# USER'S GUIDE

# LSI21002 PCI to Dual Channel SCSI Host Adapter

*Version 1.1*

**November 2000**

LSI LOGIC®

S14001.A

## Electromagnetic Compatibility Notices

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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 the 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.

Shielded cables for SCSI connection external to the cabinet are used in the compliance testing of this Product. LSI Logic is not responsible for any radio or television interference caused by unauthorized modification of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by LSI Logic. The correction of interferences caused by such unauthorized modification, substitution, or attachment will be the responsibility of the user.

The LSI Logic LSI21002 is tested to comply with FCC standards for home or office use.

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.

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This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

LSI Logic Corporation
North American Headquarters
Milpitas, CA
408.433.8000

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This document describes the LSI Logic LSI21002 PCI to Dual Channel SCSI Host Adapter and will remain the official reference source for all revisions/releases of this product until rescinded by an update.

**To receive product literature, visit us at http://www.lsilogic.com.**

# Preface

This book is the primary reference and user's guide for the LSI Logic LSI21002 PCI to Dual Channel SCSI Host Adapter. It describes how to install and configure the LSI21002 host adapter board in a PCI computer system. Basic information on setting up the SCSI bus is also provided.

## LSI Logic Technical Support

The entire LSI Logic host adapter solution has been designed for ease of use. However, if you require additional assistance, please contact the LSI Logic Technical Support Hot Line at (719) 533-7230. The hours of operation are from 7:30 a.m. to 4:30 p.m. (MST), Monday through Friday.

Before calling, please have the following information:

- Which LSI Logic host adapter are you installing?
- What system are you installing into?
- What SCSI devices are you connecting to the bus?
- How is your system configured?

It is also helpful if you are at your system when you call.

## Organization

This document has the following chapters and appendixes:

- Chapter 1, **Using the LSI21002**, defines the interfaces and characteristics of the LSI21002.
- Chapter 2, **Installing the LSI21002**, provides quick and detailed installation instructions.

- Chapter 3, **Configuring the Host Adapter**, describes the SCSI BIOS Configuration Utility to configure adapter and device settings.
- Appendix A, **Technical Specifications**, describes the physical and operational environments of the LSI21002.
- Appendix B, **Glossary**, provides definitions of various terminology that is referenced throughout this user's guide.

## Related Publications

*PCI Storage Device Management System SDMS 4.0 User's Guide,* Order Number S14007.A

## Revision Record

| Revision | Date | Remarks |
|---|---|---|
| 1.0 | 3/99 | Final version. |
| 1.1 | 11/00 | All product names changed from SYM to LSI. |

# Contents

**Figures**

**Tables**

# Chapter 1
# Using the LSI21002

This chapter describes the LSI21002 PCI to Dual Channel SCSI Host Adapter interfaces to PCI computer systems and includes these topics:



## 1.1 General Description

The LSI21002 provides internal and external SCSI interfaces to PCI computer systems that require BIOS support on the add-in SCSI adapter. It will be referred to as the LSI21002 throughout this manual. Installing the LSI21002 in your PCI system allows connection of SCSI devices over a SCSI bus.

The dual channel LSI21002 provides 16-bit Low Voltage Differential (LVD) and Single-Ended (SE) SCSI solutions for your computer, using only one PCI slot. This board supports legacy Fast SCSI devices, Ultra SCSI devices, and the newest Ultra2 SCSI devices.

Channel A supports only the SE mode. Channel B supports SE and LVD modes of operation.

The Storage Device Management System (SDMS™) software operates the board. The design of the board does not prevent other software from being used with it.

This guide, along with the *PCI Storage Device Management System SDMS 4.0 User’s Guide*, contains product information and installation instructions to help you gain the full benefits of the LSI21002.

## 1.2 Features

This section provides a high level overview of the PCI Interface, the SCSI Interface, and Board Characteristics for the LSI21002.

### 1.2.1 PCI Interface

- True PCI multifunction controller for maximum performance
- 32-bit (33 MHz) DMA bus master
- Bursts up to 128 Dwords across the PCI Bus
- Zero wait-state bus master data bursts up to 110 Mbytes/s (@33 MHz)
- Prefetches up to 8 Dwords of SCRIPTS instructions
- PCI Universal 3.3 V/5 V bus support
- Supports PCI write and invalidate, read line, and read multiple commands

### 1.2.2 SCSI Interface

- Two separate SCSI channels
- Wide Ultra2 SCSI LVD synchronous transfers as fast as 80 Mbytes/s (Channel B)
- Wide Ultra SCSI SE synchronous transfers as fast as 40 Mbytes/s (Channel A)
- SCSI synchronous offset up to 31
- Supports variable block size and scatter/gather data transfers
- 16-bit SE/LVD
- Four connectors:

  50-pin high density for the external Channel A

  50-pin narrow (ribbon) for internal Channel A

  68-pin high density for internal Channels A and B
- Fast, Ultra, and Ultra2 data transfer capability
- SCSI termination power (TERMPWR) source with auto-resetting circuit breaker and TERMPWR shorted LED for each channel

- Supports SE and LVD signaling with automatic termination
  - Channel A is SE only with autosense termination
  - Channel B is SE or LVD with termination permanently enabled
- Performs complex bus sequences without interrupts, including restore data pointers
- SCSI Plug and Play
- SCSI Configured AutoMatically (SCAM) See Chapter 3, "Configuring the Host Adapter," for details about SCAM capability
- Flash ROM for BIOS storage
- Serial EEPROM for each channel for user configuration utility and SCAM information storage
- SCSI activity LED for each channel
- LSI53C896 includes 8 Kbytes internal RAM per channel for SCRIPTS instruction storage

### 1.2.3 Board Characteristics

- PCI board dimensions
  Approximately 190.5 mm x 96.52 mm (7.5 x 3.8 inches)
- Universal 32-bit PCI card edge connector
- ISA/EISA bracket

## 1.3 Interface Descriptions

This section provides a more detailed explanation about the PCI Interface, the SCSI Interface, the SCSI Activity LED Interface, and Wide Ultra2 SCSI.

### 1.3.1 The PCI Interface

PCI is a high-speed standard local bus for interfacing a number of I/O components to a PC processor and memory subsystem. The PCI functionality for the LSI21002 is contained within the LSI53C896 PCI Dual Channel SCSI Multifunction Controller. The LSI53C896 connects directly to the PCI bus and generates timing protocol in compliance with the PCI specification.

The PCI interface operates as a 32-bit DMA bus master. The connection is made through edge connector J1 (see Figure 2.1). The signal definitions and pin numbers conform to the PCI Local Bus Specification Revision 2.1 standard. The LSI21002 conforms to the PCI universal signaling environment for a 5 V or 3.3 V PCI bus.

### 1.3.2 The SCSI Interface

The SCSI functionality for the LSI21002 is contained within the LSI53C896 chip. The LSI53C896 connects directly to the two SCSI buses for SE or LVD SCSI applications and generates timing and protocol in compliance with the SCSI standard. One SCSI interface operates at a burst transfer rate of up to 40 Mbytes/s for wide Ultra SCSI transfers, and the other up to 80 Mbytes/s for wide Ultra2 SCSI transfers.

Channel A is SE only with active autosensing termination. The Channel A interface is made through connectors J2, J3, and J4. Connector J2 is a 68-pin high density latching right angle receptacle for internal SCSI connections. Connector J3 is a 50-pin high density right angle receptacle that protrudes throughout the ISA/EISA bracket. Connector J4 is a 50-pin narrow (ribbon) internal connector.

Channel B may be either SE or LVD with active termination always enabled. The Channel B interface is made through connector J5. J5 is a 68-pin high density latching right angle connector for internal SCSI connections.

See Figure 2.1 for the location of these connectors.

The LSI21002 supplies SCSI bus TERMPWR through a blocking diode and self-resetting 1.5 A short circuit protection device. An on-board LED lights up when TERMPWR is shorted and has turned off.

A 40 MHz oscillator is installed on the LSI21002 to provide the clock frequency to the LSI53C896 that is necessary to support SCSI transfers.

### 1.3.3 SCSI Activity LED Interface

The LSI21002 LED interface is a four-wire arrangement that allows connection of an LED harness to the board. The connector on the LSI21002 is J6 for both channels. See Table A.7 in Appendix A for the signal name and pin numbers for this LED interface.

### 1.3.4 Wide Ultra2 SCSI

The LSI21002 has full support for Wide Ultra2 SCSI. This interface is an extension of the SCSI-3 family of standards that expands the bandwidth of the SCSI bus to allow faster synchronous data transfers, up to 80 Mbytes/s. Wide Ultra2 SCSI provides a doubling of the data rate over the Ultra SCSI interface, while it allows increased cable length and more devices than Ultra SCSI interfaces.

Special SCSI cables are specified for operation with Wide Ultra and Ultra2 SCSI devices, and you must consider the total number of devices and the length of your SCSI bus when setting up your system. The section on connecting your SCSI peripherals in Chapter 2, "Installing the LSI21002," provides a more detailed explanation of SCSI bus connections. See Table 1.1for maximum bus lengths in meters.

When you purchased the LSI21002 kit, the cable provided in the kit is matched for a Fast/Ultra/Ultra2 SE or LVD operation. This cable also has built-in LVD termination since most Ultra2 hard disk drives are not made with on-board LVD termination.

**Table 1.1 Standard Cables**

| Maximum Bus Length, Meters[1] | | | |
|---|---|---|---|
| STA Term | SE | LVD | Maximum Devices |
| Wide Ultra SCSI | 1.5 | see note[2] | 8 |
| Wide Ultra SCSI | 3 | see note[2] | 4 |
| Wide Ultra2 SCSI | see note[3] | 12 | 16 |

1. This parameter may be exceeded in point-to-point and engineered applications.
2. LVD was not defined in the original SCSI standards for this speed. If all devices on the bus support LVD, then 12-meter operation is possible at this speed. However, if any device on the bus is SE only, then the entire bus switches to SE mode, and the distances in the SE column apply.
3. SE and high power differential are not defined at Ultra2 speeds.

# Chapter 2
# Installing the LSI21002

This chapter describes installing the LSI21002 into PCI computer systems and includes these topics:



## 2.1 Quick Installation Procedure

This section provides quick setup instructions for the experienced computer user with prior host adapter installation and SCSI bus setup experience. If you prefer more detailed guidance for installing the LSI21002, please follow the instructions in Section 2.2, “Detailed Installation Procedure.”

For safe and proper installation, check the user’s manual that was supplied with your computer and perform the following steps.

Step 1. Before proceeding, ground yourself so that a static discharge does not damage the board. Remove the LSI21002 from the packing and check that it is not damaged. An example of this host adapter board is shown in Figure 2.1.

Step 2. Switch off and unplug the system.

Step 3. Remove the cabinet cover on your computer to access the PCI slots.

Caution. Ground yourself by touching a metal surface before handling boards. Static charges on your body can damage electronic components. Handle plug-in boards by the edge;

do not touch board components or gold connector contacts. The use of a static ground strap is recommended.

Step 4. Locate the slots for the PCI plug-in board installation. A 32-bit slot should be used. The LSI21002 will work in a 64-bit slot, but only 32 bits are used. The LSI21002 requires a PCI slot that allows bus master operation. See Figure 2.2.

Step 5. Remove the blank panel on the back of the computer aligned with the PCI slot that you intend to use. Save the bracket screw.

Step 6. Carefully insert edge connector J1 of the host adapter into the PCI slot. Make sure the edge connector is properly engaged before pressing the board into place. See the example shown in Figure 2.2.

Note. You may notice that the components on the PCI host adapter face the opposite way from those on other non-PCI plug-in boards you have in your system. This is correct, and the board is keyed to go in only one way.

Step 7. The bracket around connector J3 should fit where the blank panel was removed. Secure it with the bracket screw before making the internal and external SCSI bus connections (see Figure 2.2).

Step 8. If you are connecting any internal SCSI devices, plug a 68-pin connector on the end of the internal SCSI ribbon cable into connector J2 or J5, or plug a 50-pin connector into J4 for an 8-bit SCSI (see Figure 2.1). Make certain to match pin 1 on all connectors.

Note. It is possible to use both internal connectors if no external devices are attached to the host adapter. You may use only two of the three connectors at once.

Step 9. Connect your computer's LED cable if desired. This LED cable drives the front panel LED found on most PC cabinets to indicate activity on the SCSI bus. See Table A.7 in Appendix A for the signal name and pin numbers for this LED interface.

Step 10. Replace the cabinet cover as described in the user's manual for your computer.

Step 11. Make all external SCSI bus connections.

Remember: The SCSI bus requires proper termination and no duplicate SCSI IDs.

Step 12. Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* (or the guide for the software that you will use) to load the driver software for your particular operating system.

## 2.2 Detailed Installation Procedure

This section provides step-by-step instructions for installing your LSI21002 and connecting it to your SCSI peripherals. If you are experienced in these tasks, you may prefer to use Section 2.1, "Quick Installation Procedure." If you are not confident that you can perform the tasks as described here, LSI Logic suggests getting assistance.

### 2.2.1 Before You Start

Before you start, look through the task list below to get an overall idea of the steps to perform.

- Open your PC cabinet and select an open PCI slot
- Insert the host adapter
- Connect your internal and external SCSI peripherals
- Terminate the SCSI bus
- Set the peripheral SCSI IDs
- Make any configuration changes
- Replace your PC cabinet cover
- Install the software

The SCSI host adapter acts on your computer's behalf as the host to your suite of SCSI peripherals. Each chain of SCSI peripheral devices and their host adapter work together, and they are referred to as a SCSI bus.

### 2.2.2 Inserting the Host Adapter

For safe and proper installation, check the user's manual supplied with your computer and perform the following steps:

Step 1. Before proceeding, ground yourself so that a static discharge does not damage the board. Remove the LSI21002 from the packing and check that it is not damaged. An example of this host adapter board is shown in Figure 2.1.

Step 2. Switch off and unplug power cords for all components in your system.

Step 3. Remove the cabinet cover on your computer to access the PCI slots.

Caution: Ground yourself by touching a metal surface before removing the cabinet cover. Static charges on your body can damage electronic components. Handle plug-in boards by the edge; do not touch board components or gold connector contacts. The use of a static ground strap is recommended.

Step 4. Locate the slots for the PCI plug-in board installation. A 32-bit slot should be used. The LSI21002 will work in a 64-bit slot, but only 32 bits are used. The LSI21002 requires a PCI slot that allows bus master operation. See Figure 2.2.

Step 5. Remove the blank panel on the back of the computer aligned with the PCI slot that you intend to use. Save the bracket screw.

Step 6. Carefully insert edge connector J1 (see Figure 2.1) of the host adapter into the PCI slot. Make sure the edge connector is properly engaged before pressing the board into place as shown in Figure 2.2.

Step 7. You may notice that the components on the PCI host adapter face the opposite way from those on other non-PCI adapter boards you have in your system. This is correct, and the board is keyed to go in only one way.

Step 8. The bracket around connector J3 (see Figure 2.1) should fit where you removed the blank panel. Secure it with the bracket screw (see Figure 2.2) before making the internal and external SCSI bus connections.

**Figure 2.1 Hardware Connections for the LSI21002**

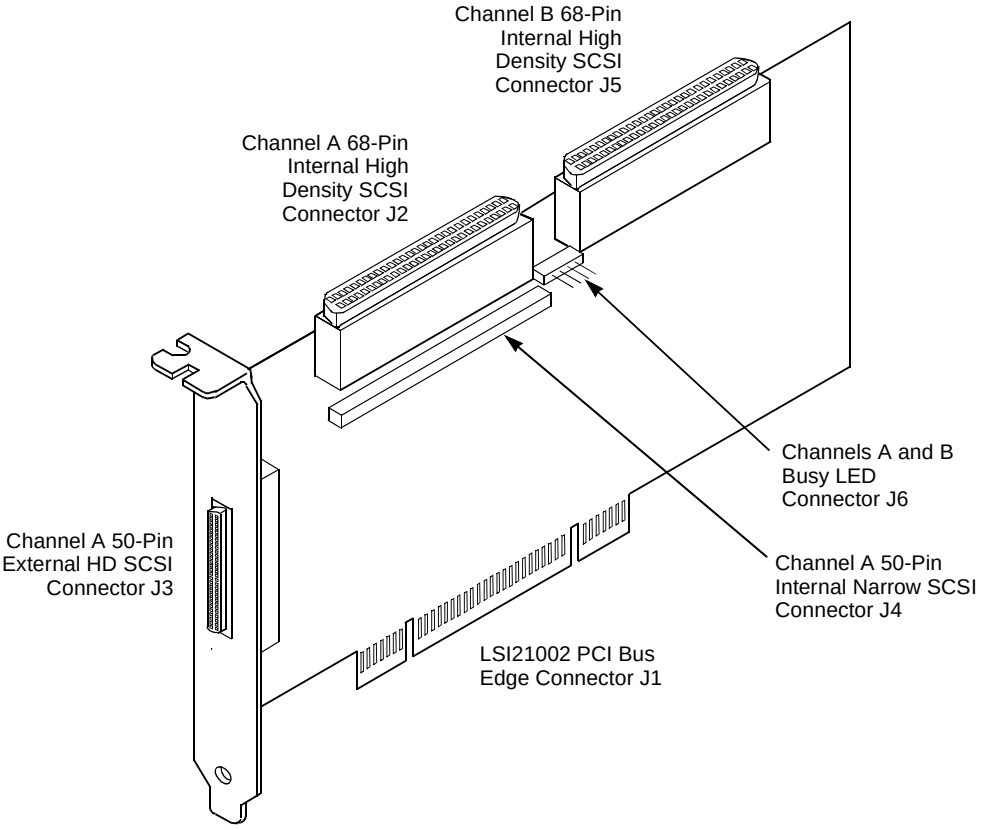
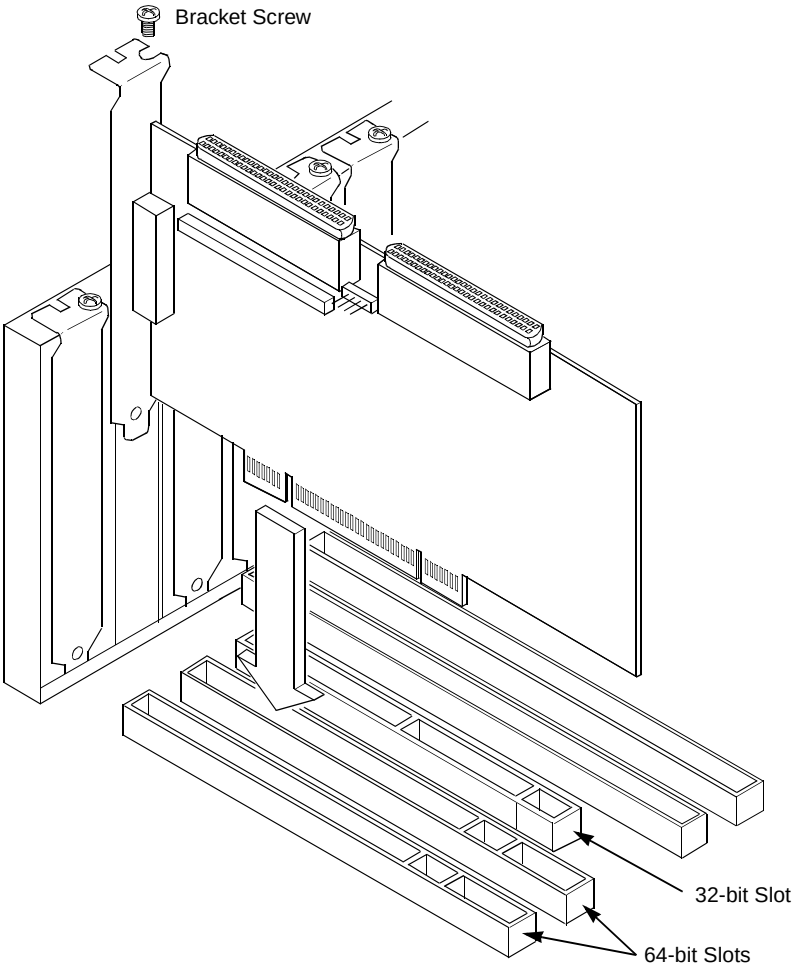


**Figure 2.2 Inserting the Host Adapter**



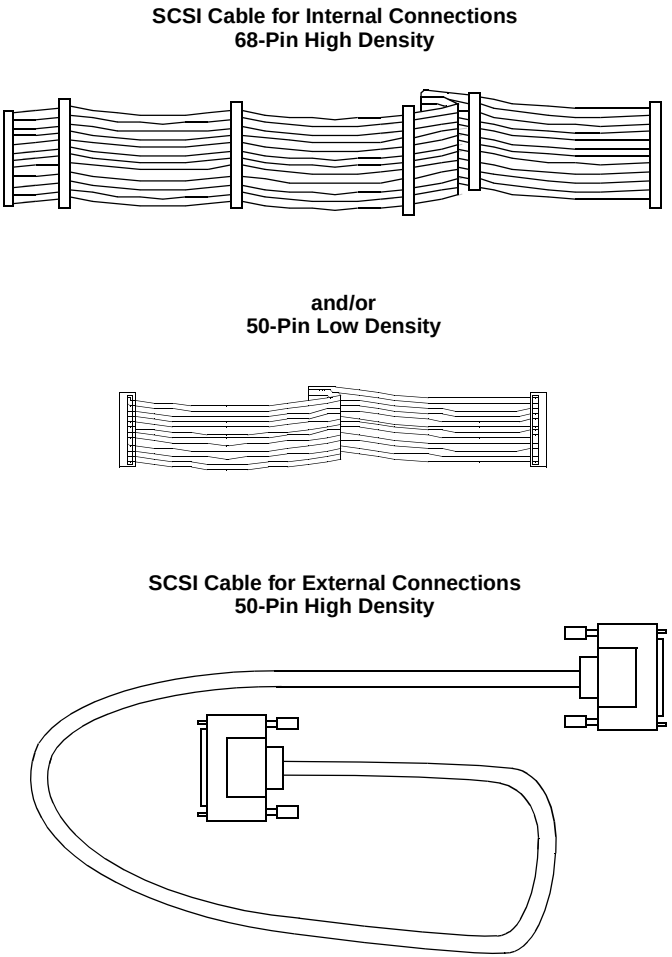

## 2.2.3 Connecting the SCSI Peripherals

All internal SCSI bus connections to the LSI21002 are made with an unshielded, 68- or 50-conductor ribbon cable (see Figure 2.3). One side of this cable is marked with a color to indicate the pin-1 side. The connectors on this cable are keyed to ensure a proper pin-1 connection. Use Ultra/Ultra2 rated cables for these bus speeds. (See Table 1.1 in Chapter 1.)

For convenience, Channel A also has a 50-pin narrow (ribbon) connector. Some internal cables come with an SE/LVD terminator on one end. This end should be furthest from the host adapter.

All external SCSI bus connections to the LSI21002 are made with a shielded, 50-pin high density cable (see Figure 2.3). The connectors on this cable are always keyed to ensure a proper pin-1 connection.

**Figure 2.3 SCSI Cables**

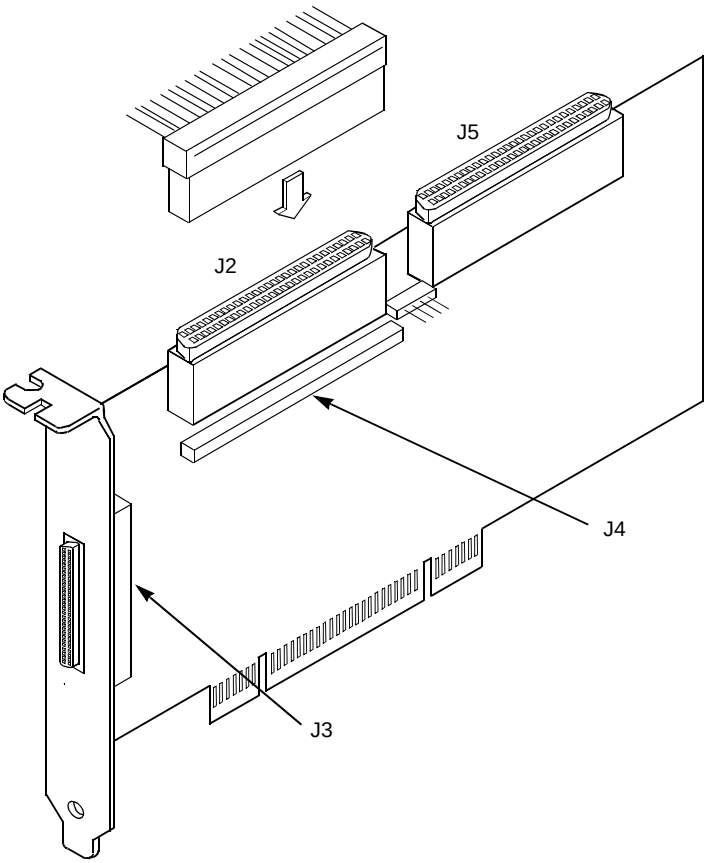


### 2.2.3.1 Making Internal SCSI Bus Connections

This section provides step-by-step instructions about making internal SCSI bus connections:

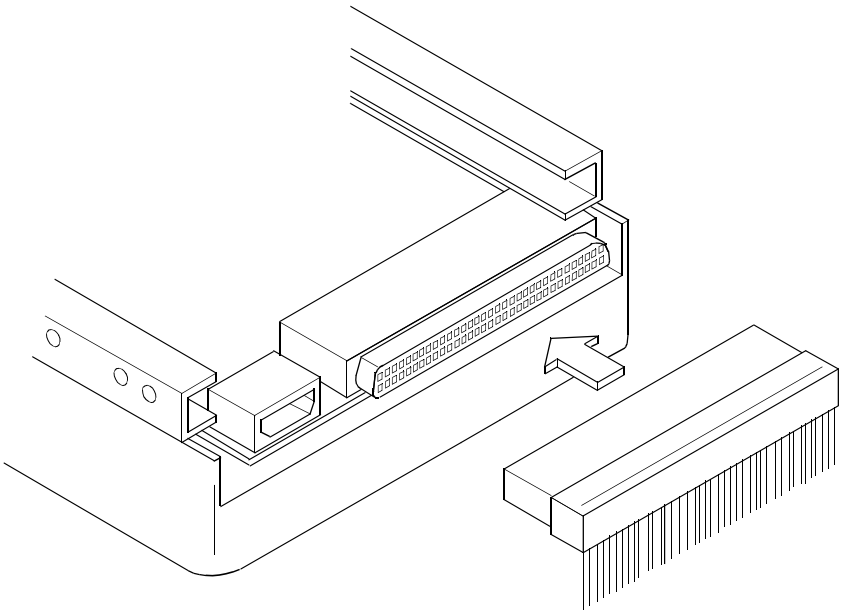
Step 1. To connect an internal SCSI device, plug the 68-pin connector end of a wide internal SCSI ribbon cable into connector J2 or J5. See the example in Figure 2.4.

**Figure 2.4 Internal SCSI Ribbon Cable to Host Adapter**



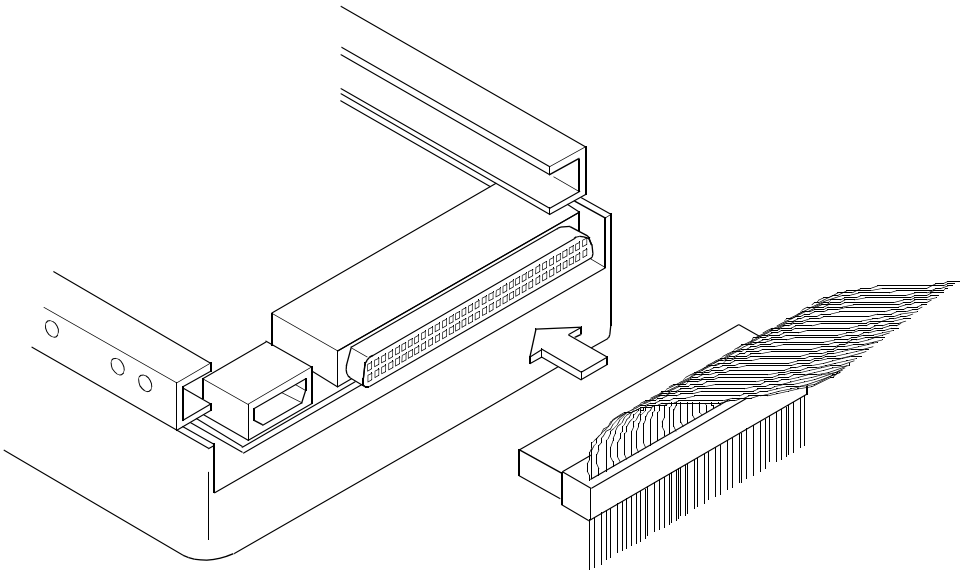
Step 2. Plug the 68-pin connector on the other end of the wide internal SCSI ribbon cable into the SCSI connector on the internal SCSI device. Pin 1 must match on all connections. An example of this connection appears in Figure 2.5.

**Figure 2.5 Internal SCSI Ribbon Cable to Internal SCSI Device Connection**



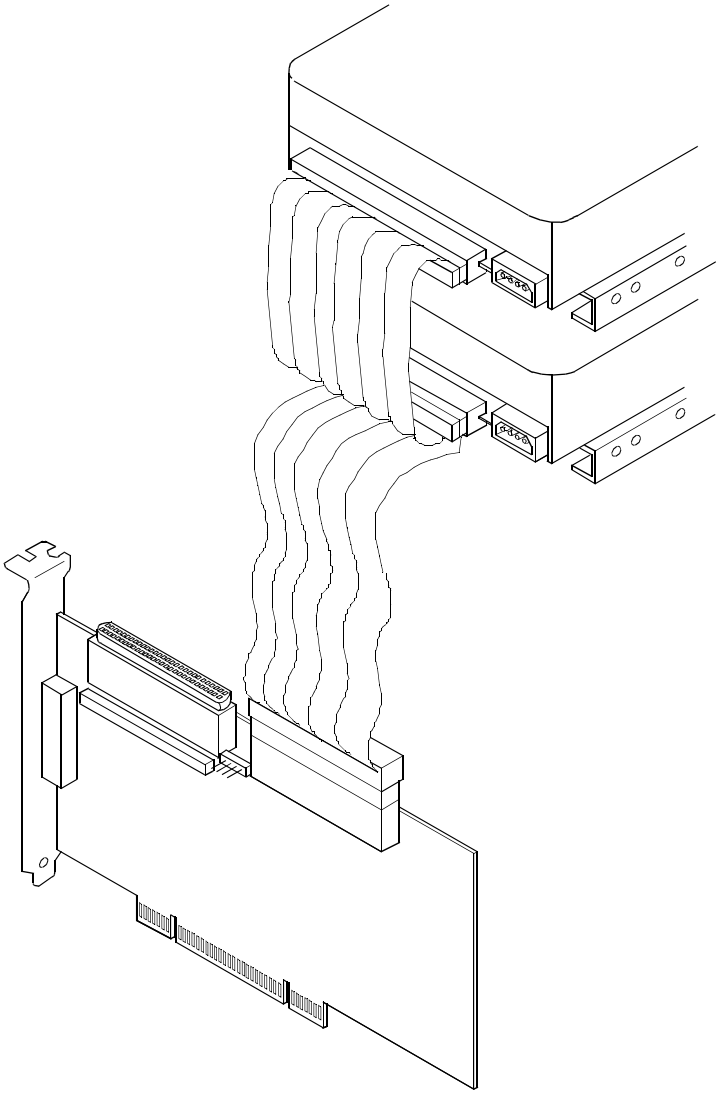
Step 3. To plug in additional internal SCSI devices, use an internal SCSI ribbon cable with the required number of connectors attached along its length. See the example in Figure 2.6.

**Figure 2.6 Connecting Additional Internal SCSI Devices**



An example of multiple internal SCSI devices chained together is shown in Figure 2.7. Make sure to match pin 1 on all connections.

**Figure 2.7 Multiple Internal SCSI Devices Chained Together**



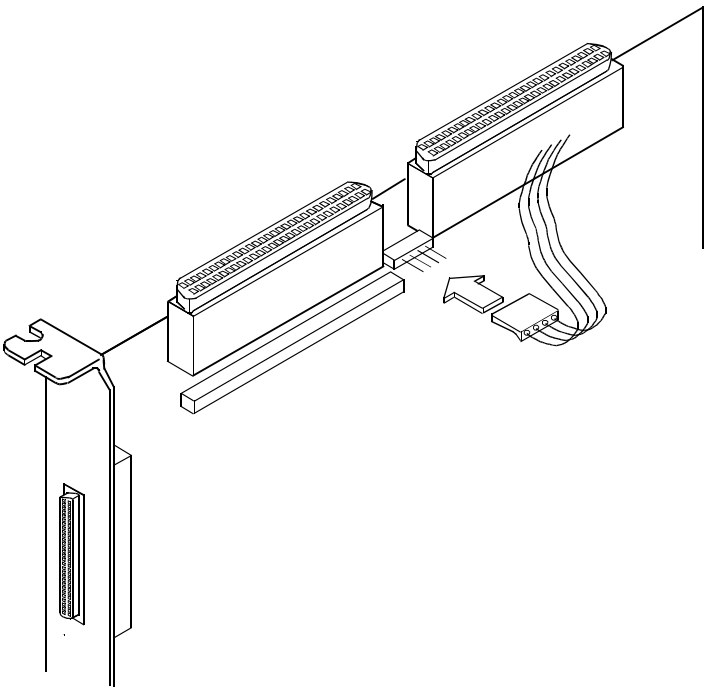
Step 4. Most PC cabinets are designed with a front panel LED, which may already be connected to an existing IDE controller. You may connect this LED cable to your SCSI host adapter, as shown in Figure 2.8. This connection causes the front panel LED to indicate activity on the SCSI bus.

The Busy LED connector J6, shown in Figure 2.1, is not keyed. The J6 connector is a 4-pin one row right angle header for both Channel A and Channel B.

Some LED cables have only two wires. In this case, place the connector on one end of J6. If the LED does not light during SCSI bus activity from this host adapter, you may have to rotate the LED connector 180° on J6.

See Table A.7 in Appendix A for connector pinout information.

**Figure 2.8 SCSI LED Connector**



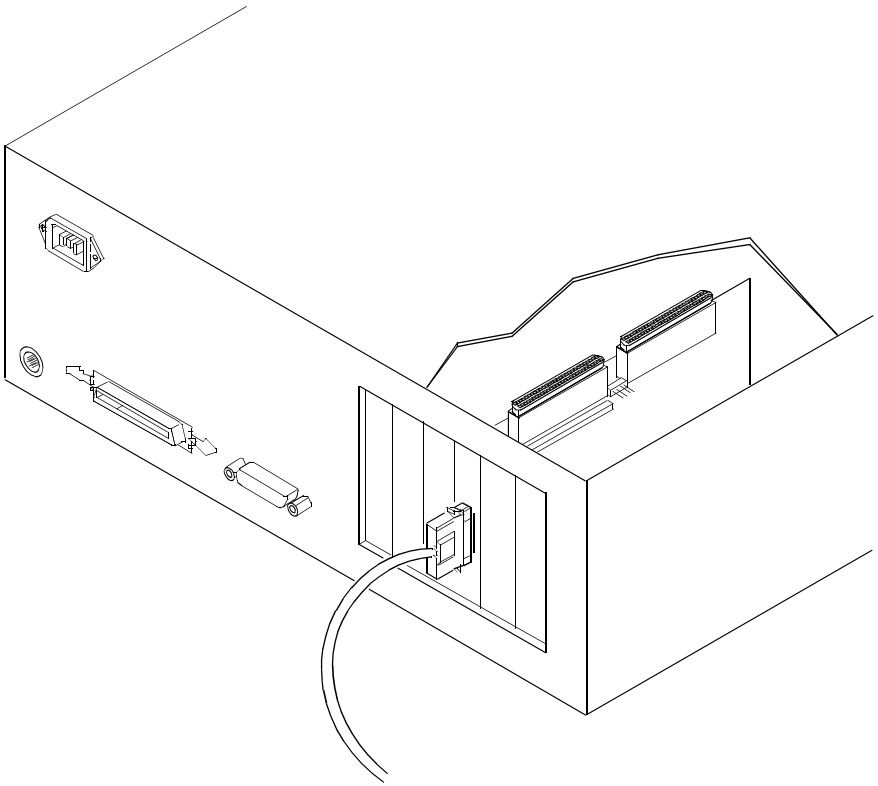
### 2.2.3.2 Making External SCSI Bus Connections

This section provides step-by-step instructions about making external SCSI bus connections:

Step 1. To connect external SCSI devices to the LSI21002, plug the 50-pin high density connector on one end of a shielded external high density cable (see Figure 2.3) into the host adapter connector J3 (see Figure 2.1 and Figure 2.9).

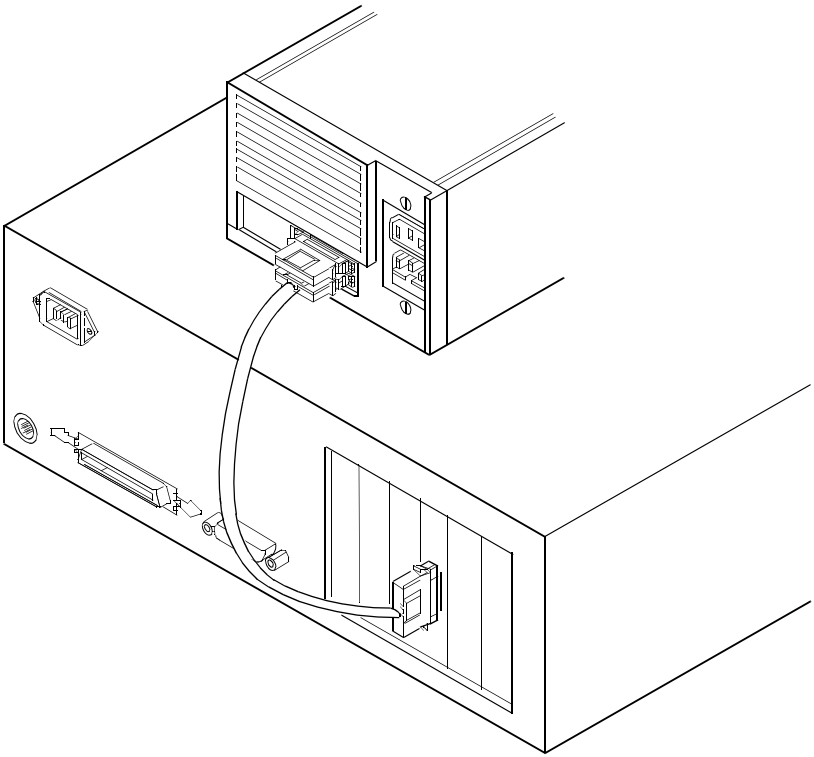
This connector is now bracketed onto the back panel of your computer. Figure 2.9 shows this connection.

**Figure 2.9 External Cable to Host Adapter**



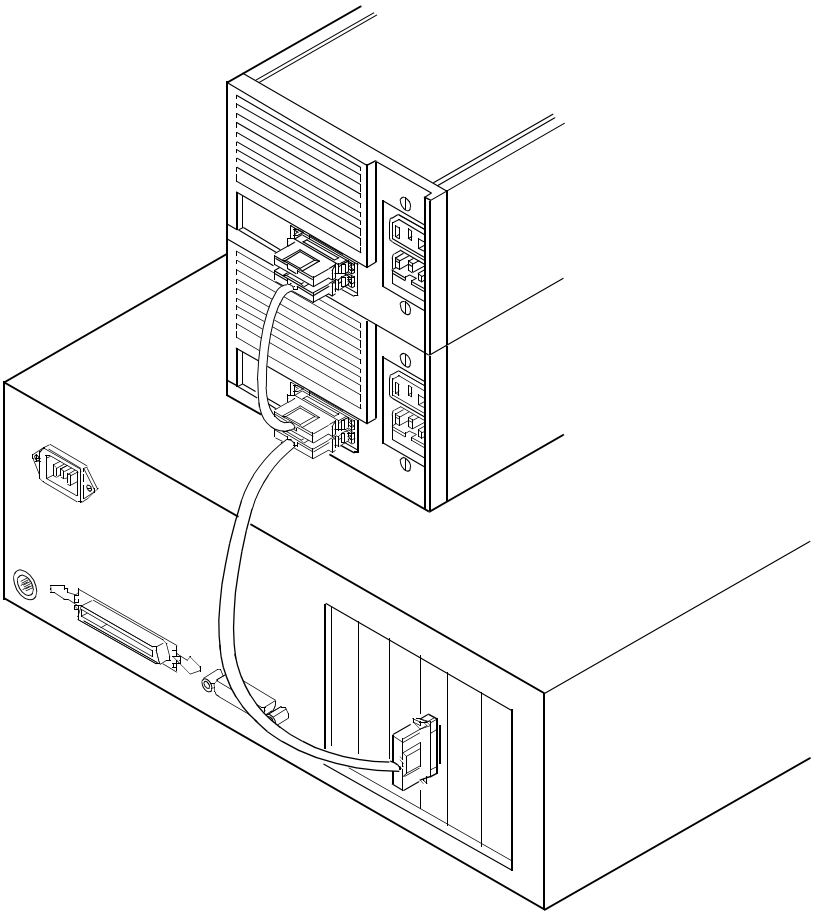
Step 2. Plug the 50-pin high density connector on the other end of the shielded external SCSI cable into the SCSI connector on the external SCSI device. An example of this connection is shown in Figure 2.10.

**Figure 2.10 External Cable to External SCSI Device**



Step 3. To connect more than one external SCSI device to the host adapter, chain them together with shielded external SCSI cables. See the example in Figure 2.11.

**Figure 2.11 Multiple External SCSI Devices Chained Together**



## 2.2.4 SCSI Bus Termination

The devices that make up the SCSI bus are connected serially (chained together) with SCSI cables. The first and last physical SCSI devices connected on the ends of the SCSI bus must be terminated. All other SCSI devices on the bus must have their terminators removed or disabled.

Remember: The LSI21002 is also on the SCSI bus, and its termination is automatically enabled when it is connected to the end of the bus.

LVD peripheral devices are normally terminated with external terminators, but are sometimes set with jumpers or with a switch on the peripheral. Refer to the peripheral manufacturer's instructions and to your computer user's manual for information on how to identify the terminator setting of each device and how to change it.

Caution: The autoenable/disable sensing feature of Channel A on the LSI21002 may enable termination erroneously if it is directly cabled to another SCSI device or host adapter using the same sensing method. The LSI21002 senses SCSI devices by detecting the ground signal on conductor 50 of a 68-conductor SCSI cable or conductor 22 of a 50-conductor SCSI cable. Only the SE/LVD terminators on Channel B will always remain on.

When connecting another host adapter to a connector, termination must be disabled on the board that is not at the end of the bus through software control.

The LSI21002 automatically controls SCSI bus termination for four different bus configurations, depending on the use of connectors (see Figure 2.1). The four bus configurations are:

- Only for internal SCSI connections,
- Only for an external SCSI connection, and
- Connections to both internal and external SCSI connectors
- Connections to both internal connectors.

Termination on the LSI21002 for these four different bus configurations are discussed below. Please note that only SE termination control is allowed on Channel A.

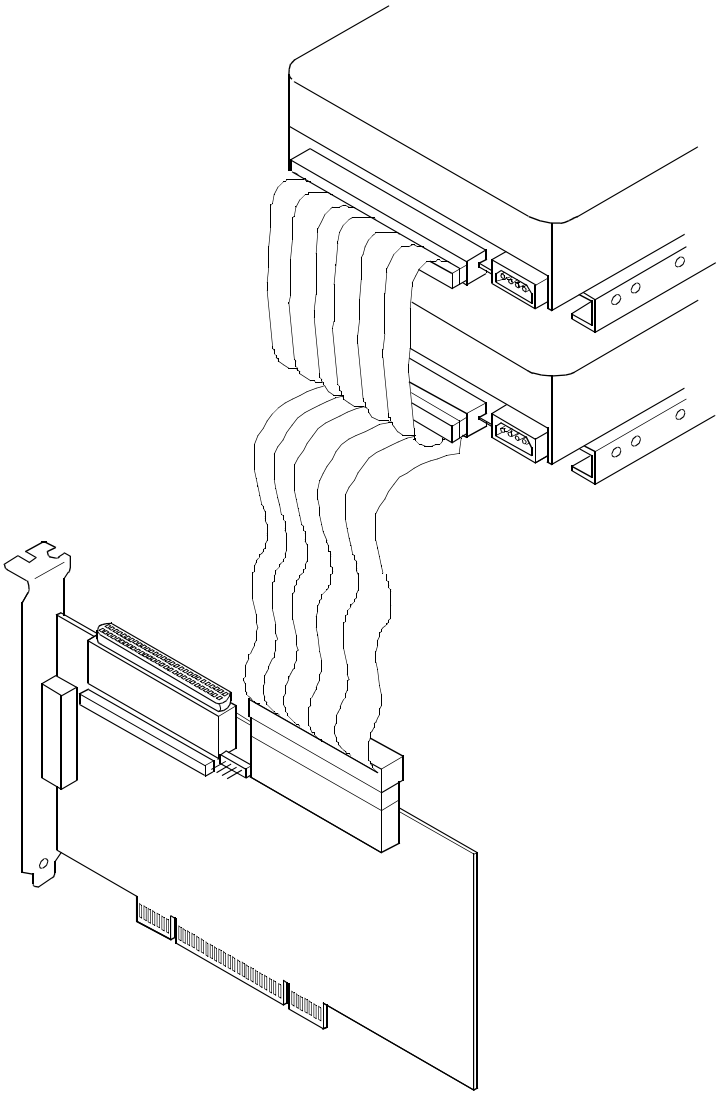
#### 2.2.4.1 Internal SCSI Connections

If only internal SCSI device connections on the host adapter have been made, then terminate the last internal device on the SCSI bus. You must disable the termination on all other devices. Termination on the LSI21002

is automatically enabled for Channel A. The termination for Channel B is enabled all the time.

Figure 2.12 shows an example of how termination is determined for this SCSI bus configuration.

**Figure 2.12 Internal SCSI Device Termination**

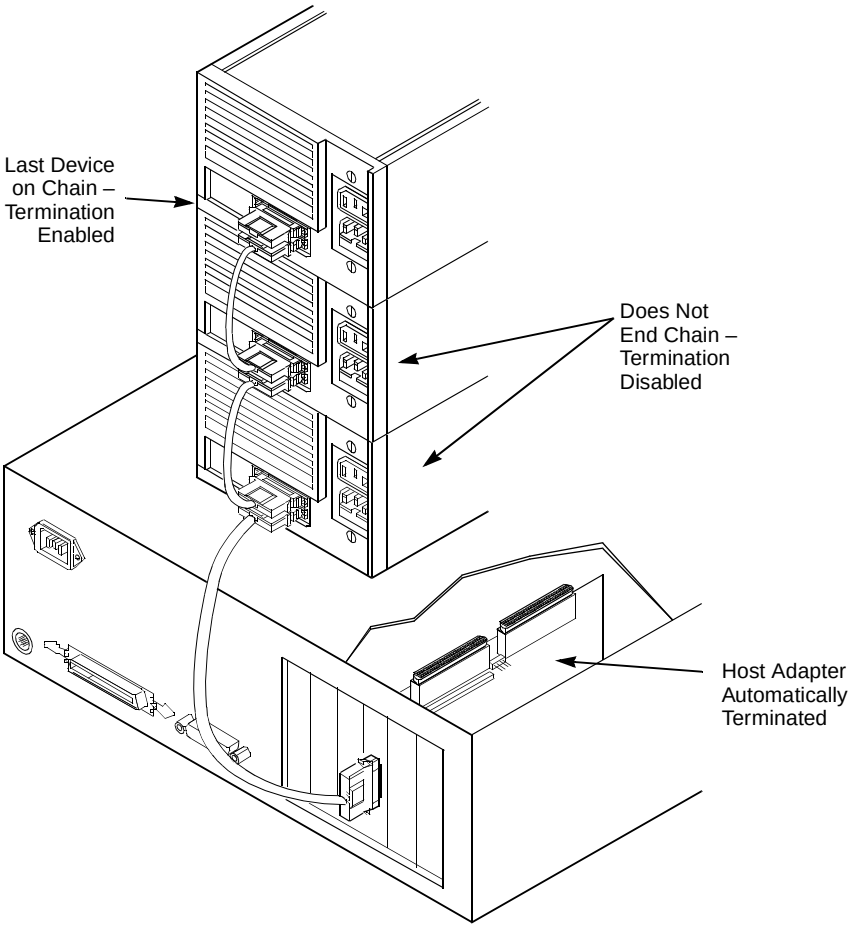


### 2.2.4.2 External SCSI Connections

If only external SCSI device connections to the host adapter have been made, then terminate the last external device on the SCSI bus. You must disable the termination on all other devices. Termination on the host adapter is automatically enabled for Channel A.

Figure 2.13 shows an example of how termination is determined for this SCSI bus configuration on the host adapter external Channel A.

**Figure 2.13 External SCSI Device Termination**

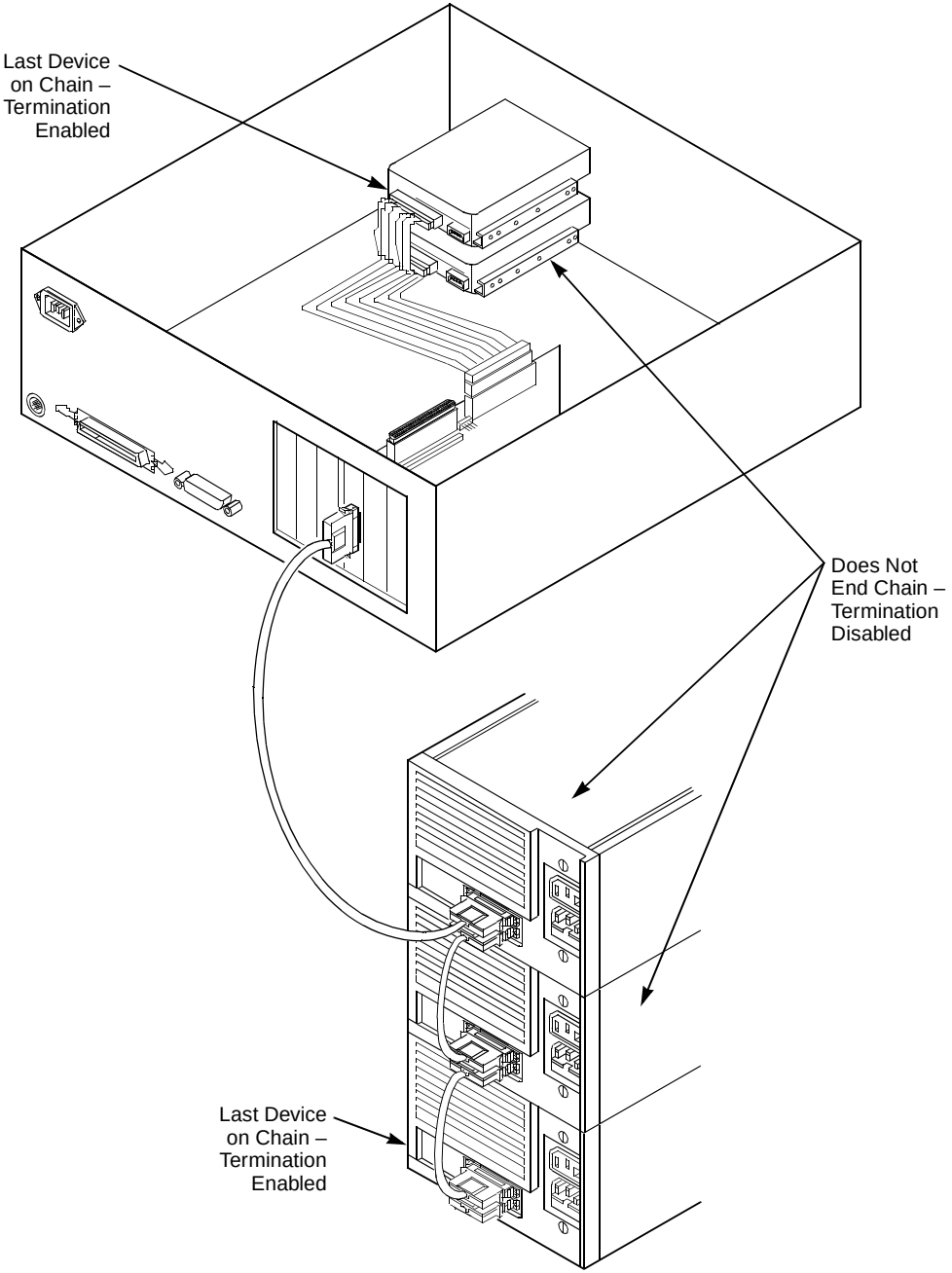


#### 2.2.4.3 Internal and External SCSI Connections

If internal and external SCSI devices are connected to the host adapter, then terminate the last internal and external devices on the SCSI bus. You must disable the termination on all other devices. Termination on Channel A of the host adapter is automatically disabled in this case.

Figure 2.14 shows an example of how termination is determined for this SCSI bus configuration on the host adapter internal Channel A and external Channel A.

**Figure 2.14 Internal and External SCSI Device Termination**

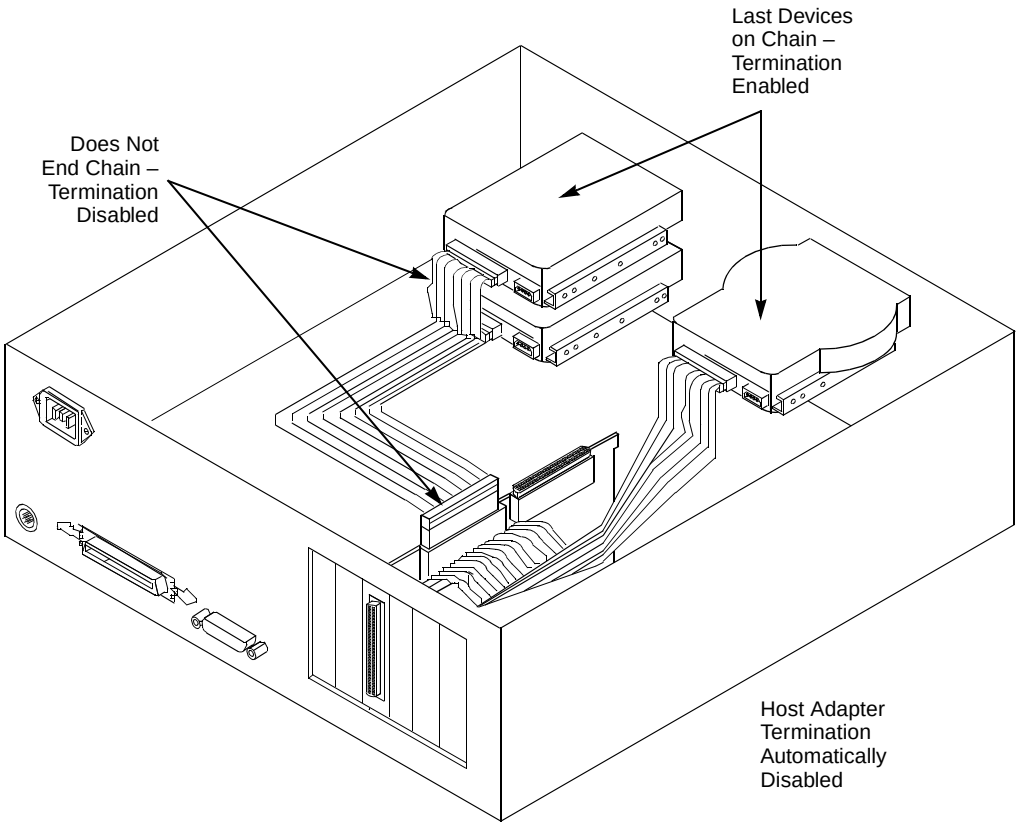


### 2.2.4.4 Internal SCSI Connections for both Internal Connectors

If internal SCSI device connections to both internal connectors (J2 and J4) on your host adapter have been made, then terminate the internal devices on each end of the SCSI bus. You must disable the termination on all other devices. Termination on Channel A of your host adapter is automatically disabled in this case. Remember, you must not use the external connector J3 if you use both internal connectors.

Figure 2.15 shows an example of how termination is determined for this SCSI bus configuration

**Figure 2.15 Internal and Internal SCSI Device Termination**



### 2.2.4.5 Setting SCSI IDs

You must set each SCSI device and the host adapter to a separate SCSI ID, 0–15 for a 16-bit SCSI. SCSI ID 7 is the preset host adapter setting, giving it the highest priority on the SCSI bus. If you plan to boot your computer from a hard disk drive on the SCSI bus, that drive should have SCSI ID 0, or the lowest SCSI ID on the bus. Chapter 3, "Configuring the Host Adapter," explains how to set the host adapter ID using the LSI Logic SCSI BIOS Configuration Utility.

The peripheral device SCSI IDs are usually set with jumpers or with a switch on the peripheral. Refer to the peripheral manufacturer's instructions and to the user's manual for your computer to determine the ID of each device and how to change it. You must have no duplication of SCSI IDs on a SCSI bus.

Note: SCAM support is turned off by default for the BIOS version 4.11.00 and above. You may choose to turn this on to assist in assigning SCSI IDs.

Determine the SCSI ID of each device on the SCSI bus. Note any duplications.

Make any necessary changes to the SCSI IDs and record the IDs for future reference. Table 2.1 is provided as a place to keep this record.

**Table 2.1 SCSI ID Record**

| SCSI ID | SCSI Device Channel A | SCSI Device Channel B |
|---|---|---|
| 15 | | |
| 14 | | |
| 13 | | |
| 12 | | |
| 11 | | |
| 10 | | |
| 9 | | |
| 8 | | |
| 7 | LSI21002 (default) | LSI21002 (default) |
| 6 | | |
| 5 | | |
| 4 | | |
| 3 | | |
| 2 | | |
| 1 | | |
| 0 | | |

## 2.3 Setting Interrupts (Exceptional Cases)

Normally, you do not change the default interrupt routing for the LSI21002, since performance is usually increased by having two separate interrupts.

However, if your system does not support two separate interrupts, INTA/INTB/ (see Figure A.1) is provided to change the interrupt routing. This capability requires enabling the INTA/INTB/ to act as a jumper for special configuration purposes. This feature is not packaged with the standard LSI21002, as the default interrupt routing is sufficient for most systems.

In the exceptional case, where a user would require jumper settings, Table 2.2 explains these settings:

**Table 2.2 Setting Interrupts**

| Jumper Setting | Condition |
|---|---|
| Jumper Out (default)  | SCSI Channel B is routed to INTB/ on the PCI bus |
| Jumper In  | SCSI Channel B is rerouted to INTA/ on the PCI bus |

Contact Technical Support for further information concerning jumper settings for this board.

## 2.4 Completing the Installation

Before replacing the cover on your computer, review this installation procedure check list. This can save you effort later.

| Verify Installation Procedures | Done |
|---|---|
| Host adapter connection in PCI bus slot secure | |
| Internal SCSI bus connections secure (pin-1 continuity) | |
| External SCSI bus connections secure | |
| Proper SCSI bus termination established | |
| Unique SCSI IDs set and recorded for each device | |

Step 1. Replace the computer cover.

Step 2. Plug in all power cords, and switch on power to all devices and your computer.

Step 3. Wait for your computer to boot up.

Step 4. To change the configuration of the host adapter, see Chapter 3, "Configuring the Host Adapter."

Step 5. Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* (or the guide for the software that you plan to use) to load the driver software for your particular operating system.

# Chapter 3
# Configuring the Host Adapter

This chapter describes configuring the LSI21002 and includes these topics:



## 3.1 When to Configure the LSI21002

In most cases you should not need to change the default configuration of your host adapter. You may decide to alter these default values if there is a conflict between device settings, or if you need to optimize system performance.

Table 3.1 and Table 3.2 list the configuration settings you can change. The global settings effect your host adapter and all SCSI devices that are connected to it. The device settings affect only individual SCSI devices.

**Table 3.1 Global Default Settings**

| Settings for the Host Adapter and All Devices | Default Settings |
|---|---|
| SCAM Support | Off[1] |
| Parity Checking | Enabled |
| Host Adapter SCSI ID | 7 |
| Scan Order | Low to High (0-Max) |

1. After 4.11.00 version of the BIOS.

**Table 3.2 Device Default Settings**

| Settings for Individual SCSI Devices | Default Settings |
|---|---|
| Synchronous Transfer Rate (Mbytes/s) | 40 or 80 |
| Data Width | 16 |
| Disconnect | On |
| Read/Write I/O Time-out (seconds) | 10 |
| Scan for Devices at Boot Time | Yes |
| Scan for SCSI LUNs | Yes |
| Queue Tags | On |

## 3.2 Starting the SCSI BIOS Configuration Utility

If you have SCSI BIOS Version 4.XX, and it includes the LSI Logic SCSI BIOS Configuration Utility, you can change the default configuration of your SCSI host adapters. You may decide to alter these default values if there is a conflict between device settings or if you need to optimize system performance.

You can see the version number of your SCSI BIOS in a banner displayed on your computer monitor during boot. If the utility is available, the following message also appears on your monitor:

```
Press Ctrl-C to start LSI Logic Configuration Utility...
```

This message remains on your screen for about five seconds, giving you time to start the utility. If you decide to press “Ctrl-C,” the message changes to:

```
Please wait, invoking LSI Logic Configuration Utility...
```

After a brief pause, your computer monitor displays the Main Menu of the LSI Logic SCSI BIOS Configuration utility.

NonVolatile Random Access Memory (NVRAM) is provided on the LSI53C896 SCSI device.

Important: This utility is a powerful tool. If, while using it, you somehow disable all of your controllers, pressing Ctrl-A (or Ctrl-E on version 4.04 or later) after memory initialization during reboot allows you to re-enable and reconfigure.

Not all devices detected by the Configuration Utility can be controlled by the BIOS. Devices such as tape drives and scanners require that a device driver specific to that peripheral be loaded. This device driver is provided by the device manufacturer.

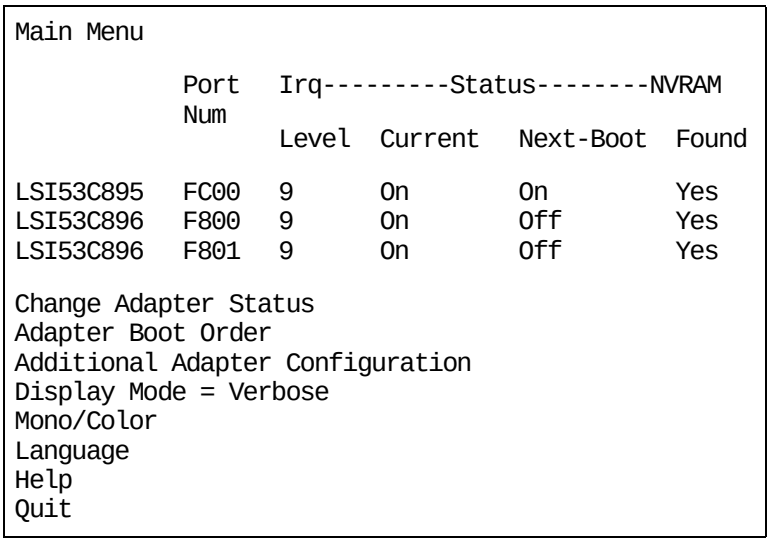
### 3.2.1 Configuration Utility Main Menu

When you start the LSI Logic SCSI BIOS Configuration Utility, the Main Menu appears. This menu displays a list of up to four LSI Logic PCI to SCSI host adapters and information about each of them. The LSI21002 appears on the menu as two LSI53C896 entries; one for each channel. To select an adapter, use only the arrow keys and enter key. Then, you can view and/or change the current settings for that adapter and the SCSI devices attached to it.

You can select an adapter only if Current Status is “On”. Changes are possible since NVRAM is present on this host adapter.

Figure 3.1 is an example of the Main Menu:

**Figure 3.1 Main Menu**




Below the list of host adapters on the Main Menu display, you see eight options. They are described in detail below. If these settings are altered, the system reboots upon exit from the Configuration Utility using the Quit option.

### 3.2.1.1 Change Adapter Status

Change Adapter status allows you to activate or deactivate a host adapter and all SCSI devices attached to it. When this option is used to make a change, the change takes place after a reboot that is automatic upon exit from the utility.

Figure 3.2 is an example of the Change Status on Next Boot menu:

**Figure 3.2 Change Status on Next Boot Menu**

```
Main Menu

Change Status on Next Boot:

            Port   Irq---------Status--------NVRAM
            Num
                   Level  Current   Next-Boot  Found

LSI53C895   FC00   9      On        On         Yes
LSI53C896   F800   9      On        Off        Yes
LSI53C896   F801   9      On        Off        Yes
```

To change an adapter's status, select it and press Enter. Then press the Escape (Esc) key to exit from this menu.

### 3.2.1.2 Adapter Boot Order

Adapter Boot Order allows you to set the order in which host adapters will boot when you have more than one LSI Logic host adapter in your system. When this option is selected, the Boot Order Menu appears.

Figure 3.3 is an example of the Boot Order Menu:

**Figure 3.3 Boot Order Menu**

```
 Main Menu

 BootSeq      Bus  DevFunc  BootSeq             Bus  DevFunc

0  LSI53C895  00   A0       1        LSI53C896  00   98

2  LSI53C896  00   90
```

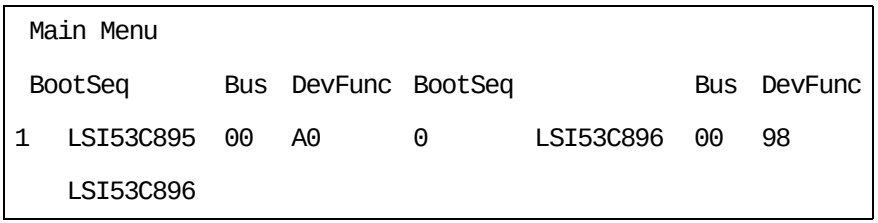
To change an adapter's boot order, select it and press Enter. You are then prompted to enter the new boot sequence number. To remove an adapter's boot order, press Enter again rather than entering a new sequence number. While the maximum capacity is 32 adapters, only 0 through 3 can be assigned a boot order. If an invalid number is entered, an error message appears. When the adapters are ordered as desired, press the Escape (Esc) key to exit from this menu.

### 3.2.1.3 Additional Adapter Configuration

Additional Adapter Configuration allows you to configure an adapter that is not assigned a boot order. When this option is selected, the Adapter Configuration Menu appears.

Figure 3.4 is an example of the Adapter Configuration Menu:

**Figure 3.4 Adapter Configuration Menu**




Highlight the adapter to be configured and press `Enter`. The message `Resetting Adapter, Please wait` appears, and then the system scans for devices. The Utilities Menu appears and lists the available options, which are described below.

### 3.2.1.4 Display Mode

Display Mode determines how much information about your host adapters and SCSI devices appear on your computer monitor during boot. For more complete information, choose the verbose setting. For a faster boot, choose the terse setting.

### 3.2.1.5 Mono/Color

Mono/Color allows the user to choose between a monochrome or color display for the SCSI BIOS Configuration Utility. If needed, choose the mono setting to get a more readable screen on a monochrome monitor.

### 3.2.1.6 Language

If enabled, the Language option allows you to select from five languages for the Configuration Utility: English, German, French, Italian, and Spanish. Call Technical Support if you have any additional questions.

#### 3.2.1.7 Help

The Help option allows the user to bring up a help screen with information about the Main Menu.

#### 3.2.1.8 Quit

The Quit option allows exiting from the SCSI BIOS Configuration Utility when the Main Menu is displayed.

#### 3.2.1.9 Esc

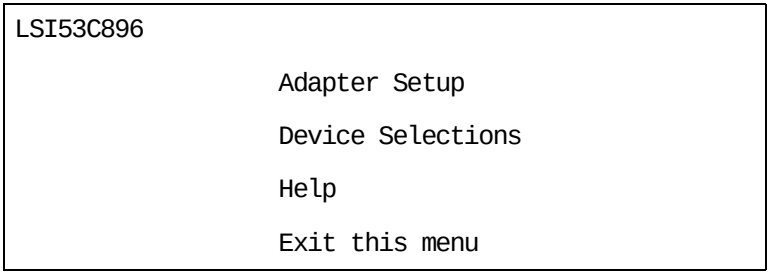
Pressing the Esc key allows exiting from all the screens except the Main Menu.

### 3.2.2 Utilities Menu

When you select a host adapter on the Main Menu, the Utilities Menu appears.

Figure 3.5 is an example of the Utilities Menu:

**Figure 3.5 Utilities Menu**




Choose Adapter Setup to view and change the selected adapter settings. Choose Device Selections to view and change settings for the devices attached to the selected adapter.

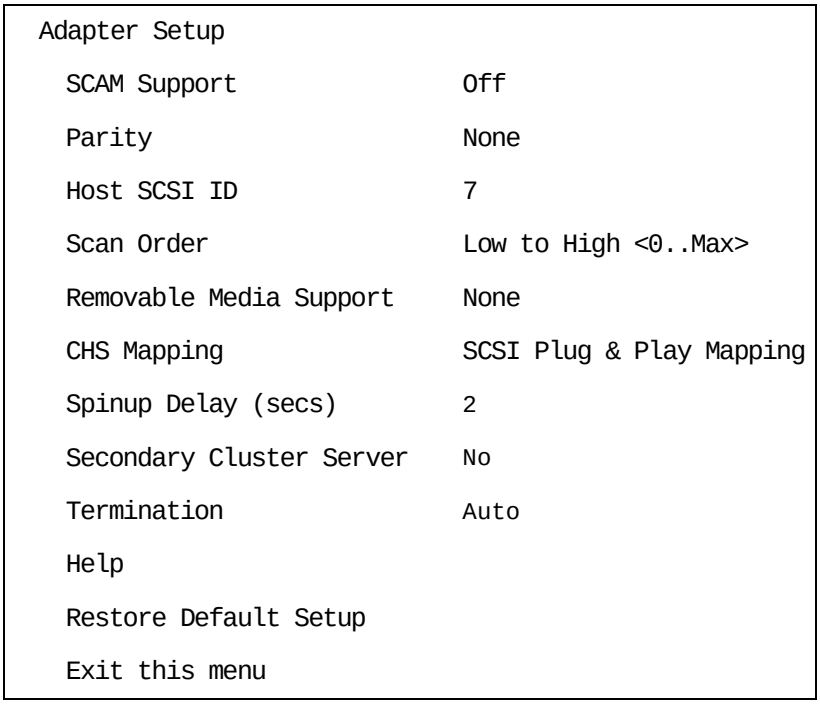
You are returned to this menu after making changes to the configuration of any host adapter or connected SCSI device. Before exiting from this menu, you are prompted to save or cancel any changes.

### 3.2.2.1 Adapter Setup Menu

When you select Adapter Setup, the corresponding menu appears.

Figure 3.6 is an example of the Adapter Setup Menu:

**Figure 3.6 Adapter Setup Menu**




The settings in this menu are global settings that affect the selected host adapter and all SCSI devices attached to it.

**SCAM Support –** The LSI Logic BIOS Version 4.XX and above supports the SCSI Plug and Play protocol called SCAM. SCAM support by default is turned off in versions 4.11.00 and later for the LSI53C896 device. You may choose to turn it on. Note that if this BIOS is flashed onto a board with existing settings, then these settings will not be changed to reflect the new BIOS defaults. Go into the Configuration Utility to change settings.

**Parity –** The LSI Logic PCI to SCSI host adapters always generate parity, but some older SCSI devices do not. Therefore, you are offered the option of disabling parity checking.

Note: When disabling parity checking, it is also necessary to disable disconnects for all devices, as parity checking for the reselection phase is not disabled. If a device does not generate parity, and it disconnects, the I/O never completes because the reselection never completes.

**Host SCSI ID –** In general, it is suggested that you do not change your host adapter ID from the default value of 7, as this gives it the highest priority on the SCSI bus.

**Scan Order –** This option allows the user to tell the SCSI BIOS and device drivers to scan the SCSI bus from low to high (0 to max) SCSI ID, or from high to low (max to 0) SCSI ID. If you have more than one device on the SCSI bus, changing the scan order changes the order in which drive letters are assigned by the system. Drive order may be reassigned differently in systems supporting the BIOS Boot Specification (BBS). See the *PCI Storage Device Management System SDMS 4.0 User's Guide,* Chapter 2 "SCSI BIOS" for additional information regarding BBS.

Note: The scan order option may conflict with operating systems that automatically assign a drive order.

**Removable Media Support –** This option defines the removable media support for a specific drive. When this option is selected, a window appears with three choices:

- None

  Indicates there is no removable media support whether the drive is selected in BBS as being first, or first in scan order in non-BBS.

- Boot Drive Only

  Provides removable media support for a removable hard drive if it is first in the scan order.

- With Media Installed

  Provides removable media support wherever the drive(s) actually resides.

One of these choices can be selected by highlighting it and pressing `Enter`.

**CHS Mapping –** This option defines the cylinder head sector (CHS) values that will be mapped onto a disk without pre-existing partitioning information. SCSI Plug and Play Mapping is the default value.

To support interchange with noncompatible systems, there is another option that can be selected by choosing CHS Mapping and then cursoring to `Alternate CHS Mapping`.

Note: Neither of these options will have any affect after the disk has been partitioned with the FDISK command.

To remove partitioning, two options are available:

- Reformat the disk using the Format Device option. See Section 3.2.2.2, “Device Selections Menu.”
- Use the FDISK/MBR command at the C:\ prompt, where MBR represents master boot record.

Important: Reformatting the disk or using FDISK/MBR erases all partitioning and data that exists. Be careful that you target the correct disk when using either the Format utility or the FDISK/MBR command.

After clearing the partitions and data, it is necessary to reboot and clear the memory or the old partitioning data will be reused.

**Spinup Delay (seconds) –** This option allows the user to stagger spin ups between devices for a longer period of time to balance the total current load. The default value is 2 seconds with choices between 1 and 10 seconds.

This is a power management feature designed to accommodate disk devices that may have heavy current load during power up. If multiple drives are being powered up simultaneously and drawing heavy current loads, then this option staggers the spin ups to limit start-up current.

**Secondary Cluster Server –** This option allows the user to enable an adapter to join a cluster of adapters without doing any SCSI bus resets.

This is a requirement for Microsoft Cluster Server. The default value is No with an alternate option of Yes.

**Termination –** This option allows the user to have termination control providing an adapter has controllable termination. The default value is Auto termination. The alternate value is Off.

### 3.2.2.2 Device Selections Menu

When you select the Device Selections option, the corresponding menu appears.

Figure 3.7 is an example of the Device Selections Menu:

**Figure 3.7 Device Selections Menu**

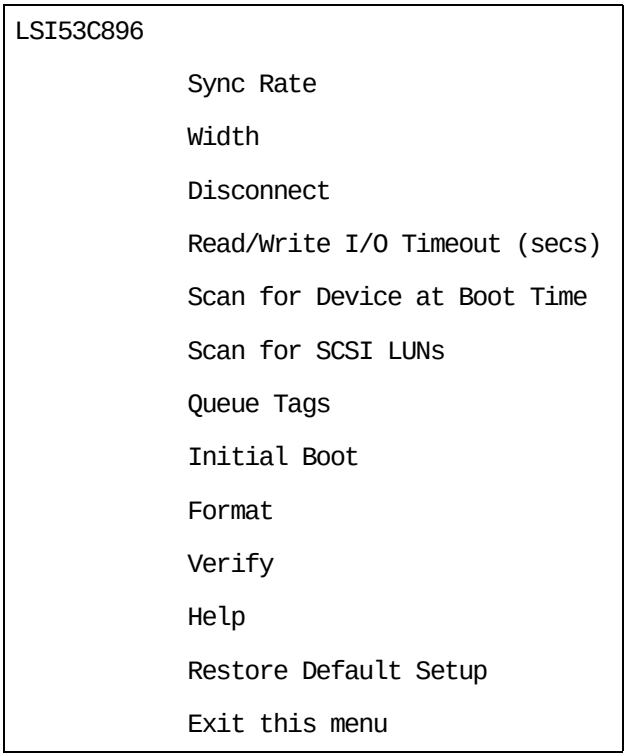
```
Device Selections 0-7

              Sync   Data   Disc   Time   Scan          Queue    Initial
              Rate   Width         Out    Bus    LUNS   Tags     Boot
0-Dev0 N/A    80     16     On     10     Yes    Yes    On       No
1-Dev1 N/A    80     16     On     10     Yes    Yes    On       No
2-Dev2 N/A    80     16     On     10     Yes    Yes    On       No
3-Dev3 N/A    80     16     On     10     Yes    Yes    On       No
4-Dev4 N/A    80     16     On     10     Yes    Yes    On       No
5-Dev5 N/A    80     16     On     10     Yes    Yes    On       No
6-Dev6 N/A    80     16     On     10     Yes    Yes    On       No
LSI53C896     80     16     On     10     Yes    Yes    On       No
Device Selections 8-15
Help
Exit this menu
```

The settings in this menu affect individual SCSI devices attached to the selected host adapter. Changes made from this menu do not cause the system to reboot upon exit from the SCSI BIOS Configuration Utility. To

change a value, select the required device by using the arrow keys and press Enter. A new menu appears providing the options and utilities available.

See an example of this menu in Figure 3.8:

**Figure 3.8 Device Selections Menu (Cont.)**




**Sync Rate (Mbytes/s) –** This option defines the maximum data transfer rate the host adapter attempts to negotiate. The host adapter and a SCSI device must agree to a rate they can both handle.

**Width (Bits) –** This option defines the maximum SCSI data width the host adapter attempts to negotiate. The host adapter and a SCSI device must agree to a width they can both handle. Only host adapters that can do 16-bit data transfers have this option enabled.

**Disconnect –** SCSI devices have the ability to disconnect from the initiator during an I/O transfer. The disconnect option frees the SCSI Bus

to allow other I/O processes. This option tells the host adapter whether or not to allow a device to disconnect. Some devices run faster with disconnects enabled (typically newer devices), while some run faster with disconnects disabled (typically older devices).

**Read/Write I/O Time-out (Seconds) –** This option sets the amount of time the host adapter waits for a read, write, or seek command to complete before trying the I/O transfer again. Since this provides a safeguard allowing the system to recover if an I/O operation fails, it is recommended that you always set the time-out to a value greater than zero.

Note: If the time-out is set to zero, then the I/O will never time-out.

**Scan for Device at Boot Time –** Set this option to "No" when there is a device you do not want to be available to the system. Also, on a bus with only a few devices attached, you can speed up boot time by changing this setting to "No" for all unused SCSI IDs.

**Scan for SCSI Logical Unit Numbers (LUNs) –** Set this option to "No" if you have problems with a device that responds to all LUNs whether they are occupied or not. For example, if there is a SCSI device with multiple LUNs but you do not want all of those LUNs to be available to the system, then set this option to "No." This will limit the scan to LUN0 only.

**Queue Tags –** This option allows the user to enable or disable the issuing of queue tags during I/O requests when your device driver can do this.

**Initial Boot –** This option allows any device attached to the first adapter to become the boot device. It provides the users of non-BBS personal computers with some of the flexibility of a BBS machine.

**Format –** If enabled, this option allows the user to low-level format a magnetic disk drive. Low-level formatting will completely and irreversibly erase all data on the drive. Note that this utility will only format 512-byte sectors. For other sector sizes, **do not use** this utility.

**Verify –** This option allows the user to read all the sectors on a disk looking for errors. When selected, this option displays the following message:

```
"Verify all sectors on the device
 Press ESC to abort
 Else press any key to continue"
```

**Help –** This option displays a help screen with information about the current menu.

**Restore Default Setup –** This option resets all device selections back to their optimal settings. Select this option to restore all manufacturing defaults for the specified adapter. Note that all user customized options will be lost upon saving after restoring default setup.

**Exit this menu –** This option allows the user to leave the current menu screen and return to the previous screen.

## 3.3 Exiting the SCSI BIOS Configuration Utility

Some changes only take effect after your system reboots. It is important that you exit this SCSI BIOS Configuration Utility properly. Return to the Main Menu and exit by using the Quit option.

# Appendix A Technical Specifications

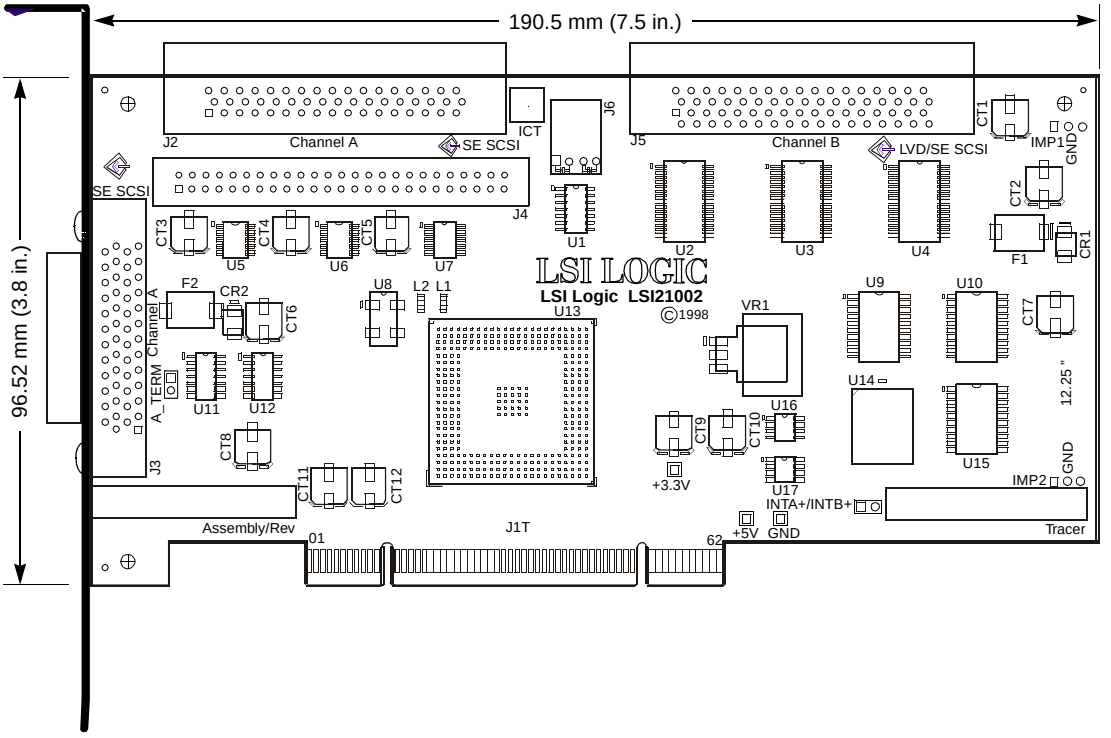
This section discusses the physical environment associated with the LSI21002 and includes a mechanical drawing of the LSI21002 (Figure A.1).



## A.1 Physical Environment

The LSI21002 has specific physical, electrical, thermal, and safety characteristics, which are described in the next sections. Additionally the board is compliant with electromagenetic emissions. For instructions on installing this host adapter board into your computer, please refer to Chapter 2, “Installing the LSI21002.”

**Figure A.1 LSI21002 Mechanical Drawing**




Note:

- J1: PCI 32-bit, universal type board edge connector.
- J2 and J5: 68-pin high density shielded latching right angle connector.
- J3: 50-pin high density shielded right angle connector.
- J4: 50-pin low density shrouded vertical connector.
- J6: 4-pin low density unshrouded right-angle header.

## A.1.1 Physical Characteristics

The dimensions of the LSI21002 are approximately 190.5 mm x 96.52 mm (7.5 x 3.8 inches). PCI connection is made through edge connector J1. The component height on the top and bottom of the LSI21002 follows the PCI specification.

Internal 16-bit SCSI connection is made through 68-pin high density connectors; J2 for Channel A or J5 for Channel B. External SCSI connection is made to Channel A through the 50-pin high density connector J3.

Channel A also has connector J4, which is a 50-pin narrow (ribbon) connector for internal connections.

Connector J3 extends through the ISA/EISA bracket, which is attached to the face of the connector outside of the cabinet where the LSI21002 is installed.

Connector J6 connects the Busy LED. It is a 4-pin, one row, right angle header and indicates bus activity for both Channel A and Channel B.

## A.1.2 Electrical Characteristics

The LSI21002 maximum power requirements, which include SCSI TERMPWR, under normal operation are as follows:

**Table A.1 Maximum Power Requirements**

| | | | |
|---|---|---|---|
| +5 V DC | ±5% | 3.0A | Over the operating range 5 °C to 55° C |
| +12 V DC | ±5% | 0.1A | Over the operating range 5 °C to 55° C (used while programming Flash BIOS) |

The PCI PRSNT1# and PRSNT2# pins are set to indicate a 15 W maximum configuration.

Under abnormal conditions, such as a short on SCSI TERMPWR, + 5 V current may be higher. At temperatures of at least 25 °C, a current of 4 A is sustained no longer than thirty seconds before the self-resetting TERMPWR short circuit protection device opens.

## A.1.3 Thermal, Atmospheric Characteristics

The board is designed to operate in an environment, which is defined by the following parameters:

- Temperature range: 0 to 55 °C (dry bulb)
- Relative humidity range: 5% to 90% (noncondensing)
- Max dew point temperature: 32 °C

The board is designed for a storage and transit environment, which is defined by the following parameters:

- Temperature range: – 45 °C to + 105 °C (dry bulb)
- Relative humidity range: 5% to 90% (noncondensing)

### A.1.4 Electromagnetic Compliance

The board is designed and implemented so as to minimize electromagnetic emissions, susceptibility, and the effects of electrostatic discharge. The board carries the CE mark, and meets the requirements of FCC and CISPR Class B. It is also marked with the FCC self-certification logo.

### A.1.5 Safety Characteristics

The bare board meets or exceeds the requirements of UL flammability rating 94 V0. The bare board is also marked with the supplier's name or trademark, type, and UL flammability rating. Since this board is installed in a PCI bus slot, all voltages are below the SELV 42.4 V limit.

---

## A.2 Operational Environment

The LSI21002 is designed for use in PCI computer systems with an ISA/EISA bracket type. The SDMS software operates the board; however, the design of the board does not prevent the use of other software.

An on-board flash memory device is provided to allow BIOS code and open boot code support through the PCI bus and a serial EEPROM for each channel.

### A.2.1 The PCI Interface

The PCI interface operates as a 32-bit DMA bus master. The connection is made through edge connector J1, which provides connections on both the front and back of the board. The signal definitions and pin numbers conform to the PCI Local Bus Specification Revision 2.1 standard. The signal assignments appear in Table A.2 and Table A.3.

Note: The + 3.3 V pins are tied together and decoupled with high frequency bypass capacitors to ground. No current from these 3.3 V pins is used on the board. The PCI portion of the LSI53C896 chip is powered from the 3 V/5 V pins.

**Table A.2 PCI Connector J1 Front Side Signals**

| Signal Name | Pin | Signal Name | Pin | Signal Name | Pin |
|---|---|---|---|---|---|
| –12 V | 1 | GND | 22 | +3.3 V | 43 |
| TCK | 2 | AD27 | 23 | C_BE1/ | 44 |
| GND | 3 | AD25 | 24 | AD14 | 45 |
| TDO | 4 | +3.3 V | 25 | GND | 46 |
| +5 V | 5 | C_BE3/ | 26 | AD12 | 47 |
| +5 V | 6 | AD23 | 27 | AD10 | 48 |
| INTB/ | 7 | GND | 28 | GND | 49 |
| INTD/ | 8 | AD21 | 29 | KEYWAY | 50 |
| GND (PRSNT1/) | 9 | AD19 | 30 | KEYWAY | 51 |
| RESERVED | 10 | +3.3 V | 31 | AD08 | 52 |
| GND (PRSNT2/) | 11 | AD17 | 32 | AD07 | 53 |
| KEYWAY | 12 | C_BE2/ | 33 | +3.3 V | 54 |
| KEYWAY | 13 | GND | 34 | AD05 | 55 |
| RESERVED | 14 | IRDY/ | 35 | AD03 | 56 |
| GND | 15 | +3.3 V | 36 | GND | 57 |
| CLK | 16 | DEVSEL/ | 37 | AD01 | 58 |
| GND | 17 | GND | 38 | 3 V/5 V | 59 |
| REQ/ | 18 | LOCK/ | 39 | ACK64/ | 60 |
| 3 V/5 V | 19 | PERR/ | 40 | +5 V | 61 |
| AD31 | 20 | +3.3 V | 41 | +5 V | 62 |
| AD29 | 21 | SERR/ | 42 | | |

Note: Shaded pins are not connected.

**Table A.3 PCI Connector J1 Back Side Signals**

| Signal Name | Pin | Signal Name | Pin | Signal Name | Pin |
|---|---|---|---|---|---|
| TRST/ | 1 | AD28 | 22 | PAR | 43 |
| +12 V | 2 | AD26 | 23 | AD15 | 44 |
| TMS | 3 | GND | 24 | +3.3 V | 45 |
| TDI | 4 | AD24 | 25 | AD13 | 46 |
| +5 V | 5 | IDSEL | 26 | AD11 | 47 |
| INTA/ | 6 | +3.3 V | 27 | GND | 48 |
| INTC/ | 7 | AD22 | 28 | AD09 | 49 |
| +5 V | 8 | AD20 | 29 | KEYWAY | 50 |
| RESERVED | 9 | GND | 30 | KEYWAY | 51 |
| +5 V | 10 | AD18 | 31 | C_BE0/ | 52 |
| RESERVED | 11 | AD16 | 32 | +3.3 V | 53 |
| KEYWAY | 12 | +3.3 V | 33 | AD06 | 54 |
| KEYWAY | 13 | FRAME/ | 34 | AD04 | 55 |
| RESERVED | 14 | GND | 35 | GND | 56 |
| RST/ | 15 | TRDY/ | 36 | AD02 | 57 |
| 3 V/5 V | 16 | GND | 37 | AD00 | 58 |
| GNT/ | 17 | STOP/ | 38 | 3 V/5 V | 59 |
| GND | 18 | +3.3 V | 39 | REQ64/ | 60 |
| RESERVED | 19 | SDONE | 40 | +5 V | 61 |
| AD30 | 20 | SBO/ | 41 | +5 V | 62 |
| +3.3 V | 21 | GND | 42 | | |

Note: Shaded pins are not connected.

### A.2.2 The SCSI Interface

The SCSI interface conforms to ANSI X3T10.11/1142.

The SCSI interface operates as two 16-bit, SE or LVD channels, and supports Fast, Ultra, and Ultra2 SCSI protocols. The interface is made through connectors J2, J3, and J4 for Channel A and J5 for Channel B.

J2 is a 68-pin high density latching right angle connector for internal SCSI connections to Channel A. J3 is a 50-pin high density right angle connector that protrudes through the ISA/EISA bracket for external connections to Channel A. Also on Channel A is connector J4, which is a 50-pin narrow (ribbon) connector for internal connections. Channel A has auto-sensing, active SE SCSI termination.

J5 is a 68-pin high density latching right angle connector for internal SCSI connections to Channel B. Channel B has Active, SE or LVD SCSI termination that is always enabled.

SCSI termination power is supplied by the board.

Tables A.4, A.5, A.6, and A.7 show the signal assignments for J2, J3, J4 and J5 respectively (see Figure 2.1, in Chapter 2).

**Table A.4 SCSI Connector J2, Channel A, Internal**

| Signal Name | Pin | Signal Name | Pin | Signal Name | Pin |
|---|---|---|---|---|---|
| GND | 1 | GND | 24 | SD7/ | 47 |
| GND | 2 | GND | 25 | SDP/ | 48 |
| GND | 3 | GND | 26 | GND | 49 |
| GND | 4 | GND | 27 | CPRSNT_A[1] | 50 |
| GND | 5 | GND | 28 | TERMPWR | 51 |
| GND | 6 | GND | 29 | TERMPWR | 52 |
| GND | 7 | GND | 30 | N/C | 53 |
| GND | 8 | GND | 31 | GND | 54 |
| GND | 9 | GND | 32 | SATN/ | 55 |
| GND | 10 | GND | 33 | GND | 56 |
| GND | 11 | GND | 34 | SBSY/ | 57 |
| GND | 12 | SD12/ | 35 | SACK/ | 58 |
| GND | 13 | SD13/ | 36 | SRST/ | 59 |
| GND | 14 | SD14/ | 37 | SMSG/ | 60 |
| GND | 15 | SD15/ | 38 | SSEL/ | 61 |
| GND | 16 | SDP1/ | 39 | SC_D/ | 62 |
| TERMPWR | 17 | SD0/ | 40 | SREQ/ | 63 |
| TERMPWR | 18 | SD1/ | 41 | SI_O/ | 64 |
| N/C | 19 | SD2/ | 42 | SD8/ | 65 |
| GND | 20 | SD3/ | 43 | SD9/ | 66 |
| GND | 21 | SD4/ | 44 | SD10/ | 67 |
| GND | 22 | SD5/ | 45 | SD11/ | 68 |
| GND | 23 | SD6/ | 46 | | |

1. CPRSNT_A is used to sense the connection of a standard SCSI device by sensing SCSI standard GND on this pin.

**Table A.5 SCSI Connector J3, Channel A, External**

| Signal Name | Pin | Signal Name | Pin | Signal Name | Pin |
|---|---|---|---|---|---|
| GND | 1 | GND | 18 | GND | 35 |
| GND | 2 | GND | 19 | CPRSNT_B[1] | 36 |
| GND | 3 | GND | 20 | N/C | 37 |
| GND | 4 | GND | 21 | TERMPWR | 38 |
| GND | 5 | GND | 22 | N/C | 39 |
| GND | 6 | GND | 23 | GND | 40 |
| GND | 7 | GND | 24 | SATN/ | 41 |
| GND | 8 | GND | 25 | GND | 42 |
| GND | 9 | SD0/ | 26 | SBSY/ | 43 |
| GND | 10 | SD1/ | 27 | SACK/ | 44 |
| GND | 11 | SD2/ | 28 | SRST/ | 45 |
| N/C | 12 | SD3/ | 29 | SSEL/ | 46 |
| N/C | 13 | SD4/ | 30 | SSEL/ | 47 |
| N/C | 14 | SD5/ | 31 | SC_D/ | 48 |
| GND | 15 | SD6/ | 32 | SREQ/ | 49 |
| GND | 16 | SD7/ | 33 | SI_O/ | 50 |
| GND | 17 | SDP/ | 34 | | |

1. CPRSNT_B is used to sense the connection of a standard SCSI device by sensing SCSI standard GND on this pin.

**Table A.6 SCSI Connector J4, Channel A, Internal**

| Signal Name | Pin | Signal Name | Pin | Signal Name | Pin |
|---|---|---|---|---|---|
| GND | 1 | SDP/ | 18 | GND | 35 |
| SD0/ | 2 | GND | 19 | SBSY/ | 36 |
| GND | 3 | GND | 20 | GND | 37 |
| SD1/ | 4 | GND | 21 | SACK/ | 38 |
| GND | 5 | CPRSNT_C[1] | 22 | GND | 39 |
| SD2/ | 6 | N/C | 23 | SRST/ | 40 |
| GND | 7 | N/C | 24 | GND | 41 |
| SD3/ | 8 | N/C | 25 | SMSG/ | 42 |
| GND | 9 | TERMPWR | 26 | GND | 43 |
| SD4/ | 10 | N/C | 27 | SSEL/ | 44 |
| GND | 11 | N/C | 28 | GND | 45 |
| SD5/ | 12 | GND | 29 | SC_D/ | 46 |
| GND | 13 | GND | 30 | GND | 47 |
| SD6/ | 14 | GND | 31 | SREQ/ | 48 |
| GND | 15 | SATN/ | 32 | GND | 49 |
| SD7/ | 16 | GND | 33 | SI_O/ | 50 |
| GND | 17 | GND | 34 | | |

1. CPRSNT_C is used to sense the connection of a standard SCSI device by sensing SCSI standard GND on this pin.

**Table A.7 SCSI Connector J5, Channel B, Internal**

| Signal Name | Pin | Signal Name | Pin | Signal Name | Pin |
|---|---|---|---|---|---|
| SD12+ | 1 | SACK+ | 24 | SD7– | 47 |
| SD13+ | 2 | SRST+ | 25 | SDP– | 48 |
| SD14+ | 3 | SMSG+ | 26 | GND | 49 |
| SD15+ | 4 | SSEL+ | 27 | GND | 50 |
| SDP1+ | 5 | SC_D+ | 28 | TERMPWR | 51 |
| SD0+ | 6 | SREQ+ | 29 | TERMPWR | 52 |
| SD1+ | 7 | SI_O+ | 30 | N/C | 53 |
| SD2+ | 8 | SD8+ | 31 | GND | 54 |
| SD3+ | 9 | SD9+ | 32 | SATN– | 55 |
| SD4+ | 10 | SD10+ | 33 | GND | 56 |
| SD5+ | 11 | SD11+ | 34 | SBSY– | 57 |
| SD6+ | 12 | SD12– | 35 | SACK– | 58 |
| SD7+ | 13 | SD13– | 36 | SRST– | 59 |
| SDP+ | 14 | SD14– | 37 | SMSG– | 60 |
| GND | 15 | SD15– | 38 | SSEL– | 61 |
| DIFFSENS | 16 | SDP1– | 39 | SC_D– | 62 |
| TERMPWR | 17 | SD0– | 40 | SREQ– | 63 |
| TERMPWR | 18 | SD1– | 41 | SI_O– | 64 |
| N/C | 19 | SD2– | 42 | SD8– | 65 |
| GND | 20 | SD3– | 43 | SD9– | 66 |
| SATN+ | 21 | SD4– | 44 | SD10– | 67 |
| GND | 22 | SD5– | 45 | SD11– | 68 |
| SBSY+ | 23 | SD6– | 46 | | |

### A.2.2.1 SCSI Activity LED Interface

The LSI21002 LED interface with an LED harness to be connected to the board. The connector on the LSI21002 is J6 for both channels. Table A.8 lists the signals and pin numbers for the LED connector J6.

**Table A.8 Connector J6 Signals**

| Signal Name | Pin |
|---|---|
| A_LED+ | 1 |
| A_LED– | 2 |
| B_LED– | 3 |
| B_LED+ | 4 |

# Appendix B
# Glossary

| | |
|---|---|
| **Address** | A specific location in memory, designated either numerically or by a symbolic name. |
| **Asynchronous Data Transfer** | One of the ways data is transferred over the SCSI bus. It is slower than synchronous data transfer. |
| **BBS** | BIOS Boot Specification. |
| **BIOS** | Basic Input/Output System. Software that provides basic read/write capability. Usually kept as firmware (ROM based). The system BIOS on the mainboard of a computer is used to boot and control the system. The SCSI BIOS on the host adapter acts as an extension of the system BIOS. |
| **Bit** | A binary digit. The smallest unit of information a computer uses. The value of a bit (0 or 1) represents a two-way choice, such as on or off, true or false, and so on. |
| **Bus** | A collection of wires in a cable or copper traces on a circuit board used to transmit data, status, and control signals. EISA, PCI, and SCSI are examples of buses. |
| **Bus Mastering** | A high-performance way to transfer data. The host adapter controls the transfer of data directly to and from system memory without bothering the computer's microprocessor. This is the fastest way for multitasking operating systems to transfer data. |
| **Byte** | A unit of information consisting of eight bits. |
| **Chain** | A topology in which every processor is connected to two others, except for two end processors that are connected to only one other. |
| **CISPR** | An international committee on radio frequency interference (Committee, International and Special, for Protection in Radio). |

| | |
|---|---|
| **Configuration** | Refers to the way a computer is set up; the combined hardware components (computer, monitor, key board, and peripheral devices) that make up a computer system; or the software settings that allow the hardware components to communicate with each other. |
| **CPU** | Central Processing Unit. The “brain” of the computer that performs the actual computations. The term Microprocessor Unit (MPU) is also used. |
| **DMA** | Direct Memory Access. A method of moving data from a storage device directly to RAM, without using the CPU’s resources. |
| **DMA Bus Master** | A feature that allows a peripheral to control the flow of data to and from system memory by blocks, as opposed to PIO (Programmed I/O) where the flow is byte by byte. |
| **Device Driver** | A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device. |
| **Differential** | A hardware configuration for connecting SCSI devices. It uses a pair of lines for each signal transfer (as opposed to single-ended SCSI which references each SCSI signal to a common ground). |
| **Dword** | A double word is a group of 4 consecutive bytes or characters that are stored, addressed, transmitted, and operated on as a unit. The lower two address bits of the least significant byte must equal zero in order to be Dword aligned. |
| **EEPROM** | Electronically-Erasable Programmable Read Only Memory. A memory chip typically used to store configuration information. See NVRAM. |
| **EISA** | Extended Industry Standard Architecture. An extension of the 16-bit ISA bus standard. It allows devices to perform 32-bit data transfers. |
| **External SCSI Device** | A SCSI device installed outside the computer cabinet. These devices are connected in a continuous chain using shielded cables. |
| **Fast SCSI** | A standard for SCSI data transfers. It allows a transfer rate of up to 10 Mbytes/s over an 8-bit SCSI bus and up to 20 Mbytes/s over a 16-bit SCSI bus. |
| **FCC** | Federal Communications Commission. |
| **File** | A named collection of information stored on a disk. |

**Firmware** Software that is permanently stored in ROM. In the case of BIOS, it can be accessed during boot time without the aid of an operating or file system.

**Hard Disk** A rigid disk permanently sealed into a drive cartridge. A hard disk can store very large amounts of information magnetically.

**Host** The computer system in which a SCSI host adapter is installed. It uses the SCSI host adapter to transfer information to and from devices attached to the SCSI bus.

**Host Adapter** A circuit board and/or integrated circuit device that provides a SCSI bus connection to the computer system.

**Internal SCSI Device** A SCSI device installed inside the computer cabinet. These devices are connected in a continuous chain using an unshielded ribbon cable.

**IRQ** Interrupt Request Channel. A path through which a device can get the immediate attention of the computer's CPU. The PCI bus assigns an IRQ path for each SCSI host adapter.

**ISA** Industry Standard Architecture. A type of computer bus used in most PC's. It allows devices to send and receive data 16-bits at a time.

**Kbyte** Kilobyte. A measure of computer storage equal to 1024 bytes.

**Local Bus** A way to connect peripherals directly to the computer processor's data path. It bypasses the slower ISA and EISA buses. PCI is a local bus standard.

**Logical Unit** A subdivision, either logical or physical, of a SCSI device. Most devices have only one logical unit, but up to sixteen are allowed for a 16-bit SCSI bus and eight are allowed for an 8-bit SCSI bus.

**LUN** Logical Unit Number. An encoded three-bit number for the logical unit.

**LVD** Low Voltage Differential. LVD is a robust design methodology that improves power consumption, data integrity, cable lengths and support for multiple devices, while providing a migration path for increased I/O performance.

**Mainboard** A large circuit board that holds RAM, ROM, the microprocessor, custom integrated circuits, and other components that make a computer work. It also has expansion slots for host adapters and other plug-in boards.

| | |
|---|---|
| **Main Memory** | The part of a computer's memory which is directly accessible by the CPU (usually synonymous with RAM). |
| **Mbyte** | Megabyte. A measure of computer storage equal to 1024 kilobytes. |
| **Motherboard** | See Mainboard. In some countries, the term Motherboard is not appropriate. |
| **Multitasking** | The initiation and control of more than one sequence of operations. This allows programs to operate in parallel. |
| **Multithreading** | The simultaneous accessing of data by more than one SCSI device. This increases the aggregate data throughput. |
| **NVRAM** | NonVolatile Random Access Memory. Actually an EEPROM (Electronically Erasable Read Only Memory chip) used to store configuration information. See EEPROM. |
| **Operating System** | A program that organizes the internal activities of the computer and its peripheral devices. An operating system performs basic tasks such as moving data to and from devices, and managing information in memory. It also provides the user interface |
| **Parity Checking** | A way to verify the accuracy of data transmitted over the SCSI bus. One bit in the transfer is used to make the sum of all the 1 bits either odd or even (for odd or even parity). If the sum is not correct, an error message appears. SCSI uses odd parity. |
| **PCI** | Peripheral Component Interconnect. A local bus specification that allows connection of integrated peripheral controller components, peripheral add-in boards, and processor/memory systems. It bypasses the slower ISA and EISA busses. |
| **Peripheral Devices** | A piece of hardware (such as a video monitor, disk drive, printer, or CD-ROM) used with a computer and under the computer's control. SCSI peripherals are controlled through a SCSI host adapter. |
| **Pin-1 Orientation** | The alignment of pin-1 on a SCSI cable connector and the pin-1 position on the SCSI connector into which it is inserted. External SCSI cables are keyed to ensure proper alignment, but internal SCSI ribbon cables may not be. |

**PIO** Programmed Input/Output. A way the CPU can transfer data to and from memory using the computer's I/O ports. PIO can be faster than DMA, but requires CPU time.

**Port Address** Also Port Number. The address through which commands are sent to a host adapter board. This address is assigned by the PCI bus.

**Port Number** See Port Address.

**Queue Tags** A way to keep track of multiple commands that allows for increased throughput on the SCSI bus.

**RAM** Random Access Memory. Generally, the computer's primary working memory in which program instructions and data are stored and are accessible to the CPU. Information can be written to and read from RAM. The contents of RAM are lost when the computer is turned off.

**RISC Core** Some SCSI chips contain a RISC (Reduced Instruction Set Computer) processor, programmed through microcode scripts.

**ROM** Read Only Memory. Memory from which information can be read but not changed. The contents of ROM are not erased when the computer is turned off.

**SCAM** SCSI Configured Automatically. A method to automatically allocate SCSI IDs via software when SCAM compliant SCSI devices are attached.

**SCSI** Small Computer System Interface. A specification for a high performance peripheral bus and command set. The original standard is now referred to as SCSI-1.

**SCSI-2** The current SCSI specification which adds features to the original SCSI-1 standard.

**SCSI-3** The next SCSI specification, which adds features to the SCSI-2 standard.

**SCSI Bus** A host adapter and one or more SCSI peripherals connected by cables in a linear chain configuration. The host adapter may exist anywhere on the chain, allowing connection of both internal and external SCSI devices. A system may have more than one SCSI bus by using multiple host adapters.

| | |
|---|---|
| **SCSI Device** | Any device that conforms to the SCSI standard and is attached to the SCSI bus by a SCSI cable. This includes SCSI host adapters and SCSI peripherals. |
| **SCSI ID** | A way to uniquely identify each SCSI device on the SCSI bus. Each SCSI bus has fifteen available SCSI IDs numbered 0 through 15 for Wide SCSI (or 0–7 for an 8-bit SCSI). The host adapter is assigned ID 7 giving it priority to control the bus. |
| **SDMS** | Storage Device Management System. An LSI Logic software product that manages SCSI system I/O. |
| **STA** | SCSI Trade Association. A group of companies that cooperate to promote SCSI parallel interface technology as a viable mainstream I/O interconnect for commercial computing. |
| **Single-Ended SCSI** | A hardware specification for connecting SCSI devices. It references each SCSI signal to a common ground. This is the most common method (as opposed to differential SCSI and low voltage differential SCSI, which uses a separate return for each signal). |
| **Synchronous Data Transfer** | One of the ways data is transferred over the SCSI bus. Transfers are clocked with fixed-frequency pulses. |
| **System BIOS** | Controls the low level POST (Power-On Self-Test), and basic operation of the CPU and computer system. |
| **Termination** | The electrical connection required at each end of the SCSI bus, composed of a set of resistors. |
| **Ultra SCSI** | A standard for SCSI data transfers. It allows a transfer rate of up to 20 Mbytes/s over an 8-bit SCSI bus, and up to 40 Mbytes/s over a 16-bit SCSI bus. STA (SCSI Trade Association) supports using the term “Ultra SCSI” over the older term “Fast-20”. |
| **Ultra2 SCSI** | A standard for SCSI data transfers. It allows a transfer rate of up to 40 Mbytes/s over an 8-bit SCSI bus, and up to 80 Mbytes/s over a 16-bit SCSI bus. STA supports using the term “Ultra2 SCSI” over the older term “Fast-40”. |
| **VCCI** | Voluntary Control Council for Interference. |
| **VHDCI** | Very High Density Cable Interconnect. |

**Wide SCSI** A SCSI-2 feature allowing 16 or 32-bit transfers on the SCSI bus. This dramatically increases the transfer rate over the standard 8-bit SCSI bus.

**Wide Ultra SCSI** The STA term for SCSI bus width 16 bits, SCSI bus speed maximum data rate 40 Mbytes/s.

**Wide Ultra2 SCSI** The STA term for SCSI bus width 16 bits, SCSI bus speed maximum data rate 80 Mbytes/s.

**Word** A two byte (or 16-bit) unit of information.

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W. E. Tel: 800.860.9953
St. Louis Park
I. E. Tel: 612.525.9999

**Mississippi**
A. E. Tel: 800.633.2918
W. E. Tel: 256.830.1119

**Missouri**
W. E. Tel: 630.620.0969
St. Louis
A. E. Tel: 314.291.5350
I. E. Tel: 314.872.2182

**Montana**
A. E. Tel: 800.526.1741
W. E. Tel: 801.974.9953

**Nebraska**
A. E. Tel: 800.332.4375
W. E. Tel: 303.457.9953

**Nevada**
Las Vegas
A. E. Tel: 800.528.8471
W. E. Tel: 702.765.7117

**New Hampshire**
A. E. Tel: 800.272.9255
W. E. Tel: 781.271.9953

**New Jersey**
North/South
A. E. Tel: 201.515.1641
Tel: 609.222.6400
Mt. Laurel
I. E. Tel: 856.222.9566
Pine Brook
B. M. Tel: 973.244.9668
W. E. Tel: 800.862.9953
Parsippany
I. E. Tel: 973.299.4425
Wayne
W. E. Tel: 973.237.9010

**New Mexico**
W. E. Tel: 480.804.7000
Albuquerque
A. E. Tel: 505.293.5119

## U.S. Distributors by State (Continued)

**New York**
Hauppauge
I. E. Tel: 516.761.0960
Long Island
A. E. Tel: 516.434.7400
W. E. Tel: 800.861.9953
Rochester
A. E. Tel: 716.475.9130
I. E. Tel: 716.242.7790
W. E. Tel: 800.319.9953
Smithtown
B. M. Tel: 800.543.2008
Syracuse
A. E. Tel: 315.449.4927

**North Carolina**
Raleigh
A. E. Tel: 919.859.9159
I. E. Tel: 919.873.9922
W. E. Tel: 800.560.9953

**North Dakota**
A. E. Tel: 800.829.0116
W. E. Tel: 612.853.2280

**Ohio**
Cleveland
A. E. Tel: 216.498.1100
W. E. Tel: 800.763.9953
Dayton
A. E. Tel: 614.888.3313
I. E. Tel: 937.253.7501
W. E. Tel: 800.575.9953
Strongsville
B. M. Tel: 440.238.0404
Valley View
I. E. Tel: 216.520.4333

**Oklahoma**
W. E. Tel: 972.235.9953
Tulsa
A. E. Tel: 918.459.6000
I. E. Tel: 918.665.4664

**Oregon**
Beaverton
B. M. Tel: 503.524.1075
I. E. Tel: 503.644.3300
Portland
A. E. Tel: 503.526.6200
W. E. Tel: 800.879.9953

**Pennsylvania**
Mercer
I. E. Tel: 412.662.2707
Philadelphia
A. E. Tel: 800.526.4812
B. M. Tel: 877.351.2355
W. E. Tel: 800.871.9953
Pittsburgh
A. E. Tel: 412.281.4150
W. E. Tel: 440.248.9996

**Rhode Island**
A. E. 800.272.9255
W. E. Tel: 781.271.9953

**South Carolina**
A. E. Tel: 919.872.0712
W. E. Tel: 919.469.1502

**South Dakota**
A. E. Tel: 800.829.0116
W. E. Tel: 612.853.2280

**Tennessee**
W. E. Tel: 256.830.1119
East/West
A. E. Tel: 800.241.8182
Tel: 800.633.2918

**Texas**
Arlington
B. M. Tel: 817.417.5993
Austin
A. E. Tel: 512.219.3700
B. M. Tel: 512.258.0725
I. E. Tel: 512.719.3090
W. E. Tel: 800.365.9953
Dallas
A. E. Tel: 214.553.4300
B. M. Tel: 972.783.4191
W. E. Tel: 800.955.9953
El Paso
A. E. Tel: 800.526.9238
Houston
A. E. Tel: 713.781.6100
B. M. Tel: 713.917.0663
W. E. Tel: 800.888.9953
Richardson
I. E. Tel: 972.783.0800
Rio Grande Valley
A. E. Tel: 210.412.2047
Stafford
I. E. Tel: 281.277.8200

**Utah**
Centerville
B. M. Tel: 801.295.3900
Murray
I. E. Tel: 801.288.9001
Salt Lake City
A. E. Tel: 801.365.3800
W. E. Tel: 800.477.9953

**Vermont**
A. E. Tel: 800.272.9255
W. E. Tel: 716.334.5970

**Virginia**
A. E. Tel: 800.638.5988
W. E. Tel: 301.604.8488
Haymarket
B. M. Tel: 703.754.3399
Springfield
B. M. Tel: 703.644.9045

**Washington**
Kirkland
I. E. Tel: 425.820.8100
Maple Valley
B. M. Tel: 206.223.0080
Seattle
A. E. Tel: 425.882.7000
W. E. Tel: 800.248.9953

**West Virginia**
A. E. Tel: 800.638.5988

**Wisconsin**
Milwaukee
A. E. Tel: 414.513.1500
W. E. Tel: 800.867.9953
Wauwatosa
I. E. Tel: 414.258.5338

**Wyoming**
A. E. Tel: 800.332.9326
W. E. Tel: 801.974.9953

# Direct Sales Representatives by State (Components and Boards)

E. A. Earle Associates
E. L. Electrodyne - UT
GRP Group 2000
I. S. Infinity Sales, Inc.
ION ION Associates, Inc.
R. A. Rathsburg Associates, Inc.
SGY Synergy Associates, Inc.

**Arizona**
Tempe
E. A. Tel: 480.921.3305

**California**
Calabasas
I. S. Tel: 818.880.6480
Irvine
I. S. Tel: 714.833.0300
San Diego
E. A. Tel: 619.278.5441

**Illinois**
Elmhurst
R. A. Tel: 630.516.8400

**Indiana**
Cicero
R. A. Tel: 317.984.8608
Ligonier
R. A. Tel: 219.894.3184
Plainfield
R. A. Tel: 317.838.0360

**Massachusetts**
Burlington
SGY Tel: 781.238.0870

**Michigan**
Byron Center
R. A. Tel: 616.554.1460
Good Rich
R. A. Tel: 810.636.6060
Novi
R. A. Tel: 810.615.4000

**North Carolina**
Cary
GRP Tel: 919.481.1530

**Ohio**
Columbus
R. A. Tel: 614.457.2242
Dayton
R. A. Tel: 513.291.4001
Independence
R. A. Tel: 216.447.8825

**Pennsylvania**
Somerset
R. A. Tel: 814.445.6976

**Texas**
Austin
ION Tel: 512.794.9006
Arlington
ION Tel: 817.695.8000
Houston
ION Tel: 281.376.2000

**Utah**
Salt Lake City
E. L. Tel: 801.264.8050

**Wisconsin**
Muskego
R. A. Tel: 414.679.8250
Saukville
R. A. Tel: 414.268.1152

# Sales Offices and Design Resource Centers

**LSI Logic Corporation**
**Corporate Headquarters**
**1551 McCarthy Blvd**
**Milpitas CA 95035**
**Tel: 408.433.8000**
**Fax: 408.433.8989**

**NORTH AMERICA**

**California**
Irvine
18301 Von Karman Ave
Suite 900
Irvine, CA 92612
♦ Tel: 949.809.4600
Fax: 949.809.4444

Pleasanton Design Center
5050 Hopyard Road, 3rd Floor
Suite 300
Pleasanton, CA 94588
Tel: 925.730.8800
Fax: 925.730.8700

San Diego
7585 Ronson Road
Suite 100
San Diego, CA 92111
Tel: 858.467.6981
Fax: 858.496.0548

Silicon Valley
1551 McCarthy Blvd
Sales Office
M/S C-500
Milpitas, CA 95035
♦ Tel: 408.433.8000
Fax: 408.954.3353
Design Center
M/S C-410
Tel: 408.433.8000
Fax: 408.433.7695

Wireless Design Center
11452 El Camino Real
Suite 210
San Diego, CA 92130
Tel: 858.350.5560
Fax: 858.350.0171

**Colorado**
Boulder
4940 Pearl East Circle
Suite 201
Boulder, CO 80301
♦ Tel: 303.447.3800
Fax: 303.541.0641

Colorado Springs
4420 Arrowswest Drive
Colorado Springs, CO 80907
Tel: 719.533.7000
Fax: 719.533.7020

Fort Collins
2001 Danfield Court
Fort Collins, CO 80525
Tel: 970.223.5100
Fax: 970.206.5549

**Florida**
Boca Raton
2255 Glades Road
Suite 324A
Boca Raton, FL 33431
Tel: 561.989.3236
Fax: 561.989.3237

**Georgia**
Alpharetta
2475 North Winds Parkway
Suite 200
Alpharetta, GA 30004
Tel: 770.753.6146
Fax: 770.753.6147

**Illinois**
Oakbrook Terrace
Two Mid American Plaza
Suite 800
Oakbrook Terrace, IL 60181
Tel: 630.954.2234
Fax: 630.954.2235

**Kentucky**
Bowling Green
1262 Chestnut Street
Bowling Green, KY 42101
Tel: 270.793.0010
Fax: 270.793.0040

**Maryland**
Bethesda
6903 Rockledge Drive
Suite 230
Bethesda, MD 20817
Tel: 301.897.5800
Fax: 301.897.8389

**Massachusetts**
Waltham
200 West Street
Waltham, MA 02451
♦ Tel: 781.890.0180
Fax: 781.890.6158

Burlington - Mint Technology
77 South Bedford Street
Burlington, MA 01803
Tel: 781.685.3800
Fax: 781.685.3801

**Minnesota**
Minneapolis
8300 Norman Center Drive
Suite 730
Minneapolis, MN 55437
♦ Tel: 612.921.8300
Fax: 612.921.8399

**New Jersey**
Red Bank
125 Half Mile Road
Suite 200
Red Bank, NJ 07701
Tel: 732.933.2656
Fax: 732.933.2643

Cherry Hill - Mint Technology
215 Longstone Drive
Cherry Hill, NJ 08003
Tel: 856.489.5530
Fax: 856.489.5531

**New York**
Fairport
550 Willowbrook Office Park
Fairport, NY 14450
Tel: 716.218.0020
Fax: 716.218.9010

**North Carolina**
Raleigh
Phase II
4601 Six Forks Road
Suite 528
Raleigh, NC 27609
Tel: 919.785.4520
Fax: 919.783.8909

**Oregon**
Beaverton
15455 NW Greenbrier Parkway
Suite 235
Beaverton, OR 97006
Tel: 503.645.0589
Fax: 503.645.6612

**Texas**
Austin
9020 Capital of TX Highway North
Building 1
Suite 150
Austin, TX 78759
Tel: 512.388.7294
Fax: 512.388.4171

Plano
500 North Central Expressway
Suite 440
Plano, TX 75074
♦ Tel: 972.244.5000
Fax: 972.244.5001

Houston
20405 State Highway 249
Suite 450
Houston, TX 77070
Tel: 281.379.7800
Fax: 281.379.7818

**Canada**
**Ontario**
Ottawa
260 Hearst Way
Suite 400
Kanata, ON K2L 3H1
♦ Tel: 613.592.1263
Fax: 613.592.3253

**INTERNATIONAL**

**France**
Paris
**LSI Logic S.A.**
**Immeuble Europa**
53 bis Avenue de l'Europe
B.P. 139
78148 Velizy-Villacoublay
Cedex, Paris
♦ Tel: 33.1.34.63.13.13
Fax: 33.1.34.63.13.19

**Germany**
Munich
**LSI Logic GmbH**
Orleansstrasse 4
81669 Munich
♦ Tel: 49.89.4.58.33.0
Fax: 49.89.4.58.33.108

Stuttgart
Mittlerer Pfad 4
D-70499 Stuttgart
♦ Tel: 49.711.13.96.90
Fax: 49.711.86.61.428

**Italy**
Milan
**LSI Logic S.P.A.**
Centro Direzionale Colleoni Palazzo
Orione Ingresso 1
20041 Agrate Brianza, Milano
♦ Tel: 39.039.687371
Fax: 39.039.6057867

**Japan**
Tokyo
**LSI Logic K.K.**
Rivage-Shinagawa Bldg. 14F
4-1-8 Kounan
Minato-ku, Tokyo 108-0075
♦ Tel: 81.3.5463.7821
Fax: 81.3.5463.7820

Osaka
Crystal Tower 14F
1-2-27 Shiromi
Chuo-ku, Osaka 540-6014
♦ Tel: 81.6.947.5281
Fax: 81.6.947.5287

## Sales Offices and Design Resource Centers (Continued)

**Korea**
Seoul
**LSI Logic Corporation of Korea Ltd**
10th Fl., Haesung 1 Bldg.
942, Daechi-dong,
Kangnam-ku, Seoul, 135-283
Tel: 82.2.528.3400
Fax: 82.2.528.2250

**The Netherlands**
Eindhoven
**LSI Logic Europe Ltd**
World Trade Center Eindhoven
Building 'Rijder'
Bogert 26
5612 LZ Eindhoven
Tel: 31.40.265.3580
Fax: 31.40.296.2109

**Singapore**
Singapore
**LSI Logic Pte Ltd**
7 Temasek Boulevard
#28-02 Suntec Tower One
Singapore 038987
Tel: 65.334.9061
Fax: 65.334.4749

**Sweden**
Stockholm
**LSI Logic AB**
Finlandsgatan 14
164 74 Kista
♦ Tel: 46.8.444.15.00
Fax: 46.8.750.66.47

**Taiwan**
Taipei
**LSI Logic Asia, Inc.**
**Taiwan Branch**
10/F 156 Min Sheng E. Road
Section 3
Taipei, Taiwan R.O.C.
Tel: 886.2.2718.7828
Fax: 886.2.2718.8869

**United Kingdom**
Bracknell
**LSI Logic Europe Ltd**
Greenwood House
London Road
Bracknell, Berkshire RG12 2UB
♦ Tel: 44.1344.426544
Fax: 44.1344.481039

♦ Sales Offices with Design Resource Centers

# International Distributors

**Australia**
New South Wales
**Reptechnic Pty Ltd**
3/36 Bydown Street
Neutral Bay, NSW 2089
♦ Tel: 612.9953.9844
Fax: 612.9953.9683

**Belgium**
**Acal nv/sa**
Lozenberg 4
1932 Zaventem
Tel: 32.2.7205983
Fax: 32.2.7251014

**China**
Beijing
**LSI Logic International Services Inc.**
**Beijing Representative Office**
Room 708
Canway Building
66 Nan Li Shi Lu
Xicheng District
Beijing 100045, China
Tel: 86.10.6804.2534 to 38
Fax: 86.10.6804.2521

**France**
Rungis Cedex
**Azzurri Technology France**
22 Rue Saarinen
Sillic 274
94578 Rungis Cedex
Tel: 33.1.41806310
Fax: 33.1.41730340

**Germany**
Haar
**EBV Elektronik**
Hans-Pinsel Str. 4
D-85540 Haar
Tel: 49.89.4600980
Fax: 49.89.46009840

Munich
**Avnet Emg GmbH**
Stahlgruberring 12
81829 Munich
Tel: 49.89.45110102
Fax: 49.89.42.27.75

Wuennenberg-Haaren
**Peacock AG**
Graf-Zepplin-Str 14
D-33181 Wuennenberg-Haaren
Tel: 49.2957.79.1692
Fax: 49.2957.79.9341

**Hong Kong**
Hong Kong
**AVT Industrial Ltd**
Unit 608 Tower 1
Cheung Sha Wan Plaza
833 Cheung Sha Wan Road
Kowloon, Hong Kong
Tel: 852.2428.0008
Fax: 852.2401.2105

**Serial System (HK) Ltd**
2301 Nanyang Plaza
57 Hung To Road, Kwun Tong
Kowloon, Hong Kong
Tel: 852.2995.7538
Fax: 852.2950.0386

**India**
Bangalore
**Spike Technologies India Private Ltd**
951, Vijayalakshmi Complex,
2nd Floor, 24th Main,
J P Nagar II Phase,
Bangalore, India 560078
♦ Tel: 91.80.664.5530
Fax: 91.80.664.9748

**Israel**
Tel Aviv
**Eastronics Ltd**
11 Rozanis Street
P.O. Box 39300
Tel Aviv 61392
Tel: 972.3.6458777
Fax: 972.3.6458666

**Japan**
Tokyo
**Daito Electron**
Sogo Kojimachi No.3 Bldg
1-6 Kojimachi
Chiyoda-ku, Tokyo 102-8730
Tel: 81.3.3264.0326
Fax: 81.3.3261.3984

**Global Electronics Corporation**
Nichibei Time24 Bldg. 35 Tansu-cho
Shinjuku-ku, Tokyo 162-0833
Tel: 81.3.3260.1411
Fax: 81.3.3260.7100
Technical Center
Tel: 81.471.43.8200

**Marubeni Solutions**
1-26-20 Higashi
Shibuya-ku, Tokyo 150-0001
Tel: 81.3.5778.8662
Fax: 81.3.5778.8669

**Shinki Electronics**
Myuru Daikanyama 3F
3-7-3 Ebisu Minami
Shibuya-ku, Tokyo 150-0022
Tel: 81.3.3760.3110
Fax: 81.3.3760.3101

Yokohama-City
**Innotech**
2-15-10 Shin Yokohama
Kohoku-ku
Yokohama-City, 222-8580
Tel: 81.45.474.9037
Fax: 81.45.474.9065

**Macnica Corporation**
Hakusan High-Tech Park
1-22-2 Hadusan, Midori-Ku,
Yokohama-City, 226-8505
Tel: 81.45.939.6140
Fax: 81.45.939.6141

**The Netherlands**
Eindhoven
**Acal Nederland b.v.**
Beatrix de Rijkweg 8
5657 EG Eindhoven
Tel: 31.40.2.502602
Fax: 31.40.2.510255

**Switzerland**
Brugg
**LSI Logic Sulzer AG**
Mattenstrasse 6a
CH 2555 Brugg
Tel: 41.32.3743232
Fax: 41.32.3743233

**Taiwan**
Taipei
**Avnet-Mercuries Corporation, Ltd**
14F, No. 145,
Sec. 2, Chien Kuo N. Road
Taipei, Taiwan, R.O.C.
Tel: 886.2.2516.7303
Fax: 886.2.2505.7391

**Lumax International Corporation, Ltd**
7th Fl., 52, Sec. 3
Nan-Kang Road
Taipei, Taiwan, R.O.C.
Tel: 886.2.2788.3656
Fax: 886.2.2788.3568

**Prospect Technology Corporation, Ltd**
4Fl., No. 34, Chu Luen Street
Taipei, Taiwan, R.O.C.
Tel: 886.2.2721.9533
Fax: 886.2.2773.3756

**Wintech Microeletronics Co., Ltd**
7F., No. 34, Sec. 3, Pateh Road
Taipei, Taiwan, R.O.C.
Tel: 886.2.2579.5858
Fax: 886.2.2570.3123

**United Kingdom**
Maidenhead
**Azzurri Technology Ltd**
16 Grove Park Business Estate
Waltham Road
White Waltham
Maidenhead, Berkshire SL6 3LW
Tel: 44.1628.826826
Fax: 44.1628.829730

Milton Keynes
**Ingram Micro (UK) Ltd**
Garamonde Drive
Wymbush
Milton Keynes
Buckinghamshire MK8 8DF
Tel: 44.1908.260422

Swindon
**EBV Elektronik**
12 Interface Business Park
Bincknoll Lane
Wootton Bassett,
Swindon, Wiltshire SN4 8SY
Tel: 44.1793.849933
Fax: 44.1793.859555

♦ Sales Offices with Design Resource Centers