

GPIB

Getting Started with Your CPCI-GPIB or PMC-GPIB and the NI-488.2M™ Software for Windows NT

December 1996 Edition
Part Number 321384A-01

© Copyright 1996 National Instruments Corporation.
All Rights Reserved.



Internet Support

support@natinst.com

E-mail: info@natinst.com

FTP Site: ftp.natinst.com

Web Address: <http://www.natinst.com>



Bulletin Board Support

BBS United States: (512) 794-5422

BBS United Kingdom: 01635 551422

BBS France: 01 48 65 15 59



Fax-on-Demand Support

(512) 418-1111



Telephone Support (U.S.)

Tel: (512) 795-8248

Fax: (512) 794-5678



International Offices

Australia 02 9874 4100, Austria 0662 45 79 90 0, Belgium 02 757 00 20,

Canada (Ontario) 905 785 0085, Canada (Québec) 514 694 8521, Denmark 45 76 26 00,

Finland 09 527 2321, France 01 48 14 24 24, Germany 089 741 31 30,

Hong Kong 2645 3186, Israel 03 5734815, Italy 02 413091, Japan 03 5472 2970,

Korea 02 596 7456, Mexico 5 520 2635, Netherlands 0348 433466,

Norway 32 84 84 00, Singapore 2265886, Spain 91 640 0085, Sweden 08 730 49 70,

Switzerland 056 200 51 51, Taiwan 02 377 1200, U.K. 01635 523545

National Instruments Corporate Headquarters

6504 Bridge Point Parkway Austin, TX 78730-5039 Tel: (512) 794-0100

Important Information

Warranty

The GPIB hardware is warranted against defects in materials and workmanship for a period of two years from the date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace equipment that proves to be defective during the warranty period. This warranty includes parts and labor.

The media on which you receive National Instruments software are warranted not to fail to execute programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace software media that do not execute programming instructions if National Instruments receives notice of such defects during the warranty period. National Instruments does not warrant that the operation of the software shall be uninterrupted or error free.

A Return Material Authorization (RMA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. National Instruments will pay the shipping costs of returning to the owner parts which are covered by warranty.

National Instruments believes that the information in this manual is accurate. The document has been carefully reviewed for technical accuracy. In the event that technical or typographical errors exist, National Instruments reserves the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should consult National Instruments if errors are suspected. In no event shall National Instruments be liable for any damages arising out of or related to this document or the information contained in it.

EXCEPT AS SPECIFIED HEREIN, NATIONAL INSTRUMENTS MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER'S RIGHT TO RECOVER DAMAGES CAUSED BY FAULT OR NEGLIGENCE ON THE PART OF NATIONAL INSTRUMENTS SHALL BE LIMITED TO THE AMOUNT THEREOF PAID BY THE CUSTOMER. NATIONAL INSTRUMENTS WILL NOT BE LIABLE FOR DAMAGES RESULTING FROM LOSS OF DATA, PROFITS, USE OF PRODUCTS, OR INCIDENTAL OR CONSEQUENTIAL DAMAGES, EVEN IF ADVISED OF THE POSSIBILITY THEREOF. This limitation of the liability of National Instruments will apply regardless of the form of action, whether in contract or tort, including negligence. Any action against National Instruments must be brought within one year after the cause of action accrues. National Instruments shall not be liable for any delay in performance due to causes beyond its reasonable control. The warranty provided herein does not cover damages, defects, malfunctions, or service failures caused by owner's failure to follow the National Instruments installation, operation, or maintenance instructions; owner's modification of the product; owner's abuse, misuse, or negligent acts; and power failure or surges, fire, flood, accident, actions of third parties, or other events outside reasonable control.

Copyright

Under the copyright laws, this publication may not be reproduced or transmitted in any form, electronic or mechanical, including photocopying, recording, storing in an information retrieval system, or translating, in whole or in part, without the prior written consent of National Instruments Corporation.

Trademarks

NAT4882®, NI-488®, Turbo488®, NI-488.2™, NI-488.2M™, and TNT4882C™ are trademarks of National Instruments Corporation.

Product and company names listed are trademarks or trade names of their respective companies.

WARNING REGARDING MEDICAL AND CLINICAL USE OF NATIONAL INSTRUMENTS PRODUCTS

National Instruments products are not designed with components and testing intended to ensure a level of reliability suitable for use in treatment and diagnosis of humans. Applications of National Instruments products involving medical or clinical treatment can create a potential for accidental injury caused by product failure, or by errors on the part of the user or application designer. Any use or application of National Instruments products for or involving medical or clinical treatment must be performed by properly trained and qualified medical personnel, and all traditional medical safeguards, equipment, and procedures that are appropriate in the particular situation to prevent serious injury or death should always continue to be used when National Instruments products are being used. National Instruments products are NOT intended to be a substitute for any form of established process, procedure, or equipment used to monitor or safeguard human health and safety in medical or clinical treatment.

FCC/DOC Radio Frequency Interference Class A 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. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC). This equipment has been tested and found to comply with the following two regulatory agencies:

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. 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.

Notices 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.*

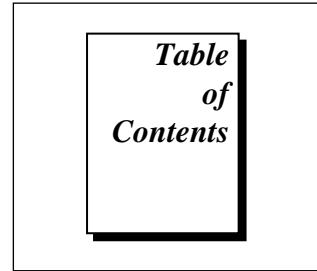
This device complies with the FCC rules only if used with shielded interface cables of suitable quality and construction. National Instruments used such cables to test this device and provides them for sale to the user. The use of inferior or nonshielded interface cables could void the user's authority 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: *Interference to Home Electronic Entertainment Equipment Handbook*. This booklet is available from the U.S. Government Printing Office, Washington, DC 20402.

Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.



About This Manual

How to Use the Manual Set	ix
Organization of This Manual.....	x
Conventions Used in This Manual	xi
Related Documentation	xii
Customer Communication	xii

Chapter 1

Introduction

How to Use This Manual.....	1-1
What You Need to Get Started	1-2
Hardware Description.....	1-2
Software Description	1-3
Optional Programming Tools	1-3

Chapter 2

Installation and Configuration

Install the Hardware.....	2-1
Install the CPCI-GPIB	2-1
Install the PMC-GPIB	2-2
Install the Software.....	2-4
Configure the Software.....	2-5

Chapter 3 Verifying the Installation

Chapter 4 Using the GPIB Hardware and Software

Introduction to the Win32 Interactive Control Utility	4-1
Introduction to the GPIB Spy Utility	4-2
General Programming Considerations	4-2
Running Existing DOS and Windows GPIB Applications	4-3

Appendix A Specifications

Hardware Characteristics	A-1
Software Transfer Rates	A-2

Appendix B Troubleshooting and Common Questions

Troubleshooting Diagnostic Utility Failures	B-1
Missing Software Components	B-1
No GPIB Interfaces Present	B-1
GPIB Cables Need To Be Disconnected.....	B-2
Address Resource Conflict	B-2
Interrupt Resource Conflict	B-2
GPIB Software Problem Encountered	B-2
Unknown Problem Encountered.....	B-2
Resolving Resource Conflicts	B-3
Using Windows NT Diagnostic Tools	B-3
Examining NT Devices to Verify the NI-488.2M Installation	B-3
Examining the NT System Log Using the Event Viewer	B-4
Common Questions.....	B-5

Appendix C Customer Communication

Glossary

Figures

Figure 2-1. Installing the CPCI-GPIB.....	2-2
Figure 2-2. Installing the PMC-GPIB	2-3
Figure 2-3. NI-488.2M Software for Windows NT Installation Screen	2-4
Figure 3-1. Diagnostic Utility after Testing.....	3-2

Tables

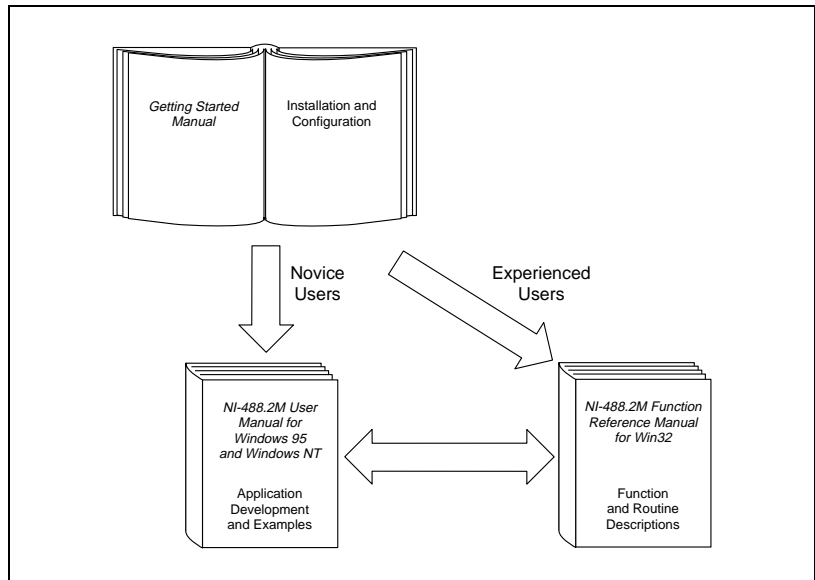
Table A-1. CPCI-GPIB Hardware Characteristics	A-1
Table A-2. PMC-GPIB Hardware Characteristics.....	A-2
Table A-3. NI-488.2M Software Transfer Rates for the CPCI-GPIB and PMC-GPIB	A-2

**About
This
Manual**

This manual contains instructions for installing and configuring the National Instruments CPCI-GPIB or PMC-GPIB and the NI-488.2M software for Windows NT. The NI-488.2M software is intended for use with Microsoft Windows NT version 3.51 or higher.

This manual assumes that you are already familiar with the Windows NT operating system.

How to Use the Manual Set



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

Use the *NI-488.2M User Manual for Windows 95 and Windows NT* to learn the basics of GPIB and how to develop an application program. You can also use the User Manual as a reference for debugging information and detailed examples.

Use the *NI-488.2M Function Reference Manual for Win32* 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 briefly describes the GPIB hardware and the NI-488.2M software.
- Chapter 2, *Installation and Configuration*, contains instructions to help you configure and install your GPIB hardware and NI-488.2M software.
- Chapter 3, *Verifying the Installation*, describes how to verify the hardware and software installation.
- Chapter 4, *Using the GPIB Hardware and Software*, helps you get started with the NI-488.2M software for Windows NT.
- Appendix A, *Specifications*, describes the electrical, physical, and environmental characteristics of the GPIB hardware and the recommended operating conditions.
- Appendix B, *Troubleshooting and Common Questions*, contains troubleshooting information and the answers to common questions.
- Appendix C, *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 that appear in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

The following conventions are used in this manual.

- » The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options»Substitute Fonts** directs you to pull down the **File** menu, select the **Page Setup** item, select **Options**, and finally select the **Substitute Fonts** options from the last dialog box.
 - bold** Bold text denotes the names of menus, menu items, parameters, dialog boxes, dialog box buttons or options, icons, windows, or LEDs.
 - bold italic* Bold italic text denotes a note, caution, or warning.
 - bold monospace** Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are unique from the other examples.
 - 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.
 - italic* Italic text denotes emphasis, a cross reference, or an introduction to a key concept. This font also denotes text for which you supply the appropriate word or value, as in *Windows 3.x*.
 - `monospace` Text in this font denotes text or characters that you should literally enter from the keyboard, sections of code, programming examples, and syntax examples. This font can also denote the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and for statements and comments taken from programs.
- The *Glossary* lists abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms.

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*
- *Microsoft Windows NT System Guide*, Microsoft Corporation

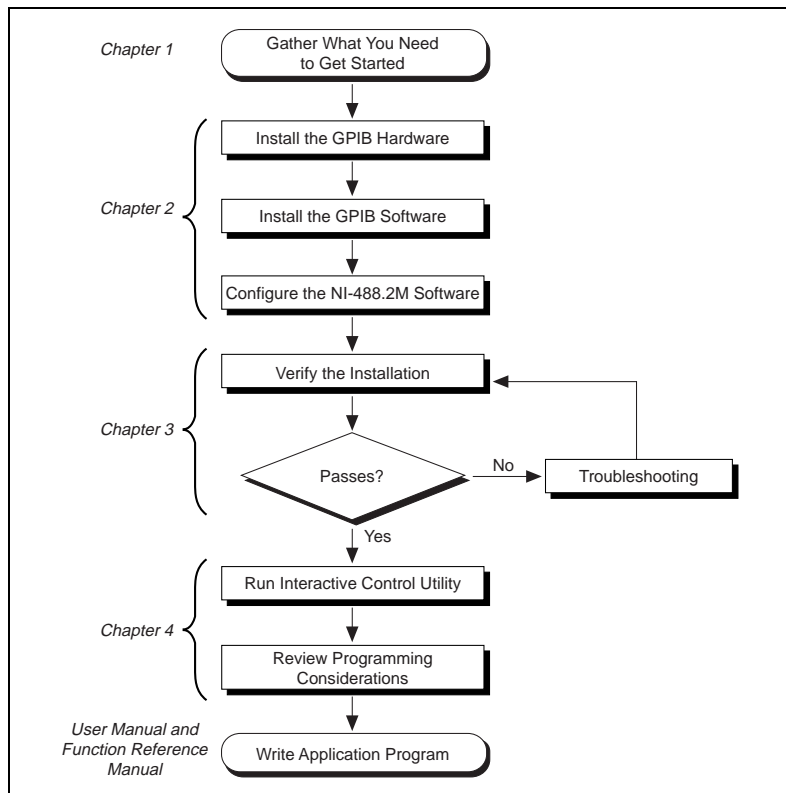
Customer Communication

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

Introduction

This chapter explains how to use this manual, lists what you need to get started, and briefly describes the GPIB hardware and the NI-488.2M software.

How to Use This Manual



What You Need to Get Started

- CPCI-GPIB or PMC-GPIB board, which your kit contains
- The following 3.5 in., high density (1.44 MB) disks, which your kit contains:
 - GPIB Software for Windows NT (Setup Disk)
 - GPIB Software for Windows NT (NI-488.2M Software)
- Windows NT Version 3.51 or higher installed on your system
- GPIB cable for the CPCI-GPIB—single-shielded or double-shielded, Type X1, X2, X4, X5, or X11, which you can order from National Instruments
or
GPIB cable for the PMC-GPIB—Type X13, which is included in your kit

Hardware Description

The Plug and Play GPIB hardware, along with the NI-488.2M software, transforms your system into a fully functional GPIB Talker/Listener/Controller that has complete communications and bus management capability. The TNT4882C chip on each Plug and Play GPIB board combines the circuitry of the NAT4882 ASIC, the Turbo488 ASIC, and GPIB transceivers to create a single-chip IEEE 488.2 interface. The TNT4882C also implements the HS488 high-speed protocol, which increases the maximum data transfer rate to up to 7.8 Mbytes/s, depending on the system and the system configuration. For more information about transfer rates, refer to Appendix A, *Specifications*, in this manual. For more information about HS488, refer to Chapter 7, *GPIB Programming Techniques*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*.

The CPCI-GPIB and PMC-GPIB each contain one GPIB load; you can connect up to 14 instruments to one of these interfaces. If you want to use more instruments, you can order a bus extender or expander from National Instruments. Refer to Appendix A, *Specifications*, for more information about the GPIB hardware specifications and operating conditions.

Software Description

The NI-488.2M software for Windows NT includes a loadable Windows NT kernel device driver and supporting utilities.

The NI-488.2M software package includes the following components:

- Device driver
- Diagnostic test
- Configuration utility
- Interactive control program
- Utilities for software development and debugging
- Language interface library for Microsoft Visual C/C++, Borland C/C++, and Visual Basic
- Virtual device driver and special DOS and Windows 3 drivers for running existing NI-488.2 for DOS and Windows 3 applications under Windows NT
- Example programs that use NI-488 functions and NI-488.2 routines

For a detailed list of files, refer to the *NI-488.2M User Manual for Windows 95 and Windows NT*.

Optional Programming Tools

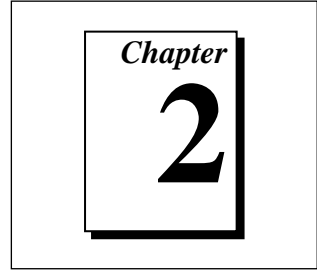
Your kit includes the NI-488.2M software for Windows NT. In addition, you can order the LabWindows[®]/CVI[™] or LabVIEW software from National Instruments. LabWindows/CVI and LabVIEW include instrument driver libraries that make it easier to communicate with your GPIB instruments.

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 hundreds of 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.

Installation and Configuration



This chapter contains instructions to help you configure and install your GPIB hardware and NI-488.2M software.

Install the Hardware

This section describes how to install your GPIB hardware. Refer to the section that describes the installation for your particular board.

Install the CPCI-GPIB



Warning: *Electrostatic discharge can damage several components on these GPIB boards. To avoid such damage in handling your board, touch the antistatic plastic package to a metal part of your system chassis before removing the board from the package.*

1. Make sure that your system is turned off. Keep the system plugged in so that it remains grounded while you install the CPCI-GPIB.
2. Choose an unused CompactPCI slot in your system.
For maximum performance, the CPCI-GPIB has an onboard DMA controller that can only be used if the board is installed in a slot that supports bus arbitration, or bus master cards. National Instruments recommends installing the CPCI-GPIB in such a slot. If you install in a non-master slot, you must disable the CPCI-GPIB onboard DMA controller using the board-level call `ibdma`. Refer to the *NI-488.2 Function Reference Manual for Win32* for a complete description of `ibdma`.
3. Remove the slot cover for the slot you have chosen.
4. Insert the CPCI-GPIB board into the slot. It might be a tight fit, but do not force the board into place. Figure 2-1 shows how to install the CPCI-GPIB into a CompactPCI subrack.

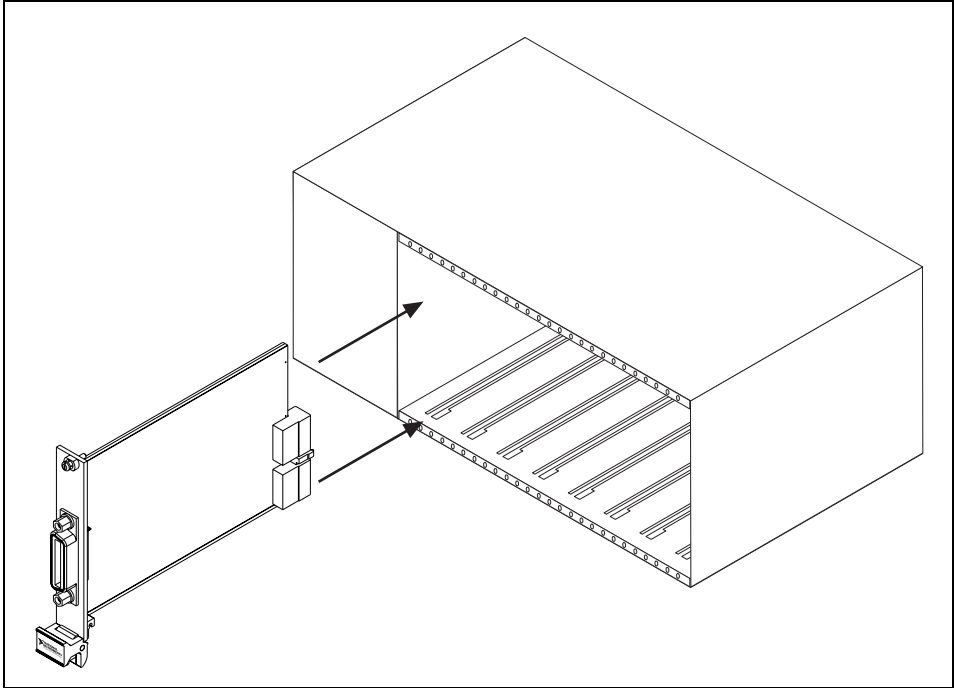


Figure 2-1. Installing the CPCI-GPIB

5. Screw the front panel of the CPCI-GPIB to the front panel mounting rail of the system.
6. Turn on your system and start Windows NT.

The CPCI-GPIB installation is now complete. Proceed to the *Install the Software* section later in this chapter.

Install the PMC-GPIB



Warning: *Electrostatic discharge can damage several components on these GPIB boards. To avoid such damage in handling your board, touch the antistatic plastic package to a metal part of your system chassis before removing the board from the package.*

1. Make sure that your system is turned off.
2. Find an unused PMC slot in your system. You may need to remove the host from the system to access the PMC slot.
3. Remove the corresponding slot filler panel from the host.

4. Insert the PMC-GPIB into the slot as shown in Figure 2-2. It might be a tight fit, but do not force the board into place.

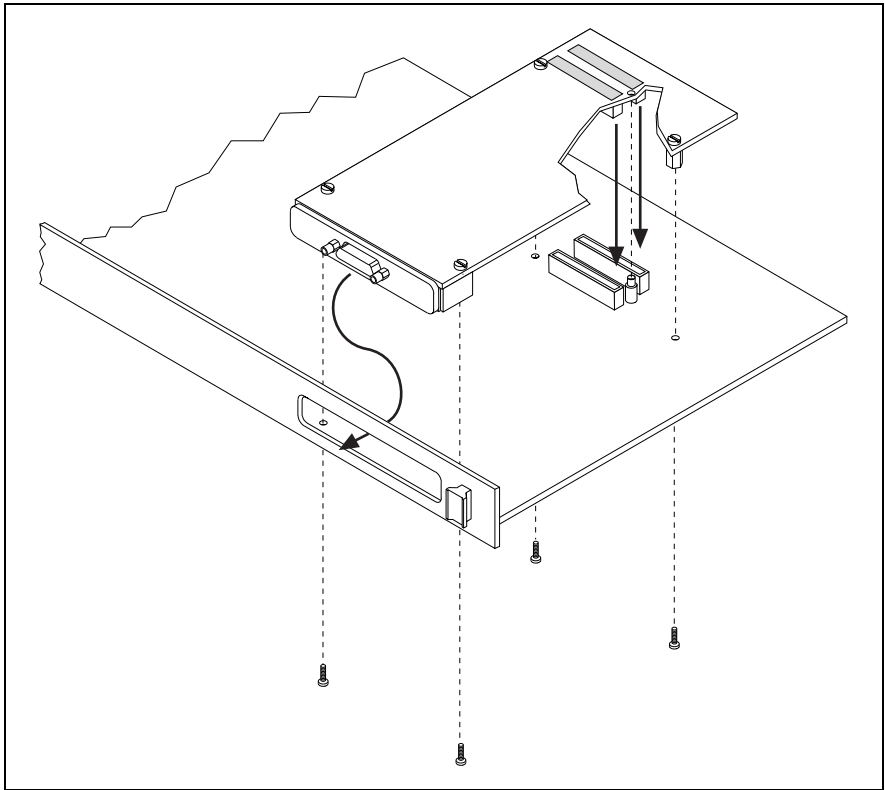


Figure 2-2. Installing the PMC-GPIB

5. Use the mounting hardware provided to fasten the PMC-GPIB to the host.
6. Reinstall the host, if you removed it to install the PMC-GPIB.
7. Turn on your system and start Windows NT.

The PMC-GPIB hardware installation is now complete. Proceed to the next section, *Install the Software*.

Install the Software

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

1. Log onto your Windows NT system using the Administrator account. The NI-488.2M installation program must have Administrator privileges because the program modifies the configuration registry of your system.
2. Insert the GPIB Software for Windows NT (Setup Disk) into an unused drive.
3. Windows NT 3.51: Select **Run...** from the **File** menu in the **Program Manager**.

Windows NT 4.0 or higher: Select **Run...** from the **Start** menu.

Type the following command into the dialog box:

```
x:\setup
```

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

The software installation begins with the following screen. Although the CPCI-GPIB and PMC-GPIB are not listed on this screen, they are compatible with the PCI-GPIB.

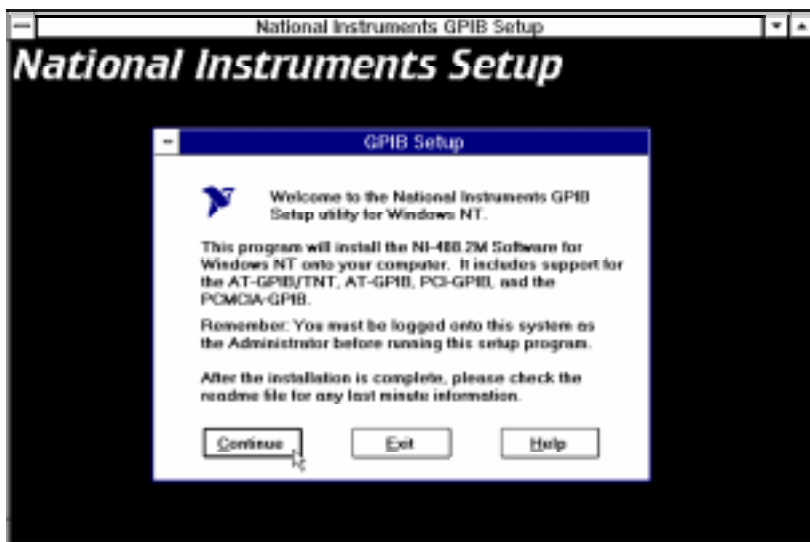


Figure 2-3. NI-488.2M Software for Windows NT Installation Screen

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

When the setup program has finished copying the software onto your system, it attempts to start the NI-488.2M driver. If the setup program cannot start the driver, it instructs you to run the GPIB Configuration utility in order to check your system configuration and then to restart Windows NT, which forces the driver to load.

Before you use the NI-488.2M software with your CPCI-GPIB or PMC-GPIB, you must reconfigure the software. Refer to the next section, *Configure the Software*, for instructions on running the GPIB Configuration utility.

Configure the Software

The GPIB 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 before you can use the NI-488.2M software for Windows NT. Follow these steps to run the utility:

1. Double-click on the **GPIB** icon in the **Control Panel**.

Windows NT 3.51: Open the **Control Panel** in the **Main** group of the **Program Manager**.

Windows NT 4.0 or higher: Select **Start»Settings»Control Panel**.

The GPIB Configuration utility displays a list of all the GPIB boards and device names.

2. Use the **Board Type** button to specify the type of GPIB interface you are using. The CPCI-GPIB and PMC-GPIB are compatible with the PCI-GPIB, so the **Board Type** you select should be **PCI-GPIB**.
3. Click on the **OK** button to save your changes.
4. Shut down and restart your system.
5. Double-click on the **GPIB** icon in the **Control Panel**.

Windows NT 3.51: Open the **Control Panel** in the **Main** group of the **Program Manager**.

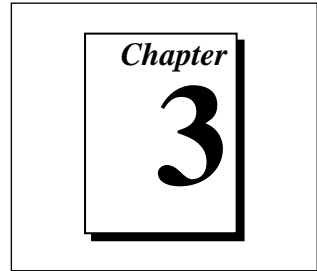
Windows NT 4.0 or higher: Select **Start»Settings»Control Panel**.

6. Double-click on each GPIB interface that you set to **PCI-GPIB** for the **Board Type**, and select the appropriate serial number.

7. Examine or edit any other information. You can use the online help if you have any questions. For more information about GPIB Configuration utility options, refer to the *NI-488.2M User Manual for Windows 95 and Windows NT*.
8. Click on the **OK** button to save your changes.

After you have installed and configured the software, you should verify the installation. Continue to the next chapter, Chapter 3, *Installation Verification*.

Verifying the Installation



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

You can use the Diagnostic utility, installed with your GPIB software, to test the hardware and software installation. The Diagnostic utility verifies that your hardware and software are functioning properly and that the configuration of your GPIB interfaces does not conflict with anything else in your system.

Follow these instructions to run the Diagnostic utility:

Windows NT 3.51: Double-click on the **Diagnostic** icon in the **NI-488.2M Software for Windows NT** group of the **Program Manager**.

Windows NT 4.0 or higher: Select the **Diagnostic** item under **Start»Programs»NI-488.2M Software for Windows NT**.

When you have started the Diagnostic utility, test your GPIB interfaces by clicking on the **Test All** button. If the Diagnostic utility test is successful, it puts a check mark next to the interface and changes its status from **untested** to **passed**. If the Diagnostic utility test fails, it puts an X next to the interface, and changes its status from **untested** to **failed**. Figure 3-1 shows the Diagnostic utility dialog box after it has tested some GPIB interfaces.

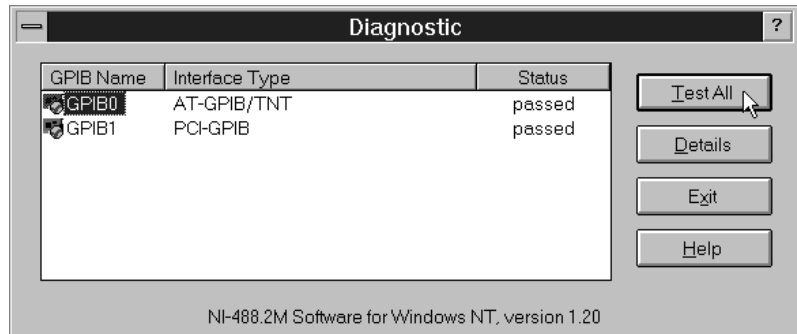
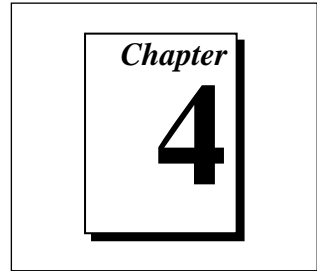


Figure 3-1. Diagnostic Utility after Testing

For both the CPCI-GPIB and PMC-GPIB, the **Interface Type** listed in the Diagnostic is **PCI-GPIB**.

You can get details on any of the tested GPIB interfaces by selecting the interface and clicking on the **Details** button. For each failed GPIB interface, select it and click on the **Details** button to get a description of the failure encountered. Use that information and the information in Appendix B, *Troubleshooting and Common Questions*, to troubleshoot the problem. There is also extensive troubleshooting information in the Diagnostic utility online help.

Using the GPIB Hardware and Software



This chapter helps you get started with the NI-488.2M software for Windows NT.

Introduction to the Win32 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 the function calls return. You can use this 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.

Follow these instructions to run the Win32 Interactive Control Utility.

Windows NT 3.51: Double-click on the **Win32 Interactive Control** icon in the **NI-488.2M Software for Windows NT** group of the **Program Manager**.

Windows NT 4.0 or later: Select the **Win32 Interactive Control** item under **Start»Programs»NI-488.2M Software for Windows NT**.

This utility includes extensive online help. For more information about the Win32 Interactive Control utility, refer to the *NI-488.2M User Manual for Windows 95 and Windows NT*.

Introduction to the GPIB Spy Utility

Included with the NI-488.2M software is GPIB Spy, a Win32 utility that you can use to monitor NI-488.2M calls made by Win32, Win16, and DOS GPIB applications. You can use GPIB Spy to do the following:

- Capture information about NI-488 functions and NI-488.2M routines as your GPIB applications invoke them.
- Display captured information, including, but not limited to, input and output parameter values, I/O buffer contents, and return values.
- Save, restore, and print captured information.

Follow these instructions to run GPIB Spy:

Windows NT 3.51: Double-click on the **GPIB Spy** icon in the **NI-488.2M Software for Windows NT** group of the **Program Manager**.

Windows NT 4.0 or higher: Select the **GPIB Spy** item under **Start»Programs»NI-488.2M Software for Windows NT**.

For more information about the GPIB Spy utility, refer to Chapter 5, *GPIB Spy Utility*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*, or use the GPIB Spy context-sensitive online help.

General Programming Considerations

As you begin developing your Win32 NI-488.2M application, remember the following points:

- For your C/C++ application, you must include the NI-488.2M header file in your source code.
- You can access the NI-488.2M software through the 32-bit DLL, `gpiib-32.dll`, either by linking with one of the language interfaces provided with the NI-488.2M software, or by using direct DLL entry from any programming environment.
- Several sample GPIB applications are included with the NI-488.2M software. Use these as a guide for your own application development.

For information about choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2M User Manual for Windows 95 and Windows NT*. For detailed information about each NI-488 function and NI-488.2 routine, refer to the *NI-488.2M Function Reference Manual for Win32*.

Running Existing DOS and Windows GPIB Applications

You can run existing DOS and Windows GPIB applications under Windows NT by using the GPIB Virtual Device Driver, `gpib-vdd.dll`, which is included with your NI-488.2M software.

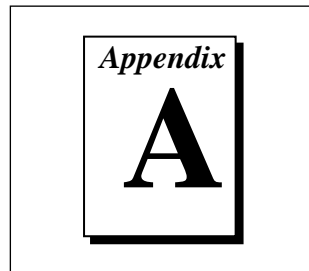
To run DOS GPIB applications, load the special GPIB device driver `gpib-nt.com` instead of `gpib.com`, which you normally use with DOS. When you install the NI-488.2M software, the installation program copies `gpib-nt.com` into a new subdirectory called `doswin16`. To use `gpib-nt.com`, you must modify your `config.nt` file to load `gpib-nt.com` whenever a DOS application runs. The `config.nt` file is located in your `winnt\system32` directory, where `winnt` is your Windows NT directory, for example, `c:\windows`. To load `gpib-nt.com`, add the following line to your `config.nt` file:

```
device=path\doswin16\gpib-nt.com
```

where *path* is the directory where you installed the GPIB software (the default installation directory is `c:\gpib-nt`).

To run 16-bit Windows GPIB applications, the system uses the special GPIB dynamic link library, `gpib.dll`. When you install the NI-488.2M software, the installation program copies `gpib.dll` into the `winnt\system32` directory, where `winnt` is your Windows NT directory, for example `c:\windows`. As long as `gpib.dll` is in your Windows NT directory, your system automatically accesses `gpib.dll` whenever you launch a 16-bit Windows GPIB application.

Specifications



This appendix describes the electrical, physical, and environmental characteristics of the GPIB hardware and the recommended operating conditions.

Hardware Characteristics

Table A-1. CPCI-GPIB Hardware Characteristics

Characteristic	Specification
Dimensions	100 by 160 mm (3.94 by 6.3 in.)
Power Requirement (from CompactPCI bus)	+5 VDC 600 mA typical 800 mA maximum
I/O Connector	IEEE 488 Standard 24-pin
Operating Environment Temperature Relative Humidity	0° to 50° C 10% to 90%, noncondensing
Storage Environment Temperature Relative Humidity	-20° to 70° C 5% to 95%, noncondensing
EMI	FCC Class A Verified

Table A-2. PMC-GPIB Hardware Characteristics

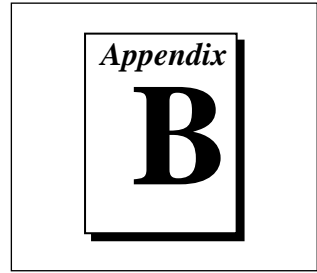
Characteristic	Specification
Dimensions	74 by 149 mm (2.9 by 5.9 in.)
Power Requirement (from PMC bus)	+5 VDC 600 mA typical 800 mA maximum
I/O Connector	Micro D-sub 25-pin
PCI Signaling Environment	+5 VDC
Power Dissipation	3 Watts typical 4 Watts maximum
Operating Environment Temperature Relative Humidity	0° to 55° C 10% to 90%, noncondensing
Storage Environment Temperature Relative Humidity	-20° to 70° C 5% to 95%, noncondensing
EMI	FCC Class A Verified

Software Transfer Rates

Table A-3. NI-488.2M Software Transfer Rates for the CPCI-GPIB and PMC-GPIB

GPIB Hardware	Transfer Method	Maximum GPIB Transfer Rate
CPCI-GPIB	3-wire (IEEE 488)	1.5 Mbytes/s*
	High Speed (HS488)	7.8 Mbytes/s*
PMC-GPIB	3-wire (IEEE 488)	1.5 Mbyte/s*
	High Speed (HS488)	7.8 Mbyte/s*
* Actual speed may vary considerably from speed shown because of system and instrumentation capabilities.		

Troubleshooting and Common Questions



This appendix contains troubleshooting information and the answers to common questions.

Troubleshooting Diagnostic Utility Failures

The following sections explain common error messages the Diagnostic utility generates.

Missing Software Components

This error occurs if the software components that are necessary for the GPIB Software for Windows NT to function correctly are not present in the system. If you encounter this problem, reinstall the GPIB Software for Windows NT and run the Diagnostic utility again.

No GPIB Interfaces Present

This error occurs if there are no GPIB interfaces physically present in the system or there is a resource conflict with the interfaces that are installed. If you encounter this problem, use the GPIB Configuration utility to examine the installed GPIB interfaces and the resources assigned to each. Then, run the Diagnostic utility again.

To access this information in the GPIB Configuration utility, complete the following steps:

1. Double-click on the **GPIB** icon in the **Control Panel**.

Windows NT 3.51: Open the **Control Panel** in the **Main** group of the **Program Manager**.

Windows NT 4.0 or higher: Select **Start»Settings»Control Panel**.

2. Click on the **Board Type** button and verify that the type of GPIB interface listed for each logical board name is correct. Click on the **OK** button to return to the main dialog box.
3. Double-click on each board name and verify that the hardware settings displayed in the dialog box match your actual hardware settings.

GPIB Cables Need To Be Disconnected

This error occurs if you have any GPIB cables connected to the GPIB interface. Disconnect all GPIB cables and run the Diagnostic utility again.

Address Resource Conflict

This error occurs if the address resources assigned to a GPIB interface conflict with the address resources that other devices in the system are using. To resolve an address resource conflict, refer to the *Resolving Resource Conflicts* section later in this appendix. After you have resolved the conflict, run the Diagnostic utility again.

Interrupt Resource Conflict

This error occurs if the interrupt resources assigned to a GPIB interface conflict with the interrupt resources that other devices in the system are using. To resolve an interrupt resource conflict, refer to the *Resolving Resource Conflicts* section later in this appendix. After you have resolved the conflict, run the Diagnostic utility again.

GPIB Software Problem Encountered

This error occurs if the Diagnostic utility detects that it is unable to communicate correctly with the GPIB hardware using the installed GPIB software. If you encounter this error, shut down your system, restart it, and run the Diagnostic utility again. If the problem persists, try reinstalling the GPIB software for Windows NT.

Unknown Problem Encountered

This error occurs if an unknown problem is encountered when you try to execute the Diagnostic utility. If this error occurs, shut down your system, restart it, and run the Diagnostic utility again. If the problem persists, try reinstalling the GPIB software for Windows NT.

Resolving Resource Conflicts

Resource conflicts occur when your system contains hardware that is configured to use the same resources as your GPIB interface. The NI-488.2M driver detects some resource conflicts when it loads. When the driver detects conflicts as it loads, it records an error message describing the conflict. You can use the **Event Viewer**, as described in the following section, *Using Windows NT Diagnostic Tools*, to see which resource is in conflict.

Once you have identified the resource that caused the conflict, use the GPIB Configuration utility to reconfigure your GPIB interface so that it uses conflict-free resources. To help in the selection of conflict-free resources, Microsoft has provided a utility called **Windows NT Diagnostics**. This utility displays a list of the I/O port addresses, interrupt levels, and DMA channels that are currently being used in your system. Assign resources this utility does not list to your GPIB interface.

Follow these instructions to run the Windows NT Diagnostics:

Windows NT 3.51: Double-click on the **Windows NT Diagnostics** icon in the **Administrative Tools** group of the **Program Manager**.

Windows NT 4.0 or higher: Select **Start»Programs»Administrative Tools»Windows NT Diagnostics**.

Using Windows NT Diagnostic Tools

There are many reasons why the NI-488.2M driver might not load. If the software is not properly installed or if there is a conflict between the GPIB hardware and the other hardware in the system, the NI-488.2M driver fails to start. Two Windows NT utilities are useful in determining the source of the problem: the **Devices** applet in the **Control Panel**, and the **Event Viewer**. The following sections describe the information available through each utility.

Examining NT Devices to Verify the NI-488.2M Installation

To verify whether the NI-488.2M devices are installed correctly (that is, that the devices are started), run the **Devices** applet in the **Control Panel**, as shown in the following paragraphs.

Windows NT 3.51: Open the **Control Panel** in the **Main** group of the **Program Manager**.

Windows NT 4.0 or later: Select **Start»Settings»Control Panel**.

This utility lists all of the devices Windows NT detects. Each device has a status associated with it. If the NI-488.2M driver is installed correctly, the following lines appear in the list of NT devices:

<u>Device</u>	<u>Status</u>	<u>Started</u>
GPIB Board Class Driver	Started	Automatic
GPIB Device Class Driver	Started	Automatic

You should also see one or more lines similar to the following:

<u>Device</u>	<u>Status</u>	<u>Started</u>
GPIB Port Driver (PCI-GPIB)	****	System

The **GPIB Board Class Driver**, the **GPIB Device Class Driver**, and at least one of the **GPIB Port Drivers** listed by the **Devices** applet should have a status of **started**. If not, refer to the next section, *Examining the NT System Log Using the Event Viewer*.

If the GPIB Class Driver lines are not present or at least one GPIB Port Driver line is not present, the NI-488.2M software is not installed properly. You must reinstall the NI-488.2M software.

Examining the NT System Log Using the Event Viewer

Windows NT maintains a system log. If the NI-488.2M driver is unable to start, it records entries in the system log explaining why it failed to start. You can examine the system log by running the **Event Viewer** utility, as shown in the following paragraphs.

Windows NT 3.51: Double-click on the **Event Viewer** icon in the **Administrative Tools** group of the **Program Manager**.

Windows NT 4.0 or higher: Select **Start»Programs»Administrative Tools»Event Viewer**.

Events that might appear in the system log include the following:

- The system cannot locate the device file for one or more of the devices that make up the NI-488.2M driver and an event is logged that **The system cannot find the file specified**. In this case, the NI-488.2M software is incorrectly installed. You should reinstall the software.

- A conflict exists between the GPIB hardware and the other hardware in the system. If this is the case, an event is logged that indicates the nature of the resource conflict. To correct this conflict, reconfigure the GPIB hardware and the NI-488.2M software. Refer to Chapter 2, *Installation and Configuration*, for configuration information.

Common Questions

Can I use the CPCI-GPIB in a slot that is not configured for bus arbitration?

National Instruments recommends installing the CPCI-GPIB into a slot that supports bus arbitration, or bus master cards. But you can install the board into a non-master slot, if you disable the onboard DMA controller. Refer to the *Install the CPCI-GPIB* section in Chapter 2, *Installation and Configuration*, for more information.

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

Run the GPIB Configuration utility. To run the utility, open your Windows NT Control Panel and select the National Instruments eagle icon.

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

Run the Diagnostic utility, as follows:

Windows NT version 3.51: Start the Diagnostic utility by double-clicking on the **Diagnostic** icon in the **NI-488.2M Software for Windows NT** group of the **Program Manager**.

Windows NT version 4.0 or later: Start the Diagnostic utility by choosing the **Diagnostic** item under **Start»Programs»NI-488.2M Software for Windows NT**.

How many GPIB interfaces can I configure for use with my NI-488.2M Software for Windows NT?

You can configure the NI-488.2M Software for Windows NT to communicate with up to 4 GPIB interfaces.

How many devices can I configure for use with my NI-488.2M Software for Windows NT?

The NI-488.2M Software for Windows NT provides a total of 100 logical devices for applications to use. The default number of devices is 32.

Are interrupts required with the NI-488.2M Software for Windows NT?

Interrupts are required.

How can I determine if my GPIB hardware and software are correctly installed?

Run the Diagnostic utility, as follows:

Windows NT version 3.51: Start the Diagnostic utility by double-clicking on the **Diagnostic** icon in the **NI-488.2M Software for Windows NT** group of the **Program Manager**.

Windows NT version 4.0 or later: Start the Diagnostic utility by choosing the **Diagnostic** item under **Start»Programs»NI-488.2M Software for Windows NT**.

When should I use the Win32 Interactive Control utility?

You can use the Win32 Interactive Control utility to test and verify instrument communication, troubleshoot problems, and develop your application. For more information, refer to Chapter 6, *Win32 Interactive Control Utility*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*.

How do I use an NI-488.2M language interface?

For information about using NI-488.2M language interfaces, refer to Chapter 3, *Developing Your Application*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*.

What do I do if the Diagnostic utility fails with an error?

Use the Diagnostic online help, or refer to the getting started manual, to troubleshoot specific problems. If you have already completed the troubleshooting steps, fill out the support forms in Appendix C, *Customer Communication*, and contact National Instruments.

What is wrong if `ibwrt` or `ibrd` calls cause my system to hang?

If the Diagnostic utility passes, but `ibrd` or `ibwrt` calls cause your system to hang, you might have the CPCI-GPIB installed in a slot that is not configured for bus arbitration. Refer to the *Install the CPCI-GPIB* section in Chapter 2, *Installation and Configuration*, for more information.

How do I communicate with my instrument over the GPIB?

Refer to the documentation that came from the instrument manufacturer. The command sequences you use are totally dependent on the specific instrument. The documentation for each instrument should include the GPIB commands you need to communicate with it. In most cases, NI-488 device-level calls are sufficient for communicating with instruments. Refer to Chapter 3, *Developing Your Application*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*, for more information.

Can I use the NI-488 and NI-488.2 calls together in the same application?

Yes, you can mix NI-488 functions and NI-488.2 routines.

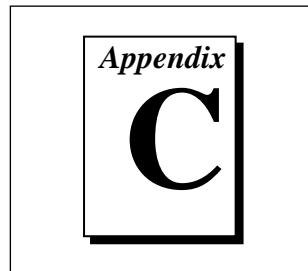
What can I do to check for errors in my GPIB application?

Examine the value of `ibsta` after each NI-488 or NI-488.2 call. If a call fails, the ERR bit of `ibsta` is set and an error code is stored in `iberr`. For more information about global status variables, refer to Chapter 3, *Developing Your Application*, in the *NI-488.2M User Manual for Windows 95 and Windows NT*.

What information should I have before I call National Instruments?

When you call National Instruments, you should have the results of the Diagnostic test. Also, make sure you have filled out the technical support form in Appendix C, *Customer Communication*.

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.

Electronic Services



Bulletin Board Support

National Instruments has BBS and FTP sites dedicated for 24-hour support with a collection of files and documents to answer most common customer questions. From these sites, you can also download the latest instrument drivers, updates, and example programs. For recorded instructions on how to use the bulletin board and FTP services and for BBS automated information, call (512) 795-6990. You can access these services at:

United States: (512) 794-5422

Up to 14,400 baud, 8 data bits, 1 stop bit, no parity

United Kingdom: 01635 551422

Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

France: 01 48 65 15 59

Up to 9,600 baud, 8 data bits, 1 stop bit, no parity



FTP Support

To access our FTP site, log on to our Internet host, `ftp.natinst.com`, as anonymous and use your Internet address, such as `joesmith@anywhere.com`, as your password. The support files and documents are located in the `/support` directories.



Fax-on-Demand Support

Fax-on-Demand is a 24-hour information retrieval system containing a library of documents on a wide range of technical information. You can access Fax-on-Demand from a touch-tone telephone at (512) 418-1111.



E-Mail Support (currently U.S. only)

You can submit technical support questions to the applications engineering team through e-mail at the Internet address listed below. Remember to include your name, address, and phone number so we can contact you with solutions and suggestions.

support@natinst.com

Telephone and Fax Support

National Instruments has branch offices all over the world. Use the list below to find the technical support number for your country. If there is no National Instruments office in your country, contact the source from which you purchased your software to obtain support.



Telephone



Fax

Australia	02 9874 4100	02 9874 4455
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 527 2321	09 502 2930
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 5734815	03 5734816
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	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

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

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

Name _____

Title _____

Company _____

Address _____

Fax (____) _____ Phone (____) _____

Computer brand _____ Model _____ Processor _____

Operating system (include version number) _____

Clock Speed _____ MHz RAM _____ MB Display adapter _____

Mouse ____ yes ____ no Other adapters installed _____

Hard disk capacity _____ MB Brand _____

Instruments used _____

National Instruments hardware product model _____ Revision _____

Configuration _____

National Instruments software product _____ Version _____

Configuration _____

The problem is _____

List any error messages _____

The following steps will reproduce the problem _____

Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Complete a new copy of this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

National Instruments Products

GPIB Board and Revision Number

— PMC-GPIB Board Revision _____

or

— CPCI-GPIB Board Revision _____

NI-488.2M Software for Windows NT Revision Number on Disk _____

Programming Language Interface Version _____

Shield Ground Connected to Logic Ground (yes or no) _____

Other Products

Computer Make and Model _____

Microprocessor _____

Clock Frequency _____

Type of Monitor Card Installed _____

Windows NT Version _____

Application Programming Language (Microsoft C, and so on) _____

Other Boards in System _____

Base I/O Address of Other Boards _____

Interrupt Level of Other Boards _____

DMA Channels of Other Boards _____

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 CPCI-GPIB or PMC-GPIB and the NI-488.2M™ Software for Windows NT*

Edition Date: December 1996

Part Number: 321384A-01

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

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

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-	milli-	10^{-3}
c-	centi-	10^{-2}
k-	kilo-	10^3
M-	mega-	10^6

°	degrees
%	percent
A	amperes
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
C	Celsius
DIP	dual inline package
DMA	direct memory access
EISA	Extended Industry Standard Architecture
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
Hz	hertz
I/O	input/output
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
ISA	Industry Standard Architecture
kernel	The set of programs in an operating system that implements basic system functions
m	meters
MB	megabytes of memory
PC	personal computer

Glossary

RAM	random-access memory
s	seconds
VDC	volts direct current