

Getting Started with Your EISA-GPIB and the NI-488.2™ Software for Windows

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This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual, may cause interference to radio and television reception. This equipment has been tested and found to comply with the following two regulatory agencies:

Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class B digital device. A Class B device is distinguishable from a Class A device by the appearance of an FCC ID number located on the Class B device.

Canadian Department of Communications

This device complies with the limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications (DOC).

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe B prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des communications du Canada.

Instructions to Users

These regulations are designed to provide reasonable protection against interference from the equipment to radio and television reception in residential areas.

There is no guarantee that interference will not occur in a particular installation. However, the chances of interference are much less if the equipment is installed and used according to this instruction manual.

If the equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, one or more of the following suggestions may reduce or eliminate the problem.

- Operate the equipment and the receiver on different branches of your AC electrical system.
- Move the equipment away from the receiver with which it is interfering.
- Reorient or relocate the receiver's antenna.
- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

Notice to user: Changes or modifications not expressly approved by National Instruments could void the user's authority to operate the equipment under the FCC Rules.

If necessary, consult National Instruments or an experienced radio/television technician for additional suggestions. The following booklet prepared by the FCC may also be helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock Number 004-000-00345-4.

Contents

About This Manual	ix
How to Use the Manual Set	ix
Organization of This Manual	x
Conventions Used in This Manual.....	x
Related Documentation	xi
Customer Communication	xi
Chapter 1	
Introduction	1-1
How to Use This Manual	1-1
What You Need to Get Started	1-2
Hardware Description	1-2
Software Description	1-2
ni-pnp Utility Overview	1-2
Optional Programming Environments	1-3
Chapter 2	
Hardware Installation and Configuration	2-1
Install the Hardware	2-1
Configure the Hardware.....	2-2
Note for Systems with Multiple Types of GPIB Boards	2-2
Chapter 3	
Software Installation and Configuration	3-1
NI-488.2 Software Components	3-1
Install the Software	3-1
Configure the Software (Optional)	3-2
Chapter 4	
Installation Verification and Troubleshooting	4-1
Troubleshooting ni-pnp Error Messages	4-1
Run the Hardware Diagnostic Test	4-2
Troubleshooting Hardware Diagnostic Test Error Messages	4-2
Case 1	4-2
Case 2	4-3
Case 3	4-3
Run the Software Diagnostic Test	4-4
Troubleshooting Software Diagnostic Test Error Messages	4-4
Presence Test of Software Components	4-5
Presence Test of Driver	4-5
Presence Test of Board	4-5
GPIB Cables Connected	4-6
Common Questions	4-6

Chapter 5	
Using Your NI-488.2 Software	5-1
Introduction to the Win16 Interactive Control Utility	5-1
General Programming Considerations	5-1
Appendix A	
Hardware Specifications	A-1
Appendix B	
Customer Communication	B-1
Glossary	G-1

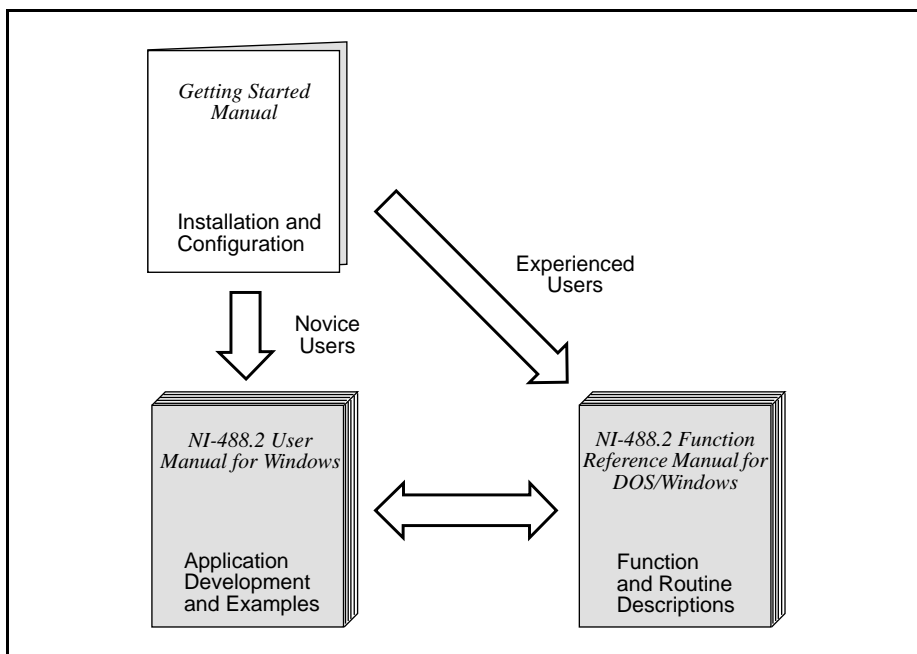
Tables

Table A-1.	Electrical Characteristics	A-1
Table A-2.	Physical Characteristics	A-1
Table A-3.	Environmental Characteristics	A-1

About This Manual

This manual contains instructions for installing and configuring the National Instruments EISA-GPIB interface board and the NI-488.2 software for Windows. The interface board is intended for use in personal computers equipped with EISA bus slots. The NI-488.2 software is intended for use with Microsoft Windows version 3.1 or higher. This manual assumes that you are already familiar with the Windows operating system.

How to Use the Manual Set



Use this getting started manual to install and configure your EISA-GPIB board and NI-488.2 software for Windows.

Use the *NI-488.2 User Manual for Windows* to learn the basics of GPIB and how to develop an application program. The user manual also contains debugging information and detailed examples.

Use the *NI-488.2 Function Reference Manual for DOS/Windows* for specific NI-488 function and NI-488.2 routine information, such as format, parameters, and possible errors.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this manual, lists what you need to get started, and includes a brief description of the EISA-GPIB board and the NI-488.2 software.
- Chapter 2, *Hardware Installation and Configuration*, contains instructions for configuring and installing your EISA-GPIB board.
- Chapter 3, *Software Installation and Configuration*, contains instructions for installing and configuring your NI-488.2 software.
- Chapter 4, *Installation Verification and Troubleshooting*, describes how to verify the hardware and software installation and how to troubleshoot problems.
- Chapter 5, *Using Your NI-488.2 Software*, describes the Win16 Interactive Control utility and lists some programming considerations.
- Appendix A, *Hardware Specifications*, describes the characteristics of the EISA-GPIB board and the recommended operating conditions.
- Appendix B, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and a description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

The following conventions are used in this manual.

bold	Bold text denotes menus, menu items, dialog buttons, or options.
<i>italic</i>	Italic text denotes a cross reference.
<i>bold italic</i>	Bold italic text denotes a note or warning.
monospace	Text in this font denotes text or characters that are to be literally input from the keyboard. It is also used for the proper names of disk drives, directories, programs, device names, and filenames.
<i>italic monospace</i>	Italic text in this font denotes that you must supply the appropriate words or values in the place of these items.

bold monospace	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
<>	Angle brackets enclose the name of a key on the keyboard—for example, <PageDown>.
IEEE 488 and IEEE 488.2	IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1987, respectively, which define the GPIB.

Abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms are listed in the *Glossary*.

Related Documentation

The following documents contain information that you may find helpful as you read this manual.

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- *Microsoft Windows User's Guide*, Microsoft Corporation

Customer Communication

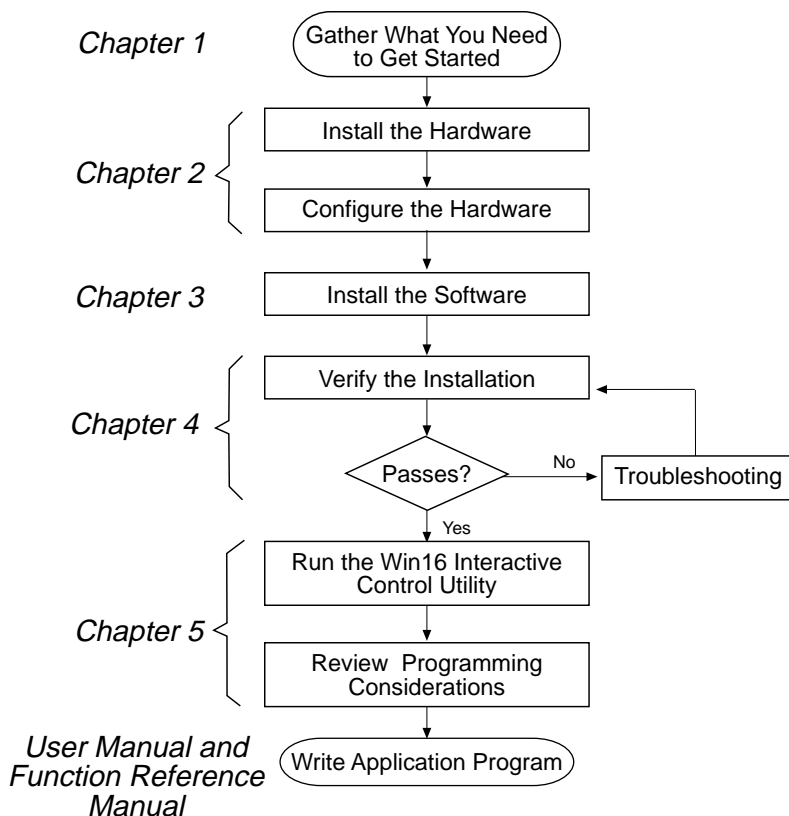
National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you to complete. These forms are in Appendix B, *Customer Communication*, at the end of this manual.

Chapter 1

Introduction

This chapter explains how to use this manual, lists what you need to get started, and includes a brief description of the EISA-GPIB board and the NI-488.2 software.

How to Use This Manual



What You Need to Get Started

- ❑ EISA-GPIB board
- ❑ 3.5 in. high density (1.44 MB) distribution disk:
NI-488.2 Software for Windows and the AT-GPIB/TNT+, AT-GPIB/TNT (PnP), EISA-GPIB and AT-GPIB/TNT
- ❑ Windows version 3.1 or higher installed on your computer
- ❑ A blank disk to use for a backup copy of the EISA configuration disk

Hardware Description

The EISA-GPIB board, equipped with a TNT4882C ASIC, transforms any PC AT compatible computer, equipped with an EISA bus, into a full-functioning GPIB Talker/Listener/Controller. The TNT4882C chip combines the circuitry of the NAT4882 ASIC, the Turbo488 performance-enhancing ASIC, and GPIB transceivers to create a single-chip IEEE 488.2 Talker/Listener/Controller interface. The TNT4882C also implements the HS488 high-speed protocol, which increases the maximum data transfer rate of the EISA-GPIB up to 7.5 Mbytes/s. For more information about HS488, refer to Chapter 7, *GPIB Programming Techniques*, in the *NI-488.2 User Manual for Windows*.

You can use standard GPIB cables to connect the EISA-GPIB with up to 14 instruments. If you want to use more than the maximum number of instruments, you can order a bus extender or expander from National Instruments. Refer to Appendix A, *Hardware Specifications*, for more information about the EISA-GPIB hardware specifications and recommended operating conditions.

Software Description

The NI-488.2 software for Windows includes a Windows dynamic link library, language interface libraries, and debugging and development utilities. The NI-488.2 software and GPIB hardware transform a general-purpose PC into a GPIB Talker/Listener/Controller that has complete communications and bus management capability.

ni-pnp Utility Overview

The `ni-pnp` utility is a small program that runs each time you reboot your computer. It collects information about National Instruments interfaces in your system. In EISA systems, `ni-pnp` queries the EISA BIOS to obtain the current configuration of each National Instruments interface that is installed. In systems that are Plug and Play ready, `ni-pnp` simply retrieves the current configuration of each interface. In systems without Plug and Play system software, `ni-pnp` performs the actual configuration of each

interface. `ni-pnp` does not select the resources to assign to interfaces. If your system does not assign resources, you must run the GPIB software configuration utility to assign resources to the GPIB interfaces. After the configuration of each interface is determined, `ni-pnp` provides this information to the NI-488.2 driver.

Optional Programming Environments

Your kit includes the NI-488.2 software for Windows. In addition, you can order the LabWindows®/CVI or LabVIEW software from National Instruments.

LabWindows/CVI and LabVIEW include instrument driver libraries that make it easier to communicate with your GPIB instruments.

LabWindows/CVI is an interactive ANSI C development environment for building test and measurement and instrument control systems. It includes interactive code-generation tools and a graphical editor for building custom user interfaces. It also includes built-in libraries for IEEE 488.2, VXI, RS-232 control, and plug-in data acquisition. When you order LabWindows/CVI, you also get more than 300 complete instrument drivers, which are modular, source-code programs that handle the communication with your instrument so that you do not have to learn the programming details.

LabVIEW is a complete programming environment that departs from the sequential nature of traditional programming languages and features a graphical programming environment. It includes all the tools needed for instrument control, data acquisition, analysis, and presentation. LabVIEW also includes an extensive instrument driver library.

For more information about LabWindows/CVI and LabVIEW, contact National Instruments.

Chapter 2

Hardware Installation and Configuration

This chapter contains instructions for configuring and installing your EISA-GPIB board.

Warning: *Several components on your EISA-GPIB board can be damaged by electrostatic discharge. To avoid such damage in handling the board, touch the antistatic plastic package to a metal part of your computer chassis before removing the board from the package.*

Install the Hardware

Before you install the EISA-GPIB, make sure you have a backup copy of the EISA configuration disk. If you do not have one, you can make one by following the instructions in the manual that came with your computer.

Follow these steps to install the EISA-GPIB board:

1. Copy all of the .CFG files from the NI-488.2 distribution disk to your backup copy of the EISA configuration disk. The NI-488.2 distribution disk contains .CFG files for the AT-GPIB, AT-GPIB/TNT, and EISA-GPIB.
2. Turn off your computer. Keep the computer plugged in so that it remains grounded while you install the EISA-GPIB board.
3. Remove the top or side cover of the computer.
4. Remove the expansion slot cover on the back of the computer.
5. Insert the EISA-GPIB board into an unused slot with the GPIB connector sticking out of the opening on the back panel. Make sure that you insert the board all the way into the slot. Sometimes the board seems to click firmly into place, even though it is only part of the way in.
6. Screw the mounting bracket of the EISA-GPIB to the back panel rail of the computer.
7. Replace the cover.

Configure the Hardware

1. Restart your computer with the backup copy of the EISA configuration disk inserted into the disk drive. Follow the instructions that came with your computer to automatically configure the computer. If more than one type of GPIB board is installed in your system make sure you read the following section, *Note for Systems with Multiple Types of GPIB Boards*.

The configuration utility on the disk automatically configures the EISA-GPIB hardware by assigning values for the interrupt level and DMA channel of the interface board.

2. If you would like to see what values were assigned by the configuration utility, follow the instructions for viewing the EISA configuration that came with your computer.
3. Remove the EISA configuration disk.
4. Restart your computer.

After you install the NI-488.2 software, it automatically configures itself to use the hardware settings. If you are installing one EISA-GPIB board, the software assigns it as `gpiB0`. If you are installing more than one board, the board in the lowest-numbered slot is `gpiB0`, the board in the next lowest-numbered slot is `gpiB1`, and so on.

Note for Systems with Multiple Types of GPIB Boards

The NI-488.2 software for the EISA-GPIB is compatible with the following GPIB interface boards:

- AT-GPIB
- AT-GPIB/TNT
- EISA-GPIB
- AT-GPIB/TNT (PnP)
- AT-GPIB/TNT+

The AT-GPIB/TNT and AT-GPIB are legacy (ISA) interface boards. The EISA-GPIB is an EISA interface board. If you want to mix legacy and EISA GPIB interfaces in an EISA system, the EISA configuration utility must have information about each legacy and EISA GPIB interface that is installed. The NI-488.2 distribution disk contains three EISA configuration files. These `.CFG` files describe the AT-GPIB, AT-GPIB/TNT, and EISA-GPIB. For detailed information about how to add legacy board information to the EISA configuration utility, refer to the instructions that came with your computer.

Chapter 3

Software Installation and Configuration

This chapter contains instructions for installing and configuring your NI-488.2 software.

NI-488.2 Software Components

The NI-488.2 software includes the following components:

- Device driver
- Hardware and software diagnostic tests
- Configuration utility
- Interactive control program
- Utilities for software development
- Language interface libraries for the following languages:
 - Microsoft C
 - Microsoft Visual Basic for Windows
- Example programs that use NI-488 functions and NI-488.2 routines

For a detailed list of files, refer to the *NI-488.2 User Manual for Windows*.

Install the Software

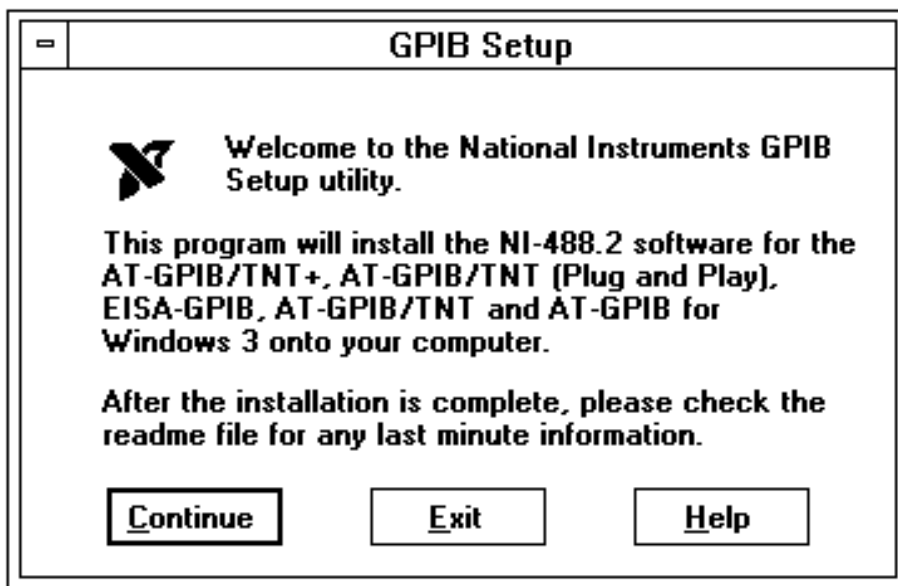
After you have installed and configured the hardware, you are ready to install the NI-488.2 software. Complete the following steps to run the software installation program.

1. Insert the NI-488.2 distribution disk into an unused drive.
2. Choose **Run** from the **File** menu in the **Program Manager** window and type the following command into the dialog box:

```
x:\setup
```

where *x* is the letter of the drive containing the distribution disk (usually a or b).

The software installation begins with the following screen:



The interactive Windows setup program takes you through the necessary steps to install the NI-488.2 software. For help during the installation, click on the **Help** button. You can exit the setup at any time by clicking on the **Exit** button.

3. When the installation is complete, restart your computer.

After you have installed your software, you might want to view or modify the driver configuration. Refer to the next section for instructions on running the GPIB software configuration utility. If you do not want to run the GPIB software configuration utility, refer to Chapter 4, *Installation Verification and Troubleshooting*, for instructions on verifying the hardware and software installation.

Configure the Software (Optional)

The GPIB software configuration utility is an interactive utility that you can use to examine or modify the configuration of the driver. You can also use it to enable or disable the use of DMA or interrupts.

Note: *You cannot use the GPIB software configuration utility to configure the base I/O address, the DMA channel, or the interrupt level of the EISA-GPIB card. These options can be configured only by using the EISA configuration utility that came with your computer. For more information, refer to the Configure the Hardware section in Chapter 2, Hardware Installation and Configuration.*

To run the GPIB software configuration utility, double-click on the **GPIB** icon in the **Control Panel**, which is located in the **Main** group of the **Program Manager**. The GPIB software configuration utility displays a list of all the GPIB boards and device names. Double-click on any name to examine or edit it. You can use the online help if you have any questions. For more information about the GPIB software configuration utility, refer to the *NI-488.2 User Manual for Windows*.

After the software is installed and configured, you should verify the installation. Refer to Chapter 4, *Installation Verification and Troubleshooting*.

Chapter 4

Installation Verification and Troubleshooting

This chapter describes how to verify the hardware and software installation and how to troubleshoot problems.

Troubleshooting ni-pnp Error Messages

The `ni-pnp.exe` program should be located in the root directory of your boot drive, usually `C:\`. It should be run from your `autoexec.bat` file, so that `ni-pnp` executes every time your system is started. `ni-pnp` normally produces very little output when it is run, displaying only the name of each National Instruments interface board it detects. Most errors that `ni-pnp` might detect are handled transparently. If `ni-pnp` finds an error from which it cannot recover, it displays a message and describes the best method for fixing the problem.

Some possible problems that `ni-pnp` might report include boards with unassigned resources and boards for which resource conflicts exist. If `ni-pnp` encounters a board with no assigned resources, it displays the following message:

This interface has no assigned resources.

If you receive this message, you must run the GPIB software configuration utility and assign resources to the board. If `ni-pnp` detects an I/O address conflict, it displays the following message:

I/O Address Conflict.

If you receive this message, you must run the GPIB software configuration utility and change the base I/O address for the board.

You can run `ni-pnp` in a verbose output mode. In this mode, `ni-pnp` displays more information about each interface, including its assigned resources. To run `ni-pnp` in verbose mode, change to the directory which contains `ni-pnp.exe`. This is the root of the boot drive (usually `C:\`). Run `ni-pnp` with the verbose output flag by typing `ni-pnp /v`.

A different, more serious error can also occur on systems that are not Plug and Play ready. Because `ni-pnp` must assign resources to the boards, it must first perform the Plug and Play ISA isolation sequence. The isolation sequence is a method by which all Plug and Play boards can be detected. It is possible, although rare, that this isolation sequence could lock up your computer. If this occurs, restart your computer. `ni-pnp` then detects that your computer was locked up and displays an error message describing the problem. `ni-pnp` can enter a fail-safe detection mode in which it records each I/O port before testing that port. If your computer locks up while testing a port in this mode, `ni-pnp` excludes that I/O port from future testing. If you know that you do not have

any National Instruments Plug and Play boards in your system, you can configure `ni -pnp` so that it does not attempt to detect any Plug and Play boards. `ni -pnp` prompts you to choose between entering the fail-safe mode or disabling the detection of Plug and Play boards.

Run the Hardware Diagnostic Test

To verify and test the hardware installation, run the Hardware Diagnostic Test that came with your NI-488.2 software. The test verifies that your hardware is functioning properly and that the configuration of your board does not conflict with anything else in your system.

To run the Hardware Diagnostic Test, double-click on the **Hardware Diagnostic Test** icon in the **NI-488.2 GPIB Software** group.

If the Hardware Diagnostic Test completes with no errors, your hardware is functioning properly. If it returns an error message, refer to the next section for troubleshooting instructions.

Troubleshooting Hardware Diagnostic Test Error Messages

The steps required to troubleshoot error messages depend on what type of boards you have in your system. The following sections describe three ways to troubleshoot error messages. Follow the steps in Case 1 when *every* board in your system has a configuration file. If any of the ISA boards in your system does not have a configuration file, follow the steps described in Case 2 or Case 3. Case 2 applies when you know both the DMA channel and the IRQ level for *every* ISA board, while Case 3 applies when you do not.

Case 1

To troubleshoot Hardware Diagnostic Test error messages when *every* board in your system has a configuration file, follow these steps:

1. Run the EISA configuration utility and make sure that there are no interrupt request or DMA channel conflicts in your system. The configuration program on the EISA configuration disk prevents these types of conflicts, and can show you which DMA channels or IRQ levels to use.
2. If the EISA configuration utility indicates that there are no conflicts and the Hardware Diagnostic Test still fails, complete the forms in Appendix B, *Customer Communication*, and contact National Instruments.

Case 2

To troubleshoot Hardware Diagnostic Test error messages when you know both the DMA channel and the IRQ level for *every* ISA board in your system that does not have a configuration file, do the following:

1. Run the EISA configuration utility and use the information you have about DMA channels and IRQ levels to resolve conflicts between the ISA boards and the EISA-GPIB board.
2. If you verify that there are no conflicts and the Hardware Diagnostic Test still fails, complete the forms in Appendix B, *Customer Communication*, and contact National Instruments.

Case 3

To troubleshoot Hardware Diagnostic Test error messages when you do *not* know both the DMA channel and the IRQ level for *every* ISA board in your system that does not have a configuration file, you must determine non-conflicting settings for the EISA-GPIB board by trial and error. Steps 1 through 3 describe this process.

1. Make sure the EISA-GPIB board works when interrupts and DMA are disabled.
 - a. Run the EISA configuration utility and configure the EISA-GPIB board to not use interrupts or DMA.
 - b. Run the Hardware Diagnostic Test again.
 - c. If the test fails again, complete the forms in Appendix B, *Customer Communication*, and contact National Instruments.
2. Make sure you are using a valid IRQ.
 - a. Run the EISA configuration utility and configure the EISA-GPIB board to use an IRQ level that you believe is available. Do not configure the EISA-GPIB board to use DMA at this time.
 - b. Run the Hardware Diagnostic Test again.
 - c. If the test fails, another ISA board that does not have a configuration file may be using this interrupt request level. Try using another setting and run the test again.
 - d. If the Hardware Diagnostic Test continues to fail, complete the forms in Appendix B, *Customer Communication*, and contact National Instruments.

3. Make sure you are using a valid DMA channel.
 - a. Run the EISA configuration utility and configure the EISA-GPIB board to use a DMA channel that you believe is available.
 - b. Run the Hardware Diagnostic Test again.
 - c. If the test fails, another ISA board that does not have a configuration file may be using this DMA channel. Try using another setting and run the test again.
 - d. If the Hardware Diagnostic Test continues to fail, complete the forms in Appendix B, *Customer Communication*, and contact National Instruments.

Run the Software Diagnostic Test

To verify and test the hardware and software installation, run the Software Diagnostic Test that came with your NI-488.2 software. The Software Diagnostic Test is a Windows application that requires no user interaction.

Follow these steps to run the Software Diagnostic Test:

1. Disconnect any GPIB cables.
2. Double-click on the **Software Diagnostic Test** icon in the **NI-488.2 GPIB Software** group in the **Program Manager**.

If the Software Diagnostic Test completes with no errors, you have installed the NI-488.2 software correctly. If it returns an error message, refer to the next section for troubleshooting instructions.

Troubleshooting Software Diagnostic Test Error Messages

The following sections explain common error messages generated by the Software Diagnostic Test.

Note: *In the following paragraphs, `gpibx` refers to board `gpib0`, `gpib1`, `gpib2`, or `gpib3` as appropriate.*

Presence Test of Software Components

The Software Diagnostic Test checks for the presence of `ni-pnp.ini`, `gpib.ini` and `gpib.dll`.

If the `ni-pnp.ini` file is not found in the root of the boot drive, the following error message is displayed:

```
An unexpected ERROR occurred:  
Unable to locate NI-PNP.INI  
Try reinstalling the NI-488.2 software.
```

If the `gpib.ini` file is not found in the Windows directory, the following error message is displayed:

```
An unexpected ERROR occurred:  
Unable to locate GPIB.INI in the Windows directory: C:\WINDOWS.  
Try reinstalling the NI-488.2 software.
```

If the `gpib.dll` file is not found in either the Windows or the Windows System directory, the following error message is displayed:

```
An unexpected ERROR occurred:  
Unable to locate GPIB.DLL in the Windows or Windows system  
directory.  
Try reinstalling the NI-488.2 software.
```

If you get any of these messages, you must reinstall the NI-488.2 software.

Presence Test of Driver

The Software Diagnostic Test displays the following message when it fails because of a mismatch between `gpib.ini` and `gpib.dll`:

```
<<< No handler present for GPIBx. >>>
```

If this message appears, you should reinstall the NI-488.2 software.

Presence Test of Board

The following error message appears if the board `gpibx` is not installed or if the software is not configured properly:

```
<<< No board present for GPIBx. >>>
```

If this message appears, you could have one of the following situations:

- The board might not be properly configured. Run the GPIB software configuration utility to verify the hardware settings. Refer to the *Configure the Hardware* section of Chapter 2, *Hardware Installation and Configuration*, for more information.
- The board might not be properly installed. Refer to the *Install the Hardware* section of Chapter 2, *Hardware Installation and Configuration*, for more information.

GPIB Cables Connected

The following error message appears if a GPIB cable is connected to the GPIB board when you run the Software Diagnostic Test:

```
Call(25) 'ibcmd " "' failed, ibsta (0x134) not what was expected (0x8130)
```

```
Call(25) 'ibcmd " "' failed, expected ibsta (0x100) to have the ERR bit set.
```

Disconnect all GPIB cables before trying the test again.

Common Questions

Which NI-488.2 software (DOS or Windows) do I need to install?

If you want to run a GPIB application under DOS, install the NI-488.2 software for DOS. If you want to run a GPIB application in Windows, you must install the NI-488.2 software for Windows.

Can I have the NI-488.2 for DOS and Windows drivers installed at the same time?

Yes, there is nothing wrong with installing both. However, it is better not to use them at the same time.

How can I determine which type of GPIB board I have installed?

Run the GPIB Information utility. It returns information about the GPIB boards currently configured for use in your system. For more information about the GPIB Information utility, refer to the *NI-488.2 User Manual for Windows*.

How can I determine which version of the NI-488.2 software I have installed?

Run the GPIB Information utility. It returns information about the version of the NI-488.2 software currently installed. For more information about the GPIB Information utility, refer to the *NI-488.2 User Manual for Windows*.

What do I do if one of the diagnostic tests fails with an error?

Refer to the troubleshooting sections of this chapter for specific information about what might cause these tests to fail.

When should I use the Win16 Interactive Control program?

You can use the Win16 Interactive Control program to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information about the program, refer to Chapter 5, *Interactive Control Program*, in the *NI-488.2 User Manual for Windows*.

How do I use an NI-488.2 language interface?

For information about using NI-488.2 language interfaces, refer to Chapter 3, *Developing Your Application*, in the *NI-488.2 User Manual for Windows*.

What information should I have before I call National Instruments?

When you call National Instruments, you should have the results of the diagnostic tests and the output from the GPIB Information utility. Also, make sure you have filled out the configuration form in Appendix B, *Customer Communication*.

Chapter 5

Using Your NI-488.2 Software

This chapter describes the Win16 Interactive Control utility and lists some programming considerations.

Introduction to the Win16 Interactive Control Utility

You can use the Interactive Control utility to enter NI-488 functions and NI-488.2 routines interactively and display the results of the function calls automatically. Without writing an application, you can use the utility to do the following:

- Verify GPIB communication with your device quickly and easily.
- Learn the NI-488 functions and NI-488.2 routines before you write your application.
- Become familiar with the commands of your device.
- Receive data from your GPIB device.
- Troubleshoot problems with your application.

For more information about the Win16 Interactive Control utility, refer to the *NI-488.2 User Manual for Windows*.

General Programming Considerations

As you begin developing your NI-488.2 application, remember the following points:

- You must link the language interface library with your compiled source code.
- You must include the header file in your source code.

For information about choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2 User Manual for Windows*. For detailed information about each NI-488 function and NI-488.2 routine, refer to the *NI-488.2 Function Reference Manual for DOS/Windows*.

Appendix A

Hardware Specifications

This appendix describes the characteristics of the EISA-GPIB board and the recommended operating conditions.

Table A-1. Electrical Characteristics

Characteristic	Specification
Maximum GPIB Transfer Rates (Windows)	
IEEE 488 Handshake	1.5 Mbytes/s*
HS488 Handshake	7.5 Mbytes/s*
Power Requirement	+5 VDC 300 mA
* Actual speed may vary considerably from speed shown because of instrumentation capabilities.	

Table A-2. Physical Characteristics

Characteristic	Specification
Dimensions	11.4 cm by 16.5 cm (4.5 in. by 6.5 in)
I/O Connector	IEEE 488 Standard 24-pin

Table A-3. Environmental Characteristics

Characteristic	Specification
Operating Environment	
Component Temperature	0° to 40° C
Relative Humidity	5% to 90%, noncondensing
Storage Environment	
Temperature	-20° to 70° C
Relative Humidity	5% to 90%, noncondensing
EMI	FCC Class B Certified

Appendix B

Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems you might have as well as a form you can use to comment on the product documentation. Filling out a copy of the *Technical Support Form* before contacting National Instruments helps us help you better and faster.

National Instruments provides comprehensive technical assistance around the world. In the U.S. and Canada, applications engineers are available Monday through Friday from 8:00 a.m. to 6:00 p.m. (central time). In other countries, contact the nearest branch office. You may fax questions to us at any time.

Corporate Headquarters

(512) 795-8248

Technical support fax: (800) 328-2203
(512) 794-5678

Branch Offices	Phone Number	Fax Number
Australia	(03) 879 9422	(03) 879 9179
Austria	(0662) 435986	(0662) 437010-19
Belgium	02/757.00.20	02/757.03.11
Denmark	45 76 26 00	45 76 71 11
Finland	(90) 527 2321	(90) 502 2930
France	(1) 48 14 24 24	(1) 48 14 24 14
Germany	089/741 31 30	089/714 60 35
Hong Kong	02 2637 5019	02 2686 8505
Italy	02/48301892	02/48301915
Japan	(03) 3788-1921	(03) 3788-1923
Korea	02 596-7456	02 596-7455
Mexico	05 202 2544	05 202 2544
Netherlands	03480-33466	03480-30673
Norway	32-848400	32-848600
Singapore	2265886	2265887
Spain	(1) 640 0085	(1) 640 0533
Sweden	08-730 49 70	08-730 43 70
Switzerland	056/20 51 51	056/20 51 55
Taiwan	62 377 1200	62 737 4644
U.K.	1635 523545	1635 523154

Technical Support Form

Photocopy this form and update it each time you make changes to your software or hardware, and use the completed copy of this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

If you are using any National Instruments hardware or software products related to this problem, include the configuration forms from their user manuals. Include additional pages if necessary.

Name _____

Company _____

Address _____

Fax (____) _____ Phone (____) _____

Computer brand _____

Model _____ Processor _____

Operating system _____

Speed _____MHz RAM _____MB

Display adapter _____

Mouse _____yes _____no

Other adapters installed _____

Hard disk capacity _____MB Brand _____

Instruments used _____

National Instruments hardware product model _____

Revision _____

Configuration _____

National Instruments software product _____

Version _____

Configuration _____

(continues)

The problem is _____

List any error messages _____

The following steps will reproduce the problem _____

EISA-GPIB Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Update this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration.

National Instruments Products

- EISA-GPIB Revision _____
- NI-488.2 Software Version Number on Distribution Disk _____
- Programming Language Interface Version _____
- Board Settings

	Slot Number	Interrupt Level	DMA Channel
gpib0	_____	_____	_____
gpib1	_____	_____	_____
gpib2	_____	_____	_____
gpib3	_____	_____	_____

Other Products

- Computer Make and Model _____
- Microprocessor _____
- Clock Frequency _____
- Type of Monitor Card Installed _____
- Windows Version _____
- Application Programming Language (BASIC, C, Pascal, and so on) _____
- Other Boards in System _____
- Base I/O Address of Other Boards _____
- Interrupt Level of Other Boards _____
- DMA Channels of Other Boards _____

Glossary

Prefix	Meaning	Value
c-	centi-	10^{-2}
k-	kilo-	10^3
M-	mega-	10^6

°	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
C	Celsius
DLL	dynamic link library
DMA	direct memory access
EISA	Extended Industry Standard Architecture
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
Hz	hertz
ISA	Industry Standard Architecture
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
I/O	input/output
IRQ	interrupt request
KB	kilobytes of memory
MB	megabytes of memory
PC	personal computer
RAM	random-access memory
s	seconds
VDC	volts direct current