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**GPIB-PCIIB**

**Getting Started with Your  
GPIB-PCIIB and the  
NI-488<sup>®</sup> Software for  
MS-DOS**

**June 1994 Edition**

**Part Number 320226B-01**

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**National Instruments Corporate Headquarters**

6504 Bridge Point Parkway

Austin, TX 78730-5039

(512) 794-0100

Technical support fax: (800) 328-2203

(512) 794-5678

**Branch Offices:**

Australia (03) 879 9422, Austria (0662) 435986, Belgium 02/757.00.20,

Canada (Ontario) (519) 622-9310, Canada (Québec) (514) 694-8521,

Denmark 45 76 26 00, Finland (90) 527 2321, France (1) 48 14 24 24,

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# **FCC/DOC Radio Frequency Interference Compliance**

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

## **Federal Communications Commission**

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

## **Canadian Department of Communications**

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

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

## **Instructions to Users**

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

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

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

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

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

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

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## *About This Manual*

monospace	Lowercase text in this font denotes text or characters that are to be literally input from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, variables, filenames, and extensions, and for statements and comments taken from program code.
<>	Angle brackets enclose the name of a key on the keyboard—for example, <PageDown>.
-	A hyphen between two or more key names enclosed in angle brackets denotes that you should simultaneously press the named keys—for example, <Control-Alt-Delete>.
<Enter>	Key names are capitalized.

## **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 the Appendix, *Customer Communication*, at the end of this manual.

# Chapter 1

## Introduction

---

This chapter lists what you need to get started and lists optional equipment.

### What You Need to Get Started

GPIB-PCIIB interface board

One of the following:  
3.5 in. NI-488 Distribution Disk for NI-488 MS-DOS Handler,  
BASICA, QuickBASIC, C<sup>\*</sup>, and Universal Interfaces

or

5.25 in. NI-488 Distribution Disk for NI-488 MS-DOS Handler,  
BASICA, QuickBASIC, C<sup>\*</sup>, and Universal Interfaces

\* Microsoft C

### Optional Equipment

You can call National Instruments to order the following optional equipment.

- Double-shielded GPIB cables\*  
GPIB Type X2 cables (1 m, 2 m, or 4 m)

\* To meet FCC emission limits for a Class B device, you must use a double-shielded (Type X2) GPIB cable. Operating this equipment with a single-shielded (Type X1) cable may cause interference to radio and television reception in residential areas.

# Chapter 2

## Hardware Configuration and Installation

This chapter contains the instructions to configure and install the GPIB-PCIIB interface board.

### Configuration

Figure 2-1 shows the location of the GPIB-PCIIB configuration jumpers and switches.

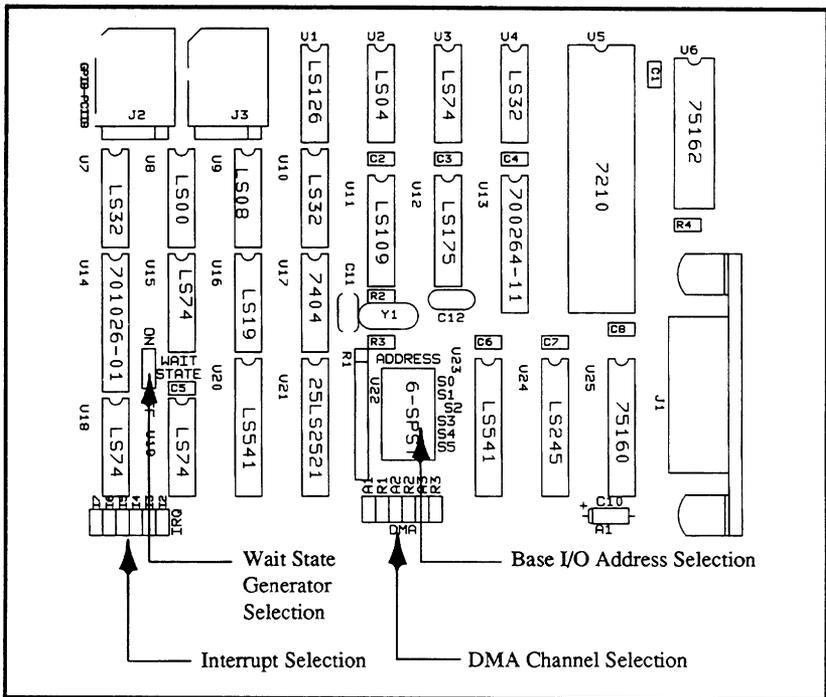


Figure 2-1. GPIB-PCIIB Parts Locator Diagram

The settings of the base I/O address, the interrupt line, and the DMA channel to which the GPIB-PCIIB was configured at the factory are suitable for most computer systems. These default settings must exactly match the software configurations in the NI-488 software.

### Switch and Jumper Settings

Table 2-1 shows the factory settings and optional configurations for the switches and jumpers on the GPIB-PCIIB.

Table 2-1. Factory Default Settings and Optional Configurations

<b>GPIB-PCIIB</b>	<b>Default</b>	<b>Optional</b>
Base I/O Address (hex)	hex 2B0	000 - 3F0
DMA Channel	1	2, 3, Not Used
Interrupt Line (IRQ)	7	2, 3, 4, 5, 6, Not Used

If your computer is an IBM PC, PC/XT, or PC AT, the base address must be set higher than hex 200 or the computer will not recognize your GPIB-PCIIB board. Base addresses below hex 200 may work on some compatibles.

## Base I/O Address Selection

The GPIB-PCIIB is programmed by the CPU by reading and writing eight consecutive addresses on the I/O channel. The base I/O address for the GPIB-PCIIB is determined by the switches at position U22. The switches are set at the factory for the I/O address 2B0 hex. The GPIB-PCIIB uses the I/O address space 2B0 through 2BF hex with this setting.

**Note:** *Check to determine that this space is not already used by other equipment installed in your computer. If any equipment in your computer uses this I/O address space, change the base I/O address of either the GPIB-PCIIB or the other device. If the GPIB-PCIIB I/O address is changed, make a corresponding change to the GPIB-PCIIB software as described in the Step 3. Configure the Software section of Chapter 3.*

Press the side marked OFF to select a binary value of 1 for the corresponding address bit. Press the ON side of the switch to select a binary value of 0 for the corresponding address bit. Refer to Figure 2-2.

Figure 2-2 shows two possible switch settings. In this figure, the black side of the switch is the side you press down. Each of the address selections shows how the base I/O address was calculated from the switch positions.

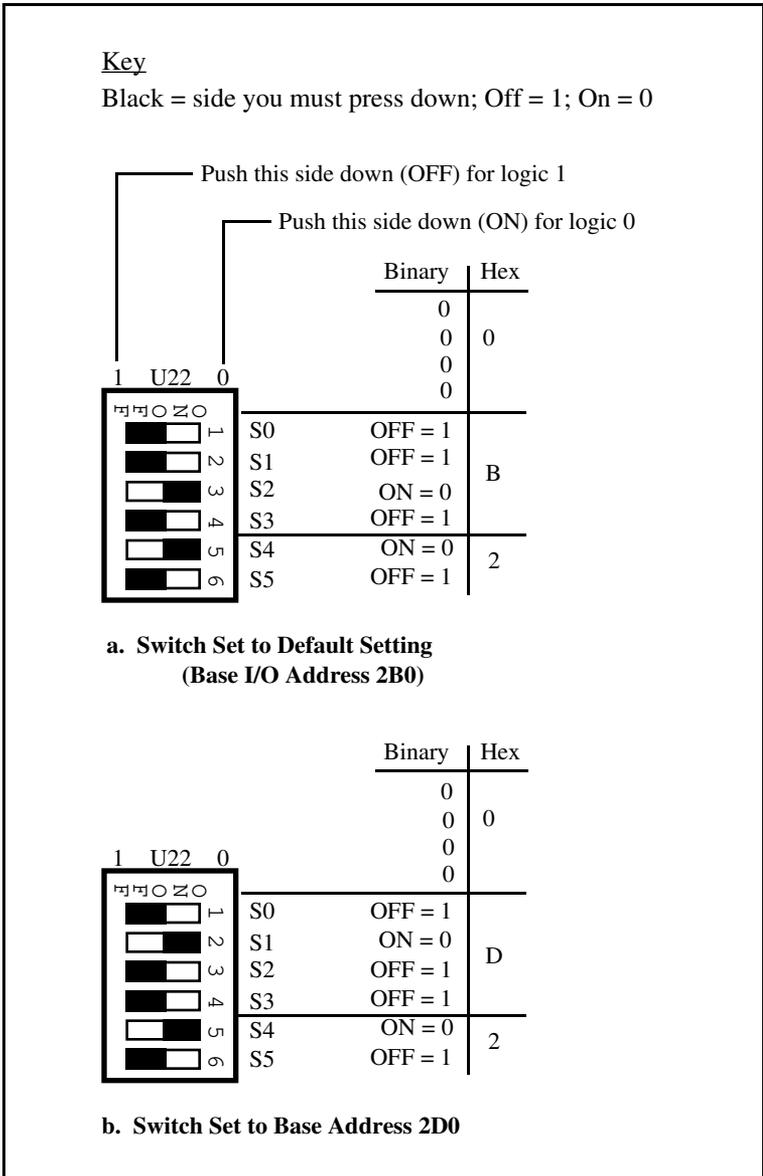


Figure 2-2. Base I/O Address Switch Settings

## Interrupt Selection

The GPIB-PCIIB interface board can use one of six interrupt lines of the PC I/O channel. The interrupt line is selected by placing a jumper across the double rows of pins which are located at the lower left side of the GPIB-PCIIB (see Figure 2-1). You must select an interrupt line and place the jumper in the appropriate position to enable that line. The interrupt lines that the GPIB-PCIIB can use are I7, I6, I5, I4, I3, and I2.

Once you have selected an interrupt line, place the jumper on the appropriate pins to select the interrupt line. Figure 2-3 shows four of the allowable jumper configurations.

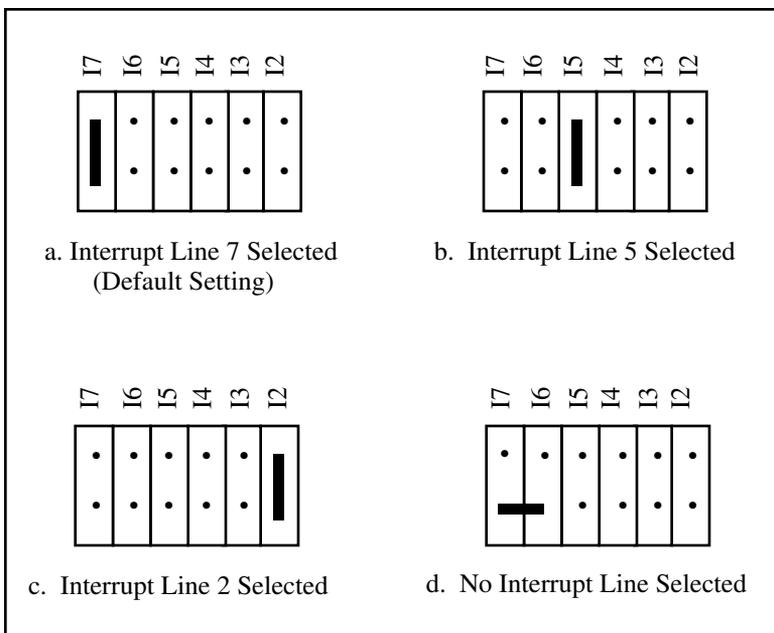


Figure 2-3. Interrupt Jumper Setting Options

## DMA Channel Selection

The DMA channel used by the GPIB-PCIIB is selected by jumpers located at the lower center of the interface board (see Figure 2-1). The GPIB-PCIIB is set at the factory to use DMA channel 1. Verify that this DMA channel is not also used by equipment already installed in your computer. If any device uses DMA channel 1, change the DMA channel used by either the GPIB-PCIIB or the other device. The GPIB-PCIIB hardware can use DMA channels 1, 2, or 3, or no channel at all. Each DMA channel consists of two signal lines as shown in Table 2-2.

Table 2-2. DMA Channels for the GPIB-PCIIB

DMA Channel	Signal Lines	
	DMA Acknowledge	DMA Request
1	DACK1	DRQ1
2	DACK2	DRQ2
3	DACK3	DRQ3

Two jumpers must be positioned to select a DMA channel. The DMA Acknowledge and DMA Request lines selected must have the same numeric suffix for proper operation. Figure 2-4 displays the jumper position options.

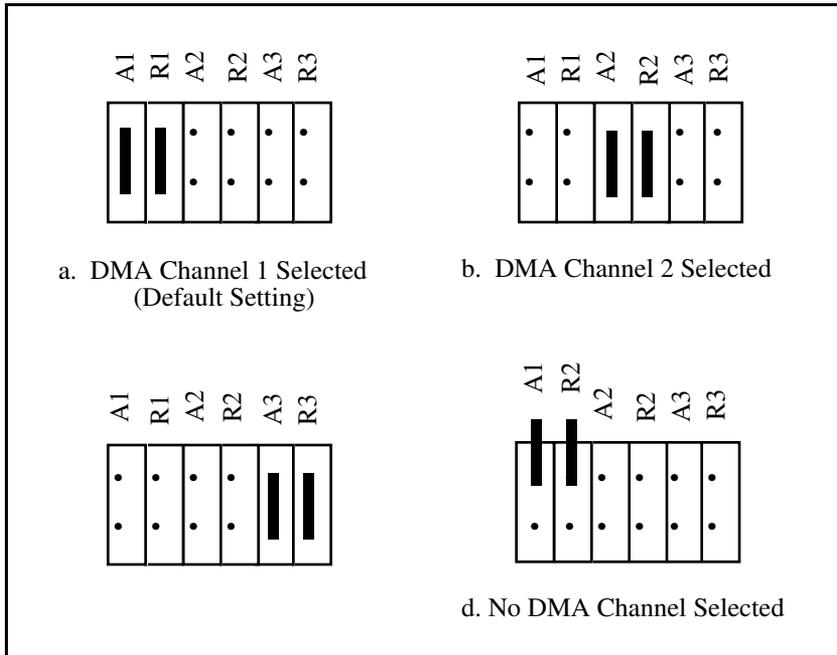


Figure 2-4. DMA Channel Jumper Setting Options

## Wait State Generator

**Note:** *The wait state generator is not located on revisions of the GPIB-PCIIB interface board earlier than Revision B.*

To configure the GPIB-PCIIB to generate wait states, you must move the wait state generator jumper (see Figure 2-1) to the enabled position.

Enabling the wait state generator guarantees that the timing requirements of the GPIB-PCIIB are met on computers with very fast I/O cycles (less than 180 nsec). The default configuration setting for the wait state generator is at the disabled position as almost all personal computers already have sufficiently long I/O cycles. Figure 2-5 shows the two possible settings for the wait state generator.

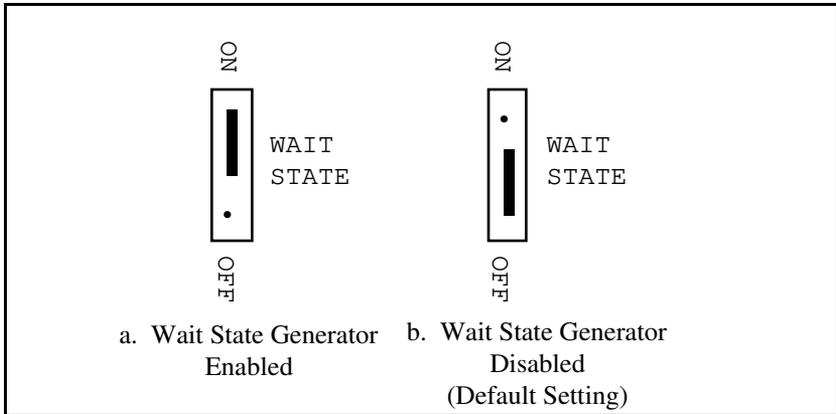


Figure 2-5. Wait State Generator Settings

In the space provided here, record the new settings of the base I/O address, the DMA channel, the interrupt line, and the wait state generator so that you will have them handy when you install the software.

<b>GPIB-PCIIB</b>	<b>New Setting</b>
Base I/O Address:	_____
DMA Channel:	_____
Interrupt Line:	_____
Wait State Generator:	_____

## Installation

The GPIB-PCIIB can be installed in any unused expansion slot in your computer. After you change (if needed), verify, and record the switches and jumper settings, you are ready to install the GPIB-PCIIB.

The following steps are general installation instructions. Consult the user manual or technical reference manual of your personal computer for specific instructions and warnings.

1. Turn off your computer.
2. Remove the top cover or access port to the I/O channel.
3. Remove the expansion slot cover on the back panel of the computer.
4. Insert the GPIB-PCIIB in an unused slot with the IEEE-488 receptacle sticking out the opening of the back panel. It may be a tight fit, but do not force the board in place.
5. Screw the mounting bracket of the GPIB-PCIIB to the back panel rail of the computer.
6. Check the installation.
7. Replace the top cover or access port to the computer.
8. Connect the GPIB cable to the GPIB-PCIIB.

The GPIB-PCIIB interface board is now installed and ready for verification testing.

# Chapter 3

## Software Installation and Configuration

---

This chapter contains the instructions to install and configure the NI-488 software.

### The NI-488 Software Package

Before installing the software, you should review the files on your NI-488 distribution diskette to gain an understanding of what they are.

### Main Programs and Files

The following programs and files are required to program the GPIB-PCIB from BASICA, QuickBASIC, Microsoft C, or Universal interface using the NI-488 software handler:

- `GPIB.COM` is the NI-488 software handler file that is loaded at system startup by the Disk Operating System. *Handler* is a term used by National Instruments to refer to a loadable device driver.
- `ULI.COM` is the Universal Language Interface software driver file needed to use the Universal Language Interface Using HP-Style Calls option of the NI-488 software package.
- `BIB.M` is a binary language interface file that gives an application program written in BASICA access to the NI-488 handler.
- `QBIB*.OBJ` is a binary language interface file that gives an application program written in QuickBASIC access to the NI-488 handler. (\* represents the version number corresponding to the QuickBASIC version that it interfaces with.)
- `MCIB*.OBJ` is a binary language interface file that gives an application program written in Microsoft C access to the NI-488 handler. (\* represents the memory model that the Microsoft C application will use.)

- `DECL.BAS` is a declaration file that contains code to be placed at the beginning of BASICA application programs.
- `QBDECL.BAS` is a declaration file that contains code to be placed at the beginning of the QuickBASIC application programs.
- `DECL.H` is a declaration file that contains code to be included at the beginning of Microsoft C application programs.

## Additional Programs and Files

The following programs and files are used to install the NI-488 software, diagnose hardware and software problems, and provide examples for programming from BASICA, QuickBASIC, Microsoft C, and Universal interfaces:

- `IBDIAG.EXE` is a program that you can use to test the hardware installation. It is called by `IBSTART.BAT` after the handler is installed, or can be accessed directly at the DOS command line.
- `IBSTART.BAT` is a batch file that you can use to install the NI-488 software. It is a multipurpose program that performs the software installation. It copies files, modifies `CONFIG.SYS` (the MS-DOS system configuration file) using `MKCFG.EXE`, and tests the hardware using `IBDIAG.EXE`.
- `IBTEST.EXE` is a program that you can use to test the installation of the NI-488 software.
- `IBCONF.EXE` is a software configuration program that you can use to change the configuration parameters of the NI-488 software handler.
- `IBIC.EXE` is an interactive control program that executes functions you enter from the keyboard. It helps you to learn the functions, to program your instrument or other GPIB device, and to develop your application program.
- `APPMON.COM` is the applications monitor program. It is a resident program that is useful in debugging your application. The applications monitor can halt program execution (trap) on return from GPIB driver calls, so that you can inspect function arguments, buffers, return values,

GPIB global variables, and other pertinent data. The applications monitor performs automatic error detection.

- IBTRAP .EXE is a program that configures the applications monitor.
- BTEST .BAS, CTEST .C, and PTEST .PAS are example programs to use with the Universal Language Interface.

Readme files are included on the distribution diskette. README .DOC discusses the GPIB-PCIIB software handler. The remaining Readme files discuss programming considerations for different versions of QuickBASIC and Microsoft C.

Example programs are also included on the distribution diskette. Refer to the README .DOC file for a complete list of these example programs.

## Installing the Software

The NI-488 distribution diskette has a batch file named IBSTART .BAT that installs the NI-488 software for you. The term *startup disk* refers to the hard disk or diskette that contains MS-DOS. The startup disk is read by your computer when you power-on or restart your computer.

### Step 1. Preparation

Your first step depends on whether you start from a diskette or a hard disk. Perform the step that applies to your system.

- **Starting from a Diskette**

If you start MS-DOS from a diskette, your startup diskette must have enough free space to hold a copy of the NI-488 software that is located on the distribution diskette.

Insert the startup diskette into the primary drive (usually named A:) and the distribution diskette into the secondary drive (usually named B:). Start your system if you have not already done so.

- **Starting from a Hard Disk**

If you start MS-DOS from a hard disk, the hard disk must have enough free space to hold a copy of the NI-488 software that is located on the distribution diskette.

Start your system. Then insert the NI-488 distribution diskette into a diskette drive.

## Step 2. Run IBSTART

### Accessing IBSTART

After starting the computer, run IBSTART from the NI-488 distribution diskette by first entering the following command:

```
y:
```

where you replace *y* with the letter of the distribution diskette drive, and then entering the following command:

```
ibstart x:
```

where you replace *x* with the letter of the startup drive.

For example, if the NI-488 distribution diskette is in drive B and you have started up from drive C, enter the following command to switch to drive B:

```
b:
```

Next, enter the following command to run the IBSTART .BAT batch file:

```
ibstart c:
```

### Running IBSTART

IBSTART first creates a directory named GPIB-PC on the startup disk, then copies the NI-488 software to that directory, except for the files GPIB.COM and IBCONF.EXE, which are copied to the root directory.

If the insufficient disk space message appears, abort the IBSTART program by pressing <Ctrl-C>.

**Note:** *You may press <Ctrl-C> at any time to abort the **IBSTART** program.*

Increase the free space on your startup drive and run IBSTART again. You can increase the free space on your startup drive by deleting some files from the startup drive. If you wish to keep the files, you can save them on a diskette that you did not start from.

Next, IBSTART creates or modifies the DOS system configuration file CONFIG.SYS to contain the line

```
DEVICE = GPIB.COM
```

GPIB.COM is the name of the software handler file. By reading this CONFIG.SYS file at startup time, DOS installs device drivers and handlers.

Next, IBSTART leads you through a hardware diagnostics check for the GPIB-PCIIB interface board using the program IBDIAG.EXE.

- Simply press <Enter> in response to each of the prompts. For each hardware setting that you changed, type in the correct value and then press <Enter> to enter the value and cause the next prompt to display. (Refer to the settings you recorded in Chapter 2.)

If IBDIAG returns an error message, check the following:

- Check the hardware configuration (switch and jumper settings) to ensure that:
  - the hardware configuration settings are the same as the values you entered when prompted by the IBDIAG program.
  - the hardware configuration settings are not configured to the same setting as another board or device in your computer. Try reconfiguring the hardware and run IBDIAG again.
- Check the GPIB-PCIIB to ensure that it is not connected to a GPIB device. IBDIAG requires that the GPIB-PCIIB interface board *not* be connected to a GPIB device.

If you have performed these steps and `IBSTART` still fails, complete the *GPIB-PCIB Hardware and Software Configuration Form* in the Appendix and then call National Instruments for technical support.

If the diagnostics passed, you can proceed through the remainder of this chapter.

Finally, `IBSTART` advises you to do the following:

- Run `IBCONF` if you must reconfigure the software.
- Restart your system to load the handler into DOS.
- Run `IBTEST.EXE` to test the software configuration.

### Step 3. Configure the Software (Optional)

**Note:** *If you are not using default configuration settings, you must complete this step. This step is not required if you are using default configuration settings.*

The file `IBCONF.EXE`, located on your NI-488 distribution diskette, can be used to change or examine the configuration parameters of the NI-488 software handler `GPIB.COM`.

1. If you have to change default configurations, run `IBCONF` by entering the following commands:

```
cd\  
ibconf
```

2. Press any key to remove the startup screen.
3. Once the configuration map appears, make sure that `GPIB0` is highlighted and then press `<F8>` to edit the board configurations.
4. Use the Up and Down arrow keys to move the highlight among the configurable board parameters.

5. The configurable parameters can be changed by one of two methods, as described in the prompt field.

ENTER (directly from keyboard)

or

SELECT (use right/left arrow keys)

6. Press <F9> to end edit.
7. Press <F9> once again to quit.
8. IBCONF will then display a prompt asking if you want to save your changes. Enter *y* for yes.

All board and device configurable parameters can be altered in this manner. See Section Two of the *NI-488 MS-DOS Software Reference Manual* for more information on how to run IBCONF and on the configurable software parameters and their default values. There is also some additional information on IBCONF later in this chapter.

#### **Step 4. Restart (Optional)**

You *must* restart your computer if you have made any changes using IBCONF as explained in *Step 3*.

Restart your computer from the startup drive you specified when you ran IBSTART by pressing <Ctrl-Alt-Del> so that DOS will load the modified handler GPIB.COM.

## Step 5. Test the Software Installation

The file `IBTEST.EXE` on your NI-488 distribution diskette is a program that tests the installation of the software. Run `IBTEST` from the GPIB-PC directory created by `IBSTART` by entering the following commands:

```
cd \GPIB-PC
ibtest
```

If errors occur, then check the following:

- Is the handler configured for your model GPIB?
- Did you change any of the hardware configurations on the GPIB interface board? If so, check the current configurations of the GPIB board in `IBCONF`. Make sure that the hardware settings match the software configurations in `IBCONF`. If you make changes in `IBCONF`, make sure you save them and restart your computer (refer to *Step 3* and *Step 4*).
- Are the `GPIB.COM` and `CONFIG.SYS` files installed in the root directory of your startup drive? If not, put them in your root directory and restart the computer. The following line must appear in your `CONFIG.SYS` file:

```
DEVICE = GPIB.COM
```

- Did you restart your system before you ran `IBTEST`? If not, do so now (refer to *Step 4*).

If you have completed this checklist and `IBTEST` still fails, complete the *GPIB-PCIB Hardware and Software Configuration Form* in the Appendix and then call National Instruments for technical support.

If no errors occur, you can proceed to learn how to use the software and to develop your application program.

## Step 6. Developing Your Application Program

The easiest way to learn how to communicate with your instrument is by controlling it interactively. Located in your GPIB-PC directory is an interactive control program entitled `IBIC.EXE`. This program allows you to write to and read from your instrument while it updates the status of these GPIB transfers and displays any errors that occur.

To use this program, connect your instrument to the bus and enter the following commands:

```
cd \GPIB-PC
IBIC
```

Then begin entering NI-488 commands as described in Section Five of the *NI-488 MS-DOS Software Reference Manual*.

## More About IBCONF

You use `IBCONF` to edit the description in the handler file of characteristics of the devices and boards in the system. Running `IBCONF` to place this information directly in the handler file eliminates having to restate it inside each application program.

`IBCONF` passes two groups of features to the handler. The first group consists of the characteristics of the instruments or devices attached to your GPIB-PCIIB board. The second group consists of the characteristics of each GPIB-PCIIB board installed in the computer.

## Characteristics of the Instruments

Each instrument used with the GPIB-PCIIB board has the following characteristics:

- A symbolic name of each device on the GPIB (such as `DEV5` or `PS5010`).
- A GPIB-PCIIB access board for each device (for example, `GPIB0`). The access board is discussed in *Characteristics of Each GPIB-PCIIB*.
- A primary and, if used, a secondary address for each device.

- A time limit imposed when executing certain functions. This time limit ensures that transfers do not hang up the GPIB indefinitely.
- A way to terminate I/O transmissions to and from the device. Some devices require or append an EOS character, such as the ASCII line feed character, to data strings. Others use the GPIB END message, which is sent or received via the EOI signal line. Still others use both. Some terminate messages only when a predetermined number of bytes are sent or received.

## Characteristics of Each GPIB-PCIIB Board

Each GPIB-PCIIB board has the following characteristics:

- A symbolic name (such as GPIB0 or GPIB1).
- A GPIB primary and, possibly, a secondary address.
- A computer I/O address.
- The capability to be designated as the system controller of the devices on its bus.
- A time limit imposed when executing certain functions.
- A way to terminate I/O transmissions to and from the board when executing board calls, for example, by an EOS character, an END message, and/or a byte count.
- An interrupt line that the board uses, if any.
- A DMA channel that the board uses, if any.
- High-speed or normal timing when transmitting data to a device. With normal timing, there is a delay of at least 2  $\mu$ sec after the data is placed on the GPIB before the Data Valid (DAV) line is asserted. With high-speed timing, this delay is decreased to about 500 nsec. High-speed timing is strongly recommended.
- The ability to disable device unaddressing.

## Default Configurations

The software has factory default configurations. For example, the default device names of the 16 GPIB devices are DEV1 through DEV16, but you can choose to assign more descriptive names to each device, such as METER for a digital multimeter. Do not, however, give a GPIB device the same name as a directory or file on your diskette drive.

You can also use IBCONF to look at the current default settings in the handler file.

**Note:** *If you do not make changes using IBCONF, default characteristics of the software remain in effect.*

## Primary Default Characteristics

The following are the primary default characteristics of the handler:

- There are 16 active devices with symbolic names DEV1 through DEV16.
- GPIB addresses of these devices are the same as the device number—for example, DEV1 is at address 1.
- The 16 devices are assigned to GPIB0 as their access board. GPIB0 is the symbolic name of the first GPIB-PCIIB board in your system. If you have an additional GPIB-PCIIB board in your system, its symbolic name is GPIB1.
- Each GPIB-PCIIB board is system controller of its independent bus and has a GPIB address of 0.
- The END message is sent with the last byte of each data message to a device. Each data message that is read from a device automatically terminates when END is received. No EOS character is recognized.
- The time limit on I/O and wait function calls is approximately 10 sec.
- GPIB0 is a GPIB-PCIIB board at base I/O address 02B0 hex, using DMA channel 1 and no interrupt line.

## Specific Board Characteristics of IBCONF for the GPIB-PCIIB

In addition to the board and device characteristics of IBCONF listed in Section Two of the *NI-488 MS-DOS Software Reference Manual*, the GPIB-PCIIB handler has the following option.

### Disable Device Unaddressing (Board Characteristic Only)

Normally, devices are unaddressed upon completion of a device function by sending the Untalk (UNT) and Unlisten (UNL) interface commands. A *yes* response to this field eliminates this unaddressing on device functions. The default option for this characteristic is *no*.

## Running IBCONF

When you ran IBSTART, a copy of IBCONF .EXE was placed on your startup drive.

To run IBCONF, go to the root directory of the startup drive and enter the following command:

```
ibconf
```

IBCONF scans the handler file, GPIB .COM, and reads its data structures into memory. After you press any key, the program then displays the device map for board GPIB0.

Modify only the copy of GPIB .COM created by IBSTART in your root directory—that is, always run IBCONF from your root directory. Never modify the master copy by running IBCONF from the distribution diskette with the distribution diskette not write-protected.

## Exiting IBCONF

Once all changes have been made, exit IBCONF by pressing the function key <F9>. The program first asks if it should Save changes? before exiting. Typing a *y* response causes the changes to be written to the file on disk. Before exiting, the program checks for situations that may cause problems such as the following:

- GPIB addressing conflict between a device and its access board.
- GPIB boards not present in the host machine at the specified address.
- Timeouts disabled on a device or board.

If any of these situations is encountered, you are notified and given the option of re-entering or exiting IBCONF. To disable automatic checking when starting IBCONF, enter the following command:

```
ibconf -e
```

After exiting, the system *must* be restarted for the new values to take effect.

# Chapter 4

## Using Your GPIB-PCIIB

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Now that your software and hardware are installed, read Section Three of the *NI-488 MS-DOS Software Reference Manual* for a description of the NI-488 function groups available for the GPIB-PCIIB. The functions are described in the order you will most likely use them. Pay special attention to the device functions, which are found in Group I, Group II, and Group III. Read Section Four of the *NI-488 MS-DOS Software Reference Manual* for a detailed description of the NI-488 software.

After reading about these functions and their capabilities, practice using them with your programmable instrument or device in an interactive environment using the IBIC program described in Section Five of the *NI-488 MS-DOS Software Reference Manual*.

# Appendix

## Customer Communication

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

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

### Corporate Headquarters

(512) 795-8248

Technical support fax: (800) 328-2203  
(512) 794-5678

<b>Branch Offices</b>	<b>Phone Number</b>	<b>Fax Number</b>
Australia	(03) 879 9422	(03) 879 9179
Austria	(0662) 435986	(0662) 437010-19
Belgium	02/757.00.20	02/757.03.11
Denmark	45 76 26 00	45 76 71 11
Finland	(90) 527 2321	(90) 502 2930
France	(1) 48 14 24 00	(1) 48 14 24 14
Germany	089/741 31 30	089/714 60 35
Italy	02/48301892	02/48301915
Japan	(03) 3788-1921	(03) 3788-1923
Netherlands	03480-33466	03480-30673
Norway	32-848400	32-848600
Spain	(91) 640 0085	(91) 640 0533
Sweden	08-730 49 70	08-730 43 70
Switzerland	056/20 51 51	056/27 00 25
U.K.	0635 523545	0635 523154

# Technical Support Form

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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 \_\_\_\_\_

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 \_\_\_\_\_

(continues)

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

Version \_\_\_\_\_

Configuration \_\_\_\_\_

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

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

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

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# GPIB-PCIIB Hardware and Software Configuration Form

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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-PC Model : \_\_\_\_\_
- NI-488 Software Revision Number on Disk \_\_\_\_\_  
(Disk Label: *NI-488 Distribution Disk for MS-DOS Handler with BASICA and QuickBASIC Language Interfaces* )
- Application Programming Language (BASICA, QuickBASIC, C, Pascal, and so on) \_\_\_\_\_
- Programming Language Interface Revision \_\_\_\_\_
- Interrupt Level of GPIB-PCIIB \_\_\_\_\_
- DMA Channel of GPIB-PCIIB \_\_\_\_\_
- Base I/O Address of GPIB-PCIIB \_\_\_\_\_

## Other Products

- Computer Make and Model \_\_\_\_\_
- Microprocessor: \_\_\_\_\_

- Clock Frequency \_\_\_\_\_
- Type of Monitor Card Installed \_\_\_\_\_
- DOS Version : \_\_\_\_\_
- Programming Language Version \_\_\_\_\_
- Other Boards in System \_\_\_\_\_
- Base I/O Address of Other Boards \_\_\_\_\_
- DMA Channels of Other Boards \_\_\_\_\_
- Interrupt Level of Other Boards \_\_\_\_\_





# Glossary

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Prefix	Meaning	Value
n-	nano-	$10^{-9}$
$\mu$ -	micro-	$10^{-6}$

hex                      hexadecimal  
in.                      inch  
m                         meter  
sec                      second