Instrumentation

The Worldwide Publication for Measurement and Automation

Fourth Quarter 2003

Newsletter™

NI Introduces 100 MS/s Mixed-Signal Test Platform

The new National Instruments family of 100 MS/s mixed-signal modular instruments combined with LabVIEW 7 Express revolutionizes the way engineers characterize electrical designs and build manufacturing test systems. This new suite of PXI instruments extends NI LabVIEW 7 Express into design and test applications that require high-performance, tightly synchronized analog and digital signal generation and acquisition. The complete NI integrated software and

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What Do You Think of LabVIEW 7?

The last issue of *Instrumentation Newsletter* launched the latest generation of our LabVIEW graphical programming environment. As we stated in that issue, LabVIEW 7 Express represents our largest investment ever in a new version of LabVIEW, and as you could expect, we are quite proud of the features and functionality that came out of our investment. Based on the first weeks of the launch, we are also quite pleased with the response we have received. We thought we would share some quotes and comments that have been written about LabVIEW 7 Express by customers and editors:

"Experts and novices alike will lust after the latest LabVIEW."
– EDN *headline, May 29, 2003*

"...the developers of NI's flagship graphical data-acquisition, instrument-control, analysis, and presentation environment have outdone themselves...LabVIEW's huge army of already-fanatical fans will find the new version's speed and extended capabilities irresistible."
– EDN, *May 29, 2003*

"LabVIEW 7 Express...goes far beyond the previous versions to the point where programming is more about knowing what you want to accomplish than the mechanics of actually having to implement it in code."
– Embedded System's Industry Insider, *Venture Development Corp.*

"The more I use LabView 7 Express here, the more I am impressed. I can't imagine the amount of work that has gone into this product."
– *John Howard, Sperry Marine*

"This product is so revolutionary it is hard to grasp all the implications it brings to our industry."
– *Robert Macody, President of Thomas Publishing*

"Even though my programming experience is in C, with LabVIEW 7 Express, I believe that I can do the same amount of programming in less time."
– *Anthony Cheng, Abbott Labs*

"If you think about the engineering time that NI put into the development (of LabVIEW 7 Express), you realize that the attractive pricing is due to the ubiquitous and all-pervasive nature of LabVIEW."
– ChipCenter.com, *May 2003*

"LabVIEW 7 Express reduces development time when compared to previous versions, delivering an environment in which beginners can achieve fast development."
– *Mr. Watanabe, Keisokugiken, Japan*

"LabVIEW 7 Express closes the gap between sophisticated applications with complex code and simple code for more basic applications."
– *Nicola Chiari, SIDeA S.p.A., Italy*

"The new version (of LabVIEW) produces far less complicated data-flow diagrams than previous versions, is much less complicated to use, and now can target FPGA-based devices as well as those running Palm OS and Pocket PC."
– Software Development Times, *June 1, 2003*

"Woohoo! ;-)"
– *info-LabVIEW forum*

We hope you've had a chance to see LabVIEW 7 Express, featured on ***ni.com/labview***. If so, we want to hear from you – what do you think? We believe that the functionality of LabVIEW 7 Express can make you, your colleagues, and your company more productive today. Do you agree? We're happy to hear what you like and what you don't like. The feedback will assist us as we embark on new innovations and improvements for future versions of LabVIEW. ■

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Automated Monitoring Improves Oilfield Safety

Operating a fleet of more than 1,400 oilfield service rigs, Key Energy invests heavily in technology to keep safety high and costs low for its customers. The company's most ambitious technology project, the KeyView system, automates data collection, transmission, analysis, and reporting across its widely distributed fleet of rigs, improving both safety and efficiency in the process.

Key contracted with Advanced Measurements Inc. (AMI) of Calgary, Alberta, a knowledgeable systems integrator, to ensure success on the project. AMI is a National Instruments Select Integrator with 15 years of LabVIEW development experience in a variety of applications, including oilfield data capture.

The KeyView system monitors oilfield service rigs for enhanced safety and efficiency.

Using NI Compact FieldPoint rugged distributed I/O and the LabVIEW Real-Time Module, the KeyView project collects operations data on rig location (GPS), rig activity, and job status using a graphical operator terminal. The system monitors physical parameters including block position, hook weight, rod torque, hydraulic and pneumatic system, and engine performance. The system transmits this data from each rig via satellite, inserting it into a database at the corporate office. A custom Web site gives both staff and customers access to real-time and historical job information.

More Data Equals Greater Safety

The KeyView system has three safety systems right on the rig. With the first system, sensors and software detect if the operator directs the block (the "hook" part that performs the lifting) to approach the upper or lower limit on the derrick too quickly, risking impact. Should this occur, three outputs controlled by Compact FieldPoint take control to prevent impact as well as reduce injury and damage.

In the second system, sensors and software monitor at high speeds the weight suspended on the block. Sudden increases in weight while lifting indicate something is stuck; again, Compact FieldPoint takes control and limits the rig operation to prevent injuries and damage. With the third safety system, sensors monitor H2S gas concentrations, giving two levels of strobe and audible alarm for rig crews. The highest level alarm also triggers a satellite transmission, so outside supervision can provide emergency response if required.

Monitoring Lowers Costs

By monitoring actual rig operations, the operations and maintenance staff can lower costs and provide better training, resulting in greater efficiency. In addition, data analysis tools at the corporate office give management the ability to not only monitor performance indicators, but also determine best operating practices.

Key consists of a series of former smaller businesses. Having access to quantitative monitoring, recording, and analysis of rig operations across a large family of operations gives the company an opportunity to see the best operating practices for each area, procedure, and even individual operation. From this knowledge, the company can develop standard methods to reflect best practices.

By monitoring actual rig operations, the operations and maintenance staff can lower costs and provide better training, resulting in greater efficiency.

Customers benefit by seeing in real time the location and job status of rigs that are working for them, giving them the ability to plan subsequent jobs and work programs more efficiently. They also have access to measured data showing the time required to perform the job and the amount of work performed, resulting in reduced supervision and more accurate billing. In addition, customers receive reports with objective, measured data showing the quality of the work performed.

John Hood, CIO at Key, says the success of KeyView required several critical components: the commitment of Key to use technology aggressively, AMI's ability of AMI to provide a complex, integrated solution, and the rugged and reliable NI Compact FieldPoint hardware. According to Hood, "KeyView will place Key at the forefront of its industry and provide the company with a significant competitive advantage." ■

ni.com/success

NI Introduces 100 MS/s Mixed-Signal Test Platform

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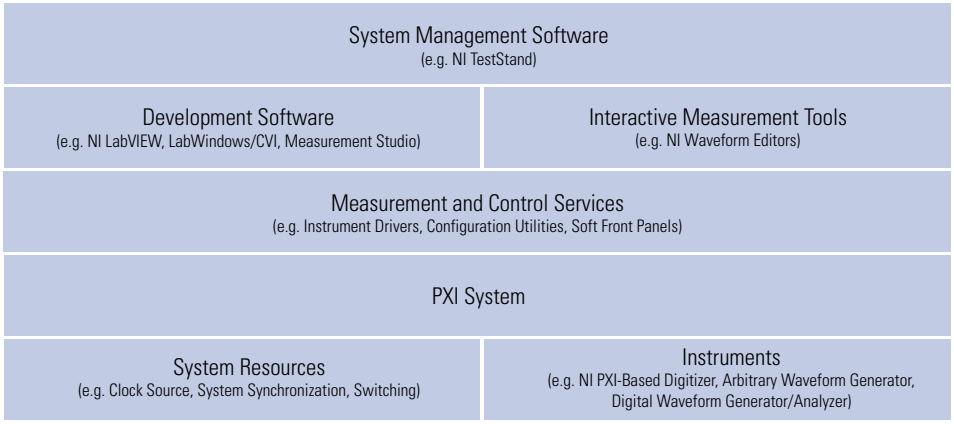
hardware platform includes a suite of instruments matched in frequency and capability:

- 100 MS/s, 14-bit digitizer (NI PXI-5122)
- 100 MS/s, 16-bit arbitrary waveform generator (NI PXI-5421)
- 100/50 MHz digital waveform generator/analyzer (NI PXI-6552/1)
- 100 MHz clock and frequency generator (NI PXI-5404)
- Timing and synchronization module (NI PXI-6653)
- 500 MHz switching (NI PXI-2593)

This article describes the core architectures and technologies supporting the mixed-signal platform. Additional technical information on the three newest instruments – NI PXI-5122 digitizer, NI PXI-5421 arbitrary waveform generator (AWG), and NI PXI-6552/1 digital waveform generator/analyzer – is included on pages 12 and 13.



A modular platform is ideal for mixed-signal prototyping and test because it offers flexible, accurate measurements and higher system performance.

A Modular Approach to Mixed-Signal Test

Convergence in the electronics industry has driven the need to prototype and test complex designs that integrate voice, video, audio, and data. Characterizing and testing these mixed-signal devices, in which complex digital and analog signals live side by side, is challenging. A cable TV set-top box, for example, may include input and output signals for cable, satellite, video, audio, USB, and LAN. Testing such a complex device requires coordinated generation and acquisition of the analog and digital test signals and sophisticated software for measurement and analysis. Changes in product design – for example, the addition of a FireWire (IEEE 1394) port for streaming video on the set-top box – demand flexibility in the test system to adapt to the new testing requirements. Finally, the pressure to get new products to market and develop test systems at the lowest possible cost has never been greater.

A modular platform built on commercial hardware and software technologies is ideal for rapidly prototyping and testing mixed-signal devices. National Instruments has built a complete hardware and software platform around LabVIEW software and industry-standard PXI hardware, as shown above.

This modular platform has three key advantages:

- Flexible, software-based measurements to meet specialized and rapidly changing requirements
- World-class measurement performance for accurate measurements
- Higher system throughput and tight synchronization

Flexible Software-Based Measurements Meet Changing Test Requirements

While functionality is converging in electronics products, communication standards, data formats, and processing technologies are diverging. Our set-top box example includes multiple data transmission methods (quadrature phase shift keying (QPSK) for upstream cable and four quadrature amplitude modulation (QAM) for downstream cable), multiple video signal formats (digital, analog, high-definition TV), and multiple peripheral ports (USB, FireWire). The next iteration of the product will undoubtedly have more, not fewer, functions and standards that need testing. It is essential that you can adapt to these changes quickly by reducing the overall time needed to iterate models, prototypes, and test system designs.

LabVIEW 7 Express and PXI modular instruments provide a flexible platform to adapt the functionality of your system to these changes. Because you can define the functionality of the system in LabVIEW, you can create unique tests that are not possible with traditional, vendor-defined systems. The new analysis capabilities of LabVIEW 7 Express provide a complete platform for simulation and software-defined measurements that compliment the modular, broad-based hardware.

World-Class Measurement Performance

Measurement performance is essential for accurately characterizing and testing your designs. The new NI modular instruments deliver world-class analog performance, timing accuracy, and stability demonstrated by two-year guardbanded specifications maintained over 0-55C.

The NI PXI-5122 digitizer and NI PXI-5421 arbitrary waveform generator deliver 14 and 16-bit resolution, respectively. This represents from 16 to 64 times the resolution of traditional arbitrary waveform generators and oscilloscopes. Meticulously designed analog signal paths are optimized for low spurious noise, achieving better than 80 dBc SFDR and an ultralow -75 dB THD, while achieving wide bandwidth (43 and 100 MHz

Signal Analysis VIs	Design Verification VIs
Amplitude and Level Measurements	Masks and Limits
Spectral and Distortion Measurements	Histogram
Timing and Transition Measurements	Statistics
Curve Fitting	
Analog and Digital Modulation	

LabVIEW 7 Express includes new analysis VIs designed specifically for signal analysis and design verification.

respectively). In a high-channel-count or mixed-signal system, timing between modules is crucial. The SMC can align samples between modules with subnanosecond skew to deliver unmatched synchronization. The NI PXI-5122, NI PXI-5421, and NI PXI-6552 all have built-in self-calibration and a two-year NIST-traceable calibration cycle to maintain accuracy over time.

Higher System Throughput and Tight Synchronization

PXI provides an excellent platform for meeting both the system accuracy and throughput requirements of a mixed-signal system by combining the commercial PCI bus with electrical and mechanical features designed specifically for integrated test systems. The high-speed PCI bus can transfer data at 132 Mbytes/s – about 100 times faster than the GPIB bus used on most stand-alone instruments. PXI adds specific timing and synchronization features to the PCI bus; in addition, eight bused trigger lines and a low-skew star trigger are available to PXI modules to route trigger and clock signals to other modules and create a tightly integrated system. For example, you can use the PXI trigger bus to handshake between the digitizer and AWG to maximize throughput of a stimulus-response test and thereby accelerate common measurements such as frequency response and distortion.

The common platform used in the NI mixed-signal test platform is critical to achieving such a high level of integration. NI designed the Synchronization and Memory Core (SMC), a common architecture used in the new PXI-5122 digitizer, PXI-5421 AWG, and PXI-655x digital waveform generator/analyzer, to deliver an unprecedented level of integration between modules. The SMC can achieve time alignment within hundreds of picoseconds between instruments. To learn more about SMC, see in the sidebar at right.

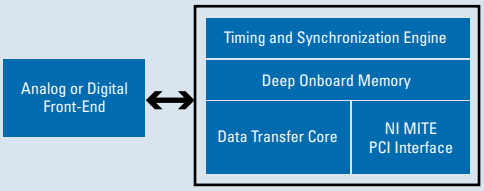
For mixed-signal applications from design to manufacturing, the new NI 100 MS/s mixed-signal platform provides a solution for the challenges facing design and test engineers. LabVIEW 7 Express and PXI provide a robust and flexible platform to meet unique and changing application needs, build fast and accurate test systems, and lower overall test costs. ■

To take the virtual tour of the new modular instruments based on the NI Synchronization and Memory Core, visit ni.com/info and enter nsi3401.

SMC Architecture Provides Integration Between Instrument Modules

The Synchronization and Memory Core (SMC) is a digital core architecture used on three new high-performance 100 MS/s modular instruments. With the SMC architecture, these instruments deliver an unprecedented level of integration between modules. The SMC makes the following possible:

- Synchronization of multiple 100 MS/s digitizer channels with subnanosecond skew
- High-speed streaming of data from instrument memory to the PC host
- Creation of complex digital and analog waveforms with up to 2 million waveform segments or 3.3 million sequencing instructions



With the Synchronization and Memory Core, three new 100 MS/s NI instruments deliver unprecedented integration between modules.

Timing and Synchronization Engine Delivers Tight Integration and High Accuracy

The SMC synchronization engine delivers a common set of triggering, clocking, and events for multichannel and mixed-signal applications. For instance, in applications requiring synchronized digital generation and analog acquisition, you can use the NI PXI-655x digital pattern generator/analyzer to generate digital data and the NI PXI-5122 digitizer to acquire the analog data and achieve subnanosecond correlation on the digital and analog data. This functionality is important for accurately characterizing a mixed-signal device such as a data converter. Future software releases will support full SMC capabilities for subnanosecond alignment.

Data Transfer Cores

The SMC uses a field-programmable gate array (FPGA) to provide a common, flexible data generation and retrieval engine to the analog and digital instruments. With these cores, all SMC-based modules have consistent waveform sequencing and triggering capabilities.

Deep Flexible Memory

The SMC onboard memory gives you the ability to generate complex waveforms and measure high-speed signals over long durations by supporting up to 512 MB of memory. Unlike traditional instruments, the SMC can store data and instructions in the same physical memory, so the NI PXI-5421 AWG and the NI PXI-655x digital waveform generator/analyzer can generate waveforms. With SMC, you can trade waveform memory space for instruction space and download up to 2 million waveforms or 3.3 million sequencing instructions. ■

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NI Compact Vision System Makes Cameras Smarter

The new NI CVS-1454 Compact Vision System extends the power of LabVIEW Real-Time to a new, rugged, machine vision package that withstands the harsh environments common in robotics, automated test, and industrial inspection systems. The Compact Vision System offers unprecedented I/O capabilities and network connectivity for distributed machine vision applications. It uses FireWire (IEEE 1394) technology so you can select from more than 40 cameras with a wide range of functionality, performance, and price. In addition, with three FireWire ports, you can connect multiple cameras to one Compact Vision System, significantly lowering the price of your deployed system. To program the system, you can either configure your machine vision application quickly with Vision Builder for Automated Inspection or program your application with LabVIEW and the Vision Development Module.

The NI Compact Vision Systems shares dimensions (4 by 5 by 2.5 in.) with the new Compact FieldPoint distributed I/O product line introduced last fall. The two integrate easily through Ethernet, RS-232, or DIO to share measurement information or to close control loops remotely. The industrial packaging of the Compact Vision System also contains no moving parts, fans, or vents. This results in a reliable device designed to perform flawlessly whether inspecting silicon wafers in a clean room or two-by-fours in a lumber mill.

Configure or Program – You Choose

National Instruments machine vision software approach combines the power and flexibility of a programming language such as LabVIEW and the ease of use of a menu-driven environment such as NI Vision Builder for Automated Inspection. Vision Builder for Automated Inspection simplifies the development process by replacing programming complexity with an interactive, configurable environment. It provides easy-to-use inspection functions, region of interest tools, inspection benchmarking, I/O communication tools, and an operator interface for quick development and deployment to the factory floor. Use it for gauging, determining whether a part is present, alignment, and optical character recognition applications. To bridge you from a configuration environment to an easy-to-use programming environment such as LabVIEW, Vision Builder for Automated Inspection generates LabVIEW code for easily modifying and extending your source code to meet the requirements of your custom applications.

With LabVIEW, you can develop your own custom image processing algorithms, optimize your application for speed, optimize memory usage, develop a custom user interface, and integrate the I/O capabilities to PXI and Compact FieldPoint. You also can ensure your inspection is stable and deterministic, with LabVIEW Real-Time and time-bounded functions. By their nature, most machine vision functions are not deterministic because image content, rather than image size, determines the speed of a particular image-processing step. For example, you can perform particle analysis on an image with three particles more quickly than processing an equivalently sized image with seven particles. However, with time-bounded functions, if your inspection is not finished in the allotted time, then the unit under test automatically fails and the software prepares for the next inspection. This is useful because the processing time needed to inspect defective units is often much greater than the time needed to inspect acceptable ones. Time-bounded functions ensure your inspection system does not spend valuable time excessively inspecting defective products.

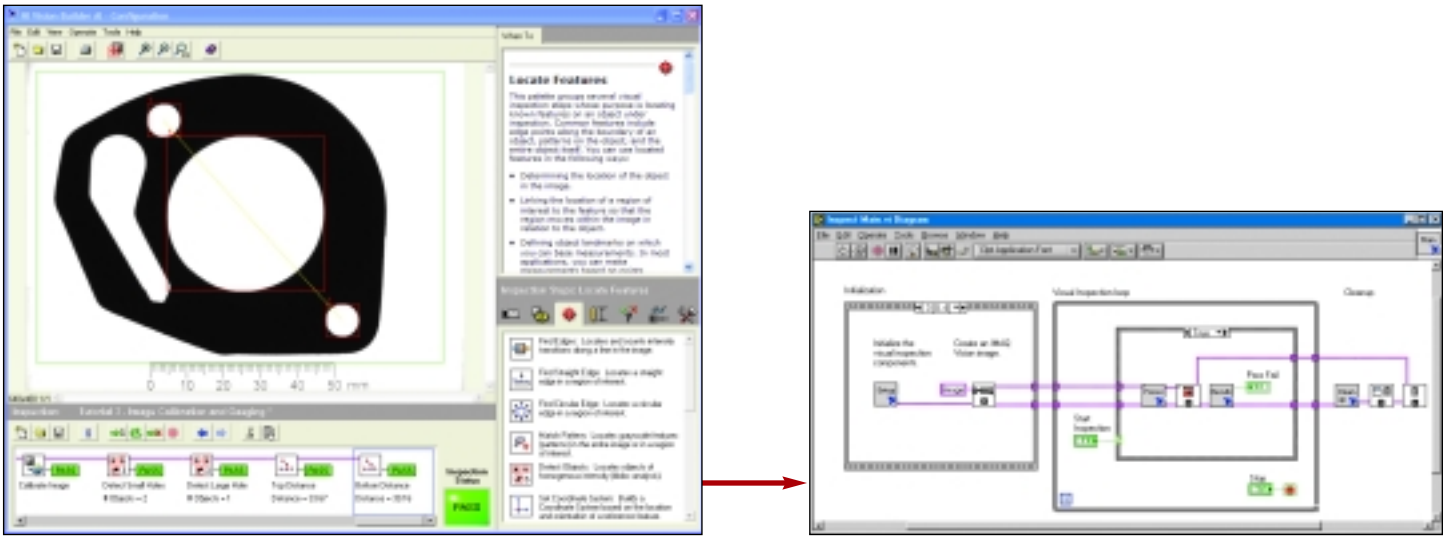
The NI CVS-1454 Compact Vision System gives you the power to build applications with multiple cameras without the need for separate processing units, saving you time and money.

Flexible Connectivity and Integrated I/O Capabilities

The NI Compact Vision System concept was designed with versatile and durable connectivity in mind. It works with any FireWire camera that adheres to an industrial IEEE 1394 camera specification, called DCAM, and can interface with many types of external devices (such as relays and triggers) with 29 DIO lines. You can connect multiple cameras simultaneously to each Compact Vision System. For example, with the shared bandwidth of 400 Mb/s, you can use three FireWire cameras to one Compact Vision System to inspect an object from the top and two sides without buying three separate processing units. This saves not only money, but also programming and integration time. To search for a camera that meets your application needs, visit ***ni.com/cameras***.

You can connect multiple cameras to one Compact Vision System, significantly lowering the price of your deployed system.

Machine vision systems often require more than just a camera and an image processing unit; they must synchronize and communicate with other hardware components such a lighting, triggers, relays, and PLCs. The CVS-1454 simplifies this process by providing software and hardware connections to these industrial components. Its 15 digital input lines are configured to read triggers, decode quadrature encoder feedback, or count pulse trains. Use these inputs to asynchronously trigger the start of each inspection or to synchronize your image inspection to the speed of a conveyer belt. Use 14 digital outputs on the CVS-1454 to drive pulses and pulse trains to control strobe lights, toggle relays, or activate status lights. You can use the RS-232 serial port on the Compact



Using NI Vision Builder for Automated Inspection configurable software, you can quickly develop an inspection application and download it onto the Compact Vision System.

Vision System to communicate with PLCs, lighting sources, or distributed I/O modules.

For lens, lighting, and contrast adjustments, it helps to view images at full frame rates. The Compact Vision System provides two methods for displaying real-time inspection information. The VGA video output directly on the Compact Vision System displays the current image being acquired as well as any custom overlay information, such as pass/fail information, real world measurements, or regions of interest. Use the VGA output for focusing your cameras and for providing real-time feedback to local operators. Remote users can use the Ethernet display option to access images and inspection data from over the network.

The NI CVS-1454
Rugged, Industrial Form Factor with No Moving Parts or Vents

Software Options

PROGRAMMING	OR	NO PROGRAMMING
Build Inspection with LabVIEW 7 Express and the Vision 7 Development Module		Configure Inspection with Vision Builder for Automated Inspection

Hardware Components

- 3 IEEE-1394 (FireWire) Ports
- High-Performance Processor
- VGA Video
- 14 Digital Output Lines
- 15 Digital Input Lines
- RS-232 Port
- Ethernet Port
- 32 MB NVRAM
- 128 MB DRAM

The rugged NI CVS-1454 provides a variety of I/O options to integrate machine vision with other industrial devices.

To incorporate data acquisition (DAQ) into your machine vision application, you can integrate the Compact Vision System with Compact FieldPoint (cFP) or PXI. This provides a convenient package for assembly, packaging, and automated test applications that require a real-time, embedded platform. The Compact Vision System, Compact FieldPoint, and PXI are all LabVIEW Real-Time targets and can easily communicate with each other using built-in LabVIEW functionality for Ethernet, RS-232, or DIO.

Compact, Rugged Design

The Compact Vision System reliably operates in temperatures ranging from 0 to 55 °C. To avoid long-term environmental interference from airborne particles, the Compact Vision System has no vents, fans, or moving parts. Also, all of its connectors use secure, screw-in mounting terminals that virtually eliminate failures caused by unintended disconnection. The combination of LabVIEW Real-Time with this compact, rugged packaging creates an intelligent machine vision system that excels in industrial environments, where dependability and durability are a must, and in remote monitoring and robotic control applications where compactness and versatility are essential.

With the Compact Vision System, you choose the IEEE-1394 cameras and the configurable or programmable software that meets the needs of your unique machine vision application. With these choices, combined with the rugged design, I/O capabilities, industry-leading processing power, and low price of the Compact Vision System, you can easily create custom machine vision applications that work reliably even in the most unforgiving conditions. ■

To download a data sheet for the NI CVS-1454, or to request evaluation copies of the Vision Development Module for LabVIEW and Vision Builder for Automated Inspection, visit ni.com/info and enter **nsi3402**.

To read more on integrating the Compact Vision System with Compact FieldPoint, visit ni.com/info and enter **nsi3403**.

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TestStand 3.0 Delivers Instant Connectivity with LabVIEW

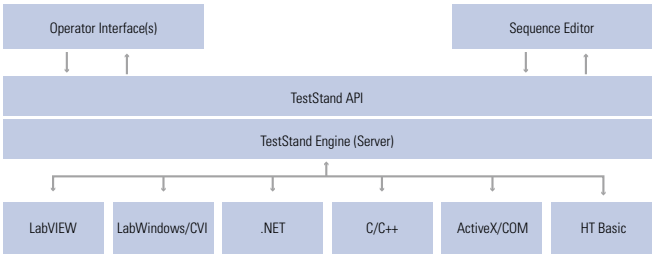


Figure 1. The modular TestStand 3.0 architecture delivers built-in features for achieving faster time to test and increased code reuse.

National Instruments TestStand 3.0 test management software helps you build your automated prototype, validation, and manufacturing test systems. TestStand 3.0 delivers more than 30 new features for reducing test development time, including instant connectivity with LabVIEW 7 Express, new TestStand user interface controls for significantly faster development of custom test system operator interfaces, and an improved deployment utility for rapidly deploying test systems located locally and worldwide.

The globalization of product development and manufacturing has changed the test industry rapidly and generated challenging requirements for faster time to test. A modular test system architecture results in decreased development time and easier test system maintenance. In fact, nine out of the top 10 global electronics companies already are using NI TestStand and LabVIEW to achieve faster time to test. Specifically, NI TestStand delivers a modular test architecture that inherently separates your test-specific code from the common test system features, such as unit-under-test tracking, limit testing, result collection, and report generation.

"The TestStand 3.0 adapter interfaces for LabVIEW and LabWindows/CVI are much improved over TestStand 2.0. They are intuitive and straightforward, which helps me develop my tests faster."

– Tom Grobengieser, Delphi-Delco Electronic Systems

New programming tools, such as LabVIEW 7 Express, greatly increase your productivity in developing test applications to acquire and analyze your data. Regardless of your programming environment, combining your individual test programs together to build an automated test system often requires a significant amount of programming. Now, with the TestStand off-the-shelf, customizable architecture, you can quickly assemble your new and existing test programs into a modular, automated test system. TestStand manages all the sequencing, branching, looping, limit testing, and report generation required in automated test systems. The modular TestStand 3.0 framework provides an open environment that you can modify easily to match your specific test system requirements. Using TestStand, you can focus your engineering efforts on core product and test development while TestStand manages your common test system tasks.

Instantly Connect Your LabVIEW 7 Express VIs

TestStand 3.0 introduces significant enhancements to the module adapters, which provide connectivity to popular test development languages. A redesigned LabVIEW adapter interface connects your LabVIEW VIs to TestStand without any programming. The new LabVIEW adapter interface, shown in Figure 2, provides direct connectivity to your LabVIEW 7 Express VIs, so you can share data between TestStand and your test programs. For maximum throughput and performance, the execution times of the LabVIEW adapter interface now are comparable to calling a dynamic link library (DLL) from TestStand. Also, you can remotely automate LabVIEW VIs located on other networked machines. This feature is useful for automating test modules running on a non-Windows OS or a LabVIEW Real-Time embedded target, such as PXI or FieldPoint Distributed I/O. Using the new LabVIEW Adapter in TestStand 3.0, you can import and view your LabVIEW VI documentation and help files when specifying your test module in TestStand.

In addition to the new functionality in the LabVIEW adapter, TestStand 3.0 includes improved adapter interfaces to NI LabWindows/CVI, as well as C/C++, C#, and Visual Basic .NET. These improved module adapters deliver greater flexibility for your test applications and unparalleled integration with your test programming environment.

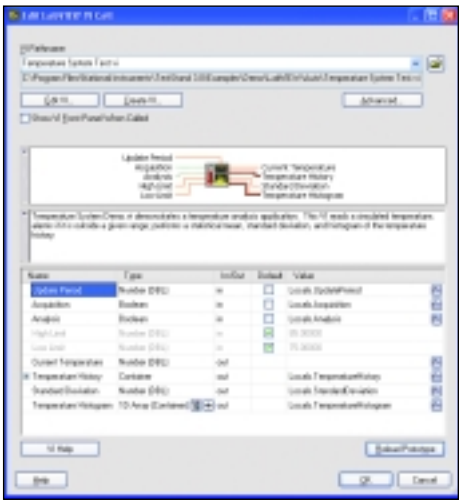


Figure 2. TestStand 3.0 instantly connects with your VIs without any additional programming.

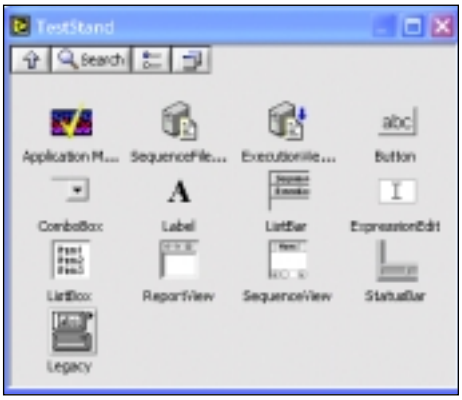


Figure 3. The new user interface controls in TestStand 3.0 reduce code deployment by 90 percent.

Build Custom Operator Interfaces in Minutes

Another important aspect in building a modular test-system architecture is providing a consistent operator interface with multiple levels of program access depending on the skill level of the operator. Developing operator interfaces for an automated test system previously required substantial effort because of a rich set of functionality.

With new user interface controls in TestStand 3.0, you can develop an operator interface for TestStand in as little as 15 minutes. These new controls manage all communication required between TestStand and your operator interface. The controls are installed with TestStand 3.0 for immediate use in LabVIEW, LabWindows/CVI, C++, Visual Basic .NET, and C#.

The new TestStand 3.0 user interface controls include two types of controls – manager controls and visible controls. The manager controls are hidden at run-time and automate the communication with the TestStand engine. In the past, these automated tasks represented as much as 50 percent of the operator interface development time on tasks including starting the TestStand engine, loading sequence files, login procedures, managing execution reference handles, and shutting down the TestStand engine. The visible controls bind to the manager controls and common controls, such as buttons, labels, and list boxes. You can configure all of the new TestStand user interface controls at design time through property pages and during execution through flexible application programming interfaces (APIs). The new TestStand 3.0 user interface controls dramatically reduce development time and overall code. NI TestStand R&D developers noticed a significant reduction in code after programming the new example operator interfaces using the TestStand 3.0 user interface controls. For example, the new LabVIEW operator interface uses 24 VIs, whereas the previous TestStand 2.0 operator interface requires more than 200. NI developers also observed similar reductions in the development of the LabWindows/CVI operator interface, reducing the number of lines of code by 90 percent. The new operator interface requires approximately 1,000 lines of code, compared to the more than 12,000 lines required when using TestStand 2.0. With these substantial improvements in operator interface development, you can significantly reduce development and maintenance efforts and benefit from greater flexibility.

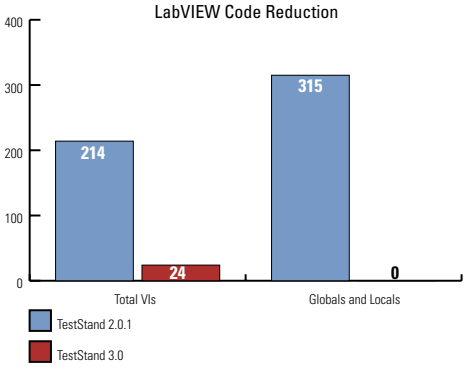
"Features such as the new LabVIEW flexible adapter, new TestStand user interface controls, and on-the-fly reporting and logging are reducing my test management efforts by 75 percent. I can now spend more time concentrating on the task at hand rather than programming supporting code."

– Chris Clark, Viodia, Inc.

Rapidly Deploy Your Test Systems

Effectively managing and organizing the development of a sophisticated automated test system is crucial for a smooth deployment of the test systems in your organization. Test management software can assist you in both of these areas through project-based management and deployment features.

TestStand 3.0 includes a new deployment utility that guides you through packaging your TestStand-based application for deployment. The new deployment utility integrates tightly with your TestStand workspace and project views to ensure all of the necessary test sequences, code modules, and resource files arrive at your deployed test stations. The deployment utility automatically packages the four major components needed for your system deployment, including sequences, test modules, operator interfaces, and TestStand run-time engine components. The resulting deployment package is a Windows installer ready for deployment at your local or global test sites.



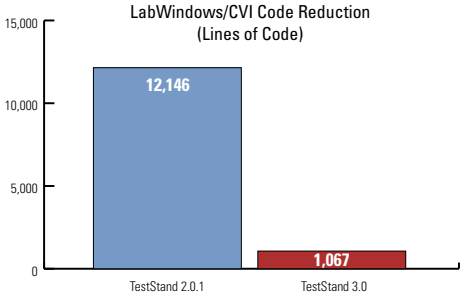


Figure 4. The new LabVIEW operator interface uses 24 VIs, whereas the previous TestStand 2.0 operator interface requires more than 200.

Strategies for Fastest Time to Test

Developing test systems more quickly and cost-effectively begins long before you program the first instrument call in your tests. You must evaluate the flexibility of your test system architecture and take advantage of optimized test software tools. Using TestStand3.0 and LabVIEW 7 Express, you can potentially eliminate hundreds of hours of development time. This means you can develop test systems faster and deliver a cost-effective and easily maintainable test architecture. ■

To learn more about the new features in TestStand 3.0, visit ni.com/info and enter **nsi3404.**

Richard McDonell
TestStand Product Manager
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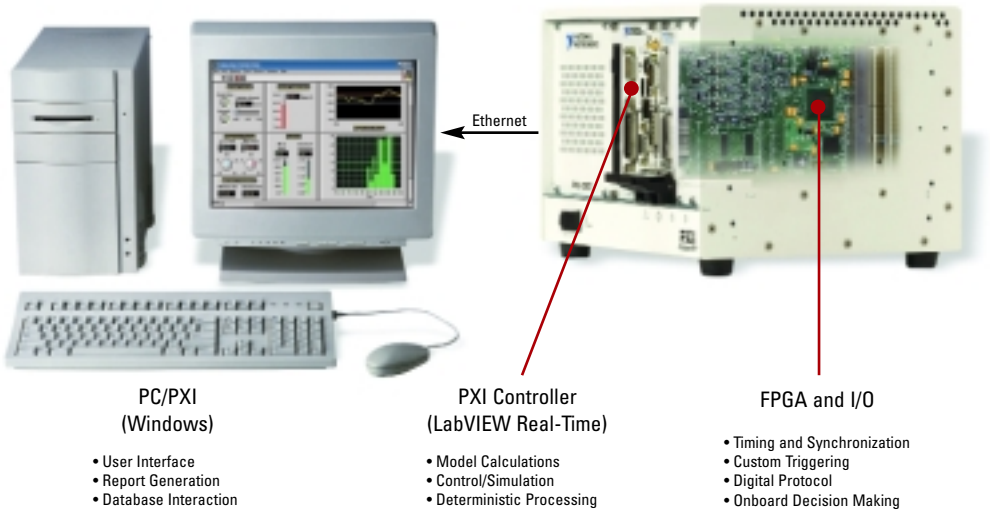
ni.com/teststand

Extending the LabVIEW Platform to FPGAs

With the LabVIEW 7 FPGA Module and NI reconfigurable I/O (RIO) hardware, you can use the intuitive LabVIEW environment to address applications that previously required the development of custom I/O hardware and expertise in hardware design tools such as VHDL.

Together, LabVIEW 7 Express, the LabVIEW 7 Real-Time Module, and the LabVIEW 7 FPGA Module comprise a powerful platform that addresses complex applications in areas such as hardware-in-the-loop (HIL) testing, rapid control prototyping, and analog or discrete control. These types of applications benefit from a distributed architecture that takes advantage of the benefits of multiple execution targets. You can use LabVIEW on your Windows PC to handle the user interface for the application, as well as to generate reports, interact with databases, and publish data to the Internet or your company intranet. You can add the LabVIEW 7 Real-Time Module for simulation and control calculations and deterministic execution of your algorithms. You then can add the LabVIEW 7 FPGA Module for high-speed I/O processing, immediate output generation, and onboard decision making for rapid response to incoming signals.



By distributing your application among multiple LabVIEW targets, you can take advantage of the benefits of Windows, real-time operating systems, and FPGAs.

Add Intelligence to Your I/O

All LabVIEW FPGA operations are timed by a 40 MHz global clock. Thus, you can determine the timing of your I/O handling with a resolution of 25 nanoseconds. Depending on the complexity of your algorithms, you can perform onboard decision making at over 100 kHz using analog I/O and over 1 MHz for digital I/O. Embedding part of your application in FPGA hardware offers new options for system development. You might create a counter that tracks how many times a pulse pattern occurs and triggers a simultaneous analog input and digital output operation, or you might simulate the output of sensors for an HIL test system. You are not limited by driver software options for triggering or for buffering and transferring blocks of data. Your FPGA application immediately processes each data point and reacts appropriately.

Because of the ability to rapidly respond to each incoming data value, you can intuitively implement digital communication protocols and define your own onboard decision making in hardware. You also can take advantage of other benefits of a hardware execution target such as pipelined algorithm execution. Because there is no operating system that must timeslice a microprocessor, your pipelined operations truly execute simultaneously.

Solving Application Challenges

With the LabVIEW platform, engineers and scientists use LabVIEW 7 Express, LabVIEW 7 Real-Time, and LabVIEW 7 FPGA to solve tough challenges in a variety of fields. For example, Woodward Governor Company uses this software in an engine simulator for HIL testing of engine control units (ECUs). The company runs its model-based engine simulation in LabVIEW Real-Time. This process makes decisions at a nominal loop rate, and the FPGA VI performs the high-speed I/O handling necessary for synchronizing the signals with the engine timing.

Nanonis GmbH in Switzerland has developed a new control system for scanning probe microscopes (SPM) that provides more flexibility and ease of use to researchers. The company used LabVIEW 7 Real-Time for the main control algorithm. The FPGA VI monitors the probe and moves the sample if the probe is about to be damaged. Nanonis also implemented the lock-in amplifier in an FPGA on the RIO module. (To read more about this customer solution, see “Building High-Precision Control Systems with LabVIEW 7” on page 23.)

The Future of LabVIEW

In the future, LabVIEW will expand to even more hardware targets, many of them powered by FPGAs. An example of this is the new NI Compact Vision System, an industrial system for rugged machine vision applications. NI engineers used the LabVIEW Real-Time and FPGA modules to develop this system. LabVIEW Real-Time handles the user-defined image acquisition and processing in this system while algorithms designed in the LabVIEW FPGA Module handle the encoder signals, triggers, and the digital I/O lines as well as user-configurable pulse train outputs for controlling external devices such as solenoids, lighting, and cameras. To learn more, read “NI Compact Vision System Makes Cameras Smarter” on page 6. ■

To view a multimedia demonstration of the LabVIEW FPGA Module, visit ni.com/info and enter **nsi3405.**

ni.com/labview

Simulate Real-World xDSL Noise with Signal Generator

This article is the third in a series on unique measurement applications that highlights how you can use virtual instrumentation to solve specific measurement applications that are difficult or even impossible with traditional instrumentation solutions. This application example focuses on communications signal integrity analysis.

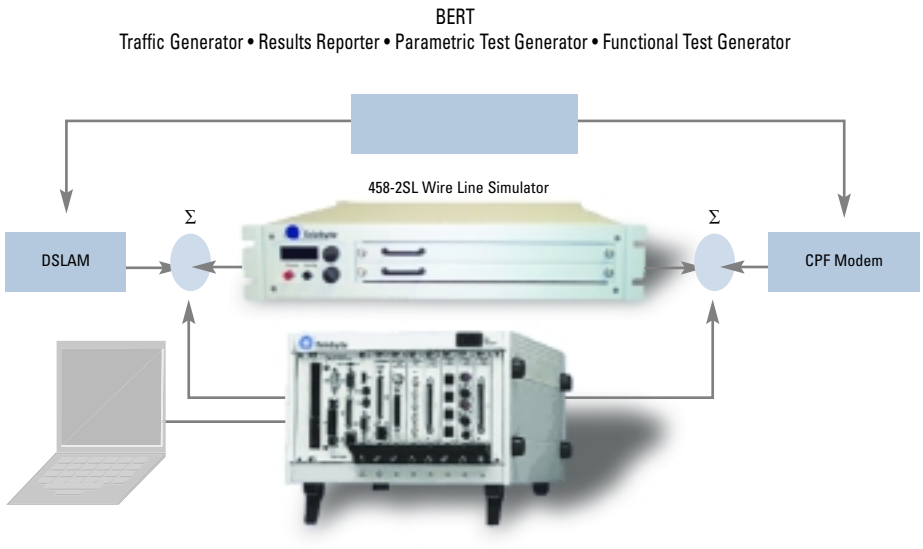
A very popular method for achieving high-speed access to the Internet over conventional telephone lines is using digital subscriber line (DSL) technology. You can implement DSL technology using signaling devices such as modems and digital subscriber line access multiplexers (DSLAMs). Real-world noise and interference can significantly impact the performance of these signal devices, driving manufacturers to test them during the both the design and verification phases of product development. Tests involve sending data through a simulated telephone line represented by a local loop simulator and then corrupting the data with noise/interference prior to demodulation. A measurement is then made of the xDSL modem speed that you can support at a given simulated local loop length. These tests are typically referred to as "reach tests." Common interference noise types include additive white Gaussian noise, near-end cross talk, and far-end cross talk.

Simulating Real-World Noise Conditions

Noise/interference generator solutions provided by traditional instrument vendors make it difficult to accurately represent real-world noise conditions, and do not provide a versatile software and hardware platform to meet continually changing demands.

Reliable simulation of transmission line interference requires hardware with a low noise floor so you can discern the simulated noise conditions from the noise inherent to the generation system. Using the new NI PXI-5421 100 MS/s 16-bit arbitrary waveform generator, telecommunications company Telebyte, Inc., developed an interference simulator that goes below the -140 dBm/Hz noise floor requirement required by several UTI standards. Crest factor – the ratio of peak voltage to rms voltage of the output signal – typically describes how well the noise/interference generated by the loop simulator approximates a Gaussian amplitude distribution. Using the Gaussian noise algorithms of LabVIEW, the company also created a system that exceeded the standard crest factor requirements of five, delivering crest factors in excess of six.

Another challenge with most existing test systems is simulating noise variations that occur in real-world transmission lines. Typically, a short segment of live noise is recorded and later repeated in a loop to obtain longer durations of noise. The longer noise segment is then used to approximate the noise conditions over a transmission line for a bit error rate test. However, the periodic nature of looping these short recordings does not give an accurate picture of the random noise variations that occur on a real transmission line. To overcome this challenge, Telebyte developed patent-pending software algorithms to generate nonperiodic noise patterns using a finite amount of memory and disk space. When used with the flexible memory architecture of the new PXI-5421 waveform generator, the noise/interference simulator can generate non-periodic noise from 100 seconds to more than 16 hours.



Telebyte's xDSL Local Loop Simulator with PXI-Based Interference Simulator

Unique Measurement Approach

Telebyte's unique approach to testing xDSL signaling devices based on a precision hardware and versatile software platform gives them the ability to provide additional features not available in today's standard test solutions. Noise types in xDSL networks, such as far-end cross talk, are dependent on the actual loop length, which can vary from a few hundred meters to several kilometers. In comparison, traditional ADSL+ test systems used in Japan deliver the ability to test just a few loop lengths. Telebyte has combined software developed with NI LabVIEW and the flexible memory and high resolution of the PXI-5421 waveform generator to develop an interference simulator to test loop lengths from 0 to 8,100 meters in five-meter increments. Also, the interference simulator can upload custom noise files such as those recorded from a customer's real-world field test where nonstandard noise sources are present. ■

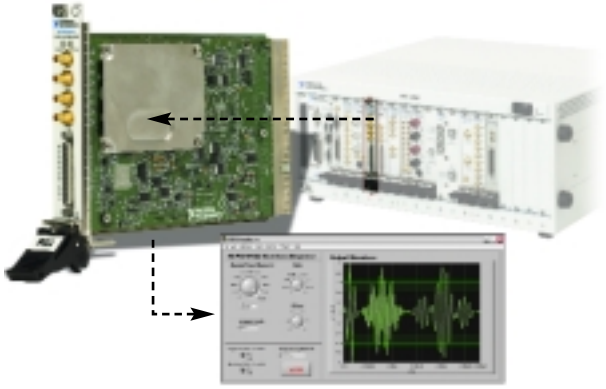
To see more examples of software-defined measurements in the Unique Measurements Library, visit ni.com/info and enter **nsi3406**.

To learn more about Telebyte and the interference simulator, visit ni.com/info and enter **nsi3407**.

ni.com/pxi

Arbitrary Waveform Generator Features 16 Bits at 100 MS/s

The new NI PXI-5421 high-resolution arbitrary waveform generator is a versatile signal generator for applications including communications, consumer electronics, semiconductors, video, and scientific research. It features 16-bit resolution, a 100 MS/s update rate, up to 256 MB of memory, and an optional 16-bit low-voltage differential signal (LVDS) digital pattern output. Using PXI timing and synchronization, along with the new common Synchronization and Memory Core (SMC) architecture, the new arbitrary waveform generator integrates with other SMC-based devices to build mixed-signal test systems.



The NI PXI-5421 excels at both time and frequency domain applications.

Precise Signal Generation

The new PXI module generates standard and user-defined waveforms with 16-bit resolution and 12 Vpp amplitude into a 50 Ω load. Its less than five percent pulse aberration, -76 dBc spurious free dynamic range, and -148 dBm/Hz noise floor make it ideal for demanding time and frequency-domain applications. You can access software-selectable 1x, 2x, 4x, or 8x digital interpolation filters and a 7-pole elliptical analog filter to suppress unwanted sampling images. With up to 256 MB of onboard memory, you can store multiple waveform segments, and then sequence and loop these signals to generate complex test patterns.

Timing and Synchronization Engine

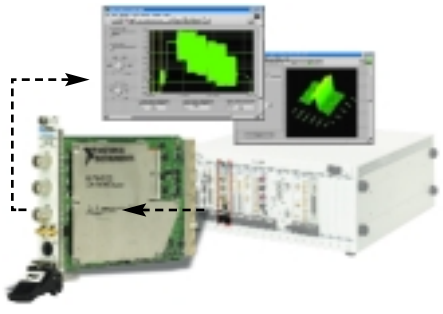
Leveraging the SMC architecture, you can synchronize two or more PXI-5421 arbitrary waveform generators for high-channel-count applications, and build mixed-signal test systems with PXI-5122 digitizers and PXI-6551/2 digital waveform generators/analyzers. You also can import external PLL references and triggers through front panel connectors or the PXI trigger bus. ■

To view full specifications for the new NI PXI-5421 arbitrary waveform generator, visit ni.com/info and enter **nsi3408**.

ni.com/modularinstruments

New 100 MS/s 14-Bit Digitizer Has 256 MB of Memory

You can use the new NI PXI-5122 high-resolution, low-distortion digitizer for a wide variety of applications, such as communications, RADAR, high-energy physics, and video test. The digitizer features two 100 MS/s simultaneously sampled input channels with 14-bit resolution, 100 MHz bandwidth, and up to 256 MB of memory per channel. Using PXI timing and synchronization, along with the new common Synchronization and Memory Core (SMC) architecture, the NI PXI-5122 digitizer integrates with other SMC-based devices to build mixed-signal test systems.



The NI PXI-5122 and NI LabVIEW combine to provide more than 400 measurements.

Measurement Software

When used with NI LabVIEW 7 Express, the new PXI digitizer provides the full range of common oscilloscope measurements along with more than 400 time and frequency analysis functions. The Spectral Measurements and Modulation Toolkits, available for use with the PXI digitizer, provide additional frequency domain measurements such as power in band, zoom FFT, power spectral density, and digital and analog demodulation.

Measurement Precision, Flexibility

With 14-bit accuracy, the new PXI digitizer has 64 times the resolution of traditional 8-bit instruments. High-performance ADCs, low-distortion variable gain amplifiers, and a stable VCXO timebase give the PXI-5122 digitizer up to -75 dBc spurious free dynamic range and 62 dB signal-to-noise ratio with less than 2 ps rms of total system jitter. The software selectable 50 Ω or 1 ΩM input impedance, input ranges from 200 mV to 20 V, seven trigger modes, and noise and anti-alias filters make it ideal for both time and frequency domain analysis. With up to 256 MB of memory per channel, the PXI digitizer gives you the ability to store 128 million 14-bit samples or more than one million triggered events in multiple-record mode.

Timing and Synchronization Engine

Using SMC technology, you can synchronize two or more NI PXI-5122 digitizers or synchronize to the new NI PXI-5421 arbitrary waveform generators and the new PXI-655x digital waveform generator/analyzers (page 13). You also can import an external sample clock, reference clock, and trigger through the front panel or PXI trigger and PXI star trigger bus.

To view specifications for the new NI PXI-5122 digitizer, visit ni.com/info and enter nsi3409.

ni.com/modularinstruments

Build Flexible Test Systems with 100 MHz Digital I/O

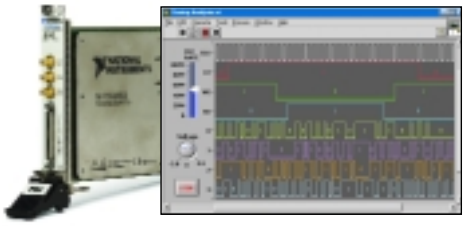
You can quickly develop systems for communications, military and avionics, semiconductor, and consumer electronics with NI LabVIEW and the new NI PXI-6551 and PXI-6552 digital waveform generator/analyzers. These 20-channel modules couple flexible software with precise hardware to deliver 100 MHz clock rates, programmable voltage levels, and deep onboard memory for rapid prototyping and test applications. Using PXI timing and synchronization, along with the new common Synchronization and Memory Core (SMC) architecture, the new digital waveform generator/analyzers integrate with other SMC-based devices to build mixed-signal test systems.

Flexible Software

The new PXI digital waveform generator/analyzers integrate with the new Digital Waveform Editor, an interactive software tool for creating and editing digital waveforms. You can design your own waveforms or import test patterns from spreadsheet or VHDL simulation tools in ASCII or value change dump (.VCD) formats. Then you can import the waveforms into LabVIEW or other test development tools for test execution.

Precise Generation and Acquisition

With the NI PXI-655x digital waveform generator/analyzers, you can use an internal or external clock up to 100 MHz (50 MHz with the NI PXI-6551.) You also can shift the clock phases with a resolution of 0.4 percent of the clock period, which is critical for settling and setup and hold times. To test various devices or to characterize how a given device performs under changing conditions, you can program the voltage levels between -2.0 and 5.5 V with 10 mV resolution. The onboard memory stores waveform data and instructions for sequencing and looping and can store up to 64 Mbit/ch.



NI PXI-6551 and PXI-6552 have 40 LabVIEW examples.

Timing and Synchronization Engine

Using SMC technology, you can synchronize two or more digital waveform generator/analyzers for high-channel-count applications, and build mixed-signal test systems with PXI-5122 digitizers and PXI-5421 arbitrary waveform generators. You also can share sample clocks, reference clocks, triggers, and markers through the front panel connectors or the PXI backplane. ■

To request an evaluation copy of the Digital Waveform Editor or download full specifications of the NI PXI-655x digital waveform generator/analyzers, visit ni.com/info and enter **nsi3410**.

ni.com/modularinstruments

New Switch Modules Provide 16 Unique Configurations

NI extends its switch offering with the release of four high-density PXI and SCXI flexible switch modules that deliver 16 unique configurations to address a range of applications. The specification of each configuration is shown in the table below. These new switch modules can track and store the number of relay cycles on each module. You can access this information in your application through the NI-SWITCH driver software and use it to determine when you should replace a module. This feature can prevent costly system downtime due to incorrectly passing or failing a device under test because of faulty switch relays.

5 A General-Purpose Configurations

Module	Configurations
NI PXI-2566	SPDT (Form C)
NI SCXI-1166	SPDT (Form C)

500 MHz RF Switch Configurations

Module	Configurations
NI PXI-2593	16x1, dual 8x1, and quad 3x1 unterminated multiplexers
	8x1 and dual 4x1 terminated multiplexers
	18-terminal flexible sparse matrix
NI SCXI-1193	32x1, dual 16x1, quad 8x1, and nine 3x1 unterminated multiplexers
	16x1, dual 8x1, and quad 4x1 terminated multiplexers
	36-terminal flexible sparse matrix

Four new NI switches deliver 16 unique configurations.

New High-Current Switch Modules

The NI PXI-2566 and NI SCXI-1166 modules have 16/32 independent SPDT (Form C) nonlatching relays with very low on resistance and low thermal offsets. They can carry current up to 5 A per channel and switch voltages up to 150 VDC/125 VAC. These general-purpose modules are ideal for routing high-current signals and controlling devices such as motors, fans, heaters, and lights.

New RF Switch Modules with High Density

The NI PXI-2593 and SCXI-1193 500 MHz modules are very flexible, high-density 50 Ω RF relay modules. You can programmatically configure them as unterminated multiplexers, externally terminated multiplexers, or dimensionally flexible sparse matrices. With a dimensionally flexible sparse matrix, you can define the row and column dimensions. For example, you can configure the 18 terminals on the PXI-2593 as a 2-by-16, 4-by-14, 9-by-9 sparse matrix, or any size in between.

Software Delivers Tight System Integration

NI-SWITCH driver software is optimized for use with NI LabVIEW, LabWindows/CVI, Visual Basic, and Visual C++. For additional assistance in configuring, programming, and managing higher-channel-count switching systems, NI Switch Executive software offers an easy-to-use, intelligent switch management and visual routing environment. ■

To download the data sheets for these switch modules and to view more information on other PXI and SCXI switch modules, visit ni.com/info and enter **nsi3411**.

ni.com/switches

NI-DAQ 7 Maximizes Throughput, Eases Synchronization

NI-DAQ 7, the latest version of NI-DAQ driver software, makes NI data acquisition (DAQ) devices easier to program and speeds application performance. In the last issue of *Instrumentation Newsletter*, we discussed how the DAQ Assistant, which is included with NI-DAQ 7 and LabVIEW 7 Express, makes DAQ programming in LabVIEW dramatically easier by quickly configuring and generating DAQ applications. In this issue, we take a more comprehensive look at new NI-DAQ technologies that are now available in LabWindows/CVI and Measurement Studio, as well as LabVIEW 7 Express.

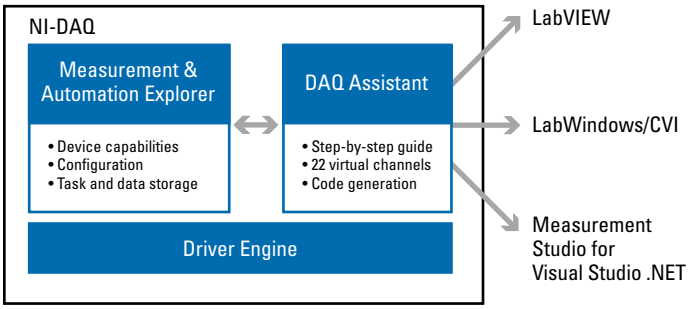


Figure 1. The new DAQ Assistant in LabVIEW 7 Express communicates with many different software components to gather information and quickly generate your code.

The first things you notice about NI-DAQ 7 are the new DAQ Assistant and the clean, consistent VIs, functions, and class libraries. You may not, however, immediately discover the low-level code generation and API features that make the DAQ Assistant possible or advanced performance features, such as multithreading and synchronization, that are now much easier to use. This article discusses some of these architectural features that save critical development time and significantly improve DAQ system performance.

Automatically Generate DAQ Code

The new DAQ Assistant in LabVIEW 7 Express, LabWindows/CVI, and Measurement Studio provides a step-by-step guide for configuring your NI-DAQ measurement tasks. You choose your measurement type, hardware, and additional parameters such as timing and triggering, and the DAQ Assistant generates all the necessary code. As you configure a measurement task, the DAQ Assistant communicates with many different software components to gather information and generate code (Figure 1). First, you launch the DAQ Assistant from your application development environment (ADE) – LabVIEW, LabWindows/CVI, or Measurement Studio for Visual Studio – and the DAQ Assistant then retrieves system configuration, device capabilities, and available virtual channels from NI Measurement & Automation Explorer (MAX). After you configure a task, the DAQ Assistant queries the actual hardware to verify your settings and stores the configured task in the MAX database. Next, you generate the DAQ code for your ADE. In LabVIEW, for example, you can select Generate Code from the pop-up menu on the Task Name Constant. Through each of these steps, the DAQ Assistant handles many complex interactions behind the scenes to generate code for 22 different measurements with hundreds of measurement parameters across more than 50 measurement devices and three different development environments.

Achieve Total I/O System Throughput with Multithreading

NI LabVIEW, LabWindows/CVI, and Measurement Studio can execute parallel sections of a program in multiple threads, thereby maximizing processor and bus usage during simultaneous operations. NI-DAQ 7 now provides these multithreading advantages to maximize your total I/O system throughput.

Measurement multithreading controls a single function on a DAQ device independent of other I/O operations on the same device or on other devices. For example, imagine a simple application where you want to read an analog input in one loop and simultaneously update a digital line as quickly as possible. The analog read is fairly complex, but needs to execute only a few times per second to retrieve data. The read function spends most of the time waiting for a full set of samples to be ready, leaving a lot of processor time for the digital loop to execute quickly.

Without measurement multithreading, the read function actually sits and waits for data, blocking all other operations and greatly slowing the concurrent digital output and limiting I/O throughput. With the multithreading ability of NI-DAQ 7, the read function still waits for the samples to arrive, but now, rather than blocking other operations, it sleeps and yields processor time while it waits. The digital output then can run at full speed in a separate thread while the read sleeps. This application example is simple, but multithreading becomes much more important as you control more devices and functions simultaneously. Each device and function can operate independently with a different thread. I/O throughput is limited only by processor speed and not single-threaded driver inefficiencies. In addition, Figure 2 shows speed improvements for digital input when running with concurrent, 10,000 sample/s analog acquisitions. The speed increase begins at about 100 times for small sample sizes and increases as the sample size gets larger.

Automatic Trigger and Clock Routing Improves Synchronization

Synchronization is important when measuring and generating dynamic signals. To ensure there is no phase mismatch in different generated or acquired signals, you commonly share clocks and triggers. However, programming your devices to route clock signals and share triggers is often very difficult, making synchronization one of the most complex portions of your DAQ programming. NI-DAQ 7 makes synchronization much easier with an automatic routing engine and a consistent, well defined API.

The automatic trigger and clock routing engine in NI-DAQ 7 manages all of the routing and synchronization resources in your DAQ system. This engine maintains a complete table of all possible routes and can route clocks and triggers to external

pins, within device subsections, and among multiple devices. For example, in multidevice analog input synchronization, NI-DAQ routes the analog input sample clock from the first device across the RTSI bus or PXI trigger bus and replaces the onboard sample clock on the second (slave) device with the new signal. By sharing a clock, the devices sample with no phase mismatch. In much the same way, NI-DAQ also can automatically route trigger signals from the master to slave device to ensure that the acquisition begins at exactly the same time.

You never explicitly program the automatic routing engine in NI-DAQ 7. Instead, you complete routing and synchronization with the timing and triggering VIs, functions, and methods. Figure 3 shows the LabVIEW code you need to synchronize the analog input on two multifunction DAQ devices as described above. Notice that the timing and triggering VIs program not only the rate and type of clock or trigger, but also the source. For the master device, the clock and trigger sources are onboard and thus are unwired. For the slave device, you simply select the clock or trigger of the master device from a list in the source constant. In the past, you would have had to use a route signal VI or function for each of the signals you were routing and also manually identify the best route across the RTSI bus or PXI trigger bus. That low-level functionality is still available in NI-DAQ 7, but is rarely needed. In this way, NI-DAQ 7 simplifies the signal routing and synchronization of DAQ systems.

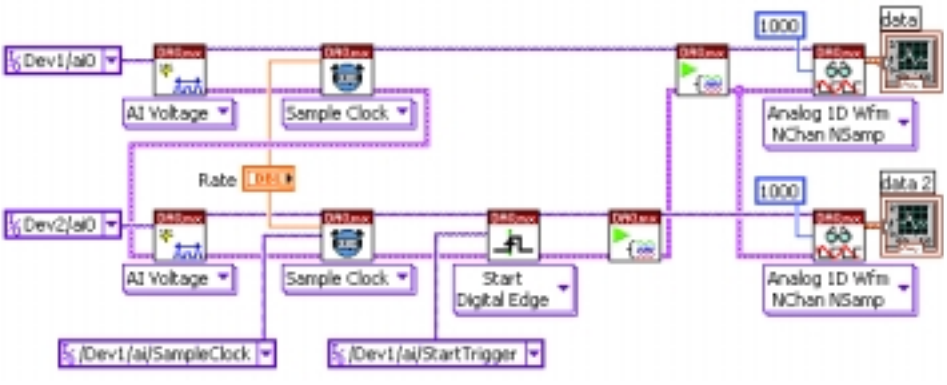


Figure 3. Accomplish routing and synchronization with timing and triggering VIs, functions, and methods.

Use One Interface across All ADEs

The new NI-DAQmx API provides a clean, consistent interface across all ADEs. LabVIEW VIs relate directly to functions in LabWindows/CVI and ANSI C, as well as to Measurement Studio methods and properties for Visual Studio .NET. This feature makes it easy for you to migrate applications and example programs among ADEs and easy for the DAQ Assistant to generate code specific to each ADE. This consistency is possible because the NI-DAQ driver engine is modular. Instead of using a C API with a complex LabVIEW or .NET mapping layer on top, NI-DAQ has one common API component with basic DAQ functions such as timing, triggering, read, and write. Thin ADE interfaces on top of the common API component add ADE-specific interfaces without changing core functionality. In addition, these ADE-specific components contain only necessary functions such as the actual VIs or waveform datatype interfaces. The result is an architecture that delivers consistency without sacrificing performance.

Integrate NI-DAQ with Your ADE

From the DAQ Assistant down to the low-level routing engine and multithreading, NI-DAQ 7 simplifies DAQ programming and helps you build faster, more powerful DAQ systems. Released first with LabVIEW 7 Express, NI-DAQ 7 now brings these advantages to LabWindows/CVI 7.0 and Measurement Studio 7.0 for Visual Studio .NET as well. ■

To read more in-depth articles on these NI-DAQ 7 technologies or to download an evaluation copy of LabVIEW 7 Express, visit ni.com/info and enter **nsi3412**.

Malcolm Borgendale
DAQ Product Manager
malcolm.borgendale@ni.com

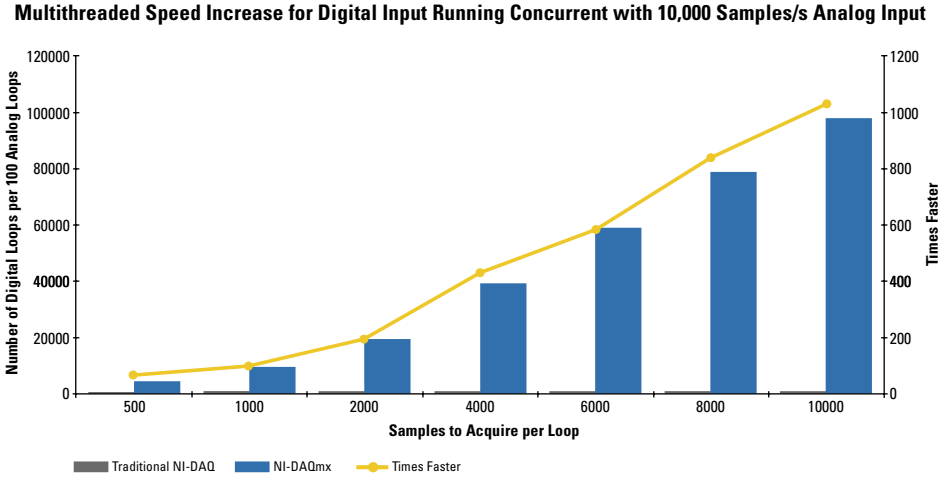


Figure 2. Concurrent I/O operations execute up to 1,000 times faster in NI-DAQ 7.
(Speed improvements vary by PC and DAQ application. Test performed using an NI PCI-6052E on a 500 MHz PIII with 128 MB of RAM.)

ni.com/daq

Compact FieldPoint Combines PLC and PC Functionality

Today, programmable automation controllers (PACs), such as NI Compact FieldPoint, provide a new option for implementing industrial data acquisition systems. PACs combine the best features of the PC, including the processor, RAM, and powerful software, with the reliability, ruggedness, and distributed nature of the PLC. Specifically, Compact FieldPoint provides easy-to-use PC-based features, such as a floating-point processor for custom calculations, an embedded interactive Web server for easy control and monitoring, removable CompactFlash for data logging, and Ethernet connectivity to share data across the network easily. It couples this PC functionality with rugged PLC packaging to deliver a CE heavy industrial electromagnetic compatibility rating for electrically noisy environments, a -25 to 60 °C temperature range, and 50 g shock and 5 g vibration ratings for mobile and vibrating environments. Compact FieldPoint is an ideal platform if you need to perform control or data logging with acquisition rates at 300 Hz or lower in a rugged or distributed environment.

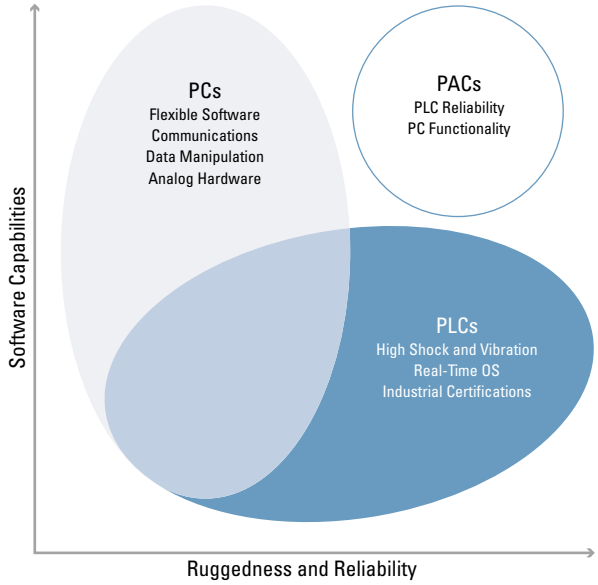
Achieving High-Accuracy Analog I/O

From its PC heritage, PACs, such as Compact FieldPoint, feature high-accuracy analog I/O with built-in signal conditioning, NIST-traceable calibration, and up to 16-bit resolution. With Compact FieldPoint, you can accurately interface with digital I/O, perform analog output, and input calibrated analog values from sensors, including thermocouples, RTDs, current sources, and high-voltage sources. Once you have measured analog signals, you may need to use the signals as a variable in a control algorithm or as inputs for analysis calculations. Because Compact FieldPoint runs LabVIEW Real-Time, you can rapidly build your application using the built-in functions, or easily implement your own custom calculations.

With Compact FieldPoint, you can program with LabVIEW for easy analog manipulation, data logging, and networking, while providing ruggedness formerly limited to PLCs.

Methods for Logging and Sharing Your Data

Once you acquire and analyze data, you often need to log the data or share it over a network. You can use Ethernet to share logged or real-time data from Compact FieldPoint across your network. With Compact FieldPoint, you can distribute process information, share reports, and remotely control embedded LabVIEW applications.



PACs such as Compact FieldPoint combine the packaging and ruggedness of a PLC with the software flexibility and functionality of a PC, providing sophisticated control and logging in rugged environments.

For logging, Compact FieldPoint uses nonvolatile internal Flash and removable CompactFlash for storage, so you can store more than 1 GB of data in standard DOS-compatible files. You can use Compact FieldPoint to log data in two ways:

First, you can use Compact FieldPoint as a stand-alone data logger by logging data in a standard tab or comma-delimited file, standard Excel spreadsheet formats, or more advanced formats, such as XML. To retrieve the data, you can use a built-in FTP server, transmit the data over a phone line, or simply remove the CompactFlash and physically transport it to a PC for further analysis.

Second, you can use Compact FieldPoint as a redundant logger on a networked system with a distributed control system (DCS) or PC-based control system that logs the information to a database. If communication is interrupted, Compact FieldPoint automatically logs the data locally. Then, once the connection is restored, Compact FieldPoint can transmit the data over the network, where you can easily insert it into the database for loss-free logging.

Compact FieldPoint couples PC functionality with rugged PLC packaging to deliver a CE heavy industrial electromagnetic compatibility rating for electrically noisy environments.

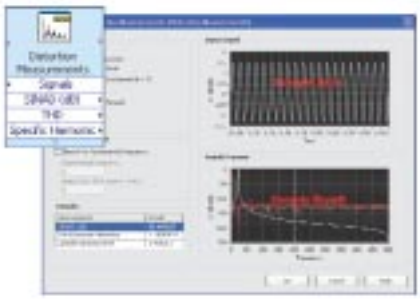
If you need to design an embedded control or logging system in an environment with extreme temperatures, or high shock and vibration, Compact FieldPoint is an ideal control platform. With Compact FieldPoint, you can program with LabVIEW for easy analog manipulation, data logging, and networking, while providing ruggedness formerly limited to PLCs. ■

To find answers to the 10 questions you need to ask before selecting a programmable controller, visit ni.com/info and enter **nsi3413**.

ni.com/pac

Create Express VIs with Express VI Development Toolkit

With the introduction of LabVIEW 7 Express came 38 revolutionary Express VIs that cover the broad spectrum of commonly used functions in test, measurement, and control applications ranging from data acquisition and instrument control to measurement analysis and file I/O. Now, with the new Express VI Development Toolkit you can create your own custom Express VIs for your unique applications.



Use the Express VI Development Toolkit to create, manage, and validate custom Express VIs.

Characterized by interactive configuration dialogs, reduced wiring, and a dramatically decreased learning curve, Express VIs encapsulate the functionality of five to 15 standard VIs each, giving you easy access to powerful measurement technology through a point-and-click interface. Additionally, they give you the ability to experiment with your data by applying various measurement tasks, such as advanced analysis algorithms, without recoding. Express VIs give you a productivity boost in creating common measurement applications by significantly reducing necessary wiring and programming expertise.

Custom VIs for Unique Applications

With the Express VI Development Toolkit, you can use express technology for tasks unique to your application. For example, you can use Express VIs to create easy-to-maintain code for OEM software or intuitive interfaces to custom I/O hardware. You also can create Express VIs to distribute throughout your organization to colleagues ranging from expert developers to technicians new to the LabVIEW environment.

You design your Express VIs by modifying existing standard or Express VIs, or by customizing a blank template. Each Express VI is composed of an Express Source VI and an Express Configuration Dialog Box VI, which are created, managed, and validated within the Create or Edit Express VI dialog included in the toolkit.

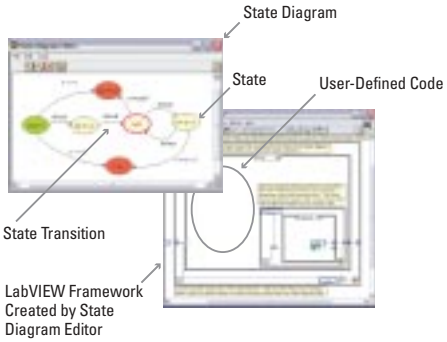
The Express VI Development Toolkit gives you the ability to create customized, interactive Express VIs that make LabVIEW development easier and more productive for you, your colleagues, and your end users. ■

For more information on creating custom Express VIs for LabVIEW, visit ni.com/info and enter **nsi3414.**

ni.com/labview

Interactively Develop State Machines in LabVIEW

The new LabVIEW State Diagram Toolkit interactively creates LabVIEW code that functions as the framework for building robust, maintainable applications. This toolkit adds the State Diagram Editor, a new tool for drawing state machine diagrams, to LabVIEW to help you visually draw the logic that defines an application. As you create this visual representation of the logic, the State Diagram Editor automatically generates LabVIEW code that functions as the design framework for your application.



The State Diagram Editor is a visual editing space for drawing state machines to generate LabVIEW code.

State machines are one of the most commonly used software frameworks because they represent even the most complex tasks in simple visual terms, making it relatively easy to create robust code. Because LabVIEW is graphical in nature, it is an ideal environment for building state machine diagrams and using these diagrams to generate code.

Add State Diagrams to Your LabVIEW Applications

When you place a state diagram structure on the block diagram, LabVIEW opens the State Diagram Editor, a visual editing space for drawing state machines. As you add components such as states and transitions to the state machine diagram, LabVIEW generates code to match each change. A series of while loops and case statements represent the logic for state machines in code, which is easy to graphically display in LabVIEW. In addition to constructing this logical framework, the LabVIEW State Diagram Toolkit inserts comments in the resulting LabVIEW block diagram to indicate where your code should be created. After you successfully describe the application in the state machine diagram, the LabVIEW code is complete. At any time, you can easily modify your application by reopening the State Diagram Editor and making changes or adding new features. LabVIEW automatically makes the corresponding changes to your framework.

The LabVIEW State Diagram Toolkit provides new tools in LabVIEW for quickly building state machine diagrams to construct good application architectures and interactively generate LabVIEW code. ■

To download examples and register for upcoming Web events about LabVIEW design patterns, visit ni.com/info and enter **nsi3415.**

ni.com/labview

NI Measurement Studio 7.0 Expands NI .NET Offering

Measurement Studio delivers native tools for Microsoft Visual Studio .NET that add scientific user interface controls, measurement hardware classes, code-generating assistants, in-depth analysis class libraries, wizards, templates, and highly extensible .NET and C++ classes. By using a measurement-specific add-in tool, you can dramatically reduce your application development time. These plug-ins transform the general-purpose Microsoft Visual Studio .NET programming environment into an optimized measurement development environment.

Write Less Code

When you create your application in Visual Studio .NET without Measurement Studio, you spend weeks or even months developing measurement-specific components and trying to understand low-level hardware connectivity. For example, to set up simple instrument communication in Visual Basic .NET, you would have to develop and understand more than 200 lines of code simply to connect to and establish communication with an instrument.

However, by adding Measurement Studio tools, you can communicate with an instrument through the integrated assistant and write only one line of code.

"The new Measurement Studio GPIB and VISA .NET class libraries truly expedite my instrumentation application development. The native integration of the Measurement Studio classes enable me to use my existing C# programming knowledge to quickly connect and communicate with test instruments."

– Hector Creamer, Long-Time Measurement Studio User

Measurement Studio 7.0 – Native .NET and C++ Classes

Just as Microsoft rewrote the Visual Studio languages for the .NET framework, NI completely rewrote and redesigned Measurement Studio with a new architecture to deliver native measurement and automation tools for optimal .NET and C++ development.

In addition to porting functionality from the previous version, Measurement Studio 7.0 also includes new features such as interactive graph zooming and panning, DataSocket architecture enhancements, extensible properties and methods, signal generation, code-generating measurement assistants, dynamic help capabilities, an optimized data acquisition driver interface, and tighter test management integration.

Shorter Time to Your Measurements

Measurement Studio simplifies hardware communication by delivering rich hardware class libraries for high-level, intuitive interfaces to GPIB, VISA, and DAQ driver interfaces. Achieve more than basic instrumentation connectivity through:

- Object-oriented DAQ, GPIB, and VISA class libraries for Visual Basic .NET and Visual C# .NET
- Configuration-based ActiveX controls for DAQ, motion, vision, GPIB, and VISA
- DAQ, FieldPoint, modular instrument, GPIB, and VISA support for Visual C++

Although these interfaces greatly simplify data acquisition and instrument connectivity processes, Measurement Studio 7.0 extends these capabilities with two new code-generating assistants and a native interface to the newly architected NI-DAQmx driver.

The Instrument I/O Assistant and DAQ Assistant are integrated as .NET designers that include guides for configuring, testing, and programming measurement tasks and automatically generating Visual Basic .NET, Visual C#, or Visual C++ code. The DAQ Assistant interactively configures data acquisition tasks to include custom timing, scaling, and triggering with minimal programming. The DAQ Assistant also generates NI-DAQ 7 code interfacing the DAQmx driver, which prevents blocking on simultaneous operations and is 10 to 20 times faster when doing concurrent I/O and 10 to 20 times faster when performing single-point I/O measurements. The Instrument I/O Assistant communicates directly with GPIB, Ethernet, USB, serial, PXI, and VXI instruments, automatically parses the returned data, and generates reusable code modules. This interactive wizard can prototype instrument control systems, take quick measurements, and even develop simple instrument drivers.

New Measurement Studio I/O assistants provide an interactive approach to hardware connectivity .

Once you acquire the data, analysis is the next fundamental step. Measurement Studio 7.0 includes .NET and C++ analysis libraries to enhance measurements with decision-making capabilities, advanced signal processing, and statistical computations.

Technology Support Continuum

Since its first release in 1996, Measurement Studio has proven itself as the most productive tool for developing measurement and automation applications with standard Microsoft programming languages. Even as the underlying Microsoft technologies change, Measurement Studio continues to be the add-in tool preferred for rapid development in the Visual Studio environment. In addition to mastering the latest technologies – Visual Basic .NET, Visual C# .NET, and Visual C++ .NET – Measurement Studio also works with Visual Basic 6.0 and Visual C++ 6.0 to help engineers and scientists make the transition from COM-based tools to the new .NET architecture. ■

To download the Measurement Studio 7.0 white paper and reduce your application development time, visit ni.com/info and enter **nsi3416.**

ni.com/mstudio

LabWindows/CVI 7.0 Improves Hardware Integration

NI LabWindows/CVI, first introduced as LabWindows for DOS in 1987, has continuously improved the productivity of engineers and scientists through the proven test and measurement-specific ANSI C development environment. With new LabWindows/CVI 7.0, this tradition continues by greatly enhancing the ability to develop powerful applications through a redesigned workspace, code-generating measurement assistants, driver software optimizations, additional sophisticated user interface controls, and further debugging capabilities.

The new, fully integrated workspace of LabWindows/CVI 7.0 gives optimal productivity for sophisticated application development.

Easily Manage Sophisticated Applications

NI designed the new, fully integrated LabWindows/CVI 7.0 workspace for optimal productivity – especially when developing larger, more sophisticated applications containing multiple source and project files. The environment provides easy access to built-in measurement libraries and a comprehensive project view, as well as dynamic reference information and example programs. With a more than 15-year history, LabWindows/CVI has built a strong user community, resulting in thousands of example applications that present a useful starting point for sophisticated applications. LabWindows/CVI includes a Web-integrated Example Finder to access and sort more than 250 examples delivered with the product and thousands more on the Web.

"The integrated workspace of LabWindows/CVI 7.0 creates a more efficient environment to develop and manage my large applications."

– Pierre Duriez, Industrial Computing Manager, Fuji Electric

Connect to Multiple Instruments

Often, the most critical elements of measurement applications are connecting to instrumentation, and engineers and scientists in the test industry have made it clear that connectivity to a multitude of instruments from different vendors is crucial when selecting a software package. With its network of more than 1,000 instrument drivers from more than 150 vendors, LabWindows/CVI has proven itself an industry leader alongside NI LabVIEW, in easily programming instrument control applications. However, LabWindows/CVI 7.0 takes instrument control to the next level of productivity with Instrument I/O Assistant.

The new Instrument I/O Assistant provides a simple interface to quickly prototype applications and autoparse instrument data without any programming. The assistant also generates code you can easily import and reuse with any existing application– removing the tedium of instrument connectivity, basic communication, and string parsing. With the generated code, you need only add two lines of code to invoke the more than 300 lines of code created by the assistant. This saves time and lets you quickly focus on taking measurements.

Driver Software Optimizations

In addition to the Instrument I/O Assistant, LabWindows/CVI 7.0 also features the DAQ Assistant as an intuitive interface to the DAQmx framework. The DAQ Assistant interactively defines a measurement task, determines the measurement capabilities of the DAQ device, and then generates code modules containing the acquisition functionality. The tight integration of NI-DAQ and DAQ Assistant in LabWindows/CVI gives you an efficient, productive way to take measurements.

Additional Enhancements

In addition to the new environment, the new Instrument I/O and DAQ hardware assistants, and an improved interface to the NI-DAQ driver, LabWindows/CVI 7.0 also features:

- A fully customizable tree control for clearly representing hierarchical data
- User interface controls with built-in DataSocket binding
- Design-time tools for easy access to prototype and parameter information
- Function panel enhancements including XML conversion capabilities
- Further analysis library functions for signal generation
- Tighter test data management integration with NI TestStand

LabWindows/CVI continues its tradition of bringing you productivity and power through the intuitive ANSI C development environment and built-in, powerful measurement capabilities. ■

To receive FREE LabWindows/CVI 7.0 trial software and experience true ANSI C productivity, visit ni.com/info and enter **nsi3417.**

ni.com/cvi

High-Performance Real-Time Board for Desktop PCs

The new PCI-7041/6040E is a high-performance, real-time board that plugs into a desktop PC. This board is ideal for control applications where high performance and low cost is required. The PCI-7041 is the next generation of the PCI-7030 with two main advantages over its predecessor – faster performance and improved stand-alone operation.

The PCI-7041/6040E consists of two components – a processor board running a real-time operating system and a multifunction I/O board. With LabVIEW Real-Time, you create a custom application and then download it to the processor on the plug-in board. The embedded VI accesses the 8 AI, 2 AO, 8 DIO, and 2 CTR channels of the multifunction I/O board. With the PCI-7041, your embedded VI executes independently of Windows, providing a reliable deterministic execution platform for LabVIEW applications.

The new PCI-7041/6040E board delivers faster performance and improved stand-alone operation.

Faster Performance

The NI PCI-7041/6040E real-time board is based on a new hardware architecture that increases performance of real-time desktop applications. The 700 MHz Pentium III processor runs single PID loops at up to 26 kHz – 17 times faster than the previous real-time plug-in board. The 512 KB of static memory speeds downloading applications and transferring data so you now can stream data from your real-time plug-in board to the host PC at rates of up to 2 Mbytes/s.

Improved Stand-Alone Operation

The 32 MB of CompactFlash provides nonvolatile memory to store the real-time kernel, startup applications, and logged data. For example, you can download a VI to the CompactFlash memory, configure the board to run the VI at startup, and insert the board in a passive PCI backplane, or in a PCI slot of another PC. As long as the board is supplied with enough power, it will run the startup application.

Using the NI LabVIEW 7 Real-Time Module and the new NI PCI 7041-6040E real-time board, you can integrate high-speed real-time control with your existing desktop measurement system. The faster processor, nonvolatile memory, and new hardware architecture increase performance for your real-time desktop systems. ■

To download a data sheet for the NI PCI 7041/6040E, visit ni.com/info and enter **nsi3418.**

ni.com/lvrt

Control Eight Axes of Motion in a Single 3U PXI Slot

The new NI PXI-7350 motion controller offers eight axes in a single PXI slot, integrated data acquisition, and enhanced performance capabilities. These new features make the PXI-7350 an ideal motion controller for a wide range of automation applications, such as pick and place and automated test.

Calibrated Inputs for Accuracy

Motion control applications often require analog I/O either for feedback or to take simple measurements. Using the new PXI-7350 motion controller, you now have eight calibrated, 16-bit analog inputs to get accurate, single point, software-timed data acquisition. Using these calibrated inputs, you can read potentiometers to acquire position measurements, load cells to acquire force measurements, and a wide variety of other sensors your system might require.

Increased Position Triggering Speed

For applications requiring hardware-timed acquisition or special signal conditioning, the new PXI-7350 offers powerful triggering capabilities with NI data acquisition boards. The new PXI-7350 motion controller features arbitrary position triggers, also called position compare or breakpoints, so you can trigger measurements as you reach arbitrary, predetermined positions in your system at rates of up to 2 kHz – a more than 100 percent increase over previous motion controllers. When triggering at a set position interval, you can trigger at even higher rates of 4 MHz. This feature is useful for applications such as scanning, where you need to correlate position with measurements.

Brushless Servo Motor Commutation

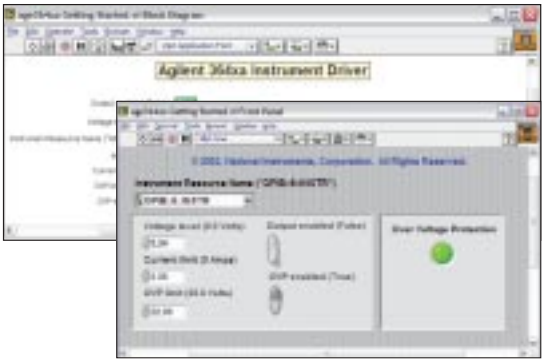
The new PXI-7350 offers sinusoidal commutation, so you can connect to the widest variety of brushless servo motors. Sinusoidal commutation is a special type of commutation used for smoothly controlling the special brushless type servo motors commonly found in industrial applications because of their high torque and low maintenance. Although some motor drives include sinusoidal commutation within the drive, many systems still require the motion controller to provide the commutation now available on the PXI-7350. ■

The new PXI-7350 is the latest high-performance motion controller from National Instruments, and includes onboard data acquisition.

For more information about the PXI-7350 motion controller, visit ni.com/info and enter **nsi3419.**

ni.com/motion

Easily Integrate Power Supplies into Your ATE System



Easily incorporate programmable power supplies into your existing test and measurement systems using LabVIEW and LabWindows/CVI instrument drivers.

Programmable power supplies are the most commonly used instruments in ATE systems. They are essential for tasks such as powering test fixtures, supplying test stimuli to the DUT, powering a device under test (DUT) while it undergoes tests from other instruments, and providing reliability stresses, such as over current and over voltage, to the DUT. Power supplies also are used in a variety of scientific applications that require you to control the power supplies programmatically and coordinate the stimulus with other measurements.

National Instruments offers an easy and convenient means to incorporate programmable power supplies into your existing test and measurement systems through instrument drivers.

Drivers from Top Power Supply Vendors

NI provides more than 150 LabVIEW and LabWindows/CVI instrument drivers for power supplies from leading vendors such as Agilent, Keithley, Kepco, Sorensen, and Kikusui to ensure complete software integration of your test system. These instrument drivers control and communicate with the programmable power supplies in your system and provide a high-level, easy-to-use programming model to give you complete access to complex measurement capabilities of instruments through an intuitive application programming interface (API). LabVIEW and LabWindows/CVI instrument drivers deliver modular, off-the-shelf components that are immediately ready to use in your ATE programs.

Many of these power supply instrument drivers comply with the Interchangeable Virtual Instruments (IVI) standards and feature interchangeability, simulation, and state caching capabilities that are well suited for ATE applications. Using these drivers with an environment-native interface is crucial for the proper and productive use of instrument communication in your program development. If you need interchangeability and simulation in your test applications, IVI drivers provide a high-performance tool that can save you significant development time and maintenance costs.

Simplified Instrument Communication and Control

Programmable power supplies typically communicate through GPIB, RS-232, or analog control. GPIB and RS-232-based instrument drivers are available for download on the Instrument Driver Network, an extensive library of NI and third-party drivers that contains more than 2,200 instrument drivers from 150 vendors, NI Alliance Program members, Instrument Driver Development Program members, and other developers.

You also can easily control analog-based programmable power supplies by using the analog outputs from an NI analog output board, such as the NI PCI or PXI-6731 or the NI PCI or PXI-6711. An analog-controlled power supply typically responds linearly to an input voltage. For example, if you are controlling a 0 to 100 V power supply, it may require an input of 0 to 10 V for control. This means that for 50.2 V output, you should supply 5.02 V from the analog output board. Most analog power supplies specify an input accuracy to ensure a full range of output voltages or currents.

Whether your application is simple or complex, NI has the instrument drivers that make connecting to, communicating with, and controlling your programmable power supply seamless. ■

To download an instrument driver for your programmable power supply or more than 2,200 other instruments, visit ni.com/info and enter **nsi3420.**

IVI-Compliant DC Power Supplies

Visit the Instrument Driver Network (*ni.com/idnet*) to download the following IVI-compliant power supply instrument drivers for these power supplies:

Agilent
663XXA – Mobile Comm DC Source
6610XA – Modular Power System
662XA – Dual-Output DC Power Supply
66XXA – Single-Output DC Power Supply
66XXBC – DC Power Supply
E363XA – DC Power Supply
E364XA – DC Power Supply

American Reliance
PPS Series – Power Supply

Keithley
2302 – Battery Simulator
2306 – Battery Charger/Simulator
2303/B/PJ – High Speed Power Supply
2304A – High Speed Power Supply

Rohde & Schwarz
NGPT – Programmable Triple Power Supply
NGPX – Programmable Power Supply

Stanford Research
PS310 – DC Power Supply
PS325 – DC Power Supply
PS350 – DC Power Supply

Tektronix
2520G – DC Power Supply
2521G – DC Power Supply

Xantrex
HPD – DC Power Supply
XDC – DC Power Supply
XFR – DC Power Supply
XHR – DC Power Supply
XPD – DC Power Supply
XT – DC Power Supply

ni.com/idnet

Speed Development with LabVIEW Examples and Templates

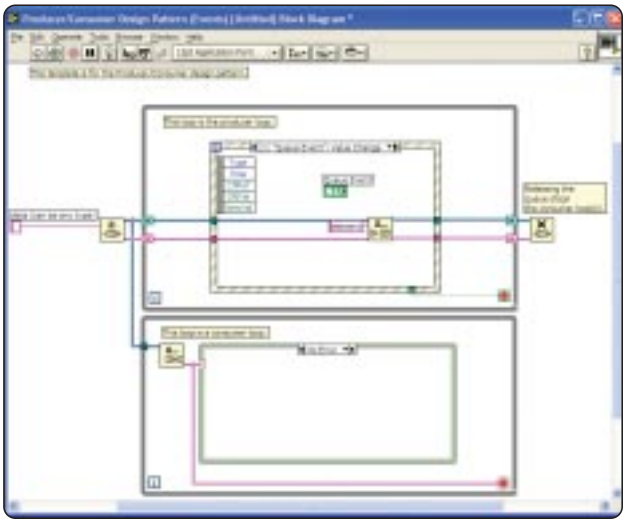
Whether you are new to LabVIEW or a long-time LabVIEW developer, you can extend your programming skills by looking at example VIs created by other developers. You can use these examples as starting points for building your LabVIEW applications or to quickly learn about new features and programming techniques in LabVIEW 7 Express.

With LabVIEW 7 Express, you can use the new Web-integrated Example Finder to access the more than 500 included example VIs or expand your search to the Web for thousands more. With this new feature, you can customize your search results to show only those example VIs that integrate with your hardware as well as access new examples as soon as they are posted to LabVIEW Zone.

Not only can you use the Example Finder to search the Web directly, but you also can use it to submit your own LabVIEW VIs to LabVIEW Zone for others in the LabVIEW community to use as examples. To do this, go to the Submit tab in the Example Finder and click on "Submit an Example." You submit your VI and provide a short description, and others can pull your example VI through their Example Finder search.

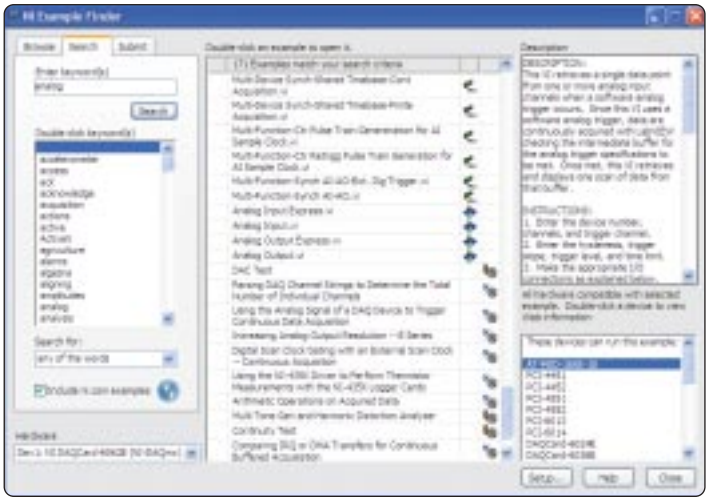
Jump Start Your Development

In addition to the thousands of example programs immediately available, LabVIEW 7 Express also includes application templates and design patterns to further speed your development. NI engineers have analyzed thousands of applications built in LabVIEW and determined the best programming practices for these applications. Using this information, they developed new application templates and design patterns that you can use as a starting framework for your development.



Use design patterns such as the producer/consumer model shown above to improve your LabVIEW applications.

With application templates, new users can run applications immediately and build on them as their needs change or experience grows. You start by choosing from more than 20 new templates and design patterns, and then use that template as a starting point to build the rest of your applications. A variety of templates are available for data acquisition, analysis, and instrument control. If you are using the LabVIEW Real-Time Module, the LabVIEW FPGA Module, or LabVIEW PDA Module, example programs for real-time, FPGA, or PDA development also will appear in your search.



Include thousands of additional VIs when you search for LabVIEW examples.

Design Your Own Application Templates

If you consistently use the same base program to start each application, you can design custom templates to get started faster. For advanced application developers, the design patterns, including event-based UIs, state machines, client-server models, and others, provide a solid framework on which to develop robust, maintainable code. These design patterns are easy to read, maintain, and understand, and provide a familiar framework from which you can develop your applications. Once you have developed your application with a design pattern, you can easily modify or expand on it.

With LabVIEW 7 Express, you can start your development without spending days or weeks learning a new product. Once you get started, powerful tools such as design patterns help you develop powerful, maintainable applications more quickly and efficiently. ■

New in LabVIEW Zone

Articles

- Changing the Face of Design Patterns with the LabVIEW 7 Express Event Structure
- Resample Waveforms with One Simple Express VI

Web Events

- Benefits of the New Data Acquisition Interface: NI-DAQ 7
- Incorporating the New Tree Control and Subpanel Features of LabVIEW 7 Express

ni.com/labviewzone

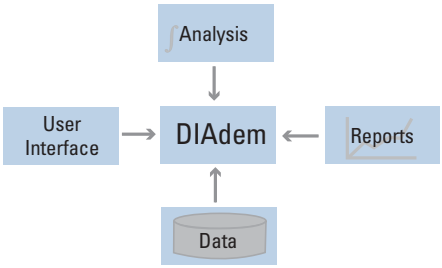
Developing a Data Management System with NI DIAdem

by Jim Knuff
Principal System Engineer
Raytheon Missile Systems

The Challenge: Streamlining a highly inefficient reporting process and providing a common gateway for engineering groups to quickly access their test data.

The Solution: Using National Instruments DIAdem 8.1 to achieve an automated and integrated solution for test data management, data analysis, and report generation.

At Raytheon Missile Systems, we build exo-atmospheric ballistic missile interceptors that require design solutions from all engineering disciplines, including cryogenics, thermal, electromagnetic interference, and propulsion. The tests we perform on these vehicles produce an array of data that spans all of these disciplines. Each group carefully crafts and validates their analysis techniques and typically prefers a different analysis tool to ascertain performance.



DIAdem communicates directly with a managed database, and we use dialog editor to create sophisticated GUIs to control an analysis and report-generation process.

Using DIAdem, we have created an automated and integrated solution built around a managed database for test data management, data analysis, and report generation. We use DIAdem to manage the analysis of our test data directly or use an ActiveX or COM interface to connect with standard analytic tools.

With the DIAdem scripting interface, we can communicate directly with our managed database and standard tools. We also use the DIAdem dialog editor to create sophisticated GUIs to control the analysis and report generation process.

Every time we test a new unit, DIAdem automatically generates reports. Our test engineers use these reports immediately after testing to view the results of tests and determine whether additional testing is necessary. This reduces repeated tests and the acquisition of additional, unnecessary data. With DIAdem, we achieve rapid visibility of test progress and product performance across multiple test units and integrated product teams.

By using DIAdem, we can turn our data into usable results in minutes rather than days. We have documented an overall time reduction of 95 percent since we integrated DIAdem into our system. ■

To read the full-length customer solution, visit ni.com/info and enter **nsi3421.**

ni.com/success

Building High-Precision Control Systems with LabVIEW 7

by Dr. Jörg Rychen, Nanonis GmbH

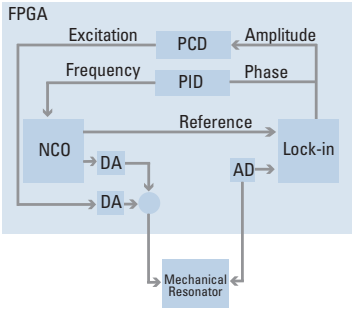
The Challenge: Developing a high-performance, compact, and modern control system for a scanning probe microscope.

The Solution: Using National Instruments PXI platform, LabVIEW 7 Express, LabVIEW 7 Real-Time Module, LabVIEW 7 FPGA Module, and a PXI-7831R reconfigurable I/O board to implement a fully digital, easy-to-use modular control system.

At Nanonis, we have developed an easier, more flexible control system and intuitive user interface for scanning probe microscopes (SPMs) by moving to a fully digital system and implementing all the system functionality in software. Atomic force microscopes are custom tools used in fields with an interest in surface properties at nanoscopic scales. By scanning a sharp tip over the sample, users can record the topography of the surface. These microscopes provide such precision that users can see individual atoms.

With the recent advances in microelectronics technology, we now can implement fully digital systems. We implemented the time-critical control algorithms with the LabVIEW 7 Real-Time Module running on a 1.26 GHz CPU in a PXI chassis. With our LabVIEW-based system, we built and tested a high-performance, fully digital phase-locked loop (PLL) on the NI PXI-7831R reconfigurable I/O board.

The intrinsic parallelism of LabVIEW was key to writing efficient, structured, and modular code without any knowledge of FPGA programming languages, such as VHDL. We reduced the cost of our PLL by $20,000, and our LabVIEW 7 FPGA system achieved higher performance than any traditional setup with external components. ■



The block diagram of the PLL implemented on the FPGA illustrates the Numerical Controlled Oscillator that generates the reference and the excitation signal for the high-Q mechanical resonator.

To read the full-length customer solution, visit ni.com/info and enter **nsi3422.**

ni.com/success

Improve Safety with Isolated Measurement Devices

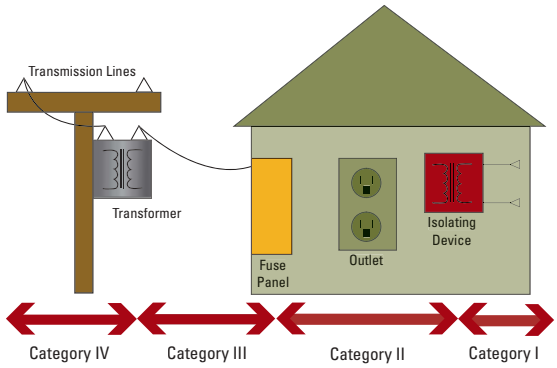
When measuring high-voltage signals, determining whether your data acquisition (DAQ) system is safe should be your first consideration. Making high-voltage measurements can prove hazardous to your equipment, to the unit under test, and even to you and your colleagues. To ensure the safety of your system, you should use isolated measurement devices to serve as an insulation barrier between yourself and hazardous voltages.

While isolation ensures safety by physically and electrically separating two parts of a circuit, it does not hinder them from interacting. Measurement devices typically achieve isolation by one of the following methods:

- Magnetic coupling – Conductive coils within a transformer create and detect a magnetic field proportional to the measured signal. This method provides excellent protection against hazardous voltages, particularly transients.
- Capacitive coupling – This method uses a capacitor with a level of charge proportional to the measured signal. Capacitive coupling requires the least space to implement, but it is not as effective as other coupling methods against transient voltages.
- Optical coupling – This method uses a photoconductive element with the level of light proportional to the measured signal. Because this is expensive for analog signals, optical coupling is primarily used for digital systems.

In addition to safety, improving isolation dramatically increases the overall value of your DAQ system by:

- Improving safety – By creating an insulation barrier, isolation permits the ground reference of the input and output of a measurement device to vary in voltage levels. While the device input may receive a transient voltage spike, its output remains within safe voltage levels.
- Improving accuracy – Isolation physically prevents ground loops and improves the accuracy of your measurements. Ground loops, a common source of measurement noise and inaccuracy, are the result of a DAQ system and its input signal having separate grounds at different potentials. This induces an extraneous current, which can create a variety of errors.
- Improving performance – Common-mode voltage, another source of measurement error, is present on both the positive and negative input of your measurement device, but is not part of the signal you intend to measure. Isolation increases the ability of your system to reject this voltage, improving its common-mode rejection ratio and overall performance.



The International Electrotechnical Commission defines four installation categories to address transient voltages.

Incorporating Isolation into Your DAQ System

There are two main isolation types to consider when selecting the proper isolation hardware for your application. Isolated measurement devices generally use either channel-to-channel isolation or bank isolation. Channel-to-channel isolation devices typically cost more and provide better common-mode rejection ratios and higher acquisition speeds. These devices have an isolation amplifier for each channel, so you can access all channels in parallel. On the other hand, bank isolation devices rely on multiplexers that switch multiple channels to each amplifier. This decreases the cost of isolation, but also reduces the sampling rate and flexibility of your system. You also should consider the isolation specifications. Unfortunately, manufacturers do not always use the same specifications when describing measurement devices with isolation. Consider these three key specifications when evaluating isolated DAQ devices:

- Maximum nominal working voltage – This is the maximum input voltage the isolation barrier can sustain without degrading system performance.
- Installation category – This defines the maximum transient voltage, relative to the nominal working voltage, against which the isolation barrier can protect. There are four installation categories represented by the Roman numerals I to IV.
- Insulation – Isolated DAQ devices usually have basic insulation, double insulation, or reinforced insulation. The latter two provide superior isolation and ensure user and equipment protection.

Protect Your System with NI Isolation High-Voltage Hardware

National Instruments provides several isolation products that ensure both user and equipment protection for high-voltage measurements. SCXI is the high-performance NI signal conditioning and switching platform for E Series DAQ devices, and SCC is the NI family of portable, modular signal conditioning devices for E Series and basic multifunction DAQ devices. Both SCXI and SCC products provide increased isolation to any DAQ system in a flexible, modular package. For example, the NI SCXI-1125, SCXI-1120, SCXI-1121, and SCXI-1122 isolated amplifier modules are 1,000 VAC/DC (when used with the NI SCXI-1316 terminal block), Category II devices with double insulation. In addition, NI SCC-AIxx modules provide 300 V AC/DC, Category II protection with double insulation for lower-channel-count applications. ■

To request the FREE NI signal conditioning tutorial or read the High-Voltage Measurement and Isolation white paper, visit ni.com/info and enter **nsi3423**.

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Align and Resample Signals with One Simple Express VI

Signal comparison is often not a trivial task. Even simple tasks, such as adding or subtracting waveforms, can be difficult – especially if the signals you are comparing lack common timestamps, sampling rates, and durations. You can handle simultaneously sampled signals using an NI PXI-4472 dynamic signal acquisition device or resample the waveforms to change the timestamps, sample period, and duration of a signal to match another signal.

A common example of the usefulness of resampling is performing audio manipulation with professional audio equipment. While these devices typically use a sampling rate of 48 kHz, home equipment typically processes sound at 44.1 kHz. Transferring sound from one system to the other requires that you resample one of the signals to match the other. With care, you can accomplish this without affecting the quality of the sound.

Software-based resampling is one of the new features of LabVIEW 7 Express, and it includes an interactive Align and Resample Express VI and a traditional waveform datatype VI. In short, interpolation, as applied to resampling, predicts new values based on existing signal samples that you input. The LabVIEW Express VI gives you four methods of interpolation.

Software-based resampling is one of the new features of LabVIEW 7 Express, which includes an interactive Align and Resample Express VI and a traditional waveform datatype VI.

Linear Interpolation

The linear interpolation method assumes that you know two neighboring samples of the waveform, and that between those two samples the signal changes at a constant rate. The algorithm essentially draws a straight line between these two samples and returns the appropriate point along that line.

Coerce Method

The coerce method returns an output sample value equal to the input sample value closest to the output sample value in time. An advantage of this method is that it requires almost no computation.

Spline Interpolation

The spline method uses the spline interpolation algorithm to compute the resampled values. The LabVIEW 7 Express implementation relies on a cubic spline, yielding smooth transitions between the samples and good quality on single-shot short records.

FIR Filter-Based Interpolation

This method applies a digital finite impulse response (FIR) filter to compute the resampled values. With the LabVIEW 7 Express implementation, you can set the attenuation level of aliased signal components. A normalized bandwidth selection also specifies the fraction of the smallest of input and output not attenuated. For example, when going from 44.1 to 48 kHz or from 48 to 44.1 kHz, you would always define these rates as the specified fraction of 44.1 kHz. This method provides excellent results for frequency analysis, although it is more intensive computationally.

Resampling is not only useful in the time domain. You also can use the resampling functionality to compare spectra with different Δf or f_0. Or, you can use it to compare, for example, a logarithmic frequency-swept SPICE model with a linear frequency-axis FFT measurement.

The LabVIEW Align and Resample VI is optimized for two modes of operation – single-shot and continuous. In single-shot mode, the function has a time-symmetric behavior and distributes the interpolation settling error on both sides, while the continuous settles only at the beginning of the first record but then expects the following input blocks to be time contiguous. For example, you can use the continuous mode to resample one hour of music from 44.1 to 48 kHz in one-second blocks.

With the Align and Resample Express VI configuration dialog, you can interactively align and resample a signal by applying any of four interpolation modes.

This Express VI is one of the 13 new Express VIs available in LabVIEW 7 Express. These Express VIs encompass the most frequently-used functions from the more than 400 available measurement analysis and signal processing functions in LabVIEW. ■

To learn more about the 13 new analysis Express VIs, visit ni.com/info and enter **nsi3424.**

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Measure 100 V Inputs, High-Speed Strain with PXI DAQ

National Instruments introduces the first two modules in the new SC Series integrated data acquisition and signal conditioning devices, which are designed to extend the measurement capabilities of the PXI platform. The NI PXI-4220 and NI PXI-4204 modules can measure high-speed strain and voltage up to 100 V, respectively. The PXI-4220 module is ideal for high-speed structural test, while the PXI-4204 works well for 42 V automotive applications. Both devices incorporate integrated signal conditioning, enabling them to measure sensors and high-voltage signals beyond the capabilities of a typical data acquisition device.

Take 42 V PowerNet Automotive Measurements

The PXI-4204 module is a full-featured, eight-channel measurement device with a ±100 V input range and 16-bit accuracy, making it ideal for higher voltage applications such as fuel cell and battery testing. Programmable filter and gain settings on each channel ensure that the PXI-4204 module achieves maximum accuracy over the entire ±100 V input range. In addition, the PXI-4204 module works with NI LabVIEW 7 Express and NI-DAQ, so the DAQ Assistant in LabVIEW 7 can configure the PXI-4204 module and acquire data through a menu-based window, eliminating the need to manually program the device.

Take High-Speed, Bridge-Based Measurements

The NI PXI-4220 module is a full-featured data acquisition device with dual 16-bit inputs for quarter, half, and full-bridge sensors, such as strain gauges, load cells, and pressure sensors. Bridge configuration, excitation, amplification, and filtering are fully programmable per channel. In addition, the module provides simultaneous sample-and-hold capability to eliminate phase delay between channels. Each input channel of the PXI-4220 data acquisition device also includes a 9-pin D-Sub connector for easy connection to bridge sensors, and programmable shunt and null calibration circuitry, which improves the accuracy of measurements by eliminating both gain and offset error. ■

Device	Bus	Analog Inputs	Resolution	Sampling Rate	Input Range	Triggers	Filter Settings Per Channel
NI PXI-4204	PXI	8 DI	16 bits	200 kS/s	±0.5 to ±100 V	Digital (2)	2-pole Butterworth (6 Hz or 10 kHz)
NI PXI-4220	PXI	2 quarter, half, or full-bridge	16 bits	200 kS/s	±0.01 to ±10 V	None	4-pole Butterworth (10 Hz, 100 Hz, 1 kHz, 10 kHz, bypass)

National Instruments PXI-4204 and PXI-4220 are the first two devices in the new SC Series of 16-bit, PXI data acquisition (DAQ) devices with integrated, measurement-specific signal conditioning.

To try out an NI data acquisition system over the Web, read an interactive Measurement Ready white paper, or view product data sheets, visit ni.com/info and enter nsi3425.

ni.com/sigcon

SCC Signal Conditioning Modules Extend I/O Capability

NI recently expanded its SCC portable, modular signal conditioning series to include load cell inputs and isolated waveform outputs. The NI SCC-SG24 is a dual-channel, full-bridge input module that provides amplification, lowpass filtering, and 10 V excitation – making it ideal for load cells, pressure sensors, and other full-bridge sensors. The NI SCC-AO10 is a single-channel, isolated analog voltage output module with a ±10 V output range and 300 V isolation.

Take New Measurements with Portable SCC Systems

With the new SCC-SG24 signal conditioning module from NI, you have all the capabilities of the SCC platform that make it ideal for portable applications – it stacks under a laptop, has low power consumption, and can be powered from a DAQCard in your laptop. With support for load cells and pressure sensors in the small, lightweight SCC system, you can create portable applications such as in-vehicle tests and field tests with laptops.

The new NI SCC-SG24 module provides load cell inputs for portable DAQ systems.

Ensure System Safety with Isolation

The new SCC-AO10 is the first product from National Instruments to provide isolated waveform outputs. It is referenced to its own isolated ground, with up to 300 V of common-mode voltage between grounds. In addition, the SCC-AO10 module increases the output current drive capacity of an E Series DAQ device to ±30 mA. Isolation is important not only for inputs, but also for analog outputs. If outputs connect to devices with high common-mode voltages or those that have the potential to carry voltage spikes, nonisolated systems may be at risk of damage. The SCC-AO10 provides 300 V isolation to protect both the SCC system and the user from high voltages. ■

To download data sheets and full product specifications, visit ni.com/info and enter nsi3426.

To take a tutorial on the benefits of signal conditioning and explore system requirements, visit ni.com/info and enter nsi3427.

ni.com/sigcon

Learn Unique Measurement Techniques on ni.com

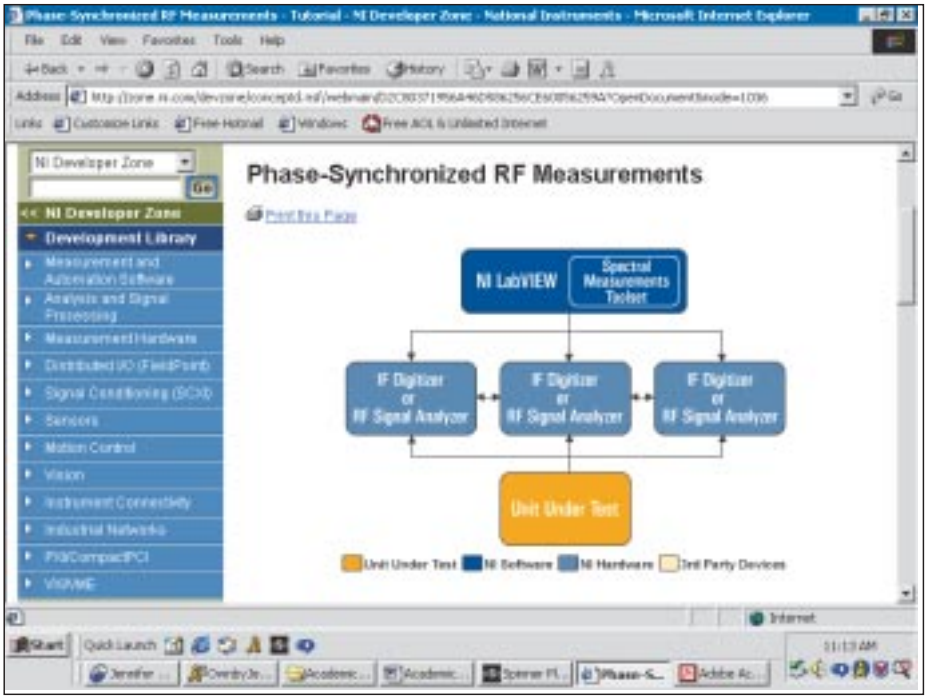
Browse custom and unique measurement examples in the recently released Unique Measurements Library on ***ni.com***.

Each unique measurement example demonstrates how using a software-based measurement system can help you meet your particular measurement application needs. Examples of functions and measurements you can find online include:

- Measuring ignition coil flyback voltage
- Driving digital print heads
- Building custom video test patterns
- Performing Gabor order tracking
- Acquiring nonadjacent RF frequency bands
- Generating baseband I and Q signals with full amplitude, phase, and offset control

All measurement examples include system block diagrams and information on how to perform the measurement. Many examples include links to application notes and example code. In addition, you can share your unique measurement solutions with colleagues online and help them solve their own unique measurement challenges. ■

To access the Unique Measurements Library, visit ni.com/info and enter **nsi3428**.



Browse by instrument or analysis type to find hundreds of measurement examples in the Unique Measurements Library.

Flex Your Coding Muscle with the LabVIEW Zone Coding Challenge

Show your individual coding flair while going head-to-head with your peers in the LabVIEW Zone Coding Challenge. Regular challenges are posted at ***ni.com/labviewzone/codingchallenge,*** where you can get together and compete with other LabVIEW code junkies. You also can develop your skills by practicing on past coding challenges such as Vampire Numbers or the Bit Twiddling Challenge, get answers to your questions or share ideas in the discussion forum, and even suggest a challenge of your own. ■

Find out what is new in LabVIEW 7 Express at ***ni.com/labviewzone***.

Add Your Own Comments to Example Code

With more than 3,000 example programs, the Developer Zone Example Code Library has long been the place to go to search for example programs from National Instruments and third-party contributors, and to contribute your own code to help out other engineers and scientists. With recent updates to the Example Code Library, you can not only rate the document quality, but also add comments to these examples. After reviewing the example code, click on the "Add Comments" link at the bottom of the page to provide alternate techniques, corrections, improvements, and compliments for the benefit of the author and future visitors. ■

To visit the Example Code Library, visit ni.com/info and enter **nsi3429**.

Click to Have an NI Representative Call You

Can't find what you're looking for on ***ni.com***? When visiting the NI Web site, you can click on the "Get Live Help Now" button located on most ***ni.com*** pages to have an NI technical representative call you. ■

ni.com

NI Hardware Services Enhance Application Performance

PXI Factory Installation Services

Get your PXI or PXI/SCXI combination systems running quickly and easily with NI Factory Installation Services (FIS) during application development and deployment. Trained NI technicians install the software and hardware and configure the system to your specifications, so it is ready to use when you receive it.

NI ships FIS systems with a startup software utility that shows the software and hardware installed in your system. This utility includes version numbers of application and driver software, as well as links to system documentation such as online software and hardware manuals.

Our online PXI and PXI/SCXI advisors lead you through a series of questions to help you build a complete system, including chassis, controller, modules, accessories, and software. These advisors offer an onscreen graphical image of your system and give you the ability to automatically order the entire system through our online store. Or, if you prefer to order through fax or phone, you can use an advisor-generated configuration ID to do so. ■

To view other key FIS benefits, or to configure your system online with our product advisors, visit ni.com/info and enter **nsi3430.**

Calibration

Ensure Measurement Accuracy

To help you meet your calibration needs, NI provides calibration support and services, including manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. We recommend you calibrate your measurement hardware annually†.

Basic Calibration Service

NI provides a FREE basic calibration certificate with all new measurement products. This certificate states that the product is calibrated, meets NI ISO 9000 quality requirements, and is traceable to internationally accepted standards.

Detailed Calibration Service

If your quality requirements state that you need more than a basic calibration certificate, we also can support your needs with our detailed calibration service. Through our partnerships with Verizon Metrology in the Americas and Fluke in Europe, we provide certificates that contain detailed measurement data and can meet the requirements of ISO Guide 17025 or ANSI/NCSL Z540-2. ■

†Check the documentation of your product for recommended calibration intervals.

For comprehensive calibration services information, including lists of products handled by calibration services and calibration service providers in your area, visit ni.com/info and enter **nsi3431.**

Address Project Life-Cycle Requirements with Extended Warranty

NI hardware products come equipped with a standard hardware product warranty. Our extended warranty renews the standard product warranty for one additional year for most of our popular products. As part of the extended warranty, NI incorporates any additional features in your existing product if you return it for repair.

Repair service includes all the necessary parts, labor, materials, and calibration of the product. NI offers expedited repair and advance replacement services with a 48-hour turnaround time in North America and the European Union on select products. ■

For more information about NI services or to extend your product warranty or contact a support engineer about returning your hardware for repair, visit ni.com/info and enter **nsi3432.**

Updated Training for TestStand, LabWindows/CVI

We have updated all TestStand training courses for version 3.0 and LabWindows/CVI courses for version 7.0.

NI offers a variety of courses that teach you to develop high-performance applications and subsequently lower costs by saving development time. Our updated courses include:

- TestStand I: Introduction (two days) – Develop practical test applications using the built-in tools supplied with TestStand
- TestStand II: Customization (three days) – Understand advanced features of the TestStand environment, such as multithreading and multiple unit under test (UUT) testing
- TestStand Advanced: System Design (five days) – Learn customization features and design practices essential for implementing advanced TestStand systems
- LabWindows/CVI Basics I (three days) – Master the LabWindows/CVI programming environment and create basic solutions using many built-in features
- LabWindows/CVI Basics II (two days) – Design powerful applications using Internet communication and ActiveX

NI also can bring these courses to you, reducing the time you spend away from your job and eliminating travel expenses. All NI courses are eligible for CEU/PDH credits. ■

For more information about the NI certification program, or to obtain a course calendar or register for a course, visit ni.com/info and enter **nsi3433** *or call (800) 813-3204.*

For more on our certification program, visit ni.com/info and enter **nsi3434.**

ni.com/services

Viewpoint Systems Introduces Fuel Cell Test Stand

National Instruments Select Integration Partner Viewpoint Systems introduces its fuel cell test stand. This off-the-shelf system meets the demands of fuel cell research with a powerful and flexible test environment that you can customize to your specific testing needs.

The Viewpoint fuel cell test stand uses an NI LabVIEW-based software engine. NI Compact FieldPoint is at the heart of the data acquisition system, while LabVIEW Real-Time gives you stand-alone functionality, accurate measurements, and reliable test stand control. You also can add an optional PXI chassis for high-level data analysis/modeling and data logging. A wide variety of interface options – including Ethernet, CAN, GPIB, and remote RS-232/485 (Web/network) access – handle most requirements. With this test stand, you can use existing software to get up and running in weeks instead of months or years.

The Viewpoint System fuel cell test stand is scalable with a user-defined power range of 0 to 5 kW and 30 to 250 V, or 20 to 200 A. Designed specifically for fuel cell testing, this system can control independent aspects including gas flow (up to 50 SLPM [standard liters per minute], ±1% of full scale), temperature (20 to 95 °C), pressure, and dew point (0 to 100 percent relative humidity) for both the anode and cathode gases), as well as electronic load. Basic measurements include cell or stack current, voltage, impedance, and temperature. Electrochemical measurements based on potentiostatic control are also available.

This test stand also includes safety features such as emergency shutdown detection sensors, loss of exhaust alarm, and safety relief valves. ■

To learn more about Viewpoint Systems fuel cell test stand, visit ni.com/info and enter **nsi3435.**

Customize Viewpoint Systems fuel cell test stand to meet your specific testing needs.

ni.com/alliance

Thermotron Test System Solves Electromigration Problems

National Instruments Alliance Partner Thermotron Industries announces an innovative test solution that monitors the degradation of microcircuits created by electromigration. With this system, you can precisely regulate voltages at multiple devices under test, monitor the change in current, and detect changes in circuitry.

Monitor and detect changes in your microcircuits with this Thermotron system.

The Thermotron power distribution module works in conjunction with NI data acquisition products to supply and regulate power within ±50 µV to the devices under test. Each power distribution module can detect device under test activation and recycle power if not enabled on the first attempt. With low and high-resolution modes of operation, you can take accurate measurements to detect changes in current usage.

For reliable measurement, you must have accurate control of associated stresses created by environmental chambers. With this system, you can monitor thermal and pressure sensors to keep the product heat dissipation within specified limits to protect the product and reduce safety concerns.

By integrating NI TestStand sequences using a specialized user interface, you gain the flexibility to meet the unique needs for each of your applications. You can record measurements with environmental and electrical stress information and log your measurement results to a variety of formats. Monitored events such as test completion, out-of-limit conditions, system errors, and product failures can trigger notification e-mail messages to recipients, eliminating the need for you to return to the equipment to observe test activity. With an accurate failure history, you can quickly verify circuits that minimize the effects of electromigration and quickly detect and correct product flaws. ■

To learn more about the Thermotron Electromigration Test System, visit ni.com/info and enter **nsi3436.**

ni.com/alliance

National Instruments Alliance Partners are business entities independent from National Instruments and have no agency, partnership, or joint-venture relationship with National Instruments.

New Flextronics Test System Tests Process Control Boards

Use the Flextronics Test Model 2598 tester to verify the production test of process control boards.

National Instruments Alliance Partner Flextronics Test introduces an end-of-line functional verification test system for the production test of process control boards. The Flextronics Test Model 2598 tester is designed so you can perform all tests automatically through a simple point-and-click interface. With this test system, you can reprogram controller firmware, execute and monitor internal diagnostics via a special debug port, perform packet monitoring on multiple Ethernet connections to the board, and test controller transfer functions onboard the small computer system interface subsystem.

The Model 2598 test system is equipped with many different digital and analog subsystems with which you can emulate portions of the controller host product. By combining Flextronics Test custom digital and analog circuitry with National Instruments PXI hardware, this system gives you a cost-effective solution in a very small package. Using custom software written entirely in National Instruments LabVIEW, you can exercise many high-level functions of the controller and pinpoint specific component-level problems on the board, based on its analysis of the processed image.

This system also includes Flextronics FTS standard test executive, which is built on NI TestStand, for seamless factory integration with analysis functions and automatic report generation. ■

To learn more about the Flextronics Test Model 2598, visit ni.com/info and enter **nsi3437.**

ni.com/alliance

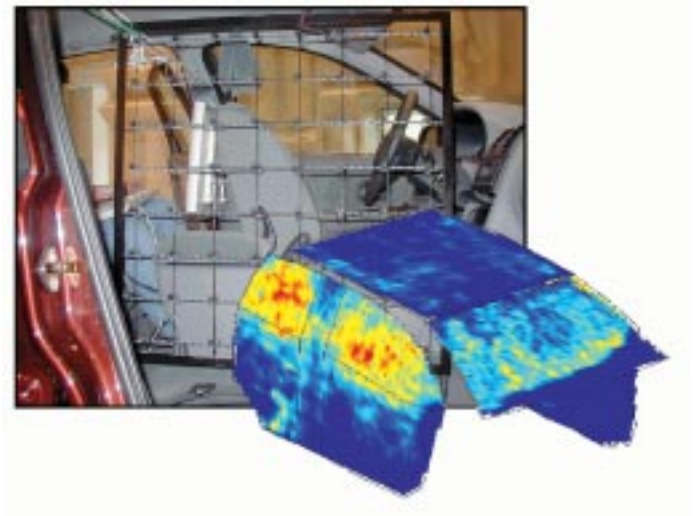
MTS Sound Explorer Creates Virtual Acoustic Mapping

National Instruments Alliance Partner MTS recently added Sound Explorer to its set of acoustic imaging tools. Used for detailed acoustic source mapping, at close range Sound Explorer easily identifies noise sources by visualizing them in 2D or 3D color displays.

You can use Sound Explorer to take exterior or interior measurements for a wide range of applications that require you to characterize and visualize noise, such as car and aircraft interiors, engines, and naval vessels. A typical application takes measurements from a microphone array with 48 to more than 100 channels, as well as an additional four reference channels for separation and removal of sound coming from uncorrelated sources.

The MTS Sound Suite products, including Sound Explorer, interface with NI PXI hardware, particularly the NI PXI-4472 24-bit dynamic signal acquisition modules for high-channel-count, high-accuracy audio-frequency measurements. These tools give you a high degree of flexibility for multichannel microphone array kits that create sound maps using sound intensity, pressure, holographic, and beamforming techniques.

The MTS Sound Suite also includes Sound Camera and Sound Quality and Jury. Sound Camera is an acoustic imaging system that relies on an array of sound pressure measurements or predictions from an acoustic analysis product as the input to a virtual camera engine. Sound Quality and Jury provide the link between repeatable engineering metrics and subjective product quality impressions.



Visualize your sound measurements with MTS Sound Explorer.

These tools help you make the right decisions during the design process. From a single measurement of a prototype, you can identify noise problems or acoustical "hotspots," estimate the pressure level, and choose between several improvements in your noise reduction strategy. Using NI products, MTS can offer these powerful tools in an affordable and modular format. ■

To learn more about the MTS Sound Explorer, visit ni.com/info and enter **nsi3438.**

ni.com/alliance

Upcoming NI Events Around the World

NI Technical Symposium

for Measurement and Automation

Get Ready for NI Technical Symposiums and NIDays

National Instruments hosts two annual series of measurement and automation events each fall. During NI Technical Symposiums and NIDays, engineers from around the globe attend a variety of instructor-led sessions held near their homes, which focus on test, measurement, and control topics. At the sessions, you can exchange ideas on innovative approaches to technical challenges, study future technology trends in virtual instrumentation, and learn firsthand how NI software and hardware save time and money. Meet developers and product experts, network with colleagues, and learn about NI products at an event near you.

NI Technical Symposiums visit 26 cities throughout the United States and Canada, and NIDays reach 39 countries and 60 cities across Europe, Latin America, and the Asia-Pacific region. Make sure you are one of the more than 8,000 engineers, developers, educators, and NI Alliance Program members who attends these exciting conferences.

Upcoming Seminars in Your Area

National Instruments regularly holds technical seminars around the world to help engineers and scientists stay ahead of the latest technologies and trends in measurement and automation. Seminars feature NI products and show you how to integrate complementary software and hardware from the world's leading suppliers into your test, measurement, and control applications. Look for these new seminars in your area:

Hands-On Introduction to the LabVIEW Graphical Development Environment

Learn how to build powerful, customized test, measurement, and control applications from scratch using intuitive, measurement-specific graphical programming through hands-on software exercises. Learn the basics of the NI LabVIEW environment, edit existing code, and write code modules from scratch. By acquiring data using this software, you can see how simple and straightforward it is to work with LabVIEW 7 Express.

Acquire, Analyze, and Present with NI Graphical Development

This new seminar introduces you to LabVIEW, demonstrates the basic LabVIEW environment, and shows you various types of applications you can develop with LabVIEW. Six software-based demonstrations include data acquisition and LabVIEW, collaborative engineering with DIAdem, and LabVIEW remote application control and automatic documentation tools. You also hear user successes from Volkswagen, the Royal Australian Armed Forces, and Virginia Tech.

Step-by-Step Data Acquisition – Learn How to Take Thousands of Measurements

See professional PC-based data acquisition systems and learn how to create modular and flexible systems with short development times at low cost. NI data acquisition and signal conditioning products ensure highly accurate measurements, and LabVIEW gives you the power to easily analyze and display your acquired data.

Developing Real-Time Applications with LabVIEW

Discover how you can take advantage of graphical development to create real-time and embedded measurement and control solutions. This seminar features LabVIEW Real-Time and RT Series hardware and showcases how you can reduce development time for applications ranging from control prototyping and hardware-in-the-loop simulation to machine monitoring and control and embedded data logging.

Register Early for NIWeek 2004 and Save

Register by November 1 for NIWeek 2004 and receive early-bird registration discounts on full conference passes and exposition space.

Attend Interactive Events through the Web

Join us online for our live interactive Web events on a variety of topics, including application solutions and hot technologies. Recent events have included:

- Advanced Topics in LabVIEW FPGA
- Develop DAQ Applications in Three Simple Steps with Next Generation Driver Software
- More Power, Less Programming: LabVIEW 7 Express ■

Fall 2003 Trade Shows

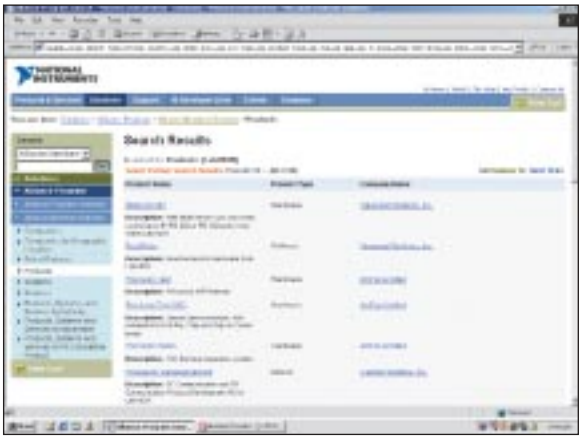
September 8-11	TurboMachinery Conference	Houston, TX
September 16-18	Embedded Systems	Boston, MA
September 23-25	AutoTestCon	Anaheim, CA
September 23-25	Meascomp	Wiesbaden, Germany
September 30-October 2	ITC	Charlotte, NC
October 6-9	Sensors Fall	Anaheim, CA
October 21-23	ISA	Houston, TX
October 21-23	Mexitronica	Guadalajara, Mexico
October 29-31	Testing Expo	Detroit, MI
November 5-7	Measurement and Technology	Tokyo, Japan
November 5-8	Frontiers In Education	Boulder, CO
November 18-20	SAE Brazil	Sao Paulo, Brazil

To register for or learn about upcoming events, visit ni.com/info and enter nsi3439.

ni.com/events

NI Offers New LabVIEW Companion Product Directory

With the LabVIEW Companion Product Directory, customers can seek assistance with system development in situations where advanced domain expertise is required or the project timeline is critically short. To help you do this, National Instruments works with leading companies that provide products and services to complement the capabilities of LabVIEW software. The NI LabVIEW Companion Product Directory helps you take advantage of these services by referring you to complementary products from third-party companies committed to solving the measurement and automation needs of mutual customers and enhancing National Instruments solutions.



Search for drivers, VIs, and systems in the LabVIEW Companion Product Directory.

The Web-based directory contains a variety of third-party, complementary LabVIEW products ranging from LabVIEW drivers for semiconductor wafer probes to fingerprint and face recognition add-on toolkits and complete systems for managing R&D, design, validation, and manufacturing test data. In the LabVIEW Companion Product Directory, you can search based on company name, product type, industry, or application category. With these search options and a wide range of available products and services, you can easily find the solution that best fits your system and application requirements. ■

To search the LabVIEW Companion Product Directory and learn how you can work with National Instruments to submit your complementary products for listing in the directory, visit ni.com/info and enter **nsi3440**.

ni.com/labview

More Information and Resources

- For a complete listing of recent newsletter issues, other resources, and new product information, visit **ni.com/info** and enter **newsletter**
- To view our current training schedule, visit **ni.com/info** and enter **nsiedu**
- To subscribe to our FREE monthly customized e-mail newsletters, *NI News* or *eSupport News*, visit **ni.com/info** and enter **nsinews**
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