

2.26 GHz Intel Core 2 Quad Real-Time Embedded Controllers for PXI

NI PXI-8110 RT **NEW!**

- Intel Core 2 Quad Q9100 processor (2.26 GHz dual core)
- 2 GB (1 x 2 GB MB DIMM) RAM (standard)
- Execution target for LabVIEW Real-Time or LabWindows™/CVI Real-Time applications
- Reliable and deterministic operation
- Ethernet control of PXI
- Watchdog timer
- 129 kHz single PID loop rate, maximum

Development System Requirements (Windows)

- LabVIEW 8.6.1 or later
 - LabVIEW Real-Time Module 8.6.1 or later
- Or
- LabWindows/CVI
 - LabWindows/CVI Real-Time Module

Deployment Software (included)

- LabVIEW Real-Time embedded software

PXI System Configuration

- Complete PXI system configuration at ni.com/pxiadvisor



Overview

National Instruments RT Series PXI embedded controllers deliver a flexible, rugged platform for your deterministic, real-time measurement and control applications. The NI PXI-8110 RT controller with its 2.26 GHz quad-core processor, 2 GB 800 MHz DDR2 standard memory, and high-performance 7200 rpm hard drive offers a high-performance platform ideal for demanding real-time test and control applications. You develop your LabVIEW application with the NI LabVIEW Real-Time Module on Windows and download the program to your PXI-8110 RT controller via Ethernet. The embedded code executes on a real-time OS. Thus, you use the powerful and flexible development tools of LabVIEW to build reliable, real-time solutions.

LabVIEW Real-Time applications running on PXI systems achieve microsecond loop rates with only 3 to 4 ns of system jitter. These real-time measurement and control systems capitalize on Intel processors coupled with the advanced timing, triggering, and I/O synchronization benefits of PXI. Furthermore, NI measurement services software extends the timing capabilities of PXI to deliver tight integration with LabVIEW Real-Time applications through operations such as hardware-timed software loops.

Run Parallel Tasks on Separate Processor Cores

The LabVIEW Real-Time Module takes advantage of the available four cores on the Intel Q9100 processor to increase performance and determinism for large real-time test and control applications. You can

either explicitly assign certain tasks to run on specific cores of the processor or let the real-time OS manage this assignment for you.

To fully exercise the available four cores on the PXI-8110 RT, you must architect applications to create four independent execution threads by implementing programming strategies such as task parallelism, data parallelism, and pipelining. As an example of its high performance, the PXI-8110 RT can process up to 167,000 1K fast Fourier transforms (FFTs) per second, which is about 45 percent faster than the NI PXI-8108 dual-core embedded controller. For in-depth multicore programming resources, visit ni.com/multicore.

Connect to Any I/O

The modularity of PXI and open development environment of LabVIEW make it easy to integrate a variety of I/O within your application. Create a custom real-time embedded solution using a PXI-8110 RT embedded controller with any number and combination of PXI/CompactPCI plug-in modules.

Built-in LabVIEW libraries help you create applications with data acquisition, dynamic signal acquisition, motion control, image acquisition, reconfigurable I/O, and instrumentation. Communicate with peripheral devices through CAN, GPIB, Ethernet, or serial protocols. Use NI-VISA to integrate third-party PXI/CompactPCI modules in your application.

In addition, the PXI-8110 RT controller includes an external SMB connection for use as a trigger input, output, or watchdog timer. Use the external SMB to pass trigger and timing signals in and out of the PXI trigger bus in your system.

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CPU	Intel Core 2 Quad Q9100 processor (2.26 GHz quad core)
800 MHz DDR2 RAM, standard	2 GB (1 x 2 GB)
800 MHz DDR2 RAM, maximum	2 GB (1 x 2 GB)
Hard drive (standard option), minimum	120 GB SATA (7200 rpm)
Hard drive (extended temperature and 24/7 option), minimum	80 GB SATA (5400 rpm)
Storage, solid state	Optional ¹
Extended temperature and 24/7 operation option	✓
10/100/1000BASE-TX (Gigabit) Ethernet	✓
Serial port (RS232)	✓
Parallel port	✓
Hi-Speed USB ports	4
GPIO (IEEE 488) controller	✓
ExpressCard/34 slot	✓
Watchdog/trigger SMB	✓

¹ Optional 32 GB solid-state drive can replace the hard drive.

Table 1. NI PXI-8110 RT Features

Create Reliable Stand-Alone Systems

To ensure reliable operation, embedded LabVIEW Real-Time applications continue to run even if the host PC is interrupted or rebooted. Because the PXI-8110 RT embedded controller runs in a separate chassis with a dedicated power supply, the operator can shut down the host computer entirely without disrupting the real-time program.

For stand-alone operation, you can embed code in the system so that it starts automatically when the system boots, requiring no human interaction. Use the LabVIEW Professional Development System and LabVIEW Real-Time Module to compile your LabVIEW application into an executable and download it to your PXI-8110 RT controller.

Dual-Boot Option

You can configure NI PXI embedded controllers to boot into Windows or the real-time OS. NI Measurement & Automation Explorer (MAX) includes features for installing and configuring PXI embedded controllers as LabVIEW Real-Time targets. The controllers use a hardware switch or BIOS setting to boot into the desired OS.

The result is a PXI embedded controller that can run embedded LabVIEW Real-Time or Windows applications. When the controller is in real-time mode, you need another Windows computer to develop and debug the LabVIEW Real-Time code for the PXI controller. To enable a Windows PXI embedded controller to dual-boot with the real-time OS, you must purchase the LabVIEW Real-Time embedded deployment software for the controller.

Extended Temperature and 24/7 Operation Option

The PXI-8110 RT embedded controller is available in two versions to address different environmental and usage conditions. The primary difference is that the version for extended temperature and 24/7 operation uses a different hard drive designed for reliability in both

low- and high-temperature extremes and 24/7 operation. The standard version of the controllers has an operating temperature of 5 to 50 °C and a storage temperature of -40 to 65 °C. The extended temperature and 24/7 operation version has an operating temperature of 0 to 55 °C and a storage temperature of -40 to 71 °C.

You can also use the extended temperature and 24/7 operation version for applications that require continuous operation for up to 24 hours/day, seven days/week because the hard drive is rated for 24/7 operation. The hard drive in the standard version of the controllers is designed to be powered on for eight hours/day, five days/week. Additionally, 24/7 operation applications may subject the hard drive to a high duty cycle (the percentage of the maximum sustained throughput of the hard drive). The hard drive in the standard version of the controllers is designed for a 20 percent duty cycle. The hard drives in the extended temperature and 24/7 operation version and the standard version have a capacity of 80 GB (minimum) with a SATA interface.

Real-Time Performance Benchmarks

Table 2 contains the PID loop rate benchmark numbers for the PXI-8110 RT. For a direct comparison, the benchmarks for the PXI-8110 RT embedded controller were artificially restricted to exercise only the first two CPU cores on the Intel Q9100 quad-core processor. You must architect real-time applications to create four independent execution threads by implementing programming strategies such as task parallelism, data parallelism, and pipelining to fully exercise the four cores on the PXI-8110 RT embedded controller. For in-depth real-time multicore programming resources, visit ni.com/multicore.

Benchmark	Processing	Channels	DAQ I/O Mode	Loop Rates (kHz)		
				PXI-8106 RT	PXI-8108 RT	PXI-8110 RT
Analog I/O	PID	1	Polling	86	136	129
Analog I/O	PID	1	Interrupt	35	50	54
Analog I/O	PID	4	Polling	51	77	75
Analog I/O	PID	4	Interrupt	33	40	41
Analog I/O	PID	16	Polling	26	31	31
Analog I/O	PID	16	Interrupt	16	24	24

Table 2. Maximum loop rates for LabVIEW Real-Time PXI systems are shown. All benchmarks use the LabVIEW Real-Time Module 8.6.1 with NI-DAQmx 8.6. Benchmarks were revised to adhere to the architecture recommended by NI for symmetric multiprocessing-enabled systems. Benchmarks that do not test network performance run on a headless target without a direct Ethernet connection for maximum performance. Benchmarks that do test network performance use interrupt-mode Ethernet via a direct connection between the host PC and real-time target with a crossover cable. Visit ni.com or contact National Instruments for additional benchmarks.

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Ordering Information

To order a complete PXI system based on a LabVIEW Real-Time embedded controller, visit ni.com/pxiadvisor.

Step 1. Controller Model – select one of the following.

NI PXI-8110 RT

Base780690-33

Extended Temperature and 24/7 Operation.....780691-33

Step 2. Select Storage Options

250 GB standard temperature HDD779175-06

32 GB solid-state HDD779175-08

Step 3. Select Accessories

Micro-GPIB to GPIB cable (0.2 m)183285-02

Micro-GPIB to GPIB cable (1 m)183285-01

Micro-GPIB to GPIB cable (2 m)183285-02

IEEE 1284 parallel port cable adapter (6 in.)777169-01

NI PXI-8252 IEEE 1394 interface module.....778925-01

BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to ni.com/pxi.

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Specifications

Specifications subject to change without notice.

Features

Processor	Intel Core 2 Quad 2.26 GHz Q9100
Chipset	Mobile Intel GM45 Express Chipset
Front-Side Bus	1066 MHz
System Memory (RAM).....	2 GB dual-channel DDR2 RAM PC2 6400 (standard)
Ethernet.....	10/100/1000BASE-TX, RJ45 connector
Hard Drive	
Base	120 GB minimum, 7200 rpm, internal 2.5 in., 9.5 mm Serial ATA interface
Extended Temperature and 24/7 Operation Option	80 GB minimum, 5400 rpm, internal 2.5 in., 9.5 mm Serial ATA interface
Video	Integrated Graphics (Mobile Intel GM45 Express Chipset)
Serial	1 (RS232)
Parallel	IEEE 1284 Type C miniature connector (adapter cable not included)
GPIOB	PCI-GPIB/TNT, micro D25 connector IEEE 488 and HS488 transfers
Hi-Speed USB	4
ExpressCard/34	1 (34 mm slot)

Power Requirements

Voltage (V)	Current (A)	
	Typical	Maximum
+3.3	2.0	3.0
+5	9.0	12.0
+12	0.1	0.3
-12	0.0	0.0

Note: The NI PXI-8110 RT is a high-performance embedded controller and consumes more power than other NI embedded controllers. It is recommended that you perform a power budget calculation for your PXI system to verify adequate power availability for all system components. Refer to KnowledgeBase 3K69SDQT for tips on budgeting power.

Physical

Board dimensions	4-slot 3U PXI module 8.1 by 13 by 21.6 cm (3.2 by 5.1 by 8.5 in.)
Slot requirements	One system slot plus three controller expansion slots
Compatibility	Fully compatible with PXI Specification
Weight.....	0.914 kg (2.02 lb) typical

Environment

Maximum altitude.....	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution degree	2
Indoor use only.	

Operating Environment

Ambient temperature range ¹	
Base	5 to 50 °C ² (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Extended temperature range.....	0 to 55 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Relative humidity range.....	10 to 90% noncondensing (tested in accordance with IEC-60068-2-56)

¹For chassis that are not available in the online catalog at ni.com, contact National Instruments for supported operating temperatures.
²5 to 40 °C for the PXI-1000B DC.

Storage Environment

Ambient temperature range	
Base	-40 to 65 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Extended temperature range.....	-40 to 70 °C (tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)
Relative humidity range.....	5 to 95% noncondensing (tested in accordance with IEC-60068-2-56)

Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse (tested in accordance with IEC-60068-2-27; test profile developed in accordance with MIL-PRF-28800F)
Random vibration	
Operating	5 to 500 Hz, 0.3 g _{rms} (with solid-state hard drive)
Nonoperating.....	5 to 500 Hz, 2.4 g _{rms} (tested in accordance with IEC-60068-2-64; nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3)

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Safety and Compliance

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note: For UL and other safety certifications, refer to the product label or visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note: For EMC compliance, operate this device according to product documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note: Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers: At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.

NI Services and Support



NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit ni.com/services.

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NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit ni.com/training.

Professional Services

Our NI Professional Services team is composed of NI applications and systems engineers and a worldwide National Instruments Alliance Partner program of more than 600 independent consultants and integrators. Services



range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

OEM Support

We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Local Sales and Technical Support

In offices worldwide, our staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through online knowledge bases, our applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at ni.com/support.

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit ni.com/ssp.

Hardware Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit ni.com/calibration.

Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit ni.com/services.



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