Product Brochure

Remote Control and System Expansion

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Contents

Remote Control and System Expansion

PXIe-8361, PCIe-8363, PXIe-8364, PXIe-8374, PXIe-8398, PXIe-8399, PCIe-8398, PXIe-8394, PXIe-8301

FIGURE 1

PXIe-8361 and PCIe-8363 Modules

- Control a PXI chassis from a desktop PC, laptop, or rack-mount controller
- Create synchronized, data-connected, multichassis PXI systems
- Up to 13.7 GB/s of sustained data throughput
- Copper and fiber-optic cable options
- Software-transparent link requiring no programming

Remote Control and System Expansion through MXI-Express

NI's PXI remote control solutions offer the performance and benefits of the PXI platform while enabling chassis control through desktop PCs, rackmount controllers, laptops, or other PXI systems. Through MXI-Express technology, NI PXI Remote Control Modules provide a simple, transparent connection between the host machine and the PXI chassis and instruments. NI offers a variety of remote control options to suit application requirements such as high-speed data throughput, long-distance cabling, and host form factors.

NI MXI-Express technology also allows data streaming and communication between multiple PXI chassis. Multichassis systems support either daisy-chain or star topologies and can take advantage of powerful features such as synchronization and peer-to-peer streaming between chassis-separated instruments.

Components of a Remotely Controlled PXI System

Desktop or Rack-Mount PC Control of a PXI Chassis

To control a PXI chassis from a desktop or rack-mount PC, a PXI Remote Control Module must be placed in the system slot fo the PXI chassis, and a host interface card must be used in the host PC. This allows the host computer to establish a PCI Express connection to the chassis using a compatible MXI-Express Cable.

Laptop Control of a PXI Chassis

When the host machine controlling the PXI chassis is a laptop PC, the NI PXIe-8301 Remote Control Module must be placed in the system slot of the PXI chassis. The PXIe-8301 and laptop must be connected using a Thunderbolt™ 3™ cable.

FIGURE 3

The PXIe-8301 provides PCI Express Gen 3 connectivity to a laptop PC.

Selection Guide	Model	Part Number	Type	MXI Bandwidth	MXI Communication Level	MXI Ports	Supported Cable Type	Supports Daisy-Chaining
Entry Level	PXIe-8361	779700-02	PXI Remote Control Module	250 MB/s	MXI-Express x1	1	Copper	—
	PCIe-8363	788814-01	Host Interface	—	MXI-Express x1	1	Copper	—
	PXIe-8364	781819-01	Bus Extension Module	250 MB/s	MXI-Express x1	—	Copper	—
	PXIe-8374	781820-04	Bus Extension Module	1 GB/s	MXI-Express x4	—	Copper	—
Performance	PXIe-8398	784178-01	PXI Remote Control Module	16 GB/s	MXI-Express Gen3 x16	4	Copper and Fiber-Optic	√
	PXIe-8399	784180-01	PXI Remote Control Module	16 GB/s	MXI-Express Gen3 x16	8	Copper and Fiber-Optic	√
	PCIe-8398	784179-01	Host Interface	—	MXI-Express Gen3 x16	1	Copper and Fiber-Optic	—
	PXIe-8394	785157-01	See Note below*	7.9 GB/s	MXI-Express Gen3 x8	—	Copper and Fiber-Optic	—
Thunderbolt	PXIe-8301	785679-01	PXI Remote Control Module	2.3 GB/s	Thunderbolt 3.0	2	Copper	—

*PXIe-839X Gen 3: Through modular cabling and/or the PXIe-8394 Gen 3 x8 bus extension module, several multichassis system configurations are possible.

NI PXIe-839x Gen 3 Multichassis Topology Notes

Through modular cabling and/or the PXIe-8394 Gen 3 x8 bus extension module, several multichassis system configurations are possible:

Star Topology	The PCIe-8398 host interface card supports either one x16 or two x8 downstream links.
Daisy-Chain Topology	The PXIe-8398 and PXIe-8399 remote control modules support either x16, x8, or x4 links for additional downstream daisy chaining. The PXIe-8394 bus extension module supports either one x8 or two x4 links from a peripheral slot for daisy chaining to additional chassis.
Tree Topology	A multitude of additional tree topologies are possible by combining both those methodologies.

Choosing a Remote Control Solution

To ensure that a remote control solution is compatible with a system and meets application needs there are various considerations to be made when selecting a remote control module and the host interface component.

Cabling

PXI Remote Control Modules support either copper cabling, fiber optic cabling, or both. Copper cables offer higher data throughput capability but are generally shorter (1 to 10 meters), while fiber optic cables are available in much longer options (up to 100 meters) but may have lower data throughput capability.

Some remote control modules are only compatible with a particular type of cable, such as the PXIe-8384 which only supports copper cables. Other remote control modules support both copper and fiber optic cables. For instance, the PXIe-8381 may be used with copper cabling for a Gen 2 x8 connection (3.2 GB/s) or with fiber optic cabling for a Gen 2 x4 connection (1.6 GB/s).

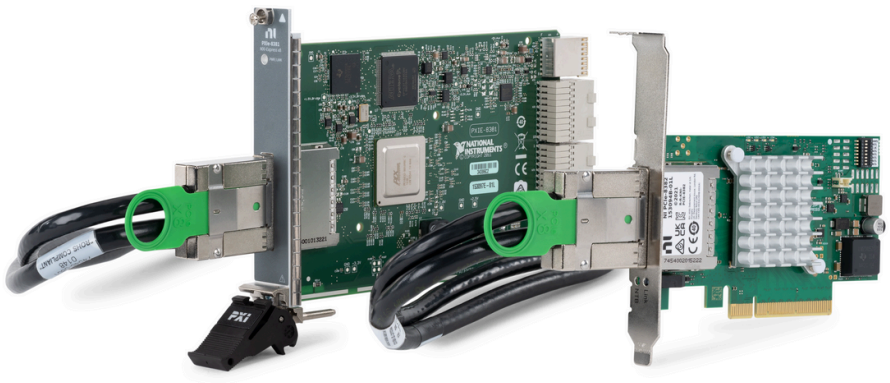


FIGURE 4

The PXIe-8381 can be used with fiber optic cabling for a Gen2 x4 connection, or with copper cabling for a Gen2 x8 connection as shown above connected to the PCIe-8382.

Data Throughput

Each remote control solution supports a specified maximum data throughput between the remote control module and the host interface. With PXI-1 devices, this data throughput is limited to 100 MB/s. With PXIe-based devices, the data throughput is greatly dependent on the hardware's PCI Express technology. For instance, the PXIe-8381 and PCIe-8398 support the transmission of data over eight lanes using PCI Express 2.0, otherwise known as Gen 2 x8, which allows for up to 3.2 GB/s of data throughput in a single direction.

A remote control solution should be chosen that meets the data throughput requirements of an application. Note that while the MXI-Express connection may allow for certain data throughput between the remote control module and the host, care should be taken to understand the total architecture of the system to understand its data throughput capabilities. For more information about the data throughput considerations, refer to the white paper Streaming Architecture of the Industry's Highest Performance PXI Express Platform.

PC Compatibility

Most PCs are immediately compatible with PXI remote control solutions. Furthermore, compatibility with MXI-Express devices is extended to even more PCs through NI's MXI-Express BIOS Compatibility Software.

Multichassis Configurations

Multichassis configurations allow two or more PXI chassis to be managed by a single master controller. As a unified system, multiple chassis can take advantage of benefits such as cross-chassis synchronization, separation of instrument types to optimize data throughput, and peer-to-peer transfers between instruments in separate chassis.

Flexible Topologies

The most common method of forming a multichassis system is through daisy chaining. A daisy-chain topology consists of one or more slave (downstream) chassis connected in series to a master (upstream) chassis that is controlled through a PC or PXI embedded controller. When using a daisy-chain topology, each slave chassis is visible to and controllable by the host machine.

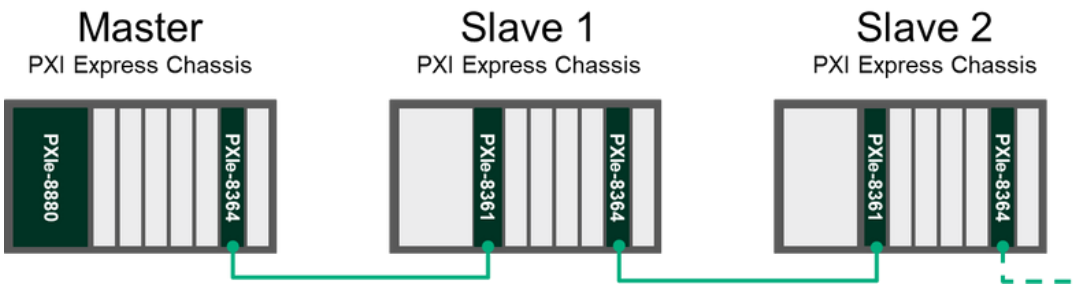


FIGURE 5

A PXIe-8364 host interface is placed in a peripheral slot of the master chassis containing an embedded controller. An additional chassis is daisy chained by connecting the PXIe-8364 to a PXIe-8361 in the system controller slot of the slave chassis. Additional modules may be used to daisy chain up to eight chassis.

While some remote control solutions require an additional module in a peripheral slot for daisy chaining, such as the PXIe-8364, some PXI Remote Control Modules contain built-in daisy-chaining capability through the inclusion of multiple ports. These include one for an upstream connection and one or more for downstream connections. Several remote control modules contain this feature, such as the PXIe-8398 and the PXIe-8399.

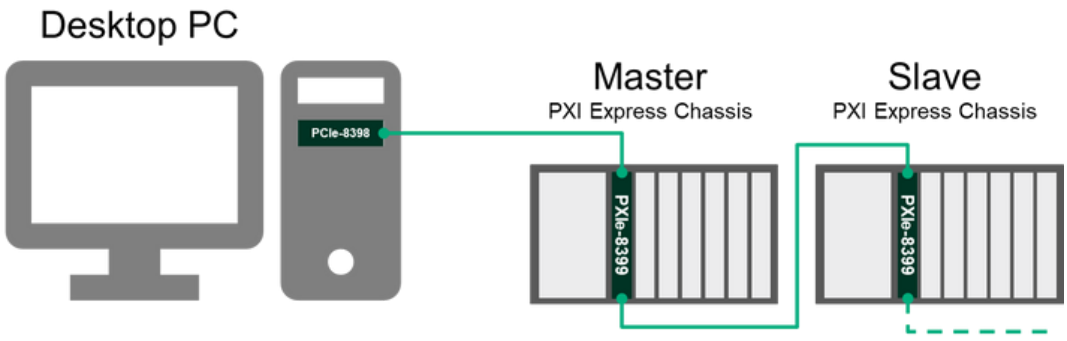


FIGURE 6

A desktop PC with a PCIe-8398 is connected to a master PXI Express chassis through a NI PXIe-8399 Remote Control Module. The PXIe-8399 features an additional port for daisy chaining, requiring only an additional PXIe-8399 in the slave chassis.

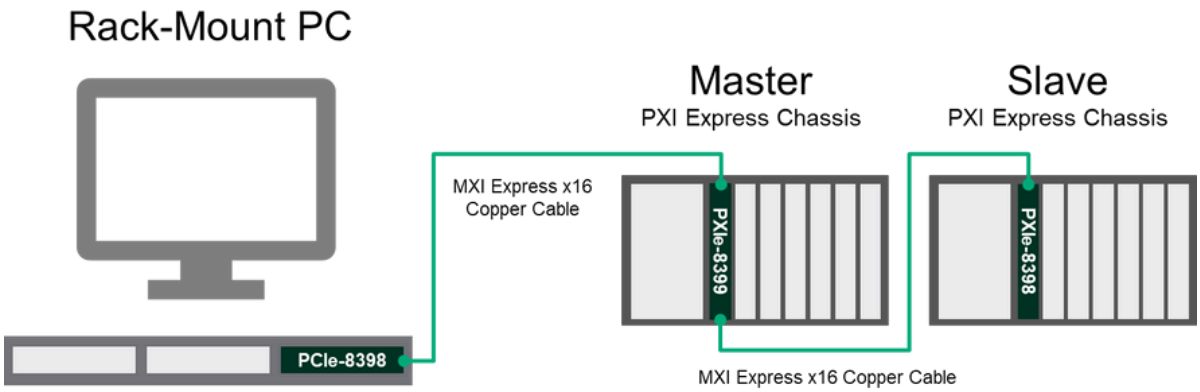


FIGURE 7

An NI rack-mount controller is connected to a master chassis using a PCIe-8398 and PXIe-8399. The PXIe-8399 features additional ports and modular cabling for daisy chaining. An additional chassis is added to the system by connecting the PXIe-8399 to a PXIe-8398 in the slave chassis. Note that if an additional chassis were required, the PXIe-8398 could be replaced with another PXIe-8399, allowing for further expansion.

Some host interface cards contain two downstream ports allowing for a star topology. Rather than connecting two slave chassis in series (daisy chain), the star topology connects two slave chassis in parallel, allowing each chassis to communicate directly to the host rather than through an intermediary chassis.

Multichassis Synchronization

PXI Remote Control Modules can leverage the architecture of the PXI platform to achieve high-accuracy synchronization between modular instruments in separate chassis. When combined with NI's timing and synchronization modules, such as the PXIe-6674T, MXI-Express enables instruments across multiple chassis to be synchronized with deskewing through NI-TClk technology. For more information about multichassis synchronization, read the white paper NI-TClk Technology for Timing and Synchronization of Modular Instruments.

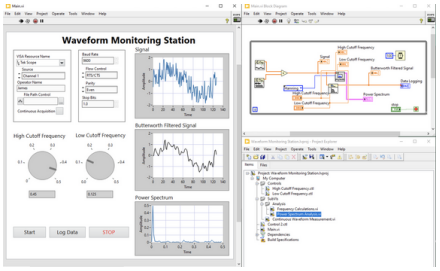
Peer-to-Peer Streaming

Peer-to-peer (P2P) streaming technology uses PCI Express to enable direct, point-to-point transfers between multiple instruments without sending data through the host processor or memory. MXI-Express technology extends P2P streaming across multiple chassis, allowing high-speed, low-latency data transfer between chassis-separated devices such as NI FlexRIO FPGA modules, digitizer modules, or vector signal transceiver modules. For more information about peer-to-peer streaming and supported devices, read the white paper An Introduction to Peer-to-Peer Streaming.

NI Software-The Right Tool for the Job

NI has a variety of software for engineers working on research, validation, and production test applications. Learn about our software that helps engineers perform quick ad-hoc tests, build an automated test system, automate data analysis and reporting, develop test sequences, and more.

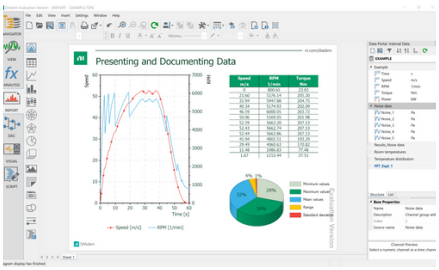
LabVIEW



Graphical programming environment that engineers use to develop automated research, validation, and production test systems.

- Acquire data from NI and third-party hardware and communicate using industry protocols
- Use configurable, interactive display elements
- Take advantage of available analysis functions

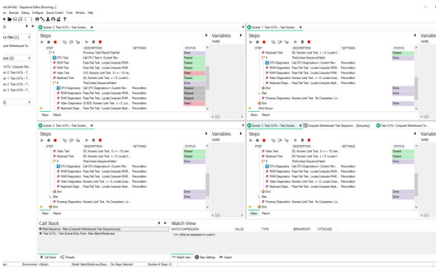
DIAdem



Data analytics software for measurement data search, inspection, analysis, and automated reporting.

- Display data in multiple 2D-axis systems
- Perform calculations with a simple point-and-click interface
- Automate your measurement data analysis workflow, from import to analysis

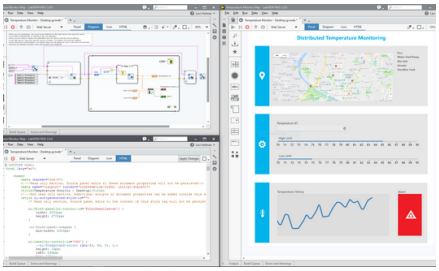
TestStand



Test executive software that accelerates system development for engineers in validation and production.

- Call and execute tests in LabVIEW, Python, C/C++, or .NET
- Conduct complex tasks, such as parallel testing
- Create customer operator interfaces and robust tools for deployment and debugging

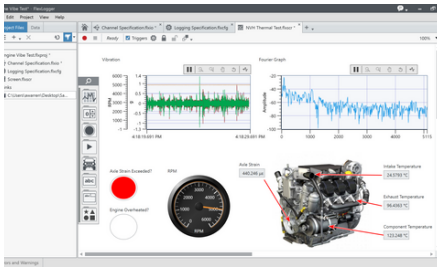
G Web



Development software that helps engineers create web-based user interfaces wihtout the need for traditional web development skills.

- Data transfer APIs for connecting to systems written in LabVIEW, Python, or C#
- Pre-built objects for data display and user input
- Included hosting on SystemLink™ Cloud

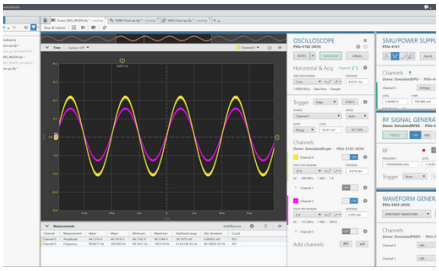
FlexLogger™



No-code data acquisition software engineers use to build validation and verification test applications.

- Interactive visualization tools for monitoring tests with drag-and-drop charts, graphs, and controls
- Ability to set alarms that monitor single channels or groups for unexpected behavior

InstrumentStudio™



Application software that simplifies setup and configuration of NI PXI hardware

- Customizable layouts for monitoring multiple instruments at once
- Interactively debug in tandem with code
- TDMS file export containing instrument settings, measurements, and raw data

Supporting Documentation

Table 2. PXI Remote Control Module Documentation

Document Type	Model
Getting Started Guide	MXI-Express Series User Manual
Specifications	PXIe-8361, PCIe-8363, PXIe-8364, PXIe-8374, PXIe-8398, PXIe-8399, PCIe-8398, PXIe-8394, PXIe-8301

Configure a Custom NI System

NI's online system advisors help you create a custom system based on your specific requirements. Use the advisor to choose compatible hardware, software, accessories, and services and then save your selections as configurations for easy quoting and purchasing later. Visit ni.com/advisor to learn more.

What Is PXI?

A Platform Approach to Test and Measurement

Powered by software, PXI is a rugged PC-based platform for measurement and automation systems. PXI combines PCI electrical-bus features with the modular, Eurocard packaging of CompactPCI and then adds specialized synchronization buses and key software features. PXI is both a high-performance and low-cost deployment platform for applications such as manufacturing test, military and aerospace, machine monitoring, automotive, and industrial test. Developed in 1997 and launched in 1998, PXI is an open industry standard governed by the PXI Systems Alliance (PXISA), a group of more than 70 companies chartered to promote the PXI standard, ensure interoperability, and maintain the PXI specification.

Software

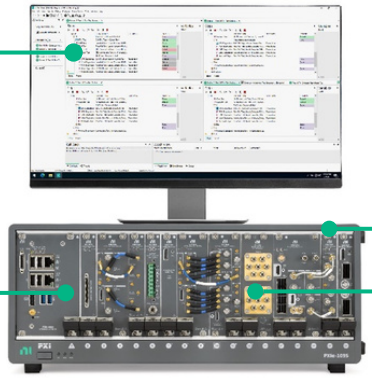
Test Management and Code Development

Code sequencing, database reporting, user management, operator interface, parallel execution, signal processing. LabVIEW, C/C++, .NET, Python

Computer

PXI Embedded Controller

Windows and Real-Time OS options, Intel Xeon processing, peripheral ports, display output, integrated hard drive



Timing and Synchronization

PXI Chassis

PCI Express Gen 3 throughput up to 24 GB/s sub-nanosecond latency, P2P streaming, integrated triggering

Instrumentation

PXI Modules

DC to mmWave, oscilloscope, programmable power supply, switch/MUX, DMM, VSA, VSG, VST, AWG, SMU, DAQ

Integrated with the Latest Commercial Technology

By leveraging the latest commercial technology for our products, we can continually deliver high performance and high-quality products to our users at a competitive price. The latest PCI Express Gen 3 switches deliver higher data throughput, the latest Intel multicore processors facilitate faster and more efficient parallel (multisite) testing, the latest FPGAs from Xilinx help to push signal processing algorithms to the edge to accelerate measurements, and the latest data converters from TI and ADI continually increase the measurement range and performance of our instrumentation.

HIGHER DATA THROUGHPUT

PCI Express Gen 3

PARALLEL TEST EXECUTION

Multicore Processors

MEASUREMENT ACCELERATION

FPGAs

INCREASED MEASUREMENT RANGE

Data Converters

PXI Instrumentation

NI offers more than 600 different PXI modules ranging from DC to mmWave. Because PXI is an open industry standard, nearly 1,500 products are available from more than 70 different instrument vendors. With standard processing and control functions designated to a controller, PXI instruments need to contain only the actual instrumentation circuitry, which provides effective performance in a small footprint. Combined with a chassis and controller, PXI systems feature high-throughput data movement using PCI Express bus interfaces and sub-nanosecond synchronization with integrated timing and triggering.

Oscilloscopes

Sample at speeds up to 12.5 GS/s with 5 GHz of analog bandwidth, featuring numerous triggering modes and deep onboard memory

Digital Multimeters

Perform voltage (up to 1000 V), current (up to 3A), resistance, inductance, capacitance, and frequency/period measurements, as well as diode tests

Digital Instruments

Perform characterization and production test of semiconductor devices with timing sets and per channel pin parametric measurement unit (PPMU)

Waveform Generators

Generate standard functions including sine, square, triangle, and ramp as well as user-defined, arbitrary waveforms

Frequency Counters

Perform counter timer tasks such as event counting and encoder position, period, pulse, and frequency measurements

Source Measure Units

Combine high-precision source and measure capability with high channel density, deterministic hardware sequencing, and SourceAdapt transient optimization

Power Supplies & Loads

Supply programmable DC power, with some modules including isolated channels, output disconnect functionality, and remote sense

FlexRIO Custom Instruments & Processing

Provide high-performance I/O and powerful FPGAs for applications that require more than standard instruments can offer

Switches (Matrix & MUX)

Feature a variety of relay types and row/column configurations to simplify wiring in automated test systems

Vector Signal Transceivers

Combine a vector signal generator and vector signal analyzer with FPGA-based, real-time signal processing and control

GPIB, Serial, & Ethernet

Integrate non-PXI instruments into a PXI system through various instrument control interfaces

Data Acquisition Modules

Provide a mix of analog I/O, digital I/O, counter/timer, and trigger functionality for measuring electrical or physical phenomena

NI Hardware Services

All NI hardware includes a one-year warranty for basic repair coverage and calibration in adherence to NI specifications prior to shipment. PXI systems also include basic assembly and a functional test. NI offers additional entitlements to improve uptime and lower maintenance costs with service programs for hardware. Learn more at ni.com/services/hardware.

	Hardware	Standard	Premium	Description
Duration at Point of Sale	1 year; included	3 years; optional	3 years; optional	NI enhances warranty coverage with additional service benefits provided with a hardware service program.
Maximum Duration with Renewal	≤3 years with service program	≤3 years	≤3 years	NI maintains the high performance and availability of your hardware for up to three years with a hardware service program.
Extended Repair Coverage	•	•	•	NI restores your device's functionality and includes firmware updates and factory calibration; <10 working days[4] + standard shipping.
System Configuration, Assembly, and Test[1]		•	•	NI technicians assemble, install software in, and test your system per your custom configuration prior to shipment.
Advanced Replacement [2]			•	NI stocks replacement hardware that can be shipped immediately if a repair is needed.
System Return Material Authorization (RMA)[1]			•	NI accepts the delivery of fully assembled systems when performing repair services.
Technical Support	•	•	•	NI provides access to support resources for your hardware.
Calibration Plan (Optional)		Standard	Expedited[3]	NI performs the requested level of calibration at the specified calibration interval for the duration of the service program.

1 This option is only available for PXI, CompactRIO, and CompactDAQ systems.
2 This option is not available for all products in all countries. Contact your local NI sales engineer to confirm availability.
3 Expedited calibration is only available for the Traceable calibration level.
4 This applies to non-RF products only. Standard extended repair coverage for RF products is <15 working days + standard shipping.

PremiumPlus Service Program

NI can customize the offerings listed above or offer additional entitlements such as on-site calibration, custom sparing, and lifecycle services through a PremiumPlus Service Program. Contact your NI sales representative to learn more.

Technical Support

NI hardware service programs and warranty include access to technical support provided by NI support agents during local business hours. Service requests can be managed online. Additionally, take advantage of NI's award-winning online resources and communities.