

GPIB Software

Software

NI-488.2

- Complete IEEE 488.2 controller software for better system configurability, efficiency, and reliability
- Recognized as the *de facto* industry standard
- Optimized for operating system and computing platform
- NI-488.2 API meets any application need
 - Traditional NI-488 functions
 - IEEE 488.2-style functions
 - Both sets of functions work with IEEE 488.1 and 488.2-compliant instruments
- Development and configuration utilities
- Interactive control utility for ease of development
- Software monitor utility for troubleshooting

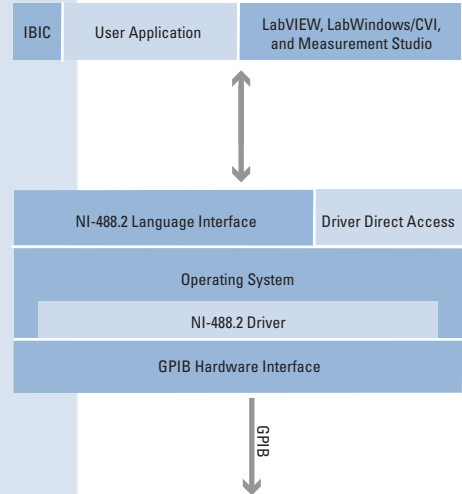
- Hardware configuration utility
- Software and hardware diagnostic utilities
- SRQ servicing functions

Operating Systems

- Windows 2000/NT/XP/Me/9x/3.1
- Mac OS X/9/8/7
- UNIX
- OS/2
- DOS

Recommended NI Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio



Overview

Starting with the IBM PC and growing to more than 20 computer platforms and more than 25 operating systems, the NI-488.2 software architecture continues to stand the test of time. National Instruments early and continuing commitment is to protect your software development investment by designing high-quality driver software. This software maximizes advances in technology and provides a consistent, easy-to-use programming interface for developing high-performance, portable, and distributed GPIB applications. This commitment to our customers includes maintaining compatibility with the installed base of existing NI-488.2 applications. It also includes providing a migration path to the future across a variety of platforms and GPIB hardware interfaces, including both external controllers and plug-in boards.

We continue to develop innovative GPIB chips (ASICs) to enhance the performance of our NI-488.2 software. NI-488.2 operates with minimal driver overhead by taking advantage of features our GPIB ASICs provide. Also, since the NI-488.2 software is backwards compatible, your existing applications can run unmodified while taking advantage of the higher performance of our GPIB ASIC technology.

Over the past decade, the NI-488.2 architecture has provided the widest selection of GPIB controller options. The flexible design of NI-488.2 has kept pace with your evolving applications and

application development environments, as well as emerging PC and workstation technology. We closely monitor industry trends to provide you with an appropriate GPIB solution when you expect it.

With each generation of GPIB hardware, in addition to leveraging our state-of-the-art ASIC technology to increase driver performance and efficiency, NI-488.2 also brings you the full benefits of modern computer buses, such as PCI, PCMCIA, Ethernet, and USB.

Most importantly, we have established a decades-old tradition of maintaining compatibility with the installed base of user applications. Today, you can still port an NI-488.2 application written in 1984 under DOS to newer operating systems, such as Windows 2000/NT/XP/Me/9x and Solaris. We fully intend to continue this tradition – always preserving your investment in our products and our technology.

NI-488.2 Development Environment

You need development tools so efficient that you can reduce your development schedule by days, weeks, and months. NI-488.2 delivers this capability with a full suite of wizards and utilities that get you up and running quickly. Under Windows 2000/NT/XP/Me/9x, the NI-488.2 development environment is integrated in NI Measurement & Automation Explorer, which gives you centralized access to the suite of NI-488.2 development wizards and utilities.

GPIB Instrument Control/Connectivity

GPIB Software

Software

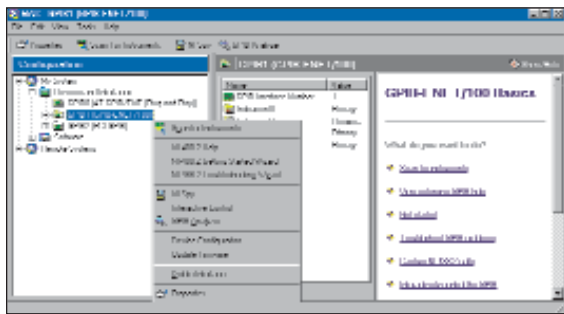


Figure 1. NI Measurement & Automation Explorer

You can use Measurement & Automation Explorer to perform the following GPIB-related tasks:

- Use the NI-488.2 Getting Started Wizard to establish basic communication with your GPIB instrument
- Scan for GPIB instruments connected to your GPIB interface
- Use the NI-488.2 Troubleshooting Wizard to solve GPIB installation and configuration problems
- Use NI Spy to monitor NI-488.2 or NI-VISA API calls to GPIB interfaces
- Configure the GPIB interface settings
- Access help resources for GPIB and NI-488.2
- Add or remove GPIB interfaces
- Get the installed software version information and optionally upgrade to the latest software

NI-488.2 Development Suite Getting Started Wizard

This wizard quickly guides you through the getting started process by helping you do the following:

- Verify your GPIB hardware and NI-488.2 software installation
- Scan for GPIB instruments
- Communicate with your GPIB instrument
- Learn how to access the NI-488.2 development suite effectively through Measurement & Automation Explorer

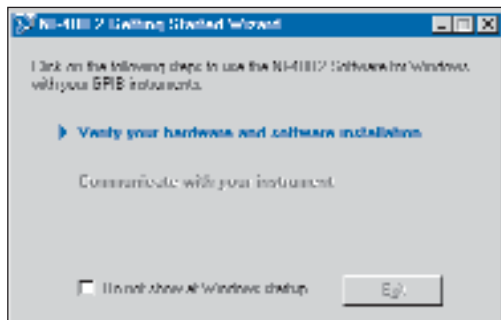


Figure 2. NI-488.2 Getting Started Wizard

Troubleshooting Wizard

Save valuable development time by quickly pinpointing any GPIB installation and configuration problems using the NI-488.2 Troubleshooting Wizard, which verifies that your GPIB hardware and the NI-488.2 software are installed and working properly.

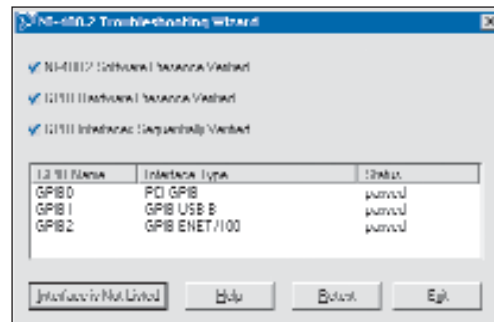


Figure 3. NI-488.2 Troubleshooting Wizard

Communicator

This tool helps novice users quickly learn how to communicate with their GPIB instruments and get started with the NI-488.2 API. The NI-488.2 Communicator helps you communicate with your GPIB instrument interactively. You can write commands to your instrument and read responses back from your instrument. The NI-488.2 Communicator also provides sample C source code, which performs a simple query of a GPIB instrument.

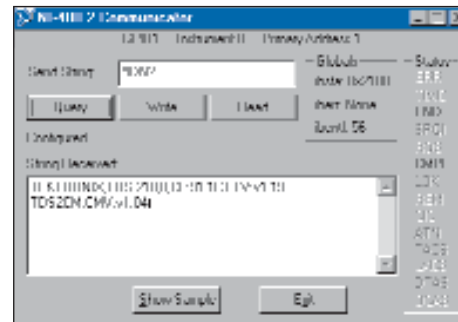


Figure 4. NI-488.2 Communicator

GPIB Instrument Control/Connectivity

GPIB Software

Software

NI Spy

Monitor the NI-488.2 API calls your application makes without having to recompile or rebuild. NI Spy monitors, records, and displays the NI-488.2, NI-VISA, and IVI calls made from applications. It gives you an easy way to verify your application is working properly, troubleshoot problems with your application, or verify the communication with your GPIB instrument. NI Spy dynamically captures and displays all NI-488.2 API calls made by any applications running in the system.

Interactive Control Utility

The more experienced user can appreciate the full access to the NI-488.2 API the interactive control utility provides. NI-488.2 has included interactive control for more than 10 years. With this powerful development and debugging tool, you can interactively communicate (read, write, serial poll, etc.) with your GPIB instrument from your keyboard. Interactive control links to the online help to provide quick and easy access to the NI-488.2 API syntax, error codes, and status variables.

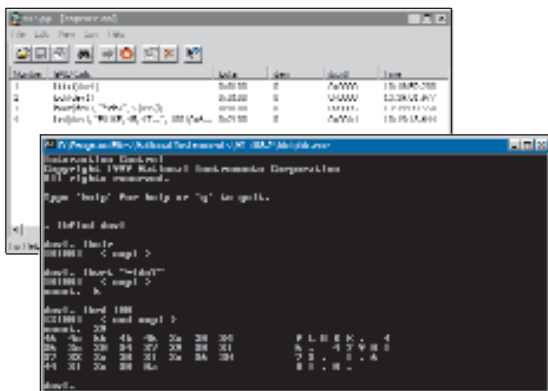


Figure 5. NI Spy and Interactive Control Utility

Online Help

Get answers to your questions quickly using our extensive online help, which includes complete information about using the development utilities, as well as a comprehensive online function reference manual. With online help, you can quickly and easily locate the syntax for a particular function, discover what a given error code means, or learn more about GPIB programming tools and techniques.

GPIB Analyzer Software

For the most experienced users, the GPIB analyzer provides a complete analysis of the events on the GPIB. This application monitors, captures, and participates in bus activity on the GPIB. The GPIB analyzer software includes tools to help you analyze

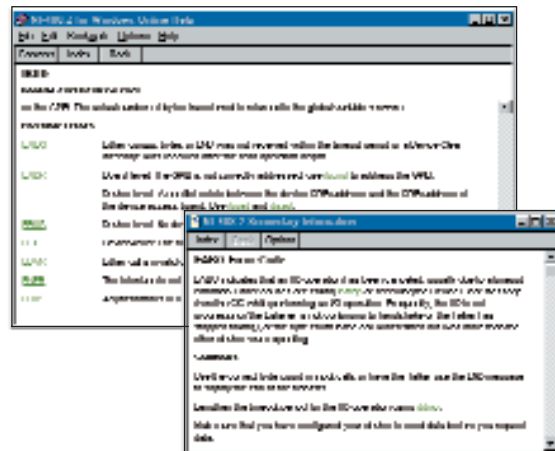


Figure 6. NI-488.2 and GPIB Online Help

the data you capture. Analyzing this data can help you solve many of the difficulties associated with GPIB communication, such as addressing inconsistencies, protocol violations, and simple bus timeout conditions. For more information, refer to page 691.



Figure 7. GPIB Analyzer Application

NI-488.2 API

NI-488.2 includes two distinct sets of functions to meet your application needs. Because both of these sets, the traditional NI-488 functions (the *de facto* standard) and the IEEE 488.2-style functions, are compatible across computer platforms and operating systems, you can port programs to other platforms with little or no source code modification. For most applications, the traditional NI-488 functions are sufficient. For more complex applications, using several devices and more than one GPIB interface, you can use the IEEE 488.2-style functions. Regardless of which programming functions you choose, the driver automatically performs bus management operations necessary to communicate with IEEE 488.1 and 488.2-compliant instruments.

GPIB Instrument Control/Connectivity

GPIB Software

| Traditional NI-488 Function | Description |
|-----------------------------|---------------------------------------|
| ibrd | Read data to buffer |
| ibrda | Read data asynchronously to buffer |
| ibrdf | Read data to file |
| ibwrt | Write data from buffer |
| ibwrta | Write data asynchronously from buffer |
| ibwrft | Write data from file |

Table 1. GPIB I/O Functions – Read from and write to GPIB devices

| Traditional NI-488 Function | Description |
|-----------------------------|---|
| ibdev | Open and initialize a device descriptor |
| ibtrg | Trigger device |
| ibclr | Clear specified devices |
| ibrsp | Return serial poll byte from device |
| ibrpp | Conduct a parallel poll |
| ibppc | Configure a device for parallel poll |
| ibpct | Pass control |
| ibonl | Place device online/offline |

Table 4. GPIB Device Control Functions – Direct bus management and polling instructions to devices

| Traditional NI-488 Function | Description |
|-----------------------------|--|
| ibfind | Open a board descriptor |
| ibsic | Send interface clear (IFC) |
| ibsr | Set/clear remote enable (REN) line |
| ibcac | Become active controller |
| ibln | Check for presence of GPIB device |
| ibgts | Go from active controller to standby |
| iblines | Get status of GPIB bus management lines |
| ibloc | Go to local |
| iblck | Acquire/release exclusive interface lock |
| ibstop | Abort asynchronous I/O |
| ibwait | Wait for GPIB event |

Table 2. Bus Management Functions – Perform system-wide action or provide system-wide status

| Traditional NI-488 Function | Description |
|-----------------------------|---|
| ibcmd | Send GPIB commands from buffer |
| ibcmda | Send GPIB commands asynchronously from buffer |

Table 5. Low-Level I/O Functions – Send more detailed information (for use in unusual GPIB situations)

| Traditional NI-488 Function | Description |
|-----------------------------|---|
| ibask | Return driver configuration information |
| ibconfig | Configure the driver |
| ibdma | Enable/disable DMA |
| ibeos | Change/disable end-of-string (EOS) mode |
| ibeot | Enable/disable END message |
| ibpad | Change primary address |
| ibrc | Request/release system control |
| ibsad | Change secondary address |
| ibtmo | Change/disable time limit |

Table 3. Configuration Functions – Set and retrieve NI-488.2 driver configuration information

| Traditional NI-488 Function | Description |
|-----------------------------|--|
| ibist | Set/clear individual status bit for parallel polls |
| ibrsv | Request service |

Table 6. Talker/Listener Functions – Use in situations where the GPIB interface is not a controller

Traditional NI-488 Functions

The traditional NI-488 functions, which are the *de facto* industry standard for GPIB programming, are fully IEEE 488.2 compatible. The high-level device functions are the best option for most users. They automatically handle the GPIB communication protocol needed to manage devices on the bus. The low-level board functions provide flexibility to handle unusual GPIB situations. The tables above list several NI-488.2 functions, grouped according to functionality, and include a short description of each.

Example Program Using Traditional NI-488 Functions

The following C code example uses NI-488 high-level device functions to query a GPIB device to identify itself:

```
int dvm;
char id[20];
dvm = ibdev(0,1,0,T10s,1,0);
ibwrt(dvm, "*IDN?", 5);
ibrd(dvm, id, 20);
```

IEEE 488.2-Style Functions

The IEEE 488.2-style functions implement the controller sequences and protocols defined in IEEE 488.2. You can specify either a single device address or a list of device addresses so that you can easily address several instruments. The tables shown on the next page list several IEEE 488.2-style functions grouped according to functionality, and include a short description of each.

Example Program Using IEEE 488.2-Style Functions

The following C code illustrates the use of IEEE 488.2-style functions.

```
char id[20];
SendIFC(0);
Send(0,6,"*IDN?",5,DABend);
Receive(0,6,id,20,STOPend);
```

An IEEE 488.2 Common Query (the identification query) is sent to a device at address 6, and the response is returned.

Multiple Platforms and Operating Systems

NI-488.2 handles National Instruments GPIB hardware products in more than 25 operating systems. The table shown on the following page includes page references to our GPIB solutions for several of the operating systems handled by NI-488.2.

Each section contains information on NI-488.2 and the GPIB hardware products handled in that particular operating system.

GPIB Software

| IEEE 488.2-Style Function | Description |
|---------------------------|---|
| Send | Send data bytes to a single GPIB device |
| Receive | Read data bytes from a GPIB device |

Table 7. Simple Device I/O – Read and write to individual GPIB devices

| IEEE 488.2-Style Function | Description |
|---------------------------|--|
| SendList | Send data bytes to multiple GPIB devices |

Table 8. Multiple Device I/O – Write the same message to several Listeners with a single message transmission

| IEEE 488.2-Style Function | Description |
|---------------------------|---|
| Trigger | Trigger a single device |
| DevClear | Clear a single device |
| ReadStatusByte | Serial poll a single device to get its status byte |
| PPoll | Perform a parallel poll |
| PPollConfig | Configure a device for parallel polls |
| PPollUnconfig | Unconfigure devices for parallel polls |
| PassControl | Pass control to another device with controller capability |

Table 9. Simple Device Control – Direct various bus management and polling instructions to individual devices

| IEEE 488.2-Style Function | Description |
|---------------------------|--|
| TriggerList | Trigger multiple devices |
| DevClearList | Clear multiple devices |
| EnableRemote | Enable remote GPIB programming of devices |
| EnableLocal | Enable operations from device's front panels |
| FindRQS | Determine which device is requesting service |
| AllSpoll | Serial poll all devices |

Table 10. Multiple Device Control – Direct bus management and polling instructions to several devices in the same message

| IEEE 488.2-Style Function | Description |
|---------------------------|---|
| ResetSys | Initialize an IEEE 488.2 system |
| SendIFC | Clear GPIB interface functions with IFC |
| FindLstn | Find all Listeners |
| TestSRQ | Determine the current state of the SRQ line |
| WaitSRQ | Wait until a device asserts Service Request |
| TestSys | Cause devices to conduct self tests |
| SendLLO | Send the local lock-out message to all devices |
| SetRWLS | Place devices in the Remote with lock-out state |

Table 11. Bus Management – Perform system-wide functions or provide system-wide status

| IEEE 488.2-Style Function | Description |
|---------------------------|--|
| SendCmds | Send GPIB command bytes |
| SendDataBytes | Send data bytes to already addressed devices |
| SendSetup | Address devices as Listeners, GPIB interface as Talker |
| RcvRespMsg | Read data bytes from already addressed devices |
| RcvSetup | Address a device as Talker, GPIB interface as Listener |

Table 12. Low-Level I/O – Break down a higher-level routine into more detailed instructions for use in unusual situations

| GPIB Solutions for | Page |
|----------------------|------|
| Windows | 654 |
| DOS | 654 |
| Mac OS | 656 |
| Solaris | 657 |
| Linux | 658 |
| HP-UX | 658 |
| OS/2 | 658 |
| Tru64 (Digital) UNIX | 658 |

Table 13. NI-488.2 operating system solutions

Ordering Information

NI-488.2 for Windows*

| | |
|----------------------------------|-----------|
| GPIB-USB-B..... | 778599-01 |
| GPIB-ENET/100 (multiuser) | 778598-01 |
| GPIB-ENET/100 (singleuser) | 778598-02 |
| PCI-GPIB | 778599-01 |
| PCMCIA-GPIB..... | 778599-01 |
| AT-GPIB/TNT | 777175-01 |
| AT-GPIB/TNT (PnP) | 777175-01 |

*Software only. Check page 655 for availability of hardware in the different Windows operating systems.

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