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Getting Started with Your NB-GPIB-P/TNT and the NI-488.2™ Software for Graphics Applications

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

Federal Communications Commission

The NB-GPIB-P 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

The NB-GPIB-P 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

This manual contains instructions for installing the National Instruments NB-GPIB-P/TNT or NB-GPIB-P board and the NI-488.2 software for graphics applications. It also contains information on hardware verification, board and device default settings, hardware specifications, and troubleshooting.

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

Organization of This Manual

This manual is organized as follows.

- Chapter 1, *Introduction*, lists what you need to get started and optional equipment you can order. It gives instructions for unpacking your GPIB board, briefly describes the GPIB hardware and NI-488.2 software, and contains a quick installation procedure.
- Chapter 2, *Hardware Installation*, contains instructions for installing your GPIB board and describes how to verify the installation.
- Chapter 3, *Software Installation*, contains a description of the files on the NI-488.2 distribution disk and instructions for installing your NI-488.2 software.
- Chapter 4, *Troubleshooting*, suggests some areas to check if you have problems installing the GPIB board and/or the NI-488.2 software after going through the procedures described in Chapter 2, *Hardware Installation*, and Chapter 3, *Software Installation*. It also lists some common questions.
- Appendix A, *Hardware Specifications*, lists the electrical, environmental, and physical characteristics of the GPIB board and the recommended operating conditions.
- Appendix B, *Changing Board and Device Default Settings*, contains information for configuring the software and a description of the configuration utility that you can use to change the board and device default settings.
- Appendix C, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and description of terms used in this manual, including abbreviations, acronyms, metric prefixes, and mnemonics.

Conventions Used in This Manual

The following conventions are used in this manual.

bold	Bold text denotes commands, menus, menu items, options, screen button names, and checkboxes.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
bold italic	Bold italic text denotes a note, caution, or warning.
`monospace`	Text in this font denotes the proper names of programs, utility names, filenames, folder names, device names, and icon names.
NB-GPIB-P/TNT	NB-GPIB-P/TNT refers to a National Instruments GPIB board for Macintosh NuBus computers that is equipped with the TNT4882C ASIC.
NB-GPIB-P	NB-GPIB-P refers to a National Instruments GPIB board for Macintosh NuBus computers that is equipped with the NAT4882 and Turbo488 ASICs.
GPIB board	GPIB board refers to the NB-GPIB-P/TNT board or the NB-GPIB-P board, in cases where the material can apply to either board.
IEEE 488 and IEEE 488.2	IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and ANSI/IEEE Standard 488.2-1987, respectively, which define the GPIB.

Abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms are listed in the *Glossary*.

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 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands*

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 comments and configuration forms for you to complete. These forms are in Appendix C, *Customer Communication*, at the end of this manual.

Chapter 1
Introduction

This chapter lists what you need to get started and optional equipment you can order. It gives instructions for unpacking your GPIB board, briefly describes the GPIB hardware and NI-488.2 software, and contains a quick installation procedure.

What You Need to Get Started

❑ One of the following boards:
NB-GPIB-P/TNT
NB-GPIB-P

❑ 3.5 in. *NI-488.2 Distribution Disk for Graphics Applications, NI-488 INIT and Configuration Files*

Optional Equipment

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

- Single-Shielded GPIB Cables*:
  Type X1 cables (1 m, 2 m, 4 m, or 8 m)
- Double-Shielded GPIB Cables*:
  Type X2 cables (1 m, 2 m, 4 m, or 8 m)
- Double-Shielded Standard GPIB to Single-End Male GPIB Cables*:
  Type X5 cables (1 m, 2 m, 4 m, or 8 m)
- Type XA Adapter
- GPIB-SWITCH boxes:
  GPIB-SWITCH2
  GPIB-SWITCH4
- GPIB Bus Extenders:
  GPIB-130 (100 to 120 VAC)
  GPIB-130 (220 to 240 VAC)

* To meet FCC emission limits for the GPIB board, you must use a shielded (Type X1, X2, or X5) GPIB cable. Operating this equipment with a non-shielded cable may cause interference to radio and television reception .

Hardware Description

The NB-GPIB-P/TNT is an IEEE 488 interface board for Macintosh NuBus computers. The TNT4882C chip on the board performs the basic IEEE 488 Talker, Listener, and Controller functions, including those required by the most recent GPIB standard, IEEE 488.2. This board can sustain data transfer rates of 1.3 Mbytes/s and can also implement a high-speed GPIB protocol (HS488), so that you can have data transfers up to 2.3 Mbytes/s. The NB-GPIB-P/TNT board is fully software compatible with all versions of NB-GPIB hardware.

The NB-GPIB-P, equipped with NAT4882 and Turbo488 ASICs, is also an IEEE 488 interface board for Macintosh NuBus computers. The NAT4882 controller chip performs the basic IEEE 488 Talker, Listener, and Controller functions, including those required by IEEE 488.2. The Turbo488 performance-enhancing chip boosts GPIB read and write transfers to rates of up to 850 kbytes/s.

You can use standard GPIB cables to connect the GPIB board with up to 14 instruments. If you need to connect more than 14 instruments, you can order a National Instruments GPIB extender or GPIB expander/isolator to add additional instruments to the system.

Refer to Appendix A, *Hardware Specifications*, for more information about the GPIB board specifications and recommended operating conditions.

Software Description

Your kit includes NI-488.2 software, which National Instruments has developed for use with the GPIB board. It is a comprehensive package of software for transforming your Macintosh into a GPIB Controller with complete communications and bus management capability.

Unpacking Your GPIB Board

Follow these steps when unpacking your GPIB board.

1. Verify that the package you received contains the correct board and distribution disk.

   Caution: ***Do NOT remove the board from its plastic package at this point.***

2. Notice that your GPIB board is shipped packaged in an antistatic plastic package to prevent electrostatic damage to the board. Several components on the board can be damaged by electrostatic discharge. To avoid such damage in handling the board, touch the plastic bag to a metal part of your computer chassis before removing the board from the bag.

3. Remove the board from the bag and inspect the board for loose components or any other sign of damage. Notify National Instruments if the board appears damaged in any way. Do *not* install a damaged board into your computer.

Quick Installation

For quick installation, complete the following steps. If you need more detailed installation information, follow the instructions in Chapter 2, *Hardware Installation*, and Chapter 3, *Software Installation*, of this manual.

1. Power off your Macintosh.

2. Install your GPIB board. Do not attach a GPIB cable yet.

3. Power on your Macintosh.

4. Insert your NI-488.2 distribution disk and double-click on the `IBDIAG` icon that appears on the screen.

5. Click on the **Test** button to run the `IBDIAG` hardware verification test.

6. If the hardware verification is successful, attach a GPIB cable between the board and your peripheral device.

7. Double-click on the `NI-488.2 Installer` icon. The installer decompresses and installs the software. If your Macintosh is running System 7.0 or later, the `NI-488 Config` file is installed in the `Control Panels` folder, and the `NI-488 INIT` and `NI-DMA/DSP` files are installed in the `Extensions` folder. If your Macintosh is running System 6, the `NI-488 Config`, `NI-488 INIT`, and `NI-DMA/DSP` files are installed in the `System Folder`. Installing the entire package requires about 1 MB of space on your hard disk and takes about five minutes.

8. Restart your Macintosh.

9. Run your application program.

Chapter 2
Hardware Installation

This chapter contains instructions for installing your GPIB board and describes how to verify the installation.

Install the Hardware

Follow these steps to install your GPIB board.

1. Turn off your computer. Keep the computer plugged in so that it remains grounded while you install the GPIB board.

2. Remove the GPIB extension connector from the GPIB board by unscrewing the thumb screws located on each side of the connector, as shown in Figure 2-1.

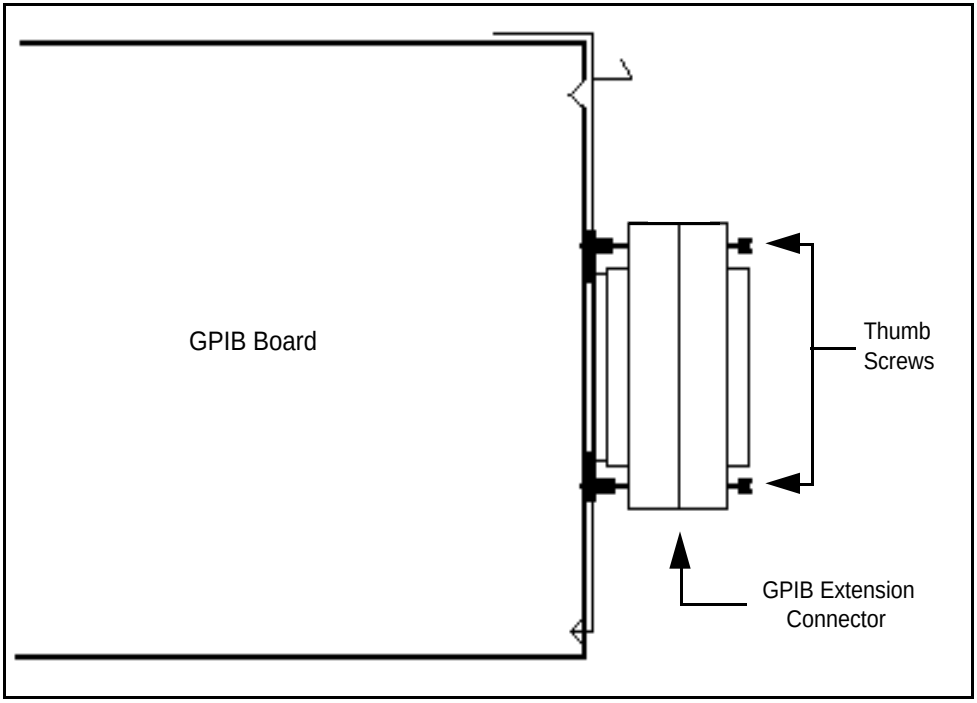


Figure 2-1. The GPIB Extension Connector

3. Install the GPIB board according to the instructions in the manual that came with your Macintosh computer. You can install the board into any slot. If you are installing multiple boards in your computer, space them evenly to maximize airflow. For example, if you are installing three boards in a computer with six slots, position them in slots two, four, and six. Figure 2-2 shows the GPIB board installed in the fourth slot of the Macintosh as viewed from the back of the computer.

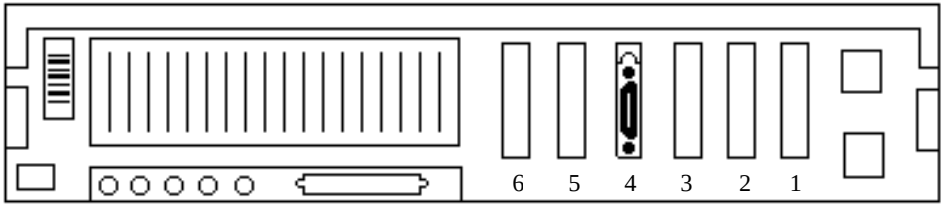


Figure 2-2. The GPIB Board Installed in the Fourth Slot of the Macintosh

4. Connect the GPIB extension connector, removed in Step 3, to the GPIB board through the slot in the Macintosh back panel. Push the connector in until it is secure.

   Note: ***In some Macintosh computers, the GPIB extension connector might not fit. You must use a Type XA adapter or a narrower single-ended cable such as the Type X5 cable, both available from National Instruments, with these computers.***

5. Tighten the thumb screws on each side of the GPIB extension connector.

6. Align the GPIB cable with the GPIB extension receptacle and push the cable in until it is secure.

   Note: ***If you plan to verify the hardware installation with the*** `IBDIAG` ***program, do not connect the GPIB cable at this time.***

7. Tighten the thumb screws on each side of the GPIB cable connector.

8. Turn on your computer.

After you have installed your board, follow the instructions in the next section to verify the hardware installation.

Verify the Hardware Installation

This section contains instructions for running the hardware verification program, `IBDIAG`.

The `IBDIAG` program is contained on the NI-488.2 distribution disk that came with your kit. This program is used to verify that the GPIB board is installed correctly and that it is in good working condition. Use the following steps to run the program.

1. Disconnect all GPIB cables from your computer.

2. Turn on your computer.

3. Insert the NI-488.2 distribution disk. When startup completes, the `IBDIAG` icon appears on the screen.

4. Double-click on the `IBDIAG` icon, which is shown in Figure 2-3.



Figure 2-3. IBDIAG Icon

A test window appears on the screen, as shown in Figure 2-4. You can exit the `IBDIAG` program without running it by choosing **Quit** from the **File** menu.

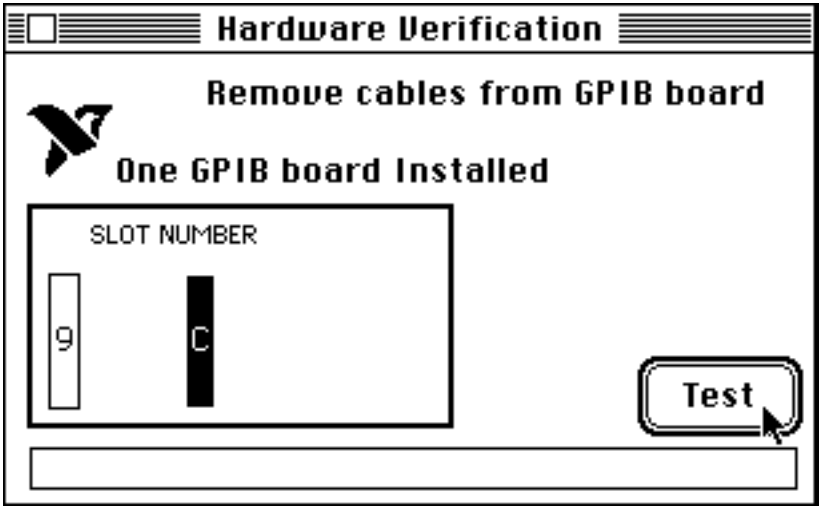


Figure 2-4. Test Window

The slot indicators show the Macintosh slots that have boards installed. A slot indicator highlighted in black shows the slot number of a GPIB board that you can test.

5. Click on the **Test** button to run a series of tests that verify the GPIB board hardware installation. A bar graph indicates the progress of the tests, and a message appears above the slot indicators at the completion of all tests.

6. View the test results. Figure 2-5 shows the test window that appears if no error was detected. You can exit the `IBDIAG` program if your hardware verification was successful by choosing **Quit** from the **File** menu.

   If `IBDIAG` completes successfully, you are ready to install the NI-488.2 software. Refer to Chapter 3, *Software Installation and Configuration*.

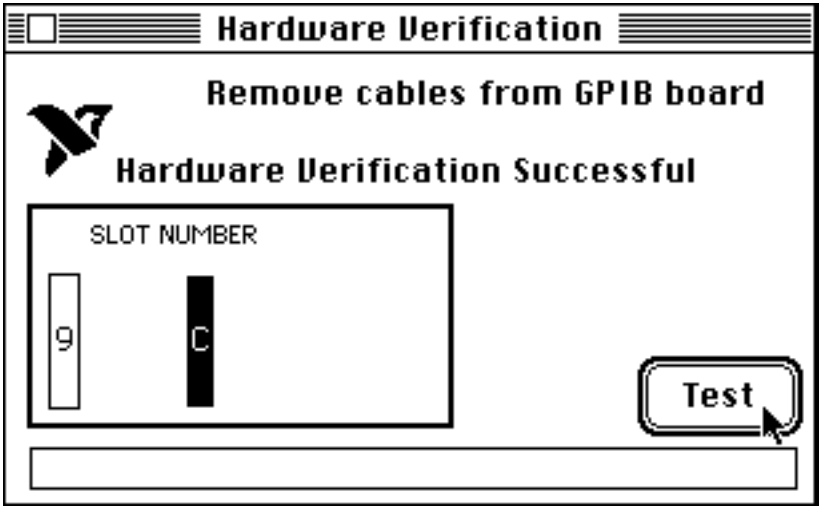


Figure 2-5. Hardware Verification Window after Successful Completion of Tests

Figure 2-6 is an example of the alert box screen that appears if an error was detected. The alert box screen has error information and the option to continue or stop.

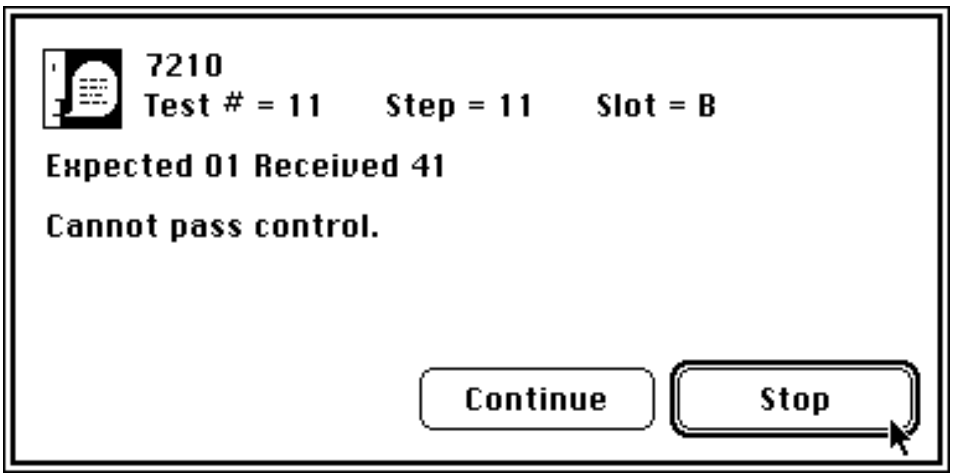


Figure 2-6. Alert Box with Error Information

7. Record the error information. Whenever an alert box screen appears, record the information before clicking on either **Continue** or **Stop**. At the end of the program, if the hardware verification did not complete successfully, a screen appears as shown in Figure 2-7.

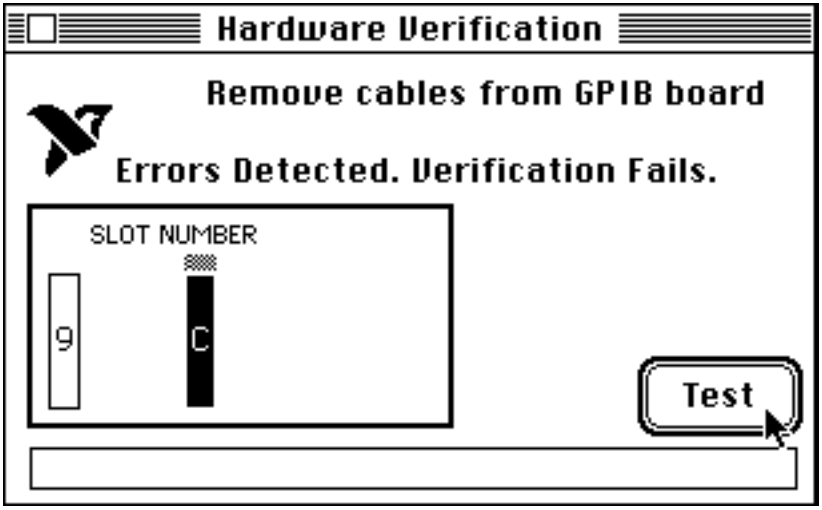


Figure 2-7. Hardware Verification Window after Unsuccessful Completion of Tests

8. If `IBDIAG` fails, make sure that the GPIB board is positioned securely in its slot and that no GPIB cables are connected. Run the `IBDIAG` program again. If the program still detects errors, record the errors and refer to Chapter 4, *Troubleshooting*, for possible solutions.

9. To exit from the `IBDIAG` program, select **Quit** from the **File** menu.

If the `IBDIAG` program completed without detecting an error, you can connect your GPIB cable and proceed to Chapter 3, *Software Installation*, to install your software.

Chapter 3
Software Installation

This chapter contains a description of the files on the NI-488.2 distribution disk and instructions for installing your NI-488.2 software.

NI-488.2 Software Components

The NI-488.2 distribution disk includes the following components:

- `NI-488.2 Installer` is a program that installs the NI-488.2 software onto your Macintosh.
- `Read Me` is a file that contains the latest updates and corrections to the manual when appropriate.
- `NI-488 INIT` is an INIT that loads the device drivers for installed National Instruments GPIB interfaces when you power on or restart your Macintosh.
- `NI-488 Config` is a control panel configuration utility that you can use to examine or change the software settings.
- `NI-DMA/DSP` is a system extension that provides DMA functionality through an RTSI connection to an NB-DMA-2800 or NB-DMA-8.
- `IBDIAG` is a stand-alone diagnostic program that verifies the GPIB hardware installation and reports any errors or conflicts with the system.
- `IBIC 488.2` is an interactive communication program that you can use to communicate with GPIB devices from the keyboard. You can also use `IBIC 488.2` to troubleshoot problems.

Install the Software

Your NI-488.2 software is distributed in compressed form on one disk. Installing all of the software requires about 1 MB of space on your hard disk and takes about five minutes.

If an `NI-488 INIT` file is already installed in your system, the `NI-488.2 Installer` program removes it and replaces it with the current `NI-488 INIT`. If the `NI-488 Config` or `NI-DMA/DSP` files are already installed in your system, they are also replaced.

Install your NI-488.2 software by completing the following steps.

Step 1. Install the NI-488.2 Files and Folders

Caution: ***Virus detection software might prevent the install program from copying important files to the*** `System Folder`. ***You must disable or bypass any virus prevention software before attempting the installation procedure.***

1. Insert the NI-488.2 distribution disk and double-click on the `NI-488.2 Installer` icon shown in Figure 3-1.

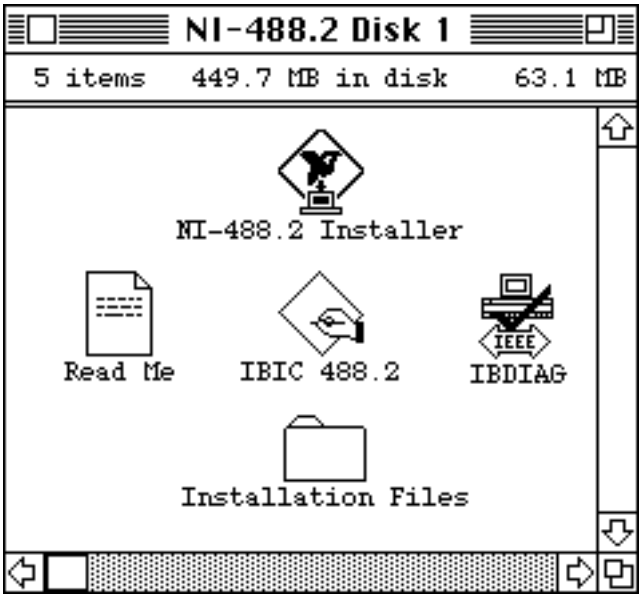


Figure 3-1. The NI-488.2 Installer Icon

2. If you have a National Instruments software driver already installed, the dialog box shown in Figure 3-2 appears. If the dialog box does not appear, skip to Step 3.

   If you want to copy the bus and device settings from your original driver to the new `NI-488 INIT`, click on the **Retain** button. Otherwise, reset all settings to the defaults by clicking on the **Clear** button. To exit from the installation procedure, click on the **Cancel** button.

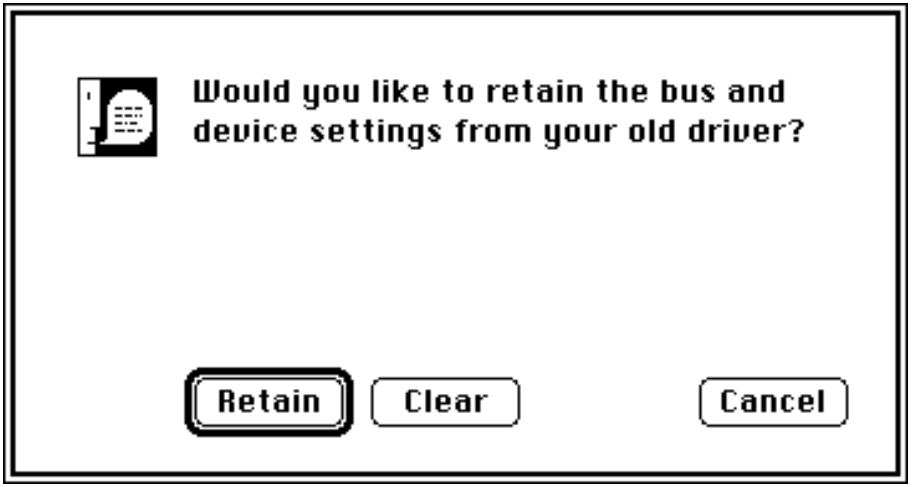


Figure 3-2. Settings Dialog Box

2. The dialog box shown in Figure 3-3 appears on screen. Click on the **Install** button to install the NI-488.2 software. The installer creates a folder named `NI-488.2` to contain NI-488.2 files and folders.

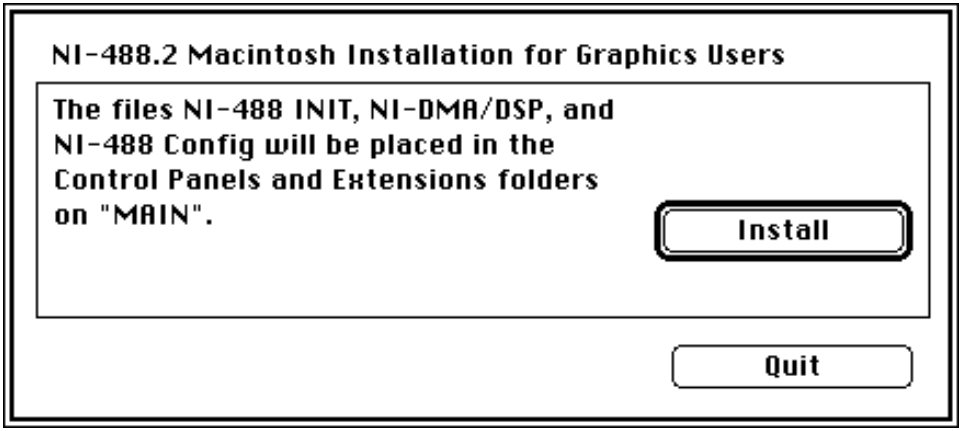


Figure 3-3. Installation Dialog Box

If you are running System 7.0 or later, the `NI-488 Config` file is placed in the `Control Panels` folder, and the `NI-488 INIT` and `NI-DMA/DSP` files are placed in the `Extensions` folder. If you are running System 6 or earlier, the `NI-488 Config`, `NI-488 INIT`, and `NI-DMA/DSP` files are installed in the `System Folder`.

Step 2. Configure the Software (Optional)

Your NI-488.2 software is used by the application software when communicating with external GPIB devices. Because most applications can use the default configuration of the software, it is usually not necessary to reconfigure the software. Do not change the default configuration unless your application requires it.

Note: ***If your application requires you to change the default parameters of the NI-488.2 software, refer to Appendix B,*** *Changing Board and Device Default Settings****, and then complete*** *Step 3. Restart Your Macintosh****.***

Step 3. Restart Your Macintosh

The NI-488.2 software is installed every time you start or restart your Macintosh. Restart the Macintosh by selecting **Restart** from the **Special** menu. The NI-488.2 software displays the National Instruments icon momentarily in the lower left corner of the screen to indicate that the software is being installed. If the National Instruments icon does not appear on your screen, repeat the installation procedure.

You have now completed the hardware and software installation and are ready to use your GPIB board and NI-488.2 software.

Chapter 4
Troubleshooting

This chapter suggests some areas to check if you have problems installing the GPIB board and/or the NI-488.2 software after going through the procedures described in Chapter 2, *Hardware Installation*, and Chapter 3, *Software Installation*. It also lists some common questions.

If you still have problems after you try the solutions recommended in this chapter, complete the appropriate forms in Appendix C, *Customer Communication*, and contact National Instruments for technical support.

Troubleshooting Hardware Problems

- Make sure that all GPIB cables are connected properly, unless you are running the hardware verification test.
- Make sure that the GPIB board is positioned securely in its slot.
- If the `IBDIAG` hardware verification test fails, make sure that no GPIB cables are connected to the GPIB board.

Troubleshooting Software Problems

The `NI-488 Config` control panel (GPIB configuration utility) should show the following default software configuration:

- The **Interface Type** menu selection should be set to **NuBus boards**.
- An **X** should appear in a system slot box that corresponds to the location of your GPIB board.

You can use the `NI-488 Config` control panel utility to examine and adjust the configuration of the software. Refer to Appendix B, *Changing Board and Device Default Settings*, for more information on running the utility and for information about the configurable software parameters.

Common Questions

What do I do if my board does not show up in the `NI-488 Config` utility?

In `NI-488 Config`, an **X** should appear in a system slot box that corresponds to the location of your GPIB board. If an **X** does not appear in any box, try moving the board to a different slot. If other boards are already installed, swap the arrangement of the boards.

What do I do if my GPIB extension connector does not fit?

You may need to order a Type XA adapter or a Type X5 single-ended GPIB cable. Both products are available from National Instruments.

What do I do if I have installed the NI-488.2 software and now my Macintosh crashes upon startup?

Try changing the name of the `NI-488 INIT` to `ZNI-488 INIT`. Because INITs load in alphabetical order, the `ZNI-488 INIT` will load last, preventing possible corruption from INITs that load after it. If changing the name of the `NI-488 INIT` does not solve the problem, another INIT file might have a conflict with the `NI-488 INIT`. Try removing some of your other INIT files. You can store them in a temporary folder in case you need to reload them later. If you are using System 7.5 or later, you can use the `Extensions Manager` control panel to disable certain extensions and control panels.

My system has been crashing since I switched to a Quadra computer. What should I do?

This problem was associated with some versions of the `NB Handler INIT`. Upgrade to the `NI-488 INIT` to resolve this situation.

What do I do if my board does not work correctly with a scanner or film recorder?

Try checking the **Unaddressing** option in `NI-488 Config`. Refer to Appendix B, *Changing Board and Device Default Settings*, for information on running the `NI-488 Config` configuration utility.

What do I do if the `IBDIAG` hardware verification test fails with an error?

Record any error information that appears in the alert box.

What information should I have before I call National Instruments?

When you call National Instruments, you should have the results of the `IBDIAG` hardware verification test. In addition, make sure you have filled out the configuration form in Appendix C, *Customer Communication*.

Appendix A
Hardware Specifications

This appendix lists the electrical, environmental, and physical characteristics of the GPIB board and the recommended operating conditions.

Table A-1. Electrical Characteristics of the NB-GPIB-P/TNT

Characteristic	Specification
Number of GPIB loads	1
Maximum Transfer Rate (programmed I/O)	1.3 Mbytes/s using three-wire handshake* 2.3 Mbytes/s using HS488*
Power Requirement	+5 VDC, 350 mA maximum
* Actual rates depend on instrument capabilities and system configuration.	

Table A-2. Electrical Characteristics of the NB-GPIB-P

Characteristic	Specification
Number of GPIB loads	1
Maximum Transfer Rate (programmed I/O)	850 kbytes/s*
Power Requirement	+5 VDC, 1.25 A maximum
* Actual rates depend on instrument capabilities and system configuration.	

Table A-3. Environmental Characteristics of the NB-GPIB-P/TNT

Characteristic	Specification
Operating Temperature	0° to 40° C
Storage Temperature	-20° to 70° C
Relative Humidity	5% to 90%, noncondensing
EMI	FCC Class A Verified

Table A-4. Environmental Characteristics of the NB-GPIB-P

Characteristic	Specification
Operating Temperature	0° to 40° C
Storage Temperature	-20° to 70° C
Relative Humidity	5% to 90%, noncondensing
EMI	FCC Class B Certified

Table A-5. Physical Characteristics of the NB-GPIB-P/TNT and NB-GPIB-P

Characteristic	Specification
Dimensions	17.78 cm by 10.16 cm (7.0 in. by 4.0 in.)
I/O Connector	IEEE 488 Standard 24-pin

Appendix B
Changing Board and Device Default Settings

This appendix contains information for configuring the software and a description of the configuration utility that you can use to change board and device default settings.

When to Use the GPIB Configuration Utility

The GPIB configuration utility, `NI-488 Config`, is a control panel utility. With `NI-488 Config`, you can change the default GPIB settings that your interface board uses to communicate with other devices.

Note: ***The default configuration of the NI-488.2 software is suitable for most graphics applications. DO NOT CHANGE THE DEFAULT PARAMETERS OF THE NI-488.2 SOFTWARE UNLESS YOUR GRAPHICS APPLICATION REQUIRES YOU TO DO SO.***

The parameters that you would most likely change for graphics applications are as follows:

- Device Name — Each device is known to the software by a unique name. By default, these names are `dev1` through `dev64`.
- Device Address — Each external device on the GPIB is required to have a unique numerical address on the bus. You can set an address by changing the DIP switches on the devices. The GPIB board uses these addresses when communicating with particular devices. The default devices, `dev1` through `dev64`, have default addresses of 1 through 30 for `dev1` through `dev30`, 1 through 30 for `dev31` through `dev60`, and 1 through 4 for `dev61` through `dev64`.
- Timeout — Data transfers must complete within a specified time period, the timeout. Instead of waiting indefinitely for a data transfer to complete, the software returns to the application with an error status if a timeout is exceeded. The default timeout is 10 s.

Running the Configuration Utility

This section contains information on running the `NI-488 Config` configuration utility. It explains how to use the utility and describes the configuration settings that you can modify.

Opening the Configuration Utility

The `NI-488 Config` configuration utility appears in the `Control Panels` folder when you install your NI-488.2 software. Open the `Control Panels` folder by choosing **Control Panels** from the menu as shown in Figure B-1.

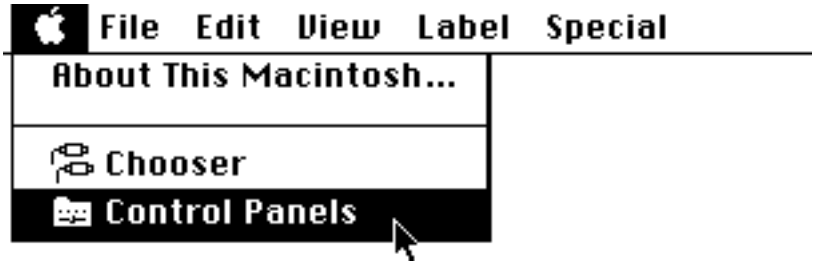


Figure B-1. Choose Control Panels

To access the configuration utility, double-click on the `NI-488 Config` icon. The utility displays the currently defined values for characteristics of a particular device or bus, such as addressing and timeout information. Help for modifying the current settings is available at the bottom of the window.

The Opening Screen

The configuration control panel consists of three frames, arranged vertically and separated by a heavy line. Each frame is labeled in Figure B-2.

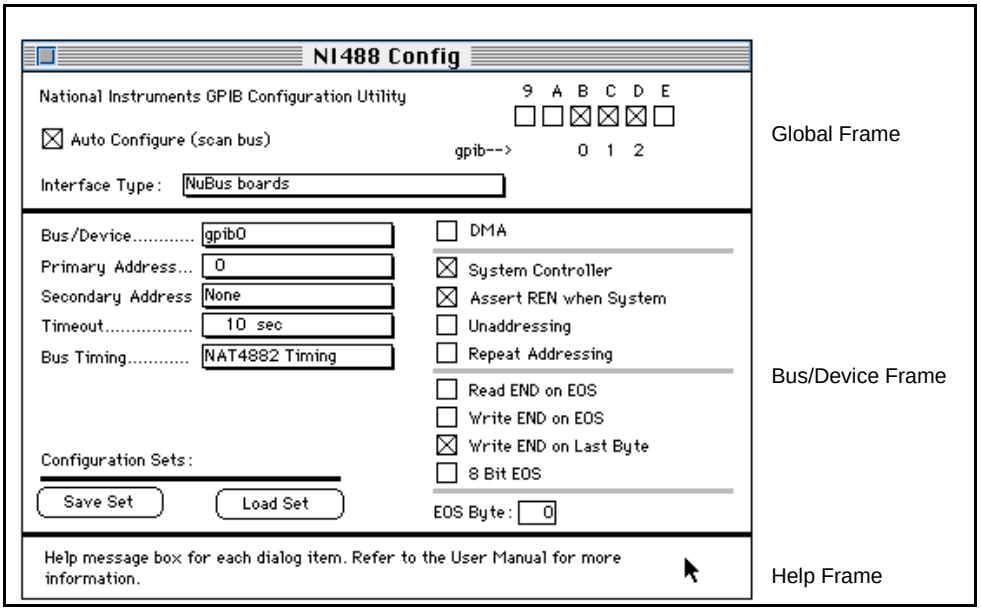


Figure B-2. Opening Screen of NI-488 Config

The global and bus/device frames contain the configuration characteristic settings. The help frame displays information about the item over which the cursor is positioned.

The **Interface Type** and **Bus/Device** menus affect the display of configuration controls. For example, selecting a serial interface hides the **Auto Configure** checkbox.

Default Configuration

Your NI-488.2 software is shipped with the following default configurations:

- The **Auto Configure** checkbox is selected.
- All buses are configured as shown in the bus/device frame in Figure B-2.
- All devices are configured similarly to `dev1` shown in the bus/device frame in Figure B-3. The devices `dev1` through `dev30` use bus `gpib0` and are at the primary addresses 1 through 30, respectively. The devices `dev31` through `dev60` use bus `gpib1` and are at the primary addresses 1 through 30, respectively. The devices `dev61` through `dev64` use bus `gpib2` and are at the primary addresses 1 through 4, respectively.

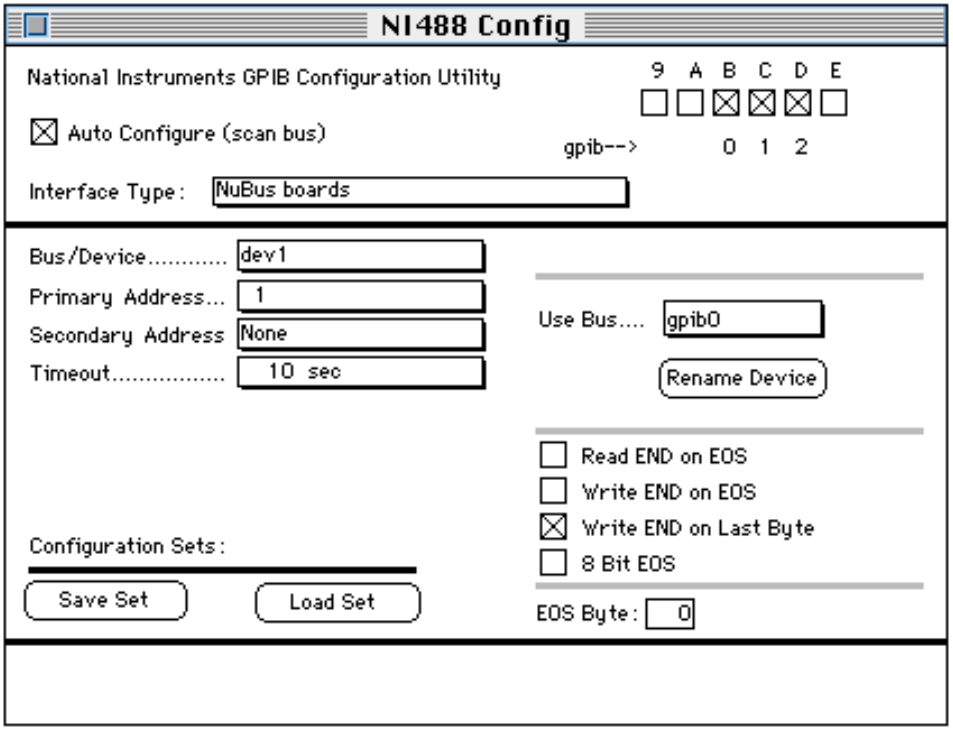


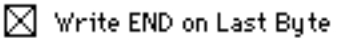
Figure B-3. Device Default Settings

Control Items

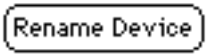
The `NI-488 Config` control panel has four types of control items:



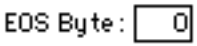
The rectangular boxes with drop shadows and labels to the left have pop-up menus of options. The currently selected option is displayed in the box. To select an option on the pop-up menu, click and hold down the mouse button when the cursor is over the box.



A checkbox is a small square box that contains an X when selected and is labeled at the right or on the top. An unselected checkbox displays an alert box when clicked.



A button is a rounded rectangular box.



An editable text box is a rectangular box labeled to the left.

Help Frame

When you place the cursor over any configuration item, a help message for that item appears in the help frame. Figure B-4 shows the default configuration for bus `gpib0`. The global frame shows the automatic association of bus `gpib0` with a GPIB board installed in System slot 3 (NuBus slot xB). The cursor is positioned over the **Auto Configure** checkbox and a corresponding help message appears in the help frame.

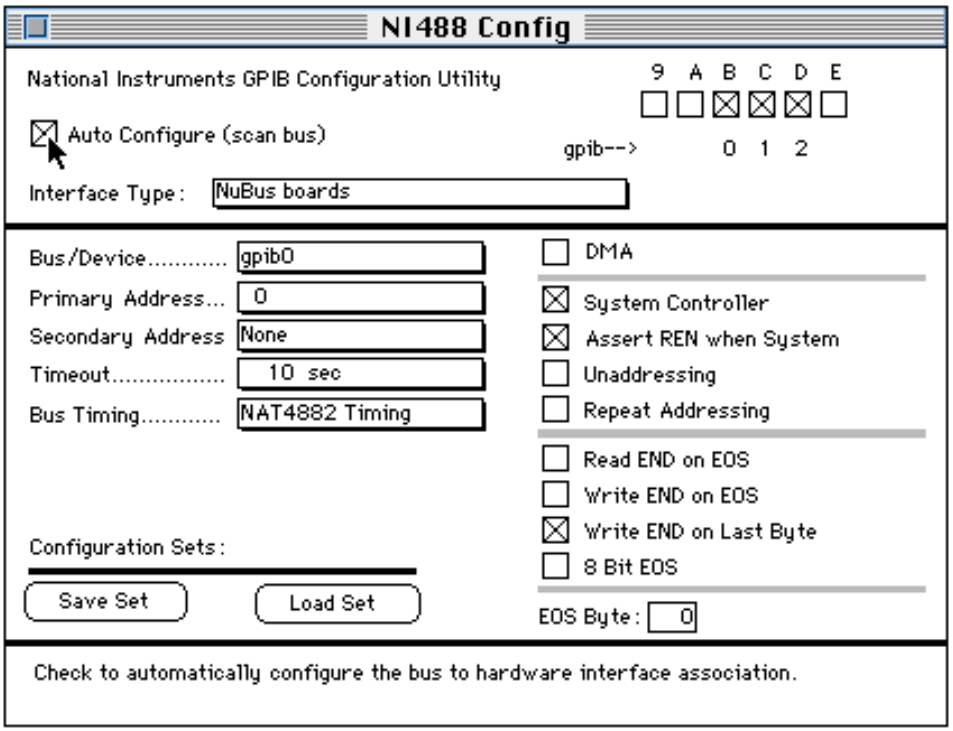


Figure B-4. Help Frame in NI-488 Config

Global Frame

The **Interface Type** pop-up menu options let you switch the checkboxes among interface types. Choose **NuBus boards** for boards, such as the NB-GPIB-P/TNT or NB-GPIB-P, installed in a NuBus Macintosh. The other options apply to different types of National Instruments GPIB products. For more information on configuring one of those products, refer to the documentation that came with the product.

To the upper right of the **Interface Type** menu box is a row of interface checkboxes with which you can associate an IEEE 488 bus. Slot numbers appear above the checkboxes, and associated bus numbers, if any, appear below the checkboxes. To manually associate a bus with an interface, first unselect **Auto Configure**. When you select an interface checkbox with **Auto Configure** selected, the next available bus is assigned to it. Figure B-5 shows the manual association of bus 0 to System slot 3 (NuBus slot xB).

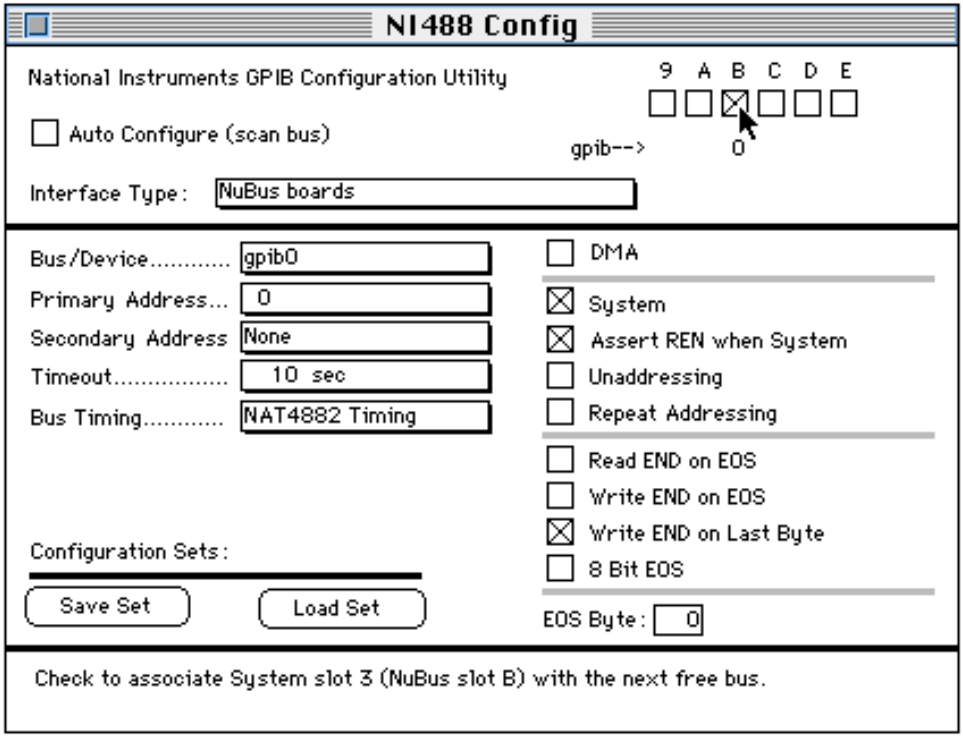


Figure B-5. Manual Bus Association in NI-488 Config

Selecting the **Auto Configure** checkbox in the global frame automatically configures the buses according to the way the boards are contained in the system. When **Auto Configure** is checked, each bus, `gpib0` through `gpib7`, is associated with the next GPIB board found by the Slot Manager when searching System slots 1 through 6 (NuBus

slots 9 through E) and expansion slots x1 through x8 (NuBus slots 1 through 8). Select the **Auto Configure** checkbox unless your application requires compatibility with older releases of the NI-488.2 driver, where the naming conventions of the buses are different. Do *not* check the **Auto Configure** checkbox if you want to change the order that device-identifying software uses GPIB interfaces.

Bus/Device Frame

Items in the bus/device frame configure characteristics of a bus, a device, or either. Table B-1 lists the primary bus/device options available in `NI-488 Config`. The sections following the table describe the options in more detail.

For information on product-specific options, such as the **Serial** or **IP Address** pop-up boxes, refer to the getting started manual that came with your GPIB hardware.

Table B-1. Bus/Device Options in NI-488 Config

Option	Type	Default Setting
Primary Address	Bus/Device	0
Secondary Address	Bus/Device	None
Timeout	Bus/Device	10 sec
Read END on EOS	Bus/Device	Disabled
Write END on EOS	Bus/Device	Disabled
Write END on Last Byte	Bus/Device	Enabled
8-bit EOS	Bus/Device	Disabled
EOS Byte	Bus/Device	0
Bus Timing	Bus Only	(Interface-specific)
TNT High Speed	Bus Only	Disabled
DMA	Bus Only	Disabled
System Controller	Bus Only	Enabled
Assert REN when System	Bus Only	Enabled
Unaddressing	Bus Only	Disabled
Repeat Addressing	Bus Only	Disabled
Rename Device	Device Only	dev1-dev64
Use Bus	Device Only	gpib0

Options for Buses or Devices

Select the bus or device you want to configure from the **Bus/Device** pop-up menu. The following options in the bus/device frame apply to both buses and devices. Also refer to the subsequent sections *Options for Buses Only* and *Options for Devices Only.*

Primary Address

Each device and bus must have unique primary addresses in the range decimal 0 to decimal 30 (hex 1E). The primary GPIB address of any device is set within that device, either with hardware switches or, in some cases, a software program. This address must match the address listed in the configuration utility. Refer to the device documentation for instructions about the device address. The primary GPIB address of all NI-488.2 driver buses is 0, unless changed by the configuration utility. There are no hardware switches on the interface board to select the GPIB address. Use the **Primary Address** pop-up menu to select the primary address of the bus or device.

Secondary Address

You must assign a secondary address in the range decimal 96 (hex 60) to decimal 126 (hex 7E) to any device or bus using secondary addressing. As with primary addressing, the secondary GPIB address of any device is set within that device, either with hardware switches or, in some cases, a software program. This address must match the address listed in the configuration utility. Refer to your device documentation for instructions. By default, secondary addressing is disabled for all devices and boards unless you change it with the configuration utility.

Select the secondary address of the bus or device from the **Secondary Address** pop-up menu. The secondary addresses are displayed in three formats: zero-based, decimal, and hexadecimal. Only the zero-based format is displayed in the pop-up menu box. Selecting **None** means that only primary addressing is used for this bus or device. If you configure any bus or device for secondary addressing, all buses and devices used by the application must be configured for secondary addressing.

Timeout

The timeout value is the approximate length of time that can elapse before I/O functions complete. Select the I/O timeout of the bus or device from the **Timeout** pop-up menu. The abbreviations used in the **Timeout** pop-up menu are: µ**sec** (microseconds), **msec** (milliseconds), and **sec** (seconds). Selecting **None** means I/O for this bus or device will never time out.

EOS Modes

The options described below determine how the device I/O transmissions terminate:

- **Read END on EOS** – Some devices send an EOS byte signaling the last byte of a data message. Checking this box causes the NI-488.2 software to terminate read operations when it receives the EOS byte.
- **Write END on EOS** – Checking this box causes the NI-488.2 software to assert the EOI (send END) line when the EOS character is sent.
- **Write END on Last Byte** – Some devices, as Listeners, require that the Talker terminate a data message by asserting the EOI signal line (sending END) with the last byte. Checking this box causes the NI-488.2 software to assert EOI on the last data byte.
- **8-bit EOS**– Along with the designation of an EOS character, you can specify whether all eight bits are compared to detect EOS, or if just the seven least significant bits (ASCII or ISO format) are compared to detect EOS.

EOS Byte

You can program some devices to terminate a read operation when a selected character is detected. A linefeed character (decimal 10) is a popular EOS character.

Notice that to send the EOS character to a device in a write operation, you must explicitly include that byte in your data string.

Enter the EOS byte (0 to 255) of the bus or device in the **EOS Byte** editable text box. To change the EOS byte, click inside the box, enter the new number, and press the <return> key.

Options for Buses Only

Select the device you want to configure from the **Bus/Device** pop-up menu. The following sections describe the available bus options. See also the section *Options for Buses or Devices* earlier in this chapter.

Bus Timing

This pop-up menu appears when configuring a bus associated with a NAT4882-based interface, such as the NB-GPIB-P. You can use it to specify the T1 delay of the board source handshake capability. This delay determines the minimum interval following Ready for Data (RFD) after which the board may assert Data Valid (DAV) during a write or command operation. If the total length of the GPIB cable in the system is less than 15 m and all devices are *on*, you can choose the sub-item **Very High** (350 ns) from the **NAT4882 Timing** pop-up menu. For total cable lengths greater than 15 m, choose **Low** (2 µs) or **High** (500 ns) depending on the maximum capability of your particular device.

TNT High Speed

If you are using a National Instruments TNT4882C-based interface, such as the NB-GPIB-P/TNT, a second item, **TNT High Speed**, appears enabled. Initially, the sub-item **High Speed Mode Disabled** is checked. If your device is capable of 1-wire high-speed handshaking, you can enable the HS488 high-speed protocol by choosing the sub-item corresponding to the total GPIB cable length of your setup. For maximum performance, select the sub-item **GPIB cable is 1 meter**.

DMA

When the **DMA** box is checked, direct memory access hardware is used for data transfers, freeing the CPU for other work. Uncheck the **DMA** box to transfer data using the CPU. DMA channels are allocated for GPIB when you check the **DMA** box or call the `ibdma` function with v = 1 in an application program. (This option only applies if you are using an NB-GPIB style board connected to a GPIB DMA-2800 or DMA-8-6 that is capable of supporting DMA.)

System Controller

Generally, the NI-488.2 driver is the System Controller (SC). In some situations, such as in a network of computers linked by the GPIB, another device might be System Controller. Selecting the **System Controller** box designates the NI-488.2 driver as System Controller. Unselecting the box designates that it is *not* System Controller. Each bus can have only one System Controller.

Assert REN when System (Controller)

Some devices must be in remote state to communicate over the GPIB. Checking this box permits the driver to assert the Remote Enable condition (REN) when it is System Controller, placing all instruments subsequently addressed into remote state.

Unaddressing

Some devices must be unaddressed after each data or command transfer. To force unaddressing commands to be sent at the end of device functions, check the **Unaddressing** box. (Unchecking the **Unaddressing** box slightly improves the performance of your application, because unaddressing commands are not sent at the end of device functions.)

Repeat Addressing

Normally, a device remains addressed after a read or write operation is performed. However, some devices require addressing for each operation. If you check the **Repeat Addressing** box, read or write operations readdress the selected device even if the same operation was just performed with that device.

Options for Devices Only

Select the device you want to configure from the **Bus/Device** pop-up menu. The device is connected to the bus number that appears in the **Use Bus** text box. The following sections describe the available device options. Also refer to the previous options listed under *Options for Buses or Devices*.

Rename Device

You can rename the device displayed in the **Bus/Device** pop-up menu by clicking the **Rename Device** button and entering the new name. This feature is helpful when configuring a large number of devices, because the new name of the device that you entered appears in the **Bus/Device** pop-up menu. However, to avoid the confusion of naming and renaming devices, use the NI-488 function `ibdev` in new applications to dynamically configure new devices. You can use `ibdev` to configure the driver from your program instead of from the configuration utility.

Use Bus

You can connect the device displayed on the **Bus/Device** pop-up menu to a different bus by selecting the new bus from the **Use Bus** pop-up menu. The new bus number appears to the left of the device name in the **Bus/Device** pop-up menu.

Exiting the Configuration Utility

To exit the configuration utility, click on the close box in the upper left corner of the configuration screen.

An alert message displays if you close the utility while any of the following conditions applies.

Note: ***The term*** *bus* ***is defined as a GPIB interface board number. The bus number is not related to the number of the slot that the GPIB interface board occupies.***

- The Macintosh must be restarted to load new drivers or change the serial port settings.

- A device GPIB address conflicts with the GPIB address of the bus to which it is connected. Each GPIB address must be unique.
- No GPIB board is in the slot associated with one of the buses.
- A bus or device I/O timeout is set to **None** (disabled).

Appendix C
Customer Communication

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

Branch Offices	**Phone Number**	**Fax Number**
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
Mexico	95 800 010 0793	95 800 010 0793
Netherlands	03480-33466	03480-30673
Norway	32-848400	32-848600
Singapore	2265886 2265887	
Spain	(91) 640 0085	(91) 640 0533
Sweden	08-730 49 70	08-730 43 70
Switzerland	056/20 51 51	056/20 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	0635 523545	0635 523154

Technical Support Form

Technical support is available at any time by fax. Include the information from your configuration form. Use 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 _____

National Instruments software product _____

Version _____

Configuration _____

Application Program _____

Version _____

Graphics Devices Used _____

_____

(continues)

The problem is _____

List any error messages _____

The following steps will reproduce the problem _____

GPIB Board Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Update this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration.

National Instruments Products

- GPIB Board and Revision Number (for one of the following boards):
  - – NB-GPIB-P/TNT Board Revision _____
  - – NB-GPIB-P Board Revision _____
- NI-488.2 Software Version Number on Disk _____

Other Products

- Programming Language and Version Number _____
- Computer Make and Model _____
- Memory Capacity on Computer _____
- Clock Frequency _____
- Operating System Version _____
- Number of GPIB Devices on Bus _____
- Other Hardware Devices in System _____
- Type of Monitor _____
- Graphics Devices Used _____

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 NB-GPIB-P/TNT and the NI-488.2™ Software for Graphics Applications**

Edition Date: **January 1995**

Part Number: **320230B-01**

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

(continues)

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

_____

_____

_____

_____

_____

_____

_____

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_____

_____

_____

Thank you for your help.

Name _____

Title _____

Company _____

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Glossary

Prefix	Meaning	Value
n-	nano-	10^{-9}
µ-	micro-	10^{-6}
m-	milli-	10^{-3}
c-	centi-	10^{-2}
k-	kilo-	10^{3}
M-	mega-	10^{6}

°	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
ASIC	application-specific integrated circuit
C	Celsius
DAV	Data Valid
DIP	dual inline package
DMA	direct memory access
EMI	electromagnetic interference
EOI	End-or-Identify
EOS	End-of-String
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
ISO	International Standards Organization
KB	kilobytes of memory
m	meters
MB	megabytes of memory
RAM	random-access memory
REN	Remote Enable
RFD	Ready for Data
RTSI	Real-Time System Integration
s	seconds
SCSI	Small Computer System Interface
VAC	volts alternating current
VDC	volts direct current

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