

**Getting Started with Your PCMCIA-GPIB+,  
the NI-488.2™ Software for Windows, and the  
GPIB Analyzer**

**November 1995 Edition**

**Part Number 370922A-01**

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**National Instruments Corporate Headquarters**

6504 Bridge Point Parkway

Austin, TX 78730-5039

(512) 794-0100

Technical support fax: (800) 328-2203

(512) 794-5678

**Branch Offices:**

Australia 03 9 879 9422, Austria 0662 45 79 90 0, Belgium 02 757 00 20,

Canada (Ontario) 519 622 9310, Canada (Québec) 514 694 8521,

Denmark 45 76 26 00, Finland 90 527 2321, France 1 48 14 24 24,

Germany 089 741 31 30, Hong Kong 2645 3186, Italy 02 48301892,

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## **FCC/DOC Radio Frequency Interference Compliance**

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 A digital device. Operation is subject to the following two conditions:

1. This device may not cause harmful interference in commercial environments.
2. This device must accept any interference received, including interference that may cause undesired operation.

### **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 A 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 harmful interference from the equipment to radio reception in commercial areas. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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.

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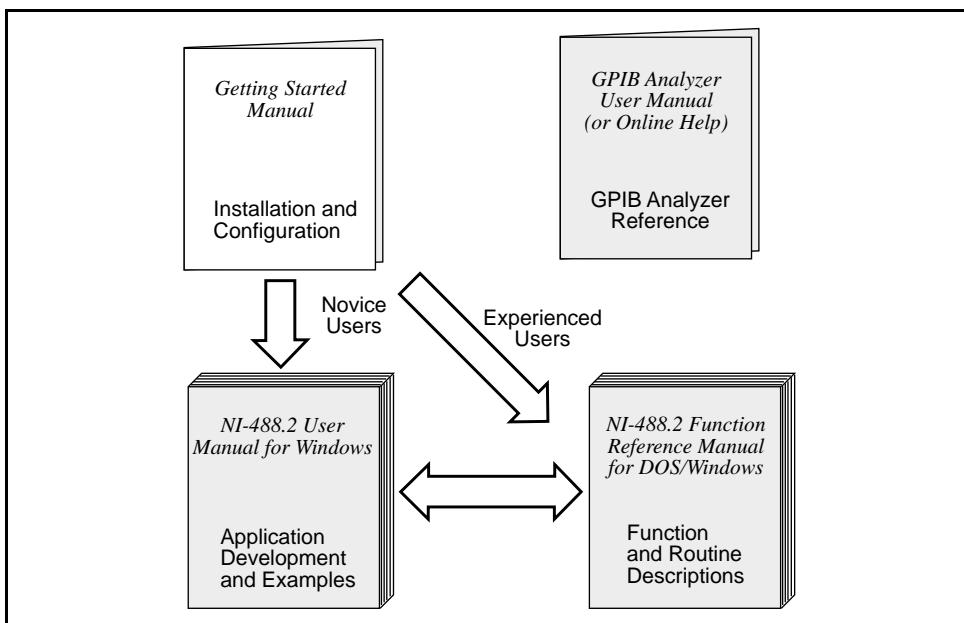
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# About This Manual

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This manual contains instructions for installing and configuring the National Instruments PCMCIA-GPIB+ card, the NI-488.2 software for Windows, and the GPIB analyzer. The PCMCIA-GPIB+ card is intended for use on computers with a Type II PCMCIA socket. The NI-488.2 software and the GPIB analyzer are 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 GPIB board, the NI-488.2 software for Windows, and the GPIB analyzer.

Use the *NI-488.2 User Manual for Windows* if you want 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.

## About This Manual

Use the *GPIB Analyzer User Manual* and the GPIB analyzer online help for information on how to use the GPIB analyzer to monitor bus activity and troubleshoot IEEE 488 hardware and software problems.

## 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 NI-488.2 software, the GPIB analyzer, and the PCMCIA-GPIB+ card.
- Chapter 2, *Installation and Configuration*, contains instructions for installing and configuring your NI-488.2 software, the GPIB analyzer, and the PCMCIA-GPIB+.
- Chapter 3, *Verify the Installation*, describes how to verify the hardware and software installation.
- Chapter 4, *Begin to Use the PCMCIA-GPIB+*, gives a brief explanation of the various elements of the NI-488.2 software and the GPIB analyzer.
- Appendix A, *Specifications*, describes the physical characteristics of the PCMCIA-GPIB+ and the recommended operating conditions.
- Appendix B, *Troubleshooting*, describes how to troubleshoot problems.
- Appendix C, *Common Questions*, lists common questions and answers.
- Appendix D, *Using Two or More GPIB Cards*, contains information about how PCMCIA-GPIB+ cards are assigned as GPIB boards or as the GPIB analyzer if you are using more than one PCMCIA-GPIB+ card.
- Appendix E, *How System Resources Are Assigned to the PCMCIA-GPIB+*, contains information about how PCMCIA Card Services assigns resources to the PCMCIA-GPIB+.
- Appendix F, *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 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.

<b>bold</b>	Bold text denotes menus, menu items, icons, or dialog buttons or options.
<i>italic</i>	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
<b><i>bold italic</i></b>	Bold italic text denotes a note, caution, or warning.
monospace	Text in this font denotes text or characters that are to be literally input from the keyboard and sections of code. This font is also used for the proper names of disk drives, directories, programs, device names, functions, variables, and filenames.
<b><i>bold monospace</i></b>	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 488.2-1992, 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 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*.
- *Card Services Specification, Release 2.1*, Personal Computer Memory Card International Association (PCMCIA).
- *Microsoft Windows User's Guide*, Microsoft Corporation.

## *About This Manual*

- *PC Card Standard, Release 2.1*, Personal Computer Memory Card International Association (PCMCIA).
- *Socket Services Specification, Release 2.1*, Personal Computer Memory Card International Association (PCMCIA).

## **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 F, *Customer Communication*, at the end of this manual.

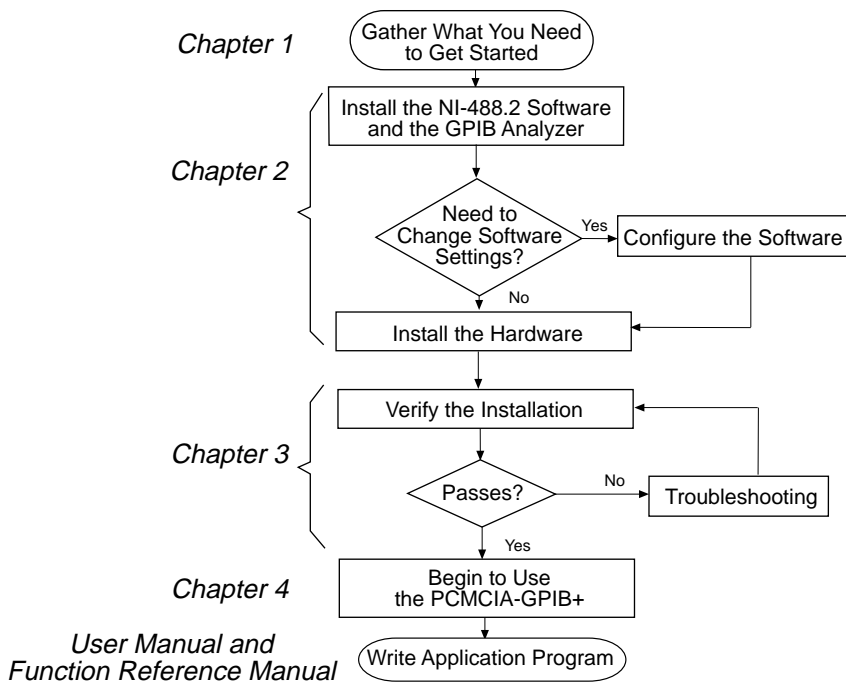
# Chapter 1

## Introduction

---

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

### How to Use This Manual



## What You Need to Get Started

- PCMCIA-GPIB+ card, which your kit contains
- NI-488.2 Software for Windows and the PCMCIA-GPIB and PCMCIA-GPIB+*, which your kit contains
- GPIB Analyzer Software for Windows 3 and the AT-GPIB/TNT+ and PCMCIA-GPIB+*, which your kit contains
- PCMCIA-GPIB cable, which your kit contains
- PCMCIA system software (Card Services) installed on your computer
- Microsoft Windows version 3.1 or higher installed on your computer
- MS-DOS version 4.0 or higher installed on your computer
- Personal computer using at least a 25 MHz 80386 or higher microprocessor (National Instruments recommends a 33 MHz 80486 or higher microprocessor.)
- VGA resolution (or better) video adapter
- Minimum of 3 MB of hard disk space
- Minimum of 4 MB of RAM
- A math coprocessor is recommended. Systems that contain a math coprocessor include the following: an 80386/80387 combination, an 80486SX/80487 combination, an 80486DX, or a Pentium processor. If your processor does not have a math coprocessor, you can use the software emulator, which your kit contains.

## Optional Equipment

Call National Instruments for more information about the following optional equipment.

- Serial or parallel bus extender and cables
- Bus expander/isolator
- GPIB mechanical switch
- GPIB data buffer

## Hardware Description

The PCMCIA-GPIB+ combines the abilities of the PCMCIA-GPIB and a complete GPIB analyzer into a single Type II PCMCIA card. The PCMCIA-GPIB+ is a low-cost, high-speed alternative to GPIB Controllers and analyzers packaged separately. Because the PCMCIA-GPIB+ supports both the NI-488.2 software and the GPIB analyzer, you can develop your GPIB application and perform low-level GPIB analysis using the same computer.

The PCMCIA-GPIB+ uses a TNT4882C ASIC, which 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 PCMCIA-GPIB+ to 1.9 Mbytes/s. For more information about HS488, refer to Chapter 7, *GPIB Programming Techniques*, in the *NI-488.2 User Manual for Windows*.

The PCMCIA-GPIB+ is fully compatible with other IEEE 488 devices. You can connect the PCMCIA-GPIB+ with up to 14 devices. If you want to use more than 14 devices, you can order a bus extender or expander from National Instruments. Refer to Appendix A, *Hardware Specifications*, for more information about the PCMCIA-GPIB+ hardware specifications and operating conditions.

## NI-488.2 Software Description

The NI-488.2 software and GPIB hardware transform any computer with a Type II PCMCIA socket running Windows into a GPIB Talker/Listener/Controller that has complete communications and bus management capability. The NI-488.2 software for Windows includes the following components:

- Device driver (dynamic link library)
- Hardware and software diagnostic tests
- Configuration utility
- Interactive control program
- Utilities for software development
- Language interface libraries for Microsoft C and Microsoft Visual Basic for Windows
- Example programs that use NI-488 functions and NI-488.2 routines



The NI-488.2 driver and GPIB analyzer driver communicate with PCMCIA Card Services to dynamically allocate system resources as you insert or remove PCMCIA-GPIB+ cards so that you do not have to configure the base I/O addresses and interrupt level.

Refer to the *NI-488.2 User Manual for Windows* for more information about the NI-488.2 software.

## GPIB Analyzer Software Description

The bus analyzer portion of the PCMCIA-GPIB+ is a Windows application called the GPIB analyzer. The GPIB analyzer was created using the National Instruments LabWindows<sup>®</sup>/CVI development environment. You can use the GPIB analyzer to capture, monitor, and participate in bus activity on the GPIB. You can also use the analyzer to troubleshoot a variety of IEEE 488 hardware and software problems. The GPIB analyzer can help you solve GPIB communication problems, such as addressing inconsistencies, protocol violations, and simple bus timeout conditions.

The analyzer software consists of the following components:

- GPIB analyzer application
- GPIB analyzer device drivers (dynamic link library and virtual device driver)
- GPIB analyzer online help
- LabWindows/CVI Run-Time System (used by the GPIB analyzer)
- Math coprocessor emulator (available for use if your computer does not have a math coprocessor)

For more information on how to use the GPIB analyzer, refer to the analyzer online help or the *GPIB Analyzer User Manual*.

## Optional Programming Tools

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.

## **LabWindows/CVI and the GPIB Analyzer**

The GPIB analyzer uses the LabWindows/CVI Run-Time System for its graphical user interface. The easy-to-use LabWindows/CVI development environment, advanced graphical capabilities, and ability to generate stand-alone executables made LabWindows/CVI the perfect tool for the development of the GPIB analyzer.

You may already have the LabWindows/CVI Run-Time System installed on your computer for other purposes. In that case, the GPIB analyzer installer will only reinstall the LabWindows/CVI Run-Time System if the version that comes with the GPIB analyzer is newer than the version that is already installed on your computer.

LabWindows/CVI requires floating-point capability for its graphical interfaces. If you are using a computer without floating-point hardware (an 80386 processor without 80387, or an 80486SX without 80487), the GPIB analyzer installation program installs a virtual device driver that emulates floating-point capability. The virtual device driver, which is included with your National Instruments kit, is called WEMU387.386. It has been extensively tested with the GPIB analyzer and LabWindows/CVI, but is not guaranteed to work with other applications that require floating-point capability.

# Chapter 2

## Installation and Configuration

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This chapter contains instructions for installing and configuring your NI-488.2 software, the GPIB analyzer, and the PCMCIA-GPIB+.

### Install the NI-488.2 Software

Complete the following steps to run the software installation program.

1. Insert the GPIB analyzer distribution disk, Disk 1 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 displays the dialog box shown in Figure 2-1, when the installation begins.

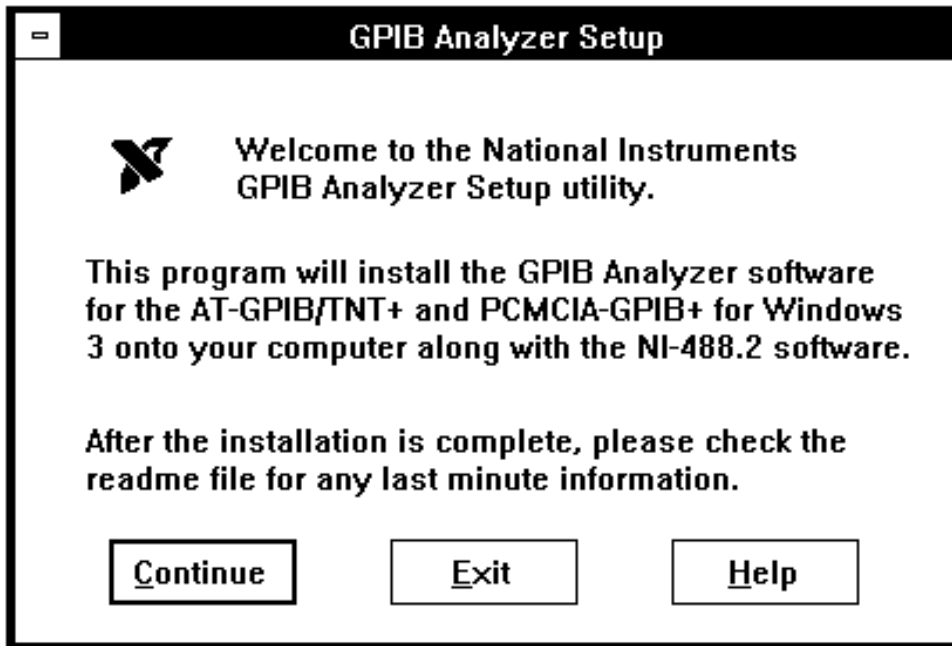


Figure 2-1. Software Installation Dialog Box

The interactive setup program takes you through the necessary steps to install the NI-488.2 software and the GPIB analyzer. You can click **Install** to accept the default location for the NI-488.2 software, or change the location. For help during the installation, click on the **Help** button. You can exit the setup at any time by clicking on the **Exit** button. Click on the **Continue** button to begin installing the NI-488.2 software and the GPIB analyzer.

3. Restart Windows after the installation is complete.

After you have installed your software, you might want to view or modify the NI-488.2 software or GPIB analyzer configuration. If you want to assign specific system resources to PCMCIA-GPIB+ cards, or if you need to change the default NI-488.2 software or GPIB analyzer configuration settings, you must reconfigure the software. Refer to the next section for instructions on running the GPIB software configuration utility. If you do not need to configure the software, proceed to the *Install the PCMCIA-GPIB+ Hardware*, later in this chapter, for instructions on installing your PCMCIA-GPIB+.

## Configure the Software (Optional)

If you installed the version of the NI-488.2 software that was included with your kit, you can use the GPIB software configuration utility to examine or modify the configuration of the NI-488.2 and GPIB analyzer drivers. You must run the GPIB configuration utility if you want the PCMCIA-GPIB+ card to use specific base I/O addresses or a specific interrupt level. Refer to Appendix D, *Using Two or More GPIB Cards*, and Appendix E, *How System Resources Are Assigned to the PCMCIA-GPIB+* for information on the PCMCIA-GPIB+ configuration settings.

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. 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*.

If you chose not to install the version of the NI-488.2 software included with your kit, and you need to configure the GPIB analyzer to use specific resources, you must use the GPIB analyzer configuration utility. To run the GPIB analyzer configuration utility, double-click on the **GPIB Analyzer** icon in the **Control Panel**, which is located in the **Main** group of the **Program Manager**.

After the software is installed and configured, proceed to the next section for instructions on installing the PCMCIA-GPIB+ card.

## Install the PCMCIA-GPIB+ Hardware

To install the PCMCIA-GPIB+ in your computer, insert the PCMCIA-GPIB+ card into a free PCMCIA socket the same way you insert a disk into a floppy drive. The PCMCIA-GPIB+ has no jumpers or switches to set, and you do not need to power down the system when you insert it. The NI-488.2 software and the GPIB analyzer automatically detect the PCMCIA-GPIB+ and configure it for use. Figure 2-2 shows how to insert the PCMCIA-GPIB+ and how to connect the PCMCIA-GPIB cable.

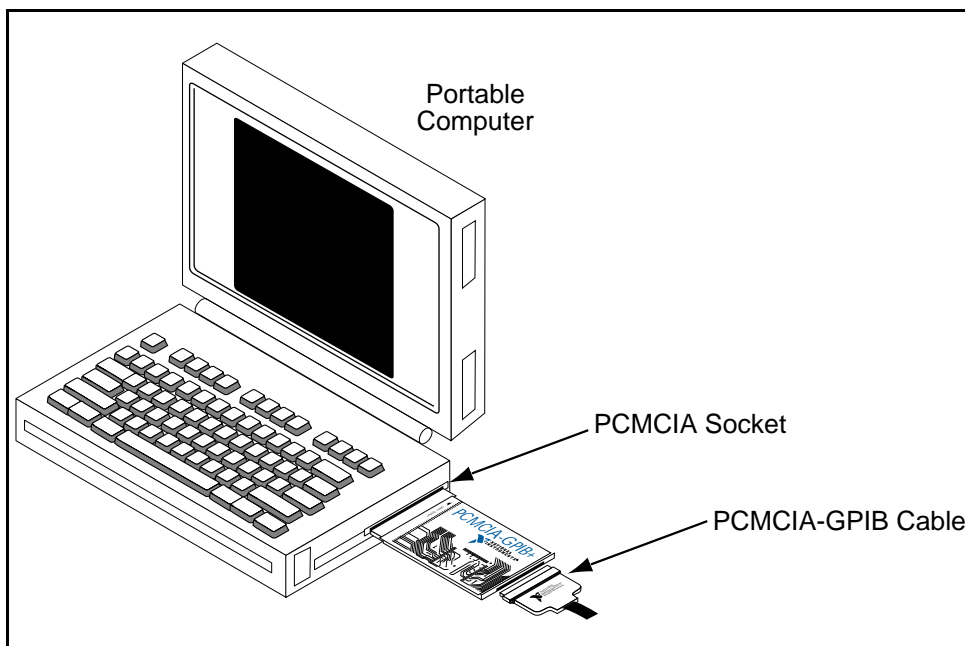


Figure 2-2. Inserting the PCMCIA-GPIB+

# Chapter 3

## Verify the Installation

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This appendix describes how to verify the hardware and software installation.

### 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 PCMCIA system software is functioning properly.

Follow these steps to run the Hardware Diagnostic Test:

1. Remove all PCMCIA-GPIB+ cards from the system.
2. With the system powered on, insert the PCMCIA-GPIB+ card that you want to test. You must remove the card and then re-insert it so that Card Services will recognize the card correctly.
3. Disconnect the PCMCIA-GPIB cables, shown in Figure 2-2.
4. Double-click on the **Hardware Diagnostic Test** icon in the **GPIB Analyzer Software** group of the **Program Manager**.

The test asks if you want to test the card listed or another card. If you have more than one card, the test asks you if you want to test all PCMCIA-GPIB+ cards in the system or if you want to test each PCMCIA-GPIB+ card individually. With the individual PCMCIA-GPIB+ test, or if you have only one card, you can test specific I/O addresses and a specific interrupt level. The test also gives you a chance to change the resources before you start the test.

If the following message appears:

```
Device passed the hardware diagnostics
```

then the Hardware Diagnostic Test completed with no errors; your hardware and PCMCIA system software are both functioning properly. If the test returns an error message, refer to Appendix B, *Troubleshooting*, for troubleshooting instructions. If the test is successful, select **Exit** from the **File** menu to exit the Hardware Diagnostic Test, and then proceed to the next section.

## Run the NI-488.2 Software Diagnostic Test

To verify and test the NI-488.2 software installation, run the Software Diagnostic Test that came with your NI-488.2 software. This test makes calls to the driver just as an application would. The GPIB analyzer is tested when it starts up, but not when you run the Software Diagnostic Test.

Follow these steps to run the Software Diagnostic Test:

1. Remove all PCMCIA-GPIB+ cards from the system.
2. With the system powered on, insert all of the PCMCIA-GPIB+ cards that you want to test. The Software Diagnostic Test is capable of testing up to four PCMCIA-GPIB+ cards at once. You must remove the card and then re-insert it so that Card Services will recognize the card correctly.
3. Disconnect any PCMCIA-GPIB cables, shown in Figure 2-2.
4. Double-click on the **Software Diagnostic Test** icon in the **NI-488.2 PCMCIA -GPIB Software** group in the **Program Manager**.

You can use the online help included in the Software Diagnostic Test if you have any questions. The Software Diagnostic Test displays the word “Finished” in the lower left corner of the screen when it finishes. If the Software Diagnostic Test completes with no errors, you have installed the NI-488.2 software correctly. If the test returns an error message, refer to Appendix B, *Troubleshooting*, for troubleshooting instructions. Select **Exit** from the **File** menu to exit the Software Diagnostic Test.



# Chapter 4

## Begin to Use the PCMCIA-GPIB+

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This chapter gives a brief explanation of the various elements of the NI-488.2 software and the GPIB analyzer.

### Using the NI-488.2 Software

#### Using the Win16 Interactive Control Utility

You can use the interactive control utility to enter NI-488 functions and NI-488.2 routines interactively and see the values returned by the function calls. 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*.

#### Using GPIB Spy

GPIB Spy is a GPIB application monitor for Windows applications. It monitors the NI-488 and NI-488.2 calls made to the NI-488.2 driver for Windows, and it records and displays information about the calls. You can use the GPIB Spy application to locate and analyze errors in your application or in the configuration of the NI-488.2 software.

Because the GPIB Spy utility monitors the calls to the NI-488.2 driver, it can only be used to debug data transfers in NI-488.2 applications running on the same machine as the PCMCIA-GPIB+. To analyze what actually happens on the bus, or to analyze applications running on other computers, you should use the GPIB analyzer.

For more information about GPIB Spy, see Chapter 6, *GPIB Spy*, in 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*.

## Using the GPIB Analyzer Software

To start the GPIB analyzer, double click on the **GPIB Analyzer** icon in the **GPIB Analyzer Software** group of the **Program Manager**.

The bus analysis hardware of the PCMCIA-GPIB+ includes the ability to analyze all GPIB activity. This hardware is accessed using a Windows application called the GPIB analyzer. Because the GPIB analyzer monitors the actual GPIB signals, it provides the best mechanism for debugging and optimizing a GPIB system. Whether or not you use the NI-488.2 capabilities of the PCMCIA-GPIB+, you can use the GPIB analyzer to do the following:

- Verify that an NI-488.2 application is communicating on the bus as expected.
- Determine if a GPIB device is properly conforming to the protocol and, if it is not, find possible solutions.
- Analyze performance of a GPIB system and determine how each device affects performance.
- Resolve timeout problems related to non responsive GPIB devices.
- Determine the cause of missing bytes in a data stream.
- Resolve problems related to standard IEEE 488 3-wire handshaking or HS488 handshaking protocols.
- Debug bus problems by manually controlling GPIB signal lines.

You can find information on how to use the GPIB analyzer in the *GPIB Analyzer User Manual* and the online help. The online help can be accessed using the **Help** menu within the analyzer program. The *GPIB Analyzer User Manual* provides complete information on the GPIB analyzer.

# Appendix A

## Specifications

---

This appendix describes the physical characteristics of the PCMCIA-GPIB+ and the recommended operating conditions.

### Hardware

Table A-1. PCMCIA-GPIB+ Hardware Characteristics

Characteristic	Specification
Dimensions	85.6 by 54.0 by 5.0 mm (3.370 by 2.126 by 0.197 in.)
Power Requirement (from PCMCIA expansion slot)	+5 VDC    150 mA Typical
I/O Interface	Special IEEE 488 Cable with 24-pin converter for PC Card
Operating Environment Component Temperature Relative Humidity	0° to 40° C 10% to 90%, noncondensing
Storage Environment Temperature Relative Humidity	-20° to 70° C 5% to 90%, noncondensing
EMI	FCC Class A Verified

## Software

Table A-2. NI-488.2 Software Characteristics for the PCMCIA-GPIB+

Characteristic	Specification
GPIB Transfer Rates 3-Wire (IEEE 488.1) Reads Writes HS488 Reads Writes	  0.8 Mbytes/s* 1.3 Mbytes/s*  1.2 Mbytes/s* 1.9 Mbytes/s*
* Actual speed may vary considerably from speed shown due to system and instrumentation capabilities.	

# Appendix B

## Troubleshooting

---

This appendix describes how to troubleshoot problems.

### Troubleshooting Hardware Diagnostic Test Error Messages

The following paragraphs explain how to troubleshoot common error messages the Hardware Diagnostic Test generates.

#### Test for Presence of PCMCIA Software

The Hardware Diagnostic Test verifies the presence of the PCMCIA system software. It displays the following error message if it detects a problem:

```
<<< No PCMCIA software present >>>
```

If this message appears, you can take the following actions:

- Notice the messages that the PCMCIA system software prints when the system is powered on. These messages may help you identify the problem. Refer to the documentation that came with your PCMCIA system software for more information.
- Contact your computer vendor to acquire the PCMCIA system software (Card Services) for your computer.

#### Test for Presence of PCMCIA-GPIB+ Card

The following error message appears if the PCMCIA-GPIB+ card cannot be found:

```
<<< No PCMCIA card present >>>
```

If this message appears, you can take the following actions:

- Make sure that the PCMCIA-GPIB+ card is fully inserted into the PCMCIA socket.
- Make sure the interrupt level that Card Services uses to detect PCMCIA card insertions is functioning properly. Refer to the next section, *Checking the Card Services Interrupt Level*.

- Make sure that Card Services is using a valid range of system memory addresses to read the Card Information Structure (CIS) from PCMCIA cards. Refer to the section *Checking the Card Services Memory*, later in this appendix.

## Troubleshooting Card Services

### Checking the Card Services Interrupt Level

To check the interrupt level that Card Services uses to detect PCMCIA card insertions, follow these steps:

1. Reboot the system with the PCMCIA-GPIB+ card inserted, and run the Hardware Diagnostic Test again. The PCMCIA-GPIB+ card is then detected when Card Services first loads and not by way of an interrupt.

If the Hardware Diagnostic Test succeeds after rebooting, Card Services is using an invalid interrupt level. Proceed to the next step in this list. If the Hardware Diagnostic Test fails again, the interrupt setting is valid; proceed to the next section, *Checking the Card Services Memory*.

2. Determine which interrupt setting Card Services is using.

If you have Card Services version 2.1 or higher, you can determine the interrupt level Card Services is using by running the PCMCIA Diagnostic Test. Refer to the section *Troubleshooting with the PCMCIA Diagnostic Test*, later in this appendix for information on the PCMCIA Diagnostic Test. You can often determine the interrupt level Card Services is using by examining the `device=` lines in your `config.sys` file. Refer to the documentation that came with your PCMCIA software for more information.

3. Change the invalid interrupt level to an available setting.

Refer to the documentation that came with your PCMCIA software for information on changing interrupt levels.

### Checking the Card Services Memory

The Card Information Structure (CIS) contains information used to identify PCMCIA cards. If you are unable to access any of your PCMCIA cards, Card Services might be using an invalid range of system memory addresses for CIS access.

In addition to the 1000 hex bytes of memory Card Services uses for CIS access, there is usually other system memory available to Card Services. You can assign these memory addresses to PCMCIA cards that contain physical memory such as random access memory (RAM), but the PCMCIA-GPIB+ does not require them.

For a memory manager and Card Services to coexist, the system memory that they use must not intersect. For example, if the PCMCIA software is using memory addresses D3000 to D8FFF (hex), and a memory manager is using addresses C0000 to D3FFF, Card Services cannot successfully use addresses D3000 to D3FFF.

To change the range of system memory addresses used for CIS access, follow these steps:

1. Determine the memory the PCMCIA software is using.

If you have Card Services version 2.1 or higher, you can determine the memory used by running the PCMCIA Diagnostic Test utility. Usually, Card Services uses the first 1000 hex bytes for CIS access. Refer to the section *Troubleshooting with the PCMCIA Diagnostic Test* later in this appendix for information on the PCMCIA Diagnostic Test. You can often determine the memory used by examining the `device=` lines in your `config.sys` file. Refer to the documentation that came with your PCMCIA software for more information.

2. Determine whether the memory range the PCMCIA software is using is actually available in your system and, if not, determine what memory is available.

Sometimes the PCMCIA software cannot use certain memory ranges because other things such as Read Only Memory (ROM) are using them. For example, if the PCMCIA software is using memory addresses C8000 to D3FFF (hex), and the computer's ROM is using addresses C8000 to CFFFF, Card Services cannot successfully use addresses C8000 to CFFFF.

The best way to obtain information about the available memory in your system is to run the utilities that came with your memory manager. An example of such a utility is the DOS `msd.exe` that comes with many Microsoft products such as Windows. You can use `msd.exe` to display a map of all memory in your system and tell you which memory ranges are available.

**Note:** *In order for utilities like `msd.exe` to give the most accurate depiction of system memory, it is sometimes helpful to edit your `config.sys` file to temporarily comment out any memory manager software by adding `REM` to the beginning of its `device=` line.*

If your computer does not have memory scanning utilities like `msd.exe`, you can assume that the PCMCIA software cannot use the current memory, and try using the next range of addresses. For example, if the PCMCIA software is currently using C8000 to CFFFF, you can try using D0000 to D7FFF.

3. Change to the available memory range.

To use the PCMCIA-GPIB+ card, only 1000 hex bytes are needed, so that Card Services can identify PCMCIA cards. You may need to allocate more memory to the PCMCIA software if you plan to use PCMCIA cards with onboard memory. Refer to the documentation that came with your PCMCIA software for information on changing memory that the PCMCIA software uses.

4. Make sure that your memory management software is configured to avoid the memory range the PCMCIA software is using. You will probably need to edit your `config.sys` file and change parameters passed to your memory manager on its `device=` line. This step is very important, because if your memory management software tries to use memory Card Services is using, the resulting conflict may cause your system to crash.

- If you are using `emm386.exe`, update its memory exclusion option so that it matches the memory range the PCMCIA software is using. The memory exclusion option is included in the `device=` line of `config.sys` and has the following syntax:

```
X= start - end
```

where `start` is the first four characters of the hex base address the PCMCIA software is using, and `end` is the first four characters of the last hex address the PCMCIA software is using. For example, if the PCMCIA software is configured to use memory D0000 to D3FFF hex, your `device=` line for `emm386.exe` might look like this:

```
device=c:\DOS\emm386.exe X=D000-D3FF
```

- If you are using `himem.sys`, you do not need to make a change. The `himem.sys` memory manager does not access memory that the PCMCIA software can use.
- If you are using `386max.exe`, update its memory exclusion option so that it matches the memory range the PCMCIA software is using. The memory exclusion option is included in the `device=` line of `config.sys` and has the following syntax:

```
RAM= start -end
```



where *start* is the first four characters of the hex base address the PCMCIA software is using, and *end* is the first four characters of the address that immediately follows the last hex address the PCMCIA software is using. For example, if the PCMCIA software is configured to use memory D0000 to D1FFF hex, your device= line for 386max.exe might look like this:

```
device=c:\386max\386max.exe RAM=D000-D200
```

- If you are using some other memory manager, refer to the documentation that came with your memory manager software.

## Test for PCMCIA-GPIB+ Configuration

The following error message appears if the Hardware Diagnostic Test cannot set a configuration for the PCMCIA-GPIB+ card because some other client of Card Services already configured the card:

```
<<< Cannot acquire configuration for PCMCIA card >>>
```

If this message appears, you must determine which Card Services client has already configured the PCMCIA-GPIB+. To determine all of the current Card Services clients, run the PCMCIA Diagnostic Test. Refer to the section *Troubleshooting with the PCMCIA Diagnostic Test* later in this appendix for information on this Diagnostic Test. For information on how to prevent these clients from configuring the PCMCIA-GPIB+, refer to the documentation that came with your PCMCIA software.

## Test for Acquisition of I/O Ranges and Interrupt Levels

The following error message appears if the Hardware Diagnostic Test cannot acquire a range of system I/O space with which to access the TNT4882C ASIC or the GPIB analyzer circuitry of the PCMCIA-GPIB+:

```
<<< Cannot acquire address(es) for PCMCIA card >>>
```

If this message appears, take the following actions:

- Make sure that there are at least 20 hex bytes of system I/O space that Card Services can assign to the TNT4882C ASIC of the PCMCIA-GPIB+ card. Make sure that any available base I/O address starts on a 32 byte boundary, and that bit 6 (hexadecimal 020) is zero. Some possible base I/O addresses to try adding are 2C0 hex, 240 hex, and 300 hex. Refer to the documentation that came with your PCMCIA software for information on adding new I/O windows.

- Make sure that there are at least 10 hex bytes of system I/O space that Card Services can assign to the GPIB analyzer circuitry of the PCMCIA-GPIB+ card. Make sure that any available base I/O address starts on a 16 byte boundary, and that bit 6 (hexadecimal 020) is one. Some possible base I/O addresses to try adding are 220 hex, 320 hex, and 330 hex. Refer to the documentation that came with your PCMCIA software for information on adding new I/O windows.

The following error message appears if the Hardware Diagnostic Test cannot acquire an interrupt level for use with the PCMCIA-GPIB+ card:

```
<<< Cannot acquire interrupt level for PCMCIA card >>>
```

If this message appears, make sure that there is a free interrupt level that Card Services can assign to the PCMCIA-GPIB+ card. Interrupts 3 and 5 are usually available. Refer to the documentation that came with your PCMCIA software for information on adding new interrupt levels.

## Test for Access to I/O Ranges and Interrupt Levels

The following message appears if the Hardware Diagnostic Test cannot successfully use the I/O range obtained from Card Services to access the TNT 4882C ASIC of the PCMCIA-GPIB+:

```
<<< Controller Section Base I/O Address Conflict >>>
```

If this or a similar message appears, make sure that no other hardware is using the I/O range assigned to the TNT4882C ASIC of the PCMCIA-GPIB+ card. The easiest way to do this is to prevent the PCMCIA software from assigning this I/O address to the PCMCIA-GPIB+. The Hardware Diagnostic Test displays the I/O address setting before it begins testing. Refer to the documentation that came with your PCMCIA software for information on excluding I/O addresses.

The following message appears if the Hardware Diagnostic Test cannot successfully use the I/O range obtained from Card Services to access the GPIB analyzer:

```
<<< Analyzer Section Base I/O Address Conflict >>>
```

If this or a similar message appears, make sure that no other hardware is using the I/O range assigned to the GPIB analyzer. The easiest way to do this is to prevent the PCMCIA software from assigning this I/O address to the PCMCIA-GPIB+. The Hardware Diagnostic Test displays the I/O address setting before it begins testing. Refer to the documentation that came with your PCMCIA software for information on excluding I/O addresses.

The following message appears if the Hardware Diagnostic Test cannot successfully use the interrupt level obtained from Card Services to access the PCMCIA-GPIB+:

```
<< Interrupt Level Conflict >>
```

If this or a similar message appears, or if the Hardware Diagnostic Test locks up your computer, make sure that no other hardware is using the interrupt level assigned to the PCMCIA-GPIB+ card. The easiest way to correct the problem is to prevent the PCMCIA software from using the interrupt level assigned to the PCMCIA-GPIB+. The Hardware Diagnostic Test displays the interrupt level setting before it begins testing. Refer to the documentation that came with your PCMCIA software for information on excluding interrupt levels.

## Troubleshooting with the PCMCIA Diagnostic Test

For help in troubleshooting Hardware Diagnostic Test errors, you can run the PCMCIA Diagnostic Test. It scans the current state of the PCMCIA software on your computer and then displays such information as the interrupt levels and I/O ranges that are available for Card Services clients.

To run the PCMCIA Diagnostic Test, double-click on the **PCMCIA Diagnostic Test** icon in the **GPIB Analyzer Software** group in the **Program Manager**. Although results vary depending on the capabilities and configuration of your PCMCIA software, the PCMCIA Diagnostic Test results should be similar to the following example. If you are using a version of Card Services earlier than 2.1, the PCMCIA Diagnostic Test cannot show memory, I/O, or IRQ usage information.

```
PCMCDIAG : PCMCIA Software Diagnostic Utility (Mar 10 1995)
Copyright 1995 National Instruments Corporation
All rights reserved
```

```
INSTALLED PCMCIA SOFTWARE
-----
```

```
Socket Services installed.
```

```
Card Services Release 2.10 (Vendor Release 2.00)
(C) Copyright 1992-1994 by Award Software Inc.
All rights reserved. Disassembly or decompilation prohibited.
```

```
This PCMCIA software can be used with N.I. drivers for DOS.
This PCMCIA software can be used with N.I. drivers for Windows.
```

```
Press return to continue.
```

```
CARD SERVICES CLIENTS
-----
```

```
PCENABLE
```

```
PCDISK
```

```
Press return to continue.
```

PCMCIA MEMORY WINDOW USAGE

-----

Base address 0xCF000, Size 0x01000, IN USE  
Owning Client = UNKNOWN (probably used by Card Services to  
identify cards)  
Base address 0xD0000, Size 0x08000, NOT IN USE

Press return to continue.

PCMCIA I/O WINDOW USAGE

-----

Base address 0x210, Size 0x064, NOT IN USE  
Base address 0x278, Size 0x004, NOT IN USE  
Base address 0x2E8, Size 0x008, NOT IN USE  
Base address 0x2F8, Size 0x048, NOT IN USE  
Base address 0x3BC, Size 0x004, NOT IN USE  
Base address 0x3E8, Size 0x008, NOT IN USE

Press return to continue.

PCMCIA INTERRUPT REQUEST LEVEL (IRQ) USAGE

-----

Interrupt request level 0x3, NOT IN USE  
Interrupt request level 0x5, NOT IN USE  
Interrupt request level 0xA, IN USE  
Owning Client = UNKNOWN (probably used by Card Services to  
detect cards)

Press return to continue.

ALLOCATION OF RESOURCES TO PCMCIA SOCKETS

-----

Socket 0

-----

CARD EXISTS BUT NOT IN USE

Socket 1

-----

CARD DOES NOT EXIST IN SOCKET

When the PCMCIA I/O window and IRQ information is displayed, you can use it to determine the available resources. Then, using the individual PCMCIA card test mode of the Hardware Diagnostic Test, you can test each resource combination with the PCMCIA-GPIB+ to determine which resources cause problems. When you determine which resources cause problems, you can prevent the PCMCIA software from using those resources. For example, in the preceding sample PCMCIA Diagnostic Test output, you can determine that IRQ 3 and IRQ 5 are available. Base I/O addresses 240 and 300 hex are available for the TNT4882C ASIC. Base I/O addresses 220, 230, 320, and 330 hex are available for the GPIB analyzer circuitry. If the Hardware Diagnostic Test fails for I/O addresses 300 and 220 hex and IRQ 5, but passes for I/O addresses 240 and 220 hex and IRQ 5, you should prevent your PCMCIA software from using I/O address 300.

For more information about the error messages the Hardware Diagnostic Test prints, refer to the section *Troubleshooting Hardware Diagnostic Test Error Messages* earlier in this appendix. Refer to the documentation that came with your software for information on changing I/O addresses and interrupt levels.

## Troubleshooting Software Diagnostic Test Error Messages

The following paragraphs explain how to troubleshoot common error messages the Software Diagnostic Test generates.

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

### Invalid Interrupt Levels

The Software Diagnostic Test might lock up your computer if Card Services allocates an invalid interrupt level to one of the PCMCIA-GPIB+ cards being tested. You can either use the GPIB configuration utility to disable the use of interrupts for the appropriate PCMCIA-GPIB+ card, or you can reconfigure Card Services so that it uses only valid interrupt levels. For information on the GPIB configuration utility, refer to the *Configure the Software (Optional)* section in Chapter 3, *Installation and Configuration*. For more information on how to determine and change the interrupt levels used for PCMCIA purposes, refer to the section *Troubleshooting Hardware Diagnostic Test Error Messages*, earlier in this appendix.

## Presence Test of Software Components

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

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

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

If any of these messages appear, 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 general error in the NI-488.2 driver:

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

If this message appears, you should run the Hardware Diagnostic Test to verify that the PCMCIA software is configuring the PCMCIA-GPIB correctly. If the Hardware Diagnostic Test completes successfully, 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 *Configure the Software (Optional)* in Chapter 3 for more information.
- The board might not be properly installed. Refer to *Install the PCMCIA-GPIB+ Hardware* in Chapter 3 for detailed instructions.
- The PCMCIA-GPIB+ card might not be fully inserted. Make sure that all PCMCIA-GPIB+ cards are fully inserted into the PCMCIA sockets.
- The interrupt levels and I/O ranges that Card Services is using to detect and configure PCMCIA cards might not be functioning properly. For more information on how to resolve this problem, refer to the section *Troubleshooting Hardware Diagnostic Test Error Messages* earlier in this appendix.

## PCMCIA-GPIB Cables Connected

The following error message appears if both ends of the PCMCIA-GPIB cable are connected 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 PCMCIA-GPIB cables before trying the test again.

# Appendix C

## Common Questions

---

This appendix lists common questions and answers.

### 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, install the NI-488.2 software for Windows. If you want to use the GPIB analyzer, install the GPIB analyzer. You can install any one, all, or any combination of the software mentioned. The GPIB analyzer only runs in Windows, so if you want to use the analyzer, you need to install the NI-488.2 software for Windows. If you have a previous version of the NI-488.2 software installed, you do not have to reinstall it, whether you want to use the GPIB analyzer or not.

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

Yes, you can install 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. If you run the GPIB Information utility without specifying any parameters, 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. If you run the GPIB Information utility without specifying any parameters, 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*.

#### **How can I determine which version of the GPIB analyzer I have installed?**

Within the GPIB analyzer, choose **About** from the **Help** menu of the main window.



**What can I do if I frequently run out of conventional memory?**

If you frequently run out of conventional memory, you can try loading some of your device drivers into high memory. Edit the `config.sys` file and change the `device=` line for those device drivers to `devicehigh=`. You can load the NI-488.2 device driver for DOS (`gpib.com`) into high memory by making this change.

**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. If you suspect that the problem is related to the PCMCIA software, you can run the PCMCIA Diagnostic Test for detailed PCMCIA software diagnostic information. For more information on the PCMCIA Diagnostic Test, refer to the section *Troubleshooting with the PCMCIA Diagnostic Test* in this chapter.

**When should I use the Win16 Interactive Control Utility?**

You can use the Win16 Interactive Control utility to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information about the Software Diagnostic Test, refer to Chapter 5, *The Win16 Interactive Control Utility*, 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 F, *Customer Communication*.

**How do I use the GPIB analyzer?**

You can use the analyzer to capture, monitor, and participate in GPIB activity and to help solve problems with IEEE 488 hardware or software. For help on using the analyzer, consult the extensive online help within the analyzer itself or the *GPIB Analyzer User Manual*.

**Should I run the GPIB analyzer on its own computer?**

You do not have to run the GPIB analyzer on its own computer. Because the PCMCIA-GPIB+ is an NI-488.2 interface, you can develop your NI-488.2 application and use the GPIB analyzer in the background on the same computer.

**Can I use the PCMCIA -GPIB cable with the PCMCIA -GPIB+?**

Yes, both cards use the same type of connector and cable.

**Can I use the GPIB analyzer without using the NI-488.2 portion of the PCMCIA-GPIB+?**

You can choose not to install the NI-488.2 software when you install the GPIB analyzer. You can use the GPIB analyzer to debug any GPIB interface without the presence of the NI-488.2 software.

**Can I use the GPIB analyzer for debugging if I am not using the PCMCIA -GPIB+ in my application?**

You can use the GPIB analyzer for applications that use other IEEE 488.2 interface boards. For instance, you could install the GPIB analyzer on a machine that uses a GPIB-ENET and the NI-488.2 software, and then use the analyzer to debug applications for the GPIB-ENET.

# Appendix D

## Using Two or More GPIB Cards

---

This chapter contains information about how PCMCIA-GPIB+ cards are assigned as GPIB boards or as the GPIB analyzer if you are using more than one PCMCIA-GPIB+ card.

### How PCMCIA-GPIB+ Cards Are Assigned as GPIB Boards

**Note:** *In the following paragraphs, the term PCMCIA-GPIB+ card refers to the actual card that you insert into your computer. The NI-488.2 software uses a logical reference to access each PCMCIA-GPIB and PCMCIA-GPIB+ card that you install. In the following paragraphs, the term GPIB boards will be used to refer to these logical references, and the term PCMCIA-GPIB+ will be used to refer to either a PCMCIA-GPIB card or a PCMCIA-GPIB+ card.*

Whenever you reboot your computer and begin to use the NI-488.2 software, the NI-488.2 device driver scans the PCMCIA sockets and assigns the PCMCIA-GPIB+ cards as GPIB boards, such as `gpi0`, `gpi1`, and so on. If your computer has more than one PCMCIA socket, the NI-488.2 software starts the scan at the lowest numbered socket. As the NI-488.2 software finds the PCMCIA-GPIB+ cards that were inserted before power-on, it assigns the PCMCIA-GPIB+ in the lowest numbered socket as `gpi0`, the next lowest numbered PCMCIA-GPIB+ as `gpi1`, and so on.

If you insert a PCMCIA-GPIB+ card while your computer is powered on, the NI-488.2 software assigns it as the first available GPIB board. A GPIB board reference is considered available if it has no existing PCMCIA-GPIB+ card assigned to it.

If you are using only one PCMCIA-GPIB+ card, it is always assigned `gpi0` regardless of which socket it is in. If you are using more than one PCMCIA-GPIB+ card, the assignment of the cards as GPIB boards varies depending on whether the cards were inserted with your computer on or off. If all PCMCIA-GPIB+ cards are inserted with your computer powered off, the card located in the lowest numbered slot is assigned as `gpi0`. If all PCMCIA-GPIB+ cards are inserted with your computer powered on, the first card you insert is assigned as `gpi0`.

If you remove a PCMCIA-GPIB+ card while your computer is powered on, you can no longer use the GPIB board to which it was assigned. If you attempt to access a GPIB board whose PCMCIA-GPIB+ card has been removed, the NI-488.2 software indicates a Non-Existent Board Error (ENEB). For information about GPIB error codes, refer to the *NI-488.2 User Manual for Windows*.

If you remove a PCMCIA-GPIB+ card and then reinsert it while an application is using its GPIB board, the GPIB board loses its state information and the ENEB error is reported. To use the GPIB board again, you must place the GPIB board back online by

using `ibfind` or `ibonl` with a parameter of 1. As a general rule, you should place the GPIB board offline before removing its PCMCIA-GPIB+ card by calling `ibonl` with a parameter of 0.

## Example

Suppose you have a system with four PCMCIA sockets numbered 0, 1, 2, and 3. With the computer powered off, you insert PCMCIA-GPIB+ cards into sockets 0 and 2, and then power on the computer. The PCMCIA-GPIB+ card in socket 0 is assigned as `gpib0`, and the PCMCIA-GPIB+ card in socket 2 is assigned as `gpib1`.

You start an application that uses `gpib0` and place it online. After communicating with the GPIB devices attached to `gpib0`, you decide to remove the PCMCIA-GPIB+ card in socket 0. You then insert a PCMCIA-GPIB+ card into socket 3. Even though you insert the PCMCIA-GPIB+ in a different socket, the NI-488.2 software assigns it as `gpib0`, because `gpib0` was made available when you removed its card from socket 0. But when you try to access `gpib0`, the NI-488.2 software returns the ENEB error.

After realizing what has happened, you quit the application and restart it. Since the application calls `ibfind` to initialize `gpib0`, you are then able to use the PCMCIA-GPIB+ card in socket 3 successfully.

Later, you decide to insert a third PCMCIA-GPIB+ card into socket 1. Because `gpib0` and `gpib1` are already assigned as existing PCMCIA-GPIB+ cards, the NI-488.2 software assigns the card as `gpib2`.

## How a PCMCIA-GPIB+ Card Is Assigned as a GPIB Analyzer

Only one PCMCIA-GPIB+ card at a time can be used as a GPIB analyzer. The first PCMCIA-GPIB+ card assigned as a GPIB board, usually `gpib0`, is used as the GPIB analyzer.

If you remove the PCMCIA-GPIB+ card that is used as the GPIB analyzer while your computer is powered on and the GPIB analyzer application is running, a dialog box appears to warn you that the card is not present. You can use the PCMCIA-GPIB+ as the analyzer again if you reinsert it.

# Appendix E

## How System Resources Are Assigned to the PCMCIA-GPIB+

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This chapter contains information about how PCMCIA Card Services assigns resources to the PCMCIA-GPIB+.

### How System Resources Are Assigned to the PCMCIA-GPIB+

When the NI-488.2 software assigns a PCMCIA-GPIB+ card as a GPIB board, the card has to be configured with certain system resources. The GPIB analyzer needs similar resources. These resources include a base I/O address with which to access the registers of the TNT4882C ASIC, a base I/O address with which to access the registers of the GPIB analyzer circuitry, and an interrupt level with which to notify the NI-488.2 software and the GPIB analyzer of events. The NI-488.2 and GPIB analyzer device drivers share the single interrupt level. The base I/O address of the TNT4882C (used by NI-488.2) points to a window 20 hex bytes in length. The base I/O address for the GPIB analyzer circuitry points to a window 10 hex bytes in length. In order for the PCMCIA-GPIB+ to differentiate between accesses to the TNT4882C and GPIB analyzer, bit 6 (hexadecimal 020) of the I/O addresses must always be zero for the TNT4882C window and one for the GPIB analyzer window.

The NI-488.2 software and the GPIB analyzer obtain the base I/O addresses and interrupt level from Card Services. For example, if interrupt levels 3, 4, 7, and 10 are available for distribution by Card Services, any one of those four interrupt levels might be assigned to a PCMCIA-GPIB+ card when it is inserted.

If you want to assign specific base I/O addresses or interrupt levels to the PCMCIA-GPIB+, use the GPIB configuration utility. For more information about the GPIB configuration utility, including how to assign specific resources to a GPIB board, refer to the *NI-488.2 User Manual for Windows*.

In addition to the resources used to configure the PCMCIA-GPIB+, the Card Services software itself requires certain system resources. Card Services uses an interrupt level to detect when PCMCIA cards are inserted and removed. Card Services also requires a base memory address that points to a window 1000 hex bytes in length. This memory window is used to read the Card Information Structure (CIS) contained on all PCMCIA cards. The CIS identifies the card manufacturer and model and determines what resources the card requires. If Card Services does not have a valid memory window, the NI-488.2 software and the GPIB analyzer cannot detect and configure the PCMCIA-GPIB+ card.

# Appendix F

## Customer Communication

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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

<b>Branch Offices</b>	<b>Phone Number</b>	<b>Fax Number</b>
Australia	03 9 879 9422	03 9 879 9179
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	519 622 9310	519 622 9311
Canada (Quebec)	514 694 8521	514 694 4399
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	2645 3186	2686 8505
Italy	02 48301892	02 48301915
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	95 800 010 0793	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	01635 523545	01635 523154

# Technical Support Form

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Technical support is available at any time by fax. Include the information from your configuration form. Use additional pages if necessary.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Fax (\_\_\_\_) \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

Computer brand \_\_\_\_\_

Model \_\_\_\_\_ Processor \_\_\_\_\_

Operating system \_\_\_\_\_

Speed \_\_\_\_\_MHz RAM \_\_\_\_\_MB

Hard disk capacity \_\_\_\_\_MB

Instruments used \_\_\_\_\_

National Instruments hardware product model \_\_\_\_\_

Revision \_\_\_\_\_

Configuration \_\_\_\_\_

National Instruments software product \_\_\_\_\_

Version \_\_\_\_\_

Configuration \_\_\_\_\_

PCMCIA software product \_\_\_\_\_

Vendor \_\_\_\_\_

Version \_\_\_\_\_

Card Services version \_\_\_\_\_

(continues)

The problem is \_\_\_\_\_

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List any error messages \_\_\_\_\_

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The following steps will reproduce the problem \_\_\_\_\_

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# PCMCIA-GPIB+ Hardware and Software Configuration Form

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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

- PCMCIA-GPIB+ Hardware Revision \_\_\_\_\_
  - NI-488.2 Software Version Number on Distribution Medium \_\_\_\_\_
- 

- GPIB Analyzer Version Number from **About** Box \_\_\_\_\_
- Board Settings

	Specific Addresses and Interrupt (yes/no)	Base I/O Addresses	Interrupt Level
gpib0	_____	_____	_____
gpib1	_____	_____	_____
gpib2	_____	_____	_____
gpib3	_____	_____	_____

## Other Products

- Computer Make and Model \_\_\_\_\_
- Microprocessor \_\_\_\_\_
- Floating-Point Support \_\_\_\_\_
- Other PCMCIA Cards Used \_\_\_\_\_
- Clock Frequency \_\_\_\_\_

(continues)

• Windows Version \_\_\_\_\_

• Application Programming Language (Microsoft C, Microsoft Visual Basic for Windows) \_\_\_\_\_

• PCMCIA System Software Used

Vendor \_\_\_\_\_

Version \_\_\_\_\_

Resources Used by Card Services

Interrupt Levels \_\_\_\_\_

I/O Address Ranges \_\_\_\_\_

Memory Address Ranges \_\_\_\_\_

Are all of your PCMCIA software components made by the same vendor?

yes \_\_\_\_\_ no \_\_\_\_\_

Memory Manager Used

Vendor \_\_\_\_\_

Version \_\_\_\_\_

Memory Addresses and Type (extended, expanded, and so on)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





# Glossary

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Prefix	Meaning	Value
m-	milli-	$10^{-3}$
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
BIOS	Basic Input/Output System
C	Celsius
CIS	Card Information Service
DLL	dynamic link library
DMA	direct memory access
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
hex	hexadecimal
Hz	hertz
I/O	input/output
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
KB	kilobytes of memory
m	meters
MB	megabytes of memory
PC	personal computer
PCMCIA	Personal Computer Memory Card International Association
RAM	random-access memory
s	seconds
VDC	volts direct current