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High-Performance GPIB Interfaces for ISA

NI AT-GPIB/TNT (Plug and Play), NI AT-GPIB/TNT, NI AT-GPIB/TNT+

- Completely IEEE 488.2 compatible
- FIFO to decouple GPIB transfers from ISA bus transfers
- 16-bit ISA bus interface
- Maximum transfer rates (Windows)
  - More than 1.5 Mbytes/s (IEEE 488.1)
  - More than 1.6 Mbytes/s (HS488)
- 8-bit slot compatible with DMA disabled

AT-GPIB/TNT (Plug and Play)

- Automatic software configuration of I/O base address, interrupt level, and DMA channel
- Choice of at least seven interrupt lines and three 16-bit DMA channels

AT-GPIB/TNT

- Jumper-selectable hardware features

AT-GPIB/TNT+

- GPIB controller and analyzer on a single board

Operating Systems

- Windows 2000/NT/XP/Me/9x/3.1
- OS/2
- DOS

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio

Driver Software (included)

- NI-488.2
- GPIB Analyzer application (Windows NT only)



Overview

The National Instruments AT-GPIB/TNT is a high-performance IEEE 488 interface for PCs with ISA slots. An NI TNT family ASIC makes the AT-GPIB/TNT a maximum-performance IEEE 488.2 interface board. The TNT ASIC performs the basic IEEE 488 Talker, Listener, and Controller functions required by the most recent GPIB specification, IEEE 488.2. The AT-GPIB/TNT can sustain data transfer rates greater than 1.5 Mbytes/s using the IEEE 488.1 3-wire handshake. The AT-GPIB/TNT also implements the high-speed GPIB protocol (HS488).

There are three versions of the NI AT-GPIB/TNT – the AT-GPIB/TNT (Plug and Play), which features a jumperless configuration; the legacy AT-GPIB/TNT, which uses DIP switches and jumpers to configure the interface; and the AT-GPIB/TNT+, a combination AT-GPIB/TNT (Plug and Play) and GPIB analyzer in one board. All three interfaces contain identical GPIB interface functionality.



Figure 1. AT-GPIB/TNT

AT-GPIB/TNT (Plug and Play)

The AT-GPIB/TNT (Plug and Play) is jumperless and contains all circuitry needed for Plug and Play compatibility. Plug and Play systems automatically allocate the interface hardware resources (I/O address, DMA channel, and interrupt level) at startup. For non Plug and Play systems running DOS or Windows, the National Instruments NI-PNP utility configures the hardware resources.

Legacy AT-GPIB/TNT

You can use the legacy AT-GPIB/TNT with DOS, OS/2, and Windows 2000/NT/XP/Me/9x/3.1, This version of the AT-GPIB/TNT uses DIP switches and jumpers to configure the interface hardware resources.

Analyzer Option

The AT-GPIB/TNT+ is a low-cost, high-speed alternative to separate GPIB controller and analyzer products. The GPIB analyzer portion of the AT-GPIB/TNT+ can capture and monitor GPIB activity up to 1.6 Mbytes/s, ideal for troubleshooting.

You can use the built-in GPIB analyzer for troubleshooting a variety of IEEE 488 software and hardware problems. It can alleviate many of the difficulties associated with GPIB communication, such as addressing inconsistencies, protocol violations, and simple bus timeout conditions.

In addition to including industry-standard NI-488.2 software, the AT-GPIB/TNT+ comes with an easy-to-use graphical analyzer application. You can use the AT-GPIB/TNT+ to monitor, capture, and participate in bus activity on the GPIB at high speeds. You can

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High-Performance GPIB Interfaces for ISA

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 GPIB real-time status, including the 16 GPIB control and data lines.

See page 691 for more information on GPIB analyzer software.

About Plug and Play ISA

The Plug and Play ISA specification simplifies PC ISA system configuration by automatically configuring each board address, interrupt, and DMA channel, without your intervention at system startup. Systems comprised entirely of Plug and Play ISA boards can take full advantage of the automatic configuration capability. With the Plug and Play ISA specification, existing (legacy) ISA boards can remain in the same system. For mixed systems, however, you might need to configure hardware components and resolve conflicts. Each Plug and Play hardware interface requires extra circuitry and software capability so that it implements resources for identification, configuration, and conflict detection and resolution. The National Instruments AT-GPIB/TNT (Plug and Play) and AT-GPIB/TNT+ are compliant with the Plug and Play ISA specification.

HS488

The NI AT-GPIB/TNT can use a high-speed GPIB protocol (HS488). HS488, adopted as part of ANSI/IEEE Standard 488.1-2003, increases the maximum data transfer rate of IEEE 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 non-interlocked handshake. If any active listeners cannot conduct 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 configuration.

Transfer Rates

The AT-GPIB/TNT software and hardware provide maximum performance even when the data block is small. Figures 2 and 3 illustrate the maximum data transfer performance of the AT-GPIB/TNT. Actual obtainable data transfer rates depend on host computer, system configuration, and device capability.

Common Features

TNT Family ASIC

The TNT family of ASICs is comprised of the first maximum-performance single-ASIC IEEE 488.2 Talker, Listener, and Controller

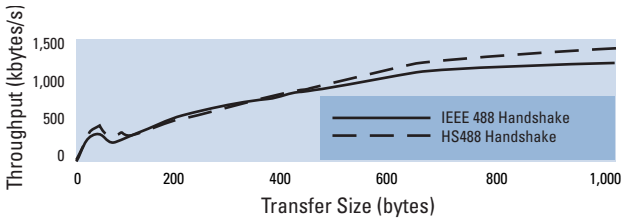


Figure 2. AT-GPIB/TNT Data Transfer Benchmarks (Small Data Blocks)

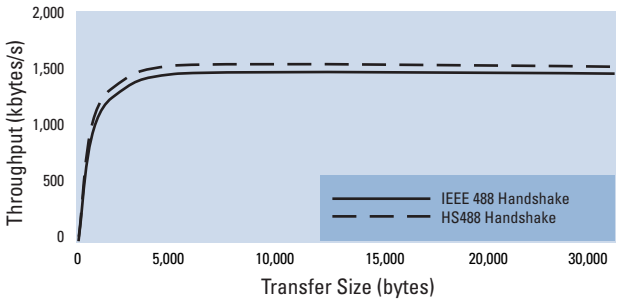


Figure 3. AT-GPIB/TNT Data Transfer Benchmarks

interfaces with integrated IEEE 488.1-compliant transceivers. The TNT ASICs also implement the patented HS488 protocol for high-speed GPIB data transfers. The TNT ASICs implement automatic handshake holdoffs on the last byte of GPIB reads, DMA transfer complete synchronization with the IEEE 488 handshake, and automatic END transmission on the last byte of DMA writes. Because the AT-GPIB/TNT performs these functions in hardware, you save significant CPU time relative to performing the same functions in software.

ISA Bus Interface Logic

The ISA bus interface logic decodes the control signals of the ISA bus to provide access to the AT-GPIB/TNT internal registers. You can use the AT-GPIB/TNT with DMA disabled in an 8-bit PC/XT slot, if the board fits.

32-Byte FIFO

A 32-byte FIFO on the AT-GPIB/TNT buffers data sent to or received from the GPIB. By buffering the data, the ISA bus and the GPIB can overlap their respective accesses to the FIFO, rather than one bus waiting for the other to complete a cycle. This process increases the data transfer rate.

The FIFO also provides byte-to-word packing and unpacking. This byte packing requires only one bus cycle on the ISA bus for every two bytes transferred on the GPIB, thus using less ISA bus bandwidth.

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High-Performance GPIB Interfaces for ISA

Ordering Information

Hardware and Software

AT-GPIB/TNT (Plug and Play) and NI-488.2 for
- Windows 2000/XP 778036-01
- Windows 2000/XP (with 2 m cable) 778036-51
- Windows NT 777542-01
- Windows NT (with 2 m cable) 777542-51
- Windows Me/9x 777154-01
- Windows Me/9x (with 2 m cable) 777154-51
- Windows 3.1/DOS 776943-01
- Windows 3.1/DOS (with 2 m cable) 776943-51

AT-GPIB/TNT and NI-488.2 for
- Windows 2000/XP 778037-01

Windows 2000/XP (with 2 m cable) 778037-51
- Windows NT 776836-01
- Windows NT (with 2 m cable) 776836-51
- Windows Me/9x 777074-01
- Windows Me/9x (with 2 m cable) 777074-51
- Windows 3.1/DOS 776786-01
- Windows 3.1/DOS (with 2 m cable) 776786-51

AT-GPIB/TNT+, NI-488.2, and GPIB analyzer software for
- Windows NT 777561-01
- Windows NT (with 2 m cable) 777561-51
- Windows Me/9x 777155-01
- Windows Me/9x (with 2 m cable) 777155-51
- Windows 3.1/DOS 776944-01
- Windows 3.1/DOS (with 2 m cable) 776944-51

Software Only

NI-488.2 for
- Windows 2000/NT/XP/Me/9x 777175-01
- OS/2 (for AT-GPIB/TNT only) 776763-01
- NI-488DDK (for AT-GPIB/TNT) 777430-01

GPIB Cables

X2 cable (double-shielded)
- 1 m 763061-01
- 2 m 763061-02
- 4 m 763061-03
- 8 m 763061-04

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Specifications

IEEE 488 Compatibility

IEEE 488.1 and IEEE 488.2 compatible

Maximum IEEE 488 Bus Transfer Rates

IEEE 488 interlocked handshake ..... 1.5 Mbytes/s
IEEE 488 non-interlocked (HS488) handshake ..... 1.6 Mbytes/s
(Actual rates depend on system configuration and instrument capabilities.)

GPIB Analyzer Performance

Sampling rate ..... 20 MHz
Timestamp resolution ..... 50 ns

Power Requirement from ISA I/O Channel

+5 VDC
- AT-GPIB/TNT (Plug and Play) ..... 120 mA typical, 240 mA maximum
- AT-GPIB/TNT (legacy) ..... 50 mA typical, 100 mA maximum
- AT-GPIB/TNT+ ..... 445 mA typical, 845 mA maximum

Electrostatic Discharge Protection (GPIB I/O pins)

By Mil 883C Section 3015C ..... 1,500 V

Physical

Dimensions ..... 10.7 by 16.5 cm (4.2 by 6.5 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 95%, noncondensing

Compliance

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