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2.7 GHz Dual-Core Embedded Controller for PXI PXI-8840



- Intel Core i5-4400E dual-core processor (2.7 GHz (base), 3.3 GHz (single-core Turbo Boost))
- 4 GB (1 x 4 GB DIMM) single-channel 1600 MHz DDR3 standard, 8 GB (1 x 8 GB DIMM) maximum
- 2 USB 3.0 ports and 4 USB 2.0 ports
- Two 10/100/1000BASE-TX Ethernet ports
- Other peripherals (1 ExpressCard/34 slot, 2 display port video connectors, 1 GPIB (IEEE 488) controller, and 1 RS232 serial port)
- Complete PXI system configuration at ni.com/pxiadvisor
- Software - OS and drivers already installed and hard-drive-based recovery image
- Compatible with Windows 7 OS (64- or 32-bit)

Overview

The PXI-8840 is a high-performance Intel Core i5-4400E processor-based embedded controller for PXI systems. With the 2.7 GHz base frequency, 3.3 GHz (single-core Turbo Boost) dual-core processor, and single-channel 1600 MHz DDR3 memory, the PXI-8840 is ideal for processor-intensive, modular instrumentation, and DAQ applications.

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Application and Technology

PXI-8840 Features

CPU	Intel Core i5-4400E, 2.7 GHz (base), 3.3 GHz (single-core Turbo Boost)
L2 cache	3 MB
Single-channel 1600 MHz DDR3L RAM, standard	4 GB (1 x 4 GB)
Single-channel 1600 MHz DDR3L RAM, maximum	8 GB (1 x 8 GB)
Hard drive (standard option), minimum	250 GB SATA (5400 rpm)
Hard drive (extended temperature and 24/7 option), minimum	80 GB SATA
10/100/1000BASE-TX (Gigabit) Ethernet ports	2
USB 3.0 ports	2
USB 2.0 ports	4
GPIB (IEEE 488) controller	
Serial port (RS232)	
ExpressCard/34 slot	
Watchdog/trigger SMB	
Installed OS	Windows 7 Professional 64-bit (Recommended) Windows 7 Professional 32-bit

Table 1. PXI-8840 Features

Dual-Core Processor

The PXI-8840 includes the dual-core Intel Core i5-4400E processor. Dual-core processors contain two cores, or computing engines, in one physical package. To increase the number of threads that you can process, the PXI-8840 uses Intel Hyper-Threading technology that takes each of the two physical cores and splits them into two virtual cores for a total of four virtual cores. These four virtual cores can execute four computing tasks, which is advantageous in multitasking environments such as Windows 7. Multithreaded system development environments, such as LabVIEW, can take full advantage of the processing cores on the PXI-8840 by automatically separating their tasks into independent threads.

The PXI-8840 offers a 20 percent improvement over the PXI-8115 dual-core embedded controller.

SYSmark 2012 Overall Performance

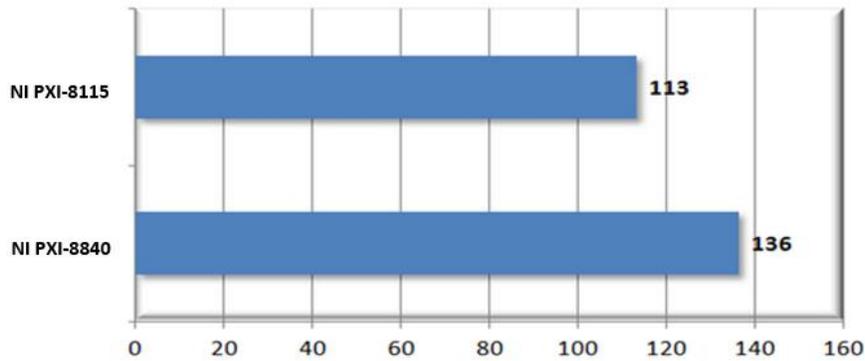


Figure 1. Embedded Controller Benchmarks (data with Windows 7 64-bit, max RAM, and SYSmark 2012)

Previously, to fully exercise the two physical cores on the PXI-8840, applications had to be architected to create multiple independent execution threads by implementing programming strategies such as task parallelism, data parallelism, and pipelining. However, Intel introduced Turbo Boost technology to provide performance benefits for all types of applications without requiring the application to be optimized for multicore processors. The PXI-8840 has a 2.7 GHz base clock frequency, and, with Intel Turbo Boost technology, the frequency automatically increases based on the application type. For example, when running applications that generate only a single processing thread, the CPU places the one unused core into an idle state and increases the active core's clock frequency from 2.7 GHz to 3.3 GHz.¹ Turbo Boost provides performance increases for all types of applications and can significantly reduce test times for processor-intensive applications.

¹Processor should not throttle CPU frequency under reasonable, worst-case processor workloads in high operating temperatures.

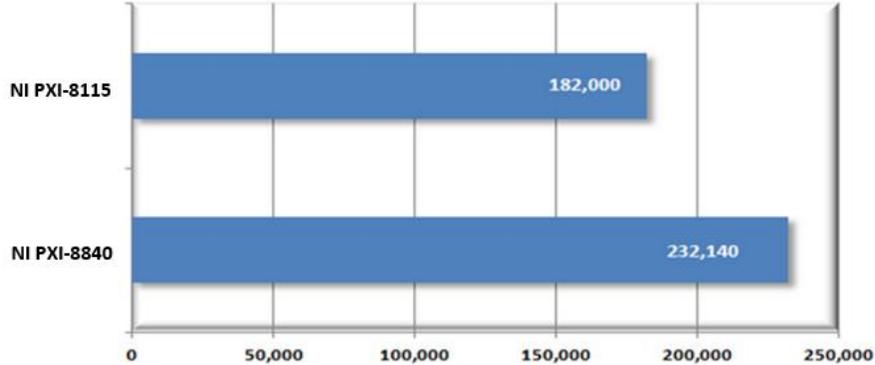


Figure 2. The PXI-8840 can process 232,140 1K FFTs per second, which is 28 percent faster than the PXI-8115 embedded controller.

Hardware

With state-of-the-art packaging, the PXI-8840 integrates the Intel Core i5-4400E 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 controller design minimizes integration issues and eliminates the need for complex cabling to daughterboards. The PXIe-8840 block diagram is shown in Figure 3.

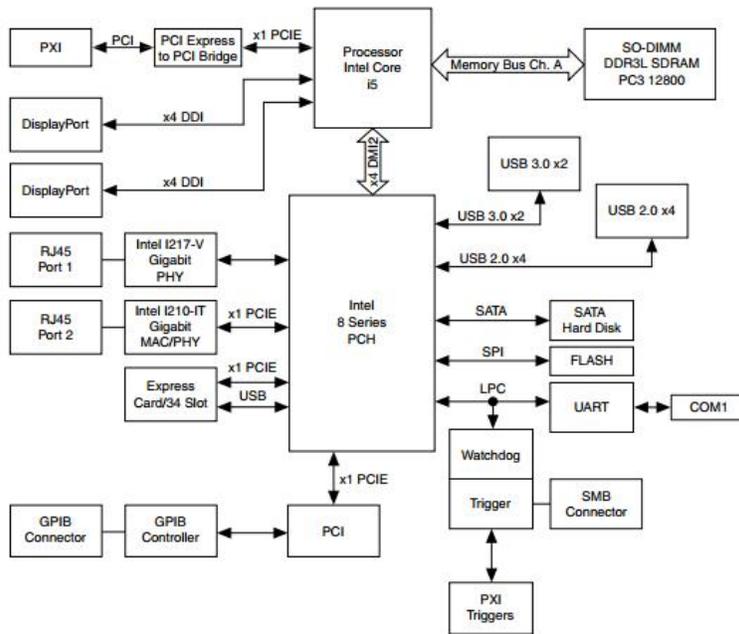


Figure 3. PXI-8840 Block Diagram

In-ROM Memory and Hard-Drive Diagnostics

To improve the serviceability of the PXI-8840, in-ROM diagnostics for the hard drive and memory can be quickly accessed without requiring external third-party tools. By running these diagnostics, the results of analysis can determine if replacement of the hard drive or memory is required. The design of the controller allows for quick field replacement of critical components such as the hard drive and the memory without affecting the warranty. To ease the process of buying spare components, you can purchase hard drive and memory upgrades with the PXI-8840. The combination of this and the in-ROM diagnostics significantly improves PXI-8840 serviceability.

Peripheral I/O

This module includes high-performance peripheral I/O such as two 10/100/1000BASE-TX (Gigabit) Ethernet ports, two USB 3.0 ports, and four USB 2.0 ports for connection to a keyboard, mouse, CD-ROM/DVD-ROM drive for software installation, or other standard PC peripherals such as speakers, printers, or memory sticks. You can use an RS232 port to connect to serial devices. Additionally, the PXI-8840 controller includes an integrated GPIB (IEEE 488) controller, which controls external instrumentation to save additional cost and a slot.

Building Hybrid Test Systems

The PXI-8840 has two Ethernet ports, which enable the development of a hybrid test system. With the ability to use the second Ethernet port, you can combine multiple buses in your test systems. By taking advantage of hybrid test systems that combine components from multiple platforms, you can integrate new buses into existing test systems to help balance design considerations, take advantage of a variety of technologies, and extend the life of your systems.

ExpressCard

This embedded controller features an ExpressCard/34 slot. ExpressCard uses the PCI 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 third 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-8840 delivers intense, realistic 3D graphics with sharp images, fast rendering, smooth motion, and high detail but 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-8840 features two DisplayPort 1.2 video connectors. A DisplayPort to VGA adapter is included with the controller for use with VGA monitors. For information on approved DisplayPort to DVI adapters, refer to this [KnowledgeBase](#) article.

For more information, refer to the NI website at ni.com/info and enter the Info Code *displayport*.

Dual Monitor Support

The dual DisplayPort video ports on the PXI-8840 support simultaneous output. With this built-in capability, you can connect two 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.

Memory

The PXI-8840 uses single-channel 1600 MHz DDR3L RAM, which makes the controller ideal for data-intensive applications requiring significant analysis. It has a single SO-DIMM socket for the DDR3L RAM. 4 GB (1 x 4 GB DIMM) of RAM is standard with an 8 GB upgrade option.

Memory Option	Configuration	Part Number
4 GB	1 x 4 GB DIMM	Standard, no additional part number required
8 GB	1 x 8 GB DIMM	Add 1 x 783001-8192

Table 2. Memory Upgrade Options

Extended Temperature and 24/7 Operation Option

By using solid-state disks (SSDs), the PXI-8840 can address different environmental and usage conditions. These SSD upgrades use a drive that is 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 °C to 50 °C and a storage temperature of -40 °C to 65 °C. With an extended temperature SSD, the operating temperature is 0 °C to 55 °C and the storage temperature is -40 °C to 70 °C.

You can also use controllers with an SSD upgrade 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 controller 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 extended temperature and 24/7 operation version has a capacity of 80 GB (minimum). See specifications for further details.

Hard-Drive-Based Recovery Image

The PXI-8840 embedded controller is shipped with a factory image of the software installation stored on a separate partition of the hard drive. In 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-8840 controller or replicate the installation on other PXI-8840 controllers. For more information on this tool, refer to [KnowledgeBase 2ZKC02OK](#).

Software

The PXI-8840 comes with the following minimum set of software already installed:

- Microsoft Windows 7 Professional OS (contact NI or visit ni.com/pxiadvisor for localized versions of Windows 7 and for other available OSs)
- Hard-drive-based recovery image
- NI-VISA and NI-488.2 drivers
- Drivers for all built-in I/O ports

With an NI system assurance program (Base or Standard) added to your 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 TestStand software as well as DAQ modules, a digitizer, an arbitrary waveform generator, and a digital multimeter (DMM). With an NI system assurance 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 TestStand software.

Additionally, your embedded controller is configured with a customized hard-drive-based recovery image, so you can restore your controller to the as-shipped configuration at any time. This combination of software configuration and recovery tools provides both a productive and reliable development experience with your PXI system out of the box. To configure a complete PXI system with an NI system assurance program, contact NI or visit ni.com/pxiadvisor.

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Support and 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

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

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