Product Flyer

PXI Controllers

Contents

PXIe Embedded Controllers

PXIe-8881, PXIe-8880, PXIe-8862, PXIe-8861, PXIe-8842, PXIe-8840, PXIe-8822, and PXIe-8821

PXIe-8821, PXIe-8880, PXIe-8881 Controllers

- Latest high-performance Intel® processors with up to 18 cores available
- OSs: Windows 11, Windows 10, Windows 7, Linux Desktop (RHEL, OpenSUSE, Ubuntu), NI Linux Real-Time
- Processor frequencies up to 4.1 GHz (Base) and 4.6 GHz (Max Turbo)
- System bandwidth up to 24 GB/s

- Memory and storage up to 64 GB and 512 GB, respectively
- Solid-state drives, Thunderbolt™ 3, USB 3.0, Gigabit Ethernet, and other peripheral ports
- Ready-to-use with factory installed OS, hardware drivers, and applications

Controllers for Automated Test and Measurement

Our highest performance PXI Express embedded controllers provide class-leading performance in a compact embedded form factor for your PXI-based test, measurement, and control systems. Besides offering high CPU performance, these controllers provide high I/O throughput coupled with a rich set of peripheral I/O ports and up to 64 GB of RAM. They are available with the latest processor options in a rugged form factor designed to operate in a wide temperature range from 0 ºC to 55 ºC in high shock and vibration environments.

Table 1. PXI Express Embedded Controller Specifications by Model

	PXIe-8881[1]			PXIe-8880	PXIe-8862	PXIe-8861	PXIe-8842	PXIe-8840	PXIe-8822	PXIe-8821
Processor	Intel Xeon W-2225	Intel Xeon W-2245	Intel Xeon W-2295	Intel Xeon E5-2618L v3	Intel Core i7-11850HE	Intel Xeon E3-1515MV5	Intel i5-11500HE	Intel Core i5-4400E	Intel core i3-11100HE	Intel Core i3-4110E
Processor Cores	4	8	18	8	8	4	6	2	4	2
Processor Frequency (GHz)	4.1 4.6, Turbo	3.9 4.5, Turbo	3 4.6, Turbo	2.3 3.4, Turbo	2.6 4.7, Turbo	2.8 3.7, Turbo	2.6 4.5, Turbo	2.7 3.3, Turbo	2.4 4.4, Turbo	2.6
Standard Memory (GB)	16	32	64	8	2 x 8	8	8	4	8	2
Maximum Memory (GB)	64			24	2 x 16	32	16	8	16	8
System Bandwidth (GB/s)	24			24	16	16	8	2	4	2
Standard Storage	512, SSD			240, SSD	512, SSD	512, SSD	512, SSD	250, SSD	512, SSD	320, HDD
TPM Version	2.0			1.2	2.0	2.0	2.0	-	2.0	-
Ethernet (GbE)	1			2	2.5	2	2.5	2	2.5	1
USB Ports	4 USB 2.0 2 USB 3.2 Gen 1			4 USB 2.0 2 USB 3.0	4 USB 2.0 2 USB 3.0	4 USB 2.0 2 USB 3.0	4 USB 2.0 2 USB 3.0	4 USB 2.0 2 USB 3.0	2 USB 2.0 2 USB 3.0	2 USB 2.0 2 USB 3.0
Thunderbolt 3 Ports	2			-	2	2	1	-	-	-

[1]The PXIe-8881 is a high power controller and is only supported by chassis having 82 W slot cooling capacity, such as the PXIe-1092 or PXIe-1095 chassis.

Detailed View

High bandwidth streaming PCI Express Gen 3

Up to 64 GB DDR4 RAM (16 GB standard)

1 GPIB port

4 USB 2.0

2 Gigabit Ethernet ports

1 Display Port v1.2

2 USB 3.0

External SMB watchdog/trigger

Secured with TPM v2.0
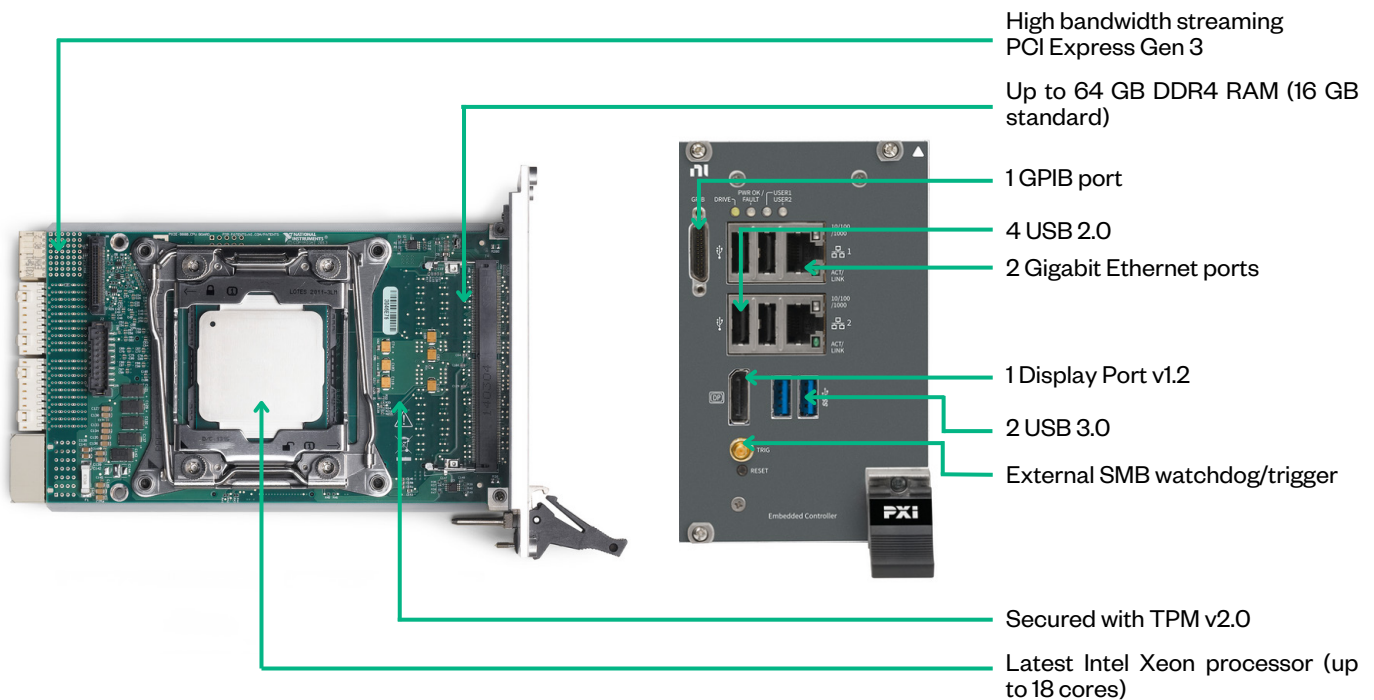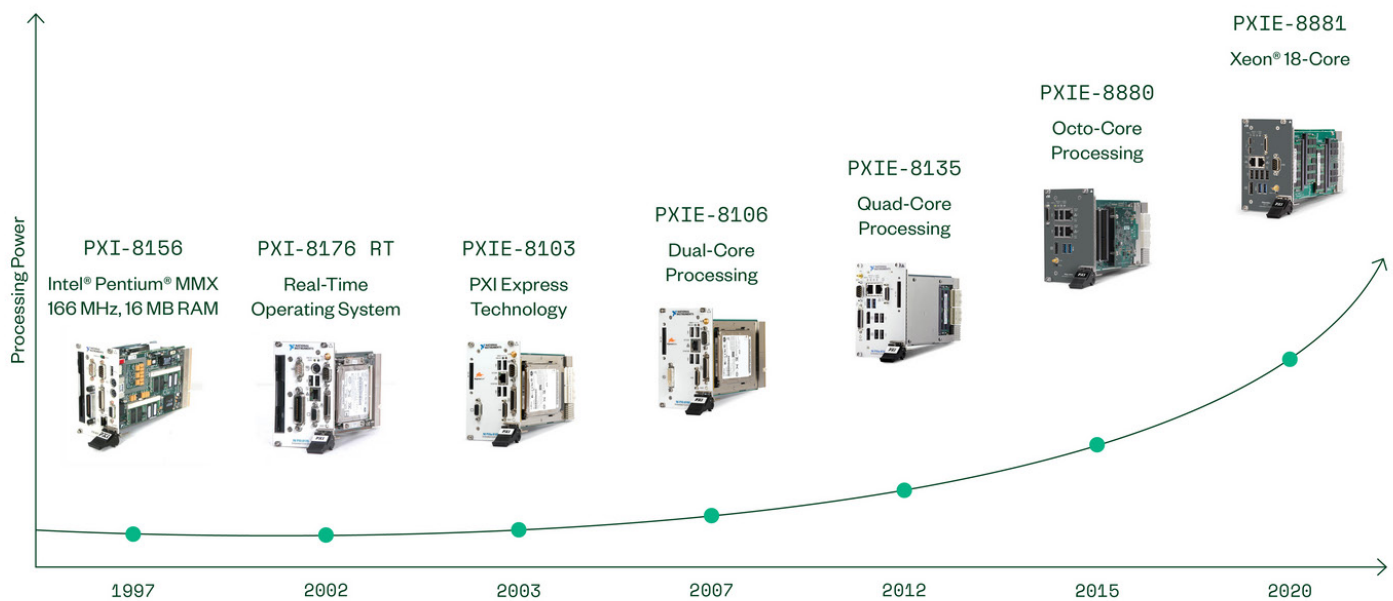
Latest Intel Xeon processor (up to 18 cores)

FIGURE 2

Detailed View of a PXIe Controller

Key Features

High Performance

As the founding member of the PXI Alliance, NI has been at the forefront of technology, delivering to market new PXI embedded controllers that continually feature the latest processors. NI has close partnerships with key processor manufacturers, including Intel and Advanced Micro Devices (AMD), so NI controllers feature the latest processors such as the Intel Atom, Core i7, and Xeon. This highlights NI's commitment to providing the test and measurement industry with the best technology available in a PXI embedded controller. Figure 3 shows the progression of processing power in NI controllers over time.
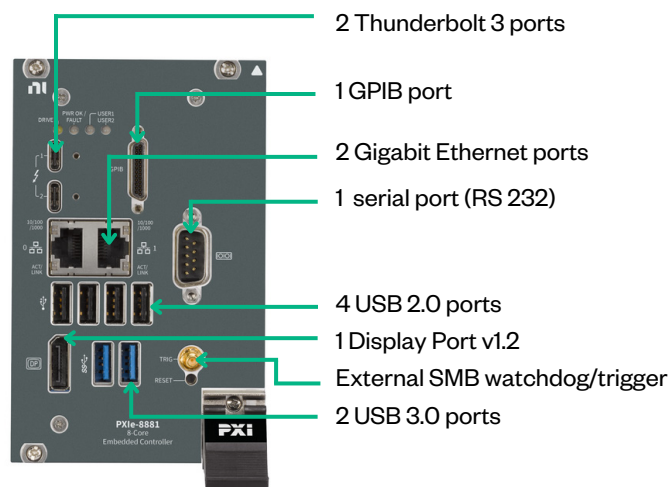
In addition to computing performance, I/O bandwidth plays a critical role in designing instrumentation systems. As modern test and measurement systems become more complex, the instruments and system controller need to exchange increasingly more data. The PXIe-8881 uses the advancements of PCI Express technology to offer both one x16 and one x8 Gen 3 PCI Express link for interfacing to the PXI chassis backplane. Using the PXIe-8881 with a Gen 3 PXI Express chassis, such as the PXIe-1095, provides total system data throughput up to 24 GB/s. With this high bandwidth, you can now implement computationally intensive applications that demand high-throughput rates such as next- generation wireless communication design and prototyping, RF record and playback, advanced driver-assistance systems (ADAS) development, and noise mapping.

Processing Power

PXI-8156
Intel® Pentium® MMX
166 MHz, 16 MB RAM

PXI-8176 RT
Real-Time
Operating System

PXIE-8103
PXI Express
Technology

PXIE-8106
Dual-Core
Processing

PXIE-8135
Quad-Core
Processing

PXIE-8880
Octo-Core
Processing

PXIE-8881
Xeon® 18-Core

1997   2002   2003   2007   2012   2015   2020

Differentiated I/O

PXI Express embedded controllers from NI feature a variety of I/O connectivity to interface to stand-alone instruments or peripheral devices. I/O offerings include up to two Thunderbolt 3 ports; two USB 3.0 and four USB 2.0 ports; dual Gigabit Ethernet, GPIB, and serial ports; two display ports for dual-monitor support; and parallel ports. The variety of included ports increases the versatility of the controller and leads to cost savings because you do not need supplementary PXI modules to add those functionalities. Instead, you can use more slots in a PXI chassis for additional measurement modules.

2 Thunderbolt 3 ports

1 GPIB port

2 Gigabit Ethernet ports

1 serial port (RS 232)

4 USB 2.0 ports

1 Display Port v1.2

External SMB watchdog/trigger

2 USB 3.0 ports

Durability

We offer PXI controllers with Solid-State Drives (SSDs) so you can test under a wide range of conditions. Our controllers with SSDs are designed to operate in extreme shock, high altitude, and random vibration environments. SSDs also provide lower read and write seek times compared to standard rotating medium hard drives. This means higher sequential and random data read and write rates. Applications using SSDs offer faster application load times and overall test-time savings due to faster file I/O.

NI engineers apply advanced design simulation and create custom heat sinks to ensure reliability in the embedded controllers, from concept to completion. The controllers also undergo extensive thermal, mechanical, and electrical testing to ensure that the CPU doesn't throttle its processor performance in harsh conditions. Using its expertise in developing and testing embedded controllers, NI provides rugged and reliable controllers engineers count on to deploy in the field or in the laboratory.

Real-Time OS

NI offers PXI embedded controllers that run a real-time OS and LabVIEW Real-Time Module software instead of a standard Windows OS. A real-time OS can handle multiple processes at once and perform repeated tasks within a tight time boundary. Systems running Windows or another general-purpose OS cannot guarantee the completion of a certain task in a specified time because the OS shares the processor with other system processes running in parallel.

With a real-time OS, you can run a single program with precise timing and, more specifically:
• Perform tasks within a guaranteed worst-case timeframe
• Carefully prioritize different sections of your program
• Run loops with nearly the same timing each iteration (typically within microseconds)
• Detect if a loop missed its timing goal

View "What is a Real-Time OS?" and "Do I Need a Real-Time System?" for more information.

Data Security

The Trusted Platform Module (TPM), a secure cryptoprocessor, is a component on select embedded controllers specifically designed to elevate platform security above the capabilities of today's software by providing a protected space for key operations and other security-critical tasks. Using both hardware and software, the TPM protects encryption and signature keys at their most vulnerable stages—operations when the keys are being used unencrypted in plain-text form. The TPM is specifically designed to shield unencrypted keys and platform authentication information from software-based attacks. The PXIe-8881 and PXIe-8862/42/22 models are all equipped with the latest version of TPM, 2.0. To learn more about other TPM-supported NI hardware, view the NI white paper on "TPM Support for NI Controllers."

Additionally, the PXIe-8861 and PXIe-8862 feature removeable hard drives for use in even the most security-sensitive locations. The hard drive retains all user and system information even after powering down due to its nonvolatile memory. A removeable hard drive makes the declassification process straightforward when the setup is deployed in a classified area. When you have finished testing, simply remove the hard drive and store it in a secure environment.

FIGURE 5
The PXIe-8861 offers a removeable hard disk drive.

Software

OS Compatibility

Use NI's online OS Compatibility Checker to see which OS is compatible with your embedded controller and other NI hardware. Some controller models are supported by multiple drivers. OS compatibility may vary depending on the driver.

Drivers

All PXI embedded controllers are delivered with PXI Platform Services installed. With this NI driver, you can monitor the health of your PXI controller. Figure 6 shows the system attributes you can view such as temperature, CPU load, memory, and disk capacity, among others, in NI Measurement and Automation Explorer (NI-MAX). You can use this driver software to configure your controller and other NI hardware devices through the intuitive user interface.

Use NI-MAX to execute system diagnostics, run test panels, view all connected devices and software, and more. Check out "What is NI-MAX?" for information on additional capabilities.

Temperature Sensors

Name	CPU Temp
Reading	43°C
Health State	Normal

System Resources

Total Physical Memory	7.93 GB							
Free Physical Memory	5.19 GB							
Total Virtual Memory	16.4 GB							
Free Virtual Memory	13.7 GB							
Primary Disk Capacity	150 GB							
Primary Disk Free Space	74.9 GB							
CPU Model	Intel(R) Xeon(R) CPU E3-1515M v5 @ 2.80GHz							
CPU Cores	4							
CPU Logical Processors	8							
CPU Total Load	19%	6%	25%	6%	13%	6%	19%	13%
CPU Interrupt Load	0%	0%	6%	0%	0%	0%	12%	0%

FIGURE 6
View PXI system attributes through NI-MAX.

Supported Development Environments

Supported development environments include LabVIEW, C/C++, and Python. NI understands that creating a flexible, high-performing system requires using the best aspects of many tools. With LabVIEW, you can integrate languages such as C/C++ and Python, to build a versatile test system quickly. NI offers online resources on topics such as integrating languages with LabVIEW and using Python with NI hardware and software to get you started.

LabVIEW Real-Time Module

The LabVIEW Real-Time Module is a software add-on for LabVIEW that you can use to create and deploy reliable, stand-alone applications that execute on embedded hardware devices. The module fully supports the NI Linux Real-Time OS, which is a new Linux distribution with industrial grade, real-time capabilities that offers real-time performance with the approachability and usability of a desktop OS. Use NI Linux Real-Time to ensure reliability and precise timing in system applications for test, monitoring, and control.

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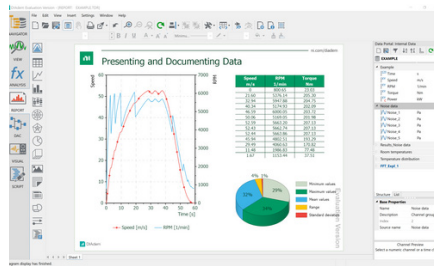
LabVIEW
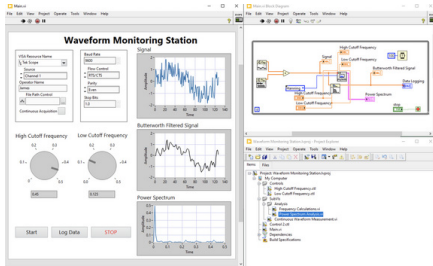
Graphical programming environment that engineers use to develop automated research, validation, and production test systems.

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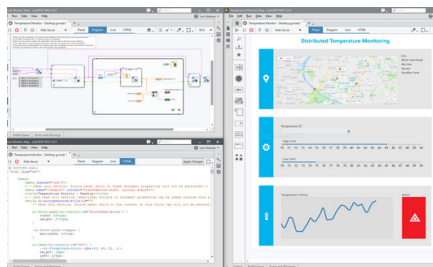
TestStand
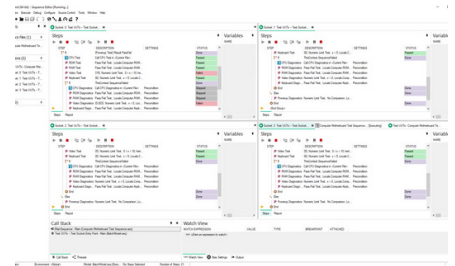
Test executive software that accelerates system development for engineers in validation and production.

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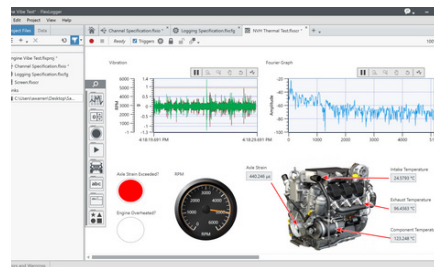
No-code data acquisition software engineers use to build validation and verification test applications.

- 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™
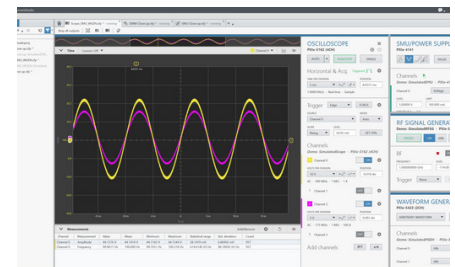
Application software that simplifies setup and configuration of NI PXI hardware

- 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. PXIe Embedded Controller Documentation

Document Type	Model
Getting Started Guide	8881, 8880, 8862/42/22, 8861, 8840, 8821
Specifications	8881, 8880, 8862/42/22, 8861, 8840, 8821

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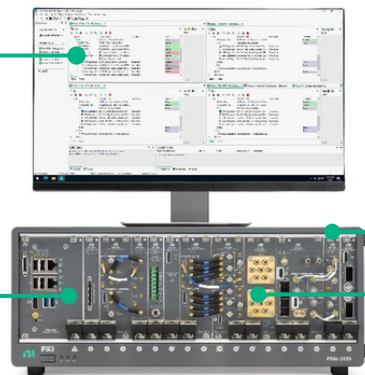
Timing and Synchronization
PXI Chassis
PCI Express Gen 3 throughput up to 24 GB/s sub-nanosecond latency, P2P streaming, integrated triggering

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	PARALLEL TEST EXECUTION	MEASUREMENT ACCELERATION	INCREASED MEASUREMENT RANGE
PCI Express Gen 3	Multicore Processors	FPGAs	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 Instruments
Perform characterization and production test of semiconductor devices with timing sets and per channel pin parametric measurement unit (PPMU)

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

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

Switches (Matrix & MUX)
Feature a variety of relay types and row/column configurations to simplify wiring in automated test systems

GPIB, Serial, & Ethernet
Integrate non-PXI instruments into a PXI system through various instrument control interfaces
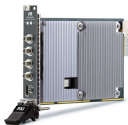
Digital Multimeters
Perform voltage (up to 1000 V), current (up to 3A), resistance, inductance, capacitance, and frequency/period measurements, as well as diode tests

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

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

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

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

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.

ni.com/pxi