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For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

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2.7 GHz Dual-Core Real-Time Embedded Controller for PXI

PXI-8840 RT



- 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 DDR3L standard
- Execution target for LabVIEW 2013 Real-Time Module or later applications
- Reliable and deterministic operation
- Two USB 3.0 ports and four USB 2.0 ports
- Two 10/100/1000BASE-TX Ethernet ports
- Other peripherals (ExpressCard/34 slot, DVI-I video connector, GPIB (IEEE 488) controller, and RS232 serial port)
- Complete PXI system configuration at ni.com/pxiadvisor

Overview

NI RT Series PXI embedded controllers deliver a flexible, rugged platform for your deterministic, real-time measurement and control applications. The PXI-8840 RT with the 2.7 GHz base frequency, 3.3 GHz (single-core Turbo Boost mode) dual-core processor, and single-channel 1600 MHz DDR3L memory offers a high-performance platform ideal for demanding real-time test and control applications. You can develop your LabVIEW application with the LabVIEW Real-Time Module on Windows and download the program to your PXI-8840 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 millisecond loop rates with only 3 to 4 µs of system jitter. These real-time measurement and control systems capitalize on the latest processors combined 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.

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PXI-8840 RT Features

CPU	Intel Core i5-4400E, 2.7 GHz (base), 3.3 GHz (single-core Turbo Boost mode)
L2 cache	3 MB
Single-channel 1600 MHz DDR3L RAM, standard	4 GB (1 x 4 GB)
Hard drive (standard option), minimum	250 GB SATA (5400 rpm)
Hard drive (extended temperature and 24/7 option), minimum	80 GB SATA
10/100/1000 BASE-TX (Gigabit) Ethernet ports	2
USB 3.0 ports	2
USB 2.0 ports	4
GPIB (IEEE 488) controller	
Serial port (RS232)	
Parallel port	—

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ExpressCard/34 slot	
Watchdog/trigger SMB	

Table 1. PXI-8840 RT Features

Run Parallel Tasks on Separate Processor Cores

The LabVIEW Real-Time Module takes advantage of the available two cores on the Intel 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.

The PXI-8840 RT features Intel Turbo Boost technology, which provides performance benefits for all types of applications without requiring the application to be optimized for multicore processors. This controller has a 2.5 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 2.5 GHz to 3.1 GHz.[1] Turbo Boost delivers performance increases for all types of applications and can significantly reduce test times for processor-intensive applications.

Note: Intel Turbo Boost technology can increase application jitter, so be careful when enabling this setting on real-time systems.

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

In-ROM Memory and Hard-Drive Diagnostics

To improve the serviceability of the PXI-8840 RT, you can quickly access in-ROM diagnostics for the hard drive and memory 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 RT. The combination of this and the in-ROM diagnostics significantly improves PXI-8840 RT serviceability.

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-8840 RT with any number and combination of PXI/CompactPCI plug-in modules. With built-in LabVIEW libraries, you can 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. And use NI-VISA to integrate third-party PXI/CompactPCI modules into your application.

In addition, the PXI-8840 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.

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-8840 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 in an executable and download it to your PXI-8840 RT controller.

Video

The PXI-8840 RT includes the Intel Core i5-4400E integrated graphics processing unit, which 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 RT features two DisplayPort 1.2 video connectors. A DisplayPort to VGA adapter is included with the controller for use with VGA monitors. For more information, refer to the NI website at **ni.com/info** and enter the info code **displayport**.

Dual Monitor Support

You can configure NI PXI embedded controllers to boot into Windows or the real-time OS. 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

By using solid-state disks, the PXI-8840 RT can address different environmental and usage conditions. These solid-state drive (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 solid-state disk, 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.

Real-Time Performance Benchmarks

Table 2 contains the proportional integral derivative (PID) loop rate benchmark numbers for the PXI-8840 RT. It has Intel Turbo Boost technology enabled, which can increase application jitter, so be careful when enabling this setting on real-time systems.

Benchmark	Processing	Channels	DAQ I/O Mode	PXI-8115 RT Loop Rates (kHz)	PXI-8840 RT Loop Rates (kHz)
Analog I/O	PID	1	Polling	189	239
Analog I/O	PID	1	Interrupt	71	104
Analog I/O	PID	4	Polling	112	130
Analog I/O	PID	4	Interrupt	64	88
Analog I/O	PID	16	Polling	40	43
Analog I/O	PID	16	Interrupt	31	35

Table 2. Maximum loop rates for LabVIEW Real-Time PXI systems are shown. All benchmarks use the LabVIEW 2013 Real-Time Module with NI-DAQmx 9.3.5. Benchmarks were revised to adhere to the NI-recommended architecture for symmetric multiprocessing enabled systems. Benchmarks that do not test network performance run on a headless

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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 NI for additional benchmarks.

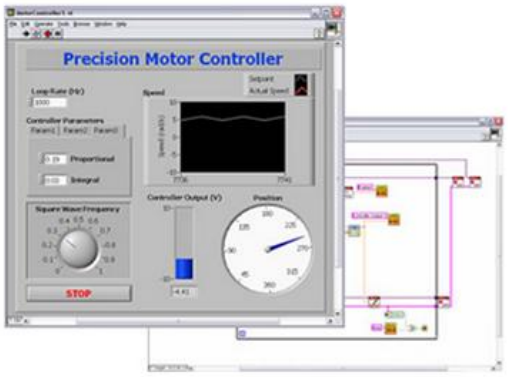
Memory

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

Software Recommendations

LabVIEW Real-Time Module

- Design deterministic real-time applications with LabVIEW graphical programming
- Download to dedicated NI or third-party hardware for reliable execution and a wide selection of I/O
- Take advantage of built-in PID control, signal processing, and analysis functions
- Automatically take advantage of multicore CPUs or set processor affinity manually
- Includes real-time OS, development and debugging support, and board support
- Purchase individually or as part of a Developer Suite bundle



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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.

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