2.26 GHz Quad-Core Embedded Controller for PXI

NI PXI-8110 *NEW!*

- Intel Core 2 Quad Q9100 processor (2.26 GHz quad core)
- 2 GB (1 x 2 GB DIMM) dual-channel 800 MHz DDR2 RAM standard, 4 GB (1 x 4 GB DIMMs) maximum
- High-performance 7200 rpm integrated hard drive with standard option
- 10/100/1000BASE-TX Ethernet
- Up to 132 MB/s system and slot bandwidth
- 4 Hi-Speed USB ports
- ExpressCard/34 slot
- DVI-I video connector
- IEEE 1284 ECP/EPP parallel port
- GPIB (IEEE 488) controller
- RS232 serial port

- Internal PXI trigger bus routing
- Watchdog timer

Software
- OS and drivers already installed
- Hard-drive-based recovery image

PXI System Configuration
- Complete PXI system configuration at **ni.com/pxiadvisor**

Overview

The NI PXI-8110, an extreme-performance embedded controller based on the Intel Core 2 Quad Q9100 processor, is designed for use in PXI and CompactPCI systems. With its 2.26 GHz quad-core processor, 2 GB 800 MHz DDR2 standard memory, and a high-performance 7200 rpm drive, the PXI-8110 is ideal for applications requiring intensive analysis, signal and image processing, and execution of complex system models. This embedded controller in a PXI chassis offers a compact, high-performance PC-based platform for test, measurement, and control applications.

CPU	Intel Core 2 Quad Q9100 processor (2.26 GHz quad core)
Front-side bus	1066 MHz
L2 cache	12 MB
Dual-channel 800 MHz DDR2 RAM, standard	2 GB (1 x 2 GB)
Dual-channel 800 MHz DDR2 RAM, maximum	4 GB (1 x 4 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)
10/100/1000BASE-TX (Gigabit) Ethernet	✓
GPIB (IEEE 488) controller	✓
Serial port (RS232)	✓
Parallel port	✓
Hi-Speed USB ports	4
ExpressCard/34 slot	✓
Watchdog/trigger SMB	✓
Installed OS	Windows Vista Business, Windows Vista Business (downgraded to Windows XP Professional)[1]

[1]Contact National Instruments or visit **ni.com/pxiadvisor** for information on other available operating systems.

Table 1. NI PXI-8110 Features

Quad-Core Processor

The PXI-8110 includes the quad-core Intel Core 2 Quad Q9100 processor. Quad-core processors contain four cores, or computing engines, in one physical package. They can simultaneously execute four computing tasks, which is advantageous in multitasking environments such as Windows Vista or Windows XP, where multiple applications run simultaneously. Multithreaded system development environments, such as NI LabVIEW, can take full advantage of the available four processing cores on the PXI-8110 by automatically separating their tasks into independent threads. With its quad-core processor, this controller can simultaneously execute four of these threads. Figure 1 compares the SYSmark 2007 overall performance of the PXI-8110 controller with other PXI embedded controllers.

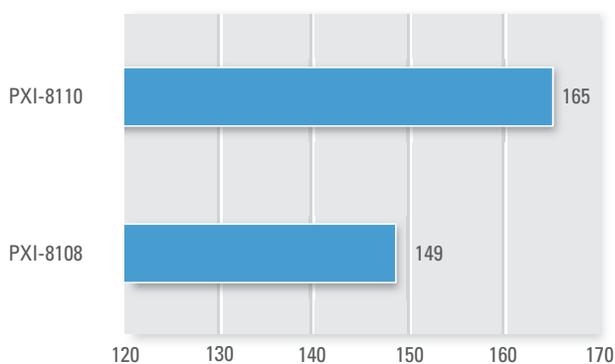### SYSmark 2007 Overall Performance

Figure 1. Embedded Controller Benchmarks

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2.26 GHz Quad-Core Embedded Controller for PXI

To fully exercise the available four cores on the PXI-8110, applications must be architected 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 can process up to 215,000 1K fast Fourier transforms (FFTs) per second, which is about 80 percent faster than the NI PXI-8108 dual-core embedded controller. Previously, you could achieve this type of performance only by using a bulky workstation. The PXI-8110 provides this same capability in a compact, 3U form factor. For in-depth multicore programming resources, visit **ni.com/multicore**.

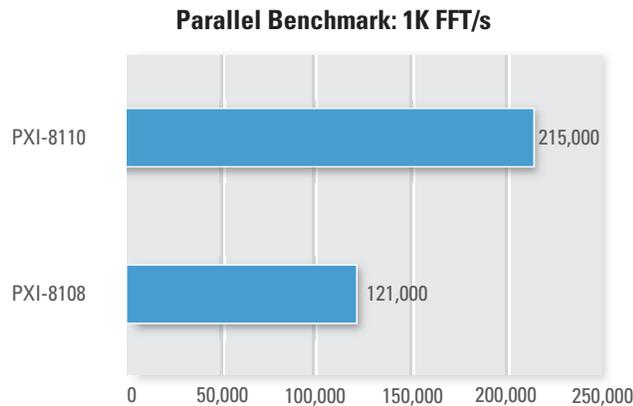### Parallel Benchmark: 1K FFT/s

Figure 2. The PXI-8110 can process 215,000 1K FFTs per second, which is about 80 percent faster than the NI PXI-8108 embedded controller.

Hardware

With state-of-the-art packaging, the PXI-8110 integrates the Intel Core 2 Quad Q9100 processor and all standard and extended PC I/O ports into a single unit. Because many of the I/O ports on the controller are integrated, all active slots in the chassis remain available for measurement and control modules. This rugged one-piece controller design minimizes integration issues and eliminates the need for complex cabling to daughter boards. The PXI-8110 block diagram is shown in Figure 3.

Peripheral I/O

The PXI-8110 includes high-performance peripheral I/O such as 10/100/1000BASE-TX (gigabit) Ethernet and four Hi-Speed USB ports for connection to a keyboard, a mouse, a CD-ROM/DVD-ROM drive for software installation, or other standard PC peripherals such as speakers, printers, or memory sticks. Use the IEEE 1284 ECP/EPP parallel port to connect to a wide variety of devices, including tape backup drives, printers, and scanners. An RS232 port is available for connecting to serial devices. Additionally, the PXI-8110 controller includes an integrated GPIB (IEEE 488) controller, which provides control of external instrumentation, saving additional cost and a slot.
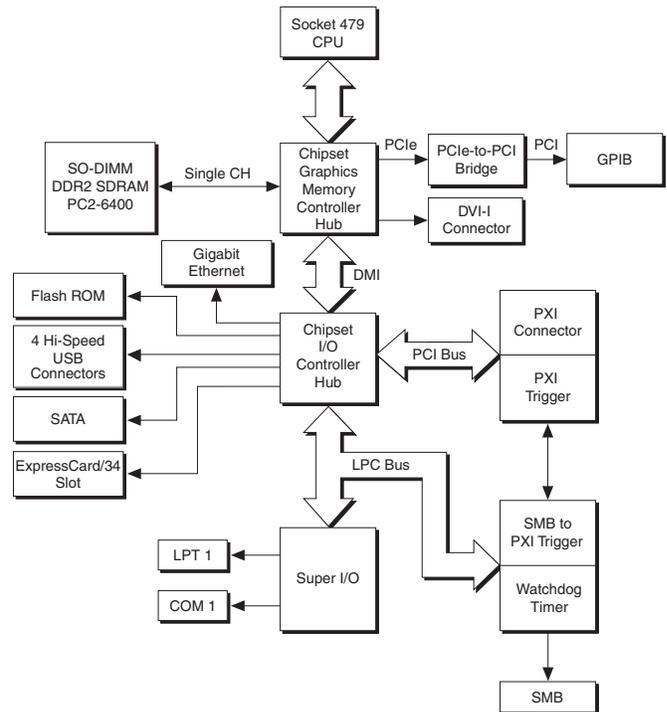

Figure 3. NI PXI-8110 Block Diagram

ExpressCard

This embedded controller features an ExpressCard/34 slot. ExpressCard uses the PCI Express and Hi-Speed USB serial interfaces to provide up to 2.5 Gb/s of bidirectional throughput. Use the ExpressCard/34 slot to add a second gigabit Ethernet port to your system or additional peripheral I/O such as external hard drives, RAID arrays, 802.11 wireless LAN, IEEE 1394, Bluetooth, or various memory adapters.

Video

The PXI-8110 includes a Mobile Intel GM45 Express Chipset (Graphics and Memory Controller Hub) that has an integrated graphics processing unit. It delivers intense, realistic 3D graphics with sharp images, fast rendering, smooth motion, and high detail, without the need for an additional video card or peripheral. This unique architecture provides balanced memory usage between graphics and the system for optimal performance. Additionally, the PXI-8110 features a DVI-I video connector that is compatible with digital (DVI) and analog video (VGA) monitors. A DVI-I to VGA adapter is included with the controller for use with VGA monitors.

Dual Monitor Support

The DVI-I video port on the PXI-8110 is capable of supporting simultaneous DVI and VGA output. With this built-in capability, you can connect a digital and an analog monitor or two analog monitors to your PXI system at the same time with independent displays. This negates the need for a separate PXI or CompactPCI video module to connect two monitors to your PXI system. A DVI-I (male) to DVI-D (female) and VGA (female) splitter is required for connecting the two monitors.

Memory

The PXI-8110 uses dual-channel 800 MHz DDR2 SDRAM, which makes the controller ideal for data-intensive applications requiring significant analysis. It has a single SO-DIMM socket for the DDR2 SDRAM. 2 GB (1 x 2 GB DIMM) of RAM is standard with upgrade options to 4 GB.

Extended Temperature and 24/7 Operation Option

This 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 both reliability in 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 70 °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 drive in the extended temperature and 24/7 operation version has a capacity of 80 GB (minimum). See specifications for further details.

USB Peripherals

National Instruments offers a USB-to-dual-PS/2 keyboard/mouse adapter cable to connect a legacy PS/2 keyboard and mouse to a single USB port on your embedded controller. Additionally, NI offers external USB CD-ROM/DVD-ROM and USB floppy drives for use with your embedded controller. Connect these drives to your embedded controller for easy software installation and upgrades. Both are completely powered through the USB ports, so no external power connections are required. Additional USB peripherals, such as USB speakers to add audio, or USB memory sticks to add easily removable memory, are widely available from PC peripheral manufacturers.

Additional Peripheral I/O

National Instruments offers numerous plug-in modules to add more peripheral I/O to your PXI system. With the wide variety of peripheral I/O modules available, you can choose modules that add communication with serial, IEEE 1394, and SCSI, in addition to numerous others. You also can obtain modules for controlling other PXI or VXI/VME systems. Visit **ni.com/pxiadvisor** to configure a system with additional peripheral I/O modules.

Hard-Drive-Based Recovery Image

The PXI-8110 embedded controller is shipped with a factory image of the software installation stored on a separate partition of the hard drive. In the case of software corruption, you can invoke a recovery tool during the controller's boot-up process that can use this backup image to restore the controller to its shipping software configuration. You also can use this recovery tool to create custom images that you can store on external mass storage devices such as a USB memory stick, USB hard drives, and USB CD/DVD drives. With this ability, you can create custom backup images that you can use to either recover a PXI-8110 controller or replicate the installation on other PXI-8110 controllers. For more information on this tool, refer to KnowledgeBase 2ZKC02OK.

Software

The PXI-8110 comes with the following minimum set of software already installed:

- Microsoft Windows OS (contact National Instruments or visit **ni.com/pxiadvisor** for a list of available Microsoft OSs and for localized versions)
- Hard-drive-based recovery image
- NI-VISA and NI-488.2 drivers
- Drivers for all built-in I/O ports (Table 1)

With the NI Standard System Assurance Program added to a PXI system order, your embedded controller is shipped already configured with all software and drivers applicable for your system. For example, assume you order a PXI system that includes LabVIEW and NI TestStand software, as well as data acquisition modules, a digitizer, an arbitrary waveform generator, and a digital multimeter (DMM). With the standard program, NI not only assembles and tests your system but also fully configures the embedded controller with the appropriate NI-DAQmx, NI-SCOPE, NI-FGEN, and NI-DMM drivers as well as LabVIEW and NI TestStand.

To configure a complete PXI system with the NI Standard System Assurance Program, contact National Instruments or visit **ni.com/pxiadvisor**.

Ordering Information

For online configuration of a complete PXI system, including the NI Standard System Assurance Program, visit **ni.com/pxiadvisor.**

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

NI PXI-8110

Base 780690-xx

Extended Temperature and 24/7 ....780691-xx

Step 2. Replace "xx" to select installed OS.

Windows Vista Business (English)......................................-02

Windows Vista Business – downgraded to

Windows XP Professional (English)..............................-01

Localized Windows XP or Other OS[1] ....-00

[1]Contact National Instruments or visit **ni.com/pxiadvisor** for the latest operating systems.

Step 3. Memory upgrades – select the amount of upgrade memory.

Standard:

2 GB MB (1 x 2 GB DIMM)

Recommended upgraded memory configurations:

4 GB (1 x 4 GB DIMM must be purchased)

4 GB DDR2 RAM for PXI-8110 780446-4096

Step 4. Accessories[1]

120 GB (or greater) 7200 rpm,

2.5 in. SATA HDD spare/replacement 780970-01

80 GB (or greater) 2.5 in. SATA extended temp

hard-drive upgrade 779175-07

32 GB 2.5 in. SATA solid-state

hard-drive upgrade 779175-08

250 GB (or greater) 2.5 in. SATA hard-drive upgrade 779175-06

DVI-I (male) to DVI-D (female) and

VGA (female) splitter 780868-01

USB-to-dual-PS/2 keyboard/mouse adapter cable 778713-02

External USB CD-ROM/DVD-ROM drive 778492-01

External USB floppy drive.......................................778492-02

USB English keyboard and optical mouse 779660-01

Parallel port adapter cable (6 in.)................................777169-01

NI MKD-1117 (rack-mount 1U LCD monitor,

keyboard, mouse drawer)....................................779872-01

NI FPM-1017 (17 in. flat panel monitor) 779559-01

NI FPT-1015 (flat panel touch screen

with VGA interface and USB) 779560-01

GPIB port adapter cable, 2 m 183285-02

[1]For additional peripheral I/O modules, including serial, IEEE 1394, and SCSI, visit **ni.com/pxiadvisor**.

BUY NOW!

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

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) 4 GB dual-channel DDR2 RAM PC2 6400 (maximum)
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)
GPIB	PCI-GPIB/TNT, micro D25 connector IEEE 488 and HS488 transfers
Hi-Speed USB	4
ExpressCard/34	1 (34 mm slot)

Power Requirements

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

Note: The NI PXI-8110 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)

[1]For chassis that are not available in the online catalog at ni.com, contact National Instruments for supported operating temperatures.
[2]5 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)

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**.

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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

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