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**GPIB**

# **Getting Started with Your LC-GPIB and the NI-488.2™ Software for MacOS**

July 1997 Edition  
Part Number 320485C-01



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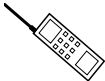
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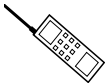
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# Important Information

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# FCC/DOC Radio Frequency Interference Class B Compliance

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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 B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

**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 B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

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



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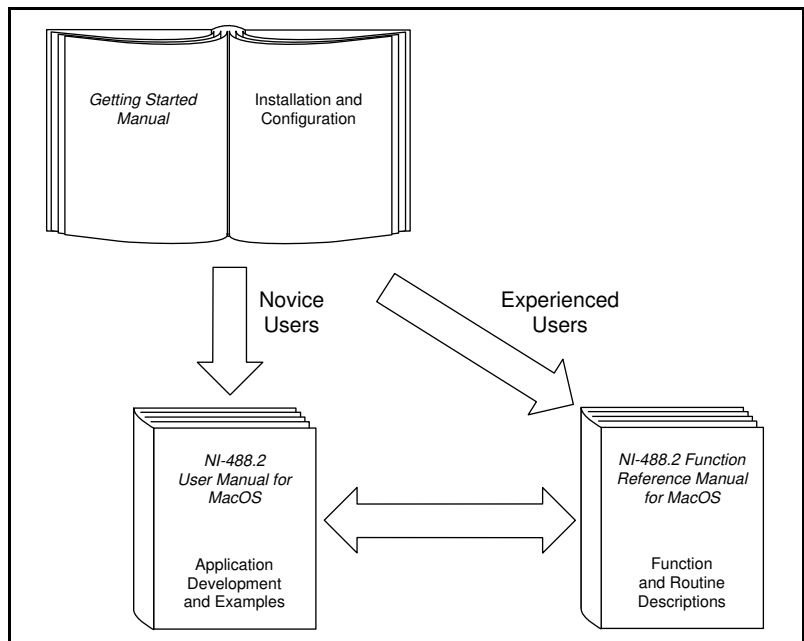
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## About This Manual

This manual contains instructions for installing and configuring the National Instruments LC-GPIB interface board and NI-488.2 software for MacOS for use on a Macintosh LC series computer. This manual is meant to be used with the *NI-488.2 User Manual for MacOS* and the *NI-488.2 Function Reference Manual for MacOS*.

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

## How to Use This Manual Set



Use this getting started manual to install and configure your GPIB hardware and NI-488.2 software.



Use the *NI-488.2 User Manual for MacOS* to learn the basics of GPIB and how to develop an application program. The user manual also contains debugging information and detailed examples.

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

## Organization of This Manual

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This manual is organized as follows:

- Chapter 1, *Introduction*, lists what you need to get started and optional cables you can order, gives a description of the LC-GPIB hardware and NI-488.2 software, and describes the electronic key support circuitry resident on the LC-GPIB.
- Chapter 2, *Hardware and Software Installation*, contains instructions for configuring and installing your LC-GPIB board and installing the NI-488.2 software.
- Chapter 3, *Verify the Installation*, contains instructions for verifying the hardware and software installation.
- Appendix A, *Hardware Specifications*, specifies the electrical, environmental, and physical characteristics of the LC-GPIB board and the conditions under which it should be operated.
- Appendix B, *Troubleshooting*, suggests some areas to check if you have problems installing the LC-GPIB board or the NI-488.2 software after going through the procedures described in Chapter 2, *Hardware and Software Installation*, and Chapter 3, *Verify the Installation*.
- 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, mnemonics, and symbols.

## Conventions Used in This Manual

---

	The following conventions are used in this manual:
<b>bold</b>	Bold text denotes the names of menus, menu items, parameters, dialog box, dialog box buttons or options, icons, windows, or LEDs.
<i>bold italic</i>	Bold italic text denotes a note, caution, or warning.
<i>italic</i>	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
monospace	Text in this font denotes text or characters that should literally enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and for statements and comments taken from programs.
IEEE 488 IEEE 488.2	IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1987, respectively, which define the GPIB.
	The <i>Glossary</i> lists abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms.

## 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*
- *Dallas Semiconductor Product Data Book*, Dallas Semiconductor

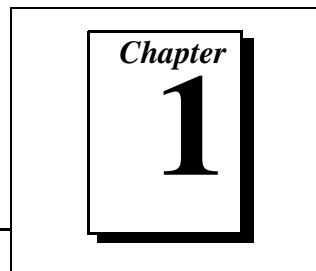
## Customer Communication

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

# Introduction

---



This chapter lists what you need to get started and optional cables you can order, gives a description of the LC-GPIB hardware and NI-488.2 software, and describes the electronic key support circuitry resident on the LC-GPIB.

## What You Need to Get Started

---

- One of the following boards:
  - LC-GPIB
  - LC-GPIB Interface Board with MC68882 FPU
- HD26 GPIB Interface Cable, 2 m
- 3.5 in. *NI-488.2 Software for MacOS Distribution Disk*

## Optional Cables

---

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

You can contact National Instruments to order any of the following shielded GPIB cables.

- Single-Shielded GPIB cables:
  - Type X1 cables — 1 m, 2 m, or 4 m
- Double-Shielded GPIB cables:
  - Type X2 cables — 1 m, 2 m, or 4 m
- Double-Shielded Standard GPIB to single-end male GPIB cables:
  - Type X5 cables — 1 m, 2 m, or 4 m

## Hardware Description

---

The LC-GPIB is a high-performance IEEE 488.2 plug-in board for the Apple Macintosh LC computer. With the combination of the National Instruments NAT4882 and Turbo488 ASICs, the LC-GPIB is a high-speed IEEE 488.2 Controller. The NAT4882 chip performs the basic IEEE 488 Talker, Listener, and Controller functions as well as all of the IEEE 488.2 Controller functions. The Turbo488 increases the performance of the LC-GPIB by combining two 16-byte FIFOs with circuitry to pack and unpack 16-bit accesses from the LC to 8-bit transfers across the GPIB. Data transfer rates can surpass the maximum specified rate of 1 MB/s for both read and write operations, the actual rate depending upon instrumentation capabilities.

A special HD26-to-IEEE 488 cable connects the LC-GPIB with up to 14 instruments. If more than 14 instruments are required, you can use the National Instruments IEEE 488 extenders or expander to add additional instruments to the system. The optional MC68882 FPU is recognized at system startup by the Macintosh LC and is available to any program. The MC68882 increases the computational performance of programs that can utilize this feature.

## Software Description

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The NI-488.2 software is part of your LC-GPIB kit. It is a comprehensive set of programs and drivers for transforming the Macintosh into a GPIB Controller with complete communications and bus management capability. The NI-488.2 software package also comes with the FutureBASIC, Macintosh Programmer's Workshop (MPW) C, THINK C, and Metrowerks CodeWarrior C language interfaces.

## Optional Programming Tools

---

Your kit includes the NI-488.2 software for MacOS. In addition, you can order the LabVIEW software from National Instruments. LabVIEW includes instrument driver libraries that make it easier to communicate with your GPIB instruments.

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.

When you order LabVIEW, 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.

For more information about LabVIEW, contact National Instruments.

## Electronic Key Option

---

The LC-GPIB comes equipped with electronic key support circuitry to protect against software piracy. With this circuitry, software can communicate with electronic keys through the Accessory Register. The LC-GPIB is equipped with the electronic key option and has a connector for one electronic key. The electronic key supported by the LC-GPIB is the Dallas Semiconductor DS1204. The DS1204 electronic keys are small 32-byte memory modules that store eight bytes of a user-defined identification code, 8 bytes of a security match code, and 16 bytes of read/write non-volatile memory. The identification code and security match code are programmed into the key by the software manufacturer. At the beginning of a software program, the codes in the electronic keys can be compared to the code in the program. If the code in the key does not match the code in the software, the program does not execute. Therefore, the user cannot run the program without the properly programmed key installed on the LC-GPIB board. For information on programming the key, refer to the *Dallas Semiconductor Product Data Book*.

# Hardware and Software Installation

Chapter

2

This chapter contains instructions for configuring and installing your LC-GPIB board and installing the NI-488.2 software.

If your LC-GPIB does not function properly after you perform the steps in this chapter, follow the instructions in Chapter 3, *Verify the Installation*, to test your hardware.

## Configure the Shield Ground Jumper

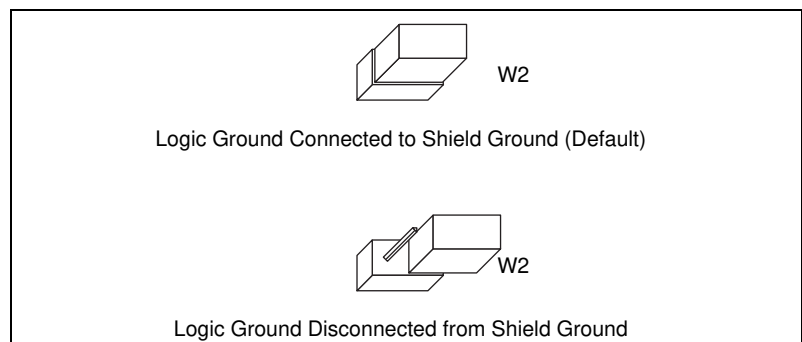
The LC-GPIB board is set at the factory with the jumper in place to connect the logic ground of the LC-GPIB board to its shield ground. This configuration minimizes EMI emissions.



**Caution:** *The LC-GPIB board was tested for compliance with FCC standards with the shield ground connected to logic ground. Removing the jumper might cause EMI emissions to exceed any or all of the applicable standards.*

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

1. Locate the jumper W2 on your LC-GPIB board.
2. Remove the jumper and place it across only one of the jumper pins as shown in Figure 2-1.



**Figure 2-1.** Shield Ground Configuration

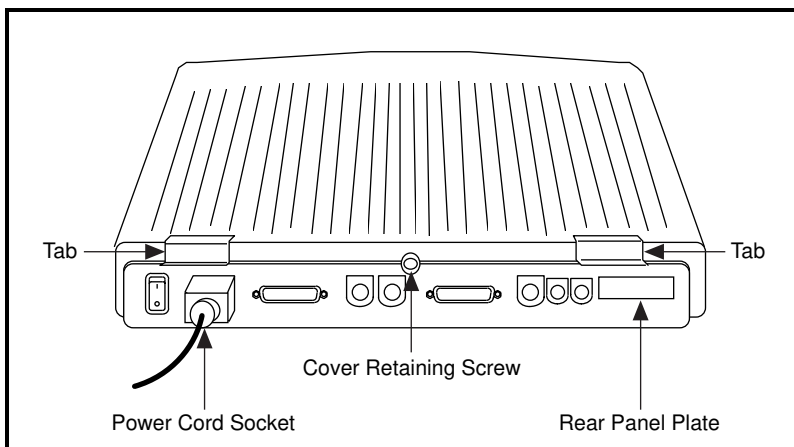
3. Record the jumper setting on the *LC-GPIB Hardware and Software Configuration Form* in Appendix C, *Customer Communication*.

## Install the Hardware

---

Complete the following steps to install your LC-GPIB.

1. Turn off your Macintosh LC.
2. Unplug the power cord.
3. Lift the monitor off of the computer.
4. Remove the cover retaining screw from the back of the Macintosh LC; it is located at the center near the top. See Figure 2-2.



**Figure 2-2.** Back View of the Macintosh LC

5. Remove the cover from the Macintosh LC by lifting the two tabs at the top edge of the unit.
6. Remove the rear panel plate (see Figure 2-2) by pinching together the two plastic tabs that are inside the unit and pushing the rear panel plate through the opening at the back of the Macintosh LC.
7. Remove the metal panel from inside the unit. The metal plate should be free after removing the rear panel plate.
8. Flip the LC-GPIB board so that the components on the board are facing down and the GPIB connector is facing the rear of the Macintosh LC towards the opening in the back of the Macintosh LC.

9. Install the LC-GPIB board by aligning the 96-position pin connector on the LC-GPIB with the 96-position connector on the Macintosh LC motherboard. The GPIB connector should be aligned with the opening in the back of the Macintosh LC. Push the LC-GPIB board down so the 96-position connectors are mated fully.
10. Replace the cover of the Macintosh LC.
11. Replace the cover retaining screw.

**Note:**

***If you want to run the hardware verification diagnostics for the LC-GPIB, skip to step 15 and then refer to Chapter 3, Verify the Installation, of this manual. Do not connect the GPIB cables to the LC-GPIB board or your device before running the hardware verification program. If you do not want to verify the installation, continue with steps 12 through 16.***

12. Align the HD26 GPIB cable with the GPIB extension receptacle.
13. Push the GPIB cable in until it is secure.
14. Tighten the screws on each side of the GPIB cable connector with a screwdriver.
15. Install the power cord.
16. Turn on the power to your computer.

The LC-GPIB board installation is complete.



## Install the Software

---

The NI-488.2 software is distributed in compressed form on one disk. Installing all of the software requires about 1.5 MB of space on your hard disk and takes about 5 minutes.

### NI-488.2 Software Components

The NI-488.2 software includes the following components:

- NI-488.2 `Installer` is the software installation program.
- 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-DMA2800 or NB-DMA-8.
- The `C LI` and `BASIC LI` folders contain language interfaces for Macintosh Programmer's Workshop (MPW) C, THINK C, Metrowerks CodeWarrior C, and FutureBASIC.
- IBIC 488.2 is an interactive GPIB control utility.
- NI-488.2 `Test` is a software diagnostic utility.
- IBDIAG NUBUS, IBDIAG PCI, and IBDIAG PCMCIA are hardware diagnostic utilities.
- The `Ethernet` folder contains utilities that are applicable only if you have a National Instruments GPIB-ENET.
- The `Read Me` file contains the latest updates and corrections to the manual when appropriate.

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

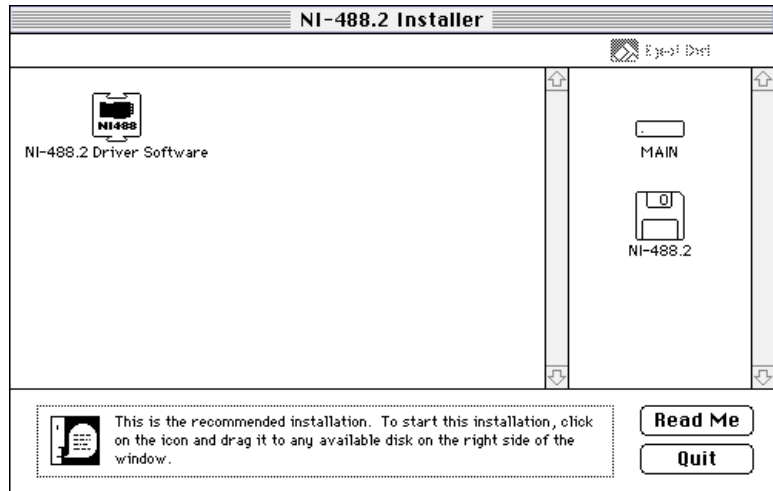
## Step 1. Install the NI-488.2 Files and Folders



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

To install the NI-488.2 files and folders, complete the following steps:

1. Insert the NI-488.2 software distribution disk and double-click on the NI-488.2 Installer icon.
2. To install the NI-488.2 software, click on the icon on the left side of the **Installer** window, shown in Figure 2-3, and drag it to any available disk on the right side of the window.



**Figure 2-3.** Installer Window

After installation of all of the software, the NI-488.2 folder should contain the items shown in Figure 2-4. The NI-488 Config file is placed in the Control Panels folder and the NI-488 INIT and NI-DMA/DSP files are installed in the Extensions folder.

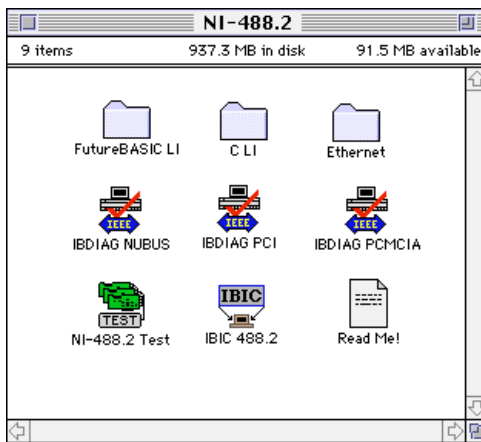


Figure 2-4. File and Folder Organization after Installation

## Step 2. Examine or Change the Software Settings

The default settings of the NI-488.2 software work for most applications and devices. However, you might want to change a device name or primary address. Also, if more than one GPIB interface or external box is installed, you might want to associate a device with a particular interface.

NI-488 Config is a configuration utility that you can use to examine and change the software settings for your board. You can activate the configuration utility by selecting **Control Panels** from the **Apple Icon** menu and selecting **NI-488 Config**. After activating the utility, make sure that the **Interface Type** menu selection is set to **Nubus boards**.

Figure 2-5 shows a possible configuration for the LC-GPIB. The **Auto Configure** box is selected by default and assigns `gpib0` (bus number 0) to the appropriate slot. If an **X** does not appear in a system slot box, follow the instructions in Chapter 3, *Verify the Installation*, to verify that the board is operating correctly.

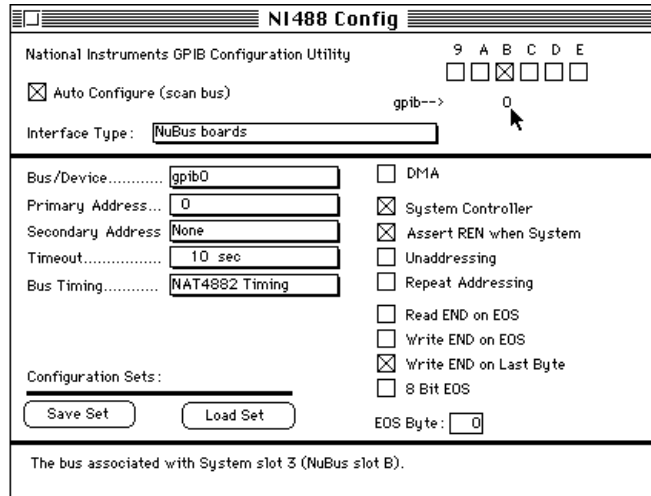


Figure 2-5. NI-488 Config Control Panel

### Step 3. Restart Your Macintosh

The NI-488.2 software is installed every time you start or restart your Macintosh. 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 before continuing to Chapter 3, *Verify the Installation*.

# Verify the Installation

---

This chapter contains instructions for verifying the hardware and software installation.

## Verify the Hardware Installation

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Included with your NI-488.2 software is a hardware verification program. This program is used to verify that the hardware is installed correctly and that it is in good working condition. Use the following steps to run the program.



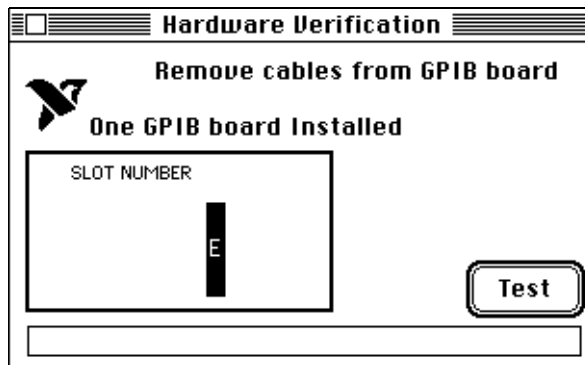
**Caution:** *Disconnect all GPIB cables from your Macintosh LC computer before running the hardware verification program.*

1. Turn on your Macintosh LC computer.
2. Open the NI488.2 folder and double-click on the IBDIDAG NUBUS icon, shown in Figure 3-1.



**Figure 3-1.** IBDIAG NUBUS Icon

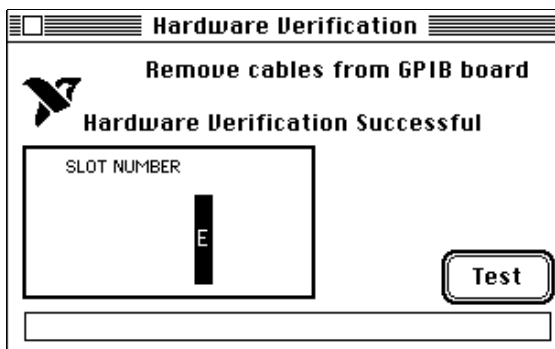
A test window appears on the screen, as shown in Figure 3-2.



**Figure 3-2.** Test Window

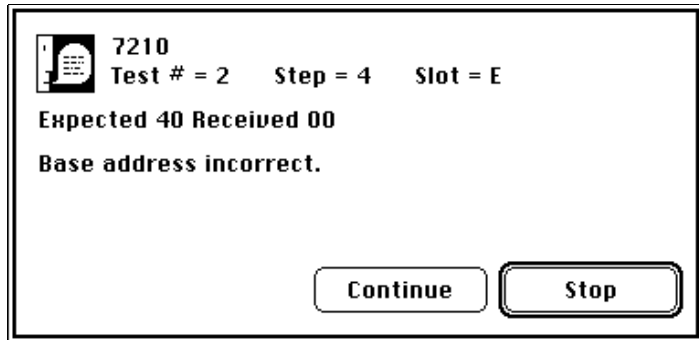
The slot indicator shows the Macintosh slot that has the board installed. Upon entering the program, slot E should be highlighted in black. This indicates that a board was found in the direct slot and can be tested. If slot E is not highlighted, check to see that the board is installed properly. If the problem persists, contact National Instruments.

3. Click on the **Test** button to run a series of tests that verify the LC-GPIB 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.
4. View the test results. Figure 3-3 shows the test window that appears if no error was detected. Skip to Step 7 if no error was detected.



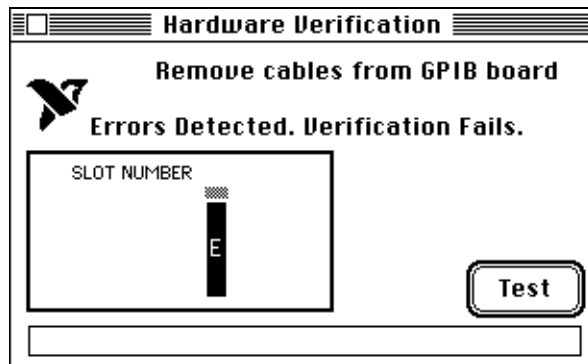
**Figure 3-3.** Hardware Verification Window after Successful Completion of Tests

Figure 3-4 shows 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, as shown in Figure 3-4.



**Figure 3-4.** Alert Box with Error Information

5. 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 displays as shown in Figure 3-5.



**Figure 3-5.** Hardware Verification Window after Unsuccessful Completion of Tests

6. Run the `IBDIAG NUBUS` program again. If the program still detects errors, record the errors and then refer to Appendix C, *Customer Communication*, fill out the forms, and contact National Instruments.
7. To exit from the `IBDIAG NUBUS` program, select **Quit** from the **File** menu.

If the hardware verification program completed without detecting an error, you can finish installing the LC-GPIB board. The instructions are located in the *Install the Hardware* section of Chapter 2. Start with Step 12.

## Verify the Software Installation

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This step verifies that the driver is installed and functioning with the LC-GPIB.

Follow these steps to verify the software installation:

1. Disconnect all GPIB cables from the LC-GPIB board.
2. Double-click on the `NI-488.2 Test` icon in the `NI-488.2` folder.  
If no error messages appear on the screen, the installation is complete.
3. If error messages do appear on the screen, select **Restart** from the **Special** menu, and double-click on the `NI-488.2 Test` icon. If the test fails again, reinstall the NI-488.2 software from the distribution disk, restart your Macintosh, and double-click on the `NI-488.2 Test` icon.

If any one of the software installation steps fails, review the material in Appendix B, *Troubleshooting*, which describes how to troubleshoot problems and lists some common questions. Run `NI-488 Config` if you need to change a software setting. If the software settings are correct and the verification still fails, carefully note all error information on the forms in Appendix C, *Customer Communication* and contact National Instruments.

If the verification test is successful, you are ready to write your own application program. Refer to the *NI-488.2 Function Reference Manual for MacOS* for sample programs.



# Hardware Specifications

Appendix

A

This appendix specifies the electrical, environmental, and physical characteristics of the LC-GPIB and the conditions under which it should be operated.

**Table A-1.** Electrical Characteristics

Characteristic	Specification
Number of GPIB Loads	1
GPIB Transceivers	SN75162BDW/SN75160BSW
Maximum Transfer Rate GPIB Reads GPIB Writes	Over 1 MB/s* Over 1 MB/s*
Power Requirement Without MC68882 With MC68882	+5 VDC, 0.27 A typical, 0.641 A maximum +5 VDC, 0.31 A typical, 0.791 A maximum
* Actual rates depends on instrument capabilities and system configuration.	

**Table A-2.** Environmental Characteristics

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

**Table A-3.** Physical Characteristics

<b>Characteristic</b>	<b>Specification</b>
Dimensions	13.7 cm by 8.1 cm (5.4 in. by 3.2 in.)
I/O Connector	HD26 D-Sub, 26-pin, female

# Troubleshooting

---

The logo for Appendix B, featuring the word "Appendix" in a serif font above a large, bold, black letter "B". The entire logo is enclosed in a double-line rectangular border.

This appendix suggests some areas to check if you have problems installing the LC-GPIB board or the NI-488.2 software after going through the procedures described in Chapter 2, *Hardware and Software Installation*, and Chapter 3, *Verify the Installation*.

If you still have problems after completing the steps in this appendix, complete the appropriate forms in Appendix C, *Customer Communication*, and then contact National Instruments for technical support.

## Troubleshooting Hardware Problems

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- Verify that all GPIB cables are connected properly.
- Make sure that the LC-GPIB board is inserted properly in its 96-pin connector (verify the installation steps).
- If `IBDIAG NUBUS` fails, make sure that all GPIB cables are removed from the LC-GPIB.

## Troubleshooting Software Problems

---

The `NI-488 Config` control panel (GPIB configuration utility) should show the following 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 LC-GPIB board.

You can use the `NI-488 Config` control panel utility to examine and adjust the configuration of the software. Refer to Chapter 6, *GPIB Configuration Utility*, in the *NI-488.2 User Manual for MacOS* for more information on running the utility and for information about the configurable software parameters.

## Common Questions

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### **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 X5 single-ended GPIB cable, available from National Instruments.

### **What do I do if the hardware or software verification test fails with an error?**

Refer to the troubleshooting sections of this appendix for information about what might cause these tests to fail.

### **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 changing the **Unaddressing** option in the NI-488 Config control panel.

**When should I use IBIC 488.2?**

You can use IBIC 488.2 to test and verify instrument communication, troubleshoot problems, and develop your application program. For more information about IBIC 488.2, refer to Chapter 4, *Interface Bus Interactive Control Utility*, in the *NI-488.2 User Manual for MacOS*.

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

For information about using NI-488.2 language interfaces, refer to the *NI-488.2 User Manual for MacOS*.

**How can I use the files located in the Ethernet folder?**

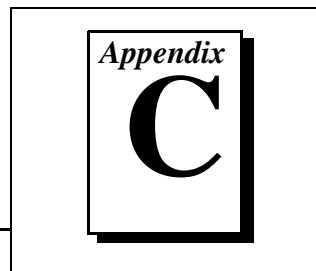
You do not need to use the files in the Ethernet folder unless you have a National Instruments GPIB-ENET.

**What information should I have before I call National Instruments?**

When you call National Instruments, you should have the results of the hardware and software verification tests. In addition, make sure you have filled out the forms in Appendix C, *Customer Communication*.

# Customer Communication

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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.



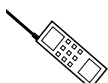
## E-Mail Support (currently U.S. only)

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

[support@natinst.com](mailto:support@natinst.com)

## Telephone and Fax Support

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



### Telephone



### Fax

Australia	03 9879 5166	03 9879 6277
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 527 2321	09 502 2930
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 5734815	03 5734816
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	01635 523545	01635 523154

# Technical Support Form

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

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

Name \_\_\_\_\_

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: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# LC-GPIB 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

LC-GPIB model and revision number \_\_\_\_\_

NI-488.2 software version number of disk \_\_\_\_\_

Shield ground jumper connected (yes or no) \_\_\_\_\_

NI-488 config control panel settings \_\_\_\_\_

## Other Products

Programming language and version number \_\_\_\_\_

Computer make and model \_\_\_\_\_

Memory capacity on computer \_\_\_\_\_

Clock frequency or speed \_\_\_\_\_

Operating system version \_\_\_\_\_

Number of GPIB devices on bus \_\_\_\_\_

Other hardware devices in system \_\_\_\_\_

Type of monitor \_\_\_\_\_

# 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 LC-GPIB and the NI-488.2™ Software for MacOS*

**Edition Date:** July 1997

**Part Number:** 320485C-01

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

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

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Thank you for your help.

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Phone (\_\_\_\_) \_\_\_\_\_ Fax (\_\_\_\_) \_\_\_\_\_

**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

## Glossary

Prefix	Meanings	Value
n-	nano-	$10^{-9}$
$\mu$ -	micro-	$10^{-6}$
m-	milli-	$10^{-3}$
c-	centi-	$10^{-2}$
M-	mega-	$10^6$

°	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
ASIC	application-specific integrated circuit
C	Celsius
DMA	direct memory access
EMI	electromagnetic interference
FCC	Federal Communications Commission
FIFO	first-in-first-out
FPU	floating-point unit
GPIB	General Purpose Interface Bus
Hz	hertz
I/O	input/output
IEEE	Institute for Electrical and Electronic Engineers
in.	inches
m	meters
MB	megabytes of memory
RAM	random-access memory
s	seconds
VDC	volts direct current