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Product Brochure

PXI Express Embedded Controllers

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PXIe Embedded Controllers

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



FIGURE 1
PXIe-8821, 8880, 8881 Controllers

- Latest High-performance Intel® processors with up to 18 cores available
- Operating system (OS): 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
- Standard Storage and Memory up to 512 GB and 64 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

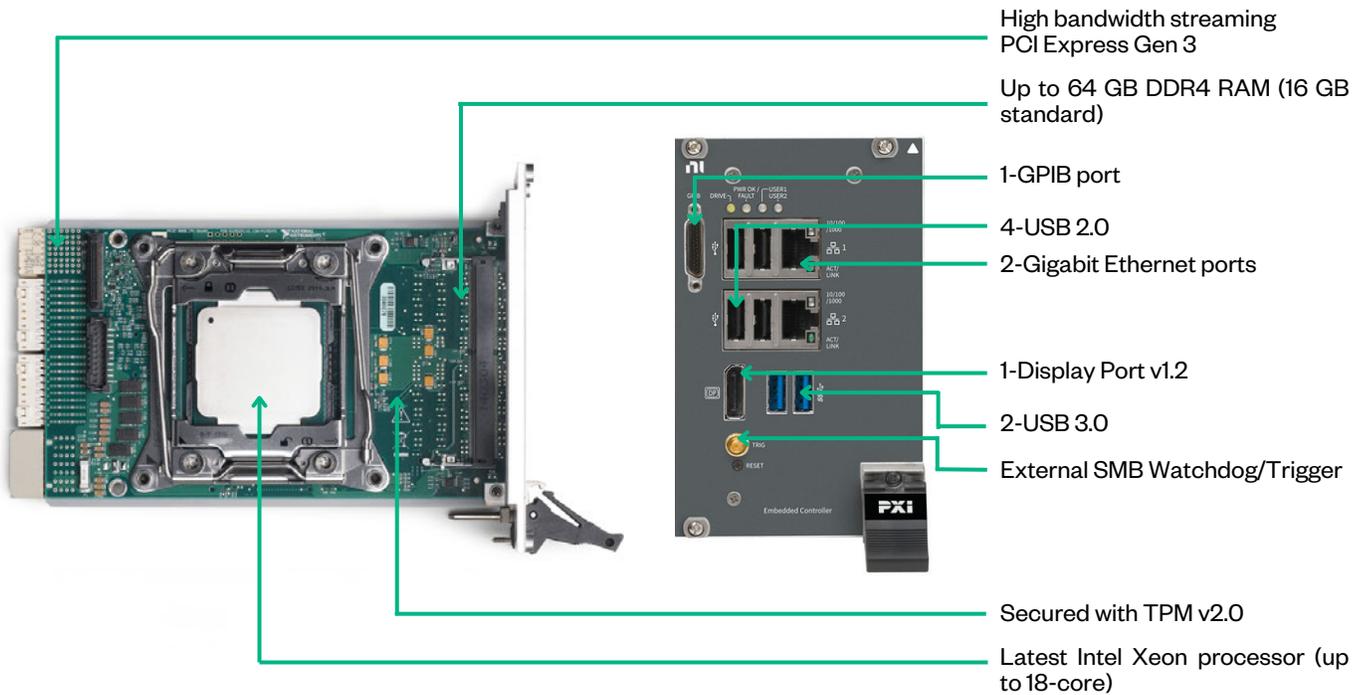
Our highest performance PXI Express embedded controllers provide class-leading performance in a compact embedded form factor for your PXI-based test, measurement, and control systems. Besides offering high CPU performance, these controllers provide high I/O throughput coupled with a rich set of peripheral 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°C to 55°C and high shock and vibration environments. When in storage, the controllers can withstand temperature fluctuations between -40°C and 71°C.

Table 1. PXI Express Embedded Controller Specifications by Model

	PXIe-8881*			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	2 USB 2.0 2 USB 3.0	2 USB 2.0 2 USB 3.0				
Thunderbolt 3 Ports	2			-	2	2	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



Key Features

High Performance

For over 20 years, NI has been in the business of releasing PXI embedded controllers, which continually feature the latest processors on the market. We developed close working relationships with key processor manufacturers such as Intel and Advanced Micro Devices (AMD). In fact, NI is an associate member of the Intel Intelligent Systems Alliance, allowing us access to the latest Intel product roadmaps and samples. We make a habit of releasing PXI embedded controllers shortly after major computer manufacturers such as Dell or HP release computers with the newest high-performance embedded mobile processors. This way, our controllers continuously feature the latest processors such as the Intel Atom, Core i7, or Xeon processors. This highlights our commitment to providing the instrumentation industry with the best technology available in a PXI embedded controller. The progression of processing power in our controllers over time can be seen in Figure 2.

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, there is a growing need to exchange more and more data between the instruments and the system controller. With the introduction of PCI Express and PXI Express, our embedded controllers are meeting this need and now deliver up to 24 GB/s of system bandwidth to the PXI Express chassis backplane.

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 easily 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.

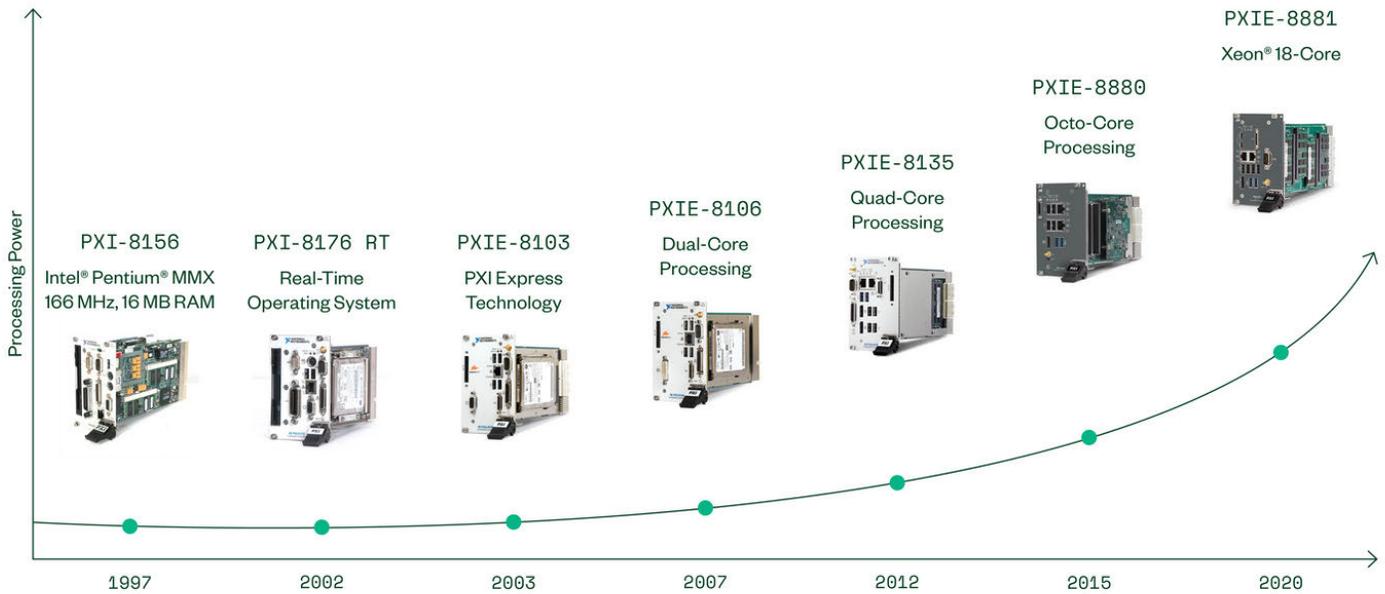


FIGURE 2

The evolution of processing power in PXI controllers over the years

Differentiated I/O

Our PXI and PXI Express embedded controllers 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, two USB 3.0, four USB 2.0 ports, Dual-Gigabit Ethernet, GPIB, serial, 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 supplementary PXI modules are not required to add those functionalities. Instead, you can utilize more slots in a PXI chassis for additional measurement modules.

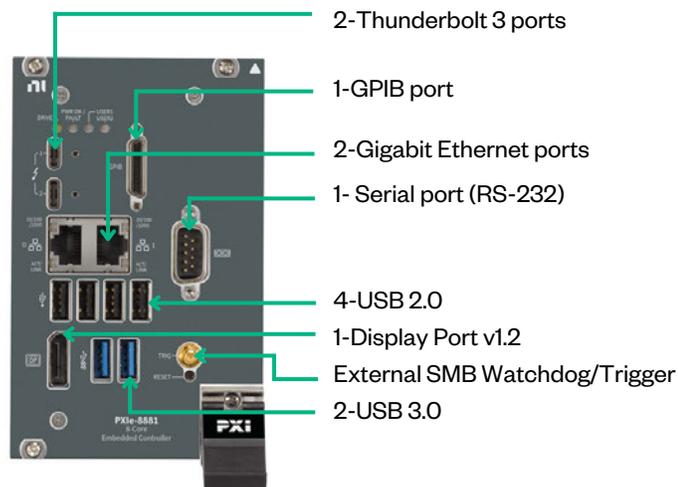


FIGURE 3

The PXIe-8881 features rich I/O options for peripheral device connections.

Durability

We offer PXI controllers with solid-state drives (SSD) so you can perform testing 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 as compared to standard rotating medium hard drives, which translates to higher sequential and random data read and write rates. Applications using SSDs experience faster application load times and overall test-time savings due to faster file I/O.

Our 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 our expertise in developing and testing embedded controllers, we provide rugged and reliable controllers engineers count on to deploy in the field or in the laboratory.

Real-Time OS

We offer 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.

A real-time OS allows you to run a single program with precise timing, and more specifically it can:

- 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

Visit [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, 8862/42/22, are all equipped with the latest version of TPM, 2.0. To see other TPM-supported NI hardware, view our 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 non-volatile memory. A removeable hard drive makes the declassification process straightforward when the setup is deployed in a classified area. When testing is finished, simply remove the hard drive, and store it in a secure environment.



FIGURE 4

The PXIe-8861 offers a removeable hard disk drive.

Software

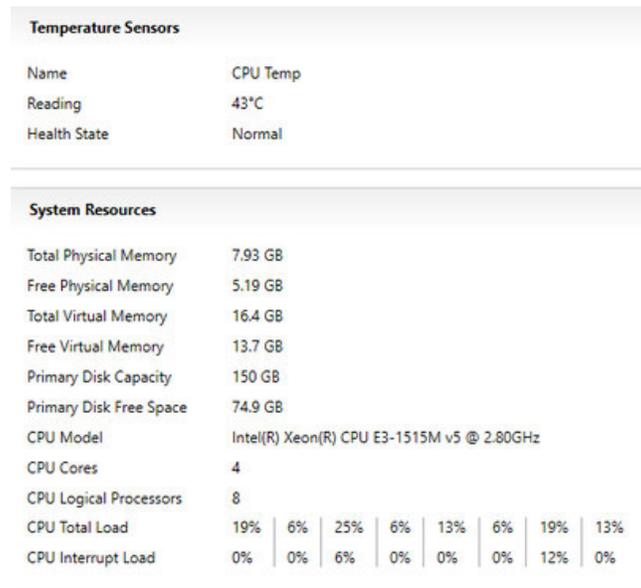
OS Compatibility

Use our online [OS Compatibility Checker](#) to see which OS is compatible with your chosen 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 come installed with PXI Platform Services, an NI driver that enables you to monitor the health of your PXI controller. Figure 5 shows the system attributes you can view such as temperature, CPU load, memory, and disk capacity among others in NI-MAX (NI Measurement and Automation Explorer). NI-MAX is a software that allows you to configure your controller & other NI hardware devices through an intuitive user interface, and it comes automatically installed with the PXI Platform Services driver.

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 5
View PXI system attributes through NI-MAX.

Supported Development Environments

Supported development environments include LabVIEW, C/C++, and Python. We understand that creating a flexible, high-performing system requires using the best aspects of many tools. LabVIEW lets you integrate languages such as C/C++ and Python, allowing you to build a versatile test system quickly. We offer online resources on topics such as [integrating languages with LabVIEW](#) and [using python with NI hardware and software](#) to get you started.

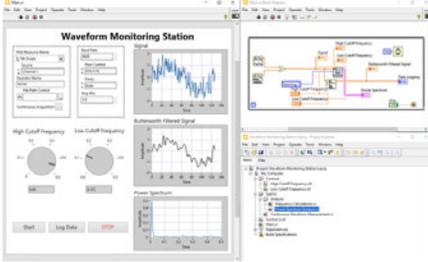
LabVIEW Real-Time Module

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.

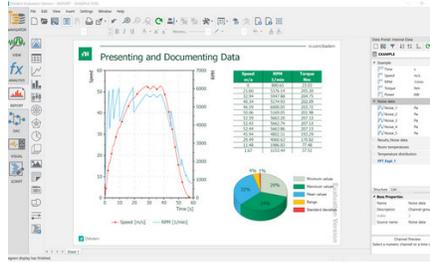
LabVIEW



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

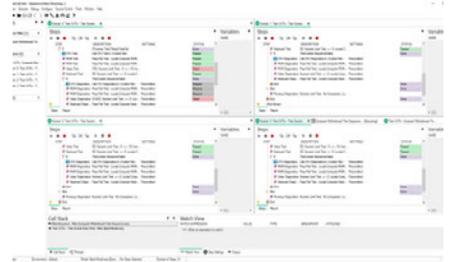
DIAdem



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

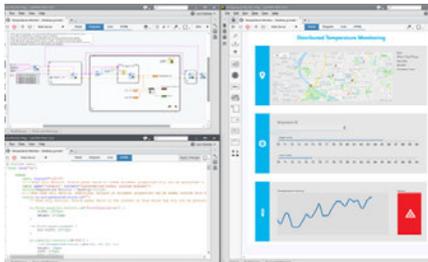
TestStand



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

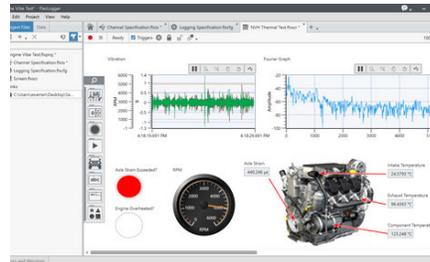
G Web



Development software that helps engineers create web-based user interfaces without 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

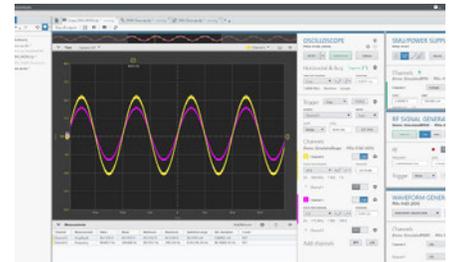
FlexLogger™



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

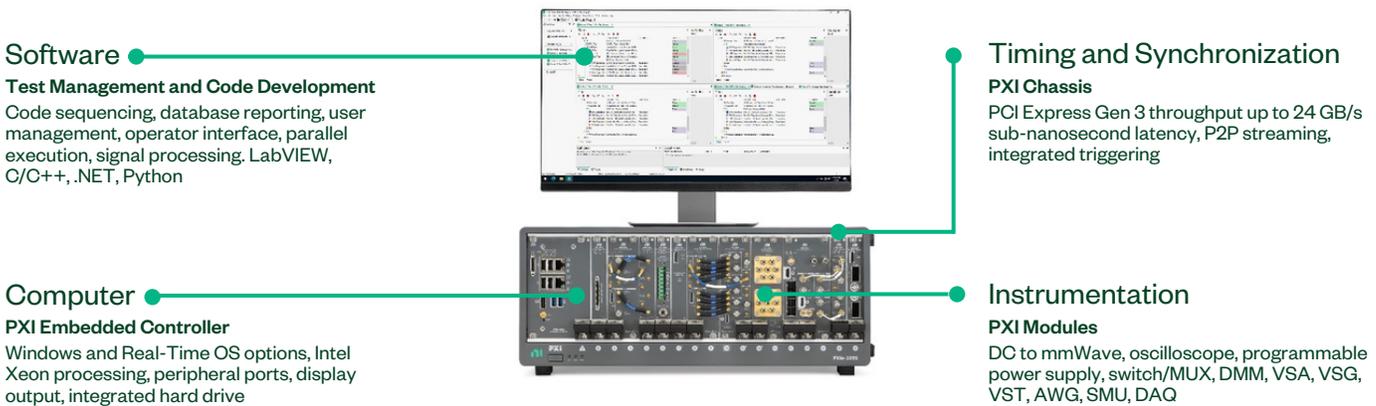
Configure a Custom NI System

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.



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.

<p>HIGHER DATA THROUGHPUT</p>  <p>PCI Express Gen 3</p>	<p>PARALLEL TEST EXECUTION</p>  <p>Multicore Processors</p>	<p>MEASUREMENT ACCELERATION</p>  <p>FPGAs</p>	<p>INCREASED MEASUREMENT RANGE</p>  <p>Data Converters</p>
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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 sparring, 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](#).

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