What Is PXI?

This tutorial provides an overview of PXI, including the PXI hardware architecture, software architecture, and an introduction to configuring PXI systems.

Table of Contents:
- Introduction
- Hardware Architecture
- Software Architecture
- System Configuration
- Summary

Introduction

PXI (PCI eXtensions for Instrumentation) is a rugged PC-based platform for measurement and automation systems. PXI combines PCI electrical-bus features with the rugged, modular, Eurocard packaging of CompactPCI, and then adds specialized synchronization buses and key software features. PXI is both a high-performance and low-cost deployment platform for measurement and automation systems. These systems serve applications such as manufacturing test, military and aerospace, machine monitoring, automotive, and industrial test.

Developed in 1997 and launched in 1998, PXI was introduced as an open industry standard to meet the increasing demands of complex instrumentation systems. Today, PXI is governed by the PXI Systems Alliance (PXISA), a group of more than 65 companies chartered to promote the PXI standard, ensure interoperability, and maintain the PXI specification. For more information on the PXISA, including the PXI specification, refer to the PXISA website at www.pxisa.org.

Hardware Architecture

PXI systems are comprised of three basic components – chassis, system controller, and peripheral modules.
Figure 2. PXI Timing and Triggering Buses – PXI combines industry-standard PC components, such as the PCI bus, with advanced triggering and synchronization extensions on the backplane.

PXI Controllers
As defined by the PXI Hardware Specification, all PXI chassis contain a system controller slot located in the leftmost slot of the chassis (slot 1). Controller options include remote controllers from a desktop, workstation, server, or a laptop computer and high-performance embedded controllers with either a Microsoft OS (Windows 2000/XP) or a real-time OS (LabVIEW Real-Time).

PXI Remote Controllers
There are two types of PXI remote controllers:
- Laptop control of PXI
- PC control of PXI

Laptop Control of PXI
With ExpressCard MXI (Measurement eXtensions for Instrumentation) and PCMCIA CardBus interface kits, users can control PXI systems directly from laptop computers. During boot-up, the laptop computer will recognize all peripheral modules in the PXI system as PCI devices.

ExpressCard MXI interface kit
PCMCIA CardBus interface kit

Figure 3. Laptop Control of PXI
The ExpressCard MXI interface kit provides a 110 MB/s PCI Express-to-PCI bridge from the laptop computer to the PXI chassis. The PCMCIA CardBus interface kit provides a 50 MB/s PCI-to-PCI bridge from the laptop computer to the PXI chassis. Users now have the advantage of mobile/portable PXI systems with laptop control of PXI. You can purchase any ExpressCard MXI compatible laptop or PCMCIA CardBus compatible laptop to remotely control your PXI system. For more information please refer to Laptop control of PXI.

PC Control of PXI
With MXI-Express and MXI-4 interface kits, users can control PXI systems directly from desktop, workstation, or server computers. During boot-up, the computer will recognize all peripheral modules in the PXI system as PCI devices.

Figure 4a. Remote control with 2-port MXI-Express provides simultaneous control of two PXI chassis with combined 160 MB/s throughput.

The MXI-Express interface kit provides a 110 MB/s PCI Express-to-PCI bridge from the PC to the PXI chassis. The NI PXI-PCIe8362 2-port interface kit, users will be able to control two PXI systems simultaneously from a single PC.

Figure 4b. Remote control with MXI-4 provides PC control of PXI, as well as multichassis PXI systems.

The MXI-4 interface kit provides a 78 MB/s PCI-to-PCI bridge from PC to the PXI system. MXI-4 interface kit comes with low-cost copper links or fiber-optic links for both extended distances and electrical isolation. As shown in Figure 4b, you can build multichassis PXI systems with MXI-4 as well. Using a MXI-4 link, you can implement either a daisy-chain or a star topology to build multichassis systems. For more information on topologies for multichassis configurations, refer to the MXI-4 Series User Manual. For more information please refer to PC control of PXI.

With PXI remote controllers, you can maximize processor performance with minimized cost by using a desktop computer or laptop to remotely control a PXI system. Because all remote control products are software transparent, no additional programming is required.

PXI Embedded Controllers
Embedded controllers eliminate the need for an external PC, therefore providing a complete system contained in the PXI chassis. PXI embedded controllers are typically built using standard PC components in a small, PXI package. For example, the NI PXI-8187 controller has a Pentium 4-M 2.5 GHz processor, up to 1 GB of DDR RAM, a hard drive, and standard PC peripherals such as USB 2.0, Ethernet, serial, and parallel ports. Additionally, you can install your choice of OSs on the PXI controller, including Windows 2000/XP or LabVIEW Real-Time.
What Is PXI?

PXI is a modular instrumentation platform that combines the familiar PC architecture with rugged industrial packaging. PXI systems allow users to configure systems tailored to their specific needs.

PXI is based on the standard PCI bus, which means that nearly all software and hardware components that run on Windows-based PC systems will also run on PXI systems. This includes LabVIEW Real-Time, which is a real-time software architecture for Windows-based systems.

For more information on PXI, including links to product pages, pricing, datasheets, and specifications, visit http://zone.ni.com/devzone/conceptd.nsf/webmain/5D1A4BAB15C82C2C...

To configure PXI systems online, visit ni.com/pxiadvisor.

Summary

PXI modular instrumentation defines a rugged computing platform for measurement and automation users that clearly takes advantage of the technology advancements of the mainstream PC industry. By using the standard PCI bus, PXI modular instrumentation systems can benefit from widely available software and hardware components. The software applications and OSs that run on PXI systems are already familiar to users because they are already in use on common desktop computers. PXI meets your needs by adding rugged industrial packaging, plentiful slots for I/O, and features that provide advanced timing and triggering capabilities.

Visit ni.com/pxi for more information on PXI, including links to product pages, pricing, datasheets, and specifications.

If you have any additional questions, you can contact a Technical Sales Representative either by phone at (888) 280-7645 or via e-mail.