GPIB

Getting Started with Your Plug and Play GPIB Hardware and Software for Windows 95

November 1995 Edition
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Important Information

Warranty

Copyright

Trademarks

WARNING REGARDING MEDICAL AND CLINICAL USE OF NATIONAL INSTRUMENTS PRODUCTS

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. This equipment has been tested and found to comply with the following two regulatory agencies:

Federal Communications Commission

The PCMCIA-GPIB+ and PCMCIA-GPIB comply 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

The PCMCIA-GPIB+ and PCMCIA-GPIB comply 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.

FCC/DOC Radio Frequency Interference Class B Compliance

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

Federal Communications Commission

The AT-GPIB/TNT (Plug and Play), AT-GPIB/TNT+ , and PCI-GPIB comply with Part 15 of the Federal Communications Commission (FCC) Rules for a Class B digital device. A Class B device is distinguishable from a Class A device by the appearance of an FCC ID number located on the Class B device.

Canadian Department of Communications

The AT-GPIB/TNT (Plug and Play), AT-GPIB/TNT+ , and PCI-GPIB comply with the limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications (DOC).

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

Instructions to Users

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

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

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

• Operate the equipment and the receiver on different branches of your AC electrical system.

• Move the equipment away from the receiver with which it is interfering.

• Reorient or relocate the receiver's antenna.

• Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

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

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

┌─────────────────┐
│ ***Table***   │
│ ***of***   │
│ ***Contents***   │
└─────────────────┘

About This Manual

Chapter 1
Introduction

Chapter 2
Installation and Configuration

Chapter 3
Verify the Installation

Chapter 4
Begin to Use the GPIB Software

Appendix A
Uninstall the Hardware and Software

Appendix B
Change the Driver for the GPIB Hardware

Appendix C
Troubleshooting and Common Questions

Appendix D
Specifications

Appendix E
Customer Communication

Glossary

Figures

Tables

This manual contains instructions to help you install and configure the National Instruments Plug and Play GPIB hardware and software for Windows 95. This manual assumes that you are already familiar with Windows 95.

How to Use the Manual Set
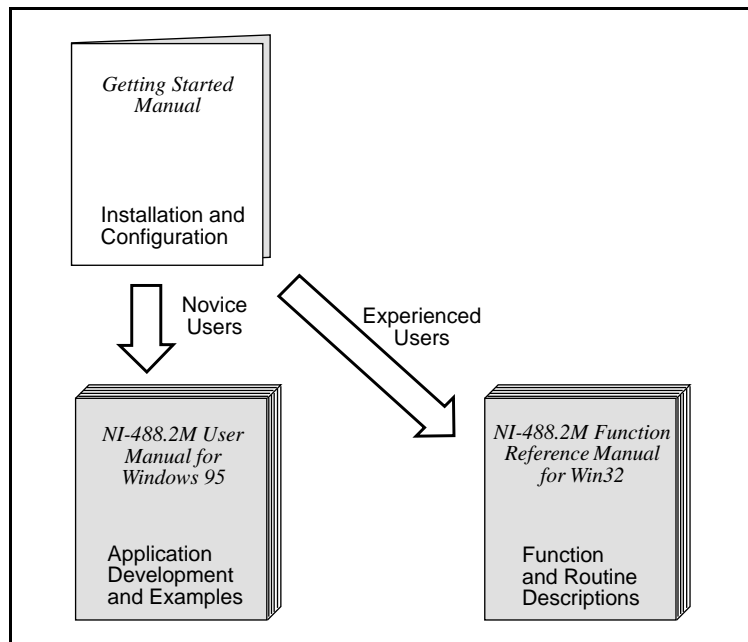
Use this getting started manual to install and configure your Plug and Play GPIB hardware and software for Windows 95.

Use the *NI-488.2M User Manual for Windows 95* 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-488.2M 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 optional equipment you can order, and briefly describes the Plug and Play GPIB hardware and software for Windows 95.

- Chapter 2, *Installation and Configuration*, describes how to install and configure the Plug and Play GPIB hardware and software for Windows 95.

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

- Chapter 4, *Begin to Use the GPIB Software,* helps you get started with the NI-488.2M software and the GPIB Analyzer.

- Appendix A, *Uninstall the Hardware and Software*, describes how to uninstall the Plug and Play GPIB hardware and software from Windows 95.

- Appendix B, *Change the Driver for the GPIB Hardware,* contains instructions to help you install your GPIB driver if the **New Hardware Found** window does not appear after you install the GPIB interface.

- Appendix C, *Troubleshooting and Common Questions*, describes how to troubleshoot problems and answers some common questions.

- Appendix D, *Specifications*, describes the physical characteristics of the GPIB hardware and the transfer rates of the NI-488.2M software, along with the recommended operating conditions.

- Appendix E, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.

- The *Glossary* contains an alphabetical list and a description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

The following conventions are used in this manual.

bold	Bold text denotes menus, menu items, dialog buttons, or options.
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, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, directories, programs, subprograms, subroutines, device names, functions, variables, field names and filenames.
`bold monospace`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
»	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** option from the last dialog box.
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.
AT-GPIB/TNT (PnP)	AT-GPIB/TNT (PnP) refers to the AT-GPIB/TNT (Plug and Play) interface board.
	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*

- *Microsoft Windows 95 User's Guide,* Microsoft Corporation

Customer Communication

National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you to complete. These forms are in Appendix E, *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 optional equipment you can order, and briefly describes the Plug and Play GPIB hardware and software for Windows 95.

How to Use This Manual

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              Chapter 1          ( Gather What You Need )
                                 (   to Get Started     )
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                                 ┌────────▼──────────┐
                                 │ Install the GPIB Software │
                                 └────────┬──────────┘
                                          │
              Chapter 2          ┌────────▼──────────┐
                                 │ Install the GPIB Hardware │
                                 └────────┬──────────┘
                                          │
                                 ┌────────▼──────────┐
                                 │  Configure the NI-488.2M  │
                                 │        Software           │
                                 └────────┬──────────┘

                                 ┌────────▼──────────┐ ◄──────────┐
                                 │ Verify the Installation │        │
                                 └────────┬──────────┘           │
              Chapter 3                   │                      │
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                                 │ Run Interactive Control Utility │
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              Chapter 4                   │
                                 ┌────────▼──────────┐
                                 │  Review  Programming      │
                                 │    Considerations         │
                                 └────────┬──────────┘

           User Manual and               │
          Function Reference  ( Write Application Program )
                Manual
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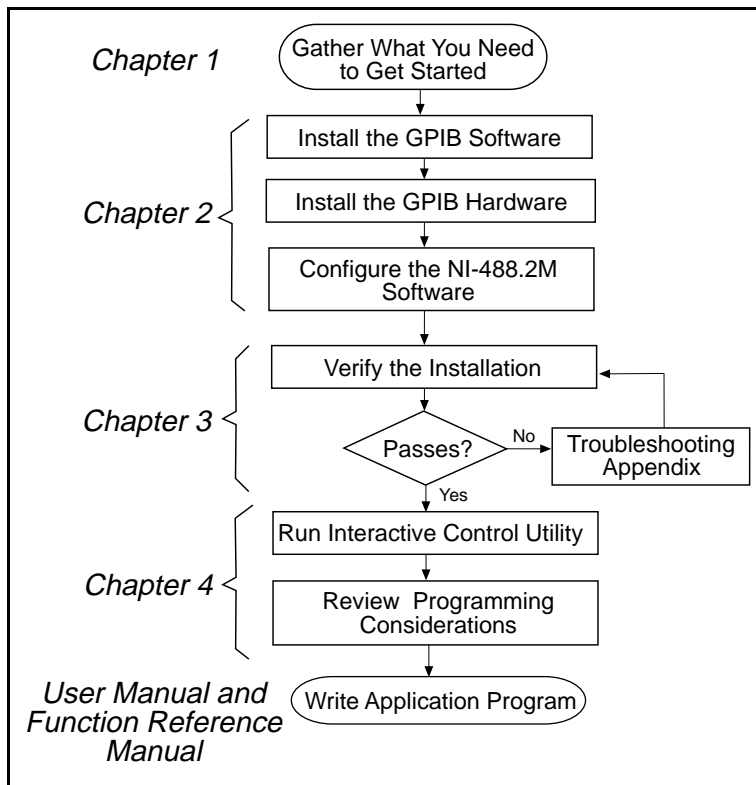
What You Need to Get Started

Make sure you have all of the items listed before you attempt to install the hardware and software.

❑ Windows 95 installed on your computer

❑ One of the following Plug and Play GPIB interfaces:
AT-GPIB/TNT (PnP)
AT-GPIB/TNT+
PCI-GPIB
PCMCIA-GPIB
PCMCIA-GPIB+

❑ The following 3.5 in., high density (1.44 MB) disks, which come in your kit:
GPIB Software for Windows 95 (Setup Disk)
GPIB Software for Windows 95 (NI-488.2M Software)

❑ If you have the AT-GPIB/TNT+ or PCMCIA-GPIB+, you also need the following 3.5 in., high density (1.44 MB) disk, which comes in your kit:
GPIB Software for Windows 95 (GPIB Analyzer Software)

❑ If you have the AT-GPIB/TNT+ or PCMCIA-GPIB+, and you plan to use the GPIB Analyzer software, you must have the following:
• Personal computer using a 25 MHz 80386 or higher microprocessor. National Instruments recommends a 33 MHz 80486 or higher microprocessor.
• Math coprocessor (80386 with an 80387, 80486SX with an 80487, 80486DX, or higher microprocessor)

❑ GPIB cables—single-shielded or double-shielded, Type X1, X2, X4, X5, or X11, which you can order from National Instruments

Optional Equipment

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

• Serial or parallel bus extender and cables

• Bus expander/isolator

• GPIB mechanical switch

• GPIB data buffer

Plug and Play GPIB Hardware Overview

National Instruments Plug and Play GPIB hardware includes the following interfaces:

AT-GPIB/TNT (Plug and Play)
AT-GPIB/TNT+
PCI-GPIB
PCMCIA-GPIB
PCMCIA-GPIB+

The AT-GPIB/TNT (PnP) and AT-GPIB/TNT+ are completely software-configurable and compliant with the Plug and Play ISA standard. The PCI-GPIB is completely software-configurable and compliant with the PCI Local Bus Specification. The PCMCIA-GPIB and PCMCIA-GPIB+ are completely software-configurable and compliant with the PC Card standard.

The Plug and Play GPIB hardware transforms any PC-compatible computer into a full-functioning GPIB Talker/Listener/Controller. 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 8 Mbytes/s, depending on the computer and the system configuration. For more information about transfer rates, refer to Appendix D, *Specifications*, in this manual. For more information about HS488, refer to Chapter 6, *GPIB Programming Techniques*, in the *NI-488.2M User Manual for Windows 95*.

The AT-GPIB/TNT+ and PCMCIA-GPIB+ combine the abilities of the GPIB controller and a complete GPIB analyzer into a single interface. These interfaces offer a low-cost, high-speed alternative to GPIB controllers and analyzers packaged separately. Because these two interfaces support both the NI-488.2M software and the GPIB Analyzer, you can develop your application and perform low-level GPIB system analysis using the same computer.

The AT-GPIB/TNT (PnP), PCI-GPIB, and PCMCIA-GPIB each contain one GPIB load; you can connect up to 14 instruments to one of these interfaces. The AT-GPIB/TNT+ and the PCMCIA-GPIB+ each contain two GPIB loads; you can connect 13 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 D, *Specifications*, for more information about the hardware specifications and recommended operating conditions.

NI-488.2M Software Overview

The NI-488.2M software includes a native, 32-bit multitasking Windows 95 driver that is fully Plug and Play aware. The driver components are dynamically loaded when Windows 95 detects new Plug and Play GPIB hardware. The driver components are dynamically unloaded when Windows 95 detects the removal of Plug and Play GPIB hardware.

The NI-488.2M software for Windows 95 supports the concurrent use of multiple types of GPIB hardware. For example, you can communicate with GPIB devices through both a PCI-GPIB and PCMCIA-GPIB in the same system at the same time. The NI-488.2M software is fully integrated into the Windows 95 operating system. It is configurable through the **System** applet and uninstallable through the **Add/Remove Programs** applet of the **Control Panel**.

The NI-488.2M software, along with the Plug and Play GPIB hardware, transforms a general-purpose PC into a GPIB Talker/Listener/Controller with complete communications and bus management capability. The NI-488.2M software includes the following components:

- Device driver
- Hardware and software diagnostic test utilities
- Configuration utility
- Interactive control program
- Utilities for software development
- Language interface libraries for Microsoft C/C++ 2.0 and Microsoft Visual Basic 4.0
- Example programs that use NI-488 functions and NI-488.2 routines

Refer to Appendix D, *Specifications*, for more information about the NI-488.2M software specifications and recommended operating conditions.

GPIB Analyzer Software Overview

The GPIB Analyzer software, available only with the AT-GPIB/TNT+ or PCMCIA-GPIB+ hardware, can capture, monitor, and participate in bus activity on the GPIB. You can also use the GPIB+ hardware and GPIB Analyzer software to troubleshoot a variety of IEEE 488 hardware and software problems. The GPIB Analyzer can help you solve GPIB communication problems such as addressing inconsistencies, protocol violations, and simple bus timeout conditions. The built-in timestamping capability can be used to benchmark GPIB applications.

The GPIB Analyzer consists of the following components.

• GPIB Analyzer application

• GPIB Analyzer device drivers

• GPIB Analyzer online help

• LabWindows/CVI Run-Time System (used by the GPIB Analyzer)

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

Optional Programming Tools

Your kit includes the NI-488.2M software for Windows 95. In addition, you can order the LabVIEW software from National Instruments. LabVIEW includes instrument driver libraries that make it easier to communicate with your GPIB instruments.

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 LabVIEW, contact National Instruments.

Installation and Configuration
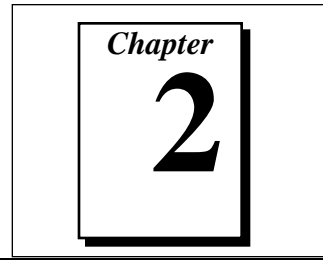
This chapter describes how to install and configure the Plug and Play GPIB hardware and software for Windows 95.

System Preparation

If you have been using your Plug and Play GPIB hardware in Windows 95 with either the NI-488.2 software for Windows 3 or the Compatibility Release for Windows 95, you need to remove the Plug and Play GPIB hardware information before installing the Plug and Play GPIB software.

To remove the hardware information from Windows 95, double-click the **System** icon under **Start»Settings»Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab, click the **View devices by type** button, and double-click on the **Other Devices** icon.

To remove an interface, select it from the list of interfaces under **Other Devices**, and click the **Remove** button. After you remove the appropriate interface information from the Device Manager, click **OK** to exit the Device Manager.

Install the Plug and Play GPIB Software

Before installing the hardware, complete the following steps to install the Plug and Play GPIB software for Windows 95.

1. Select **Start»Settings»Control Panel**.

2. Run the **Add/Remove Programs** applet. A dialog box similar to the one in Figure 2-1 appears.
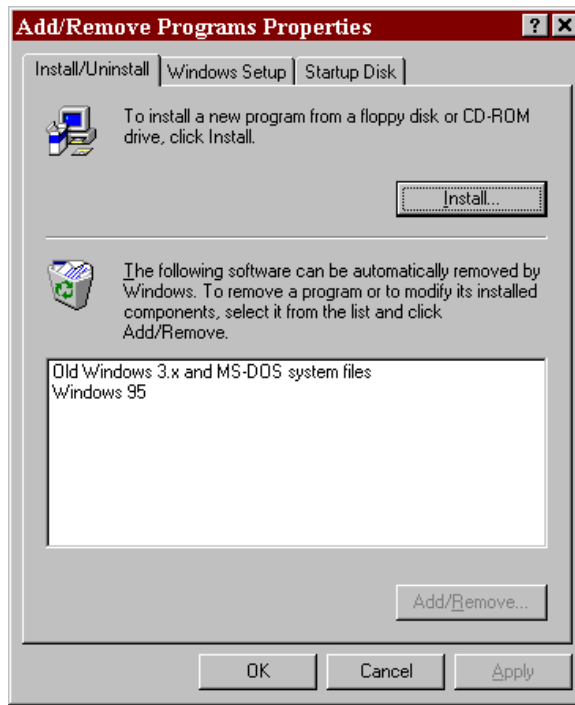
Figure 2-1. Add/Remove Programs Properties Dialog Box

Notice that you can use this same applet to uninstall the GPIB software at a later time if you want to. Refer to Appendix A, *Uninstall the Hardware and Software*, for more information.

3. Click on the **Install...** button.

4. Insert the *GPIB Software for Windows 95 (Setup Disk),* and click on the **Next** button to proceed.

5. The software installation wizard begins with the screen shown in Figure 2-2. Choose the appropriate type of installation to begin the setup process. If you want to view an online copy of this manual, click the first option. If you are ready to install one or more of the software components, click the second or third option. The second and third options both install the NI-488.2M software. In addition, the third option installs the GPIB Analyzer software, which is supported only by the AT-GPIB/TNT+ and the PCMCIA-GPIB+.
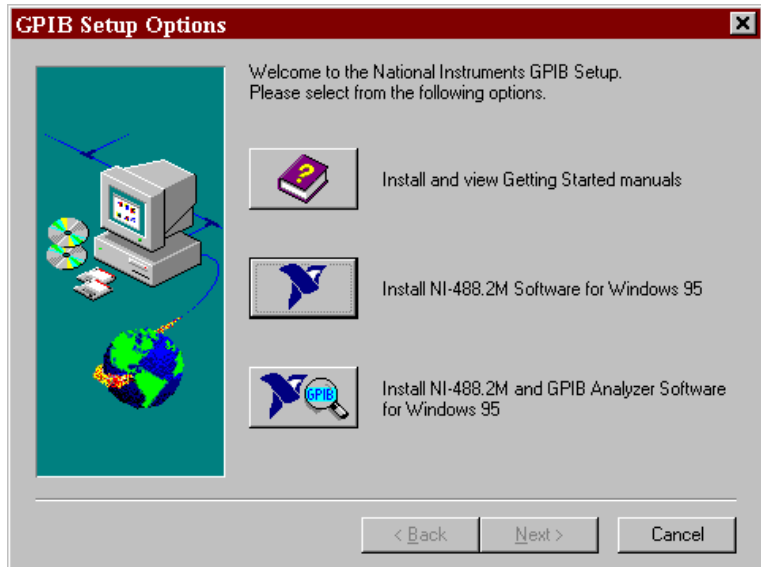
Figure 2-2.   GPIB Software Setup Screen

The setup wizard guides you through the necessary steps to install the GPIB software. You may go back and change values where appropriate by choosing **Back**. You can exit the setup where appropriate by choosing **Cancel**.

6.   If you need to install the hardware, or this is your first time to use the GPIB software for Windows 95, shut down Windows 95 and proceed to the next section, *Install the Plug and Play GPIB Hardware*. Otherwise, when you have finished the setup process, restart Windows 95 and proceed to Chapter 3, *Verify the Installation*.

Install the Plug and Play GPIB Hardware

Install the PCMCIA-GPIB+ or PCMCIA-GPIB

To install the PCMCIA-GPIB+ or PCMCIA-GPIB in your computer, insert the card into a free PC Card (PCMCIA) socket the same way you insert a disk into a floppy drive. The card has no jumpers or switches to set, and you do not need to power down the system when you insert it. Figure 2-3 shows how to insert the PCMCIA-GPIB+ or PCMCIA-GPIB and how to connect the PCMCIA-GPIB cable.
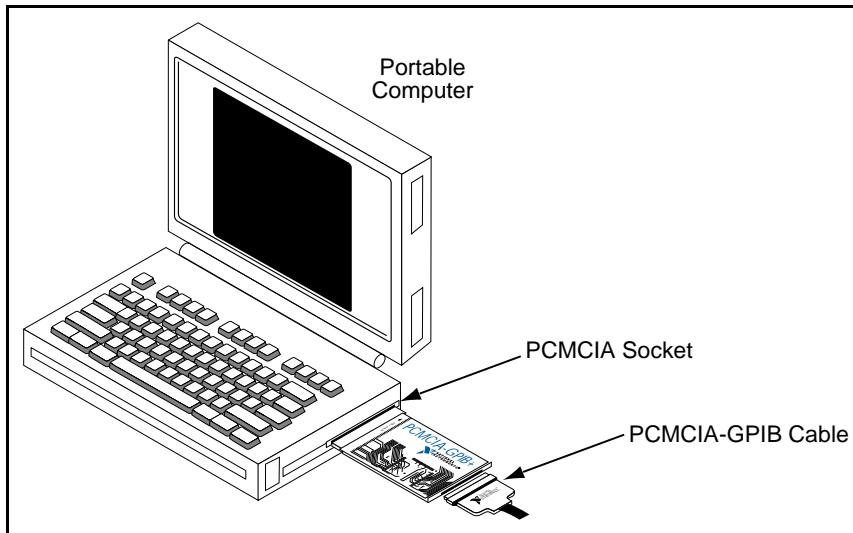
Figure 2-3. Inserting the PCMCIA-GPIB+ or PCMCIA-GPIB

Windows 95 automatically pops up one or more **New Hardware Found** windows when it detects and configures a PC Card. If you are installing a PCMCIA-GPIB+, several **New Hardware Found** windows appear when you insert the card. If you are installing a PCMCIA-GPIB, a single **New Hardware Found** window appears when you insert the card. If no **New Hardware Found** window appears when you insert your PC Card, refer to Appendix B, *Change the Driver for the GPIB Hardware*.

The PCMCIA-GPIB+ or PCMCIA-GPIB hardware installation is now complete. Proceed to the *Verify the Hardware Resources* section, later in this chapter.

Install the AT-GPIB/TNT (PnP), AT-GPIB/TNT+, or PCI-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 computer chassis before removing the board from the package.*

If your GPIB hardware is already installed but this is your first time to install the GPIB software, skip to step 8. Otherwise, perform the following steps to install the GPIB hardware.

1. Turn off your computer. Keep the computer plugged in so that it remains grounded while you install the GPIB hardware.

2. Remove the top cover (or other access panels) to give yourself access to the computer expansion slots.

3. Find an unused expansion slot of the appropriate type in your computer. The AT-GPIB/TNT (PnP) and AT-GPIB/TNT+ each require a 16-bit expansion slot. The PCI-GPIB requires a PCI expansion slot.

4. Remove the corresponding slot cover on the back panel of the computer.

5. Insert the GPIB board into the slot with the GPIB connector sticking out of the opening on the back panel, as shown in Figure 2-4. It might be a tight fit, but do not force the board into place.
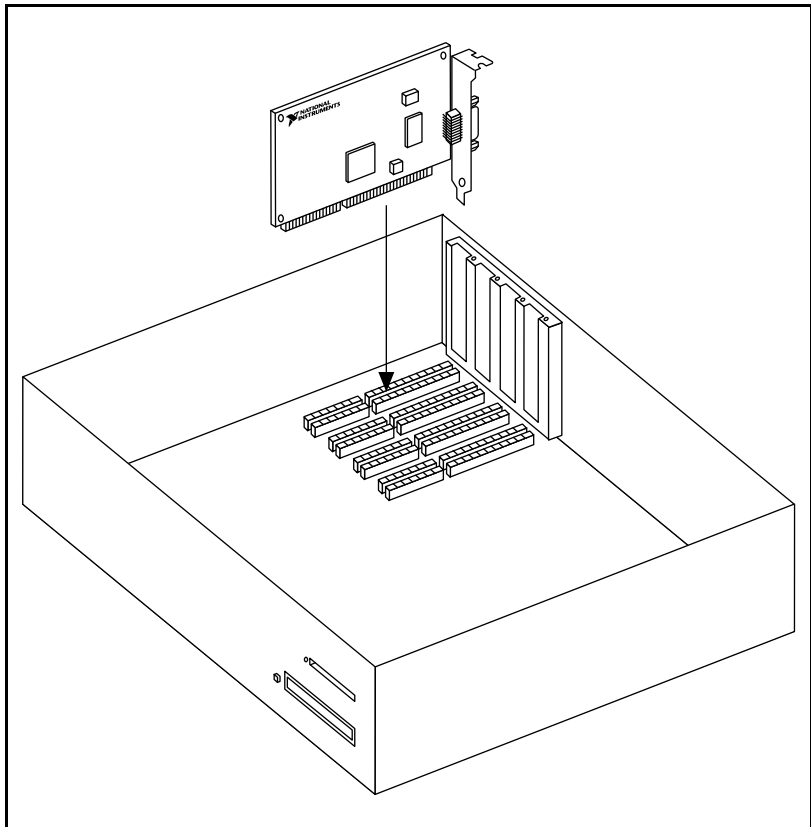
Figure 2-4. Installing the GPIB Board

6. Screw the mounting bracket of the GPIB board to the back panel rail of the computer.

7. Replace the top cover (or the access panel to the expansion slot).

8. Turn on your computer and start Windows 95. Windows 95 should automatically detect the GPIB hardware.

   If your GPIB hardware is a PCI-GPIB, Windows 95 automatically determines which driver is appropriate. A **New Hardware Found** dialog box appears, then goes away on its own.

   If your GPIB hardware is an AT-GPIB/TNT (PnP), a **New Hardware Found** dialog box appears. Make sure that **Windows default driver** is selected, and click the **OK** button.

   If your GPIB hardware is an AT-GPIB/TNT+, two **New Hardware Found** dialog boxes appear. In each of the dialog boxes, make sure that **Windows default driver** is selected, and click the **OK** button.

   If the **New Hardware Found** dialog box does not appear when you restart Windows 95, refer to Appendix B, *Change the Driver for the GPIB Hardware*.

The GPIB hardware installation is now complete. Proceed to the next section, *Verify the Hardware Resources*.

Verify the Hardware Resources

Verify that Windows 95 has configured the Plug and Play GPIB hardware properly and that the drivers for the Plug and Play GPIB hardware have been loaded properly.

To perform the verification, double-click on the **System** icon in the **Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab, click the **View devices by type** button at the top of the page, and double-click the **National Instruments GPIB Interfaces** icon.

First, verify that the driver for your Plug and Play GPIB hardware has loaded successfully. If a circled exclamation point appears through the eagle icon, the GPIB interface is not working properly. Figure 2-5 shows an example of an AT-GPIB/TNT (PnP) that is working properly, and Figure 2-6 shows an example of an AT-GPIB/TNT (PnP) that is not working properly.
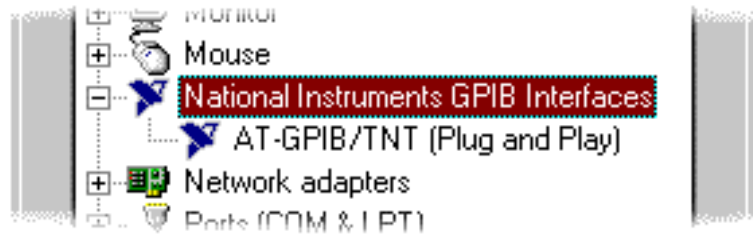
Figure 2-5. GPIB Interface That Is Working Properly

Figure 2-6. GPIB Interface That Is Not Working Properly

A GPIB interface might be not working properly for a variety of
reasons. If Windows 95 is unable to acquire resources for the interface,
or the driver for that interface fails to load, a circled exclamation point
appears on top of the icon for that interface.

The driver fails to load if the GPIB interface presence test fails because
of an Input/Output Range or Memory Range conflict. The driver also
fails to load if the GPIB interface has not been assigned an Interrupt
Request resource. The Plug and Play GPIB software works only for
GPIB interfaces that are configured to use an Interrupt Request level.
If your computer does not have any available Interrupt Request levels,
Windows 95 might configure your GPIB interface without an Interrupt
Request level. In this case, you need to free an Interrupt Request level
so the GPIB interface can use it. Refer to the *Troubleshooting Missing
Interrupt Request Problems* section of Appendix C, *Troubleshooting
and Common Questions*, for information about this procedure.

After you have verified that the driver for your Plug and Play GPIB
hardware has loaded successfully, you need to verify that the Plug and
Play GPIB hardware is properly configured. To verify the
configuration, double-click on the name of the GPIB interface, click the
Resources tab, and examine the assigned resources to verify that there
are no conflicts. The **Conflicting Device List:** lists any conflicts. If
conflicts exist, uncheck the **Use automatic settings** checkbox and use

the **Change Setting...** button to select conflict-free resources for the Plug and Play GPIB hardware.

When you have finished verifying the hardware resources, proceed to the next section, *Configure the NI-488.2M Software*.

Configure the NI-488.2M Software

You do not need to configure the NI-488.2M software unless you are using more than one GPIB interface in your system. If you are using more than one interface, you should configure the NI-488.2M software to associate a logical name (GPIB0, GPIB1, and so on) with each physical GPIB interface.

The NI-488.2M software configuration utility is fully integrated with the Windows 95 Device Manager. You can use it to examine or modify the configuration of the NI-488.2M software. The context-sensitive online help includes all of the information that you need to properly configure the NI-488.2M software.

To configure the NI-488.2M software, select **Start»Settings»Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab, click the **View devices by type** radio button at the top of the page, and double-click the **National Instruments GPIB Interfaces** icon.

To configure a particular interface, double-click on that interface type in the list of installed interfaces immediately below **National Instruments GPIB Interfaces**. The **Resources** page provides information about the hardware resources assigned to the GPIB interface, and the **NI-488.2M Settings** page provides information about the software configuration for the GPIB interface. Use the **Interface Name** drop-down box to select a logical name (GPIB0, GPIB1, and so on) for the GPIB interface. Repeat this process for each interface you need to configure. Figure 2-7 shows the **NI-488.2M Settings** page for an AT-GPIB/TNT (PnP).

☞   **Note:**   *GPIB Analyzer software settings are available through the GPIB Analyzer application.*
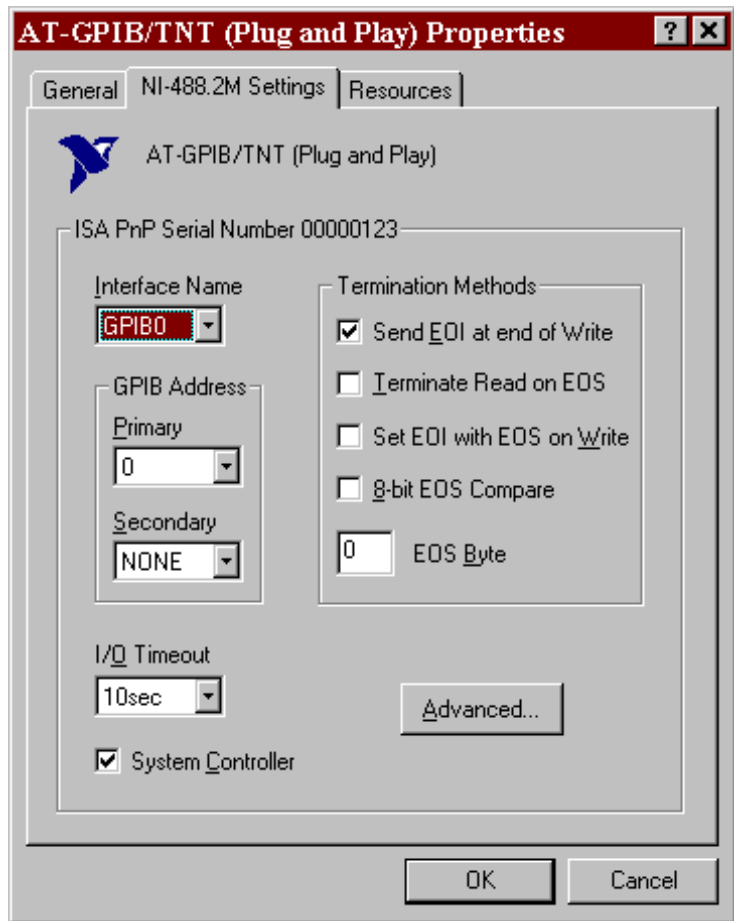
Figure 2-7. NI-488.2M Settings Page for the AT-GPIB/TNT (PnP)

If you want to examine or modify the logical device templates for the GPIB software, select the **National Instruments GPIB Interfaces** icon from the **Device Manager** page, and click the **Properties** button. Select the **Device Templates** tab to view the logical device templates, as shown in Figure 2-8.
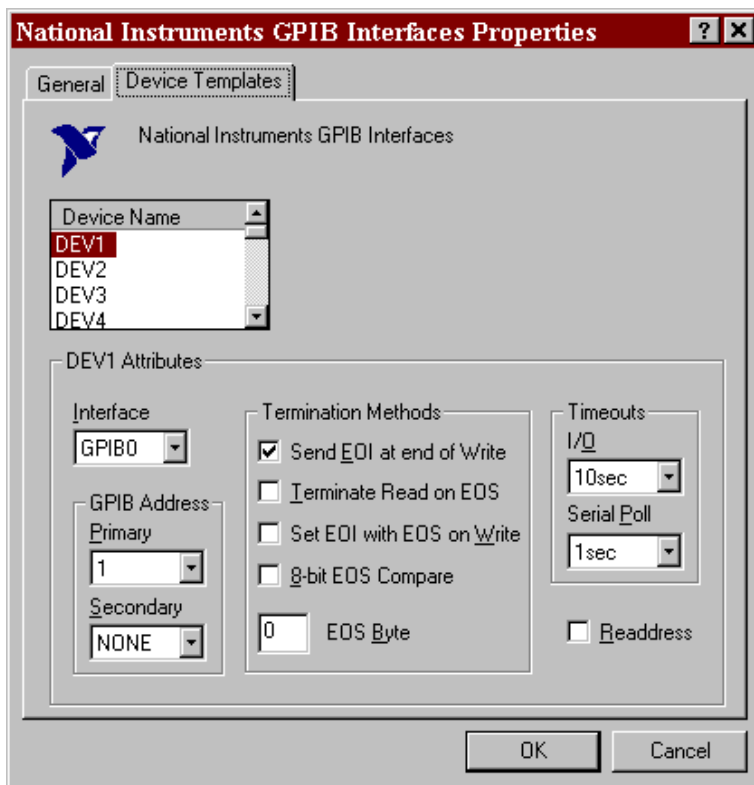
Figure 2-8. Device Templates Page for the Logical Device Templates

When you have finished configuring the NI-488.2M software, proceed to Chapter 3, *Verify the Installation*.

Verify the Installation

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

Run the Hardware Diagnostic Test

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

To run the test, select the **Hardware Diagnostic** item under **Start»Programs»NI-488.2M Software for Windows 95**.

If the Hardware Diagnostic Test completes with no errors, your hardware is functioning properly. If it returns an error message, refer to Appendix C, *Troubleshooting and Common Questions*, for troubleshooting instructions. When the Hardware Diagnostic Test completes with no errors, continue with the next section.

Run the NI-488.2M Software Diagnostic Test

After you have successfully completed the Hardware Diagnostic Test, verify the NI-488.2M software installation by running the Software Diagnostic Test that is installed with your NI-488.2M software.

To run the test, select the **Software Diagnostic** item under **Start»Programs»NI-488.2M Software for Windows 95**.

If the Software Diagnostic Test completes with no errors, you have installed the NI-488.2M software correctly. If it returns an error message, refer to Appendix C, *Troubleshooting and Common Questions*, for troubleshooting instructions.

Begin to Use the GPIB Software
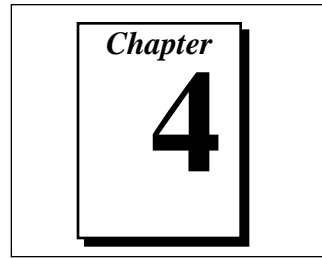
This chapter helps you get started with the NI-488.2M software and the GPIB Analyzer.

Using the NI-488.2M Software

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 returned by the function calls. 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.

To run this utility, select the **Win32 Interactive Control** item under **Start»Programs»NI-488.2M Software for Windows 95**. 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*.

General Programming Considerations

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

- You must include the NI-488.2M header file in your source code.

- The NI-488.2M software is accessed through the 32-bit DLL, `gpib-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*. For detailed information about each NI-488 function and NI-488.2 routine, refer to the *NI-488.2M Function Reference Manual for Win32*.

Using the GPIB Analyzer Software

To start the GPIB Analyzer, select the **GPIB Analyzer** item under **Start»Programs»GPIB Analyzer Software for Windows 95**.

The GPIB analysis hardware of the AT-GPIB/TNT+ and PCMCIA-GPIB+ includes the ability to analyze all GPIB activity. This hardware is accessed using a Windows application called the GPIB Analyzer. Because the GPIB Analyzer monitors the actual GPIB signals, it provides the best mechanism for debugging and optimizing a GPIB system. You can use the GPIB Analyzer to do the following:

• Verify that an NI-488 or NI-488.2 application is communicating on the bus as expected.

• Determine if a GPIB device is properly conforming to the protocol and, if it is not, find possible solutions.

• Analyze performance of a GPIB system and determine how each device affects performance.

• Resolve timeout problems related to nonresponsive GPIB devices.

• Determine the cause of missing bytes in a data stream.

• Resolve problems related to standard IEEE 3-wire handshaking or the new high-speed HS488 handshaking protocols.

• Debug bus problems by manually controlling GPIB signal lines.

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

Uninstall the Hardware and Software
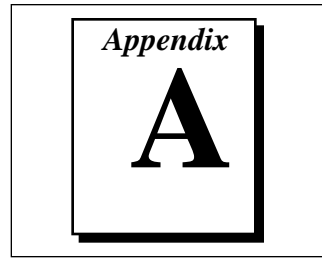
This appendix describes how to uninstall the Plug and Play GPIB hardware and software from Windows 95.

Uninstalling the Plug and Play GPIB Hardware

Before physically removing the Plug and Play GPIB hardware from the computer, you must remove the hardware information from the Windows 95 Device Manager.

To remove the hardware information from Windows 95, double-click the **System** icon under **Start»Settings»Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab, click the **View devices by type** button, and double-click on the **National Instruments GPIB Interfaces** icon.

To remove an interface, select it from the list of interfaces under **National Instruments GPIB Interfaces** as shown in Figure A-1, and click the **Remove** button.
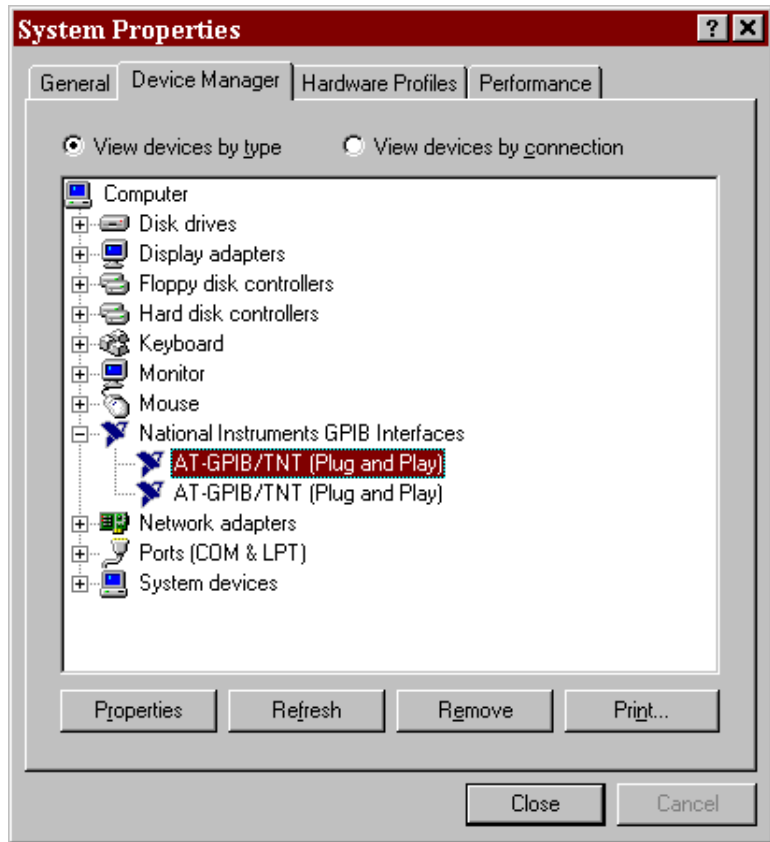
Figure A-1. Selecting an Interface to Remove

After you remove the appropriate interface information from the Device Manager, you should physically remove the interface from your computer. If your interface is a PCMCIA-GPIB+ or PCMCIA-GPIB, you may eject it after you have removed the hardware information from the Device Manager. If your interface is an AT-GPIB/TNT (PnP), AT-GPIB/TNT+, or PCI-GPIB, you should shut down Windows 95, switch off the computer, and physically remove the interface.

Uninstalling the Plug and Play GPIB Software

Before uninstalling the software, you should remove all GPIB interface information from the Windows 95 Device Manager, as described in the previous section. You do not need to shut down Windows 95 before uninstalling the software.

Complete the following steps to remove the Plug and Play GPIB software.

1. Select **Start»Settings»Control Panel**.

2. Run the **Add/Remove Programs** applet. A dialog box similar to the one in Figure A-2 appears. This dialog box lists the software available for removal.
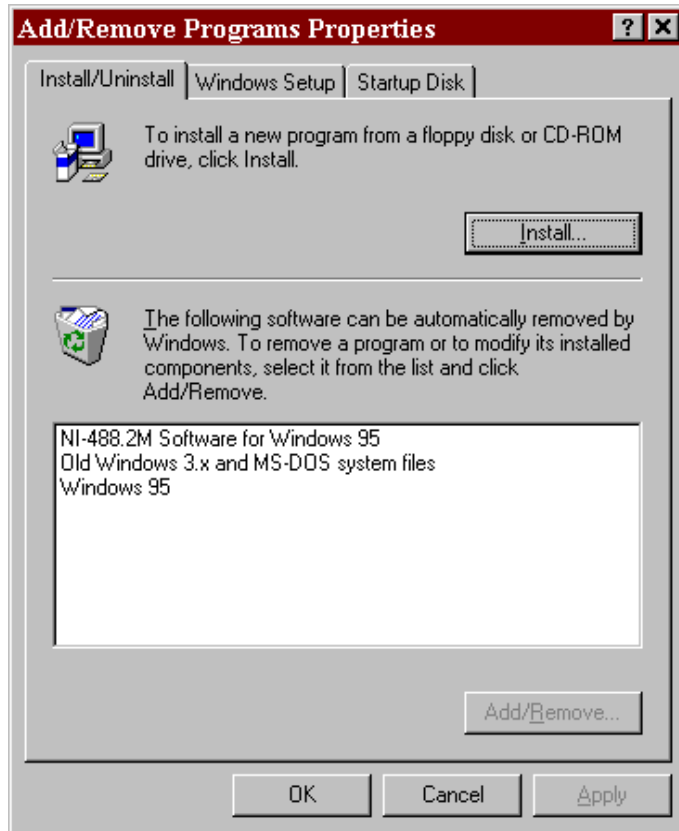
Figure A-2. Add/Remove Programs Properties Dialog Box

3. Select the GPIB software you want to remove, and click the **Add/Remove...** button. The uninstall program runs and removes all folders, programs, VxDs, DLLs, and registry entries associated with the GPIB software. Figure A-3 shows the results of a successful uninstallation.
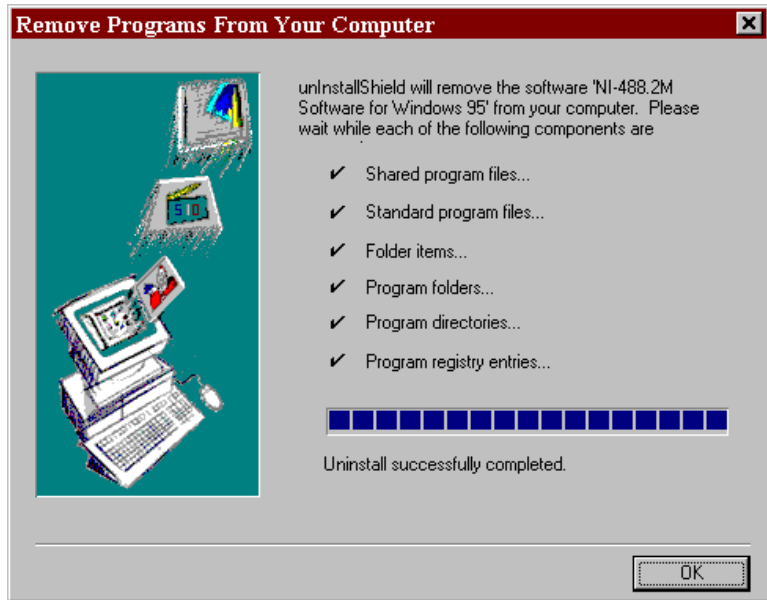
Figure A-3. Uninstallation Results

If you have interfaces other than PC Cards (PCMCIA-GPIB+ or PCMCIA-GPIB) and you have not physically removed them from your computer, shut down Windows 95, power off your computer, and remove the interfaces now.

If you want to reinstall the hardware and software, refer to Chapter 2, *Installation and Configuration*.

Change the Driver for the GPIB Hardware
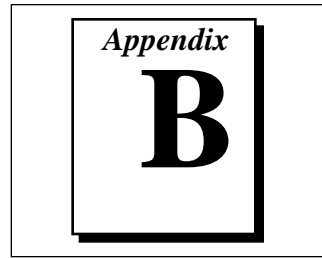
This appendix contains instructions to help you install your GPIB driver if the **New Hardware Found** window does not appear after you install the GPIB interface.

Normally, if Plug and Play GPIB hardware exists on a computer running Windows 95 and the driver for the interface has not yet been installed, Windows 95 displays a **New Hardware Found** window when it detects the new hardware. You can then install the driver from the dialog box. If the **New Hardware Found** window does not appear, complete the following steps to install the driver for the Plug and Play GPIB hardware.

1. Select **Start»Settings»Control Panel**.

2. Double-click on the **System** icon to display the **System Properties** dialog box for the computer.

3. Click on the **Device Manager** tab at the top of the **System Properties** sheet to bring up the **Device Manager** property page. Make sure the **View devices by type** button at the top of the **Device Manager** page is selected.

4. Click on the + sign next to **Other Devices** to display a list of all hardware devices that Windows 95 recognizes but are not yet associated with a particular type of hardware. One device in the list should be the Plug and Play GPIB hardware that needs a driver change. For example, if you are using an AT-GPIB/TNT (PnP), the list of hardware devices in **Other Devices** will include a **National Instruments AT-GPIB/TNT** (**Plug and Play),** as shown in Figure B-1.
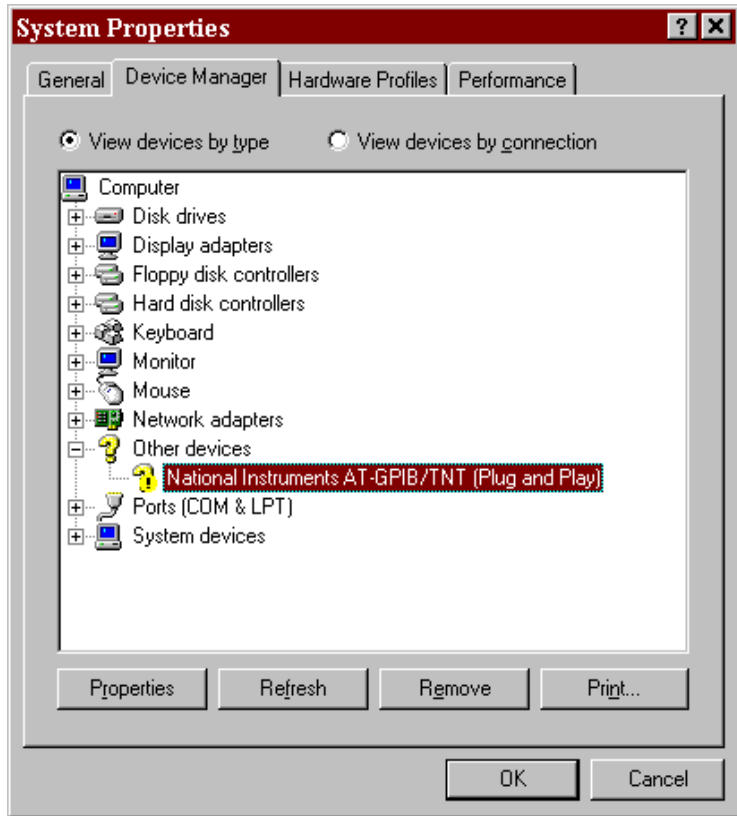
Figure B-1. Device Manager Property Page

5. Highlight the name of the Plug and Play GPIB interface by clicking on it. Then, click on the **Properties** button at the bottom of the **Device Manager** property page. This displays the property sheet for the highlighted GPIB interface. The property sheet contains several property pages, including a **General** page, a **Driver** page, and a **Resources** page.

6. Click on the **Driver** tab to display the **Driver** property page, then click on the **Change Driver** button to install the driver software for the GPIB interface. A **Select Hardware Type** dialog box appears, as shown in Figure B-2, to prompt for the GPIB interface type. **Other devices** is highlighted by default.

Figure B-2. Select Hardware Type Dialog Box

7. Click the **OK** button with **Other devices** highlighted. A **Select Device** dialog box appears next, as shown in Figure B-3. This dialog box lists the device models that are compatible with the GPIB interface being installed. If no GPIB interface is listed, restart Windows 95 and repeat the steps described in this appendix.

In the **Select Device** dialog box, the corresponding Plug and Play GPIB device should be selected by default. If not, select this device by clicking on it.

Figure B-3. Select Device Dialog Box

8. Click on the **OK** button to return to the **Driver** property page, then click on the **OK** button to accept the driver change.

9. Restart Windows 95 and proceed to the *Verify the Hardware Resources* section of Chapter 2, *Installation and Configuration.*

Troubleshooting and Common Questions
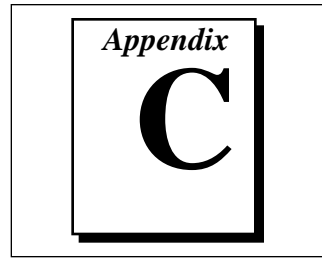
This appendix describes how to troubleshoot problems and lists some common questions.

Troubleshooting Missing Interrupt Request Problems

The Plug and Play GPIB software works properly only if the Plug and Play GPIB hardware is configured to use an Interrupt Request level. If your computer does not have any available Interrupt Request levels, Windows 95 might configure your GPIB interface without an Interrupt Request level, or might not configure your GPIB interface at all. You can verify if this is the case by using the Device Manager to examine the resources assigned to your Plug and Play GPIB hardware.

To examine the assigned resources, complete the following steps.

1. Select **Start»Settings»Control Panel**.
2. Double-click on the **System** icon.
3. In the **System Properties** dialog box that appears, select the **Device Manager** tab.
4. Click the **View devices by type** button at the top of the **Device Manager** page.
5. Double-click the **National Instruments GPIB Interfaces** icon.
6. Double-click on the GPIB interface for which you want to examine the resources.
7. Click on the **Resources** tab.

If the GPIB interface is a PCMCIA-GPIB+ or PCMCIA-GPIB, Windows 95 does not assign any resources to the interface unless a free Interrupt Request level exists. In this case, the **Resources** page has only a **Set Configuration Manually** button. If the GPIB interface is an AT-GPIB/TNT+ , AT-GPIB/TNT (PnP), or PCI-GPIB, the **Resources** page includes a list of **Resource settings:**, but no **Interrupt Request**

entry appears there. In either case, the solution is to free an Interrupt Request level so that one can be assigned to the GPIB interface.

To free an Interrupt Request level for the GPIB interface, you must remove a device that is using an Interrupt Request level from the system. To view the system-wide allocation of Interrupt Request resources and remove a device, perform the following steps.

1. Click **Cancel** to exit from the GPIB hardware properties dialog box.

2. Double-click on the **Computer** icon at the top of the **Device Manager** list of devices.

3. Click on the **View Resources** tab.

4. Select the **Interrupt Request (IRQ)** button. By scanning through the list of Interrupt Request settings, you can determine which devices are using which Interrupt Request levels.

5. When you have located a device to remove, click **Cancel** to exit the **Computer Properties** dialog box.

6. Select the device and click the **Remove** button to remove the device.

After you have freed an Interrupt Request level for use by the GPIB hardware, restart Windows 95 so it can correctly assign resources to the GPIB hardware, then refer to the *Verify the Hardware Resources* section of Chapter 2, *Installation and Configuration*.

Troubleshooting Hardware Diagnostic Test Error Messages

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

Driver Not Installed Properly

The following error message appears if the GPIB driver is not installed or is installed improperly:

ERROR: NI-488.2M Software incorrectly installed.

If this message appears, you must reinstall the NI-488.2M software for Windows 95.

GPIB Interface Not Present

The following error message appears if a GPIB interface is not physically present in the system or if you have not assigned logical board names using the Device Manager:

ERROR: No GPIB interfaces present in the system.

If this message appears, the board might not be properly installed or configured. Refer to Chapter 2, *Installation and Configuration*, for detailed installation instructions.

Using Single-Cycle DMA

The GPIB interfaces normally use demand-mode DMA. If your computer cannot use demand-mode DMA, the Hardware Diagnostic Test prints a message telling you to use single-cycle DMA. You can configure the NI-488.2M software to select single-cycle DMA. Refer to the *Configure the NI-488.2M Software* section of Chapter 2, *Installation and Configuration*, for more information on configuring the software.

Resource Conflicts

Address Conflict

One of the following error messages appears if there is an address conflict between the GPIB interface under test and another interface in your system:

ERROR: I/O Address Conflict Detected (Controller).

ERROR: I/O Address Conflict Detected (Analyzer).

ERROR: Memory Address Conflict Detected.

To resolve an address conflict between your GPIB interface and other interfaces, refer to the *Resolving Resource Conflicts* section, later in this appendix.

Interrupt Level Conflict

One of the following error messages appears if there is an interrupt level conflict between the GPIB interface under test and another interface in your system:

ERROR: Interrupt Level Conflict Detected (Controller).

`ERROR: Interrupt Level Conflict Detected (Analyzer).`

To resolve an interrupt conflict between your GPIB interface and other interfaces, refer to the *Resolving Resource Conflicts* section, later in this appendix.

DMA Channel Conflict

One of the following error messages appears if there is a DMA channel conflict between the GPIB interface under test and another interface in your system:

`ERROR: DMA Channel Conflict Detected (Controller).`

`ERROR: DMA Channel Conflict Detected (Analyzer).`

To resolve a DMA channel conflict between your GPIB interface and other interfaces, refer to the next section, *Resolving Resource Conflicts*.

Resolving Resource Conflicts

Resource conflicts typically occur when your system contains legacy boards that use resources that have not been reserved properly with the Device Manager. If a resource conflict exists, write down the resource that caused the conflict and refer to the *Microsoft Windows 95 User's Guide* for instructions on how to use the Device Manager to reserve I/O, IRQ, and DMA resources for legacy boards.

Note for AT-GPIB/TNT+ and PCMCIA-GPIB+ Users

The GPIB Analyzer software can communicate with only a single AT-GPIB/TNT+ or PCMCIA-GPIB+ interface at one time. If your system has more than one AT-GPIB/TNT+ or PCMCIA-GPIB+ installed, you need to use the Device Manager to disable the analyzer functionality on all but one of the AT-GPIB/TNT+ or PCMCIA-GPIB+ interfaces. See the *GPIB Analyzer Questions* section, later in this appendix, for instructions on how to disable the analyzer functionality of an AT-GPIB/TNT+ or PCMCIA-GPIB+.

A limitation of having a single active GPIB analyzer is that the Hardware Diagnostic Test checks the analyzer functionality of only the active GPIB analyzer when it runs. All other AT-GPIB/TNT+ interfaces appear as AT-GPIB/TNT (PnP) interfaces. All other PCMCIA-GPIB+ interfaces appear as PCMCIA-GPIB interfaces.

Troubleshooting Software Diagnostic Test Error Messages

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

Presence Test of Software Components

The Software Diagnostic Test checks for the presence of the necessary driver components, `gpib-32.dll` and `gpibmngr.dll`.

If the `gpib-32.dll` file is not found in the Windows system directory, an error message similar to the following one appears:

An unexpected ERROR occurred:
Unable to locate C:\WINDOWS\SYSTEM\GPIB-32.DLL.
Try reinstalling the NI-488.2M software.

If the `gpibmngr.dll` file is not found in the Windows system directory, an error message similar to the following one appears:

An unexpected ERROR occurred:
Unable to locate C:\WINDOWS\SYSTEM\GPIBMNGR.DLL
Try reinstalling the NI-488.2M software.

If either of these messages appears, you must reinstall the NI-488.2M software.

Presence Test of Board

☞   **Note:**   *In the following paragraphs,* gpib*x* *refers to board* gpib0, gpib1, gpib2, ... *as appropriate.*

The following error message appears if the board gpib*x* is not physically present in the system:

<<< No interface present for GPIBx. >>>

If this message appears, the board might not be properly installed or configured. Refer to Chapter 2, *Installation and Configuration,* for detailed instructions.

GPIB Cables Connected

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

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

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

Disconnect all GPIB cables before trying the test again.

Troubleshooting EDVR Error Conditions

In some cases, calls to NI-488 functions or NI-488.2 routines may return with the ERR bit set in `ibsta` and the value EDVR in `iberr`. The value stored in `ibcntl` is useful in troubleshooting the error condition.

EDVR Error Condition with ibcntl Set to 0xE028002C

If a call is made with a board number that is within the range of allowed board numbers (typically 0 to 3), but which has not been assigned to a GPIB interface, an EDVR error condition occurs with `ibcntl` set to 0xE028002C. You can assign a board number to a GPIB interface by configuring the NI-488.2M software and selecting an interface name. Refer to the *Configure the NI-488.2M Software* section of Chapter 2, *Installation and Configuration*, for information on how to configure the NI-488.2M software.

EDVR Error Condition with ibcntl Set to 0xE0140025

If a call is made with a board number that is not within the range of allowed board numbers (typically 0 to 3), an EDVR error condition occurs with `ibcntl` set to 0xE0140025.

EDVR Error Condition with ibcntl Set to 0xE0140035

If a call is made with a device number that is not within the range of allowed device numbers (typically 1 to 32), an EDVR error condition occurs with `ibcntl` set to 0xE0140035.

EDVR Error Condition with ibcntl Set to 0xE0320029

If a call is made with a board number that is assigned to a GPIB interface that is unusable because of a resource conflict, an EDVR error condition occurs with ibcntl set to 0xE0320029. Refer to the *Resolving Resource Conflicts* section, earlier in this appendix. This error is also returned if you remove a PCMCIA-GPIB+ or PCMCIA-GPIB while the driver is accessing it.

Common Questions

GPIB Hardware and NI-488.2M Software Questions

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

Run the GPIB Information utility. To run the utility, select the **GPIB Information** item under **Start»Programs»NI-488.2M Software for Windows 95**. GPIB Information returns information about the GPIB boards currently configured for use in your system.

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

Run the GPIB Information utility. To run the utility, select the **GPIB Information** item under **Start»Programs»NI-488.2M Software for Windows 95**. GPIB Information returns information about the version of the NI-488.2M software currently installed.

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

Refer to the troubleshooting sections of this appendix for specific information about what might cause these tests to fail. If you have already completed the troubleshooting steps, fill out the forms in Appendix E, *Customer Communication*, and contact National Instruments.

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 program. For more information, refer to Chapter 4, *Begin to Use the GPIB Software*.

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*.

Why does the uninstall program leave some components installed?

The uninstall program removes only items that the installation program installed. If you add anything to a directory that the installation program created, the uninstall program does not delete that directory, because the directory is not empty after the uninstallation. You will need to remove any remaining components yourself.

I have already installed my NI-488.2M software, and when I try to install my AT-GPIB/TNT (PnP) or AT-GPIB/TNT+, Windows 95 does not recognize my new hardware, or it recognizes my new hardware but reports a problem. When Windows 95 reports a problem with my hardware, it reports an error code of 9 in the General page for the hardware in the Device Manager. What should I do?

This is a known problem with early revisions of the AT-GPIB/TNT (PnP) and AT-GPIB/TNT+ boards. If you are experiencing this problem, contact National Instruments to have your board upgraded.

What information should I have before I call National Instruments?

When you call National Instruments, you should have all of the information filled out on the *Hardware and Software Configuration Form* in Appendix E, *Customer Communication*.

GPIB Analyzer Questions

Which GPIB hardware products support the GPIB Analyzer software?

You can use the GPIB Analyzer only if you have an AT-GPIB/TNT+ or a PCMCIA-GPIB+.

How do I use the GPIB Analyzer?

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

Should I run the GPIB Analyzer on a separate computer?

You do not have to run the GPIB Analyzer on a separate computer. Because the AT-GPIB/TNT+ and PCMCIA-GPIB+ are NI-488.2 interfaces, you can develop your NI-488.2 application and use the GPIB Analyzer in the background on the same computer.

Can I use the GPIB Analyzer for debugging if I am not using the AT-GPIB/TNT+ or PCMCIA-GPIB+ in my application?

As long as you have an AT-GPIB/TNT+ or PCMCIA-GPIB+ installed, you can use the GPIB Analyzer for applications that use other IEEE 488.2 interface boards. For example, you could install the GPIB Analyzer hardware and software on the machine that uses some other GPIB interface that is supported by the NI-488.2M Software for Windows 95. You could then use the GPIB Analyzer to debug applications that use the other GPIB interface.

When I start the GPIB Analyzer, why do I get a message that says "`LabWindows/CVI requires a math coprocessor`"?

In order for the GPIB Analyzer to function properly under Windows 95, your personal computer must have a math coprocessor. For more information, refer to the *What You Need to Get Stared* section of Chapter 1, *Introduction*.

Why do so many different New Hardware Found windows appear when I first insert my PCMCIA-GPIB+ card?

Six **New Hardware Found** windows appear when a PCMCIA-GPIB+ is first inserted under Windows 95. The first window contains the name **National Instruments PCMCIA-GPIB+**, which is obtained from the actual PCMCIA-GPIB+ hardware. Windows 95 then associates the hardware name with a name in the Device Manager, **NI PCMCIA-GPIB+ Multi-function Parent**. The term *Multi-function Parent* appears because although the PCMCIA-GPIB+ is physically a single PC Card device, it actually supports two functions (GPIB Analyzer and GPIB Controller). The Device Manager temporarily displays a **New Hardware Found** window with the name **Unknown Device** as it begins to search for the name of the first child function. When it finds the first child function, it changes the text to **PCMCIA-GPIB+ (GPIB Analyzer)**. It repeats the process to locate the second child function name **PCMCIA-GPIB+ (GPIB Controller)**. When the **New Hardware Found** windows have all closed, both functions of the PCMCIA-GPIB+ can be used.

I have already installed my NI-488.2M software, and when I try to install my PCMCIA-GPIB+, a New Hardware Found dialog box appears prompting me for input, but the Windows default driver selection is grayed out. What should I do?

This is a known problem with early revisions of the PCMCIA-GPIB+ card. Normally, when Windows 95 detects a PCMCIA-GPIB+, several **New Hardware Found** dialog boxes appear, but none of them require any user input. They appear momentarily only to inform you that the card was detected. If you are experiencing this problem, contact National Instruments to have your PCMCIA-GPIB+ card upgraded.

How do I change the resources (Base I/O Address and Interrupt Request) assigned to the PCMCIA-GPIB+ card?

Because the PCMCIA-GPIB+ is a single physical PC Card device that supports two separate functions (GPIB Analyzer and GPIB Controller), it is registered as a "Multi-function adapter" in the Device Manager. Windows 95 does not allow the resources of the Multi-function child devices (the GPIB Analyzer and GPIB Controller under **National Instruments GPIB Interfaces**) to be changed directly.

To change the resources of the PCMCIA-GPIB+ from within the Device Manager, you must open the **Multi-function Adapter** class and double-click on the **NI PCMCIA-GPIB+ Multi-function Parent** device. Use the **Resource** page to change the resources. Any resource changes are automatically reflected to the child devices.

Is it possible to disable the GPIB Analyzer or GPIB Controller function of my PCMCIA-GPIB+ or AT-GPIB/TNT+ (GPIB+) if I am not using it?

Yes. For example, if you have two GPIB+ interfaces in your system, only one can be used as a GPIB Analyzer, so you should disable the GPIB Analyzer on the other interface. To do this, open the Device Manager, look under **National Instruments GPIB Interfaces**, and open the GPIB Analyzer (or GPIB Controller) you want to disable. In the **Device usage** field on the **General** page, check marks appear to the left of the current configuration (usually **Original Configuration (Current)**). Click on the checkbox to remove the check mark, then click **OK**.

Why does the uninstall program leave some components installed?

The uninstall program removes only items that the installation program installed. If you add anything to a directory that the installation program created, the uninstall program does not delete that directory,

because the directory is not empty after the uninstallation. You will
need to remove any remaining components yourself.

What information should I have before I call National Instruments?

When you call National Instruments, you should have all of the
information filled out on the *Hardware and Software Configuration
Form* in Appendix E, *Customer Communication*.

Specifications

This appendix describes the physical characteristics of the GPIB hardware and the transfer rates of the NI-488.2M software, along with the recommended operating conditions.

Hardware Characteristics

Table D-1. AT-GPIB/TNT (PnP) Hardware Characteristics

Characteristic	Specification
Dimensions	10.67 by 16.51 cm (4.2 by 6.5 in.)
Power Requirement (from PC AT I/O channel)	+5 VDC 120 mA typical 200 mA maximum
I/O Connector	IEEE 488 Standard 24-pin

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 B Certified

Table **D-2**. AT-GPIB/TNT+ Hardware Characteristics

Characteristic	Specification
Dimensions	10.67 by 16.51 cm (4.2 by 6.5 in.)
Power Requirement (from PC AT I/O channel)	+5 VDC 460 mA typical 850 mA maximum
I/O Connector	IEEE 488 Standard 24-pin

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 B Certified

Table **D-3**. PCI-GPIB Hardware Characteristics

Characteristic	Specification
Dimensions	13.34 by 10.67 cm (5.25 by 4.2 in.)
Power Requirement (from PCI bus)	+5 VDC 600 mA typical
I/O Connector	IEEE 488 Standard 24-pin

Operating Environment
  Ambient 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 B Certified

Table **D-4** . PCMCIA-GPIB+ Hardware Characteristics

Characteristic	Specification
Dimensions	85.6 by 54.0 by 5.0 mm (3.370 by 2.126 by 0.197 in.)
Power Requirement (from PCMCIA expansion slot)	+5 VDC 150 mA typical
I/O Interface	Special IEEE 488 cable with 24-pin converter for PC Card

Operating Environment
  Component Temperature
  Relative Humidity
	0° to 40° C
	10% to 90%, noncondensing

Storage Environment
  Temperature
  Relative Humidity
	-20° to 70° C
	5% to 90%, noncondensing

EMI	FCC Class A Verified

Table **D-5**. 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 Transfer Rates

Table D-6. NI-488.2M Software Transfer Rates for the Plug and Play GPIB Hardware

GPIB Hardware	Transfer Method	Maximum GPIB Transfer Rate

AT-GPIB/TNT (PnP), AT-GPIB/TNT+	3-wire (IEEE 488)
	  In ISA computer
	  In EISA computer
	
	High Speed (HS488)
	  In ISA computer
	  In EISA computer
		
		1.5 Mbytes/s*
		1.5 Mbytes/s*
		
		1.8 Mbytes/s*
		2.8 Mbytes/s*

PCI-GPIB	3-wire (IEEE 488) High Speed (HS488)	1.5 Mbytes/s* 4.8 Mbytes/s*
PCMCIA-GPIB+, PCMCIA-GPIB	3-wire (IEEE 488) High Speed (HS488)	1.4 Mbytes/s* 1.7 Mbytes/s*
* Actual speed may vary considerably from speed shown because of system and instrumentation capabilities.		
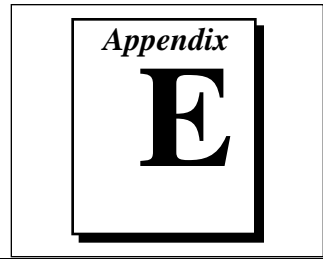
Customer Communication

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

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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 or (800) 327-3077
    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: 1 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.

FaxBack Support

FaxBack is a 24-hour information retrieval system containing a library of documents on a wide range of technical information. You can access FaxBack from a touch-tone telephone at the following numbers:

(512) 418-1111 or (800) 329-7177

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

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

GPIB: gpib.support@natinst.com
DAQ: daq.support@natinst.com
VXI: vxi.support@natinst.com
LabVIEW: lv.support@natinst.com
LabWindows: lw.support@natinst.com
HiQ: hiq.support@natinst.com
VISA: visa.support@natinst.com

Fax and Telephone 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.
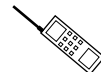
	Fax	Telephone
Australia	03 9 879 9422	03 9 879 9179
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	519 622 9310	519 622 9311
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 71 11
Finland	90 527 2321	90 502 2930
France	1 48 14 24 24	1 48 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	5 202 2544	5 520 3282
Netherlands	03480 33466	03480 30673
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 20 51 51	056 20 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 _____

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 Interface Type and Revision _____

NI-488.2M Software for Windows 95 Version Number on Disk _____

Programming Language Interface Version _____

GPIB Information Output_____

Hardware Diagnostic Test Results _____

Software Diagnostic Test Results _____

Other Products

Resource Summary Report from the Device Manager

(To create this report, first display the **System Properties** dialog box for the computer by double-clicking on the **System** icon under **Start»Settings»Control Panel**. Then click on the **Device Manager** tab and highlight the **Computer** icon. Click on the **Print** button, and check the **Print to file** checkbox in the **Print** dialog box before clicking on **OK**.)

_____

_____

Programming Environment Information

Programming Language _____

Compiler Vendor _____

Compiler Version _____

Application Information

DOS Application _____   Win16 Application _____   Win32 Application _____

If Win16 or Win32, method of accessing DLL (link with language interface or direct entry?)

_____

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 Plug and Play GPIB Hardware and Software for Windows 95

Edition Date: November 1995

Part Number: 321035A-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.

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

°	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
base I/O address	lowest I/O address used by the GPIB hardware
C	Celsius
DLL	dynamic link library
DMA	direct memory access
EISA	Extended Industry Standard Architecture
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
Hz	hertz
I/O	input/output
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
IRQ	interrupt request
ISA	Industry Standard Architecture
KB	kilobytes of memory

legacy board	ISA board whose system resources are chosen by changing physical switches or jumpers on the board
m	meters
MB	megabytes of memory
PC	personal computer
PnP	Plug and Play
RAM	random-access memory
resource	hardware settings used by devices in a computer system, including ISA interrupt level, DMA channel, and base I/O address
s	seconds
VDC	volts direct current