USER'S GUIDE

LSI22915A
PCI to Dual Channel
Ultra160 SCSI
Host Adapter

September 2003

Version 1.3

LSI LOGIC®

DB15-000155-03

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 SYM#### 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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取扱説明書に従って正しい取り扱いをして下さい。

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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Document DB15-000155-03, Version 1.3 (September 2003)
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Preface

This book is the primary reference and user's guide for the LSI22915A PCI to Dual Channel Ultra160 SCSI Host Adapter. It lists features and technical specifications of the LSI22915A and has detailed instructions on installing the board and connecting SCSI devices to it.

Audience

This document assumes that you have some familiarity with the SCSI interface and SCSI devices. It is intended to help you install and use the LSI22915A host adapter.

Organization

This document has the following chapters and appendix:

- Chapter 1, **Describing the LSI22915A**, defines the features, interfaces and characteristics of the LSI22915A.
- Chapter 2, **Installing the LSI22915A**, provides both quick and detailed installation instructions.
- Chapter 3, **Technical Specifications**, describes the physical and operational environments of the LSI22915A.
- Appendix A, **Glossary of Terms and Abbreviations**, defines various terms that are referenced in this user's guide.

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Related Publications

LSI53C1010-66 PCI to Dual Channel Ultra160 SCSI Multifunction Controller Technical Manual, Version 2.2, Document No. DB14-000126-04

PCI Local Bus Specification, Revision 2.2, www.pcisig.com

PCI Storage Device Management System SDMS™ 4.0 User's Guide, Version 12, Document No. DB15-000099-04

Revision Record

Version	Date	Remarks
1.0	6/2000	Initial version.
1.1	10/2000	All product names changed from SYM to LSI.
1.2	4/2001	Updated to reflect new mechanical drawing, name change, and features.
1.3	9/2003	Corrections made to names and descriptions of some jumpers. Some unneeded technical information removed. General editing and cleanup.

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Chapter 1
Describing the LSI22915A

This chapter describes the features, interfaces, and characteristics of the LSI22915A PCI to Dual Channel Ultra160 SCSI Host Adapter. The chapter includes the following sections:

1.1 Introduction

The LSI22915A has two 16-bit Low Voltage Differential (LVD) and Single-Ended (SE) Ultra160 SCSI channels that connect to the PCI local bus on your computer. The LSI22915A is tailored to systems that require on-board BIOS support. When you install the LSI22915A in your PCI system, you can connect up to 15 SCSI disk drives and other SCSI devices to each of its two SCSI channels. In addition to Ultra160 SCSI devices, the LSI22915A also supports legacy Fast, Ultra, and Ultra2 SCSI devices.

The LSI22915A controls the SCSI devices that are connected to it. The chain of internal and external SCSI devices connected to each SCSI channel is referred to as a SCSI bus.

Storage Device Management System (SDMS™) software operates the board. However, the design of the board allows you to use other SCSI software. BIOS support for this host adapter is incorporated on the board in a 128 Kbyte Flash EEPROM.

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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 LSI22915A.

1.2 Features

This section provides a high-level overview of the PCI interface, the SCSI interfaces, and other board characteristics of the LSI22915A.

1.2.1 PCI Interface

The PCI interface connection is made through edge connector J6, which is shown in Figure 2.1 on page 2-2. The PCI interface includes these features:

- Full 64-bit (66 MHz) DMA bus master
- Zero wait-state bus master data bursts
- PCI Universal 3.3 V/5 V bus support
- Compliance with PC 99 Specification
- Compliance with *PCI Local Bus Specification, Revision 2.2*

1.2.2 SCSI Interfaces

The LSI22915A has two 16-bit, synchronous or asynchronous, SE or LVD interfaces. They support Ultra160 SCSI protocols and 16-bit arbitration. The interface is made through connectors J1 and J3 for Channel A, and J7 and J4 for Channel B. The SCSI interface includes these features:

- Two separate SCSI channels
- 16-bit SE/LVD
- Automatically enabled termination
- Fast, Ultra, Ultra2, and Ultra160 data transfer capability
- SCSI termination power (TERMPWR) source with autoresetting circuit breaker and TERMPWR shorted LED for each channel
- SCSI Plug and Play
- SCSI Configured AutoMatically (SCAM)
- Flash EEPROM for BIOS storage

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- Serial nonvolatile random access memory (NVRAM) on each channel for user configuration utility and SCAM information storage
- SCSI activity LED for each channel

1.2.3 Board Characteristics

The board characteristics of the LSI22915A are:

- PCI board dimensions of 4.2 by 8.4 inches (106.68 by 213.36 mm)
- Universal 64-bit PCI card edge connector
- Two 68-pin Very High Density Cable Interconnect (VHDCI) connectors, one for each external channel
- Two 68-pin high density (HD) connectors, one for each internal channel
- ISA/EISA bracket

1.2.4 LED Interface

The LSI22915A LED interface is a four-wire arrangement that allows you to connect an LED harness to the board. The connector on the LSI22915A is HDR2 for both channels. Table 3.2 on page 3-4 lists the signal names and pin numbers for this LED interface.

The LSI22915A has four individual LEDs per channel to indicate the operating state of the board.

1.2.5 Ultra160 SCSI Benefits

Ultra160 SCSI is an extension of the SCSI Parallel Interface-3 (SPI-3) draft standard that allows faster synchronous SCSI data transfer rates than Ultra2 SCSI. When enabled, Ultra160 SCSI performs 80 megatransfers/s, resulting in approximately double the synchronous data transfer rates of Ultra2 SCSI. The LSI53C1010 performs 16-bit, Ultra160 SCSI synchronous data transfers as fast as 160 Mbytes/s.

The faster data transfer rate is most noticeable in heavily loaded systems or large block size applications such as video on demand and image processing.

Important. To achieve Ultra160 SCSI performance, you must connect only LVD devices to the bus. If you mix any SE devices with LVD devices, the entire bus drops to SE, limiting bus performance to Ultra SCSI levels.

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1.2.6 Double Transition (DT) Clocking

DT clocking is used to achieve Ultra160 data transfer speed. DT clocking means transferring data on both rising and falling edges of the request and acknowledge signals. DT clocking doubles data transfer speeds without increasing the clock rate.

1.2.7 Cyclic Redundancy Check (CRC)

Ultra160 SCSI includes CRC, which offers higher levels of data reliability by ensuring complete integrity of transferred data. CRC is a 32-bit scheme, referred to as CRC-32. CRC is guaranteed to detect all single bit errors, any two bits in error, or any combination of errors within a single 32-bit range.

1.2.8 Asynchronous Information Protection (AIP)

The LSI53C1010 also supports AIP, which protects all nondata phases, including command, status, and messages. CRC, along with AIP, provides end-to-end protection of the SCSI I/O.

1.3 SureLINK™ Ultra160 SCSI Domain Validation Benefits

SureLINK Domain Validation represents the latest SCSI interconnect management solution. It ensures robust and low risk Ultra160 SCSI implementations by extending the Domain Validation guidelines documented in the ANSI T10 SPI-3 specifications. Domain Validation verifies that the system is capable of transferring data at Ultra160 speeds, allowing it to renegotiate to lower speed and bus width if necessary.

SureLINK Domain Validation controls the manageability enhancements in the LSI53C1010 PCI to Dual Channel Ultra160 SCSI controller. Fully integrated in the SDMS software solution, SureLINK technology provides Domain Validation at boot time, as well as throughout system operation.

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1.4 LVDlink™ Technology Benefits

The LSI22915A supports LVD, a signaling technology that increases the reliability of SCSI data transfers over longer distances than those supported by SE SCSI. The low current output of LVD allows the I/O transceivers to be integrated directly onto the chip. LVDlink technology lowers the amplitude of noise reflections and allows higher transmission frequencies. LVD provides a long-term migration path to even faster SCSI transfer rates without compromising signal integrity, cable length, or connectivity.

Important: All SCSI devices on the bus must be LVD or SE. If the board detects a High Voltage Differential (HVD) device, it puts the SCSI bus in the high impedance state and shuts down.

1.5 TolerANT® Technology Benefits

The LSI53C1010 feature TolerANT technology, which includes active negation on the SCSI drivers and input signal filtering on the SCSI receivers. The benefits of TolerANT technology include increased noise immunity when the signal transitions to HIGH, better performance due to balanced duty cycles, and improved fast SCSI transfer rates. In addition, TolerANT SCSI devices do not cause glitches on the SCSI bus at power-up or power-down. This protects other devices on the bus from data corruption.

When it is used with the LVDlink transceivers, TolerANT technology provides excellent signal quality and data reliability in real world cabling environments. TolerANT technology is compatible with both the Alternative One and Alternative Two termination schemes proposed by the ANSI.

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Chapter 2
Installing the LSI22915A

This chapter provides instructions on how to install the LSI22915A. The chapter contains the following sections:

2.1 Quick Installation Procedure

This section is intended for the experienced computer user who has experience installing host adapters and setting up a SCSI bus. For more detailed information, refer to Section 2.2, “Detailed Installation Procedure.”

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

Step 1. *Ground yourself* before handling the host adapter board. LSI Logic recommends using a static ground strap.

Step 2. Remove the LSI22915A from the packaging and check that it is not damaged. Figure 2.1 shows an example of this host adapter board.

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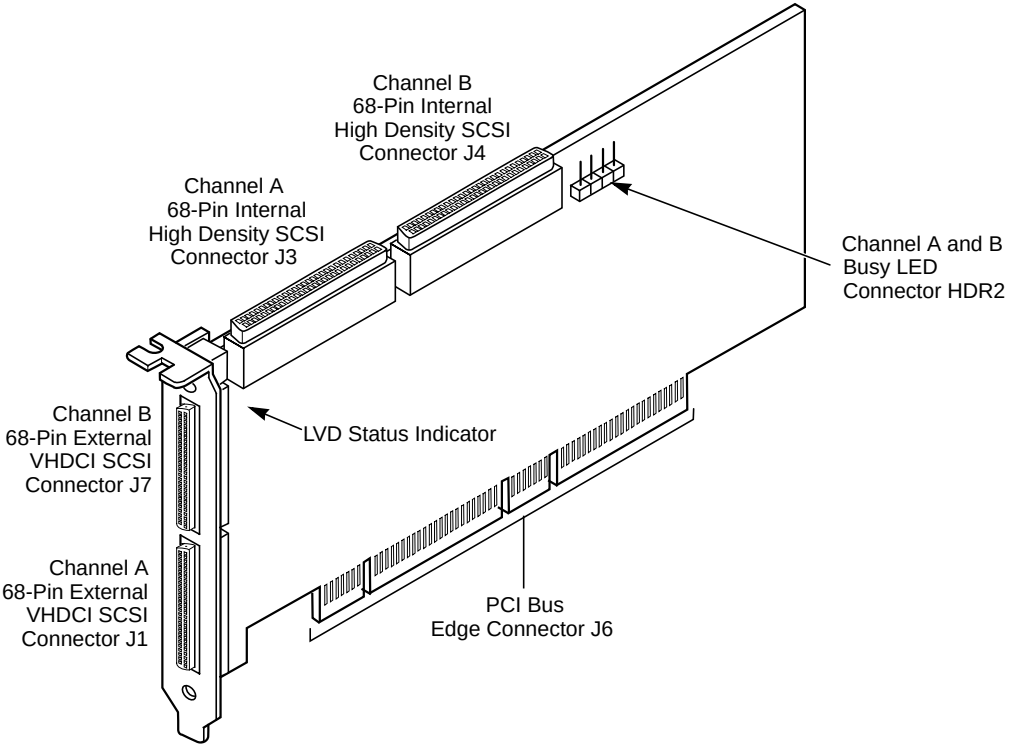
Figure 2.1 Hardware Connections for the LSI22915A



Step 3. Switch off and unplug your system.

Step 4. Open your PC cabinet.

Step 5. Locate the PCI slots in the PC.

Step 6. Insert the LSI22915A board into the selected PCI slot.

Step 7. Connect the internal and external SCSI devices.

Step 8. Connect the LED cable to HDR2 on your SCSI host adapter, if you wish to connect the LED to the SCSI LED connector.

Step 9. Terminate the SCSI bus.

Step 10. Set the SCSI IDs of the SCSI devices. The SCSI bus requires proper termination and no duplicate SCSI IDs.

Step 11. Make any configuration changes.

Step 12. Close your PC cabinet cover. The host adapter installation is complete.

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Step 13. Refer to the *PCI Storage Device Management System SDMS™ 4.0 User's Guide* (or the guide for the software you use) to load the driver software for your particular operating system.

2.2 Detailed Installation Procedure

This section provides detailed instructions for installing the LSI22915A and connecting it to your SCSI devices. If, after reviewing this procedure, you are not confident that you can perform the tasks as described here, LSI Logic suggests that you get assistance.

2.2.1 Preparing for Installation

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

Step 1. *Ground yourself* before removing the host adapter board from its package.

Caution: 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. LSI Logic recommends using a static ground strap.

Step 2. Remove the LSI22915A from the packaging and check that it is not damaged. Figure 2.1 shows this host adapter.

Step 3. Switch off the computer and unplug power cords for all components in your system.

Step 4. Remove the cover from your computer per the instructions in the user's manual for your system to access the PCI slots.

Step 5. Locate the PCI slots in your PC.

Important: The LSI22915A requires a PCI slot that allows bus master operation. Refer to the user's manual for your computer to confirm the location of the PCI slots.

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2.2.2 Inserting the Host Adapter

Step 1. Remove the blank bracket panel on the back of the computer aligned with the PCI slot you intend to use. Save the bracket screw.

Step 2. Carefully insert edge connector J6 of the host adapter into the PCI slot. Make sure the edge connector is properly aligned before pressing the board into place. The bracket around connectors J1 and J7 should fit where you removed the blank panel. Refer to Figures 2.1 and 2.2 for details.

Note: You can install a 64-bit host adapter in a 32-bit slot if no 64-bit slots are available. However, if you do this, the data transmission rate is limited to standard PCI speed.

Note: You may notice that the components on a PCI host adapter face the opposite way from non-PCI adapter boards you have in your system. This orientation is correct. The board is keyed and can only be inserted one way.

Step 3. Secure the board with the bracket screw before connecting internal and external SCSI devices. Refer to Figure 2.2.

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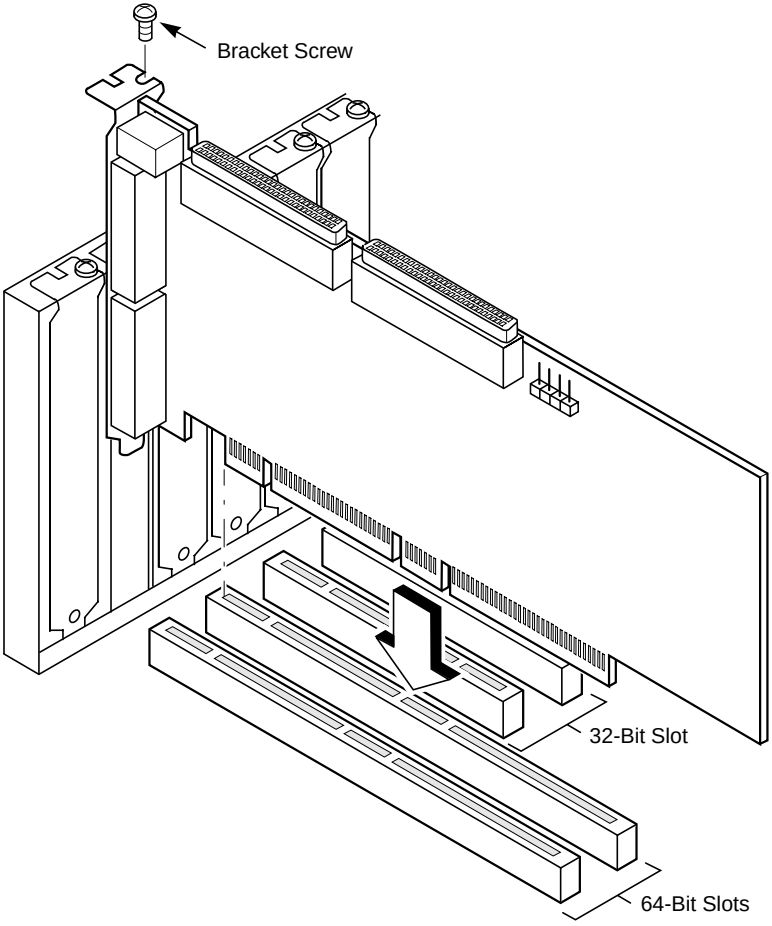
Figure 2.2 Inserting the Host Adapter



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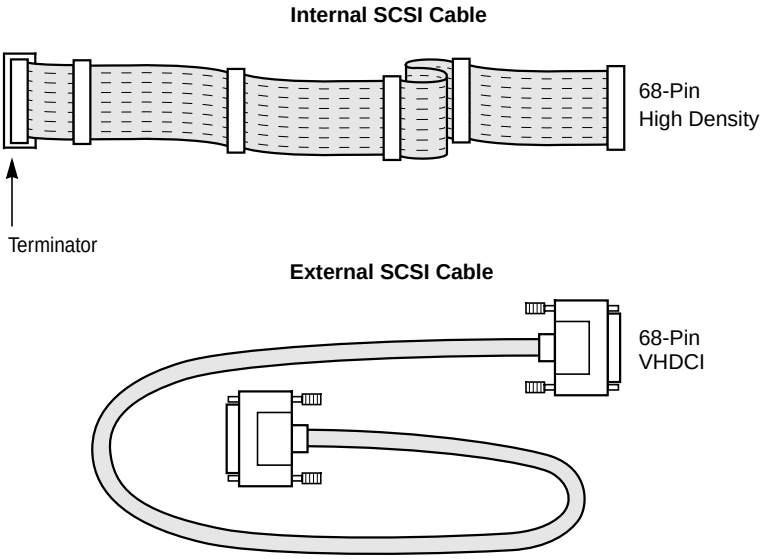
2.2.3 Connecting SCSI Devices

All internal SCSI devices are connected to the LSI22915A with an unshielded, 68-conductor ribbon cable. 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 proper pin-1 orientation. Some internal cables have a terminator on one end, as shown in Figure 2.3. When the SCSI devices are connected, this end should be farthest from the host adapter.

All external SCSI devices, such as an external disk drive, are connected to the LSI22915A with shielded, 68-conductor cables. The connectors on this cable are always keyed to ensure proper pin-1 orientation. Figure 2.3 shows both types of SCSI cables.

Figure 2.3 SCSI Cables



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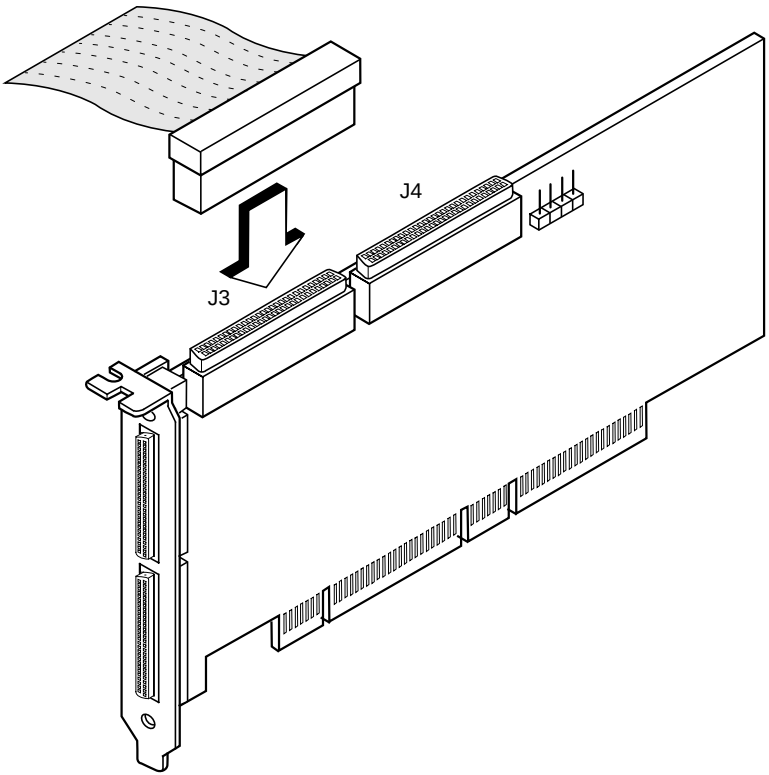
2.2.4 Connecting Internal SCSI Devices

This section provides step-by-step instructions for connecting internal SCSI devices, such as disk drives, to the LSI22915A. If you only have external SCSI devices, skip to Section 2.2.5, “Connecting External SCSI Devices,” on page 2-12.

Step 1. Plug one end of the 68-pin internal SCSI ribbon cable into either connector J3 or J4. Figure 2.4 shows how to make this connection.

Important: You must match pin 1 on this and all subsequent connections.

Figure 2.4 Connecting Internal SCSI Ribbon Cable to Host Adapter



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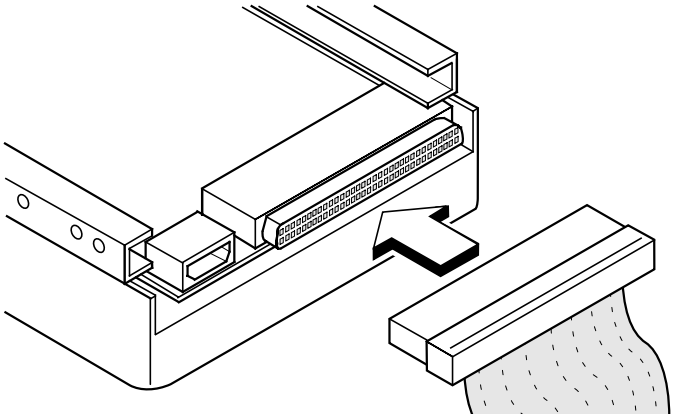
Step 2. If you have only one internal device to connect, plug the other end of the internal SCSI ribbon cable into the SCSI connector on your internal SCSI device. Figure 2.5 shows how to do this.

Note: If the internal SCSI device cannot be terminated, you must use a cable with a built-in SCSI terminator. This connector must be on the *end* of the SCSI cable.

Figure 2.5 Connecting SCSI Ribbon Cable to Internal SCSI Device



If you have more than one internal SCSI device to connect, use an internal SCSI ribbon cable with the required number of connectors attached along its length and continue with the next step. If you have only one internal device, skip to page 2-11.

Step 3. Plug the cable into each additional internal SCSI device as shown in Figure 2.6.

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Figure 2.6 Connecting Additional Internal SCSI Devices

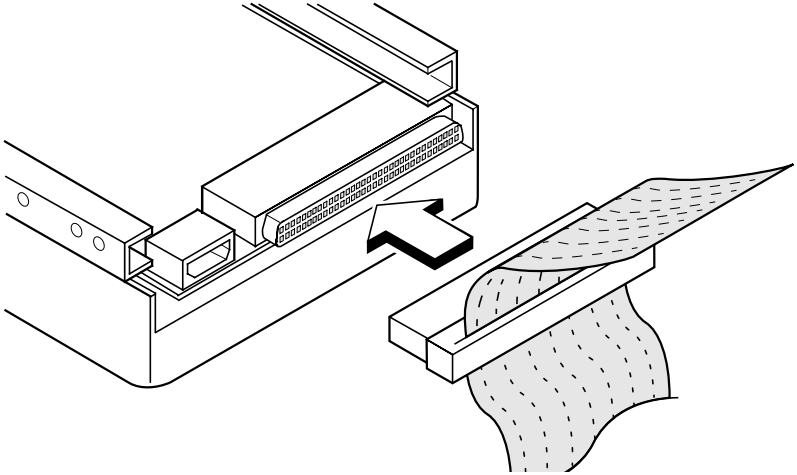

Figure 2.7 shows an example of how to connect multiple internal SCSI devices. Make sure to match pin 1 on all the connections.

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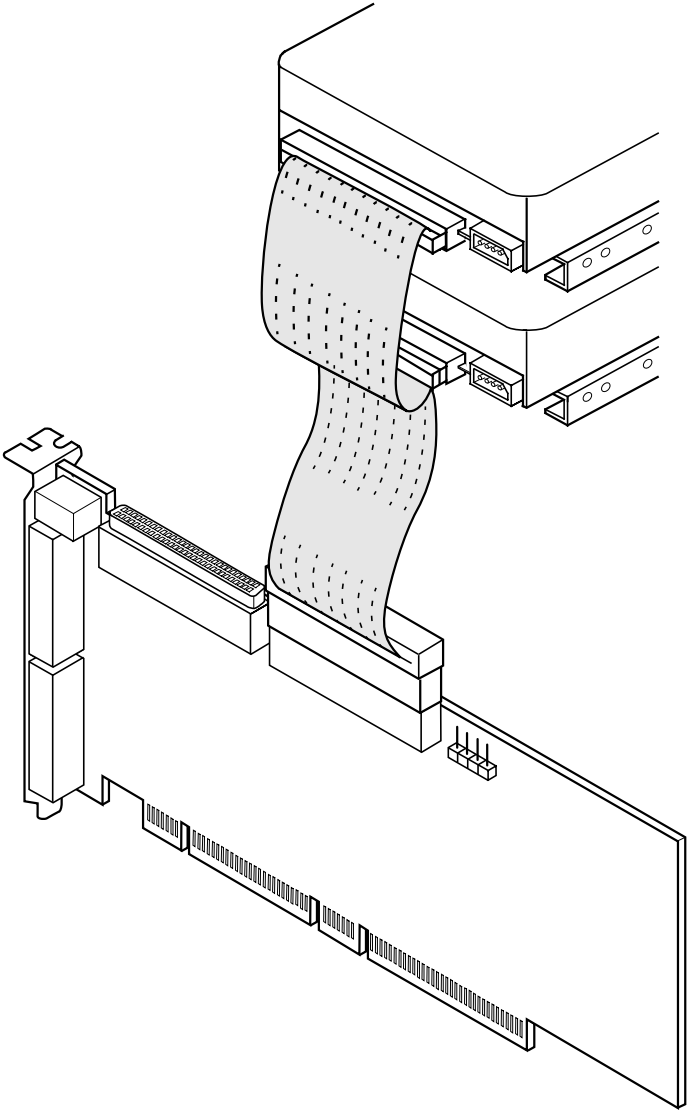
Figure 2.7 Connecting Multiple Internal SCSI Devices



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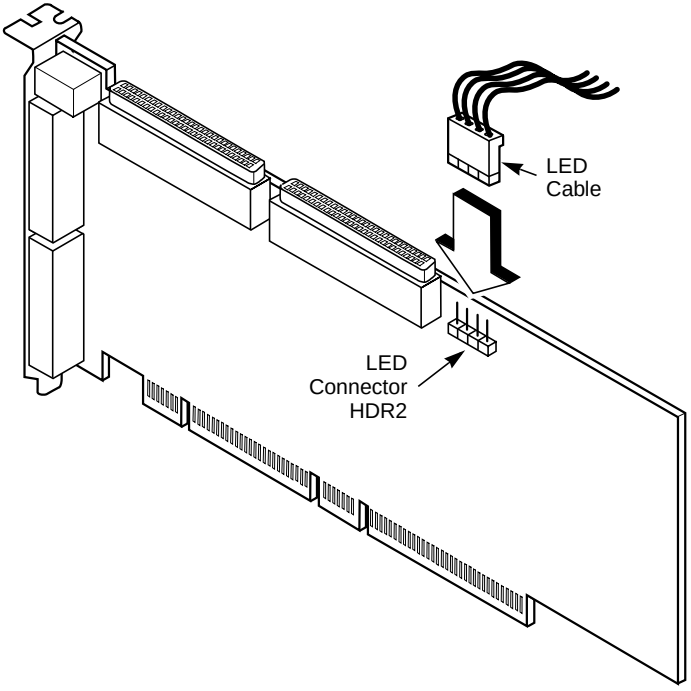
Most PC cabinets have a front panel LED. If you want the front panel LED to indicate activity on the SCSI bus, follow the next step.

Step 4. Connect the LED cable to HDR2 on the host adapter, as shown in Figure 2.8.

When properly connected, the front panel LED lights up when there is activity on the SCSI bus.

The LED connector HDR2 is not keyed. The orientation of the LED cable should not matter as long as all four pins are connected. If the LED does not light during SCSI bus activity from this host adapter, you may have to rotate the LED cable connector 180 degrees on HDR2. If your connector has only two wires, refer to Table 3.2 on page 3-4 for connector pinout information.

Figure 2.8 SCSI LED Connector



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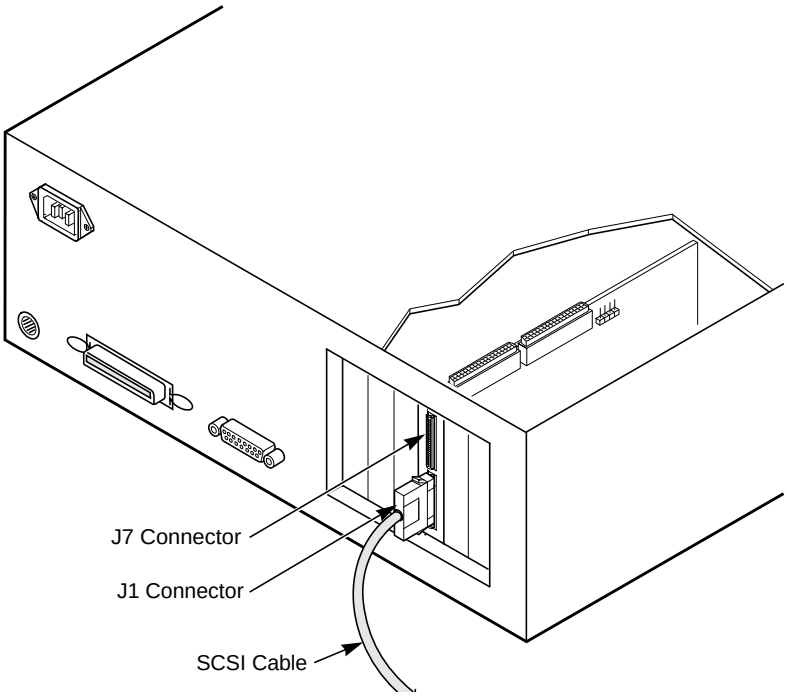
2.2.5 Connecting External SCSI Devices

This section provides step-by-step instructions for connecting external SCSI devices to the LSI22915A.

Step 1. Plug the 68-pin HD connector on one end of a shielded external SCSI cable into the host adapter connector J1 or J7. Figure 2.9 shows this connection.

Figure 2.9 Connecting External SCSI Cable to Host Adapter



Step 2. Plug the 68-pin connector on the other end of the shielded external SCSI cable into the SCSI connector on your external SCSI device. Figure 2.10 shows how to make this connection.

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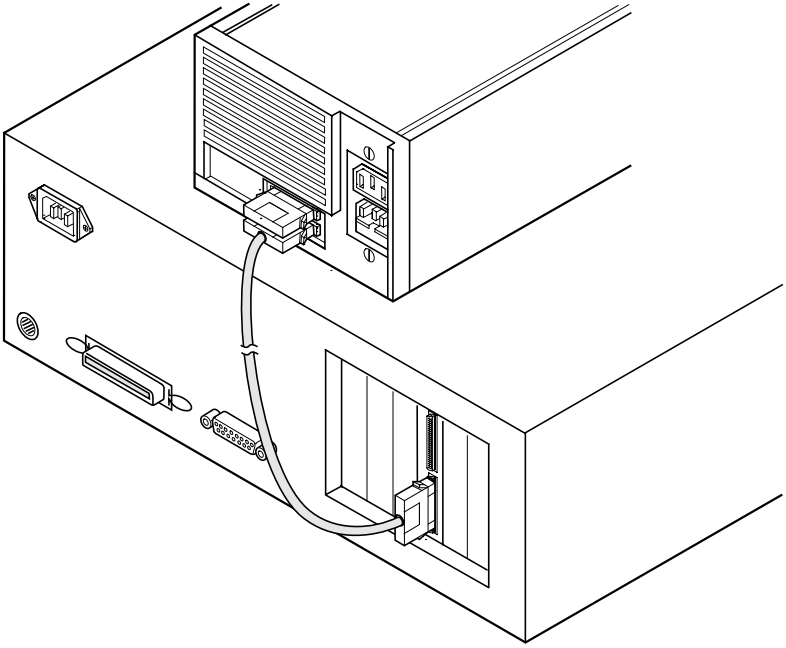
Figure 2.10 Connecting External SCSI Cable to External SCSI Device



If this is the only external SCSI device on your system, skip to Section 2.2.6, “Terminating the SCSI Bus,” on page 2-15 for termination instructions. If you have multiple SCSI devices, follow Step 3.

Step 3. Chain multiple SCSI devices together with shielded external SCSI cables. Figure 2.11 shows an example of how to connect external SCSI devices.

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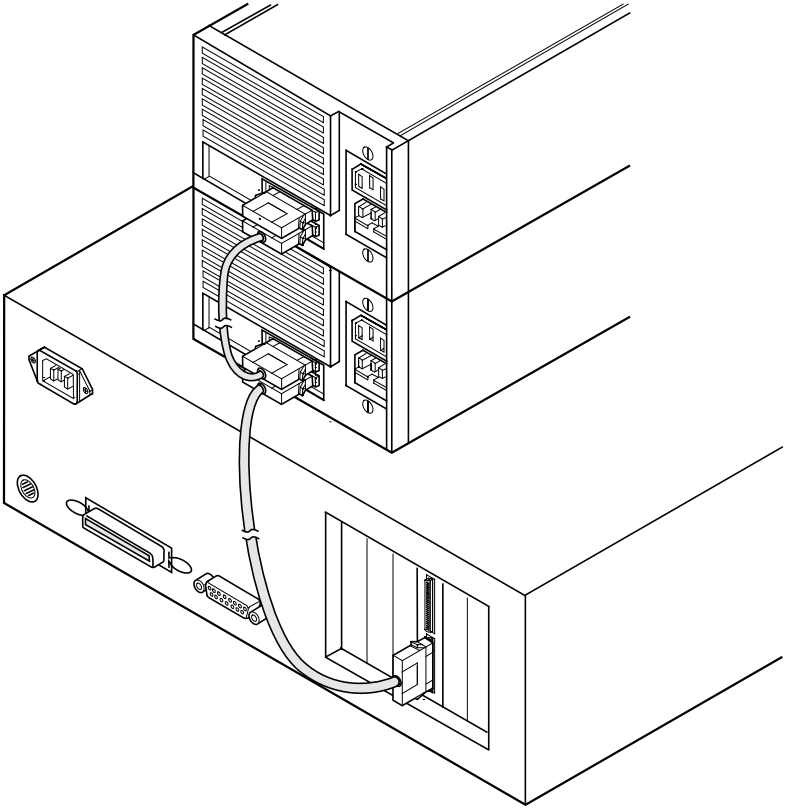
Figure 2.11 Chaining Multiple External SCSI Devices Together



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2.2.6 Terminating the SCSI Bus

The devices that make up the SCSI bus are connected serially (chained together) with SCSI cables. The SCSI devices at each end of the SCSI bus must have their terminators active. The SCSI devices between the two end devices must have their terminators removed or disabled. The LSI22915A automatically enables its own termination when it is at the end of the bus. (In other words, the LSI22915A terminates itself if you connect *only* internal SCSI devices or *only* external SCSI devices.)

LVD SCSI devices are usually terminated with external terminators, but sometimes termination is set with jumpers or with a switch on the device. Refer to the device manufacturer's instructions and to the computer's user's manual to learn how to change termination settings on the device.

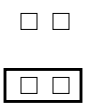
Caution: The LSI22915A may enable its own termination erroneously if it is directly cabled to another SCSI device or host adapter that uses the same sensing method. (The LSI22915A senses SCSI devices by detecting the ground signal on pin 50 of the SCSI cable.)

As stated above, the LSI22915A automatically terminates itself when it is at the end of the SCSI bus. You can disable the autotermination feature on SCSI Channel A by installing a jumper on the HDR3 connector, or on SCSI channel B by installing a jumper on the HDR5 connector. (Figure 3.1 on page 3-2 shows where these headers are located.)

Note: There are very few reasons for disabling autotermination on the LSI22915A. In nearly all situations it should be left enabled (the default).

Figure 2.12 shows how jumpers on HDR3 and HDR5 control autotermination:

Figure 2.12 Autotermination Jumpers



Autotermination Enabled (No Jumper Installed)

Termination Disabled (Jumper Installed)

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The LSI22915A automatically controls SCSI bus termination for these three different bus configurations:

- Section 2.2.6.1, “Internal SCSI Devices Only”
- Section 2.2.6.2, “External SCSI Devices Only”
- Section 2.2.6.3, “Internal and External SCSI Devices”

2.2.6.1 Internal SCSI Devices Only

If you connect only internal SCSI devices to the host adapter, you must terminate the last internal device on the SCSI bus and disable termination on all other devices. Termination on the host adapter is automatically enabled.

Figure 2.13 shows how termination is set for a configuration with internal SCSI devices only.

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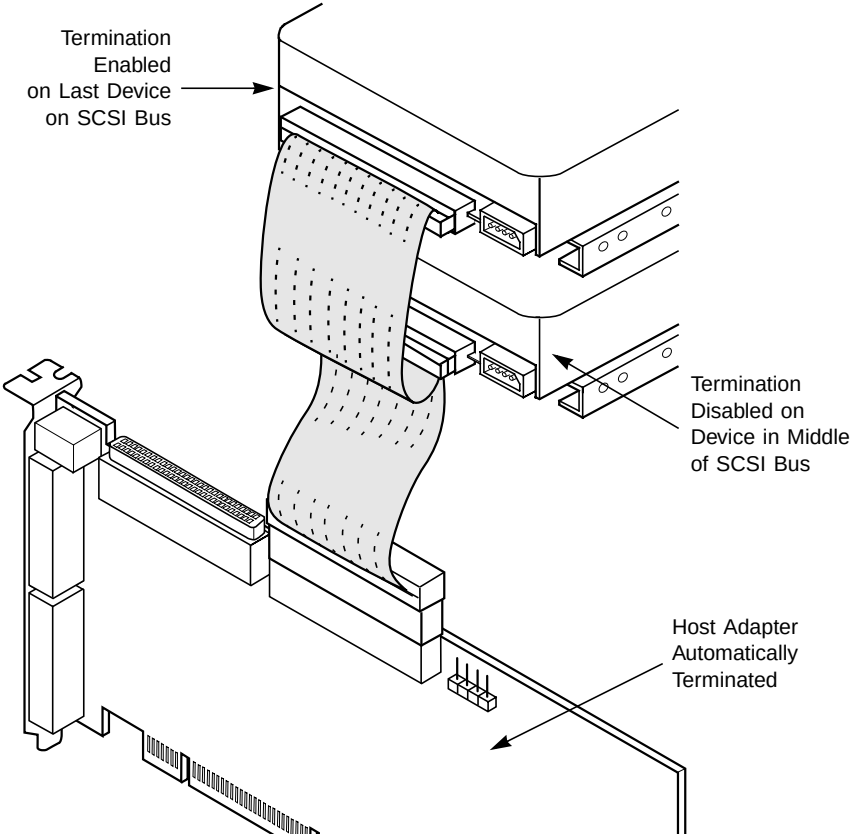
Figure 2.13 Internal SCSI Device Termination



2.2.6.2 External SCSI Devices Only

If you connect only external SCSI devices to the host adapter, you must terminate the last external device on the SCSI bus and disable termination on all other devices. Termination on the host adapter is automatically enabled.

Figure 2.14 shows how termination is set for a configuration with external SCSI devices only.

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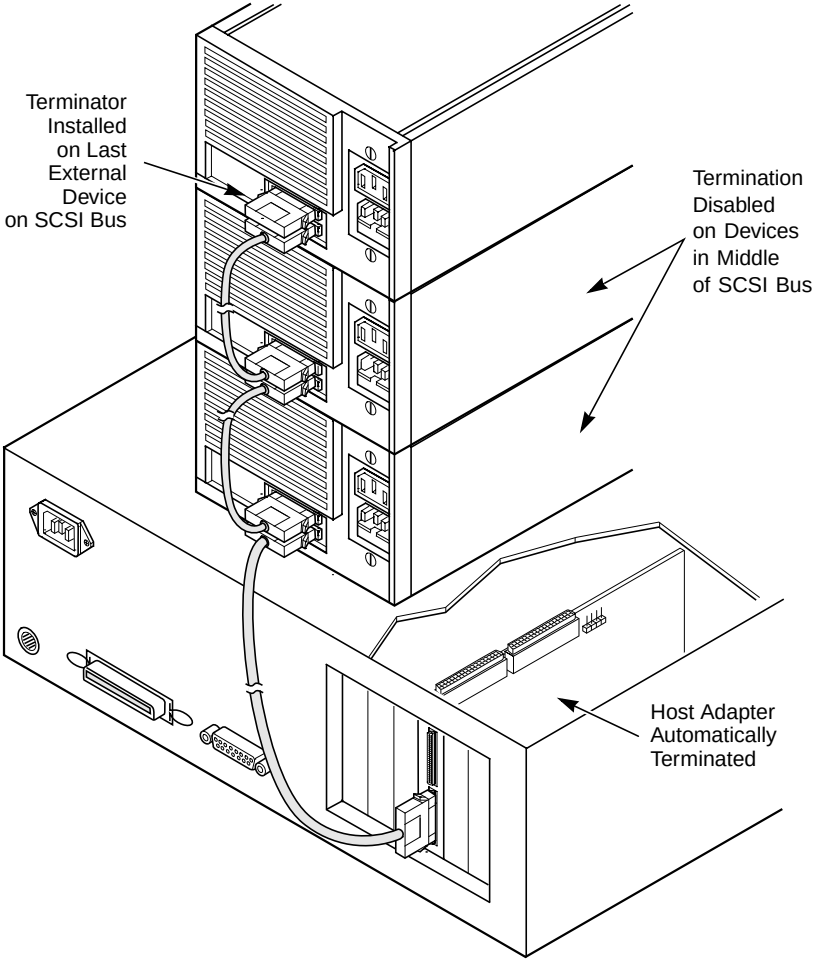
Figure 2.14 External SCSI Device Termination



2.2.6.3 Internal and External SCSI Devices

If you connect both internal and external SCSI devices to the host adapter, you must terminate the last internal and external devices on the SCSI bus and disable termination on all other devices. Termination on the host adapter is automatically disabled.

Figure 2.15 shows how termination is set for a configuration with internal and external devices.

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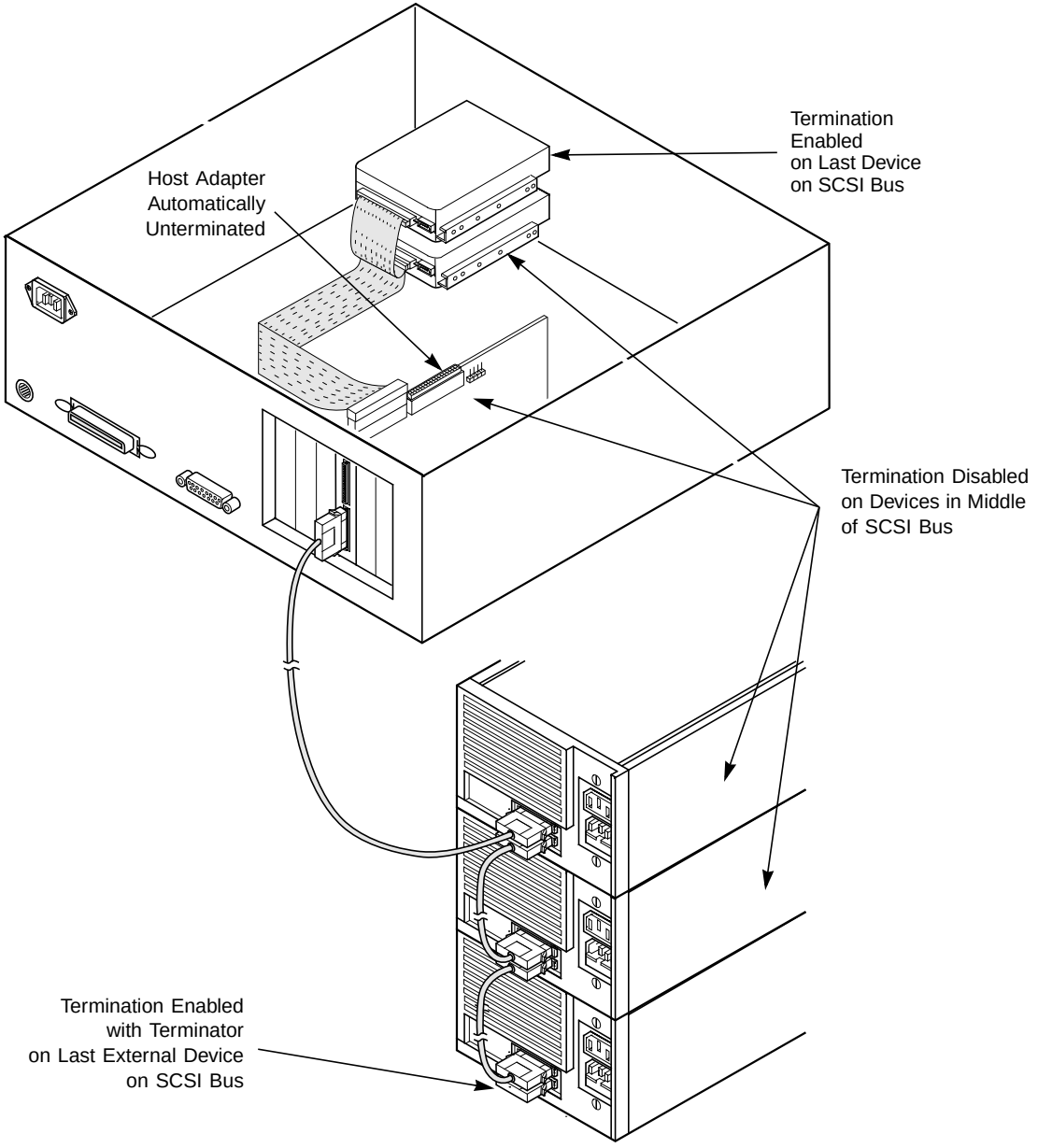
Figure 2.15 Internal and External SCSI Device Termination



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Note: If the LSI22915A is connected to another host adapter or SCSI device that uses the same sensing method for automatic termination, you must override the termination for that channel by installing a jumper or by using software control.

2.2.7 Setting SCSI IDs

Set each SCSI device and the host adapter to a separate SCSI ID, 0 through 15. SCSI ID 7 is the preset host adapter setting, giving it the highest priority on the 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.

Normally, you should not change the host adapter SCSI ID setting from its default. If you wish to do so, refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide,* which explains how to change the host adapter ID using the LSI Logic SCSI BIOS Configuration Utility.

SCSI IDs on hard disk drives and other SCSI devices are usually set with jumpers or with a switch on the device. Refer to the device documentation to determine the ID of each device and how to change it. No two devices on the SCSI bus can have the same SCSI ID.

Step 1. Determine the SCSI ID of each device on the SCSI bus, noting any duplications.

Step 2. Make any necessary changes to the SCSI IDs and record the IDs in Table 2.1 for future reference.

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Table 2.1 SCSI ID Record

SCSI ID	SCSI Channel A	SCSI Channel B
15		
14		
13		
12		
11		
10		
9		
8		
7	LSI22915A (default)	LSI22915A (default)
6		
5		
4		
3		
2		
1		
0		

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2.3 Completing the Installation

Before replacing the cover on your computer, review this installation procedure by following the steps listed. 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 cabinet cover on your computer.

Step 2. Plug in all power cords.

Step 3. Switch power on to all devices and to your computer.

Step 4. Wait for your computer to boot up.

Step 5. Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* (or to the guide for the software you plan to use) to load the driver software for your particular operating system and to change the configuration of your host adapter, if necessary.

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Chapter 3
Technical Specifications

This chapter explains the technical specifications of the LSI22915A. Figure 3.1 lists the key elements of this board. The chapter contains the following sections:

- Section 3.1, “Physical Environment”
- Section 3.2, “Operational Environment”

3.1 Physical Environment

This section discusses the physical, electrical, thermal and atmospheric, and safety characteristics of the LSI22915A. It should be noted that this board is compliant with electromagnetic standards set by the FCC.

3.1.1 Physical Characteristics

The dimensions of the LSI22915A are approximately 4.2 by 8.4 inches (106.68 by 213.36 mm). The LSI22915A interfaces with the PCI bus through edge connector J6. The component height on the top and bottom of the LSI22915A follows the *PCI Local Bus Specification, Revision 2.2,* standard.

The LSI22915A has two internal 68-pin high density connectors: J3 for SCSI Channel A, and J4 for SCSI Channel B. It also has two external 68-pin VHDCI connectors: J1 for SCSI Channel A, and J7 for SCSI Channel B.

The J1 and J7 connectors extend through the ISA/EISA bracket, which is attached to the face of the connector outside of the cabinet where the LSI22915A is installed. The HDR2 connector is a 4-pin one row right-angle header. It connects the Busy LED for both Channel A and Channel B.

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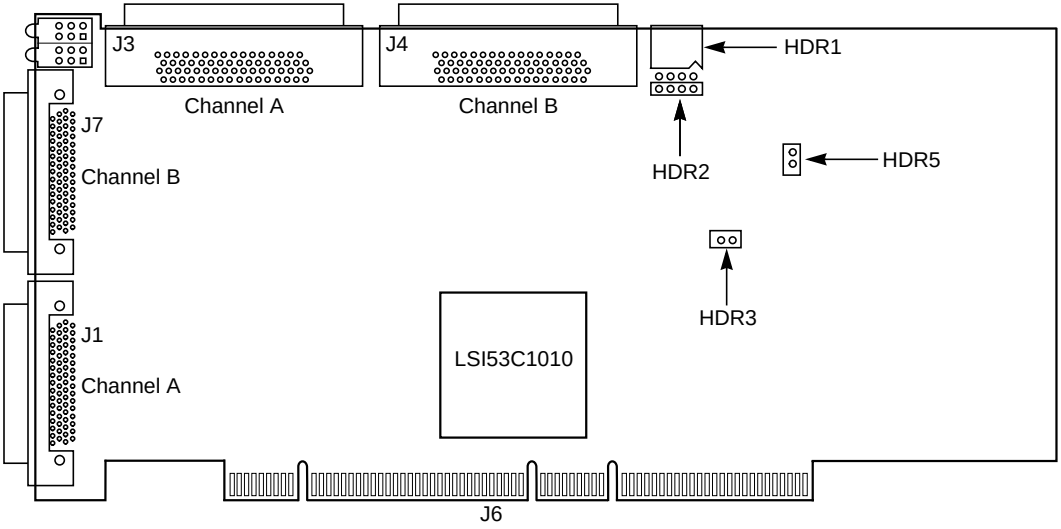
Figure 3.1 LSI22915A Board Layout



3.1.2 Electrical Characteristics

Table 3.1 lists the LSI22915A maximum power requirements, which include SCSI TERMPWR (termination power), under normal operation.

Table 3.1 Maximum Power Requirements

+5 V DC	±5%	3.0 A	Over the operating range 5–55 °C

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 30 seconds before the self-resetting TERMPWR short circuit protection device opens.

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3.1.3 Thermal and Atmospheric Characteristics

The thermal and atmospheric characteristics of the LSI22915A host adapter board are:

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

The following parameters define a storage and transit environment for the LSI22915A host adapter board:

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

3.1.4 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. Because this board is installed in a PCI bus slot, all voltages are below the SELV 42.4 V limit.

3.2 Operational Environment

The LSI22915A is designed for use in PCI computer systems with an ISA/EISA bracket type. The SDMS software operates the board, but the board design does not prevent the use of other software.

3.2.1 PCI Interface

The PCI interface operates as a 32-bit or 64-bit DMA bus master. The host adapter interfaces with the PCI bus through connector J6. The signal definitions and pin numbers conform to the *PCI Local Bus Specification, Revision 2.2,* standard. Refer to Figure 3.1 for details.

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3.2.2 SCSI Interface

The SCSI interface operates as two 16-bit synchronous or asynchronous SE/LVD buses. It supports Ultra160 SCSI protocols and 16-bit arbitration. The LSI22915A provides automatic active differential SCSI termination and supplies SCSI TERMPWR.

The SCSI interface uses connectors J1 and J3 for Channel A, and connectors J7 and J4 for Channel B. Connectors J1 and J7 are 68-pin VHDCI right-angle receptacles that protrude through the ISA/EISA bracket. Connectors J3 and J4 are 68-pin high density latching right-angle receptacles for internal SCSI connections.

3.2.3 LED Interface

The LED interface is a four-wire arrangement that allows you to connect an LED harness to the board. J5 is the connector for both channels. Table 3.2 lists the signal and pin numbers for this SCSI host adapter.

Table 3.2 LED Connector Pinout

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

Each SCSI channel of the LSI22915A has four activity LEDs that indicate the operating state of the channel:

- SCSI Activity – Green LED, left edge of board
- TERMPWR Shorted – Yellow LED, left edge of board
- LVD Mode – Green LED, left edge of board in LVD Mode
- TERMPWR Good – Green LED, left edge of board when TERMPWR is above +3 V

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Appendix A
Glossary of Terms and Abbreviations

160/m	An industry initiative extension of the Ultra160 SCSI specification that requires support of Double Transition Clocking, Domain Validation, and Cyclic Redundancy Check.
AIP	Asynchronous Information Protection. Provides error checking for asynchronous, nondata phases of the SCSI bus.
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 boots and controls 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 unbroken signal lines across which information is transmitted from one part of a computer system to another. Connections to the bus are made using taps on the lines.
CISPR	A special international committee on radio 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, keyboard, and peripheral devices) that make up a computer system; or the software settings that allow the hardware components to communicate with each other.
CRC	Cyclic Redundancy Check. An error detection code used in Ultra160 SCSI. Four bytes are transferred with the data to increase the reliability of data transfers. CRC is used on the Double Transition (DT) Data-In and DT Data-Out phases.

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Differential SCSI	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).
DMA	Direct Memory Access. A type of computer memory access that does not involve the microprocessor. DMA often transfers data directly between memory and an “intelligent” peripheral device.
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 processor is in control and the flow is by byte.
Domain Validation	A software procedure in which a host queries a device to determine its ability to communicate at the negotiated Ultra160 data rate.
DT Clocking	In DT Clocking, data is sampled on both the asserting and deasserting edge of the REQ/ACK signal. DT clocking may only be implemented on an LVD SCSI bus.
EEPROM	Electronically Erasable Programmable Read Only Memory. A memory chip that typically stores 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 specific types of shielded cables.
Fast SCSI	A standard for SCSI data transfers. Fast SCSI 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.
Host Adapter	A circuit board or integrated circuit 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.
ISA	Industry Standard Architecture. A type of computer bus used in most PCs. ISA allows devices to send and receive data up to 16 bits at a time.
Kbyte	Kilobyte. A measure of computer storage equal to 1024 bytes.

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LUN	Logical Unit Number. An identifier, zero to seven, for a logical unit.
LVDlink	Low Voltage Differential Link. Allows greater Ultra3 SCSI device connectability and longer SCSI cables. LVDlink technology lowers the amplitude of noise reflections and allows higher transmission frequencies. Detailed information may be found in Section 1.4, “LVDlink™ Technology Benefits,” on page 1-5.
Mbyte	Megabyte. A measure of computer storage equal to 1024 kilobytes.
NVRAM	Nonvolatile Random Access Memory. Actually, an Electronically Erasable Read Only Memory (EEPROM) chip that stores 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, managing information in memory, and providing the user interface.
PCI	Peripheral Component Interconnect. A local bus specification that allows connection of peripherals directly to computer memory. It bypasses the slower ISA and EISA buses.
SCSI	Small Computer System Interface. A specification for a high-performance peripheral bus and command set. The original standard is referred to as SCSI-1.
SCSI Bus	A host adapter and one or more SCSI devices 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.
SCSI Device	Any device that conforms to the SCSI standard and is attached to a SCSI bus by a SCSI cable. This includes SCSI host adapters, SCSI disk drives, and other kinds of SCSI devices.
SCSI ID	A unique identifier for each SCSI device on the SCSI bus. Each SCSI bus has eight available SCSI IDs numbered 0 through 7 (or 0 through 15 for Wide SCSI). The host adapter is normally assigned the highest ID (7 or 15), giving it priority to control the bus.
SDMS	Storage Device Management System. An LSI Logic software product that manages SCSI system I/O.

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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, which uses a separate ground for each signal).
SureLINK	The domain validation method developed and used by LSI Logic. SureLINK Domain Validation provides three levels of integrity checking: Basic (level 1), Enhanced (level 2), and Margined (level 3).
Synchronous Data Transfer	One of the ways data is transferred over the SCSI bus. Transfers are clocked with fixed frequency pulses. This is faster than asynchronous data transfer. Synchronous data transfers are negotiated between the SCSI host adapter and each SCSI device.
TolerANT	A technology developed and used by LSI Logic to improve data integrity, data transfer rates, and noise immunity, through the use of active negation and input signal filtering.
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. The STA 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. The SCSI Trade Association (STA) supports using the term “Ultra2 SCSI” over the term “Fast-40”.
Ultra160 SCSI	A standard for SCSI data transfers. It allows a transfer rate of up to 160 Mbytes/s over a 16-bit SCSI bus.
VCCI	Voluntary Control Council for Interference.
VHDCI	Very High Density Cable Interconnect.

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