High-Performance GPIB Interface for PCI

PCI-GPIB

TNT4882C ASIC
  Complete IEEE 488.2 compatibility
  FIFO buffers to decouple GPIB
    transfers from PCI transfers
  GPIB monitor port for board and
    bus-level diagnostics
  Complete in-system
    functional testing
    with loop-back mode
  Reduced software overhead
Maximum GPIB transfer rates
  Over 1.5 Mbytes/s using IEEE 488.1
  Over 7.7 Mbytes/s using HS488
PCI MITE ASIC
  Complete PCI 2.2
    compatible interface
  Bus-master DMA Controller

*Contact National Instruments for OEM
pricing on PCI-GPIB and other products.*

HS488   **TNT4882C**

Driver Software
NI-488.2
  Windows 2000/NT/Me/9x
  Mac OS
  Solaris
  Digital Unix
NI-488DDK
For any operating system
Examples included for–
  DOS
  Digital Unix
  HP-UX
  IRIX
  VxWorks

Application Software
LabVIEW
Measurement Studio
Measure

Overview

The National Instruments PCI-GPIB is a high-performance Plug and Play IEEE 488 interface for personal computers and workstations equipped with PCI expansion slots. You can use the PCI-GPIB in PCs running Windows 2000/NT/Me/9x, Power Macintosh computers, Sun Ultra Workstations, and DEC Alpha Workstations.

The National Instruments PCI-MITE and TNT4882C ASICs make the PCI-GPIB a maximum-performance IEEE 488.2 interface for the PCI bus. The PCI-MITE ASIC, a complete PCI interface, is compliant with PCI Specification 2.2. The hardware is completely software-configurable and compatible with the Plug and Play standard for easy hardware installation. The TNT4882C chip performs the basic IEEE 488 Talker,
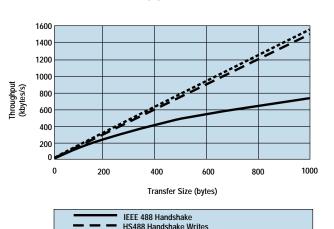
Listener, and Controller functions required by all versions of IEEE 488, including IEEE 488.2. The PCI-GPIB can sustain data transfer rates over 1.5 Mbytes/s using the IEEE 488.1 3-wire handshake. The PCI-GPIB also implements the high-speed HS488 GPIB protocol for benchmarked data transfers more than 7.7 Mbytes/s.

HS488

The PCI-GPIB can use HS488, the high-speed GPIB protocol. HS488, patented by National Instruments, increases the maximum data transfer rate of ANSI/IEEE Standard 488.1-1987 up to 8 Mbytes/s. HS488 is a superset of the IEEE 488.1 protocol that attempts to conduct data transfers with the new higher-speed protocol. If all active Listeners are not capable of HS488 transfers, the protocol automatically uses the IEEE 488.1 3-wire handshake protocol. Maximum data transfer rates obtainable using HS488 depend on the host computer architecture and system configuration. The PCI-GPIB has transfer rates more than 7.7 Mbytes/s.

The TNT4882C 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 have high-speed capability without changing your application programs. The TNT4882C can implement high-speed data transfers automatically. Thus, devices that have the TNT4882C chip can transparently communicate using HS488 if the corresponding Talker or Listener can also use HS488.
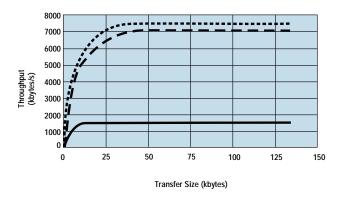
Figure 1. PCI-GPIB Data Transfer Benchmarks (Small Data Blocks)

IEEE 488 Handshake
HS488 Handshake Writes
HS488 Handshake Reads

High-Performance GPIB
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Figure 2. PCI-GPIB Data Transfer Benchmarks

Legend:
- IEEE 488 Handshake
- HS488 Handshake Writes
- HS488 Handshake Reads

Transfer Rates

The PCI-GPIB hardware and software 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 PCI-GPIB include the MITE, TNT4882C, and GPIB transceivers.

PCI-MITE

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 PCI-GPIB registers, the onboard ROM, and the TNT4882C 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.

TNT4882C

The TNT4882C ASIC is the first maximum performance single-chip IEEE 488.2 Talker, Listener, and Controller interface with integrated IEEE 488.1-compatible transceivers. The TNT4882C also implements 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 the PCI-GPIB performs these functions in hardware, you save significant CPU time relative to performing the same functions in software.

GPIB Transceivers

Transceivers interface the PCI-GPIB to the IEEE 488 bus, and provide power-up/power-down bus protection (glitch-free). The transceivers are integrated into the TNT4882C circuitry.

NI-488DDK

The NI-488 Driver Development Kit (NI-488DDK) is a comprehensive source code package for developing applications for operating systems other than those supported by 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. The NI-488DDK, a subset of our NI-488.2, uses the same syntax, so migration of applications between the NI-488DDK and NI-488.2 is straightforward.

Optional Features
Ethernet

The National Instruments PCI-8212 was designed for those cases in which you need to control GPIB instruments and have a network connection in your system. This board combines a GPIB controller and a standard Ethernet Controller in a single PCI board, adding network functionality to your PCI-GPIB controller. You receive the same high performance PCI-GPIB interface and 10/100 Ethernet interface in one combination board, saving slots in your computer. For more information, see page 770.

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 GPIB activity up to 8 Mbytes/s, making it ideal for troubleshooting GPIB applications. For more information, see page 755.

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Ordering Information

PCI-GPIB and NI-488.2

Windows 2000 778032-01

Windows 2000 (2 m cable)..................................778032-51

Windows NT 777073-01

Windows NT (2 m cable)......................................777073-51

Windows Me/9x 777158-01

Windows Me/9x (2 m cable) 777158-51

Mac OS¹ 777075-01

Mac OS¹ (2 m cable) 777075-51

Solaris...777462-01

Solaris (2 m cable) 777462-51

Digital Unix (OSF/1)...777260-01

¹Includes XA adapter (see page 811)

Software Only

NI-488.2 for Digital Unix.......................................777065-01

Provided on DAT and 3.5 in. disk

NI-488DDK...777430-01

GPIB Cables

X2 cable (double-shielded)

1 m 763061-01

2 m 763061-02

4 m 763061-03

8 m 763061-04

Specifications

IEEE 488 Compatibility
Compatible with IEEE 488.1 and IEEE 488.2

Capability Code	Description
SH1	Source Handshake
AH1	Acceptor Handshake
T5, TE5	Talker, Extender Talker
L3, LE3	Listener, Extender Listener
SR1	Service Request
PP1, PP2	Local/Remote Parallel Poll
RL1	Remote/Local
C1, C2, C3, C4, C5	Controller
E1, E2	Three-state bus drivers with automatic switch to open collector during parallel poll

IEEE 488 Bus Transfer Rates

Standard IEEE 488 handshake .... 1.5 Mbytes/s

HS488 handshake .... 7.7 Mbytes/s

(actual rates depend on system configuration and instrument capabilities)

Power Requirement from PCI Bus

+5 VDC .... 300 mA typical

450 mA maximum

Physical dimensions .... 13.3 by 10.7cm

(5.3 by 4.2 in.)

I/O connector... IEEE 488 standard 24-pin

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 90%, noncondensing