Overview

The National Instruments GPIB controllers for PCI and PXI combine high-performance hardware with a complete suite of development tools to get your applications up and running fast.

The National Instruments PCI-MITE and TNT family ASICs make the PCI-GPIB a maximum-performance IEEE 488.2 interface for the PCI bus. The PCI-MITE, a complete PCI interface, is compliant with PCI Specification 2.1. The hardware is completely software configurable and compatible with the Plug and Play standard for easy hardware installation. The TNT chip performs the basic IEEE 488 Talker, Listener, and Controller functions required by all versions of IEEE 488, including IEEE 488.2. The PCI-GPIB can sustain data transfer rates of more than 1.5 Mbytes/s using the IEEE 488.1 3-wire interlocked handshake. The PCI-GPIB also implements the high-speed IEEE 488.1 non-interlocked handshake (HS488) for benchmarked data transfers at more than 7.7 Mbytes/s.

The PCI-GPIB is a low-profile IEEE 488 interface for computers that accept boards of this size. The PCI-GPIB is functionally equivalent to the high-performance PCI-GPIB and maintains compatibility for both 3.3 V and 5 V PCI slots.

The PXI-GPIB is a low-cost, high-performance IEEE 488 interface for PXI, the standard for PCI-based modular instrumentation that uses the PCI bus in a rugged Eurocard configuration. Because PXI is electrically a superset of desktop PCI with a different physical configuration, the PXI-GPIB module has the same functionality and performance as a PCI-GPIB board. The PXI-GPIB is available with NI-488.2 for Windows 2000/NT/XP/Me/9x and Solaris.

The PCI-GPIB+ interface combines the PCI-GPIB with a GPIB protocol analyzer. The NI PCI-8232 and PXI-8232 interfaces include PCI-GPIB functionality as well as an Intel 10/100/1000 BaseT Ethernet port. These combination devices save slots in your system while providing the full performance and functionality of their individual components.

HS488

The GPIB controllers for PCI and PXI can use HS488, the high-speed GPIB protocol patented by National Instruments and approved by the IEEE in ANSI/IEEE Standard 488.1-2003. HS488 increases the maximum data transfer rate of ANSI/IEEE Standard 488.1-1987 to 8 Mbytes/s and is a superset of the IEEE 488.1 protocol that attempts to conduct data transfers with the new high-speed non-interlocked handshake. If any active listener is not capable of HS488 transfers, the protocol automatically uses the IEEE 488.1 3-wire interlocked handshake protocol. Maximum data transfer rates obtainable using HS488 depend on the host computer architecture and system
Interfaces for PCI and PXI

High-Performance

GPIB Interfaces for PCI and PXI

configuration. The PCI family of controllers has transfer rates of more than 7.7 M bytes/s.

The TNT family of ASICs completely and transparently handles the HS488 protocol without additional circuitry. Because HS488 is a superset of IEEE 488.1, you can mix existing GPIB devices with devices that are high-speed capable without changing your application programs. The TNT ASICs can implement high-speed data transfers automatically. Thus, devices that have a TNT chip can transparently communicate using HS488 if the corresponding Talker or Listener can also use HS488.

Transfer Rates
The NI PCI/PXI GPIB Controller software and hardware provide maximum performance even when the data block is small. Figures 1 and 2 describe typical performance. Actual obtainable data transfer rates depend on host computer, operating system, system configuration, and device capability.

Hardware
The key functional components of the NI PCI/PXI GPIB family include the PCI-MITE and the TNT family of ASICs.

PCI-MITE Single-Chip PCI Interface
The PCI interface logic is integrated in the PCI-MITE ASIC, a high-performance, single-chip PCI interface. The PCI-MITE implements all PCI-defined configuration registers and additional control and status registers. To provide access to the on-board registers, the onboard ROM, and the TNT ASIC, the PCI-MITE decodes the address and control signals of the PCI bus.

The PCI-MITE provides bus mastering using a sophisticated DMA Controller to enhance overall performance during data transfers. The DMA Controller automatically provides several modes of operation, including link chaining, to maximize data transfer performance.

TNT ASIC Family
The TNT family of ASICs is comprised of the first maximum-performance single-chip IEEE 488.2 Talker, Listener, and Controller interfaces with integrated IEEE 488.1 compatible transceivers. The TNT ASICs also implement the HS488 mode of operation for high-speed GPIB data transfers. The transfer functions implement Automatic Handshake Holdoff on the last byte of a GPIB read and Automatic END transmission on the last byte of a GPIB write. Because these functions are performed in hardware, you save significant CPU time relative to performing the same functions in software. The TNT family includes a basic ASIC and a new ASIC that also includes all the features and performance of the PCI-MITE.

Combination GPIB Controller and Gigabit Ethernet Port
Use the National Instruments PCI-8232 or PXI-8232 when you need to control GPIB instruments and add a network connection in your system. These boards combine a GPIB controller and a Gigabit Ethernet port in a single device, adding network functionality to your GPIB controller. You receive the same high-performance GPIB interface and Ethernet interface in one combination device while saving a slot in your computer or PXI chassis.

The NI PCI-8232 and PXI-8232 take advantage of the industry-leading performance of the Intel 82540EM Gigabit Ethernet Controller, which is compatible with 10BaseT, 100BaseFX, and 1000BaseT networks. The PCI-8232 and PXI-8232 automatically connect at the highest available speed. Based on Intel high-performance technology, these Ethernet controllers maintain peak performance as your network environment evolves and increase the performance of demanding desktop applications by using their duplex capability. The boards also implement Auto-MDI negotiation, which allows the Ethernet port to link using both crossover and straight-through cables.

Combination GPIB Controller and Analyzer
The National Instruments PCI-GPIB+ combines a PCI-GPIB controller and a complete GPIB analyzer on a single board. The PCI-GPIB+ is a low-cost, high-speed alternative to separate GPIB controller and analyzer products.

The GPIB analyzer portion of the PCI-GPIB+ can capture and monitor HS488 activity up to the full 8 M bytes/s rate. You can use the
High-Performance

GPIB Interfaces for PCI and PXI

The PCI-GPIB+, in addition to including industry-standard NI-488.2, comes with an easy-to-use graphical analyzer application. You can use the PCI-GPIB+ to monitor, capture, and participate in bus activity on the GPIB at high speeds. You can capture GPIB activity according to user-specified GPIB criteria. Furthermore, user-specified GPIB events can trigger the capture. You can view captured GPIB information in multiple windows in the analyzer application or save it for later viewing. The GPIB Analyzer software displays the real-time status of the GPIB, including the 16 GPIB control and data lines.

NI-488DDK

NI-488DDK is a driver development kit, a comprehensive source code package for developing applications for operating systems other than those for which NI offers a standard NI-488.2 driver. NI-488DDK consists of more than 20 board-level functions provided in source code to give you a head start when you must design your own GPIB driver. Because NI-488DDK, a subset of our NI-488.2, uses the same syntax, migration of applications from the NI-488DDK to NI-488.2 is straightforward.

Ordering Information

GPIB Controller for PCI
NI PCI-GPIB and NI-488.2 for
  Windows 2000/XP/M/e98 ............................778032-01
  Windows 2000/XP/M/e98 (with 2 m X2 GPIB cable) ............................778032-51
  Windows NT ........................................777073-01
  Windows NT (with 2 m X2 GPIB cable) ............................777073-51
  Windows 95 ........................................777158-01
  Windows 95 (with 2 m X2 GPIB cable) ..................777158-51
  Mac OS ........................................777075-01
  Mac OS (with 2 m X2 GPIB cable) ........................777075-51
  Solaris ........................................777462-01
  Solaris (with 2 m X2 GPIB cable) ......................777462-51

1Includes XA adapter (See page 707)

GPIB Controller for Low-Profile PCI
NI PCI-GPIB/LP and NI-488.2 for
  Windows 2000/XP/M/e98
    (with 2 m X13 cable) ............................778255-01
  Windows NT
    (with 2 m X13 cable) ............................778769-01

GPIB Controller for PXI
NI PXI-GPIB and NI-488.2 for
  Windows 2000/XP/M/e98 ............................778039-01
  Windows NT ........................................777398-01
  Windows 95 ........................................777399-01
  Solaris ........................................778247-01
NI PXI-GPIB and NI-488DDK ............................777431-02

For additional operating systems, contact National Instruments

Combination GPIB Controller and Analyzer for PCI
NI PCI-GPIB+, NI-488.2, and GPIB Analyzer Software for
  Windows 2000/XP/M/e98 ............................778033-01
  Windows 2000/XP/M/e98 (with 2 m X2 GPIB cable) ........................778033-51
  Windows NT ........................................777560-01
  Windows NT (with 2 m X2 GPIB cable) ...............777560-51

Combination GPIB Controller and Gigabit Ethernet Port for PCI
NI PCI-8232 and NI-488.2 for
  Windows 2000/XP/M/e98 ............................778472-01
  Windows NT ........................................778473-01

Combination GPIB Controller and Gigabit Ethernet Port for PXI
NI PXI-8232 and NI-488.2 for
  Windows 2000/XP/M/e98 ............................778658-01
  Windows NT ........................................778659-01

Software Only
NI-488.2 ........................................778599-01
NI-488.2 and analyzer ..................................778599-01
NI-488DDK ..............................................777430-01

Cables
  GPIB X2 cable (double-shielded)
    1 m ........................................763061-01
    2 m ........................................763061-02
    4 m ........................................763061-03
    8 m ........................................763061-04
  GPIB X13 cable (for PCI-GPIB/LP)
    1 m ........................................183285-01
  Ethernet CAT 5 twisted-pair cable (E1 Cable)
    1 m ........................................182219-01
    5 m ........................................182219-05
    10 m ........................................182219-10
  Ethernet CAT 5 shielded cable (ES Cable)
    1 m ........................................189174-01
    5 m ........................................189174-05
    10 m ........................................189174-10

BUY ONLINE!
Visit ni.com/info and enter pcigpib, pxigpib, gpibplus, px18232, and/or pci8232.
High-Performance
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Specifications

IEEE 488 Compatibility
IEEE 488.1 and IEEE 488.2 compatible

<table>
<thead>
<tr>
<th>Capability Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH1</td>
<td>Source Handshake</td>
</tr>
<tr>
<td>AH1</td>
<td>Acceptor Handshake</td>
</tr>
<tr>
<td>T5, T5b</td>
<td>Talker, Extender Talker</td>
</tr>
<tr>
<td>L3, LE3</td>
<td>Listener, Extender Listener</td>
</tr>
<tr>
<td>SR1</td>
<td>Service Request</td>
</tr>
<tr>
<td>PP1, PP2</td>
<td>Local/Remote Parallel Poll</td>
</tr>
<tr>
<td>RL1</td>
<td>Remote/Local</td>
</tr>
<tr>
<td>C1, C2, C3, C4, C5</td>
<td>Controller</td>
</tr>
<tr>
<td>E1, E2</td>
<td>Three-state bus drivers with automatic switch to open collector during parallel poll</td>
</tr>
</tbody>
</table>

Maximum IEEE 488 Bus Transfer Rates
IEEE 488 interlocked handshake.............. 1.5 Mbytes/s
IEEE 488 non-interlocked
(HS488) handshake................................ 7.7 Mbytes/s
(Actual rates depend on system configuration and instrument capabilities.)

GPIB Analyzer Performance
Sampling rate............................................. 20 MHz
Timestamp resolution.............................. 50 ns

Ethernet Performance
10BaseT................................................. 10 Mb/s, full-duplex
100BaseTX............................................. 100 Mb/s, full-duplex
1000BaseT........................................... 1000 Mb/s, full-duplex

Power Requirements
PCI-GPIB, PXI-GPIB, PCI-GPIB/LP (183617x-01-based board)
+5 VDC......................................................... 2.5 W typical, 3.75 W maximum
PCI-8232
+5 VDC......................................................... 4.4 W typical, 5.8 W maximum
PXI-8232
+3.3 VDC..................................................... 3.0 W typical, 4.0 W maximum
PCI signaling level.................................. Universal

Physical Dimensions
PCI (183617x-01-based board).................. 13.3 by 10.7 cm (5.3 by 4.2 in.)
PCI (188513x-01-based board).................. 12.0 by 6.44 cm (4.72 by 2.54 in.)
PCI (Low Profile)................................. 12.0 by 6.44 cm (4.72 by 2.54 in.)
PXI.......................................................... 16 by 10 cm (6.3 by 3.9 in.)

I/O Connectors
GPIB......................................................... IEEE 488 standard 24 pin
Ethernet.................................................... RJ45

Operating Environment
Ambient temperature............................... 0 to 55 °C
Relative humidity................................... 10 to 90%, noncondensing

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

Compliance
Online at ni.com/hardref.net