

INSTALLATION GUIDE

Installing Your GPIB-SCSI-A and NI-488.2™ for Solaris

This document describes how to configure and connect the GPIB-SCSI-A to your Sun SPARC system and how to install NI-488.2 for Solaris. The NI-488.2 software included in this kit is intended for use with Sun SPARC systems running Solaris 2.6 or later. Other documentation, including the software reference manual, is available on your NI-488.2 software for Solaris CD in the `\documentation` folder.

Before you install your GPIB controller, consult the manual that came with your workstation for specific instructions and warnings. You must have superuser privileges to install the hardware and software.

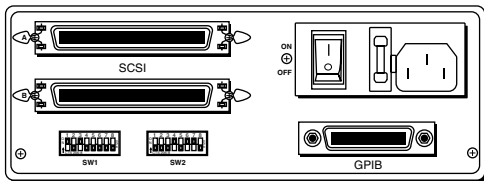


Figure 1. GPIB-SCSI-A Rear Panel

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, which are 100 to 120 VAC, 200 mA UL/CSA approved, or 220 to 240 VAC, 125 mA IEC approved.

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 (Target 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 *Configuration Switch Settings for SW1* section). 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 in Figure 1 is used to configure the power-on primary GPIB address and SCSI ID of the GPIB-SCSI-A. Figure 2 shows the factory default settings.

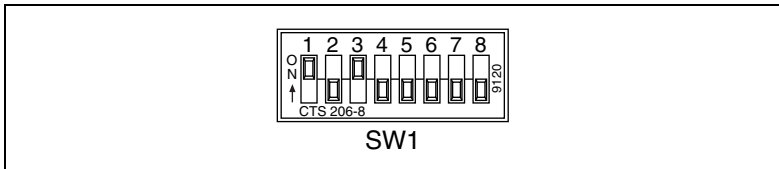


Figure 2. SW1 Default Mode Switch Settings

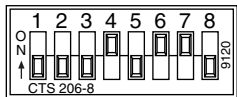
Switches 1 through 3 are used to configure the SCSI ID. Switch 1 is the most significant bit, and Switch 3 is the least significant bit. For example, if Switches 1 through 3 are set to OFF, ON, ON, the SCSI ID is 3.

Switches 4 through 8 are used to configure the power-on primary GPIB address. Switch 4 is the most significant bit, and Switch 8 is the least significant bit. For example, if Switches 4 through 8 are set to OFF, OFF, OFF, ON, OFF, a primary address of 2 is indicated. The largest primary address that can be set is 30.

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.

Configuration Switch Settings for SW2

The DIP switch at location SW2 on the rear panel in Figure 3 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 3 shows the factory default settings. Make sure that these switches are set as shown in Figure 3. If they are not, set these switches as indicated.



SW2

Figure 3. SW2 Default Mode Switch Settings

Table 1 shows the factory default configurations of the eight switches for SW2.

Table 1. 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

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 power 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 power off your computer. (You need superuser 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 in the [Using SCSI Terminating Resistors](#) section.
2. Connect the GPIB cable to the GPIB-SCSI-A and tighten the thumbscrews 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.

Using SCSI Terminating Resistors

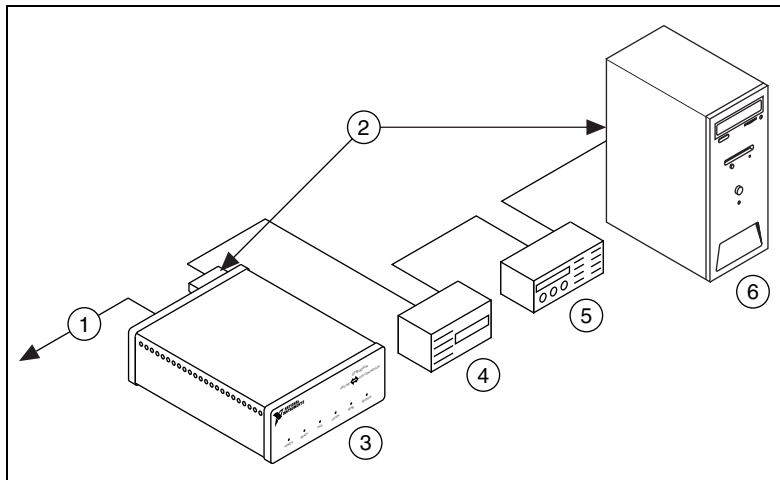
Because of its high-speed capabilities, the SCSI bus is sensitive to the electrical characteristics of the SCSI cabling. When a signal is sent through the SCSI bus, it bounces back and creates echoes along the cabling. Any device in the middle of the daisy-chained SCSI bus receives these signal echoes. 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 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 4 shows where to install terminating resistors if the GPIB-SCSI-A is located at the end of a system.



- | | | |
|-------------------------|-------------------|-------------------|
| 1 To GPIB Devices | 3 GPIB-SCSI-A | 5 SCSI Disk Drive |
| 2 Terminating Resistors | 4 SCSI Tape Drive | 6 SCSI Host |

Figure 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 4) do not have terminating resistors installed. The devices at each end of the SCSI bus should have terminating resistors installed.

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 2.6 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 superuser 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 superuser (`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 the [Installation Verification](#) section.

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

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 the [Common Questions](#) section.

Using NI-488.2 with Solaris

This section 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`:

```
ibconf
```

For more information about `ibic`, refer to Chapter 6, *ibic*, of 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, refer to 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*.

Common Questions

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

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.

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.

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`.

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. You also can create 32-bit or 64-bit applications. The driver installs both 32-bit and 64-bit language interface libraries on the system. For information on using the NI-488.2 language interfaces, refer to the *Programming Considerations* section.

Technical Support and Professional Services

Visit the following sections of the National Instruments Web site at `ni.com` for technical support and professional services:

- **Support**—Online technical support resources include the following:
 - **Self-Help Resources**—For immediate answers and solutions, visit our extensive library of technical support resources available in English, Japanese, and Spanish at `ni.com/support`. These resources are available for most products at no cost to registered users and include software drivers and updates, a KnowledgeBase, product manuals, step-by-step troubleshooting wizards, conformity documentation, example code, tutorials and application notes, instrument drivers, discussion forums, a measurement glossary, and so on.
 - **Assisted Support Options**—Contact NI engineers and other measurement and automation professionals by visiting

ni.com/support. Our online system helps you define your question and connects you to the experts by phone, discussion forum, or email.

- **Training**—Visit ni.com/training for self-paced tutorials, videos, and interactive CDs. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, NI Alliance Program members can help. To learn more, call your local NI office or visit ni.com/alliance.
- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electronic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/hardref.nsf.
- **Calibration Certificate**—If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration.

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