Embedded High-Performance VXIbus Controllers

Overview
The National Instruments VXIpc-870B Series embedded controllers are flexible, high-performance Pentium III-based controllers in a rugged package ideal for VXI systems. An NI VXIpc-870B Series controller 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 NI VXIpc-870B Series controllers come in four models with various options that provide the most cost-effective VXI embedded control solution available. Table 1 details the standard features of the VXIpc-870B Series controllers. The VXIpc-870B Series controllers require two VXI C-size slots. The VXIpc-871B and VXIpc-874B include all the standard features, but also add an integrated 24X max CD-ROM drive. The VXIpc-872B and VXIpc-875B also contain all standard features, but instead of a CD-ROM drive, they offer one PCI expansion slot.

If you require a solid-state storage medium for operation in harsh environments, you can use the VXIpc-870B Series controllers with an internal solid-state flash drive in place of the internal hard drive, or a removable solid-state flash drive that you can install and remove directly from the front panel.

Options
VXIpc-871B and 874B (with integrated 24X max CD-ROM drive)
- Windows 2000 installed, internal hard drive
- Windows NT installed, internal hard drive
- Windows XP installed, internal hard drive
- No OS installed, internal hard drive
- VxWorks software available
- Linux software available
- Internal IDE flash drive available
- Removable ATA flash drive available

VXIpc-872B and 875B (with PCI expansion slot)
- Windows 2000 installed, internal hard drive
- Windows NT installed, internal hard drive
- Windows XP installed, internal hard drive
- No OS installed, internal hard drive
- VxWorks software available
- Linux software available
- Internal IDE flash drive available
- Removable ATA flash drive available

Table 1. VXIpc-870B Series Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Intel Pentium III, 1.26 GHz/1.4 GHz</td>
</tr>
<tr>
<td>Floppy Drive</td>
<td>Integrated 3.5 in., 1.44 MB</td>
</tr>
<tr>
<td>IDE Controller</td>
<td>Ultra ATA 10/66/33, B&amp;IDE and PIO modes</td>
</tr>
<tr>
<td>Ethernet</td>
<td>10/100BaseT (PL45)</td>
</tr>
<tr>
<td>SCSI</td>
<td>Wide Ultra2 SCSI (E IDE/SE)</td>
</tr>
<tr>
<td>Video</td>
<td>Integrated Intel 82815 graphics controller</td>
</tr>
<tr>
<td>Memory</td>
<td>256 MB PC133 SDRAM, (2 SD-DIMM slots upgradeable to a total of 512 MB)</td>
</tr>
<tr>
<td>PC Card Controller</td>
<td>2 slots (2 Type I or 2 Type II)</td>
</tr>
<tr>
<td>GPIB</td>
<td>IEEE 488.2 20-pin miniature connector</td>
</tr>
<tr>
<td>Serial Ports</td>
<td>2 RS232 (9-pin miniature connector)</td>
</tr>
<tr>
<td>Parallel Port</td>
<td>IEEE 1284-compatible</td>
</tr>
<tr>
<td>PS/2</td>
<td>2 ports (keyboard/mouse)</td>
</tr>
<tr>
<td>USB</td>
<td>2 ports (USB 1.1 compatible)</td>
</tr>
</tbody>
</table>

1Not included. 2Supported in Windows 2000 only.
The VXIpc-870B Series uses industry-standard VXI plug&play software, including NI-VXI/NI-VISA and NI-488.2 software. 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 be confident that your software development will not become obsolete as your needs change and VXI technology evolves over time.

**Hardware**

NI VXIpc-870B Series controller hardware consists of a double-width module that fits directly in a C-size VXI mainframe. You can use the VXIpc-870B Series in Slot 0 or in non-Slot 0 operation, so you can use several VXIpc-870B Series controllers in a system together. The VXIpc-870B Series uses the Intel 815E chipset to deliver maximum performance and flexibility for your VXI system. Figure 1 shows the block diagram for the VXIpc-870B Series embedded controllers.

**Hardware Architecture**

State-of-the-art packaging technology gives the VXIpc-870B Series controllers the full functionality of a desktop PC in a VXI module. National Instruments made a number of technological advances to make the VXIpc-870B Series controllers possible, including the MITE and MANTIS custom ASICs for high-performance VXI control, as well as the PCI MITE and TNT4882 ASIC for GPIB control. Many expansion options exist on the VXIpc-870B Series controllers, including CardBus, SCSI, and GPIB. These expansion options interface to the microprocessor through the PCI bus to realize the fastest performance possible.

You can easily add external SCSI drives through the Wide Ultra2 SCSI interface located on the front panel. All VXIpc-870B Series controllers have a 10/100BaseT Ethernet port, so you can quickly and easily integrate the VXIpc-870B into a LAN or WAN. The VXIpc-870B Series also comes with at least a 30 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-870B Series with an internal 24X max CD-ROM drive for installation of application software (available only on the VXIpc-871B/VXIpc-874B), or you can use it to run test software like a standard desktop PC. The VXIpc-870B Series motherboard also provides you with one PCI expansion slot for either one full-length or one short-length PCI expansion card (available only on the VXIpc-872B/VXIpc-875B).

**Processor**

The VXIpc-870B Series features 1.26 or 1.4 GHz Intel Pentium III processors in the FC-PGA2 package. The processors come with 512 KB of level 2 cache and interface to the chipset through the 133 MHz AGTL+ system bus.

**Memory**

VXIpc-870B Series controllers come with two SO-DIMM sockets for memory. The system handles a maximum of 512 MB of PC133 memory. You can purchase additional 256 MB memory modules and upgrade your system memory.

**Intel 82815 Graphics Controller**

The NI VXIpc-870B Series uses the integrated Intel 82815 graphics controller and dynamic memory video technology (DMVT). Using DMVT, the integrated graphics controller achieves optimum graphics and memory performance by dynamically sharing the high-speed PC133 system memory. With this video memory management, the VXIpc-870B Series offers a wide range of video resolutions and colors, a few of which are listed in Table 2.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Colors</th>
</tr>
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<tbody>
<tr>
<td>640 x 480</td>
<td>16 M colors</td>
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<tr>
<td>800 x 600</td>
<td>16 M colors</td>
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<tr>
<td>1024 x 768</td>
<td>16 M colors</td>
</tr>
<tr>
<td>1280 x 1024</td>
<td>16 M colors</td>
</tr>
<tr>
<td>1600 x 1200</td>
<td>256 colors</td>
</tr>
</tbody>
</table>

Table 2. VXIpc-870B Series Graphics Support
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SCSI
The LSI53C895A is a PCI controller providing Wide Ultra2 SCSI performance to the VXIpcc-870B Series controllers. The controller can perform transfers as fast as 40 M transfers/s (80 MB/s). The SCSI controller operates in low-voltage differential mode and is backward compatible with single-ended devices.

PC Card Expansion
You can also add third-party peripheral cards through two PC card slots on the front panel. The VXIpcc-870B Series handles two Type I/II or one Type III PC card. The controller uses the Texas Instruments PCI1450 PCI-PC card bridge. You can boot from an AT A solid-state flash memory card in VxWorks or Linux if you configure the controller through the BIOS.1

IEEE 488.2/HS488 Interface
The VXIpcc-870B Series uses the PCI mini-MITE and TNT4882 ASIC (PCI-GPIB-compatible) for 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 VXIpcc-870B Series is fully compatible with the National Instruments industry-standard NI-488.2 driver software for a variety of operating systems. Any software using NI-488.2 runs on a VXIpcc-870B Series controller. Using the HS488 protocol, the VXIpcc-870B Series can handle speeds up to 8 MB/s.

NI Watchdog
NI watchdog is a counter/timer that can monitor an application program by having the software check in with NI watchdog. Please call National Instruments technical support for more information on this feature.

Real-Time Clock
The VXIpcc-870B Series uses the integrated real-time clock along with a user-replaceable battery for CMOS setting backup. The battery is a hermetically sealed lithium battery, making it suitable for use in industrial applications.

BIOS
The Phoenix BIOS was developed specifically for the VXIpcc-870B Series controllers. The BIOS incorporates both a SCSI option ROM and PXE network boot ROM, so you have the option of either SCSI or network booting.

Another special feature of this BIOS is a PC card booting from an ATA flash memory PC card. The BIOS can configure the TI PCI1450 PC card controller in IDE mode, so some operating systems, such as VxWorks or Linux, can boot from a PC card.1

USB CD-ROM Drive
National Instruments offers an optional external USB CD-ROM drive for use with the VXIpcc-872B embedded controller. Using the USB interface, you can connect this CD-ROM drive to your embedded controller for easy system software recovery, installation, and upgrades. Because USB is not available with Windows NT, the external CD-ROM drive works only as a recovery device under this operating system. This drive is completely powered through the USB port, so no external power connections are required.

VXIbus
VXI Addressing – The VXIpcc-870B Series controllers feature the MITE and MANTIS custom ASICs for accessing the VXI backplane resources. To access VXI memory or VXI devices, VXIpcc-870B Series controllers use the multiple windowing scheme of the MITE, so you can access all of the VXI address space. The MITE exports independent VXI address windows, providing you with three completely user-configurable windows. You can also set each 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 – Using the VXIpcc-870B, you 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 those of the VXIpcc-870B Series, free up CPU processing time by moving the burden of block data transfers to one of the DMA controllers on the MITE. Instead of the computer microprocessor transferring the data and/or commands, 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.

VXI Slot 0 Functionality – The VXIpcc-870B Series 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 a VXIpcc-870B Series controller in another slot and use it in the non-Slot 0 mode. No matter what your configuration needs, a VXIpcc-870B Series controller 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 VXIpcc-870B Series controllers have an SMB connector on the front panel for an external clock. Onboard programmable logic can configure the VXIpcc-870B Series 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 way, you can configure multiple mainframes to operate off a single 10 MHz system clock.
Embedded High-Performance VXIbus Controllers

Advanced Trigger/Timing – With the VXIpc-870B Series, you have full software and hardware control of the VXI trigger lines. The VXIpc-870B Series controllers have two SMB trigger I/O connectors on the front panel for routing any TTL trigger line between the backplane and external devices. The VXIpc-870B Series can respond to all VXI-defined protocols on all P2 TTL and ECL trigger lines at the same time. The hardware also includes an internal counter, which 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-870B Series can function as an interrupter and an interrupt handler for any or all of the VXIbus interrupt lines in a VXI mainframe. Using NI-VXI/NI-VISA software, your application can be notified when any interrupt is asserted, and can assert any interrupt level with a programmable status. You can use the NI-VXI configuration software to assign which interrupt levels should be handled by each device in the system.

Software
The VXIpc-870B Series includes NI-VXI/NI-VISA software, making it completely compliant with VXIplug&play Systems Alliance specifications. NI-VXI/NI-VXI is the combination of the popular NI-VXI VXIbus interface software and new-generation virtual instrumentation software architecture VISA I/O software, also standardized by the VXIplug&play Systems Alliance. Because the VXIpc-870B Series is completely VXIplug&play-compliant, you can run all the latest VXIplug&play software, including executable soft front panels, with which you can operate the instrument immediately, and standardized LabVIEW, LabWindows/CVI, and Measurement Studio instrument drivers to simplify your programming tasks.

NI-VXI/NI-VISA comes with a VXI bus interface library that you can use with a number of popular programming environments and compilers, including LabVIEW, LabWindows/CVI, and Measurement Studio, as well as Microsoft Visual C++, Borland C++, and Microsoft Visual Basic. NI also offers industry-standard NI-488.2 software for controlling external GPIB instruments through the VXIpc-870B Series front-panel GPIB port. Application software developed using the VXIpc-870B Series and the NI-VXI/NI-VISA bus interface software is compatible with many other VXI controller platforms, including computers 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 VXIpc controllers 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. The NI-VXI and NI-DAQ software for the VXIpc-870B Series controllers is not compatible with National Instruments legacy VXI data acquisition and signal conditioning devices. Please see technical support at ni.com for additional information.

Ordering Information

<table>
<thead>
<tr>
<th>NI VXIpc-871B</th>
<th>No OS installed on internal hard drive</th>
<th>778295-00</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Windows 2000 installed on internal hard drive</td>
<td>778295-01</td>
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<tr>
<td></td>
<td>Windows NT 4.0 installed on internal hard drive</td>
<td>778295-02</td>
</tr>
<tr>
<td></td>
<td>Windows XP installed on internal hard drive</td>
<td>778295-03</td>
</tr>
<tr>
<td>NI VXIpc-872B</td>
<td>No OS installed on internal hard drive</td>
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</table>

Additional Software Options

<table>
<thead>
<tr>
<th>NI-VXI/NI-VISA for Linux</th>
<th>778130-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI-VXI/NI-VISA for VxWorks</td>
<td>778597-01</td>
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</tbody>
</table>

Memory Upgrade Options

The VXIpc-870B Series controllers come with two SO-DIMM sockets accessible for memory expansion. These controllers come with 256 MB of PC133 SDRAM in one socket with the other socket available for expansion. The system handles a maximum of 512 MB of PC133 memory. You can purchase the following SDRAM module to add to your controller. 256 MB SDRAM | 778469-256 |

Flash Drive Options

| Internal IDE flash drive | 778600-01 |
| Removable ATA flash PC card | 778600-02 |

Additional Accessories

| USB CD-ROM drive | 778492-01 |
| Parallel port adapter cable (6 in) | 777169-01 |
| GPIB adapter cable (2 m) | 183285-02 |
| Serial adapter cable (8 in) | 183286-08 |

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Embedded High-Performance VXIbus Controllers

Specifications

Complies with VXI Specification 3.0
Complies with IEEE 488.2

Physical
Size .......................................................... Fully enclosed, shielded VXI C-size board
Dimensions .................................................. 233.35 by 340 mm
(9.187 by 13.386 in)
Weight
VXIpc-871B ................................................ 2.4 kg (5.3 lb)
VXIpc-872B ................................................ 2.2 kg (4.9 lb)
Number of VXI slots .................................. 2

Power Requirements

<table>
<thead>
<tr>
<th>VDC</th>
<th>DC (Typical)</th>
<th>Dynamic (Typical)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5</td>
<td>9.75 A</td>
<td>4.25 A</td>
</tr>
<tr>
<td>+12</td>
<td>150 mA</td>
<td>150 mA</td>
</tr>
<tr>
<td>-12</td>
<td>50 mA</td>
<td>50 mA</td>
</tr>
<tr>
<td>-2</td>
<td>100 mA</td>
<td>125 mA</td>
</tr>
<tr>
<td>-5.2</td>
<td>200 mA</td>
<td>125 mA</td>
</tr>
</tbody>
</table>

Total power (typical) ................................ 52.4 W

Operating Environment
Ambient temperature range ....................... 5 to 50 °C
Relative humidity range .............................. 10 to 90%, noncondensing

Storage Environment
Ambient temperature range ....................... -20 to 70 °C
Relative humidity range .............................. 5 to 95%, noncondensing

Mean Time Between Failures (MTBF)
VXIpc-871B/VXIpc-874B ................................ 88,000 hours
VXIpc-872B/VXIpc-875B ................................ 86,000 hours
(Predictions performed in accordance with Bellcore Reliability Methods)

Shock and Vibration

Functional shock .................................. 30 g peak, half-sine, 11 ms pulse

Random vibration
Operational ........................................ 5 to 500 Hz, 0.3 g
Nonoperational .................................. 5 to 500 Hz, 2.4 g
(Predictions performed in accordance with MIL-T-28800E and MIL-STD-810E Method 514.)

Safety Compliance
EN 61010-1, IEC 61010-1

Specifications subject to change without notice.
NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle— from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit ni.com/services

Training and Certification
NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit ni.com/training

Professional Services
Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide NI Alliance Partner Program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance

OEM Support
We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem

Local Sales and Technical Support
In offices worldwide, our staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through online knowledge bases, our applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at ni.com/support

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit ni.com/ssp

Hardware Services
NI Factory Installation Services
NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI™ combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with ni.com/pxiadvisor

Calibration Services
NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit ni.com/calibration

Repair and Extended Warranty
NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit ni.com/services