GPIB

Getting Started with Your PC/104-GPIB and the GPIB Software for Windows 95

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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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This manual contains instructions to help you install and configure the National Instruments PC/104-GPIB interface module and the GPIB software for Windows 95. The interface module is intended for use in a PC/104-based system.

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

How to Use the Manual Set

Use this getting started manual to install and configure your PC/104-GPIB and the GPIB software for Windows 95.

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

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

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, explains how to use this manual, lists what
  you need to get started, and briefly describes the PC/104-GPIB and
  the GPIB software for Windows 95.

- Chapter 2, *Installation and Configuration*, contains instructions to
  help you install and configure your PC/104-GPIB hardware and the
  GPIB software for Windows 95.

- Chapter 3, *Verify the Installation*, describes how to verify the
  hardware and software installation.

- Chapter 4, *Begin to Use the GPIB Software*, helps you get started
  with the GPIB software for Windows 95.

- Appendix A, *Uninstalling the Hardware and Software*, describes
  how to uninstall your PC/104-GPIB and GPIB software for
  Windows 95.

- Appendix B, *Troubleshooting and Common Questions*, describes
  how to troubleshoot problems and answers some common
  questions.

- Appendix C, *Specifications*, describes the physical characteristics
  of the 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** option from the last dialog box.
☞	This icon to the left of bold italicized text denotes a note, which alerts you to important information.
⚠	This icon to the left of bold italicized text denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes the names of menus, menu items, parameters, dialog boxes, dialog box buttons or options, icons, windows, or LEDs.
bold monospace	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.
bold italic	Bold italic text denotes a 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 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.
italic monospace	Italic text in this font denotes that you must supply the appropriate words or values in place of these items.
monospace	Text in this font denotes text or characters that you should 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, file names and extensions, and for statements and comments taken from programs.

Related Documentation

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

- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- Microsoft Windows 95 Online Help, Microsoft Corporation
- *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.

Introduction

Chapter

1

This chapter explains how to use this manual, lists what you need to get started, and briefly describes the PC/104-GPIB and the GPIB software for Windows 95.

How to Use This Manual

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

What You Need to Get Started

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

❑ Windows 95 or later installed on your system

❑ One of the following modules:

- 16-bit PC/104-GPIB
- 8-bit PC/104-GPIB

❑ PC/104 installation kit:

- Four standoffs
- Four screws
- Four hex nuts
- 20 in. GPIB connection ribbon cable

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

- *GPIB Software for Windows 95 (Disk 1 of 2)*
- *GPIB Software for Windows 95 (Disk 2 of 2)*

❑ GPIB cables—single-shielded or double-shielded, Type X1, X2, or X5, which you can order from National Instruments

Optional Equipment

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

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

GPIB Hardware Overview

The *PC/104 Specification* 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-functional 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 MB/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 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 includes a native, 32-bit multitasking Windows 95 driver that is fully Plug and Play aware. Because the PC/104-GPIB is a non Plug and Play module, Windows 95 is unable to detect its addition to or removal from your system dynamically. You must manually inform Windows 95 about the insertion or removal of the PC/104-GPIB from your system. This manual describes the insertion and removal procedures for the PC/104-GPIB.

The GPIB software for Windows 95 supports the concurrent use of multiple types of GPIB hardware. For example, you can communicate with GPIB devices through both a PC/104-GPIB and an AT-GPIB/TNT in the same system at the same time. The GPIB software is integrated into the Windows 95 operating system. It is configurable through the System Properties applet and uninstallable through the Add/Remove Programs applet of the Control Panel.

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 includes the following components:

- Device driver

- Diagnostic test utility

- Configuration utility

- Interactive control program

- Utilities for software development

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

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

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

Optional Programming Environments

Your kit includes the GPIB software for Windows 95. In addition, you can order the LabWindows/CVI or LabVIEW software from National Instruments. LabWindows/CVI and LabVIEW include instrument driver libraries that make it easier to communicate with your GPIB 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.

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

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

Installation and Configuration

This chapter contains instructions to help you install and configure your PC/104-GPIB hardware and the GPIB software for Windows 95.

Install the GPIB Software

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

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

2. Double-click on the **Add/Remove Programs** icon in the Control Panel to launch the Add/Remove Programs applet. A dialog box similar to the one in Figure 2-1 appears.

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

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

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

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

Figure 2-2. GPIB Software Setup Screen

5. Click on the **Next** button to proceed with the installation.
    The setup wizard guides you through the necessary steps to install
    the GPIB software. You may go back and change values if
    necessary by clicking on the **Back** button. You can exit the setup
    when necessary by clicking on the **Cancel** button.

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

Install the Hardware

This section describes how to install your PC/104-GPIB hardware.

If you have previously installed the GPIB Compatibility Release for
Windows 95, you should remove any system-reserved resources for
your PC/104-GPIB. System-reserved resources are only acquired
manually. If you did not use the Device manager to acquire
system-reserved resources, you do not need to use the Device Manager
to remove such resources. If you do need to remove system-reserved
resources, refer to the *Removing System-Reserved Resources* section of
Appendix B, *Troubleshooting and Common Questions*.

Identify Resources for the PC/104-GPIB

Before installing the PC/104-GPIB hardware, use the **Add New Hardware Wizard** to inform Windows 95 about the new hardware you are about to install in your system as described in the following steps.

☞   **Note:**   *For 8-bit operation, you must disable DMA and use only interrupt request line 3, 4, 5, 6, 7, or none. Because the resources you can use are limited, you will probably have to manually change the resources Windows 95 assigns when you run the Add New Hardware Wizard.*

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

2. Launch the **Add New Hardware Wizard** by double-clicking on the **Add New Hardware** icon.

3. Click on the **Next** button in the first **Add New Hardware Wizard** dialog box.

4. Check **No** instead of **Yes (Recommended)** in the next **Add New Hardware Wizard** dialog box. Because the PC/104-GPIB is a non-Plug and Play module, Windows 95 is unable to detect its presence. Click on the **Next** button to continue.

5. Select the type of hardware you want to install in the next **Add New Hardware Wizard** dialog box. Select the **National Instruments GPIB Interfaces** item if it appears in the dialog box; otherwise, select the **Other Devices** item, as shown in Figure 2-3. Click on the **Next** button to continue.

Figure 2-3. Add New Hardware Wizard Hardware Selection

6. Select the manufacturer and model of your hardware in the next
    Add New Hardware Wizard dialog box. Select **National
    Instruments** as the manufacturer and **PC/104-GPIB** as the model.

7. Click on the **Next** button to continue. Windows 95 attempts to
    assign nonconflicting resources to the PC/104-GPIB.

    If Windows 95 is able to assign resources successfully, the next
    Add New Hardware Wizard dialog box describes the resources
    assigned to the PC/104-GPIB, as shown in the example dialog box
    in Figure 2-4. Skip to Step 8 to proceed.

Figure 2-4. PC/104-GPIB Resources Assigned Successfully

If Windows 95 is unable to assign resources successfully, the next **Add New Hardware Wizard** dialog box explains the problem, as shown in the example dialog box in Figure 2-5.

Figure 2-5. PC/104-GPIB Resources Not Assigned Successfully

If this dialog box appears, click on the **Next** button to continue, then click on **Start Conflict Troubleshooter** to let Windows 95 help you determine how to resolve the conflicts that are preventing it from assigning resources. Follow all of the steps recommended by the Conflict Troubleshooter help.

When you reach the step of looking for nonconflicting resources for the PC/104-GPIB, you need to change the **Setting based on** selection on the **Resources** page of the **PC/104-GPIB Properties** dialog box, as shown in Figure 2-6.

If you are installing the PC/104-GPIB in an 8-bit stack, use **Basic configuration 3** and make sure that the interrupt request line is set to a free line in the range IRQ3 to IRQ7 or no interrupt.

Figure 2-6. PC/104-GPIB Resources Settings

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

8. Write down the conflict-free resources that Windows 95 assigned to the PC/104-GPIB.

9. Select **Shut Down** from the **Start** menu. In the **Shut Down Windows** dialog box, select the **Shut down the computer** option and click on the **Yes** button.

If the resources Windows 95 assigns to the PC/104-GPIB match the default settings shown in Table 2-1, and you are installing the PC/104-GPIB in a 16-bit stack, you are ready to install the PC/104-GPIB. If not, you must reconfigure the hardware.

Configure the Hardware (Optional)

⚠ **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.*

If the resources that Windows 95 assigns do not match the default settings, you must change the hardware settings to match the assigned resources. 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, 7, or none, and disable DMA. Table 2-1 shows the PC/104-GPIB default settings.

Table 2-1. Hardware Default Settings

PC/104-GPIB Setting	Default
Base I/O Address (hex)	2C0-2DF
DMA Channel	5
Interrupt Line (IRQ)	11

Figure 2-7 shows the location of the configuration jumpers and switches on the PC/104-GPIB. The following sections explain how to reconfigure your 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 2-7. PC/104-GPIB Parts Locator Diagram

Configure the PC/104-GPIB Input/Output Range

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 an Input/Output Range of

2C0 hex to 2DF hex. If this setting does not match the setting that Windows 95 assigns to the PC/104-GPIB, follow these steps to reconfigure the base I/O address setting.

1. Locate the base I/O address switch at SW1 on your PC/104-GPIB. Refer to the parts locator diagram, Figure 2-7.

    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 Settings					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	1	0	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
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

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

Switch Settings					Base I/O Address (hex)	I/O Address Space Used (hex)
A9	**A8**	**A7**	**A6**	**A5**		
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. Change the switch settings to configure the GPIB module to match the base I/O address of the Input/Output Range assigned by Windows 95.

    Press down on the side marked OFF to select a binary value of 1 for the corresponding address bit. Press down on the ON side of the switch to select a binary value of 0. Refer to Figure 2-8 for an example of the switch settings and corresponding base I/O addresses.

Figure 2-8. PC/104-GPIB Base I/O Address Switch Settings

3. Record your new settings on the *Hardware and Software Configuration Form* in Appendix D, *Customer Communication*.

Configure the PC/104-GPIB Interrupt Request

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. By default, the PC/104-GPIB is configured to use interrupt request line 11. If this setting does not match the interrupt that Windows 95 assigns to your PC/104-GPIB, or if you are installing the PC/104-GPIB in an 8-bit stack, you must reconfigure the interrupt request line.

☞ **Note:**   *If you are installing the PC/104-GPIB in an 8-bit stack, the only interrupt lines available to you are 3, 4, 5, 6, 7, or none.*

Follow these steps to reconfigure the interrupt request line:

1. Find W1 and W3, the jumpers 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 2-7.

2. Change the jumper settings to configure the PC/104-GPIB to the interrupt request line Windows 95 assigns or, if you are installing the PC/104-GPIB in an 8-bit stack, to the line in the range IRQ3 to IRQ7 you chose on the **Resources** page of the **PC/104-GPIB Properties** dialog box.

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

3. Record your new settings on the *Hardware and Software Configuration Form* in Appendix D, *Customer Communication*.

Figure 2-9 shows the setting for IRQ11.

Figure 2-9. PC/104-GPIB Interrupt Jumper Setting for IRQ11 (Default Setting)

Figure 2-10 shows the setting for IRQ5.

Figure 2-10. PC/104-GPIB Interrupt Jumper Setting for IRQ5

Configure the PC/104-GPIB Direct Memory Access

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 software are designed to perform DMA. In most cases, data transfers using DMA are significantly faster than programmed I/O transfers, which use more CPU time. However, if Windows 95 is unable to assign a DMA resource to the PC/104-GPIB, or if you are installing the PC/104-GPIB in an 8-bit stack, you can configure DMA to none and still use the GPIB software for Windows 95. By default, the PC/104-GPIB is configured to use DMA channel 5.

☞   **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 2-12, which shows how to set the DMA jumpers for no DMA.*

Follow these steps to reconfigure the DMA channel.

1. Locate the jumpers that select the DMA channel. Refer to the parts locator diagram, Figure 2-7.

2. Change the jumper settings to configure the PC/104-GPIB to the DMA channel Windows 95 assigns or to no DMA if you are installing the PC/104-GPIB in an 8-bit stack.

    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. PC/104-GPIB DMA Channel Settings

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

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

Figure 2-11. PC/104-GPIB DMA Jumper Setting for DMA Channel 7

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

Figure 2-12. PC/104-GPIB DMA Jumper Setting for No DMA Channel

3. Record your new settings on the *Hardware and Software Configuration Form* in Appendix D, *Customer Communication*.
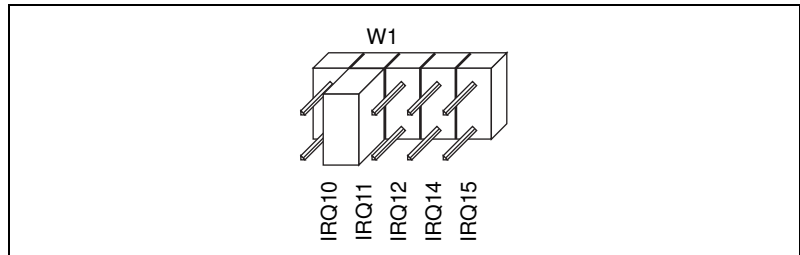
Setting the PC/104-GPIB Shield Ground Configuration

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.

☞ **Note:** *The PC/104-GPIB was tested for compliance with FCC and CE standards with the shield ground connected to logic ground. Removing the jumper might cause EMI emissions to exceed any or all of the applicable standards.*

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

1. Refer to Figure 2-7 to locate the shield ground jumper W5 on the PC/104-GPIB.

2. Remove the jumper and place it across only one of the jumper pins, as shown in Figure 2-13.

a. Logic Ground Connected to Shield Ground (Default)

b. Logic Ground Disconnected from Shield Ground

Figure 2-13. PC/104-GPIB Ground Configuration Jumper Settings

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

Now that you have properly configured the hardware, proceed to the *Install the PC/104-GPIB* section for installation instructions.

Install the PC/104-GPIB

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.

Perform the following steps to install the PC/104-GPIB. In this section, the term *parent module* generically refers to either the parent system or the adjacent PC/104 module you stack the PC/104-GPIB onto.

1. Shut down Windows 95 and turn off your computer. Keep the computer 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 the PC/104-GPIB has been plugged in, 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. Refer to Figure 2-14.

| 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 2-14. Installing the PC/104-GPIB

5. Plug the GPIB ribbon cable into the GPIB connection on the PC/104-GPIB. The GPIB connection 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. Power on your system and start Windows 95.

The PC/104-GPIB hardware installation is now complete. You are ready to configure the software.

Configure the GPIB Software

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

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

Resolve Conflicts

If you have other non Plug and Play hardware in your system, Windows 95 might assign incorrect resources to your PC/104-GPIB. If this happens, Windows 95 shows that the PC/104-GPIB is not working, and you must reconfigure the PC/104-GPIB module and the GPIB software.

On the **Device Manager** page, look at the items listed under the
National Instruments GPIB Interfaces icon. If there is no
National Instruments GPIB Interfaces icon or if a circled X or
exclamation point (!) appears through the eagle icon, the PC/104-GPIB
is not working properly. Figure 2-15 shows an example of a
PC/104-GPIB that is working properly, and Figure 2-16 shows an
example of a PC/104-GPIB that is not working properly.

Figure 2-15. PC/104-GPIB That Is Working Properly

Figure 2-16. PC/104-GPIB That Is Not Working Properly

You can see if the problem is a resource conflict by looking at what
resources are conflicting, if the PC/104-GPIB appears under the
National Instruments GPIB Interfaces icon. Double-click on the
PC/104-GPIB name and click on the **Resources** tab, which provides
information about the hardware resources assigned to the
PC/104-GPIB. The **Conflicting Device List** lists any conflicts. If
conflicts exist, use the **Setting based on** drop-down list and the
Change Setting button to select conflict-free resources for the
PC/104-GPIB.

If you cannot find conflict-free resources for the PC/104-GPIB, or if
no conflicts are listed, refer to the *Troubleshooting Device Manager
Problems* section of Appendix B, *Troubleshooting and Common
Questions*, to resolve the problem.

Assign an Interface Name

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

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

2. Click on the **GPIB Settings** tab, which provides information about the software configuration for the PC/104-GPIB.

3. Use the **Interface Name** drop-down box to select a logical name (GPIB0, GPIB1, and so on) for the PC/104-GPIB.

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

Figure 2-17. GPIB Settings Page for the PC/104-GPIB

View or Modify Logical Device Templates (Optional)

If you want to examine or modify the logical device templates for the GPIB software, select the **National Instruments GPIB Interfaces** icon from the **Device Manager** page, and click on the **Properties** button. Select the **Device Templates** tab to view the logical device templates, as shown in Figure 2-18.

Figure 2-18. Device Templates Page for the Logical Device Templates

Verify the Installation

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

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

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

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

Figure 3-1. Diagnostic Utility after Testing

You can get details on any tested GPIB interface by selecting the interface and clicking on the **Details** button. For each failed GPIB interface, select it and click on the **Details** button to get a description of the failure. Use that information and the information in Appendix B, *Troubleshooting and Common Questions*, to troubleshoot the problem.

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

Begin to Use the GPIB Software

This chapter helps you get started with the GPIB software for Windows 95.

Introduction to the Win32 Interactive Control Utility

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

- Verify GPIB communication with your device.

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

- Become familiar with the commands of your device.

- Receive data from your GPIB device.

- Troubleshoot problems with your application.

To run this utility, select the **Win32 Interactive Control** item under **Start»Programs»GPIB Software for Windows 95**. This utility includes extensive online help, available by entering help at the : prompt.

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

Introduction to the NI Spy Utility

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

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

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

- Save, restore, and print captured information.

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

Running Existing DOS GPIB Applications

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

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

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

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

2. Select the **Device Manager** tab in the **System Properties** dialog box that appears.

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

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

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

6. Click on the checkbox labeled **Enable Support for DOS GPIB Applications**, and click on the **OK** button.

7. Restart your system.

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

General Programming Considerations

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

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

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

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

For information about choosing a programming method, developing your application, or compiling and linking, refer to the *GPIB User Manual for Windows 95 and Windows NT*. For detailed information about each NI-488 function and NI-488.2 routine, refer to the *NI-488.2M Function Reference Manual for Win32* or the online help file, which you can access by selecting **Start»Programs»GPIB Software for Windows 95»GPIB Help**.

Uninstalling the Hardware and Software

This appendix describes how to uninstall your PC/104-GPIB and GPIB software for Windows 95.

Uninstalling the Hardware

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

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

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

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

4. Click on the **OK** button, shut down Windows 95, turn off your system, and physically remove the interface from your system.

Figure A-1. Selecting the PC/104-GPIB

Uninstalling the Software

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

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

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

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

If you have not physically removed your hardware, shut down
Windows 95, turn off your system, and remove the GPIB hardware.

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

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

Troubleshooting and Common Questions

Appendix

B

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

Troubleshooting EDVR Error Conditions

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

EDVR Error Condition with ibcntl Set to 0xE028002C (-534249428)

If a call is made with a board number that is within the range of allowed board numbers (typically 0 to 3), but which has not been assigned to a GPIB interface, an EDVR error condition occurs with ibcntl set to 0xE028002C. You can assign a board number to the PC/104-GPIB by configuring the GPIB software and selecting the name of the PC/104-GPIB. For information about how to configure the GPIB software, refer to the *Configure the GPIB Software* section of Chapter 2, *Installation and Configuration*.

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

If a call is made with a board number that is not within the range of allowed board numbers (typically 0 to 3), an EDVR error condition occurs with ibcntl set to 0xE0140025. Refer to the *Assign an Interface Name* section of Chapter 2, *Installation and Configuration*.

EDVR Error Condition with ibcntl Set to 0xE0140035 (-535560139)

If a call is made with a device name that is not listed in the logical device templates that are part of the GPIB Configuration utility, an EDVR error condition occurs with ibcntl set to 0xE0140035. Refer to the *View or Modify Logical Device Templates (Optional)* section of Chapter 2, *Installation and Configuration*.

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

If a call is made with a board number that is assigned to a PC/104-GPIB that is unusable because of a resource conflict, an EDVR error condition occurs with `ibcntl` set to 0xE0320029 or 0xE1050029. This error indicates that the PC/104-GPIB is not working properly. Refer to the *GPIB Interface Not Working Properly* section later in this appendix.

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

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

Troubleshooting Device Manager Problems

The Windows 95 Device Manager contains configuration information for all of the GPIB hardware that it detects or you input information for. To start the Windows 95 Device Manager, double-click on the **System** icon under **Start»Settings»Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab and click on the **View devices by type** button at the top of the page. Depending on the problem, do one of the following:

*   If there is no **National Instruments GPIB Interfaces** item and you are certain you have a PC/104-GPIB installed, refer to the *No National Instruments GPIB Interfaces Item* section of this appendix.

*   If the **National Instruments GPIB Interfaces** item exists, but the PC/104-GPIB is not listed there, refer to the *Missing GPIB Interface* section of this appendix.

*   If the PC/104-GPIB is listed, but has a circled X or exclamation mark (!) over its icon, refer to the *GPIB Interface Not Working Properly* section of this appendix.

No National Instruments GPIB Interfaces Item

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

details on how to use the **Add New Hardware Wizard** to add information about GPIB hardware, refer to the *Install the Hardware* section in Chapter 2, *Installation and Configuration*.

Missing GPIB Interface

If the **National Instruments GPIB Interfaces** item exists, but the PC/104-GPIB is not listed there, the PC/104-GPIB is not properly installed. For GPIB hardware, this means that the **Add New Hardware Wizard** has not been run to add the new hardware to your Windows 95 system. To run the **Add New Hardware Wizard**, double-click on the **Add New Hardware** icon under **Start»Settings»Control Panel**. For details on how to use the **Add New Hardware Wizard** to add information about the PC/104-GPIB, refer to the *Install the Hardware* section in Chapter 2, *Installation and Configuration*.

GPIB Interface Not Working Properly

If the PC/104-GPIB is not working properly, its icon has a circled X or exclamation mark (!) overlaid on it, as shown in Figure B-1.

Figure B-1. PC/104-GPIB That Is Not Working Properly

This problem can occur for several reasons. If you encounter this problem, the Device Manager should list an error code that indicates why the problem occurred. To see the error code for the PC/104-GPIB, select it and click on the **Properties** button to go to the **General** page. The **Device Status** section of the **General** page shows the error code. Locate the error code in the following list to find out why your PC/104-GPIB is not working properly.

- Code 8: The GPIB software was incompletely installed. To solve this problem, reinstall the GPIB software for Windows 95.

- Code 22: The PC/104-GPIB is disabled. To enable the PC/104-GPIB, check the appropriate configuration checkbox in the **Device Usage** section of the **General** page.

- Code 24: The PC/104-GPIB is not installed, or it is not configured to match the resources assigned to it. Either install the PC/104-GPIB, or verify that the resources assigned to it on the **Resources** page match its settings.

- Code 27: Windows 95 was unable to assign the PC/104-GPIB any resources. To solve this problem, free up system resources by disabling other unnecessary hardware so that enough resources are available for the PC/104-GPIB.

Removing System-Reserved Resources

If you have previously installed the Compatibility Release for Windows 95, you should remove any system-reserved resources for your PC/104-GPIB. System-reserved resources are only acquired manually. If you did not use the Device Manager to acquire system-reserved resources, you do not need to use the Device Manager to remove such resources.

To remove any resources that you reserved for your PC/104-GPIB, complete the following steps.

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

2. Run the **System Properties** applet by double-clicking on the **System** icon.

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

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

5. Double-click on the **Computer** icon.

6. In the **Computer Properties** dialog box that appears, click on the **Reserve Resources** tab.

7. Remove the **Interrupt request (IRQ)**, **Input/output (I/O)**, and **Direct memory access (DMA)** resources that you reserved for the PC/104-GPIB by clicking on the board and clicking on the **Remove** button.

8. Click on the **OK** button to exit the **Computer Properties** dialog box.

9. Click on the **OK** button again to exit the Device Manager.

Troubleshooting Diagnostic Utility Failures

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

Missing Software Components

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

No Properly Configured GPIB Interfaces Found

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

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

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

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

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

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

5. After you have opened the **National Instruments GPIB Interfaces** icon, double-click on the GPIB interface name and select the **GPIB Settings** tab to examine the logical board name associated with that

interface. If it is set to **None**, change it to the appropriate name, such as **GPIB0**.

GPIB Cables Need to Be Disconnected

This error occurs if you have any GPIB cables connected to the 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 the PC/104-GPIB conflict with the address resources being used by other devices in the system. Resource conflicts typically occur when your system contains legacy boards that use resources that have not been reserved properly with the Device Manager. If a resource conflict exists, write down the resource that caused the conflict and refer to the Microsoft Windows 95 Online Help for instructions on how to use the Device Manager to reserve I/O resources for legacy boards. After the conflict has been resolved, run the Diagnostic utility again.

Interrupt Resource Conflict

This error occurs if the interrupt resources assigned to the PC/104-GPIB conflict with the interrupt resources being used by other devices in the system. Resource conflicts typically occur when your system contains legacy boards that use resources that have not been reserved properly with the Device Manager. If a resource conflict exists, write down the resource that caused the conflict and refer to the Microsoft Windows 95 Online Help for instructions on how to use the Device Manager to reserve IRQ resources for legacy boards. After the conflict has been resolved, run the Diagnostic utility again.

DMA Resource Conflict

This error occurs if the DMA resources assigned to the PC/104-GPIB conflict with the DMA resources being used by other devices in the system. Resource conflicts typically occur when your system contains legacy boards that use resources that have not been reserved properly with the Device Manager. If a resource conflict exists, write down the resource that caused the conflict and refer to the Microsoft Windows 95 Online Help for instructions on how to use the Device Manager to reserve DMA resources for legacy boards. After the conflict has been resolved, run the Diagnostic utility again.

Single-Cycle DMA Required

This error occurs if the Diagnostic utility detects that it is unable to perform demand-mode DMA for the PC/104-GPIB and that the GPIB software has not been configured to use single-cycle DMA. If you encounter this error, you should use the Device Manager to configure the GPIB software to use single-cycle DMA for all DMA transfers, and then run the Diagnostic utility again.

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

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

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

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

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

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

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

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

GPIB Software Problem Encountered

This error occurs if the Diagnostic utility detects that it is unable to communicate correctly with the GPIB hardware using the installed GPIB software. If you encounter this error, shut down your system, restart it, and run the Diagnostic utility again. If the problem persists, try reinstalling the GPIB software for Windows 95.

Unknown Problem Encountered

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

Common Questions

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

Refer to the *GPIB Interface Not Working Properly* section of this appendix for specific information about what might cause this problem. If you have already completed the troubleshooting steps, fill out the forms in Appendix D, *Customer Communication*, and contact National Instruments.

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

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

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

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

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

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

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

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

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

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

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

Neither DMA nor interrupts are required.

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

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

When should I use the Win32 Interactive Control utility?

You can use the Win32 Interactive Control utility to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information, refer to the *Introduction to the Win32 Interactive Control Utility* section in Chapter 4, *Begin to Use the GPIB Software*.

How do I use a GPIB language interface?

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

How do I modify the hardware resources that Windows 95 assigned to my PC/104-GPIB?

To modify the hardware resources assigned to the PC/104-GPIB, double-click on the **System** icon under **Start»Settings»Control Panel**. In the **System Properties** dialog box that appears, select the **Device Manager** tab, click on the **View devices by type** button, and double-click on the **National Instruments GPIB Interfaces** icon. Next, double-click on the **PC/104-GPIB** item under **National Instruments GPIB Interfaces**, and click on the **Resources** tab. Change the **Settings**

based on selection or use the **Change Setting** button to modify the resources used by your PC/104-GPIB. Make sure to update the switches and jumpers on your board to match the new assigned resources.

Why does the uninstall program leave some components installed?

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

What information should I have before I call National Instruments?

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

Specifications

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. PC/104-GPIB Hardware Characteristics

Characteristic	Specification
Dimensions	9.017 cm by 9.589 cm (3.55 in. 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) In ISA System	1.5 Mbytes/s*
High Speed (HS488) In ISA System	1.8 Mbytes/s*
* Actual speed may vary considerably from speed shown because of system and instrumentation capabilities.	

Customer Communication

The appendix box shows "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 95 Version Number on Disk _____

Programming Language Interface Version _____

Diagnostic Utility Results _____

Other Products

Resource Summary Report from the Device Manager

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

_____

_____

Programming Environment Information

Programming Language _____

Compiler Vendor _____Compiler Version _____

Application Information

DOS Application _____ Win16 Application _____ Win32 Application _____

_____

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

_____

Documentation Comment Form

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

Title: *Getting Started with Your PC/104-GPIB and the GPIB Software for Windows 95*

Edition Date: January 1998

Part Number: 321374B-01

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

_____

_____

_____

_____

_____

_____

_____

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

_____

_____

_____

_____

_____

_____

_____

Thank you for your help.

Name   _____

Title   _____

Company _____

Address _____

_____

Phone (___)_____ Fax (___) _____

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

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

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

°   degrees

%   percent

A   amperes

ANSI   American National Standards Institute

ASIC   application-specific integrated circuit

base I/O address   lowest I/O address used by the GPIB hardware

C   Celsius

CE   Conformite Europeene

CPU   central processing unit

DLL   dynamic link library

DMA   direct memory access

EMI   electromagnetic interference

FCC   Federal Communications Commission

GPIB   General Purpose Interface Bus

hex   hexadecimal

Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
I/O	input/output
IRQ	interrupt request
ISA	Industry Standard Architecture
m	meters
MB	megabytes of memory
PC	personal computer
RAM	random-access memory
s	seconds
VDC	volts direct current