

GPIB

Getting Started with Your GPIB-SCSI-A and NI-488.2™ for Solaris



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FCC/Canada Radio Frequency Interference Compliance*

Determining FCC Class

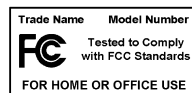
The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). Depending on where it is operated, this product could be subject to restrictions in the FCC rules. (In Canada, the Department of Communications (DOC), of Industry Canada, regulates wireless interference in much the same way.)

Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products. By examining the product you purchased, you can determine the FCC Class and therefore which of the two FCC/DOC Warnings apply in the following sections. (Some products may not be labeled at all for FCC; if so, the reader should then assume these are Class A devices.)

FCC Class A products only display a simple warning statement of one paragraph in length regarding interference and undesired operation. Most of our products are FCC Class A. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

FCC Class B products display either a FCC ID code, starting with the letters **EXN**, or the FCC Class B compliance mark that appears as shown here on the right.

Consult the FCC web site <http://www.fcc.gov> for more information.



FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE Mark Declaration of Conformity**, 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).

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

Class A

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. 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.

Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

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

Class B

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.

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.

Compliance to EU Directives

Readers in the European Union (EU) must refer to the Manufacturer's Declaration of Conformity (DoC) for information** pertaining to the CE Mark compliance scheme. The Manufacturer includes a DoC for most every hardware product except for those bought for OEMs, if also available from an original manufacturer that also markets in the EU, or where compliance is not required as for electrically benign apparatus or cables.

To obtain the DoC for this product, click **Declaration of Conformity** at ni.com/hardref.nsf/. This website lists the DoCs by product family. Select the appropriate product family, followed by your product, and a link to the DoC appears in Adobe Acrobat format. Click the Acrobat icon to download or read the DoC.

* Certain exemptions may apply in the USA, see FCC Rules §15.103 **Exempted devices**, and §15.105(c). Also available in sections of CFR 47.

** The CE Mark Declaration of Conformity will contain important supplementary information and instructions for the user or installer.

Conventions



The following conventions are used in this manual:

This icon denotes a note, which alerts you to important information.



This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

bold

Bold text denotes the names of light-emitting diodes (LEDs).

italic

Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

monospace

Text in this font denotes text or characters that you should 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 code excerpts.

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Introduction

This chapter explains how to use this manual, lists what you need to get started, and briefly describes the GPIB-SCSI-A and NI-488.2 for Solaris.

What You Need to Get Started

- Solaris version 2.5.1 or higher installed on your Sun SPARC system
- One of the following GPIB-SCSI-A boxes:
 - 100–120 VAC
 - 220–240 VAC
- One of the following power cords:
 - U.S.A. standard power cord
 - U.K. power cord
 - Switzerland power cord
 - Australian power cord
 - Universal European power cord
 - North American power cord
- Standard 50-pin SCSI-1 terminator
- Type SCSI-G Cable: GPIB-SCSI-A (50-pin SCSI-1) to Sun SPARC system (SCSI-2 50-pin)–1 m
- NI-488.2 for Solaris and GPIB-SCSI-A, Version 2.x* CD
- Super-user privilege
- One of the following shielded GPIB cables, which you can purchase from National Instruments:
 - Type X1 single-shielded cables (1, 2, or 4 m)
 - Type X2 double-shielded cables (1, 2, or 4 m)



Caution To meet FCC emission limits for this device, you must use a shielded (Type X1 or X2) GPIB cable. Operating this equipment with a non-shielded cable may interfere with radio and television reception.

GPIB Hardware Overview

The GPIB-SCSI-A is a high-performance interface product that transparently handles data transfers between the SCSI and the GPIB. The GPIB-SCSI-A is actually an 8-bit microcomputer that operates as a full-function IEEE 488.2/SCSI Controller. It can turn any computer with a SCSI port into a GPIB Talker/Listener/Controller or it can 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 488.2-1987 and the ANSI Standard X3T9.2. It is able to interpret and execute commands that you send to it over the GPIB or SCSI ports and to perform all necessary GPIB-to-SCSI protocol conversions.

Standard GPIB cables can connect the GPIB-SCSI-A with up to 14 devices. If you need to connect to more than 14 devices, you can add them to your system using an IEEE 488 extender or expander, such as the National Instruments GPIB-130, GPIB-120A, or GPIB-140A. Refer to Appendix B, [Specifications](#), for more information about the GPIB hardware specifications and recommended operating conditions.

NI-488.2 Overview

NI-488.2 for Solaris consists of a loadable driver and utilities that transform a Sun SPARC system running Solaris into an IEEE 488.2 (GPIB) Controller with complete communications and bus management capabilities.

NI-488.2 includes the following components:

- C language interface
- Software diagnostic utility
- Interactive control utility
- Interactive configuration utility

NI-488.2 supports multiple GPIB-SCSI-A boxes installed in a Sun SPARC system, and is completely compatible with both IEEE 488 and IEEE 488.2 instruments.

Installation

This chapter describes how to install NI-488.2 for Solaris and how to configure and connect the GPIB-SCSI-A to your Sun SPARC system. The NI-488.2 software included in this kit is intended for use with Sun SPARC systems running Solaris 2.5.1 or higher.

Figure 2-1 shows the rear panel of the GPIB-SCSI-A.

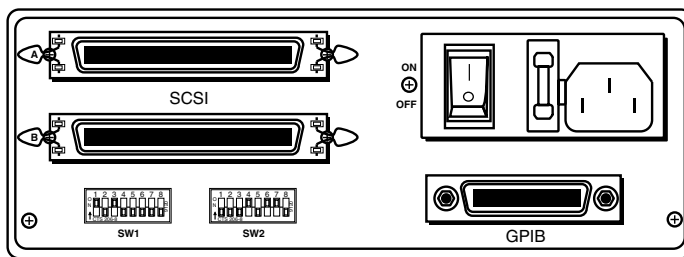


Figure 2-1. GPIB-SCSI-A Rear Panel

Configuring the Hardware

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.

The GPIB-SCSI-A is shipped from the factory with a 100-120 V or a 220-240 V power supply. Before you use the GPIB-SCSI-A, verify that the voltage on the power supply matches the voltage that is supplied in your area.



Caution Operating the GPIB-SCSI-A at any voltage other than the one specified on the bottom of the unit could damage the unit. Replacement fuses must be the proper type and rating. See Appendix B, *Specifications*, for fuse information.

The GPIB-SCSI-A is shipped from the factory configured to operate in SCSI (S) mode. Optional parity checking on the SCSI port is disabled. The SCSI ID that the GPIB-SCSI-A responds to is set at 5, and the primary GPIB address is set at 0. Additionally, the GPIB-SCSI-A kit is shipped from the factory with a SCSI terminating resistor installed. Depending on how you connect the GPIB-SCSI-A to your system, you may want to remove the terminating resistor.



Note The only parameters available for configuration with this kit are the SCSI ID and the GPIB address. Do *not* change any other switch settings from the factory default settings.

The factory default setting of the GPIB-SCSI-A Target ID is 5. To confirm that a Target ID of 5 is available in your system, print out the startup messages from the last time you booted with the following command:

```
dmesg
```

Among the startup messages are the devices found on the SCSI bus and their respective Target ID numbers. If a Target ID of 5 is not available in your system, select an unused Target ID (a number between 0 and 7) and set the appropriate switch to that Target ID number (refer to the next section, *Configuration Switch Settings for SW1*). Typically, Targets 1 and 3 are used by the internal disks, Target 4 is used by a tape drive (if you have a tape drive), and Target 0 is used by an external disk drive. Target 7 is always used by the Sun SPARC system central processing unit.

Configuration Switch Settings for SW1

The DIP switch at location SW1 on the rear panel (see Figure 2-1) is used to configure the power-on primary GPIB address and SCSI ID of the GPIB-SCSI-A. Figure 2-2 shows the factory default settings.

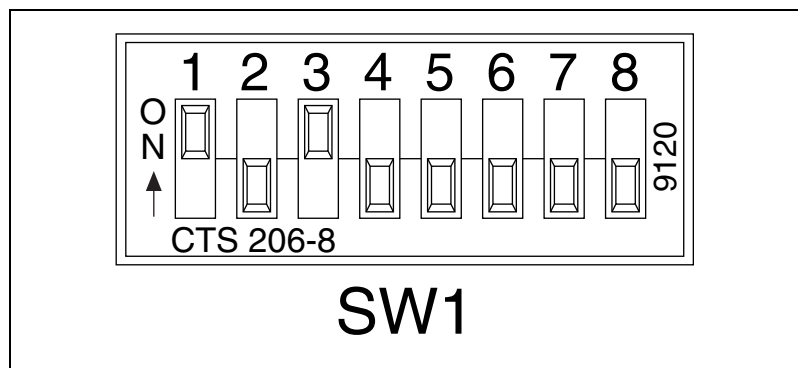


Figure 2-2. SW1 Default Mode Switch Settings

The default settings of switches 1 through 3 are ON, OFF, ON, respectively, to select the SCSI ID of 5. Switches 4 through 8 are OFF, indicating that the GPIB primary address of the GPIB-SCSI-A is 0.

Tables 2-1 and 2-2 show the possible configurations of the eight switches for SW1 and what each configuration indicates. Factory default settings are in **bold**.

Table 2-1. SW1 Configuration Parameters for Switches 1 through 3

Switches			Indication
1	2	3	
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 2-2. SW1 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

Table 2-2. SW1 Configuration Parameters for Switches 4 through 8 (Continued)

Switches					Indication
4	5	6	7	8	
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 2-1) is used to configure the mode of operation for the GPIB-SCSI-A. These switch settings should *not* be changed for use with the Sun SPARC system. Figure 2-3 shows the factory default settings. Make sure that these switches are set as shown in Figure 2-3. If they are not, set these switches as indicated.

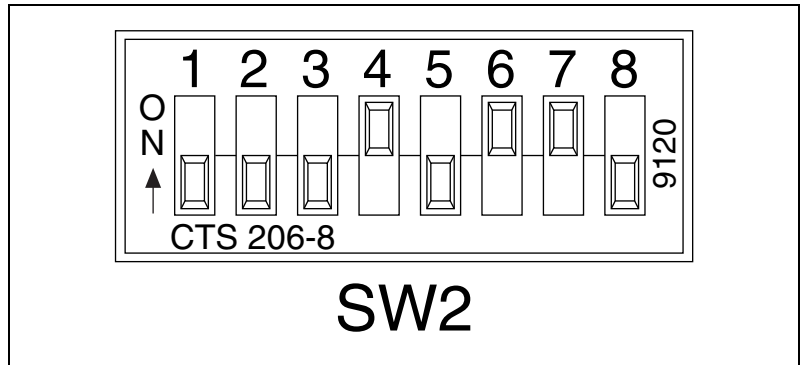


Figure 2-3. SW2 Default Mode Switch Settings

Table 2-3 shows the factory default configurations of the eight switches for SW2.

Table 2-3. Factory Default Configurations for SW2

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

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 device in the middle of the daisy-chained SCSI bus receives these signal echoes. You should use terminating resistor packs to prevent echoes and ensure proper termination of a signal. Read the documentation for each device in your system to find out what kind of termination it provides.

If your GPIB-SCSI-A is located at the end of an 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 2-4) has a terminating resistor installed. Remove the terminating resistor packs on all devices except for the one 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 an SCSI bus because more than two sets might overload the signals and generate errors.

Figure 2-4 shows where to install terminating resistors if the GPIB-SCSI-A is located at the end of a system.

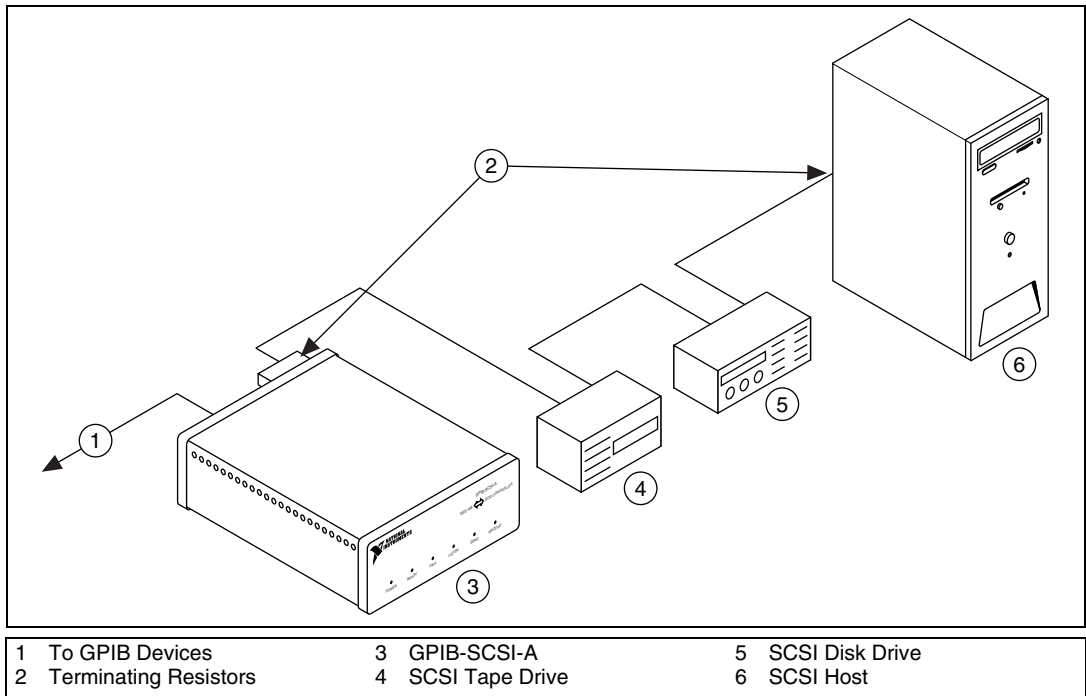


Figure 2-4. Location of Terminating Resistors for GPIB-SCSI-A at End of SCSI Bus

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. Also ensure that all other devices in the middle of the bus (for example, the SCSI disk drive in Figure 2-5) do not have terminating resistors installed. The devices at each end of the SCSI bus should have terminating resistors installed.

Figure 2-5 shows where to install terminating resistors if the GPIB-SCSI-A is at a location other than the end of a system.

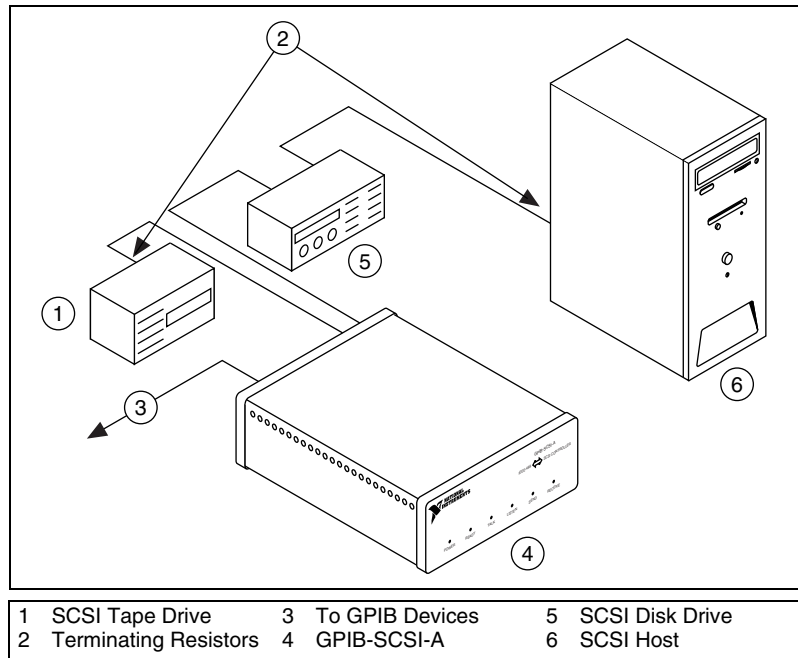


Figure 2-5. Location of Terminating Resistors for GPIB-SCSI-A Not at End of SCSI Bus

Connecting the Hardware

The following are general instructions for connecting the GPIB-SCSI-A to the Sun SPARC system. Consult the chapter on installing external drives in the installation guide that came with your Sun SPARC system for specific instructions and warnings.

There are two methods for connecting the GPIB-SCSI-A to the Sun SPARC system. One method is connecting the GPIB-SCSI-A directly to the Sun SPARC system unit 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; thereby, a single port on the host can serve a variable number of devices. Daisy-chaining is the suggested method for connecting the GPIB-SCSI-A to the Sun SPARC system.

Whether you are using a direct connection or daisy-chaining, there are four basic steps to connecting the GPIB-SCSI-A.

1. Shut down your system and turn off your computer.
2. Connect the cables.
3. Switch on your GPIB-SCSI-A.
4. Power on your system.

Step 1. Shut Down the System

Complete the following steps to shut down your system:

1. Enter the `shutdown` command and turn off your computer. (You need super-user privilege to do a shutdown.)
2. 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 earlier in this chapter.
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 should come on immediately and the **READY** 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** indicator does not come on within 10 seconds after the unit is powered on, recheck all connections and switch settings and retry the power-on sequence. If the **READY** light still fails to come on, contact National Instruments.

Step 4. Power On Your System

Complete the following steps to power on your system:

1. Plug the power cords of the Sun SPARC system and any other SCSI equipment into a power outlet.
2. Power on all devices.
3. Power on your system.

Installing NI-488.2

Complete the following steps to install NI-488.2 for Solaris:

1. Insert the NI-488.2 for Solaris installation CD.
2. You must have superuser privilege before you can install NI-488.2 for Solaris. If you are not already a superuser, type `su root` and enter the root password.
3. Add NI-488.2 to the operating system by entering the following command.

- a. On Solaris 2.5.1 or later versions, the CD automatically mounts as soon as you insert the CD. If this feature is disabled on your workstation, you must mount the CD by typing the following command:

```
/usr/sbin/mount -o ro -F hsfs /dev/dsk/c0t6d0s2 /cdrom/cdrom0
```

- b. Enter the following command to add NI-488.2 to your system:

```
/usr/sbin/pkgadd -d /cdrom/cdrom0 NICscsia
```
4. Follow the instructions on your screen to complete the installation.

Configuring the Software with `ibconf` (Optional)

`ibconf` is an interactive utility you can use to examine or modify the configuration of the driver. You might want to run `ibconf` to change the settings of the software parameters. You must have super-user privilege to run `ibconf`.

`ibconf` is largely self explanatory and contains help screens that explain all commands and options. For more information on using `ibconf`, refer to the *NI-488.2M Software Reference Manual*.

Complete the following steps to change the default parameters of your NI-488.2 software. The driver should not be in use while you run `ibconf`.

1. Log on as super-user (`root`).
2. Type the following command to start `ibconf`:

```
ibconf
```

After you have installed and configured the software, you should verify the installation. Refer to Chapter 3, [Installation Verification](#).

Removing NI-488.2 (Optional)

If you ever decide to stop using your GPIB-SCSI-A, you can remove NI-488.2 from your system. To remove NI-488.2 from the kernel configuration, you must have superuser privilege and the driver must not be in use.

Enter the following command to unload the software:

```
pkgrm NICscsia
```

Installation Verification

This chapter describes how to verify the software installation.

The software installation test `ibtsta` verifies that the driver is installed correctly. It checks for correct access to the device driver.

Run `ibtsta` by entering the following command:

```
ibtsta
```

If no error occurs in `ibtsta`, NI-488.2 is installed correctly.

If `ibtsta` fails, it displays an error message that explains why the test failed and how you can correct the problem. If you are unable to run `ibtsta` successfully after you have followed the on-screen instructions, refer to Appendix A, [Troubleshooting and Common Questions](#).

Using NI-488.2 with Solaris

This chapter helps you get started with NI-488.2 for Solaris.

Introduction to `ibic`

The NI-488.2 software includes the Interface Bus Interactive Control utility, `ibic`. You can use `ibic` to enter NI-488 functions and IEEE 488.2-style functions (also known as *NI-488.2 routines*) interactively and display the results of the function calls automatically. Without writing an application, you can use `ibic` to do the following:

- Verify GPIB communication with your device quickly and easily
- Become familiar with the commands of your device
- Receive data from your GPIB device
- Learn new NI-488.2 functions and routines before integrating them into your application
- Troubleshoot problems with your application

Enter the following command to run `ibic`:

```
ibic
```

For more information about `ibic`, refer to Chapter 6, *ibic*, in the *NI-488.2M Software Reference Manual*.

Programming Considerations

Depending on the programming language you use to develop your application, you must include certain files, statements, or global variables at the beginning of your application. For example, you must include the header file `sys/ugpib.h` in your source code if you are using C/C++.

You must link the language interface library with your compiled source code. Link the GPIB C language interface library using one of the following commands, where `example.c` is your application name:

```
cc example.c -lgpib
or
cc example.c -dy -lgpib
or
cc example.c -dn -lgpib
```

`-dy` specifies dynamic linking, which is the default method. It links the application to `libgpib.so`. `-dn` specifies static linking in the link editor. It links the application to `libgpib.a`. For more information about compiling and linking, see the man pages for `cc` and `ld`.

For information about each NI-488 function and IEEE 488.2-style function, choosing a programming method, developing your application, or compiling and linking, refer to the *NI-488.2M Software Reference Manual*.

Troubleshooting and Common Questions

This appendix describes how to troubleshoot problems and answers some common questions. Also refer to Appendix B, *Common Errors and Their Solutions*, in the *NI-488.2M Software Reference Manual*.

Troubleshooting



Caution 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. Refer to the *Using SCSI Terminating Resistors* section of Chapter 2, *Installation*, for more information.
- The SW1 DIP switch settings on the GPIB-SCSI-A should be set to the correct SCSI ID (Target ID) and the correct GPIB primary address. Refer to the *Configuration Switch Settings for SW1* section of Chapter 2, *Installation*, for more information.
- The SW2 DIP switch should remain in the default configuration. Refer to the *Configuration Switch Settings for SW2* section of Chapter 2, *Installation*, for more information.
- Check the fuse.



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

- The GPIB-SCSI-A must be powered on.

Common Questions

How do I know that my GPIB-SCSI-A and driver are installed correctly?

The `ibtsta` test verifies that both the hardware and software are installed correctly. Run `ibtsta` by entering the following command:

```
ibtsta
```

If no error occurs in `ibtsta`, NI-488.2 is installed correctly.

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

If `ibtsta` fails, make sure that no GPIB cables are connected to the GPIB-SCSI-A. If necessary, remove and reinstall NI-488.2 from the CD. If you already have completed the troubleshooting steps, contact National Instruments.

What could be causing a problem if the installation process fails?

The most probable reason is that the GPIB-SCSI-A is at a different SCSI Target ID than what you entered during installation. Reinstall using the correct ID.

How should I check for errors in my GPIB application?

Examine the value of `ibsta` after each NI-488 or NI-488.2 call. If a call fails, the ERR bit of `ibsta` is set and an error code is stored in `iberr`. For more information about global status variables, refer to the following sections in the *NI-488.2M Software Reference Manual*: the *General Programming Information* section in Chapter 3, *Understanding the NI-488.2 Software*, and Appendix B, *Common Errors and Their Solutions*.

When should I use `ibic`?

You can use `ibic` to practice communication with your instrument, troubleshoot problems, and develop your application program. For more information about `ibic`, refer to Chapter 6, *ibic*, in the *NI-488.2M Software Reference Manual*.

What is wrong if `ibfind` returns a -1?

The driver may not be installed correctly or the nodes may not have been created when the driver was loaded. Try removing and reinstalling NI-488.2 from the CD, as described in Chapter 2, *Installation*.

Also, the file may require read/write privileges you do not have, or you may have renamed a device. Make sure that the device names in your application program match the device names in `ibconf`.

How do I use an NI-488.2 language interface?

For information about using NI-488.2 language interfaces, refer Chapter 4, *Using NI-488.2 with Solaris*. Also refer to the *NI-488.2M Software Reference Manual*.

How do I communicate with my instrument over the GPIB?

Refer to the documentation that came from the instrument manufacturer. The command sequences you use are totally dependent on the specific instrument. The documentation for each instrument should include the GPIB commands you need to communicate with it. In most cases, NI-488 device-level calls are sufficient for communicating with instruments. Refer to Chapter 5, *NI-488M Software Characteristics and Functions*, in the *NI-488.2M Software Reference Manual*, for more information.

What information should I have before I call National Instruments?

Please have the results of the diagnostic test `ibtsta`. You also should have run `ibic` to try to find the source of your problem.

Does this driver work with 64-bit Solaris?

Yes. NI-488.2 for Solaris works with either 32-bit or 64-bit Solaris.

Specifications

This appendix lists the electrical, environmental, and physical specifications of the GPIB-SCSI-A and the recommended operating conditions.

Electrical Characteristics

Power supply unit.....	100 to 120 VAC \pm 10%, 50/60 Hz input or 220 to 240 VAC \pm 10%, 50/60 Hz input
Maximum current requirement	100 to 120 VAC, 90 mA 220 to 240 VAC, 45 mA
Fuse rating and type	100 to 120 VAC, 200 mA UL/CSA approved 220 to 240 VAC, 125 mA IEC approved

Environmental Characteristics

Temperature	
Operating	0 to 40 °C
Storage	-20 to 70 °C
Relative humidity	
Operating	10 to 90% noncondensing conditions
Storage	5 to 90% noncondensing conditions
EMI	FCC Class A Verified

Physical Characteristics

Overall case size	74.5 by 190.2 by 250.9 mm (2.934 by 7.489 by 9.88 in.)
Case material	All metal enclosure
Rack mounting	Single or dual kits available
Weight.....	1.81 kg (4 lb)



Technical Support Resources

Web Support

National Instruments Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of ni.com.

NI Developer Zone

The NI Developer Zone at ni.com/zone is the essential resource for building measurement and automation systems. At the NI Developer Zone, you can easily access the latest example programs, system configurators, tutorials, technical news, as well as a community of developers ready to share their own techniques.

Customer Education

National Instruments provides a number of alternatives to satisfy your training needs, from self-paced tutorials, videos, and interactive CDs to instructor-led hands-on courses at locations around the world. Visit the Customer Education section of ni.com for online course schedules, syllabi, training centers, and class registration.

System Integration

If you have time constraints, limited in-house technical resources, or other dilemmas, you may prefer to employ consulting or system integration services. You can rely on the expertise available through our worldwide network of Alliance Program members. To find out more about our Alliance system integration solutions, visit the System Integration section of ni.com.

Worldwide Support

National Instruments has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of ni.com. Branch office Web sites provide up-to-date contact information, support phone numbers, e-mail addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. Phone numbers for our worldwide offices are listed at the front of this manual.

Glossary

Prefix	Meaning	Value
m-	milli-	10^{-3}
k-	kilo-	10^3
M-	mega-	10^6

°	degrees
%	percent
A	amperes
ANSI	American National Standards Institute
C	Celsius
DIP	dual inline package
DMA	direct memory access
EMI	electromagnetic interference
g	grams
GPIB	General Purpose Interface Bus
Hz	hertz
IEEE	Institute of Electrical and Electronic Engineers
in.	inches
lb	pounds
LED	light-emitting diode
m	meters
MB	megabytes of memory
RAM	random-access memory
s	seconds
SCSI	Small Computer System Interface (bus)

Glossary

V	volts
VAC	volts alternating current
VDC	volts direct current

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