GPIB

Getting Started with Your AT-GPIB/TNT (PnP) and the GPIB Software for Windows NT

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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:

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- Consult the dealer or an experienced radio/TV technician for help.

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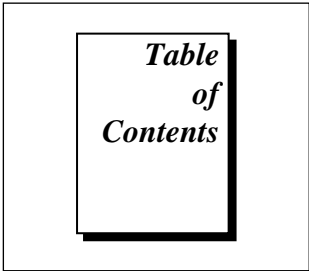
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Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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This manual contains instructions on how to install and configure the National Instruments AT-GPIB/TNT (PnP) interface and the NI-488.2M software for Windows NT.

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

How to Use the Manual Set
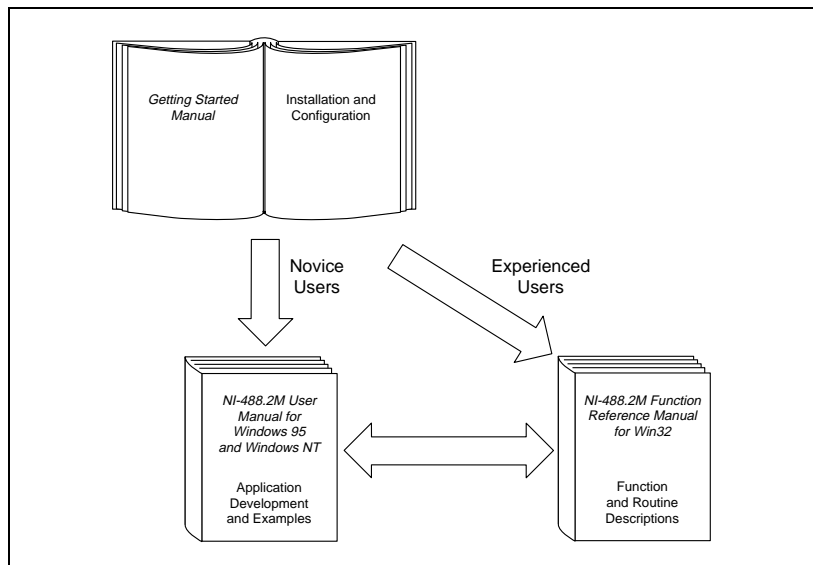
Use this manual to install and configure your AT-GPIB/TNT (PnP) board and the NI-488.2M software for Windows NT.

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

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

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this manual, lists what you need to get started, and briefly describes the AT-GPIB/TNT (PnP) board and the NI-488.2M software.

- Chapter 2, *GPIB Software Installation,* contains instructions on how to install the NI-488.2M software for Windows NT version 4.0 or higher.

- Chapter 3, *Plug and Play Software Installation,* contains instructions on how to install the ISA Plug and Play software on your system.

- Chapter 4, *Hardware Installation*, contains instructions on how to install your AT-GPIB/TNT (PnP) board.

- Chapter 5, *Software Configuration*, contains instructions on how to configure the NI-488.2M software for Windows NT.

- Chapter 6, *Verify the Installation*, describes how to verify the hardware and software installation.

- Chapter 7, *Begin to Use the GPIB Software,* helps you get started with the NI-488.2M software for Windows NT.

- Appendix A, *Hardware Specifications*, describes the electrical, physical, and environmental characteristics of the AT-GPIB/TNT (PnP) board and the recommended operating conditions.

- Appendix B, *Troubleshooting and Common Questions*, contains troubleshooting information and the answers to common questions.

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

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

Conventions Used in This Manual

The following conventions appear in this manual:

»	The **»** symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options» Substitute Fonts** directs you to pull down the **File** menu, select the **Page Setup** item, select **Options**, and finally select the **Substitute Fonts** options from the last dialog box.
bold	Bold text denotes the names of menus, menu items, parameters, dialog boxes, dialog box buttons or options, icons, windows, or LEDs.
bold italic	Bold italic text denotes a note, caution, or warning.
`bold monospace`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are unique from the other examples.
IEEE 488 and IEEE 488.2	IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1992, respectively, which define the GPIB.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept. This font also denotes text for which you supply the appropriate word or value, as in Windows 3.*x*.
`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 can also denote the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and for statements and comments taken from programs.

Related Documentation

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

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*

- ANSI/IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*

- *Microsoft Windows NT System Guide*, Microsoft Corporation

Customer Communication

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

Introduction

This chapter explains how to use this manual, lists what you need to get started, and briefly describes the AT-GPIB/TNT (PnP) board and the NI-488.2M software.

How to Use This Manual

Chapter 1	Gather What You Need to Get Started
Chapter 2	Install the GPIB Software
Chapter 3	Install the Plug and Play Software
Chapter 4	Install the Hardware
Chapter 5	Configure the Software
Chapter 6	Verify the Installation
	Passes? — No → Troubleshooting
	Yes
Chapter 7	Begin to Use the GPIB Software
	Review Programming Considerations
User Manual and Function Reference Manual	Write Application Programs

What You Need to Get Started

❑ AT-GPIB/TNT (PnP)

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

❑ Windows NT version 4.0 or higher installed on your computer

Hardware Description

The AT-GPIB/TNT (PnP) hardware complies with the Plug and Play ISA
Standard. It is completely software configurable. The
AT-GPIB/TNT (PnP) board, equipped with the TNT4882C ASIC, uses
the NI-488.2M software to transform any ISA or EISA bus computer into
a fully functional GPIB Talker/Listener/Controller that has complete
communications and bus management capability. The TNT4882C chip
combines the circuitry of the NAT4882 ASIC, the Turbo488
performance-enhancing ASIC, and GPIB transceivers to create a
single-chip IEEE 488.2 Talker/Listener/Controller interface. The
TNT4882C also implements the HS488 high-speed protocol, which
increases the maximum data transfer rate of the AT-GPIB/TNT (PnP) to
2.2 Mbytes/s, when used in an ISA bus. For more information about
HS488, refer to Chapter 7, *GPIB Programming Techniques,* in the
NI-488.2M User Manual for Windows 95 and Windows NT.

The AT-GPIB/TNT (PnP) board is fully compatible with all versions of
AT-GPIB hardware. You can use standard GPIB cables to connect the
AT-GPIB/TNT (PnP) with up to 14 instruments. If you want to use more
than the maximum number of instruments, you can order a bus extender
or expander from National Instruments. Refer to Appendix A, *Hardware
Specifications,* for more information about the GPIB hardware
specifications and operating conditions.

Software Description

The NI-488.2M software for Windows NT includes a loadable
Windows NT kernel device driver and supporting utilities, including the
following components:

- Device driver

- Diagnostic test

- Configuration utility

- Interactive control program

- Utilities for software development and debugging

- Language interface library for Microsoft Visual C/C++,
  Borland C/C++, and Visual Basic

- Virtual device driver and special DOS and Windows 3 drivers for
  running existing NI-488.2 for DOS and Windows 3 applications
  under Windows NT

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

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

Optional Programming Tools

Your kit includes the NI-488.2M software for Windows NT. In addition,
you can order the LabWindows®/CVI or LabVIEW software from
National Instruments.

LabWindows/CVI is an interactive ANSI C development environment for
building test and measurement and instrument control systems. It
includes interactive code-generation tools and a graphical editor for
building custom user interfaces. It also includes built-in libraries for
IEEE 488.2, VXI, RS-232 control, and plug-in data acquisition. When
you order LabWindows/CVI, you also get hundreds of complete
instrument drivers, which are modular, source-code programs that handle
the communication with your instrument so that you do not have to learn
the programming details.

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

For more information about LabWindows/CVI and LabVIEW, contact National Instruments.

GPIB Software Installation
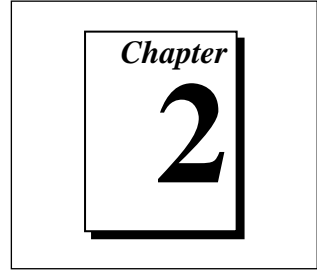
This chapter contains instructions on how to install the NI-488.2M software for Windows NT version 4.0 or higher.

☞ **Note:** *The AT-GPIB/TNT (PnP) is supported only under Windows NT version 4.0 or higher.*

Before you install and configure the hardware, complete the following steps to install the NI-488.2M software for Windows NT:

1. Log onto your Windows NT system using the Administrator account. This installation program must have Administrator privileges because the program modifies the configuration registry of your computer.

2. Insert the *GPIB Software for Windows NT (Setup Disk)* into an unused drive.

3. Select **Run...** from the **Start** menu.

4. Type the following command in the dialog box:

   x:\setup

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

   The software installation begins with the following screen.
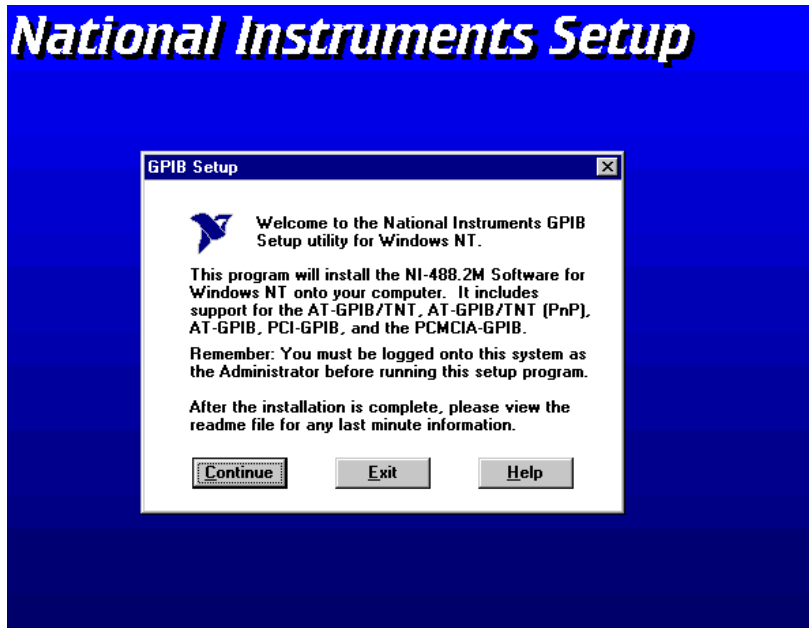
Figure 2-1. NI-488.2M Software for Windows NT Installation Screen

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

When the setup program has finished copying the software to your computer, it attempts to start the NI-488.2M driver. If the setup program cannot start the driver, it instructs you to restart Windows NT, which forces the driver to load.

Next, you need to enable support for ISA Plug and Play hardware in your system. Proceed to Chapter 3, *Plug and Play Software Installation*.

Plug and Play
Software Installation
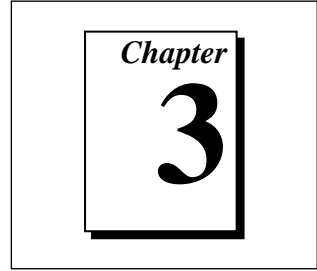
This chapter contains instructions on how to install the ISA Plug and Play software on your system.

The AT-GPIB/TNT (PnP) is an ISA Plug and Play interface. By default, Windows NT 4.0 does not support ISA Plug and Play hardware. For Windows NT to detect and configure the ISA Plug and Play hardware, you must enable support for Plug and Play by installing the `pnpisa.sys` file. To install the `pnpisa.sys` file from your Windows NT 4.0 CD-ROM, complete the following steps:

1. Log onto your Windows NT system using the `Administrator` account. This installation program must have `Administrator` privileges because the program modifies the configuration registry of your computer.

2. Locate the `pnpisa.inf` file in the `Drvlib\Pnpisa\X86` folder on the Windows NT 4.0 CD-ROM.

3. Right-click on the `pnpisa.inf` file and click on the **Install** button in the context-sensitive menu that appears.

4. After the installation is complete, restart your computer.

The software installation and enabling of support for ISA Plug and Play hardware on your system is now complete. Proceed to Chapter 4, *Hardware Installation*.

Hardware Installation

This chapter contains instructions on how to install your AT-GPIB/TNT (PnP) board.

Warning: *Electrostatic discharge can damage several components on your AT-GPIB/TNT (PnP) board. To avoid electrostatic damage when you handle the board, touch the antistatic plastic package to a metal part of your computer chassis before you remove the board from the package.*

Complete the following steps to install your AT-GPIB/TNT (PnP) board:

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 (PnP) board 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 (PnP) board into the slot with the GPIB connector sticking out of the opening on the back panel, as shown in Figure 4-1. It might be a tight fit, but do not force the board into place.
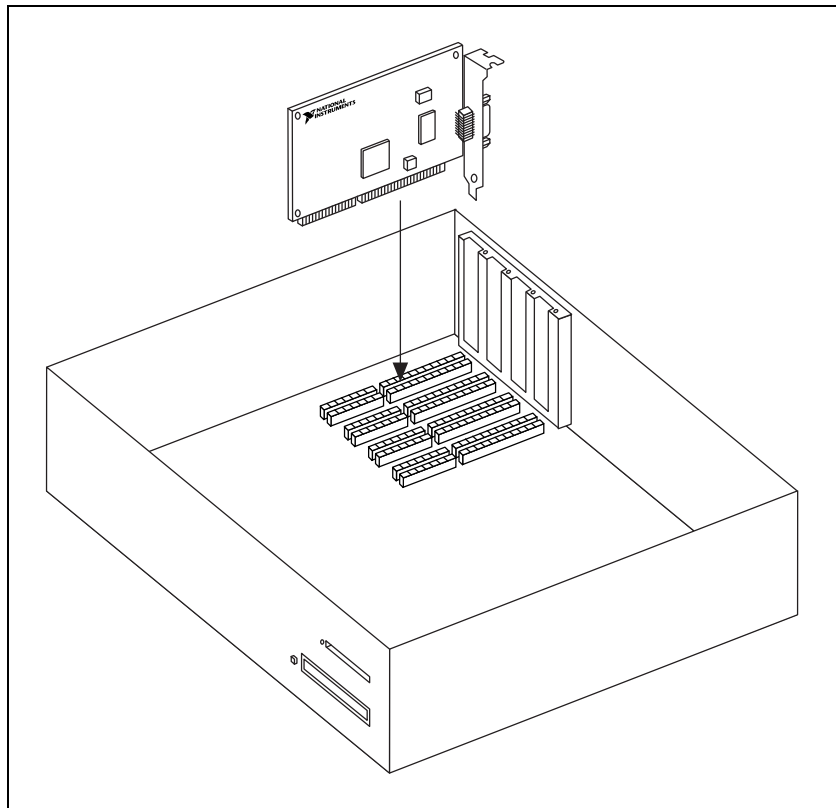
Figure 4-1. Installing the AT-GPIB/TNT (PnP) Board

6. Screw the mounting bracket of the AT-GPIB/TNT (PnP) board to the back panel rail of the computer.

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

8. Turn on your computer and start Windows NT. Windows NT should automatically detect the GPIB hardware and display a **New Hardware Found** dialog box. After Windows NT detects the hardware, a **System Settings Change** dialog box appears. Click on the **Yes** button to restart your system.

The AT-GPIB/TNT (PnP) board hardware installation is now complete. Proceed to Chapter 5, *Software Configuration.*

Software Configuration

This chapter contains instructions on how to configure the NI-488.2M software for Windows NT.

By default, Windows NT does not configure ISA Plug and Play hardware. The AT-GPIB/TNT (PnP) board is an ISA Plug and Play board and must be configured using the NI-488.2M software after you install the hardware.

The GPIB Control Panel applet is an interactive utility you can use to examine or modify the configuration of the driver. You must run the GPIB Control Panel applet before you begin to use the AT-GPIB/TNT (PnP) board. Complete the following steps to run the applet:

1. Double-click on the **GPIB** icon in the **Control Panel**. To open the Control Panel, select **Start»Settings»Control Panel**.

    The GPIB Control Panel applet displays a list of all the GPIB boards and device names.

2. In the **GPIB Configuration** dialog box, select a GPIB interface from the **GPIB Board** list. If you are using only one GPIB interface, select **GPIB0**.

3. Click on the **Board Type** button, select **AT-GPIB/TNT (PnP)** from the **Board Type** list, and click on the **OK** button.

4. Click on the **Configure** button to bring up the **GPIB Configuration** dialog box, as shown in Figure 5-1. For more information about GPIB Control Panel applet options, refer to the online help.
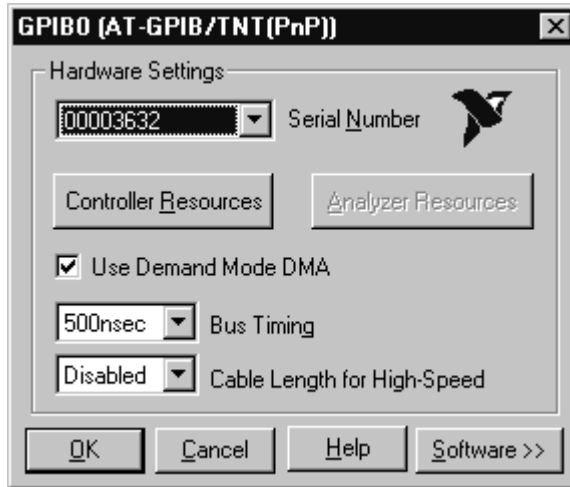
Figure 5-1. AT-GPIB/TNT (PnP) Configuration Dialog Box

5. In the **GPIB Configuration** dialog box, click on the **Controller Resources** button to set resources for the board.

6. In the **AT-GPIB/TNT (Plug and Play) Properties** dialog box that appears, examine the assigned resources. Figure 5-2 shows the **AT-GPIB/TNT(Plug and Play) Properties** dialog box. Use the **Setting based on** drop-down list and the **Change Setting...** button to select conflict free resources. While editing the **Setting based on** drop-down list, select either **Basic Configuration 0000** or **Basic Configuration 0001**, the only two valid basic configurations. The valid resources are as follows:

   a. Reserving a DMA channel is optional. The options for the DMA channel are 5, 6, 7, or none. To select a different DMA channel, highlight **Direct Memory Access** and click on the **Change Setting...** button. To set the DMA channel to **None**, select **Basic Configuration 0001** from the **Setting based on** drop-down list.

   b. Reserving address space is mandatory.

☞ **Note:**   *The default I/O range assigned by Windows NT is not valid and must be changed to a valid value.*

To select a base I/O address, highlight **Input/Output Range** and click on the **Change Setting...** button. The AT-GPIB/TNT (PnP) address space must be in the range of 0x100 to 0x3E0. You must have 0x20 bytes of contiguous I/O address space. For example, if you are selecting a base I/O address of 0x2C0, enter **2C0** for

the start value and enter **2DF** for the end value. A base address value of **2C0** usually works with a GPIB interface.

c. Reserving an IRQ level is mandatory. To select an IRQ level, highlight **Interrupt Request** and click on the **Change Setting...** button. The options for the IRQ level are 3, 4, 5, 6, 7, 9, 11, 12, 14, or 15. An IRQ level of 11 usually works with a GPIB interface.
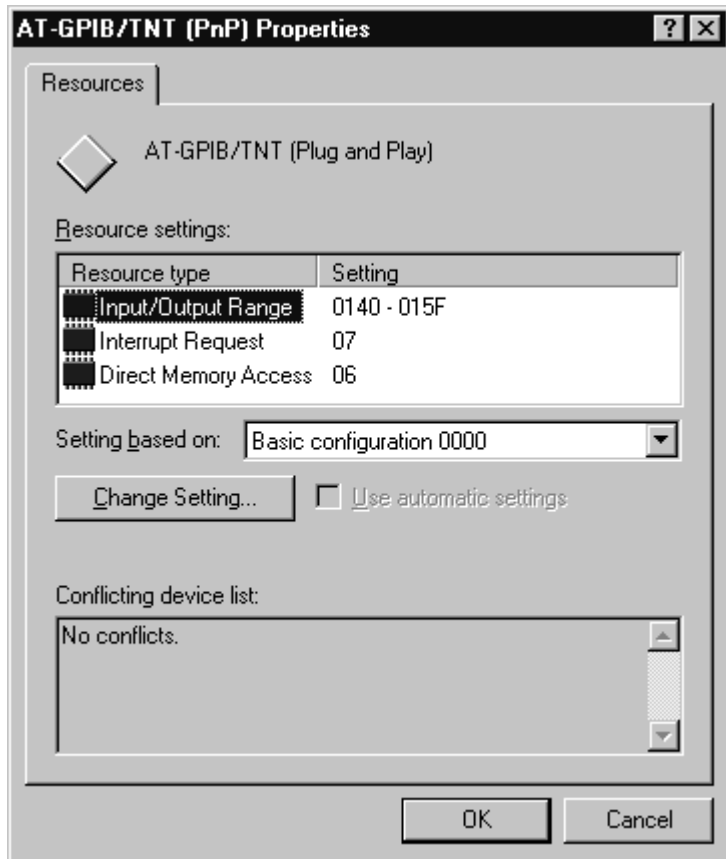
Figure 5-2. AT-GPIB/TNT (Plug and Play) Properties Dialog Box

7. When you have changed the hardware settings to valid settings and there are no resource conflicts, click on the **OK** button. When the **Creating a Forced Configuration** dialog box appears, click on the **Yes** button to confirm the setting of the selected resources.

8. After you configure your software, restart Windows NT and proceed to Chapter 6, *Verify the Installation*.

Verify the Installation

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

You can use the Diagnostic utility, installed with your NI-488.2M software, to test the hardware and software installation. The Diagnostic utility verifies that your hardware and software are functioning properly and that the configuration of your GPIB interfaces does not conflict with anything else in your system.

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

When you have started the Diagnostic utility, test your GPIB interfaces by clicking on the **Test All** button. If the Diagnostic utility test is successful, it places a check mark next to the interface and changes its status from `untested` to `passed`. If the Diagnostic utility test fails, it puts an X next to the interface, and changes its status from `untested` to `failed`. Figure 6-1 shows the **Diagnostic** dialog box after it has tested some GPIB interfaces. The AT-GPIB/TNT (PnP) board appears as **AT-GPIB/TNT** in the **Diagnostic** dialog box.
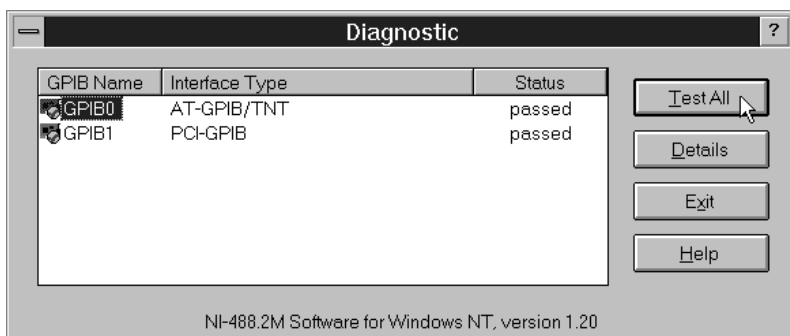
Figure 6-1. Diagnostic Utility after Testing

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

Begin to Use the GPIB Software
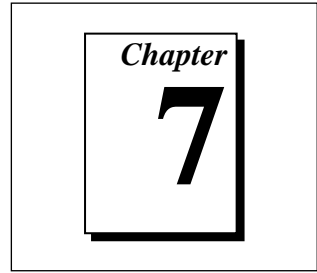
This chapter helps you get started with the NI-488.2M software for Windows NT.

Introduction to the Win32 Interactive Control Utility

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

- Verify GPIB communication with your device quickly and easily.

- Learn the NI-488 functions and NI-488.2 routines before you write your application.

- Become familiar with the commands of your device.

- Receive data from your GPIB device.

- Troubleshoot problems with your application.

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

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

Introduction to the GPIB Spy Utility

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

- Capture information about NI-488 functions and NI-488.2M routines as your GPIB applications invoke them.

- Display captured information, including, but not limited to, input and output parameter values, I/O buffer contents, and return values.

- Save, restore, and print captured information.

To run GPIB Spy, select the **GPIB Spy** item under **Start»Programs»NI-488.2M Software for Windows NT**.

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

General Programming Considerations

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

- For your C/C++ application, you must include the NI-488.2M header file in your source code.

- You can access the NI-488.2M software through the 32-bit DLL, `gpib-32.dll`, either by linking with one of the language interfaces provided with the NI-488.2M software, or by using direct DLL entry from any programming environment.

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

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

Running Existing DOS and Windows GPIB Applications

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

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

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

where *path* is the directory where you installed the NI-488.2M software (the default installation directory is `c:\gpib-nt`).

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

Hardware Specifications

This appendix describes the electrical, physical, and environmental characteristics of the AT-GPIB/TNT (PnP) board and the recommended operating conditions.

Table A-1. Electrical Characteristics for the AT-GPIB/TNT (PnP)

Characteristic	Specification

Maximum GPIB Transfer Rates:
  3-Wire (IEEE 488)
High Speed (HS488):
  In ISA computer
	1.5 Mbytes/s*
	
	2.2 Mbytes/s*

Power Requirement (from PC AT I/O channel)	+5 VDC 120 mA Typical 200 mA Maximum
* Actual speed may vary considerably from speed shown due to system and instrumentation capabilities.	

Table A-2. Physical Characteristics for the AT-GPIB/TNT (PnP)

Characteristic	Specification
Dimensions	10.67 cm by 16.51 cm (4.2 in. by 6.5 in.)
I/O Connector	IEEE 488 Standard 24-Pin

Table A-3. Environmental Characteristics for the AT-GPIB/TNT (PnP)

Characteristic	Specification

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

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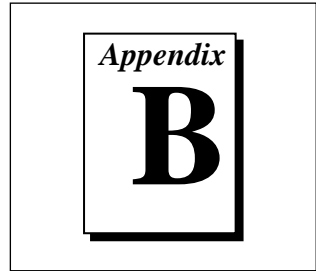
This appendix contains troubleshooting information and the answers to common questions.

Troubleshooting Diagnostic Utility Failures

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

Missing Software Components

This error occurs if the software components that are necessary for the NI-488.2M software for Windows NT to function correctly are not present in the system. If you encounter this problem, reinstall the NI-488.2M software for Windows NT and run the Diagnostic utility again.

No GPIB Interfaces Present

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

To access this information in the GPIB Control Panel applet, complete the following steps:

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

2. Click on the **Board Type** button and verify that the type of GPIB interface listed for each logical board name is correct. Click on the **OK** button to return to the main dialog box.

3. Double-click on each board name and verify that the hardware settings displayed in the dialog box match your actual hardware settings.

GPIB Cables Need to Be Disconnected

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

Address Resource Conflict

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

Interrupt Resource Conflict

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

DMA Resource Conflict

This error occurs if the DMA resources assigned to a GPIB interface conflict with the DMA resources that other devices in the system are using. To resolve a DMA resource conflict, refer to the *Resolving Resource Conflicts* section later in this appendix. After you have resolved the conflict, 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 you have not configured the NI-488.2M software to use single-cycle DMA. GPIB interfaces that use the system DMA controller, such as the AT-GPIB/TNT (PnP), normally use demand-mode DMA. If you encounter this error, you should use the GPIB Control Panel applet to

configure the NI-488.2M software to use single-cycle DMA for all DMA transfers, and then run the Diagnostic utility again.

To configure the NI-488.2M software to use single-cycle DMA for a particular GPIB interface, complete the following steps:

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

2. Double-click on the GPIB interface you want to configure.

3. Make sure that the **Use Demand Mode DMA** item is unchecked.

NI-488.2M 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 NI-488.2M software. If you encounter this error, shut down your computer, restart it, and run the Diagnostic utility again. If the problem persists, reinstall the NI-488.2M software for Windows NT.

Unknown Problem Encountered

This error occurs if an unknown problem is encountered when you try to execute the Diagnostic utility. If this error occurs, shut down your computer, restart it, and run the Diagnostic utility again. If the problem persists, reinstall the NI-488.2M software for Windows NT.

Resolving Resource Conflicts

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

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

To run the Windows NT Diagnostics utility, select
Start»Programs»Administrative Tools»Windows NT Diagnostics.

Using Windows NT Diagnostic Tools

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

Examining NT Devices to Verify the NI-488.2M Installation

To verify whether the NI-488.2M devices are installed correctly (that is, that the devices are started), select **Start»Settings»Control Panel** and double-click on the **Devices** icon.

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

Device	**Status**	**Started**
GPIB Board Class Driver	**Started**	**Automatic**
GPIB Device Class Driver	**Started**	**Automatic**

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

Device	**Status**	**Started**
GPIB Port Driver (AT-GPIB)	********	**System**
GPIB Port Driver (PCI-GPIB)	********	**System**

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

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

Examining the NT System Log Using the Event Viewer

Windows NT maintains a system log. If the NI-488.2M driver is unable to start, it records entries in the system log explaining why it failed to start. To examine the system log by running the Event Viewer utility, select **Start»Programs»Administrative Tools»Event Viewer**.

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

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

- A conflict exists between the GPIB hardware and the other hardware in the system. If this is the case, an event is logged that indicates the nature of the resource conflict. To correct this conflict, reconfigure the NI-488.2M software. Refer to Chapter 5, *Software Configuration*.

Common Questions

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

To run the Diagnostic utility, choose the **Diagnostic** item under **Start»Programs»NI-488.2M Software for Windows NT**.

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

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

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

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

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

Interrupts are required, but DMA is not.

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

To run the Diagnostic utility, choose the **Diagnostic** item under **Start»Programs»NI-488.2M Software for Windows NT**.

How do the AT-GPIB/TNT (PnP) and AT-GPIB/TNT+ boards appear under Board Type in the Diagnostic utility?

For both the AT-GPIB/TNT (PnP) and AT-GPIB/TNT+ the appropriate **Board Type** is **AT-GPIB/TNT**.

Does the AT-GPIB/TNT (PnP) board work under Windows NT 3.5.1?

No, the AT-GPIB/TNT (PnP) board is only supported under Windows NT version 4.0 or higher.

Does the AT-GPIB/TNT+ board work under Windows NT version 4.0 or higher?

Yes, the AT-GPIB/TNT+ board can be used under Windows NT version 4.0 or higher, but only with the Controller functionality; the Analyzer functionality is not currently supported under Windows NT. To use your AT-GPIB/TNT+ board, follow the instructions in Chapters 2 through 5. In addition to configuring **Controller Resources**, you must also configure **Analyzer Resources**, even though Analyzer software is not supported. To configure the Analyzer, click on the **Analyzer Resources** button. In the **Setting based on** list, select **Basic Configuration 0001** and click on the **Change Setting...** button to assign interrupt and address space resources to the Analyzer.

Does the GPIB Analyzer software work with the AT-GPIB/TNT+ interface in Windows NT?

No, the Analyzer functionality is currently not supported. However, you can use your AT-GPIB/TNT+ as an AT-GPIB/TNT (PnP), provided that you select both **Controller** and **Analyzer Resources**.

When should I use the Win32 Interactive Control utility?

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

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

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

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

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

How do I communicate with my instrument over the GPIB?

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

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

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

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

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

What information should I have before I call National Instruments?

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

Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems 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 application 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 U.S. only)

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

`support@natinst.com`

Telephone and Fax Support

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

	Telephone	Fax
Australia	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
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 725 725 11	09 725 725 55
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 5734815	03 5734816
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	01635 523545	01635 523154

Technical Support Form

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

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

Name _____

Title _____

Company _____

Address _____

_____

Fax   (____) _____   Phone (____) _____

Computer brand _____ Model _____ Processor _____

Operating system (include version number) _____

Clock Speed _____ MHz   RAM _____ MB   Display adapter _____

Mouse ____ yes _____ no   Other adapters installed _____

Hard disk capacity _____ MB   Brand _____

Instruments used _____

National Instruments hardware product model _____ Revision _____

Configuration _____

National Instruments software product _____ Version _____

Configuration _____

The problem is _____

_____

_____

_____

List any error messages _____

_____

_____

The following steps will reproduce the problem _____

_____

_____

Hardware and Software Configuration Form

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

National Instruments Products

AT-GPIB/TNT (PnP) Board and Revision Number _____

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

Programming Language Interface Version _____

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

Board Settings:

	Base I/O Address	**Interrupt Level**	**DMA Channel**
gpib0	_____	_____	_____
gpib1	_____	_____	_____
gpib2	_____	_____	_____
gpib3	_____	_____	_____

Other Products

Computer Make and Model _____

Microprocessor _____

Clock Frequency _____

Type of Monitor Card Installed _____

Windows NT Version _____

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

Other Boards in System _____

Base I/O Address of Other Boards _____

Interrupt Level of Other Boards _____

DMA Channels of Other Boards _____

Documentation Comment Form

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

Title: *Getting Started with Your AT-GPIB/TNT (PnP) and the GPIB Software for Windows NT*

Edition Date: June 1997

Part Number: 321675A-01

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

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

_____
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_____

Thank you for your help.

Name   _____

Title   _____

Company   _____

Address   _____

_____

Phone   (____) _____   Fax   (_____) _____

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National Instruments Corporation   National Instruments Corporation
6504 Bridge Point Parkway   (512) 794-5678
Austin, TX 78730-5039

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

°	degrees
%	percent
A	amperes
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
B	bytes
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
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
I/O	input/output
IRQ	interrupt request
ISA	Industry Standard Architecture

kernel	set of programs in an operating system that implements basic system functions
m	meters
MB	megabytes of memory
PC	personal computer
PnP	Plug and Play
RAM	random-access memory
s	seconds
VDC	volts direct current