Real-Time Embedded Controllers for PXI

NI PXI-8176 RT, NI PXI-8175 RT, NI PXI-8145 RT

- Real-time, deterministic performance
- Headless, reliable operation
- 1.26 GHz Intel Pentium III processor, maximum
- 40 kHz single PID loop rates, maximum
- Ethernet connectivity
- Watchdog timer
- Integrated serial ports
- Built-in nonvolatile memory

Real-Time PXI Modules

- Data acquisition
- Reconfigurable I/O
- SCXI signal conditioning (except 112x and 119x switches)
- Digitizers
- Dynamic signal acquisition
- Switches
- Image acquisition
- Motion control

- GPIB interface
- Serial interface
- CAN interface
- MXI-3 chassis expansion

Required Software

- LabVIEW Professional or Full Development System
- LabVIEW Real-Time Module

Overview

The National Instruments RT Series PXI embedded controllers deliver a flexible, rugged platform for your deterministic, real-time embedded measurement and control applications. You develop your applications with NI LabVIEW and the LabVIEW Real-Time Module under Windows or Mac OS X, then download and embed the program to run on your RT Series PXI embedded controller under a real-time operating system. Thus, you can use all the powerful development tools of LabVIEW to develop real-time, reliable solutions. With RT Series PXI embedded controllers, your real-time measurement and control systems capitalize on all the benefits of PXI systems, including rugged industrial construction and modularity. Build real-time PXI systems with any number and combination of PXI and Compact PCI measurement hardware modules.

All RT Series embedded controllers deliver real-time deterministic performance and headless, reliable operation. NI offers embedded controllers ideal for high-performance control applications with PID control loop rates up to 40 kHz and embedded controllers ideal for lower-cost real-time applications (see Table 1). Each controller communicates with a Windows or Mac OS X computer running the LabVIEW Real-Time Module over standard Ethernet, and includes a Watchdog timer for monitoring the status of a system.

Reliable Stand-Alone Operation

With an RT Series embedded controller, the LabVIEW Professional Development System, and the LabVIEW Real-Time Module, you can permanently embed code on the system so it starts automatically when the system boots. To ensure reliable operation for real-time control, embedded LabVIEW Real-Time applications continue to run even if the host computer is interrupted or the operator performs a soft reboot of the host computer. Because the RT Series PXI embedded controllers run in a separate chassis with a dedicated power supply, the operator can shut down the host computer entirely without disrupting the embedded program.

Dual-Boot Option

You can use Measurement & Automation Explorer (MAX) to configure some models of the Windows-based PXI embedded controllers to dual-boot as real-time embedded controllers. With MAX on a Windows host machine, you can create floppy disks that you can use to install or remove the real-time operating system from your PXI controller without affecting the native Windows operating system. (The Mac OS X hosts will have these utilities shipped with the LabVIEW Real-Time Module.) The result is an RT Series controller that boots off a floppy disk into a real-time operating system or off the hard drive into a Windows operating system. To enable a Windows-based PXI embedded controller to dual-boot with

	PXI-8176 RT	PXI-8175 RT	PXI-8145 RT
Processor	1.26 GHz Intel Pentium III	866 MHz Intel Pentium III	266 MHz low-power Intel Pentium MMX
Maximum rate for single PID loop	39 kHz	30 kHz	6 kHz
Ethernet connectivity	100BaseTX/10BaseT	100BaseTX/10BaseT	100BaseTX/10BaseT
Serial ports	2	2	1
GPIB ports	1	–	–
Nonvolatile memory	20 GB Ultra DMA IDE hard drive[2]	20 GB Ultra DMA IDE hard drive[2]	32 MB CompactFlash
DRAM	512 MB SDRAM, maximum[1]	512 MB SDRAM , maximum[1]	128 MB SDRAM, maximum[1]
Watchdog	Software configurable	Software configurable	Internal
Shock and Vibration	Basic	Basic	Extended

[1]With upgrades, 64 MB standard on PXI-8145 RT; 128 MB standard on PXI-8176 RT and PXI-8175 RT
[2]Because of rapidly changing hard drive technology, contact NI for the latest hard drive options

Table 1. PXI Real-Time Embedded Controller Selection Guide

Real-Time Embedded Controllers for PXI

a real-time OS, you must purchase a LabVIEW Real-Time run-time license with your Windows-based controller.

Integration with Mac OS X

The LabVIEW Real-Time Module and PXI are your solution for data acquisition, GPIB, serial, and Ethernet communication within the Mac OS X environment. Build your application on a host Mac OS X computer and download it directly to an RT Series embedded PXI controller.

PXI-8176 RT

The PXI-8176 RT is a high-performance PXI embedded controller capable of running a single PID loop at 39 kHz. With the 1.26 GHz Pentium III processor, the PXI-8176 RT is a high-end, real-time controller.

PXI-8175 RT

The PXI-8175 RT contains an 866 MHz Intel Pentium III processor capable of running a single PID loop at 30 kHz.

PXI-8145 RT

The PXI-8145 RT controller is ideal for low-cost, real-time applications. This series of PXI controllers includes a low-power Pentium 266 MHz processor capable of running a single PID loop at up to 6 kHz. The controllers module can withstand higher vibration and shock because it uses nonvolatile CompactFlash memory. With the single-board architecture and low-power processor, NI built this controller for embedded applications where space is limited.

PXI Hardware for Real-Time Applications

The modularity of PXI and open connectivity of LabVIEW make it easy to integrate a variety of I/O within your application. You can take advantage of the timing and triggering functionality of PXI to synchronize measurements across several I/O devices, increasing the performance of your real-time system.

Create a custom real-time embedded solution using an RT Series PXI Embedded Controller with any number and combination of PXI plug-in modules. Built-in LabVIEW libraries help you create powerful applications with data acquisition, dynamic signal acquisition, motion control, image acquisition, and CAN communication. Use NI-VISA to integrate third-party PXI/CompactPCI modules in your application. In addition, the RT Series PXI controllers include built-in Ethernet and serial ports. You can use these built-in ports to communicate with peripheral devices while reserving slots in the PXI chassis for other measurement I/O devices. Table 2 lists all of the PXI hardware you can use with LabVIEW Real-Time, with page references for additional information.

Function	Product	Page
Data acquisition	PXI-61xx S Series multifunction DAQ	197
	PXI-60xx E Series multifunction DAQ	199
	PXI-67xx analog output	362
	PXI-65xx digital I/O	432
	PXI-660x counter/timer	386
	PXI-7831R reconfigurable I/O[2]	220
SCXI and SCC signal conditioning	All SCXI hardware except 112x and 119x switching modules	270
	All SCC hardware	251
Digitizers	PXI-5102	448
Dynamic signal acquisition	PXI-4472 24-bit dynamic signal acquisition	402
Switches	PXI-2501	488
	PXI-2503	488
	PXI-2565	497
	PXI-2590	492
Image acquisition	PXI-14xx image acquisition module[1,2]	603
Motion control	PXI-7358 high-performance 8-axis motion controller	633
	PXI-7344 high-performance 4-axis motion controller[2]	636
	PXI-7334 low-cost 4-axis motion controller[2]	638
Bus interfaces	PXI-8232 GPIB/Gigabit Ethernet module	665
	PXI-842x Serial interface modules	717
	PXI-846x CAN interface modules[2]	747
PXI chassis expansion	PXI-833x MXI-3 for system expansion to multiple PXI Chassis	157

[1]Requires LabVIEW Vision Development Module, version 6.1 or later [2]Not supported under Mac OS X

Table 2. Additional Hardware for Real-Time Applications

Real-Time Embedded Controllers for PXI

Ordering Information

Step 1. Controller Model – Select one of the following models:
NI PXI-8176 RT 778468-33
NI PXI-8175 RT 778467-33
NI PXI-8145 RT 778201-01
To convert a standard PXI-8175 or PXI-8176 controller to an RT Series PXI controller, you can purchase one LabVIEW Real-Time run-time license per controller to add real-time target capabilities.
LabVIEW Real-Time Run-Time License 777849-01

Step 2. NI Factory Installation Service – Select one of the following for system/controller set ups (see page 249)
Customer-defined configuration[1].....960596-01
PXI/SCXI Combination Systems.....960596-04
[1]Systems only

Step 3. Memory Upgrades – If you want to upgrade your memory, select one or two of the following memory options, as applicable to your selected controller:
128 MB SDRAM (8145 RT) 777885-128
256 MB SDRAM (8175 RT, 8176 RT).....778469-256
512 MB SDRAM (8175 RT, 8176 RT).....778469-512

BUY ONLINE!
*Visit **ni.com/info** and enter pxi8176rt, pxi8175rt, and/or pxi8145rt.*

Specifications

Complies with PXI Specification and CompactPCI, PICMG 2.0 specification.
Supports bus-mastering in all PXI/CompactPCI slots.

Physical

Number of slots required

PXI-8145 RT	1 system slot, 1 controller expansion slot (to the left of system slot)
PXI-8175 RT/PXI-8176 RT	1 system slot, 3 controller expansion slots (to the left of system slot)

Dimensions

PXI-8175 RT/ PXI-8176 RT	8.1 by 13 by 21.6 cm (3.2 by 5.1 by 8.5 in. 3U)
PXI-8145 RT	4.1 by 13 by 21.6 cm (1.6 by 5.1 by 8.5 in. 3U)

Weight

PXI-8145 RT	340 g (12 oz)
PXI-8175 RT	1.1 kg (2.4 lb)
PXI-8176 RT	1.2 kg (2.7 lb)

Peripherals

Ethernet

PXI-8145 RT/8175 RT/8176 RT	10/100 BaseT, RJ-45 connector

Serial Port

PXI-8175 RT/PXI-8176 RT	2 RS-232
PXI-8145 RT	1 RS-232

GPIB Port

PXI-8176 RT	PCI-GPIB/TNT, full size

DRAM

PXI-8175 RT/PXI-8176 RT	512 MB maximum, 7.5 ns SDRAM

1 SO-DIMM Socket

PXI-8145 RT	128 MB maximum, 10 ns SDRAM

1 SO-DIMM Socket

Hard drive (PXI-8175 RT, PXI-8176 RT)	Internal 2.5 in., 20 GB minimum
Flash memory (PXI-8145 RT)	32 MB