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Embedded Pentium III VXIbus Controllers

VXIpc-87x

- VXIplug&play compliant
- Intel Slot 1-based design
 - 700 MHz Pentium III, VXIpc-870/700
- High-performance PCI-based
- Peripherals
 - 10/100BaseT Ethernet
 - Wide Ultra SCSI-3 (SE)
 - PC Card (native Win98/NT support)
 - 16 bit PC card (native Win98 support)
 - Ultra DMA 33 Enhanced IDE
 - 2 USB Ports
- MITE-Based VXIbus interface
 - DMA
 - VME64
- Storage and memory
 - Up to 384 MB SDRAM using SODIMMs
 - Internal 1.44 MB floppy drive
 - Internal 6 GB Ultra DMA2 hard drive
- Programmable WatchDog Timer with Measurement & Automation Explorer support
- Complete VXI Slot 0 Resource Manager
- Jumperless configuration
- 30 Mbytes/s block performance
- 12 Mbytes/s random read/write performance
- 1 Mbytes/s word serial performance

NI-VXI/NI-VISA Software

- Windows 2000/NT/98
- VxWorks
- Linux

Application Software

- LabVIEW
- Measurement Studio



Overview

The VXIpc-87x embedded VXI controllers use state-of-the-art technology and packaging to create a solid, PC-based foundation for controlling VXI systems. The VXIpc-87x controllers are based on the Intel Pentium III Slot 1 architecture, 100 MHz processor chipset bus, along with an Advanced Graphics Port (AGP) for SVGA connection. This chipset also provides Ultra DMA 33 enhanced IDE, Universal Serial Ports (USB), and the ISA bus.

Feature	Description
Floppy drive	Integrated 3.5 in., 1.44 MB
Hard drive	6 GB*
Ethernet	10/100 BaseT (RJ45)
SCSI	Wide Ultra SCSI-3
Video	AGP, 2 MB 64-bit accelerated SGRAM
Memory	128 MB standard SDRAM, SODIMMs 384 MB maximum
PCMCIA	1 Type I/II, 1 Type I / II / III
GPIB	IEEE 488.2 (26-pin miniature connector)
Serial ports	2 RS-232, HS488 (9-pin miniature connector)
Parallel port	IEEE 1284 compatible
Keyboard†	PS/2
Mouse†	PS/2
USB	2 Ports

*Note: Because hard drive technology changes rapidly, contact National Instruments for the latest options.
†Not included.

Table 1. VXIpc-87x Features

Placing a computer directly in a VXI chassis gives you direct control of VXI registers, memory, interrupts, and triggers while maintaining compatibility with the scores of software packages and tools available for general-market desktop PC computers. The VXIpc-870 Series are flexible, high-performance controllers in a

small, rugged package ideal for VXI systems. The VXIpc-87x controllers require two VXI C-size slots.

The VXIpc-87x comes in several models and various options to provide the most cost-effective solution. All VXIpc-870 models come complete with a 3.5 in. floppy drive, Super VGA, USB, two PS/2 ports, serial and parallel ports, and 128 MB of SDRAM. Other standard features include GPIB, 16 bit PC Card, 10/100 Ethernet and Wide Ultra SCSI-3, and at least a 6 GB hard drive. VXI CLK I/O, TrigIN and TrigOUT SMBs are also standard.

You can order the VXIpc-87x in three different configurations. The first configuration, the VXIpc-871, includes all standard features, but it also adds an integrated 24X CD ROM. The VXIpc-872 uses the same base model as the VXIpc-871, but instead of a CD ROM drive, it offers one PCI/ISA expansion slot. The third option, the VXIpc-873, is targeted to users who need solid-state storage media for operation in harsh environments. You can order the VXIpc-873 with either an internal solid-state drive in place of the internal hard drive, or a removable solid-state drive that you can install and remove directly from the front panel.

INFO CODES

For more information or to order products online, visit ni.com/info and enter:

- vxic871
- vxic872
- vxic873

BUY ONLINE!

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Options

VXIpc-871/700

- Windows 2000 installed, internal hard drive
- Windows NT installed, internal hard drive
- Window 98 installed, internal hard drive
- No operating system installed, internal hard drive
- VxWorks software available
- Linux software available

VXIpc-872/700

- Windows 2000 installed, internal hard drive
- Windows NT installed, internal hard drive
- Window 98 installed, internal hard drive
- No operating system installed, internal hard drive
- VxWorks software available
- Linux software available

VXIpc-873/700

- No operating system installed, internal flash drive
- No operating system installed, removable flash drive
- VxWorks software installation available
- Linux software available

The VXIpc-87x uses completely compatible *VXIplug&play* software, including NI-VXI/NI-VISA and NI-488.2 software for Windows. The NI-VXI/NI-VISA bus interface software is a comprehensive software package for configuring, programming, and troubleshooting your VXI system. With NI-VXI/NI-VISA, you can feel confident that your software development will not become obsolete or wasted as your needs change and VXI technology evolves over time.

Hardware

The hardware consists of a double-width module that fits directly in a C-size VXI mainframe. You can use the VXIpc-870 in slot 0 or in non-slot 0 operation, so you can use several VXIpc-87x controllers in a system together.

Hardware Architecture

State-of-the-art packaging technology gives the VXIpc-87x controllers the full functionality of a desktop PC in a VXI module. A number of technological advances were required to make the VXIpc-870 Series computers possible, including the MITE and MANTIS custom ASICs for high-performance VXI control, as well as the PCIMITE and TNT4882 ASIC for GPIB control. Many external peripherals included with VXIpc-87x interface to the microprocessor through the PCI local bus to realize the fastest performance possible. You use the AGP port to connect SVGA for the highest performance video possible.

You can upgrade the standard 128 MB of DRAM in your VXIpc-87x simply by adding readily available standard computer SDRAM SODIMMs, just like notebook PCs. You can maximally configure this controller with 384 MB of SDRAM. You can also easily add external SCSI drives through the optional SCSI-3 interface located on the front panel. The VXIpc-87x has Ethernet capability, so you can quickly and easily integrate the VXIpc-87x into a LAN or WAN. You can also configure the VXIpc-87x with at least a 6 GB hard drive. As technology continues to advance, hard drive sizes change. Be sure to check with National Instruments for the latest hard drive offerings. You can also configure the VXIpc-870 with an internal 24X CD ROM for installation of application software, or you can use it to run test software like a standard desktop PC.

Processor

Using the Intel Slot 1 architecture provides a modular CPU design. The Slot 1 CPU houses the CPU and high-speed 256K L2 Cache. The CPU connects to the motherboard through the 100 MHz GTL+ slot 1 bus. The VXIpc-87x controllers are Pentium III based, providing 256 KB of L2 cache.

SDRAM

The VXIpc-87x uses three SODIMM sockets for SDRAM that are user accessible for memory expansion. NI ships the VXIpc-870 with 128 MB of SDRAM in one SODIMM socket, leaving two sockets free for user-installable SDRAM. Each SODIMM socket can accommodate a 128 MB SODIMM, making the maximum RAM capacity 384 MB.

AGP Graphics

The VXIpc-87x uses a S3 VirgeMX AGP-based graphics controller to provide SVGA connection. The AGP graphics controller is coupled to 2 MB of high-speed 64-bit SGRAM. By using the AGP port for graphics, a higher speed connection between the CPU and graphics controller is possible, offloading traffic from the PCI bus. A few of the resolutions supported include:

Resolution	Colors
640X460	16 M colors
800X600	16 M colors
1024X768	64 K colors
1280X1024	256 colors
1600X1200	256 colors

Table 1. VXIpc-870 Series Features

Embedded Pentium III VXIbus Controllers

10/100BaseT Ethernet and SCSI-3

The Ethernet and SCSI on the VXIpc-87x function as a dual function PCI device that provides connection to 10/100BaseT Ethernet and Wide Ultra SCSI-3. The Ethernet device implements autonegotiation for connection to 10BaseT and 100BaseTX automatically at 10 and 100 Mb/s. The Wide Ultra SCSI-3 function is compatible with SCSI-1, SCSI-2, and SCSI-3. It works with 16-bit Wide Ultra SCSI transfers up to 40 Mbytes/s and 8-bit Ultra SCSI synchronous transfers at 20 Mbytes/s.

PC Card Expansion

You can also add third-party peripheral cards, such as additional serial ports, through one of the two PC Card slots on the front panel. The VXIpc-87x accommodates one Type I/II/III PC Card and one Type I/II PC Card simultaneously. The VXIpc-87x uses the Cirrus 6730 PCI-PC-Card bridge compatible with Windows NT/98.

PCI or ISA Expansion

The VXIpc-87x motherboard can have an expansion slot for either one full-length PCI expansion card or one 16-bit XT-height ISA bus card. You can insert either one PCI or one ISA card, but not both at the same time.

IEEE 488.2/HS488 Interface

The VXIpc-87x uses the PCI MITE and TNT4882 ASIC (PCI-GPIB compatible) to give full GPIB control of external instruments via a front panel connector. GPIB control capability is fully IEEE 488.2 compatible. The GPIB interface on the VXIpc-87x is fully compatible with the National Instruments industry-standard NI-488.2 driver for a variety of operating systems. Any software using NI-488.2 will run on the VXIpc-87x. Using the new HS488 protocol, the VXIpc-87x can handle speeds up to 8 Mbytes/s.

NI WatchDog

The NI WatchDog is a general-purpose counter/timer you can use to monitor the application program by having the software check in with the WatchDog. On a WatchDog timeout, the WatchDog can assert any of the following – RESET, CPU interrupt, CPU NMI, VXI Trigger Line, or VXI Interrupt. The NI WatchDog can be acknowledged using either a software command or a VXI Trigger. The NI WatchDog has a 32 kHz-reference clock to achieve a timeout from 62.5 μ s to 2 s.

Real-Time Clock

The VXIpc-87x uses a standard real-time clock with a user-replaceable battery for CMOS setting backup.

BIOS

The VXIpc-87x uses a 2 MB flash device for BIOS code. The BIOS code is based on the AWARD Modular BIOS. The BIOS code incorporates the VIDEO BIOS and SCSI BIOS in one device. The BIOS is user upgradeable through a flash update utility. Contact National Instruments for currently available BIOS.

Programmable Reset Circuitry

The programmable reset circuitry on the VXIpc-87x simplifies software development. You can independently program the circuitry to reset the VXI backplane, the VXI register set (the MITE and the MANTIS), or the local processor. Therefore, you can reset the VXI backplane without rebooting the computer, or vice versa.

VXI Power Monitor Circuitry

A status LED indicates when all voltages are present. You can use the status LED as a quick indication something is wrong with the system.

VXI Bus

VXI Addressing – The VXIpc-87x controllers feature the MITE and MANTIS custom ASICs for accessing the VXI backplane resources. To access VXI memory or VXI devices, VXIpc-87x controllers use the multiple windowing scheme of the MITE, so you can access all of the VXI address space. You can configure the VXI address windows to “look” at specific areas of VXI memory, or you can use NI-VXI/NI-VISA to do this automatically. The MITE exports independent VXI address windows, providing the user with three completely user-configurable windows. You can use one or all three windows; you can also configure the window size and location. This multiple windowing scheme alleviates the performance penalty related to the context switching of one window that you must constantly move between the different address spaces.

DMA Transfers to and from VXI – The VXIpc-87x can perform block-mode transfers using one of the two on-chip DMA controllers on the MITE. Controlling external VXI devices often takes valuable CPU time, because the microprocessor typically shoulders the burden of transferring data to and from devices. However, MITE-based VXI controllers, such as the VXIpc-87x, free up CPU processing time by moving the burden of block data transfers to one of the DMA controllers integrated in the MITE. Instead of the computer microprocessor transferring the data and/or commands, the NI-VXI/NI-VISA software uses the MITE ASIC to execute the block data transfers. While the MITE transfers the data, the processor can perform application-specific tasks, such as data presentation and analysis.

Embedded Pentium III VXIbus Controllers

VXI Slot 0 Functionality – The VXIpc-87x controllers have full VXI Slot 0 capability, including a MODID register and a CLK10 source, as required by the VXIbus specification. You can also install the VXIpc-87x in another slot and use it in the Non-Slot-0 mode. No matter what your configuration needs, the VXIpc-87x can automatically detect whether it is inserted into Slot 0 and automatically enable or disable the Slot-0 onboard circuitry without switches and jumpers.

External VXI CLK10 Synchronization – The VXIpc-87x controllers have an SMB connector on the front panel for an external clock. Onboard programmable logic can configure the VXIpc-870 to drive its 10 MHz VXI CLK10 signal to this connector as an output or to use this connector as an input for the 10 MHz VXI CLK10 signal. In this fashion, you can configure multiple mainframes to operate off a single 10 MHz system clock. You can control all CLK10 routing features through software.

Advanced Trigger/Timing – With the VXIpc-87x, a programmer has full hardware and software control of the VXI trigger lines. The VXIpc-87x has two SMB trigger I/O connectors on its front panel for routing any TTL trigger line between the backplane and external devices. The VXI trigger interface is based on the advanced MANTIS ASIC developed by National Instruments. The MANTIS provides the complete VXIpc-87x VXI interface to the outer rows of the P2 backplane connector in a single chip. The VXIpc-87x can respond to all VXI-defined protocols on all P2 TTL and ECL trigger lines at the same time. The MANTIS features an internal cross-matrix switching system for routing between lines as well as to and from the front panel and onboard clocks. An internal counter gives sophisticated counting of events and interrupting on trigger edges and pulses, as well as generating pulse trains, variable length pulses, and pulse stretching.

VXI Interrupts – The VXIpc-87x can function as an interrupter and an interrupt handler for any or all of the VXIbus interrupt lines in a VXI mainframe. The VXIpc-87x works with both Release on Acknowledge (ROAK) and Release on Register Access (RORA) devices. All interrupts are routed to the microprocessor. The VXIpc-87x can also detect other VXIbus conditions, including assertion of ACFAIL, SYSFAIL, and BERR.

Front Panel

The front panel of each VXIpc-87x contains 15 connectors, 10 LEDs, and a reset button. In addition, it includes an integrated 3.5 in. floppy disk drive. The 15 front panel connectors are listed below:

- Two 16550 RS-232 serial connectors
- Extended capabilities parallel (ECP) connector
- 15-pin VGA controller connector
- SMB external 10 MHz clock I/O connector
- SMB trigger IN connector
- SMB trigger OUT
- Audio OUT connector

- PS/2 style keyboard connector
- PS/2 style mouse connector
- 26-pin GPIB connector
- 10/100BaseT Ethernet connector
- Two USB connectors
- SCSI-3 connector

Six of the front panel LEDs provide VXI and PC status. They are as follows:

- FAILED
- SYSFAIL
- ONLINE
- PWROK
- DRIVE
- ACCESS
- SCSI

The other three LEDs, listed below, show the status for the Ethernet port:

- RECEIVE/TRANSMIT
- LINK
- 100BaseT Active

Software

The VXIpc-87x comes with NI-VXI/NI-VISA software, making it completely compliant with *VXIplug&play* Systems Alliance specifications. NI-VXI/NI-VISA is the combination of our popular NI-VXI VXIbus interface software and our new-generation VISA I/O software, which has also been standardized by the *VXIplug&play* Systems Alliance. Because the VXIpc-87x is completely *VXIplug&play* compliant, you can run all of the latest *VXIplug&play* software, including executable soft front panels, with which you can operate the instrument immediately, and standardized LabVIEW and Measurement Studio instrument drivers to ease your programming task.

NI-VXI/NI-VISA comes with a VXIbus interface library that you can use with a number of popular programming environments and compilers, including Microsoft Visual C++, Borland C++, Microsoft Visual Basic, Measurement Studio, and LabVIEW. The industry-standard NI-488.2 software for controlling external GPIB instruments through the VXIpc-870 front-panel GPIB port is also available. Application software developed using the VXIpc-87x and the NI-VXI/NI-VISA bus interface software is compatible with many other VXI controller platforms, including computers that have been equipped with a MXI-2 or MXI-3 based interface. NI-VXI and NI-VISA I/O software compatibility across platforms protects your software investment in the future. Because the software for all these configurations is compatible, you can program both general-purpose external PCs and embedded VXIpcs using the same programming tools and concepts. You can easily port VXI software to other platforms as your controller requirements change or expand in the future.

Embedded Pentium III VXIbus Controllers

Ordering Information

VXIpc-871/700

Windows 2000 installed, 128 MB SDRAM, internal hard drive	778340-711
Windows NT installed, 128 MB SDRAM, internal hard drive	778340-012
Windows 98 installed, 128 MB SDRAM, internal hard drive	778340-013
No operating system installed, 128 MB SDRAM, internal hard drive	778340-011

VXIpc-872/700

Windows 2000 installed, 128 MB SDRAM, internal hard drive	778341-712
Windows NT installed, 128 MB SDRAM, internal hard drive	778341-012
Windows 98 installed, 128 MB SDRAM, internal hard drive	778341-013

No operating system installed, 128 MB SDRAM, internal hard drive	778341-011
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VXIpc-873/700

No operating system installed, internal flash drive	778342-111
No operating system installed, removable flash drive	778342-211

Linux Software

NI-VXI/NI-VISA for Linux**	778130-01
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VxWorks Software

NI-VXI/NI-VISA for VxWorks*	777250-04
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Memory Upgrade

64 MB upgrade	777906-64
128 MB upgrade	777906-128

*For VxWorks, order VXIpc870/700 without operating system and NI-VXI/NI-VISA for VxWorks.

**For Linux, order the VXIpc-870/700 without operating system and NI-VXI/NI-VISA for Linux.

Specifications

Complies with VXI Specification 2.0
Complies with IEEE 488.2

Power Requirements

+5 VDC	9 A
+12 V	10 mA
-12 V	10 mA
-2 V	100 mA
-5.2 V	300 mA
+24 V	1 mA
-24 V	1 mA

Physical

Size	Fully enclosed, shielded VXI C-size board
Dimensions	233.35 by 340 mm (9.187 by 13.386 in.)
Weight	2.5 kg (5.5 lb)
Number of VXI Slots	2
	Class 1 TTL

Operating Environment

Ambient Temperature	0 to 55 °C
Relative Humidity	0 to 90%, noncondensing

Storage Environment

Ambient Temperature	-20 to 70 °C
Relative Humidity	5 to 95%, noncondensing

Shock and Vibration

Functional shock	MIL-T-28800E Class 3 (30 g Half-Sine Shock Pulse) also meets IEC 60068-2-27
Random vibration	MIL-T-28800E, MIL-STD-810E Category 1
Operational	5 to 500 Hz, 0.3 g _{rms}
Nonoperational	5 to 500 Hz, 2.4 g _{rms}



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