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PRODUCT FLYER

PXI Remote Control and System Expansion

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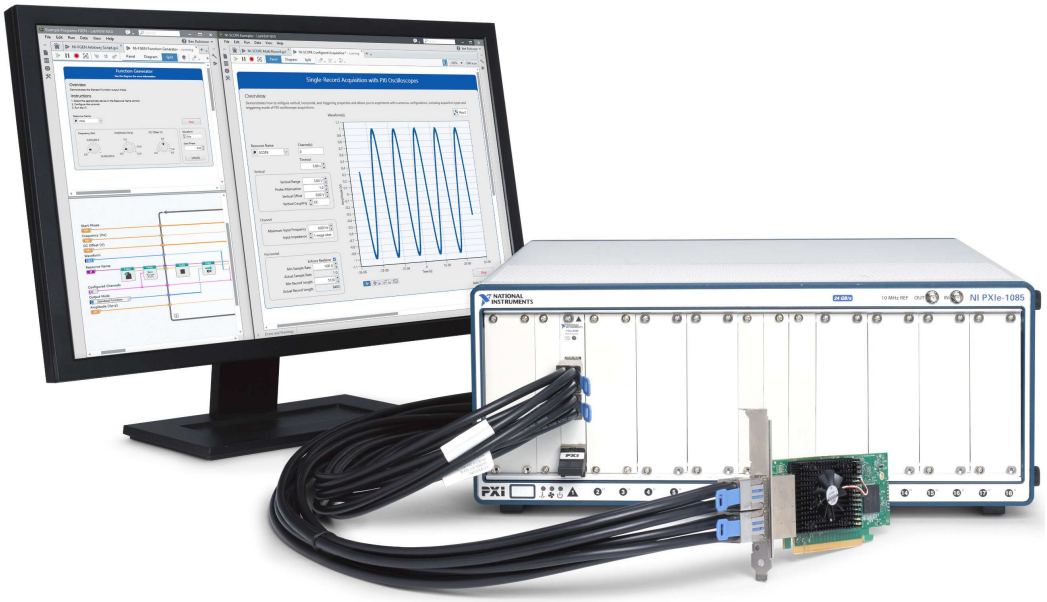
NATIONAL INSTRUMENTS

PXI Remote Control and System Expansion

PXIe-8301, PXI-836x, PXIe-836x, PXIe-837x, PXIe-838x, and PXIe-839x



- Control a PXI chassis from a desktop PC, laptop, or rackmount 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, 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.

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 Rackmount PC Control of a PXI Chassis

To control a PXI chassis from a desktop or rackmount PC, a PXI Remote Control Module must be placed in the system slot of 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.

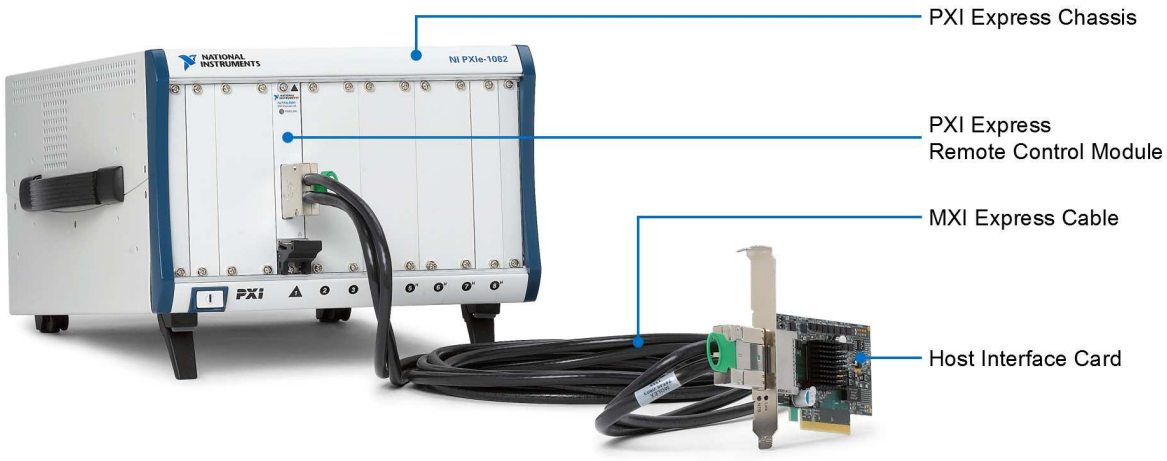


Figure 1. PXIe-8381 (remote control module) and PCIe-8381 (host interface card) allow desktop PC control of a PXI Express chassis with PCI Express Gen 2 x8 data throughput.

Laptop Control of a PXI Chassis

When the host machine controlling the PXI chassis is a laptop PC, the PXIe-8301 remote control module must be placed in the system controller slot of the PXI chassis. The PXIe-8301 and laptop must be connected using a Thunderbolt 3™ cable.

Figure 2. The PXIe-8301 provides PCI Express Gen 3 connectivity to a laptop PC.

Table 1. NI PXI remote control and system expansion offerings

MXI-Express Technology	Gen1 x1 Copper	Gen1 x1 Fiber Optic	Gen1 x4 Copper	Gen1 x4 Fiber Optic	Gen2 x8	Gen3 x4	Gen3 x16
Sustained Throughput[1]	100 MB/s (PXI-1) 192 MB/s (PXI Express)	100 MB/s	832 MB/s	838 MB/s	3.2 GB/s	2.3 GB/s	13.7 GB/s
Cable Options	Copper (up to 7m)	Fiber Optic (up to 100m)	Copper (up to 7m)	Fiber Optic (up to 100m)	Copper (up to 5m) Fiber Optic[2] (up to 100m)	Copper (up to 2m)	Copper (up to 3m)
PXI Remote Control Module	PXIe-8360 (PXI Express) PXI-8360 (PXI-1)	PXI-8368	PXIe-8370	PXIe-8375	PXIe-8381	PXIe-8301	PXIe-8398 (four x4 ports) PXIe-8399 (eight x4 ports)
Host Interfaces	PCIe-8361 (1-port) PCIe-8362 (2-port) PCI-8361 (1-port) ExpressCard 8360	PCI-8366	PCIe-8371	PCIe-8375	PCIe-8381	Thunderbolt 3	PCIe-8398
Bus Extension Module for Multichassis Configurations	PXIe-8364 (PXI Express) PXI-8364 (PXI-1)	PXI-8367	PXIe-8374	N/A	PXIe-8384	N/A	See Notes Below
Multiple Ports Available for Multichassis Configurations	N/A	N/A	N/A	2nd port for daisy-chaining	N/A	N/A[3]	See Notes Below

[1] Data throughput is a theoretical unidirectional maximum and assumes the system architecture allows for the listed throughput.
[2] The fiber optic option is limited to a Gen 2 x4 connection, with a maximum throughput of 1.6 GB/s.
[3] The second port on the PXIe-8301 can be used for additional Thunderbolt or USB-C devices such as external storage or displays but does not support daisy chaining to additional chassis.

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 the two above 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-8375 which only supports fiber optic cables. Other remote control modules support both copper and fiber optic cables. For instance, the PXIe-8381 maybe used with copper cabling for a Gen2 x8 connection (3.2 GB/s) or with fiber optic cabling for a Gen2 x4 connection (1.6 GB/s).

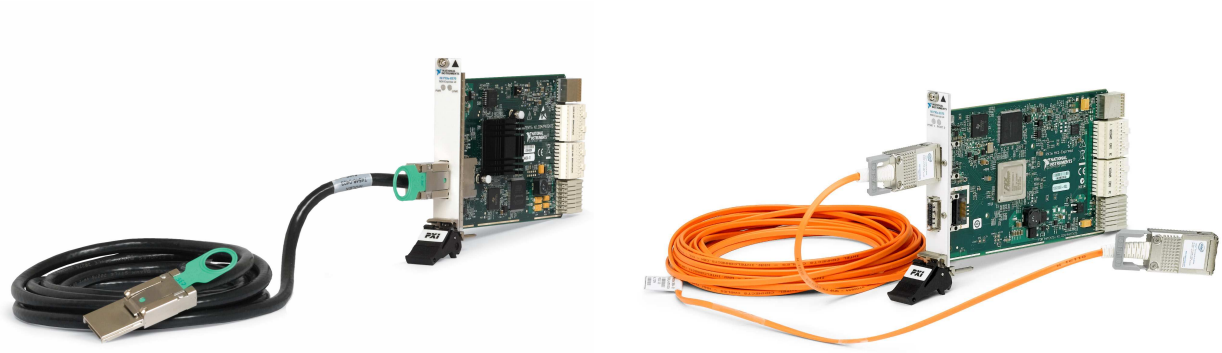


Figure 3. The PXIe-8370 (left) only supports copper cabling while the PXIe-8375 (right) only supports fiber optic cables.

Data Throughput

Each remote control solution supports a specified maximum data throughput between 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-8381 support the transmission of data over eight lanes using PCI Express 2.0, otherwise known as Gen2 x8, which allows for up to 3.2 GB/s of data throughput in a single direction.

A remote control solution should be chosen such that it 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 PXI system to understand its data throughput capabilities. For more information about 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.

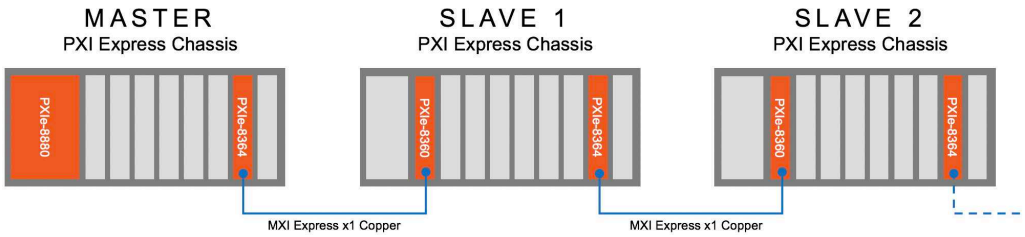


Figure 4. A PXIe-8364 host interface module is placed in a peripheral slot of the master chassis containing an embedded controller. An additional chassis is daisy chained by connecting the PXIe-8364 to a PXIe-8360 in the system controller slot of the slave chassis. Additional modules may be used to daisy-chain 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 – one for an upstream connection and one or more for downstream connections. Several remote control modules contain this feature – the PXIe-8375, PXIe-8398, and the PXIe-8399.

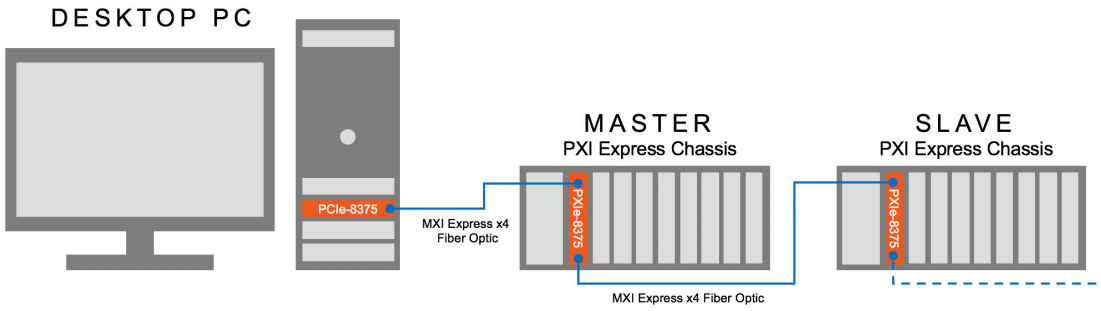


Figure 5. A desktop PC with a PCIe-8375 is connected to a master PXI Express chassis through a PXIe-8375 Remote Control Module. The PXIe-8375 features an additional port for daisy-chaining, requiring only an additional PXIe-8375 in the slave chassis. Note that the last downstream chassis in the system will have an unused port.

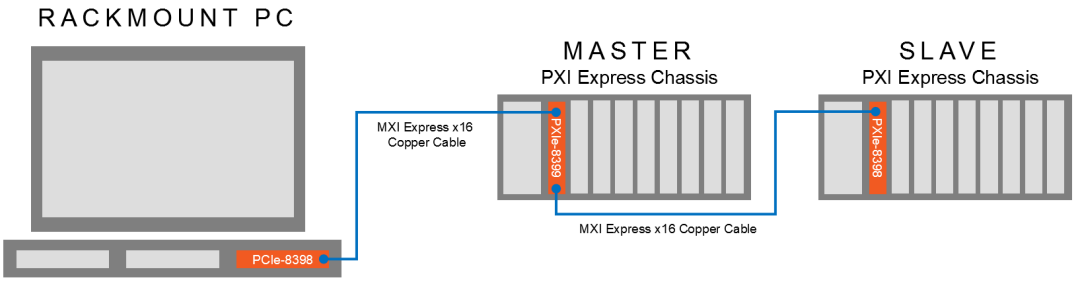


Figure 6. An NI rackmount controller is connected to a master chassis using a PCIe-8398 and PXIe-8399. The PXIe-8399 features additional ports and modular cabling for daisy-chaining. An additional chassis is added to the system by connecting the PXIe-8399 to a PXIe-8398 in the slave chassis. Note that 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.

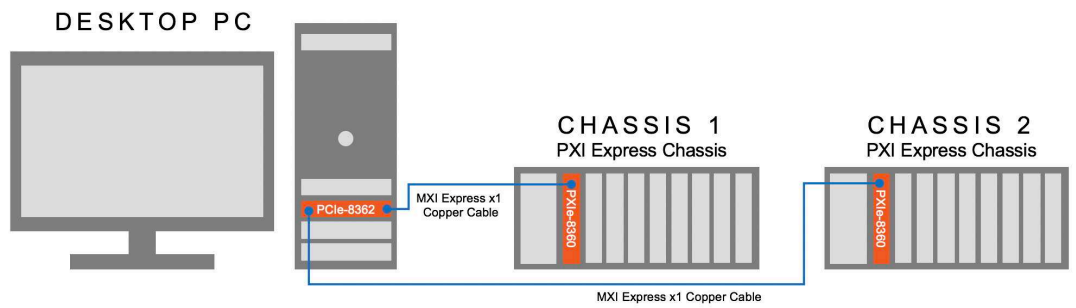


Figure 7. The PCIe-8362 host interface card contains two MXI-Express connections, allowing two PXI Express chassis to be controlled through a desktop PC using a star topology.

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: National Instruments NI-TClk Technology for Timing and Synchronization of Modular Instruments.

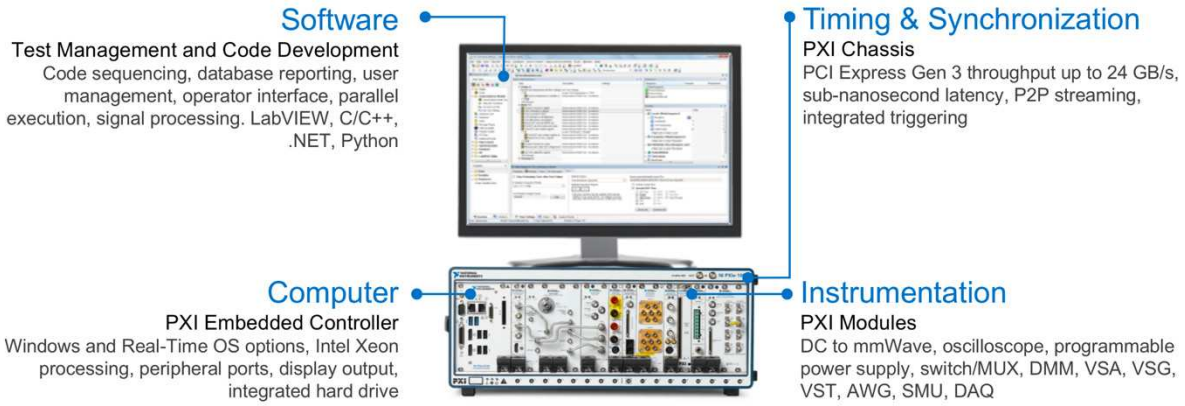
Peer-to-Peer Streaming

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 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.

Platform-Based Approach to Test and Measurement

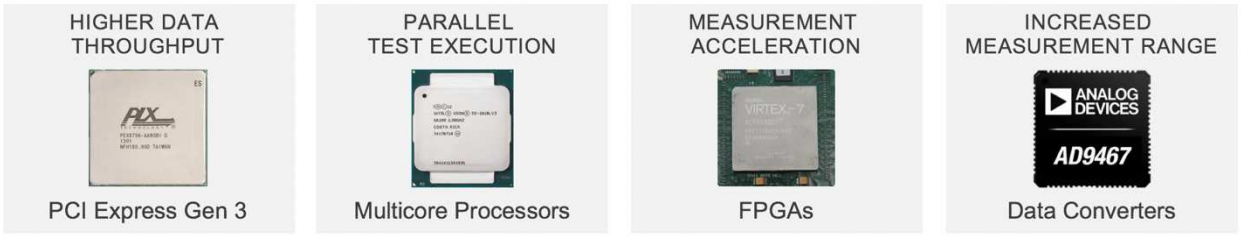
What Is PXI?

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.



Integrating 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.



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

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

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

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

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.

	Standard	Premium	Description
Program Duration	1, 3, or 5 years	1, 3, or 5 years	Length of service program
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System Return Material Authorization (RMA)[1]		•	NI accepts the delivery of fully assembled systems when performing repair services.
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 only includes traceable levels.

PremiumPlus Service Program

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

Technical Support

Every NI system includes a 30-day trial for phone and e-mail support from NI engineers, which can be extended through a Software Service Program (SSP) membership. NI has more than 400 support engineers available around the globe to provide local support in more than 30 languages. Additionally, take advantage of NI's award winning online resources and communities.

10 December 2019