Getting Started with Your GPIB-SCSI-A and the NI-488M™ Software for the Silicon Graphics Indigo^2/Indy Running IRIX

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

This device complies with the FCC rules only if used with shielded interface cables of suitable quality and construction. National Instruments used such cables to test this device and provides them for sale to the user. The use of inferior or nonshielded interface cables could void the user's authority to operate the equipment under the FCC rules.

If necessary, consult National Instruments or an experienced radio/television technician for additional suggestions. The following booklet prepared by the FCC may also be helpful: *Interference to Home Electronic Entertainment Equipment Handbook.* This booklet is available from the U.S. Government Printing Office, Washington, DC 20402.

Canadian Department of Communications

This Class 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.

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About This Manual

This manual contains instructions for installing and configuring the National Instruments GPIB-SCSI-A SCSI-to-IEEE 488 Controller and NI-488M multitasking software for use with the Silicon Graphics Indigo^2/Indy running under the IRIX operating system. This manual is meant to be used with the *NI-488M Software Reference Manual*.

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, gives instructions for inspecting your GPIB-SCSI-A, and briefly describes the hardware and the NI-488M software.
- Chapter 2, *Hardware Configuration and Installation*, describes how to configure the GPIB-SCSI-A and how to connect the GPIB-SCSI-A to the Silicon Graphics computer.
- Chapter 3, *Software Installation and Configuration*, lists all the files located on the distribution tape, and contains step-by-step instructions for installing and configuring your NI-488M software, verifying the installation of your NI-488M software, and getting started with your GPIB application program.
- Appendix A, *Hardware Specifications*, lists the electrical, environmental, and physical specifications of the GPIB-SCSI-A.
- Appendix B, *Troubleshooting*, suggests some areas to check if you have problems installing the GPIB-SCSI-A or the NI-488M software after going through Chapter 2 and Chapter 3.
- Appendix C, *Customer Communication*, contains forms you can use when requesting help from National Instruments or to comment on our products and manuals.

- The *Glossary* contains an alphabetical list and description of terms used in this manual including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.

Conventions Used in This Manual

The following conventions are used in this manual.

bold	Bold text denotes the names of light-emitting diodes (LEDs).
bold italic	Bold italic text denotes a note, caution, or warning.
`bold monospace`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
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 488.2-1992, respectively, which define the GPIB.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
`monospace`	Text in this font denotes text or characters that are to be literally input from the keyboard and sections of code. This font is also used for the proper names of paths, directories, programs, device names, functions, variables, and filenames.
Silicon Graphics computer	This term refers to the Silicon Graphics Indigo^2 and Indy Workstations running IRIX 5.*x* or higher.

Abbreviations, acronyms, metric prefixes, mnemonics, 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 System Interface (SCSI)*
- ANSI/IEEE Standard 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*
- ANSI/IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols, and Common Commands*
- Indigo^2 Workstation Owner's Guide, Silicon Graphics, Inc., Mountain View, California 94039 (Document Number 007-9096-010)

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 C, *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, gives instructions for inspecting your GPIB-SCSI-A, and briefly describes the hardware and the NI-488M 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
- ❑ Type SCSI-G cable
  - GPIB-SCSI-A (50-pin SCSI-1) to SCSI-2 (50-pin high density)–1 m
- ❑ The following software media:
  - *NI-488M Distribution Tape for the GPIB-SCSI-A and the Silicon Graphics Indigo^2/Indy Running IRIX*

Optional Equipment

You can call National Instruments to order the following optional equipment.

- Rack-mount kit
  - Single (one unit)
  - Dual (two units)

- Double-shielded Type SCSI-J cable
  - GPIB-SCSI-A (50-pin Champ) to SCSI-1 (50-pin Champ) (available in 1 m or 2 m lengths)

- Shielded GPIB cables*
  - GPIB Type X1 cables (1 m, 2 m, 4 m, or 8 m)
  - GPIB Type X2 cables (1 m, 2 m, 4 m, or 8 m)

  * To meet FCC emission limits for a 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.

Inspection

Before you install the GPIB-SCSI-A, inspect the shipping container and its contents for damage. Retain the packaging material for possible inspection or for reshipment.

If the equipment appears to be damaged, do not attempt to operate it. Contact National Instruments for instructions. If the damage appears to have been caused in shipment, file a claim with the carrier.

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. It can turn any computer with a SCSI port into a GPIB Talker/Listener/Controller or 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 perform all necessary GPIB-to-SCSI protocol conversions.

Software Description

The NI-488M software is a comprehensive package consisting of a multitasking driver and programs that transform a Silicon Graphics Indigo^2 or Indy running IRIX 5.*x* or higher (hereafter referred to as *Silicon Graphics computer*) into a GPIB Controller with complete communications and bus management capabilities. The NI-488M software includes the following items:

- NI-488M driver for GPIB-SCSI-A (`gpib.o`)
- C language interface (`cib.c`)
- Automatic installation program (`instgpib`)
- Installation tests (`ibtsta` and `ibtstb`)
- Interactive control program (`ibic`)
- Interactive configuration program (`ibconf`)

Chapter 2
Hardware Configuration and Installation

This chapter describes how to configure the GPIB-SCSI-A and how to connect the GPIB-SCSI-A to the Silicon Graphics computer.

Configure the Hardware

The GPIB-SCSI-A is shipped from the factory with a 100 to 120 VAC or 220 to 240 VAC power supply. Before you configure the GPIB-SCSI-A, verify that the voltage specified on the bottom panel label 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 panel label could damage the unit. Replacement fuses must be the proper type and rating. See Appendix A,*** *Hardware 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 GPIB-SCSI-A is set at SCSI ID 5 and primary GPIB address 0. Additionally, the GPIB-SCSI-A kit 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 chapter.

Note: ***The 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.***

The SCSI ID factory default setting of the GPIB-SCSI-A is 5. If SCSI ID 5 is used by another SCSI device in your system, select an unused SCSI ID

and set the appropriate switch to that SCSI ID number (refer to *Configuration Switch Settings for SW1* later in this chapter).

SCSI ID 0 is used by the Silicon Graphics central processing unit, and cannot be used by the GPIB-SCSI-A.

You can use the `hinv` command to inventory the hardware for your Silicon Graphics computer. For example, after entering `hinv`, you might see the following messages:

```
Disk Drive: unit 1 on SCSI controller 0
CDROM: unit 7 on SCSI controller 0
```

These messages reveal that SCSI IDs 1 and 7 are used by the disk drive and CD-ROM drive, respectively, and are not available. `hinv` will not list the GPIB-SCSI-A.

Configuration Switch Settings for SW1

The DIP switch at location SW1 on the rear panel is used to configure the power-on primary GPIB address and SCSI ID of the GPIB-SCSI-A.

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

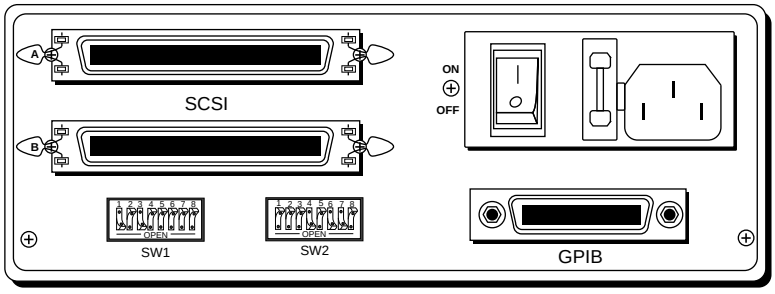

Figure 2-1. GPIB-SCSI-A Rear Panel

Figure 2-2 shows the default configuration of DIP switch SW1. Switches 1 through 3 are ON, OFF, ON, respectively, to select 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.

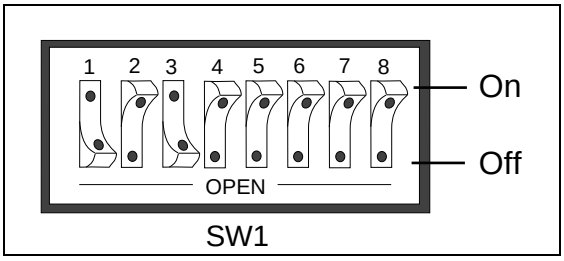

Figure 2-2. SW1 Default Mode Switch Settings

Tables 2-1 and 2-2 show the possible configurations of the eight switches and what each configuration indicates. The factory default settings are in ***bold italic***.

Table 2-1. Configuration Parameters for SW1 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. Configuration Parameters for SW1 Switches 4 through 8

Switches 1	2	3			Indication
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

(continues)

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

Switches 1	2	3			Indication
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 Silicon Graphics computer.

Make sure that these switches are set as shown in Figure 2-3. If they are not, set these switches as indicated.

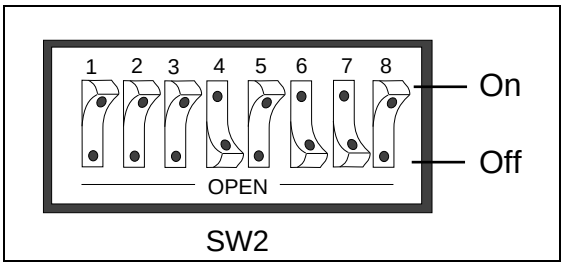

Figure 2-3. SW2 Default Mode Switch Settings

Table 2-3 and the subsequent paragraph describe the factory default configurations of the eight switches.

Table 2-3. Factory Default Configurations for SW2

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

Connect the Hardware

The following are general instructions for connecting the GPIB-SCSI-A to the Silicon Graphics computer.

Daisy-Chaining

There are two methods for connecting the GPIB-SCSI-A to the Silicon Graphics computer. One method is connecting the GPIB-SCSI-A directly to the computer by using a cable with the proper connectors at each end. The other method is *daisy-chaining*. Daisy-chaining is connecting more than one SCSI device to a host. It allows a single port on the host to serve a variable number of devices. Daisy-chaining is the suggested method for connecting the GPIB-SCSI-A to the Silicon Graphics computer.

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

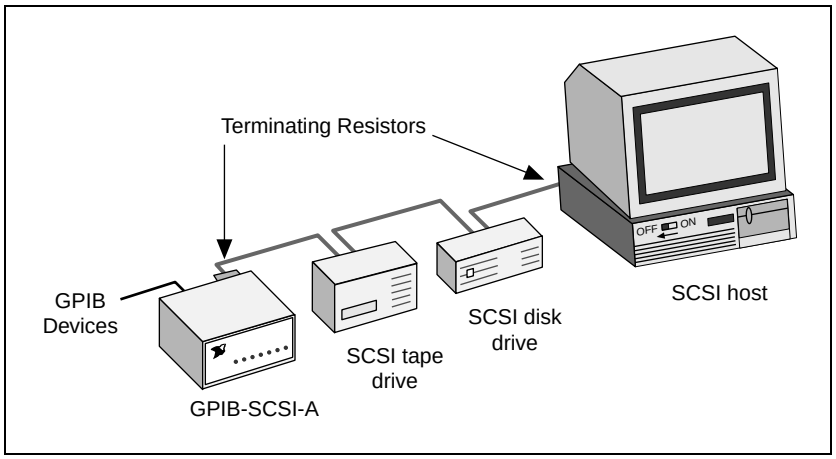

Figure 2-4. Terminating Resistors for GPIB-SCSI-A at End of SCSI Bus

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 daisy-chained bus (for example, the SCSI disk drive and the GPIB-SCSI-A 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 when the GPIB-SCSI-A is *not* located at the end of a SCSI system.

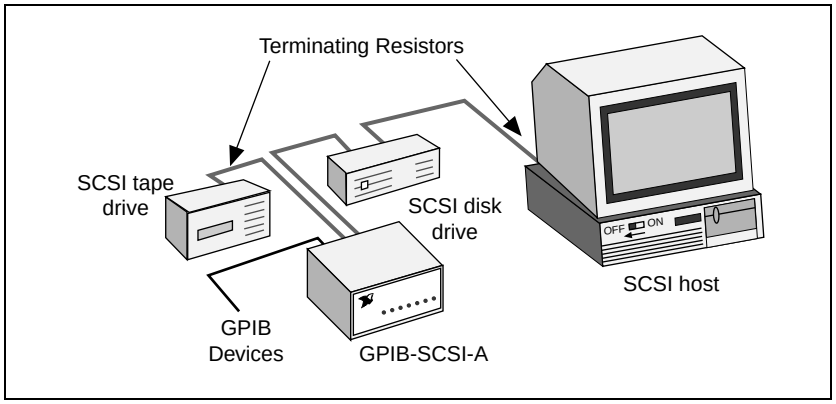

Figure 2-5. Terminating Resistors for GPIB-SCSI-A Not at End of SCSI Bus

Connection Steps

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

1. Shut down your system.
2. Connect the cables.
3. Switch on your GPIB-SCSI-A and power on your system.

Step 1. Shut Down the System

Complete the following steps to shut down your system:

1. Select **`System Shutdown`** from the **Toolchest** in the upper left corner of your screen and reply `yes` to the prompt.

2. Turn off your computer when the shutdown procedure has completed**.**

3. 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 securely fasten it. 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 in the power cord into an AC outlet of the correct voltage.

Step 3. Switch On Your GPIB-SCSI-A and Power On Your System

Complete the following steps to switch on your GPIB-SCSI-A and power on your system:

1. 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 on the front panel should come on after the GPIB-SCSI-A has passed its power-on self-test, indicating 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 and retry the power-on sequence. If the **READY** LED still fails to come on, refer to Appendix C, *Customer Communication*, fill out the forms, and contact National Instruments.

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

Chapter 3
Software Installation and Configuration

This chapter lists all the files located on the distribution tape, and contains step-by-step instructions for installing and configuring your NI-488M software, verifying the installation of your NI-488M software, and getting started with your GPIB application program.

Step 1. Prepare to Install the Software

Before installing the NI-488M software, consider the following:

- You must have super-user privileges.
- The NI-488M distribution tape is in `TAR` format.

The files contained on the NI-488M tape are as follows:

`README`	Release Notes
`gpib.o`	NI-488M driver for GPIB-SCSI-A
`cib.c`	C language interface
`ugpib.h`	Include file for user programs
`ibtsta`	Installation test part A
`ibtstb`	Installation test part B
`ibic`	Interactive control utility
`ibconf`	Software configuration utility
`instgpib`	Install shell script

Step 2. Install the Software

Follow these procedures to install the NI-488M software.

Set Up a Working Directory

1. Log on as super-user (`root`).

2. Create a working directory (for example, `/usr/gpib`) and change to that directory by entering the following commands:

   ```
   mkdir /usr/gpib
   cd /usr/gpib
   ```

3. Copy the files from the NI-488M tape to your working directory by entering the following command:

   ```
   tar xvf /dev/tape
   ```

Install the Driver

You can install the software automatically or manually.

Installing the Driver Automatically

The interactive program `instgpib` installs the driver for you. Run `instgpib` in the appropriate subdirectory, `Irix5.x` or `Irix6.x` of your working directory, and follow the instructions in the shell script. Enter the following command to start the program:

```
./instgpib
```

Installing the Driver Manually

To install the software manually, you must install the utility files, the C library, and the driver, as well as build a new IRIX kernel. The following procedures contain step-by-step instructions for installing the driver manually. You should complete the following steps from the appropriate driver software subdirectory, such as `/usr/gpib/Irix6.x`, of the working directory you created in the *Set Up a Working Directory* section.

Install the Utility Files

Complete the following two steps to install the utility files.

1. Copy the file `ugpib.h` to `/usr/include/sys` by entering the following command:

   ```
   cp ugpib.h /usr/include/sys
   ```

2. Copy files `ibic`, `ibconf`, `ibtsta`, and `ibtstb` to a directory in the command search path (for example, `/usr/bin`) by entering the following commands:

   ```
   cp ibic /usr/bin
   cp ibconf /usr/bin
   cp ibtsta /usr/bin
   cp ibtstb /usr/bin
   ```

Install the C Library

You must compile the file `cib.c` and convert it to a library, because the *NI-488M Software Reference Manual* assumes you have created a library for the C language interface. To create a C language library, enter the following commands:

```
cc -c -cckr cib.c
ar r /usr/lib/libgpib.a cib.o
```

Alternatively, you can add `cib.o` to an existing library or include `cib.o` during the link phase of each compile operation.

Create a Device Special File

Each device on the IRIX system needs its own device special file in the `/dev` directory.

1. Enter the following command to create a device special file for device `gpib0`:

   ```
   mknod  /dev/gpib0  c  32  255
   ```

   where 32 and 255 are the major and minor device numbers, respectively.

2. List all the device special files prefixed `dev` by entering the following command:

   ```
   ls -l /dev/dev*
   ```

   Remove the files `/dev/dev1` through `/dev/dev16` if `/dev/dev1` is listed at minor number `1` as in:

   ```
   crw-r--r-- 1 root sys 32,1 Mar 13 14:07 /dev/dev1
   ```

   Otherwise, proceed to *Build a New IRIX Kernel*.

Build a New IRIX Kernel

To build a new IRIX kernel with the NI-488M driver installed, complete the following steps.

1. Change to the `/var/sysgen/system` directory by entering the following command:

   ```
   cd /var/sysgen/system
   ```

2. Use the editor of your choice to create a file called `gpib.sm`, and enter the following line into the file:

   ```
   INCLUDE:gpib
   ```

3. Copy the file `gpib.o` from the driver software directory to the `/var/sysgen/boot` directory. For example, if you are installing the driver for IRIX 6.2, enter the following command:

   ```
   cp /usr/gpib/Irix6.x/gpib.o /var/sysgen/boot
   ```

   where `/usr/gpib` is the working directory created in step 2 of *Set Up a Working Directory* in this chapter.

4. Use the editor of your choice to create a file called `gpib` in the `/var/sysgen/master.d` directory, and enter the following lines into the file:

   ```
   *FLAGP   PREFIX   SOFT    #DEV    DEPENDENCIES
   sc       ib       32      -       scsi
   ```

5. Save the current version of the kernel by entering the following command:

   ```
   cp /unix /unix.bak
   ```

6. Run the `lboot` utility by entering the following command:

   ```
   lboot -u /unix.install
   ```

7. Reboot the system by entering the following command:

   ```
   reboot
   ```

   When you reboot, the system replaces the current kernel `/unix` with the new kernel found in `/unix.install`.

The following message about the GPIB-SCSI-A appears on your screen to confirm that the software is installed correctly.

```
National Instruments <GPIB-SCSI-A> Installed
```

Note: ***If you upgrade your operating system, you must reinstall the NI-488M software.***

Step 3. Configure the Software with ibconf

After the software is correctly installed, run the software configuration utility `ibconf` (you must have super-user privilege). You must run `ibconf` because it creates all the device special files needed by the software. `ibconf` is a self-explanatory utility with help screens that you can use to inspect and modify the default software parameters. If you changed the default settings of the GPIB-SCSI-A, such as the GPIB primary address, you must make a corresponding change to the default parameters shown in `ibconf`.

For more detailed information about `ibconf`, refer to the *NI-488M Software Reference Manual*.

The synopsis of the command is as follows.

`ibconf [irix_kernel]`

where *`irix_kernel`* is optional and can be any IRIX kernel with the driver for the GPIB-SCSI-A installed. The default IRIX kernel is `/unix`.

For example, to configure the IRIX kernel `/unix` with the driver for the GPIB-SCSI-A, enter the following command:

```
ibconf
```

To run `ibconf` when the kernel being started is named `/unix.new`, enter the following command:

```
ibconf /unix.new
```

After you make any necessary changes, save the current configuration by entering `y` before exiting `ibconf`. Even if you have not made any changes to the configuration settings, you should still enter a `y` to have `ibconf` create the special device files `gpib*` and `dev*` in the `/dev` directory.

This completes the software installation and configuration procedures. Reboot the system.

Step 4. Verify the Installation

There are two software installation tests: `ibtsta` and `ibtstb`.

- `ibtsta` checks for a correct node `/dev/gpib0` and correct access to the device driver.

  Note: ***The first*** `ibfind` ***will exhibit a delay of a few seconds. This delay is due to operating system constraints with respect to scanning the SCSI bus for the existence of a GPIB-SCSI-A box.***

- `ibtstb` checks for correct DMA and interrupt operation. `ibtstb` requires a GPIB analyzer and can be omitted if an analyzer is not available.

Complete the following steps to verify the software installation.

1. Run `ibtsta` by entering the following command:

   ```
   ibtsta
   ```

   If you boot with an IRIX kernel named something other than `/unix`, enter the full pathname when prompted.

2. If `ibtsta` completes with no errors and a bus analyzer is available, you can also run `ibtstb`. Connect the bus analyzer to the GPIB-SCSI-A Controller, and then run `ibtstb` by entering the following command:

   ```
   ibtstb
   ```

If an error occurs in `ibtsta` or `ibtstb`, refer to Appendix B, *Troubleshooting*.

If no error occurs, the NI-488M driver is installed correctly.

Step 5. Develop Your Application

Once the driver software has been installed and verified successfully, you are ready to proceed with development of your GPIB-SCSI-A application software. As you begin developing your program, remember these points:

- The first `ibfind` will exhibit a delay of a few seconds. This delay is due to operating system constraints with respect to scanning the SCSI bus for the existence of a GPIB-SCSI-A box.

- The file `cib.c` is the interface between your C language application program and the operating system entry points to the NI-488M GPIB-SCSI-A driver. To use the NI-488M functions, you must either compile `cib.c` and include the resulting object file during the link phase of each application compile operation, or link the GPIB library `libgpib` as shown in the following examples.

  ```
  cc test.c cib.o
  ```

  or

  ```
  cc test.c -lgpib
  ```

- Your application program must include `<sys/ugpib.h>`.

- The NI-488M functions are compatible with any other NI-488M functions used with other National Instruments products, except for the following functions. These functions are not supported by the NI-488M software for the GPIB-SCSI-A:

  `ibdma`

  `ibsgnl`

Appendix A
Hardware Specifications

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

Table A-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 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

Table A-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 A-3. Physical Characteristics

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

Appendix B
Troubleshooting

This appendix suggests some areas to check if you have problems installing the GPIB-SCSI-A or the NI-488M software after going through Chapter 2, *Hardware Configuration and Installation* and Chapter 3, *Software Installation and Configuration.*

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

Hardware

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

- Make sure the GPIB-SCSI-A Controller is securely connected to the SCSI cable.
- 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 Chapter 2, *Hardware Configuration and Installation* for more information.)
- Check the DIP switch settings on the GPIB-SCSI-A Controller. Make sure that SW1 is set to the correct SCSI ID, and the correct GPIB primary address. SW2 should not be changed from its factory default setting. (See *Configure the Hardware* in Chapter 2, *Hardware Configuration and Installation* for more information.)
- Make sure that the GPIB-SCSI-A is powered on.
- Make sure that the total cable length in the SCSI system does not exceed 6 m.

- Make sure that the total cable length in the GPIB system does not exceed 20 m.

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

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

Software

- Make sure that the SCSI ID of the GPIB-SCSI-A is not used by any other device.

- Record any error messages that appear in `/usr/adm/SYSLOG`.

- If `lboot` reports the following error, you need to free up some disk space from your hard drive.

```
/var/sysgen/root/usr/bin/ld:
Fatal error in writing to final object file (No space
left on device)
Fatal error in writing to final object file (No space
left on device)
lboot: ld returned 256--failed
```

  Look for unnecessary files or core files first. If you are unsure of which files you can safely delete, consult with the expert on Silicon Graphics computers in your organization, or contact Silicon Graphics customer support. If you still need more room, you may remove your `unix.bak` file before trying `lboot` again.

Appendix C
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: (512) 794-5678

Branch Offices	**Phone Number**	**Fax Number**
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Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	519 622 9310	
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	90 527 2321	90 502 2930
France	1 48 14 24 24	1 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	95 800 010 0793	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	01635 523545	01635 523154

Technical Support Form

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

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

Name _____

Company _____

Address _____

_____

Fax (___)_____ Phone (___)_____

Computer brand _____

Model _____ Processor _____

Operating system _____

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 _____

(continues)

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. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

National Instruments Products

- GPIB-SCSI-A Model _____
- NI-488M Software Version Number on Distribution Medium _____
- SW1 Switch Setting _____
- SW2 Switch Setting _____
- Terminating Resistor Pack Installed (yes or no) _____

Other Products

- Application Programming Language _____
- IRIX Version _____
- Other SCSI devices in System and SCSI ID of each _____

  _____

  _____

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-488M™ Software for the Silicon Graphics Indigo^2/Indy Running IRIX**

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Part Number: **320795B-01**

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

(continues)

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Thank you for your help.

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Glossary

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

o	degrees
%	percent
A	amperes
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 of Electrical and Electronic Engineers
in.	inches
lb	pounds
LED	light-emitting diode
MB	megabytes of memory
m	meters
RAM	random-access memory
SCSI	Small Computer System Interface (bus)
UL	Underwriters Laboratories

V	volts
VAC	volts alternating current
VDC	volts direct current