GPIB 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
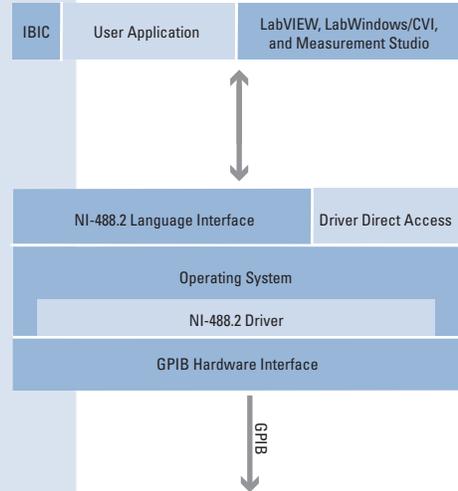- Software monitor utility for troubleshooting

- 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

IBIC	User Application	LabVIEW, LabWindows/CVI, and Measurement Studio

NI-488.2 Language Interface	Driver Direct Access

Operating System

NI-488.2 Driver

GPIB Hardware Interface

GPIB

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.
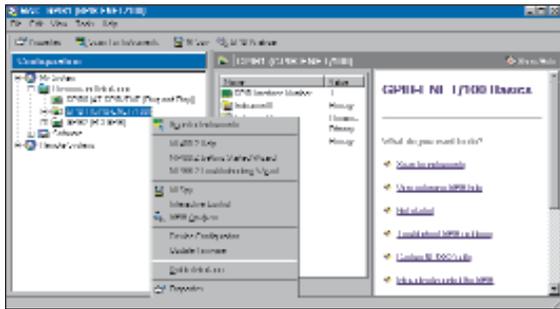
GPIB Software

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
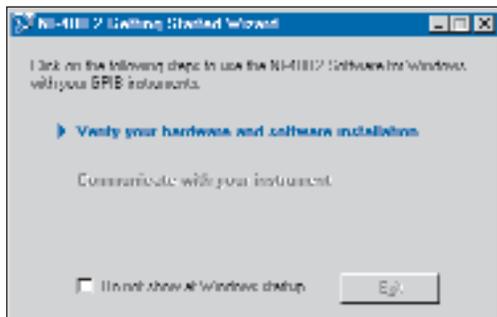- Learn how to access the NI-488.2 development suite effectively through Measurement & Automation Explorer

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.
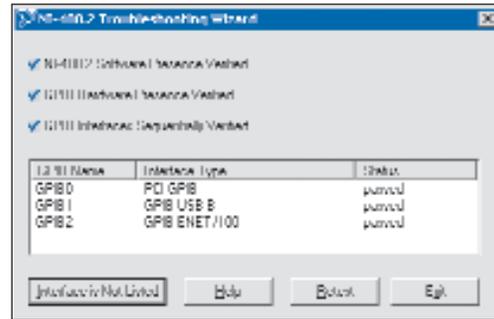
Figure 3. NI-488.2 Troubleshooting Wizard

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 Software

NI Spy

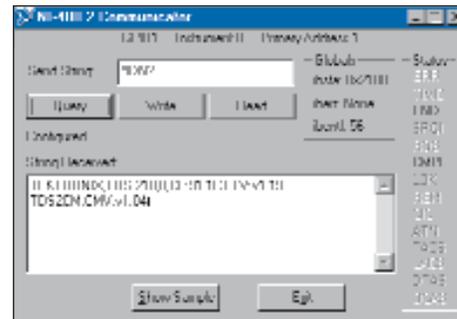Monitor the NI-488.2 API calls your application makes without having to recompile or rebuild. NI Spy monitors, records, and displays the NI-488.2, NI-VISA, and IVI calls made from applications. It gives you an easy way to verify your application is working properly, troubleshoot problems with your application, 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.
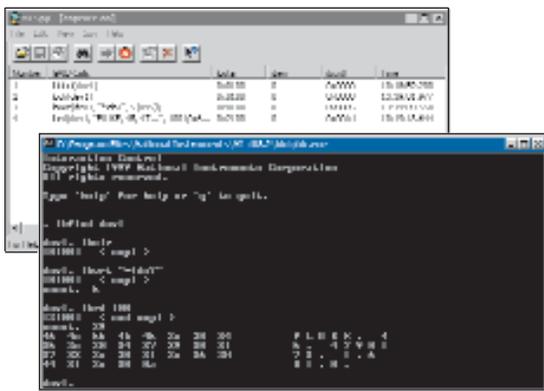

Figure 5. NI Spy and Interactive Control Utility

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
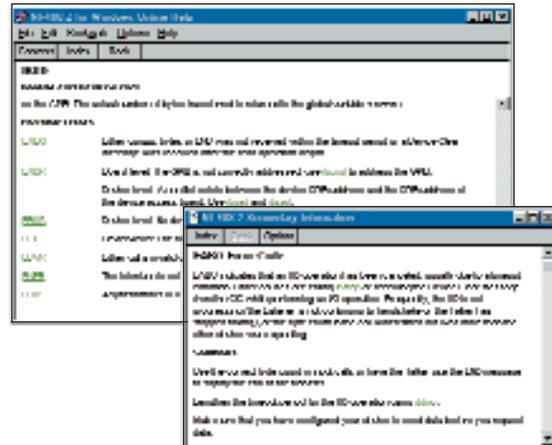

Figure 6. NI-488.2 and GPIB Online Help

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.

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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
ibwrtf	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)
ibsre	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
ibrsc	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.

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
RceiveSetup	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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