Getting Started with Your PCMCIA-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 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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About This Manual

This manual contains instructions for installing and configuring the National Instruments PCMCIA-GPIB card and the NI-488.2 software for Windows. The PCMCIA-GPIB card is intended for use on computers with a Type II PCMCIA socket. 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
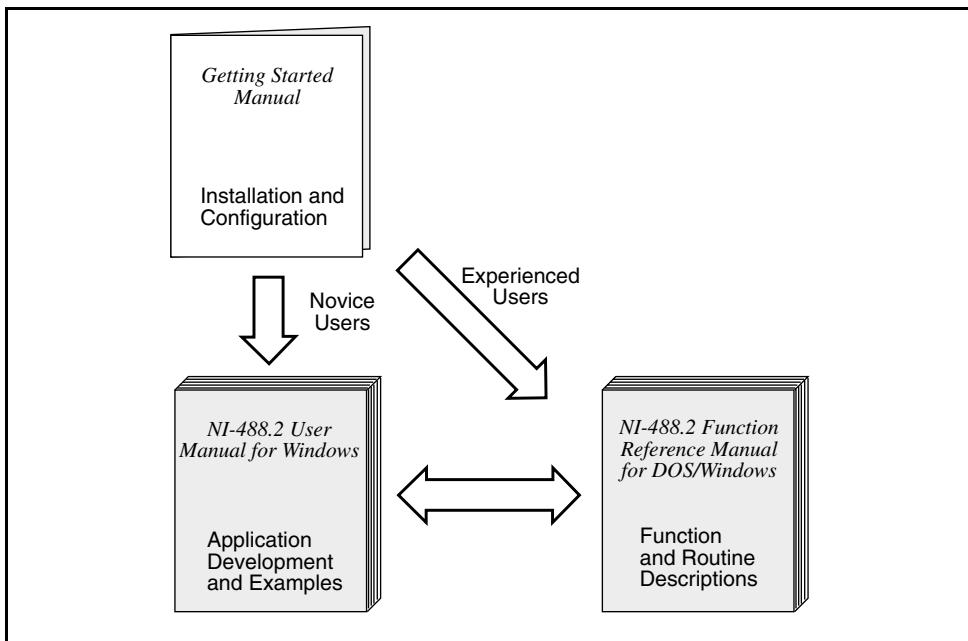
Use this getting started manual to install and configure your GPIB board and NI-488.2 software for Windows.

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.

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 and the PCMCIA-GPIB card.

- Chapter 2, *Installation and Configuration*, contains instructions for installing and configuring your NI-488.2 software and the PCMCIA-GPIB.

- Chapter 3, *Verify the Installation,* describes how to verify the hardware and software installation.

- Chapter 4, *Begin to Use Your NI-488.2 Software,* introduces the Win16 Interactive Control utility and lists some programming considerations.

- Appendix A, *Specifications*, describes the physical characteristics of the PCMCIA-GPIB hardware and software, along with 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 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.

bold	Bold text denotes menus, menu items, icons, or dialog buttons or options.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
bold italic	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.
`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 488.2-1992, 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.

- *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 and the PCMCIA-GPIB card.

How to Use This Manual

```
Chapter 1        ( Gather What You Need )
                 (   to Get Started    )
                          │
                          ▼
              ┌───────────────────────────┐
              │ Install the NI-488.2 Software │
              └───────────────────────────┘
Chapter 2                 │
                          ▼
                   ◇ Need to ◇           Yes    ┌──────────────────────┐
                   Change Software  ─────────▶  │ Configure the Software │
                   Settings?                    └──────────────────────┘
                          │ No                            │
                          ▼                               │
              ┌───────────────────────────┐ ◀────────────┘
              │    Install the Hardware    │
              └───────────────────────────┘

              ┌───────────────────────────┐ ◀────────────┐
              │    Verify the Installation  │             │
              └───────────────────────────┘             │
Chapter 3                 │                              │
                          ▼                              │
                   ◇ Passes? ◇      No    ┌─────────────────┐
                                ─────────▶ │ Troubleshooting │
                          │ Yes            └─────────────────┘
                          ▼
Chapter 4     ┌───────────────────────────┐
              │       Begin to Use         │
              │    the PCMCIA-GPIB         │
              └───────────────────────────┘
User Manual and           │
Function Reference Manual ▼
              ( Write Application Program )
```
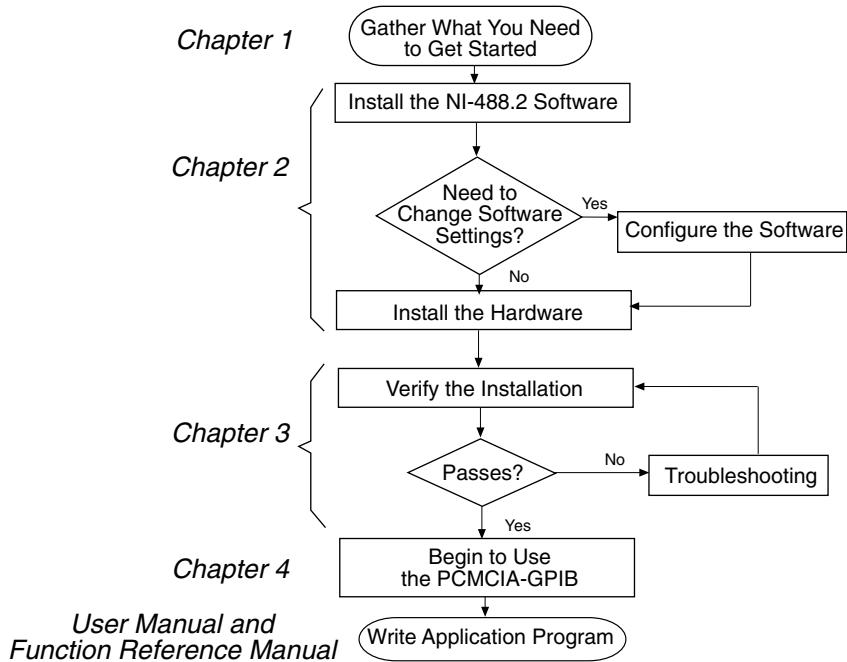
What You Need to Get Started

❏   PCMCIA-GPIB, which your kit contains

❏   *NI-488.2 Software for Windows and the PCMCIA-GPIB 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

NI-488.2 Software Description

The NI-488.2 software for Windows includes a loadable Windows dynamic link library, language interface libraries, and debugging and development utilities. 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 driver communicates 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 address and interrupt levels.

Hardware Description

The PCMCIA-GPIB uses the 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 2.1 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, *Specifications,* for more information about the PCMCIA-GPIB hardware specifications and operating conditions.

The PCMCIA-GPIB+ combines the abilities of the PCMCIA-GPIB and the GPIB analyzer in a single card. In addition to NI-488.2 software, the PCMCIA-GPIB+ kit includes the GPIB analyzer software for Windows. The GPIB analyzer can be used in Windows for troubleshooting a variety of IEEE 488 hardware and software problems. For more information about the PCMCIA-GPIB+ card, contact National Instruments.

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.

Chapter 2
Installation and Configuration

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

Install the NI-488.2 Software

Complete the following steps to run the software installation program.

1. Insert the NI-488.2 software for Windows 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 displays the dialog box shown in Figure 2-1, when the installation begins.
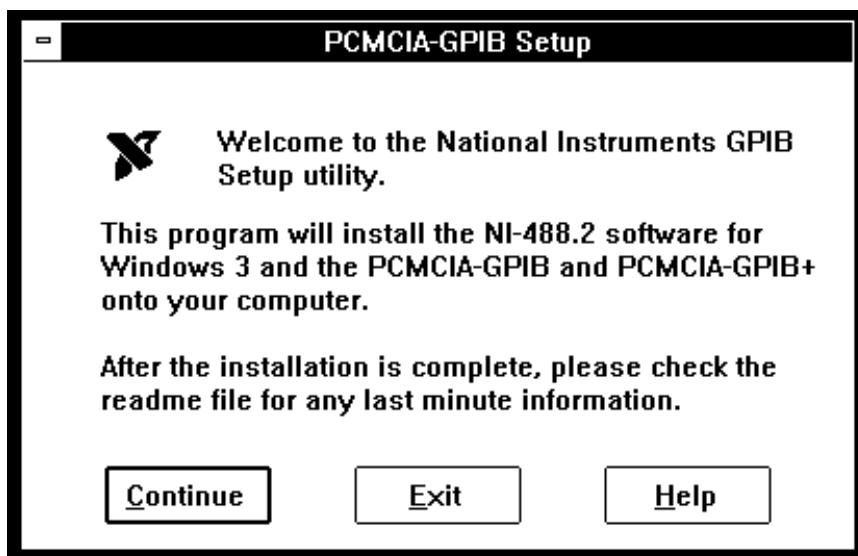

Figure 2-1. NI-488.2 Software Installation Dialog Box

The interactive 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. Click on the **Continue** button to begin installing the NI-488.2 software.

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 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 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 section entitled *Install the PCMCIA-GPIB Hardware,* later in this chapter, for instructions on installing your PCMCIA-GPIB.

Configure the Software (Optional)

The GPIB software configuration utility is an interactive utility you can use to examine or modify the configuration of the driver. You must run the GPIB configuration utility if you want the PCMCIA-GPIB card to use a specific base I/O address or 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*.

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 automatically detects the PCMCIA-GPIB and configures it for use as a GPIB board. Figure 2-2 shows how to insert the PCMCIA-GPIB and how to connect the PCMCIA-GPIB cable.
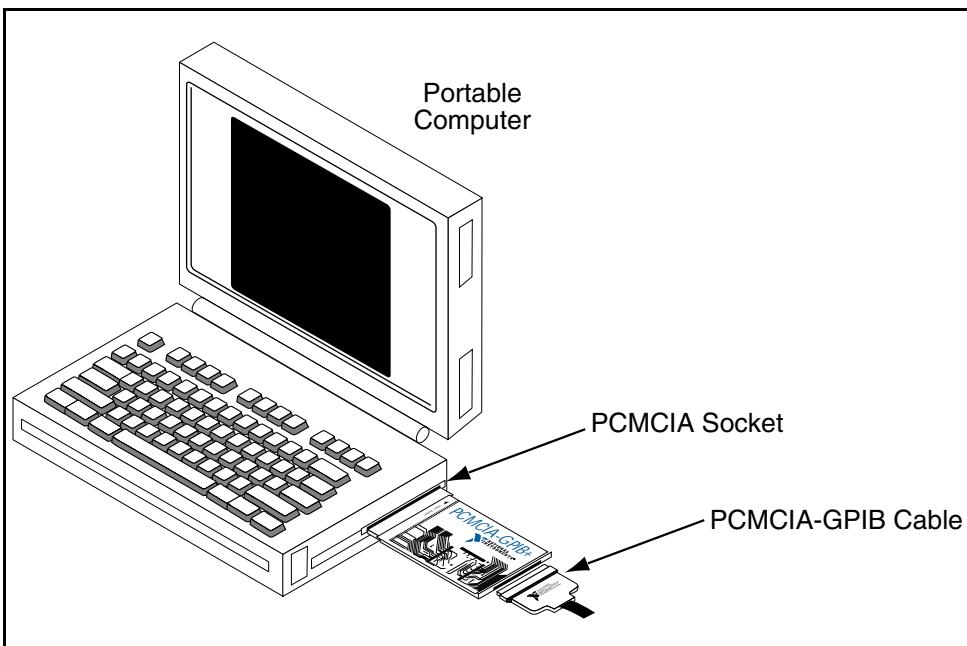

Figure 2-2. Inserting the PCMCIA-GPIB

Chapter 3
Verify the Installation

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 cable, shown in Figure 2-2.

4. Double-click on the **Hardware Diagnostic Test** icon in the **NI-488.2 PCMCIA-GPIB 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, 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.

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 is 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 the section *Troubleshooting Software Diagnostic Test Error Messages* in Appendix B, *Troubleshooting,* for troubleshooting instructions. Select **Exit** from the **File** menu to exit the Software Diagnostic Test.

Chapter 4
Begin to Use Your NI-488.2 Software

This chapter introduces 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
Specifications

This appendix describes the physical characteristics of the PCMCIA-GPIB hardware and software, along with 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 65 mA Typical 85 mA Maximum
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	1.3 Mbytes/s*
Writes	1.3 Mbytes/s*
HS488	
Reads	1.3 Mbytes/s*
Writes	2.1 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 *Checking the Card Services Interrupt Level* section, later in this appendix.

• 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. 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 they are used by other things such as Read Only Memory (ROM). 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. However, you may need to allocate more memory to the PCMCIA software if you plan on using PCMCIA cards with onboard memory. Refer to the documentation that came with your PCMCIA software for information on changing the 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 PCMCIA-GPIB:

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

If this message appears, make sure that there are at least 20 hex bytes of system I/O space that Card Services can assign to the PCMCIA-GPIB card. Some possible base I/O addresses to try adding are 220 hex, 240 hex, 300 hex, and 320 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, either make sure that there is a free interrupt level that Card Services can assign to the PCMCIA-GPIB card, or disable interrupts using the GPIB configuration utility. The PCMCIA-GPIB does not require the use of interrupts. However, GPIB transfer performance may degrade without the use of interrupts. Also, other PCMCIA cards may require the use of interrupts. If you need to use interrupt levels for your PCMCIA cards, note that 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 PCMCIA-GPIB:

<<< 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 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 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. This interrupt level is not required for the PCMCIA-GPIB, and you can use the GPIB configuration utility to disable interrupts. However, other PCMCIA cards may require the use of interrupts. 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 **NI-488.2 PCMCIA-GPIB 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 board 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, IRQ 5, and the 20 hex byte I/O windows at 220, 240, 300,
and 320 hex are available for the PCMCIA-GPIB. (The PCMCIA-GPIB cannot use a
base I/O address such as 210 hex, because the I/O window must be 0x20 in length and
must be a multiple of 0x20.) If the Hardware Diagnostic Test fails for I/O address 300
hex and IRQ 5, but passes for I/O address 240 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 PCMCIA 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 2, *Installation and Configuration*. For more information on how to determine and change the interrupt levels the PCMCIA software uses, 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 System directory, the following error message is displayed:

```
An unexpected ERROR occurred:
  Unable to locate GPIBPCM.DLL in the 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 GPIB*x*.   >>>

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 gpib*x* is not installed or if the software is not configured properly:

<<< No board present for GPIB*x*.   >>>

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 2, *Installation and Configuration*, for more information.

- The board might not be properly installed. Refer to *Install the PCMCIA-GPIB Hardware* in Chapter 2, *Installation and Configuration*, 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 a PCMCIA-GPIB cable is connected at both ends 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.

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*.

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 Appendix B, *Troubleshooting*, 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 Appendix B, *Troubleshooting*.

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.*

Appendix D
Using Two or More GPIB Cards

This chapter contains information about how PCMCIA-GPIB cards are assigned as GPIB boards 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 card that you install. In the following paragraphs, these logical references are referred to as GPIB boards.*

Whenever you reboot your computer and begin to use the NI-488.2 software, the NI-488.2 software scans the PCMCIA sockets and assigns the PCMCIA-GPIB cards as GPIB boards, such as gpib0, gpib1, 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 gpib0, the next lowest numbered PCMCIA-GPIB as gpib1, 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 gpib0 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 gpib0. If all PCMCIA-GPIB cards are inserted with your computer powered on, the first card you insert is assigned as gpib0.

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`.

Appendix E
How System Resources Are Assigned to the PCMCIA-GPIB

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. These resources include a base I/O address with which to access the registers of the TNT4882C ASIC, and an interrupt level, which the card uses to notify the NI-488.2 software of events. The PCMCIA-GPIB does not need to be configured with a DMA channel. The base I/O address points to a window 20 hex bytes in length. The NI-488.2 software obtains the base I/O address 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 a specific base I/O address or interrupt level 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 cannot detect and configure the PCMCIA-GPIB card.

Appendix F
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 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

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 _____

The problem is _____

_____

_____

_____

_____

_____

_____

_____

List any error messages _____

_____

_____

_____

_____

_____

_____

_____

The following steps will reproduce the problem _____

_____

_____

_____

_____

_____

_____

PCMCIA-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

- PCMCIA-GPIB Hardware Revision _____

- NI-488.2 Software Version Number on Distribution Medium

  _____

- Board Settings

	Specific Address and Interrupt (yes/no)	Base Memory Address	Interrupt Level
gpib0	_____	_____	_____
gpib1	_____	_____	_____
gpib2	_____	_____	_____
gpib3	_____	_____	_____

Other Products

- Computer Make and Model _____

- Microprocessor _____

- Other PCMCIA Cards Used _____

- Clock Frequency _____

- Windows Version _____

(continues)

- 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)

     _____

     _____

     _____

Documentation Comment Form

National Instruments encourages you to comment on the documentation supplied with our products. This information helps us provide quality products to meet your needs.

Title: **Getting Started with Your PCMCIA-GPIB and the NI-488.2** ™ **Software for Windows**

Edition Date: **November 1995**

Part Number: **370918A-01**

Please comment on the completeness, clarity, and organization of the manual.

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If you find errors in the manual, please record the page numbers and describe the errors.

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_____

_____

_____

_____

Thank you for your help.

Name   _____

Title   _____

Company   _____

Address   _____

           _____

Phone   (_____)   _____

Mail to: Technical Publications
            National Instruments Corporation
            6504 Bridge Point Parkway
            Austin, TX 78730-5039

Fax to: Technical Publications
            National Instruments Corporation
            (512) 794-5678

Glossary

Prefix	Meaning	Value
m- k- M-	milli- kilo- mega-	10^{-3} 10^{3} 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