

Getting Started with Your LC-GPIB and the NI-488.2™ Software for Macintosh

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Federal Communications Commission

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

Canadian Department of Communications

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

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

Instructions to Users

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

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

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

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

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

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

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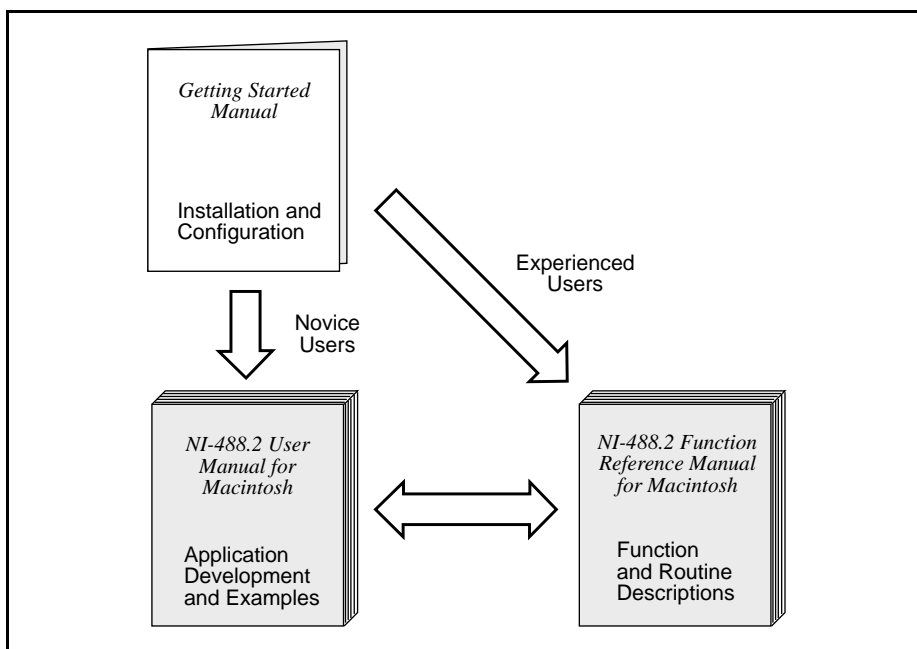
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About This Manual

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

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 Macintosh* 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 Macintosh* for specific NI-488 function and NI-488.2 routine information, such as format, parameters, and possible errors.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, 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, installing the NI-488.2 software, and verifying the software installation.
- Appendix A, *Hardware Verification*, contains instructions for running the hardware verification program.
- Appendix B, *Hardware Specifications*, specifies the electrical, environmental, and physical characteristics of the LC-GPIB board and the conditions under which it should be operated.
- Appendix C, *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 Appendix A, *Hardware Verification*.
- Appendix D, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and 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:

bold	Bold text denotes menus, menu items, or dialog box buttons or options.
<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 the names of commands, files, icons, and utilities.

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.

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

Customer Communication

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

Chapter 1

Introduction

This chapter 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. *LC-GPIB Hardware Verification Disk*
- ❑ 3.5 in. *NI-488.2 Software for Macintosh Distribution Disk*

Optional Cables

To meet FCC emission limits for this Class B device, 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 Mbytes/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

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 an interactive debugger and the Microsoft QuickBASIC, 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 Macintosh. 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 more than 300 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 package, the codes in the electronic keys can be compared to the code in the software package. If the code in the key does not match the code in the software, the software package does not execute. Therefore, the user cannot run the software package 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*.

Chapter 2

Hardware and Software Installation

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

If your LC-GPIB does not function properly after you perform the steps in this chapter, follow the instructions in Appendix A, *Hardware Verification*, 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.

Figure 2-1 shows the location of the shield ground jumper (W2).

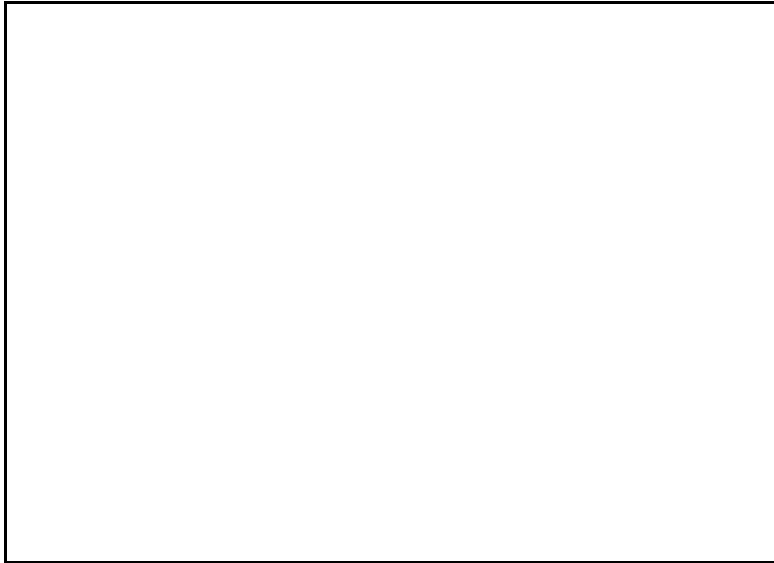


Figure 2-1. LC-GPIB Parts Locator Diagram

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

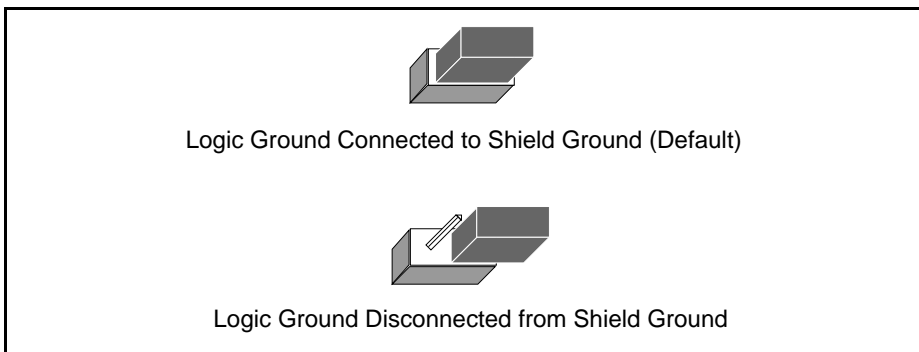


Figure 2-2. Shield Ground Configuration

3. Record the jumper setting on the *LC-GPIB Hardware and Software Configuration Form* in Appendix D, *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 2-3.

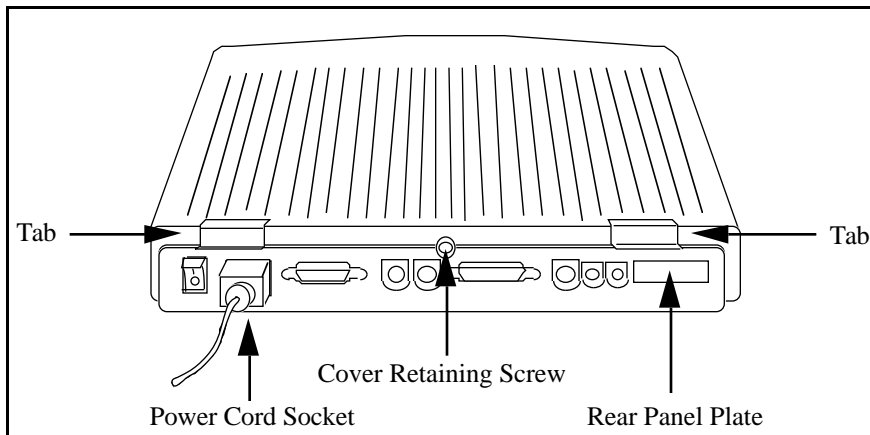


Figure 2-3. Back View of the Macintosh LC

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 2-3) 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 Appendix A, Hardware Verification, 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 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.
- NB-Boards is a control panel utility that displays information about the boards currently installed in your computer if it contains plug-in slots.

- 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 Microsoft QuickBASIC.
- Device Manager Calls contains sample programs that make high-level and low-level Device Manager calls.
- IBIC 488.2 is an interactive GPIB control utility.
- NI-488.2 Test is a software diagnostic utility.
- 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.

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

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.*

1. Insert the NI-488.2 software distribution disk and double-click on the NI-488.2 Installer icon.
2. If you have a National Instruments software driver already installed, the dialog box shown in Figure 2-4 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.

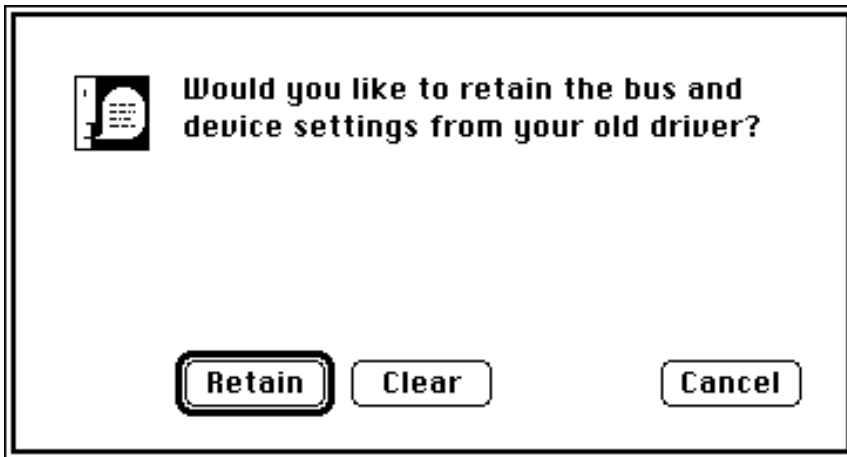


Figure 2-4. Settings Dialog Box

3. The installer creates a folder named NI-488.2 to contain NI-488.2 files and folders. If you want to name the folder something else, click on the **Change Folder** button in the installation dialog box, shown in Figure 2-5, and enter a new folder name.

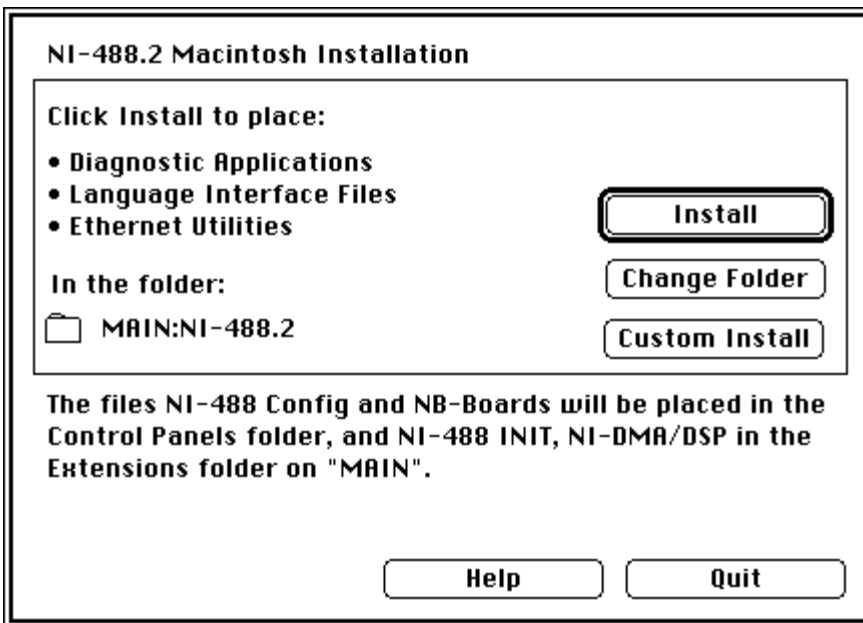


Figure 2-5. Installation Dialog Box

4. Click on the **Install** button to install all of the NI-488.2 software. If you want to install only some of the files, click on the **Custom Install** button and select the items to install.

After installation of all of the software, the NI-488.2 folder should contain the items shown in Figure 2-6. 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. NB-Boards, a control panel utility, appears with the files.

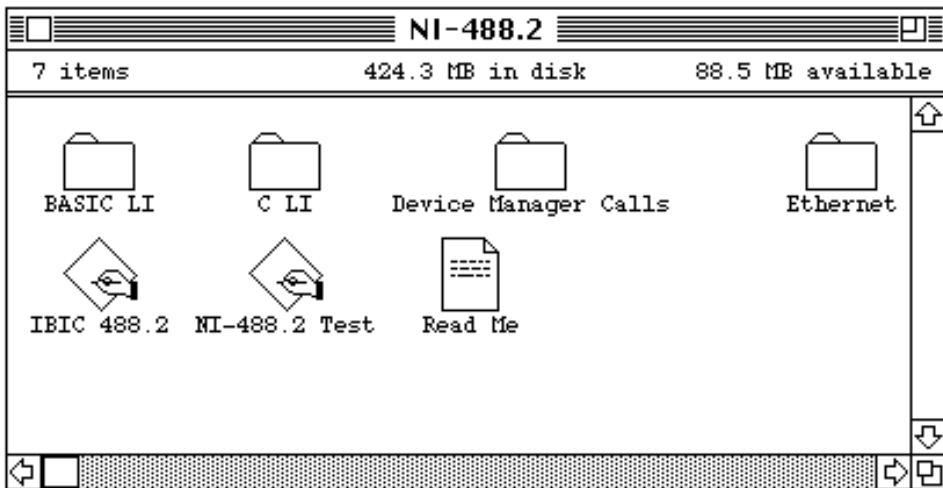


Figure 2-6. File and Folder Organization after Installation

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** menu and double-clicking on the NI-488 Config icon. After activating the utility, make sure that the **Interface Type** menu selection is set to **Nubus boards**.

Figure 2-7 shows a possible configuration for the LC-GPIB. The **Auto Configure** box is selected by default and assigns `gpi0` (bus number 0) to the appropriate slot. If an **X** does not appear in a system slot box, follow the instructions in Appendix A, *Hardware Verification*, to verify that the board is operating correctly.

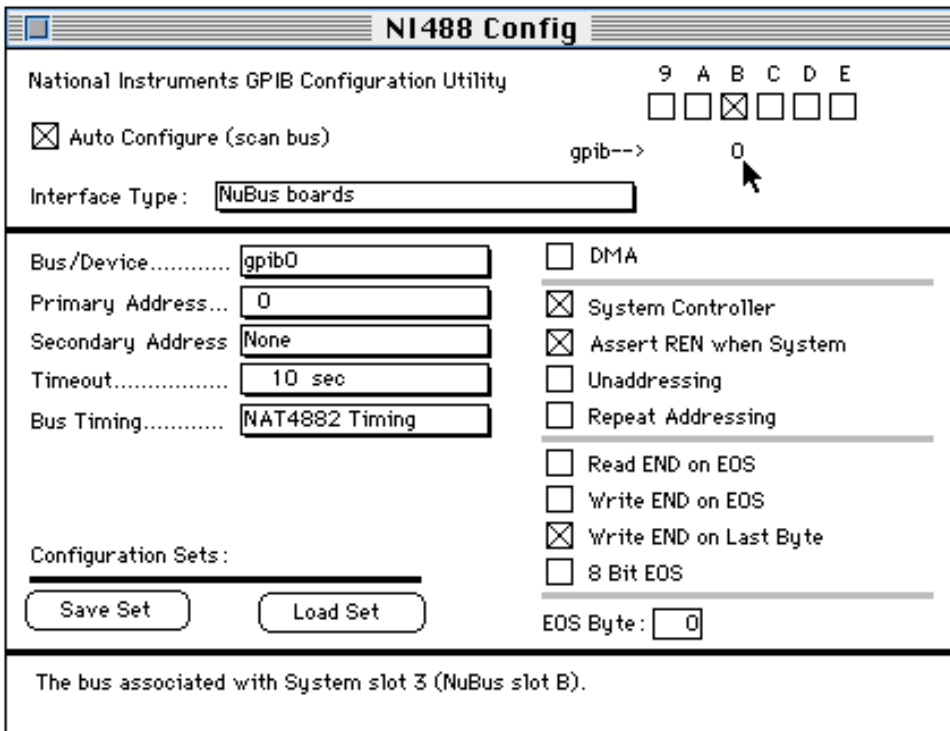


Figure 2-7. NI-488 Config Control Panel

Step 2. 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 the next section, *Verify the Software Installation*.

Verify the Software Installation

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 C, *Troubleshooting*, which describes how to troubleshoot problems and lists some common questions. If you need to change a software setting, refer to the *Configure the Software* section of this chapter. If the software settings are correct and the verification still fails, carefully note all error information on the *LC-GPIB Hardware and Software Configuration Form* in Appendix D, 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 Macintosh* for sample programs.

Configure the Software (Optional)

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.

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

Appendix A

Hardware Verification

This appendix contains instructions for running the hardware verification program.

Included in your LC-GPIB kit is a disk containing 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.

Preparation

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

1. Turn on your Macintosh LC computer.
2. Insert the hardware verification disk. When startup completes, the disk icon called Hardware Verification, as shown in Figure A-1, appears on the screen.



Figure A-1. Hardware Verification Icon

3. Double-click on the Hardware Verification icon.

Run the IBDIAG Program

1. Double-click on the IBDIAG icon, which is shown in Figure A-2.



Figure A-2. IBDIAG Icon

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

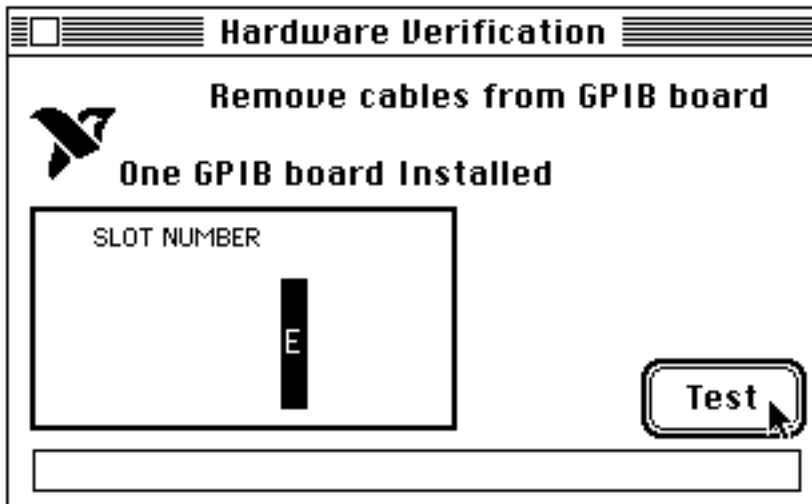


Figure A-3. Test Window

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.

2. 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.
3. View the test results. Figure A-4 shows the test window that appears if no error was detected. Skip to *Exit from the IBDIAG Program*, later in this appendix, if no error was detected.

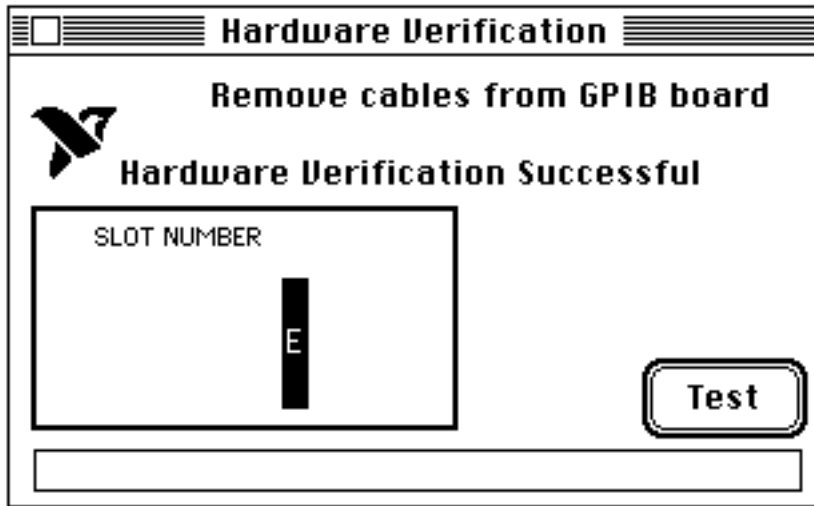


Figure A-4. Hardware Verification Window after Successful Completion of Tests

Figure A-5 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 A-5.

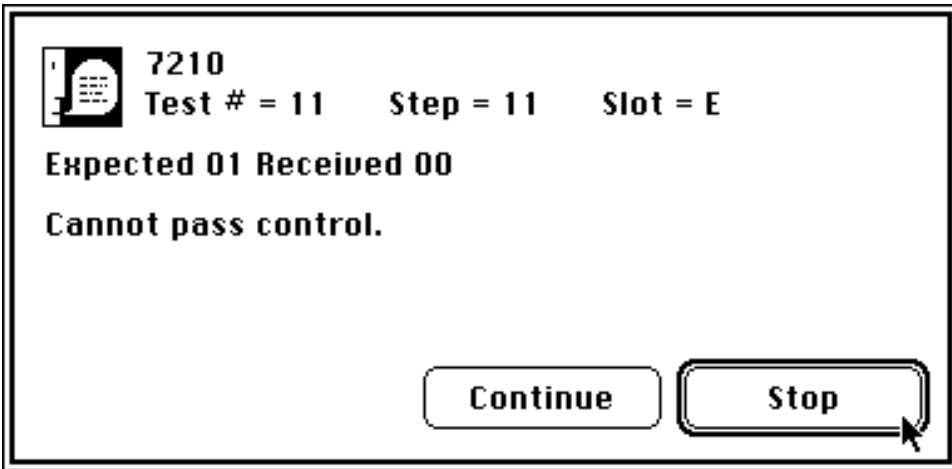


Figure A-5. Alert Box with Error Information

4. 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 A-6.

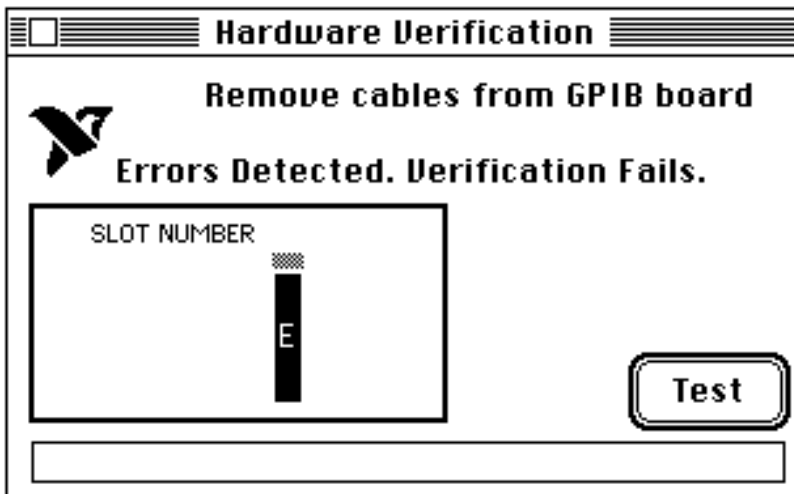


Figure A-6. Hardware Verification Window after Unsuccessful Completion of Tests

5. Run the IBDIAG program again. If the program still detects errors, record the errors and then refer to Appendix D, *Customer Communication*, fill out the configuration forms, and contact National Instruments.

Exit from the IBDIAG Program

To exit from the IBDIAG 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.

Appendix B

Hardware Specifications

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

Table B-1. Electrical Characteristics

Characteristic	Specification
Number of GPIB Loads	1
GPIB Transceivers	SN75162BDW/SN75160BDW
Transfer Rates	
GPIB Reads	Over 1 Mbytes/s*
GPIB Writes	Over 1 Mbytes/s*
Power Requirement	
Without MC68882	+5 VDC, 0.27 A typical, 0.641 A maximum
With MC68882	+5 VDC, 0.31 A typical, 0.791 A maximum
* Actual rate depends on instrument capabilities and system configuration.	

Table B-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 Certified

Table B-3. Physical Characteristics

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

Appendix C

Troubleshooting

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 Appendix A, *Hardware Verification*.

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

Troubleshooting Hardware Problems

- 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 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 Macintosh* for more information on running the utility and for information about the configurable software parameters.

Common Questions

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

Run the NB-Boards control panel utility for information about the GPIB boards installed in your computer.

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 Macintosh*.

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 Macintosh*.

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 configuration form in Appendix D, *Customer Communication*.

Appendix D

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

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

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

Name _____

Company _____

Address _____

Fax (____) _____ Phone (____) _____

Computer brand _____

Model _____ Processor _____

Operating system _____

Speed _____MHz RAM _____MB

Display adapter _____

Mouse _____yes _____no

Other adapters installed _____

Hard disk capacity _____MB Brand _____

Instruments used _____

National Instruments hardware product model _____

Revision _____

Configuration _____

National Instruments software product _____

Version _____

Configuration _____

(continues)

The problem is _____

List any error messages _____

The following steps will 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. 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

- LC-GPIB Model and Revision _____
- NI-488.2 Software Version Number on Disk _____
- Shield Ground Jumper Connected (yes or no) _____
- NI-488 Config Control Panel Settings _____

Other Products

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

Glossary

Prefix	Meaning	Value
n-	nano-	10^{-9}
μ -	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
GPIO	General Purpose Interface Bus
Hz	hertz
IEEE	Institute for Electrical and Electronic Engineers
in.	inches
I/O	input/output
m	meters
MB	megabytes of memory
RAM	random-access memory
s	seconds
VDC	volts direct current