web connection on your computer, DAQ Designer displays current pricing information and links you to a suite of online system configurators available at **ni.com**

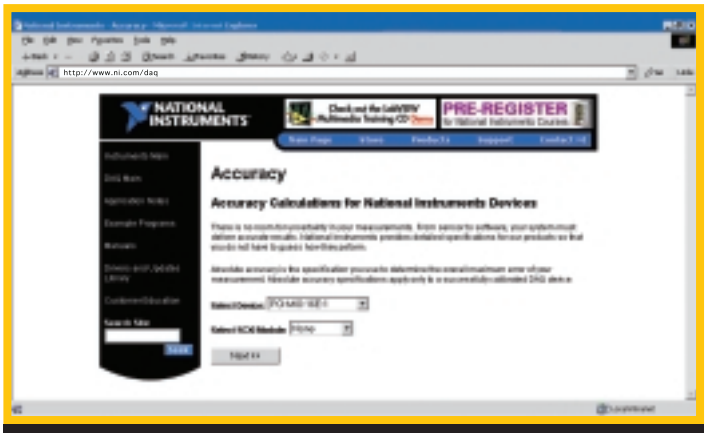
As an added resource, DAQ Designer provides direct links to NI Developer Zone™, your resource for building measurement and automation systems and information on additional products offered, such as switches and FieldPoint™ dual-channel modules.

DAQ Designer 2001 configuration advisor is available in nine languages on one CD, including Chinese, English, French, German, Italian, Japanese, Korean, Portuguese, and Spanish.

To request your DAQ Designer 2001 CD, visit ni.com/info and enter **newsletter**.

ni.com/daq

Online Tool Makes Accuracy Calculations Easy



Determine your entire system accuracy with the Accuracy Calculator.

Now, with the online Accuracy Calculator, you can automatically compute the measurement accuracy of your entire measurement system. In any measurement system, you must associate some degree of uncertainty with a measured value. National Instruments has always provided detailed accuracy specifications for our DAQ and SCXI signal conditioning products.

In practice, your application often depends on a combination of several of these devices. Many factors, such as temperature and signal value, contribute to the level of measurement uncertainty. And, the measurement uncertainty of each device becomes part of the measurement uncertainty in your entire system. In the past, evaluating the overall accuracy of your measurement system required tedious hand calculations to take into account the inaccuracy of each component.

Based on particular input parameters, the Accuracy Calculator returns the absolute accuracy in volts and the absolute accuracy with respect to the input (RTI) as a percentage.

To provide the most complete accuracy information, the Accuracy Calculator automatically accounts for these variables:

- DAQ device used in the system
- SCXI modules (if any)
- Range of signal measurement
- Temperature drift
- Filtering
- Sampling type
- Time from calibration

In this way, you can determine the total measurement accuracy in your entire data acquisition system.

To find the Accuracy Calculator and more information on accuracy, visit ni.com/info and enter **newsletter**.

Also, for an in-depth look at accuracy, read "Understanding Accuracy Specifications and Computer-Based Instruments Parts 1-3" at ni.com/zone

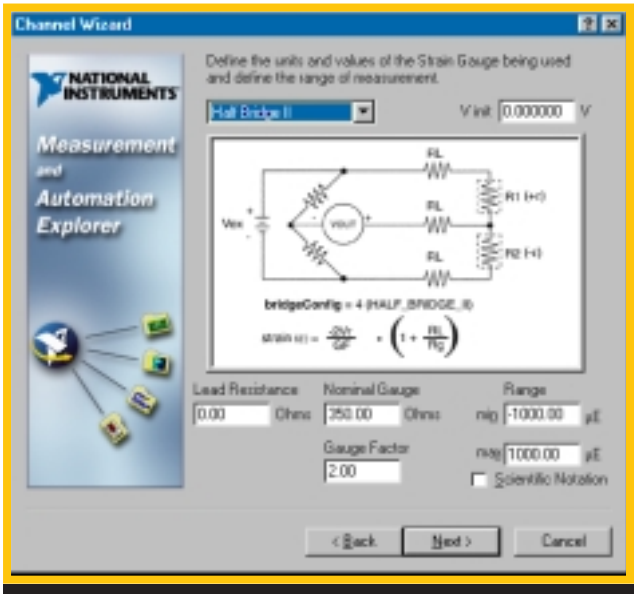
ni.com/zone

NI-DAQ™ 6.9 Delivers Internet-Ready Measurement Intelligence

With enhanced capabilities for networked applications, simplified measurement of strain, improved performance, and compatibility with new industry standards, NI-DAQ 6.9 and Measurement & Automation Explorer 2.0 deliver the next level of "measurement intelligence" – the tight integration of measurement hardware with software to simplify configuration and improve measurement functionality. They are the critical software components which interface your data acquisition and signal conditioning hardware to your programming environment, such as National Instruments LabVIEW and Measurement Studio or Microsoft Visual Basic.

Name Channels and Convert Engineering Units Easily

DAQ systems often monitor temperature, displacement, and acceleration, in addition to electrical phenomena, such as voltages and currents. NI-DAQ 6.9 and Measurement & Automation Explorer simplify the measurement of strain gauges, which are transducers used to measure physical quantities, such as strain, force, and torque. You can configure and name a strain gauge channel with Measurement & Automation Explorer and then use the name in your program to access the channel. NI-DAQ then automatically converts the electrical units to the strain units meaningful to you, eliminating the need for tedious handwritten conversion code in your application.



NI-DAQ 6.9 and Measurement & Automation Explorer make monitoring strain easy.

Network with Internet-Ready Measurement Software

National Instruments integrated Internet technologies into NI-DAQ in 1997, so you could quickly build high-performance measurement applications distributed across a network. With remote data access (RDA) technology built into NI-DAQ, you can use a measurement-equipped computer as a server that you control from a client. You control operation of the measurement devices connected to the server as if they were installed in the client.

With NI-DAQ 6.9, you can also easily access named channels across the network using Measurement & Automation Explorer and the LabVIEW 6*i* DAQ Channel Name I/O Control. You can browse channels on the measurement server as if they were present on the client computer.

Develop Secure Applications

To prevent unauthorized access to the server, you now can protect the server through built-in password protection. You can share your measurement resources in a controlled environment.

Use GPS to Synchronize Measurements Worldwide

In some applications, such as seismic activity monitoring and power grid evaluation, you must correlate measurement systems across wide geographical areas. Combined with a NI 6608 counter/timer device, NI-DAQ 6.9 offers GPS time synchronization that you can use to correlate measurements anywhere in the world with absolute timing, without requiring a direct connection between the measurement systems. Because of this new GPS time synchronization capability, you can synchronize measurements with an accuracy of 400 ns plus the accuracy of the GPS receiver you use. For more information on GPS and telematics, see page 3.

NI-DAQ 6.9 offers the GPS time synchronization, which you can use to correlate measurements anywhere in the world with absolute timing.

Create Faster Solutions with Improved Execution Speed

This new version features a five-fold increase of speed for single-point and single-scan operations for named channels. With this improvement, you can create faster control-loop solutions while taking advantage of named channels. In particular, you can use named channels to create faster solutions when you combine LabVIEW Real-Time software with data acquisition products to create deterministic real-time applications.

Use Industry-Standard Compatibilities

NI-DAQ 6.9 works with Windows 2000/NT/Me/9x. Separate versions of NI-DAQ are available for the Mac OS. NI-DAQ 6.9 also works with Version 2.0 of the OLE for process control (OPC) Data Access Specification.

For more information and to download NI-DAQ 6.9, visit ni.com/info and enter **newsletter**.

ni.com/daq