Tech Tip – Understanding LVDT Position Measurements

Position and displacement measurements are growing in popularity. Here are some helpful tips if you are using LVDTs in your present or future applications.

1. **Understand your LVDTs configuration for your application**. LVDTs are available for use in either a 4 or a 5-wire configuration. While the number of wires describes the number of physical connections between your LVDT and your measurement system, it also describes how the measurement system interprets the signals from the LVDT. In a 4-wire configuration, the measurement circuitry uses the onboard excitation signal to demodulate the incoming signal from the LVDT. In a 5-wire configuration, the measurement system ignores the excitation signal, and uses the common-mode voltage signal from the LVDT for demodulation. While some LVDTs can operate in either mode, you must use other LVDTs in one configuration or the other. Therefore, it is beneficial to choose an LVDT measurement system that handles both configurations.
2. **LVDTs may operate at other excitation amplitudes and frequencies than those listed by the manufacturer**. An LVDT is a ratiometric device. The output signal is proportional to the excitation signal. You may set the excitation voltage at a level below the manufacturer's specified maximum and still expect linear operation. You may use a different frequency also, but expect the sensitivity and null voltage to change.
3. **Stay within the recommended travel specification of your LVDT**. LVDTs are available in a variety of lengths and sizes. However, all LVDTs come with a specified distance of travel. Outside of this range, the LVDT begins to behave in a non-linear fashion, creating measurement errors. Therefore, always choose an LVDT with the travel needed for your application, and operate the LVDT inside of those specifications.
4. **Beware of excitation signal cross talk between channels**. For many applications, it is convenient to wire multiple LVDTs to one multiconductor cable. In those instances, it is possible for the excitation signals of different LVDTs to couple through the lead wires causing small periodic variations in your readings. To eliminate this affect, choose an LVDT measurement system that can synchronize the excitation signals of multiple channels.
5. **There is a difference between AC LVDTs and DC LVDTs**. Most LVDTs are AC LVDT, requiring an external AC excitations source. However, there are versions of LVDTs known as DC LVDTs. These sensors have built-in conditioning and generate a DC signal corresponding to their position. While DC LVDTs do not require external conditioning, they do have limited temperature range specifications of operation and are more expensive.

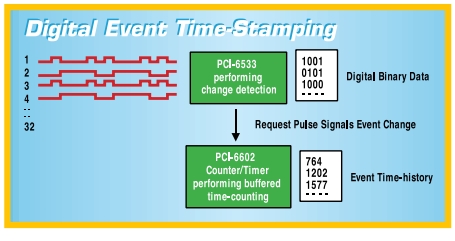
If you are looking to implement a position measurement system, we recommend the SCXI-1540 LVDT module. This module offers all of the critical features you require for your position measurement systems, along with the power of measurement ready SCXI.

For more information on our SCXI-1540 LVDT module, check the SCXI-1540 data sheet on the reply card or visit ni.com/info/news

ni.com/scxi

Time Stamping Digital Events

Time stamping is the ability to record absolute and/or relative time information together with a measurement sample or simultaneous digital event. With time stamping, you can recreate your acquired signal or event history accurately with respect to time. A free running counter, whose value is latched every time the monitored event or measurement happens, takes the time stamp. If you cannot share a clock to synchronize multiple measurements or events, time stamping is the only way to post-correlate measurement or event data.



Sample System

For this example system, we are using the PCI-6533 high-speed digital I/O device together with a PCI-6602 counter timer device.

You can use the high-speed digital I/O device in change-detection mode. It monitors up to thirty-two digital input lines and creates a digital pulse on the request line every time one of these lines changes state. The counter timer device performs event counting on one of its counters to latch a counter value in a buffer every time it receives notification from the request line of the digital I/O device. The request line of the digital I/O device internally routes to the source of the counter using the RTSI timing and synchronization bus found on all National Instruments data acquisition devices.

Additional Functions

In addition to time stamping, you can use these devices to perform these operations:

- Monitor up to thirty-two signal events and record their relative times – helps you reconstruct the event history
- Perform up to thirty-two channels of high-speed continuous frequency, period, or pulse-width measurements
- Correlate digital events with analog input, analog output, and counter measurements – for example position stamping in which the counter records position every time a digital event happens

For more information, view the PCI-6602 data sheet at ni.com/info/news

ni.com/scxi

Arbitrary Waveform Generators Address Complex Applications with Deep Memory

Deep fast access onboard memory is a feature that distinguishes the National Instruments arbitrary waveform generators from others.

Onboard Memory

Standard onboard memory for our 40 MS/s arbitrary waveform generator, the NI 5411, is 4 MB and 16 MB for our high-accuracy analog video signal generator, the NI 5431, which translates to storage of 2 million samples and 8 million samples on the instruments respectively. You can also purchase the NI 5411 with the larger 16 MB onboard memory option.

Deep memory makes possible the storage of large and complex user-defined waveforms or waveforms digitized from deep memory digital storage oscilloscopes on the instrument. As a result, you can output waveforms at very high speeds (40 MS/s) because there is no need for continuous waveform memory transfers from computer memory to the instrument during waveform generation. Typically, this causes latencies in high-speed waveform generation. In addition, the onboard memory consists of optimized fast access memory modules.

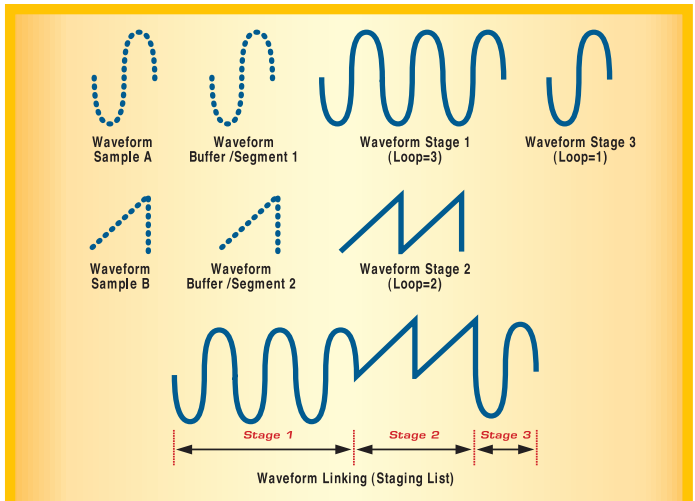
Waveform Generation

An arb addresses the user-defined waveform data stored in onboard memory buffers and converts each waveform data point, a (16-bit digital word) in memory to an analog voltage via a digital to analog converter (DAC). Only the 12 most significant bits are sent to the DAC. Thus the analog output of the NI 5411/NI 5431 has 12-bit vertical resolution.

The waveform is amplified and output through an analog amplifier. You can replay this waveform continuously or operate it as a triggered, gated, or burst waveform.

1. By controlling the update rate (sampling frequency), and the total number of points cycled (start to stop addresses), you can increase and decrease the frequency of the waveform. The update rate is the rate at which data is read from the buffer and sent to the arb output.
2. Setting the waveform data value and the gain of the output amplifier controls the output amplitude of the waveform.

Take the following scenario. The update rate is specified as 10 KHz; 10 Ksamples/s. A waveform is stored in memory where 256 samples are used to represent the unit cycle of the waveform. The output is a waveform with a frequency of 39.065 Hz. 39.065 Hz ↔ 10Ksamples/s ÷ 256 samples/cycle = 39.065 cycles/s.



The figure illustrates the concepts of waveform samples, buffer, stage, staging list, and linking and looping.

Sequencing, Linking, and Looping

It is true that fast access memory on the arb is valuable in providing speed and precision when generating arbitrary waveforms. But many applications, such as communications and disk drive testing, use complex signals that require many data points to define, and thus large amounts of memory. Because fast access memory for arbs is not cheap, we use memory access techniques to define complex signals from a limited set of data points, thus optimizing memory usage. These techniques include waveform sequencing, linking, and looping. By sequencing, linking, and looping, sample data does not have to be repeated in a buffer. This would waste valuable memory space. You only need to include this data once, and if it is needed again, you can link the waveform back to this data. If needed repetitively, you can loop the data, also reducing the amount of data you need to store in memory. In the above example, Waveform Buffer/Segment 1 represents a single cycle of a sine wave, and the waveform samples in Sample A are 12-bit samples. Waveform Stage 1 shows a stage created from Buffer 1.

1. Stage 1 is Buffer 1 with three cycle iterations. Waveform Sample B shows samples for Waveform Buffer/Segment 2, which represents a triangular waveform. You create Waveform Stage 2 using two iterations of Buffer 2.
2. Finally, you can link or sequence all three stages to create your final waveform.

Deep memory is essential for creation of long and complex waveforms, and waveform linking and looping is a critical feature for optimization of generating very long arbitrary waveforms, making efficient use of the available onboard memory.

Deep memory makes possible the storage of large and complex waveforms.

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For more information, view the NI 5411 and NI 5431 data sheets at ni.com/info/news

ni.com/instruments

Endless Possibilities Exist for Ethernet-Based Instrument Control Systems

Traditionally, networked applications have been useful for overcoming physical limitations, such as hazardous environments, cabling setup restrictions, or simply the control of systems in different locations. Many engineers are now realizing that networked instrumentation systems not only help overcome these limitations, but offer easier and more efficient integration for their systems.

With Ethernet networking, you can create one system in which all the pieces are easily integrated together – you control instruments, acquire data, process it, send it to databases, analyze it, and present it efficiently by having immediate access to it from virtually anywhere. With National Instruments Ethernet-to-GPIB and Ethernet-to-Serial controllers, you can easily network your existing GPIB or serial equipment into one application located anywhere in the world accessible via TCP/IP. The ability to connect all the components of your instrumentation system into one central network application brings endless possibilities to engineers looking for better and more efficient ways to develop and test products. By combining a new architecture, 100BaseT networking capabilities, and the high-speed HS488™ protocol, you can enhance performance by more than 10X as compared to existing GPIB controllers, making performance comparable to that of GPIB plug-in controllers with the flexibility of Ethernet GPIB control.

The GPIB-ENET/100 is easy to use and configure. Any program previously written for other National Instruments GPIB interfaces runs unmodified. You can configure the GPIB-ENET/100 with dynamic host configuration protocol (DHCP) or with a simple configuration utility. No dip switches or jumpers are required, and the controller offers flexible installation options including rack mounting, DIN rail mounting, wall mounting, and stackable stand-alone use. By combining the Ethernet-to-GPIB or the Ethernet-to-Serial controllers with National Instruments software, the possibilities are endless. Following are some examples:

With the GPIB-ENET/100, you can easily access remote equipment via TCP/IP.

With National Instruments Ethernet-to-GPIB and Ethernet-to-Serial controllers, you can easily network your existing GPIB or serial equipment into one application via TCP/IP.

You can monitor and control your remote instrumentation systems in several ways. You can directly connect a (remote) computer to an instrumentation system. If this computer is running any of our development environments, such as LabVIEW or Measurement Studio, you can use a second (local) computer at a completely different location to control the software running on the remote computer. Or, you could replace the remote computer with the Ethernet-to-GPIB or the Ethernet-to-Serial controllers and have complete control of the instrumentation system from your local computer. The latter method does not require you to write any extra code.

You can create Web pages that control remote GPIB instruments without writing a single line of code. You can use Measurement Studio to create Web pages based on ActiveX controllers by using a wizard that does not require any code development. In addition, Interchangeable Virtual Instrumentation (IVI™) ActiveX controls provide us with instrument soft front panels that you can place in a Web page for interactive control of the instruments. Finally, because you can configure the GPIB-ENET/100 in IVI as an interface for controlling a specific instrument, integration of all pieces provides you with a simple yet powerful method for creating Web pages and controlling your system within minutes.

You can control new Ethernet-based instruments with existing NI-VISA™ code. Our latest version of NI-VISA works with the VXI-11 protocol for control of Ethernet-based instruments, in addition to working with the control of VXI, GPIB, and serial instruments interchangeably. Thus, the high-level software provides you with tools to develop bus-independent instrument drivers efficiently. The VXI-11 protocol defines how to control Ethernet-based instruments that were designed to respond to SCPI-style commands. If you are using an Ethernet-based instrument for which there are VISA drivers available (such as VXI*plug&play* drivers), you can use existing code simply by specifying at the beginning of the program that you are using the Ethernet instrument interface instead of a GPIB or serial interface.

With the Ethernet-to-GPIB and Ethernet-to-Serial controller, you now have the freedom to access and control your test and measurement instrumentation from any remote location.

Vanessa Trujillo, GPIB Product Manager
E-mail vanessa.trujillo@ni.com

For more information, check GPIB-ENET/100 data sheet on the reply card or visit ni.com/info/news

ni.com/gpib

Increased Performance with New GPIB-USB Controller

With our latest USB-to-GPIB converter, GPIB-USB-A, we have enhanced performance by a factor of 20x for typical applications. The GPIB-USB-A works with the latest operating systems, including Windows 2000/98 and Windows Millennium Edition (Me). The GPIB-USB-A is the easiest way to get up and running with your instrumentation application.

The Universal Serial Bus (USB) Specification has grown steadily in popularity because of its wide availability and ease of use. However, USB technology has been limited primarily to control of peripheral devices. Since 1998, we have offered a USB-to-GPIB converter, so you can take advantage of the USB bus for controlling GPIB systems. We now offer a high-performance USB-to-GPIB converter that takes advantages of features of the newest operating systems.

The new GPIB-USB-A offers several convenient features to the user. On connection to the USB port of a computer, devices are automatically recognized by the computer's operating system. Also, you can exchange USB-based equipment freely without turning off the computer. Our external USB-to-GPIB converter takes advantage of these features and facilitates rapid automation of GPIB instruments.

GPIB-USB-A enhances by a factor of 20X from typical applications.

The user does not need an extra power cable because the controller is bus powered, and they do not need an additional GPIB cable because the controller plugs directly to the instrument. Also, the user does not need to deal with dip switches or open the computer to install a board. Furthermore, you do not need to modify existing software for GPIB applications because the USB-to-GPIB conversion is transparent and the NI-488.2™ API does not change.

For more information, check GPIB-USB-A data sheet on the reply card or visit ni.com/info/news

ni.com/gpib

USB 2.0 Specification Released

In April at the Windows Hardware Engineering Conference (WinHEC) in New Orleans, the release of the final version of the Universal Serial Bus (USB) 2.0 specification was announced.

The new specification boosts the maximum bit rate from the previous USB 1.1 specification 40 times – from 12 to 480 Mbs – while maintaining backwards compatibility with the USB 1.1 specification. That is, a USB 2.0 host or hub is required to handle USB 1.1 devices that operate at 1.5 Mbs (low speed) and 12 Mbs (full speed) along with devices operating at 480 Mbs (high speed).

This past May at the USB 2.0 Developers' Conference in Anaheim, Microsoft reiterated that it aims for USB 2.0 to work with Windows 2000 by Q4 2000. We expect some peripheral devices to be in the market-place around the same time; however, broad USB 2.0 availability is aimed for mid-2001.

With its greatly increased bandwidth, ease of use, and support from PC industry leaders, such as Microsoft and Intel, USB 2.0 should be an attractive interface for a wide range of peripherals. With USB 2.0, printers and scanners are faster than those with traditional serial and parallel port connections. With a bandwidth of 480 Mbs, USB 2.0 gives mass storage devices such as hard drives and zip drives a simple and inexpensive hot-pluggable interface. Therefore, hard drives can be portable and slotless computers can expand with greater ease. Streaming multimedia devices such as video cameras that have mediocre performance at 12 Mbs can have outstanding performance at 480 Mbs.

National Instruments currently has USB solutions for GPIB (see above) and data acquisition. Because USB 2.0 is backwards compatible, National Instruments current USB products are already compatible with the USB 2.0 specification. National Instruments is committed to providing more powerful and innovative USB solutions for the test and measurement world.

For more information, visit ni.com/usb

ni.com/usb

Ethernet and GPIB Controllers in One Plug-In Board Expand Your System

The PCI-8212 combines a PCI-GPIB controller and a standard Ethernet interface in a single PCI slot, providing you with additional slots for your instrumentation system. This board combines the functionality of two key components on today's instrumentation systems, while maintaining their high-performance capabilities.

The PCI-GPIB circuitry on the PCI-8212 uses the MITE™ and TNT4882™ ASICs for high performance. The hardware is completely software-configurable and compatible with the Plug and Play standard for easy hardware installation. The PCI-GPIB can sustain data transfer rates up to 1.5 Mbytes/s using the IEEE 488.1 3-wire handshake. The PCI-GPIB also implements the high-speed HS488 GPIB protocol for data transfers up to 8 Mbytes/s.

The PCI-8212 board preserves your software investments, and includes NI-488.2™ and NI-VISA™ application program interface (API) software for Windows 2000/NT/9x. Any software program previously written in either API for other National Instruments GPIB interfaces runs unmodified on the PCI-8212 board.

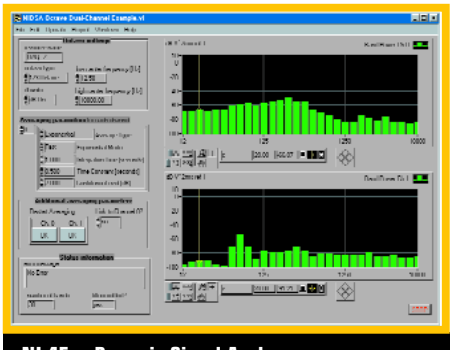
The Ethernet controller is the new Intel 82559 Fast Ethernet controller. This controller is compatible with both 10BaseT and 100BaseTX networks, automatically connecting at the highest speed available. By combining National Instruments GPIB expertise with industry-leading performance Ethernet controller technology, the PCI-8212 provides the performance and functionality that you need to control your networked instrumentation systems.

For more information, check PCI-8212 data sheet on the reply card or visit ni.com/info/news

ni.com/gpib

Real-Time Octave Analysis Software Expands Functionality of the NI 4551 Dynamic Signal Analyzer

Applications in the fields of audio, acoustic, and environmental noise use octave analysis to obtain meaningful measurements and results. Federal aviation regulations require the use of real-time octave analyzers for data analysis. Appliance and office equipment manufacturers test their products for environmental noise levels and often specify sound power levels for them. Octave analysis is also used to measure sound levels inside rooms or concert halls in order to determine proper construction materials.



NI 45xx Dynamic Signal Analyzer

We designed the National Instruments Real-Time Octave Analysis Software for use with the National Instruments NI 45xx dynamic signal analyzers. When combined with the NI 45xx dynamic signal analyzer, you can perform full, 1/3, and 1/12 real-time octave analysis according to ANSI S1.11 and IEC 1260 standards. An onboard processor, part of the NI 45xx dynamic signal analyzer, enables the real-time processing. The number of channels available for your application depends on the dynamic signal analyzer that you choose. In conjunction with LabVIEW or LabWindows/CVI, a component of Measurement Studio, and the examples that ship with the Real-Time Octave Analysis Software, you can quickly develop your application.

Because of the level measurements functionality of this software, you can quickly turn your NI 45xx dynamic signal analyzer into a flexible sound level meter. You can acquire up to 16 selectable level measurements simultaneously with or without weighting along with your real-time octave analysis. One shot and auto restart linear (Leq) averaging modes are also available. You can start and stop your averaging at time intervals determined by you, as well as rearm the averaging automatically with the auto restart mode.

The Real-Time Octave Analysis Software is an excellent addition to the existing functionality of the NI 45xx for PCI dynamic signal analyzer. You can perform octave analysis and level measurements with a choice of averaging modes and weighting filters. With this software add-on, the NI 45xx dynamic signal analyzer has the functionality of an FFT analyzer, swept sine analyzer, and octave analyzer.

For more information, check Real-Time Octave Analysis Software data sheet on the reply card or visit ni.com/info/news

ni.com/dsa

New Measurement Analysis Capability of LabVIEW 6*i* Gives You Flexibility

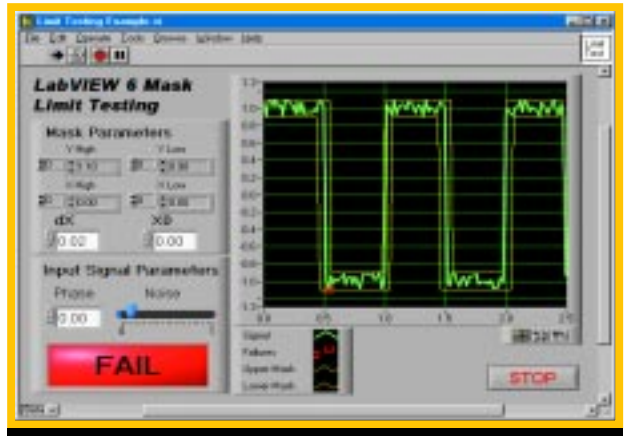
The new measurement analysis tools in LabVIEW 6*i* are a set of more than 30 tools (VIs) that can speed up development because you avoid coding and testing these routines yourself. In addition, by using the new waveform data type, the routines automatically associate signal samples with timing information, making them more powerful and easier to use.

Measurement Analysis Highlights

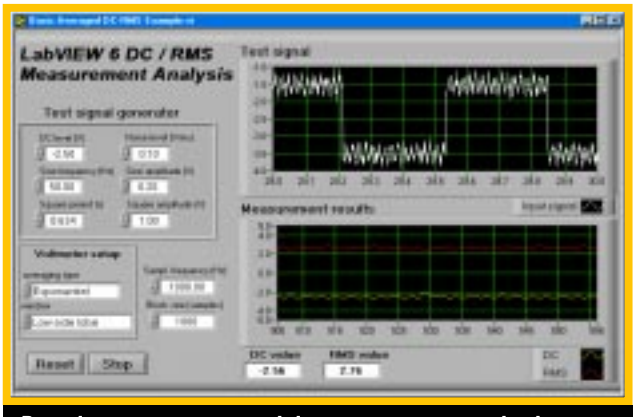
Highlights of these new routines fall into six categories:

1. **DC/RMS measurements** – take both averaged and non-averaged DC and RMS measurements. A key capability of these VIs is their flexibility, by modifying parameters you can tradeoff between speed and accuracy in your measurements. Example parameters include measurement time, averaging type (exponential or linear), an exponential averaging time constant, and a window type.
2. **Tone detection and distortion measurements** – extract peak parameters, such as frequency, amplitude, and phase from a time domain signal. The new VI includes a proprietary algorithm that compensates for inaccuracies because of spectral leakage and the discrete nature of the Discrete Fourier Transform (DFT). The same tone detection algorithm is also the basis for new Harmonic Distortion Analyzer and SINAD (Signal + Noise + Distortion) tools.
3. **Averaged frequency analysis** – perform spectral analysis with three types of averaging, including RMS, vector, and peak hold. By applying averaging, you can reduce signal fluctuations, improve the signal to noise ratio (SNR), and extract spectral peaks. These new routines also use an updated FFT algorithm that speeds up calculations for common array sizes (non-power of two). Most users will see speedups of 20 percent or more over the FFT found in LabVIEW 5.1.
4. **Limit mask testing** – setup pass/fail type tests quickly with results that depend on the time or frequency content of a signal. Commonly applied in telecom and machine conditioning applications, these tools compare a test signal with a predefined mask that specifies high and low values as a function of time or frequency. Pass and fail states are output during a test depending on whether or not a test signal exceeds or goes below these mask values at a particular frequency. To ease the creation of masks, the measurement analysis library includes two methods of specifying a mask; either as a set of arrays or as a function.
5. **Filtering** – apply infinite impulse response (IIR) and finite impulse response (FIR) digital filters to input signals. These tools feature the flexibility to design a filter in several different ways. For instance, one method of choosing an IIR filter is to select an order and a set of cutoff frequencies. You can also have the filter automatically choose an optimal order based on passband and stopband widths and gains that you specify.
6. **Signal generation** – generate standard signals (sine, square, triangle, etc.) for the new waveform datatype. You can also generate multitone signals with user control over the gain and phase of each component signal. With such signals, you can run frequency response tests in parallel, rather than one at a time, which can shorten test time. Other applications include generation of DTMF test signals for telephony and implementation of test stations that comply with standards that require multitone test.

LabVIEW 6*i* now includes both high and low-level analysis tools, giving you both efficiency and flexibility.



This limit mask test checks the input signal (green) against high and low limits (yellow). This particular signal fails because some portions of the input exceed or go below these limits (red squares).



By setting parameters, you can balance measurement speed and accuracy requirements with the new DC/RMS measurement analysis VIs.

LabVIEW 6*i* now includes both high and low-level measurement analysis tools, giving you both the efficiency of common analysis routines and the flexibility of building your own custom analysis with a wide variety of lower-level tools.

Sam Shearman, Signal Processing and Analysis Software Product Manager
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For more information, visit ni.com/analysis

ni.com/analysis

LabVIEW 6*i*, Infrared Imaging, and Ultrasonic Stimulation Combine to Deliver ThermoSoniX™

by Dino J. Farina, President,
Image Therm Engineering,
Dr. Austin Richards, Applications Engineer,
Indigo Systems Corporation, and
Prof. Xiaoyan Han, Professor,
Wayne State University

The Challenge: Integrating and building an easy-to-use and cost-effective system for non-destructive identification of cracks and defects in cast parts.

The Solution: Developing the ThermoSoniX Test Station using an Indigo Systems Corporation infrared camera, an ultrasonic excitation source, and custom pneumatically actuated hardware with LabVIEW, image acquisition (IMAQ), and data acquisition (DAQ) hardware and software.

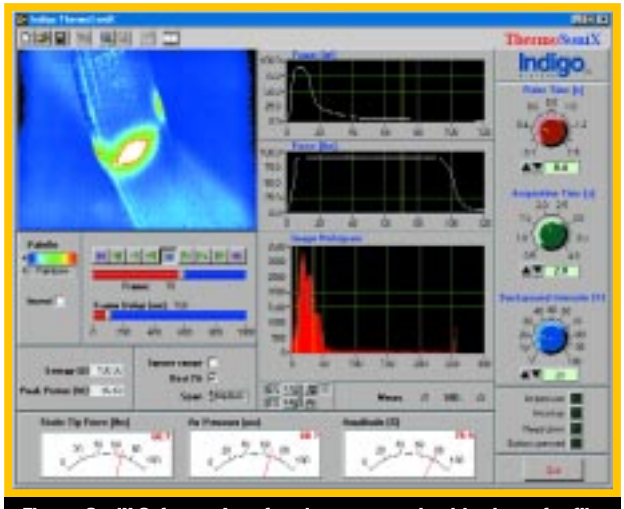
Cracks and defects in parts used in a variety of applications ranging from mission-critical aerospace and automotive parts to household fixtures can cause catastrophic failures when the parts are stressed during use. Using National Instruments LabVIEW software and hardware, Image Therm Engineering and Indigo Systems created an innovative solution, ThermoSoniX (patent pending), to find these cracks and defects quickly and accurately. Image Therm and Indigo Systems plan to upgrade ThermoSoniX to LabVIEW 6*i* because of the improved execution performance, including increased speed, smaller memory footprint, and tighter integration of DAQ and IMAQ available in LabVIEW 6*i*.

Manufactured Parts

The physical microstructure of all manufactured parts contains microscale cracks and defects. Various manufacturing steps, such as heat-treating, melting, casting, and cold-working, can alter these cracks and defects because they can change the internal stresses in the part. These so-called compression cracks are particularly troublesome for manufacturers because they are difficult to detect by visual inspection and can cause premature failures in parts without warning.

The ThermoSoniX Method

ThermoSoniX works by synchronizing ultrasonic stimulation with infrared imaging to identify cracks and defects in ferrous and non-ferrous metals, ceramics, and composite parts. When exposed to ultrasonic energy (typically 20 to 40 kHz), cracks or defects in a part can vibrate differentially inducing localized heating. ThermoSoniX uses an Indigo infrared camera to effectively image this induced heating, which is typically only a fraction of a degree. By combining LabVIEW with IMAQ and DAQ, ThermoSoniX analyzes the synchronized digital images acquired from the Indigo infrared camera through an IMAQ board and analog signals from the integrated ultrasonic excitation source through a DAQ board, then automatically produces intuitive images that highlight the cracks and defects in the part.



ThermoSoniX Software Interface incorporates intuitive icons for file I/O, camera control, and test set-up.

System Implementation and Setup

The software design of the ThermoSoniX system is inherently modular and is based on a LabVIEW state-machine architecture. We chose this approach because we could rapidly develop the system using time-tested tools and functions and leverage advances in hardware and driver software performance while keeping the overall software simple and easy to use. The modularity of the Test Station makes it well suited for custom integrated systems for production and online applications. We chose LabVIEW for ThermoSoniX system development because it offered us the best mix of rapid prototyping tools, built-in support for synchronized IMAQ and DAQ using the RTSI bus, and a modular framework that would enable us to offer cost-effective, custom integrated versions of the system. In addition, the built-in support for RTSI-based synchronization of IMAQ and DAQ events radically simplified the hardware implementation and cabling.

The Indigo Systems Merlin camera family uses a modular electronics framework to give optimal performance in many different IR spectral bands while keeping the digital output on the cameras identical.

Summary

ThermoSoniX delivers radically improved part inspection performance by replacing many of the expensive, time-consuming, and environmentally unfriendly techniques currently used in the non-destructive testing (NDT) market.

For more information, contact Dino Farina, President, Image Therm Engineering Inc., 142 North Rd, Suite 100, Sudbury, MA 01776, tel (978) 371-8822 x201, e-mail dfarina@imagetherm.com or Dr. Austin Richards, Applications Engineer, Indigo Systems Corporation, 5385 Hollister Ave #103, Santa Barbara, CA 93111, tel (805) 964-9797, e-mail richards@indigosystems.com

ni.com/success

Start-Up Kits – A Faster Way to Your Solution

Busy test professionals need to complete tests quickly for numerous and often unique applications. Computer-based measurement and automation brings the flexibility you need and, now, start-up kits get you started quickly.

What is a Start-Up Kit?

A start-up kit is a combination of ready-to-run example code, a list of suggested hardware, a specification sheet, and setup instructions. We designed the kit to be a starting point, and for some, complete functionality if it meets the specific application need. Together with your computer and sensors, these kits create a quick solution. Currently, National Instruments has several start-up kits available. These include:

- Dynamometer Controller
- Transient Noise Detector (Engine Knock Detector)
- Frequency Detector

Use these kits along with standard National Instruments hardware and software, such as LabVIEW and data acquisition products.

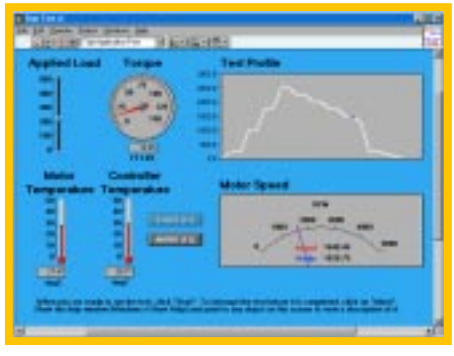
A Start-Up Kit is a combination of ready-to-run example code, a list of suggested hardware, a specification sheet, and setup instructions.

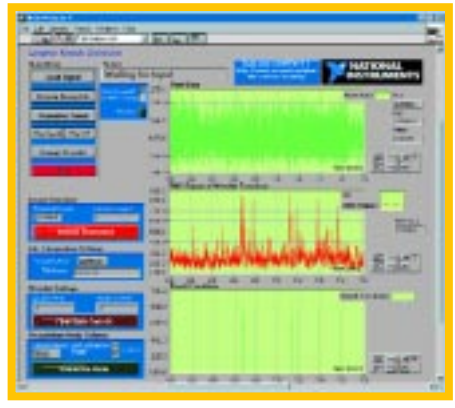
An Architecture for Expandability

If the start-up kit example code meets your application needs, then you are ready to run. If you need additional functionality, use the modular example code as a starting place for straightforward modification. Typically the code is based on a "state-machine" architecture that provides segmentation of major functions. This helps in locating functional modules for modification.

A Start-Up Kit Example

The frequency detector is a start-up kit currently available from National Instruments. With it, you can enter frequency ranges and amplitudes. If a frequency and/or amplitude is exceeded, the kit stores the data segment containing that information to hard disk. An included data reviewer provides post acquisition viewing of the data and audible playback through a standard PC sound card.





Currently, National Instruments and Alliance Program members develop start-up kits. You can download them from the National Instruments Web site at ni.com/auto, part of the National Instruments Solutions Exchange on NI Developer Zone™. The Solutions Exchange is a forum for you to get the latest computer-based measurement and automation-based solution examples so you have your tests running quickly.

For more information, visit NI Developer Zone Solutions Exchange at ni.com/auto

ni.com/auto

Dell and NI Workstations Are Ready for Order

National Instruments and Dell Computer Corporation are pleased to announce immediate availability in the U.S. of the new "Measurement Ready" and "Instrument Ready" Precision 420 Workstations.

Measurement Ready and Instrument Ready systems come direct from Dell with National Instruments DAQ and GPIB hardware, and LabVIEW software installed, configured, and ready to run on a high-performance Dell Precision 420 WorkStation – capable of handling your most challenging measurement and automation applications. The Measurement Ready Precision 420 Workstation bundle (MSRWS) includes LabVIEW Full Development System, PCI-6052E multi-function board, and PCI-GPIB board. The Instrument Ready Precision 420 Workstation bundle (INSTWS) includes the LabVIEW Full Development System and a PCI-GPIB board.

These value added offerings are not standard Dell factory options, but you can order them to be factory installed on your Dell Precision 420 Workstation through DellPlus.

Visit the National Instruments Web site at ni.com/dell to learn more about the Measurement Ready and Instrument Ready Workstations and the National Instruments and Dell Strategic Alliance.

ni.com/dell

This Quarter at ni.com™

NI Developer Zone – All Meat, No Fluff

NI Developer Zone is a valuable resource for building measurement and automation systems. It contains more than 1,600 instrument drivers, 1,200 example programs, 400 tutorials, 100 presentations, and a Measurement Glossary with more than 2,500 definitions. Bookmark zone.ni.com now!

In August, we also unveil the NI Developer Zone eZine, an online collection of articles with a decidedly technical focus. The NI Developer Zone technical newsletter

features four monthly columns focusing on LabVIEW techniques (contributed by LTR magazine), DAQ, automated test, and general software.

LabVIEW	Remembering Control Values
DAQ	System Calibration Reduces Measurement Uncertainty
Test	Choice of Spectrum Analyzer Determined by Choice of Measurements
Software	Curve-Fitting in LabVIEW 6*i*

zone.ni.com

Online Demos Now Available

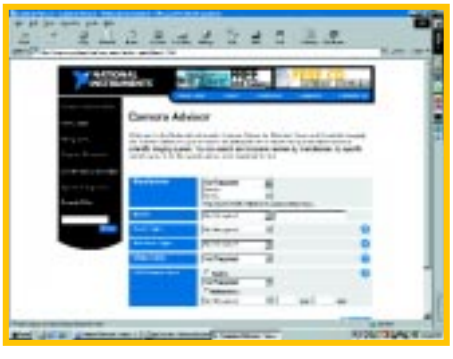
Take advantage of the Internet capability of NI products by experimenting with them via your Web browser. New online demos include:

- Inverted Pendulum – Download a LabVIEW VI and control an inverted pendulum using LabVIEW RT from anywhere in the world. The demo includes a QuickCam broadcasting images of the pendulum live on the Web.
- Weather Station – Check weather conditions around the world with the FieldPoint™ weather network. Each location transmits temperature, humidity, wind speed and direction, and other weather conditions via the LabVIEW Web Server to a PC in Austin, Texas for display on the Web.

ni.com/info/news

Camera Advisor™ Helps Complete Your Image Application

Engineers and scientists now have a one-stop resource on the Internet for selecting a scientific imaging or industrial machine vision camera. With National Instruments Camera Advisor, at ni.com/camera, users can compare camera features and specifications for more than 100 cameras. Camera Advisor also explains how various cameras work with National Instruments software and hardware.



Users who visit this new section of the National Instruments Web site can compare different models and makes of cameras, such as line scan, area scan, progressive scan, color, and digital and analog cameras. They can also use Camera Advisor to compare technical details of the cameras.

Visit Camera Advisor at ni.com/camera

ni.com/camera

Learn More about Networked Measurements at ni.com

This issue of *Instrumentation Newsletter* focused on networked measurements. The NI Developer Zone Product Resource Library contains a variety of material on this topic, including:

- Developing Networked Data Acquisition Systems with NI-DAQ – Learn how you can take advantage of your existing network infrastructure and your existing programming investment to install a remote data acquisition system.
- How to Network Two PCs for Remote Data Acquisition – Learn how to install a two-station Ethernet LAN and configure Windows to implement remote data acquisition when there is no network in place.
- Developing Distributed GPIB Test Systems Using GPIB-ENET and Existing Ethernet Networks – Learn the basics of implementing distributed test applications using an Ethernet-to-GPIB controller. Includes three example applications in source code to help you develop your own distributed test applications.
- Building an Interactive Web Page with DataSocket – Learn how to create a software component that you can insert in a Web page to read, write, or share data with other applications across the Internet.
- Performing Remote Measurements – Examine several remote measurement scenarios, including how to deal with firewalls and how to communicate with remote measurement nodes over different transport media.

Find links to all of these materials and more at ni.com/info/news

ni.com/info/news

Motion Goto! Program Offers Standard Configurators

Viewpoint Systems, a National Instruments Select Integrator, announces the Motion Goto! program in which you can order standard and custom configurations based on National Instruments motion control hardware and mechanical hardware from other major manufacturers.

There are standard system configurations for moving a conveyor belt as part of a pick-and-place system, rotating a shaft in an encoder-based test system, and moving a camera over a large plate or sheet under inspection.

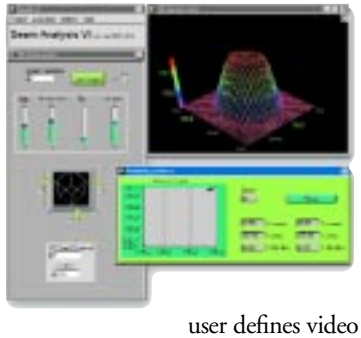
You can also mix and match components to suit a variety of needs. All standard configurations begin with National Instruments FlexMotion™ 7344 available for PCI, PXI, and FireWire buses. Small-motor applications use National Instruments MID power drives to provide the electrical needs of the motors. Large motor applications that require voltages exceeding 24 VDC are handled using third-party drives interfacing to the NI 7344 motion control card via National Instruments Universal Motion Interface (UMI). Whether through a MID power drive or a UMI, all necessary motion signals are available to NI 7344 motion control cards.

For more challenging applications, you can order a custom motion control system with capabilities expanded beyond the standard configuration and designed to suit your needs.

For more information, contact Doug Femec of Viewpoint Systems Inc, 800 West Metro Parkway, Rochester, NY 14623, tel (716) 475-9555, fax (716) 475-9645, e-mail info@viewpointusa.com, or Web viewpointusa.com/MotionGoto.html

General Vision Releases New Beam Analysis System

General Vision Inc. announces Beam Analysis Version 5.8 for laser beam diagnostics and profiling. Beam Analysis VI 5.8 is developed with National Instruments LabVIEW and IMAQ Vision Toolkit and interfaces with National Instruments PCI-1407, PCI-1408, and PCI-1424.



Version 5.8 can process video images from standard analog monochrome cameras and digital cameras with up to 16-bit pixel resolution and unlimited spatial resolution. For any project, users can choose among three live beam analysis modes and two data logging options.

To begin a new beam experiment or project, the user defines video acquisition settings, chooses a method to delimit the beam edge, and calibrates pixel and intensity dimensions in user-unit. For optimization of the speed performance, the user can select the list of measurements and display necessary information for the project. The definition of a project can then be saved to disk and retrieved at any time.

For more information, contact General Vision Inc., 1150 Industrial Avenue, Suite C, Petaluma, CA 94952, tel (707) 765-6150, fax (707) 765-6473, e-mail info@general-vision.com, Web general-vision.com

Alfautomazione Introduces End-of-Line Tester for Automotive Telematic Systems

Car navigators and telematic systems are becoming the new frontier of car electronics, where many communication and multimedia functions are integrated. Alfautomazione, a Select Integrator, introduces the NAVTEST3000, an open test platform for car telematics based on worldwide standards and available parts for the global market.

NAVTEST3000 uses National Instruments PXI, TestStand, and IMAQ to perform telematic communication testing, audio testing, voice recognition testing, and GPS testing. In addition, users can test CD or DVD players, AM/FM radio, gyroscopes, and front panels.

The system provides a dual fixture turntable for testing of two stations simultaneously. Tests are performed in parallel on two UUTs for higher optimization of the work cycle and higher throughput and efficiency than a single fixture system. The test application independently controls the system automation so operator safety is ensured by design. Operator functions are separated from the system administration functions by separate hardware and software passwords, which safeguards system integrity and ease of use. System shielding, grounds separation, and proper system design provide low system background noise and radiation.

The NAVTEST3000 fixtures and application software can be interchanged in less than five minutes. Because of the mechanical design compactness and ruggedness, you can easily transport the system all over the world.

For more information about NAVTEST3000, contact Alfautomazione at Via Magenta, 12-20035, Lissone (Mi) Italy, tel +39 039 245 99 72, fax +39 039 245 99 80, or Web alfautomazione.it

NIWeek 2000 Connects People and Solutions

On August 16-18th, more than 1,500 people from around the world gathered in Austin for NIWeek 2000 the Worldwide Conference on Measurement and Automation. With the latest advances in PC technologies, there are now more ways than ever to connect your measurements to automate your tests and processes.

At NIWeek the LabVIEW engineering team unveiled the new LabVIEW 6*i*. Dr. Truchard, President and CEO, followed with his presentation on "The Return of Edison" proclaiming that with the advancement in computer-based tools, we are again returning to the days of Edison – where a small band of researchers can once again accomplish great things. On Thursday, Tim Dehne, Vice President of Engineering, gave attendees a tour through our engineering department and how we are leveraging Internet and network technologies, so you can publish data to the Web, stream data between computers, make remote measurements over Ethernet, and distribute your application execution. On Friday, Paul Saffo, Director at the Institute for Future, discussed how to thrive during technology change. Throughout the week, we explored how to make measurements in our Internet and digital world, and how to get the most out of state-of-the-art hardware and industry-leading software.

Make Plans to Join Us Next Time

Make plans now to attend NIWeek 2001! Find out about the latest developments in computer-based measurement and automation while enjoying the festivities surrounding this industry event. In the meantime, be sure to join us for NIDays – one-day events that are held regionally around the world.

To register for NIWeek 2001, visit ni.com/niweek

Best Application Contest Winners

114 customers participated in the Best Application Contest. Criteria for the contest included technical challenge, innovation, and cost-effectiveness of the solutions. National Instruments would like to recognize the following people:

Best in Category Awards

Academic Mike Warren and Jay Porter from Texas A&M University for their paper, "A Low-Cost Virtual Instrumentation Tester for Teaching Mixed Signal Characterization Concepts"

Aerospace/Defense Dr. Kamal Poddar and Dr. Sanjay Gupta from the Indian Institute of Technology for their paper, "Instrumentation of a 3m Low Speed Wind Tunnel"

Automotive Dino Farina from Image Therm Engineering, Inc. for his paper, "ThermoSonix – A Novel Infrared and Ultrasonic-Based System for Non-Destructive Testing Built with LabVIEW, IMAQ Vision, and DAQ"

Automotive-Power Train Alfred Collins from Raeburn Technology for his paper, "Engine Knock Analyzer"

Biomedical Eric Nerhlich from San Francisco Industrial Software for his paper, "Prototyping a Digital Flow Cytometer the NI Way"

Maintenance/Field Test Lance Butler from B&B Technologies for his paper, "LabVIEW and NI Instrumentation Create an In Vehicle Thermal Monitoring System"

Production and Manufacturing Greg Harasym, Steve Conquergood and Jeff Aitchitson from Advanced Measurements Inc. for their paper, "Behlen Industries – LabVIEW RT Controller"

R&D Carmen Maria Retevoi from the National Institute for Research and Development For Cryrogenics and Isotope Separation for her paper, "Virtual Instrumentation for Monitoring the Purifying Installation from Cryrogenic Pilot Plant with Remote Data Acquisition"

Semiconductor S.B. Rajnarayanan from Soliton Automation Pvt. Ltd. for his paper, "PC-Based System Results in Faster Testing of Electronic Components"

Telecom Sundaram Raghuraman from VI Engineering for his paper, "Radio Frequency Test Stands for Remote Controllers"

Test and Quality G. Abdulla from Soliton Automation Pvt. Ltd. for his paper, "Large Scale Battery Test System"

LabVIEW Interface Now Available for Karl Suss Probe Systems

Bloomy Controls, a Select Integrator, has developed the Suss Interface Toolkit for LabVIEW. With the toolkit, semiconductor test engineers now can seamlessly incorporate National Instruments LabVIEW into Karl Suss manual, semiautomatic, and fully automatic probe systems to customize and automate wafer-level test applications.

The Suss Interface Toolkit for LabVIEW has the look and feel of a standard LabVIEW instrument driver with which LabVIEW developers are familiar. With the toolkit, users can make wafer, microscope, and programmable probehead stage movements, make movements to the first die, and step through the wafer map with a click of a button. In addition, users now can easily create custom test system interfaces and link to a much wider variety of test instrumentation to the probe systems for their specific application.

For more information, contact Karl Suss, 228 Suss Drive, Waterbury Center, VT 05677, tel (802) 244-5181, fax (802) 244-5103, e-mail info@suss.com , Web suss.com or Bloomy Controls, 839 Marshall Phelps Rd., Windsor, Conn 06095, tel (860) 298-9925, fax (860) 298-9535, e-mail info@bloomy.com, Web bloomy.com

Learn about the new Internet capability of LabVIEW 6*i* on page 1.

New Basic IVI Class Drivers Available FREE at ni.com

Coincident with the release of the IVI Driver Toolset 1.1, National Instruments is making available a base version of the IVI class drivers for free download from the Instrument Driver Network at ni.com/idnet With these drivers, you have instrument interchangeability but not any advanced simulation or enhanced debugging support. These drivers are available as LabVIEW programs (VIs), LabWindows/CVI – a component of Measurement Studio – function panel (.fp) files, and dynamic link libraries (DLLs) for other development environments such as Visual Basic and Visual C++.

We updated the IVI Driver Toolset Version 1.1 so the included drivers are all compliant with revision 2.0 of the IVI Foundation class API specifications for oscilloscopes, digital multimeters, DC power supplies, arbitrary waveform/function generators, and switches/matrices. The IVI Driver Toolset includes class drivers that support advanced class-level simulation, enhanced debugging through integration into NI-Spy, support for more than 100 instrument models through instrument-specific IVI drivers, and IVI soft front panels for interactive control of instruments.

For more information, check IVI brochure on the reply card.

ni.com/idnet

Look for the National Instruments booth at these upcoming trade shows:

AutoTestCon – Anaheim, CA	Aug 19-21	**High Technology** – Toronto, Ontario	Oct 3-4
Sensors – Detroit, MI	Aug 19-21	**Vision Show** – San Jose, CA	Oct 3-5
Embedded Systems Conf – San Jose, CA	Aug 26-28	**International Test Conf** – Atlantic City, NJ	Oct 3-5
Assembly Technology Expo – Chicago, IL	Aug 26-28	**China Hitech Fair** – Shenzhen, China	Oct 5-8
MessComp – Wiesbaden, Germany	Sep 5-7	**Het Instrument** – Utrecht, Netherlands	Oct 9-13
Komponent – Göteborg, Sweden	Sep 5-8	**Taitronics 2000** – Taipei, Taiwan	Oct 9-13
MICONEX 2000 – Beijing, China	Sep 11-14	**SEMIcon SW** – Austin, TX	Oct 17-18
Embedded Computing and RT Computer Show – Oslo, Norway	Sep 13-18	**Mexitronica** – Guadalajara, Mexico	Oct 17-19
SEP – Paris, France	Sep 19-21	**SMAU** – Milan, Italy	Oct 19-23
Inter/electronic – Brussels, Belgium	Sep 19-22	**Embedded Computing and RT Computer Show** – Nice, France	Oct 24
Embedded Computing and RT Computer Show – Helsinki, Finland	Sep 20	**Matelec** – Madrid, Spain	Oct 24-28
Instrumentation – Sandown, UK	Sep 27-28	**Nepcon Texas** – Dallas, TX	Nov 1-2
Tekniikka 2000 – Jyväskylä, Finland	Sep 27-29	**Photonics** – Boston, MA	Nov 6-8
MT Austria – Viena, Austria	Sep 27-29	**Telecom** – Tel Aviv, Israel	Nov 6-9
Embedded Computing and RT Computer Show – Utrecht, Netherlands	Sep 28	**BIAS 2000** – Milan, Italy	Nov 7-11
KES2000 – Seoul. Korea	Oct 2-6	**Electronica** – Muenchen, Germany	Nov 21-24

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