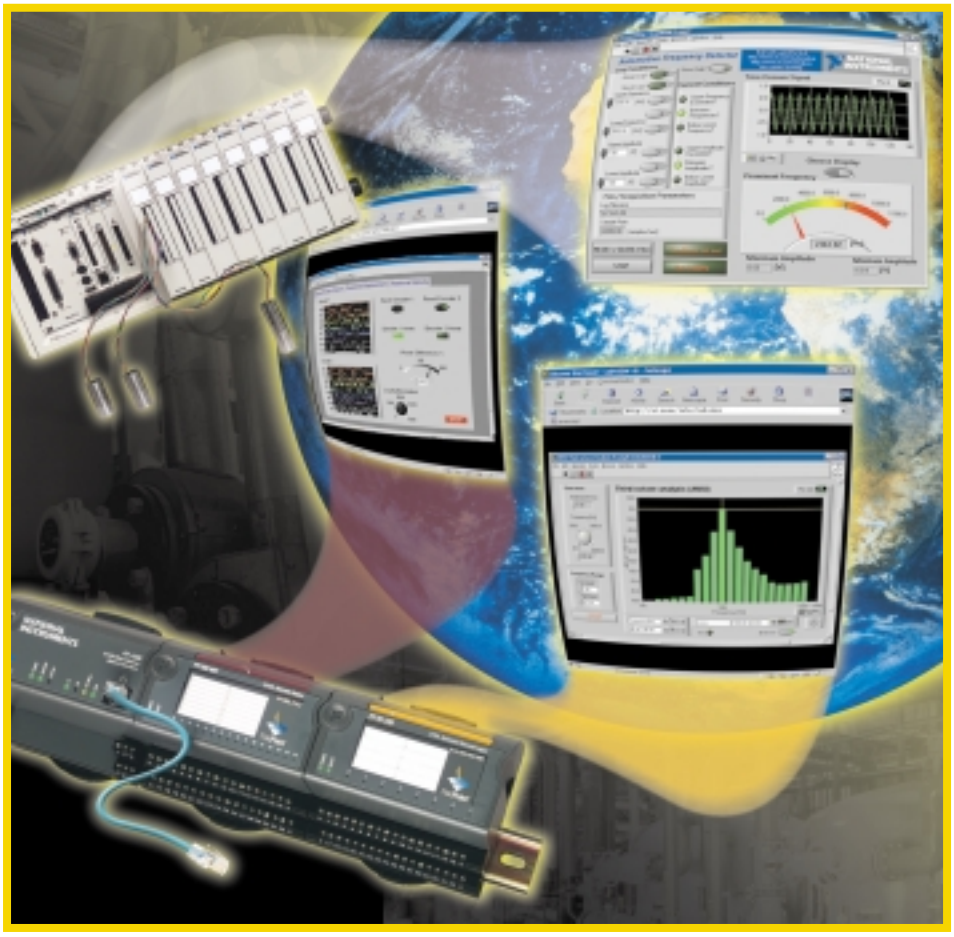
Instrumentation newsletter

Technical News from National Instruments

Third Quarter 2000



Network Measurements and the Technical Enterprise

Network technologies such as Ethernet, HTML, wireless communication, and the Internet are changing our methods for taking and automating measurements.

For years, National Instruments has incorporated network technologies into hardware and software products, so you can exploit the benefits of networks and the Internet in your solution. (See Network Measurements – The Next Generation of Measurement Solutions, *Instrumentation Newsletter*™ Q3 1999). In this edition, we further explore the benefits of network measurement solutions and expand on how these new solutions will affect your enterprise.

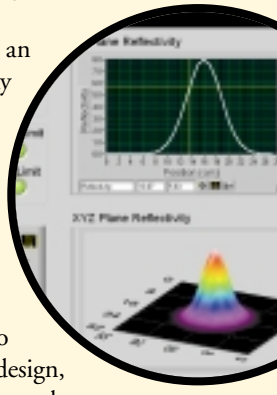
The Impact of the Internet

To fully understand what the Internet brings to measurement solutions, we must first take a step back and consider the impact of the PC. The rapidly evolving PC industry delivered high-performance processing power, fast and inexpensive memory and storage, high-speed

continued on page 4

Discover the Power of LabVIEW™ 6*i* – Internet-Ready Measurement Applications

National Instruments tightly integrates Internet technologies into LabVIEW 6*i*, making it possible to quickly build high-performance measurement and automation applications and easily incorporate them throughout all levels of an enterprise.



Today, the Web is an essential part of the way a business operates. Not only does the Web provide you with a way to gain visibility, share information, and sell products, but it also gives you the power to improve the way you design, manufacture, and test products. You can use the Web as a tool to decrease design time, ensure quality, and share information throughout the enterprise.

LabVIEW 6*i* continues to build on the measurement products of previous versions – with it you can now create measurement and automation applications faster and easier than ever before. Through the tight integration of hardware and software, LabVIEW 6*i* offers measurement intelligence that combines hardware configuration with powerful new measurement, analysis, and display functions. LabVIEW 6*i* also delivers significant advances in the areas of productivity, user interface development, and performance.

continued on page 6

NATIONAL INSTRUMENTS™

Here's What You Missed...

- Learning about real-time control systems from design to deployment
- Knowing how to use stable timing and PXI phase-locking to take better measurements
- Discovering NI Developer Zone™ – the essential technical source for measurement and automation

...If You Missed the Last Issue.

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An Inside Look at the LabVIEW Development Team

Software developers throughout our organization are committed to producing a quality product. The core development team is pictured here.

As this issue goes to print, we are deep into the release process for LabVIEW 6*i*, our newest version that offers many new Internet-ready enhancements to increase your development productivity. Many things have changed since the early years of LabVIEW development, but one thing that has not changed is our commitment to producing a quality product. People often ask me what the LabVIEW team is really like, so I wanted to give you a glimpse of the loyal team that has created LabVIEW for more than 17 years. For those of you who attended NIWeek™ 2000, hopefully you had a chance to meet some of the team.

Today, not only is Jeff Kodosky, often referred to as the father of LabVIEW, still actively involved with LabVIEW development, but also five of the original 11 developers who worked on the LabVIEW 1 project. Talk about job satisfaction! Since the beginning, the LabVIEW Development Team has organized themselves in an open room, no wall environment. Almost all desks have at least two computers, often running different operating systems to ensure cross platform compatibility. Of course, over the years, the size of the team has grown significantly, and today their desks span from one end of the building to the other. We also regulate our configuration much more tightly now. In the early days configuration management was called "bowling" – they used an orange Tupperware bowl on the top of a computer to denote who currently had control of the master source code!

But some things remain the same; we all celebrate a great product. So what do they do to celebrate the release of each new version of LabVIEW? They have an official toast to the new version, not with beer or wine, but with Grappa. Congratulations to the LabVIEW team on the release of LabVIEW 6*i*, and enjoy a glass of Grappa!

John Graff, VP Marketing

ni.com

Distributed Machine Vision – A Networked Solution for Vision System Developers

Measurement and automation users are quickly embracing vision to improve product quality and save cost.

Because of advances in easy-to-use vision software and powerful processors, two significant technical trends are emerging.

First, because of the computational power and data bandwidth of the PC, it has become the dominant platform for vision. Second, users are distributing inspection along the production or automated test environment using network protocols – primarily Ethernet. National Instruments is addressing both of these trends.

Networked Vision History

In the past, intelligent cameras that included a digital signal processor (DSP) for vision processing provided a method for distributing machine vision on a production line. Along the production line, these "smart cameras" performed simple image processing functions such as thresholding, gauging, and histograms, then returning the results to a host PC. By using several smart cameras, users could distribute processing for relatively simple applications, such as part present or not present, counting, and dimensional measurements. Users have typically viewed smart cameras as a sophisticated sensor. Limitations of smart cameras include lack of processing power, limited networking capabilities, and limited integration with other types of I/O, such as motion control, data acquisition, and inflexible software.

Remarkably, the National Instruments distributed vision system deployment price is comparable to a smart camera price.

Distributed Machine Vision Using PXI™

For today's network solution, the National Instruments PXI platform and vision software addresses the user's needs. This distributed vision system consists of a PXI/CompactPCI™ chassis, a controller (233 MHz Pentium MMX processor), a plug-in monochrome board (IMAQ™ PXI-1407), and a monochrome camera. The distributed vision system offers a 233 MHz Intel Pentium MMX processor; small chassis of 10 x 8 x 7.5 in.; Ethernet connectivity; and the ability to integrate motion control, data acquisition, and more cameras. Plus, users can take advantage of advanced development tools – configurable (no programming) and programmable. Remarkably, the National Instruments distributed vision system deployment price is comparable to a smart camera price.

Vision Software

With NI Vision software, you can solve vision applications quickly using a combination of interactive or configurable tools and programming environments such as LabVIEW, Visual Basic, and C. IMAQ Vision Builder is an interactive environment where you script a solution without programming. The National Instruments offering has the ability to scale from configurable and programmable software development environments, giving the user the ability to solve simple applications quickly and the flexibility to solve diverse applications that include motion control, other diverse I/O, and high performance.

National Instruments Distributed Vision System

Feature	Specification
Processor	233 MHz Intel Pentium MMX
Backplane	PXI/CompactPCI
Chassis	4-slot chassis with universal AC power supply
Programmable vision software	LabVIEW, Visual Basic, C
Interactive vision software	IMAQ Vision Builder
Motion control and measurement integration	3 PXI/CompactPCI slots
System size (does not include camera)	10.12 x 8.38 x 7.50 in.
Peripherals	2 serial ports, 1 USB port, 1 parallel port, 4 GB hard drive, 3.5 in. floppy drive, SuperVGA
Network communications	10baseT Ethernet
Camera and lens	Sold separately
Deployment system cost	Less than $5,000 (U.S. $)

Real-Time Visual Inspection of Recycling Plant

Vision Solutions – Recycling Plastic

Vision is networked along a recycling system to process plastic waste with a minimum of human intervention. Using LabVIEW and IMAQ Vision, the system identifies plastic objects by shape and then separates them from other waste pieces while moving at 2.5 m/s on a conveyer belt. Data acquisition controls and blows pressurized air to sort parts when they pass points on the conveyer system. LabVIEW and IMAQ Vision classify the objects in less than 5 ms to keep up with the speed of the conveyor.

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For more details on these vision applications, visit ni.com/vision

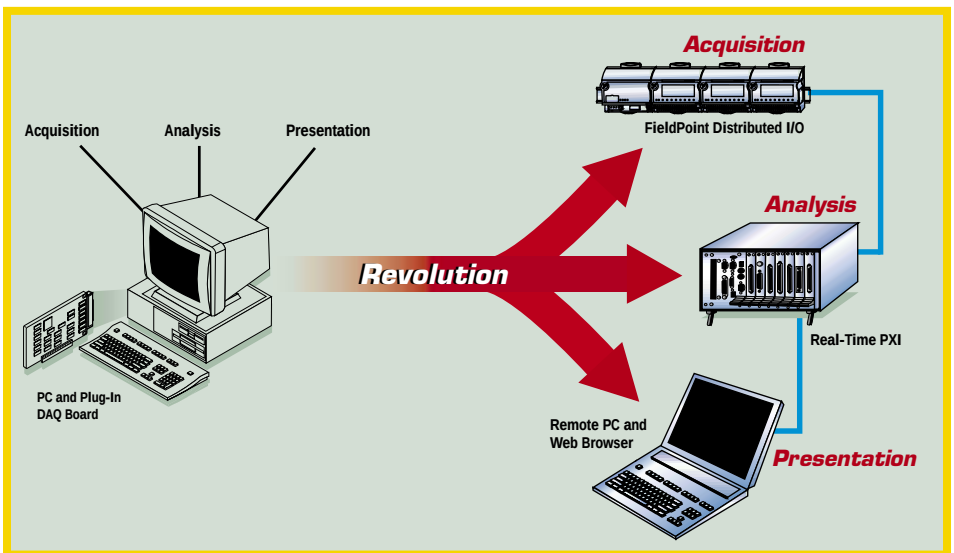
ni.com/vision

Network Measurements and the Technical Enterprise

continued from page 1

I/O, and vivid displays in a low-cost, off-the-shelf package. This PC platform paved the way to create user-defined measurement solutions that surpass the performance of traditional vendor-defined instruments at a much lower cost.

Just as these advancements in PC technologies transformed the way we automate measurements, networks are revolutionizing the fundamental architecture of PC-based measurement solutions. Some have proposed that network technologies are ushering in a "Post-PC era." However, this does not paint a complete picture. In fact, networks are not antiquating the PC, but revolutionizing the PC platform. The basic components found in a PC platform such as I/O, processors, memory and storage, and displays are still the building blocks, but are no longer required to be packaged as a self-contained unit. With networking technologies you can distribute these components to the location most appropriate for your application. The platform is fundamentally the same, but the deployment and capabilities of the platform are radically enhanced. By using network technologies in your measurement solutions, you can perform I/O on the production floor, deploy additional processing power for in-depth analysis in the control center, log and store post-analysis information to corporate databases, and display key information to clients around the world via a Web browser.



With networking technologies, you can distribute the acquisition, analysis, and presentation that were traditionally performed by a single PC.

The Technical Enterprise

National Instruments hardware and software tools provide the capabilities you need to create a powerful network measurement solution and to connect your solution to your existing business enterprise. This combination of your network measurement solution and your corporate information management infrastructure is called the technical enterprise.

Now your measurement systems can talk directly to your information management systems for unparalleled productivity throughout your company. By increasing the availability of real-time information from your measurement solutions to your business systems, you can more effectively manage the business to increase time to market, improve product quality, increase production throughput, lower production costs, and improve customer support. To create this technical enterprise, you need the right building blocks – high-performance measurement hardware and tightly integrated software tools designed to exploit the benefits of network technologies quickly and easily.

Measurement Building Blocks

There are several basic building blocks for creating your network measurement solution. These components address the acquisition, analysis, and presentation functionality that were historically performed within a single PC.

Measurement nodes are acquisition devices that you can deploy independently on a network. They can range from small I/O modules to larger high-speed acquisition units connected to the network or a more traditional PC with an Ethernet connection to the network and measurement devices in expansion slots such as PCI or USB. These nodes can have inherent analysis capabilities and can publish raw data or post-analysis information to the network.

A measurement server is a networked computer that is capable of managing large channel counts and performing advanced datalogging and supervisory control. You can also use them to warehouse your data and turn your measurements into the information you need to run your operation efficiently.

Measurement browsers are Web browsers or other software interfaces that can view the measurements or analyzed information published by the measurement nodes as well as the information collected and produced by your measurement servers.

Techniques for Information Sharing

There are three basic techniques of information sharing you can employ with a network measurement solution:

- Remote measurement
- Remote publishing
- Remote control and execution

Remote Measurement

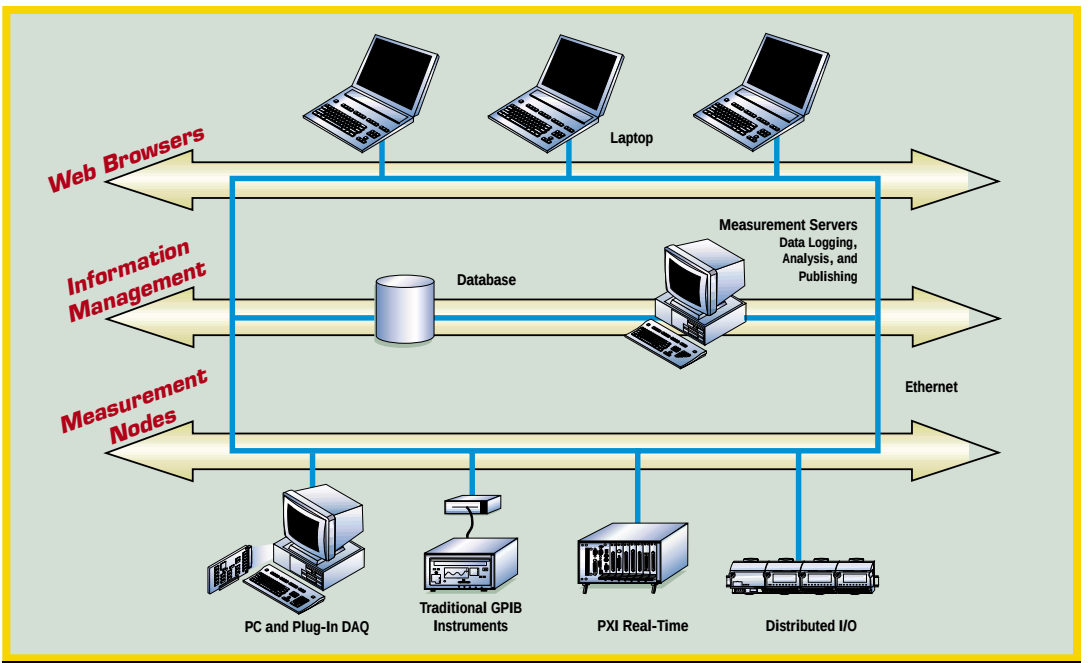
It is often desirable or even requisite that measurements be made at locations physically separated from a host PC. Data collection in harsh environments or across a large geographic area often require I/O to be near the physical phenomena being measured while analysis and presentation occur in a safe or centralized location. In this case, you can use network technologies to deploy a measurement node with the desirable measurement capabilities in the remote location that returns data over the network for further analysis and presentation.

Remote Publishing

With a network measurement solution, you can publish measurements acquired and analyzed in the research lab or on the factory floor on the network and present the results to multiple clients located anywhere in the world.

Remote Execution

Distributing different portions of program execution over a network can significantly increase the performance of your measurement and automation system. Whether distributing control routines to run independently on a remote measurement node or distributing processor intensive analysis routines to several networked computers, you improve system efficiency because no single processor becomes stressed under the heavy load of required operations.



National Instruments hardware and software tools provide the capabilities you need to create a powerful network measurement solution and to connect your solution to your existing business enterprise.

Network Measurement Solutions

You can use National Instruments measurement devices to create a wide variety of measurement nodes tailored to your unique requirements. From a compact, distributed FieldPoint™ system to a high-speed, high-channel count combination of our PXI™ modular instrumentation and SCXI™ high-performance signal conditioning, you have the flexibility to address the most stringent measurement requirements via a network.

With National Instruments LabVIEW software, you can maximize your productivity when creating network measurement solutions.

With National Instruments LabVIEW software, you can maximize your productivity when creating network measurement solutions. You can use LabVIEW to distribute processor intensive routines to other computers on your network to improve the speed and efficiency of your applications. With the LabVIEW real-time capabilities, you can execute deterministic control routines on your remote measurement nodes while the LabVIEW datalogging and supervisory control capabilities are ideal for managing more complex, high-channel count measurement solutions over a network. National Instruments Measurement Studio™ provides similar networking capabilities tightly integrated into the LabWindows™/CVI, Visual Basic, and Visual C++ environment. With Measurement Studio, you can develop applications in these environments that publish measurement information over a network or that run inside a Web browser for creating powerful network measurement solutions.

For applications running on a production line, you can use National Instruments TestStand™ to automatically store your measurement information and test results from LabVIEW or Measurement Studio applications directly into your corporate databases. With TestStand, you can automatically generate HTML test reports that you can view inside a Web browser. With these tools, you get both real-time and historical measurement information anywhere over the network for improved data sharing and connectivity throughout your enterprise.

The widespread availability of networking technologies and the innovation in measurement hardware and software products from National Instruments is fueling the measurement revolution by transforming the components traditionally found inside the PC into a platform for network measurements. With these innovations, you can easily deploy powerful distributed measurement and automation systems while connecting with your business systems to create your technical enterprise.

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For more information on networking, visit ni.com/info/news

ni.com/dvi

LabVIEW 6*i* – Internet-Ready Measurement Applications

continued from page 1

You can now quickly publish measurements to the Web with a few mouse clicks or use the Web to distribute your LabVIEW applications to anyone, even those without LabVIEW, through the new LabVIEW Player.

Develop Internet-Ready Applications

LabVIEW 6*i* empowers you to share your measurement and automation applications with colleagues worldwide. Whether publishing test results, sharing data for additional processing, or distributing application execution across many computers, LabVIEW 6*i* makes sharing data easy and convenient.

With LabVIEW 6*i* and the new LabVIEW Player, engineers and scientists around the world can instantly access programs (VIs) from their Web browser. Users can create VIs and distribute them across the Web to colleagues who then can open and run these VIs with the LabVIEW Player even if they do not have LabVIEW. The LabVIEW Player is available free of charge from National Instruments at ni.com/labview

Whether publishing test results, sharing data for additional processing, or distributing application execution across many computers, LabVIEW 6*i* makes it easy and convenient.

In addition to sharing VIs, LabVIEW 6*i* users can instantly publish data using DataSocket™ from any user interface object to other applications or Web pages in only a few mouse clicks and without any programming. LabVIEW also facilitates distributing your VIs and applications throughout the enterprise by transparently performing execution and data sharing across a network, regardless of the operating system of the computers on the network. Using the improved VI Server, you can create distributed applications that acquire data on a remote computer, analyze the data on a powerful workstation, and present the results anywhere. You can easily share test results and measurement data with colleagues across an enterprise and around the world with LabVIEW built-in Internet tools.

To further integrate applications into the Web, you can take advantage of the new LabVIEW 6*i* report generation functions to publish reports in HTML format. Built on the existing National Instruments report framework, these new functions professionally document the results of an application quickly and easily by adding graphics, panels, bulleted lists, and tables.

With measurement intelligence, you can increase your productivity and increase system performance.

Measurement Intelligence Generates Instant Results

LabVIEW 6*i* delivers measurement intelligence – the tight integration of measurement hardware with software – to simplify configuration and improve measurement functionality. Measurement intelligence integrates enhanced measurement capabilities that boost users to new levels of productivity. LabVIEW 6*i* measurement intelligence includes simplified measurement and device configuration, new measurement and display functions, and a new, comprehensive waveform data format.

Measurement intelligence in LabVIEW 6*i* extends connectivity beyond data acquisition and instrument control by now including image acquisition and motion control libraries. With these new libraries, you can add imaging and inspection to your measurement applications or automate them with motion control.

At the heart of measurement intelligence is a comprehensive waveform data format that defines names, unit information, and frequency characteristics of measured signals. By standardizing on this waveform data type, data acquisition, measurement, mathematics, file I/O, and display functions connect quickly to produce immediate results. The waveform data type speeds development by simplifying and reducing the amount of code you have to write.

LabVIEW 6*i* also simplifies configuration and use of measurement devices because with it you can create, configure, and access I/O channels in Measurement & Automation Explorer directly from LabVIEW. Once configured, these channels are available in LabVIEW 6*i* through the new I/O Name controls. All data acquisition and instrument control functions use these I/O controls for easy identification of measurement devices.

New User Interface

By leveraging advanced computer graphics technology, LabVIEW 6*i* delivers three-dimensional user interface controls for developing professional measurement systems. The new controls set a higher standard for user interface design in measurement and automation applications. In addition to the LabVIEW palette of controls designed for engineering and scientific applications, LabVIEW 6*i* also adds Microsoft Windows-style controls, including tab dialogs, a multicolumn listbox, and tip strips which provide context-based information you can assign to any control or indicator. LabVIEW 6*i* now includes significant new graphing functions, including multi-axis charts and graphs, rotated text labels, and a new digital I/O graph to represent timing data and digital patterns.

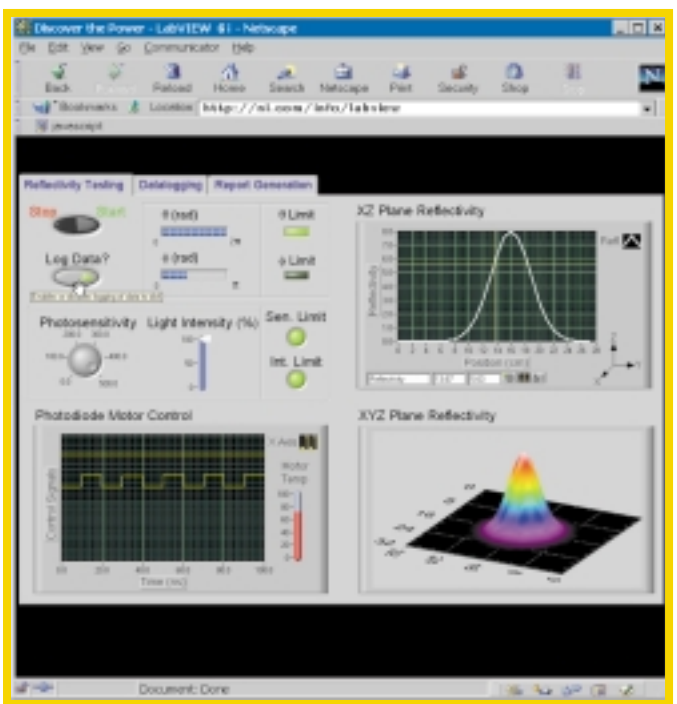
Integrate LabVIEW into Other Applications

To ensure LabVIEW code easily integrates with different programming languages and enterprise tools, LabVIEW 6*i* generates a 32-bit dynamic link library (DLL) or shared library from any VI. You can easily integrate these DLLs or shared libraries into other programming environments, such as Microsoft Visual Basic or Visual C++, or National Instruments Measurement Studio.

Enhanced Productivity

Through the years, LabVIEW has made measurement and automation system developers more productive by helping them concentrate on developing products instead of spending time on the mechanics of programming. LabVIEW 6*i* enhances this productivity gain by introducing a number of features to further accelerate measurement and automation application development. With the new grouping feature, front panel objects maintain their sizes and positions relative to each other when moved or resized. The newly added locking functionality anchors controls and indicators to front panels so they cannot be moved or deleted.

With control references, LabVIEW 6*i* programmers pass information about front panel objects to subVIs for programmatic property configuration and retrieval. Therefore, you build cleaner code components that modify the appearance or behavior of user interfaces, which you can reuse in other LabVIEW applications. Automatic wiring further enhances productivity by automatically connecting block diagram objects together when you move or place objects on the diagram. LabVIEW 6*i* delivers a number of improvements in array and string functions for even easier insertion, replacement, and deletion of characters and elements in strings and arrays. Incorporation of LabVIEW 6*i* polymorphic VIs into applications means you can create VIs whose functionality adapts according to input data. This leads to more compact code and also improves the potential for code reuse.



LabVIEW 6*i* integrates Internet capabilities so you can share applications around the world.

With LabVIEW 6*i*, you can quickly search through the controls and functions palettes with a navigation bar that behaves like the familiar navigation buttons in a Web browser. These palettes also provide a search button for text-based searches on controls, functions, and VIs.

Improved Performance

Driven by stringent performance requirements, LabVIEW 6*i* dramatically improves execution speed, application launch time, and memory and disk footprints. Many real-time and embedded applications, as well as large applications requiring datalogging and supervisory control, demand high-performance solutions. Production test applications are no different because decreased test times mean higher production throughput. For more information on the performance improvements, see ni.com/labview

LabVIEW 6*i* measurement intelligence includes simplified measurement and device configuration, new measurement and display functions, and a comprehensive waveform data format.

Delivering Internet-Ready Measurement Intelligence

LabVIEW 6*i* provides the power and flexibility to create high-performance measurement and automation systems faster and more efficiently than ever before. The new measurement functionality combines tight integration with the Web and changes the way companies produce products. No matter what phase of the product lifecycle, LabVIEW is the software platform for measurement and automation applications.

Ryan Wright, LabVIEW Product Manager
E-mail ryan.wright@ni.com

For more information, check LabVIEW Version 6i – Internet-Ready Measurement Applications white paper on the reply card or visit ni.com/info/news

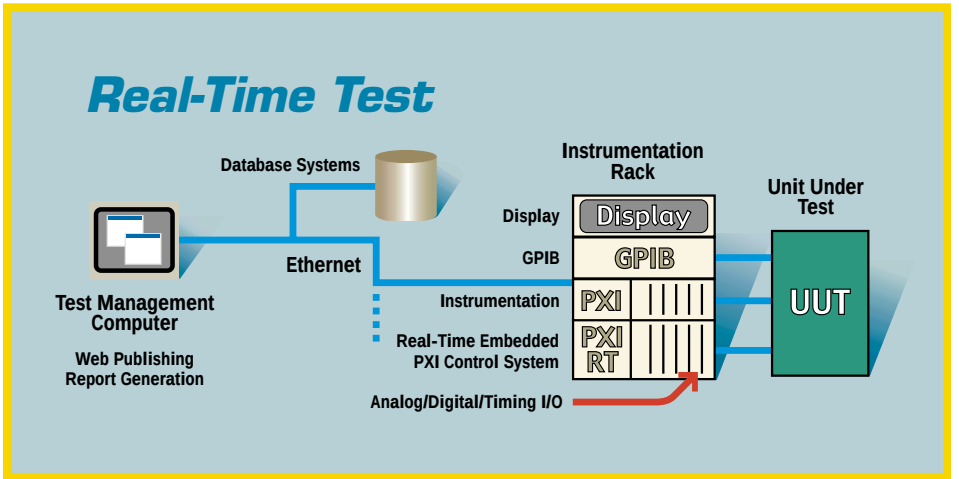
For upgrade information, visit ni.com/advisor

For free seminar information, visit ni.com/labviewtour

ni.com/labview

Reliably Test Your Products in Real Time

Traditionally, test instruments have been vendor-defined with a specific set of functions. With the revolution of virtual instrumentation, engineers defined their own test systems to create solutions to exactly fit their needs.



Use RT Series PXI systems to control the test, or the test environment, while integrating other instrumentation in the same rack. Use the same software development environment for test, measurement, and real-time control.

Now, with LabVIEW RT, you can create your own custom instrument with the flexibility of LabVIEW graphical programming and the real-time reliability and performance of an embedded real-time operating system. With LabVIEW RT, you can easily integrate deterministic real-time components into your test applications. LabVIEW RT combines the ease-of-use and flexibility of LabVIEW graphical programming with the reliability and performance of a real-time operating system.

When you want to add real-time I/O to your production test application, you need to easily shift between Windows and independent, real-time hardware. With the LabVIEW development environment, you use the same programming techniques for a real-time system that you use for the rest of your test application. For anything from a few I/O points with some intelligence to a complex large-channel count real-time box, you can develop your test application in LabVIEW RT on Windows. You then download your application to run in real-time on independent data acquisition hardware.

Because you can embed LabVIEW code, you can separate the real-time components of your test. This separation increases performance, in addition to running critical sections of test without interruption.

Real-Time Configurations with LabVIEW RT

LabVIEW RT consists of two components – the development system that runs on a Windows computer and the RT Engine that runs in a real-time operating system kernel embedded on a hardware target. You develop and debug in Windows, then execute in real-time by downloading and running the code on the target.

Two configurations deliver rapid development of real-time systems with LabVIEW and off-the-shelf data acquisition hardware for faster time-to-market and easier long-term maintenance and scalability of systems. The first configuration is a Windows computer with LabVIEW RT installed and an RT Series data acquisition (DAQ) board plugged into that computer. This configuration adds a real-time component to an existing Windows system. In addition to the RT Series DAQ board, the Windows application could be controlling plug-in instruments, vision, motion, and other hardware.

You can use LabVIEW RT and the RT Series PXI controller to create a reprogrammable black box in a rugged CompactPCI system.

The second configuration is LabVIEW RT installed on a Windows computer and downloading code via Ethernet to run on a separate PXI controller. This configuration offers a complete real-time system with any combination of available National Instruments PXI plug-in data acquisition cards. The real-time controller also has serial RS-232 ports, a GPIB port, and hard disk. This system can run stand-alone as a headless device, or it can communicate via TCP/IP over the built-in Ethernet port to LabVIEW for Windows application on another computer.

This configuration helps expand your existing test systems quickly. With the Ethernet-based real-time controller, you can easily add modern test equipment and procedures to your existing platform. For example, if you have a successful UNIX-based tester, you can easily integrate PXI with real-time via Ethernet.

Embedded, Flexible Real-Time Systems

You can use LabVIEW RT and the RT Series PXI controller to create a reprogrammable black box in a rugged CompactPCI system. This system operates as a headless, embeddable PXI system that can run custom real-time LabVIEW code controlling any combination of data acquisition I/O in the PXI chassis. Via Ethernet, this headless system can communicate back to a Windows computer running the user interface and numerous other functions such as writing data to disk, sending data to databases, and communicating with other I/O.

This is particularly convenient for products with a short lifecycle, where the real-time tests must change frequently to accommodate new products. Instead of having to reprogram your system in C or assembly, LabVIEW RT offers an alternative rapid development environment to quickly modify your tests for new products.

The headless rugged chassis of the PXI real-time system also makes it ideal for embedding into a cart, rack, or other environment that requires no interruptions from a user interface application. It can also act as distributed intelligence in a harsh environment, where the test sequence and operator interface is far away from the execution of the test. The distributed PXI real-time system can also create static data files to transmit via TCP/IP to other systems for report generation, or simply log data to its hard drive until you want to retrieve it. If you need to implement a distributed test system, the PXI real-time controller provides an ideal Ethernet-based architecture.

Using LabVIEW RT to build the control application for your environmental chamber and the applications for your tests, you have a unified development environment for both components of your solution.

Real-Time Environmental Control

Using LabVIEW RT to build the control application for your environmental chamber as well as the applications for your tests, you have a unified development environment for both components of your solution. You can also reduce your floor space by having both systems enclosed in a single set of PXI/CompactPCI chassis, whether you use the RT Series DAQ boards or the real-time PXI controller.

Because the RT target runs with the reliability of a real-time operating system, you can continuously control your environmental test chamber. Even if the Windows system is interrupted, crashes, or requires a reboot, the RT application on the hardware target continues to run. After the operator finishes rebooting, your control program seamlessly reconnects to the Windows application. With LabVIEW RT, you not only survive a reboot of your computer-based system, but you do not have to restart the control once your system comes back up.

Real-Time Safety Component to a Windows System

In your test application, you may want a single real-time component to operate an emergency shutdown sequence. This is particularly important when you are testing a valuable product that could be damaged if the test malfunctions. In this scenario, you can use a PXI or PCI-based Windows system using the RT Series data acquisition board. This intelligent DAQ board can continuously monitor critical parameters and run a response sequence even if the host Windows computer is busy, crashing, or rebooting.

LabVIEW RT and RT Series hardware extend existing computer-based test systems to real-time and embedded test applications. You can use the programming expertise you already have and upgrade your system to run headless and embedded in real time. The tight integration with I/O makes programming the data acquisition, GPIB, RS-232, and Ethernet I/O on the real-time side exactly the same as programming regular LabVIEW. The VIs and application programming interfaces (APIs) are unchanged, making it easy to scale your system for future real-time needs. Finally, by developing your real-time test systems with off-the-shelf industry standards such as LabVIEW, PXI, and data acquisition, your system is much easier to maintain for long-term use.

Norma Dorst, Real-Time Product Manager
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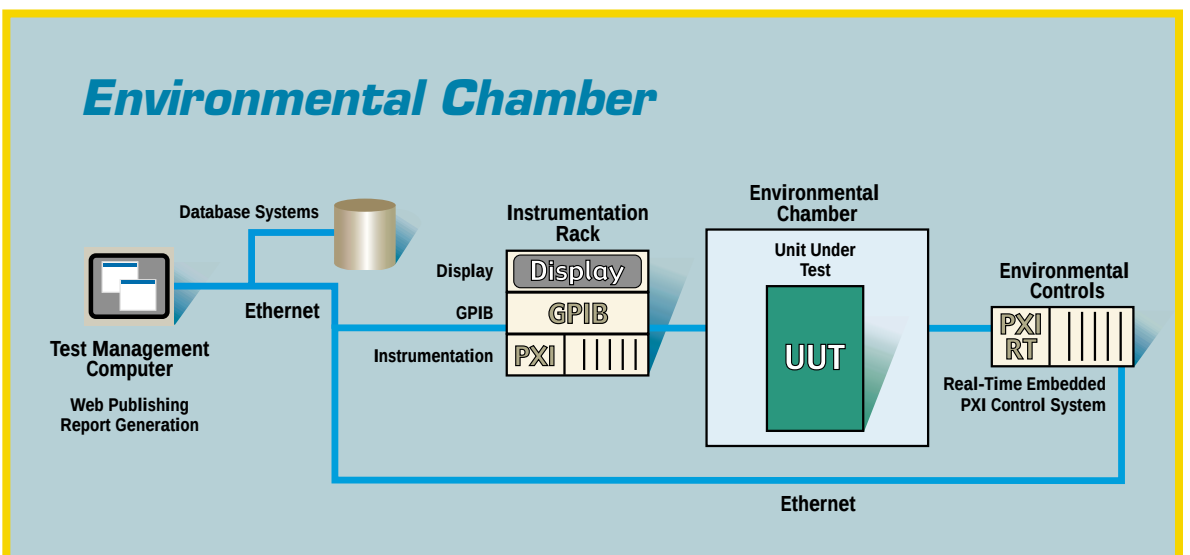
For more information on LabVIEW RT, check LabVIEW RT brochure on the reply card.

ni.com/labviewrt



Use LabVIEW RT to build the control application for your environmental chamber and your test applications for a unified development environment. Because the system runs in real-time, you can reliably and continuously control your environmental chamber.

Wireless Data Acquisition Improves Paper Mill

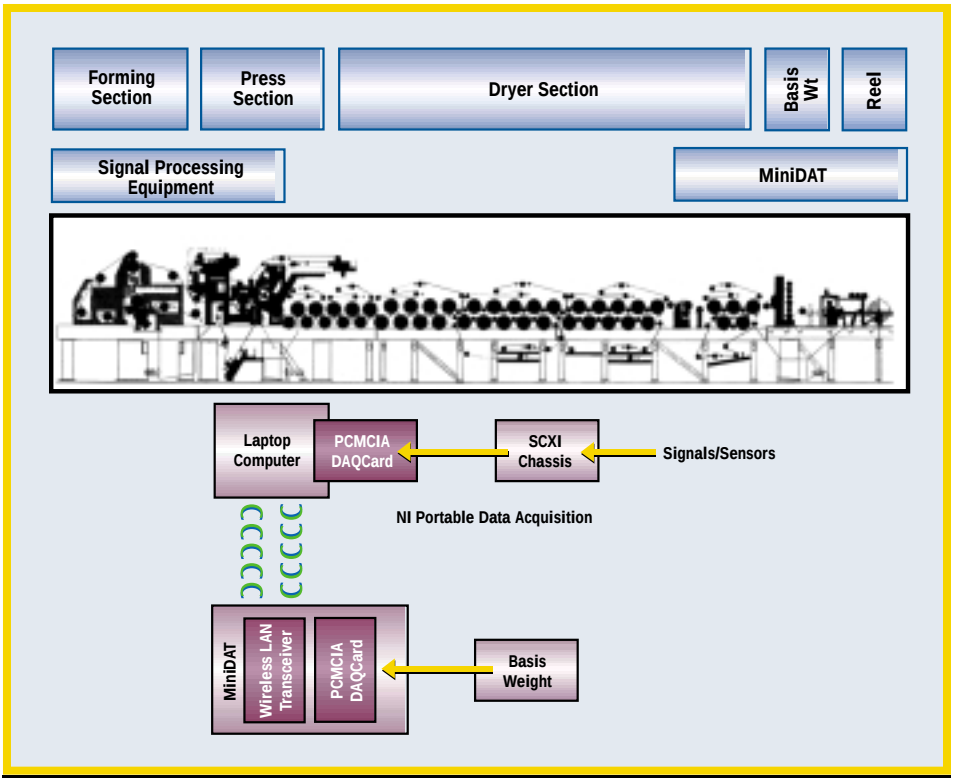
by Phil Taber, Consulting Engineer, AstenJohnson, and Bob Myers, Product Sales Manager, ViaSat

The Challenge: Setting up instrumentation to measure process instabilities in a paper mill, a difficult environment for routing cables.

The Solution: Combining SCXI, LabVIEW, and ViaSat MiniDAT for wireless data acquisition.

AstenJohnson designs, manufactures, and markets paper machine clothing for all sections of the paper machine. Paper machine clothing is a highly engineered textile fabric installed on paper machines to carry the paper stock through each stage of the paper making process.

To meet customer needs, AstenJohnson provides the Diagnostic Service Group, comprised of papermakers and diagnostic engineers, to help the customer troubleshoot, identify, and solve machine productivity issues. When a problem cannot be identified using conventional papermaking methods, they use electronic diagnostic equipment to measure process instabilities.



Wireless NI Data Acquisition with MiniDAT

Typical Machine Setup

We condition all signals using the National Instruments SCXI-1001, 12-slot chassis. This chassis is equipped with SCXI modules that provide 34 channels of signal conditioning for pressure, vibration, triggers, and several specialty sensors. We setup the chassis in multiplexed mode using the NI-DAQ™ software driver and a DAQCard™-AI-16XE-50 PCMCIA card. We record and analyze all signals using a custom analysis package written specifically for AstenJohnson in LabVIEW.

Most of the required test points are located on the wet end of the machine in the stock approach system. Therefore, we set up the SCXI chassis and laptop computer on the wet end of the machine and dispatched 100 ft cables to the individual test points in the approach system, including the basement. To measure the impact the variations in the stock approach system have on the sheet quality, we access the online basis weight signal on the dry end of the machine. The distance between the wet and dry end of many of the machines measured is typically 400 to 500 ft and requires stringing 100 ft cables together from one end of the machine to the other. The cables pose an extreme safety risk because they must be laid on the floor and routed around section drives, line shafts, and stock chests.

Wireless Data Acquisition

ViaSat MiniDAT provides a high-speed, multichannel, networked, wireless link between the dry end process signals and laptop computer simultaneously accessing data from the SCXI chassis, eliminating the need to run long cables from one end of the machine to the other.

By connecting the MiniDAT directly to the SCXI-1001 chassis, we have direct access to all signals from a remote location. This is especially useful when making changes to machine operating parameters. We can locate the analyst and laptop computer in the machine control room providing direct feedback of the changes on the papermaking process. Each MiniDAT has its own IP address making it possible to access several devices at various locations on the machine. Because of this, we have considered installing the diagnostic instrumentation at a mill site and troubleshooting over the Internet.

We also use the MiniDAT to access signals from an SCXI-1000, 4-slot chassis. This chassis provides 15 channels of pressure, trigger, and specialty sensor signal conditioning. We use this at mill sites that provide no immediate access for the 100 ft cables to be run to pressure tap locations in the basement of the machine. By using the MiniDAT, we access the signals from the SCXI-1000 chassis through the concrete machine room floor.

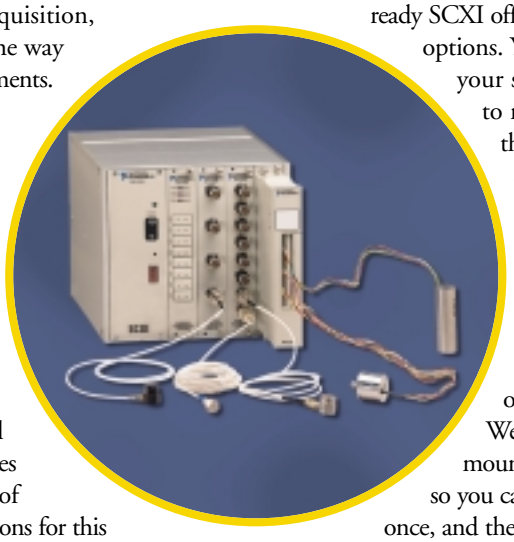
For more information about AstenJohnson consulting services, contact Phil Taber, tel (843) 549-3033, e-mail phil.taber@astenjohnson.com

For more information about MiniDAT, contact Bob Myers at ViaSat, tel (760) 476-2514, e-mail rmyers@viasat.com

ni.com/success

SCXI Measurement Ready Signal Conditioning

In 1992, National Instruments introduced SCXI, the first front-end signal conditioning platform for data acquisition, and revolutionized the way people took measurements. No other signal conditioning option offered the channel expansion, speed, or tight hardware and software integration with plug-in data acquisition technologies.



In 2000, National Instruments introduces the next generation of measurement innovations for this industry-standard signal conditioning platform. Measurement ready SCXI delivers new hardware and software technologies to simplify system development, ensure measurement accuracy, and integrate all of your conditioning into a single, high-performance platform.

Programmable Modules

Unlike other non-intelligent signal conditioning systems, SCXI is designed specifically for computer-based measurement and automation applications. With measurement ready SCXI modules, you program each channel's gain, filtering, and excitation settings through software commands. This feature greatly simplifies system configuration and application development, as you exactly match your SCXI system to your input signals.

NIST Traceable Calibration Services

In order to meet stricter testing or production guidelines, your measurement or automation system must not only be accurate; it must offer proof of its accuracy. Therefore, National Instruments SCXI modules come with a NIST traceable calibration certificate. In addition, SCXI modules offer other calibration services, including autocalibration for environmental temperature compensation, and even detailed calibration certificates with before and after measurement results.

Direct Connectivity

For simplified signal connections, measurement ready SCXI offers more connectivity options. You can now attach your signals directly to modules with thermocouple, BNC, SMA, and SMB connectors. For higher channel-density modules, we offer rack-mount options with 32 thermocouple jacks or BNC connectors. We still offer front-mounting terminal blocks, so you can wire your system once, and then quickly engage or disengage your signals a bank at a time.

New Switching Technologies

Besides just conditioning analog signals, SCXI also offers switching modules for programmable signal routing and control of external devices. Choose general-purpose relay modules to control external devices, such as lamps, solenoids, and small motors. Choose multiplexer switching modules to expand the channel-count of your DMM, or the new 4 GHz bandwidth RF switching modules to expand the channel count of your oscilloscope. Finally, use matrix switching modules to programmatically route multiple test signals to multiple measurement devices through software commands.

New Measurement Solutions

SCXI now offers new measurement capabilities to solve even more applications. Recent SCXI module releases offer customers new sound, vibration, temperature, and position measurement solutions in addition to new anti-alias lowpass filtering and high-voltage input modules.

Software Integration/Configuration

With improvements to the software, system configuration is greatly simplified, as you "detect" your hardware automatically. You configure each channel for thermocouples, RTDs, accelerometers, voltages, or currents through Measurement & Automation Explorer. All scaling is handled automatically. Finally, with the new "random scanning" architecture, you acquire data from only those channels you select, maximizing acquisition performance.

All of these technologies are compatible with your existing SCXI systems. If your next application does require signal conditioning or switching, we recommend the platform designed for computer-based measurement and automation systems – SCXI.

Travis Ferguson,
Signal Conditioning Product Manager

To learn more about measurement ready signal conditioning, visit our Web site at ni.com/newscxi

ni.com/newscxi

Waveform Datatype for NI-DAQ 6.8

The latest release of our data acquisition software driver, NI-DAQ 6.8, installs with LabVIEW 6*i* for seamless integration of the waveform datatype in data acquisition applications. Fully localized in French, German, and Japanese, NI-DAQ 6.8 also works with Measurement & Automation Explorer 2.0 to provide named channel configuration for accelerometer and linear variable differential transformer (LVDT) measurements.

The waveform datatype is a new general-purpose data format that includes a name and timestamp of data acquired, so you can post-correlate data from multiple hardware devices, that is acquired at different times. These new features are available with no loss in acquisition or setup performance.

Download the English version of NI-DAQ 6.8 for free at ni.com/nidaq

New IMAQ Board Available for High-Speed Serial Link

With the Channel Link board, you have significantly faster data rates.

Engineers and scientists can now surpass the acquisition rates of digital frame grabbers and IEEE 1394 cameras using a new National Instruments PCI image acquisition board along with a high-speed serial data technology, National Semiconductor Channel Link, to link digital cameras with personal computers.

National Semiconductor developed Channel Link for low-cost data display on laptop computer monitors. National Instruments and other machine vision leaders, such as Basler and PULNiX America Inc., have applied it to machine vision. With Channel Link, engineers and scientists have high-speed data transfers with a simple connector and a cable that are much smaller than their counterparts on the RS-644 and RS-422 parallel interfaces. Also, with the purchase of National Instruments new Channel Link PCI board, engineers and scientists receive all the software drivers needed for developing image acquisition applications.

With the new PCI-1428 image acquisition board from National Instruments, engineers and scientists rewrite less code – in addition, National Instruments scalable driver software, NI-IMAQ™, offers one API that works with low-cost analog cameras and high-speed digital cameras.

The Channel Link board is significantly faster than other digital protocols, such as IEEE 1394. The speeds are comparable to digital cameras with parallel digital data. With Channel Link, you also have simple cable connectivity – a big benefit for vision engineers and scientists.

Traditional parallel digital interfaces would require cables with more than 48 pairs of wires to transmit the 24-bit images produced by today's high-end machine vision cameras. Cables this large would be cumbersome and would likely break under stress, according to Rebecca Grosklaus of PULNiX America Inc.

"Big cables also need big connectors," Grosklaus said. "That is why we decided to build cameras with Channel Link technology. It is smaller and easier to work with, needing only five pairs of wires."

Also, as the machine industry grows, so does the demand for higher data rates, according to Chris Seymour, Product Development Manager for Basler Vision Technologies, which teamed with PULNiX to bring the Channel Link technology to machine vision.

For more information, download the PCI-1428 data sheet at ni.com/info/news

ni.com/vision

NI Makes Motion System Configuration and Test Easy

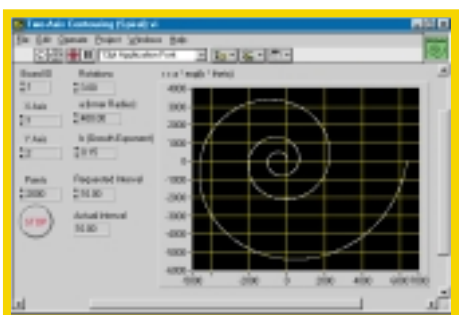
The latest release of NI-Motion™ has a new motion configuration environment to help you get up and running fast. This environment is now integrated into National Instruments Measurement & Automation Explorer, which means you easily test and configure your system without programming. You configure and test parameters such as limit switch settings, motor types, and more. Once you have these parameters in place, you can save your configuration to use in your applications.

With the environment's interactive panels, you can test two-axis vector moves or circular moves. With your 7344 Series high-performance controller configured for open loop stepper motors, you get a preview of what your motion will be before you even connect your motors. Even without motors, the two-axis plot or virtual stage displays the position to which your motors move when they are connected.

Contouring Improvements to VIs

With Version 5.0 of NI-Motion, you also have the ability to contour or generate a smooth profile by splining through an arbitrary series of positions. With this new contouring capability, you can set up a variety of arbitrary motion profiles for different contours and shapes. Application examples include labeling, laser cutting, and winding.

To give you more flexibility when integrating other National Instruments products, NI-Motion gives you the ability to route your encoder pulses directly over the RTSI™ bus. NI-Motion 5.0 works with a variety of application software packages, including Measurement Studio and Microsoft Visual Basic.



Contouring and ease of integration are two new features of NI-Motion 5.0.

Download your free NI-Motion software at ni.com/motion

ni.com/motion