GPIB

Getting Started with Your AT-GPIB/TNT+ or PCMCIA-GPIB+ and the GPIB Software for Windows 95

Internet Support

E-mail: support@natinst.com
FTP Site: ftp.natinst.com
Web Address: http://www.natinst.com

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BBS United Kingdom: 01635 551422
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Telephone Support (USA)

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National Instruments Corporate Headquarters

6504 Bridge Point Parkway   Austin, Texas 78730-5039   USA   Tel: 512 794 0100

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Class A

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.

Canadian Department of Communications

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

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Federal Communications Commission

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Canadian Department of Communications

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

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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.

About This Manual

Chapter 1
Introduction

Chapter 2
Installation and Configuration

Chapter 3
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Chapter 4
Begin to Use the GPIB Software

Appendix A
Uninstalling the Hardware and Software

Appendix B
Forcing Windows 95 to Detect the GPIB Hardware

Appendix C
Troubleshooting and Common Questions

Appendix D
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This manual contains instructions to help you install and configure the National Instruments AT-GPIB/TNT+ or PCMCIA-GPIB+ hardware and the GPIB software for Windows 95.

This manual assumes that you are already familiar with Windows 95.

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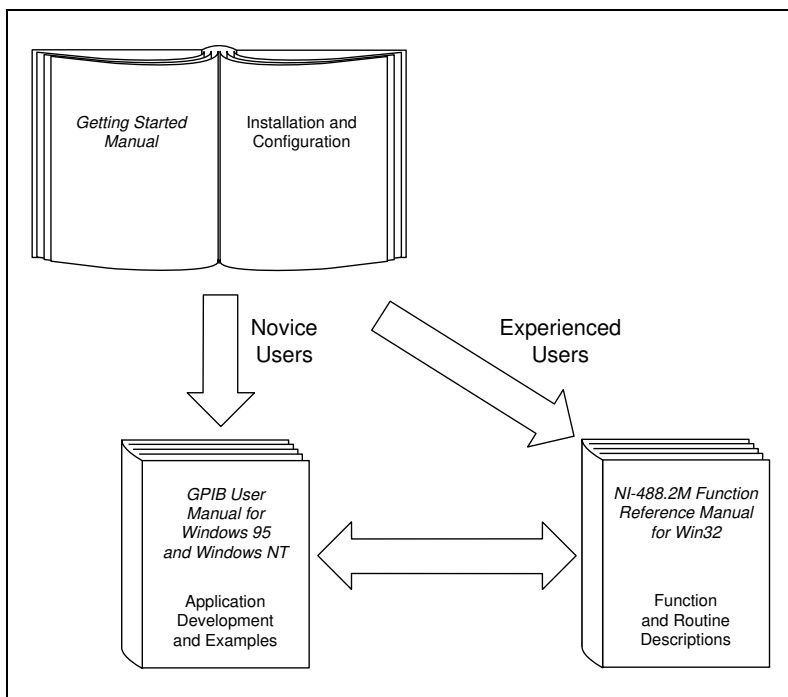
Use this getting started manual to install and configure your GPIB hardware and software for Windows 95.

Use the *GPIB User Manual for Windows 95 and Windows NT* 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 AT-GPIB/TNT+ and PCMCIA-GPIB+ hardware and GPIB software for Windows 95.

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

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

- Appendix B, *Forcing Windows 95 to Detect the GPIB Hardware*, contains instructions to help you install your GPIB interface if Windows 95 has not detected it properly.

- 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, the transfer rates of the GPIB software, and 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:

»	The **»** symbol leads you through nested menu items and dialog box options. 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.
☞	This icon to the left of bold italicized text denotes a note, which alerts you to important information.
⚠	This icon to the left of bold italicized text denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes the names of menus, menu items, parameters, dialog boxes, dialog box buttons or options, icons, windows, Windows 95 tabs, 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 different 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 from which you supply the appropriate word or value, as in Windows 3.*x*.
`italic monospace`	Italic text in this font denotes that you must supply the appropriate words or values in the place of these items.
`monospace`	Text in this font denotes text or characters that should literally enter from the keyboard, sections of code, programming examples, and

syntax examples. This font is also used for 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.

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 Online Help, 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 AT-GPIB/TNT+ and PCMCIA-GPIB+ hardware and the GPIB software for Windows 95.

How to Use This Manual

Chapter 1	Gather What You Need to Get Started
Chapter 2	Install the Software
	Install the Hardware
	Configure the Software
Chapter 3	Verify the Installation
	Passes? — No → Troubleshooting Appendix
	Yes
Chapter 4	Run Interactive Control Utility
	Review Programming Considerations
User Manual and Function Reference Manual	Write Application Program
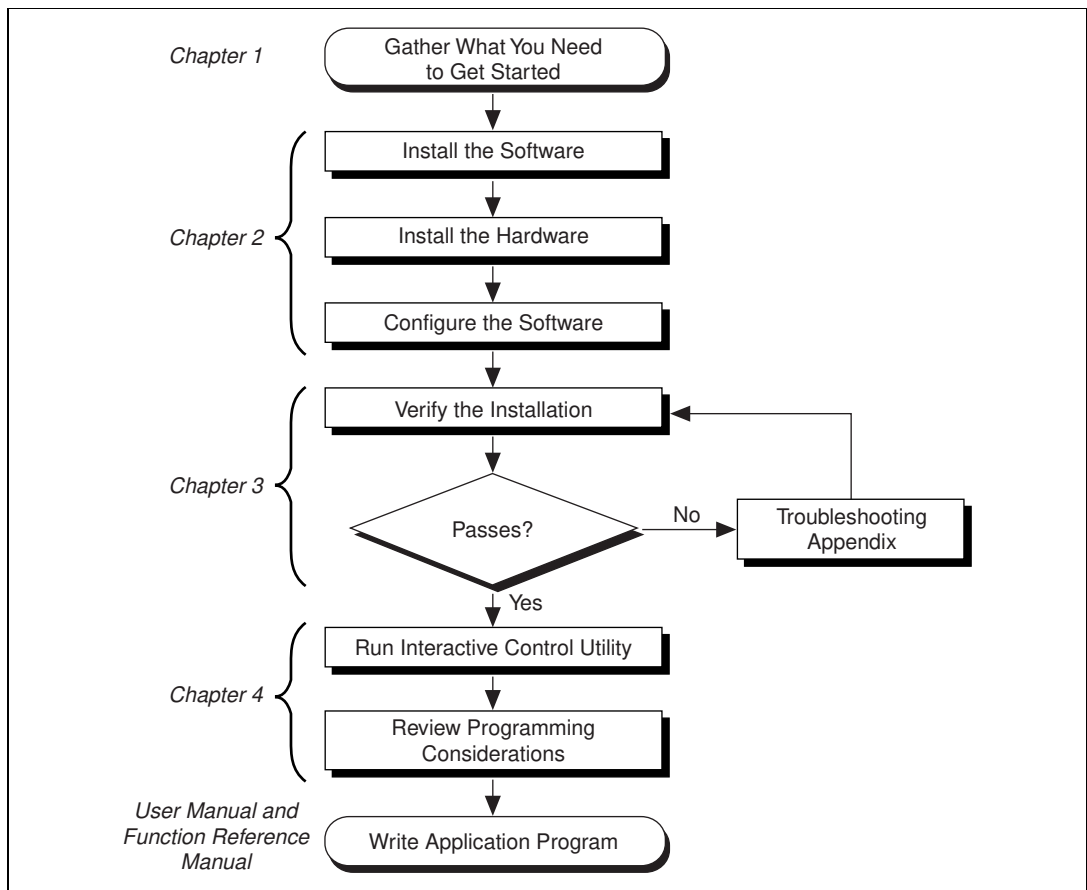
What You Need to Get Started

Make sure you have all of the following items before you attempt to install the hardware and software:

❑ Windows 95 or later installed on your computer

❑ AT-GPIB/TNT+ or PCMCIA-GPIB+ interface

❑ The following 3.5 in., high-density (1.44 MB) disks, which come in your kit:

- *GPIB Software and GPIB Analyzer Software for Windows 95 (Disk 1 of 3)*

- *GPIB Software and GPIB Analyzer Software for Windows 95 (Disk 2 of 3)*

- *GPIB Software and GPIB Analyzer Software for Windows 95 (Disk 3 of 3)*

❑ 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 Hardware Overview

The AT-GPIB/TNT+ hardware is completely software-configurable and complies with the Plug and Play ISA standard. The PCMCIA-GPIB+ hardware is completely software-configurable and complies with the PC Card standard. Both interfaces transform your computer into a fully functioning GPIB Talker/Listener/Controller. The TNT4882C chip on the 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 2.8 MB/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 7, *GPIB Programming Techniques*, in the *GPIB User Manual for Windows 95 and Windows NT*.

The AT-GPIB/TNT+ and PCMCIA-GPIB+ both combine the abilities of the GPIB controller and a complete GPIB analyzer into a single interface. This interface offers a low-cost, high-speed alternative to GPIB controllers and analyzers packaged separately. Because they support both the GPIB 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+ and PCMCIA-GPIB+ each contain two GPIB loads and can be connected to up to 13 instruments apiece. 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.

GPIB Software Overview

The GPIB 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 GPIB hardware. The driver components are dynamically unloaded when Windows 95 detects the removal of GPIB hardware.

The GPIB software for Windows 95 supports the concurrent use of multiple types of GPIB hardware. For example, you can communicate

with GPIB devices through both an AT-GPIB/TNT+ and PCMCIA-GPIB in the same system at the same time. The GPIB 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 GPIB software, along with the GPIB hardware, transforms your computer into a GPIB **Talker/Listener/Controller** with complete communications and bus management capability. The GPIB software includes the following components:

• Device driver

• Diagnostic test utility

• Configuration utility

• Interactive control program

• Utilities for software development

• Language interface libraries for Microsoft Visual C/C++ 2.0 or later, Borland C/C++ 4.0 or later, and Microsoft Visual Basic 4.0 or later

• Example programs that use NI-488 functions and NI-488.2 routines

Refer to Appendix D, *Specifications*, for information about the GPIB software transfer rates.

GPIB Analyzer Software Overview

The GPIB Analyzer software comes with the AT-GPIB/TNT+ and PCMCIA-GPIB+ hardware. You can use it to capture, monitor, and participate in bus activity on the GPIB and 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*.

Time-Saving Development Tools

Your kit includes the GPIB software for Windows 95. In addition, you
can order the LabWindows/CVI or LabVIEW software from National
Instruments to speed your application development time and make it
easier to communicate with your instruments.

LabVIEW is an easy-to-use, graphical programming environment you
can use to acquire data from thousands of different instruments,
including IEEE 488.2 devices, VXI devices, serial devices, PLCs, and
plug-in data acquisition boards. After you have acquired raw data, you
can convert it into meaningful results using the powerful data analysis
routines in LabVIEW. LabVIEW also comes with hundreds of
instrument drivers, which dramatically reduce software development
time, because you do not have to spend time programming the low-level
control of each instrument.

LabWindows/CVI is similar to LabVIEW, except that it combines an
interactive, easy-to-use development approach with the programming
power and flexibility of compiled ANSI C code.

For ordering information, or to request free demonstration software,
contact National Instruments.

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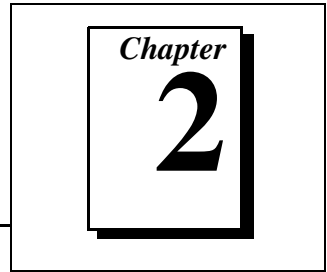
This chapter describes how to install and configure the GPIB hardware and software for Windows 95.

Install the GPIB Software

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

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

2. Double-click on the **Add/Remove Programs** icon in the Control Panel to launch 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

You can use this same applet to uninstall the GPIB software at a later time. Refer to Appendix A, *Uninstalling the Hardware and Software*, for more information.

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

4. Insert the *GPIB Software for Windows 95 (Disk 1 of 3)*, and click on the **Next** button to proceed. The software installation wizard begins with the screen shown in Figure 2-2.

5. Click on the **Next** button to proceed with the installation.

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 clicking on the **Back** button. You can exit the setup if necessary by clicking on the **Cancel** button.

6. When the setup is complete, restart Windows 95.

Install the AT-GPIB/TNT+ Hardware

⚠ **Caution:** *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.*

1. Shut down Windows 95 and 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 in your computer.

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 2-3. It might be a tight fit, but do not force the board into place.
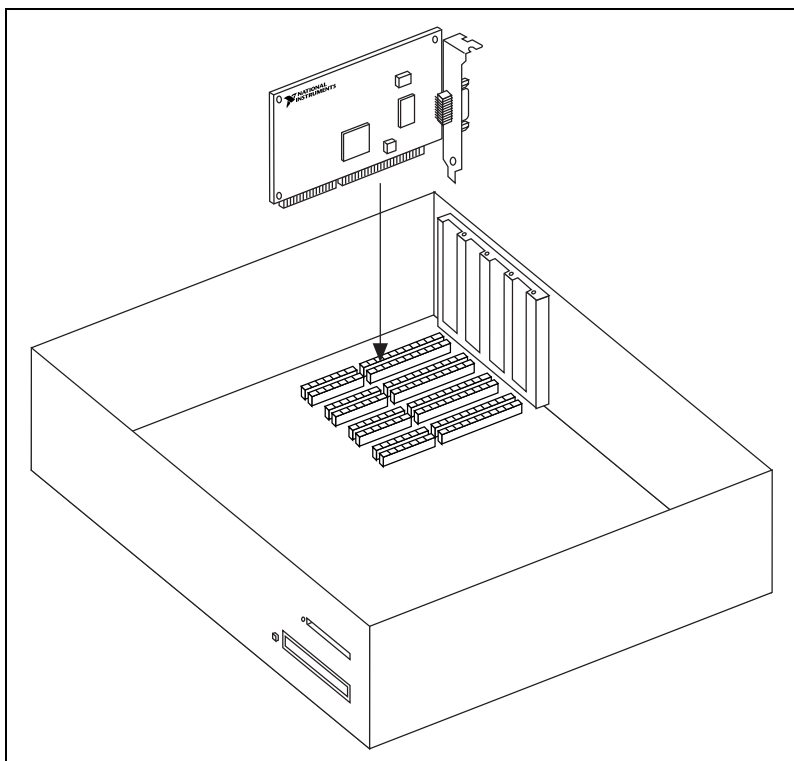
Figure 2-3. Installing the AT-GPIB/TNT+

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 and briefly display a **New Hardware Found** dialog box.

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

Install the PCMCIA-GPIB+ Hardware

To install the PCMCIA-GPIB+ in your computer, first start
Windows 95. If the card is not already inserted, insert it 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 2-4 shows how to
insert the PCMCIA-GPIB+ and how to connect the cable.
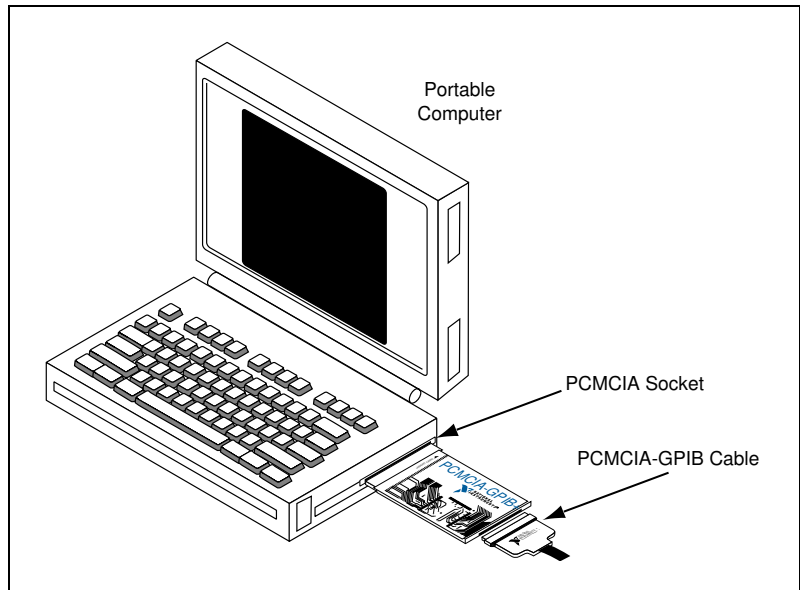
Figure 2-4. Inserting the PCMCIA-GPIB+

Windows 95 automatically pops up one or more **New Hardware Found**
dialog boxes when it detects and configures a PC Card.

If no **New Hardware Found** dialog box appears when you insert your
PC Card, make sure that 32-bit PCMCIA drivers are enabled. In the
System Properties dialog box under **Start»Settings»Control
Panel»System**, select the **Performance** tab and look at the **PC Cards
(PCMCIA):** line. If it reads `32-bit`, the 32-bit PCMCIA drivers are
enabled. In this case, follow the instructions in Appendix B, *Forcing
Windows 95 to Detect the GPIB Hardware*. Otherwise, enable 32-bit
PCMCIA drivers by running the **PC Card (PCMCIA) Wizard**, a control
panel applet found under **Start»Settings»Control Panel»PC Card
(PCMCIA)**. After enabling 32-bit PCMCIA drivers, you need to shut

down your computer and restart it. When your computer restarts, your PCMCIA-GPIB+ is detected, if it has been inserted, and the **New Hardware Found** dialog boxes appear. If a **New Hardware Found** dialog box still does not appear, refer to Appendix B, *Forcing Windows 95 to Detect the GPIB Hardware*.

Configure the GPIB Software

The GPIB Configuration utility is fully integrated with the Windows 95 Device Manager. You can use it to examine or modify the configuration of the GPIB software. The context-sensitive online help, available by right-clicking on any of the controls on the configuration utility tabs, includes all of the information that you need to configure the GPIB software properly.

To begin to configure the GPIB software, double-click on the **System** icon under **Start»Settings»Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab, click on the **View devices by type** button at the top of the tab, and scroll down to the **National Instruments GPIB Interfaces** icon.

Resolve Conflicts

If you have other non Plug and Play hardware in your system, Windows 95 might assign incorrect resources to your AT-GPIB/TNT+. If this happens, Windows 95 shows that the board is not working, and you must reconfigure the AT-GPIB/TNT+ module and the GPIB software.

On the **Device Manager** page, look at the items listed under the **National Instruments GPIB Interfaces** icon. If there is no **National Instruments GPIB Interfaces** icon or if a circled X or exclamation point (!) appears through the eagle icon, the AT-GPIB/TNT+ is not working properly. Figure 2-5 shows an example of an AT-GPIB/TNT+ that is working properly, and Figure 2-6 shows an example of an AT-GPIB/TNT+ that is not working properly.
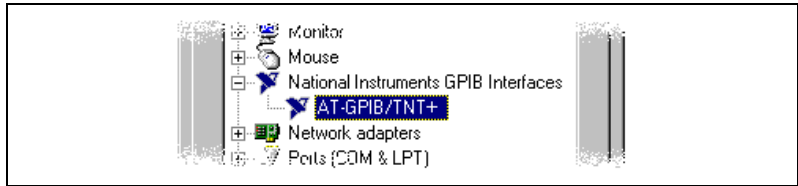
Figure 2-5. GPIB Interface That Is Working Properly
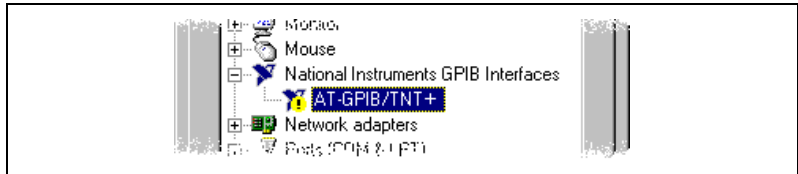
Figure 2-6. GPIB Interface That Is Not Working Properly

You can see if the problem is a resource conflict by looking at what resources are conflicting, if the AT-GPIB/TNT+ appears under the **National Instruments GPIB Interfaces** icon. Double-click on the AT-GPIB/TNT+ name and click on the **Resources** tab, which provides information about the hardware resources assigned to the AT-GPIB/TNT+. The **Conflicting Device List** lists any conflicts. If conflicts exist, use the **Setting based on** drop-down list and the **Change Setting** button to select conflict-free resources for the AT-GPIB/TNT+.

If you cannot find conflict-free resources for the AT-GPIB/TNT+, or if no conflicts are listed, refer to the *Troubleshooting Device Manager Problems* section of Appendix C, *Troubleshooting and Common Questions*, to resolve the problem.

Assign an Interface Name

If you are using more than one interface, you must configure the GPIB software to associate a logical name (GPIB0, GPIB1, and so on) with each physical GPIB interface. Follow these steps:

1. Double-click on the first interface in the list immediately below **National Instruments GPIB Interfaces**.

2. Click on the **GPIB Settings** tab, which provides information about the software configuration for the AT-GPIB/TNT+.

3. Use the **Interface Name** drop-down box to select a logical name
   (GPIB0, GPIB1, and so on) for the AT-GPIB/TNT+.

4. Repeat this process for each interface you need to configure.

Figure 2-7 shows the **GPIB Settings** page for an AT-GPIB/TNT+.
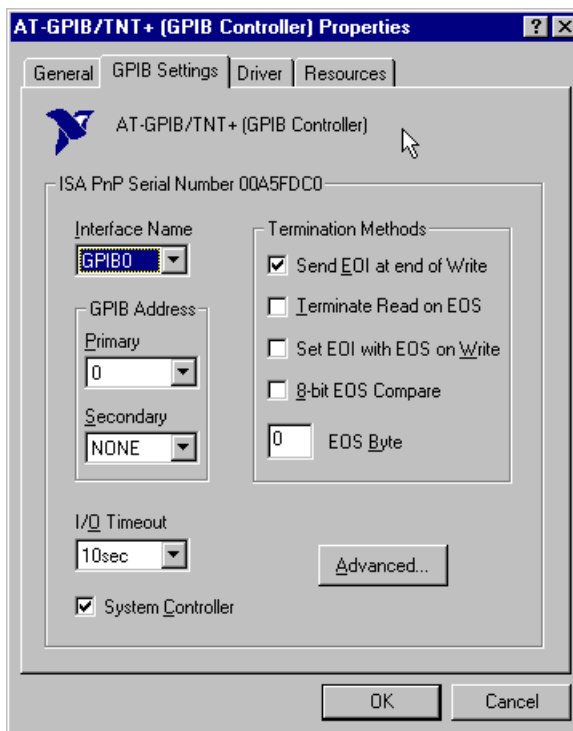
Figure 2-7. GPIB Settings Page for the AT-GPIB/TNT+

View or Modify Logical Device Templates (Optional)

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 on the **Properties** button.
Select the **Device Templates** tab to view the logical device templates,
as shown in Figure 2-8.
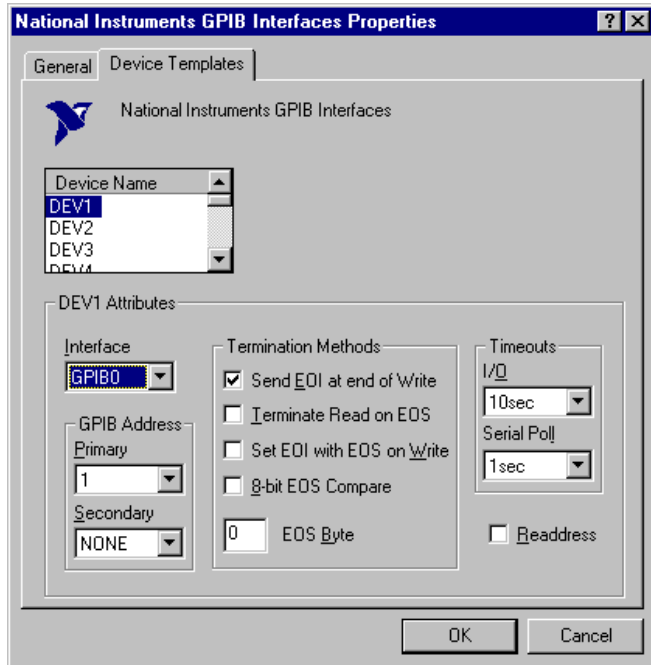
Figure 2-8. Device Templates Page for the Logical Device Templates

Verify 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 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.

To run the utility, select the **Diagnostic** item under **Start»Programs» GPIB Software for Windows 95**.

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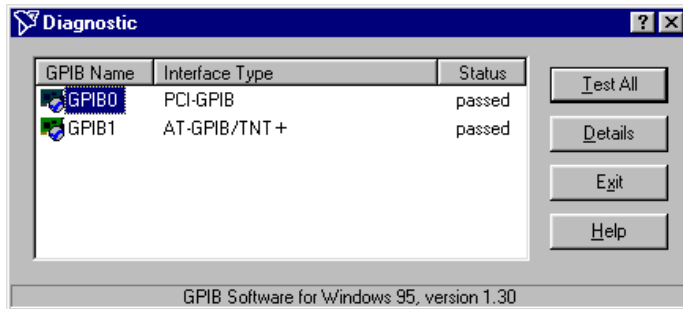
Figure 3-1. Diagnostic Utility after Testing

You can get details on any tested GPIB interface 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. Use that information and the information in Appendix C, *Troubleshooting and Common Questions*, to troubleshoot the problem.

Troubleshooting information is also available in the online help for the Diagnostic utility, which you can access by clicking on the **Help** button.

Begin to Use
the GPIB Software
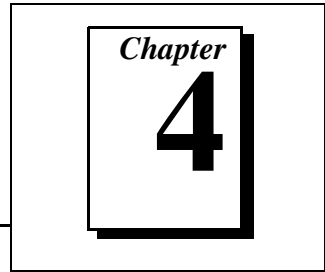
This chapter helps you get started with the GPIB software and the GPIB Analyzer software for Windows 95.

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.

• 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»GPIB Software for Windows 95**. This utility includes extensive online help, available by entering help at the : prompt.

For more information about the Win32 Interactive Control utility, refer to the *GPIB User Manual for Windows 95 and Windows NT*.

Introduction to the NI Spy Utility

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

• Capture information about NI-488 functions and NI-488.2 routines as they are invoked by your GPIB applications.

• 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.

To run NI Spy, select the **NI Spy** item under **Start»Programs»GPIB Software for Windows 95**. For more information about the NI Spy utility, refer to Chapter 5, *NI Spy Utility*, in the *GPIB User Manual for Windows 95 and Windows NT*, or use its built-in, context-sensitive online help.

Running Existing DOS GPIB Applications

With the GPIB software properly configured, you can run your existing DOS GPIB applications along with your Win16 and Win32 applications. No DOS device driver is required. In fact, you should make sure that no older version of the GPIB DOS device driver is being loaded from your `config.sys` file, a file located on the boot drive of your computer.

☞ **Note:** *To determine if* `config.sys` *is loading an older GPIB DOS driver, look for the line* `device=`*path*`\gpib.com` *in your* **`config.sys`** *file, where* *path* *refers to the drive and directory where* `gpib.com` *is located. If that line appears, either comment it out by typing* `REM` *at the beginning of the line, or delete it. If you change the* `config.sys` *file, save it and restart your system.*

To configure the GPIB software to run existing DOS GPIB applications, first make sure that you have installed the GPIB software and your GPIB hardware. Then complete the following steps:

1. Double-click on the **System** icon under **Start»Settings»Control Panel**.

2. In the **System Properties** dialog box that appears, select the **Device Manager** tab.

3. Click on the **View devices by type** button at the top of the page.

4. Click on the **National Instruments GPIB Interfaces** icon.

5. Click on the **Properties** button to display the **General** property page for the GPIB software.

6. Select the check box labeled **Enable Support for DOS GPIB Applications**, and click on the **OK** button.

7. Restart your computer.

After you restart your computer, you can begin to run your existing DOS GPIB applications.

For more information about running existing DOS GPIB applications with the GPIB software for Windows 95, refer to the *GPIB User Manual for Windows 95 and Windows NT*.

General Programming Considerations

As you begin developing your Win32 GPIB application, remember the following points:

• For your C/C++ application, you must include the GPIB header file in your source code.

• The GPIB software is accessed through the 32-bit DLL, `gpib-32.dll`, either by linking with one of the language interfaces provided with the GPIB software, or by using direct DLL entry from other programming environments.

• Several sample GPIB applications are included with the GPIB 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 *GPIB 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* or the online help file, which you can access by selecting **Start»Programs»GPIB Software for Windows 95»GPIB Help**.

Using the GPIB Analyzer Software

To start the GPIB Analyzer, select the **GPIB Analyzer** item under **Start»Programs»GPIB Analyzer 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 488 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. You can access the online help from the **Help** menu within the GPIB Analyzer program. The *GPIB Analyzer User Manual* provides complete information on the GPIB Analyzer.

Uninstalling the Hardware and Software
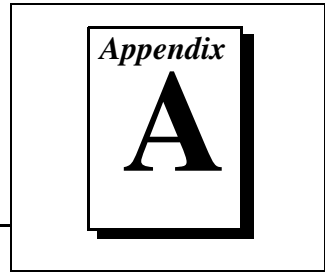
This appendix describes how to uninstall your GPIB hardware and software from Windows 95.

Uninstalling the GPIB Hardware

Before you physically remove the GPIB hardware from your system, you must remove the hardware information from the Windows 95 Device Manager. Complete the following steps to remove the hardware information:

1. Select **Start»Settings»Control Panel** and double-click on the **System** icon.

2. In the **System Properties** dialog box, select the **Device Manager** tab, click on the **View devices by type** button, and double-click on the **National Instruments GPIB Interfaces** icon.

3. To remove an AT-GPIB/TNT+ interface, select it from the **National Instruments GPIB Interfaces** list, as shown in Figure A-1. Click on the **Remove** button to remove the hardware information. To remove a PCMCIA-GPIB+ interface, select the **NI PCMCIA-GPIB+ Multi-function Parent** item under **Multifunction**, and click on the **Remove** button.

4. Click on the **OK** button, shut down Windows 95, turn off your system, and physically remove the interface from your system. You may eject the PCMCIA-GPIB+ after you have removed the hardware information from the Device Manager.
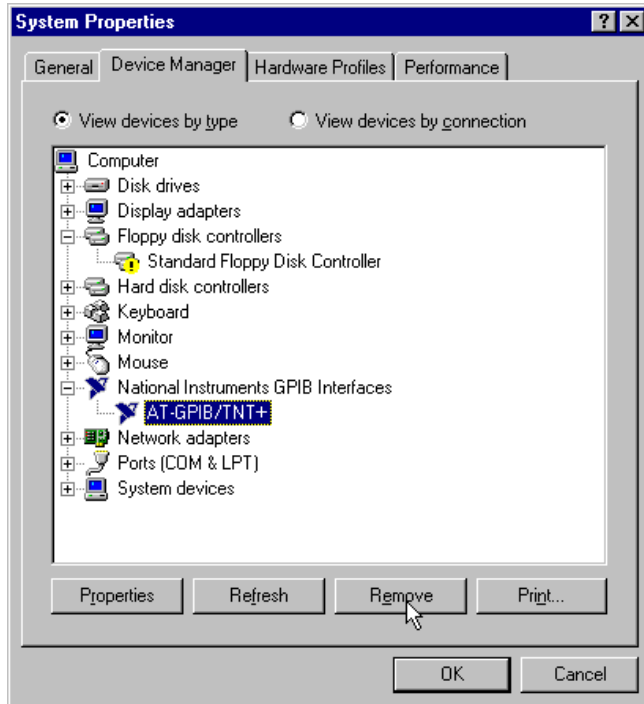
Figure A-1. Selecting an Interface to Remove

Uninstalling the GPIB Software

Before you uninstall the GPIB software, you should remove all GPIB hardware information from the Windows 95 Device Manager, as described in the previous section. Complete the following steps to uninstall the GPIB software:

1.   Select **Start»Settings»Control Panel** and double-click on the **Add/Remove Programs** icon. The dialog box shown in Figure A-2 lists the software available for removal.
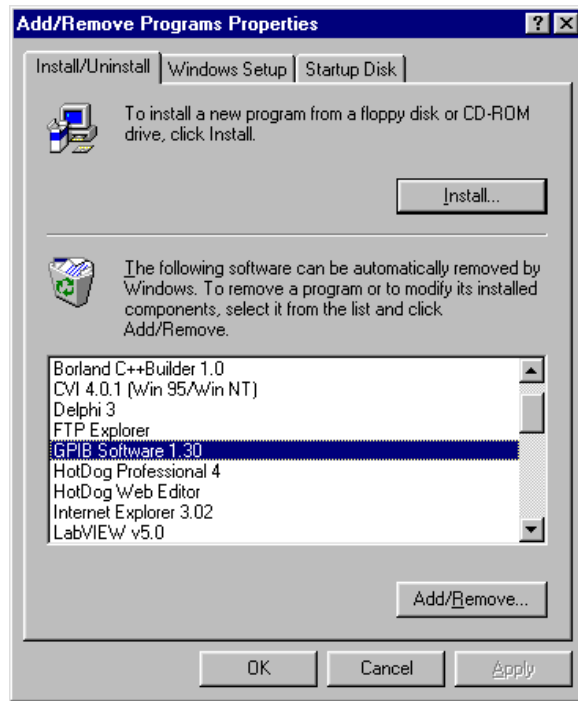
Figure A-2. Add/Remove Programs Properties Dialog Box

2. Select the GPIB software you want to remove and click on the
   Add/Remove button. The uninstall program removes all folders,
   programs, VxDs, DLLs, and registry entries associated with the
   GPIB software.

3. Repeat Step 2 to remove the Analyzer software. For more
   information about removing the Analyzer software, refer to the
   GPIB User Manual for Windows 95 and Windows NT.

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, turn off your system, and remove
the GPIB hardware.

The uninstall program removes only items that the GPIB setup program
installed. If you add anything to a directory that was created by the
GPIB setup program, 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.

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

Forcing Windows 95 to Detect the GPIB Hardware

This appendix contains instructions to help you install your GPIB interface if Windows 95 has not detected it properly.

If Windows 95 does not detect your interface properly, it may not display the **New Hardware Found** dialog boxes when expected, or the driver may return an EDVR error when you try to access the GPIB interface. This problem occurs if Windows 95 has already configured the GPIB interface as an **Other Device**. To fix the problem, complete the following steps:

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

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

3. Select the **Device Manager** tab at the top of the **System Properties** page 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 the hardware devices that Windows 95 has detected and configured as **Other Devices**.

5. For each National Instruments GPIB interface listed, select the interface by clicking on it, and then click on the **Remove** button to remove the interface from the list of **Other Devices**.

6. After you have removed all of the National Instruments GPIB interfaces from the list of **Other Devices**, click on the **Refresh** button to force Windows 95 to detect each National Instruments GPIB interface and to display a **New Hardware Found** dialog box for each one.

7. Proceed with the hardware installation, as described in Chapter 2, *Installation and Configuration*.

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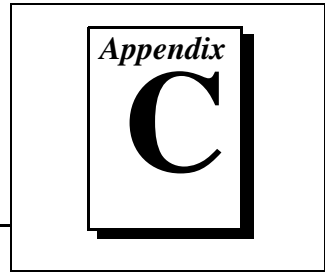
This appendix describes how to troubleshoot problems and answers some common questions.

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 (-534249428)

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 GPIB software and selecting an interface name. For information on how to configure the GPIB software, refer to the *Configure the GPIB Software* section of Chapter 2, *Installation and Configuration*.

EDVR Error Condition with ibcntl Set to 0xE0140025 (-535560155)

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 (-535560139)

If a call is made with a device name that is not listed in the logical device templates that are part of the GPIB Configuration utility, an EDVR error condition occurs with ibcntl set to 0xE0140035.

EDVR Error Condition with ibcntl Set to 0xE0320029 (-533594071) or 0xE1050029 (-519765975)

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 or 0xE1050029. This error condition indicates that the GPIB interface is not working properly. Refer to the *GPIB Interface Not Working Properly* section later in this appendix. This error is also returned if you remove the PCMCIA-GPIB+ while the driver is accessing it, or if you try to access a PCMCIA-GPIB+ and 32-bit drivers are not enabled. Refer to the *Install the PCMCIA-GPIB+ Hardware* section of Chapter 2, *Installation and Configuration*, for information about enabling 32-bit PCMCIA drivers.

EDVR Error Condition with ibcntl set to 0xE0140004 (-535560188)

This error may occur if the GPIB interface has not been correctly installed and detected by Windows 95. For details on how to install the GPIB hardware, refer to Chapter 2, *Installation and Configuration*. If you have already followed those instructions and still receive this error, Windows 95 might have configured the GPIB interface as an **Other Device**. For information about how to solve this problem, refer to Appendix B, *Forcing Windows 95 to Detect the GPIB Hardware*.

EDVR Error Condition with ibcntl set to 0xE1030043 (-519897021)

This error occurs if you have enabled DOS GPIB support and attempted to run an existing GPIB DOS application that was compiled with an older, unsupported DOS language interface.

Troubleshooting Device Manager Problems

The Windows 95 Device Manager contains configuration information for all of the GPIB hardware it is aware of that is installed in your system. To start the Windows 95 Device Manager, double-click on the **System** icon under **Start»Settings»Control Panel**. In the **System Properties** box that appears, select the **Device Manager** tab and click on the **View devices by type** button at the top of the tab.

- If there is no **National Instruments GPIB Interfaces** item and you are certain you have a GPIB interface installed, refer to the *No National Instruments GPIB Interfaces Item* section of this appendix.

- If the **National Instruments GPIB Interfaces** item exists, but the GPIB interface you are looking for is not listed there, refer to the *Missing GPIB Interface* section of this appendix.

- If the GPIB interface you are looking for is listed, but has a circled X or exclamation mark (!) over its icon, refer to the *GPIB Interface Not Working Properly* section of this appendix.

No National Instruments GPIB Interfaces Item

If you are certain you have a GPIB interface installed, but no **National Instruments GPIB Interfaces** item appears in the Device Manager, the interface is probably incorrectly listed under **Other Devices**. Double-click on the **Other Devices** item in the Device Manager and, one by one, remove each National Instruments GPIB interface listed there by selecting its name and then clicking on the **Remove** button. After all of the National Instruments GPIB interfaces have been removed from **Other Devices**, click on the **Refresh** button. At this point, the system rescans the installed hardware, and the GPIB interface should show up under **National Instruments GPIB Interfaces** without any problems. If the problem persists, contact National Instruments.

Missing GPIB Interface

If the **National Instruments GPIB Interfaces** item exists, but the GPIB interface you are looking for is not listed there, the GPIB interface is not properly installed. For Plug and Play GPIB hardware, this means the interface is not physically present in the system.

GPIB Interface Not Working Properly

If a GPIB interface is not working properly, its icon has a circled X or exclamation mark (!) overlaid on it, as shown in Figure C-1.
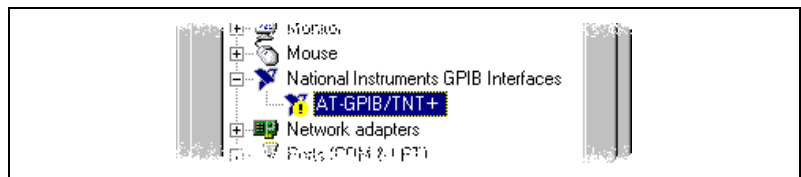
Figure C-1. GPIB Interface That Is Not Working Properly

This problem can occur for several reasons. If you encounter this problem, the Device Manager should list an error code that indicates why the problem occurred. To see the error code for a particular

interface, select the name of the interface and click on the **Properties** button to go to the **General** page for that GPIB interface. The **Device Status** section of the **General** page shows the error code. Locate the error code in the following list to find out why your GPIB interface is not working properly.

- Code 8: The GPIB software was incompletely installed. You might encounter this problem if you have installed an AT-GPIB/TNT+ but not installed the GPIB Analyzer software. To solve this problem, install the GPIB Analyzer software for Windows 95.

- Code 9: Windows 95 had a problem reading information from the GPIB interface. This problem can occur if you are using an older revision of the AT-GPIB/TNT+ interface. Contact National Instruments to upgrade your GPIB interface.

- Code 22: The GPIB interface is disabled. To enable the GPIB interface, check the appropriate configuration checkbox in the **Device Usage** section of the **General** page.

- Code 24: The GPIB interface is not present, or the Device Manager is unaware that the GPIB interface is present. To solve this problem, select the interface in the Device Manager, and click on the **Remove** button. Next, click on the **Refresh** button. At this point, the system rescans the installed hardware, and the GPIB interface should show up without any problems. If the problem persists, contact National Instruments.

- Code 27: Windows 95 was unable to assign the GPIB interface any resources. To solve this problem, free up system resources by disabling other unnecessary hardware so that enough resources are available for the GPIB interface.

Troubleshooting Diagnostic Utility Failures

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

Missing Software Components

This error occurs if the software components that are necessary for the GPIB software for Windows 95 to function correctly are not present in the system. If you encounter this problem, reinstall the GPIB software for Windows 95 and run the Diagnostic utility again.

No Properly Configured GPIB Interfaces Found

This error occurs if no GPIB interfaces are physically present in the system, if the Device Manager detected problems with the GPIB interfaces, or if you have not assigned logical board names to your GPIB interfaces using the Device Manager. If you encounter this problem, use the Device Manager to examine the installed GPIB interfaces, resolve any problems reported by the Device Manager, and ensure that logical board names are assigned to each interface. Then, run the Diagnostic utility again.

To access this information in the Device Manager, complete the following steps:

1. Double-click on the **System** icon under **Start»Settings» Control Panel**.

2. In the **System Properties** dialog box that appears, select the **Device Manager** tab.

3. Click on the **View devices by type** button at the top of the **Device Manager** page.

4. Double-click on the **National Instruments GPIB Interfaces** icon. If there is no **National Instruments GPIB Interfaces** icon, either no GPIB interfaces are installed in your system or the GPIB software for Windows 95 is installed incorrectly. If you see a **National Instruments GPIB Interfaces** icon, and a GPIB interface listed under it has a circled X or (!) over its icon, refer to the *Troubleshooting Device Manager Problems* section in this appendix.

5. After you have opened the **National Instruments GPIB Interfaces** icon, double-click on the GPIB interface name and select the **GPIB Settings** tab to examine the logical board name associated with that interface. If it is set to **None**, change it to the appropriate name, such as **GPIB0**.

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 being used by other devices in the

system. 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 Online Help for instructions on how to use the Device Manager to reserve I/O resources for legacy boards. After the conflict has been resolved, 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 being used by other devices in the system. 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 Online Help for instructions on how to use the Device Manager to reserve IRQ resources for legacy boards. After the conflict has been resolved, run the Diagnostic utility again.

DMA Resource Conflict

This error occurs if the DMA resources assigned to a GPIB interface conflict with the DMA resources being used by other devices in the system. 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 Online Help for instructions on how to use the Device Manager to reserve DMA resources for legacy boards. After the conflict has been resolved, run the Diagnostic utility again.

Single-Cycle DMA Required

This error occurs if the Diagnostic utility detects that it is unable to perform demand-mode DMA for the GPIB interface and that the GPIB software has not been configured to use single-cycle DMA. GPIB interfaces that use the system DMA controller, such as the AT-GPIB/TNT+, normally use demand-mode DMA. If you get this error, you should use the Device Manager to configure the GPIB software to use single-cycle DMA for all DMA transfers, and then run the Diagnostic utility again.

To configure the GPIB software to use single-cycle DMA for a particular GPIB interface, complete the following steps:

1. Double-click on the **System** icon under **Start»Settings» Control Panel**.

2. In the **System Properties** dialog box that appears, select the **Device Manager** tab.

3. Click on the **View devices by type** button at the top of the **Device Manager** page.

4. Double-click on the **National Instruments GPIB Interfaces** icon.

5. Double-click on the GPIB interface to be configured.

6. Select the **GPIB Settings** tab.

7. Click on the **Advanced** button and make sure that the **Demand Mode DMA** item is unchecked.

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 get this error, shut down your computer, restart it, and run the Diagnostic utility again. If the problem persists, try reinstalling the GPIB software for Windows 95.

Unknown Problem Encountered

This error occurs if an unknown problem is encountered while trying to execute the Diagnostic utility. If you encounter this problem, shut down your computer, restart it, and run the Diagnostic utility again. If the problem persists, try reinstalling the GPIB software for Windows 95.

Common Questions

GPIB Hardware and Software Questions

What do I do if my GPIB hardware is listed in the Windows 95 Device Manager with a circled X or exclamation point (!) overlaid on it?

Refer to the *GPIB Interface Not Working Properly* section of this appendix for specific information about what might cause this problem. If you have already completed the troubleshooting steps, fill out the

forms in Appendix E, *Customer Communication*, and contact National
Instruments.

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

Run the GPIB Configuration utility: select **Start»Settings»Control
Panel**, and double-click on the **System** icon. Select the **Device Manager**
tab in the **System Properties** dialog box. Click on the **View devices by
type** button at the top of the page. If any GPIB hardware is correctly
installed, a **National Instruments GPIB Interfaces** icon appears in the
list of device types. Double-click on this icon to see a list of installed
GPIB hardware.

How can I determine which version of the GPIB software I have installed?

Run the Diagnostic utility: select the **Diagnostic** item under
Start»Programs»GPIB Software. A banner at the bottom of the
Diagnostic utility window displays the version of the GPIB software
that is installed.

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

Use the Diagnostic utility online help, or refer to the *Troubleshooting
Diagnostic Utility Failures* section earlier in this appendix. If you have
already completed the troubleshooting steps, fill out the forms in
Appendix E, *Customer Communication*, and contact National
Instruments.

How many GPIB interfaces can I configure for use with my GPIB software for Windows 95?

You can configure the GPIB software for Windows 95 to communicate
with up to 100 GPIB interfaces.

How many devices can I configure for use with my GPIB software for Windows 95?

The GPIB software for Windows 95 provides a total of 1,024 logical
devices for applications to use. The default number of devices is 32. The
maximum number of physical devices you should connect to a single
GPIB interface is 14, or fewer, depending on your system configuration.

Are interrupts and DMA required for the GPIB software for Windows 95?

DMA is not required, but at least one interrupt level is required for the AT-GPIB/TNT+ and PCMCIA-GPIB+.

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

Run the Diagnostic utility: select the **Diagnostic** item under **Start»Programs»GPIB Software**. Refer to the *Troubleshooting Diagnostic Utility Failures* section in this appendix or the online help to troubleshoot any problems.

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 the *Introduction to the Win32 Interactive Control Utility* section in Chapter 4, *Begin to Use the GPIB Software*.

How do I use a GPIB language interface?

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

Why does the uninstall program leave some components installed?

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

I have already installed my GPIB software, and when I try to install my AT-GPIB/TNT+, Windows 95 does not recognize my new hardware, or it recognizes it but reports a problem. It reports an error code of 9 on the Device Manager General tab for the hardware. What should I do?

This problem may occur with early revisions of the AT-GPIB/TNT+ boards. If you are experiencing this problem, contact National Instruments to upgrade your board.

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

Six **New Hardware Found** dialog boxes appear when a PCMCIA-GPIB+ is first inserted under Windows 95. The first dialog box 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** dialog box 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** dialog boxes have all closed, you can use both functions of the PCMCIA-GPIB+.

I have already installed my GPIB software. When I try to install my PCMCIA-GPIB+, a New Hardware Found dialog box prompting me for input appears and remains. What should I do?

This is a known problem with early revisions of the PCMCIA-GPIB+. 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 upgrade your PCMCIA-GPIB+ card.

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.

What information should I have before I call National Instruments?

When you call National Instruments, you should have the results of the Diagnostic utility test. Also, make sure you have filled out the 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 different computer than the one my GPIB board is installed in?

You do not have to run the GPIB Analyzer on a separate computer. Because the AT-GPIB/TNT+ and PCMCIA-GPIB+ are GPIB interfaces, you can develop your GPIB 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?

Yes. 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 GPIB 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 Started* section of Chapter 1, *Introduction*.

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** section 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 on the **OK** button.

Why does the uninstall program leave some components installed?

The uninstall program removes only items that the GPIB setup program installed. If you add anything to a directory that was created by the GPIB setup program, 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, the transfer rates of the GPIB software, and the recommended operating conditions.

Hardware Characteristics

Table D-1. 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 55° 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. 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 55° 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-3. GPIB Software Transfer Rates

GPIB Hardware	Transfer Method	Maximum GPIB Transfer Rate

AT-GPIB/TNT+	3-wire (IEEE 488)
	    In ISA Computer
	    In EISA Computer
	
	High Speed (HS488)
	    In ISA Computer
	    In EISA Computer
		
		1.5 MB/s*
		1.5 MB/s*
		
		1.8 MB/s*
		2.8 MB/s*

PCMCIA-GPIB+	3-Wire (IEEE 488) High Speed (HS488)	1.4 MB/s* 1.7 MB/s*
* Actual speed may vary considerably from speed shown because of system and instrumentation capabilities.		

Customer Communication
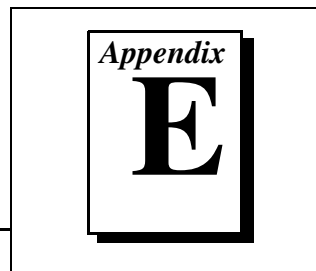
For your convenience, this appendix contains forms to help you gather the information necessary to help us solve your technical problems and a form you can use to comment on the product documentation. When you contact us, we need the information on the Technical Support Form and the configuration form, if your manual contains one, about your system configuration to answer your questions as quickly as possible.

National Instruments has technical assistance through electronic, fax, and telephone systems to quickly provide the information you need. Our electronic services include a bulletin board service, an FTP site, a fax-on-demand system, and e-mail support. If you have a hardware or software problem, first try the electronic support systems. If the information available on these systems does not answer your questions, we offer fax and telephone support through our technical support centers, which are staffed by applications engineers.

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 USA 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.

Country	Telephone	Fax
Australia	03 9879 5166	03 9879 6277
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Brazil	011 288 3336	011 288 8528
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	09 725 725 11	09 725 725 55
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 6120092	03 6120095
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
United Kingdom	01635 523545	01635 523154
United States	512 795 8248	512 794 5678

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 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 _____

GPIB Software for Windows 95 Version Number on Disk _____

Programming Language Interface Version _____

Diagnostic Utility Results _____

Other Products
Resources 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 AT-GPIB/TNT+ or PCMCIA-GPIB+ and the GPIB Software for Windows 95*

Edition Date: January 1998

Part Number: 321821A-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.

_____
_____
_____
_____
_____
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_____

Thank you for your help.

Name _____

Title _____

Company _____

Address _____

_____

Phone (___)_____ Fax (___) _____

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Austin, TX 78730-5039

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

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

°	degrees
%	percent
A	amperes
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
C	Celsius
DLL	dynamic link library
DMA	direct memory access
EISA	Extended Industry Standard Architecture
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
in.	inches

I/O	input/output
IRQ	interrupt request
ISA	Industry Standard Architecture
m	meters
MB	megabytes of memory
PC	personal computer
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