

**GPIB**

# Getting Started with Your AT-GPIB/TNT and the NI-488.2M<sup>™</sup> Software for Windows 95

November 1995 Edition  
Part Number 321036A-01

# Important Information

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## Warranty

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

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# FCC/DOC Radio Frequency Interference Compliance

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

## Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class B digital device. A Class B device is distinguishable from a Class A device by the appearance of an FCC ID number located on the Class B device.

## Canadian Department of Communications

This device complies with the limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications (DOC).

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

## Instructions to Users

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

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

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

- Operate the equipment and the receiver on different branches of your AC electrical system.
- Move the equipment away from the receiver with which it is interfering.
- Reorient or relocate the receiver's antenna.
- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

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

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

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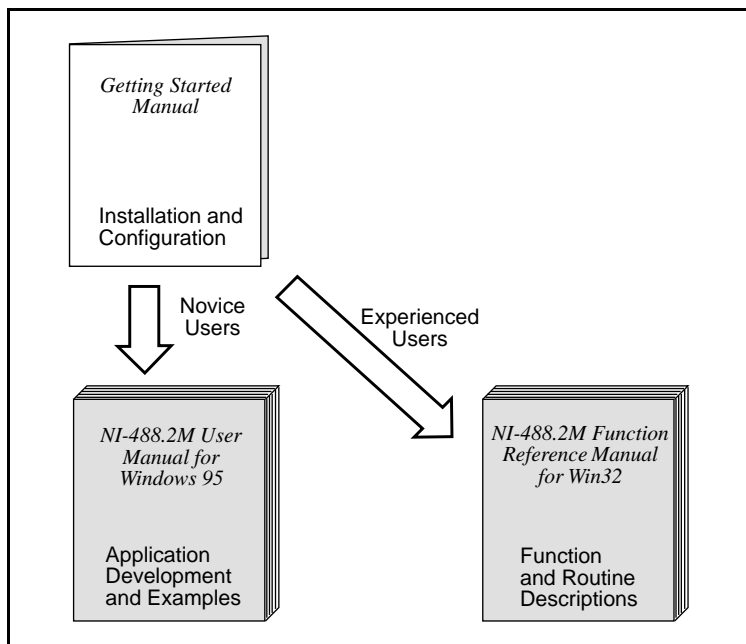
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## *About This Manual*

This manual contains instructions to help you install and configure the National Instruments AT-GPIB/TNT hardware and NI-488.2M 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 AT-GPIB/TNT and the NI-488.2M software for Windows 95.

Use the *NI-488.2M User Manual for Windows 95* to learn the basics of GPIB and how to develop an application program. The user manual also contains debugging information and detailed examples.

Use the *NI-488.2M Function Reference Manual for Win32* for specific NI-488 function and NI-488.2 routine information, such as format, parameters, and possible errors.

## Organization of This Manual

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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 the NI-488.2M software for Windows 95.
- Chapter 2, *Installation and Configuration*, describes how to install and configure the AT-GPIB/TNT hardware and the NI-488.2M software for Windows 95.
- Chapter 3, *Verify the Installation*, describes how to verify the hardware and software installation.
- Chapter 4, *Begin to Use the NI-488.2M Software*, helps you get started with the NI-488.2M software for Windows 95.
- Appendix A, *Uninstall the Hardware and Software*, describes how to uninstall the AT-GPIB/TNT hardware and NI-488.2M software from Windows 95.
- 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 and the transfer rates of the NI-488.2M software, along with 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

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	The following conventions are used in this manual.
<b>bold</b>	Bold text denotes menus, menu items, dialog boxes, dialog buttons, or options.
<i>italic</i>	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
<b>bold italic</b>	Bold italic text denotes a note, caution, or warning.
monospace	Text in this font denotes text or characters that are to be literally input from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, directories, programs, subprograms, subroutines, device names, functions, variables, field names and filenames.
<b>bold monospace</b>	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence <b>File»Page Setup»Options»Substitute Fonts</b> directs you to pull down the <b>File</b> menu, select the <b>Page Setup</b> item, select <b>Options</b> , and finally select the <b>Substitute Fonts</b> option from the last dialog box.
IEEE 488 and IEEE 488.2	<i>IEEE 488</i> and <i>IEEE 488.2</i> refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1992, respectively, which define the GPIB.  Abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms are listed in the <i>Glossary</i> .

## Related Documentation

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The following documents contain information that you may find helpful as you read this manual.

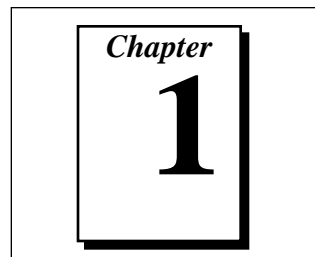
- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- *Microsoft Windows 95 User's Guide*, Microsoft Corporation

## Customer Communication

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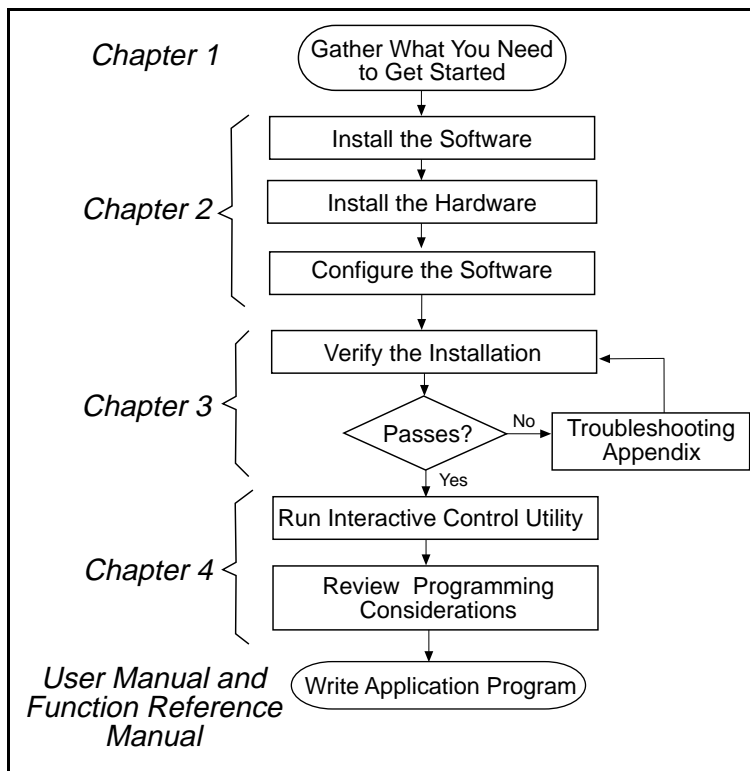
National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you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

# 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 hardware and the NI-488.2M software for Windows 95.

## How to Use This Manual



## What You Need to Get Started

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

- Windows 95 installed on your computer
- AT-GPIB/TNT interface board
- The following 3.5 in., high density (1.44 MB) disks, which come in your kit:
  - GPIB Software for Windows 95 (Setup Disk)*
  - GPIB Software for Windows 95 (NI-488.2M Software)*
- GPIB cables—single-shielded or double-shielded, Type X1, X2, or X5, which you can order from National Instruments

## Optional Equipment

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

- Serial or parallel bus extender and cables
- Bus expander/isolator
- GPIB mechanical switch
- GPIB data buffer

## AT-GPIB/TNT Hardware Overview

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The AT-GPIB/TNT is a legacy board that transforms any PC-compatible 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 8 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 6, *GPIB Programming Techniques*, in the *NI-488.2M User Manual for Windows 95*.

The AT-GPIB/TNT contains one GPIB load, and you can connect the AT-GPIB/TNT with up to 14 instruments. 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.

## NI-488.2M Software Overview

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The NI-488.2M software includes a native, 32-bit multitasking Windows 95 driver that is fully Plug and Play aware. Because the AT-GPIB/TNT is a legacy board, Windows 95 is unable to detect its addition to or removal from your system dynamically. You must manually inform Windows 95 about the insertion or removal of the AT-GPIB/TNT from your system. This manual fully describes the insertion and removal procedures.

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

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

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

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

## Optional Programming Tools

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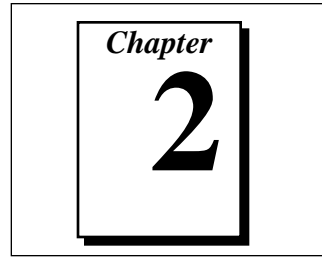
Your kit includes the NI-488.2M software for Windows 95. In addition, you can order the LabVIEW software from National Instruments. LabVIEW includes instrument driver libraries that make it easier to communicate with your GPIB instruments.

LabVIEW is a complete programming environment that departs from the sequential nature of traditional programming languages and features a graphical programming environment. It includes all the tools needed for instrument control, data acquisition, analysis, and presentation. LabVIEW also includes an extensive instrument driver library.

For more information about LabVIEW, contact National Instruments.

# Installation and Configuration

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This chapter describes how to install and configure the AT-GPIB/TNT hardware and the NI-488.2M software for Windows 95.

## System Preparation

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If you have been using your AT-GPIB/TNT in Windows 95 with either the NI-488.2 software for Windows 3 or the Compatibility Release for Windows 95, you need to remove any system resources that you reserved for the AT-GPIB/TNT in the Device Manager before installing the NI-488.2M software for Windows 95. Notice that 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, and you can proceed to the next section, *Install the Software*.

To remove any system-reserved resources, complete the following steps.

1. Select **Start»Settings»Control Panel**.
2. Run the **System** applet by double-clicking on the **System** icon.
3. In the **System Properties** dialog box that appears, select the **Device Manager** tab.
4. Click the **View devices by type** button at the top of the **Device Manager** page.
5. Double-click the **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 use by the AT-GPIB/TNT.
8. Click **OK** to exit the **Computer Properties** dialog box.
9. Click **OK** again to exit the Device Manager.

## Install the Software

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Before installing the hardware, complete the following steps to install the NI-488.2M software for Windows 95.

1. Select **Start»Settings»Control Panel**.
2. Run the **Add/Remove Programs** applet. A dialog box similar to the one in Figure 2-1 appears.

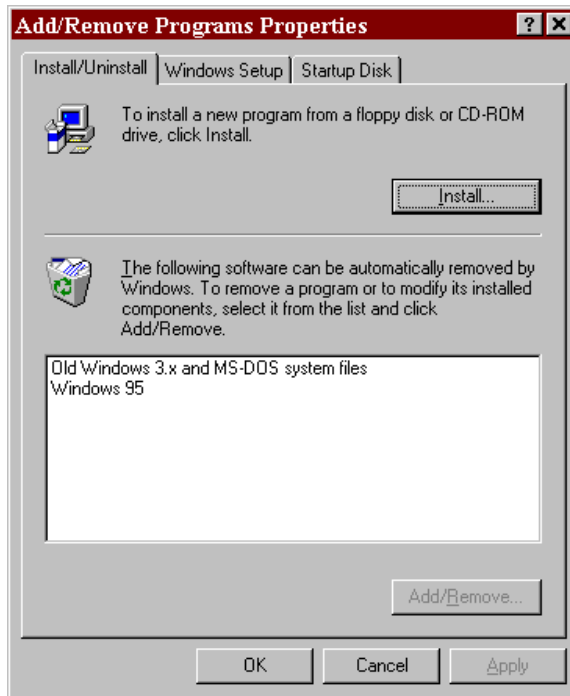


Figure 2-1. Add/Remove Programs Properties Dialog Box

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

3. Click on the **Install...** button.
4. Insert the *GPIB Software for Windows 95 (Setup Disk)*, and click on the **Next** button to proceed.
5. The software installation wizard begins with the screen shown in Figure 2-2. Choose the appropriate type of installation to begin the setup process. If you want to view an online copy of this manual, click the first option. If you are ready to install one or more of the



software components, click the second option. The third option does not apply to the software for the AT-GPIB/TNT.

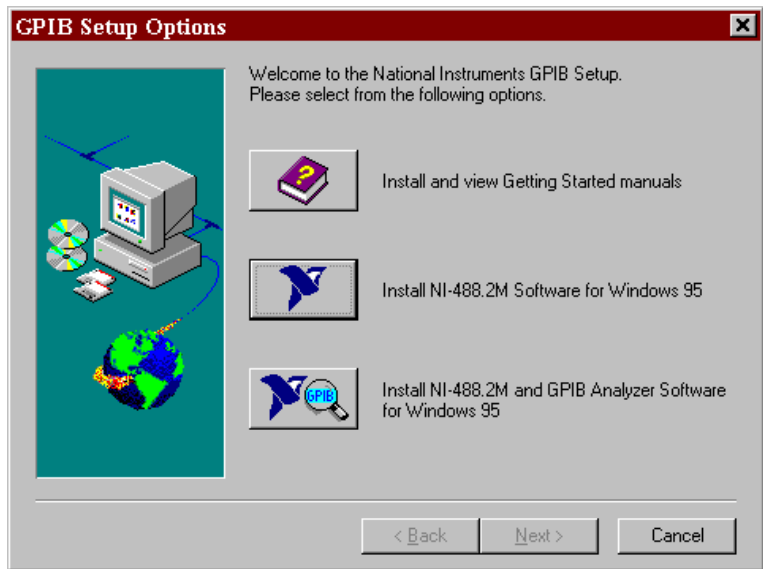


Figure 2-2. GPIB Software Setup Screen

The setup wizard guides you through the necessary steps to install the NI-488.2M software. You may go back and change values where appropriate by choosing **Back**. You can exit the setup where appropriate by choosing **Cancel**.

6. If you need to install the hardware, or this is your first time to use the NI-488.2M software for Windows 95, shut down Windows 95 and proceed to the next section, *Install the Hardware*. Otherwise, when you have finished the setup process, restart Windows 95 and proceed to Chapter 3, *Verify the Installation*.

## Install the Hardware

### Identify Resources for the AT-GPIB/TNT

Before installing the AT-GPIB/TNT, use the **Add New Hardware Wizard** to inform Windows 95 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 the **Add New Hardware** icon.
3. Click the **Next** button in the first **Add New Hardware Wizard** dialog box.
4. In the next **Add New Hardware Wizard** dialog box, you must check **No** instead of **Yes (Recommended)**. Because the AT-GPIB/TNT is a legacy (ISA) board, Windows 95 is unable to detect its presence. Click **Next** to continue.
5. The next **Add New Hardware Wizard** dialog box lets you select the type of hardware you want to install. Select the **National Instruments GPIB Interfaces** item, as shown in Figure 2-3. If there is no **National Instruments GPIB Interfaces** item, select the **Other Devices** item. Click **Next** to continue.



Figure 2-3. 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 **Next** to continue.
7. Windows 95 attempts to assign nonconflicting resources to the AT-GPIB/TNT. It first tries to use the default settings (Direct Memory Access 5, Input/Output Range 2C0-2DF, and Interrupt Request 11). If these settings are available, Windows 95 chooses them. If one or more of these resources is unavailable, Windows 95 examines all of the available resources in the system and attempts to find nonconflicting resources for the AT-GPIB/TNT.
- 8a. If Windows 95 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 2-4.



Figure 2-4. AT-GPIB/TNT Resources Assigned Successfully

- 8b. If Windows 95 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 2-5.



Figure 2-5. AT-GPIB/TNT Resources Not Assigned Successfully

In this case, click on **Next** to continue, then click **Start Conflict Troubleshooter** to let Windows 95 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 **Basic configuration 2** or **Basic configuration 3**, as shown in Figure 2-6. If no DMA channels are available, you should use **Basic configuration 3**; otherwise, use **Basic configuration 2**.

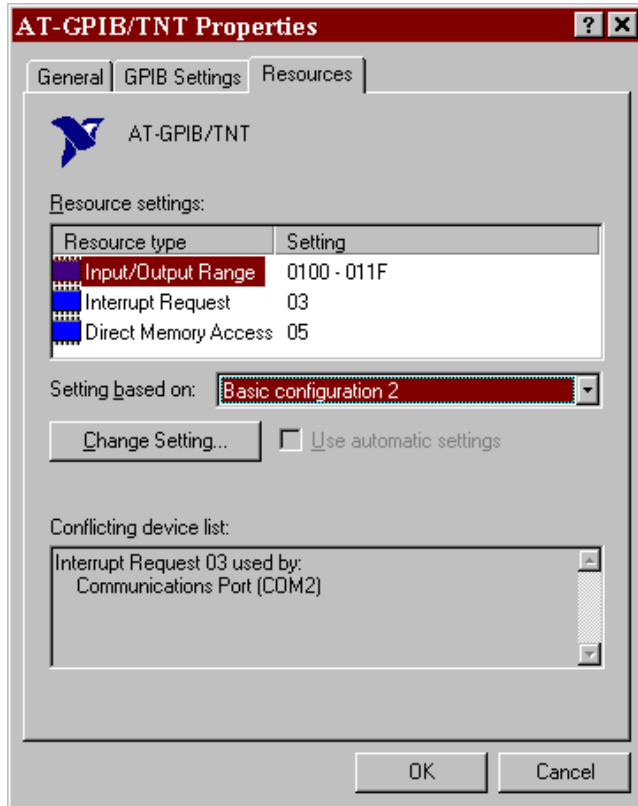


Figure 2-6. AT-GPIB/TNT Resources Settings

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

9. Write down the conflict-free resources that Windows 95 assigned to the AT-GPIB/TNT.
10. Shut down Windows 95.

## Configure the AT-GPIB/TNT



**Warning:** *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 95. If the resources assigned to it

match the default settings, you are ready to install the AT-GPIB/TNT. The default settings are:

- Input/Output Range: 2C0-2DF
- Direct Memory Access: 5
- Interrupt Request: 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 95.

Figure 2-7 shows the location of the configuration jumpers and switches on the AT-GPIB/TNT.

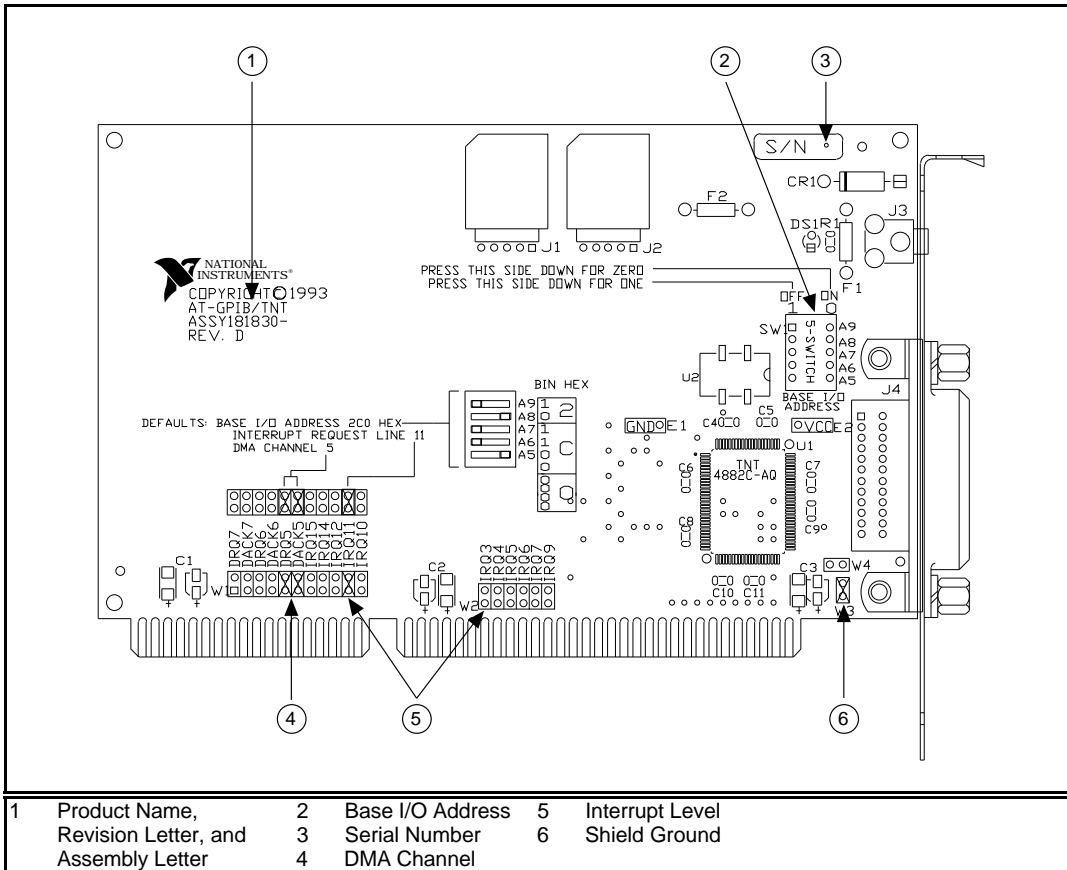


Figure 2-7. AT-GPIB/TNT Parts Locator Diagram

## Configure the Input/Output Range

The Input/Output Range is a segment of address space reserved for input and output. The base I/O address of the 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 2-7.
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 95.

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 2-8 for an example of the switch settings and corresponding base I/O addresses.

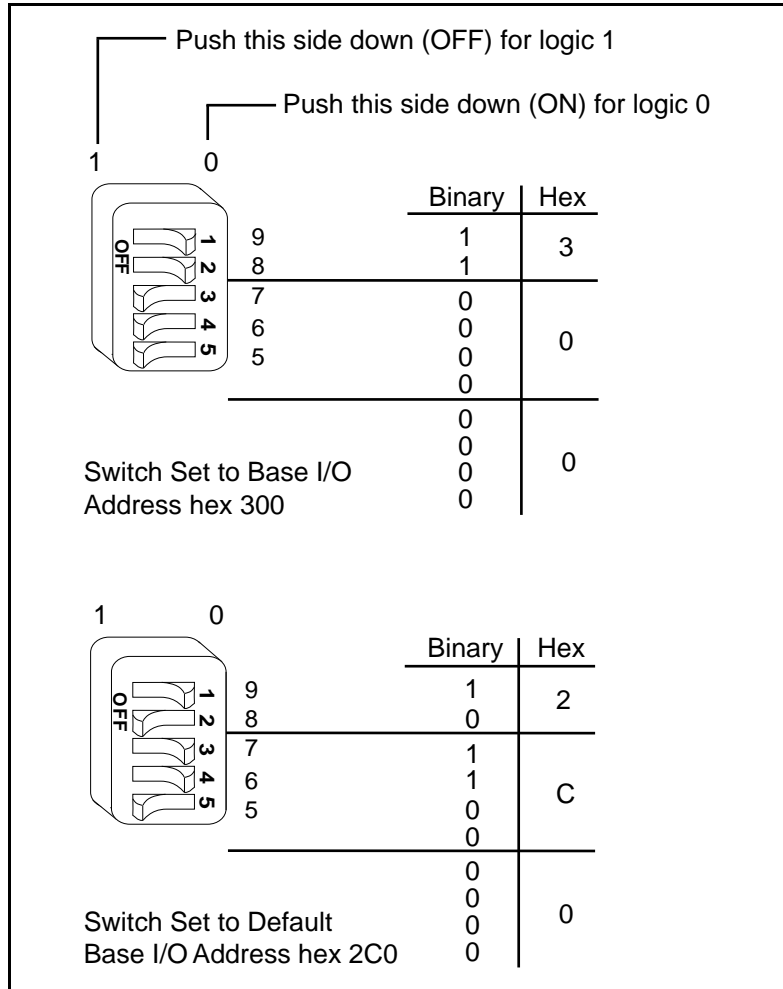


Figure 2-8. Base I/O Address Switch Settings

## Configure the 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 the NI-488.2M 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:**

***The NI-488.2M software for Windows 95 requires that the AT-GPIB/TNT be configured to use an Interrupt Request Line.***

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

Figure 2-9 shows the setting for IRQ11.

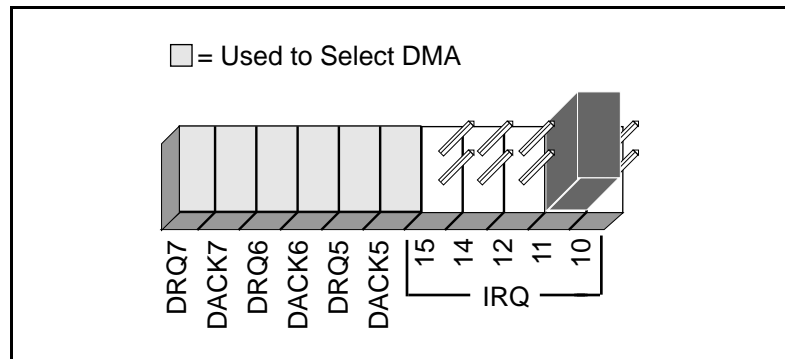


Figure 2-9. Interrupt Jumper Setting for IRQ11 (Default Setting)

Figure 2-10 shows the setting for IRQ5.

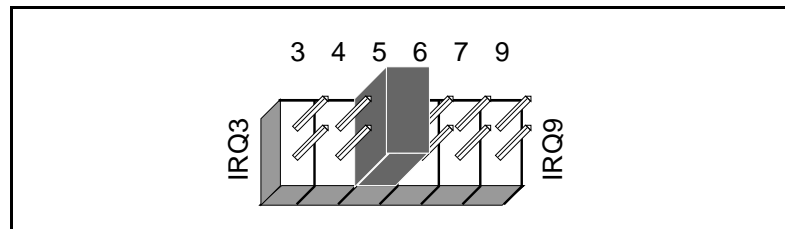


Figure 2-10. Interrupt Jumper Setting for IRQ5

## Configure the 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 the NI-488.2M software are designed to perform DMA. In most cases, data transfers using DMA are significantly faster than programmed I/O transfers, which use more CPU time. However, if Windows 95 is unable to assign a DMA resource to the AT-GPIB/TNT, you can configure DMA to none and still use the NI-488.2M software for Windows 95. 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 2-7.
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 2-1.

Table 2-1. DMA Channel Settings

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

Figure 2-11 shows the jumper position for selecting DMA channel 7.

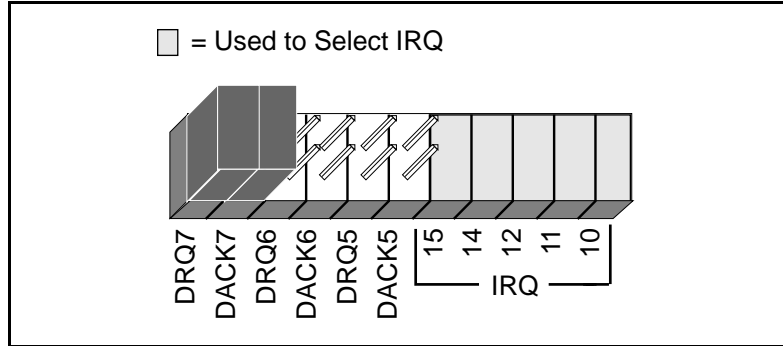


Figure 2-11. DMA Jumper Setting for DMA Channel 7

Figure 2-12 shows the jumper position for selecting no DMA channel.

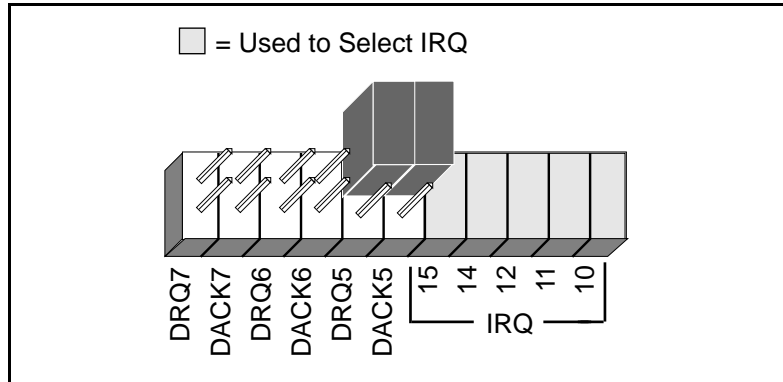


Figure 2-12. DMA Jumper Setting for No DMA Channel

## Setting the 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 2-7 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 2-13.

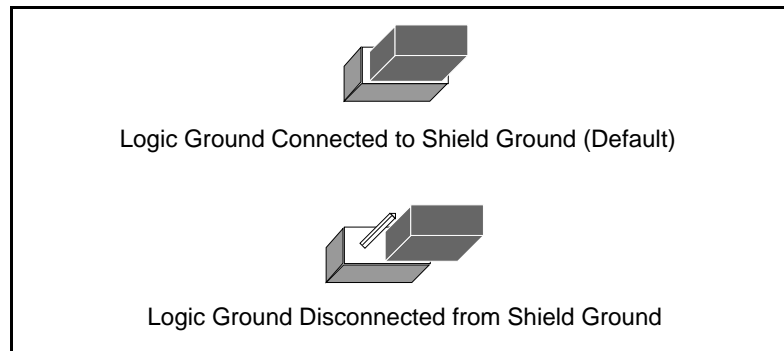


Figure 2-13. Ground Configuration Jumper Settings

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 on to the *Install the AT-GPIB/TNT* section for installation instructions.

## Install the AT-GPIB/TNT

Perform the following steps to install the AT-GPIB/TNT.

1. Turn off your computer. Keep the computer plugged in so that it remains grounded while you install the GPIB hardware.
2. Remove the top cover (or other access panels) to give yourself access to the computer expansion slots.
3. Find an unused expansion slot 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 2-14. It might be a tight fit, but do not force the board into place.

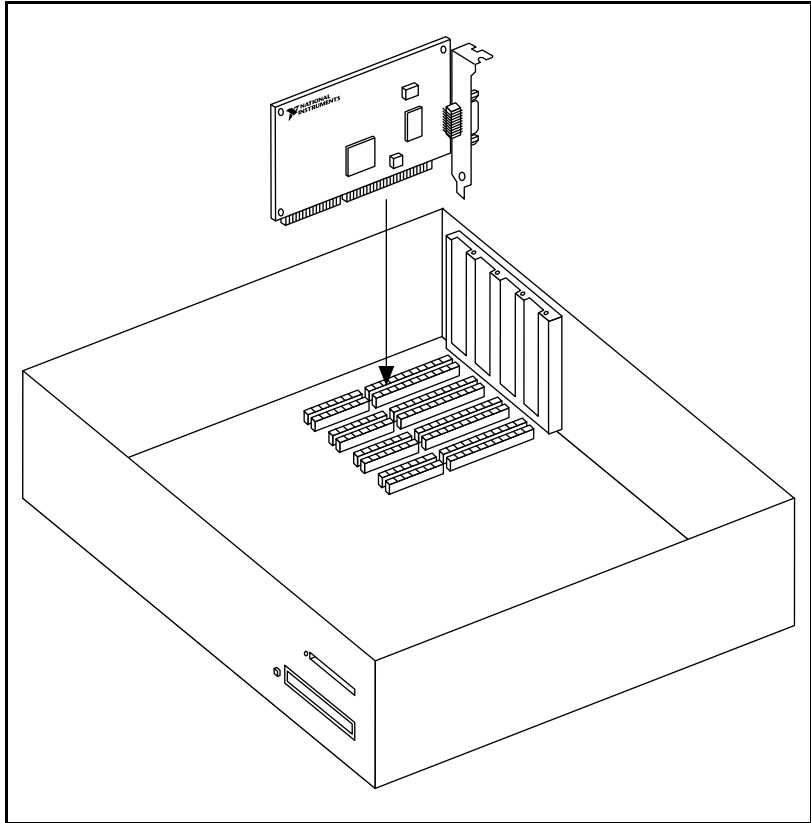


Figure 2-14. Installing the AT-GPIB/TNT

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. Turn on your computer and start Windows 95.

The GPIB hardware installation is now complete.

## Configure the NI-488.2M Software

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

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

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

To configure a particular interface, double-click on that interface type in the list of installed interfaces immediately below **National Instruments GPIB Interfaces**. The **Resources** page provides information about the hardware resources assigned to the GPIB interface, and the **NI-488.2M Settings** page provides information about the software configuration for the GPIB interface. Use the **Interface Name** drop-down box to select a logical name (GPIB0, GPIB1, and so on) for the GPIB interface. Repeat this process for each interface you need to configure. Figure 2-15 shows the **NI-488.2M Settings** page for an AT-GPIB/TNT.

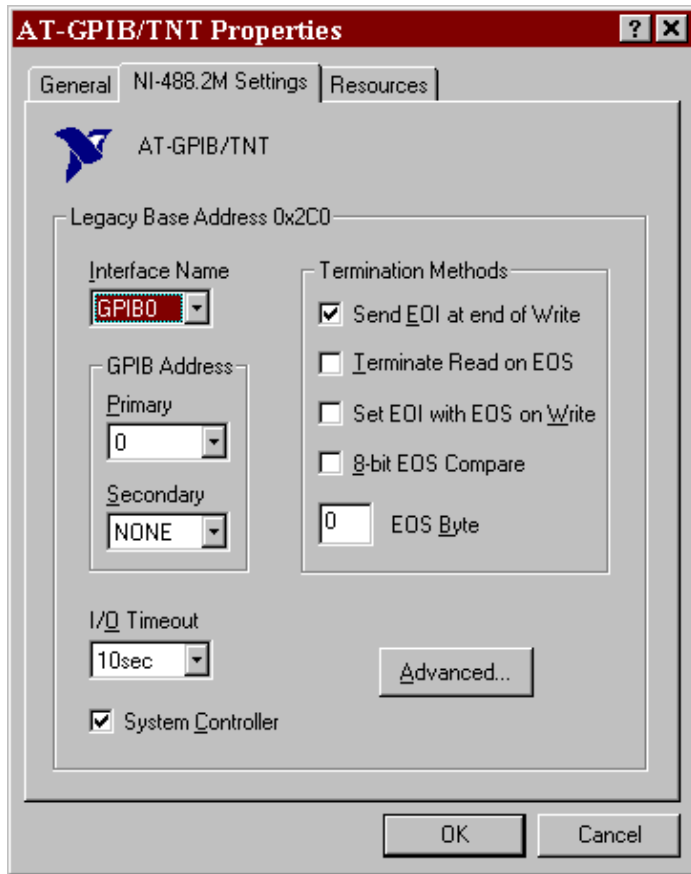


Figure 2-15. NI-488.2M Settings Page for the AT-GPIB/TNT

If you want to examine or modify the logical device templates for the GPIB software, select the **National Instruments GPIB Interfaces** icon and click 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

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



# Verify the Installation

---

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

## Run the Hardware Diagnostic Test

---

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

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

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

## Run the NI-488.2M Software Diagnostic Test

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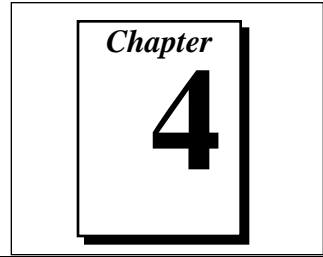
After you have successfully completed the Hardware Diagnostic Test, verify the NI-488.2M software installation by running the Software Diagnostic Test that is installed with your NI-488.2M software.

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

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

# Begin to Use the NI-488.2M Software

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This chapter helps you get started with the NI-488.2M software for Windows 95.

## Introduction to the Win32 Interactive Control Utility

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You can use the interactive control utility to enter NI-488 functions and NI-488.2 routines interactively and see the values returned by the function calls. You can use the utility to do the following:

- Verify GPIB communication with your device quickly and easily.
- Learn the NI-488 functions and NI-488.2 routines before you write your application.
- Become familiar with the commands of your device.
- Receive data from your GPIB device.
- Troubleshoot problems with your application.

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

For more information about the Win32 Interactive Control utility, refer to the *NI-488.2M User Manual for Windows 95*.

## General Programming Considerations

---

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

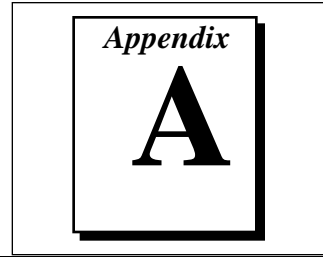
- You must include the header file in your source code.
- The NI-488.2M software is accessed through the 32-bit DLL, `gpi.b-32.dll`, either by linking with one of the language interfaces provided with the NI-488.2M software, or by using direct DLL entry from other programming environments.

- Several sample GPIB applications are included with the NI-488.2M software. Use these as a guide for your own application development.

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

# Uninstall the Hardware and Software

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This appendix describes how to uninstall the AT-GPIB/TNT hardware and NI-488.2M software from Windows 95.

## Uninstalling the Hardware

---

Before physically removing the AT-GPIB/TNT hardware from the computer, you must remove the hardware information from the Windows 95 Device Manager.

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

To remove an interface, select it from the list of interfaces under **National Instruments GPIB Interfaces** and click the **Remove** button. After you remove the appropriate interface information from the Device Manager, shut down Windows 95, switch off the computer, and physically remove the interface from your computer.

## Uninstalling the Software

---

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

Complete the following steps to remove the NI-488.2M software.

1. Select **Start»Settings»Control Panel**
2. Run the **Add/Remove Programs** applet. The dialog box shown in Figure A-1 appears. This dialog box lists the software available for removal.



Figure A-1. Add/Remove Programs Properties Dialog Box

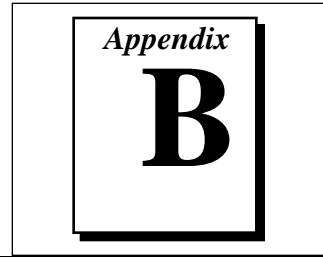
3. Select the NI-488.2M software you want to remove, and click the **Add/Remove...** button. An uninstall program runs and removes all folders, programs, VxDs, DLLs, and registry entries associated with the NI-488.2M software.

If you have not physically removed your hardware, shut down Windows 95, power off your computer, and remove the GPIB hardware now.

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

# Troubleshooting and Common Questions

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

## Troubleshooting Hardware Diagnostic Test Error Messages

---

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

### Driver Not Installed Properly

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

**ERROR: NI-488.2M Software incorrectly installed.**

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

### GPIB Interface Not Present

The following error message appears if a GPIB interface is not physically present in the system:

**ERROR: No GPIB interfaces present in the system.**

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

### Using Single-Cycle DMA

The AT-GPIB/TNT normally uses demand-mode DMA. If your computer cannot use demand-mode DMA, the Hardware Diagnostic Test prints a message telling you to use single-cycle DMA. You can configure the NI-488.2M software to select single-cycle DMA. Refer

to the *Configure the NI-488.2M Software* section of Chapter 2, *Installation and Configuration*, for more information on configuring the software.

## Resource Conflicts

### Address Conflict

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

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

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

### Interrupt Level Conflict

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

**ERROR: Interrupt Level Conflict Detected (Controller).**

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

### DMA Channel Conflict

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

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

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

## Resolving Resource Conflicts

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

## Troubleshooting Software Diagnostic Test Error Messages

---

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

### Presence Test of Software Components

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

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

**An unexpected ERROR occurred:**

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


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

**An unexpected ERROR occurred:**

**Unable to locate C:\WINDOWS\SYSTEM\GPIBMNGR.DLL  
Try reinstalling the NI-488.2M software.**

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

### Presence Test of Board

 **Note:** *In the following paragraphs, `gpibx` refers to board `gpib0`, `gpib1`, `gpib2`, ... as appropriate.*

The following error message appears if the board `gpibx` is not physically present in the system:

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



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

## GPIB Cables Connected

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

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

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

Disconnect all GPIB cables before trying the test again.

## Troubleshooting EDVR Error Conditions

---

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

### EDVR Error Condition with `ibcntl` Set to 0xE028002C

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

### EDVR Error Condition with `ibcntl` Set to 0xE0140025

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

## EDVR Error Condition with `ibcntl` Set to 0xE0140035

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

## EDVR Error Condition with `ibcntl` Set to 0xE0320029

If a call is made with a board number that is assigned to a GPIB interface that is unusable because of a resource conflict, an EDVR error condition occurs with `ibcntl` set to 0xE0320029. Refer to the *Resolving Resource Conflicts* section, earlier in this appendix.

## Common Questions

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

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

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

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

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

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

### When should I use the Win32 Interactive Control utility?

You can use the Win32 Interactive Control utility to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information, refer to Chapter 4, *Begin to Use the NI-488.2M Software*.

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

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

### **How do I modify the hardware resources that Windows 95 assigned to my AT-GPIB/TNT?**

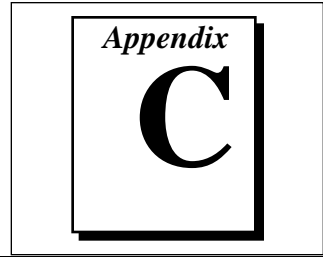
To modify the hardware resources assigned to the AT-GPIB/TNT, double-click on the **System** icon under **Start»Settings»Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab, click the **View devices by type** button, and double-click on the **National Instruments GPIB Interfaces** icon. Next, double-click on the **AT-GPIB/TNT** item under **National Instruments GPIB Interfaces**, and click on the **Resources** tab. Make sure that the **Settings based on:** list box is set to **Basic configuration 2** or **Basic configuration 3**. If no DMA channels are available, you should use **Basic configuration 3**; otherwise, use **Basic configuration 2**. Then use the **Change Setting...** button to modify the resources used by your AT-GPIB/TNT. Make sure to update the switches and jumpers on your AT-GPIB/TNT to match the new assigned resources.

### **Why does the uninstall program leave some components installed?**

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

### **What information should I have before I call National Instruments?**

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



# Specifications

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

## Hardware Characteristics

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

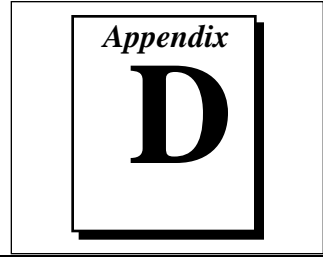
Characteristic	Specification
Dimensions	10.67 by 16.51 cm (4.2 by 6.5 in.)
Power Requirement (from PC AT I/O channel)	+5 VDC 50 mA typical 120 mA maximum
I/O Connector	IEEE 488 Standard 24-pin
Operating Environment Component Temperature Relative Humidity	0° to 40° C 10% to 90%, noncondensing
Storage Environment Temperature Relative Humidity	-20° to 70° C 5% to 90%, noncondensing
EMI	FCC Class B Certified

## Software Transfer Rates

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Table C-2. NI-488.2M Software Transfer Rates for the AT-GPIB/TNT

Transfer Method	Maximum GPIB Transfer Rate
3-wire (IEEE 488) In ISA computer In EISA computer	1.5 Mbytes/s* 1.5 Mbytes/s*
High Speed (HS488) In ISA computer In EISA computer	1.8 Mbytes/s* 2.8 Mbytes/s*
* Actual speed may vary considerably from speed shown because of system and instrumentation capabilities.	



# Customer Communication

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For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems you might have as well as a form you can use to comment on the product documentation. Filling out a copy of the *Technical Support Form* before contacting National Instruments helps us help you better and faster.

National Instruments provides comprehensive technical assistance around the world. In the U.S. and Canada, applications engineers are available Monday through Friday from 8:00 a.m. to 6:00 p.m. (central time). In other countries, contact the nearest branch office. You may fax questions to us at any time.

## Electronic Services



### Bulletin Board Support

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

United States: (512) 794-5422 or (800) 327-3077  
Up to 14,400 baud, 8 data bits, 1 stop bit, no parity

United Kingdom: 01635 551422  
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

France: 1 48 65 15 59  
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity



### FTP Support

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



## FaxBack Support

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

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



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

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

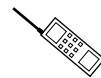
GPIB:	gpib.support@natinst.com
DAQ:	daq.support@natinst.com
VXI:	vxi.support@natinst.com
LabVIEW:	lv.support@natinst.com
LabWindows:	lw.support@natinst.com
HiQ:	hiq.support@natinst.com
VISA:	visa.support@natinst.com

## Fax and Telephone Support

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



### Fax



### Telephone

Australia	03 9 879 9422	03 9 879 9179
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	519 622 9310	519 622 9311
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 71 11
Finland	90 527 2321	90 502 2930
France	1 48 14 24 24	1 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Italy	02 48301892	02 48301915
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 202 2544	5 520 3282
Netherlands	03480 33466	03480 30673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 20 51 51	056 20 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	01635 523545	01635 523154

# Technical Support Form

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

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

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Fax (\_\_\_\_) \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

Computer brand \_\_\_\_\_ Model \_\_\_\_\_ Processor \_\_\_\_\_

Operating system (include version number \_\_\_\_\_

Clock Speed \_\_\_\_\_MHz RAM \_\_\_\_\_MB Display adapter \_\_\_\_\_

Mouse \_\_\_\_\_yes \_\_\_\_\_no Other adapters installed \_\_\_\_\_

Hard disk capacity \_\_\_\_\_MB Brand \_\_\_\_\_

Instruments used \_\_\_\_\_

National Instruments hardware product model \_\_\_\_\_ Revision \_\_\_\_\_

Configuration \_\_\_\_\_

National Instruments software product \_\_\_\_\_ Version \_\_\_\_\_

Configuration \_\_\_\_\_

The problem is \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

List any error messages \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The following steps will reproduce the problem \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# Hardware and Software Configuration Form

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

## National Instruments Products

GPIB Interface Type and Revision \_\_\_\_\_

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

Programming Language Interface Version \_\_\_\_\_

GPIB Information Output \_\_\_\_\_

Hardware Diagnostic Test Results \_\_\_\_\_

Software Diagnostic Test Results \_\_\_\_\_

## Other Products

Resource Summary Report from the Device Manager

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

\_\_\_\_\_  
\_\_\_\_\_

Programming Environment Information

Programming Language \_\_\_\_\_

Compiler Vendor \_\_\_\_\_

Compiler Version \_\_\_\_\_

Application Information

DOS Application \_\_\_\_\_ Win16 Application \_\_\_\_\_ Win32 Application \_\_\_\_\_

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

\_\_\_\_\_

# Documentation Comment Form

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

**Title:** Getting Started with Your AT-GPIB/TNT and the NI-488.2M™ Software for Windows 95

**Edition Date:** November 1995

**Part Number:** 321036A-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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## Glossary

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

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

*Glossary*

KB	kilobytes of memory
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
PnP	Plug and Play
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