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

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FCC/DOC Radio Frequency Interference Compliance

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

Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class A digital device. Operation is subject to the following two conditions:

1. This device may not cause harmful interference in commercial environments.

2. This device must accept any interference received, including interference that may cause undesired operation.

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 A 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 harmful interference from the equipment to radio reception in commercial areas. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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.

Contents

Figures

Tables

About This Manual

This manual contains instructions for installing and configuring the National Instruments GPIB-SCSI-A SCSI-to-GPIB Controller and NI-488.2 software for Macintosh. 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
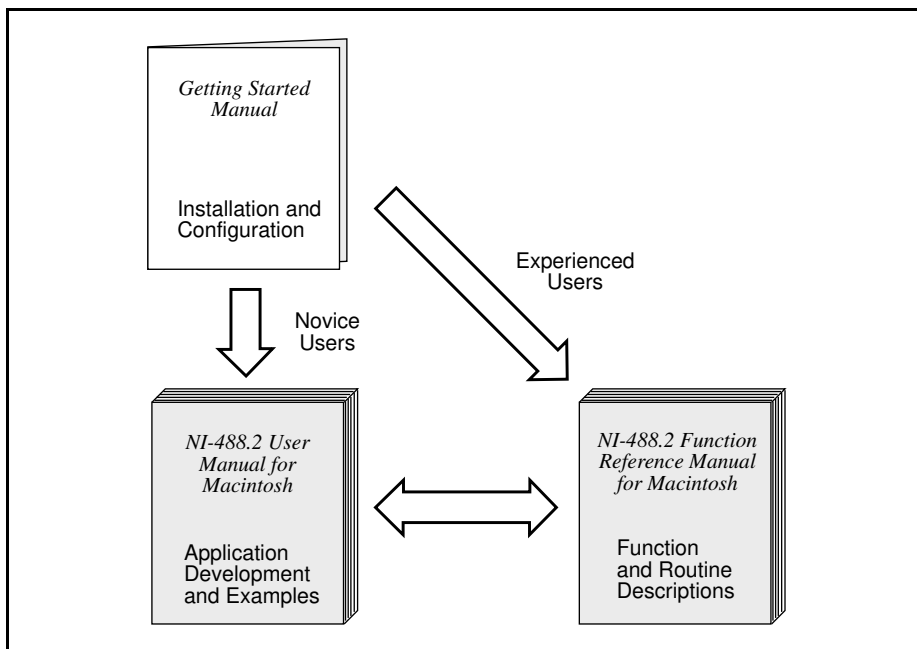
Use this getting started manual to install and configure your GPIB hardware and NI-488.2 software.

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 equipment you can order, and briefly describes the GPIB hardware and the NI-488.2 software.

- Chapter 2, *Installation*, contains instructions for connecting your GPIB-SCSI-A, installing the NI-488.2 software, and testing the software installation.

- Appendix A, *Hardware Configuration*, describes how to change the operating characteristics of the GPIB-SCSI-A and how to use SCSI terminating resistors.

- Appendix B, *Hardware Specifications*, specifies the electrical, environmental, and physical characteristics of the GPIB-SCSI-A.

- Appendix C, *Troubleshooting*, suggests some areas to check if you have problems installing the GPIB-SCSI-A or the NI-488.2 software after going through the procedures described in Chapter 2, *Installation*, and Appendix A, *Hardware Configuration.*

- Appendix D, *Customer Communication*, contains forms you can use to request help form 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, dialog box buttons or options, or LEDs.
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 names of commands, files, icons, and utilities.
IEEE 488 and IEEE 488.2	IEEE 488 and IEEE 488.2 refer to the ANSI/IEEE Standard 488.1-1987 and the ANSI/IEEE Standard 488.2-1987, 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:

*   *GPIB-SCSI-A User Manual*, National Instruments Corporation

*   ANSI X3.131-1986, *Small Computer Systems Interface (SCSI)*

*   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 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 equipment you can order, and briefly describes the GPIB hardware and the NI-488.2 software.

What You Need to Get Started

❏ One of the following boxes:
   GPIB-SCSI-A, 100 to 120 VAC
   GPIB-SCSI-A, 220 to 240 VAC

❏ One of the following power cords:
   U.S.A. standard power cord
   Switzerland power cord
   Australian power cord
   Universal European power cord
   North American power cord
   U.K. power cord

❏ Standard 50-pin SCSI-1 terminator

❏ 3.5 in. *NI-488.2 Software for Macintosh Distribution Disk*

Optional Equipment

You can order the following optional equipment from National Instruments.

*   Double-Shielded SCSI Cables:
       Type SCSI-M GPIB-SCSI-A (50-pin Champ) to Macintosh Powerbook
           port – 0.5 m
       Type SCSI-A GPIB-SCSI-A (50-pin Champ) to Macintosh (25-pin D-Sub) – 1 m
       Type SCSI-J GPIB-SCSI-A (50-pin Champ) to SCSI-1 (50-pin Champ) – 1 m
       Type SCSI-G GPIB-SCSI-A (50-pin Champ) to SCSI-2 (50-pin High
           Density) – 1 m

*   Shielded GPIB Cables*:
       Type X1 Single-Shielded Cables – 1 m, 2 m, or 4 m
       Type X2 Double-Shielded Cables – 1 m, 2 m, or 4 m

*   Rack-Mount Kits:
       Single rack-mount kit (1 unit)
       Dual rack-mount kit (2 units)

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

Hardware Description

The GPIB-SCSI-A is a high-performance interface product that transparently
handles data transfers between the SCSI and the GPIB. It is an 8-bit
microcomputer that operates as a full-function IEEE 488/SCSI Controller. The
GPIB-SCSI-A can transform any computer with a SCSI port into a GPIB
Talker/Listener/Controller or make any device on the SCSI bus look like a GPIB
device.

The GPIB-SCSI-A has all the software and logic required to implement the
physical and electrical characteristics of the ANSI/IEEE Standard 488.1-1987 and
the ANSI Standard X3T9.2. Also, all GPIB protocols have been updated to
comply with ANSI/IEEE Standard 488.2-1987. It is able to interpret and execute
commands that you send to it over the GPIB or SCSI ports and perform all
necessary SCSI-to-GPIB protocol conversions.

Software Description

The NI-488.2 software for Macintosh is a comprehensive set of programs and drivers that simplifies the job of programming the GPIB-SCSI-A to function as a GPIB Controller with complete communication and bus management capabilities. The NI-488.2 software 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.

Chapter 2
Installation

This chapter contains instructions for connecting your GPIB-SCSI-A, installing the NI-488.2 software, and testing the software installation.

If you need more detailed information, refer to Appendix A, *Hardware Configuration*.

Connect the Hardware

The following are general instructions for connecting the GPIB-SCSI-A to your Macintosh. Refer to the manual that came with your computer for specific instructions and warnings.

You can use two methods to connect the GPIB-SCSI-A to your Macintosh. One method is connecting the GPIB-SCSI-A directly to the Macintosh computer by using a cable with the proper connectors at each end. The other method is daisy-chaining. *Daisy-chaining* is a means of connecting a number of SCSI devices to a host so that a single port on the host can serve a variable number of devices. If you are installing the GPIB-SCSI-A in the middle of a daisy-chain, you need to remove the terminating resistor pack. Refer to the *Using SCSI Terminating Resistors* section in Appendix A, *Hardware Configuration*, for additional instructions for daisy-chaining SCSI devices.

There are four basic steps to connecting the GPIB-SCSI-A.

1. Shut down your system.

2. Connect the cables.

3. Switch on your GPIB-SCSI-A.

4. Power on your system.

The GPIB-SCSI-A is shipped from the factory with either a 100 to 120 VAC or 220 to 240 VAC power supply. Before you connect it, verify that the voltage specified on the rear panel label matches the voltage that is supplied in your area.

Warning: *Operating the GPIB-SCSI-A at any voltage other than the one specified on the rear panel label could damage the unit. Replacement fuses must be the proper type and rating. See Appendix B, Hardware Specifications, for fuse information.*

Step 1. Shut Down Your System

Complete the following steps to shut down your system.

1.   Select the **Shut Down** command from the **Special** menu.

2.   Turn off your computer.

3.   Turn off all of the external SCSI devices, if any, attached to your computer.

4.   Unplug the power cord from the power outlet.

Step 2. Connect the Cables

Caution: *Never connect or disconnect SCSI cables when any device (computer, tape drive, GPIB-SCSI-A, and so on) is powered-on. Doing so can cause fuses to blow inside the GPIB-SCSI-A and inside other SCSI devices that supply termination power (TERMPWR) to the SCSI bus*.

Complete the following steps to connect the cables.

1.   Connect the SCSI cable to the GPIB-SCSI-A and fasten it securely. Connect the other end to your SCSI system. Be sure to use only shielded SCSI cables. Total cable length in your SCSI system should be less than 6 m, and terminating resistors should be installed on both ends as described in Appendix A, *Hardware Configuration*.

2.   Connect the GPIB cable to the GPIB-SCSI-A and tighten the thumb screws on the connector. Connect the other end to your GPIB system. Be sure to use only shielded GPIB cables. Total cable length in your GPIB system should be less than 20 m, with a maximum separation of 4 m between any two devices. You should have no more than 15 devices in a GPIB system, and at least two-thirds of those devices must be powered on.

3.   Plug the power cord into an AC outlet of the correct voltage.

Step 3. Switch On Your GPIB-SCSI-A

Switch on your GPIB-SCSI-A by using the rocker switch on the rear panel. The **POWER** LED indicator should come on immediately and the **READY** LED indicator on the front panel should come on after the GPIB-SCSI-A has passed its power-on self-test, indicating that the unit is ready for operation.

If the **READY** LED does not come on within 10 seconds after the unit is powered on, recheck all connections and switch settings (refer to Appendix A, *Hardware Configuration*) and try the power-on sequence again. If the **READY** LED still fails to

come on, fill out the forms in Appendix D, *Customer Communication*, and contact
National Instruments.

Step 4. Power On Your System

Plug the power cords of the Macintosh computer and any other SCSI equipment into a
power outlet and power on all devices.

Install the Software

The NI-488.2 software is distributed in compressed form on one diskette. Installing all of
the software requires about 1 MB of space on your hard disk and takes about five
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 Code Warrior 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 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 the 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 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 2-1 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.
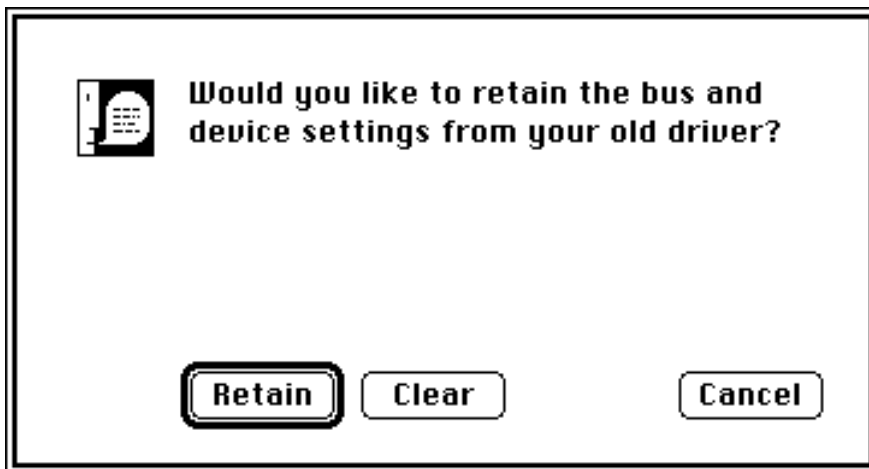
Figure 2-1. Settings Dialog Box

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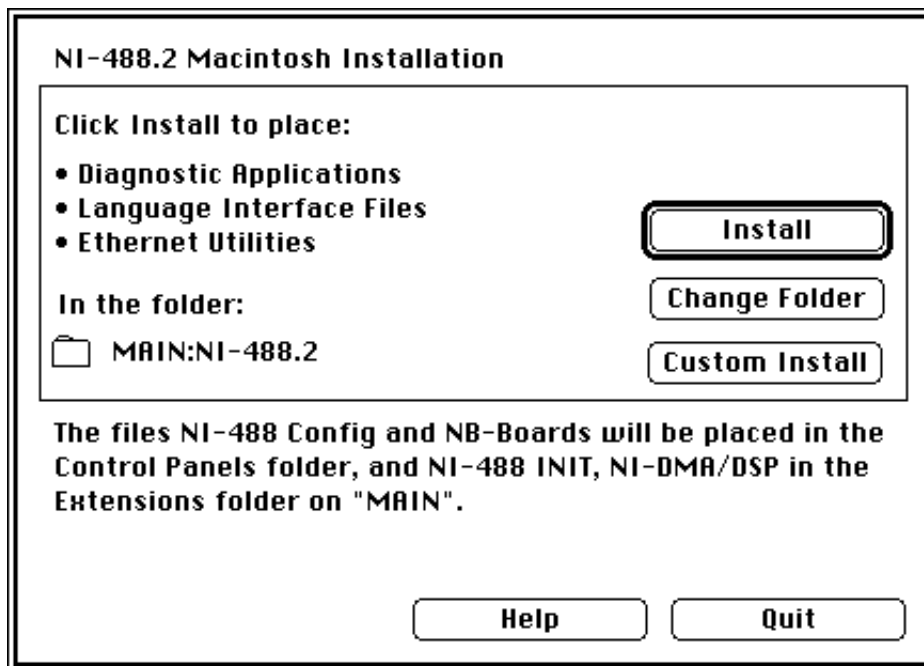
Figure 2-2. Installation Dialog Box

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 2-3. 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.
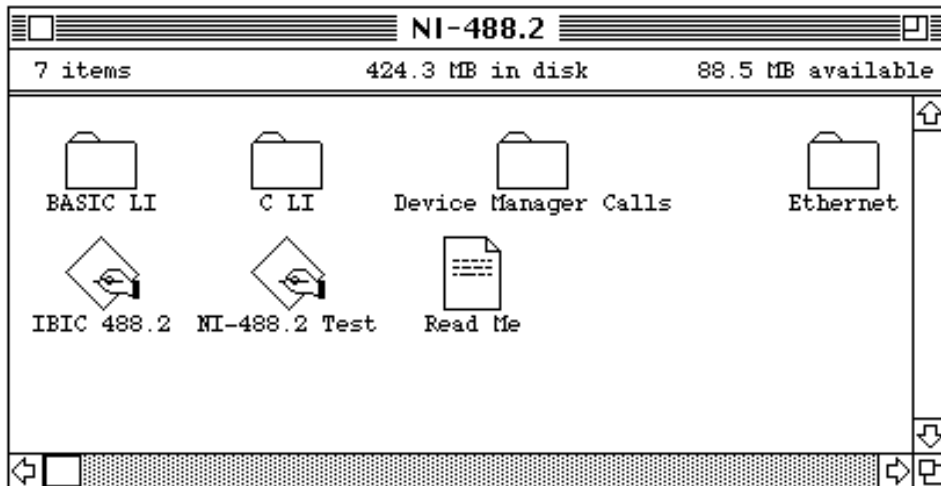

Figure 2-3. File and Folder Organization after Installation

`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 the configuration utility is activated, click on the **Interface Type** menu and select **SCSI box products** as shown in Figure 2-4. Checking the **Auto Configure** box causes a scan over the SCSI bus to locate any GPIB-SCSI-A. An **X** appears in each SCSI ID box that corresponds to a GPIB-SCSI-A. If no boxes are checked, you might need to change a hardware setting. Refer to Appendix A, *Hardware Configuration*, for instructions on changing hardware settings.
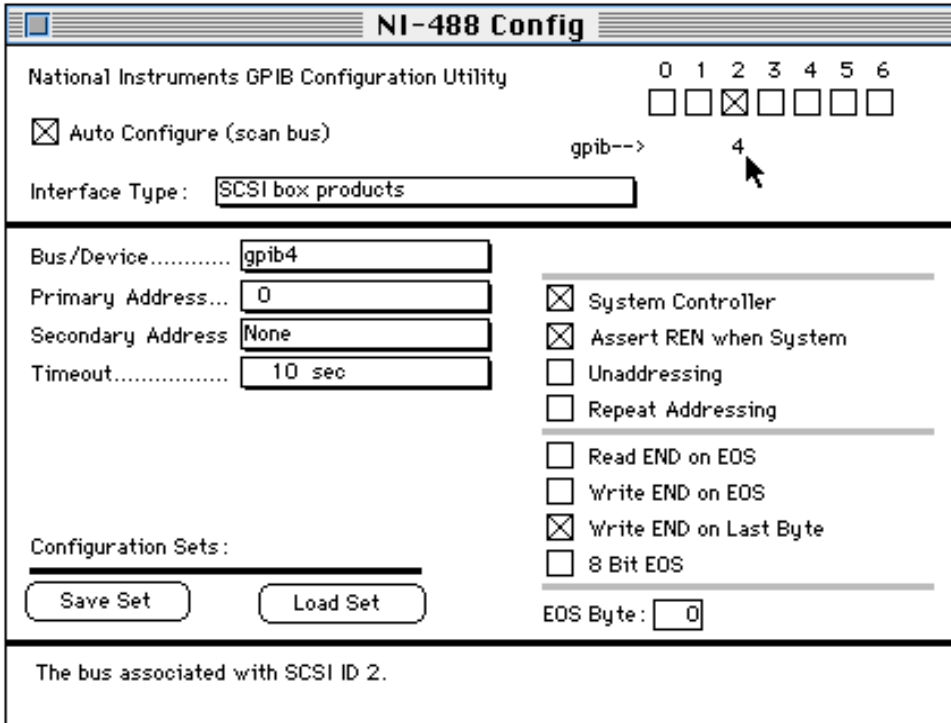
Figure 2-4. NI-488 Config Control Panel

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 GPIB-SCSI-A hardware. If any one of the software installation steps fails, you might have to change a hardware and software setting. If this is the case, refer to Appendix A, *Hardware Configuration*.

Follow these steps to run the software verification test:

1. Disconnect all GPIB cables from the GPIB-SCSI-A box.

2. Double-click on the `NI−488.2 Test` icon in the `NI−488.2` folder.

    If no error messages are displayed, the installation is complete.

3. If error messages are displayed, 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 the verification still 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 Chapter 6, *GPIB Configuration Utility*, in the *NI-488.2 User Manual for Macintosh*.

    •   If the software settings are correct and the verification still fails, carefully note all error information on the *GPIB-SCSI-A Hardware and Software Configuration Form* in Appendix D and contact National Instruments.

When 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 for the 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 Configuration

This appendix describes how to change the operating characteristics of the GPIB-SCSI-A and how to use SCSI terminating resistors.

The hardware configurations of the SCSI ID (Target ID) and the GPIB primary address must match the software configuration in the system configuration files and the NI-488.2 software for the Macintosh. The following section describes how to change the hardware configuration of the GPIB-SCSI-A.

Configuring the Switch Settings

The GPIB-SCSI-A is shipped from the factory configured to operate in S (SCSI) mode. The SCSI ID to which the GPIB-SCSI-A responds is set at 5, and the primary GPIB address is set at 0. Additionally, the GPIB-SCSI-A is shipped from the factory with a SCSI terminator installed. To determine if you need to remove it, refer to the *Using SCSI Terminating Resistors* section in this appendix.

Note: *The only switch settings available for configuration with this kit are the SCSI ID and the GPIB address, which are controlled by SW1. You do not need to change the switch settings for SW2, which controls the mode of operation.*

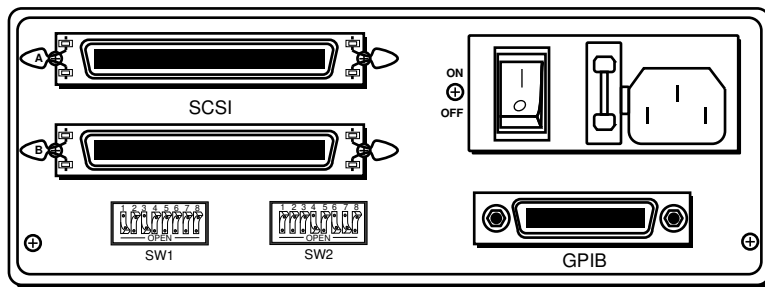Figure A-1 shows the location of the switches on the back panel of the GPIB-SCSI-A.

Figure A-1. GPIB-SCSI-A Rear Panel

Configuration Switch Settings for SW1

The DIP switch at location SW1 on the rear panel (see Figure A-1) is used to configure the power-on primary GPIB address and SCSI ID of the GPIB-SCSI-A. The DIP switch has eight configuration switches.

Figure A-2 shows the factory default setting of the GPIB-SCSI-A for switch SW1. Switches 1 through 3 are ON, OFF, and ON, respectively, selecting the SCSI ID of 5. Switches 4 through 8 are OFF to indicate that the GPIB primary address of the GPIB-SCSI-A is 0.
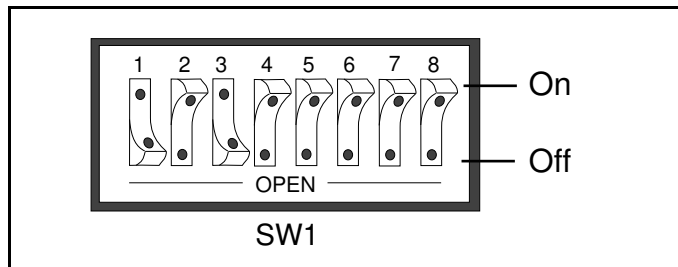
Figure A-2. SW1 Default Mode Switch Settings

Tables A-1 and A-2 show the possible configurations of the eight switches and what each configuration indicates.

Note: *Bold italic rows indicate default settings*.

Table A-1. Configuration Parameters for Switches 1 through 3

Switches			
1	**2**	**3**	**Indication**
OFF	OFF	OFF	SCSI ID of 0
OFF	OFF	ON	SCSI ID of 1
OFF	ON	OFF	SCSI ID of 2
OFF	ON	ON	SCSI ID of 3
ON	OFF	OFF	SCSI ID of 4
ON	***OFF***	***ON***	***SCSI ID of 5***
ON	ON	OFF	SCSI ID of 6
ON	ON	ON	SCSI ID of 7

Table A-2. Configuration Parameters for Switches 4 through 8

Switches					Indication
4	**5**	**6**	**7**	**8**	
OFF	*OFF*	*OFF*	*OFF*	*OFF*	*GPIB Primary Address 0*
OFF	OFF	OFF	OFF	ON	GPIB Primary Address 1
OFF	OFF	OFF	ON	OFF	GPIB Primary Address 2
OFF	OFF	OFF	ON	ON	GPIB Primary Address 3
OFF	OFF	ON	OFF	OFF	GPIB Primary Address 4
OFF	OFF	ON	OFF	ON	GPIB Primary Address 5
OFF	OFF	ON	ON	OFF	GPIB Primary Address 6
OFF	OFF	ON	ON	ON	GPIB Primary Address 7
OFF	ON	OFF	OFF	OFF	GPIB Primary Address 8
OFF	ON	OFF	OFF	ON	GPIB Primary Address 9
OFF	ON	OFF	ON	OFF	GPIB Primary Address 10
OFF	ON	OFF	ON	ON	GPIB Primary Address 11
OFF	ON	ON	OFF	OFF	GPIB Primary Address 12
OFF	ON	ON	OFF	ON	GPIB Primary Address 13
OFF	ON	ON	ON	OFF	GPIB Primary Address 14
OFF	ON	ON	ON	ON	GPIB Primary Address 15
ON	OFF	OFF	OFF	OFF	GPIB Primary Address 16
ON	OFF	OFF	OFF	ON	GPIB Primary Address 17
ON	OFF	OFF	ON	OFF	GPIB Primary Address 18
ON	OFF	OFF	ON	ON	GPIB Primary Address 19
ON	OFF	ON	OFF	OFF	GPIB Primary Address 20
ON	OFF	ON	OFF	ON	GPIB Primary Address 21
ON	OFF	ON	ON	OFF	GPIB Primary Address 22
ON	OFF	ON	ON	ON	GPIB Primary Address 23
ON	ON	OFF	OFF	OFF	GPIB Primary Address 24
ON	ON	OFF	OFF	ON	GPIB Primary Address 25
ON	ON	OFF	ON	OFF	GPIB Primary Address 26
ON	ON	OFF	ON	ON	GPIB Primary Address 27
ON	ON	ON	OFF	OFF	GPIB Primary Address 28
ON	ON	ON	OFF	ON	GPIB Primary Address 29
ON	ON	ON	ON	OFF	GPIB Primary Address 30
ON	ON	ON	ON	ON	GPIB Primary Address 0

Configuration Switch Settings for SW2

The DIP switch at location SW2 on the rear panel (see Figure A-1) is used to configure the mode of operation for the GPIB-SCSI-A. The GPIB-SCSI-A is configured at the factory to operate in SCSI (S) mode. In S mode, the SCSI port is the controlling interface. You do *not* need to change these switch settings for use with the Macintosh computer. The DIP switch has eight configuration switches. Figure A-3 shows the factory default setting.
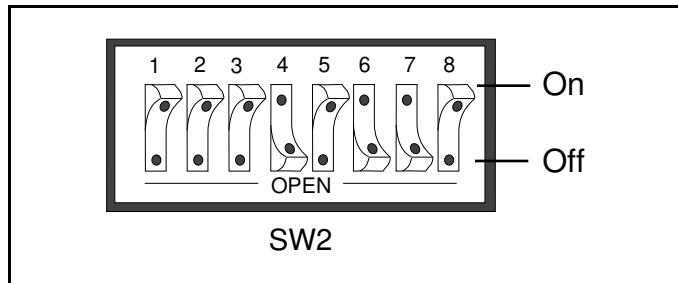
Figure A-3. SW2 Default Mode Switch Settings

Make sure that these switches are set as shown in Figure A-3. If they are not, set the switches as indicated.

Table A-3 and the subsequent paragraph describe the factory default configurations of the eight switches.

Table A-3. Factory Default Configurations for SW2

Switch	Position	Indication
8	OFF	Operating in S (SCSI) mode.
7	ON	GPIB-SCSI-A neither notices nor reports SCSI parity errors.
6	ON	GPIB-SCSI-A buffers data during data transfer commands.
5	OFF	GPIB-SCSI-A completes all data requests to the count specified.
4	ON	Double buffering is enabled.
1-3	OFF	Reserved and should remain OFF.

Switch 8 is OFF, indicating that the GPIB-SCSI-A is operating in S mode. Switch 7 is ON, indicating that the GPIB-SCSI-A neither notices nor reports SCSI parity errors. Switch 6 is ON, indicating that the GPIB-SCSI-A buffers data during data transfer commands. Switch 5 is OFF, indicating that the GPIB-SCSI-A completes all data requests to the exact count specified. Switch 4 is ON, indicating that double buffering is used. Switches 1 through 3 are OFF because they are reserved.

Using SCSI Terminating Resistors

Because of its high-speed capabilities, the SCSI bus is sensitive to the electrical characteristics of the SCSI cabling. When a signal is sent through the SCSI bus, it bounces back and creates echoes along the cabling. Any devices in the middle of the daisy-chained SCSI bus receive these signal echoes. Placement of terminating resistor packs can prevent echoes and ensure proper termination of a signal. Proper termination is essential to the devices connected on a SCSI bus. Read the documentation for each device to find out what kind of termination it provides.

If your GPIB-SCSI-A is located at the end of a SCSI bus, you can prevent echoes by leaving the terminating resistor pack installed on one of the ports on the rear panel of the GPIB-SCSI-A. Also ensure that the device at the other end of the SCSI bus (for example, the SCSI host in Figure A-4) has a terminating resistor installed. But remove the terminating resistor packs on all devices except for the two at each end because SCSI signals are not reliably passed along the SCSI bus after they reach a device with a terminator.

Caution: *Never connect more than two sets of terminating resistors on a SCSI bus because more than two sets may overload the signals and generate errors*.

Figure A-4 shows the GPIB-SCSI-A located at the end of a SCSI system.
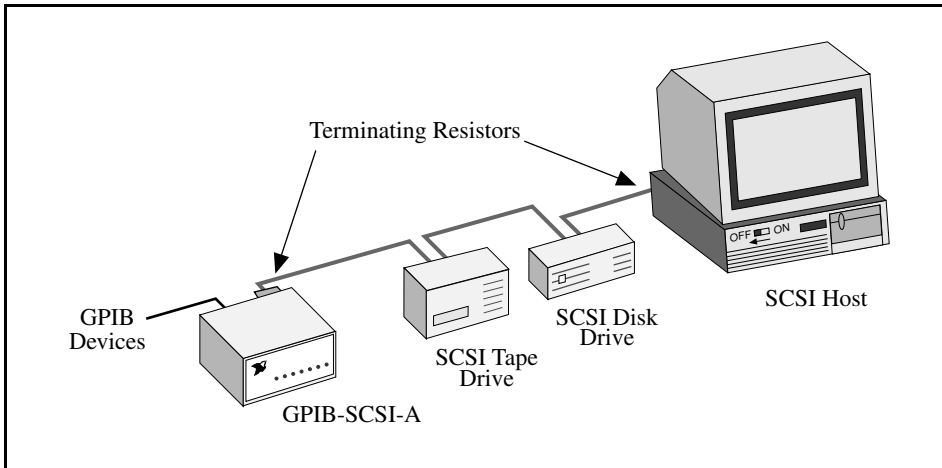
Figure A-4. Terminating Resistors for GPIB-SCSI-A at End of SCSI Bus

If your GPIB-SCSI-A is not located at the end of the SCSI bus, remove the terminating resistor pack from the rear panel of the GPIB-SCSI-A. Ensure that all devices in the middle of the bus (for example, the SCSI disk drive and the GPIB-SCSI-A in Figure A-5) do not have terminating resistors installed. The devices at each end of the SCSI bus should have terminating resistors installed.

Figure A-5 shows the GPIB-SCSI-A at a location other than the end of a SCSI system.
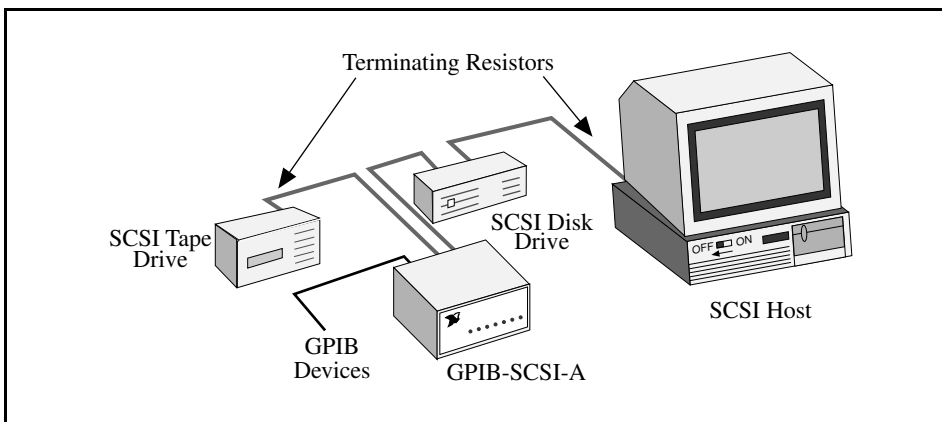
Figure A-5. Terminating Resistors for GPIB-SCSI-A Not at End of SCSI Bus

Appendix B
Hardware Specifications

This appendix specifies the electrical, environmental, and physical characteristics of the GPIB-SCSI-A.

Table B-1. Electrical Characteristics

Characteristic	Specification
Power Supply Unit	100 to 120 VAC ± 10%, 50 to 60 Hz or 220 to 240 VAC ± 10%, 50 to 60 Hz
Current	100 to 120 VAC 90 mA or 220 to 240 VAC 45 mA
Fuse Rating and Type	100 to 120 VAC 200 mA, UL/CSA approved or 220 to 240 VAC 125 mA, IEC approved

Table B-2. Environmental Characteristics

Characteristic	Specification
Operating Temperature	0° to 40° C
Storage Temperature	-20° to 70° C
Relative Humidity	10% to 90% noncondensing conditions
EMI	FCC Class A Verified

Table B-3. Physical Characteristics

Characteristic	Specification
Overall Case Size (Dimensions)	190.2 mm by 74.5 mm by 250.9 mm (7.489 in. by 2.934 in. by 9.88 in.)
Case Material	All metal enclosure
Rack Mounting	Single or dual kits available
Weight	1.81 kg (4 lb)

Appendix C
Troubleshooting

This appendix suggests some areas to check if you have problems installing the GPIB-SCSI-A or the NI-488.2 software after going through the procedures described in Chapter 2, *Installation*, and Appendix A, *Hardware Configuration.*

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

Warning: ***The GPIB-SCSI-A contains circuitry that operates with hazardous voltages. Refer service requirements to qualified personnel*** .

• The SCSI cable must be securely connected to the GPIB-SCSI-A.

• If the GPIB-SCSI-A is the last device on the SCSI bus, make sure that you have placed the terminating resistor pack on one of the SCSI ports on the rear panel of the GPIB-SCSI-A to terminate the SCSI bus. (See *Using SCSI Terminating Resistors* in Appendix A, *Hardware Configuration*, for more information.)

• Check the DIP switch settings on the GPIB-SCSI-A. Make sure that they are set to the correct SCSI ID (Target ID), the correct GPIB primary address and other feature settings, such as mode of operation, data padding, or disconnection/reconnection. (See *Configuring the Switch Settings* in Appendix A, *Hardware Configuration,* for more information.)

• If the **POWER** LED is not lit, check the fuse.

   Warning: ***Replacement fuses must be of the proper type and rating. See Appendix B*** , *Hardware Specifications* , ***for fuse information*** .

• Make sure that the GPIB-SCSI-A is powered on.

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 **SCSI box products**.

*   An **X** should appear in the ID checkbox that corresponds to the SCSI ID set by SW1
    on the GPIB-SCSI-A.

Common Questions

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

In `NI-488 Config`, an **X** should appear in the ID checkbox that corresponds to the
SCSI ID of your GPIB-SCSI-A. If an **X** does not appear in that box, make sure that all
SCSI devices daisy-chained to the SCSI cable are connected properly.

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

Refer to the troubleshooting sections of this chapter 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 may 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.

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.*

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 _____

The problem is   _____

_____

_____

_____

_____

_____

_____

_____

List any error messages   _____

_____

_____

_____

_____

_____

_____

The following steps will reproduce the problem   _____

_____

_____

_____

_____

_____

_____

GPIB-SCSI-A 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.

National Instruments Products

• GPIB-SCSI-A Model and Revision _____

• NI-488.2 Software Version Number on Disk _____

• SW1 Switch Setting _____

• SW2 Switch Setting _____

• SCSI Terminator Installed on Rear Panel (yes or no) _____

Other Products

• Programming Language and Version _____

• Computer Make and Model _____

• Memory Capacity on Computer _____

• Operating System Version _____

• Number of GPIB Devices on Bus _____

• Other SCSI Devices in System _____

• 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 GPIB-SCSI-A and the NI-488.2™ Software for Macintosh**

Edition Date: **January 1995**

Part Number: **320468B-01**

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

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(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   _____

Address   _____

             _____

Phone   (_____)   _____

Mail to: Technical Publications
              National Instruments Corporation
              6504 Bridge Point Parkway, MS 53-02
              Austin, TX 78730-5039

Fax to: Technical Publications
              National Instruments Corporation
              MS 53-02
              (512) 794-5678

Glossary

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

°	degrees
%	percent
A	amperes
AC	alternating current
ANSI	American National Standards Institute
C	Celsius
CSA	Canadian Standards Association
DIP	dual inline package
DMA	direct memory access
EMI	electromagnetic interference
FCC	Federal Communications Commission
g	grams
GPIB	General Purpose Interface Bus
Hz	hertz
IEC	International Electrotechnical Commission
IEEE	Institute for Electrical and Electronic Engineers
in.	inches
lb	pounds
LED	light-emitting diode
m	meters
MB	megabytes of memory
RAM	random-access memory
SCSI	Small Computer Systems Interface
UL	Underwriters Laboratories
V	volts
VAC	volts alternating current
VDC	volts direct current