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GPIB

Getting Started with Your AT-GPIB/TNT and the GPIB Software for Windows 98/95

July 1998 Edition
Part Number 322092A-01

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This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC). This equipment has been tested and found to comply with the following two regulatory agencies:

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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.

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

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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.

Canadian Department of Communications

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

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

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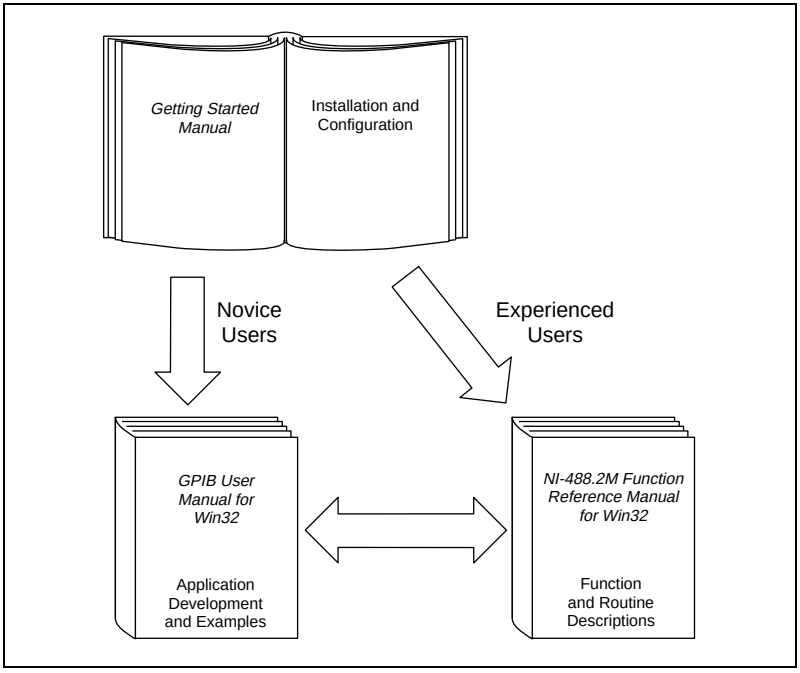
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This manual contains instructions to help you install and configure the National Instruments AT-GPIB/TNT and the GPIB software.

How to Use the Manual Set



Use this getting started manual to install and configure your AT-GPIB/TNT and the GPIB software.

Use the *GPIB User Manual for Win32* 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, provides an overview of the AT-GPIB/TNT and the GPIB software, and describes optional equipment you can order.
- Chapter 2, *Installation and Configuration*, describes how to install and configure the AT-GPIB/TNT hardware and the GPIB software.
- 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.
- Appendix A, *Uninstalling the Hardware and Software*, describes how to uninstall your AT-GPIB/TNT and the GPIB software.
- Appendix B, *Troubleshooting and Common Questions*, describes how to troubleshoot problems and answers some common questions.
- Appendix C, *Specifications*, describes the physical characteristics of the AT-GPIB/TNT, the transfer rates of the GPIB software, and the recommended operating conditions.
- Appendix D, *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 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.



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, dialog boxes, dialog box buttons or options, icons, windows, or Windows tabs.

bold italic Bold italic text denotes a note or caution.

`bold monospace` Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.

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 disk names, emphasis, a cross reference, or an introduction to a key concept.

`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 you 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*
- *LabVIEW Function and VI Overview Manual*
- *LabVIEW User Manual*
- *LabWindows/CVI Standard Libraries Reference Manual*
- *LabWindows/CVI User Manual*
- Microsoft Windows Online Help, Microsoft Corporation

Customer Communication

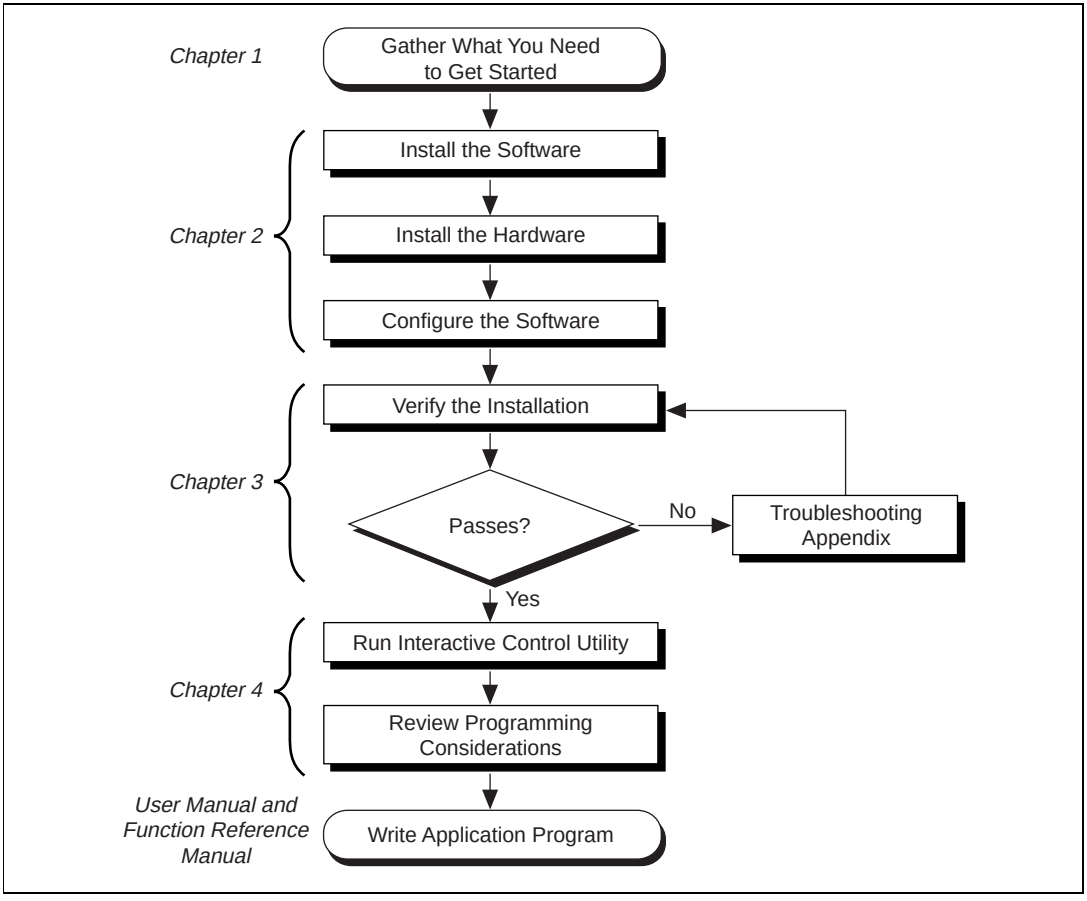
National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you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

Chapter 1

Introduction

This chapter explains how to use this manual, lists what you need to get started, provides an overview of the AT-GPIB/TNT and the GPIB software, and describes optional equipment you can order.

How to Use This Manual



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 interface
- ❑ *GPIB Software for Windows NT/98/95* CD, which comes in your kit
- ❑ GPIB cables—single-shielded or double-shielded, Type X1, X2, or X5, which you can order from National Instruments

☞ **Note:** ***If you do not have a CD drive and would like to order the GPIB software on floppy disks, contact National Instruments and order part number 777780-01.***

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 interface transforms your computer into a full-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 2.2 Mbytes/s, depending on the computer and the system configuration. For more information about transfer rates, refer to Appendix C, *Specifications*, in this manual. For more information about HS488, refer to Chapter 7, *GPIB Programming Techniques*, in the *GPIB User Manual for Win32*.

The AT-GPIB/TNT interface contains one GPIB load. You can connect up to 14 instruments to this interface. If you want to use more than 14 instruments, you can order a bus extender or expander from National Instruments. Refer to Appendix C, *Specifications*, for more information about the hardware specifications and recommended operating conditions.

GPIB Software Overview

The GPIB software includes a native, 32-bit multitasking driver that is fully Plug and Play aware. Because the AT-GPIB/TNT is not a Plug and Play interface, Windows is unable to detect its addition to or removal from your system dynamically. You must manually inform Windows about the insertion or removal of the AT-GPIB/TNT from your system.

The GPIB software 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 a PCI-GPIB in the same system at the same time. The GPIB software is fully integrated into the Windows 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 a general-purpose PC 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
- Sample applications that use NI-488 functions and NI-488.2 routines

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

Time-Saving Development Tools

Your kit includes the GPIB software for Windows. 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.

The GPIB Analyzer is another optional tool available from National Instruments that is useful in troubleshooting a variety of IEEE 488 hardware and software problems. With its built-in time-stamping capability, you can easily determine the throughput and overhead of your GPIB systems. The GPIB Analyzer software can be used with the AT-GPIB/TNT+ and PCMCIA-GPIB+ GPIB hardware, which provide GPIB Analyzer support along with the functionality of a high-performance GPIB Controller.

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

Installation and Configuration

Chapter 2

This chapter describes how to install and configure the AT-GPIB/TNT hardware and the GPIB software.

Install the GPIB Software

Before installing the hardware, complete the following steps to install the GPIB software:

1. Insert the CD *GPIB Software for Windows NT/98/95*. The CD autoplay feature automatically launches the setup wizard.

   The setup wizard guides you through the necessary steps to install the GPIB software. You can 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.

☞ **Note:** ***If you do not have a CD drive and would like to order the GPIB software on floppy disks, contact National Instruments and order part number 777780-01.***

2. When the setup is complete, restart Windows.

Install the GPIB Hardware

If you have previously installed the GPIB Compatibility Release for Windows 95/98, you should remove any system-reserved resources for your AT-GPIB/TNT. System-reserved resources are only acquired manually. If you did not use the Device Manager to acquire system-reserved resources, you do not need to use the Device Manager to remove such resources. If you do need to remove system-reserved resources, refer to the *Removing System-Reserved Resources* section of Appendix B, *Troubleshooting and Common Questions*.

Identify Resources for the AT-GPIB/TNT

Before installing the AT-GPIB/TNT, use the **Add New Hardware Wizard** to inform Windows about the new hardware you are about to install in your system.

1. Select **Start»Settings»Control Panel**.
2. Launch the **Add New Hardware Wizard** by double-clicking on the **Add New Hardware** icon.
3. Click on the **Next** button in the first **Add New Hardware Wizard** dialog box.
4. Because the AT-GPIB/TNT is not a Plug and Play interface, Windows is unable to detect its presence automatically.

   Windows 95:

   When the next **Add New Hardware Wizard** dialog box offers to detect new hardware, check **No** instead of **Yes (Recommended)**, then click on the **Next** button to continue.

   Windows 98:

   a. Click on the **Next** button in the next **Add New Hardware Wizard** dialog box.

   b. In the next dialog box, check **No, the device isn't in the list**, then click on the **Next** button to continue.

   c. In the next dialog box, check **No, I want to select the hardware from a list**, then click on the **Next** button to continue.
5. The next **Add New Hardware Wizard** dialog box lets you select the type of hardware you want to install. Select the **Other Devices** item, as shown in Figure 2-1. You may select the **National Instruments GPIB Interfaces** item instead, if it appears in the dialog box. Click on the **Next** button to continue.

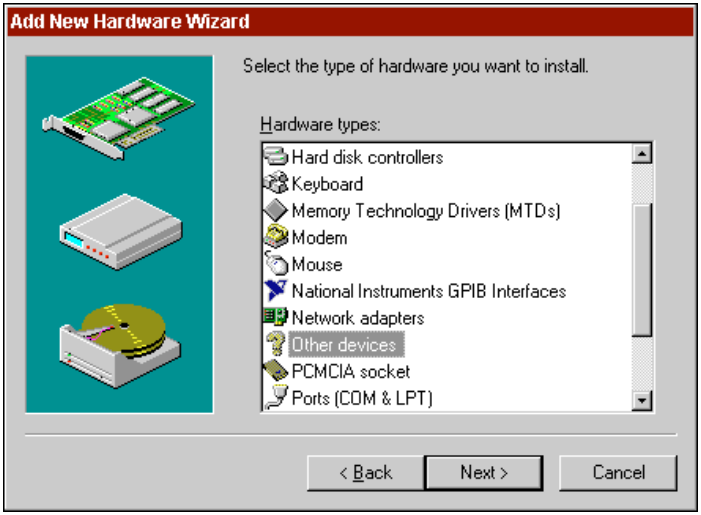


Figure 2-1. Add New Hardware Wizard Hardware Selection

6. The next **Add New Hardware Wizard** dialog box lets you select the manufacturer and model of your hardware. **Select National Instruments** as the manufacturer and **AT-GPIB/TNT** as the model, and click on the **Next** button to continue. Windows attempts to assign nonconflicting resources to the AT-GPIB/TNT.

   If Windows is able to assign resources successfully, the next **Add New Hardware Wizard** dialog box describes the resources assigned to the AT-GPIB/TNT, as shown in the example dialog box in Figure 2-2. Skip to Step 7 to proceed.

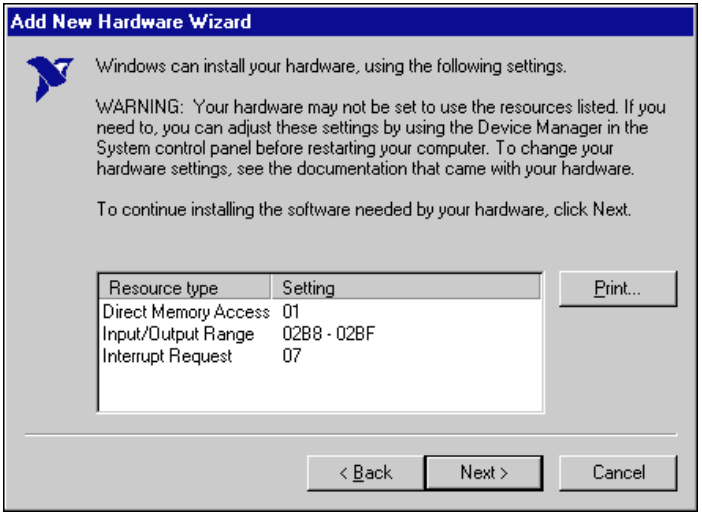


Figure 2-2. AT-GPIB/TNT Resources Assigned Successfully

If Windows is unable to assign resources successfully, the next **Add New Hardware Wizard** dialog box explains the problem, as shown in the example dialog box in Figure 2-3.

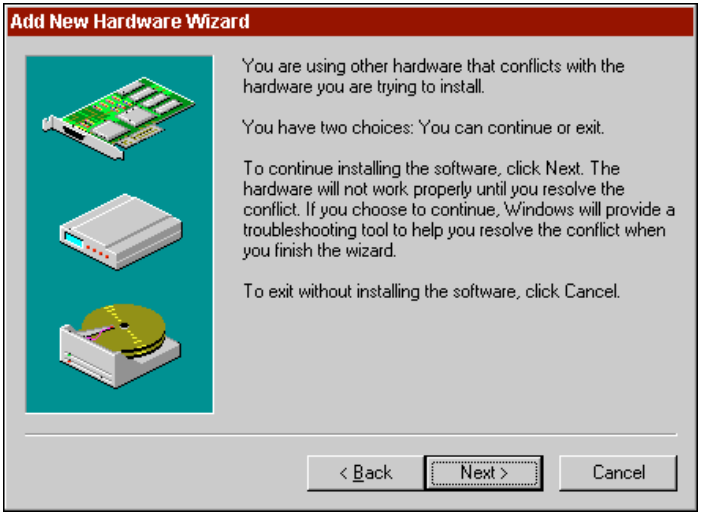


Figure 2-3. AT-GPIB/TNT Resources Not Assigned Successfully

If this dialog box appears, click on the **Next** button to continue, then click on **Start Conflict Troubleshooter** to let Windows help you determine how to resolve the conflicts that are preventing it from assigning resources. Follow all of the steps recommended by the Conflict Troubleshooter help.

When you reach the step of looking for nonconflicting resources for the AT-GPIB/TNT, you need to change the **Setting based on** selection on the **Resources** page of the **AT-GPIB/TNT Properties** dialog box to a configuration other than **Basic configuration 0** or **Basic configuration 1**, as shown in Figure 2-4.

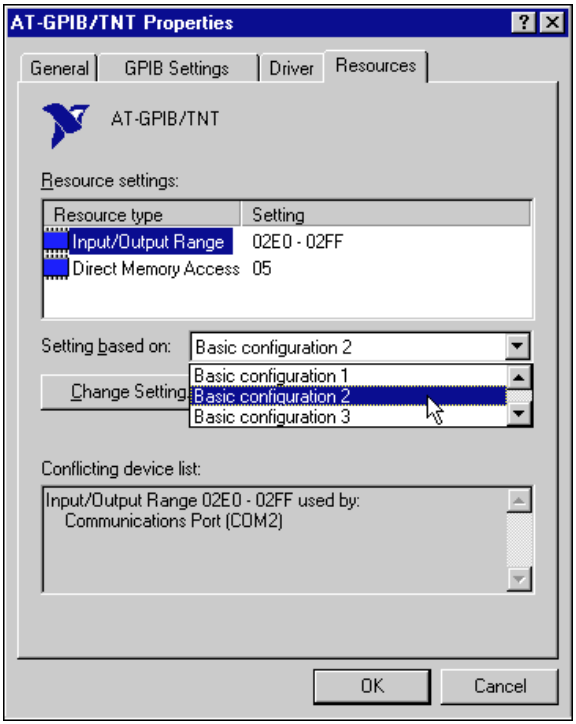


Figure 2-4. AT-GPIB/TNT Resources Settings

Continue following the instructions provided by the Conflict Troubleshooter to resolve the conflicts.

7. Write down the conflict-free resources that Windows assigned to the AT-GPIB/TNT.
8. Shut down Windows.

Configure the AT-GPIB/TNT

Caution: ***Electrostatic discharge can damage several components on the AT-GPIB/TNT. To avoid such damage in handling the board, touch the antistatic plastic package to a metal part of your computer chassis before removing the board from the package.***

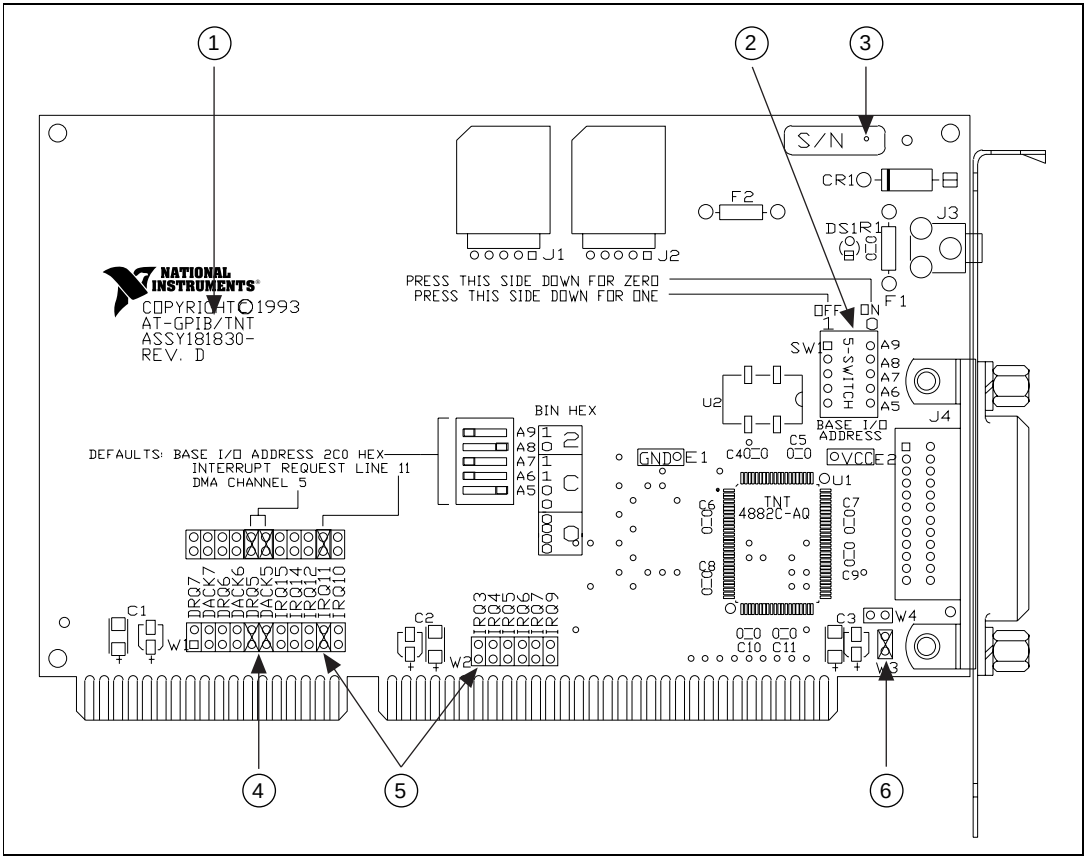
Configure the AT-GPIB/TNT jumpers and switches to match the resources assigned to it by Windows. If the resources assigned to it match the default settings, you are ready to install the AT-GPIB/TNT.

Table 2-1 shows the default settings for the switches and jumpers on the GPIB board.

Table 2-1. AT-GPIB/TNT Hardware Default Settings

GPIB Board Setting	Default
I/O range	2C0-2DF
DMA channel	5
Interrupt line (IRQ)	11

If the resources do not match the default settings, you must reconfigure the jumpers and switches, as described in the next few sections, to match the resources assigned to the AT-GPIB/TNT by Windows. Figure 2-5 shows the location of the configuration jumpers and switches on the AT-GPIB/TNT.



1	Product Name, Revision Letter, and Assembly Letter	2	Base I/O Address	4	DMA Channel	6	Shield Ground
		3	Serial Number	5	Interrupt Request Jumper		

Figure 2-5. AT-GPIB/TNT Parts Locator Diagram

Configure the AT-GPIB/TNT Input/Output Range

An I/O range is a segment of address space reserved for the input and output of a board. The base I/O address of an Input/Output Range is the first position in the Input/Output Range used by the plug-in interface board. By default, the AT-GPIB/TNT is configured to use base I/O address 2C0 hex. With this setting, the board uses an Input/Output Range of 2C0 hex to 2DF hex.

Follow these steps to reconfigure the base I/O address of the AT-GPIB/TNT:

1. Locate the base I/O address switch at SW1 on your AT-GPIB/TNT board. Refer to the parts locator diagram, Figure 2-5.
2. Change the switch settings to configure the GPIB board to match the base I/O address of the Input/Output Range assigned by Windows.

   Press down on the side marked OFF to select a binary value of 1 for the corresponding address bit. Press down on the ON side of the switch to select a binary value of 0. Refer to Figure 2-6 for an example of the switch settings and corresponding base I/O addresses. Table 2-2 shows the possible switch settings, the corresponding base I/O addresses, and the I/O address space used for each setting. The default settings are in ***bold italics***.

Table 2-2. Possible Base I/O Address Switch Settings for AT-GPIB/TNT

Switch Setting					Base I/O Address (hex)	I/O Address Space Used (hex)
A9	**A8**	**A7**	**A6**	**A5**		
0	1	0	0	0	100	100 to 11F
0	1	0	0	1	120	120 to 13F
0	1	0	1	0	140	140 to 15F
0	1	0	1	1	160	160 to 17F
0	1	1	0	0	180	180 to 19F
0	1	1	0	1	1A0	1A0 to 1BF
0	1	1	1	0	1C0	1C0 to 1DF
0	1	1	1	1	1E0	1E0 to 1FF
1	0	0	0	0	200	200 to 21F
1	0	0	0	1	220	220 to 23F
1	0	0	1	0	240	240 to 25F
1	0	0	1	1	260	260 to 27F

Table 2-2. Possible Base I/O Address Switch Settings for AT-GPIB/TNT (Continued)

Switch Setting					Base I/O Address (hex)	I/O Address Space Used (hex)
A9	A8	A7	A6	A5		
1	0	1	0	0	280	280 to 29F
1	0	1	0	1	2A0	2A0 to 2BF
1	***0***	***1***	***1***	***0***	***2C0***	***2C0 to 2DF***
1	0	1	1	1	2E0	2E0 to 2FF
1	1	0	0	0	300	300 to 31F
1	1	0	0	1	320	320 to 33F
1	1	0	1	0	340	340 to 35F
1	1	0	1	1	360	360 to 37F
1	1	1	0	0	380	380 to 39F
1	1	1	0	1	3A0	3A0 to 3BF
1	1	1	1	0	3C0	3C0 to 3DF
1	1	1	1	1	3E0	3E0 to 3FF

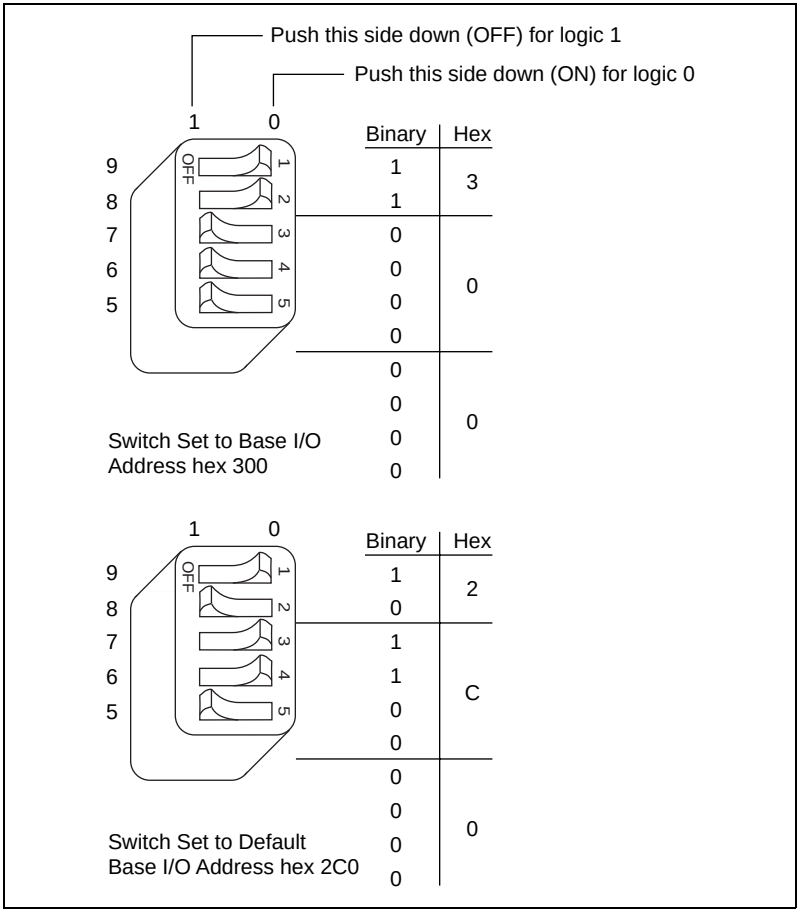


Figure 2-6. AT-GPIB/TNT Base I/O Address Switch Settings

Configure the AT-GPIB/TNT Interrupt Request

PC AT-compatible computers have a series of interrupt lines available to devices. Devices use interrupts to get immediate service from the CPU for asynchronous events. Your GPIB hardware and software use interrupts to get service from the CPU when necessary. By default, the AT-GPIB/TNT is configured to use interrupt request line 11.

☞ **Note:** ***If there are no interrupt lines available for your GPIB hardware, the jumpers that set the interrupt request line have no effect. You can leave them at the default setting.***

Follow these steps to reconfigure the interrupt request line:

1. Find the jumpers that set the interrupt request line. The jumpers are located on the lower edge of your AT-GPIB/TNT. Refer to the parts locator diagram, Figure 2-5.
2. Change the jumper settings to configure the AT-GPIB/TNT to the new interrupt request line.

   To use lines 10, 11, 12, or 15, use the jumper block shown in Figure 2-7. To use interrupt lines 3, 4, 5, 7, or 9, use the jumper block shown in Figure 2-8.

Figure 2-7 shows the setting for IRQ11.

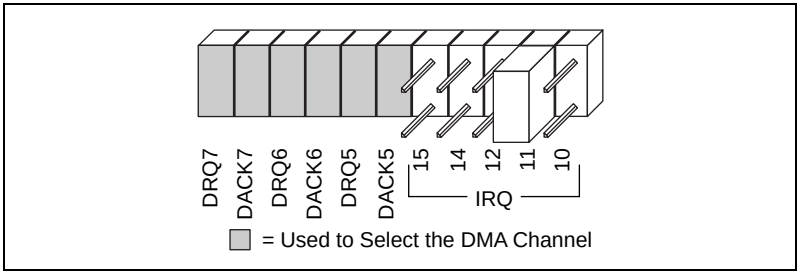


Figure 2-7. AT-GPIB/TNT Interrupt Jumper Setting for IRQ11 (Default Setting)

Figure 2-8 shows the setting for IRQ5.

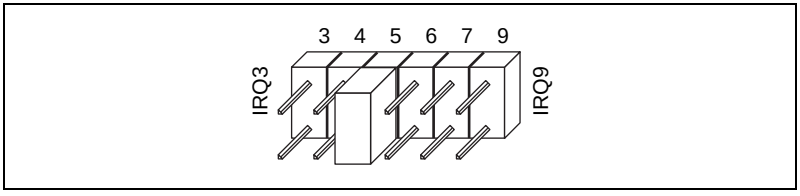


Figure 2-8. AT-GPIB/TNT Interrupt Jumper Setting for IRQ5

Configure the AT-GPIB/TNT Direct Memory Access

Direct memory access (DMA) refers to data transfers directly to or directly from devices such as the AT-GPIB/TNT and computer memory. Your GPIB hardware and software are designed to perform DMA. Programmed I/O transfers use more CPU time. However, if Windows is unable to assign a DMA resource to the AT-GPIB/TNT, you can configure DMA to none and still use the GPIB software. By default, the AT-GPIB/TNT is configured to use DMA channel 5.

Follow these steps to reconfigure the DMA channel:

1. Locate the jumpers that select the DMA channel. Refer to the parts locator diagram, Figure 2-5.
2. Change the jumper settings to configure the GPIB board to the new DMA channel. To select a new DMA channel, you must set both the DMA Acknowledge and DMA Request lines, as shown in Table 2-3.

Table 2-3. AT-GPIB/TNT DMA Channel Settings

DMA Channel	Signal Lines	
	DMA Acknowledge	**DMA Request**
5	DACK5	DRQ5
6	DACK6	DRQ6
7	DACK7	DRQ7
none	—	—

Figure 2-9 shows the jumper position for selecting DMA channel 7.

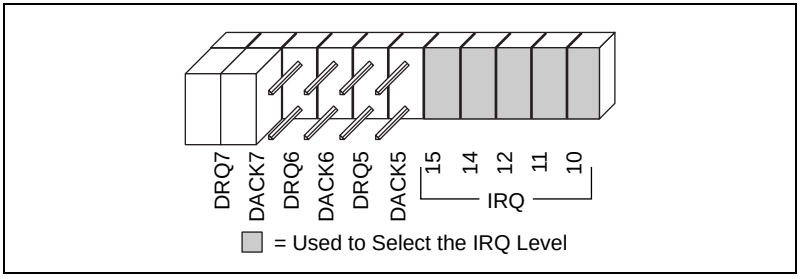


Figure 2-9. AT-GPIB/TNT DMA Jumper Setting for DMA Channel 7

Figure 2-10 shows the jumper position for selecting no DMA channel.

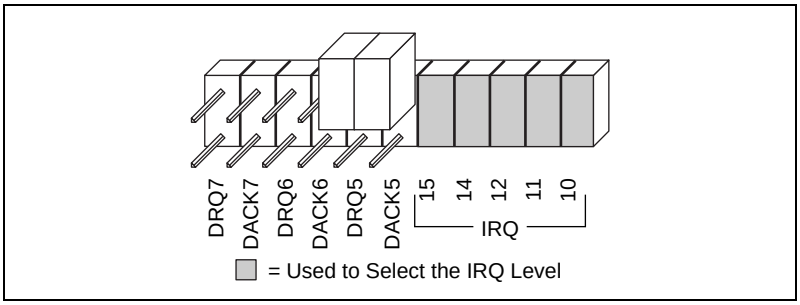


Figure 2-10. AT-GPIB/TNT DMA Jumper Setting for No DMA Channel

Setting the AT-GPIB/TNT Shield Ground Configuration

The AT-GPIB/TNT is set at the factory with the jumper in place to connect the logic ground of the AT-GPIB/TNT to its shield ground. This configuration minimizes EMI emissions.

Caution: ***The AT-GPIB/TNT was tested for compliance with FCC standards with the shield ground connected to logic ground. Removing the jumper might cause EMI emissions to exceed any or all of the applicable standards.***

If your application requires that logic ground be disconnected from shield ground, follow these steps:

1. Refer to Figure 2-5 to locate the shield ground jumper W3 on the AT-GPIB/TNT.
2. Remove the jumper and place it across only one of the jumper pins, as shown in Figure 2-11.

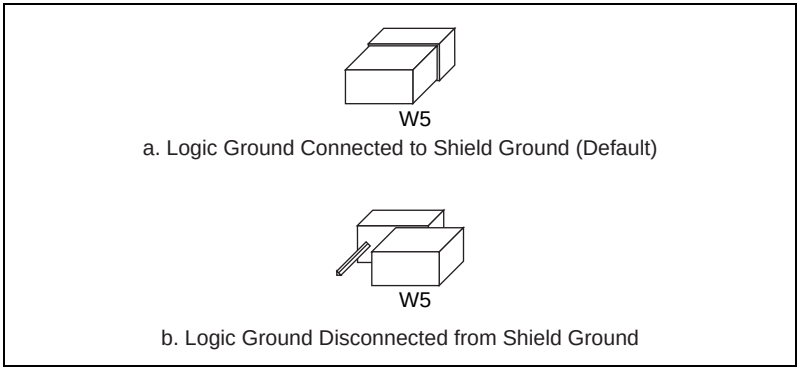


Figure 2-11. AT-GPIB/TNT Ground Configuration Jumper Settings

3. Record the jumper setting on the *Hardware and Software Configuration Form* in Appendix D, *Customer Communication*.

Now that you have properly configured the hardware, continue to the *Install the AT-GPIB/TNT* section for installation instructions.

Install the AT-GPIB/TNT

Complete the following steps to install the AT-GPIB/TNT board:

1. Shut down Windows 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. The AT-GPIB/TNT requires a 16-bit ISA expansion slot.
4. Remove the corresponding slot cover on the back panel of the computer.
5. Insert the AT-GPIB/TNT into the slot with the GPIB connector sticking out of the opening on the back panel, as shown in Figure 2-12. It might be a tight fit, but do not force the board into place.

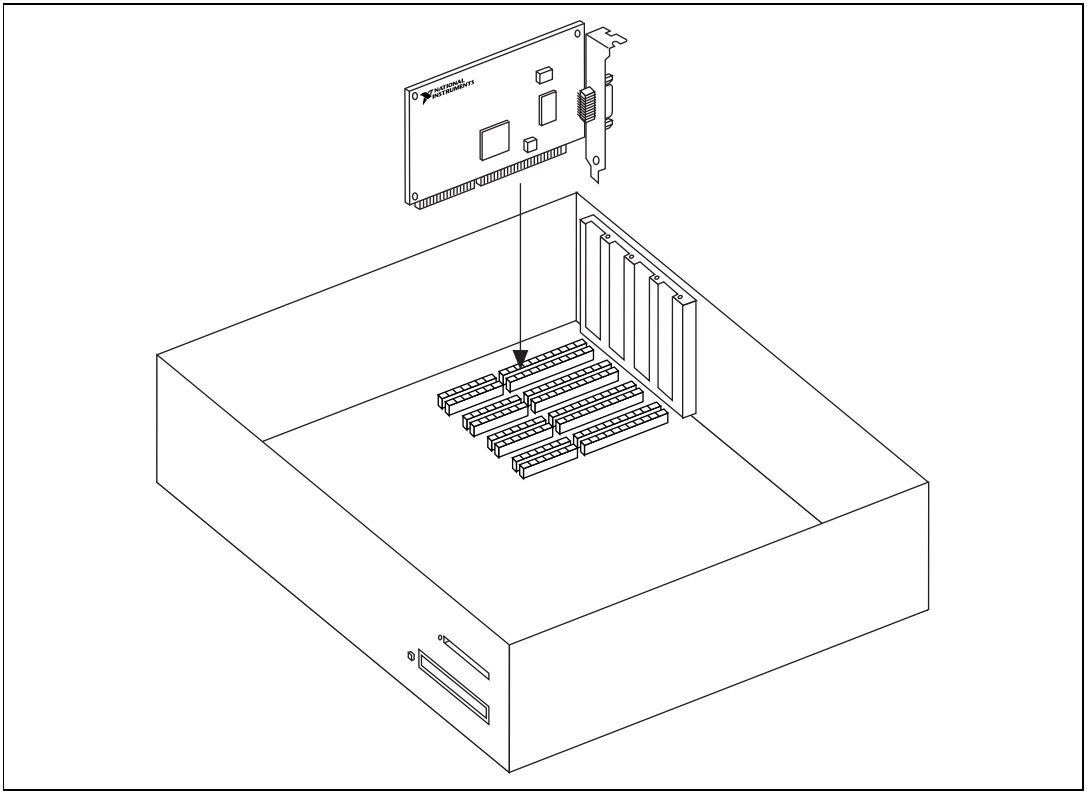


Figure 2-12. Installing the AT-GPIB/TNT

6. Screw the mounting bracket of the AT-GPIB/TNT to the back panel rail of the computer.
7. Replace the top cover (or the access port to the expansion slot).
8. Power on your computer and start Windows.

The AT-GPIB/TNT hardware installation is now complete. Proceed to the *Configure the GPIB Software* section later in this chapter.

Configure the GPIB Software

The GPIB Configuration utility is fully integrated with the Windows 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 might assign incorrect resources to your AT-GPIB/TNT. If this happens, Windows shows that the AT-GPIB/TNT 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 2-13 shows an example of a AT-GPIB/TNT that is working properly, and Figure 2-14 shows an example of a AT-GPIB/TNT that is not working properly.



Figure 2-13. GPIB Interface That Is Working Properly



Figure 2-14. 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 B, *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 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 2-15 shows the **GPIB Settings** page for an AT-GPIB/TNT.

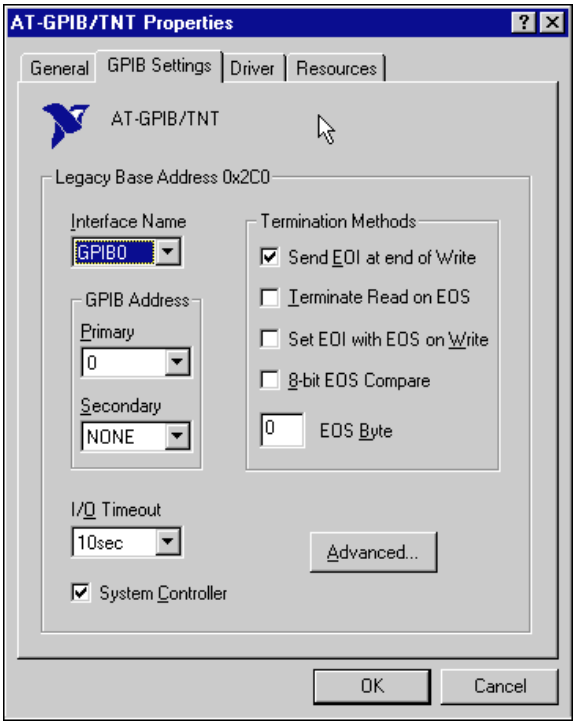


Figure 2-15. GPIB Settings Page for the AT-GPIB/TNT

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 2-16.

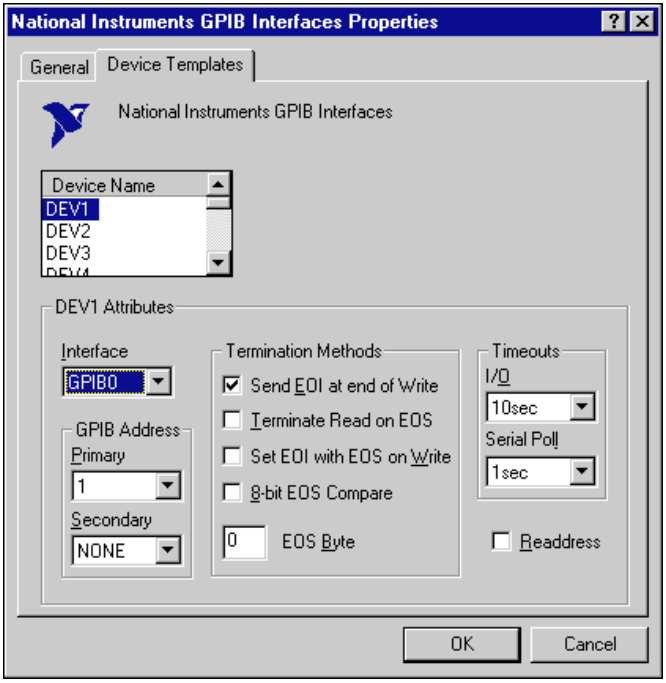


Figure 2-16. Device Templates Page for the Logical Device Templates

Chapter 3

Verify the Installation

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

The Diagnostic utility, installed with your GPIB software, verifies that your hardware and software are functioning properly. To run the utility, select the **Diagnostic** item under **Start»Programs»National Instruments GPIB**.

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.

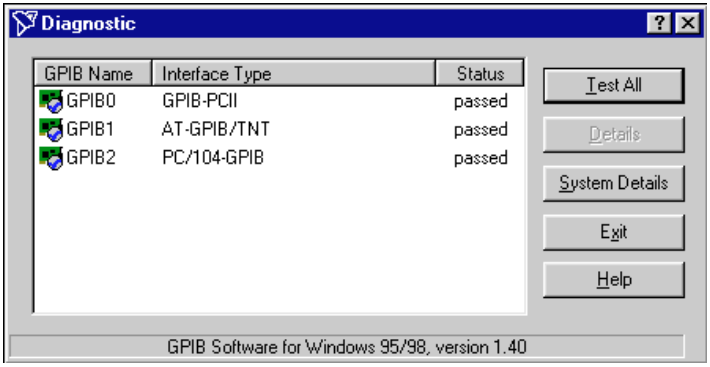


Figure 3-1. Diagnostic Utility after Testing

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, *Specifications*, 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

Chapter 4

This chapter helps you get started with the GPIB software.

Getting Started with LabVIEW

LabVIEW is a fully-functional graphical programming environment used to develop measurement and automation applications. LabVIEW features comprehensive libraries for instrument control, data analysis, and data presentation. If you already installed LabVIEW, you can use the LabVIEW GPIB functions without any additional installation. To learn about the basic concepts of GPIB communication, refer to the LabVIEW GPIB functions chapter in the *LabVIEW User Manual*. To learn more about each GPIB function, refer to the *LabVIEW Function and VI Overview Manual* and the online help.

National Instruments provides LabVIEW instrument drivers to simplify application development. Instrument drivers are high-level functions that eliminate the need to learn the complex, low-level programming commands for each instrument. For more information, refer to Chapter 7, *Getting Started with a LabVIEW Instrument Driver*, in the *LabVIEW User Manual*. If you want to write your own instrument driver, National Instruments provides application notes that help you get started.

To use instrument drivers in LabVIEW, select the **Instrument Wizard** from the **Project** menu.

For more information about National Instruments products, refer to our web site at `http://www.natinst.com/products/`.

Getting Started with LabWindows/CVI

LabWindows/CVI is an interactive C development environment used to build measurement and automation applications. It provides comprehensive libraries for instrument control, data analysis, and data presentation. If you already installed LabWindows/CVI, you can use the LabWindows/CVI GPIB Library without any additional installation. The

LabWindows/CVI GPIB Library includes the functions documented in your NI-488.2 or NI-488.2M reference manual, as well as several additional functions, which are documented in the GPIB library chapter of the *LabWindows/CVI Standard Libraries Reference Manual*. To help you use the GPIB functions, LabWindows/CVI provides function panels for the GPIB Library. To access the function panels, select **GPIB/GPIB 488.2** from the **Library** menu of the **Project** or **Source** windows. For information about using function panels, refer to the function panels chapter in the *LabWindows/CVI User Manual*.

If you need to program a GPIB instrument, you might want to use an instrument driver. An instrument driver is a set of high-level C functions for controlling a specific instrument. The low-level steps to control the instrument and read data are encapsulated in the high-level functions. You can write an instrument driver yourself, or you can use one that is already written. When you purchase LabWindows/CVI, you get free access to a library of drivers for hundreds of instruments. For more information about instrument drivers, refer to the project window chapter in the *LabWindows/CVI User Manual*.

For more information about National Instruments products, please refer to our web site at `http://www.natinst.com/products/`.

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 **Start»Programs»National Instruments GPIB»Win32 Interactive Control**. 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 Win32*.

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 **Start»Programs»National Instruments GPIB» NI Spy**. For more information about the NI Spy utility, refer to Chapter 5, *NI Spy Utility*, in the *GPIB User Manual for Win32*, 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, 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. Click on 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.

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 Win32*. 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»National Instruments GPIB»GPIB32 Help**.

Uninstalling the Hardware and Software

Appendix
A

This appendix describes how to uninstall your AT-GPIB/TNT and the GPIB software.

Uninstalling the Hardware

Before you physically remove the GPIB hardware from your system, you must remove the hardware information from the Windows 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. Select the interface you want to remove from the **National Instruments GPIB Interfaces** list, as shown in Figure A-1. Click on the **Remove** button to remove the hardware information.

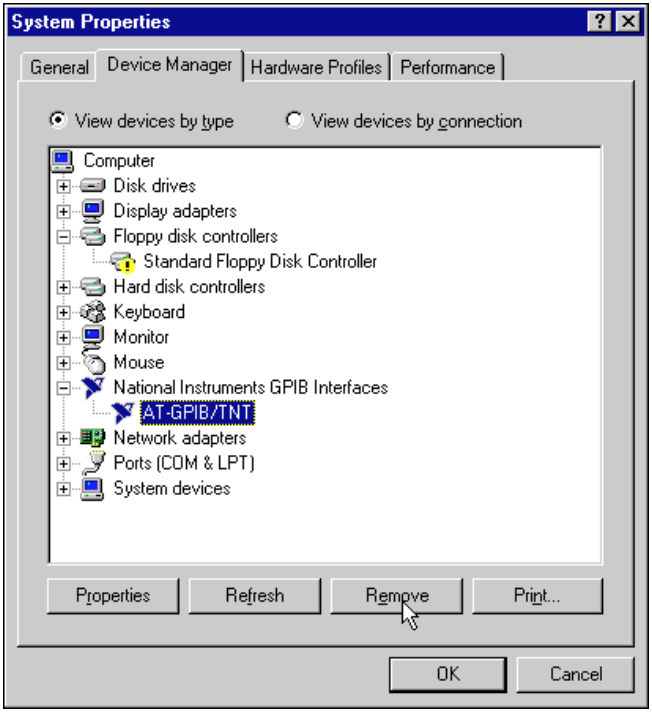


Figure A-1. Selecting an Interface to Remove

4. Click on the **OK** button, shut down Windows, turn off your system, and physically remove the interface from your system.

Uninstalling the Software

Before you uninstall the GPIB software, you should remove all GPIB hardware information from the Windows 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.

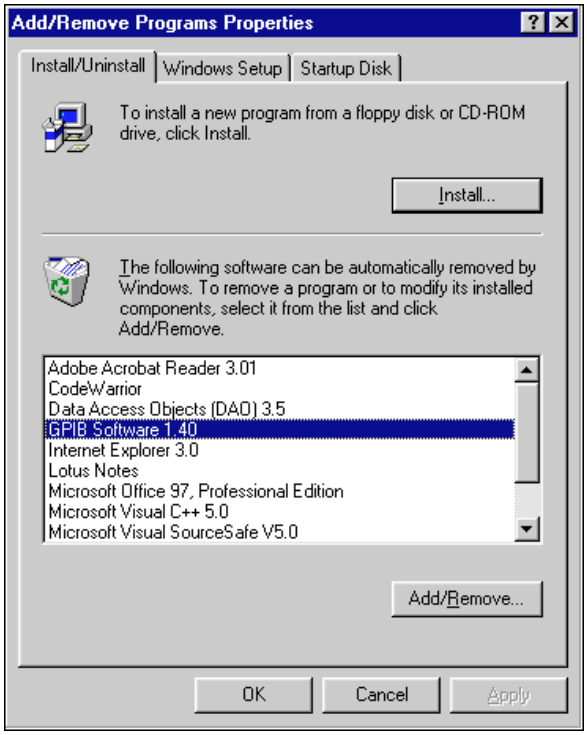


Figure A-2. Add/Remove Programs Properties Dialog Box

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.

If you have not physically removed your hardware, shut down Windows, 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*.

Troubleshooting and Common Questions

Appendix B

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 about 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 indicates that the GPIB interface is not working properly. Refer to the *GPIB Interface Not Working Properly* section later in this appendix.

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 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 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

The **National Instruments GPIB Interfaces** item might be missing from the Device Manager because you have not yet used the **Add New Hardware Wizard** in the **Control Panel** to add the new GPIB hardware to the system. To start the **Add New Hardware Wizard**, double-click on the **Add New Hardware** icon under **Start»Settings» Control Panel**. For details on how to use the **Add New Hardware**

Wizard to add information about GPIB hardware, refer to the hardware installation section in Chapter 2, *Installation and Configuration*.

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 GPIB hardware, this means that the **Add New Hardware Wizard** has not been run to add the new hardware to your Windows system. To run the **Add New Hardware Wizard**, double-click on the **Add New Hardware** icon under **Start»Settings»Control Panel**. For details on how to use the **Add New Hardware Wizard** to add information about GPIB hardware, refer to the hardware installation section in Chapter 2, *Installation and Configuration*.

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 B-1.

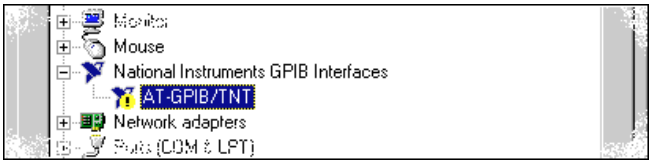


Figure B-1. GPIB Interface That Is Not Working Properly

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. To solve this problem, reinstall the GPIB software.
- 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 installed, or it is not configured to match the resources assigned to it. Either install the GPIB interface, or verify that the resources assigned to it on the **Resources** page match its settings.
- Code 27: Windows 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.

Removing System-Reserved Resources

If you have previously installed the Compatibility Release for Windows 98/95, you should remove any system-reserved resources for your AT-GPIB/TNT. System-reserved resources are only acquired manually. If you did not use the Device Manager to acquire system-reserved resources, you do not need to use the Device Manager to remove such resources.

To remove any resources that you reserved for your AT-GPIB/TNT, complete the following steps:

1. Select **Start»Settings»Control Panel**.
2. Run the **System Properties** applet by double-clicking on the **System** icon.
3. In the **System Properties** dialog box that appears, select the **Device Manager** tab.
4. Click on the **View devices by type** button at the top of the **Device Manager** page.
5. Double-click on the **Computer** icon.
6. In the **Computer Properties** dialog box that appears, click on the **Reserve Resources** tab.
7. Remove the **Interrupt request (IRQ)**, **Input/output (I/O)**, and **Direct memory access (DMA)** resources that you reserved for the AT-GPIB/TNT.
8. Click on the **OK** button to exit the **Computer Properties** dialog box.
9. Click on the **OK** button again to exit the **Device Manager** dialog box.

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 to function correctly are not present in the system. If you encounter this problem, reinstall the GPIB software 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 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 earlier 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 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 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 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.

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.

Common Questions

What do I do if my GPIB hardware is listed in the Windows 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 information about what might cause this problem. If you have already completed the troubleshooting steps, fill out the forms in Appendix D, *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»National Instruments GPIB.** A banner at the bottom of the Diagnostic utility window displays the version of the GPIB software that is installed.

I have a GPIB interface that the GPIB software for Windows 98/95 does not support. What should I do?

Contact National Instruments to order the Compatibility Release for Windows 95/98 or to upgrade your hardware.

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 D, *Customer Communication*, and contact National Instruments.

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

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

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

The GPIB software for Windows 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 ?

Neither interrupts nor DMA are required.

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

Run the Diagnostic utility: select the **Diagnostic** item under **Start» Programs»National Instruments GPIB**. 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 *Getting Started with LabVIEW* 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 Win32*.

How do I modify the hardware resources that Windows assigned to my AT-GPIB/TNT?

To modify the hardware resources assigned to the AT-GPIB/TNT, 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, and

double-click on the **National Instruments GPIB Interfaces** icon. Next, double-click on the **AT-GPIB/TNT** item under **National Instruments GPIB Interfaces**, and click on the **Resources** tab. Use the **Settings based on** list box or the **Change Setting** button to modify the resources used by your AT-GPIB/TNT. Make sure to update the switches and jumpers on your board to match the new assigned resources.

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.

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 D, *Customer Communication*.

Specifications

Appendix
C

This appendix describes the physical characteristics of the AT-GPIB/TNT, the transfer rates of the GPIB software, and the recommended operating conditions.

Hardware Characteristics

Table C-1. AT-GPIB/TNT Hardware Characteristics

Characteristic	Specification
Dimensions	10.67 cm by 16.51 cm (4.2 in. by 6.5 in.)
Power Requirement (from PC AT I/O Channel)	+5 VDC 50 mA Typical 120 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

Software Transfer Rates

Table C-2. GPIB Software Transfer Rates for the AT-GPIB/TNT

Transfer Method	Maximum GPIB Transfer Rate
3-Wire (IEEE 488)	1.5 Mbytes/s*
High Speed (HS488)	2.2 Mbytes/s*
* Actual speed may vary considerably from speed shown because of system and instrumentation capabilities.	

Customer Communication

Appendix
D

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 (Québec)	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 NT/98/95 Date on CD _____

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 and the GPIB Software for Windows 98/95*

Edition Date: July 1998

Part Number: 322092A-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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_____

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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
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(512) 794-5678

Glossary

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
B	bytes
base I/O address	lowest I/O address used by the GPIB hardware
C	Celsius
CPU	central processing unit
DLL	dynamic link library
DMA	direct memory access
EMI	electromagnetic interference
FCC	Federal Communications Commission
GPIB	General Purpose Interface Bus
hex	hexadecimal

Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
I/O	input/output
IRQ	interrupt request
ISA	Industry Standard Architecture
LED	light-emitting diode
legacy board	ISA board whose system resources are chosen by changing physical DIP switches or jumpers on the board
m	meters
MB	megabytes of memory
PC	personal computer
PCI	Peripheral Components Interconnect
PCMCIA	Personal Computer Memory Card International Association
PLC	programmable logic controller
RAM	random-access memory
resource	hardware settings used by devices in a computer system, including ISA interrupt request, DMA channel, and base I/O address
s	seconds
VDC	volts direct current
VXI	VME eXtensions for Instrumentation

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