GPIB Analyzers for PCI and PCI Express

NI PCI-GPIB+, NI PCIe-GPIB+, NI PCIe-GPIB+ Low-Profile (LP)

Analyzer Hardware
- Monitor and control all GPIB lines
- Capture GPIB events including event timestamping
- Large FIFO for high-speed captures
- Hardware triggering
- Variable handshake rate
- Capture GPIB handshake line transitions

Analyzer Software
- Easy-to-use graphical application
- Selective GPIB event capture
- Several windows for capture buffer and capture display
- Several data display formats
- Captured data searchable for specified GPIB pattern
- Capture event markers for easy analysis and benchmarking
- Selective captured event printing
- Software can run concurrently with GPIB applications

Controller
- IEEE 488.2 and HS488 compatible
- Jumperless, software configurable
- Plug-and-play compatible

Operating Systems
- Windows Vista (32- and 64-bit)/XP/2000

Driver Software (included)
- NI-488.2
- GPIB analyzer

Overview

The NI PCI-GPIB+, PCIe-GPIB+, and PCIe-GPIB+/LP devices include a complete GPIB analyzer and GPIB controller on a single device. Compatible with HS488, these devices are lower-cost alternatives to purchasing two separate products for analyzer and controller functionality. You can use them to troubleshoot IEEE 488 software and hardware problems or control GPIB instruments. You can trigger on bus patterns or specific GPIB events and benchmark system performance with the built-in timestamping capabilities.

Monitoring the Bus

The GPIB analyzer software displays the current state of the GPIB at all times. The Bus Monitor window shows the real-time state of each of the 16 GPIB data and control lines. It displays the state of the eight data lines in ASCII, hexadecimal, and binary formats and the state of the eight control lines in the binary format.

The window displays the binary format as a series of LEDs, one for each GPIB line represented.

Each GPIB data and control line has a corresponding toggle switch you can use to assert one or more of these lines at any time. Using these switches, you can exercise simple control over the GPIB, such as stepping through the states of the source or acceptor handshake. The Accept Byte button performs a single acceptor handshake sequence. The GPIB analyzer software offers several options for capturing and analyzing activity on the GPIB. You enable the capture by using the Capture button in the Action window. When the analyzer is capturing, it continually samples the GPIB and records the occurrence of user-specified GPIB events. You can configure the analyzer application to record captured information for any combination of the following GPIB events:

- Data transfers
- Command transfers
- Control-line transition
- Handshake-line transition
- Parallel-poll response

In addition, you can configure the analyzer application to continually reuse the capture buffer (treat it as a circular buffer) until you stop the capture operation.

You can configure the analyzer application to participate in the IEEE 488.1 three-wire handshake while capturing. For nonintrusive captures, you can configure the analyzer application not to participate in the IEEE 488.1 three-wire handshake while capturing. Besides capturing the standard IEEE 488.1 three-wire handshake, the analyzer application can capture high-speed HS488 data transfers. If desired, you can configure the analyzer application to record timestamps with each captured event. Recorded timestamps have a 50 ns resolution.

Sometimes you may want to focus a capture operation on a specific GPIB pattern that occurs at some unknown time. With the analyzer application, you can define a GPIB trigger condition and select the number of events to record

NATIONAL INSTRUMENTS™

before and after the specified GPIB trigger condition. You start a triggering capture using the Capture & Trigger button in the Action window. The GPIB analyzer software has a complete set of tools for viewing and interpreting captured GPIB information. Using the Capture Display window, you can monitor an in-progress capture operation or view the captured information after capture stops. Additionally, you can load and view previously saved capture information for further review and analysis. The Capture Display window shows captured information in ASCII, hexadecimal, and binary formats, and, if you specify, timestamps for each captured item. High-level interpretation of the data and control lines, including detailed addressing information, is also available in the form of standard IEEE 488 mnemonics. You can quickly scan through the captured information using scrolling and paging operations.

Figure 1. Easy Application Troubleshooting

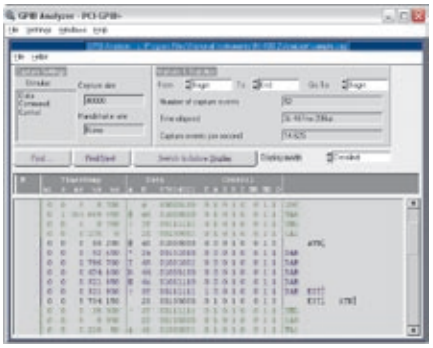

Figure 2. Real-Time Monitoring or Captured Data Analysis of the 16 GPIB Data and Control Lines

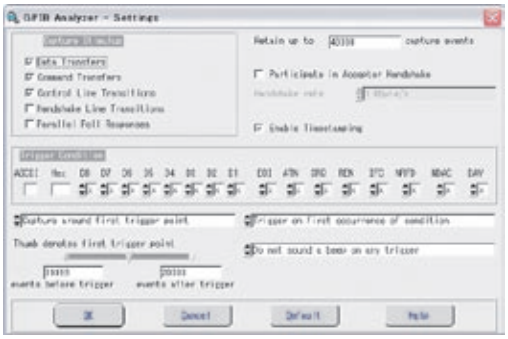

Figure 3. Bus Monitor Window

Figure 4. GPIB Analyzer Settings Window

Because you can have several Capture Display windows open, you can simultaneously view current GPIB activity in one window and view previously captured GPIB events in another window. Each Capture Display window presents the captured data in one of two formats – detailed or summarized. The detailed format shows each command message and data byte on a single line, with ASCII, hexadecimal, and binary equivalents. Using the summarized format, you can see entire GPIB messages on the same line. Postcapture analysis features include markers for highlighting and examining specific GPIB events in the captured data – you can use these markers to determine elapsed time between captured events and the number of events per second:

- Flexible pattern-search utility for quickly locating specific GPIB patterns
- Saving of captured data for later review
- Printing of captured data to a file or printer in either detailed or summarized formats

Background Operation

The GPIB analyzer software runs independently of other GPIB applications because the combined analyzer/controller board has separate circuitry for each redundant function (analyzer and controller). Thus, you can use a single analyzer and controller board to run both your GPIB controller application (uses the controller functionality) and GPIB analyzer application (uses the analyzer functionality). Of course, you can also use the analyzer to monitor activity from external GPIB devices.

Hardware Features

TNT ASIC Family

The TNT family of ASICs comprises the first single-chip IEEE 488.2 talker, listener, and controller interfaces. 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 the NI PCI-GPIB+, PCIe-GPIB+, and PCIe-GPIB+/LP perform these functions in hardware, you save significant CPU time relative to performing the same functions in software.

GPIB Analyzers for PCI and PCI Express

FIFO

A 32-byte first-in first-out (FIFO) memory buffer, integrated with the TNT ASIC, buffers data sent to or received from the GPIB. By buffering the data, you increase the data transfer rate because the I/O bus and the GPIB can overlap their respective accesses to the FIFO, rather than one bus waiting for the other to complete a cycle.

IEEE 488 Interface Functions

The NI PCI-GPIB+, PCIe-GPIB+, and PCIe-GPIB+/LP boards contain program registers that configure, control, and monitor all IEEE 488 interface functions. These functions are fully compatible with ANSI/IEEE Standard 488.2-1987.

GPIB Transceivers

Transceivers interface the NI PCI-GPIB+, PCIe-GPIB+, and PCIe-GPIB+/LP to the IEEE 488 bus. The transceivers, which are part of the TNT ASIC, provide power-up/power-down bus protection (glitch free).

Ordering Information

NI PCI-GPIB+, NI-488.2, and GPIB analyzer software for
- Windows Vista/XP/2000.....778033-01
- Windows Vista/XP/2000 (2 m cable).....778033-51

NI PCIe-GPIB+, NI-488.2, and GPIB analyzer software for
- Windows Vista/XP/2000.....780935-01
- Windows Vista/XP/2000 (2 m cable).....780935-57

NI PCIe-GPIB+/LP, NI-488.2, and GPIB analyzer software for
- Windows Vista/XP/2000.....780936-01

BUY NOW

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to **ni.com/gpib**.

Specifications

IEEE 488 Compatibility

IEEE 488.1 and IEEE 488.2 compatible

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

PCI Express Compatibility

PCI Express 1.0a

Maximum IEEE 488 Bus Transfer Rates

IEEE 488 interlocked handshake ..... 1.5 MB/s

IEEE 488 noninterlocked

(HS488) handshake..... 7.7 MB/s

Actual rates depend on system configuration and instrument capabilities.

GPIB Analyzer Performance

Sampling rate..... 20 MHz

Timestamp resolution..... 50 ns

Power Requirements

PCI

+3.3 VDC..... 0.6 W typical, 1.9 W maximum

PCI signaling level ..... Universal

PCI Express

+3.3 VDC..... 1.2 W typical, 1.65 W maximum

Physical Dimensions

PCI ..... 12.0 by 10.7 cm (4.7 by 4.2 in.)

PCI Express/PCI Express Low-Profile .... 9.75 by 6.88 cm (3.84 by 2.71 in.)

I/O Connectors

GPIB ..... IEEE 488 standard 24-pin

Operating Environment

Ambient temperature..... 0 to 55 °C

Relative humidity ..... 10 to 90%, noncondensing

Tested in accordance with IEC-60068-2-1, IEC-60068-2-2, and IEC-60068-2-56.

Storage Environment

Ambient temperature..... -20 to 70 °C

Relative humidity ..... 5 to 95%, noncondensing

Tested in accordance with IEC-60068-2-1, IEC-60068-2-2, and IEC-60068-2-56.

Compliance and Safety

Visit **ni.com/certification**.

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 NI Professional Services team is composed of NI applications and systems engineers and a worldwide National Instruments 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**.

NATIONAL INSTRUMENTS™
Certified Alliance Partner

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

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at **ni.com/advisor** to find a system assurance program to meet your needs.

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**.

NATIONAL INSTRUMENTS™

ni.com ▪ 800 813 3693
National Instruments ▪ info@ni.com