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GPIB

Getting Started with Your PC/104-GPIB and the GPIB Software for Windows NT

January 1998 Edition
Part Number 321375B-01

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Important Information

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

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

This device complies with the FCC rules only if used with shielded interface cables of suitable quality and construction. National Instruments used such cables to test this device and provides them for sale to the user. The use of inferior or nonshielded interface cables 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: *Interference to Home Electronic Entertainment Equipment Handbook*. This booklet is available from the U.S. Government Printing Office, Washington, DC 20402.

Canadian Department of Communications

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

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

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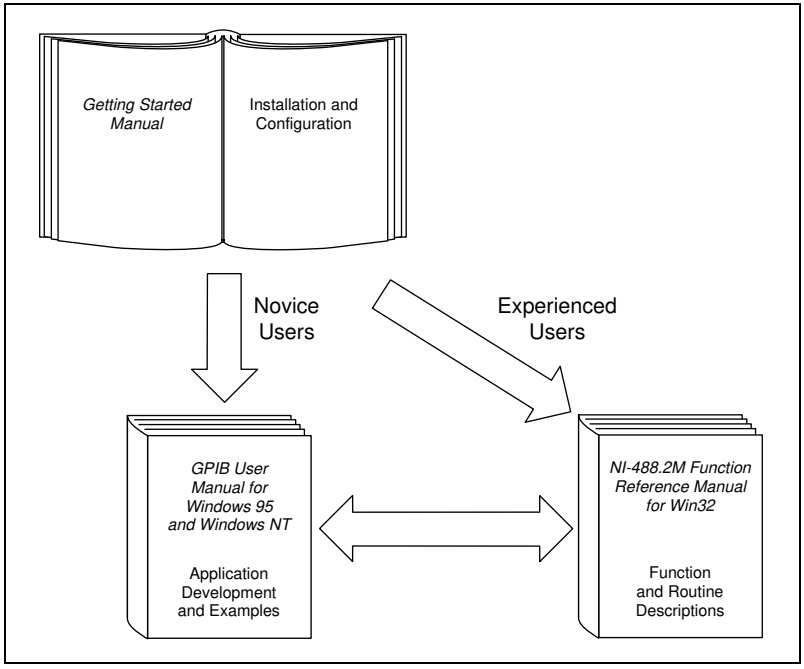
About This Manual

This manual contains instructions for installing and configuring the National Instruments PC/104-GPIB interface module and the GPIB software for Windows NT. The interface module is intended for use in a PC/104-based system. The GPIB software is intended for use with Windows NT version 4.0 or higher.

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

How to Use the Manual Set



Use this getting started manual to install and configure your PC/104-GPIB and the GPIB software for Windows NT.

Use the *GPIB User Manual for Windows 95 and Windows NT* to learn the basics of GPIB and how to develop an application program. This manual also contains application examples and troubleshooting information.

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

Organization of This Manual

The *Getting Started with Your PC/104-GPIB and the GPIB Software for Windows NT* manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this manual, lists what you need to get started and optional equipment that you can order, and briefly describes the PC/104-GPIB module and the GPIB software.
- Chapter 2, *Hardware Configuration and Installation,* describes how to configure and install your PC/104-GPIB module.
- Chapter 3, *Software Installation and Configuration*, describes how to install and configure the GPIB software for Windows NT.
- Chapter 4, *Verify the Installation*, describes how to verify the hardware and software installation.
- Chapter 5, *Begin to Use the GPIB Software,* helps you get started with the GPIB software for Windows NT.
- Appendix A, *Uninstalling the Hardware and Software*, describes how to uninstall your PC/104-GPIB and the GPIB software from Windows NT.
- 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 PC/104-GPIB, the transfer rates of the GPIB software, and the recommended operating conditions.
- Appendix D, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and a description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

The following conventions 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.
	This icon to the left of bold italicized text denotes a note, which alerts you to important information.
	This icon to the left of bold italicized text denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes the names of menus, menu items, parameters, dialog boxes, dialog box buttons or options, icons, windows, Windows 95 tabs, or LEDs.
bold italic	Bold italic text denotes an activity objective, note, caution, or warning.
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 variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text from which you supply the appropriate word or value, as in Windows 3.*x*.
`monospace`	Text in this font denotes text or characters that you should literally enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and for statements and comments taken from programs.
`monospace bold`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.
`monospace italic`	Italic text in this font denotes that you must enter the appropriate words or values in the place of these items.

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 User's Guide*, Microsoft Corporation
- *PC/104 Specification*, version 2.3

Customer Communication

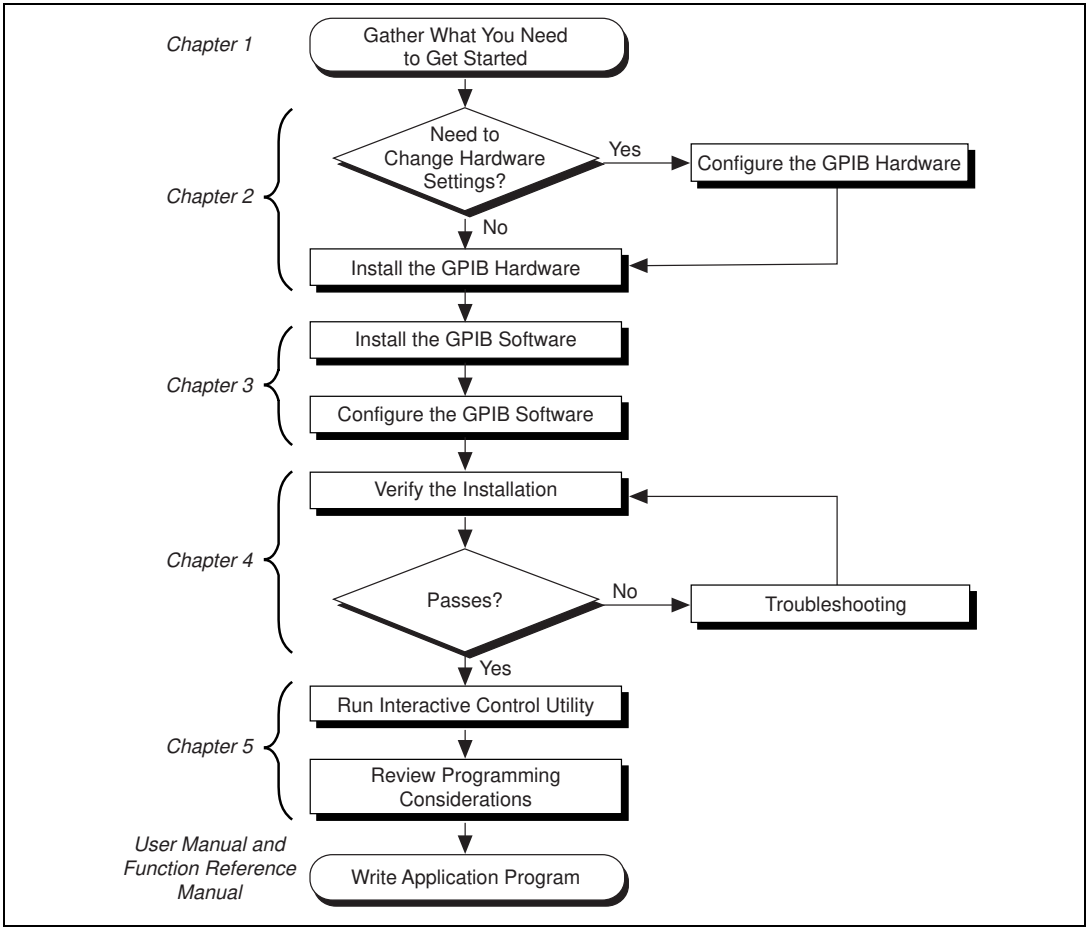
National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you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

Chapter 1

Introduction

This chapter explains how to use this manual, lists what you need to get started and optional equipment that you can order, and briefly describes the PC/104-GPIB module and the GPIB software.

How to Use This Manual



What You Need to Get Started

Make sure you have all of the following items before you install your GPIB hardware and software for Windows NT:

- ❑ One of the following modules, which your kit contains:
  - 16-bit PC/104-GPIB
  - 8-bit PC/104-GPIB
- ❑ PC/104 installation kit, which your kit contains:
  - Four standoffs
  - Four screws
  - Four hex nuts
  - 20 in. GPIB connection ribbon cable
- ❑ The following 3.5 in., high density (1.44 MB) disks, which your kit contains:
  - *GPIB Software for Windows NT (Disk 1 of 2)*
  - *GPIB Software for Windows NT (Disk 2 of 2)*
- ❑ GPIB cables—single-shielded or double-shielded, Type X1, X2, or X5, which you can order from National Instruments
- ❑ Windows NT version 4.0 or higher installed on your system

Optional Equipment

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

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

GPIB Hardware Overview

The *PC/104 Specification*, version 2.3, defines a compact version of the PC AT bus that is optimized for embedded systems applications. Unlike ISA boards that are installed in a fixed computer backplane, PC/104 modules are stacked, one on top of the other. Modules are available in 8-bit

and 16-bit versions, which correspond to the PC and PC AT bus implementations, respectively.

The PC/104-GPIB, equipped with a TNT4882C ASIC, transforms any PC/104 system into a fully-functioning GPIB Talker/Listener/Controller. 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 PC/104-GPIB up to 1.8 Mbytes/s. For more information about HS488, refer to Chapter 7, *GPIB Programming Techniques*, in the *GPIB User Manual for Windows 95 and Windows NT.*

The PC/104-GPIB is functionally identical to the AT-GPIB/TNT and can run any GPIB driver software for the AT-GPIB/TNT. The PC/104-GPIB is available in an 8-bit version and a 16-bit version. You can plug the 16-bit version into an 8-bit stack if you disable DMA transfers. The PC/104-GPIB is equipped with a 20 in. ribbon cable terminated with a panel-mount GPIB connector. You can use standard GPIB cables to connect the PC/104-GPIB 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 C, *Specifications*, for more information about the GPIB hardware specifications and recommended operating conditions.

GPIB Software Overview

The GPIB software, along with the PC/104-GPIB, transforms a PC/104 system into a GPIB Talker/Listener/Controller with complete communications and bus management capability. The GPIB software for Windows NT includes a loadable Windows NT kernel device driver and supporting utilities.

The GPIB software includes the following components:

- Device driver
- Diagnostic test utility
- Configuration utility
- Interactive control program
- Utilities for software development and debugging

- Language interface libraries for Microsoft Visual C/C++ 2.0 or later, Borland C/C++ 4.0 or later, and Microsoft Visual Basic 4.0 or later
- 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 Chapter 1, *Introduction*, in the *GPIB User Manual for Windows 95 and Windows NT*. Refer to Appendix C, *Specifications*, for information about the GPIB software transfer rates.

Time-Saving Development Tools

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

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

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

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

Hardware Configuration and Installation

Chapter 2

This chapter describes how to configure and install your PC/104-GPIB module.

Caution ***Electrostatic discharge can damage several components on your PC/104-GPIB. To avoid electrostatic damage when you handle the module, touch the antistatic plastic package to a metal part of your system chassis before you remove the module from the package.***

Using the Hardware Default Settings

The PC/104-GPIB default settings are suitable for most PC/104 systems. However, if the default settings conflict with another device in your system, if you are installing the PC/104-GPIB in an 8-bit stack, or if you need to install more than one PC/104-GPIB, you must reconfigure the hardware.

Table 2-1 shows the default settings for the switches and jumpers on the PC/104-GPIB.

Table 2-1. Hardware Default Settings

PC/104-GPIB Setting	Default
Base I/O address (hex)	2C0
DMA channel	5
Interrupt line (IRQ)	11

To modify the default settings of the PC/104-GPIB, skip to the *Configure the Hardware (Optional)* section of this chapter. If you do not need to reconfigure the module, continue to the next section, *Install the Hardware*.

Install the Hardware

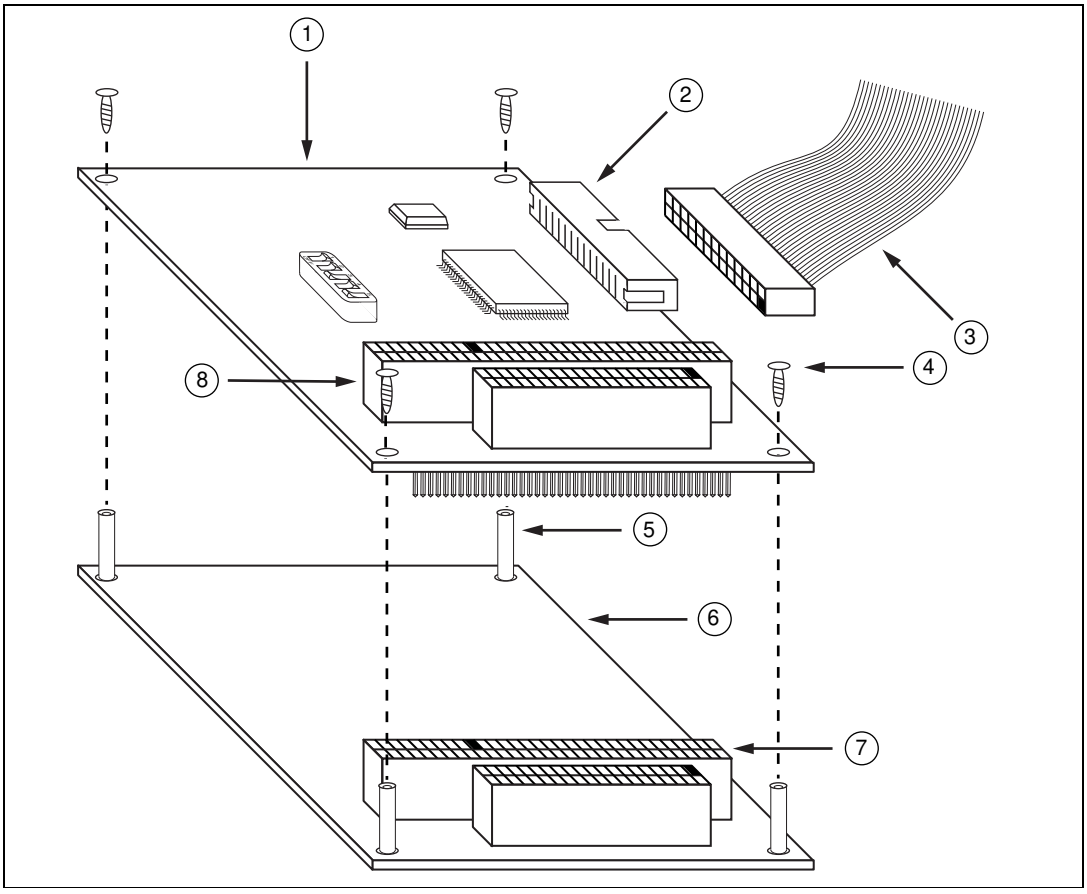
The PC/104-GPIB is available in two versions: stackthrough 16-bit and stackthrough 8-bit. 16-bit modules have two PC/104 connectors and 8-bit modules have one PC/104 connector. Verify that you have the correct version for your system.

In this section, *parent module* refers to either the parent system or the adjacent PC/104 module onto which you stack the PC/104-GPIB. Refer to Figure 2-1 as you complete the following steps to install the PC/104-GPIB:

1. Turn off your system. Keep the system plugged in so that it remains grounded while you install the PC/104-GPIB.
2. Mount the provided standoffs to the parent module before installing the PC/104-GPIB. You might need to install the provided hex nuts on the bottom side of the parent module to secure the standoffs in place. Notice that the parent module might have only two mounting holes for the standoffs instead of four; in this case, you need only two standoffs.
3. Plug the PC/104-GPIB into the parent module. The PC/104 header is keyed so that it fits in only one direction. Do not force the PC/104 connector into place.

   After you plug in the PC/104-GPIB, ensure proper contact by gently pressing down at the PC/104 connector region of the PC/104-GPIB until the module is level with respect to the parent module.

4. Fasten the PC/104-GPIB to the standoffs with the provided 4-40 screws.



1	PC/104-GPIB	3	GPIB ribbon cable	5	Standoff	7	PC/104 connector
2	GPIB connection	4	Screw	6	Parent module	8	PC/104 header

Figure 2-1. Installing the PC/104-GPIB

5. Plug the GPIB ribbon cable into the GPIB connection on the PC/104-GPIB. The header is keyed so that it fits in only one direction. Do not force the GPIB ribbon cable connector into place. The GPIB ribbon cable is 20 in. long and terminated with a panel-mount GPIB connector that can be mounted for easy access in your system.

Note ***If you plan to perform HS488 high-speed protocol transfers, you must configure the GPIB software for the amount of GPIB cable length in your system. You must add the 20 in. GPIB ribbon cable to your total GPIB cable length.***

6. Check the installation.
7. Turn on your system and start Windows NT.

The PC/104-GPIB installation is now complete. Proceed to Chapter 3, *Software Installation and Configuration*.

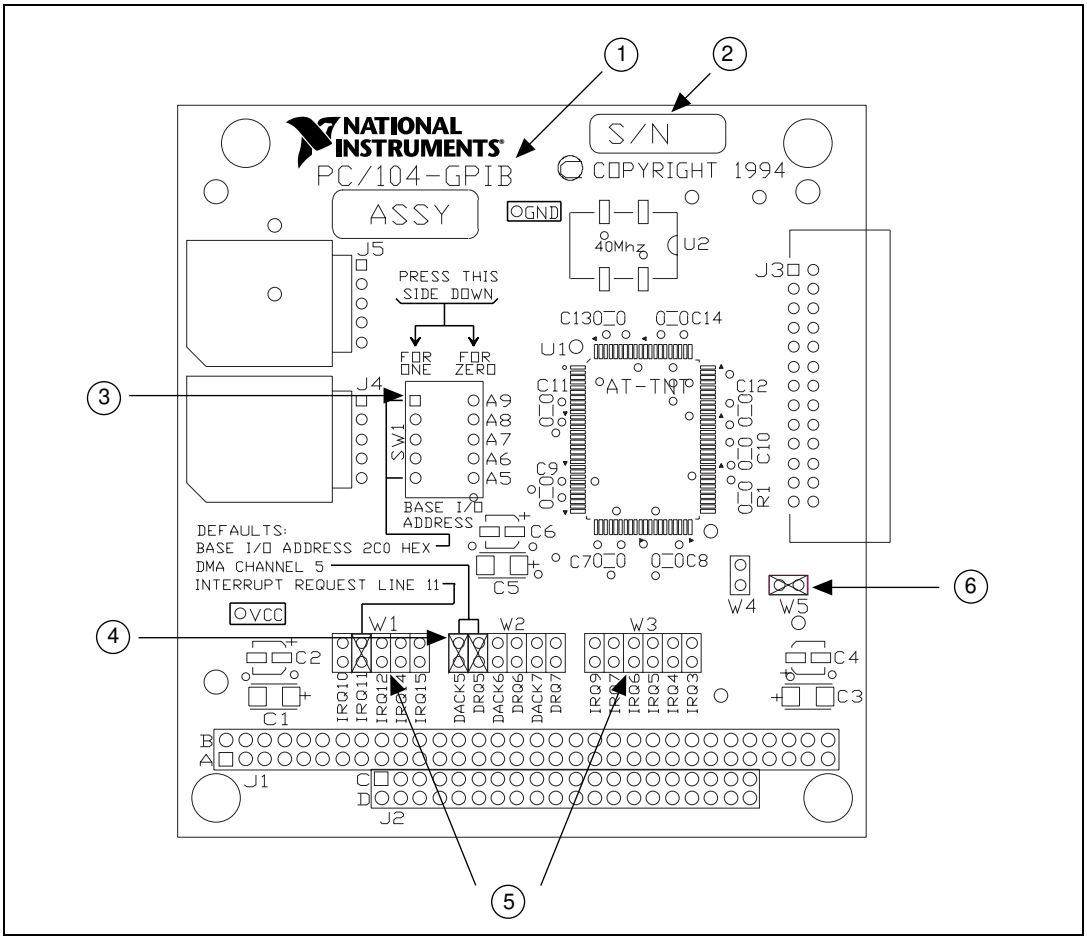
Configure the Hardware (Optional)

Follow the instructions in this section to change the hardware default settings of the PC/104-GPIB before you install it.

The default settings are suitable for most PC/104 systems. However, if the default settings conflict with another device in your system, if you are installing the PC-104-GPIB in an 8-bit stack, or if you need to install more than one PC/104-GPIB, you must reconfigure the hardware. If you are installing the PC/104-GPIB in an 8-bit stack, you must configure the PC/104-GPIB to use interrupt request level 3, 4, 5, 6 or 7, and disable DMA.

Refer to Table 2-1 for the default settings for the switches and jumpers on the PC/104-GPIB.

Figure 2-2 shows the location of the configuration jumpers and switches on the PC/104-GPIB.



1	Product Name and Assembly Number	3	Base I/O Address	5	Interrupt Levels
2	Serial Number	4	DMA Channel	6	Shield Ground

Figure 2-2. PC/104-GPIB Parts Locator Diagram

Selecting the Base I/O Address

PC/104-compatible systems have a segment of address space reserved for input and output. This segment is called the I/O address space. The base I/O address of a PC/104 module such as the PC/104-GPIB is the first position in the I/O address space occupied by the PC/104 module.

By default, the PC/104-GPIB is configured to use base I/O address 2C0 hex. With this setting, the module uses the I/O range of 2C0 hex through 2DF hex. If another device is already using this I/O range or if you are installing more than one PC/104-GPIB, complete the following steps to reconfigure the base I/O address setting:

1. Choose a new base I/O address setting.

   You can configure the base I/O addresses to any setting between 0x100 and 0x3E0 that is a multiple of 0x20 hex. If you are installing more than one PC/104-GPIB, each module must use a unique base I/O address.

   Table 2-2 lists the possible switch settings, the corresponding base I/O addresses, and the I/O address space used for each setting. The default settings are in ***bold italics***.

Table 2-2. Possible Base I/O Address Switch Settings

Switch Setting					Base I/O Address (hex)	I/O Address Space Used (hex)
A9	A8	A7	A6	A5		
0	1	0	0	0	100	100 to 11F
0	1	0	0	1	120	120 to 13F
0	1	0	1	0	140	140 to 15F
0	1	0	1	1	160	160 to 17F
0	1	1	0	0	180	180 to 19F
0	1	1	0	1	1A0	1A0 to 1BF
0	1	1	1	0	1C0	1C0 to 1DF
0	1	1	1	1	1E0	1E0 to 1FF
1	0	0	0	0	200	200 to 21F
1	0	0	0	1	220	220 to 23F
1	0	0	1	0	240	240 to 25F
1	0	0	1	1	260	260 to 27F
1	0	1	0	0	280	280 to 29F

Table 2-2. Possible Base I/O Address Switch Settings (Continued)

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

2. Locate the base I/O address switch at SW1 on your PC/104-GPIB. Refer to the parts locator diagram, Figure 2-2.
3. Change the switch settings to configure the PC/104-GPIB to the new base I/O address.

Press down on the side marked 1 to select a binary value of 1 for the corresponding address bit. Press down on the 0 side of the switch to select a binary value of 0. Refer to Figure 2-3 for an example of the switch settings and corresponding base I/O addresses.

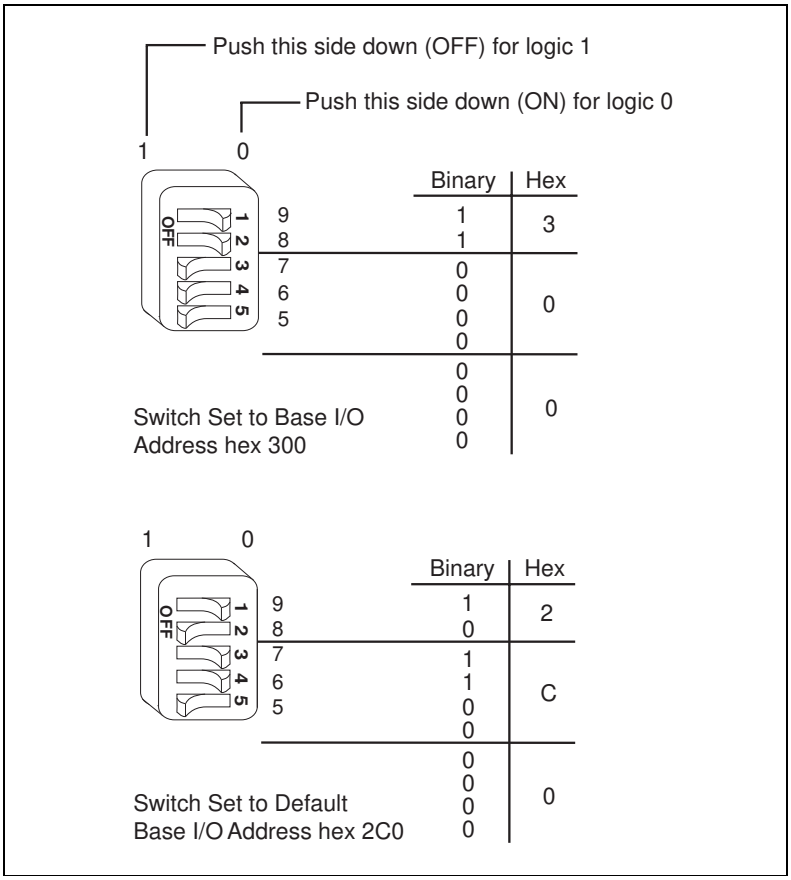


Figure 2-3. Base I/O Address Switch Settings

4. Record your new settings on the *Hardware and Software Configuration Form* in Appendix D, *Customer Communication*.
5. Remember that after you install the GPIB software, you must use the GPIB Configuration utility to configure your software settings to match your new hardware settings. Refer to the *Configure the Software* section in Chapter 3, *Software Installation and Configuration*, for information about the GPIB Configuration utility.

Selecting the Interrupt Request Line

PC/104-compatible systems have a series of interrupt request lines available to devices. Devices use interrupts to get immediate service from the CPU for asynchronous events. Your GPIB hardware and software use interrupts to get service from the CPU when necessary.

☞ **Note** ***Do not disable interrupts. The GPIB software for Windows NT requires interrupts to be enabled. It does not work properly with interrupts disabled.***

By default, the PC/104-GPIB is configured to use interrupt request line 11. If this setting conflicts with another device in your system, if you are installing the PC-104-GPIB in an 8-bit stack, or if you need to install more than one PC/104-GPIB, complete the following steps to reconfigure the interrupt request line:

1. Choose a new interrupt request line (IRQ) setting.

   If you are installing the PC/104-GPIB in a 16-bit stack, you can configure it to use any of the following interrupt lines: IRQ3, 4, 5, 6, 7, 9, 10, 11, 12, 14, or 15. Do not use interrupt line 6 or 14. On most systems, the diskette drive controller uses interrupt line 6 and the hard disk drive controller uses interrupt line 14.

   If you are installing the PC/104-GPIB in an 8-bit stack, you can configure it to use any of the following interrupt lines: IRQ3, 4, 5, 6, and 7.

   If you are installing more than one PC/104-GPIB, each module must use a unique IRQ setting.

2. Find the jumpers at W1 and W3 that set the interrupt request line. The jumpers are located on the lower edge of your PC/104-GPIB. Refer to the parts locator diagram, Figure 2-2.

3. Change the jumper settings to configure the PC/104-GPIB to the new interrupt request line.

   To use lines 10, 11, 12, 14, or 15, use the jumper block shown in Figure 2-4. To use interrupt lines 3, 4, 5, 6, 7, or 9, use the jumper block shown in Figure 2-5.

Figure 2-4 shows the setting for IRQ11.

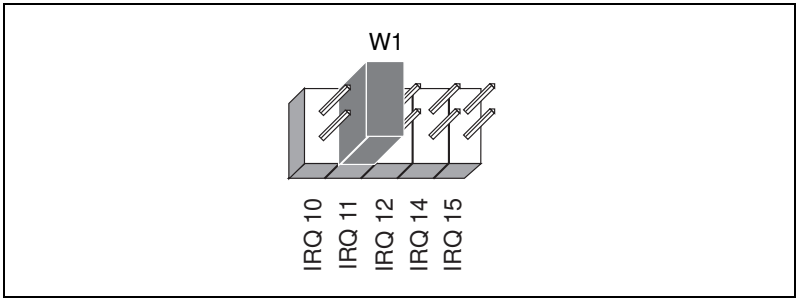


Figure 2-4. Interrupt Jumper Setting for IRQ11 (Default Setting)

Figure 2-5 shows the setting for IRQ5.

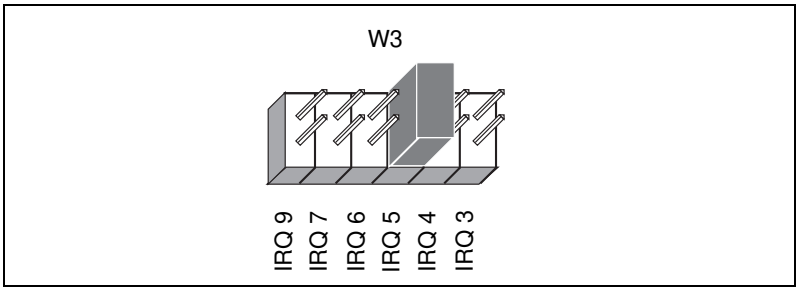


Figure 2-5. Interrupt Jumper Setting for IRQ5

4. Record your new setting on the *Hardware and Software Configuration Form* in Appendix D, *Customer Communication*.
5. Remember that after you install the GPIB software, you must use the GPIB Configuration utility to configure your software settings to match your new hardware settings. Refer to the *Configure the Software* section in Chapter 3, *Software Installation and Configuration*, for information about the GPIB Configuration utility.

Selecting the DMA Channel

Direct memory access (DMA) refers to data transfers directly to or directly from devices such as the PC/104-GPIB and system memory. Your GPIB hardware and the GPIB 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.

By default, the PC/104-GPIB is configured to use DMA channel 5. If this is not an acceptable setting, if you are installing the PC/104-GPIB in an 8-bit stack, or if you are installing more than one PC/104-GPIB, complete the following steps to reconfigure the DMA channel:

Note ***If you are installing the PC/104-GPIB in an 8-bit stack, you must disable DMA, because DMA channels 5, 6, and 7 are 16-bit DMA channels. Refer to Figure 2-8, which shows how to set the DMA jumpers for no DMA.***

1. Choose a new DMA channel setting.

   You can use channel 5, 6, or 7. If you are installing more than one PC/104-GPIB, each module must either use a unique DMA channel or must not use DMA at all.
2. Locate the jumpers at W2 that select the DMA channel. Refer to the parts locator diagram, Figure 2-2.
3. Change the jumper settings to configure the PC/104-GPIB to the new DMA channel. To select a new DMA channel, you must set both the DMA Acknowledge and DMA Request lines, as shown in Table 2-3.

Table 2-3. DMA Channels

DMA Channel	Signal Lines	
	DMA Acknowledge	DMA Request
5	DACK5	DRQ5
6	DACK6	DRQ6
7	DACK7	DRQ7

Figure 2-6 shows the jumper position for selecting DMA channel 7.

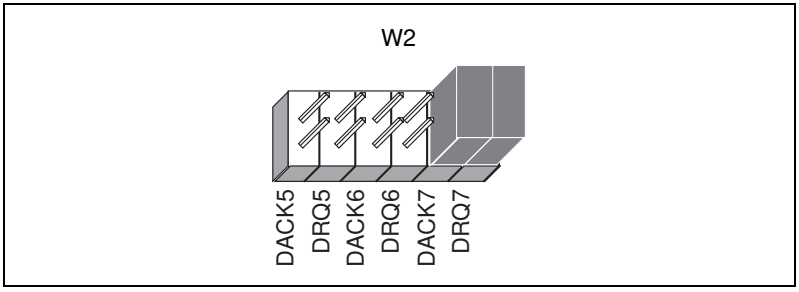


Figure 2-6. DMA Channel Jumper Setting for DMA Channel 7

4. Record your new settings on the *Hardware and Software Configuration Form* in Appendix D, *Customer Communication*.
5. Remember that after you install the GPIB software, you must use the GPIB Configuration utility to configure your software settings to match your new hardware settings. Refer to the *Configure the Software* section in Chapter 3, *Software Installation and Configuration*, for information about the GPIB Configuration utility.

Using Programmed I/O for GPIB Transfers

As an alternative to DMA transfers, you can use programmed I/O. To use programmed I/O, you should disable DMA for the PC/104-GPIB by moving the jumpers as shown in Figure 2-7.

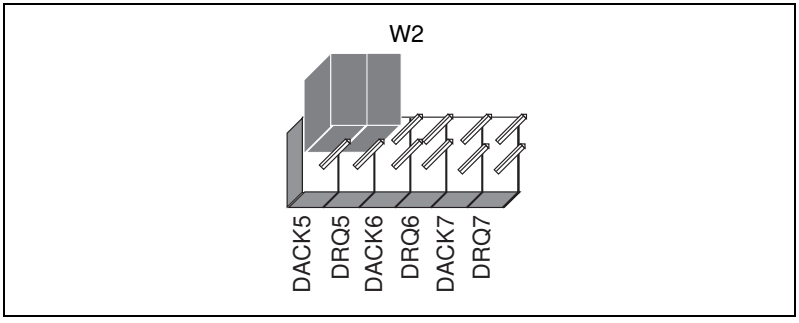


Figure 2-7. DMA Jumper Setting for No DMA Channel

Setting the Shield Ground Configuration

The PC/104-GPIB is set at the factory with the jumper in place to connect the logic ground of the PC/104-GPIB to its shield ground. This configuration minimizes EMI emissions.

Caution ***The PC/104-GPIB 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, complete the following steps:

1. Refer to Figure 2-2 to locate the shield ground jumper W5 on the PC/104-GPIB module.

2. Remove the jumper and place it across only one of the jumper pins, as shown in Figure 2-8.

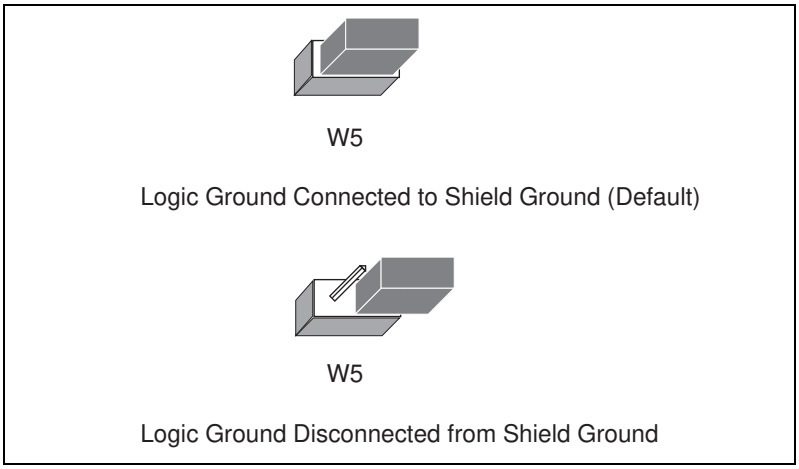


Figure 2-8. Ground Configuration Jumper Settings

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

After you properly configure the hardware, return to the *Install the Hardware* section at the beginning of this chapter for installation instructions.

Software Installation and Configuration

Chapter 3

This chapter describes how to install and configure the GPIB software for Windows NT.

Install the Software

After you have installed and configured the hardware, you are ready to install the GPIB software. Complete the following steps to install the GPIB software for Windows NT:

☞ **Note** ***The PC/104-GPIB is functionally identical to the AT-GPIB/TNT. Therefore, the GPIB software for Windows NT refers to the PC/104-GPIB as an AT-GPIB/TNT.***

1. Log onto your Windows NT system using the `Administrator` account. The GPIB setup program must have `Administrator` privileges because the program modifies the configuration registry of your system.
2. Insert the *GPIB Software for Windows NT (Disk 1 of 2)* 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 dialog box shown in Figure 3-1.

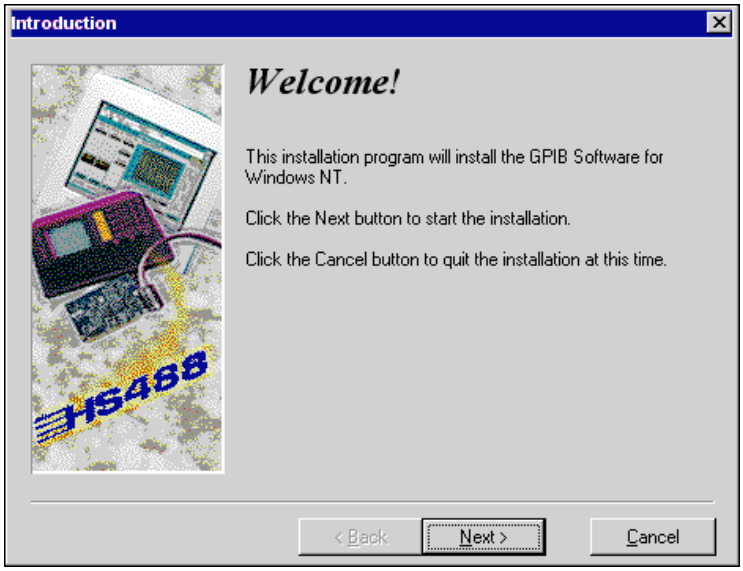


Figure 3-1. GPIB Software for Windows NT Setup Dialog Box

The setup wizard guides you through the necessary steps to install the GPIB software. To go back and change values where appropriate, click on the **Back** button. To exit the setup program at any time, click on the **Cancel** button.

Before you use the GPIB software with your PC/104-GPIB, you must reconfigure the software. Refer to the next section, *Configure the Software*, for instructions on how to run the GPIB Configuration utility.

Configure the Software

The GPIB Configuration utility is an interactive utility you can use to examine or modify the configuration of the GPIB driver. You must run the GPIB Configuration utility before you use the GPIB software for Windows NT. Complete the following steps to run the utility:

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

   The GPIB Configuration utility 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. The PC/104-GPIB is compatible with the AT-GPIB/TNT, so select **AT-GPIB/TNT** from the list that appears. Click on the **OK** button.
4. Configure your PC/104-GPIB interface:
   a. Click on the **Configure** button to bring up the **PC/104-GPIB Configuration** dialog box, as shown in Figure 3-2.

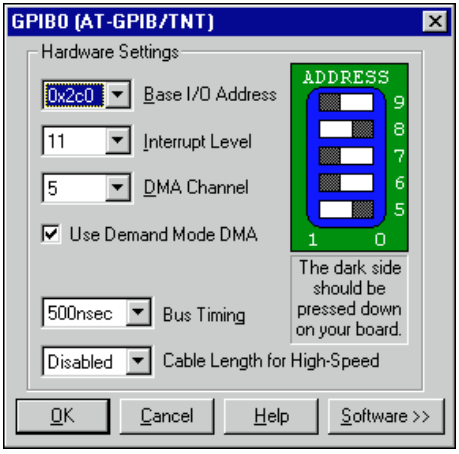


Figure 3-2. PC/104-GPIB Configuration Dialog Box

   b. If you are not using the default GPIB hardware settings, you must modify the **Base I/O Address**, **Interrupt Level**, and **DMA Channel** to match your PC/104-GPIB hardware settings.
   c. Click on the **OK** button.
   d. In the **GPIB Configuration** dialog box, click on the **OK** button to save your changes and exit the utility.
   e. In the **Restart the GPIB Software?** dialog box, click on the **Yes** button.
5. (Optional) Configure the GPIB software settings:
   a. Select **Start»Settings»Control Panel** and double-click on the **GPIB** icon.
   b. You can configure additional items, such as the GPIB primary address or I/O timeout, but they are normally configured at run

time by your application program. To examine or edit a setting, double-click on its name. You can use the online help if you have any questions. For more information about GPIB Configuration utility options, refer to the *GPIB User Manual for Windows 95 and Windows NT* or use the online help.

c. To save your changes and exit the utility, click on the **OK** button. To discard the changes and exit the utility, click on the **Cancel** button.

After you install and configure the software, you should verify the installation. Continue to the next chapter, Chapter 4, *Verify the Installation*.

Chapter 4

Verify the Installation

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

You can use the Diagnostic utility, installed with your GPIB software, to test the hardware and software installation. The 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»GPIB Software**.

After you start the Diagnostic utility, test your GPIB interfaces by clicking on the **Test All** button. If the Diagnostic utility test is successful, it puts a checkmark 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 4-1 shows the **Diagnostic** dialog box after it has tested some GPIB interfaces. The PC/104-GPIB module appears as **AT-GPIB/TNT**.

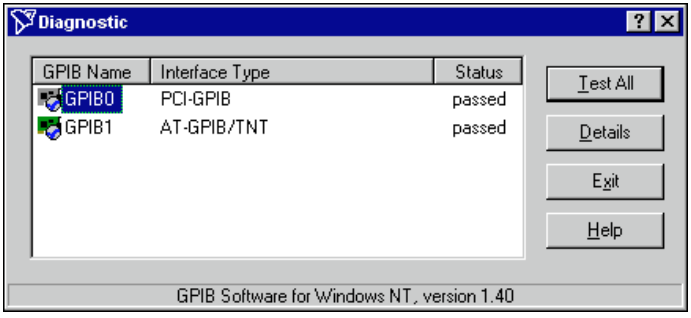


Figure 4-1. Diagnostic Utility after Testing

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. Use that information and the information in Appendix B, *Troubleshooting and Common Questions*, to troubleshoot the problem. Troubleshooting information is also available in the Diagnostic utility online help, which you can access by clicking on the **Help** button.

Begin to Use the GPIB Software

Chapter 5

This chapter helps you get started with the GPIB software for Windows NT.

Getting Started with LabVIEW

LabVIEW is a graphical programming language in which your source code looks like a flowchart. It provides the same functionality as other programming languages when controlling GPIB instruments. If you already installed LabVIEW, you can use the LabVIEW GPIB functions without any additional installation. To learn about the basic concepts of GPIB communication, refer to the LabVIEW GPIB functions chapter in the *LabVIEW User Manual*. To learn more about each GPIB function, refer to the *LabVIEW Function and VI Overview Manual* and the online help.

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

To find GPIB examples similar to your application, click on the **Solution Wizard** and **Search Examples** buttons in the startup LabVIEW dialog box.

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

Getting Started with LabWindows/CVI

If you already installed LabWindows/CVI, you can use the LabWindows/CVI GPIB Library without any additional installation. The LabWindows/CVI GPIB Library includes the functions documented in your NI-488.2 or NI-488.2M reference manual, as well as several additional functions, which are documented in the GPIB library chapter of

the *LabWindows/CVI Standard Libraries Reference Manual*. To help you use the GPIB functions, LabWindows/CVI provides function panels for the GPIB Library. To access the function panels, select **GPIB/GPIB 488.2** from the **Library** menu of the **Project** or **Source** windows. For information about using function panels, refer to the function panels chapter in the *LabWindows/CVI User Manual*.

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

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

Introduction to the Win32 Interactive Control Utility

You can use the interactive control utility to enter NI-488 functions and NI-488.2 routines interactively and see the values returned by the function calls. You can use 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»GPIB Software**.

This utility includes extensive online help, which you can access by entering `help` at the `:` prompt. For more information about the Win32 Interactive Control utility, refer to the *GPIB User Manual for Windows 95 and Windows NT*.

Introduction to the NI Spy Utility

Included with the GPIB software is NI Spy, a Win32 utility that monitors and records multiple National Instruments APIs (for example, NI-488.2 and VISA). You can use NI Spy to monitor Win32, Win16, and DOS GPIB applications. Use NI Spy to do the following:

- Capture information about NI-488 functions and NI-488.2 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 NI Spy, select the **NI Spy** item under **Start»Programs»GPIB Software**.

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

Running Existing GPIB Applications

You can run existing Win32, Win16, and DOS GPIB applications under Windows NT.

Win32 and Win16 GPIB applications run without any special modifications. To run an existing DOS GPIB application, complete the following steps.

Load the special GPIB device driver `gpib-nt.com` instead of `gpib.com`, which you normally use with DOS. When you install the GPIB software, the GPIB setup 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`. The GPIB setup program modifies the `config.nt` file by adding the following lines:

```
REM *** To run DOS GPIB applications, uncomment the
REM *** following line
REM device=path\doswin16\gpib-nt.com
```

where *path* is the directory in which you installed the GPIB software.

To load gpib-nt.com, locate these lines in your config.nt file and delete REM from the third line, as follows:

```
REM *** To run DOS GPIB applications, uncomment the
REM *** following line
device=path\doswin16\gpib-nt.com
```

where *path* is the directory in which you installed the GPIB software.

General Programming Considerations

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

- For your C/C++ application, you must include the NI-488.2M header file, decl-32.h, in your source code.
- You can access the GPIB software through the 32-bit DLL, gpib-32.dll, either by linking with one of the language interfaces provided with the GPIB software, or by using direct DLL entry from other programming environments.
- Several sample GPIB applications are included with the GPIB software. Use these as a guide for your own application development.

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

Uninstalling the Hardware and Software

Appendix A

This appendix describes how to uninstall your PC/104-GPIB and the GPIB software from Windows NT.

Uninstalling the Hardware

Before you physically remove the GPIB hardware from your system, you must remove the hardware information using the GPIB Configuration utility. Complete the following steps to remove the hardware information:

1. Select **Start»Settings»Control Panel** and double-click on the **GPIB** icon.
2. In the **GPIB Configuration** dialog box, select the GPIB interface you want to remove from the **GPIB Board** list.
3. Click on the **Board Type** button and select **None** from the list that appears, as shown in Figure A-1. Click on the **OK** button to save the new **Board Type** setting.

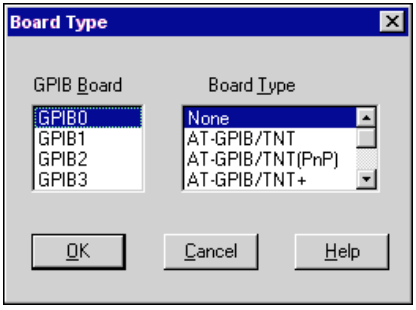


Figure A-1. Board Type Dialog Box

4. Click on the **OK** button to save your changes and exit the GPIB Configuration utility.
5. Shut down Windows NT, turn off your system, and physically remove the interface from your system.

Uninstalling the Software

Before you uninstall the GPIB software, you should set the **Board Type** for your GPIB interface(s) to **None** in the GPIB Configuration utility, as described in the previous section. Complete the following steps to uninstall the GPIB software:

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

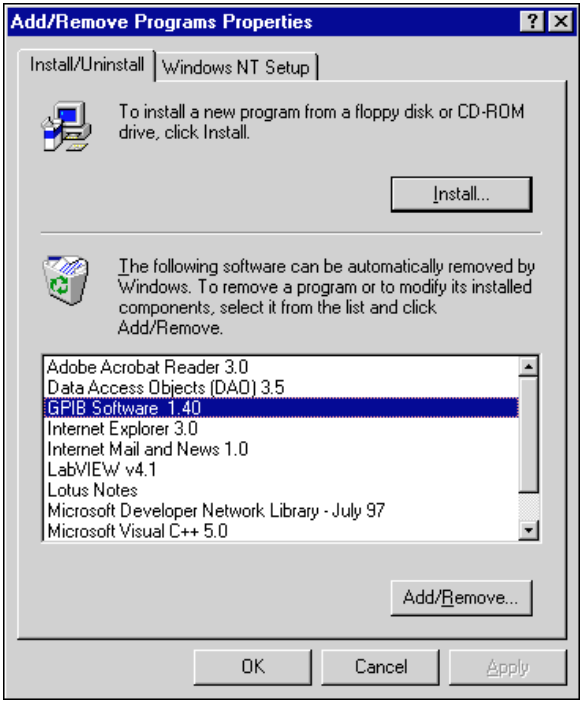


Figure A-2. Add/Remove Programs Properties Dialog Box

2. Select the GPIB software you want to remove and click on the **Add/Remove…** button. The uninstall program removes all folders, programs, DLLs, and registry entries associated with the GPIB software. During uninstallation, you are prompted about deleting shared components, as shown in Figure A-3. Click on **Yes**, **No**, or **No to All** to continue with the uninstallation.

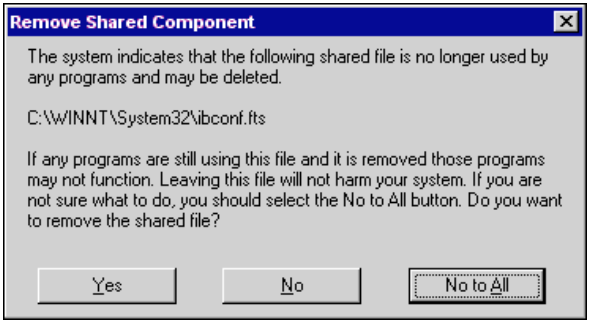


Figure A-3. Removed Shared Component Dialog Box

If you have not physically removed your hardware, shut down Windows NT, turn off your system, and remove the GPIB hardware.

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

If you want to reinstall the GPIB hardware and software, refer to Chapter 2, *Hardware Configuration and Installation*, and Chapter 3, *Software Installation and Configuration*.

Troubleshooting and Common Questions

Appendix
B

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

Troubleshooting Diagnostic Utility Failures

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

Missing Software Components

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

No GPIB Interfaces Present

This error occurs if there is no PC/104-GPIB physically present in the system or there is a resource conflict with the interfaces that are installed. If you encounter this problem, use the GPIB Configuration utility to examine any installed GPIB interfaces and the resources assigned to each. Then, run the Diagnostic utility again.

To access this information in the GPIB Configuration utility, 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 PC/104-GPIB. Disconnect all GPIB cables and run the Diagnostic utility again.

Address Resource Conflict

This error occurs if the address resources assigned to a GPIB interface conflict with the address resources being used by other devices in the system. 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 being used by other devices in the system. 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 PC/104-GPIB conflict with the DMA resources being used by other devices in the system. 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 PC/104-GPIB and that you have not configured the GPIB software to use single-cycle DMA. If you encounter this error, you should use the GPIB Configuration utility to configure the GPIB software to use single-cycle DMA for all DMA transfers, and then run the Diagnostic utility again.

To configure the GPIB software to use single-cycle DMA for the PC/104-GPIB, complete the following steps:

1. Select **Start»Settings»Control Panel** and double-click on the **GPIB** icon.
2. Double-click on **AT-GPIB/TNT**.
3. Make sure that the **Use Demand Mode DMA** item is unchecked.

GPIB Software Problem Encountered

This error occurs if the Diagnostic utility detects that it is unable to communicate correctly with the GPIB hardware using the installed GPIB software. If you encounter this error, shut down your system, restart it, and run the Diagnostic utility again. If the problem persists, reinstall the GPIB 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 system, restart it, and run the Diagnostic utility again. If the problem persists, reinstall the GPIB 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 PC/104-GPIB. The GPIB 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 Configuration utility 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 your system is currently using. You can assign resources not listed by this utility to your GPIB interface.

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

Note ***For 8-bit operation, you must disable DMA and use only interrupt request line 3, 4, 5, 6, or 7.***

Using Windows NT Diagnostic Tools

There are many reasons why the GPIB 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 GPIB 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 GPIB Installation

To verify whether the GPIB 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 detected by Windows NT. Each device has a status associated with it. If the GPIB driver is installed correctly, the following lines appear in the list of Windows 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 GPIB software is not installed properly. You should reinstall the GPIB software. Refer to Chapter 3, *Software Installation and Configuration*, for installation instructions.

Examining the NT System Log Using the Event Viewer

Windows NT maintains a system log. If the GPIB 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 GPIB driver and an event is logged that **`The system cannot find the file specified`**. In this case, the GPIB software is not installed properly. You should reinstall the GPIB software. Refer to Chapter 3, *Software Installation and Configuration*, for installation instructions.
- 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 GPIB hardware and software. Refer to Chapter 2, *Hardware Configuration and Installation*, and Chapter 3, *Software Installation and Configuration*, for configuration information.

Common Questions

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

Run the GPIB Configuration utility: select **Start»Settings»Control Panel** and double-click on the **GPIB** icon.

Note ***The PC/104-GPIB is functionally identical to the AT-GPIB/TNT. Therefore, the GPIB software for Windows NT refers to the PC/104-GPIB as an AT-GPIB/TNT.***

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

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

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

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

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

The GPIB 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 GPIB software for Windows NT?

Interrupts are required, but DMA is not.

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

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

When should I use the Win32 Interactive Control utility?

You can use the Win32 Interactive Control utility to test and verify instrument communication, troubleshoot problems, and develop your application. For more information, refer to the *Introduction to the Win32 Interactive Control Utility* section in Chapter 5, *Begin to Use the GPIB Software*.

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

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

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

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

How 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 *GPIB 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 *GPIB 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 utility test. Also, make sure you have filled out the forms in Appendix D, *Customer Communication*.

Specifications

Appendix C

This appendix describes the physical characteristics of the PC/104-GPIB, the transfer rates of the GPIB software, and the recommended operating conditions.

Hardware Characteristics

Table C-1. Hardware Characteristics for the PC/104-GPIB

Characteristic	Specification
Dimensions	9.017 by 9.589 cm (3.55 by 3.775 in.)
Power Requirement (from PC AT I/O Channel)	+5 VDC 50 mA Typical 120 mA Maximum
I/O Connector	20 in. Ribbon Cable Terminated with Panel-Mount IEEE 488 Standard 24-Pin
Operating Environment Ambient Temperature Relative Humidity	 –40° to 85° C 10% to 90%, noncondensing
Storage Environment Temperature Relative Humidity	 –40° to 85° C 5% to 90%, noncondensing
EMI	FCC Class A Verified

Software Transfer Rates

Table C-2. GPIB Software Transfer Rates for the PC/104-GPIB

Transfer Method	Maximum GPIB Transfer Rate
3-Wire (IEEE 488)	1.5 Mbytes/s*
High Speed (HS488)	1.8 Mbytes/s*

* Actual speed may vary considerably from speed shown because of system and instrumentation capabilities.

Customer Communication

Appendix
D

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

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

Electronic Services

Bulletin Board Support

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

United States: 512 794 5422
Up to 14,400 baud, 8 data bits, 1 stop bit, no parity

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

France: 01 48 65 15 59
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

FTP Support

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

Fax-on-Demand Support

Fax-on-Demand is a 24-hour information retrieval system containing a library of documents on a wide range of technical information. You can access Fax-on-Demand from a touch-tone telephone at 512 418 1111.

E-Mail Support (Currently USA Only)

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

`support@natinst.com`

Telephone and Fax Support

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

Country	Telephone	Fax
Australia	03 9879 5166	03 9879 6277
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Brazil	011 288 3336	011 288 8528
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 725 725 11	09 725 725 55
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 6120092	03 6120095
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
United Kingdom	01635 523545	01635 523154
United States	512 795 8248	512 794 5678

Technical Support Form

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

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

Name _____

Company _____

Address _____

_____

Fax (___) _____Phone (___) _____

Computer brand_____ Model _____Processor_____

Operating system (include version number) _____

Clock speed _____MHz RAM _____MB Display adapter _____

Mouse ___yes ___no Other adapters installed_____

Hard disk capacity _____MB Brand_____

Instruments used _____

_____

National Instruments hardware product model _____ Revision _____

Configuration _____

National Instruments software product _____ Version _____

Configuration _____

The problem is: _____

_____

_____

_____

_____

List any error messages: _____

_____

_____

The following steps reproduce the problem: _____

_____

_____

_____

_____

Hardware and Software Configuration Form

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

National Instruments Products

GPIB interface type and revision _____

GPIB software for Windows NT version number on disk _____

Programming language interface version _____

Diagnostic utility results _____

Board settings:

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

Other Products

Computer make and model _____

Microprocessor _____

Clock frequency or speed _____

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 PC/104-GPIB Hardware and the GPIB Software for Windows NT*

Edition Date: January 1998

Part Number: 321375B-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.

_____

_____

_____

_____

_____

_____

_____

Thank you for your help.

Name _____

Title _____

Company _____

Address _____

_____

E-Mail Address _____

Phone (___) _____ Fax (___) _____

Mail to: Technical Publications
National Instruments Corporation
6504 Bridge Point Parkway
Austin, Texas 78730-5039

Fax to: Technical Publications
National Instruments Corporation
512 794 5678

Glossary

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

°	degrees
%	percent
A	amperes
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
C	Celsius
CE	Conformite Europeene
CPU	central processing unit
DMA	direct memory access
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
m	meters
MB	megabytes of memory
PC	personal computer
RAM	random-access memory
s	seconds
VDC	volts direct current